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The tadpole of *Hyla granosa* (Anura: Hylidae) from southeastern Venezuela

El renacuajo de *Hyla granosa* (Anura: Hylidae) del sureste de Venezuela

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ABSTRACT

It is described the tadople of *Hyla granosa* Boulenger 1882, based on two lots from La Gran Sabana, Estado Bolívar, southeastern Venezuela. The larva is distinguished from the other known larvàe of the *H. granosa* group (*H. sibleszi* Rivero, 1961), by the combination of characters as follow: keratodont rows formula 2/4, oral marginal papillae small, blunts and in double rows, lateral indentation present, nares opening reniform, spiracular opening directed posteriorly. Seemingly *Hyla granosa* could reach the climax configuration of the external morphology at relatively advanced developmental stages. Since the brief data available on larvae, a definition of the *H. granosa* group based on larval morphology is not possible.

Key words: Tadpole, climax-morphology, *Hyla granosa*, Hylidae, Venezuela.

RESUMEN

Se describe el renacuajo de *Hyla granosa* Boulenger 1882, en base a dos lotes provenientes de la Gran Sabana, Estado Bolívar, sureste de Venezuela. Este renacuajo destaca de la otra larva conocida del grupo de *H. granosa* (H. sibleszi Rivero, 1961), por la siguiente combinación de caracteres: fórmula de filas de queratodontes 2/4; papilas orales marginales pequeñas, romas y en doble fila; identificación lateral presente; abertura narinal reniforme, abertura espiracular dirigida posteriormente. Aparentemente *Hyla granosa* alcanza la configuración clímax de su morfología externa en estadios prometamórficos relativamente avanzados. Los datos disponibles sobre las larvas del grupo de *H. granosa* son insuficientes para definir el grupo en base a caracteres larvarios.

Palabras claves: Renacuajo, Morfología-climax, *Hyla granosa*, Hylidae, Venezuela.

INTRODUCTION

In the Colección de Vertebrados de la Universidad de Los Andes, Sección de Herpetología, (CVULA-IV), Mérida, Venezuela, are cataloged some tadpoles that were assigned to the tree frog *Hyla granosa* Boulenger 1882. I had the opportunity to study this lot of larvae and discovered some important differences with a previous description (without illustration) of the tadpole of the same species, made by Duellman (1978). A comparison between the larvae from CVULA-IV and those described by Duellman, revealed that this incongruence were due to incomplete development of the larval morphology in the tadpoles outlined by Duellman, which were in developmental stage 25 (Gosner 1960). I present here a most extensive and detailed description, including figures, of the tadpoles in advanced stages of *Hyla granosa,* providing new data on the external morphology of the larva.

MATERIALS AND METHODS

The tadpole description of *H. granosa* is based on a lot (CVULA-IV 3185), with five specimens staged from 29 to 42 (Gosner 1960), plus two metamorphic (stages 43) larvae with an adult-like appearance (CVULA-IV 3180 and 3181), all from Quebrada de Jaspe. La Gran Sabana, Estado Bolívar, southeastern Venezuela, 880 m. in 17 march 1982, by Jaime E. Péfaur and Amelia D. de Pascual; this locality is situated within the distributional range of the species (La Marca 1992). The termino-

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logy and corporeal characters employed is a combination of those recommended by van Dijk (1966) and Lavilla (1988), keratodonts formula follow notation proposed by Altig (1970). The measurements are the same used by Lavilla & Scrocchi (1986), except by the measurements of the tail which were made at its midlength; to measure was employed a caliper Rostfrei-Gehartet (accurate ± 0.1 mm.) in a Zeiss dissecting microscope. The metamorphic specimens of *H. granosa,* in stages 43, are widely coincident with the description and figures given by Hoogmoed (1979), of the species and, as an extra precaution, the foot web and pads were compared and found to be almost identical, particularly by the oval and large inner metatarsal tubercle (Hoogmoed 1979:11; see Fig. 4B), allowing to assign tentatively this tadpoles to the species. The tadpole in stage 35 was employed to make the description, and a tadpole in stage 37 (Gosner 1960) is illustrated (Fig. 1).

RESULT

Several meristic data for the stage described of the tadpole of *Hyla granosa* are summarized as follow: total length 42.4, body length 14.4, body width 7.4, body heigh 6.0, interorbital length 3.5, eye-snout length 4.3, eye-nares length 1.0, internarial length 2.2.

