



2008

## **Leptodactylus cunicularius Sazima and Bokermann Rabbit-burrow Frog**

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## AMPHIBIA: ANURA: LEPTODACTYLIDAE

*Leptodactylus cunicularius*

## Catalogue of American Amphibians and Reptiles.

Heyer, W.R., M.M. Heyer, and R.O. de Sá. 2008.  
*Leptodactylus cunicularius*.

***Leptodactylus cunicularius* Sazima and  
 Bokermann  
 Rabbit-burrow Frog**

*Leptodactylus cunicularius* Sazima and Bokermann 1978:904. Type-locality, "Km 114/115 da Estrada de Vespasiano a Conceição do Mato Dentro, Serra do Cipó, Jaboticatubas, Minas Gerais, Brasil." Holotype, Museu de Zoologia da Universidade de São Paulo (MZUSP) 73685, formerly WCAB 48000, adult male, collected by W.C.A. Bokermann and I. Sazima on 13 December 1973 (examined by WRH).

*Leptodactylus cunicularius*: Glaw et al. 2000:225.  
*Lapsus*.

*Leptodactylus curicularius*: Diniz-Filho et al. 2004:50.  
*Lapsus*

• **CONTENT.** The species is monotypic.

• **DEFINITION.** Adult *Leptodactylus cunicularius* are moderately small. The head is longer than wide and the hind limbs are long (Table 1; Heyer and Thompson 2000 provided definitions of adult size and leg length categories for *Leptodactylus*). Male vocal sacs are internal, not externally expanded. The snout is protruding, not sexually dimorphic. Male forearms are not hypertrophied and males lack asperities on the thumbs and chest. The dorsum is variegated with small, often confluent, spots and blotches. There is a very thin interrupted mid-dorsal light stripe (pinstripe). Usually, there is a noticeable light, irregular, elongate, mid-dorsal blotch in the scapular region. The supratympanic fold is not marked differently from the surrounding region. A weak to distinct pair of interrupted (partial or along entire length) dorsolateral folds extends from the posterior portion of the eye, passing just lateral to the sacral bones and ending in the upper groin region of the leg; the folds are usually subtly highlighted with marginally lighter stripes than the surrounding dorsal region. Another pair of inter-

**Table 1.** Summary measurement data for *Leptodactylus cunicularius* (means are in parentheses).

Measurement	Males (N=15)	Females (N=6)
SVL (mm)	36-43 (39.3)	44-45 (44.2)
Head length/SVL (%)	37-42 (39)	34-38 (37)
Head width/SVL (%)	31-37 (34)	32-34 (33)
Thigh length/SVL (%)	45-55 (49)	45-50 (48)
Shank length/SVL (%)	50-63 (56)	54-58 (56)
Foot length/SVL (%)	52-63 (57)	51-56 (54)



FIGURE 1. Adult female *Leptodactylus cunicularius* from Minas Gerais; Poços de Caldas, Brazil. Photograph by Adão J. Cardoso.

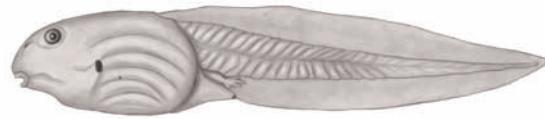


FIGURE 2. Tadpole of *Leptodactylus cunicularius* (MZUSP 80212), Gosner stage 37. Bar = 1 cm.

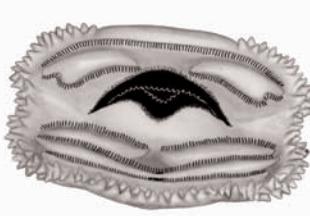


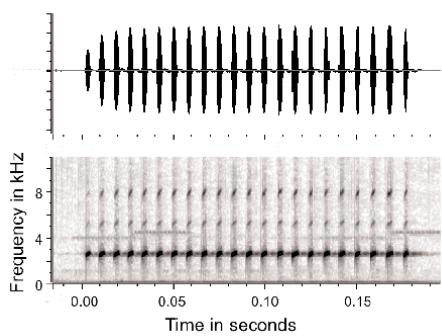
FIGURE 3. Oral disk of *Leptodactylus cunicularius* (MZUSP 80212), Gosner stage 37. Bar = 1 mm.

