

## Advertisement call of *Leptodactylus labrosus* Jiménez de la Espada, 1875 (Anura, Leptodactylidae): an unusual advertisement call within the *L. fuscus* group

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The *Leptodactylus fuscus* (Schneider, 1799) species group was first recognized by Heyer (1978), and it currently comprises 27 species distributed from southern North America (USA) to southern Argentina (Frost, 2011). Among those species, only three still have unpublished advertisement calls: (i) *L. tapiti* Sazima and Bokermann (1978) (description is ongoing, Rafael de Sá pers. comm.); (ii) *L. labrosus* Jiménez de la Espada (1875) and (iii) *L. ventrimaculatus* Boulenger (1902). The two latter species were described from Ecuador and may represent the most basal clade in the *L. fuscus* species group (Ponssa, 2008) restricted to the Pacific Coast, west of the Andes (Cisneros-Heredia, 2006a, b). Acoustic data on geographically restricted species are essential to comprehend advertisement call evolution of this species group and the genus *Leptodactylus*. Both species from Ecuador represent a case of geographical relictualism west of the Andes (Ponssa, 2008). Herein we describe the advertisement call of *L. labrosus* and compare it with known advertisement calls within the *L. fuscus* group.

Three specimens were recorded in Ecuador: 1) Rio Cuaque, Province of Manabi (0.014° S, 80.0738° W, 12 m above sea level); 2) 20 km west from El Carmen road to Pedernales, Province of Santo Domingo de los Tsáchilas (0.28118° S, 79.61756° W, 239 m above sea level); 3) 10 km north from Zapotillo, Province of Loja (4.31198° S, 80.21690° W, 231 m above sea level). Calls were recorded using either a Sony WM-D6C

tape recorder or a Sony MZ-NH1 digital recorder set at 44,100 Hz sample rate and 16 bits resolution coupled to a Sennheiser K6/ME67 directional microphone. Recordings are deposited at the audio collection of Museo de Zoología of Pontificia Universidad Católica del Ecuador (QCAZ). Sound analyses were carried out using Soundruler (v. 0.9.6.0) (Gridi-Papp, 2007); spectral trait of dominant frequency in the Audacity software (v. 1.3.13 Beta) (Audacity Team 2011); sound figures were obtained through Seewave (v. 1.5.9), R (v. 2.12.1) package (R Development Core Team, 2010). Settings for sound analyses and figures were Hanning window function with 85% overlap and 512 points resolution (FFT). We analyzed recordings from three males (N = 227 analyzed calls among three recorded specimens). Quantitative traits and sound figures of the putative aggressive call (*sensu* Wells, 2007) could not be generated as the call samples were very weak in sound intensity. Terminology of call traits essentially follows McLister, Stevens and Bogart (1995) and Duellman and Trueb (1994).

Males call buried in underground chambers in open areas adjacent to seasonal lentic water bodies. The advertisement call of *L. labrosus* (Figure 1) consists of a single very low-pitched note with very slight positive frequency modulation with pulses absent or barely defined (completely overlaid) emitted at a rate of 118–135 calls/minute (mean=127; SD=9). Call duration was 64–133 ms (mean=100; SD=26), with intercall interval 186–697 ms (mean=332; SD=37). Dominant frequency was 358–726 Hz (mean=451 Hz; SD=124).

In addition to the typical advertisement call, there is a second type of call in the recording from Zapotillo (7 call samples). Because two males call simultaneously in the recording (background vocalization of a second male), we suggest that these may be aggressive calls (*sensu* Wells, 2007). The second type of call is broadcasted either alone (one out of seven call samples) or in groups of 2 to 4 simultaneous calls. It has a pulsed structure with 2–8 well-defined pulses.

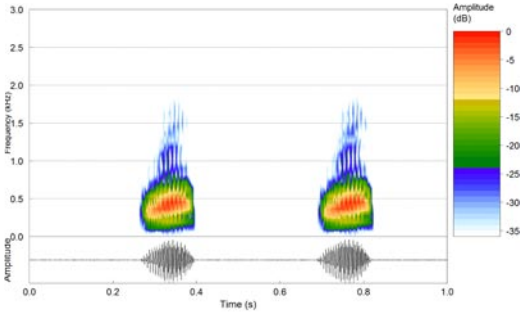
No other species of the *L. fuscus* group has been

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**Figure 1.** Audiospectrogram (above) and corresponding oscillogram (below) of a sequence of two advertisement calls of *Leptodactylus labrosus* from Ecuador (Rio Cuaque, Province of Manabí). Record file (Santiago R. Ron): QCAZ-CC179; 8 Jan 2003.

reported to have calls with peaks of dominant frequency at less than 1 kHz. Among the species with advertisement calls with low frequency, *L. elenae* (Heyer, 1978), *L. fragilis* (Brocchi, 1877), *L. mystaceus* (Spix, 1824) and *L. didymus* (Heyer, García-Lopez and Cardoso, 1996), have the first part of their calls with frequency emphasized at lower than 1 kHz, yet they present a strong positive frequency modulation so the second half of the call has the frequency emphasized at over 1 kHz (see Marquez, De La Riva and Bosch, 1995; Heyer et al., 1996; Heyer and Heyer, 2002); the advertisement call of *L. caatingae* (Heyer and Juncá, 2003) has minimum dominant frequency ~0.95 kHz, and mean dominant frequency ~1.42 kHz, whereas in *L. labrosus* minimum dominant frequency is ~0.35 kHz, and mean dominant frequency is ~0.45 kHz. The advertisement call of *L. caatingae* also differs from that of *L. labrosus* by the presence of well-defined pulses (Heyer and Juncá, 2003; pulses are absent or ill-defined in *L. labrosus*). The advertisement call of *L. labrosus* presents a very slight positive frequency modulation so that the entire call has its frequency emphasized below 1 kHz (on average 0.45 kHz).

A proper understanding of the evolution of advertisement calls requires thorough taxon sampling (Ron, 2008). In this context, to study the acoustic evolution of calls of the *L. fuscus* group it is important to describe the advertisement calls of *L. ventrimaculatus* because the clade *L. labrosus*-*L. ventrimaculatus* appears to be the most basal lineage within the *L. fuscus* group (Ponssa, 2008). The phylogenetic position of *L. labrosus* seems to be consistent with the distinctive structure of its advertisement call relative to other members of the *L. fuscus* group.

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