

A new frog of the genus *Hylodes* (Amphibia: Leptodactylidae) from Minas Gerais, Brazil

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Abstract

A new species of leptodactylid frog is described from Parque das Mangabeiras, in Belo Horizonte, Minas Gerais, south-eastern Brazil. The new species is a member of the *Hylodes lateristrigatus* group, and is characterized by medium size, snout rounded in dorsal view and protruding in lateral view, presence of vocal slits and sacs, upper surface of finger and toe discs with well-developed scutes, a weakly developed stripe on the upper lip, dorsum, arm, leg, and foot dark brown with small irregular brown and black dots, and absence of red and yellow spots in live specimens. The descriptions of the tadpoles and vocalizations, and information on natural history are provided. *Hylodes perplicatus* (Miranda-Ribeiro), previously considered a member of the *H. nasus* species group, is transferred to the *H. lateristrigatus* species group.

Key words: Amphibia, Anura, Leptodactylidae, Hylodinae, *Hylodes uai* sp. nov., advertisement call, tadpole, south-eastern Brazil

INTRODUCTION

Frogs of the genus *Hylodes* are restricted to eastern Brazil, associated with the Atlantic forest in rheophilic habitats (Haddad & Pombal, 1995; Haddad, Pombal & Bastos, 1996), with the only known exception being *H. otavioi* from the riparian forests in rocky fields at the Serra do Cipó, Minas Gerais, Brazil (Sazima & Bokermann, 1982; Haddad & Pombal, 1995). Heyer (1982) recognized four species groups in the genus *Hylodes*: *H. glaber* group with one species, *H. lateristrigatus* group with 12 species, *H. mertensi* group with one species, and *H. nasus* group with three species (Frost, 1985; Duellman, 1993; Haddad *et al.*, 1996; see below). The *H. lateristrigatus* group contains small to moderate-sized species characterized by slender bodies, smooth dorsum, and light dorsolateral stripes (Heyer, 1982; see also Haddad *et al.*, 1996). The species presently allocated to the *H. lateristrigatus* group are *H. babax* Heyer, *H. charadranaetes* Heyer & Cocroft, *H. heyeri* Haddad, Pombal & Bastos, *H. lateristrigatus* (Baumann), *H. magalhaesi* (Bokermann), *H. ornatus* (Bokermann), *H. otavioi* Sazima & Bokermann, *H. perplicatus* (Miranda-Ribeiro) (herein included in the *H. lateristrigatus* group, not in the *H. nasus* group; see Remarks), *H. phyllodes* Heyer & Cocroft, *H. regius* Gouvêa, *H. sazimai* Haddad & Pombal, and *H. vanzolinii* Heyer.

The adult, tadpole, and the vocalizations of a new species of the *Hylodes lateristrigatus* group from Serra do Curral, Parque das Mangabeiras, a species inhabiting the transition between Atlantic Forest and Cerrado domains (*sensu* Ab'Saber, 1977), is described here.

MATERIALS AND METHODS

Vocalizations were recorded with a UHER 4000 report tape recorder and UHER M518A microphone at tape speed of 19 cm/s. The tapes were analysed on a Macintosh Classic computer coupled to the MacRecord Sound System 2.0.5, using 256 points.

Specimens used in the description or examined for comparison are deposited in AL-MN (Adolpho Lutz Collection, deposited in Museu Nacional, Rio de Janeiro, Brazil), CFBH (Célio F. B. Haddad Collection, deposited in Departamento de Zoologia, Universidade Estadual Paulista, Rio Claro, SP, Brazil), MCNAM (Museu de Ciências Naturais, Pontifícia Universidade Católica de Minas Gerais, Belo Horizonte, MG, Brazil), MNRJ (Museu Nacional, Rio de Janeiro, Brazil), MZUSP (Museu de Zoologia da Universidade de São Paulo, Brazil), WCAB (Werner C. A. Bokermann collection, deposited in Museu de Zoologia da Universidade de São Paulo, Brazil), and ZUEC (Museu de História Natural, Universidade Estadual de Campinas,

