

The release call of *Hypsiboas goianus* (B. Lutz, 1968) (Anura: Hylidae) from Central Brazil

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Hearing is the most frequently used sensory modality in anuran communication processes, and it is the stimulation by different vocalizations that is key to its function (Wells, 2007). Release calls are a type of vocalization most frequently emitted by male frogs, usually when amplexed by conspecific males, and consisting of a series of simple, repeated notes (Wells, 2007). The *Hypsiboas polytaeniatus* clade is composed of 12 species, including *H. beckeri* (Caramaschi and Cruz, 2004), *H. botumirim* (Caramaschi et al., 2009), *H. buriti* (Caramaschi and Cruz, 1999), *H. cipoensis* (B. Lutz, 1968), *H. goianus* (B. Lutz, 1968), *H. jaguariaivensis* (Caramaschi et al., 2010), *H. latistriatus* (Caramaschi and Cruz, 2004), *H. leptolineatus* (Braun and Braun, 1977), *H. phaeopleura* (Caramaschi and Cruz, 2000), *H. polytaeniatus* (Cope, 1870), *H. stenocephalus* (Caramaschi and Cruz, 1999), and *H. bandeirantes* (Caramaschi and Cruz, 2013), that are widely distributed in Brazil (Caramaschi et al., 2010; Caramaschi and Cruz, 2013). However, for none of the species of the *H. polytaeniatus* clade has the release call been described. *Hypsiboas goianus* occurs in the Brazilian states of Goiás and

Minas Gerais and in the Distrito Federal (Frost, 2014). Herein, we describe for the first time the release call of *H. goianus* from the Cerrado biome.

Hypsiboas goianus males (Fig. 1) were observed in the Floresta Nacional de Silvânia (Flona; 16°39'32" S, 48°36'29" W, elevation ca. 900 m), Silvânia municipality, Goiás state. We recorded vocalizations emitted by amplexed males of *H. goianus* using a Marantz PMD 660 digital recorder and a Sennheiser ME66 microphone. Recordings were edited at a sampling frequency of 22 kHz and 16 bit with Sound Forge Audio Studio 10 software, and analyzed with Cool Edit 96 and Avisoft-Sonograph Light software. The description of the call follows Gerhardt (1998). Note duration (s), number of pulses per note, pulse duration (s), dominant frequency (Hz), and repetition rate (calls/min) were measured. We captured all individuals and measured their snout-vent length (SVL) to the nearest 0.1 mm with a caliper and their mass to the nearest 0.1 g with digital scales. Data provided for calls include mean $\pm$ standard deviation and ranges. Frequency information was obtained through Fast Fourier Transformation

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Figure 1. *Hypsiboas goianus* male from Floresta Nacional de Silvânia, Goiás state, Central Brazil. Photograph by T.B. Vieira.

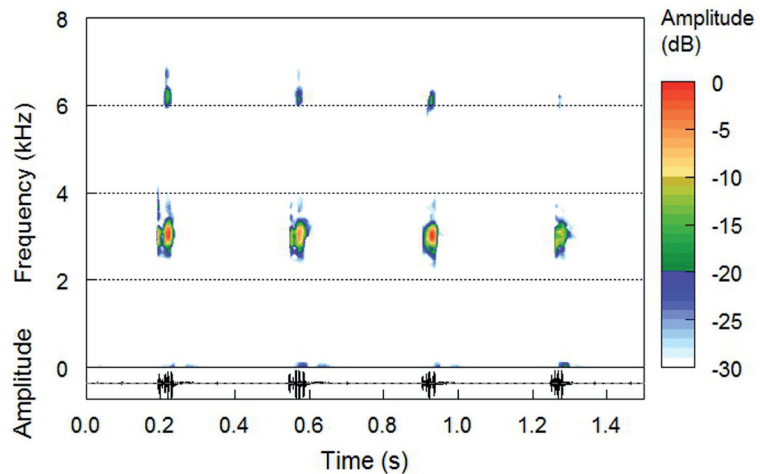


Figure 2. Release call of *Hypsiboas goianus* recorded on 18 March 2013, Silvânia municipality, Goiás state. Spectrogram (above) and oscillogram (below) of Note A.

