

# DISTRESS CALL OF *TRACHYCEPHALUS "VERMICULATUS"* (HYLIDAE) DURING PREDATION ATTEMPT BY *LEPTOPHIS AHAETULLA* (DIPSADIDAE) IN A MIDDLE MAGDALENA VALLEY HUMID FOREST

LLAMADA DE AUXILIO DE *TRACHYCEPHALUS "VERMICULATUS"* (HYLIDAE) DURANTE UN INTENTO DE DEPREDACIÓN POR *LEPTOPHIS AHAETULLA* (DIPSADIDAE) EN BOSQUES HÚMEDOS DEL MAGDALENA MEDIO

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**Resumen.**— Aquí reporto un evento de depredación de la rana arborícola lechosa *Trachycephalus "vermiculatus"* por *Leptophis ahaetulla* y proporciono información cuantitativa de la llamada de auxilio emitida por la rana arborícola. Además, comparo este evento con la información de las presas reportadas para algunas especies del género *Leptophis*.

**Palabras clave.**— Anura, bioacústica, comportamiento defensivo, depredación, Serpientes.

**Abstract.**— Here I report the predation of the milky treefrog *Trachycephalus "vermiculatus"* by *Leptophis ahaetulla* and I provide quantitative data on the distress call emitted by the milky treefrog. I also compare some *Leptophis* species' prey information based on previous records.

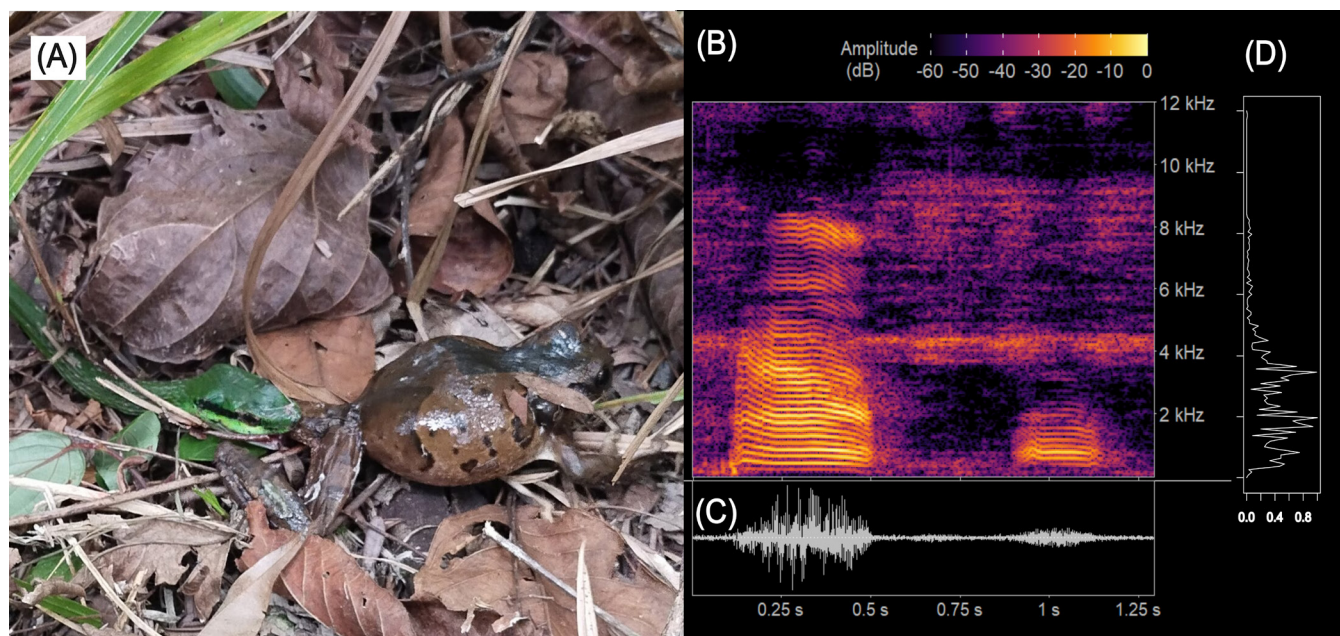
**Key words.**— Anura, bioacoustic, defensive behavior, predation, Serpentes.

Frogs constitute a significant component of the diet of multiple snake species (Wells, 2007; Zipkin et al., 2020), and knowledge of species interactions along with their defensive responses can help to understand the structure and dynamics of communities (Toledo et al., 2015). Defensive strategies of anurans are considered multimodal, that include: skin secretions cloacal discharges, puffing off the body, and the emission of distress calls (Marchisin & Anderson, 1978; de Toledo et al., 2009, Toledo et al., 2011; Toledo et al., 2015).

