

OBSERVATIONS ON THE ADVERTISEMENT CALL OF THE TILARAN ROBBER FROG *CRAUGASTOR MIMUS* (ANURA: CRAUGASTORIDAE) IN COSTA RICA

OBSERVACIONES SOBRE EL LLAMADO DE ADVERTENCIA DE LA RANA LADRONA DE TILARÁN *CRAUGASTOR MIMUS* (ANURA: CRAUGASTORIDAE) EN COSTA RICA

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Resumen. – Reportamos por primera vez un canto de anuncio de *Craugastor mimus*, el cual consiste en una nota tonal corta y débil, sin frecuencia modulada, similar a un sonido “pip”, emitida cada cuatro a nueve segundos. El reporte de este canto en *C. mimus* confirma que, en Costa Rica, todas las especies de la serie *C. laticeps* son capaces de producir vocalizaciones, a pesar de la ausencia de sacos y hendiduras vocales.

Palabras clave. – Anuros, *Craugastor laticeps*, ranas hojarasqueras, bosque lluvioso, vocalización.

Abstract. – We report for the first time an advertisement call of *Craugastor mimus*, which consists of a short and weak tonal note, without modulated frequency, like a “pip” sound, emitted every four to nine seconds. The report of this advertising call in *C. mimus* confirms that, in Costa Rica, all species in the *C. laticeps* species group can produce vocalizations, despite the absence of vocal sacs and vocal slits.

Key words. – Anurans, *Craugastor laticeps* group, leaf-litter frogs, rainforest, vocalization.

Central American frogs of the genus *Craugastor* (Cope, 1862) include 126 species (Frost, 2024), and are one of the most diverse and common groups in the tropical forest with direct developmental reproduction (Savage, 2002). *Craugastor mimus* (Taylor, 1955) is a common species categorized as Least Concern by the International Union for Conservation of Nature (IUCN, 2020) that occurs in the lowlands and foothills of the Atlantic slope, from eastern Honduras through Nicaragua to southeastern Costa Rica; near sea level to 1626 m a.s.l. (Leenders, 2016; IUCN, 2020).

Three Costa Rican species previously considered within the *Craugastor gollmeri* group (Savage, 2002; Ibañez et al., 2012; Salazar-Zúñiga & García, 2014), were included by Hedges et al. (2008) within the *Craugastor laticeps* species series. Padial et al. (2014) did not recognize this grouping because all its parts were found in a polytomy with the *C. fitzingeri* and *C. punctariolus*

series. For his part, McCranie (2018) recognizes 10 species in the *C. laticeps*-like species series, all sharing similar morphologies including the absence of male vocal slits and sacs. Therefore, McCranie (2018) suggests using the *C. laticeps* group, for this group of species, which includes *C. gollmeri*, *C. noblei* and *C. mimus*. Savage indicated that *C. mimus* does not produce any sound, like the other members of the then *C. gollmeri* group (Savage, 2002). However, descriptions of advertisement calls were reported in 2012 for *C. gollmeri* (Ibañez et al., 2012) and in 2014 for *C. noblei* (Salazar-Zúñiga & García, 2014). Herein we describe the previously unknown advertisement call of *C. mimus* for Costa Rica.

On December 23, 2023, at 19:00 h, several frog calls were heard on a plot sampling as part of a research project to inventory amphibians and reptiles in a section of the Braulio Carrillo National Park, located in district of San Ramón, La Virgen de



Figura 1. Macho de *Craugastor mimus* durante la emisión del canto. (A-B) Posición durante el canto, nótese la posición oblicua y hacia abajo de la cabeza. (B-C) Hábitat típico de la especie, un bosque húmedo tropical maduro. Fotos: Juan G. Abarca

Figure 1. *Craugastor mimus* male during the call emission. (A-B) Position during the call, note the oblique position of the head upside down. (B-C) Typical habitat of the species, a mature tropical rainforest. Photos: Juan G. Abarca

Tabla 1. Variables espectro-temporales del llamado de advertencia en machos de tres especies de la serie *Craugastor laticeps*.

Table 1. Spectro-temporal variables of the advertisement call produced in males of three species of *Craugastor laticeps* species series.