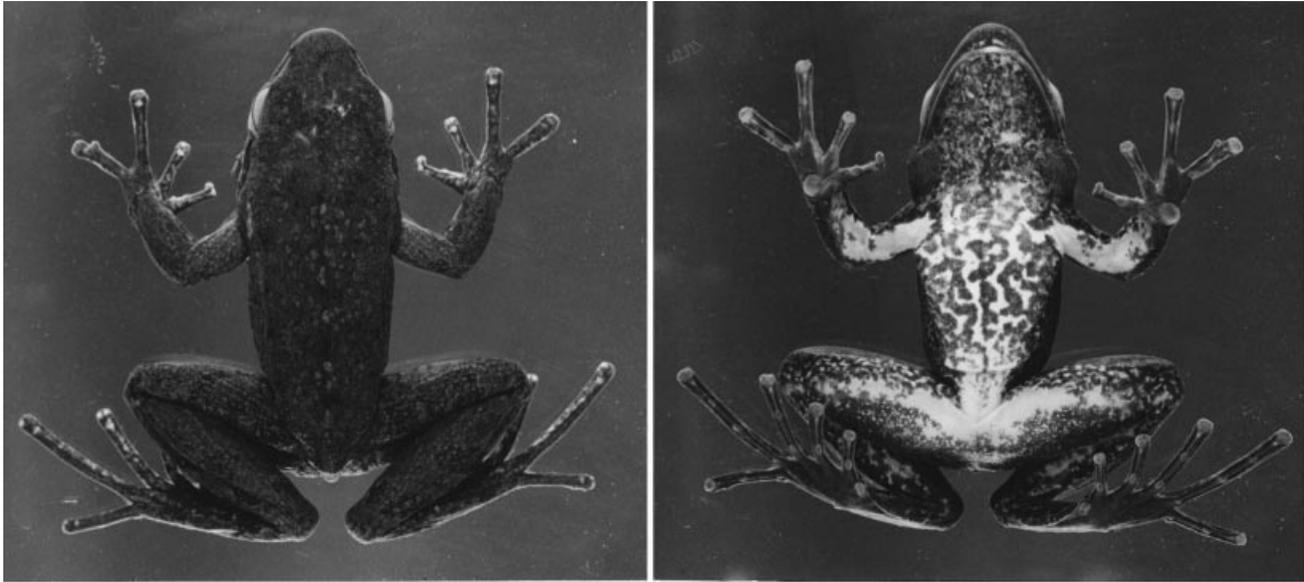


Fig. 1. *Hylodes uai*, MNRJ 23771 (holotype), dorsal and ventral views.

SP, Brazil). Additional specimens examined are listed in the Appendix.

Abbreviations used in the measurements of the adults are SVL (snout-vent length), HL (head length), HW (head width), ED (eye diameter), TD (tympanum diameter), END (eye-nostril distance), IOD (interorbital distance), IND (internostril distance), THL (thigh length), TBL (tibia length), and FL (foot length). All measurements are in millimetres. The measurements of the adults followed Duellman (1970) and Cei (1980). Measured adult specimens were fixed in 10% formalin and maintained in 70% ethyl alcohol. The tadpoles were preserved and maintained in 5% formalin. For measurements of adults, we used an ocular micrometer in a Zeiss stereomicroscope, except for SVL, HL, HW, THL, TBL, and FL, which were measured with a calliper. To measure total length, body length, body height, and body width of tadpoles, we used a calliper; for the other measurements, we used an ocular micrometer. Drawings of the holotype and tadpole were made using a Zeiss stereomicroscope with a drawing tube. The tooth row formula of the tadpoles follows Altig (1970).

RESULTS

Hylodes uai sp. nov.

(Figs 1 & 2)

Holotype

MNRJ 23771, adult male, collected at Riacho da Serra, Parque das Mangabeiras, Município de Belo Horizonte (19°55'S, 43°56'W, c. 850 m elevation), Estado de Minas

Gerais, Brazil, on 09 April 1999 by B. V. S. Pimenta, B. C. A. Elias, S. E. M. Souza, and P. C. F. Carneiro.