rupted, irregular dorsal folds may or may not be visible on either side of the dorsum mid-line. A pair of interrupted (along entire length) lateral folds extends from the posterior dorsal portion of the tympanic fold to the mid-groin level at the leg juncture; the folds are usually slightly lighter in color than the adjacent flanks. The toe tips are rounded, not dilated. The toes lack lateral ridges or fringes and either lack or have a trace of basal webbing between toes II-III-IV. The dorsal surface of the shank lacks tubercles and has weakly developed longitudinal folds, not differentially patterned. The posterior surface of the tarsus lacks tubercles. The sole of the foot is smooth but with small irregular light spots of the same size as light tubercles found in other species. The upper lip usually has a distinct light cream or tan stripe from just behind the snout tip, passing under the eye and tympanum and continuing through the commissural gland; if lacking, the upper lip region is homogeneously colored. The belly is cream-colored, with or without a few small tan blotches on the lateral-most extent of the belly. The posterior surface of the thigh ranges from an indistinct to a labyrinthine pattern of

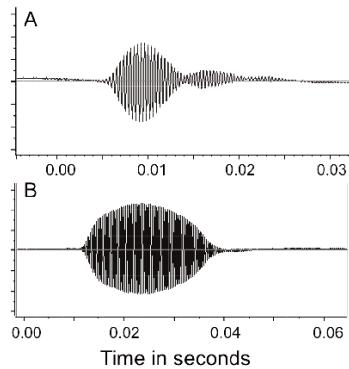
darker and lighter browns; usually there are a series of light dots on the lower posterior thigh where light stripes occur in other species.

Larvae are exotrophic, lotic, benthic guild members (McDiarmid and Altig 1999, guild IIA1, but larvae have only been collected from streams [Sazima and Bokermann 1978]). Larval characteristics of *L. cunicularius* were included in the comparisons with other larvae of the *L. fuscus* group by Langone and de Sá (2005). The oral disk is anteroventrally positioned, entire (not emarginate), and has a moderate anterior gap (about 1/2 width of oral disk) lacking marginal papillae. Submarginal papillae, if present, are not clearly distinguishable from the marginal papillae. The tooth row formula is 2(2)/3(1). Tooth row A-2 is moderately interrupted with a gap from 1/3 to 1/2 the length of a single A-2 row. The P-1 rows either abut or are just separated from each other. The spiracle is sinistral and the vent tube is median. The dorsal fin originates at the posterior end of the body. Larval total length at Gosner stage 36-40 ranges from 38.5-41.5 mm. Tail length is about 60% of total length. Eye diameter is 10-11% of body length. The width of the oral disk is 20-24% of body length. The lateral line system is distinctly visible. The dorsum of the body is uniformly suffused with melanophores. A greater concentration of melanophores is situated posteromedially to the nostrils (best seen from dorsal perspective). The spiracle is lighter than its surroundings. The ventral surfaces of the body and anal tube are patternless (lacking melanophores). The dorsal and ventral tail fins have a few small to several moderate-sized blotches of melanophores. The tail musculature has dense groupings of melanophores forming a dark blotched pattern except for the ventral third, which is lighter with scattered blotches to a relatively uniform pattern of scattered tan blotches; myotomes are distinct.

The advertisement call consists of call groups given at rates of 15-19 calls/min. Each call group consists of 6-51 (usually 16-35) calls. Call group duration varies from 0.91-3.09 s. The call group starts quietly and reaches maximum intensity by the third to sixth



**FIGURE 4.** Wave form and audiospectrogram of advertisement call group of *Leptodactylus cunicularius* (USNM recording 242, cut 2) from Jaboticatubas, Serra do Cipó, Minas Gerais, Brazil, voucher specimen WCAB 47990. Raven software was used to produce the figure.



**FIGURE 5.** Wave forms of advertisement calls of *Leptodactylus cunicularius*. A – Double-pulsed call, USNM recording 242, cut 1, from “campo rupestre” (presumably Serra do Cipó), Minas Gerais, Brazil, unvouchered. B – Single-pulsed call, USNM recording 242, cut 2 (data as in legend for Figure 4). Raven software was used to produce the figure.

