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## Advertisement call of the leptodactylid frog *Proceratophrys avelinoi*

Axel Kwet<sup>1</sup>, Diego Baldo<sup>2</sup>

<sup>1</sup> Staatliches Museum für Naturkunde, Zoologie, Rosenstein 1, D-70191 Stuttgart, Germany  
e-mail: axel.kwet@uni-tuebingen.de

<sup>2</sup> Departamento de Genética, Fac. de Cs. Exs. Qcas. y Ns. UNaM. Félix de Azara 1552, 3300 Posadas, Misiones, Argentina  
e-mail: diegobaldo@hotmail.com

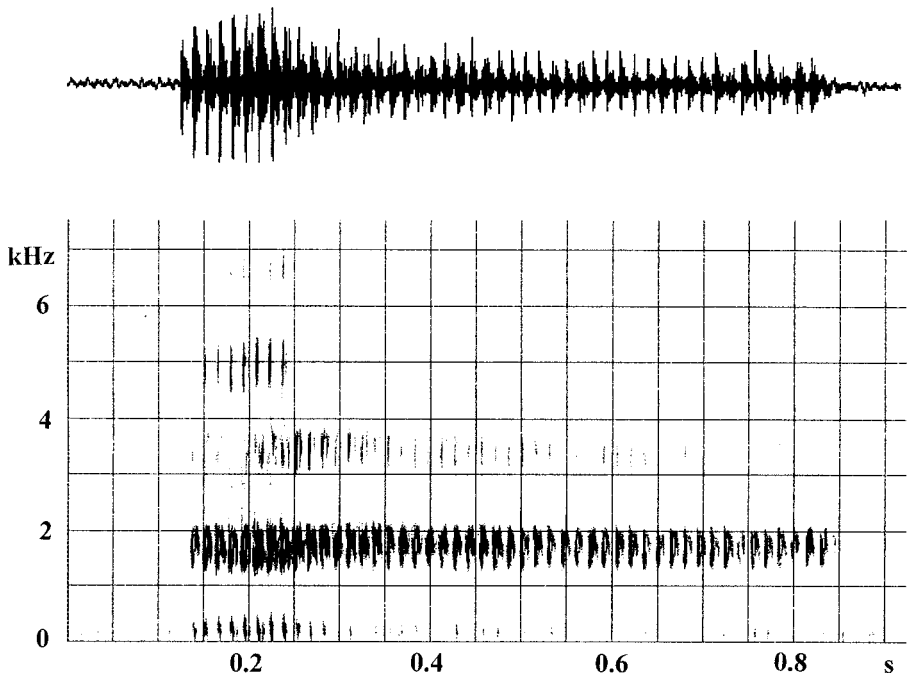
The *Proceratophrys bigibbosa* species group has recently been reviewed by Kwet and Faivovich (2001). *Proceratophrys cristinae* Braun, 1973 was regarded as a junior synonym of *Proceratophrys bigibbosa* (Peters, 1872), whereas the species identified as *P. bigibbosa* by Braun (1973) was described as *Proceratophrys brauni* Kwet and Faivovich, 2001. In addition to *P. bigibbosa* and *P. brauni*, two more species belong to the *bigibbosa* group, *Proceratophrys palustris* Giarretta and Sazima, 1993 and *Proceratophrys avelinoi* Mercadal de Barrio and Barrio, 1993. The members of this group are characterized by the presence of postocular swellings and the absence of palpebral appendages. All species are superficially

similar by their cryptic, brownish dorsal coloration and a black spotted, red, orange or tan colored ventral surface in life. An identification key based on morphological characters is given in Kwet and Faivovich (2001), color photos of *P. bigibbosa* and *P. brauni* are found in Kwet and Di-Bernardo (1999).

Three species of the *bigibbosa* group occur in southern Brazil and northeastern Argentina, whereas *P. palustris* from Minas Gerais is considered a relictual species in southeastern Brazil (Giaretta and Sazima, 1993; Giaretta et al., 2000). A second group of *Proceratophrys*, the *P. boiei* group, occurs in the eastern Atlantic rain forest of Brazil. Recently, several species of *Proceratophrys* living in open, seasonally dry habitats of Brazil that do not share derived characteristics were tentatively allocated to the “*cristiceps* group” (Giaretta et al., 2000). In order to resolve the systematic problems of this genus, bioacoustical comparisons may be useful. Regarding the *bigibbosa* group, the calls of *P. bigibbosa* and *P. brauni* are described in Kwet and Faivovich (2001), the call of *P. palustris* is commented (but not described) in Giaretta and Sazima (1993), and the advertisement call of *P. avelinoi* remains unknown. *Proceratophrys avelinoi* is a species difficult to find in the field. It is only known from six locations in the Argentinian province of Misiones (Kwet and Faivovich, 2001) and from Londrina in the Brazilian state of Paraná (Machado et al., 1999). During recent field trips in Misiones, one of us (DB) obtained recordings of the vocalization of this rare leptodactylid. In this paper we describe its advertisement call and compare it with the calls described for other species of the genus.