Description. Body depressed (about 1/5 wider than high), oval in dorsal view, chondrocranial elements visibles dorsally; ocular diameter 42% of the interorbital distance; interorbital distance wider than internarial distance (about 1/3 wider); nares directed dorsolaterally, nearer to eyes than to snout tip (about 25% of the eyes-snout tip distance from the eyes); narial opening reniform in dorsolateral view (see Fig. 2A), relatively large (1/4 of the ocular diameter); narial opening edge slightly protuberant and without projections; spiracle sinistral, forming a very short tube (2.7% of the body length), located nearer to the end and bottom of body (70.9% of the body length from the snout tip, and 55.0% of the body heigh from the dorsum); spiracular opening directed posteriorly; cloacal opening caudal, dextral-marginal, forming a relatively short tube (about 1/4 of the body length); caudal musculature does not reach the tail tip; myotomes relativelly small and weak (about 0.4 mm. of wide) in 1/3 proximal,

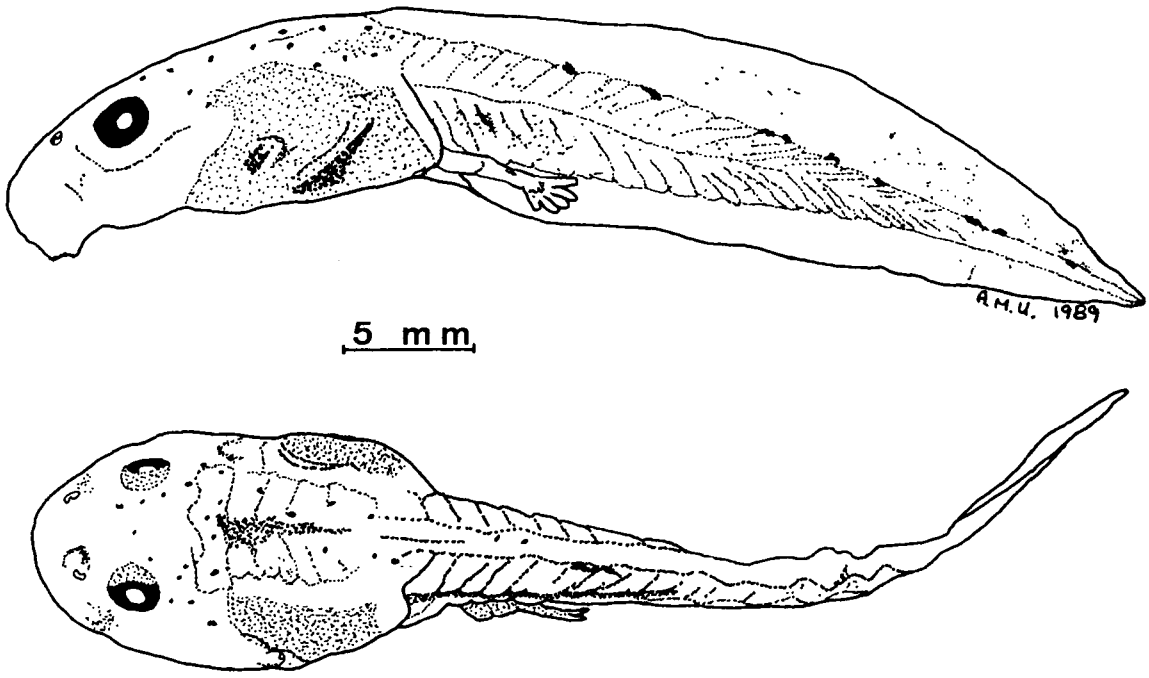

Fig. 1: Body in lateral and dorsal view of the tadpole of *hyla granosa* (CVULA-IV 3185) in stage 37. Scale = 5.0 mm.

Cuerpo en vista lateral y dorsal del renacuajo de *Hyla granosa* (CVULA-IV 3185) en estadio 37. Escala = 5,0 mm.

