

even though individuals can be present in the habitat during the whole year. Also, the population is characterized by high juvenile recruitment, with almost complete population turnover annually. Consequently each local population can be very sensitive to even minor environmental variations. Therefore, strong seasonal population fluctuations could be one of the reasons for the high susceptibility of Hylodine frogs to local extinction (Weygoldt, 1989).

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The Tadpole of *Hyla rubicundula* (Anura: Hylidae)

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The *Hyla rubicundula* species group is defined by small size, immaculate thighs, and a dorsum consistently green in life and pink to violet in preservative (Napoli and Caramaschi, 1999a). This group includes the following species: *H. rubicundula* Reinhardt and Lütken, 1862; *Hyla tritaeniata* Bokermann, 1965; *Hyla anataliasiasi* Bokermann, 1972; *Hyla araguaya* Napoli and Caramaschi, 1998; *Hyla cerradensis* Napoli and Caramaschi, 1998, and *Hyla cachimbo* Napoli and Caramaschi, 1999 (Napoli and Caramaschi, 1998; 1999a). This group occurs in northern, central, northeastern, and southeastern Brazil (Frost, 1985; Napoli and Caramaschi, 1999b). On the basis of adult characters, Lutz (1973) considered *Hyla nana* Boulenger 1889, and *Hyla sanborni* Schmidt 1944, as relatives of *H. rubicundula*.

Herein, we describe the tadpole of *H. rubicundula*. Specimens were collected at the Serra do Cipó, Municipality of Jaboticatubas (43°44'S; 19°30'W), Minas Gerais, Brazil: adults were collected in December 1997 and tadpoles in January 1998 and January 1999. Adults and tadpoles were deposited in the Museu Nacional, Rio de Janeiro, Brazil (MN RJ 25005) and the Departamento de Zoologia, Instituto de Biologia, Universidade Federal do Rio de Janeiro, Brazil (ZUF RJ 7437-39). Adults were anaesthetized in 0.25% chlore-tone, preserved in 10% formalin and stored in 70% alcohol. Tadpoles were anaesthetized in 0.1% chlore-tone and stored in 5% formalin. Tadpoles collected in

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TABLE 1. Measurements (in millimeters) of *Hyla rubicundula* tadpoles, stage 34–35 ($N = 8$; \bar{x} = mean; SD = standard deviation).

Character	\bar{x}	Range	SD
Total length	30.0	24.5–32.9	1.0
Body length	10.1	9.9–10.8	0.1
Body height	5.4	5.0–6.1	0.1
Dorsal fin	2.9	2.4–3.4	0.1
Ventral fin	1.9	1.5–2.7	0.1
Spiracle–snout distance	8.9	8.0–9.5	0.2
Interorbital distance	3.5	3.1–3.7	0.1
Internostril distance	1.6	1.4–1.7	0.0
Eye diameter	1.7	1.6–1.8	0.0
Nostril diameter	0.5	0.4–0.6	0.0
Oral disc	1.4	1.2–1.5	0.0

1998 were raised in captivity in a plastic box ($262 \times 77 \times 147$ mm) with about 1.5 l of water. The tadpoles collected in January 1999 were anaesthetized and preserved in the field. Only tadpoles in advanced stages were raised until metamorphosis for species identification and to describe the coloration and compare with adult patterns.

The description and measurements are based on tadpoles in stage 34–35 (Gosner, 1960). Other stages were eventually used to corroborate the color pattern. Measurements and nomenclature follow the methods proposed by Altig (1970) and Altig and McDiarmid (1999), except interorbital distance, which was taken between the inner margins of eyes. All measurements (in millimeters) were taken using an ocular micrometer in a Wild M7A stereomicroscope, except for total length, which was measured with calipers. Drawings were made using a Zeiss stereomicroscope with a camera lucida.

Mean total length 30.0 ± 1.0 mm ($N = 8$; Table 1); body depressed dorsoventrally in lateral view (Fig. 1A) and violin-shaped in dorsal view; body length approximately 33% of total length; snout slightly triangular in dorsal and ventral views (Fig. 1B–C); nostrils large, elliptical, directed ventrally on tip of snout, located laterally near mouth, diameter 25–35% ($\bar{x} = 31\%$) of eye diameter; internostril distance half that of interorbital distance; spiracle sinistral, short, not projecting, located at the beginning of the posterior third of the body, with inner wall present as slight ridge and lateral wall ending at same plane to insertion of medial wall; distance from opening spiracle to snout approximately 76% of body length; anal tube short, dextral, attached to ventral fin. Tail having terminal flagellum; dorsal fin beginning at posterior edge of body, dorsal fin larger and more arched than ventral fin, mainly in the anterior region. Oral disc anteroventral, reduced to U-shaped yoke around mouth and modified into a short projected tube, its width approximately 24% of width of body; papillae, denticles, and dermal ridges between beak and lower lip absent; beak strongly serrated (Fig. 1D–E).

