



The tadpole of *Aplastodiscus cavicola* (Cruz & Peixoto, 1985) (Amphibia, Anura, Hylidae)

TIAGO LEITE PEZZUTI^{1,3}, FELIPE SÁ FORTES LEITE¹, MARIA RITA SILVÉRIO PIRES²
& PAULO CHRISTIANO DE ANCHIETTA GARCIA¹

¹Laboratório de Herpetologia, Departamento de Zoologia, Instituto de Ciências Biológicas, Universidade Federal de Minas Gerais, 31270–901, Belo Horizonte, Minas Gerais, Brazil

²Laboratório de Zoologia dos Vertebrados, Departamento de Biodiversidade, Evolução e Meio Ambiente, Instituto de Ciências Exatas e Biológicas, Universidade Federal de Ouro Preto, 35400–000, Ouro Preto, Minas Gerais, Brazil

³Corresponding author. E-mail: tizzuti@yahoo.com.br

The genus *Aplastodiscus* Lutz occurs from central and southeastern Brazil to adjacent Argentina and currently comprises 15 species. Faivovich *et al.* (2005) defined three species groups within the genus: *A. albofrenatus*, *A. albosignatus* and *A. perviridis*. The *A. albosignatus* group includes *A. albosignatus* (Lutz & Lutz 1938), *A. callipygius* (Cruz & Peixoto 1985), *A. cavicola* (Cruz & Peixoto 1985), *A. flumineus* (Cruz & Peixoto 1985), *A. ibirapitanga* (Cruz, Pimenta & Silvano 2003), *A. leucopygius* (Cruz & Peixoto 1985), and *A. sibilatus* (Cruz, Pimenta & Silvano 2003). Within this group only *A. albosignatus* and *A. leucopygius* have their larval forms described (Peixoto & Cruz 1983; Gomes & Peixoto 2002, respectively).

Aplastodiscus cavicola occurs in montane Atlantic Forest sites of the States of Espírito Santo and Minas Gerais, southeastern Brazil (Cruz & Peixoto 1985; Leite *et al.* 2008). Herein, we describe *A. cavicola* tadpoles (stages 25–40; Gosner, 1960) collected in a swamp associated with permanent mountain-stream backwater, surrounded by a semi-deciduous gallery forest, at Serra da Moeda (43°53'11''S, 20°27'51''W; 985 m a. s. l.; Datum WGS 84), Municipality of Congonhas, State of Minas Gerais, in the Quadrilátero Ferrífero mountain region, southernmost edge of the Serra do Espinhaço Range, southeastern Brazil. Tadpoles were collected from October to February, 2007 and in July of 2008.

We reared some tadpoles until the end of metamorphosis to confirm species identity. We killed tadpoles in 5% lidocaine solution, then prepared and preserved them in 10% formalin and housed them at the tadpole collection of the Herpetological Collection of the Universidade Federal de Minas Gerais (UFMG), State of Minas Gerais, Belo Horizonte, Brazil. External morphology descriptions and proportions were based on nine tadpoles in stages 36–37 (lots UFMG 292a; 311a; 700a). Measurements were based on 26 specimens between stages 27 and 40 (lots UFMG 292a, b; 311a,b; 700a,b). Terminology and measurements follow Altig and McDiarmid (1999): TL (total length), BL (body length), TAL (tail length), MTH (maximum tail height), TMH (tail muscle height), TMW (tail muscle width), IOD (interorbital distance), and IND (internarial distance); Lavilla & Scrocchi (1986): BH (body height), BW (body width), ED (eye diameter), ESD (eye-snout distance), END (eye-nostril distance), NSD (nostril–snout distance), ODW (oral disc width); and Grosjean (2005): DFH (dorsal fin height), and VFH (ventral fin height). Measurements were taken with a hand caliper (total, body and tail lengths) or under a Zeiss stereomicroscope with an ocular micrometer (other measures) to the nearest 0.1 mm. Quantitative data is presented as mean ± SD (interval). Data about the morphological features of known tadpoles of the *A. albosignatus* group was obtained from their original descriptions (Peixoto & Cruz 1983; Gomes & Peixoto 2002).