Species	Note duration (ms)	Note interval (ms)	Dominant frequency (Hz)	Number of calls	Source
<i>C. mimus</i>	30 ± 2.3	5593 ± 1200	1350 ± 41	31	This study
<i>C. noblei</i>	37 ± 6 40 ± 5	507 ± 37	717 ± 10	200	Salazar & García, 2014
<i>C. gollmeri</i>	9.1 ± 2.6	135 ± 35	1827 ± 444 3087 ± 520	13	Ibáñez, et al. 2012

Sarapiquí, Heredia, Costa Rica (10.325 N, 84.080 W, WGS 84, 509 m a.s.l.). At that time, this call was not recognized as belonging to any known species, after a brief search we found a calling male of *C. mimus*, identified as male by the size of the tympanum which is approached the size of the eye (Leenders, 2016); it was on a leaf in an oblique position upside down, at a height of 1.7 m from the ground (Figs. 1A and 1B). Around this individual, at least three more individuals were heard calling at a distance greater than two meters, but only this male could be located visually. All calls were heard mid-height in the forest, which was atypical for a species classified as a leaf-litter or ground dweller, however other species classified as terrestrial can call from the elevated vegetation (Twining & Cossel, 2023). The site was a mature tropical rainforest (Figs. 1C and 1D), and during the observations the conditions were slightly rainy.

We recorded the calls using a Xiaomi Poco X5 Pro 5G cell-phone and a Canon PowerShot SX740 HS digital camera, positioned 30 cm from the calling male. Recordings were obtained in MP4 format and converted to WAV format for analysis. Recordings and metadata are archived in the Collection of Records of the Fonoteca Zoológica (www.FonoZoo.com FZ-SOUND-CODE: 14694-14695). Because the call is a single tonal note repeated after regular silent intervals of longer duration than the sound, we used the note-centered approach in the terminology for the description of the *C. mimus* call (Köhler et al., 2017). Raven parameters were set as follows: Hann window type, window size of 1024 samples, 3 dB filter bandwidth of 67.7 Hz, time grid 90% overlap, time grid size of 102 samples, 46.9 Hz frequency grid spacing. For call analysis, we considered the following variables:

note duration, inter-note interval, pulses per note, dominant frequency, frequency range and harmonic frequency.

In total, 31 calls were analyzed, from one uncollected male. The advertisement call of *C. mimus* (Fig. 2) is a distinct weak vocalization, with a maximum intensity of 76.7 ± 2.7 dB at the dominant frequency, consisting of one tonal and unmodulated note; this sounds like a short and clear “pip” note, emitted every 4 to 9 seconds; during a three-minute recording a male called 29 times. Each note has a mean duration of 30 ± 2.3 ms (N = 31), intercall interval of 5593 ± 1200 ms (N = 27; min = 4301 ms; max = 9359 ms). The note consists of three well-defined harmonics, a dominant frequency of 1350 ± 41 Hz (N = 31; min = 1264 Hz; max = 1451 Hz), the first harmonic ranges from 980 to 1700 Hz, the second between 2364 to 2992 Hz and the third between 3753 to 4442 Hz (N:31). The note frequency ranges between 980 ± 70 and 4442. ± 527 Hz (N = 31; Bandwidth = 3462 Hz).

Based on our knowledge, within the *C. laticeps* species series, only *C. noblei* and *C. gollmeri* have their calls described (Ibáñez et al., 2012; Salazar-Zúñiga & García, 2014). The call heard in *C. mimus* differs significantly from these two species (see Table 1), as it consists of a single weak note heard at 7-9 m distance, whereas the call of *C. noblei* consists of two repeated strong notes heard at 30 m distance, and the call of *C. gollmeri* consists of a series of 13 weak notes heard at 3-4 m distance. Another aspect distinguishing the call of *C. mimus* is the presence of three well-defined harmonics, whereas the notes of the other species do not exhibit clear harmonics. Note modulation only occurs in the call of *C. gollmeri*, whereas both *C. mimus* and *C. noblei* have tonal notes. *C. mimus* exhibits the highest frequency range, followed by *C. gollmeri*, and the lowest frequency range corresponds to *C. noblei* (see Table 1).

Absence of vocal sacs in some groups of amphibians led to past assumptions that many species did not emit calls or sounds (Savage, 2002), however the vocalizations of leaf litter frogs have been frequently reported (Carbajal-Márquez et al., 2019; Cossel et al. 2019; Salazar et al., 2021). Relatively faint vocalizations are associated with lacking vocal slits and absence of vocal sacs; however, these frog species do have sufficient volume to attract nearby females or establish calling territories (Cossel et al., 2019). The report of this advertisement call in *C. mimus* confirms that within Costa Rica, all the species of this species series can produce vocalizations, but recordings of more individuals are needed for a better description of the call and its possible variations. Based on this fact, we consider that it is quite possible that the rest of the species of the *C. laticeps* species series also have vocalizations, not yet described.

