

Advertisement call of *Rhinella pygmaea* (Myers and Carvalho, 1952) (Anura: Bufonidae) from the northern State of Rio de Janeiro

Thiago Ribeiro de Carvalho^{1,2,*}, Vitor Carneiro de Magalhães Tolentino and Arioaldo Antonio Giaretta¹

The *Rhinella granulosa* (Spix, 1824) species group currently comprises 13 species distributed in Central (Panama) and throughout South America (Narvaes and Rodrigues, 2009; Sanabria et al., 2010). Four species of the group [*R. bernardoi* Sanabria, Quiroga, Arias and Cortez, 2010; *R. humboldti* (Gallardo, 1965); *R. nattereri* (Bokermann, 1967); and *R. pygmaea* (Myers and Carvalho, 1952)] still have unknown advertisement calls. Herein, we describe the advertisement call of *R. pygmaea* from the Municipality of Macaé (approximately 22°18' S, 41°59' W; approximately 15 m a.s.l.), northern State of Rio de Janeiro. Bioacoustic data on *R. pygmaea* were obtained from a site located approximately 110 km southward in a straight line from its type locality: Municipality of São João da Barra, northern State of Rio de Janeiro (Narvaes and Rodrigues, 2009).

Vocalizations were recorded with a digital recorder (M-audio Microtrack II) set at 48.0 kHz sample rate and 16 bits resolution, coupled to a directional microphone (Sennheiser K6/ME66). Bioacoustic variables were analyzed with Audacity software version 2.0.2 (Audacity Team, 2012). Sound figures were obtained with Seewave version 1.6.4 (Sueur, Albin and Simonis, 2008), R platform (version 2.15.1) package (R Development Core Team, 2012); Settings were Hanning window, 85% overlap, and 256 points resolution (FFT). Call terminology followed Guerra

et al. (2011). The voucher specimen is deposited in the Collection of frogs of the Universidade Federal of Uberlândia (AAG-UFU) as follows: AAG-UFU 1125 (Figure 1; from Macaé, Rio de Janeiro).

A few males of *R. pygmaea* (Figure 1) were found calling just after a strong rainfall in March/2012, on the margins of a temporary pond in a pasture land. Several males of *R. ornata* (Spix, 1824) were calling syntopically on the same night. Advertisement call description was based on two recordings of a single male (N = 8 advertisement calls).

Advertisement call of *R. pygmaea* (Table 1; Figure 2) consists of a long sequence of three-pulse notes (56–114 notes/call; mean 92.3, SD = 27.7) emitted at rate of 25–26 notes/s (mean 25.9, SD = 0.3). One of the eight advertisement calls had its first portion composed of irregular introductory notes (irregular pattern of pulse groups and space between pulses) (see Figure 2B). Advertisement call duration was 2.1–5.9 s (mean 3.9, SD = 1.2). Note duration was 25–32 ms (mean 27.5, SD = 1.2; N = 15) and internote interval was 9–13 ms (mean 10.7, SD = 1.1; N = 15). Each three-pulse note has an amplitude modulation (ascendant at the beginning and



Figure 1. Voucher male specimen of *Rhinella pygmaea* from the Municipality of Macaé, State of Rio de Janeiro (AAG-UFU 1125; SVL = 37.7 mm).

¹ Laboratório de Taxonomia, Sistemática e Ecologia Comportamental de Anuros Neotropicais. Faculdade de Ciências Integradas do Pontal, Universidade Federal de Uberlândia (UFU), Rua 20 n° 1.600 - Bairro Tupã, 38.304-402, Ituiutaba, MG, Brasil.

² Programa de Pós-Graduação em Biologia Comparada, Universidade de São Paulo, Departamento de Biologia/FFCLRP. Avenida dos Bandeirantes, 3900, 14040-901 Ribeirão Preto, São Paulo, Brasil.

* Corresponding author: thiago_decarvalho@yahoo.com.br

Table 1. Advertisement call variables of *R. pygmaea* (present study) from the Municipality of Macaé, northern State of Rio de Janeiro; and data from *R. azarai*, *R. dorbignyi*, and *R. fernandezae* (extracted from Guerra *et al.*, 2011). Mean±SD (minimum–maximum). Diagnostic characters are in bold type.

