



### On the advertisement call of *Dermatonotus muelleri* (Boettger, 1885) (Anura, Microhylidae)

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As presently recognized, *Dermatonotus muelleri* (Boettger, 1885) occurs throughout Argentina, Bolivia, Brazil and Paraguay (Brusquetti & Lavilla 2006); Paraguay referred as the type-locality (Frost 2013). Its advertisement call was briefly described by Nelson (1973) based on a sample from Brazil. In the present work, we redescribe its advertisement call based on a large sample from the Cerrado biome of Triângulo Mineiro region, state of Minas Gerais.

Field records were gathered on 17 October 2012 at the municipality of Gurinhatã (19°02'02.05"S 49°46'07.76"W; approximately 516 m a.s.l.), region of the Triângulo Mineiro, state of Minas Gerais, Brazil. The regional climate is wet/hot from September to March and mild/dry in the other months (IBGE 1978); the original vegetation was Cerrado, portions of which can still be found as scattered patches. Recordings were made between 21:00–23:12h.

Seventy-six calls of 22 males were analyzed; pooled means and standard deviations were determined considering mean parameters of individual males; the raw data are deposited in the Dryad Repository: <http://dx.doi.org/10.5061/dryad.t8vb8>. Calls were recorded with a Marantz PMD 671, a Boss 864 (both coupled to Sennheiser ME67/K6 microphones) and a M-audio Microtrack II (Sennheiser ME66/K6) digital recorders (all set at 44.1 kHz and 16 bits resolution). Sounds were analyzed using Raven Pro 1.5, 64-bit version (Bioacoustics Research Program 2012); figures were generated using Seewave v.1.6 package (Sueur *et al.* 2008) on the R (v.2.13.0) platform (R Development Core Team 2011). Temporal acoustic variables were analyzed in oscillogram and spectral variables in spectrograms using a FFT of 256. Analyzed sound files are listed in Appendix 1. Original analyzed calls (wav) will be made available at Amphibiaweb (<http://amphibiaweb.org/>) after publication.

Voucher specimens are in the collection of frogs of the Museu de Biodiversidade do Cerrado, Universidade Federal de Uberlândia: males: AAG-UFU 1251–1254, 1256, 1259–1266; females: AAG-UFU 1255, 1257–1258. Five males are vouchers of the analyzed calls (AAG-UFU 1251–1254, 1256).

