Release call of *Odontophrynus cultripes* Reinhardt and Lütken, 1862 (Anura: Odontophrynidae) from Southeastern Brazil

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ABSTRACT: **(Release call of *Odontophrynus cultripes* Reinhardt and Lütken, 1862 (Anura: Odontophrynidae) from Southeastern Brazil)** All the eleven *Odontophrynus* species has their advertisement call described, however, only three species have their release call described. Here, we describe the release call of *Odontophrynus cultripes* from Viçosa, Minas Gerais, Brazil. The release call consists of a single pulsed note, with 0.216 – 0.336 s, dominant frequency 516.8 – 689.1 kHz, number of pulses per note 24 – 35, pulse rate 103.31 – 111.52 pulse/s. There are no difference in dominant frequency and call during of the release call and advertisement call of *O. cultripes*, however comparing number of pulses and pulse rate, the difference found between those parameters for both call types was significant. Some papers suggest the advertisement call evolved from release call, which might explain the similarities found in this work.
Keywords: Vocalization, call repertoire, acustic parameters, bioacustic.

RESUMO: **(O Canto de Soltura de *Odontophrynus cultripes* (Anura, Odontophrynidae)** Todas as onze espécies de *Odontophrynus* possuem o canto de anúncio descrito, contudo, apenas três espécies tem o canto de soltura conhecidos. Neste trabalho, nós descrevemos o canto de soltura do *Odontophrynus cultripes* de Viçosa, Minas Gerais, Brasil. O canto de soltura consiste de uma nota pulsionada, com duração de 0.216 – 0.336 s, freqüência dominante 516.8 – 689.1 kHz, número de pulsos por nota 24 – 35, taxa de pulso 103.31 – 111.52 pulso/s. Não há diferença da freqüência dominante e da duração entre o canto de soltura e o canto de anuncio de *O. cultripes*. No entanto comparando o número de pulsos e a taxa de pulsos por segundo, a diferença encontrada entre esses

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parâmetros para ambos os tipos de canto foi significativa. Alguns trabalhos sugerem que o canto de anuncio evoluiu do canto de soltura, o que poderia explicar a similaridade encontrada nesse trabalho.
Palavras-chave: Vocalização, repertório vocal, parâmetros acústico, bioacústisca.

Introduction

The genus *Odontophrynus* Reinhardt and Lütken, 1862 is currently composed of eleven species distributed from east to southeast of South America (Savage and Cei, 1965; Caramaschi and Napoli 2012). It is divided in four species groups based mainly on morphological traits (Savage and Cei, 1965). *Odontophrynus cultripes* (Figure 1) belongs to *O. cultripes* group, which is characterized by the presence of large paratoids glands in the post-orbital region, and several other glands covering the body (Savage and Cei, 1965). *O. cultripes* is distributed through a series of plateaus and mountain chains in the states of Minas Gerais e Goiás (Caramaschi and Napoli, 2011).

All the eleven *Odontophrynus* species have their advertisement call described (Barrio, 1964; Salas and di Tada, 1996; Rosset, 2007; Borteiro *et al.* 2010; Bastos *et al.* 2011; Caramaschi and Napoli, 2012; Grenat, 2013;

Figure 1. *Odontophrynus cultripes*. Adult male in life from Parque Estadual da Serra do Brigadeiro, municipality of Araponga, state of Minas Gerais, Brazil (unvouchered species) (photo by H. C. Costa).

Rosset and Baldo, 2014). However, only *O. occidentalis, O. cordobae* and *O. americanus* have their release calls described (Barrio, 1964; Grenat and Martino, 2013), evidencing the poor knowledge on the vocal repertoire of the genus.

Males emit release calls when they are clasped by other males, and by unreceptive females that have already completed the ovoposition (Wells, 2007). In addition, this vocalization is usually associated with corporal vibrations (Duellman and Trueb, 1986). Both the release call and vibrations are advantageous artefacts since they are considered important signals for the individual energy saving in an erroneous amplexus, and consequently gamete loss (Duellman and Trueb, 1986). It has been suggested that the advertisement calls evolved from release signals (Wells, 2007). Here, we describe the release call of *Odontophrynus cultripes* and provide comments on its similarity to its advertisement call.

