



The complex advertisement calls of *Allobates myersi* (Pyburn, 1981) (Anura: Aromobatidae) from São Gabriel da Cachoeira, Brazil

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Pyburn (1981) described *Allobates myersi* from Waracá, Comisaria de Vaupés, in Colombia, including the new species in the *Allobates femoralis* group (*sensu* Silverstone 1976). Advertisement calls of *A. myersi* were described as a series of whistle-like note pairs, with dominant frequency between 3100–3800 Hz, emitted at a rate of 224.6 notes per minute. However, only a short, 1.4 s long sonogram was presented in the original paper. From its description, *A. myersi* has been mentioned only in a few revisionary studies, but no further data on calls were provided (Grant et al. 2006, Lötters et al. 2007).

From 12 to 15 of May, 2008, during field work in São Gabriel da Cachoeira (SGC), Amazonas, Brazil, we found a vocally active population of *A. myersi* in forest fragments on the right bank of the Negro River (S 00°09'21", W 67°05'10"). Although the identification of the species is unambiguous based on morphology and color (Fig. 1), the advertisement calls of *A. myersi* from this site differ in number and arrangement of notes in relation to previously described calls (Pyburn 1981), showing also an unexpected pattern of variation in number and arrangement of notes within call bouts.

We recorded ten males with a Marantz PMD 660 digital recorder and a Sennheiser ME 66 directional microphone positioned approximately 1 m from focal males. Air temperature at time of recording varied from 23.5 to 27.6°C (mean at 26.1°C) between recordings. All recordings were made between 06:00–07:00h, or between 16:00–17:30h. Eight voucher specimens were collected and deposited in the herpetology collection of Instituto Nacional de Pesquisas da Amazônia (INPA-H 26396–26372, 26374, 26376, 26377, 26379), in Manaus. Calls were analyzed in Raven 1.2 (Charif et al. 2004). As calls presented within-bout variation in number and arrangement of notes, we morphotyped the observed call patterns using sonograms of all available recordings and quantified their frequency considering the total number of calls analyzed. The first two calls of each bout were considered warm-up calls, and were discarded from analyses. The most frequent call pattern was used for measurement of temporal and spectral characteristics of call components. Seven call samples were obtained from recordings of each individual and final values represented the averages between them. Spectral analyses were conducted with frequency resolution of 82 Hz and 2048 points. Lowest and highest frequencies were measured 20 db below peak frequency, avoiding overlapping with background noise. All values presented correspond to the average between the ten individuals analyzed \pm one standard deviation.

The advertisement calls of *A. myersi* from SGC are constituted by a series of calls variable in relation to number and arrangement of notes (Fig. 1A–C). Each call is formed by an initial component of three or four notes with very narrow silent inter-note intervals, followed by a note pair which might be repeated once, twice or three times (*e.g.* Fig. 1A). Some calls are formed only by the sequential repetition of groups of two notes, resembling the sonogram presented in Pyburn (1981) (*e.g.* second and third calls of Fig. 1B). Other calls lack a second component, and are constituted only by a fast trill of four, six or eight notes (*e.g.* first and sixth call of Fig. 1C).

The number of call bouts recorded for each individual varied from two to six, and a total 36 bouts were analyzed. Call bouts were 17.31 \pm 5.97 s long in average, and the average number of calls per bout was of 12 \pm 5. The average rate of call emission was 0.71 \pm 0.09 calls/s (42.6 \pm 5.4 calls/min). The call pattern formed by an initial trill of four notes followed by a single note pair (Fig. 1D) was the most frequent, being common in calls of all individuals and representing 55.8% of the total 492 calls analyzed. The second most frequent call-type was formed by an initial trill of four notes followed by two note pairs, occurring in call bouts of eight individuals and representing 18.1% of calls. The remaining 26.1% of the analyzed calls represented 10 less frequent call patterns.

Considering only the most frequent call pattern, calls were 0.62 \pm 0.04 s long in average and had an average peak frequency of 2876 \pm 162 Hz. Average lowest and highest frequency of calls were of 2449 \pm 85 Hz and 3363 \pm 109 Hz,

respectively. The first 4-note trill had average duration of 0.35 ± 0.02 s. Average peak, lowest and highest frequencies for this section were of 2869 ± 159 Hz, 2447 ± 80 Hz and 3354 ± 104 Hz. The following note pair component was in average 0.16 ± 0.01 s long. The first note of the pair had average peak, lowest and highest frequencies of 2781 ± 113 Hz, 2492 ± 95 Hz and 3127 ± 160 Hz, respectively. The same frequency parameters had an average of 2924 ± 167 Hz, 2598 ± 88 Hz and 3297 ± 118 Hz for the second note of the pair. First trill and the following note pair were split by a 0.11 ± 0.02 s silent interval.

