



# First record of *Pseudopaludicola pocoto* Magalhães, Loebmann, Kokubum, Haddad & Garda, 2014 (Anura, Leptodactylidae, Leiuperinae) in Bahia state, northeastern Brazil, with further data on its advertisement call

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**Abstract:** We report the first record of *Pseudopaludicola pocoto* from Bahia state, Brazil. In addition to the new distributional record, which fill gaps in the species distribution, new data and brief comments on its advertisement call are also provided. We also provide a map of the localities reported in the literature.

**Key words:** Bioacoustics; Caatinga biome; dwarf swamp frog; filling gap; geographic distribution; Lissamphibia

The genus of dwarf swamp frogs, *Pseudopaludicola* Miranda-Ribeiro, 1926, includes 21 species (FROST 2016; ANDRADE et al. 2016) that occur throughout South America east of the Andes (LYNCH 1989). *Pseudopaludicola* is recognized as monophyletic based on external morphological (LYNCH 1989; LOBO 1995), such as the presence of a hypertrophied antibrachial tubercle, osteological (LOBO 1995), and molecular evidence (VEIGA-MENONCELLO et al. 2014). LYNCH (1989) proposed the *Pseudopaludicola pusilla* (Ruthven, 1916) species group for *P. boliviana* Parker, 1927, *P. ceratophyes* Rivero & Serna, 1985, *P. llanera* Lynch, 1989, and *P. pusilla*, which share the morphological feature of T-shaped terminal phalanges. In subsequent analyses, LOBO (1995) and VEIGA-MENONCELLO et al. (2014) corroborated the monophyly of the *P. pusilla* group.

*Pseudopaludicola pocoto* Magalhães, Loebmann, Kokubum, Haddad & Garda, 2014 was described from municipality of Santa Quitéria, state of Ceará, Brazil, and was also

recorded in other states in northeastern Brazil: Rio Grande do Norte, Paraíba, and Pernambuco; such areas are mostly associated with the Caatinga Biome (MAGALHÃES et al. 2014; SANTANA et al. 2015; LANTYER-SILVA et al. 2016). ANDRADE et al. (2015) and SILVA et al. (2015) extended this species' distribution to the states of Minas Gerais and Piauí, respectively. In addition, ANDRADE et al. (2015) provided its first record in the Atlantic Forest Biome of southeastern Brazil. However, there is still a large distribution gap of about 900 km between the municipalities of Petrolina (LANTYER-SILVA et al. 2016) and Carlos Chagas (ANDRADE et al. 2015). Here we present a new distributional record of *P. pocoto* in Bahia state, filling gaps in the species' distribution, and provide new data and brief comments on its advertisement call (Table 1).

Adult specimens of *Pseudopaludicola pocoto* were collected and recorded on 5 and 6 April 2015 by Cyro S. Bernardes in municipality of Xique-Xique, Bahia state (10°49'47.18" S, 042°44'03.78" W; WGS 84), 400 m elevation, between 22h50 and 23h47. Specimens are deposited at Museu de Biodiversidade do Cerrado, Universidade Federal de Uberlândia (AAG-UFU), Uberlândia, Minas Gerais, Brazil, under the following accession numbers: AAG-UFU 5137–5145; the first three numbers correspond to vouchers specimens of call recordings (AAG-UFU 5137 [SVL = 13.0 mm], 5138 [SVL = 13.7 mm], and 5139 [SVL = 13.3 mm]). Our collection permit was conceded by ICMBio/SISBIO (#30059-7).

**Table 1.** Advertisement call traits of *Pseudopaludicola pocoto* from municipality of Xique-Xique, Bahia state, Brazil (present study), and comparative data for populations from northeast Brazil (MAGALHÃES et al. 2014), municipality of Carlos Chagas, Minas Gerais state (ANDRADE et al. 2015), and municipality of Cabrobó, Pernambuco state, Brazil (LANTYER-SILVA et al. 2016). Mean  $\pm$  SD (minimum–maximum);  $n$  = number of males recorded (number of analyzed notes).