	<i>R. pygmaea</i>	<i>R. azarai</i>	<i>R. dorbignyi</i>	<i>R. fernandezae</i>
Advertisement call duration (s)	3.9 ± 1.2 (2.1 – 5.9)	19.3 ± 1.1 (18.6 – 20.1)	8.3 ± 1.5 (6 – 10.8)	8.1 ± 2.8 (5.6 – 12.8)
Dominant frequency (Hz)	2593 ± 43.4 (2519 – 2643)	2499 ± 36.9 (2473 – 2525)	2128 ± 104.9 (1953 – 2349)	2044 ± 122.2 (1841 – 2339)
Notes/call	92.3 ± 27.7 (56 – 114)	264.4 ± 51.4 (228 – 301)	291.7 ± 58.1 (219 – 397)	313.4 ± 60.6 (184 – 386)
Notes/second	25.9 ± 0.4 (25 – 26)	13.7 ± 3.4 (11 – 16)	35 ± 2.9 (29 – 38)	40.6 ± 8.1 (30 – 57)
Note duration (ms)	27.6 ± 1.2 (25 – 32)	51 ± 15 (40 – 62)	23 ± 1.4 (20 – 25)	21 ± 4.2 (15 – 27)
Note interval (ms)	10.7 ± 1.1 (9 – 13)	24 ± 3.7 (21 – 26)	5 ± 2.2 (3 – 10)	5 ± 2.2 (2 – 8)
Pulses/note	3	3	3	3

descendant at the end) along its extent, with the central pulse having the highest amplitude in each note (see Figure 2C). In contrast, the advertisement call has no frequency modulation. Dominant frequency was 2519–2646 Hz (mean 2593, SD = 43). Other unrecorded males (N = 2) emitted advertisement calls with irregular

introductory notes as well (Carvalho pers. obs.).

Rhinella pygmaea can be easily distinguished from *R. granulosa*, *R. mirandaribeiroi* (Gallardo, 1965), *R. merianae* (Gallardo, 1965), and *R. centralis* (Narvaes and Rodrigues, 2009) by possessing the advertisement call composed of three-pulse notes, whereas all four

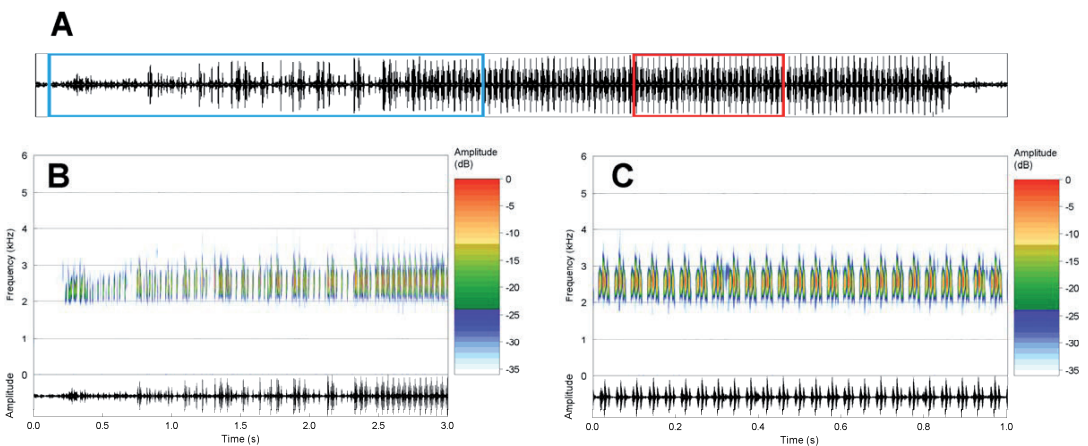


Figure 2. A – Oscillogram (~ 5.5 seconds) of one advertisement call of *R. pygmaea*: irregular introductory notes (first 2 seconds) followed by a sequence of 90 three-pulse notes. B – Audiospectrogram (above) and corresponding oscillogram (below) detailing the irregular introductory notes outlined by a blue rectangle. C – Audiospectrogram (above) and corresponding oscillogram (below) detailing 25 three-pulse notes of the sequence outlined by a red rectangle. Sound file: Rhinel_pygmaeaMacaéRJ1aTRC_AAGmt; 19:14h, 25 March 2012; air 24.9°C, water 28.0°C. Vouchered recording (AAG-UFU 1125), recorded from the Municipality of Macaé, State of Rio de Janeiro, Brazil.