Description. Body depressed, globular/depressed in lateral view, ovoid in dorsal view (Figs. 1A and 1B). Total length 3.1–3.5 times body length; body 1.3–1.6 times longer than wide, 1.7–1.9 times longer than high, and slightly wider than high. Snout rounded in both the lateral and dorsal views. Nostrils oval, dorsally positioned, anterolaterally directed, equidistant from the eyes and from the snout tip, and with projections on their marginal rims. Eyes dorsally positioned and dorsolaterally directed, their diameter equaling 0.1–0.2 times the body width and height; interorbital distance 0.5 times the body width and 3.0–3.4 times the eye diameter. Oral disc ventral (Fig. 1C), lateroventrally emarginated with its width being about 0.3 times the body width; a single row of marginal papillae aligned on its dorsal portion, and alternate on its lateral and ventral portions, with narrow dorsal and ventral gaps, the first corresponding to

the absence of about four papillae and the latter about a single papilla. Seven to eight scattered submarginal papillae are present on the lateral portions. Tooth row formula (TRF) 2(2)/4(1); A1 and A2 of the same length; P1 slightly smaller than P2; P3 smaller than P1 and P2, P4 slightly smaller than P3. Narrow jaw sheaths darkly pigmented and finely serrated on the margins; upper jaw sheath "arc" shaped and lower sheath "V" shaped. Spiracle sinistral, short and narrow; directed posteriorly with its opening in the middle third of the body; centripetal wall fused to body, with its extremity being free and longer than the external wall. Lateral line system visible. A cumuli of neuromasts can be seen anterolaterally at the base of the vent tube. Vent tube dextral, attached to the ventral fin, long and narrow with its opening directed posteroventrally. Tail length about 0.7 of the total length; well-developed musculature that reaches the tip of the pointed tail; dorsal fin low with the margin being almost parallel to the longitudinal axis of the tail muscle, emerging on the end of the posterior third of the body at a low slope; ventral fin low with its margin almost parallel to the longitudinal axis of the tail muscle; dorsal fin depth approximately 1.2–1.6 the depth of the ventral fin. Measurements for all the available developmental stages are shown in Table 1.

TABLE 1. Measurements (in mm) of *Aplastodiscus cavicola* tadpoles from Congonhas, State of Minas Gerais, Brazil, for developmental stages 27, 31, 34, 36–37 and 40 according to (Gosner 1960). For abbreviations, see the text.

Characters	Stage 27 (n=6)	Stage 31 (n=3)	Stage 34 (n=4)	Stage 36–37 (n=9)	Stage 40 (n=4)
TL	41.0±2.1 (38.1–43.3)	42.7±1.4 (41.5–44.2)	40.6±1.1 (39.5–41.8)	44.0±2.5 (40.4–47.1)	47.1±2.9 (44.6–49.9)
BL	13.0±0.6 (11.9–13.4)	12.6±0.3 (12.4–12.9)	13.0±0.3 (12.6–13.4)	13.6±0.7 (12.4–14.5)	14.1±0.3 (13.8–14.5)
TAL	28.0±2.1 (24.8–30.5)	30.2±1.4 (29.1–31.8)	27.7±1.2 (26.6–28.8)	30.4±2.0 (28.0–33.4)	33.0±2.9 (30.5–36.1)
MTH	7.2±0.6 (6.1–7.7)	7.2±0.5 (6.6–7.6)	7.4±0.3 (7.1–7.9)	7.6±0.6 (6.9–8.9)	8.1±0.8 (7.3–8.8)
TMH	4.8±0.3 (4.3–5.1)	4.5±0.2 (4.3–4.6)	4.9±0.3 (4.4–5.0)	4.8±0.4 (4.3–5.5)	5.1±0.2 (4.8–5.4)
TMW	4.5±0.3 (4.1–5.0)	4.3±0.2 (4.1–4.4)	4.4±0.2 (4.2–4.6)	4.8±0.3 (4.3–5.2)	5.3±0.6 (4.7–5.9)
ED	1.3±0.1 (1.2–1.4)	1.3±0.2 (1.2–1.5)	1.4±0.05 (1.4–1.5)	1.5±0.1 (1.4–1.8)	1.7±0.1 (1.6–1.9)
IOD	4.5±0.3 (4.1–4.8)	4.4±0.1 (4.3–4.4)	4.5±0.1 (4.3–4.6)	4.7±0.2 (4.3–5.0)	5.1±0.3 (4.6–5.3)
ESD	4.1±0.2 (3.7–4.3)	3.9±0.4 (3.5–4.3)	4.2±0.1 (4.0–4.3)	4.3±0.4 (3.5–4.7)	4.8±0.2 (4.5–4.9)
END	2.0±0.2 (1.9–2.3)	1.9±0.1 (1.9–2.1)	2.1±0.1 (2.0–2.2)	2.2±0.1 (2.0–2.4)	2.4±0.2 (2.2–2.7)
IND	3.0±0.1 (2.9–3.1)	3.3±0.8 (2.9–4.2)	3.1±0.2 (2.9–3.3)	3.1±0.1 (3.1–3.4)	3.0±0.1 (2.9–3.2)
NSD	2.3±0.2 (1.9–2.5)	2.2±0.3 (1.9–2.4)	2.2±0.2 (2.1–2.5)	2.2±0.2 (1.9–2.7)	2.5±0.1 (2.5–2.6)
BH	7.2±0.2 (6.8–7.4)	7.2±0.2 (7.1–7.4)	7.4±0.2 (7.2–7.6)	7.8±0.3 (7.2–8.1)	8.2±0.3 (7.9–8.6)
BW	8.6±0.1 (8.5–8.8)	8.9±0.4 (8.5–9.3)	9.4±0.3 (9.3–9.9)	9.5±0.4 (9.0–10.1)	9.8±0.5 (9.4–10.2)
DFH	2.0±0.2 (1.9–2.3)	2.1±0.1 (2.1–2.2)	2.2±0.1 (2.1–2.4)	2.3±0.2 (2.1–2.8)	2.4±0.4 (2.1–2.9)
VFH	1.6±0.1 (1.4–1.7)	1.6±0.1 (1.6–1.8)	1.7±0.1 (1.7–1.8)	1.7±0.3 (1.4–2.1)	1.7±0.2 (1.6–2.0)
ODW	3.0±0.1 (2.9–3.2)	2.9±0.2 (2.8–3.1)	3.0±0.2 (2.8–3.2)	3.1±0.1 (2.9–3.3)	3.0±0.1 (3.0–3.1)