Material and Methods

We recorded one individual of *Odontophrynus cultripes* on 21 November 2010, at "Mata do Seu Nico", located in municipality of Viçosa (20º45'23" S, 42º52'23" W), state of Minas Gerais, Brazil. The physiognomy in the region is classified as seasonal semi-deciduous forests (Silva and Casteleti 2005), and according to the Köppen-Geiger climate classification, Viçosa is defined as Cwa (Kottek et al. 2006). The individual was stimulated by a weak squeeze in the axillae area simulating an amplexus by another male. The release calls of this individual (SVL= 54.36mm) were recorded using a Sony ICD-B120® digital recorder with an internal microphone, with sampling frequency of 44.000 Hz and 16bit resolution and saved in an uncompressed wave format. The specimen was collected, fixed in formaldehyde (10%) and housed in alcohol (70%) in collection of the Museu de Zoologia João Moojen, Universidade Federal de Viçosa (under the label MZUFV 11348; license SISBIO/IBAMA 26157-1). Aiming compare the release call with the advertisement call, we analysed the advertisement call presented by Toledo et al.(2007) (CD-ROM track 08) recorded in São Tomé das Letras, state of Minas Gerais, Brazil (SVL=48mm). This vocalization was extracted from the CD-ROM using Windows Media Player® software and saved in .wma format. After that we converted the file to wave using the Free MP3 WMA converter 2.1® software. We analysed the calls with Raven Pro 1.4® for Windows (Cornell Lab of Ornithology) and constructed audio spectrograms in R software using the package "seewave" (Sueur et al. 2008; R Development Core Team) with the following parameters: FFT window width = 256, Frame = 100, Overlap = 75, and flat top filter.

Results

The release call of *Odontophrynus cultripes* (Figure 2) consists of a single pulsed note, with duration of 0.216–0.336 s (= 0.275 ± 0.032s, n=14) and dominant frequency of 516.8–689.1 Hz (= 676.79 ± 46.05 Hz, n=14). The number of pulses per note was 24–35 (= 29.14 ± 3.25, n=14). The number of pulses per second (pulse/rate) was 103.31–111.52 (= 106.19±2.82, n=408). The vocalization was emitted in call series while we stimulated the individual, with irregular intervals between calls.

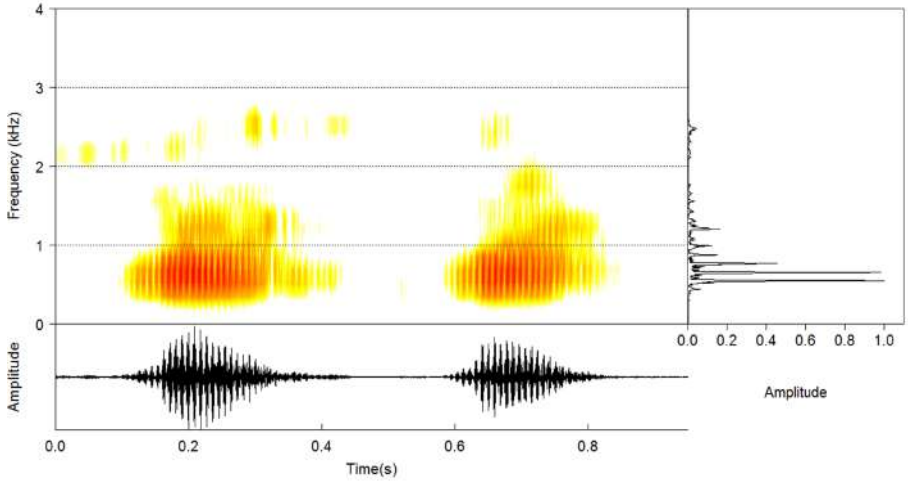

Figure 2. (a) oscillogram, and (b) audiospectrogram of a single note of the release call of *O.cultripes* from municipality of Viçosa, state of Minas Gerais, Brazil.