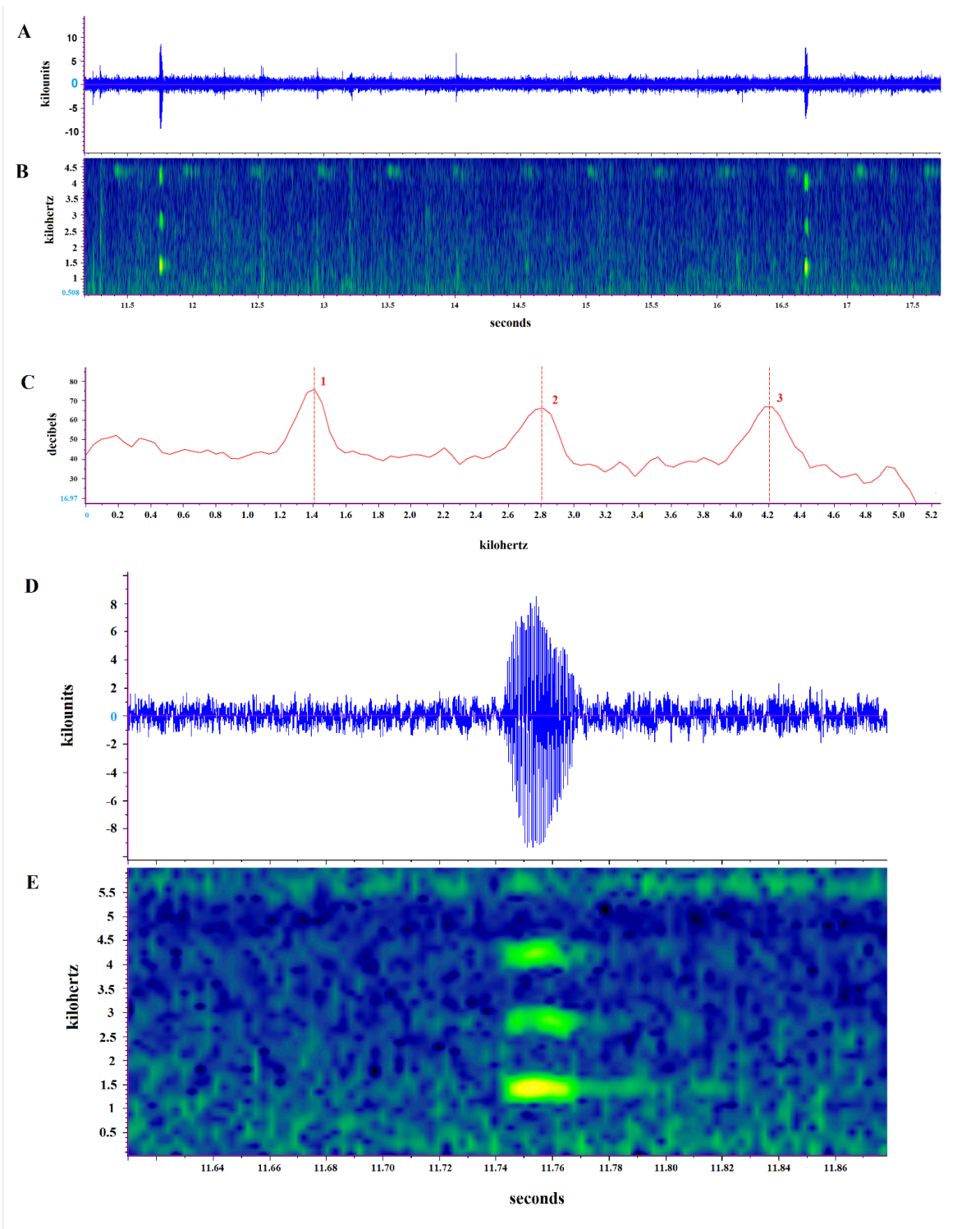


Figura 2. Canto de *Craugastor mimus*. (A) oscilograma que muestra la amplitud, (B) espectrograma con 2 notas emitidas, (C) espectro de potencia de la primera nota que muestra los tres armónicos, la línea roja punteada indica la intensidad de frecuencia más alta en cada uno, (D) oscilograma y (E) espectrograma del canto de una sola nota.

Figure 2. Advertisement call of *Craugastor mimus*. (A) oscillogram showing the amplitude, (B) spectrogram with 2 notes, (C) power spectrum of the first note showing the three harmonics, dotted red line indicates the highest frequency intensity in each, (D) oscillogram and (E) spectrogram of a single note call.

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