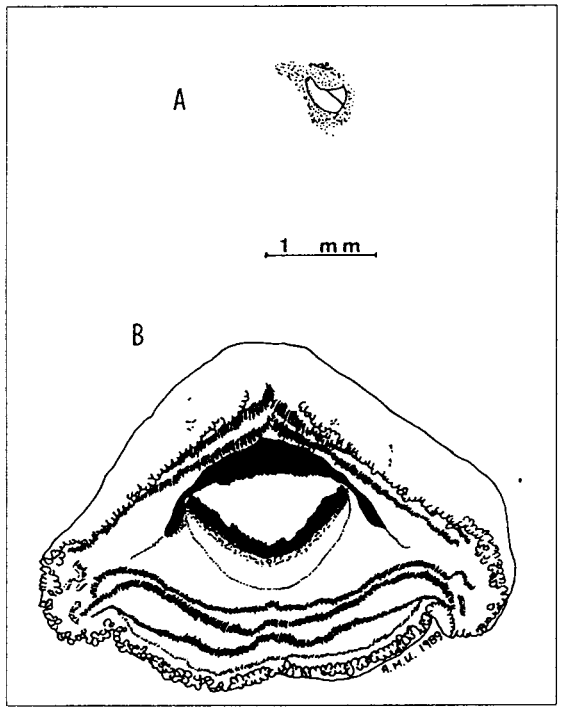

Fig. 2: (A) Narial opening in dorsolateral view, and (B) oral apparatus of the tadpole of *Hyla granosa* (CVULA-IV 3185) in stage 37. Both scale = 1.0 mm.

(A) Vista dorsolateral de la abertura narinal, y (B) aparato oral del renacuajo de *Hyla granosa* (CVULA-IV 3185) en estadio 37. Ambas escalas = 1,0 mm.

and completely visibles along caudal musculature; caudal fins with origin on the body-tail juncture; dorsal fin wider than caudal musculature (almost 5% wider at midlength); ventral fin 33% narrower than caudal musculature at midlength; tail tip with acute-semieliptical shape.

Oral apparatus located and directed ventrally, mid-sized (almost 50% of the body width); oral disc transangular; marginal papillae small and blunt in double row, divided by a rostral gap; intramarginal papillae absent; keratodonts formula 2(2)/4(1), all uniserial; suprakeratodont and infrakeratodont rows relatively similar in length; P-3 row shorter than other P-rows; keratodonts on P-4 row weaker than other keratodont rows; lateral indentation present, does not related with the keratodont rows; rostrodonts partially keratinized; free-edge of suprarostrodont straigth, whole suprarostrodont in trapezoidal shape; infrarostrodont "V" shaped; both rostrodonts similar in size; free-edges on both rostrodonts with small and acute serrations; processes of suprarostrodont directed posterolaterally (Fig. 2B).

Coloration in preservative. Dorsum brownish cream with several dark brown rounded spots, and numerous and minute dark brown dots; internal edges of nares bordered by a brown "half-moon" shaped spot; belly transparent; minute dots along caudal musculature; a series of brown spots along upper margin of caudal musculature; caudal fins semitransparent with very minute dots.

DISCUSSION

It is commoly accepted that many anuran larval morphological features have systematic value due to its ontogenetic stability (Wassersug 1976), and he consider that this morphological stability occur at larval stages ranging from 26 to 40. In *Hyla granosa* larva at stage 29 the queratodont row formula and the caudal fin high does not reach its definitive configuration (Table 1); this would be reached at some stage between 30 to 35. The features compared in the Table 1, were the only ones detected to show differences among the sample of larvae (and developmental stages) studied. Other larvae of *Hyla* show a climax-configuration of oral features at mid-advanced or advanced developmental stages; the tadpoles of some species of the *Hyla bogotensis* (Peters 1882) group present the maximun keratodont rows formula at stages between 32 and 40 (La Marca 1985, Mijares-Urrutia, in press); also, the tadpoles of *H. geographica* Spix 1824 show a keratodont formula of 2/3 in youngest specimens and a formula of 2/4 in oldest ones (Kenny 1969); other examples are the change of coloration between the young and the advanced stages in the tadpole of *Pseudis paradoxa*, and those very much complex change that occur in the tadpoles of some species of *Centrolene* (Heyer 1985, Mijares-Urrutia 1990). This differences in morphology configuration (or coloration patterns) among youngest developmental stages and those in advanced stages, could be merely a consecuence of inmaturity during the development, or could have a particular adaptative and eco-

logical value. In the available literature, studies on the change of external the morphology during the metamorphosis are mainly focused, first towards the changes in size and shape, and second the evolutionary significance of the changes (Emerson 1988, Werner 1986, and references therein).

