

A new species of *Hyla* (Anura: Hylidae) from southeastern Brazil

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Abstract: *Hyla vulcaniae* sp. n. is described from the municipality of Poços de Caldas, State of Minas Gerais, southeastern Brazil. The new species is a member of the *Hyla circumdata* group and can be diagnosed mainly by its intermediate size and anastomosing pattern of vertical stripes on the dorsal and posterior surfaces of the thighs. The new species adds to the number of endemic species from the Poços de Caldas Plateau, which represents an important area for species conservation.

Key words: Anura, endemic frogs, *Hyla*, southeastern Brazil.

Resumen: Una nueva especie de *Hyla* (Anura: Hylidae) del sudeste de Brasil. – Se describe *Hyla vulcaniae* sp. n. del municipio de Poços de Caldas, Estado de Minas Gerais, sudeste de Brasil. La nueva especie es un miembro del grupo de *Hyla circumdata* y puede diagnosticarse principalmente por su tamaño intermedio y por un patrón de bandas verticales convergentes en las superficies dorsales y posteriores de las patas posteriores. La nueva especie incrementa el número de especies endémicas de la meseta de Poços de Caldas, que constituye un área importante para la conservación de las especies.

Palabras clave: Anura, *Hyla*, ranas endémicas, sudeste de Brasil.

INTRODUCTION

The *Hyla circumdata* group is composed of species possessing a well developed prepollex, dorsal and posterior surfaces of the thighs with dark vertical stripes (HEYER, 1985), head generally wider than long, and hypertrophied forearm in males (POMBAL & HADDAD, 1993). The component species occur in the Atlantic Forest domain, mainly in forested environments (GARCIA & VINCIPROVA, 1998; FROST, 2000; CARAMASCHI *et al.*, 2001). DUELLMAN *et al.* (1997) proposed the fusion of the *Hyla pulchella* and *H. circumdata* species groups, based on shared characters such as the hypertrophied forelimbs and enlarged prepollex. GARCIA *et al.* (2001) reviewed the arguments in favor of this fusion and listed a series of

possible particular features of the members of the *circumdata* group, including the morphology of the hyoid. Because the distribution of the majority of characters is not known for most species, they concluded that both groups should be kept separate until further phylogenetic analysis. Herein we describe a new species of tree frog from the State of Minas Gerais, Brazil, which by the definitions of HEYER (1985), POMBAL & HADDAD (1993) and CARAMASCHI *et al.* (2001) is a member of the *H. circumdata* group.

MATERIALS AND METHODS

Specimens of the new species came from the municipality of Poços de Caldas, State of Minas Gerais, southeastern Brazil. The type-locality is on the Poços de Caldas Plateau

(approx. 21°48' S, 46°35' W, 1400 m above sea level), which was the mouth of an ancient volcano (MAIO, 1980; LIPORACI & ZUQUETE, 1995). The local natural vegetation types are high altitude pastures and riparian forests; human activities converted most of the original vegetation into pastures. The small streams on the plateau are bordered by forest; see CARDOSO *et al.* (1989) for illustrations. The description of the new species is based on six adults. The types and specimens examined of related species are deposited in the following Brazilian collections: Museu Nacional (MNRJ), Rio de Janeiro; Museu de História Natural da Universidade Estadual de Campinas (ZUEC), Campinas, São Paulo; Museu de Zoologia da Universidade de São Paulo (MZUSP), São Paulo; A.A. Giaretta collection (AAG) at the Universidade Federal de Uberlândia, Uberlândia, Minas Gerais, and Jorge Jim collection (JJ) at the Universidade Estadual Paulista, Botucatu, São Paulo. A list of the specimens examined of closely related species is in Appendix 1. External morphological characters of the types were measured with dial calipers to the nearest 0.1 mm. Measurements were taken as those in HEYER *et al.* (1990). Webbing formula follows SAVAGE & HEYER (1997). The description of the color in life was based on a color slide (Kodachrome) of a paratotype (ZUEC 8861). Natural history accounts were based on field observations conducted by the junior author.

Hyla vulcaniae, sp. nov.

(Figs. 1, 2 and 3)

Holotype: ZUEC 8860, male, collected at the Morro do Ferro, município de Poços de Caldas, Estado de Minas Gerais, Brasil, on 11 November 1990 by A. A. Giaretta.

