

Long-term sampling enables a new record of an anuran at the Silvânia National Forest, Central Brazil

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The Cerrado is the second largest phytogeographical domain in Brazil and one priority area for conservation, since it is a biodiversity hotspot (Myers et al., 2000). In Brazil, the implementation of protected areas is the most important mechanism to conserve the biodiversity (Araújo et al., 2012). However, only 4% of Cerrado's original area is protected as federal conservation units (Cabral and Brito, 2013). About 210 anuran species occur in the Cerrado, of which 51.7% are endemic to it (Valdujo et al., 2012), but many localities remain poorly sampled or only short-term studies are available (e.g., Kopp et al., 2010; Moraes et al., 2011). Examples of long-term monitoring of anuran species in the Cerrado are scarce in the literature, and in this sense the Silvânia National Forest (SNF) is one of the most studied localities from Cerrado biome (e.g., Bastos et al., 2003; Bini et al., 2003; Moraes et al., 2012).

The SNF is located in Silvânia county, Goiás state, central Brazil and has only 466 ha of protected area. The anuran species from this locality have been sampled for many years (e.g., Bastos et al., 2003; Moraes et al., 2012). Bastos et al. (2003) studied the anuran species in this area from 1995 to 2000, with different sampling

methods (e.g., pitfall traps with drift fences and active search) and found 29 anuran species. Moraes et al. (2012) sampled intensively the anuran species in the SNF from 2008 to 2009 and updated the species list of this locality. The results presented by Moraes et al. (2012) included four new records of anuran species. Therefore, currently 33 species may be found in this locality, of which 15 species are endemic to the Cerrado biome (Valdujo et al., 2012) and two species are listed as Data Deficient in the IUCN Red List (IUCN, 2013).

Despite these previous studies, we continued to study the anurans in the SNF. Accordingly, we annually monitor this locality, with sampling restricted to rainy season (from October to March). Herein, we present a new record of an anuran species in this area. On January 17th of 2013, at 2240 h, a male of *Leptodactylus mystaceus* (Spix, 1824) (SVL = 49.13 mm; Mass = 10.02 g; Air temperature = 21°C; Fig. 1) was found by us (16°38'18"S, 48°38'47"W, DATUM=WGS84; 936 m a.s.l.). We identified the specimen based in the



Figure 1. *Leptodactylus mystaceus*, adult male from Floresta Nacional de Silvânia, Goiás state, central Brazil.

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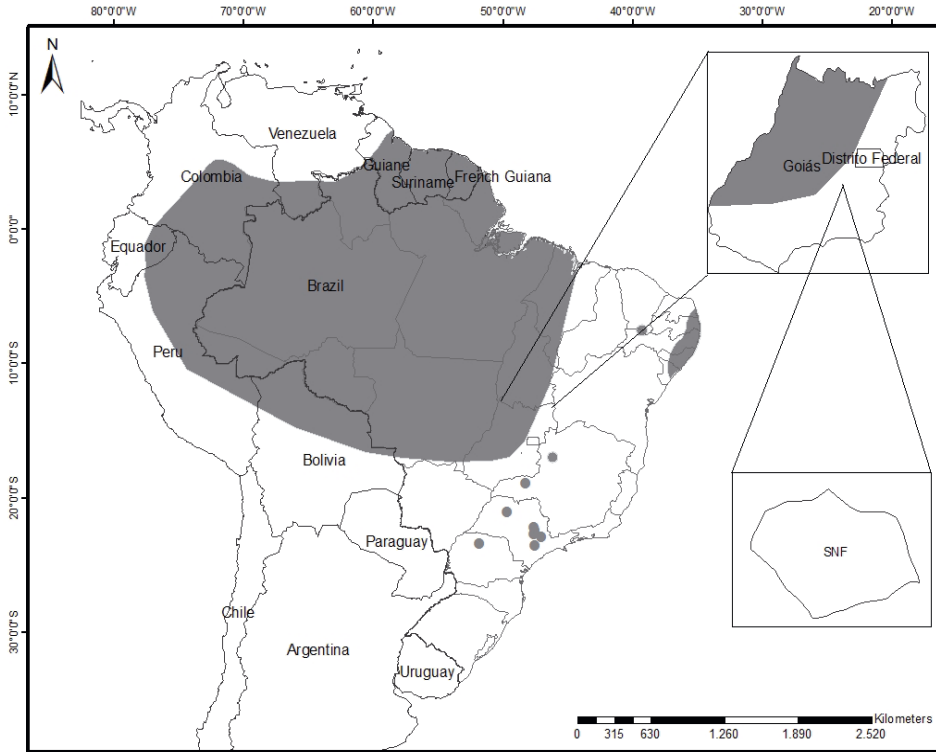


Figure 2. Map showing the geographic distribution of *Leptodactylus mystaceus* (in gray) in South America and occurrence at the Silvânia National Forest (SNF), Silvânia county, Goiás state, Brazil. Map based in IUCN (2014), Affonso *et al.* (2011), and Toledo *et al.* (2005).

morphological characters proposed by de Sá *et al.* (2014). Then, we observed the following characters: spatula-like snout shape, dorsal folds absent, dorsolateral folds distinct, complete, lateral folds absent, upper shank barred, brownish dorsal coloration and shoulder blades readily perceptible. After identification, we released the individual in the same place.