Table 1

Comparisons of several features among different larval developmental stages of *Hyla granosa* (except those metamorphic in stages 42 and 43; data from those in stage 25 was taken from Duellman 1978). The characters are coded as follows: (A) Keratodont rows formula, (B) nostrils location, (C) direction of the spiracular opening, and (D) dorsal fin heigh/caudal musculature heigh ratio.

Comparación de varios caracteres entre los diferentes estadios de desarrollo larvario de *Hyla granosa* (excepto aquellos en estadios 42 y 43; los datos de las larvas en estadio 25 fueron tomados de Duellman 1978). Los caracteres están codificados como sigue: (A) fórmula de filas de queratodontes, (B) localización de las narinas, (C) dirección de la abertura espiracular, y (D) relación altura aleta dorsal/altura musculatura caudal.

	Features			
Stages	A	B	C	D
25	1/2	At middle between eye and snout tip	dorso-posteriorly	= to 1
29	2/3	Near to eye	posteriorly	< to 1
35	2/4	Near to eye	posteriorly	> to 1
37	2/4	Near to eye	posteriorly	> to 1

The *Hyla granosa* group is currently composed by four species, *H. alemani* Rivero 1964, *H. granosa, H. ornatissima* Noble 1923, and *H. sibleszi* Rivero 1961 (Frost 1985). Hoogmoed (1979), include a good description of the tadpole of *Hyla sibleszi,* additionaly, a larvae colected from Rancho Grande, Estado Aragua, northern Venezuela, that would seems belong to *H. alemani;* this larvae, plus the *H. granosa* described here, shown a relatively generalist, very common body and oral apparatuses overall configuration, like the tadpole of anothers *Hilas*'s species group (e.g. *H. boans* (Linnaeus) group, see Table 2); also seemingly that there are a relatively important intraspecific variability in some key features (e.g. configuration and width of the rostral gap, presence or not of multiseriality of P-row of keratodonsts, presence or not of lateral indentation). Since this, a definition of the *H. granosa* group based on larval features, is not possible yet. In the Table 2 are compared the tadpoles of several species of *Hyla* from the Gran Sabana region.

Table 2

Comparison among the tadpoles of several species of *Hyla* that occur sympatrically in Venezuela with *H. granosa* (La Marca 1992). The characters are coded as follows: (A) Keratodont rows formula, (B) naris located nearer to eyes than to snout tip, (C) narial opening reniform, (D) infraangular keratodont rows multiserial, (E) lateral indentation; (Y) = present, (N) = absent. Data of larvae taken from Kenny (1969). Duellman (1978) and Hoogmoed (1979).

Comparación entre los renacuajos de varias especies de *Hyla* estos se encuentran simpátridamente en Venezuela con *H. granosa* (La Marca 1992). Los caracteres se han codificado como sigue: (A) fórmula de filas de queratodontes, (B) ubicación de las narinas más cerca de los ojos que de la punta del hocico, (C) abertura narinal reniforme, (D) filas de queratodontes infraangulares multiseriales, (E) identación lateral; (Y) = presente, (N) = ausente. Datos sobre las larvas tomados de Kenny (1969), Duellman (1978) y Hoogmoed (1979).

	Characters				
Species	A	B	C	D	E
boans	2 (2)/4(1)	Y	N	N	N
crepitans	2 (2)/4(1)	Y	Y	N	N
geographica	2 (2)/4	N	N	N	N
granosa	2 (2)/4(1)	Y	Y	N	Y
punctata	2 (1.2)/3(1)	Y	N	N	N
sibleszi	2 (2)/5(1)	Y	Y	Y	N

The date of colection of the tadpole (see Material and Methods) was during the rainy season; nevertheless, the climat in La Gran Sabana is defined as "Tropical rainy-forest" (Selva tropical lluviosa [Schubrt e Huber 1989]), this mean, in the climatological sense employed by the authors, that rainy season is constant all year around. This is agree with the data present by Duellman (1978) and Hoogmoed (1979), who comments that *Hyla granosa* breed during the rainy season.

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