Paratopotypes: ZUEC 4284, male, collected by C.F.B. Haddad, A. J. Cardoso and G.V. Andrade, on 3-4 January 1980;

ZUEC 8861, male and ZUEC 8862, female, both collected by A. A. Giaretta on 16 November 1990; MNRJ 18860, male, collected by J. Becker on 27 January 1965; and MNRJ 18844, female, H. Cunha on 05 September 1967.

Diagnosis and comparison with closely related species: For the general aspect of the species see Figs. 1 and 2; measurements are given in Table 1. The new species can be diagnosed by its intermediate size (39.7-53.3 mm SVL) and the pattern of dark anastomosed vertical stripes (irregular, X- and inverted Y-shaped) on the dorsal and posterior surfaces of the thighs (Fig. 3).

The new species can be distinguished from *H. circumdata* (Cope, 1871), *H. martinsi* Bokermann, 1964, *H. carvalhoi* Peixoto, 1981, *H. hylax* Heyer, 1985, *H. gouveai* Peixoto and Cruz, 1992, and *H. luctuosa* Pombal and Haddad, 1993 by its smaller size. From *H. hylax*, the new species also differs by having a proportionally larger tympanum and by the pattern of stripes in the thighs (Fig. 3);



FIGURE 1. *Hyla vulcaniae*, in life (paratotype ZUEC 8861). Specimen from Poços de Caldas, Minas Gerais, Brazil. Photo by Ivan Sazima.

FIGURA 1. *Hyla vulcaniae*, en vivo (paratotipo ZUEC 8861). Ejemplar de Poços de Caldas, Minas Gerais, Brasil. Fotografia de Ivan Sazima.

from *H. gouveai* and *H. carvalhoi*, by having well-defined dark stripes on the posterior surface of the thigh, absent in *H. gouveai* (PEIXOTO & CRUZ, 1992) and fragmented and irregular in *H. carvalhoi* (PEIXOTO, 1981). By its larger size, *H. vulcaniae* differs from *H. sazimai* Cardoso and Andrade, 1983, *H. nanuzae* Bokermann and Sazima, 1973, and *H. astartea* Bokermann, 1967. From *H. sazimai*, *H. nanuzae*, *H. astartea*, and *H. ibitipoca* Caramaschi and Feio, 1990, the new species



FIGURE 2. *Hyla vulcaniae* (paratotype ZUEC 8861). Dorsal (above) and ventral (below) views. Individual from Poços de Caldas, Minas Gerais, Brazil.

FIGURA 2. *Hyla vulcaniae* (paratotipo ZUEC 8861). Visiones dorsal (arriba) y ventral (abajo). Individuo procedente de Poços de Caldas, Minas Gerais, Brasil.

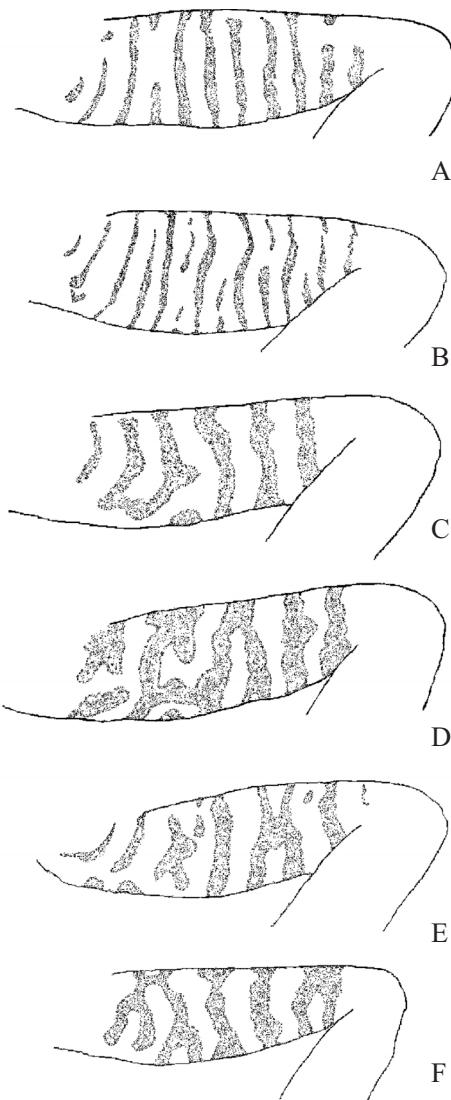


FIGURE 3. Pattern of stripes on the dorsal and posterior surfaces of the thighs of some large/medium sized species of the *Hyla circumdata* group. A: *Hyla luctuosa* (AAG 432, Atibaia, SP), B: *H. hylax* (AAG 649, Paranapiacaba, SP), C-F: *Hyla vulcaniae* (ZUEC 4284, 8860, 8861, 8862, Poços de Caldas, MG). See Fig. 9 in PEIXOTO (1981) for the pattern in other species.

