

Catalogue of American Amphibians and Reptiles.

Heyer, W.R. and M.M. Heyer. 2001. *Leptodactylus lithonaeetes*.

Leptodactylus lithonaeetes Heyer

Leptodactylus lithonaeetes Heyer 1995:708. Type locality, "SW sector Cerro Yapacana, 600 m, 3°57'N, 67°00'W, Venezuela; Amazonas." Holotype, American Museum of Natural History (AMNH) 100656, collected by Charles W. Myers and John Daly on 18–19 February 1978 (examined by WRH).

Leptodactylus lithometes: La Marca 1997:117. *Lapsus*.

Leptodactylus lithonastes: Renjifo 1997:54. *Lapsus*.

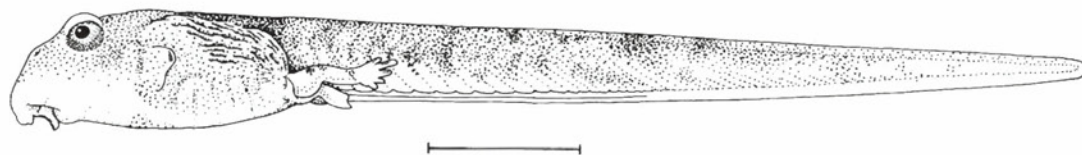
• **CONTENT.** This species is monotypic.

• **DEFINITION.** Adult *Leptodactylus lithonaeetes* are of moderate size, the head length and head width are about equal, and the hind limbs are of moderate length (Table; for size definitions, see Heyer and Thompson 2000). Male vocal sacs are laterally expanded and darkly pigmented. Adult males have one black thumb spine on each hand and a pair of chest spines. Males have a patch of black tubercles on the chin and anterior portion of the throat, and larger males also have a band of black tubercles across the chest. Most individuals either lack dorso-lateral folds or exhibit one short pair of ridges or elongate warts in the shoulder region. Some individuals have series of warts or ridges in the dorsolateral fold field that extend the entire length of the dorsum from behind the eye or extend only to the sacrum.



FIGURE 1. Adult male *Leptodactylus lithonaeetes* (AMNH 100668) from the southwestern sector of Cerro Yapacana, Amazonas, Venezuela (photograph courtesy of Charles W. Myers, American Museum of Natural History).

FIGURE 2. Tadpole of *Leptodactylus lithonaeetes*, UTA-A 23509, stage 38, TL 34.3 mm. Scale bar for larva 5 mm, for mouthparts 1 mm.



The toe tips are bulbous and the toes are free of webbing and lateral fringes. The upper shank and outer tarsus have few to many black and/or white tubercles and may or may not have a shagreen (sharkskin-like surface). The sole of the foot is smooth in most specimens (86%), some (12%) have only a few black and/or white tubercles, and few individuals (2%) have a weakly developed shagreen. The upper lip pattern demonstrates a continuum of uniform (13%), alternating light and dark vertical bars (32%), alternating light and dark oblique bars (29%), and an irregularly defined light area in the loreal region (26%). Most specimens have a dorsal pattern consisting of a series of 3–4 (rarely 2) pairs of spots ranging from small to large in size and from discrete to patterns of fusion with other spots both across and lengthwise along the dorsum; 10% of individuals have a uniform dorsum. The species lacks light middorsal stripes. The belly pattern ranges from uniformly gray-brown to boldly mottled with light spots/flecks on a darker ground. Belly patterns of juveniles and adults do not differ markedly. The posterior thigh surface patterns demonstrate a continuum ranging from indistinctly mottled through distinctly mottled with small or large light irregular spots or light vertical bars on the upper thigh surface to a large light area on the upper thigh surface.

Larvae are elongate and depressed with low tail fins, and are members of the semiterrestrial guild (Altig and Johnson 1989). The larvae have a series of glandular ridges on the body above the abdominal cavity. The oral disk is ventrally positioned, emarginate, and with an anterior gap. The tooth row formulae are 2(2)/3 or 2(2)/3(1). The spiracle is sinistral and the anal tube is median. Total length ranges from 28–36 mm (for Gosner stage 35–40 larvae). For the same larvae, the head-body length ranges from 9–10 mm, the eye diameter is 14–16% of the head-body length, and the oral disk width is 22–26% of the head-body length. The dorsum of the head-body is brown, the underside of the head-body is with or without white flecks whereas the region anterior to the guts has melanophores visible under the skin. The dorsal tail musculature and dorsal fin are mottled with or without darker flecks and/or light ocelli; the ventral tail musculature and ventral fin either lack melanophores or have melanophores on the distal half of the tail.

The advertisement call has not been recorded, but see **Descriptions**.

