# First record of *Dendropspophus frosti* (Amphibia, Anura, Hylidae) in Brazil, with comments on its reproductive behaviour

Esteban D. Koch[1*], Alexander T. Mônico[2], Igor Y. Fernandes[2], Weslei Valteran[3]

1 Programa de Pós-Graduação em Genética, Conservação e Biologia Evolutiva, Instituto Nacional de Pesquisas da Amazônia, 69080-900 Manaus, AM, Brazil.
2 Programa de Pós-Graduação em Ecologia, Instituto Nacional de Pesquisas da Amazônia, 69067-375 Manaus, AM, Brazil
3 Universidade Estadual do Amazonas, 69640-000 Tabatinga, AM, Brazil.
* Corresponding author. E-mail: *edkoch17@gmail.com*
DOI: 10.5281/zenodo.7509695

*Dendropsophus* Fitzinger, 1843 is a hylid genus that occurs from southern South America through the neotropical region to southern Mexico, with 109 described species (Frost, 2022). Many species of this genus are still unknown, or poorly studied (Orrico et al., 2021). *Dendropsophus frosti* Motta, Castroviejo-Fisher, Venegas, Orrico, and Padial, 2012 is a medium sized *Dendropsophus* with snout-vent length of males ranging from 21.1 to 23.0 mm and of females from 25.9 to 28.8 mm (Motta et al., 2012). The species calls at night perched in low vegetation and lays terrestrial eggs attached to adaxial surface of herbaceous plant leaves above water (Motta et al., 2012). The only known records of this species are from Colombia, municipality of Leticia, state of Amazonas and Peru, municipality of Piedras, state of Loreto, both in the *terra firme* forests of the Amazon basin (Motta et al., 2012). A member of the *Dendropsophus parviceps* group and *D. subocularis* clade (Orrico et al., 2021), *D. frosti* conspicuously differs from all other species of the genus that occur in the region, and even from the other species of its group. Herein, we report the first record of *D. frosti* from Brazil, and provide an updated distribution map. We also comment on undescribed reproductive characters from a population near the type locality, providing photos of a male, an amplectant pair and a clutch.

We collected four specimens of *D. frosti* at Santos Dumont Street, Tabatinga municipality, Amazonas state, Brazil (-4.232417, -69.911194; Fig. 1) between April and September 2019 and in April 2021, between 18h00 and 22h00. We also examined four specimens in the Zoological Collection Paulo Burnheim of the Universidade Federal do Amazonas (CZPB, Manaus, Amazonas, Brazil), collected on the right bank of the Japurá River, Japurá Municipality, Amazonas state, Brazil (-1.846139, -69.029528; Fig. 1) between August and September 2014. These specimens were deposited at the Zoological Collection Paulo Burnheim of the Universidade Federal do Amazonas (CZPB-AA 1552-1555, 2156, 2158, 2159 and 2244). Along with these eight collected specimens we analyzed the morphology of 11 not collected specimens recorded during the fieldwork in Tabatinga municipality.

To confirm identification, specimens were compared to the species' description, following the nomenclature used in the diagnosis (Motta et al., 2012). All individuals exhibited the principal diagnostic characters, which combined make the species differ from all its congeners, and from the other species of the *D. parviceps* group: (i) dorsum smooth, light brown, (ii) flanks dark brown, (iii) fingers IV and V and toes III and IV dark brown, (iv) venter pale brown, (v) fingers I and II, toes I and II, and tip of the finger III and toe III pale brown, (vi) iris copper; (vii) suborbital bars absent (Fig. 2).

On April 29, 2021 after two days of intense rainfall in the municipality of Tabatinga we observed a reproductive event. Several males were calling perched in the herbaceous vegetation, about 1 to 2 m above the ground, near a natural permanent pond connected to a stream (Fig. 2A). Several of these males exhibited a brighter yellowish-brown dorsum than the dark brown dorsum of females. Three amplectant pairs were observed; amplexus was axillary according to the classification of Carvajal-Castro (2020) as well as for most hylids (Fig. 2B). Although Motta et al. (2012), based on an observation in an artificial pond, suggested that the species most likely lays its eggs on rigid surfaces, such as tree trunks, we recorded six egg clutches laid on the adaxial surface of herbaceous leaves from 0.5 to 2 m above the water surface in the natural habitat of the species (Fig. 2C). After hatching, the larvae probably fall into the pond, and finish development in this lentic environment, so that the species most likely presents the reproductive mode 23A of Nunes-de-Almeida et al. (2021). The record of *D. frosti* in Japurá municipality extends its geographic distribution approximately 270 km northeast from its previous nearest known distribution and its type locality (Leticia, Colombia) (Fig. 1). This is the

first record of *D. frosti* in Brazil, and the species has not yet been included in the List of Brazilian Amphibians (Segalla et al., 2021).

