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urn:lsid:zoobank.org:pub:8605C8C1-AE9A-49F1-B021-C40043D02221

Advertisement call of the rare, explosive breeding caatinga horned frog *Ceratophrys joazeirensis* Mercadal de Barrio, 1986 (Anura, Ceratophryidae)

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The present study describes for the first time the advertisement call of *Ceratophrys joazeirensis* Mercadal de Barrio, 1986. This rare explosive breeding species is endemic to the semi-arid Caatinga biome and is known only from four localities in northeastern Brazil: Municipality of Juazeiro, State of Bahia (type locality); Municipalities of Araruna and Triunfo, State of Paraíba; and Municipality of Passa and Fica, State of Rio Grande do Norte (Mercadal de Barrio, 1986; Vieira *et al.* 2006; Santos *et al.* 2009).

Recordings from a single male were made on 13 October 2010 (26°C) at an artificial temporary pond (10°43'11.83"S, 40°21'19.54"W, 455 m a.s.l., datum WGS1984) on the side of a dirt road on the way to the Poço Pelado, Municipality of Pindobaçu, State of Bahia, northeastern Brazil. Calls were recorded with a Marantz PMD-660 digital recorder and Sennheiser ME 66 shotgun microphone. Digital recordings were carried out at 44 kHz at 16 bit sampling size and saved in wav format. The recorded male and the recordings are housed in the Herpetological Collection of the Universidade Federal de Minas Gerais, Brazil. (UFMG 6170; SVL=19,17 mm).

Description and terminology of call characters follow Duellman and Trueb (1994). Call duration, note duration, note interval (measured directly from the waveform), frequency range (measured directly from the spectrogram) and peak frequency of the call were analyzed using the software Raven Pro 1.4 (Cornell Lab of Ornithology Research Program Bioacoustics Workstation). Audio-spectrograms were produced with frame length and 256 points FFT, frame overlap = 75% and Hamming function.

The advertisement call of *C. joazeirensis* consists of a single multipulsed note with 618–721 ms (n=26 calls) of duration, 108–130 pulses/call (n=25 calls), pulse rate of 171.2–184.2 pulses/sec (n=25 calls), and interval between calls of 1.5–3.6 s (n=23 calls; Table 1). Dominant frequency coincides with the fundamental frequency of 1550.4 Hz (n=26 calls), and there was no variation in dominant frequency. In the spectrogram, six sidebands were observed in all available calls (Figure 1).

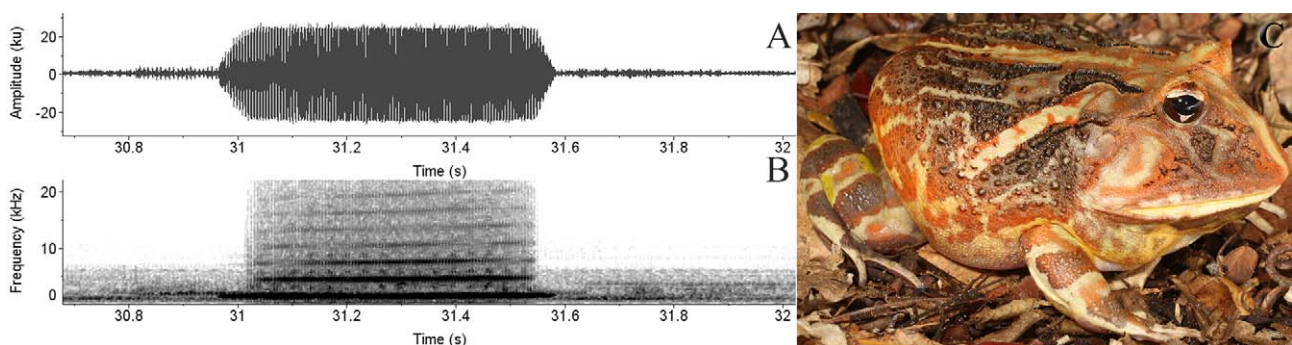


FIGURE 1 *Ceratophrys joazeirensis* (A) Oscillogram and (B) Spectrogram of the advertisement call. (C) Living adult recorded male (UFMG 6170).

The genus *Ceratophrys* Wied-Neuwied, 1824 is currently composed of eight species (Frost, 2012) of which only *C. cornuta* (Linnaeus, 1758), *C. cranwelli* Barrio, 1980 and *C. ornata* (Bell, 1843) have their advertisement calls described.

The vocalization of *C. joazeirensis* differs from that of *C. cornuta* by its higher pulse rate and lower fundamental/dominant frequency. From *C. cranwelli* it differs by having longer notes and higher number of pulses, and from *C. ornata* by having longer notes (Table 1).

TABLE 1: Comparison of advertisement call parameters of species of *Ceratophrys* with described vocalization (including the present study). Sources: Marques *et al.* 1995 (for *C. cornuta*), Lescano 2011 (for *C. cranwelli*), Barrio 1980 (for *C. ornata*). Values are presented as average±standard deviation (min-max). Temperature during recording: *C. cranwelli* (23°C), *C. joazeirensis* (26°C). For *C. cornuta* and *C. ornata* temperature was not available.

Species	Call Parameters					
	Pulse rate (pulses/sec)	Dominant frequency (hz)	Note duration(ms)	Note interval(ms)	Number of pulses/call	N(individuals/calls)
<i>C. cornuta</i>	91.8	2175.7	1026.7	–	94	1/1
<i>C. cranwelli</i>	198.3±6.3 (182.1–209.6)	1742.6±117.8 (1578.4–886.1)	340.2±12.6 (305–364)	1925.6±384.6 (1270–2758)	67.5±3.4 (59–73)	2/10
<i>C. ornata</i>	208 (186–225)	–	460 (410–530)	–	23 (20–25)	Not detailed
<i>C. joazeirensis</i>	179.9±2.6 (171.2–184.2)	1550.4	674.9±28.5 (618–721)	2400±600 (1500–3600)	121.4±5.8 (108–130)	1/26

The species of *Ceratophrys* with described vocalization (including the present study) can be promptly distinguished from each other using call parameters, suggesting that bioacoustic analysis could be a useful tool for assessing species delimitation within the genus.

Considering that *C. joazeirensis* cannot be easily distinguished morphologically from *C. aurita*, this paper brings valuable information to the taxonomy of *Ceratophrys* that could be further tested when the call of *C. aurita* is described.

Because the increase in ploidy level has been shown to decrease the pulse rate of the advertisement call of North American hylids (Keller & Gerhardt, 2001), one would expect pulse rates to be faster in the diploids *C. cranwelli* and *C. cornuta* than it is in *C. ornata* and *C. joazeirensis* (octoploids). However, it is only half as fast in *C. cornuta* and not different in *C. cranwelli*, suggesting that there must be other factors besides genome duplication determining pulse rates within *Ceratophrys*.

We are grateful to Rievers, C. and Lindemann, M. for field assistance and to Carvalho, T.R. for his valuable comments on the manuscript. Fieldwork was partly funded by Programa Biota Minas/FAPEMIG Project ‘Anfíbios e répteis da Serra do Espinhaço: preenchedo as lacunas do conhecimento de quatro áreas prioritárias para a conservação da herpetofauna de Minas Gerais’ and FAPEMIG/Vale Project ‘Taxonomia e distribuição geográfica de anfíbios do Quadrilátero Ferrífero, Minas Gerais: desenvolvendo ferramentas para aumentar a eficiência do processo de licenciamento ambiental’, and Amaranthaceae Appreciation Society. CNPq and FAPEMIG provided FSFL fellowship.

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