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Description of the tadpole of *Proceratophrys carranca* Godinho, Moura, Lacerda and Feio, 2013, (Anura, Odontophrynidae)

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Proceratophrys carranca Godinho, Moura, Lacerda & Feio, 2013 belongs to the *P. cristiceps* group, which currently contains 15 species (Brandão *et al.* 2013). This group is defined by species lacking palpebral appendages, postocular swellings and inhabiting mainly seasonally dry open environments (Cerrado and Caatinga domains) in Brazil (Giaretta *et al.* 2000). Using molecular data, Amaro *et al.* (2009) showed the non-monophyletic status of the *P. cristiceps* group. These authors emphasize that more studies are needed for to understand the taxonomy of the genus *Proceratophrys*. Larval characters are important tools that make a significant contribution to the resolution of taxonomic problems.

Herein we describe tadpoles of *Proceratophrys carranca* that were collected in January 2012 from a stream at the Fazenda Serra do Cristal, municipality of Buritizeiro, state of Minas Gerais (MG), Brazil, (17°24'13" S, 45°03'36" W; 654 m a.s.l.; MZUFV 264–6) located at the type locality of the species. All tadpoles were readily preserved in 10% formalin, and housed at the herpetological collection of the Museu de Zoologia João Moojen (MZUFV), Universidade Federal de Viçosa, municipality of Viçosa (MG), Brazil. Three tadpoles were reared to metamorphosis to confirm species identity (MZUFV 12601–03).

Description of the external morphology was based on seventeen tadpoles at stages 28–41 (Gosner 1960). All measurements were taken using a digital caliper (to the nearest 0.1 mm) and are expressed in millimeters. Morphological measurements follow Altig & McDiarmid (1999) and Mêrces & Juncá (2010).

Measurements (Standard deviation): Stages 38–29 (n=5): Total Length (TL): 20.76 (2.55); Body Length (BL): 8.8 (0.80); Body Height (BH): 5.13 (0.31); Body Width (BW): 5.7 (0.43); Tail Length (TLG): 11.96 (1.77); Maximum Tail Height (MTH): 4.15 (0.56); Tail Muscle Height (TMH): 1.84 (0.19); Dorsal Fin Height (DFH): 1.5 (0.38); Ventral Fin Height (VFH): 0.92 (0.19); Eye Diameter (ED): 0.96 (0.11); Interorbital Distance (IOD): 1.93 (0.18); Internostril Distance (IND): 1.44 (0.12); Spiracle Length (SL): 0.82 (0.10); Oral Disc Width (ODW): 1.82 (0.20); Nostril-snout Distance (NSD): 1.44 (0.15), and Eyes-snout Distance (ESD): 2.67 (0.46).

Stages 32–34 (n=5): TL: 28.11 (0.97); BL: 10.86 (0.16); BH: 5.93 (0.32); BW: 7.0 (0.36); TLG: 16.86 (0.84); MTH: 5.33 (0.62); TMH: 2.55 (0.23); DFH: 1.8 (0.25); VFH: 0.93 (0.38); ED: 1.33 (0.10); IOD: 2.69 (0.10); IND: 1.84 (0.11); SL: 0.86 (0.21); ODW: 2.22 (0.13); NSD: 1.73 (0.14), and ESD: 3.56 (0.17).

Stage 35 (n=2): TL: 29.95 (2.08); BL: 12.13(0.35); BH: 6.6 (0.09); BW: 7.54 (0.65); TLG: 17.83 (2.43); MTH: 5.9 (0.14); TMH: 2.90 (0.14); DFH: 1.93 (0.09); VFH: 1.06 (0.374); ED: 1.40 (0.00); IOD: 2.88 (0.162); IND: 1.98 (0.028); SL: 1.03 (0.424); ODW: 2.51 (0.162); NSD: 1.67 (0.155), and ESD: 3.7 (0.141).

Stage 37–38 (n=3): TL: 29.66 (0.56); BL: 11.13 (0.54); BH: 6.2 (0.33); BW: 7.42 (0.66); TLG: 18.40 (0.21); MTH: 5.87 (0.10); TMH: 2.80 (0.04); DFH: 1.93 (0.13); VFH: 1.13 (0); ED: 1.78 (0.07); IOD: 3.07 (0.09); IND: 1.93 (0.07); SL: 1.00 (0.04); ODW: 2.45 (0.17); NSD: 2.07 (0.27) and ESD: 3.88 (0.50).