• **DIAGNOSIS.** Adult *Leptodactylus lithonaeetes* have toes free of webbing and lateral fringes and indistinct dorso-lateral folds. These features are shared with at least some individuals of *L. bufonius*, *L. labialis*, *L. labyrinthicus*, *L. laticeps*, *L. latinasus*,

L. myersi, *L. rugosus*, *L. syphax*, and *L. troglodytes*. The upper shank and posterior tarsus of *L. bufonius*, *L. labialis*, *L. latinasus*, and *L. troglodytes* are covered with large prominent white tubercles and males lack thumb spines. In contrast, the upper shank and posterior tarsus of *L. lithonaetes* have black-tipped tubercles (in some preserved specimens the black tips may be lost, leaving white tubercles which are noticeably smaller than those of *L. bufonius*, etc.) and the males have a spine on each thumb. *Leptodactylus laticeps* has a tile-like dorsal pattern and is larger (minimum adult SVL 91 mm) than *L. lithonaetes* (maximum adult SVL 78 mm), which lacks a distinct tile-like pattern. *Leptodactylus labyrinthicus* is larger (minimum adult SVL 117) than *L. lithonaetes*, and no *L. labyrinthicus* have light loreal blotches, whereas several *L. lithonaetes* do. *Leptodactylus myersi* is larger (females 104–113 mm SVL, males 74–118 mm SVL) than *L. lithonaetes*, and *L. myersi* males lack the chest spines found on *L. lithonaetes*. *Leptodactylus lithonaetes* is most likely to be confused with *L. rugosus* and *L. syphax*, but all demonstrate distinctive male secondary sexual characteristics: *L. lithonaetes* has a single black spine on each thumb and a patch of brown/black tubercles on the chin/throat; all *L. syphax* and some *L. rugosus* have two spines on each thumb, and no *L. syphax* or *L. rugosus* males have a patch of chin tubercles.

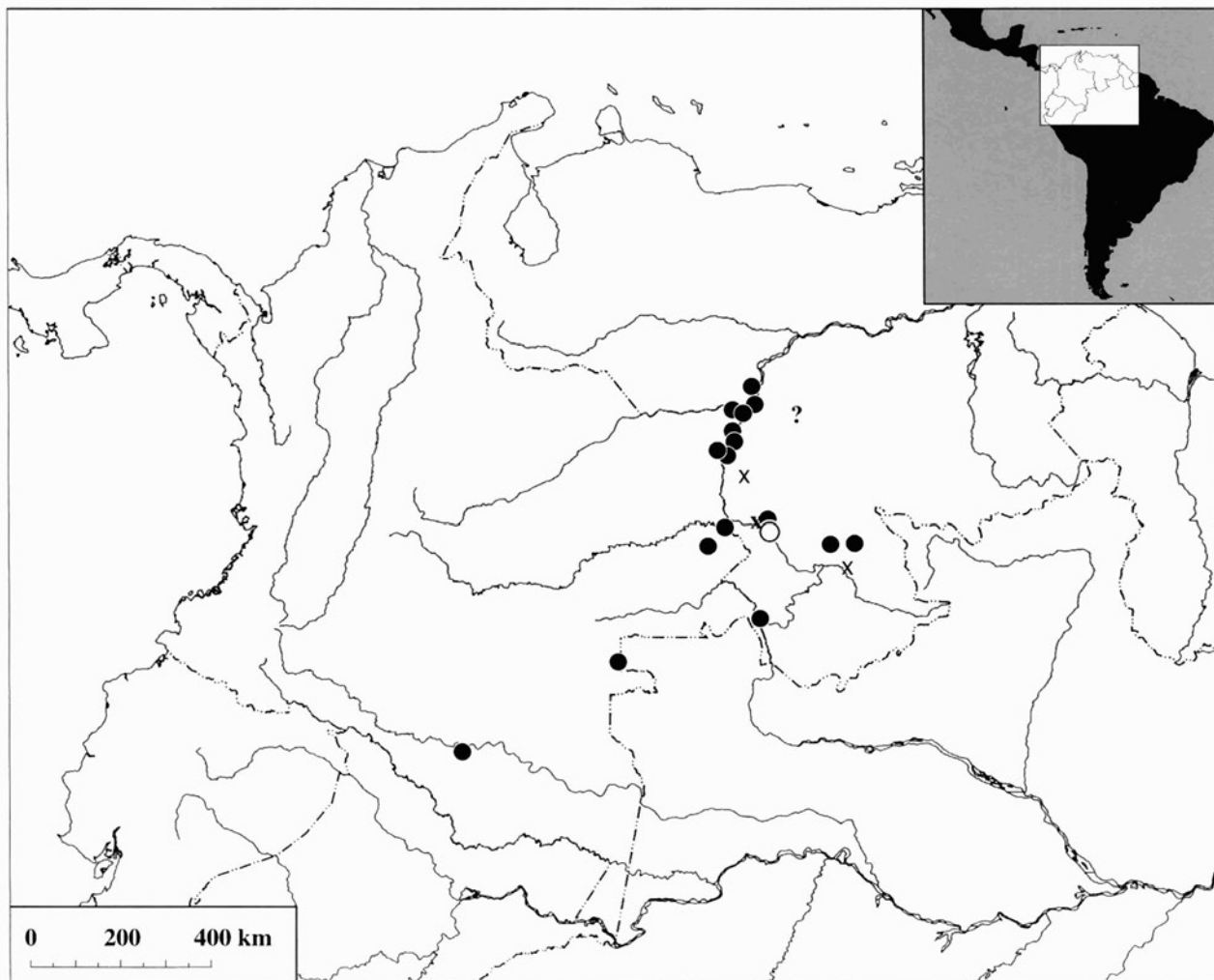
Larvae lack dorsal fins on the anterior half of the tail, a condition shared only with *L. rugosus* larvae among congeners for

