

Notes on calling site in *Scinax constrictus* Lima, Bastos & Giaretta, 2004 (Amphibia, Hylidae) in Goiás state, Brazil

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The advertisement call of anurans is crucial to mate attraction, spatial organisation, individual recognition and discrimination (Gerhardt and Huber, 2002; Wells, 2007). In chorus calling frogs, male competition may negatively affect the functions of the advertisement call as call overlap reduces the efficiency of signal transmission (Bosch and Márquez, 1996). In this context, the choice of calling site may reduce the acoustic interference of conspecifics, since it facilitates individual spacing within a chorus (Brenowitz et al., 1984). *Scinax constrictus* is a small hylid frog (males 26.09 ± 1.83 mm; females 31.93 ± 2.53 mm, Lima et al., 2004) of the *S. rostratus* species group (Lima et al., 2004; Frost, 2018). It occurs in Goiás state, southeastern Tocantins, Minas Gerais (Limeira do Oeste), and the municipality of Corumbá in Mato Grosso do Sul, Brazil (Frost, 2018). Males of *S. constrictus* vocalise on shrubby vegetation marginal to ponds in open areas (Lima et al., 2004). Herein, we report a novel observation of calling site selection for *S. constrictus*.

On 26 March 2018 at 20:44 in an area of Cerrado within the Rio Verde municipality of Goiás state (-17.743103°S, -51.001361°W, datum WGS-84, 814 m a.s.l.), we observed a male *S. constrictus* calling from a leaf perch of a species of *Trichilia* Browne, 1756 (Figure 1). The perch height appeared greater than expected for *S. constrictus* (known range 38.0-112.2 cm, n = 46, Lima

et al., 2004), we therefore documented our observation. Using a tape measure, we noted the perch height (2.3 m) and its perpendicular distance to the pond margin (1.8 m). We recorded the frog's advertisement call using a Sennheiser ME66 microphone and TASCAM DR40 recorder, storing 16-bit .WAV files at a sampling rate of 44.1 kHz. Air temperature (20.2°C) and relative humidity (89.6%) were registered with thermohygrometer. No conspecifics were observed in the immediate vicinity but calling males of *Dendropsophus minutus* (Peters, 1872), *Boana albopunctata* (Spix, 1824), *Pseudis bolbodactyla* (Lutz, 1925), and *S. fuscocomarginatus* (Lutz, 1925) were present. The focal *S. constrictus* was collected (snout-vent length = 25.94 mm; mass = 1.03 g), euthanised and preserved according to Ministério da Ciência, Tecnologia, Inovações e Comunicações guidelines (MCTIC, 2015), and deposited in the herpetological collection of Laboratório de Biologia Animal, Instituto Federal Goiano Campus Rio Verde, Goiás, Brazil as voucher specimen RV524.

Calling site positions of hylid frogs appear to be infrequently reported (e.g., Benício and Silva, 2017). To obtain and assess previous descriptions on calling perch height of *S. constrictus*, we used the keywords “*Scinax constrictus*” as the search term on Google Scholar, Scopus, and Web of Science to compile literature on this theme. We found only two papers which describe the perch height of vocalising male *S. constrictus*: 79.2 ± 13.5 cm (range 38.0-112.2 cm; n = 46 individuals) (Lima et al., 2004), and ca. 50 cm (n = 3 individuals) (Vaz-Silva et al., 2006).

We assessed five advertisement call parameters (see Köhler et al., 2017): call duration, note number, note duration, pulse number per note, and dominant frequency against the data reported by Lima et al. (2004) and Gambale et al. (2014) (Table 1). The advertisement call was a repeated, pulsed note (Figure 2), with all five variables overlapping with those previously reported, in

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Figure 1. Calling site of lone *Scinax constrictus* male from Rio Verde municipality, Goiás state, Central Brazil. (A) A.R.M recording the focal frog, positioned in vegetation at a height of 2.3 m. (B) Close-up of the vocalising frog. Photographs by Gustavo V. Oliveira.

particular with data from Gambale *et al.* (2014); the study with the greatest sample size (and therefore assumed to reflect the greater variance in call parameters). However, call duration did appear to be shorter when compared to calls from choruses (Table 1).

Calling motivation, environmental factors (e.g., ambient temperature), and heterospecific interactions are known to influence anuran advertisement call parameters (Köhler *et al.*, 2017 and references therein), and call duration is known to be highly variable within *S. constrictus* (Gambale *et al.*, 2014). The absence of vocalising conspecifics at the calling site during our observation could indicate that shorter call duration may

be attributable to a lack of intraspecific competition. However, further study of individual males calling both in and out of a chorus setting would be required to further elucidate the extrinsic factors influencing vocal behaviour and advertisement call parameters. In addition, perch height may be related to both

Table 1. Advertisement call parameters (mean, \pm SD, range) of a male *S. constrictus* from Rio Verde municipality, Goiás state, compared with previous descriptions.

Advertisement call parameters	Present study n = 1 13 calls	Lima <i>et al.</i> 2004 n = 5 30 calls	Gambale <i>et al.</i> 2014 n = 62 310 calls
Call duration (ms)	106.0 \pm 49.5 (37-179)	213.4 \pm 24.0 (180.2-242.2)	150 \pm 50 (60-260)
Note number	4.46 \pm 1.8 (2-7)	9.3 \pm 0.9 (6.0-10.0)	7.0 \pm 2.1 (3-11)
Note duration (ms)	14.3 \pm 2.93 (3.0-20.0)	17.08 \pm 2.01 (14.5-20.4)	10 \pm 10 (10-20)
Pulse number	5.8 \pm 0.92 (2-7)	7.0 \pm 2.0 (4.0-9.0)	5.6 \pm 1.0 (3-8)
Dominant frequency (Hz)	3432.0 \pm 135.5 (3186.9-3617.6)	3292.1 \pm 123.2 (3115.2-3487.6)	3409.1 \pm 189.1 (3007.5-3409.1)

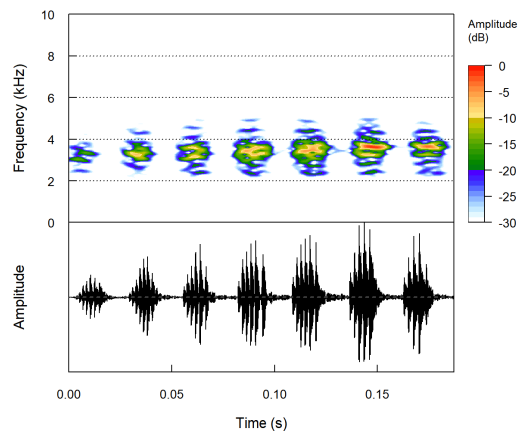


Figure 2. Advertisement call structure of a male *S. constrictus* from Rio Verde municipality, Goiás state, Central Brazil. Spectrogram (top) and waveform (bottom) were obtained using the Seewave package (Sueur *et al.*, 2008) in R statistical software (R Development Core Team, 2018).

advertisement call propagation (Kime et al., 2000) and chorus density (Bertoluci and Rodrigues 2002); this too being an area that would benefit from further study. Our observation adds to the limited reports of perch height variability in hylid frogs.

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