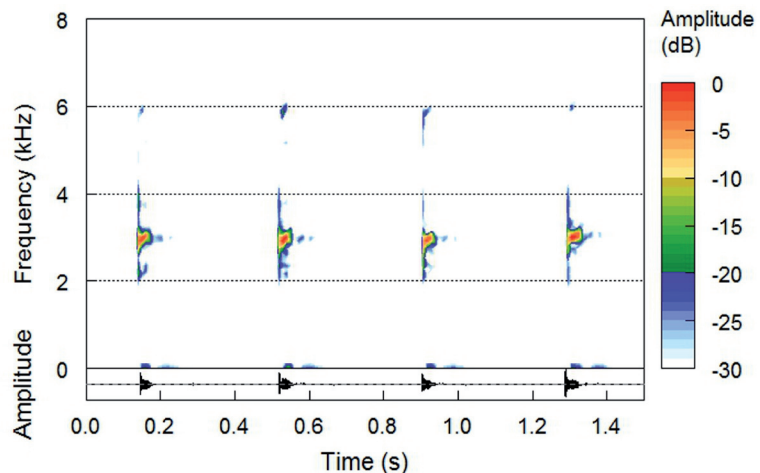


Figure 3. Release call of *Hypsiboas goianus* recorded on 18 March 2013, Silvânia municipality, Goiás state. Spectrogram (above) and oscillogram (below) of Note B.

(width 1024 points). Sound figures were obtained with Seewave 1.6.4 (Sueur *et al.*, 2008), package R 2.15.1 (R Development Core Team, 2012). Seewave settings employed were window name (Fourier transformation window) = Hanning; window length = 256 samples; overlap = 85%. We observed two instances of amplexus among *H. goianus* males. The first occurred on 18 March 2013 at 2340 hrs (air temperature 24°C, relative humidity 73%). The SVL of the male was 31.4 mm and the weight = 1.3 g. The second was recorded on 6 April 2013 at 2300

hrs (air temperature 22°C, relative humidity 85%). The SVL of the second recorded male was 32.1 mm and the weight = 1.4 g. The release call of *Hypsiboas goianus* (Figs. 2 & 3) is composed of two types of notes (here defined as Note A and Note B), which seem to be issued randomly. A harmonic structure was observed in both notes, with the fundamental frequency corresponding to the dominant frequency (Figs. 2 & 3). The average duration of Note A (Fig. 2) was 0.0351 ± 0.0149 s (range 0.023–0.079 s; N = 33). Mean pulse number was 3.636 ± 1.949

(2–10 pulses per notes; $N = 33$), with an average pulse duration of 0.0095 ± 0.0108 s (0.0044 – 0.068 s; $N = 120$ pulses). The dominant frequency varies from 2480–3000 Hz (2786.07 ± 196.36 Hz; $N = 33$), and the note repetition rate was 48.2 notes per minute ($N = 2$ males). Note B is composed of a single pulse (Fig. 3) of average duration 0.0303 ± 0.0066 s (0.017 – 0.043 s; $N = 33$). The dominant frequency of Note B varied from 2423–3000 Hz (2610.18 ± 168.24 Hz; $N = 33$) and the note repetition rate was 26.6 notes per minute ($N = 2$ males).

Advertisement and aggressive calls of *H. goianus* were described by Guimarães et al. (2001) and Menin et al. (2004). However, the release call of this species was not reported. The mean values of acoustic parameters (e.g., note duration, pulse number, dominant frequency) of release calls differs from those described for advertisement and aggressive calls and, but a similar physical structure may be observed among these calls (e.g., harmonic structure). For only few Brazilian frog species is a release call described, yet despite of this limited knowledge, release calls have been used as a diagnostic character to distinguish cryptic species, clarify taxonomic confusion, and provide phylogenetic information for the species for which this type of call has already been described (see Sullivan and Malmos, 1994; Stöck et al., 2000; di Tada et al., 2001; Wogel et al., 2004; Márquez and Eekhout, 2006; Oliveira et al., 2012; Sanabria and Quiroga, 2012; Grenat and Martino, 2013). Furthermore, release calls can help a male avoid unnecessary energy expenditure and, thus, optimize the time that males can spend in reproductive activity, since a release call should be effective in freeing the males mistakenly clasped (Emerson and Boyd, 1999; Wells, 2007).

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