

## NOTES ON GEOGRAPHIC DISTRIBUTION

### **Amphibia, Anura, Leptodactylidae, *Leptodactylus furnarius*: New country record, geographic distribution map and advertisement call.**

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The Neotropical genus *Leptodactylus* Fitzinger, 1826, currently includes 81 recognized species, and is widely distributed from southern North America throughout most of South America to central Argentina. It is also present at the Greater and Lesser Antilles (Frost 2007). Four species groups were traditionally considered within this genus: the *L. fuscus*, *L. melanonotus*, *L. ocellatus*, and *L. pentadactylus* groups (Maxon and Heyer 1988). However, a recent taxonomic revision based on morphological, behavioral, and ecological evidences, presented by Heyer (1998) and Kokubum and Giaretta (2005), placed *Lithodytes* (including *Adenomera*) as a subgenus of *Leptodactylus* on phylogenetic grounds (Frost et al. 2006).

The richest and most widely distributed group, the *Leptodactylus fuscus* species group, is characterized by laying eggs in foam nests inside terrestrial burrows (Heyer 1969; Prado et al. 2002; Haddad and Prado 2005). A member of this group, *Leptodactylus furnarius*, is distributed in central, southeastern, and southern Brazil, northeastern Paraguay, and northern Uruguay (Heyer and Heyer 2004; Brusquetti and Lavilla 2006). This frog is characteristic of open formations (IUCN et al. 2006) and typically occurs throughout much of the Cerrado Ecoregion, although its range marginally reaches the Atlantic Forest and hilly environments of northern Uruguay (Heyer and Heyer 2004; Brusquetti and Lavilla 2006).

Herein, we report the first record of *L. furnarius* in Argentina, provide a geographic distribution map including all known localities for this species, and present an analysis of its advertisement call. Voucher specimens were deposited in the Diego Baldo Collection, housed

at Museo de La Plata (MLP-DB 3555, juvenile; MLP-DB 5932-3 and 5935, three adult males; and MLP-DB 5934, one female). The advertisement call of an unvouchered specimen (seen calling but not collected) was recorded with a Sony WM-D6C tape recorder and a Sennheiser LR 6 microphone. This call was compared with previous published calls reported for the species (Sazima and Bokermann 1978; Heyer and Heyer 2004; Kokubum and Giaretta 2004), and with calls from the Célio F. B. Haddad (CFBH) Bioacoustics Collection, recorded at Itapé, municipality of Rio Claro, state of São Paulo, Brazil, on November 16, 1993 (Nagra E tape recorder, Sennheiser ME 80 microphone, no voucher specimens assigned). Recordings were analyzed with the Sound Forge 4.5 software (Sonic Foundry Inc. 1991-1998), using FFT with 2048 points, at a sampling rate of 44.1 kHz, and 16 bit resolution.



**Figure 1.** *Leptodactylus furnarius*, adult female (MLP-DB 5934) from the province of Misiones, Argentina.

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Specimens of *Leptodactylus furnarius* from Argentina (Figure 1) were collected during fieldworks carried out in December 2004 and October 2007, at the intersection of the *Ruta Nacional N° 12* and *Ruta Provincial N° 3*, Departamento Candelaria, province of Misiones, Argentina (27°27'46" S, 55°40'55" W). Individuals were found breeding in hydrophilic grasslands mainly composed by Poaceae (Figure 2). This area is characterized by rush communities and savannas, which alternate with woodlands and forest patches of *Astronium balansae* (Anacardiaceae) in a smooth hilly landscape (Cabrera 1976; Fontana 1993; Giraudo et al. 2003) named *Distrito de los Campos* (Giraudo et al. 2003). This biogeographic unit represents a transitional zone between the Atlantic Forest and the Humid Chaco ecoregions (Cabrera 1976; Dinerstein et al. 1995). Twenty-two other anuran species were found in sympatry with *L. furnarius*: *Melanophryniscus atroluteus*, *Rhinella granulosa azarai*, *R. schneideri*, *Rhinella* sp. (Bufonidae); *Dendropsophus minutus*, *D. nanus*, *D. sanborni*, *Hypsiboas caingua*, *Scinax berthae*, *S. fuscovarius*, *S. nasicus*, *S. squalirostris*, *Scinax* sp. (Hylidae); *Physalaemus albonotatus*, *P. cuvieri*, *P. riograndensis*, *Pseudopaludicola mystacalis* (Leiuperidae); *Leptodactylus fuscus*, *L. gracilis*, *L. mystacinus*, *L. ocellatus* (Leptodactylidae); and *Elachistocleis bicolor* (Microhylidae).