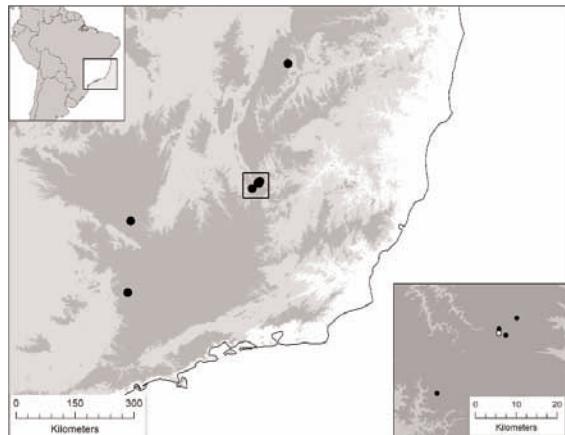
call, which intensity is maintained for the duration of the call group. The entire call group lacks frequency modulation. The dominant of the call group is equal to the fundamental frequency, ranging from 2360-2670 Hz. Harmonic frequencies may be either present or absent. Each call is comprised of a single note. The initial call of the call group is usually shorter, 0.005-0.018 s, than the remaining calls. Mid-call group call duration ranges from 0.016-0.030 s, the final call duration of the call group ranges from 0.014-0.032 s. Once maximum intensity of the call group is reached, there is no pattern as to which calls are longer, shorter, or of equal duration. Call rate varies from 649-1038/min. Each call is comprised of either a single pulse or two pulses. There is modest frequency modulation of the calls, with the exception of some introductory calls of the call group, which may be frequency modulated or not. For frequency modulated calls, the beginning frequency is lower than the ending frequency, the frequency differential averaging 170-280 Hz for the three recordings analyzed. Harmonic structure is weakly present or clearly depicted in the audiospectrogram displays (See Remarks.)

- **DIAGNOSIS.** The species of *Leptodactylus* with smooth bellies, toes without fringes or lateral ridges, and long shanks (mean shank/SVL ratio >0.50) are *L. camaquara*, *L. cunicularius*, *L. didymus*, *L. furnarius*, *L. fuscus*, *L. gracilis*, *L. jolyi*, *L. longirostris*, *L. marambaiae*, *L. mystaceus*, *L. notoaktites*, *L. plaumanni*, *L. spixii*, and *L. tapiti*. *Leptodactylus cunicularius* lacks light stripes on the dorsal surface of the shank; continuous stripes occur in *L. gracilis*, *L. marambaiae*, and *L. plaumanni*; discontinuous stripes are found in *L. jolyi*. *Leptodactylus cunicularius* lacks prominent white tubercles on the sole of the foot (the sole of the foot often has small light flecks the size of tubercles, but the sole surface is smooth); all individuals of *L. didymus* and *L. mystaceus* and most individuals of *L. notoaktites* and *L. spixii* have prominent light tubercles. All individuals of *L. cunicularius* have a narrow, interrupted light mid-dorsal pin stripe; most individu-

als of *L. fuscus*, *L. longirostris*, *L. notoaktites*, and *L. spixii* lack mid-dorsal light stripes; when they are present they are continuous and broader than the pin-stripes of *L. cunicularius*. The dorsolateral folds of *L. cunicularius* are irregular and interrupted; those of *L. furnarius*, *L. jolyi*, *L. longirostris*, *L. notoaktites*, and *L. spixii* are straight and continuous. Adult *L. cunicularius* are larger (males 36-43 mm, females 44-45 mm SVL) than adult *L. camaquara* (males 31-34 mm, females 32-38 mm SVL) and *L. tapiti* (males 30-33 mm, females 36-41 mm SVL). The advertisement calls of *L. cunicularius* are organized into call groups of less than 4 s duration, given at a rate of 649-1038/min; the calls of *L. camaquara* are organized into groups of 60 s or more duration given at a rate of about 120/min; the call of *L. tapiti* has not been reported.

- **DESCRIPTIONS.** The original descriptions of adult and larva by Sazima and Bokermann (1978) included color notes. A description of the call was provided by the same authors. The karyotype is unknown.

- **ILLUSTRATIONS.** Photos of adults and a preserved specimen are found in Eterovick and Sazima (2004) and Sazima and Bokermann (1978). A tadpole drawing and an audiospectrogram were provided by Sazima and Bokermann (1978). A color photo of larval *Leptodactylus camaquara* feeding on a dead



**Map.** The circle represents the type-locality, and the dots other records.

adult *L. cunicularius* (p. 17), a color photo and a color illustration of *L. cunicularius* reproductive habitat (pp. 117, 118), and color illustrations of incubating chambers (p. 127) are found in Eterovick and Sazima (2004).

- **DISTRIBUTION.** The species is known from about 750-1400 m in elevation. Harding (1983) indicated its distribution to be solely in Brazil and Duellman (1999) characterized its natural distribution as Atlantic Forest Domain. The following are references to Brazilian localities and elevations (when provided): Cardoso et al. 1989, Cardoso and Haddad 1992; Eterovick et al. 2005; Eterovick and Sazima 2000a,b,

2004; Haddad et al. 1988.

- **FOSSIL RECORD.** None.