abovementioned species have four-pulse notes (Guerra et al., 2011; São-Pedro, Medeiros and Garda, 2011; Morais et al., 2012). Furthermore, *R. bergi* (Céspedes, 2000) and *R. major* (Müller and Hellmich, 1936) have two and six/seven pulse-notes advertisement calls, respectively (Guerra et al., 2011). Guerra et al. (2011) reported advertisement calls of three hybrid specimens between *R. bergi* and *R. major* composed of 4–8 pulse-notes.

The advertisement call of *R. pygmaea* described in the present study was compared with other species possessing the advertisement call composed of three-pulse notes: *R. azarai* (Gallardo, 1965), *R. dorbignyi* (Duméril and Bibron, 1841), and *R. fernandezae* (Gallardo, 1957) (Table 1). The advertisement call of *R. pygmaea* possesses a remarkably lower number of notes per call in comparison with all three aforementioned species, and seems to be a good diagnostic character (see Table 1).

Besides to the distinctive body size [adult male specimens of *R. pygmaea* have a mean snout-vent length of 32.1 millimeters, whereas the combined adult male specimens of the other twelve species in the *R. granulosa* group have a mean snout-vent length of 40.4–57.3 millimeters (Narvaes and Rodrigues, 2009)], the advertisement call of *R. pygmaea* represents, henceforth, an additional diagnostic line of evidence in comparison with the other species of the *R. granulosa* group with described calls so far. Additional recordings of *R. pygmaea* would be essential to assess its bioacoustic variability.

Acknowledgements. Grants by CAPES (TRC) and CNPq (AAG). Financial support by CNPq and FAPEMIG. We thank Natan M. Maciel for critically reading the manuscript.

References

- Audacity Team (2012): Audacity (version 2.0.2): Free Audio Editor and Recorder. Available from: <http://audacity.sourceforge.net>. Last accessed on 06 September 2012).
- Guerra, C., Baldo, D., Rosset, S., Borteiro, C., Kolenc, F. (2011): Advertisement and release calls in Neotropical toads of the *Rhinella granulosa* group and evidence of natural hybridization between *R. bergi* and *R. major* (Anura: Bufonidae). *Zootaxa* **3092**: 26-42.
- Morais, A.R., Bastos, R.P., Annunziata, B.B., Kokubum, M.N.C., Maciel, N.M. (2012): Description of the advertisement call of *Rhinella mirandaribeiroi* (Gallardo, 1965) (Anura: Bufonidae). *Zootaxa* **3265**: 66-68.
- Narvaes, P., Rodrigues, M.T. (2009): Taxonomic revision of *Rhinella granulosa* species group (Amphibia, Anura, Bufonidae), with a description of a new species. *Arquivos de Zoologia, Museu de Zoologia da Universidade de São Paulo* **40**: 1-73.
- R Development Core Team (2012): R Foundation for Statistical Computing. Vienna, Austria. Available at: <http://www.R-project.org>. Last accessed on 10 September 2012.
- Sanabria, E., Quiroga, L., Arias, F., Cortez, R. (2010): A new species of *Rhinella* (Anura: Bufonidae) from Ischigualasto Provincial Park, San Juan, Argentina. *Zootaxa* **2396**: 50-60.
- São-Pedro, V.A., Medeiros, P.H., Garda, A. (2011): The advertisement call of *Rhinella granulosa* (Anura, Bufonidae). *Zootaxa* **3092**: 60-62.
- Sueur, J., Aubin, T., Simonis, C. (2008): Seewave, a free modular tool for sound analysis and synthesis. *Bioacoustics* **18**: 213-226.