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Advertisement call of *Leptodactylus viridis* (Anura: Leptodactylidae) from Minas Gerais, Brazil

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In a recent phylogeny dealing with the genus *Leptodactylus*, DE SÁ et al. (2014) corroborate the monophyly of the genus using both morphological and molecular data. According to their data, the genus is composed of the *L. fuscus*, *L. pentadactylus*, *L. melanonotus*, and *L. latrans* species groups. Among these, the *L. latrans* group currently comprises *L. bolivianus*, *L. chaquensis*, *L. guianensis*, *L. insularum*, *L. latrans*, *L. macrosternum*, *L. silvanimbus*, and *L. viridis* (DE SÁ et al., 2014).

Leptodactylus viridis is known to occur in wetlands associated with open areas in Brazilian Atlantic Forest (JIM & SPIRANDELI-CRUZ 1979, MOURA et al. 2009). Its type locality, in the municipality of Itagibá, state of Bahia (JIM & SPIRANDELI-CRUZ 1979), is also the northernmost record for this species. Other localities include Fazenda Vista Bela, municipality of Guaratinga, state of Bahia (SILVANO & PIMENTA 2002), and Fazenda Santana, municipality of Salto da Divisa, state of Minas Gerais (MOURA et al. 2009).

Despite the taxonomic importance of frog calls (see, e.g., KWET & ANGULO 2002, MARQUEZ et al. 1995, TOLEDO et al. 2014), only five species of the *L. latrans* group had their calls described (*L. bolivianus*, *L. chaquensis*, *L. insularum*, *L. latrans*, and *L. macrosternum*). DE SÁ et al. (2014) reported hearing a male *L. viridis* emitting a single-note call, and a second longer, but barely audible note. No further information on its vocalization is available. Therefore, this paper aims to describe the call of *L. viridis* and provide an updated distribution data for this species.

During fieldwork near the municipality of Carlos Chagas in the northeastern parts of the Minas Gerais state, we heard two individuals of *Leptodactylus viridis* calling. The first individual was calling at the margins of a large artifi-

cial lake and we were unable to record or find it. The second one (Fig. 1) was found calling with the body partially submersed in the water of a permanent shallow pond, in an open area (30 December 2013, air temperature 23°C, 40°57' W, 17°36' S, 187 m above sea level). We recorded 21 calls using a Marantz PMD660 digital recorder coupled with a Sennheiser ME66 unidirectional microphone at a sampling rate of 44.1 kHz and 16 bits resolution. The recording is deposited at Coleção Bioacústica UFMG (CBUFMG-139) and the voucher specimen in the Coleção Herpetológica da UFMG (UFMG 15127).

Sound analyses were made using the software Raven Pro 1.5 (Cornell Lab of Ornithology Research Program Bioacoustics Workstation). Spectrograms were generated us-



Figure 1. Call voucher of *Leptodactylus viridis* (UFMG 15127) recorded about 30 kilometres southeast of the city of Carlos Chagas, state of Minas Gerais.

ing window size FFT = 512 with a 80% overlap and DFT = 1024. Temporal parameters were measured directly from the oscillogram. Sound figures were produced using Seewave 1.7.3 (SUEUR et al. 2008), a package of the R 3.0.2 platform, 64-bit version (The R Foundation for Statistical Computing). Seewave settings: window length = 512 samples; overlap = 70%. Terminology follows the physiological proposal by McLISTER et al. (1995) in an attempt to establish homologies, as discussed by ROBILLARD et al. (2006). Other parameters measured follow COCROFT & RYAN (1995). Data are presented as mean \pm standard deviation, range.

The *L. viridis* call resembles the sound of a drop falling into water and can be heard from a long distance. It is a simple call (Fig. 2) characterized by a single type of unpulsed note emitted at regular intervals (note duration: 23.5 ± 3.6 , 16–31 ms; note rate: 13.9 notes/minute; note interval: 4.5 ± 1.2 , 3.1–8.4 s; $n = 21$ notes) (see Table 1 for complete numerical values). There is a subtle ascendant amplitude modulation, with the peak of time in the second half of the note (peak of time: 10 ± 2 , 6–16 ms; $n = 21$ notes) and a subtle ascendant frequency modulation in the final third of the note (Fig. 2B). Dominant Frequency (considered here as the frequency range in which the most energetic part of the call is comprised) is between 375 and 1,220 Hz, with the peak of energy around 560 Hz ($n = 21$ notes). We did not hear the longer notes reported by DE SÁ et al. (2014).

Among the calls described for the *Leptodactylus latrans* species group (see Table 1 for comparison between species), those of *L. chaquensis* (i.e., growl and grunt; see HEYER & GIARETTA 2009 and DE SÁ et al. 2014) can be distinguished from the call of *L. viridis* by the presence of more than

one note per call. *Leptodactylus chaquensis* trills are distinguishable by having pulses (HEYER & GIARETTA 2009). Calls of *L. latrans* (referred by STRAUGHAN & HEYER, 1976 as *L. ocellatus*) are distinguishable from those of *L. viridis* by a longer note duration and the presence of harmonics. STRANECK et al. (1993) did not provide a description of a *L. latrans* call, but a spectrogram shows a frequency modulation that distinguishes it from *L. viridis* calls. The calls of *L. macrosternum*, *L. bolivianus*, and *L. insularium* are distinguishable from the calls of *L. viridis* by having longer notes (MARQUEZ et al. 1995, TÁRANO 2010, HEYER & DE SÁ 2011, DE SÁ et al. 2014).