Paratopotypes

CFBH 2984-85, two adult males collected on 2 November 1982 by G. Kisteumacher and U. Caramaschi; MNRJ 23772-73, two adult males, no date, collected by G. Kisteumacher; MNRJ 23774, adult male collected on 17 September 1983 by L. Gabriel; MNRJ 23775, female collected on 5 May 1993 by L. B. Nascimento; MNRJ 23777, adult male, collected on 4 March 1999 by L. B. Nascimento; MCNAM 1333, female collected on 21 August 1996 by L. B. Nascimento, C. A. B. Galdino, and R. R. Carvalho Jr; MCNAM 1763 collected with the holotype.

Diagnosis. A medium-sized (SVL 31.2–33.6 mm in males), moderately slender species in the *H. lateristrigatus* group (Heyer, 1982), characterized by snout rounded in dorsal view and protruding in lateral view; presence of vocal slits and vocal sacs; upper surface of finger and toe discs with well-developed scutes; thumb without nuptial asperities or spines; dorsum, arm, leg, and foot dark brown with small irregular brown and black dots; absence of red and yellow spots in live specimens.

Comparison with other species. *Hylodes uai* is a member of the *H. lateristrigatus* species group which has the most protruding snout in lateral view. The new species differs from *H. babax* by its more rugose dorsum and snout less rounded in dorsal view. From *H. charadra-naetes* the new species differs by its straighter canthus rostralis (more concave in *H. charadra-naetes*) and more rugose dorsum. *Hylodes uai* is distinguished from *H. heyeri* by its smaller size (males 36.4–42.6 mm SVL in *H. heyeri*; Haddad *et al.*, 1996) and smoother