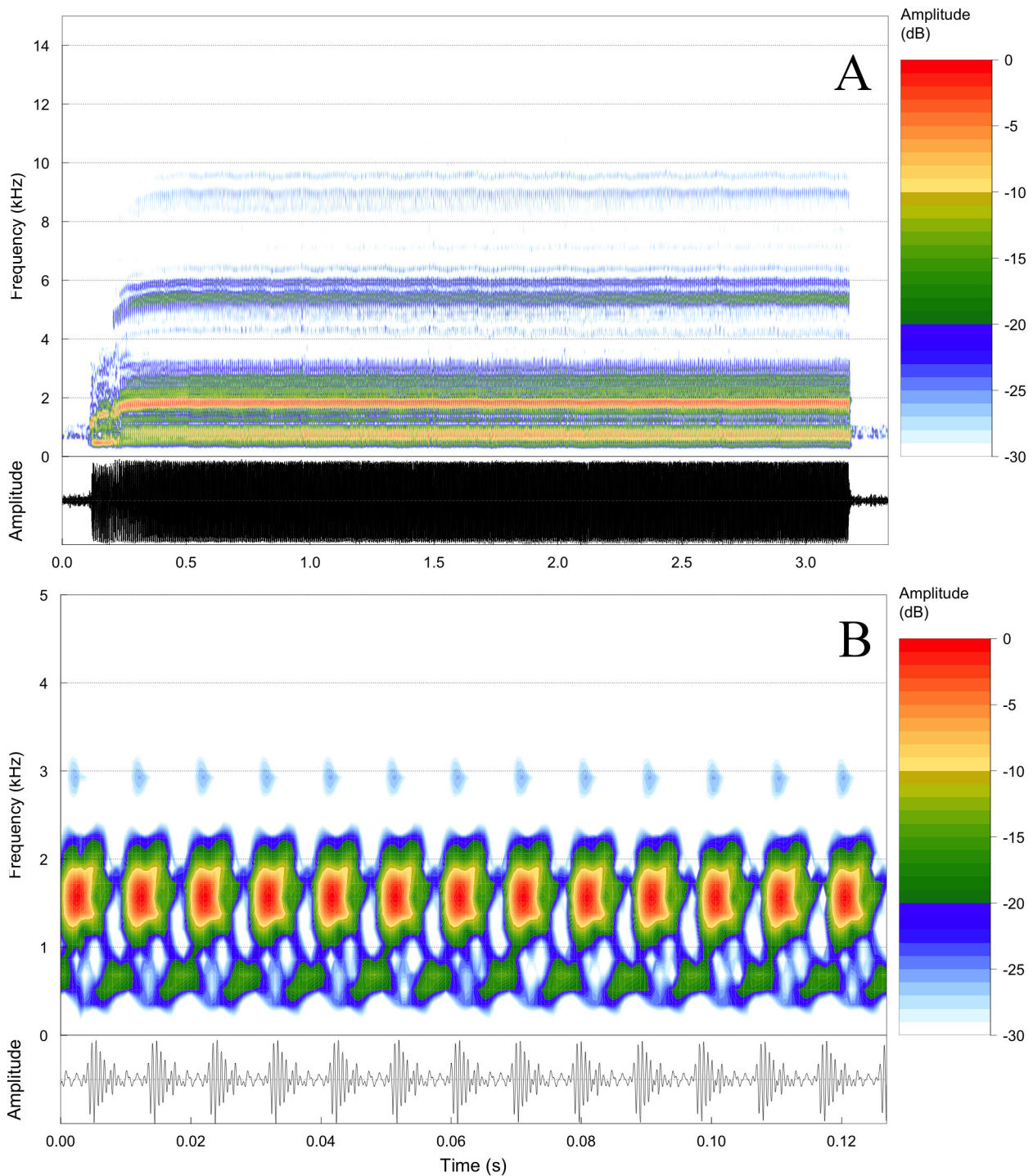
We found males *D. muelleri* calling in large numbers around a pond (30 x 10 m) the day after a heavy rain. Males called sat on the ground in shallow water (n = 30) or on land far (up to 4 m) from water (n = 3).

Advertisement call features are summarized in Table 1 and Figure 1 (A–B). The call is a long (2.5–8.0s) bass-pitched humming; it initiate with a fast ascending amplitude and keep sustained, with no noticeable modulation, to the end. Pulses last between 0.006 and 0.009s released at an average rate of 127 pulses/s. The dominant frequency is in the second harmonic and peaks between 1594 and 1922 Hz; the fundamental is between 484 and 775 Hz. The third, fourth and fifth harmonics have noticeable lower energy; the sixth can be energetic.

Adult males from Gurinhatã ranged from 52.3 to 62.4 mm SVL (mean 56.3 mm, SD = 3.04, n = 13) and females 61.9 to 73.1 mm (mean 67.9, SD = 5.64, n = 3).

Nelson (1973) described the calls of *D. muelleri* based on two records (unspecified number of males) from Pedro Leopoldo, about 600 km east from Gurinhatã, both municipalities located in Minas Gerais state, Brazil. This author refers to calls of *D. muelleri* as resembling those of *Hypopachus*, *Gastrophryne*, *Elachistocleis* and the bleat of a sheep or goat. Also in that paper, Nelson only take into account features such as length, dominant frequency and harmonic interval, features whose values that are in accordance with ours. Nelson (1973) reports that “the dominant is restricted to two adjacent harmonics” but we noticed that the first and second harmonic bands could be distinguished one another, the second being dominant.

De Sá *et al.* (2012) comment that although *Dermatonotus* is considered monotypic it may represent a complex of species that are distributed along the presently accepted the range of *D. muelleri*, so the data we present here can help to recognize the real diversity of the genus. Vizzoto (1967) reported specimens of *D. muelleri* floating in water while calling and our report of three males calling out of water is noteworthy.



