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Advertisement call of *Rhinella crucifer* (Wied-Neuwied, 1821) (Anura: Bufonidae) from southern Bahia, Brazil

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The *Rhinella crucifer* species group is currently composed by six species: *Rhinella crucifer* (Wied-Neuwied, 1821); *R. ornata* (Spix, 1824); *R. henseli* (A. Lutz, 1924); *R. abei* (Baldissera, Caramaschi & Haddad, 2004); *R. pombali* (Baldissera, Caramaschi & Haddad, 2004) and *R. inopina* Vaz-Silva, Valdujo & Pombal, 2012. Until 2012, the group was known to occur only in the Brazilian Atlantic Rain Forest from Rio Grande do Sul to Ceará, and adjacent areas in Minas Gerais and São Paulo (Baldissera *et al*. 2004). The recently described *R. inopina* revealed an allopatric distribution, occurring in forest vegetation types in eastern Cerrado (Vaz-Silva *et al*. 2012). *Rhinella crucifer* (Wied-Neuwied, 1821), occurs throughout the Atlantic Rain Forest from Rio de Janeiro to Ceará including the northeast of Minas Gerais (Baldissera *et al*. 2004; Frost, 2014). Only two species in the group have described calls: *R. ornata* as *Bufo crucifer* in Heyer *et al*. (1990) and *R. pombali* (Lourenço *et al*. 2010). The type locality of *R. crucifer* was informed as being between São Pedro de Alcantara in Santa Catarina and Barra da Vereda in Bahia, but as stated by Bokermann (1966) the type locality can be narrowed down to an area between the rivers Piabanda and Issara, both affluents of the Ilhéus river, approximately 40 km above the municipality of Itabuna. Herein we describe the advertisement call of *R. crucifer* from a population in the municipality of Igrapiúna, Bahia, Brazil, located less than 100 km from the city of Itabuna.

Between August and October 2012 we recorded 33 calls from several males, calling in a temporary pond located in the Atlantic Rain Forest domain in the Michelin Ecological Reserve, Igrapiúna, southern Bahia (13°49'15" S, 39°11'52" W). *Rhinella crucifer* is an explosive breeder showing opportunistic behavior during mate selection and males alternate between calling activity, territorial behavior and quite periods. Due to the difficulty of recording single individuals, we cannot state how many individual males were recorded, since records were made in six different occasions in the same population, thus the same males may have been recorded more than one time. Males were found calling at night, above partly submerged leaves, trunks and also at the edge of the pond (Fig. 1A). *Rhinella crucifer* was identified combining distribution data (Thomé *et al*., 2012) and morphological characters like absence of vertebral line and absence of yellow marks on flanks (Baldissera *et al*., 2004; Vaz-Silva *et al*., 2012). We used a Marantz PMD 660 digital audio recorder with a unidirectional Yoga HT-320A microphone. Calls from several males were pooled and analyzed at a resolution of 16 bits and 48 kHz sampling rate, mono channel. Waveform and spectrogram (Fig. 1B and C) were made using Raven Pro 1.3 (Bioacoustics Research Program, 2008) and analyzed with a Fast Fourier Transformation of 256 points, 50% overlap for an entire call and Window Hamming. Terminology of temporal and acoustic parameters follows Heyer *et al*. (1990). Data are presented as mean ± standard deviation (range). One individual of the recorded population was collected as voucher specimen (MZUESC-12167, SVL = 99.7 mm). Measures of note duration and interval between notes were made using five notes from the middle of the call and five notes from the beginning. Mean air temperature during recordings was 22°C (21°C–24°C) and mean air humidity was 95% (92% –99%).

The advertisement call of *R. crucifer* has no harmonic structure and is composed by a series of pulsed notes (Fig. 1B, 1C). The call begins quietly, with the first notes shorter than the following, quickly becoming intense and staying intense. The mean call duration was 3.54 ± 0.85 s (1.47–5.53 s; N = 33) with 72 ± 16 notes per call (31–104; N = 33). The first notes were shorter than the following ones. First notes duration was 0.016 ± 0.004 s (0.008–0.029 s; N = 145) and the center call notes duration was 0.027 ± 0.003 s (0.017–0.035 s; N = 130). The mean interval of first notes was 0.031 ± 0.006 s (0.015–0.044 s; N = 116) and central notes last 0.023 ± 0.013 s (0.011–0.15 s; N = 104). The mean dominant

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frequency was 855 ± 91 Hz (750–937.5 Hz; N = 32). The number of pulses per note ranged from 1 to 5 and note rate was 17–25 notes per second.