Color in life. Body uniformly brown with scattered golden dots, especially in the abdominal region; in some specimens, there are regularly-scattered black spots all over body; spiracle extremity is lightly pigmented; belly region is an opaque cream color, allowing partial intestinal tube visualization; iris is black with golden dots irregularly scattered and a golden ring around the pupil; first half of caudal musculature is a light brown with apparent axis muscles, turning grayer and with no apparent muscles until the end of tail; a dark lateral stripe starting from the end of the body, on the medial line, reaching the first 1/3 of tail; tail also presents an interrupted narrow brown line under the dorsal fin, that is more conspicuous on the distal tail half; fins translucent with evenly-scattered darker blotches and white dots that occur mainly on the dorsal fin (Figs. 2A and 2B). In metamorphosing specimens dorsum is green, the black spots become more evident, and the iris is red (Fig. 2C). The froglet coloration is very similar to that of the adults.

Color of preserved specimens. In formalin 10%, the coloration is very similar to that of the living tadpoles, but fades and loses the golden dots. The iris also loses its golden tones, becoming black.

Natural history notes. *A. cavicola* tadpoles were found on the bottom of shallow, slow-flowing swamps that are associated with permanent stream backwaters and surrounded by semi-deciduous gallery forests. The tadpoles are benthonic and show more activity at night, when they can be found foraging on the sedimentary bottom. When disturbed, they promptly run away through fast short movements and hide themselves under dead leaves and roots deposited on the bottom of the water body. Males in calling activity and tadpoles in several developmental stages (including initial-development ones) were found from November to January and in July (middle of the cold, dry season). However, as we

did not perform observations in the remaining months, it is not possible to make inferences about their reproductive period.