**Figure 2.** Habitat of *Leptodactylus furnarius* in the province of Misiones, Argentina.

This first record for Argentina extends the known geographic distribution of *L. furnarius* in about 360 km southwards (straight line distance) from the Reserve of Maracayú, department of Canindeyú, Paraguay (Brusquetti and Lavilla 2006), and approximately 300 km to the northwest from the closest known locality in Brazil, municipality of Santa Maria, state of Rio Grande do Sul (Heyer and Heyer 2004) (Figure 3).



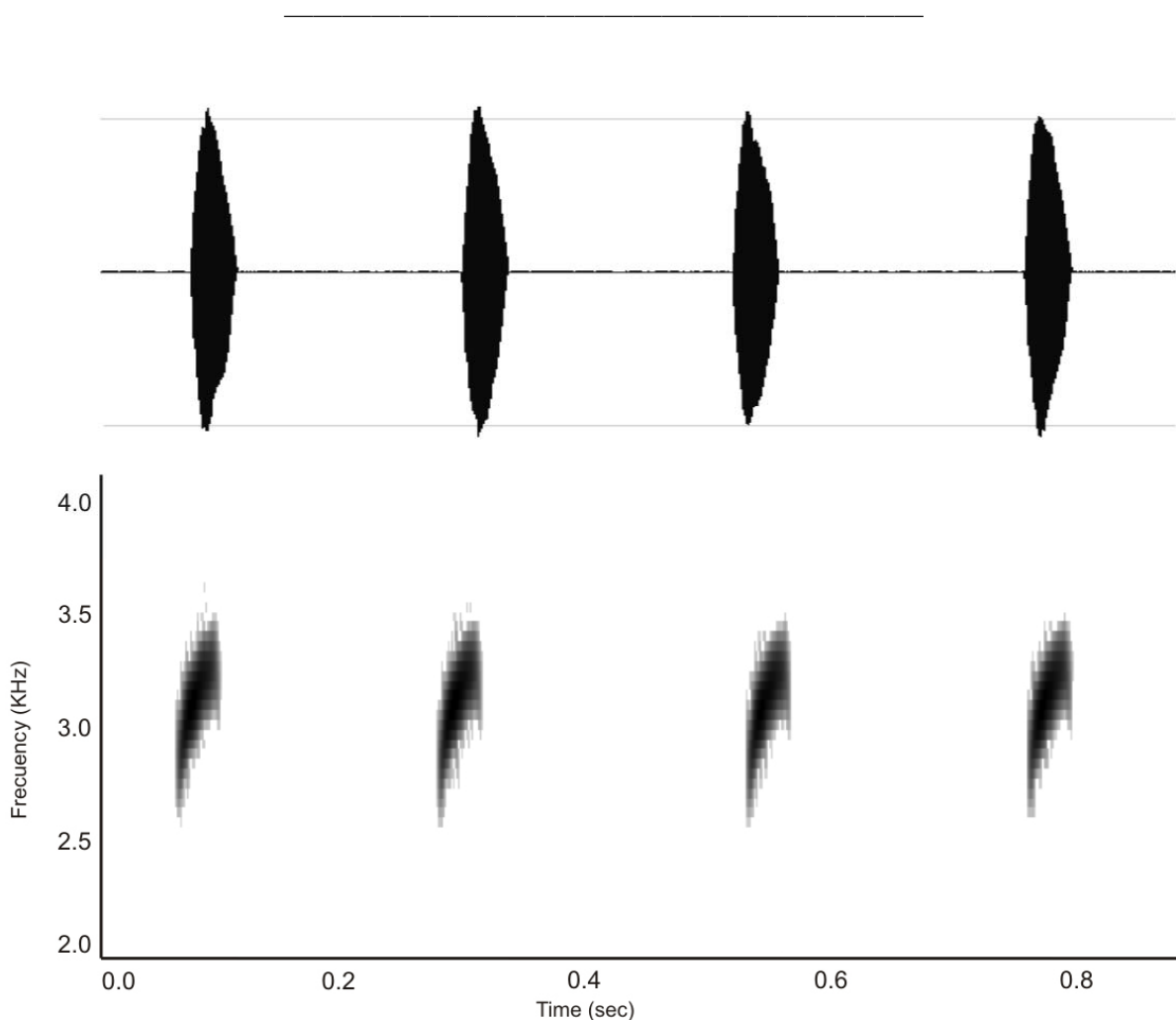
**Figure 3.** Geographic distribution of *Leptodactylus furnarius*. Asterisk, new record from Argentina; solid circles, historical records after Heyer and Heyer (2004), Vasconcelos and Rossa-Feres (2005), Brusquetti and Lavilla (2006), and Silveira (2006); open circle, type locality (Sazima and Bokermann 1978).