The reports of the occurrence of a species previously unknown to Brazil shows that vast regions of the country still have its biological richness underestimated. There is also a lack of knowledge of anuran reproductive behavior and this information would help conservation efforts and future research.

## ACKNOWLEDGEMENTS

E.D.K. and A.T.M. thanks to Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq, process: 132131/2020-0 and 142153/2019-2, respectively) for scholarship. We thank to Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES, Brazil), Fundação de Amparo à Pesquisa do Estado do Amazonas (FAPEAM, Brazil) and to Comando de Fronteira Solimões/8º Batalhão de Infantaria de Selva of the Brazilian Army for the support provided. We would like to thank the anonymous reviewers and the editor Dr. Ariadne Fares Sabbag for their important suggestions regarding the manuscript. We thank to D. Rojas, G.M. Freire, L.G. Goll, V. Magalhães, C.A.S. Rodrigues and A.M. Manuiana for the support during the fieldwork. We thank to the CZPB curator Fábio Siqueira Pitaluga de Godoi and to A. Almeida, E. Oliveira, L. Frazão-Luiz, M. Gordo, P. Azarak, R. Rojas, T. Hrbek and V. Carvalho, the field team that collected the individuals from Japurá. The permits were provided by SISBio (Process: 65749-1). *In memoriam* of Marcelo Menin, who provided the first identification of this species to the museum individuals and that was the graduate advisor of W.V.

## REFERENCES

Carvajal-Castro J.D., López-Aguirre Y., Ospina-L A.M., Santos J.C., Rojas B., Vargas-Salinas F. 2020. Much more than a clasp: evolutionary patterns of amplexus diversity in anurans. *Biological Journal of the Linnean Society* 129:652–663. doi: 10.1093/biolinnean/blaa009

Fitzinger L.J.F.J. 1843. Systema Reptilium: Fasciculus Primus. Braumüller et Seidel. Wien.

Frost D.R. 2022. Amphibian Species of the World: an Online Reference. Version 6.1. Accessible at https://amphibiansoftheworld.amnh.org/index.php. American Museum of Natural History, New York, USA. doi.org/10.5531/db.vz.0001. Access: June 20, 2022.

Motta A.P., Castroviejo-Fisher S., Venegas P.J., Orrico V.G.D., Padial J.M. 2012. A new species of the *Dendropsophus parviceps* group from the

western Amazon Basin (Amphibia: Hylidae). *Zootaxa* 3249:18-30. doi: *10.11646/zootaxa.3249.1.2*

Nunes-de-Almeida C.H.L., Haddad C.F.B., Toledo L.F. 2021. A revised classification of the amphibian reproductive modes. *Salamandra* 57:413-427.

Orrico V.G.D., Grant T., Faivovich J., Rivera-Correa M., Rada M.A., Lyra M.L., ... Haddad C.F.B. 2021. The phylogeny of Dendropsophini (Anura: Hylidae: Hilinae). *Cladistics* 37:73-105. doi: *https://doi.org/10.1111/cla.12429*

QGIS.org. 2022. QGIS Geographic Information System, Version 3.22. Available at: *http://www.qgis.org*. Access: June 27, 2022.

Segalla M., Berneck B., Canedo C., Caramaschi U., Cruz C.A.G., Garcia P.C.A., ... Langone, J. A. 2021. List of Brazilian Amphibians. *Herpetologia Brasileira* 10:121–216. doi: *10.5281/zenodo.4716176*

Tapiquén C.E.P. 2020. Geografía, SIG y Cartografía Digital. Acessible at: http://www.efrainmaps.es. Valencia, Spain. Access: November 30, 2021.