The *A. myersi* population found in SGC is allopatric to the related congeneric taxa *A. femoralis* and *A. zaparo*. Although the calls described by Pyburn (1981) for the *A. myersi* type-series could be similar to the 2-note advertisement calls of the Ecuadorian *A. zaparo* (Read 2000), and those of the recently described *A. hodli* (Simões et al. 2010), the composite advertisement call pattern registered for *A. myersi* in our study area is distinct from the one presented in the original species description, and is not shared by any species in the genus *Allobates*.

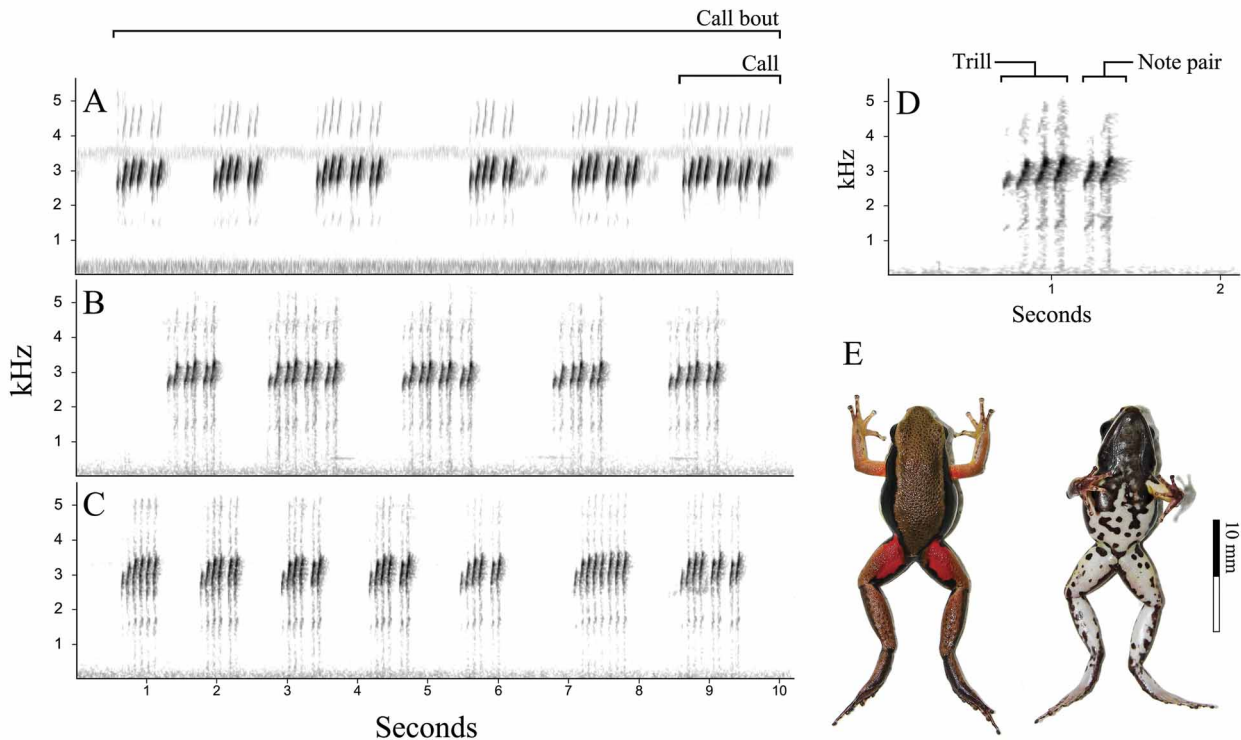


FIGURE 1. (A), (B) and (C) Segments of advertisement call bouts of three *Allobates myersi* males (voucher numbers INPA-H 26369, 26370, 26372, respectively) recorded in São Gabriel da Cachoeira, Amazonas, Brazil. Call variation in number and arrangement of notes is observed within each call bout, and between call bouts of different individuals. In segment A, six calls with three distinct arrangements are observed. In segment B, five calls with two distinct arrangements are observed. In segment C, seven calls are shown, with four distinct arrangements. (D) Detailed view of a single call formed by a fast trill of four notes, followed by a second component formed by two notes, representing the most frequent call pattern observed in the study population (E) Dorsal and ventral view, in life, of a male *A. myersi* (INPA-H 26371). The relatively large snout-to-vent length (28.1 ± 1.5 mm in average between individuals analyzed), the brown to light-brown dorsum, and the bright red flash mark with diffuse edges on dorsal surface of thighs are diagnostic characters used to distinguish *A. myersi* from other congeneric species.

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