The advertisement call of specimens here examined consists of a single and non-pulsed short note regularly repeated (Figure 4). The call exhibits an ascendant modulation frequency distributed between 2700 and 3600 Hz. The acoustic parameters of specimens from Misiones (Argentina) and Rio Claro (Brazil) are very

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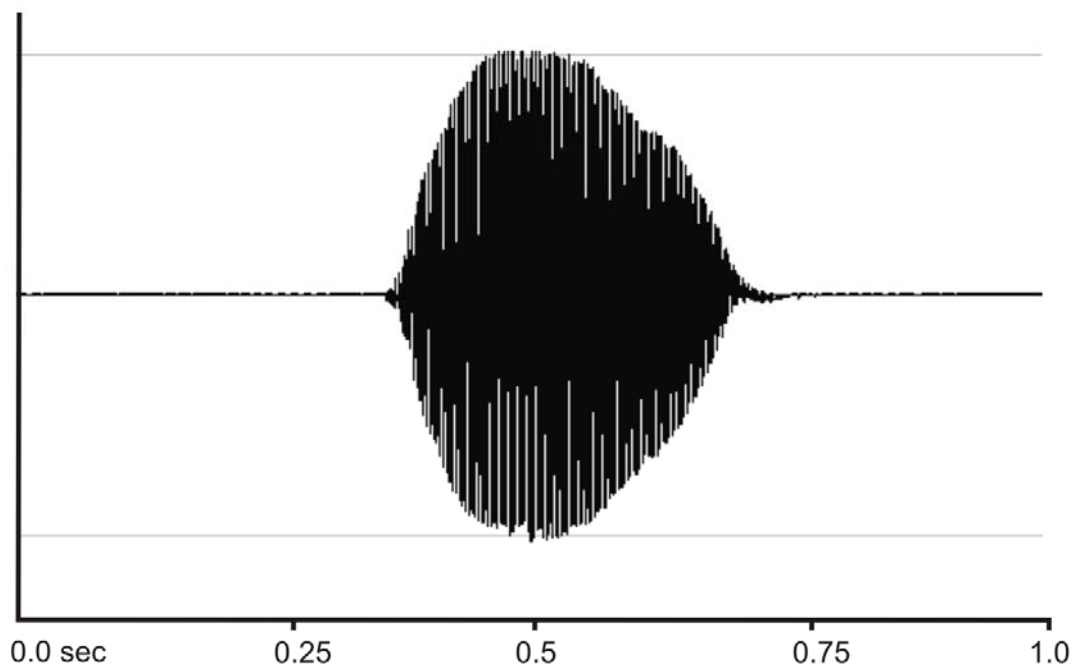
similar to those previously described from the type locality (Sazima and Bokermann 1978), from Mato Grosso (Heyer and Heyer 2004), and also from Minas Gerais (Kokubum and Giaretta 2004) (see Table 1). The dominant frequency is the fundamental one and is slightly higher for specimens from Misiones, Argentina. We did not observe any pulsed notes (Figure 5) like those