*Editora: A. F. Sabbag*

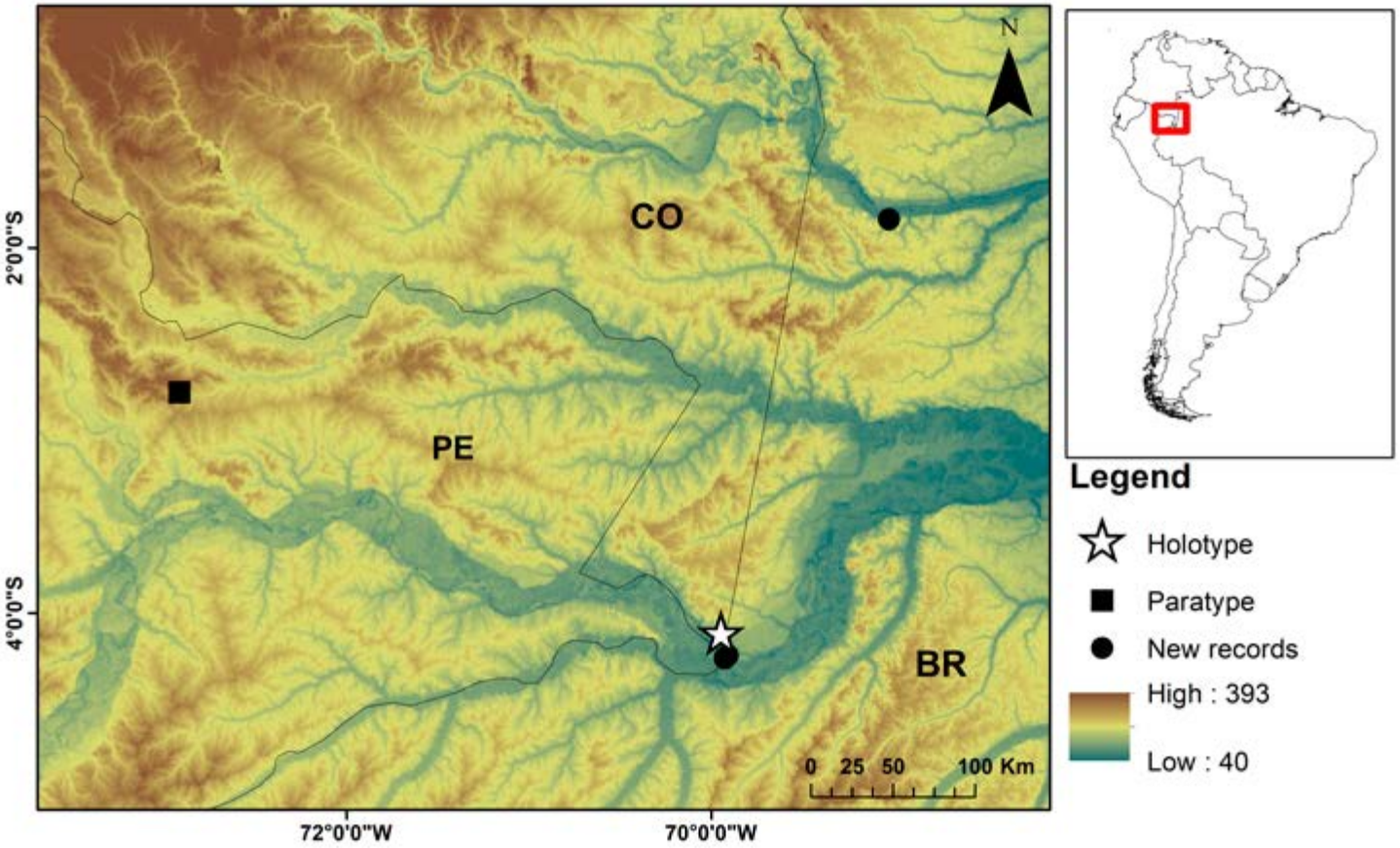


***Figure 1.*** Map of the known records of *Dendropsophus frosti*. The star indicates the type locality; the square indicates the locality of the paratype records. The dots indicate the two new records in the Brazilian Amazon. BR: Brazil, CO: Colombia, PE: Peru. Map was drawn using QGis v. 3.22 (QGIS Core Team, 2022) using the limits of the South America countries provided by Tapiquén (2020).

