



Short Communication

New records in *Thismia* (Thismiaceae) for Pará state, northern Brazil

Mathias Erich Engels^{1,5}, Fabio Araújo da Silva², Lilien Christiane Ferneda Rocha³
& Eric de Camargo Smidt⁴

Abstract

In the present study, we present new geographic distribution records of *Thismia hyalina* and *T. melanomitra* for Pará State, increasing the number of species of Thismiaceae in this state to three, with the previous register of *T. singeri*. The three species can be separated by the thickness of the roots, the presence of tuberous stems, outer tepal shape and colour, inner tepal shape and colour, and mitre presence. The description, taxonomic, ecological and geographic distribution comments along with photo plates of the studied species are presented.

Key words: Amazon, mycoheterotrophic, Neotropics, Tapajós basin.

Resumo

No presente estudo, apresentamos os novos registros de distribuição geográfica de *Thismia hyalina* e *T. melanomitra* para o estado do Pará, aumentando para três o número de espécies de Thismiaceae neste estado, com o registro anterior de *T. singeri*. As três espécies podem ser separadas pela espessura das raízes; a presença de caule tuberoso; forma e cor das tépalas externas; forma e cor das tépalas internas e presença de mitra. São apresentados a descrição, comentários taxonômicos, ecológicos e de distribuição geográfica e fotografias das espécies estudadas.

Palavras-chave: Amazônia, micoheterotrófica, região neotropical, bacia do rio Tapajós.

Thismia Griff. belongs to the Thismiaceae family and occurs in the Old and New World, covering ca. 90 species (Govaerts 2022). Despite the current circumscription of the genus encompassing New and Old World representatives, molecular studies suggest that *Thismia* is polyphyletic, with Neotropical representatives being a distinct group (Shepeleva *et al.* 2020). In Brazil, 18 species of *Thismia* have been identified; there is greater richness in the Atlantic Forest of the Southeast region, with 11 species (Flora e Funga do Brasil 2023). In Pará, northern Brazil, the first record of *Thismia* was reported less than a decade ago with *Thismia singeri* (de la Sota) Maas & H. Maas (Voloschen *et al.* 2013).

This genus is represented by small mycoheterotrophic herbs, which are difficult to visualise in the field and are not very representative in Herbaria (Silva *et al.* 2020). However, the scientific dissemination of the group to the botanical community, together with the efforts in collecting expeditions, has gradually increased the number of new samples in scientific collections. These discoveries often correspond to new geographic distribution records or new species (Mancinelli *et al.* 2012; Voloschen *et al.* 2013; Guilherme *et al.* 2016; Silva *et al.* 2020, 2022, 2023; Souza 2021; Engels *et al.* 2022; Silva & Braga 2022).

During a field expedition to the Tapajós River Basin in Pará, material from *Thismia* was

¹ Universidade Federal do Paraná, Setor de Ciências Biológicas, Depto. Botânica, Prog. Pós-graduação em Botânica, Centro Politécnico, Curitiba, PR, Brazil. ORCID: <<https://orcid.org/0000-0003-4332-5166>>.

² Universidade Federal Rural da Amazônia/Museu Paraense Emílio Goeldi, Prog. Pós-graduação em Ciências Biológicas - Botânica Tropical, Terra Firme, Belém, PA, Brazil. ORCID: <<https://orcid.org/0000-0002-1944-7246>>.

³ Universidade Federal do Paraná, Setor de Ciências Biológicas, Depto. Botânica, Prog. Pós-graduação em Botânica, Centro Politécnico, Curitiba, PR, Brazil. ORCID: <<https://orcid.org/0000-0002-9555-4887>>.

⁴ Universidade Federal do Paraná, Setor de Ciências Biológicas, Depto. Botânica, Lab. Sistemática e Ecologia Molecular de Plantas, Centro Politécnico, Curitiba, PR, Brazil. ORCID: <<https://orcid.org/0000-0002-1177-1682>>.

⁵ Author for correspondence: mathiasengels@hotmail.com

found, collected and herborized according to standard techniques (Fidalgo & Bononi 1989). The specimens were destined for MBM and RB herbaria (acronyms according to Thiers, 2022 continually updated). The descriptions were made from the examined herborized material. Additionally, online databases were consulted to verify records of *Thismia* in the national territory and adjacent countries (CRIA 2022; Jabot 2022; Tropicos 2022).

In the present study, two new records of Thismiaceae for the state of Pará are presented: *Thismia hyalina* (Miers) Benth. & Hook.f. ex F.Muell., one of the species with the widest known distribution among congeners in the national territory, and *T. melanomitra* Maas & H. Maas, a species known only from the Ecuadorian type material and from a second Brazilian record from the state of Mato Grosso (Silva *et al.* 2020; Flora e Funga do Brasil 2022).