reported by Heyer and Heyer (2004) for specimens from Mato Grosso, Brazil. These slight differences in note frequency and structure could be explained by inter-individual and/or inter-population variation, or by differences in the equipment used to record and/or calling analysis programs, for which more data are needed to clarify.



**Figure 4.** Oscillogram (above) and sonogram (below) of the advertisement call of *Leptodactylus furnarius*, unvouchered specimen; 20 December 2004; 20:45 h; air temperature 25°C; from the intersection of the *Ruta Nacional N° 12* and *Ruta Provincial N° 3*, Departamento Candelaria, province of Misiones, Argentina.

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**Figure 5.** Oscillogram of one advertisement call (see the non-pulsed structure) of *Leptodactylus furnarius*, unvouchered specimen; same data as in Figure 4.

**Table 1.** Characteristics of the advertisement call of *Leptodactylus furnarius* from the Argentinean province of Misiones and the Brazilian states of São Paulo, Mato Grosso, and Minas Gerais.

Parameters	Localities				
	São Paulo	Mato Grosso	Minas Gerais	Rio Claro	Misiones
N specimens analyzed	-	1	-	2	1
Number of calls	-	-	-	40	20
Air temperature	21-22 °C	19 °C	24 °C	26-27 °C	25 °C
Water temperature (°C)	-	23	-	-	-
Hour	-	19:30	19:00	18:50-19:05	20:45
Dominant Frequency (Hz)	-	3014	-	3067 (3018-3125)	3424 (3406-3472)
Frequency range (Hz)	(2600-3400)	(2600-3400)	(2600-3130)	(2700-3300)	(2800-3600)
Call duration (sec)	0.1	0.04	0.07	0.035 (0.032-0.039)	0.035 (0.033-0.037)
Call pulsed	-	Yes	.	No	No
Call interval (sec)	0.2	-	0.1	0.135 (0.107-0.211)	0.200 (0.163-0.284)
Call rate (call/min)	450	200	315	353 (331-380)	253
Source	Sazima and Bokermann (1978)	Heyer and Heyer (2004)	Kokubum and Giaretta (2004)	Present work	Present work