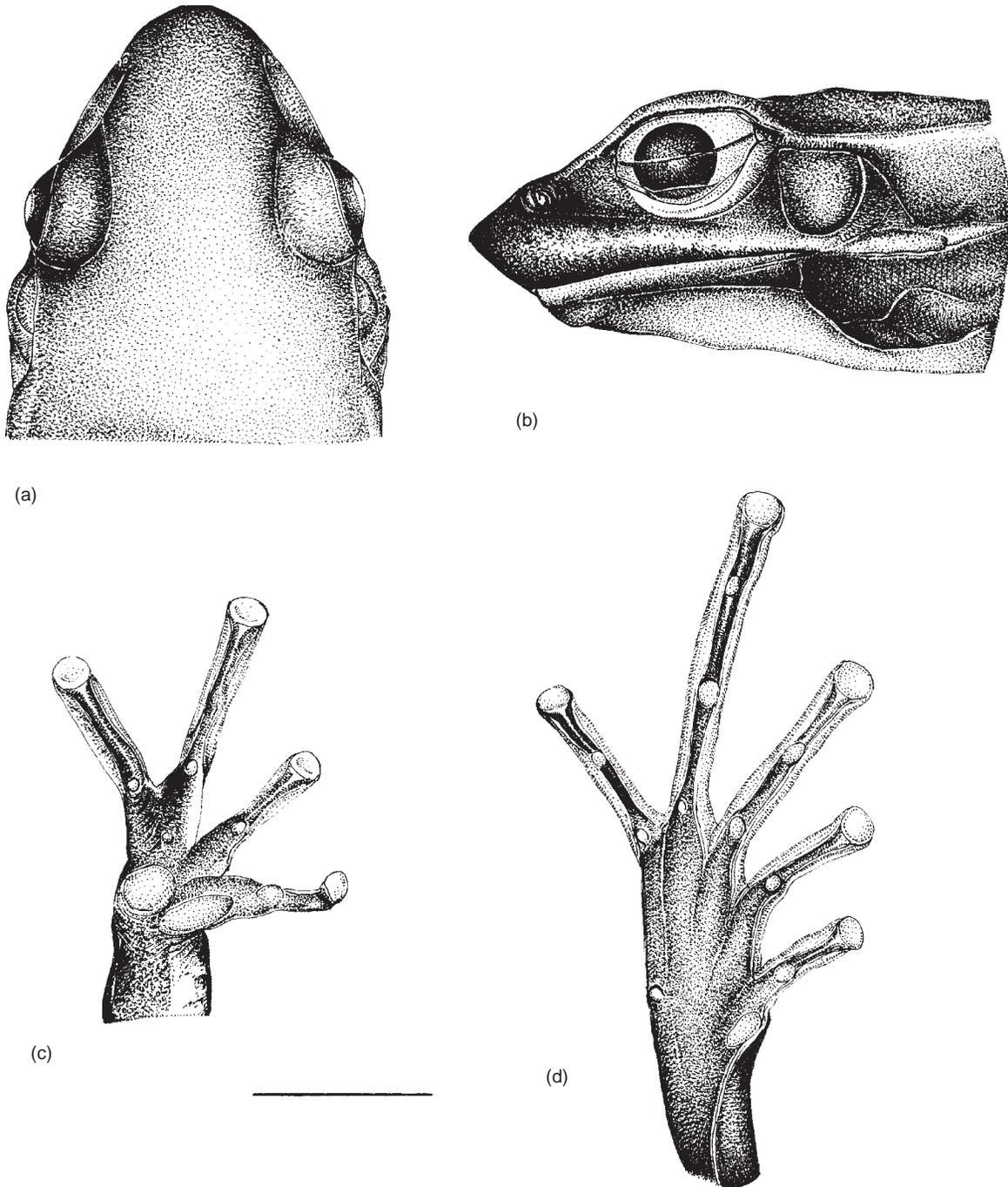


Fig. 2. *Hylodes uai*, MNRJ 23771 (holotype): (a) head, dorsal view; (b) head, lateral view; (c) hand, ventral view; (d) foot, ventral view (scale 5 mm).

dorsum. The new species can be distinguished from *H. lateristrigatus* by its smaller size (males 38–39 mm SVL in *H. lateristrigatus*; Heyer, 1982) and more rugose dorsum, and from *H. magalhaesi* by the body more robust and a weakly developed stripe on the upper lip (developed in *H. magalhaesi*). The new species is larger than *H. ornatus* (males 25 mm SVL in *H. ornatus*; Bokermann, 1967) and has well-developed scutes on the upper surfaces of the finger discs. From *H. otavioi* the new species can be distinguished by the less developed fringes on the fingers and toes and by a robust body.

From *H. phyllodes* the new species differs by the lack of nuptial thumb spines in males and by larger size (males 27.5–31.4 mm SVL in *H. phyllodes*; Heyer & Cocroft, 1986). From *H. regius*, the new species differs by the more rugose dorsum and by absence of red colours on the ventral faces of the arm, forearm, and leg of live specimens (Gouvêa, 1979). From *H. sazimai* the new species differs by its larger size (males 27.1–28.5 mm SVL in *H. sazimai*; Haddad & Pombal, 1995) and by the presence of well-developed scutes on the upper surfaces of the finger discs. From *H. vanzolinii* the new

Table 1. Measurements of males and females of *Hylodes uai* (mm)

	Males (<i>n</i> = 8)			Females (<i>n</i> = 2)
	\bar{x}	SD	Range	Range
Snout–vent length	32.7	0.86	31.2–33.6	36.3–38.2
Head length	12.7	0.66	12.0–14.2	13.2–13.7
Head width	11.2	0.67	10.3–12.7	11.3–11.7
Eye diameter	3.4	0.26	3.0–3.8	3.3–4.1
Tympanum diameter	2.4	0.15	2.1–2.5	2.3–2.6
Eye–nostril distance	2.3	0.25	2.0–2.7	2.0–2.7
Interorbital distance	3.3	0.13	3.2–3.6	3.0–3.6
Internostril distance	4.5	0.16	4.2–4.7	4.9–5.1
Thigh length	16.6	0.50	15.6–17.3	17.2–17.7
Tibia length	17.5	0.4	17.0–18.2	16.2–20.0
Foot length	15.6	1.1	15.0–16.3	17.8–18.3

species differs by the presence of vocal slits and sacs (absent in *H. vanzolinii*; Heyer, 1982), by the more rugose dorsum, and by the presence of well-developed scutes on the upper surfaces of the finger discs. The dorsum of *Hylodes uai* lacks the distinct colour pattern and the dorsal yellow spots, observed in live specimens of *H. ornatus*, *H. regius*, and *H. vanzolinii* (Bokermann, 1967; Gouvêa, 1979; Heyer, 1982).