TABLE. Summary measurement data for *Leptodactylus lithonaetes*. Means are given in parentheses.

Measurement	Males	Females
SVL (mm)	45–71 (56.3)	55–78 (63.6)
Head length/SVL (%)	37–44 (40)	36–43 (39)
Head width/SVL (%)	38–42 (40)	36–41 (39)
Thigh length/SVL (%)	37–48 (42)	39–45 (43)
Shank length/SVL (%)	40–48 (43)	38–47 (44)
Foot length/SVL (%)	42–53 (47)	40–51 (46)

which larvae have been described. The larvae of these two species are quite similar to each other and may be indistinguishable. For the limited samples available, the most diagnostic feature is the number of labial teeth on one side of the split tooth row anterior to the beak (row A-2) for Gosner stage 33–42 larvae: 37–51 for *L. lithonaetes* and 50–56 for *L. rugosus*.

• **DESCRIPTIONS.** Heyer (1995) listed morphological characteristics of the holotype and provided detailed character descriptions of adults, juveniles, and tadpoles, including color patterns. Rivero's (1961) data for *Leptodactylus rugosus*, including that pertaining to adult morphology, apparently all pertain to *L. lithonaetes* (all the specimens he cited at the top of the species account are *L. lithonaetes*). He described the advertise-



MAP. Distribution of *Leptodactylus lithonaetes*; the circle marks the type locality, dots indicate other published records, and each x indicates an unpublished record. A symbol may cover more than a single locality. The question mark represents a locality (Cerro Guanay, Bolívar, Venezuela) for which species identification is in doubt (see **Distribution**). Because the species occurs in rocky outcrops that are patchily distributed throughout its distributional range, a predictive range outline would be misleading.

ment call as “very similar to the noise produced when a stone is thrown into a quiet pool of water.” We know of no recordings of the call of *L. lithonaetes*. Rivero’s description is very different from the call described by Lynch and Vargas (2000) as “una silbato mecánico, como un juguete de cuerda” (a mechanical whistle, like a string toy). Rivero’s description probably applies to *L. sabanensis* or one of its close relatives.

• **ILLUSTRATIONS.** Color photographs of adult males are in Heyer (1995) and Renjifo (1997). Pictures of juveniles and drawings of tadpoles are in Heyer (1995). Rada de Martínez (1990) illustrated tadpoles identified as *L. rugosus*, but we were unable to find the locality (Poza Pio, T. F. Amazonas, Venezuela) to determine whether the larvae are *L. lithonaetes* or *L. rugosus*.

• **DISTRIBUTION.** *Leptodactylus lithonaetes* is known from a few localities near the border between Colombia and Venezuela and extending eastward into Colombia. The species apparently is restricted to granitic and sandstone habitats associated with flowing water. Duellman (1999) tabled its distribution as Amazon Basin-Guiana lowlands. A range map was provided by Heyer (1995).

The Venezuelan locality of Cerro Guanay, Bolívar (Gorzula and Señaris 1999) lies between the distributions of *L. lithonaetes* and *L. rugosus* as mapped by Heyer (1995). These specimens are juveniles; adult males need to be examined from that locality to determine whether the specimens are *L. lithonaetes* or *L. rugosus*. The specimens of *L. rugosus* reported by Parker (1936) and collected by the Marquis de Wavrin from the upper Orinoco in the state of Amazonas, Venezuela are probably *L. lithonaetes*.

• **FOSSIL RECORD.** None.