Acoustic traits	Xique-Xique $n = 5$ (50)	MAGALHÃES et al. (2014) $n = 9$ (135)	ANDRADE et al. (2015) $n = 2$ (30)	LANTYER-SILVA et al. (2016) $n = 1$ (30)
Note duration (ms)	322 $\pm$ 36 (170–397)	238 $\pm$ 31 (126–290)	265 $\pm$ 32 (205–323)	274 $\pm$ 22 (223–309)
Internote duration (ms)	251 $\pm$ 15 (209–291)	220 $\pm$ 59 (136–507)	251 $\pm$ 61 (196–447)	203 $\pm$ 23 (181–263)
Notes per minute	108 $\pm$ 6.5 (100–118)	124 $\pm$ 16 (94–150)	–	–
Pulses per note	3.0 $\pm$ 0.05 (2–3)	3	3	–
Pulse duration (ms)	8 $\pm$ 1 (6–10)	5 $\pm$ 1 (3–8)	6 $\pm$ 1 (3–8)	12 $\pm$ 2 (7–18)
Interpulse interval (ms)	151 $\pm$ 17 (112–187)	111 $\pm$ 21 (43–166)	122 $\pm$ 31 (54–205)	138 $\pm$ 40 (82–263)
Pulses per second	9.4 $\pm$ 1 (7.6–12)	13 $\pm$ 2 (10–18)	11 $\pm$ 2 (8–15)	–
Dominant Frequency (Hz)	5133 $\pm$ 269.8 (4734–5437)	5636 $\pm$ 300 (5168–6373)	5001 $\pm$ 90 (4823–5168)	5804 $\pm$ 107 (5625–6000)
Air temperature (°C)	27	24–25	20	–

We recorded the advertisement call of this population and compared them to those provided in the original description (MAGALHÃES et al. 2014) and ANDRADE et al. (2015), once it is the most distinctive diagnostic character for this species (MAGALHÃES et al. 2014). Calls were recorded in Xique-Xique by CSB with a Sennheiser ME67/K6 coupled to a Marantz PMD 670. Air temperature was obtained for each recorded male. The recorders were set at 48.0 kHz and 32-bit resolution. Calls were analyzed by FSA using Raven Pro 1.5, 64-bit version (Bioacoustics Research Program 2014) with the following settings: window type = Hann, window size = 256 samples, 3 dB filter bandwidth = 248 or 270 Hz, brightness = 50%, contrast = 50%, overlap = 85% (locked), hop size = 38 samples, DFT size = 1024 samples (locked), and a grid spacing = 43.1 or 46.9 Hz. Temporal variables were analyzed in oscillograms and spectral variables in spectrograms. Dominant frequency and other frequencies were assessed through the ‘Peak Frequency’ function. Figures were generated using Seewave v.1.6 package (SUEUR et al. 2008) on the R platform (version 3.3.1; R DEVELOPMENT CORE TEAM 2016). Seewave settings were as follows: Hanning window, 85% overlap, and 512 points resolution (FFT). Note and pulse terminologies followed MAGALHÃES et al. (2014), and overall acoustic terminology followed DUELLMAN & TRUEB (1994). We calculated means and standard deviations considering mean values of individual males, whereas the range (variation) encompassed the minimum and maximum values of the whole sample for each acoustic variable.