Besides the morphological differences, the new species can be distinguished from *H. babax*, *H. charadranaetes*, *H. heyeri*, *H. lateristrigatus*, *H. magalhaesi*, *H. otavioi*, *H. phyllodes*, *H. regius*, and *H. sazimai*, by details of vocalization (see Heyer & Cocroft, 1986; Haddad & Pombal, 1995; Haddad *et al.*, 1996).

Description of holotype

Body moderately slender (Fig. 1); head longer than wide, snout round in dorsal view and protruding in lateral view (Fig. 2a, b); nostrils slightly protuberant, directed laterally; canthus rostralis distinct, straight; loreal region concave; tympanum nearly round, large, diameter larger than half of eye diameter; supratympanic fold developed; lateral fold extending from supratympanic fold to groin; lateral vocal sacs present; vocal slits present; tongue large; vomerine teeth in two small series between choanae; choanae small, round; maxillary teeth not visible but discernible by probe. Arms robust; thumb without nuptial asperities or spines; subarticular tubercles single, round (Fig. 2c); outer metacarpal tubercle nearly round; inner metacarpal tubercle elliptical; finger lengths II < I < IV < III; thumb not fringed, other fingers fringed laterally; finger discs medium-sized, nearly oval; fourth finger of left hand with two discs, supernumerary disc small; upper surfaces of finger discs with well-developed scutes; finger and toe discs of about equal size. Legs robust; foot with a nearly oval inner metatarsal tubercle (Fig. 2d) and a protruding round outer metatarsal tubercle; subarticular tubercles single, nearly elliptical on toes I, II, and III; nearly round, protruding on toes IV and V; toe lengths I < II < V < III < IV; toes extensively fringed lat-

erally; extensive tarsal fold-flap continuous distally with toe fringe on inner side of first toe; toe discs nearly triangular; upper surfaces of toe discs with well-developed scutes. Dorsal skin texture slightly rugose; posterior region of the body and flanks rugose; undersurfaces smooth; rugose texture near vent and on ventral surface of thighs.

Colour in life of the holotype. Dorsum, arm, leg, and foot dark brown with small irregular dots brown and black; light brown lateral fold from posterior corner of the eye to the groin; tympanum dark brown; vocal sacs dark grey; flanks dark grey; a silver creamish stripe from below eye and tympanum to shoulder; anterior surfaces of thigh and undersurfaces of tibia dark grey with irregular whitish dots; throat dark grey mottled with grey; chest and belly dark grey with irregular white stains; both undersurfaces of thighs and arms white; palm of hand, foot, and posterior surface of thigh black; iris copper.

Colour in preservative of the holotype. In preservative (alcohol 70%), the colours are similar to those in life, except the iris turned brown.

Measurements of the holotype. SVL 33.6, HL 12.8, HW 11.1, TD 2.2, ED 3.8, IOD 3.3, END 2.5, IND 4.5, THL 17.3, TBL 18.2, FL 16.1.

Variation. In life, dorsum, arms, and legs brown to dark brown; belly grey to whitish; lateral fold silver to light brown; females with light throat, chest, and belly. Snout round to subacuminate; females with fingers and toes less fringed than males. Measurements of eight males and two females are in Table 1.

Vocalizations. Advertisement calls given sporadically; at an air temperature of 26 °C the intervals between two consecutive advertisement calls, emitted by the same male, are 6.17–10.75 s (\bar{x} = 8.30, SD = 0.93, *n* = 31); the call duration range is 0.74–1.16 s (\bar{x} = 1.05, SD = 0.24, *n* = 44 calls from three males); the range of number of notes per call is 9–14 (\bar{x} = 12.7, SD = 1, *n* = 44 calls from three males); notes are given at a rate of 11.8–14 notes/s (\bar{x} = 12.5, SD = 0.5, *n* = 44 calls from three males); notes given at regular intervals; note duration range is 0.02–0.06 s (\bar{x} = 0.045; SD = 0.009; *n* = 100 notes from three males) (Fig. 3a, b); each note is a rising frequency-