Thismia hyalina (Miers) Benth. & Hook.f. ex F.Muell., Pap. & Proc. Roy. Soc. Tasmania 1890: 234. 1891. \equiv *Myostoma hyalinum* Miers, Trans. Linn. Soc. London 25: 474. 1866. Type: BRAZIL. RIO DE JANEIRO: Serra dos Orgãos, próximo a Petrópolis, 20.IV.1862, *J. Miers* (holotype BM000938116, [line drawn of type in protologue seen]).

Fig. 1

Herb 34–115 mm tall. Roots 3–38 \times 0.3 mm, unthickened filiform, white. Tuber 6–8 \times 2–4 mm, irregular, brown. Stem 13–111 \times 1 mm, white. Leaves 2–4 mm length, verticillated, triangular, acute, white. Flower pedicellate; ovary c. 2 \times 1 mm, white; flower tube 7–10 \times 4–6 mm, obovoid, dark blue; outer tepals 7–14 \times 0.5 mm, filiform, cylindrical; inner tepals c. 4 \times 3–4 mm, laminar and free (not forming mitre), curved over the annulus in natural position, obovate, base rounded to sub-cordate, apex rounded, white; annulus 1–2 mm length, rounded. Stigma c. 2 \times 1 mm, trilobed, orange-salmon; lobes ascendants and curved to the centre. Immature fruits c. 3 \times 2 mm, salmon-hyaline; pedicel etiolated, c. 10 \times 1 mm, whitish. **Examined materials:** BRAZIL. PARÁ: Santarém, 15.II.2022, fl. and fr., *M.E.Engels & F.A.Silva 9607* (MBM).

Thismia hyalina occurs in Peru, Bolivia, and Brazil (Acre, Amazonas, Pará [new record], Mato Grosso, São Paulo and Rio de Janeiro) (Maas *et al.* 1986; Silva *et al.* 2020; Flora e Funga do Brasil 2023). The record of Bolivia is unpublished,

but there is material in an herbarium (*Fuentes 15846A*, MO) identified by a senior specialist of the family in the Neotropics, Dr. Paul Maas (see CRIA 2022). This record is considered in the present study. *Thismia hyalina* inhabits the Amazon and Atlantic Forests. In Pará, it was found in the understorey litter of the Terra Firme Forest, a well-drained and shady environment (Dense Ombrophilous Forest).

Based on available records of the species (Miers 1866; Maas *et al.* 1986; Maas-van de Kamer & Maas 2016; Silva *et al.* 2020), *Thismia hyalina* flowers from December to May and fruiting from December to March. The material from Pará was in flower and unripe fruits in February during the rainy season in the Brazilian Amazon.

Thismia hyalina was found in sympatry and synchrony with *T. melanomitra* in Pará. This event must probably be related to the favourable ecological and environmental conditions in the area, favouring the development of mycoheterotrophic plants. This event has already been observed for *Thismia* species from Mato Grosso (Silva *et al.* 2020) and *Thismia* and other mycoheterotrophic species in southern Brazil (Souza 2021).

Thismia hyalina can be recognised among the other species that occur in Pará by the unthickened filiform roots, the presence of tuberous stem, outer tepals cylindrical and filiform, and by the inner tepals free, laminar, obovate.

Based on the study of different materials from different localities, it was noticed that *T. hyalina* presents considerable variation in the colour of the floral tube, ranging from pale orange (Miers 1866 [type]), whitish to yellowish with vertical red streaks (Maas *et al.* 1986), light salmon (Engels *et al.* 4777 and Engels 4779), white (Laessøe & Okino [SP 44991]), and light orange to red (Silva *et al.* 2020); in the present material from Pará, which is dark blue, the blue colour is more evident in newly opened flowers, becoming blacker when in full anthesis (Fig. 1).

Thismia melanomitra Maas & H. Maas, Opera Bot. 92: 141. 1987. Type: ECUADOR, PROVINCIA DE NAPO: Taguna Taracoa, Rio Napo, without data, Laessøe *et al.* 59947 (holotype AAU [spirit]; isotype U, [photos of live material in protologue seen]).

Fig. 2

Herb 34–86 mm tall. Roots 17–305 \times 1–2 mm, thickened cylindrical and very long, white–brownish. Tuber absent. Stem 16–64 \times 1–2 mm, white. Leaves 1.5–4 mm in length, alternate,



Figure 1 – a-h. *Thismia hyalina* – a. specimen in the leaf litter of the understorey, indicated by the arrow; b. general view of specimens; c. tube detail; d. flower detail in side view; e-f. flower detail in front view; g. specimen with immature fruit in the understorey litter; h. immature fruit detail. Photos by M.E.Engels from M.E.Engels & F.A.Silva 9607.