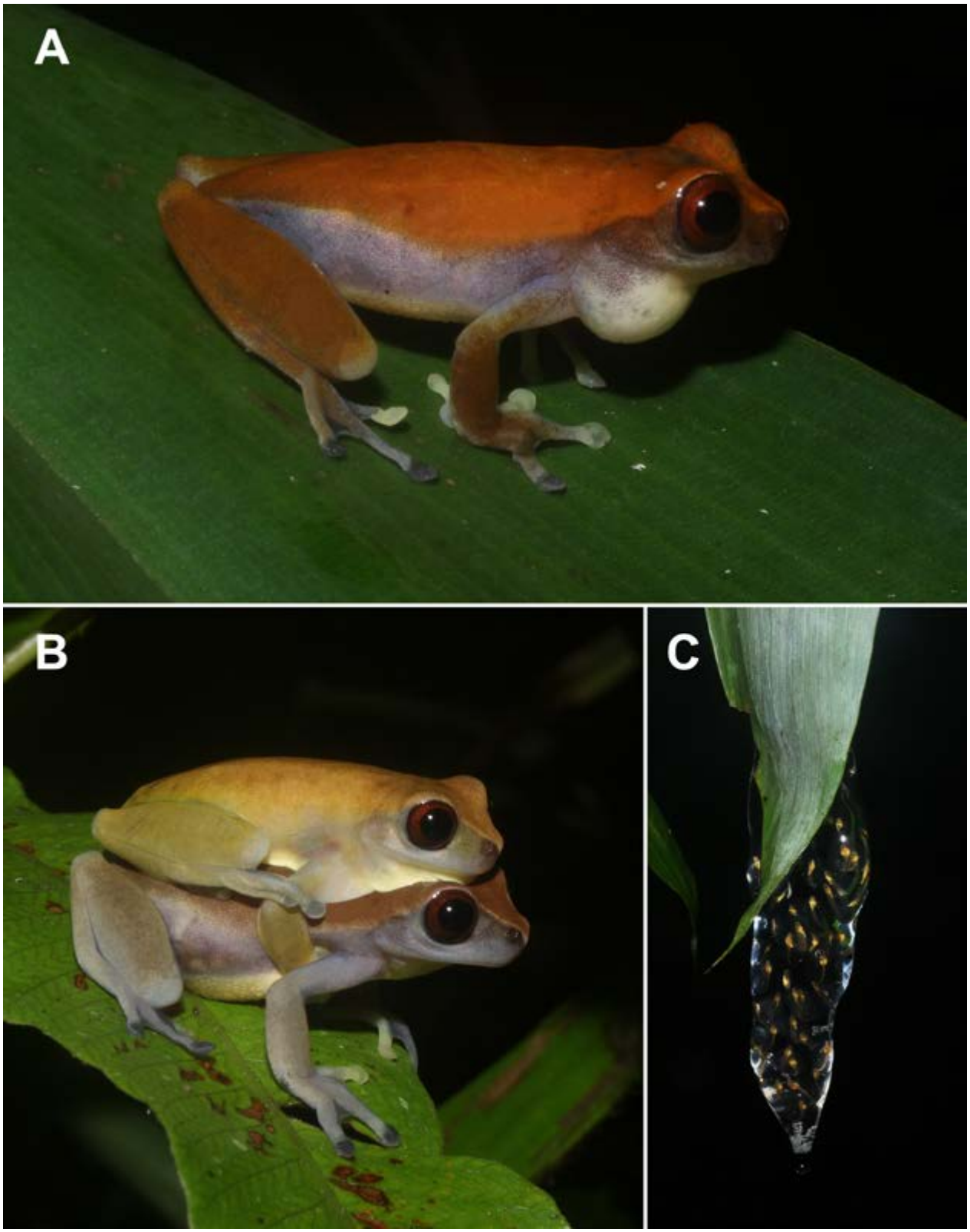


***Figure 2.*** Unvouchered individuals and egg clutch of *Dendropsophus frosti* observed in Tabatinga municipality during a night survey in April 2021. A: calling male of the species (SVL = 23.9 mm); B: amplectant pair with brighter male; C: egg clutch in a leaf above the water surface.