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### Literature cited

- Brusquetti, F. and E. O. Lavilla. 2006. Lista comentada de los anfibios de Paraguay. Cuadernos de Herpetología 20(2): 3-79.
- Cabrera, A. L. 1976. Regiones fitogeográficas argentinas. Enciclopedia Argentina de Agricultura y Jardinería 2(1): 1-85.
- Dinerstein, E., D. M. Olson, D. J. Graham, A. L. Webster, S. A. Primm, M. P. Bookbinder, and G. Ledec. 1995. A Conservation Assessment of the Terrestrial Ecoregions of Latin América and Caribbean. Washington D.C., The World Bank and World Wildlife Fundation. 129 p.
- Fontana, J. L. 1993. Los pajonales mesófilos e higrófilos del sur de Misiones (Argentina). Composición florística, hábitat y sindinámica. Louvain. Université Catholique de Louvain, Faculté des Sciences, Unité d'Écologie et Biogéographie, Louvain-La-neuve. 170 p.
- Frost, D. R. 2007. Amphibian Species of the World: an online reference. Version 5.1. Electronic Database accessible at <http://research.amnh.org/herpetology/amphibia/index.php>. American Museum of Natural History, New York, USA. Captured on 25 October 2007.
- Frost, D. R., T. Grant, J. Faivovich, R. H. Bain, A. Haas, C. F. B. Haddad, R. O. de Sá, A. Channing, M. Wilkinson, S. C. Donnellan, C. J. Raxworthy, J. A. Campbell, B. L. Blotto, P. Moler, R. C. Drewes, R. A. Nussbaum, J. D. Lynch, D. M. Green, and W. C. Wheeler. 2006. The Amphibian Tree of Life. Bulletin of the American Museum of Natural History 297: 1–370.
- Giaretta, A. A. and M. N. Kokubum. 2004. Reproductive ecology of *Leptodactylus furnarius* Sazima & Bokermann, 1978, a frog that lays eggs in underground chambers (Anura: Leptodactylidae). Herpetozoa 16(3/4):115-126.
- Giraud, A. R., H. Povedano, M. J. Belgrano, E. Krauczuk, U. Pardiñas, A. Miquelarena, D. Ligier, D. Baldo, and M. Castelino. 2003. Biodiversity of the Interior Atlantic Forest of Argentina; p. 160-180 In C. Galindo-Leal and I. G. Camara (ed.). The State of Mata Atlantica. Washington: Island Press.
- Haddad, C. F. B. and C. P. A. Prado. 2005. Reproductive modes in frogs and their unexpected diversity in the Atlantic forest of Brazil. Bioscience 55(3): 207-217.
- Heyer, W. R. 1969. The adaptive ecology of the species groups of the genus *Leptodactylus* (Amphibia, Leptodactylidae). Evolution 24: 421-428.
- Heyer, W. R. 1998. The relationships of *Leptodactylus diedrus* (Anura, Leptodactylidae). Alytes 16:1-24.
- Heyer, W. R. and M. M. Heyer. 2004. *Leptodactylus furnarius*. Catalogue of American Amphibians and Reptiles (785): 1-5.
- IUCN, Conservation International, and NatureServe. 2006. Global Amphibian Assessment. Accessible at <http://www.globalamphibians.org>. Captured on 4 May 2007.
- Kokubum, M. N. and A. A. Giaretta. 2005. Reproductive ecology and behaviour of a species of *Adenomera* (Anura, Leptodactylinae) with endotrophic tadpoles: Systematic implications. Journal of Natural History 39(20): 1745-1758.
- Maxson, L. R. and W. R. Heyer. 1988. Molecular systematics of the frog genus *Leptodactylus* (Amphibia: Leptodactylidae). Fieldiana (Zoology) (41): 1-13.
- Prado, C. P. A., M. Uetanabaro and C. F. B. Haddad. 2002. Description of a new reproductive mode in *Leptodactylus* (Anura, Leptodactylidae), with a review of the reproductive specialization toward terrestriality in the genus. Copeia (2002) 4: 1128-1133.
- Sazima, I. and W. C. A. Bokermann. 1978. Cinco novas espécies de *Leptodactylus* do centro e sudeste brasileiro (Amphibia, Anura, Leptodactylidae). Revista Brasileira de Biologia 38(4): 899-912.
- Silveira, A. L. 2006. Anfíbios do município de João Pinheiro, uma área de Cerrado no noroeste de Minas Gerais, Brasil. Arquivos do Museu Nacional 64(2): 131-139.
- Sonic Foundry, Inc. 1991-1998. Sound Forge v 4.5 computer software.
- Vasconcelos, T. S. and D. C. Rossa-Feres. 2005. Diversidade, distribuição espacial e temporal de anfíbios anuros (Amphibia, Anura) na região noroeste do estado de São Paulo, Brasil. Biota Neotropica 5(2): 1-14.

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