The tadpole of *Hypsiboas leptolineatus* (Braun and Braun, 1977), a species in the *Hypsiboas polytaenius* clade (Anura; Hylidae)[1]

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(With 3 figures)

Abstract

The larval morphology of *Hypsiboas leptolineatus* was studied. The tadpole has an ovoid body in lateral view, wider than deep; snout rounded with dorsal reniform nostrils; spiracle sinistral with lateral wall attached to body; anal tube dextral; tail fins convex with acuminate tip; oral disc ventral; labial tooth row formula is 2(2)/3(1); moderately developed beaks with serrated jaw sheaths. These external oral features are compared with those of the known tadpoles in the *Hypsiboas polytaenius* clade. The oral cavity was studied using an electron microscope. Life history aspects are commented.

Keywords: Anura, Hylidae, tadpole, *Hypsiboas leptolineatus*.

O girino de *Hypsiboas leptolineatus* Braun e Braun, 1977, uma espécie do clado *Hypsiboas polytaenius* (Anura; Hylidae)

Resumo

A morfologia larval de *Hypsiboas leptolineatus* foi estudada. O girino possui corpo ovóide em vista lateral, mais largo que alto; focinho redondo com narinas dorsais; espiráculo esquerdo, com parede lateral junto ao corpo; tubo anal destro; nadadeiras convexas, com ponta acuminada; disco oral ventral; fórmula dentária 2(2)/3(1); bico córneo moderadamente desenvolvido serrilhado. Estas características externas são comparadas com as dos outros girinos conhecidos do clado *Hypsiboas polytaenius*. A cavidade oral foi estudada usando microscopia eletrônica. Aspectos de história natural são comentados.

Palavras-chave: Anura, Hylidae, girino, *Hypsiboas leptolineatus*.

1. Introduction

The *Hypsiboas polytaenius* group was defined by Cruz and Caramaschi (1998), based on external morphological features and coloration patterns. This group, which is distributed in the central west, southeast and south of Brazil, currently comprises seven species: *H. buriti*, *H. cipoensis*, *H. goianus*, *H. leptolineatus*, *H. phaeopleura*, *H. polytaenius*, and *H. stenocephalus* (Cruz and Caramaschi, 1998; Caramaschi and Cruz, 1999, 2000; Frost, 2004). Cruz and Caramaschi (1998) and Eterovick et al. (2002) analysed the taxonomic position of the *H. polytaenius* group and discussed its proximity to the *H. pulchellus* species group. Recent molecular studies suggest that the *H. polytaenius* clade is nested within the *H. pulchellus* group (Faivovich et al., 2004; Faivovich et al., 2005).

Hypsiboas leptolineatus has been described from southern Brazil by Braun and Braun (1977). Kwet (2001) studied reproductive aspects and vocalization patterns of this species, but its tadpole remains unknown. Within the *H. polytaenius* clade, external tadpole morphology has been described for *H. polytaenius* (Heyer et al., 1990), *H. goianus* and *H. cipoensis* (Eterovick et al., 2002). In our article, we describe the larval morphology of *H. leptolineatus* and compare it with morphological characteristics of these previously described tad-

[1]This work has been done in the Zoologisches Institut der Universität Tübingen, Auf der Morgenstelle 28, D-72076 Tübingen, Germany.

poles. The morphology of the internal oral cavity of *H. leptolineatus* is also described.

2. Material and Methods

Tadpoles were collected at the Centro de Pesquisa e Conservação da Natureza Pró-Mata, Municipality of São Francisco de Paula, Serra Geral region in the State of Rio Grande do Sul, Brazil (29° 27' - 29° 35' S and 50° 08' - 50° 15' W) between 1995 and 1997 by A. Kwet. The larvae were stored in 70% alcohol and deposited in the SMNS collection (Staatliches Museum für Naturkunde Stuttgart) (see Appendix 1). External measurements were made to the nearest 0.01 mm using a stereoscopic microscope and internal features were analysed by a scanning electron microscope. Tadpoles were staged according to Gosner (1960). The terminology for describing external features follows Altig and McDiarmid (1999) and, regarding internal oral structures, Wassersug (1976, 1980).