The locality where we recorded *Leptodactylus viridis* represents the southeasternmost record for this species and is located almost 400 kilometres from its type locality. Besides, it is also located 150 kilometres from the coast, which is currently the most continental record for the species. Moreover, all previously reported localities for *L. viridis* are comprised in the lowlands within the Brazilian Atlantic Forest.

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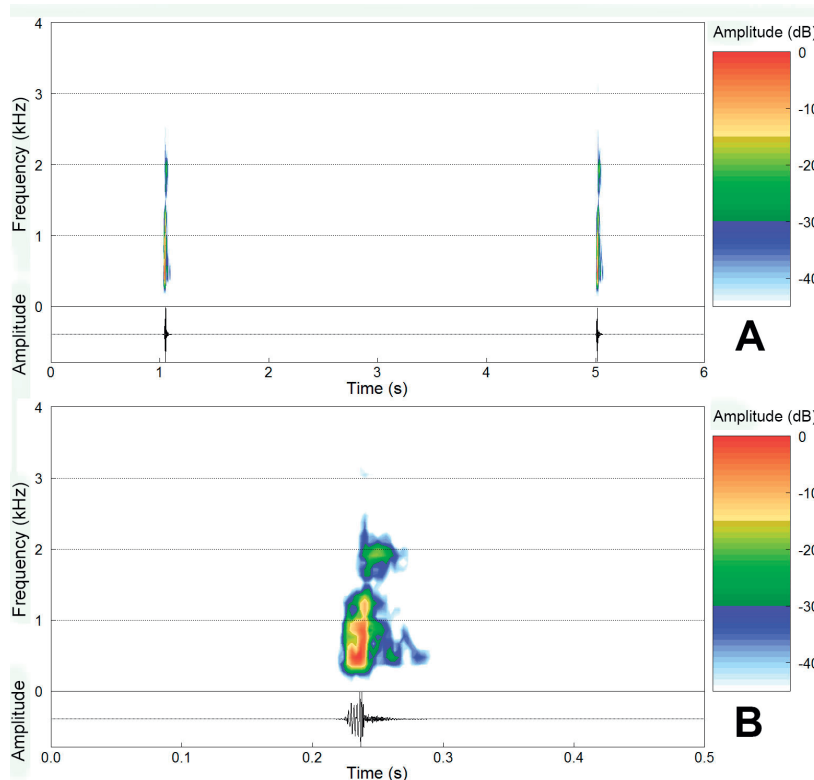


Figure 2. Spectrograms and corresponding oscillograms of calls of *Leptodactylus viridis* recorded about 30 kilometres southeast of the city of Carlos Chagas, state of Minas Gerais: A) Two notes emitted in sequence; and B) details of the second note.

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Table 1. Comparative numerical parameters of calls described for species of the *L. latrans* species group (sensu DE SÁ et al. 2014). * Carrier frequency. ** Call duration.

Species	Call type	Call duration (s)	Number of notes per call	Note duration (ms)	Note rate (notes/minute)	Interval between notes (s)	Number of pulses per note	Pulse duration (ms)	Peak time (ms)	Peak frequency (Hz)	Dominant frequency range (Hz)	Reference
<i>L. bolivianus</i>	–	–	1	116.9±19 (100.8–155.6)	51.9±20.9 (36.3–88.1)	–	–	–	–	617±21 (575.5–656.2)	–	MARQUEZ et al. (2005)
	Growl	0.541±0.075 (0.448–0.659)	25.8±3.3 (21–30)	16±3 (8–29)	47.5±1.6 (46–49)/s	–	1–2	–	–	345±2 (343–348)	274–650	
<i>L. chaquensis</i>	Grunt	–	1	112±8 (102–122)**	–	–	9.2±0.8 (8–10)	11±2 (5–14)	–	291±40 (263–343)	209–638	HEYER & GIARETTA (2009)
	Trill	0.623±0.025 (0.595–0.663)	15±0.9 (14–16)	29±7 (11–42)	23.5±1.9 (21–26)/s	–	–	–	–	460±41 (428–514)	196–613	
<i>L. insularium</i>	–	–	1	80–120	1.2–2.5/s	–	–	–	4/5 call duration	110–220 at start 890–1200 at 1/3 of call	–	HEYER & DE SÁ (2011)
<i>L. latrans</i>	–	–	1	270	–	–	–	–	100	1000 at start 930 at 80 ms 860 at 120ms 710 at 200ms 630 at end*	–	STRAUGHAN & HEYER (1976)
<i>L. macrosternum</i>	–	–	1	256.86±58.98**	–	–	8±2.3	15.64±2.36	–	630±110	–	TARANO (2010)
<i>L. viridis</i>	–	–	1	23.5±3.6 (16–31)	13.9	4.5±1.2 (3.1–8.4)	–	–	10±2 (6–16)	562.5	375–1220	This paper

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