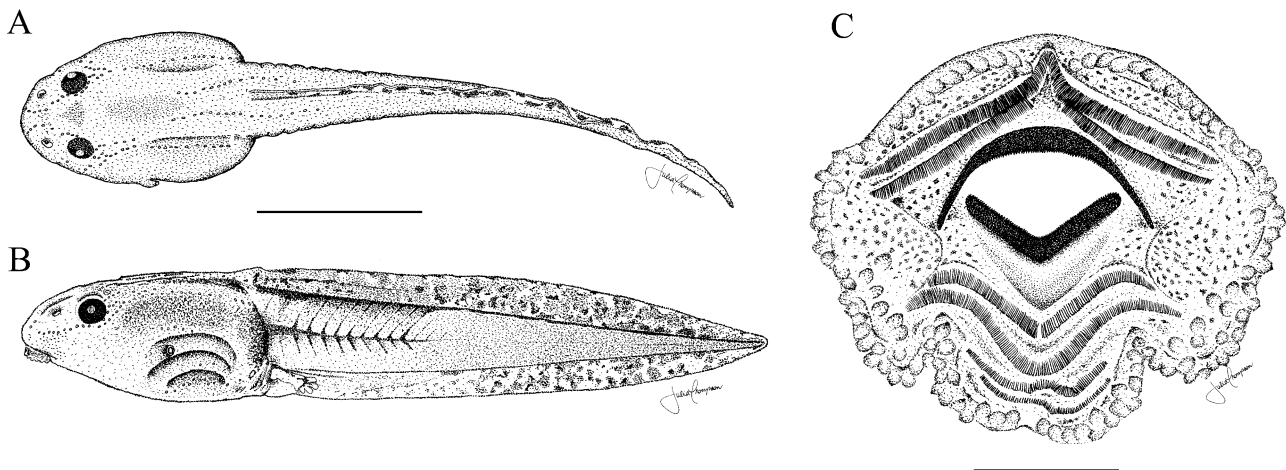


FIGURE 1. *Aplastodiscus cavicola* tadpole (UFMG700a) at stage 37 according to Gosner (1960): (A) dorsal view; (B) lateral view (scale = 10 mm); (C) oral disc (scale = 1 mm).