3. Results

3.1. Hypsiboas leptolineatus (Braun and Braun, 1977)

3.1.1. Tadpole description

Description based on 17 tadpoles in stages 25-37 (Table 1). Body ovoid in lateral view, wider than deep, 32% of total length (Figure 1); snout rounded in lateral view; nostrils dorsal, reniform, closer to eye than to tip of snout; distance between nares 55% of interorbital width; spiracle sinistral, lateral wall attached to body; anal tube dextral, right wall displaced anteriorly and dorsally; tail approximately 68% of total length; tail fins convex, height approximately 20% of its length; tail fin with acuminate tip; fin origin slightly anterior to base of the tail muscle. Oral disc ventral, width 36% of body width, with lateral folds (Figure 2); labial tooth row formula (LTRF) 2(2)/3(1); labial teeth small, closely positioned; teeth smaller in A2 than A1, and in P3 than P2; a row of marginal papillae around the whole oral disc, except for a rostral gap; a row of sub-marginal papillae laterally and ventrally; beak moderately developed; upper jaw sheath concave, lower jaw sheath U-shaped, both serrated.

In preserved specimens, body colour greyish to brownish, with notable dark patches and small dots uniformly distributed on dorsum. Tail yellowish, with a blackish to brownish line on the medium portion of the tail muscle. Brownish spots scattered on superior portion of tail. Tail fins transparent. Gut visible through belly skin. Some larvae with darker coloration and greyish to brownish tail fins, dark brownish dorsum and tail muscle.

3.1.2. Oral cavity

Buccal roof elongated with prenarial and postnarial arenas clearly visible (Figure 3a). Prenarial arena with

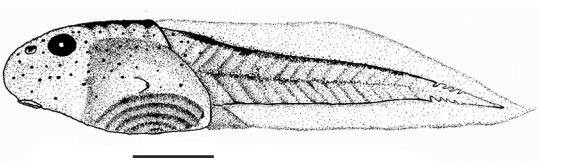

Figure 1. Tadpole of *Hypsiboas leptolineatus*: lateral view (scale line: 5 mm).

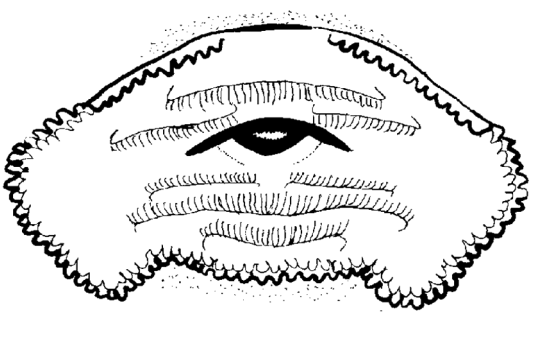

Figure 2. Tadpole of *Hypsiboas leptolineatus*: oral disc (scale line: 2 mm).

Table 1. Measurements (mean, in millimeters) of *Hypsiboas leptolineatus* tadpoles.

Stage	25 N = 3	26 N = 2	28 N = 3	34 N =1	35 N = 1	36 N = 4	37 N = 3
Total length	28.67	24.85	41.28	49.85	48.46	46.56	45.44
Body length	10.31	8.62	12.36	14.92	14.92	14.54	13.85
Body width	6.87	5.54	7.18	9.85	10.08	8.85	8.97
Body height	6.00	5.46	6.62	7.85	8.92	7.44	7.38
Tail length	18.36	16.23	28.92	34.92	33.54	32.02	31.59
Eye diameter	1.00	1.08	1.23	1.69	1.69	1.81	1.59
Oral disc width	2.56	1.88	2.79	3.23	3.31	3.37	2.92
Interorbital distance	3.92	3.23	4.28	5.08	5.38	5.27	4.92
Internarial distance	2.10	1.69	2.67	2.92	2.92	2.85	2.51
Eye-nostril distance	1.87	1.65	1.79	2.31	2.77	2.46	2.46
Nostril-snout distance	2.03	2.12	2.10	2.38	2.31	2.35	2.31