Discussion

The release call has been considered an important taxonomic trait for distinguish the cryptic species *Odontophrynus cordobae* and *O. americanus* (Martino and Sinsch, 2002). As well as important for distinguish those species, the release call of *O. cultripes* also have demonstrated taxonomic value, since it differs from previously described release calls of *O. cordobae*and *O. americanus*. The release call of *O. occidentalis* was figured and described as a call formed by a non-pulsed note (Barrio, 1964). However, there is no information regardless its call parameters such as dominant frequency or

duration. Since all known calls emitted by *Odontophrynus* species are pulsed, maybe the interpretation of Barrio (1964) as non-pulsed were actually "side-bands" (Vielliard, 1993).

The analyses of the advertisement call (Figure 3) of the *O. cultripes* digitalized (Toledo *et al.* 2007) and the description provided by (Caramaschi and Napoli, 2012) showed a similar pattern to the release call (Table 1). There was no difference between the release and the advertisement call regarding the dominant frequency or call duration. However, the number of pulses per note, and the pulse rate were different between advertisement and release calls (the release call has more pulses per note and a higher pulse rate). The release calls are modulated in frequency with energy intensity increasing at the beginning of the call (Figure 2), while in the advertisement calls the increasing of intensity is at the end of the calls (Figure 3).

The similarities found between advertisement and release calls may be an artefact of the possible evolution of release call/sign (Schmidt, 1965; Schmidt et al, 1990). These papers suggest that advertisement call may have been originally evolved from the release call. However, we found no record of such similarities between the parameters of the release and the advertisement calls in any other genus (e.g. Caldart *et al.* 2013; Garda *et al.* 2010; Guerra *et al.* 2011). Other approaches, such as phylogenetic analysis, would also provide valuable information to test this hypothesis that the advertisement call in fact evolve from release calls (Wells, 2007).

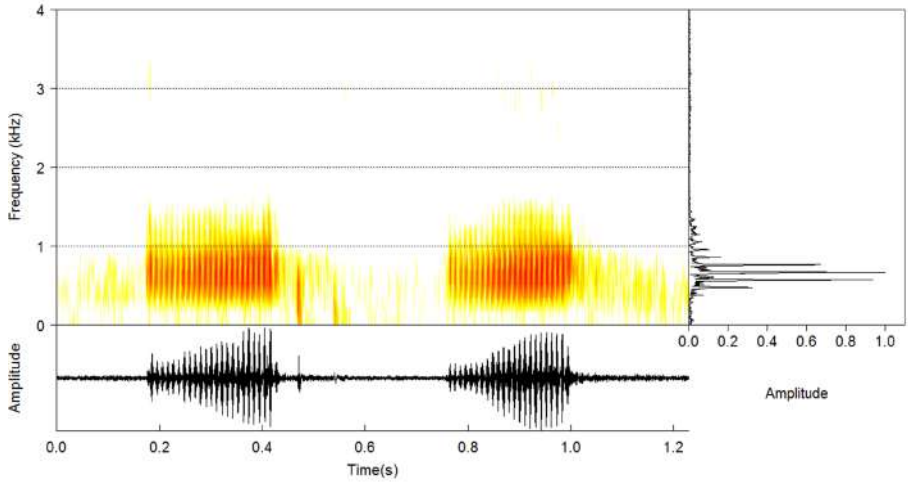

Figure 3. (a) oscillogram, and (b) audiospectrogram of a single note of the advertisement call of *Odontophrynus cultripes* from São Tomé das Letras, state of Minas Gerais, Brazil.

Table 1. Call types of *Odontophrynus cultripes*. Values are presented as mean ± SD (range), SD = standard deviation.

	Release Call	Advertisement Call	
	Present work	Toledo et al. (2007)	Caramaschi and Napoli (2012)
Dominant Frequency (Hz)	676.79 ± 46.05 (516.8–689.1)	652.18 ± 73.37 (516.8–689.1)	660
Duration (s)	0.27 ± 0.03 (0.216–0.336)	0.26 ± 0.08 (0.123–0.391)	0.34 ± 0.04 (0.27–0.40)
Number of Pulses	29.14 ± 3.25 (24–35)	24 ± 6.97 (12–31)	23.21 ± 2.19 (19–28)
Pulse rate (pulses/s)	106.19 ± 2.82 (103.31–111.52)	91.65 ± 5.23 (79.28–97.56)	69.26 ± 2.41 (62.2–71.7)

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