Leptodactylus mystaceus is known from the Amazon basin in Brazil, Bolivia, Peru, Ecuador, Colombia, Venezuela, Guianas and recently some populations have been reported in northeastern, southeast and south of Brazil (de Sá *et al.*, 2014; Frost, 2014; Affonso *et al.*, 2011; Toledo *et al.*, 2005) (Fig. 2). The occurrence of *L. mystaceus* at SNF was not reported by Bastos *et al.* (2003) and Morais *et al.* (2012). Therefore, this report increases the anuran species richness of SNF to 34 species. Although SNF is the second smallest conservation unit of this phytogeographical domain (ICMBIO, 2012), its anuran richness represents about

16% of that found in the Cerrado. This anuran richness of this area is larger than that registered in other representative protected areas of this biome, with an area more than 100.000 ha, such as Serra da Canastra National Park (29 species - Haddad *et al.*, 1988) and Emas National Park (27 species - Kopp *et al.*, 2010).

This finding reinforces the importance of long-term studies with anuran species, because these may be useful to support conservation action about the most threatened vertebrates in the world. Furthermore, this discussion demonstrates that SNF is playing an important role in the conservation of anurans from phytogeographical domain as proposed by conservation policy in Brazil (SNUC, 2000).

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References

- Affonso, I.P., Delariva, R.L., Navarro, M.P. (2010): Amphibia, Anura, Leptodactylidae, *Leptodactylus mytaceus* (Spix, 1824): Distribution extension. Checklist 7: 198-199.
- Araujo, M.A.R., Marques, C.P., Bittencourt, R.F. (2012): Unidades de Conservação no Brasil: o caminho da Gestão para Resultados. 1st edition. São Paulo, Editora RIMA.
- Bastos, R.P., Motta, J.A.O., Lima, L.P., Guimarães, L.D. (2003): Anfíbios da Floresta Nacional de Silvânia, estado de Goiás. 1st edition. Goiânia, Bastos, R.P.
- Bini, L.M., Diniz-Filho, J.A.F., Bastos, R.P., Souza, M.C., Peixoto, J.C., Rangel, T.F.L.V.B. (2003): Interspecific synchrony in a local assemblage of anurans in central Brazil: effects of phylogeny and reproductive patterns. Acta Scientiarum 25: 131-135.
- Cabral, R., Brito, D. (2013): Temporal and spatial investments in the protected area network of a megadiverse country. Zoologia 30: 177-181.
- de Sá, R.O., Grant, T., Camargo, A., Heyer, W.R., Ponssa, M.L., Stanley, E. (2014): Systematics of the Neotropical genus *Leptodactylus* Fitzinger, 1826 (Anura: Leptodactylidae): Phylogeny, the relevance of non-molecular evidence, and species accounts. South American Journal of Herpetology 9: s1-s128.
- Frost, D.R. (2014): Amphibian species of the world: an online reference. Version 5.6 (9 January 2013). Electronic Database. Available at: <http://research.amnh.org/herpetology/amphibia/index.html>. Last accessed on 20 November 2014.
- Haddad, C.F.B., Andrade, G.V., Cardoso, A.J. (1988): Anfíbios anuros do Parque Nacional da Serra da Canastra, Estado de Minas Gerais. Brasil Florestal 64: 9-20.
- ICMBIO (2012): Unidades de Conservação. Available at: <http://www.icmbio.gov.br/portal/biodiversidade/unidade-de-conservacao/biomas-brasileiros.html>. Last accessed on 30 January 2014.
- IUCN (2012): IUCN Red List of threatened species. version 2011.2. Available at: <http://www.iucnredlist.org/>. Last accessed on 15 January 2014.
- Kopp, K.A., Signorelli, L., Bastos, R.P. (2010): Distribuição temporal e diversidade de modos reprodutivos de anfíbios anuros no Parque Nacional das Emas e entorno, Estado de Goiás. - Iheringia. Série Zoologia 100: 192-200.
- Morais, A.R., Bastos, R.P., Vieira, R., Signorelli, L. (2012): Herpetofauna da Floresta Nacional de Silvânia, um remanescente de Cerrado no Brasil Central. Neotropical Biology and Conservation 7: 114-121.
- Morais, A.R., Gambale, P.G., Guimarães, L.D., Kopp, K., Signorelli, L., Vaz-Silva, W., Ramos, J., Nomura, F., Bastos, R.P. (2011): Anfíbios anuros associados a corpos de água do sudoeste do estado de Goiás, Brasil. Biota Neotropica 11: 355-363.
- Myers, N., Mittermeier, R.A., Mittermeier, C.G., Fonseca, G.A.B., Kent, J. (2000): Biodiversity hotspots for conservation priorities. Nature 403: 853-858.
- Sistema Nacional De Unidades De Conservação/SNUC (2000): Lei 9.985. Edições Ibama/MMA, Brasília.
- Toledo, L.F., Castanho, L.M., Haddad, C.F.B. (2005): Recognition and distribution of *Leptodactylus mystaceus* (Anura: Leptodactylidae) in the State of São Paulo, southeastern Brazil. Biota Neotropica 5: 57-62.
- Valdujo, P.H., Silvano, D.L., Colli, G., Martins, M. (2012): Anuran Species Composition and Distribution Patterns in Brazilian Cerrado, a Neotropical Hotspot. South American Journal of Herpetology 7: 63-78.