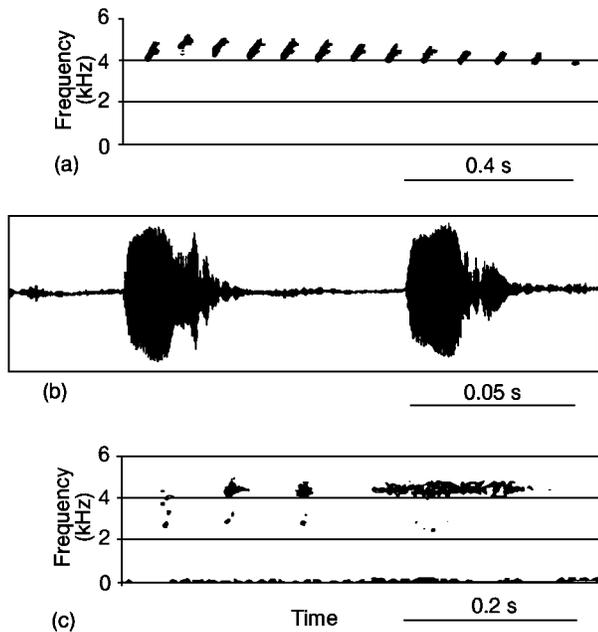


Fig. 3. *Hylodes uai*, recorded on April 1999; air temperature 26°C: (a) sonogram of the advertisement call; (b) wave form of two notes of the advertisement call; (c) territorial call.

modulated whistle. The dominant frequency range in the advertisement calls is of *c.* 3.6–5.1 kHz; there is an abrupt frequency rise in the second note and a gradual decay until the last (Fig. 3a). Territorial calls may have four whistle notes or three to four whistles plus a squeaky note; territorial calls composed just of whistles had a duration range of 0.29–0.31 s (\bar{x} = 0.30, SD = 0.01; n = 3 calls from one male), and territorial calls composed of whistles and squeaky notes had a duration range of 0.47–0.63 s (\bar{x} = 0.52, SD = 0.08, n = 4 calls from one male). The whistle notes of the territorial calls had a duration range of 0.03–0.06 s (\bar{x} = 0.038, SD = 0.008, n = 25 notes from one male), and the squeaky notes had a duration range of 0.21–0.25 s (\bar{x} = 0.23, SD = 0.018, n = 4 notes from one male). The dominant frequency range in the territorial calls is *c.* 4.0–5.0 kHz (Fig. 3c).

Tadpoles. The tadpoles (MNRJ 24941, 24942; one and two specimens, respectively) were obtained from Riacho da Serra, Parque das Mangabeiras, Belo Horizonte, Minas Gerais, Brazil, on 9 August 1989 by L. B. Nascimento. The following description is based on a tadpole in developmental stage 36 (Gosner, 1960). Total length 63.8 mm; body length 21.2 mm; body height 10.6 mm; body width 13.2 mm; internostril distance 4.3 mm; interorbital distance 4.2 mm; eye–nostril distance 2.1 mm; eye diameter 1.9 mm. Body oval in dorsal, ventral, and lateral views, widest posteriorly (Fig. 4a–c); body wider than high; snout rounded; eyes small, dorsolateral; nostrils dorsolateral, small, rounded, midway between the eyes and the tip of the snout; spiracle opening directed posterodorsally on the left side of body; cloacal tube short, conical, opening dextral; caudal musculature heavy, gradually tapering to pointed tip; dorsal fin approximately as deep as

ventral. Lateral line system composed of 12 lateral lines, six on each side of the body and tail. Body with ventral depression anterior of the coiled intestine.

The oral disc of tadpole in stage 25, is directed ventrally and bordered by two or three rows of small papillae interrupted on the anterior labium (Fig. 4d), tooth row formula 2(2)/3(1), jaw sheaths strongly developed and serrate, posterior jaw sheath v-shaped. The description of oral disc is based on a tadpole in stage 25 because the tooth rows are missing on the stage 36 specimen analysed.

In life, dorsum and sides dark brown with dark grey punctuations; ventral surface silver pale brown, but anterior region lighter than posterior; edge of spiracle whitish; tail reddish brown, fins translucent, both with dark grey punctuations, more concentrated at tip; iris bronze. In preservative, dorsum brown; lateral surfaces of body pale brown; throat and belly transparent; tail brown, with grey blotches posteriorly. Fins translucent with grey punctuations. Iris dark grey.