Stage 41 (n=2): TL: 27.16 (1.94); BL: 10.53 (0.04); BH: 5.17 (0.60); BW: 6.6 (0.00); TLG: 16.63 (1.99); MTH: 4.89 (0.05); TMH: 2.14 (0.01); DFH: 1.65 (0.07); VFH: 1.10 (0.141); ED: 1.59 (0.11); IOD: 3.82 (0.14); IND: 2.08 (0.07); SL: 0.82 (0.00); ODW: 2.41 (0.35); NSD: 1.51 (0) and ESD: 3.40 (0.10).

Tadpole description: Body depressed, wider than high, rounded and depressed in lateral view and elliptic in dorsal view (Figure 1c). Snout rounded in lateral view and oval in dorsal view. Eyes large, dorsolaterally positioned and laterally directed. Nostrils smalls, oval, dorsally positioned, closer to the eyes than to the snout. Spiracle short, sinistral, lateroventrally positioned, with posterodorsal opening and inner wall free from body (Figure 1a). Vent tube short, both walls attached directly to ventral fin with dextral opening. Tail as tall as the body, with an obtuse tip. Dorsal fin more curved than ventral fin. Dorsal fin originates at the posterior third of the body, and ventral fin originates at the vent tube level. Oral disc emarginated ventrally positioned. Marginal papillae arranged in a single row in the posterior region and double in the laterals regions. Posterior jaw sheath V-shaped with free margin. Labial tooth row formula (LTRF) 2(2)/

3(1) (Figure 1d); all tooth ridges have nearly the same length, excepting P3 which is shorter (Figure 1d). The gap in P1 is short and the gap in A2 has a moderate length.

Coloration: In formalin, dorsal body with dark brown spots delimiting a 'V' in the anterior region of the dorsum (Figure 1c). Ventral body pale with small scattered brownish melanophores. The eyes have a bluish spot. Fin transparent with sparse dark dots. Caudal musculature unpigmented with intense and frequent brown spots laterally and dark spots on the dorsal margin (Figure 1a).