The call of *R. crucifer*, *R. ornata* and *R. pombali* resemble each other. The main difference between them is the dominant frequency which is lower in *R. crucifer* (861–1033 Hz in *R. pombali* and 960–1750 Hz in *R. ornata*) (Heyer *et al*. 1990; Lourenço *et al*. 2010). Note rate seems to be other important difference. The note rate of the call of *R. crucifer* (17–25 notes per second) is larger than in the call of *R. ornata* (11.5–15.5 notes per second; Heyer *et al*. 1990). Unfortunately, Lourenço *et al*. (2010) did not provide this measure for comparison in their study on the call of *R. pombali*. Recently, Thomé *et al*. (2012), based on molecular data, suggested that *R. pombali* was described based on a hybrid between *R. crucifer* and *R. ornata*. However, for a better understanding of the relationship between these species, an integrative approach is essential, including data from the overlap zone between *R. crucifer* and *R. ornata.*

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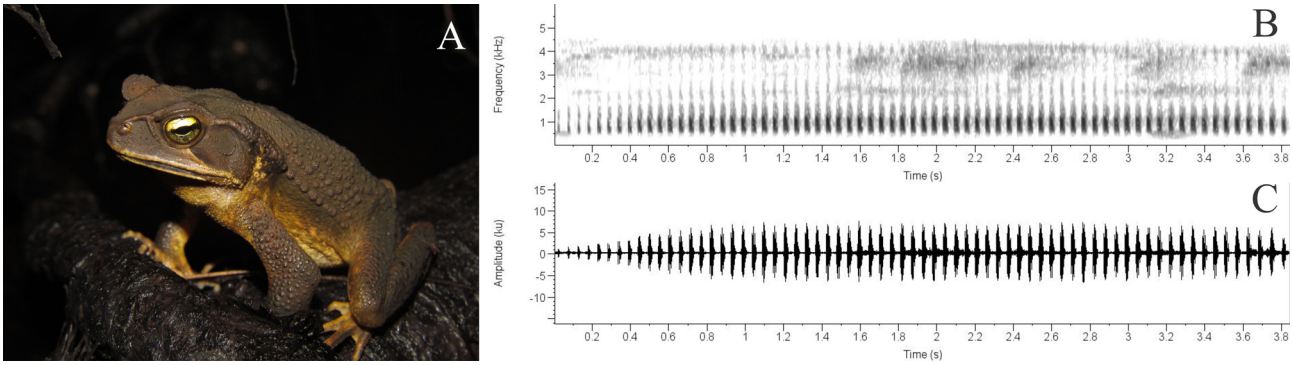

FIGURE 1. A) Individual of *Rhinella crucifer* from recorded population in Michelin Ecological Reserve, Igrapiúna, Bahia, Brazil; B) spectrogram and C) waveform of the advertisement call. Air temperature = 21°C, air humidity = 94%.

References

Baldissera, F.A.B., Caramaschi, U. & Haddad, C.F.B. (2004) Review of the *Bufo crucifer* species group, with descriptions of two new related species (Amphibia, Anura, Bufonidae). *Arquivos do Museu Nacional,* 62, 255–282.

Bioacoustics Research Program (2008) Raven Pro: Interactive Sound Analysis Software (Version 1.3) [Computer software, The Cornell Lab of Ornithology]. Ithaca, NY. Available from: http://www.birds.cornell.edu/raven (accessed 10 March 2014)

Bokermann, W.C.A. (1966) *Lista Anotada das Localidades Tipo de Anfíbios Brasileiros*. Serviço de Documentação da Reitoria da Universidade de São Paulo, São Paulo, 183 pp.

Frost, D.R. (2014) Amphibian Species of the World: an Online Reference American Museum of Natural History, New York, USA. Version 6.0 Electronic Database. Accessible from: http://research.amnh.org/herpetology/amphibia/index.html (accessed 19 February 2014)

Heyer, W.R., Rand, A.S., Cruz, C.A.G., Peixoto, O.L. & Nelson, C.E. (1990) Frogs of Boracéia. *Arquivos de Zoologia*, 31, 231–410.

Lourenço, A.C.C., Baêta, D., Abreu, A.C.L. & Pombal, J.P. (2010) Tadpole and advertisement call of *Rhinella pombali* (Baldissera, Caramaschi & Haddad, 2004) (Amphibia, Anura, Bufonidae). *Zootaxa,* 2370, 65–68.

Thomé, M.T.C., Zamudio, K.R., Haddad, C.F. & Alexandrino, J. (2012) Delimiting genetic units in Neotropical toads under incomplete lineage sorting and hybridization. *BMC Evolutionary Biology*, 12, 242. http://dx.doi.org/10.1186/1471-2148-12-242

Vaz-Silva, W., Valdujo, P.H. & Pombal, J.P. (2012) New species of the *Rhinella crucifer* group (Anura, Bufonidae) from the Brazilian Cerrado. *Zootaxa*, 3265, 57–65.