Natural history. Males of *Hylodes uai* were observed calling throughout the year, but were most abundant in the wet season (October–March). Males are diurnal. Males were also observed and collected at night, sleeping on leaves, branches, or crevices along the edges of the streams. They call from shaded places on rocks or rock crevices, in small streams. The preferential calling site is on rocks in or on the edges of the stream near waterfalls. The frogs are wary and interrupted calling when disturbed. The males stay in a same calling site on consecutive days suggesting territoriality. When disturbed, they hide or dipped in the water and after a few minutes return to the same place and began to call. Territorial calls were emitted when the males are close to a neighbour and were emitted when we used playback.

Distribution. The new species is known only from the type locality at Parque das Mangabeiras, inside the metropolitan region of the Belo Horizonte City, Minas Gerais, south-eastern Brazil, in the ecological reserve of Serra do Curral, a small mountain range belonging to the Espinhaço Mountain Complex.

Etymology

The specific name is an aleatory arrangement of letters, being also a common interjection used by the people from Minas Gerais, meaning surprise and astonishment.

REMARKS

The species of the genus *Hylodes* are restricted to eastern Brazil, associated with the Atlantic Forest, except for *H. otavioi* known from riparian forests in rocky fields at Serra do Cipó, Minas Gerais State. The type locality of *Hylodes uai* is in a transitional area between semi-deciduous forest (Atlantic forest, *sensu lato*) and Cerrado. The known distribution of species in the