Figure 2 – a-h. *Thismia melanomitra* – a. specimens in the leaf litter of the understorey, indicated by the arrows; b. general view of specimens; c. detail of the specimens (roots, bud and fruit) in the middle of leaf litter; d-e. detail of flowers in side view; f. flower detail in front view; g. specimen with ripe fruit in the understorey litter; h. ripe fruit detail. Photos by M.E.Engels from M.E.Engels & F.A.Silva 9608.

triangular, acute, white. Flower pedicellate; ovary 3–4 × 4–5 mm, white; flower tube 12–15 × 5–6 mm, oblanceoloid, black; outer tepals 5–6 × 4–5 mm, laminar, ovate, obtuse to rounded, white; inner tepals 5–6 × 2–3 mm, adnate to each other forming the mitre, curved over the annulus, black; mitre hexagonal, surface with 6 triangles foveolate; annulus c. 2 mm length, rounded. Stigma c. 2 × 2 mm, trilobed, white; lobes descendant and curved to the centre. Mature fruit 4–6 × 7–10 mm, whitish; pedicel long etiolated, 13–47 × 2–3 mm, whitish.

Examined materials: BRAZIL. PARÁ: Santarém, 15.II.2022, fl. and fr., M.E. Engels & F.A. Silva 9608 (MBM, RB).

This species is known thus far only from the Amazon Basin, Ecuador and Brazil (Mato Grosso and Pará [new record]) in the Amazon Forests (Maas & Maas 1987; Silva *et al.* 2020; Flora e Funga do Brasil 2023). In Pará, it was found in the understorey litter of the Terra Firme Forest in a well-drained environment and a shady place (Dense Ombrophilous Forest).

Based on the available records of the species (Maas & Maas 1987; Silva *et al.* 2020), *T. melanomitra* flowers from December to April and August and fruited from January to April. The material from Pará was in flower and had ripe fruits in February during the rainy season in the Brazilian Amazon.

Thismia melanomitra can be distinguished from the other species that occur in Pará by the elongated and thickened cylindrical roots; absence of tuberous stem; outer tepals laminar, ovate, white; inner tepals adnate, forming the mitre of black colour and by the mitre with superior hexagonal surface forming six foveolate triangles.

In contrast to the colour variation of *T. hyalina*, all known material of *T. melanomitra*, including the material from Pará, presents a fixed colour pattern, white flowers with tubes and mitre black (Fig. 2).

Although the new records presented here expand the known distribution of these rare mycoheterotrophic species, the deforestation and decrease in the original cover of the Brazilian Amazon Forest (*e.g.*, Fearnside 2006, 2017, 2021), which is advancing daily, represents a threat to the conservation of biodiversity, as well as these species and the general flora, since the region where they were found shows conspicuous strips of deforestation and forest degradation due to the irrational exploitation of timber resources (personal observation *in loco*).

Acknowledgements

We are grateful to Florescer Ambiental Ltda. for all support provided. We thank Alice Gerlach for her help locating specialised bibliographies. The Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES – finance code 001) for providing to M.E.E and F.A.S. a doctoral scholarship. E.C.S. was supported by the National Council for Scientific and Technological Development (CNPq) for Research Productivity Grant CNPq-Level 1D (proc. 314642/2020-0) and CNPq/MCTI/FNDCT N° 18/2021 - Universal, Band B (proc. 405493/2021-5).

References

- CRIA - Centro de Referência e Informação Ambiental - SpeciesLink (2022) Available at <<http://www.splink.net>>. Access on 21 March 2022.
- Engels ME, Muscat E, Moroti MT & Smidt EC (2022) *Thismia mantiqueirensis* (Thismiaceae), a new species of Brazilian Atlantic Rainforest. *Phytotaxa* 570: 223-228. <<https://doi.org/10.11646/phytotaxa.570.2.8>>
- Fearnside PM (2006) Desmatamento na Amazônia: dinâmica, impactos e controle. *Acta Amazônica* 36: 395-400. <<https://doi.org/10.1590/S0044-59672006000300018>>
- Fearnside PM (2017) Deforestation of the Brazilian Amazon. In: Shugart H (ed.) *Oxford research encyclopedia of environmental science*. Oxford University Press, New York. Pp. 1-48.
- Fearnside PM (2021) The intrinsic value of Amazon biodiversity. *Biodiversity and Conservation* 30: 1199-1202. <<https://doi.org/10.1007/s10531-021-02133-7>>
- Fidalgo O & Bononi VLR (1989) Técnicas de coleta, preservação e herborização de material botânico. Manual n 4. Instituto de Botânica, São Paulo. 61p.
- Flora e Funga do Brasil (2023) Available at <<http://reflora.jbrj.gov.br/reflora/floradobrasil/FB110674>>. Access on 21 March 2023.
- Guilherme FAG, Coelho CP, Smidt EC, Gomes DC & Souza LF (2016) *Thismia panamensis*: first record of Thismiaceae for the Brazilian Cerrado in Goiás state. *Check List* 12: 1877. <<https://doi.org/10.15560/12.2.1877>>
- Govaerts R (2022) World checklist of species. Royal Botanic Gardens, Kew. Available at <<http://www.kew.org/wcsp>>. Access on 21 March 2022.
- Jabot (2022) JBRJ - Instituto de Pesquisas Jardim Botânico do Rio de Janeiro. Jabot - Banco de Dados da Flora Brasileira. Available at <<http://jabot.jbrj.gov.br>>. Access on 21 March 2022.
- Mancinelli WS, Blum CT & Smidt EC (2012) *Thismia prataensis* (Thismiaceae), a new