FIGURA 3. Patrón de bandas en las superficies dorsal y posterior de las patas traseras de algunas especies del grupo de *Hyla circumdata* de mediano o gran tamaño. A: *Hyla luctuosa* (AAG 432, Atibaia, SP), B: *H. hylax* (AAG 649, Paranapiacaba, SP), C-F: *Hyla vulcaniae* (ZUEC 4284, 8860, 8861, 8862, Poços de Caldas, MG). Para los patrones en otras especies, véase Fig. 9 en PEIXOTO (1981).

also differs by having a proportionally larger tympanum. *Hyla vulcaniae* differs from *H. izecksohni* Jim and Caramaschi, 1979, by males having vocal slits. The new species has a larger maximum size than *H. raviga* Caramaschi *et al.*, 2001, and does not have the typical pattern of transverse stripes on dorsum and the vertebral stripe of that species.

Description of holotype: Snout rounded in dorsal and lateral views; supratympanic fold well defined; *canthus rostralis* distinct, straight; loreal region concave; tympanum larger than 2/3 diameter of eye; vomerine teeth in two arched series, separated from one another by narrow gap, posterior and between coanae; vocal slits present; vocal sac subgular, barely expanded externally; ulnar ridge distinct, tubercular; forearm hypertrophied; relative lengths of fingers I < II < IV < III; finger disks large, that of finger III corresponding to 1/2 diameter of the eye; subarticular tubercles on fingers discrete, single, rounded; brown nuptial pad at base of each thumb; outer metacarpal tubercle cordiform; inner metacarpal tubercle large; prepollex well developed, spine not exposed, elongated; hand web formula: I3 - 3II2 - 3III2 - 2^{1/2} IV; relative lengths of toes I < II < III = V < IV; toe disks smaller than those on fingers, that on toe IV 1/2 diameter of tympanum; outer metatarsal tubercle indistinct; inner metatarsal tubercle ovoid; subarticular tubercles on toe single, discrete, rounded; outer metatarsal fold continuous, discrete; toe web formula: I1^{1/2} - 2II1 - 2III1^{1/2} - 2IV2^{1/2} - 1^{1/2}V; calcar distinct; weak transverse glandular fold above anus; dorsal texture smooth; belly granular; throat smooth. Dorsal surfaces gray with slight darker gross reticulation; dorsolaterals of body with the reticulated pattern better defined; posterior surface of thigh with 6-8 darker transverse anastomosing stripes (X- and/or inverted Y-

shaped); gular region darker brown; transverse glandular fold above cloaca white; calcar white; belly cream. In life, the photographed specimen had brown dorsum, with darker reticulations; becoming pale yellow laterally; pupil black; iris golden. Measurements are given in Table 1.

Variation: In a paratopotype (ZUEC 4284) the subarticular tubercles of finger IV are bifid. In the type series, the number of stripes on the thigh varies from six to eight. No paratopotype has the white glandular fold above cloaca, as seen in the holotype.

Natural history: Three of the specimens were on leaves of bushes ca. 1.5 m above the margin of slow-moving streams in the forest. Calling was never heard. Tadpoles are unknown. Syntopic species at the site of collection were *Aplastodiscus pereiridis* (LUTZ, 1950) and *Scinax ranki* (ANDRADE & CARDOSO, 1987). The new species is known only from the type-locality.

Etymology: The specific name *vulcaniae* is Latin meaning from volcano. Here it is used as a noun in apposition in allusion to the occurrence of the species in a geomorphologic formation derived from volcanic activity, the Poços de Caldas Plateau (MAIO, 1980; LIPORACI & ZUQUETE, 1995).