- **PERTINENT LITERATURE.** The most inclusive account of the species is found in Sazima and Bokermann (1978). The field guide of Eterovick and Sazima (2004) furnishes a popular guide to the species. The following literature is listed by topic; the symbol (M) indicates the species is only mentioned and (S) indicates that all the species information contained therein represents a secondary source: **biogeography** (Heyer 1988, 1999); **call and call parameters** (Bilate et al. 2006, Cardoso and Haddad 1992); **checklist** (Colli et al. 2002); **conservation** (Eterovick et al. 2005, Eterovick and Sazima 2004, Young et al. 2004); **ecology, natural history, reproduction** (Arzabe and Prado 2006, Cardoso et al. 1989, Cardoso and Haddad 1992, Diniz-Filho et al. 2004 [as *L. curicularius*], Eterovick 2003, Eterovick and Barros 2003, Eterovick and Fernandes 2001, 2002, Haddad et al. 1988, Haddad and Prado 2005, Prado et al. 2002, Sazima and Bokermann 1978); **field guide** (Eterovick and Sazima 2004); **habitat** (Cardoso et al. 1989, Eterovick 2003, Eterovick and Barros 2003, Eterovick and Fernandes 2001, 2002, Eterovick and Sazima 2000b, 2004, Haddad et al. 1988, Jim 1980 (S), Sazima and Bokermann 1978); **key** (Eterovick and Sazima 2004); **morphology** (Altig and Johnston 1986, Ponssa 2001); **relationships and systematics** (Savage 2002); **species account** (Eterovick and Sazima 2004); **species comparisons** (Bilate et al. 2005, 2006, Borteiro and Kolenc 2007(S), Cardoso 1985, Cascon and Peixoto 1985, Haddad et al. 1988, Kwet et al. 2001 (M)(S), Prado and d'Heursel 2006, Wogel et al. 2000); **species or taxonomic lists** (Ananjeva et al. 1988; Diniz-Filho et al. 2004 [as *L. curicularius*], Duellman 2003, Eterovick and Sazima 2004, Frost 1985, Glaw et al. 2000 [as *L. cunicularius*], Santos 1995).

- **REMARKS.** The following common names have been used for *Leptodactylus cunicularius*: "Rabbit Burrow Frog" proposed common name at [www.learningrichmond.edu/Leptodactylus](http://www.learningrichmond.edu/Leptodactylus), "Rabbit Foam Frog" cited by Eterovick and Sazima (2004), "Rana Conejera" proposed Spanish common name at [www.learningrichmond.edu/Leptodactylus](http://www.learningrichmond.edu/Leptodactylus), and "Sazima's White-lipped Frog" by Frank and Ramus (1995).

Terminology used to describe the advertisement call follows Heyer et al. (1990). The advertisement call description is based on three recordings, USNM recording 242, cuts 1, 2, and 3. There is variation among the three recordings such as call group rate (15.0, 19.2, 15.9 calls/min), call rate (16.3-17.3, 12.0-12.7, 10.8-11.8 calls/s), mid-call group call duration (0.016-0.020, 0.024-0.030, 0.016-0.022 s), and average dominant frequency (2652, 2646, 2406 Hz) for recordings USNM 242, cut 1, cut 2, cut 3 respectively. There are no temperature data available for USNM recording 242 cut 1 and only a 2°C temperature difference between the other two recordings. There is

no voucher specimen for USNM recording 242 cut 1. Predictions of trends expected to correlate with temperature or male size (SVL) are not consistent across variables. The available data are insufficient to determine whether the observed variation among calls is due to temperature, body size, individual, or population variation. Variation in intensity of the harmonics could be due to differences among recording conditions such as distance from the microphone to the frog and amount of vegetation between the calling frog and the microphone (Reginald B. Cocroft pers. comm., e-mail message of 11 September 2006).

• **ETYMOLOGY.** The specific name is derived from the Latin, *cuniculus*, meaning “rabbit burrow”, and signifies the animal’s behavior of digging a nesting chamber in the manner of a rabbit.

• **ACKNOWLEDGMENTS.** We thank Paula Cabral Eterovick and Célio F.B. Haddad for reviewing the manuscript and clarifying and providing new localities for the species. Addison Wynn provided the distribution map. Reginald B. Cocroft kindly advised us on certain interpretations of the advertisement call of *L. cunicularius*. Research for this account was supported by NSF award DEB-0342918 to RdS and WRH.

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- Primary editor for this account, Twan Leenders.
- Published 30 April 2008 and Copyright ©2008 by the Society for the Study of Amphibians and Reptiles.