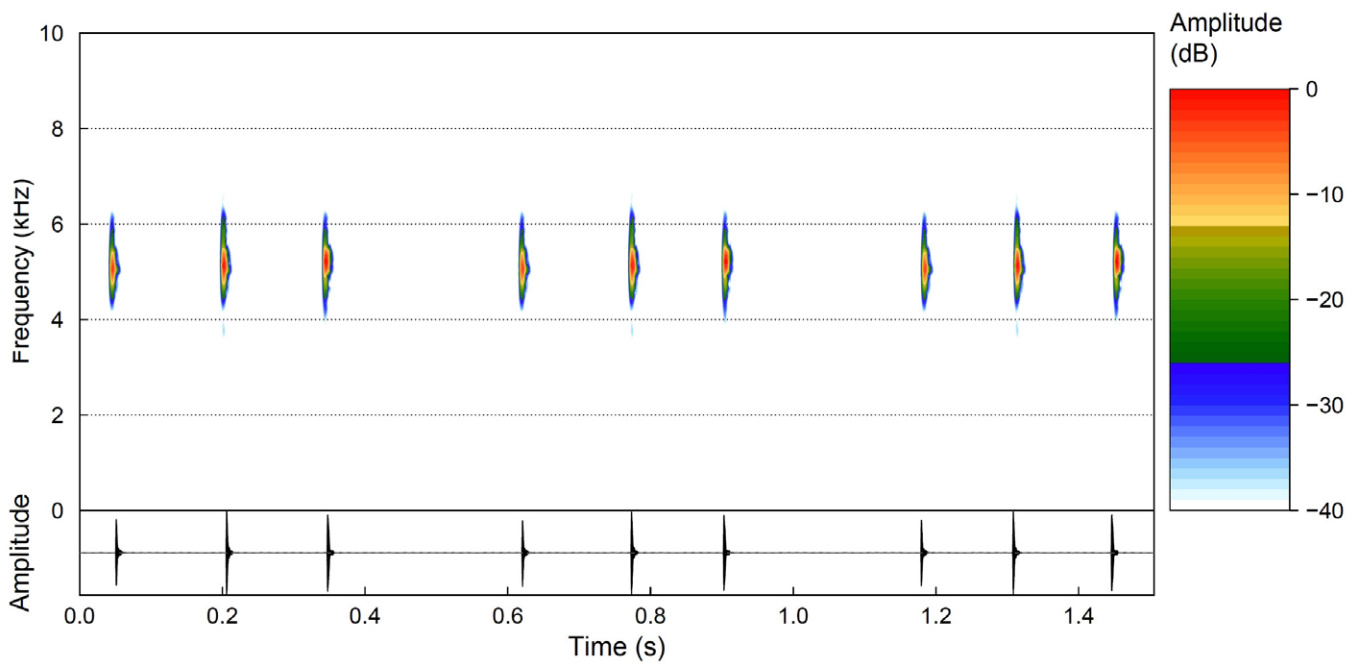
*Pseudopaludicola pocoto* has a distinctive advertisement call, which is emitted as a series of well-defined sequences of three nonconcatenated pulses per note with long between-pulse intervals (43–263 ms); these notes have duration of 126 to 323 ms; and its dominant frequency ranges from 4823 to 6374 Hz (MAGALHÃES et al. 2014; ANDRADE et al. 2015; LANTYER-SILVA et al. 2016). The calls from the studied population overlap in almost all temporal and spectral traits in comparison with previously provided data for this species (Table 1). Moreover, the calls analyzed by us have an increase in amplitude between the first and second pulse (=midpoint of call), followed by a decrease

in amplitude between the second and third pulse (Figure 1). Regarding the modulation frequency, coincidentally, the frequency of the second pulse is slightly higher than those of the first and third pulses. Contrarily, MAGALHÃES et al. (2014) and ANDRADE et al. (2015) described the call as exhibiting an ascending frequency modulation along its note duration.