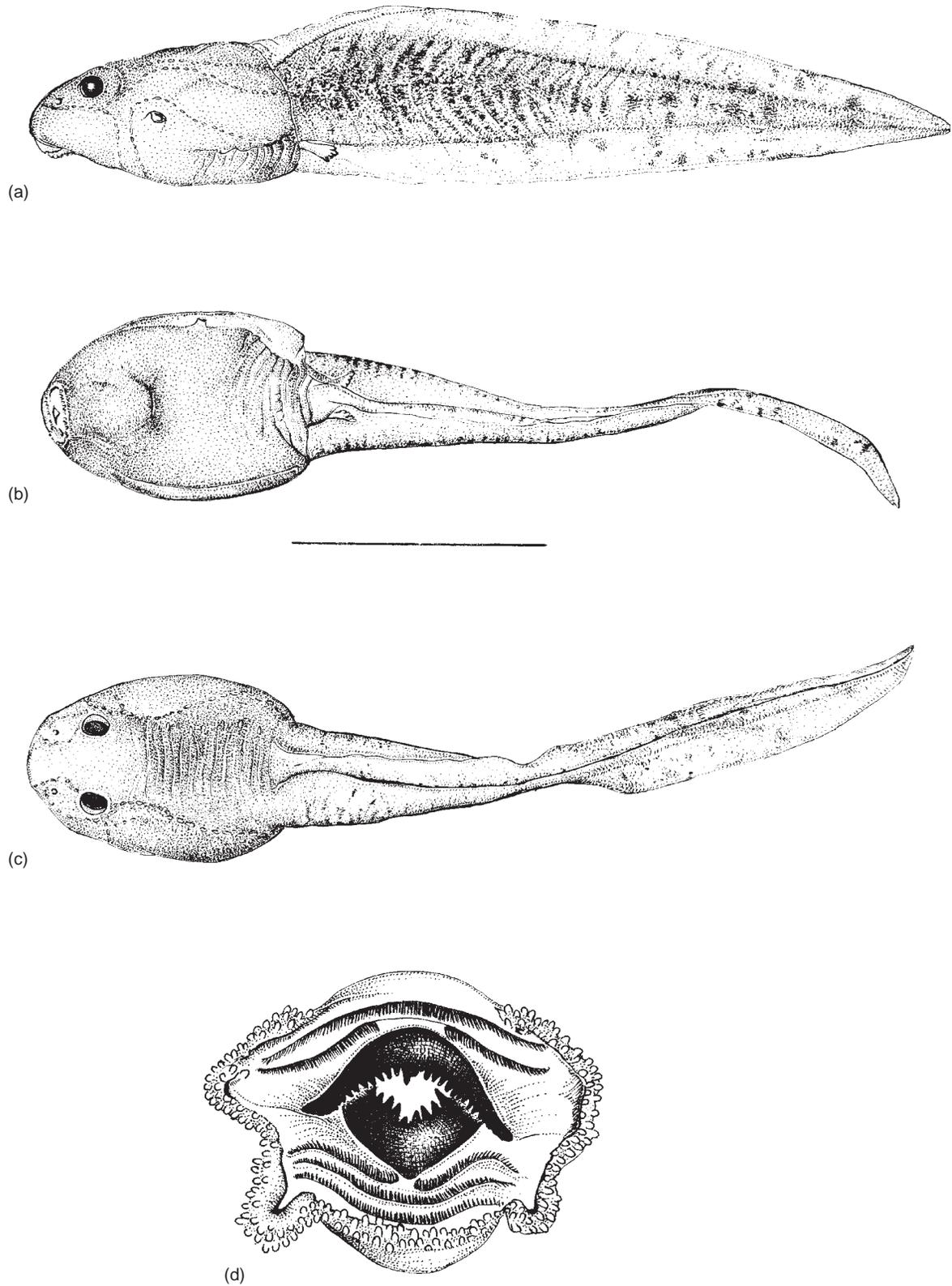


Fig. 4. Tadpole of *Hylodes uai*. Stage 36: (a) lateral view; (b) ventral view; (c) dorsal view; scale = 20 mm. Stage 25: (d) oral disc; scale = 2 mm.

genus *Hylodes* is from Alagoas State (north-eastern Brazil) to Rio Grande do Sul State (south Brazil) (Frost, 1985; Duellman, 1993; E. M. Freire, pers. comm.). *Hylodes otavioi* and *H. uai* are the most inland species. Before the collection of specimens of an unknown species of the *H. asper* group in the Alagoas State, the northern limit of the genus was Espírito Santo State (Frost, 1985; Duellman, 1993). However, *Hyla ranoides* Spix, 1824 was described from specimens collected in the State of Bahia. *Hyla ranoides* is considered a synonym of *Hylodes nasus* (Lichtenstein, 1823) (see Hoogmoed & Gruber, 1983). Other than Spix's type locality of Bahia, *Hylodes nasus* is only known from Floresta da Tijuca in the City of Rio de Janeiro, where Spix also collected (Spix & Martius, 1823). Possibly, Spix's material was incorrectly labelled and the type locality is wrong, or *H. ranoides* is not conspecific with *H. nasus*. Hoogmoed & Gruber (1983) discussed the synonymy of *H. ranoides* and *H. stercoracea* with *Hylodes nasus*.

Heyer (1982) included *Hylodes perplicatus* in the *Hylodes nanus* group. However, this species shows the light dorsolateral stripes which characterize the *H. lateristrigatus* group (Heyer, 1982). We therefore propose the transfer of *H. perplicatus* to the *H. lateristrigatus* group.

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APPENDIX*Additional specimens examined*

Hylodes babax MZUSP 57949 (holotype); *H. charadra-naetes* MZUSP 60648 (holotype), MZUSP 60649–59 (paratypes), ZUEC 8091–92, 8094–98, 8326–27 (topotypes); *H. heyeri* MNRJ 17090 (holotype), CFBH 2465–68 (paratypes), MNRJ 17091 (paratypes), ZUEC 8238, 8240, 8242–43, 8249–50, 8253–54 (paratypes); *H. later-istrigatus* AL–MN 2364 (topotype), MZUSP 53259–61 (topotypes); *H. magalhaesi* WCAB 34318–19, 34322, 34327, 34334, 37681, 37683–84, 45342, 45345 (topotypes); *H. ornatus* MZUSP 60682–83, 60843–45 (topotypes), ZUEC 737–38, 4087 (topotypes); *H. otavioi* ZUEC 3351–53, 5022 (paratypes); *H. perplicatus* MNRJ 0089 (locotype); *H. phyllodes* MZUSP 59934 (holotype), 1716–1721 (paratypes), ZUEC 2615, 6365–66, 6411 (topotype), 6797, 6987–89, 8420; *H. regius* MNRJ 4110 (holotype), 4106, 4108–09, 4111–12 (paratypes); *H. sazimai* MNRJ 15869 (paratype), MZUSP 69637 (paratype), ZUEC 9004 (holotype).