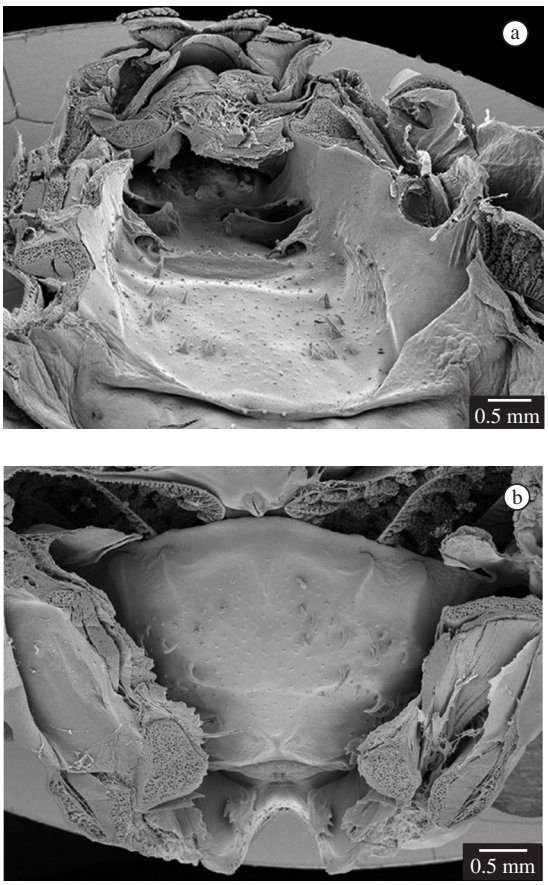

Figure 3. Section of the oral cavity of *Hypsiboas leptolineatus*: a) the buccal roof of the mouth; and b) the buccal floor (bar = 0.5 mm).

a V-shaped ridge, with a depression at central portion, placed on the middle width of the arena. Narial valve projection obliquely oriented, with posterior wall higher than anterior wall. Two pronounced lateral ridge papillae, one at each side, and smaller pointed papillae present. Median ridge approximately 75% of total width of buccal area. U-shaped buccal roof arena delimited by finger-like papillae with variable length, containing numerous small pustulations. Lateral walls of buccal roof arena with a row of papillae on each side and pustulations. Glandular zone concentrated centrally. Dorsal velum clearly delimited.

Buccal floor triangular, with a semicircular posterior limit (Figure 3b). Two compressed infralabial papillae with ramifications on borders. Two equally sized lingual papillae, symmetrically arranged in the middle of tongue. Two diagonal rows of papillae at each side of buccal floor arena. Small pustulations covering the arena. Ventral velum clearly visible.

4. Discussion

As Eterovick et al. (2002) suggested, the tadpoles of the species in the *H. polytaenius* clade may be distinguished by their tooth row formula. *Hypsiboas polytaenius* has LTRF 2(2)/3(1,2) (Heyer et al., 1990), *H. cipoensis* 2(2)/3(1), and *H. goianus* 2(1,2)/3(1) (Eterovick et al., 2002). Although the tadpole of *H. leptolineatus* presents the same LTRF as *H. cipoensis*, 2(2)/3(1), the position of the marginal papillae is different. *Hypsiboas cipoensis* has a single row of marginal papillae on the upper and lower lips, presenting a rostral gap, and two rows laterally, while *H. leptolineatus* has a row of marginal papillae on the upper lip, also with a rostral gap, and two rows of papillae laterally and on the lower lip.

The distribution ranges of the species in the *H. polytaenius* clade seem to be geographically separated. *Hypsiboas leptolineatus* is the only species occurring in southern Brazil, in higher regions of the Rio Grande do Sul and Santa Catarina states (Cruz and Caramaschi, 1998; Kwet and Di-Bernardo, 1999). *Hypsiboas goianus* occurs in central-western Brazil, in the Goiás and Distrito Federal states and in the southwest of the state of Minas Gerais. *Hypsiboas cipoensis* and *H. polytaenius* might have an allopatric distribution in southeastern Brazil. Whereas *H. cipoensis* inhabits the higher regions of Serra do Cipó, *H. polytaenius* is found on lower parts of the Serra do Mar and the Serra da Mantiqueira (Cruz and Caramaschi, 1998).

The adults of *H. leptolineatus* inhabit open areas, where they are frequently found in the proximity of small streams and ponds (Kwet, 2001). Only limited data on the tadpole ecology of *H. leptolineatus* and the other known species of the *H. polytaenius* group are available. Tadpoles of *H. leptolineatus* were observed throughout the year at the bottom of water bodies among stones (Kwet and Di-Bernardo, 1999). Tadpoles of *H. cipoensis* were observed in small streams and backwaters (Haddad et al., 1988; Eterovick et al., 2002), whereas *H. polytaenius* tadpoles were found on the floor of permanent or temporary ponds (Cardoso et al., 1989; Heyer et al., 1990). The tadpoles of *H. goianus* live at the bottom of small streams surrounded by forest vegetation (Eterovick et al., 2002). All these observations about substrate utilization indicate that the tadpoles in this clade belong to the benthic morphotype.

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Appendix 1

Specimens examined. *Hypsiboas leptolineatus* – SMNS 9377, SMNS 9381, SMNS 9383, SMNS 9458, SMNS 9466, SMNS 9478, SMNS 9509. The specimens SMNS 9381 were dissected for the study of internal oral morphology. Some damaged specimens were not included in morphometrical analysis.