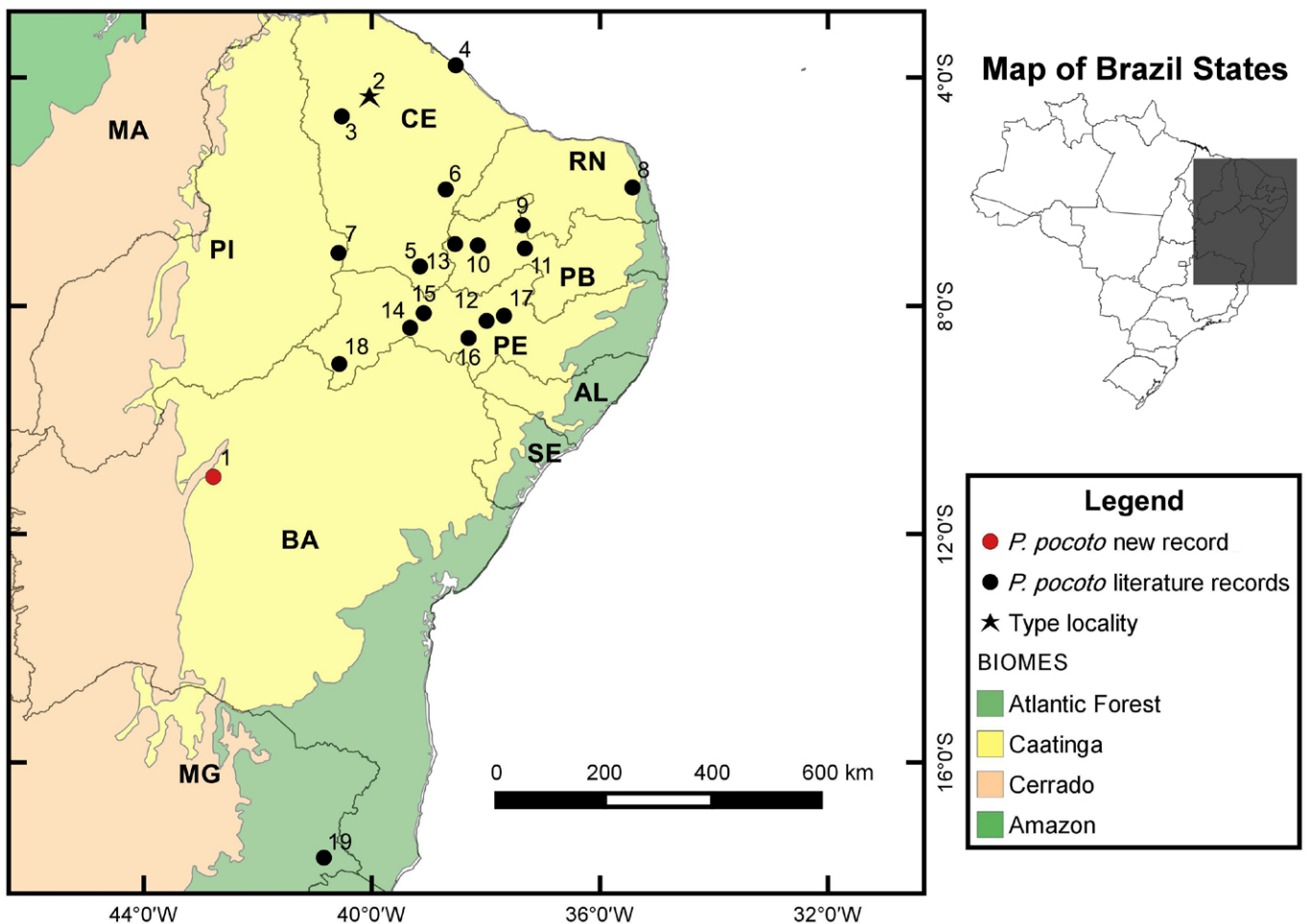
Our distributional record represents the first record for Bahia state, filling gaps and extending the known distribution of the species in approximately 760 km southwest from the type locality, 280 km southwest from Petrolina, Pernambuco state (LANTYER-SILVA et al. 2016), and 780 km northward from Carlos Chagas, Minas Gerais state (ANDRADE et al. 2015), partly filling in the large distribution gap for this widespread species (Figure 2). There are some inconsistencies on the distribution map of *P. pocoto* provided in LANTYER-SILVA et al. (2016), because there is incompatibility between the figure and its caption. Plus, the authors misrepresented some localities (e.g., locality 11 [Cajazeiras, Paraíba state] is in the Pernambuco state, and locality 13 [Cabrobó, Pernambuco state] is not where the authors figured). Our findings also confirm the importance of inventories of Brazilian anuran species, as data on their distributions are still deficient (AZEVEDO-RAMOS & GALATTI 2002; SILVANO & SEGALLA 2005). Lastly, the knowledge must be improved for frog species distributions to support evidence-based conservation and management actions.

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**Figure 1.** Three pulsed notes of advertisement call from the studied population of *Pseudopaludicola pocoto*: municipality of Xique-Xique, Bahia state, Brazil. Sound file: Pseudop\_pocotoXiqueXiqueBA5dCBS\_AAGm; 23:48 h, 06 April 2015; air 27°C. Unvouchered recording.



**Figure 2.** Geographic distribution of *Pseudopaludicola pocoto*. Municipalities labeled: (1) Xique-Xique, BA; (2) Santa Quitéria, CE; (3) Novas Russas, CE; (4) Fortaleza, CE; (5) Missão Velha, CE; (6) Jaguaribe, CE; (7) Fronteira, PI; (8) Macaíba, RN; (9) Serra Negra, RN; (10) Serra de Santa Catarina, PB; (11) Patos, PB; (12) Betânia, PE; (13) Cajazeiras, PB; (14) Cabrobó, PE; (15) Salgueiro, PE; (16) Floresta, PE; (17) Custódia, PE; (18) Petrolina, PE; and (19) Carlos Chagas, MG. Brazilian state acronyms: Bahia = BA, Ceará = CE, Piauí = PI, Rio Grande do Norte = RN, Paraíba = PB, Pernambuco = PE, and Minas Gerais = MG.

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**Authors' contributions:** FSA, FSFL, TRC and AAG wrote the text and identified the species based on the call recordings; FSA analyzed specimens and calls, made the call figure plate and the map of this study; and CSB collected the data and reviewed earlier versions of this study.

**Supplementary material:** An audio file of *Pseudopaludicola pocoto* from municipality of Xique-Xique (Bahia state) is available online as supplementary material at <http://biotaxa.org/cl>.

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