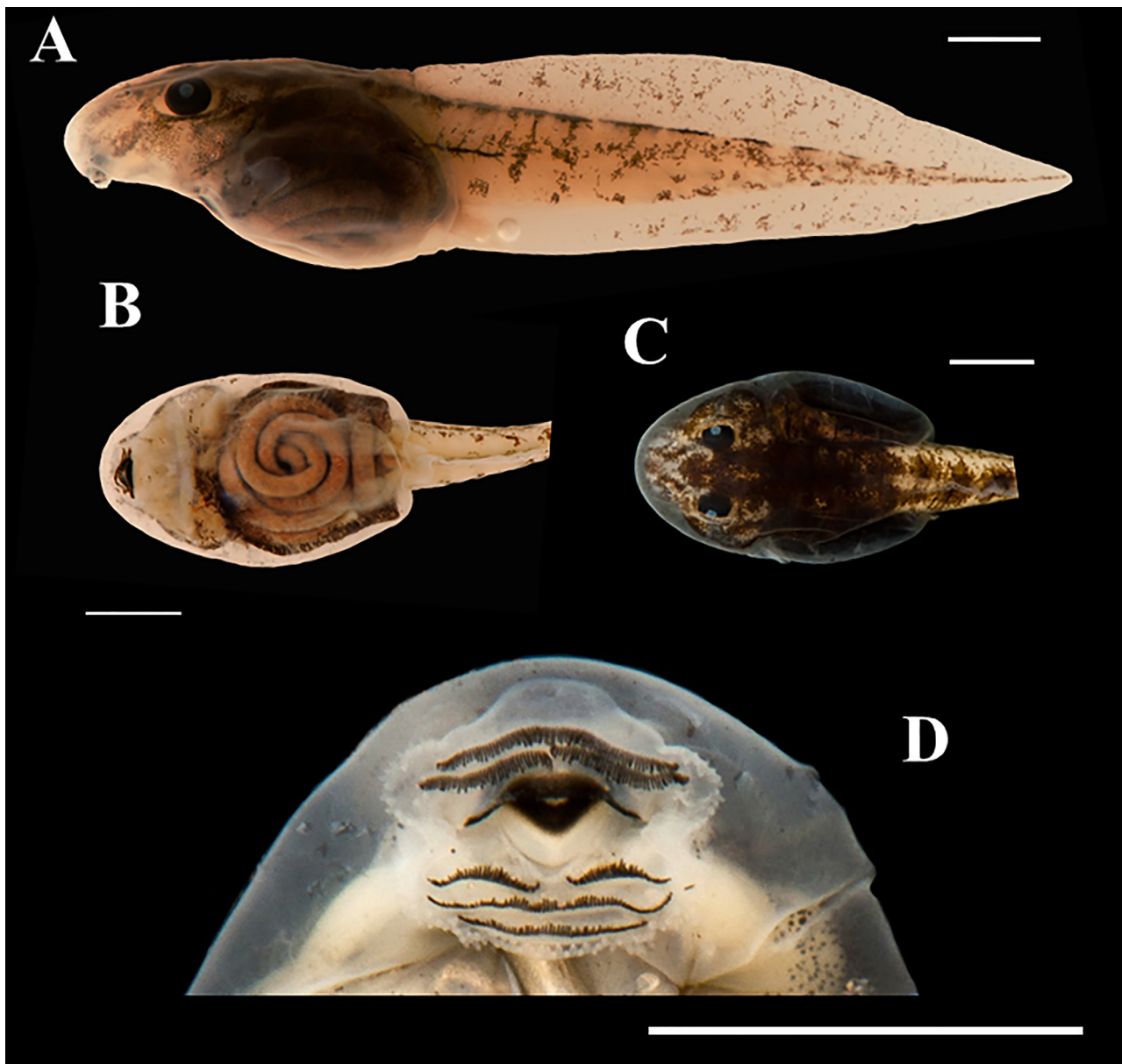


FIGURE 1. Tadpoles of *Proceratophrys carranca*. (A) Lateral, (B) ventral, and (C) dorsal body view. (D) Oral disc. (Scale = 10 mm). Photo by J.L. Neto.

Tadpoles of the *Proceratophrys cristiceps* group are very similar among them (Table 1). They have a comparable body morphology, eye position, snout shape, LTRF 2(2)/3(1), submarginal papillae present, sinistral spiracle, and dextral ventral tube. With the exception of *P. cururu* (Eterovick & Sazima 1998), all of them have emarginated oral discs. Tadpoles can be readily distinguished by their coloration in fixative: the V-shape pattern and tail coloration of *P. carranca* are absent in *P. concavitympanum* (Giarretta *et al.* 2000), *P. cristiceps* (Vieira *et al.* 2007), *P. cururu*, *P. minuta* (Napoli *et al.* 2011), *P. moratoi* (Rossa-Feres & Jim 1996), and *P. schirchi* (Peixoto *et al.* 1984).

The larvae of *Proceratophrys carranca* can also be distinguished from *P. cristiceps*, *P. cururu*, *P. minuta*, *P. moratoi*, and *P. schirchi* by the transparent fins, with sparse dark dots and caudal musculature with intense and frequent brown spots (pigmented muscle on the tail of *P. cristiceps*, tail with brownish bars in *P. minuta*, transparent and with a few brownish spots in *P. cururu*, cream in anterior portion and transparent in the remaining 2/3 in *P. moratoi* and transparent

ventral fin with brown edge, the muscular part of tail with a slightly dispersed spots and upper part of muscle tail with 4–5 five bars in *P. schirchi*).

TABLE 1. Comparison of selected larval characters among species of the *Proceratophrys cristiceps* group. n= number of tadpoles used in the description. *near to the eyes or near to the snout. All of them show a LRTF=2(2)/3(1).

Species (n)	Spiracle	Nostrils position*	Nostril shape	Oral disc position	Caudal end	Reference
<i>P. carranca</i> (n=17)	free	eyes	rounded	ventral	obtuse	present study
<i>P. concavitympanum</i> (n=2)	free	-	rounded	anteroventral	pointed	Giaretta <i>et al.</i> 2000
<i>P. cristiceps</i> (n=20)	fused	snout	rounded	ventral	pointed	Vieira <i>et al.</i> 2007
<i>P. cururu</i> (n=2)	-	snout	-	anteroventral	pointed	Eterovick & Sazima 1998
<i>P. minuta</i> (n=9)	free	eyes	reniform	ventral	rounded	Napoli <i>et al.</i> 2011
<i>P. moratoi</i> (n=9)	fused	-	rounded	ventral	rounded	Rossa-Feres & Jim 1996
<i>P. schirchi</i> (n=5)	free	eyes	reniform	ventral	acute	Peixoto <i>et al.</i> 1984

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