• **PERTINENT LITERATURE.** Relatively little literature concerns *Leptodactylus lithonaetes*. Rivero (1961) reported on the natural history of *L. lithonaetes* (as *L. rugosus*). Skin compounds of *L. lithonaetes* specimens were tabled as *L. rugosus* in Flier et al. (1980; see Heyer and Thompson 2000 for documentation of identification). C.W. Myers (in Heyer 1995) described habitat and behavior. Relationships were analyzed in Heyer (1995) and Eterovick and Sazima (2000). Barrio (1998) provided a brief species account. Barrio (1998) and La Marca (1997) included *L. lithonaetes* in faunal lists for Venezuela, and Glaw et al. (1998) cited it in a list of new species. Many literature references to *L. rugosus* prior to 1995 and some citations after that date are unclear as to whether they refer to *L. lithonaetes*, *L. myersi*, or *L. rugosus* (see Heyer and Thompson 2000).

• **REMARKS.** Barrio (1998) coined a rather unwieldy common name for *Leptodactylus lithonaetes*, sapo-rana rugoso occidental. Because we believe that common names should be designated by the people living in the region where the species occurs, and we are unaware of any such name for *L. lithonaetes*, we propose that the species should be referred to by its scientific name for all purposes.

• **ETYMOLOGY.** Heyer (1995) derived the name *lithonaetes* from the Greek *lithos*, stone or rock, and *naetes*, inhabitant, in reference to the habitat of this species.

• **ACKNOWLEDGMENTS.** John D. Lynch reviewed the paper and provided assistance with localities. César Luis Barrio

Amarós clarified certain localities and provided new, unpublished records for Venezuela. P. E. Vanzolini also provided help with problematic localities. Preparation of this account was supported in part by the Neotropical Lowlands Research Program, Smithsonian Institution (Richard P. Vari, Principal Investigator) and the National Science Foundation (award 9815787 to Rafael de Sá and WRH).

LITERATURE CITED

- Altig, R. and G.F. Johnston. 1989. Guilds of anuran larvae: relationships among developmental modes, morphologies, and habitats. *Herpetological Monographs* 3:81–109.
- Barrio, C. 1998. Sistemática y biogeografía de los anfibios (Amphibia) de Venezuela. Systematics and biogeography of the amphibians (Amphibia) of Venezuela. *Acta Biologica Venezuelica* 18:1–93.
- Duellman, W.E. 1999. Distribution patterns of amphibians in South America, p. 255–328. In W.E. Duellman (ed.), *Patterns of Distribution of Amphibians. A Global Perspective*. The Johns Hopkins University Press, Baltimore and London.
- Eterovick, P.C. and I. Sazima. 2000. Description of the tadpole of *Leptodactylus syphax*, with a comparison of morphological and ecological characters of tadpoles and adults of the species in the *L. pentadactylus* group (Leptodactylidae, Anura). *Amphibia-Reptilia* 21:341–350.
- Flier, J., M.E. Edwards, J.W. Daly, and C.W. Myers. 1980. Widespread occurrence in frogs and toads of skin compounds interacting with the ouabian site of Na⁺, K⁺-ATPase. *Science* 208:503–505.
- Gorzula, S. and J.C. Señaris. 1999. Contribution to the herpetofauna of the Venezuelan Guayana I. A data base. *Scientia Guaianae* (8):xviii + 269 p. + 32 color plates.
- Heyer, W.R. 1995. South American rocky habitat *Leptodactylus* (Amphibia: Anura: Leptodactylidae) with description of two new species. *Proceedings of the Biological Society of Washington* 108:695–716.
- and A.S. Thompson. 2000. *Leptodactylus rugosus*. Catalogue of American Amphibians and Reptiles (708):1–5.
- La Marca, E. 1997. Lista actualizada de los anfibios de Venezuela, p. 103–120. In E. La Marca (ed.), *Vertebrados Actuales y Fósiles de Venezuela. Serie Catálogo Zoológico de Venezuela. Vol. I. Museo de Ciencia y Tecnología de Mérida, Mérida, Venezuela*.
- Lynch, J. D. and M. A. Vargas. 2000. Lista preliminar de especies de anuros del Departamento del Guainía. Colombia. *Revista de la Academia Colombiana de Ciencias Exactas, Físicas y Naturales* 24:579–589.
- Parker, H.W. 1936. A collection of reptiles and amphibians from the Upper Orinoco. *Bulletin du Musée royal d'Histoire naturelle de Belgique* 12:1–4.
- Rada de Martínez, D. 1990. Contribucion al conocimiento de las larvas de anfibios de Venezuela. *Memoria, Sociedad de Ciencias Naturales La Salle* 49–50:391–403.
- Renjifo, J.M. 1997. Ranas y Sapos de Colombia. Instituto Humboldt, Colombia.
- Rivero, J.A. 1961. Salientia of Venezuela. *Bulletin of the Museum of Comparative Zoology* 126:1–207.

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Primary editor for this account, Hinrich Kaiser.

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