DISCUSSION

In several studies on frogs from the Poços de Caldas Plateau (CARDOSO & MARTINS, 1987; CARDOSO *et al.*, 1989; CARDOSO & HADDAD, 1992; GIARETTA & SAZIMA, 1993), vocal activity has not been reported for *H. vulcaniae*. Call intensity and duration of calling season are variable among the species of the *H. circumdata* group. *Hyla hylax* is active vocally, whereas *H. luctuosa* is rarely heard, even in those places where it is abundant (pers. obs.); *H. izecksohni* is thought to be voiceless (JIM & CARAMASCHI,

TABLE 1. Measurements (in mm) of the individuals of the type series of *Hyla vulcaniae*. All specimens from the municipality of Poços de Caldas, State of Minas Gerais, Brazil.

TABLA 1. Medidas (en mm) de los individuos de la serie tipo de *Hyla vulcaniae*. Todos los ejemplares proceden del municipio de Poços de Caldas, State of Minas Gerais, Brasil.

Specimens	ZUEC 8860*	ZUEC 4284	ZUEC 8861	ZUEC 8862	MNRJ 18860	MNRJ 18844
Feature						
Snout-vent length	50.2	45.2	46.4	45.7	39.7	53.3
Head width	19.6	17.0	17.7	17.3	11.9	19.1
Head length	16.3	15.7	16.0	16.3	12.9	16.6
Eye diameter	5.4	5.5	5.4	5.1	4.4	5.2
Tympanum diameter	5.0	3.9	4.4	4.2	4.0	5.0
Inter-ocular distance	5.3	5.0	5.3	6.3	5.7	6.0
Eye-nostril distance	4.9	4.4	5.1	4.2	4.4	5.7
Hand Length	17.8	15.7	15.6	13.8	13.6	12.0
Foot length	23.3	20.0	20.3	20.0	16.9	22.6
III finger disc diameter	3.0	2.3	2.3	2.3	2.2	3.9
IV toe disc diameter	2.7	2.2	2.2	2.1	2.0	2.2
Thigh length	27.0	23.7	23.7	23.2	21.0	28.7
Shank length	26.9	23.1	23.8	24.7	22.9	28.5

* Holotype

1979). The males of *Hyla vulcaniae* have vocal slits and a vocal sac, which are indicative of vocalization; the lack of reports on vocal activity in the species may be related to a short calling period, as observed in *H. luctuosa* (POMBAL & HADDAD, 1993; pers. obs.).

The abundance of endemic frogs in the Poços de Caldas Plateau (GIARETTA & SAZIMA, 1993; MINISTÉRIO DO MEIO AMBIENTE, 2000) is probably related to its topography. *Hyla vulcaniae* is an additional endemic frog to the area, which includes *Phyllomedusa ayeaye* (LUTZ, 1966), *Scinax ranki* (ANDRADE & CARDOSO, 1987), *S. calcaratum* (LUTZ, 1968), *Proceratophrys palustris* Giaretta & Sazima, 1993, and *Hyla stenocephala* Caramaschi & Cruz, 1999. Frogs may be indicative of endemism in other

animal taxa in the Poços de Caldas Plateau and call attention to the importance of the natural reserves in this area.

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APPENDIX I Additional specimens examined

APÉNDICE I Otros ejemplares examinados

Hyla astartea - MNRJ 4052 (paratotype). *H. carvalhoi* - ZUEC 7191 (topotype). *Hyla circumdata*; ZUEC 4495-4496 (Paranapiacaba - SP); ZUEC 6938 (Campos do Jordão - SP); MZUSP 2543 (Boracéia - SP). *Hyla* sp. n. - MZUSP 53573-75, 53577 (Santa Teresa - ES), 53470-53473 (Teresópolis - RJ). *H. ibitipoca* - MNRJ 4450 (holotype), 4453-4459, 4526, 4711-4713;

ZUEC 6823-6824 (paratotypes). *H. izecksohni* - JJ 1286, 4388 (paratotypes). *H. hylax* - AAG 125, 173, 360 (Paranapiacaba), 1440-1442 (Santo Amaro da Imperatriz - SC). *H. luctuosa* - AAG 77, 134 (São José do Barreiro - SP), 371, 494-495, 581-583 (Atibaia - SP), 617-618 (topotypes); ZUEC 9160, 9171 (paratotypes); 5949 (paratype). *H. nanuzae* - MNRJ 4583 (paratotype); ZUEC 3026-3027 (topotypes). *H. sazimai* - ZUEC 4195-4196, 4200 (paratotypes). *H. raviga* - MNRJ 13720 (holotype), 13721 -13726 (paratotypes).

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