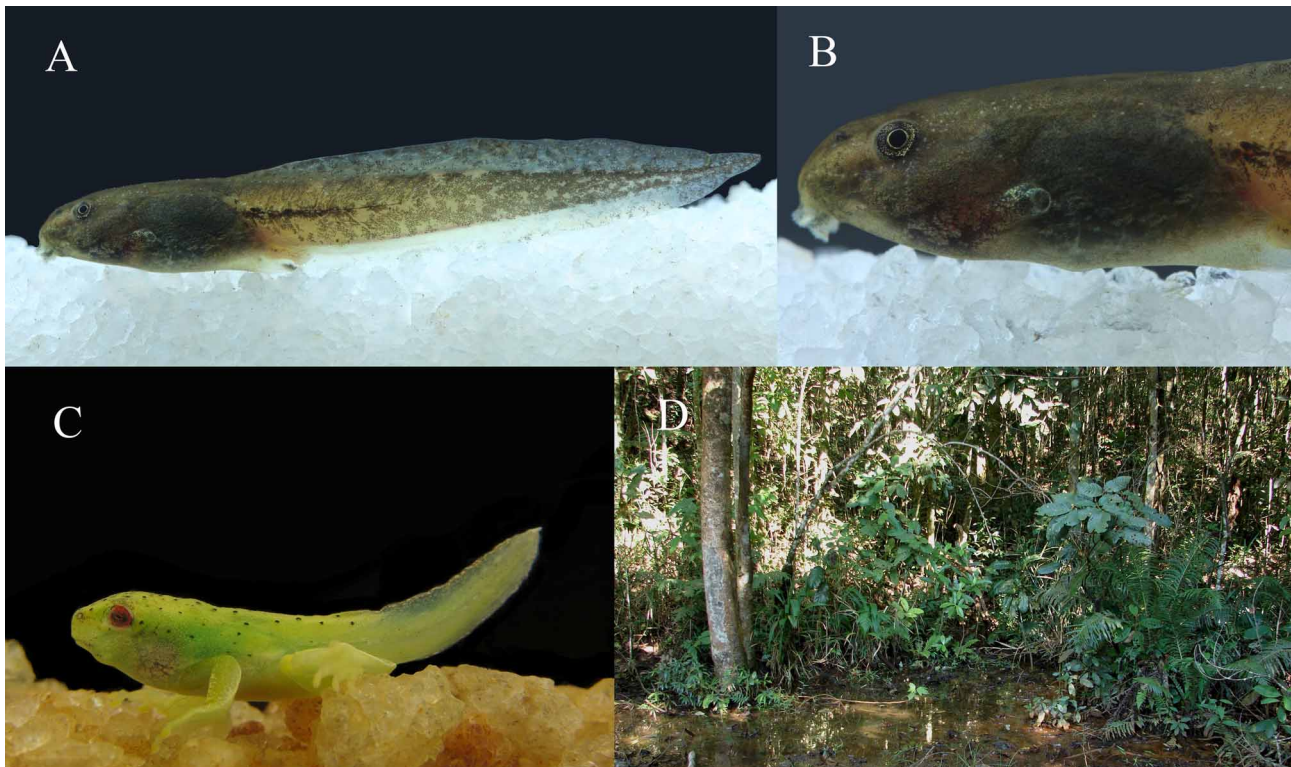


FIGURE 2. *Aplastodiscus cavicola* tadpole photographed in life: (A) lateral view; (B) detail of the body; (C) A *Aplastodiscus cavicola* froglet; (D) a typical, shallow, swamp associated with permanent slow-flowing stream backwaters which *A. cavicola* tadpoles inhabit.

A. cavicola tadpoles differ from other species of the *A. albosignatus* group because of the presence of a narrow ventral gap in the row of marginal papillae (absent in *A. albosignatus* and *A. leucopygius*), ovoid body in the dorsal view (elongate in *A. albosignatus* and oval in *A. leucopygius*); robust caudal musculature (moderate in *A. albosignatus* and *A. leucopygius*), and smaller proportion IND/END (1.3–1.6 in *A. cavicola*, 1.91 in *A. albosignatus*, and 2.4 in *A. leucopygius*). *Aplastodiscus cavicola* (TL 42.7 mm; stage 31) also differs from *A. leucopygius* (TL 52.4 mm; stage 28) because of the smaller size, iris color (red with black dots scattered and without a golden ring around the pupil in *A.*

leucopygius), and smaller value of the proportion MTH/BH (*A. leucopygius* has a deeper tail height in comparison with the body height), and from *A. albosignatus* because of the tooth row formula 2(2)/4(1) [2(2)/4 in *A. albosignatus*].

We thank P.C. Eterovick, D.C. Rossa-Feres, and S. Castroviejo-Fisher for critical review of the manuscript and helpful suggestions; H. Reis for English review; C. Cienfuegos, and A. Amaral for the field work; J. Thompson for the line drawings; and *Cattleya submarina* Biodiversity Venture for providing us field support. Specimens were collected under collection permits n° 11483-2, IBAMA registration 1616656.

References

- Altig, R. & McDiarmid, R.W. (1999) *Tadpoles: The Biology of Anuran Larvae*. The University of Chicago Press. Chicago, 337 pp.
- Cruz, C.A.G. & Peixoto, O.L. (1985 “1984”) Espécies verdes de *Hyla*: o complexo “albosignata” (Amphibia, Anura, Hylidae). *Arquivos da Universidade Federal Rural do Rio de Janeiro*, 7, 31–47.
- Faivovich, J., Haddad, C.F.B., Garcia, P.C.A., Frost, D.R., Campbell, J.A. & Wheeler, W.C. (2005) Systematic review of the frog family Hylidae, with special reference to Hyliinae: phylogenetic analysis and taxonomic revision. *Bulletin of the American Museum of Natural History*, 294, 1–240.
- Gomes, M.R. & Peixoto, O.L. (2002) O girino de *Hyla leucopygia* Cruz & Peixoto, 1984 (Amphibia, Anura, Hylidae). *Boletim do Museu de Biologia Melo Leitão*, 13, 17–25.
- Gosner, K.L. (1960) A simplified table for staging anuran embryo and larvae with notes on identification. *Herpetologica*, 16, 183–190.
- Grosjean, S. (2005) The choice of external morphological characters and developmental stages for tadpole-based anuran taxonomy: a case study in *Rana (Sylvirana) nigrovittata* (Blyth, 1855) (Amphibia, Anura, Ranidae). *Contributions to Zoology*, 74, 61–76.
- Lavilla, E.O. & Scrocchi, G.J. (1986) Morfometría larval de los géneros de Telmatobiinae (Anura: Leptodactylidae) de Argentina y Chile. *Physis*, 44, 39–43.
- Leite, F.S.F., Juncá, F.A. & Eterovick, P.C. (2008) Status do conhecimento, endemismo e conservação de anfíbios anuros da Cadeia do Espinhaço, Brasil. *Megadiversidade*, 4, 158–176.
- Peixoto, O.L. & Cruz, C.A.G. (1983) Girinos de espécies de *Hyla* do grupo “Albomarginata” do sudeste brasileiro (Amphibia, Anura, Hylidae). *Arquivos da Universidade Federal Rural do Rio de Janeiro*, 6, 155–163.