Recordings were made with a Sony TCM 359 tape recorder and an Aiwa JS 445 microphone. Advertisement calls were recorded on 14 April 2000, at Garuape-mí, Departamento Eldorado, Misiones (22°C air temperature;  $n = 41$  calls from three individuals). The calls were analyzed with a Kay DSP Sonograph 5500, using wide band display (300 Hz). Voucher specimens were deposited in the Museo de La Plata, Argentina, personal collection of Diego Baldo (MLP-DB 1246-8).

Calling males of *P. avelinoi* were observed on 1 October 1999, Campo Ramón, Departamento Oberá, on 14 April 2000, at Garuape-mí, Departamento Eldorado, and on 13 September 2000, Municipio de Caraguataí, Departamento Montecarlo. Males were heard from 21 00 h through 24 00 h sitting on the edge of small forest streams partially submerged. The advertisement call of this species (fig. 1) was relatively short, with a duration of about 0.5 s and high pulse rates of 64-72 per s, whereas the call of *P. bigibbosa* is considerably longer lasting 1.6-1.9 s, with much lower pulse rates of 23-27 per s (table 1). The call parameters of *P. brauni* are intermediate, with a duration of about 0.8 s and a pulse rate of 35-40 per s. These temporal characteristics are roughly corresponding to the snout-vent lengths (SVL) in males (see Kwet and Faivovich, 2001), being relatively small in *P. avelinoi* (SVL 23.9-29.2 mm), medium-sized in *P. brauni* (SVL 30.0-34.6 mm) and large in *P. bigibbosa* (SVL 35.5-43.8 mm). The opposite relationship existed with regard to the dominant frequency which is negatively correlated to the SVL in anurans (e.g., Duellman and Pyles, 1983). The dominant frequency had its lowest peak at 1050 Hz (500-1400 Hz) in the large-sized *P. bigibbosa*, a peak at about 1350 Hz (800-1800 Hz) in *P. brauni* and its highest peak at 1600 Hz (1050-2300 Hz) in the small *P. avelinoi*. On the other hand, the number of pulses



**Figure 1.** Oscillogram (above) and audiospectrogram (below) of the advertisement call of *Proceratophrys avelinoi*; Garuape-mí, Departamento Eldorado, Misiones, Argentina; 14 April 2000; 22:00 h; air temperature 22°C.

**Table 1.** Acoustic parameters of *P. avelinoi* advertisement calls (means  $\pm$  standard deviation, range in parentheses) in comparison with bibliographical data for other species of the genus *Proceratophrys*. <sup>1</sup>Kwet and Faivovich (2001); <sup>2</sup>Heyer et al. (1990); <sup>3</sup>Eterovick and Sazima (1998); <sup>4</sup>Weygoldt and Peixoto (1985); <sup>5</sup>data obtained from audiospectrogramm.

Recording	SVL males (mm)	Temp. (°C)	Call duration (ms)	Pulse rate (pulses/s)	Number of pulses/call	Dominant frequency (Hz)	Other frequency (Hz)
<i>P. avelinoi</i> (n = 3 males)	23.9- 29.2	22.0	544.0 $\pm$ 119.4 (220-754)	68.7 $\pm$ 1.8 (64-72)	37.5 $\pm$ 9.4 (23-70)	1600 (1050-2300)	50-500 2700-3900 4300-5300 6400-7300
<i>P. brauni</i> <sup>1</sup> (n = 2 males)	30.0- 34.6	23.5	700-900	35-40	24-28	1350 (800-1800)	–
<i>P. bigibbosa</i> <sup>1</sup> (n = 2 males)	35.5- 43.8	14.0	1600-1900	23-27	40-45	1050 (500-1400)	–
<i>P. boiei</i> <sup>2</sup> (n = 1 male)	57.9	19.4	700-800	45	30-35	600 <sup>5</sup> (350-1350)	–
<i>P. cururu</i> <sup>3</sup> (–)	36.5- 43.1	15.5	1200	45	40 <sup>5</sup>	900 (600-1000)	2500-3000
<i>P. moehringi</i> <sup>4</sup> (n = 2 males)	54.0- 61.4	18.0	3500-4000	33-40	140 <sup>5</sup>	450 <sup>5</sup> (200-700)	1250 2000

per call varied from 23-70 (on average 38) in *P. avelinoi*, 24-28 (on average 26) in *P. brauni* and 40-45 (on average 42) in *P. bigibbosa*. Although we have to take into consideration that this bioacoustical comparison is based on recordings taken at temperatures differing up to 9.5°C which could affect at least the pulse rates, the structure and overall characteristics of the calls (e.g., regular pulse repetition rates, no frequency modulation) are very similar and confirm that these species in the *bigibbosa* group might be closely related representing a natural group. As the advertisement calls of only a few others out of 17 *Proceratophrys* species (see Frost, 2000) are already described (table 1), i.e., *P. boiei* (Heyer et al., 1990), *P. cururu* (Eterovick and Sazima, 1998), and *P. moehringi* (Weygoldt and Peixoto, 1985), further comparisons are not useful at this time. At present, the call of *P. moehringi* seems to be the most distinct because of its long duration, high number of pulses and low dominant frequency.

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