- species from the Brazilian Atlantic Rain Forest. *Systematic Botany* 37: 879-882. <<https://doi.org/10.1600/036364412X656545>>
- Maas PJM, Maas-van de Kamer H, Benthem J, Snelders HCM & Rübbsa-Men T (1986) Burmanniaceae. *Flora Neotropica* 42: 1-189.
- Maas PJM. & Maas H (1987) Ecuadorian saprophytes, a preliminary review. *Opera Botanica* 92: 131-145.
- Maas-van de Kamer H, Maas PJM (2016) Burmanniaceae in Wanderley MGL, Shepherd GJ, Giulietti AM & Melhem TS. *Flora fanerógama do estado de São Paulo III*. Pp. 1-7.
- Miers J (1866) On *Myostoma*, a new genus of the Burmanniaceae. *Transactions of the Linnean Society of London* 25: 461-476.
- Mueller FJH (1891) Notes on a new tasmanian plant of the Order Burmanniaceae. *Papers and Proceedings of the Royal Society of Tasmania* 1890: 232-235.
- Silva DF, Engels ME & Soares-Lopes CR (2020) Novelties in *Thismia* (Thismiaceae) from South Brazilian Amazon with the description of a new species. *Phytotaxa* 429: 261-273. <<https://doi.org/10.11646/phytotaxa.429.4.2>>
- Silva DF & Braga JMA (2022) *Thismia petasiformis* (Thismiaceae), a new fairy lantern species from the Brazilian Amazon Forest. *Phytotaxa* 564: 221-229. <<https://doi.org/10.11646/phytotaxa.564.2.5>>
- Silva DF, Ríos RC, Souza I, Cruz VJMV & Braga JMA (2022) *Thismia cordata* (Thismiaceae), a new fairy lantern species from the Brazilian Atlantic Forest. *Phytotaxa* 571: 76-84. <<https://doi.org/10.11646/phytotaxa.571.1.6>>
- Silva DF, Honório M, Silva CG, Teixeira-Silva MA, Silveira M & Braga JMA (2023) Two new species of *Thismia* (Thismiaceae) from the Brazilian Amazon Forest. *Phytotaxa* 587: 269–282. <<https://doi.org/10.11646/phytotaxa.587.3.5>>
- Shepeleva EA, Schelkunov MI, Hroneš M, Sochor M, Dančák M, Merckx VS, Kikuchi IA, Chantanaorrapint S, Suetsugu K, Tsukaya H, Mar SS, Luu HT, Li H, Logacheva MD & Nuraliev MS (2020) Phylogenetics of the mycoheterotrophic genus *Thismia* (Thismiaceae: Dioscoreales) with a focus on the Old World taxa: delineation of novel natural groups and insights into the evolution of morphological traits. *Botanical Journal of the Linnean Society* 193: 287-315. <<https://doi.org/10.1093/botlinnean/boaa017>>
- Souza I (2021) *Thismia panamensis* (Standl.) Jonker (Thismiaceae): first record for southern Brazil. *Check List* 17: 1055-1059. <<https://doi.org/10.15560/17.4.1055>>
- Thiers B (2022 [continuously updated]) Index herbariorum: a global directory of public herbaria and associated staff. New York Botanical Gardens Virtual Herbarium. Available at <<http://sweetgum.nybg.org/science/ih/>>. Access on 21 March 2022.
- Tropicos (2022) Tropicos.org. Missouri Botanical Garden. Available at <<https://tropicos.org/name/4600101>>. Access on 21 March 2022.
- Voloschen TD, Engels ME, Assunção PACL & Smidt EC (2013) *Thismia singeri* (Thismiaceae), an augmented description and first record for Brazil. *Brazilian Journal of Botany* 36: 309-312. <<https://doi.org/10.1007/s40415-013-0037-y>>

Area Editor: Dr. Pedro Viana

Received on May 30, 2022. Accepted on December 12, 2022.



This is an open-access article distributed under the terms of the Creative Commons Attribution License.