**FIGURE 1.** Advertisement call of two *Dermatonotus muelleri* males. **A-** Audiospectrogram (above) and corresponding oscillogram (below) of an entire call. Record file: Dermatone\_muelleGurinhMG9aAAGm60s. October 17, 2012; 21:36 h. FFT = 512. **B-** Audiospectrogram (above) and corresponding oscillogram (below) of a short section at the mid portion of the call emphasizing the pulse structure. Record file: Dermatone\_muelleGurinhMG20bIH\_AAAGmt29.7s. October 17, 2012; 21:59 h. FFT = 216. In both air = 21 °C, water = 26 °C. Records from Gurinhata, region of the Triângulo Mineiro, state of Minas Gerais, Brazil.

**TABLE 1.** Acoustic variables of the advertisement call of *Dermatonotus muelleri* from the municipality of Gurinhatã, state of Minas Gerais, Brazil. N = 22 recorded males. Air temperature 26 °C, water 21–23 °C.

Call variables	Mean ± SD (Range)
Call duration (s)	5.2 ± 1.4 (2.5 – 8.0)
Pulse duration (s)	0.008 ± 0.001 (0.006 – 0.009)
Intercall interval (s)	26.4 ± 13.3 (3.8 – 55.8)
Pulses/second	127 ± 4 (119 – 133)
Calls/minute	3.6 ± 1.6 (1.8 – 9.7)
Peak of dominant frequency (Hz)	1750 ± 97 (1593 – 1922)
Peak of fundamental frequency (Hz)	667 ± 74 (484 – 775)
Maximum reached frequency (Hz)	15390 ± 7356 (5615 – 23654)

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## Appendix 1

Sound files (wav) of analyzed calls. All from the senior author collection.

Dermaton\_muellerGurinhMG1aAAGm;  
Dermaton\_muellerGurinhMG2aAAGm;  
Dermaton\_muellerGurinhMG3aAAGm;  
Dermaton\_muellerGurinhMG4aAAGm;  
Dermaton\_muellerGurinhMG5aAAGm;  
Dermaton\_muellerGurinhMG6aAAGm;  
Dermaton\_muellerGurinhMG7aAAGm;  
Dermaton\_muellerGurinhMG7bAAGm;  
Dermaton\_muellerGurinhMG8aAAGm;  
Dermaton\_muellerGurinhMG9aAAGm;  
Dermaton\_muellerGurinhMG10aAAGm;  
Dermaton\_muellerGurinhMG11aAAGm;  
Dermaton\_muellerGurinhMG11bAAGm;  
Dermaton\_muellerGurinhMG11cAAGm;  
Dermaton\_muellerGurinhMG12aAAGm;  
Dermaton\_muellerGurinhMG13aAAGm;  
Dermaton\_muellerGurinhMG14aFSA\_AAGb;  
Dermaton\_muellerGurinhMG14bFSA\_AAGb;  
Dermaton\_muellerGurinhMG14cFSA\_AAGb;  
Dermaton\_muellerGurinhMG15aFSA\_AAGb;  
Dermaton\_muellerGurinhMG15bFSA\_AAGb;  
Dermaton\_muellerGurinhMG15cFSA\_AAGb;  
Dermaton\_muellerGurinhMG16aFSA\_AAGb;  
Dermaton\_muellerGurinhMG17aFSA\_AAGb;  
Dermaton\_muellerGurinhMG17bFSA\_AAGb;  
Dermaton\_muellerGurinhMG18aIH\_AAGmt;  
Dermaton\_muellerGurinhMG18bIH\_AAGmt;  
Dermaton\_muellerGurinhMG18cIH\_AAGmt;  
Dermaton\_muellerGurinhMG18dIH\_AAGmt;  
Dermaton\_muellerGurinhMG19aIH\_AAGmt;  
Dermaton\_muellerGurinhMG20aIH\_AAGmt;  
Dermaton\_muellerGurinhMG20bIH\_AAGmt;  
Dermaton\_muellerGurinhMG20cIH\_AAGmt;  
Dermaton\_muellerGurinhMG20dIH\_AAGmt;  
Dermaton\_muellerGurinhMG21aIH\_AAGmt;  
Dermaton\_muellerGurinhMG21bIH\_AAGmt;  
Dermaton\_muellerGurinhMG21cIH\_AAGmt;  
Dermaton\_muellerGurinhMG22aIH\_AAGmt;  
Dermaton\_muellerGurinhMG22bIH\_AAGmt ;