In life, body reddish brown with conspicuous median brown mark dorsally and brown stripe from tip of snout through eye to posterior margin of body, separated from dorsal mark by broad yellowish pearl color stripes. In lateral view, a brown stripe from snout

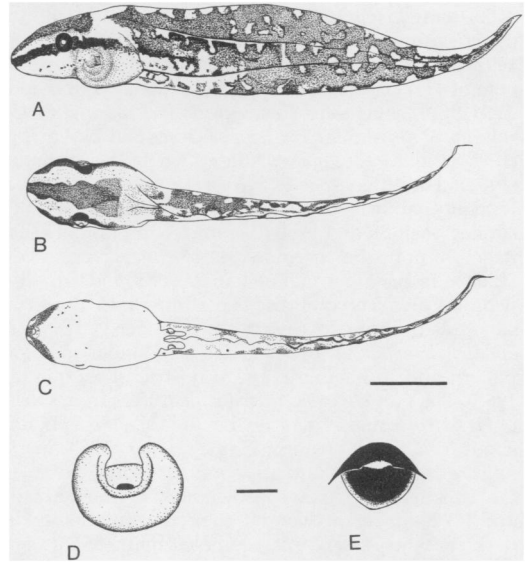


FIG. 1. The tadpole of *Hyla rubicundula* (MNRJ 25005). (A) lateral, (B) dorsal, (C) ventral views (scale = 5 mm); (D) oral disc, (E) beak (scale = 0.5 mm).

tip to the end of the body, interrupted only on the eye; a pearl color stripe below and parallel it. Eyes metallic reddish brown. Tail pale brown anteriorly, reddish brown with yellowish spots posteriorly; spots shorter and darker anteriorly and most conspicuous on margins of fins; margins fins reddish anteriorly, dark red posteriorly. In preservative, tadpoles have a faded pattern.

The color of newly metamorphosed vary from yellowish green to brown. Two color patterns were found: (1) yellowish green with two brown, longitudinal dotted lines dorsally extending from the snout to the end of body; a vertebral pearl color line in same specimens; in lateral view pearl color stripe from tip of snout through above eye to hind limbs with a parallel brown and below it; eyes metallic reddish brown; belly metallic reddish gray, except yellowish area in gular region; limbs slightly brilliant yellowish; (2) body brown in dorsal view with two brown, lateral stripes bordered below by pearl color stripes; vertebral pearl color and dotted lines present or not; eyes, limbs and belly same as first color pattern.

Captive tadpoles remained stationary for extended periods on the bottom of plastic box in a characteristic posture: The tail was curved upward in a U-shape.

Larval characters have been used to define groups of species (Duellman and Fouquette, 1968; Wild, 1992; Pugliese et al., 2000). The larvae of *H. rubicundula* show characters of the other species groups. The oral disc is similar to the *Hyla microcephala* group (papillae and denticles absent); body shape is similar to *Hyla leucophyllata* group (violin shape); and the flagelliform tip tail and robust serrated jaws sheaths are similar to *Hyla parviceps* group (Duellman and Trueb, 1983; Wild, 1992). The phylogeny of the species group is an issue beyond the scope of this paper; therefore we have followed the conventional grouping.

Currently, *Hyla nana* and *H. sanborni* are placed in the *H. microcephala* group (Klappenbach and Langone, 1992). Langone and Basso (1987) showed that the tadpole of *H. nana*, described by Bokermann (1963) and Ceï (1980), is actually *H. sanborni*. The tadpole of *H. rubicundula* is similar to *H. nana* described by Lavilla (1990) and to *H. sanborni*, described by Bokermann (1963). The three species have (1) reduced oral disc without papillae, denticles, and dermal ridges; (2) similar position and type of spiracle; and (3) tail with flagelliform tip. Furthermore, *H. rubicundula* resembles *H. nana* in having a violin-shaped body and a modified oral disc. The oral disc is modified into a protrusible tube in both species, but it is longer in *H. nana*. *Hyla rubicundula* and *H. sanborni* are similar in color pattern and in having elliptical nostrils (Bokermann, 1963). The tadpole of *H. rubicundula* differs from those of *H. sanborni* and *H. nana* by having (1) a larger body, about 34% of total length (27% in *H. nana*, 25% in *H. sanborni*); (2) larger nostrils, about 29% of eye diameter (18% in *H. nana*); (3) conspicuously pigmented tail; and (4) homogenous ventral coloration (with sparkle dark spots in *H. sanborni*; see Bokermann, 1963; Lavilla, 1990). The morphological similarity among tadpoles of *H. rubicundula*, *H. nana*, and *H. sanborni* may suggest a close relationship as proposed by Lutz (1973).

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Analysis of Sympatric Populations of *Lampropeltis triangulum sypila* and *Lampropeltis triangulum elapsoides*, in Western Kentucky and Adjacent Tennessee with Relation to the Taxonomic Status of the Scarlet Kingsnake

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The *Lampropeltis triangulum* species complex ranges from portions of northern South America through Central America, most of the continental United States and into southeastern Canada. It is a variable group,

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