Species of *Trachycephalus* genus are known to emit a white volatile, noxious alkaline skin secretion when is handled, being irritating to mucous membranes (Savage, 2002; Yeager et al., 2019; Brown 2020) but even so, reports of predation by snakes in species of this genus are common (Leary & Razafindratsita, 1998; Solé et al., 2010; Hernández-Sánchez & Guevara-Alvarado, 2022). Here I reported a predation attempt of a milky treefrog (*Trachycephalus "vermiculatus"*) by *Leptophis ahaetulla* in a Middle

Magdalena Valley humid forest, and I also described in detail the distress call of *T. "vermiculatus"* during the predation attempt.

The event was observed on fieldwork during the dry season (August 9th 2023) in the Reserva Natural El Silencio, located in Yondó municipality, Antioquia department, Colombia (6.764172° N, 74.212502° W, WGS84, 133 m a.s.l.). The site is located on the edge of a patch of tropical rainforest named "el Paujil", in a vegetation matrix with primary and secondary forests, cattle pastures, and corn crops. The individuals were observed on the ground and surrounded by herbaceous vegetation a few meters from a beast trail between 14:44 and 14:57 (weather conditions: partially clouded preceded by a rainy night, no data of air temperature available). The snake caught the left hind limb of the frog, and swallowing was unsuccessful for a few minutes. During this time, the frog keeps inflated its body, and the lateral vocal sacs showed slight inflation (Fig. 1A). During the emission of the distress call, the body deflated and the vocal sac showed



**Figura 1.** A) Registro visual del evento de depredación de *Trachycephalus “vermiculatus”* por *Leptophis ahaetulla*. B) Espectrograma, C) oscilograma y D) espectro de poder de la llamada de auxilio de *Trachycephalus vermiculatus* siendo depredada. Tamaño de la ventana = 1024, tasa de muestreo = 44.1 kHz

**Figure 1.** A) Visual record of predation event of *Trachycephalus “vermiculatus”* by *Leptophis ahaetulla*. B) Spectrogram, C) oscilogram and D) power spectrum of the distress call of *Trachycephalus vermiculatus* being predated. Window length = 1024, sampling rate = 44.1 kHz. .

no changes. The calls were recorded from less than a meter away from the individuals, with the Voice Record Pro application on a smartphone Vivo Y51 as a WAV file, a sampling rate of 48 kHz, and a 16 bits resolution. Videos of the event were also obtained using the same device and audio file was extracted from obtaining additional calls. Quantitative parameters of the call were obtained using Raven pro 1.6.0 (K. Lisa Yang Center for Conservation Bioacoustics, 2024). Recording file was prepared and deposited in the Colección de Sonidos Ambientales “Mauricio Alvarez-Rebolledo” at the Humboldt Institute (IAvH-CSA-37511).

Distress call was measured from 48 calls from the successive recordings. The signal was categorized as “dense harmonics” following Köhler et al. (2017), with slight repeated ascending and descending modulations in frequency (Fig. 1B-C). The call was mostly comprised of a single note, but in some cases the individual emitted up to three consecutive notes. Each note had a duration of  $343.6 \pm 88.5$  ms SD (range: 196.3 to 452.4 ms). The Fundamental frequency was located at 218.0 Hz (undetected in some recordings), and the first harmonic at 436.7 Hz. Dominant frequency varied between measured calls and was located in two frequency bands at a ratio close to 2:1, the first at  $722.6 \pm 94.2$  Hz

(range: 609.3 to 890.6 Hz,  $n = 36$ ) and the second at  $2304.6 \pm 164.9$  Hz (range: 2109.7 - 2437.5 Hz,  $n = 12$ ). Most energy of the call is located in a frequency bandwidth between 375.0 (Freq 5 %) and 3984.3 Hz (Freq 95 %), including between 7 and 17 harmonics of the signal (Fig. 1D). Additional harmonics were detected along the entire audible spectrum of the recording (Fig. 1B).

The distress call of *T. “vermiculatus”* differs in duration from the release call of the same species for populations in Puntarenas Province, Costa Rica (Barrio-Amoros & Güell, 2023), and from the release call obtained by manipulation in hand at Puerto Wilches Municipality, Santander, Colombia (IAvH-CSA-36317). The duration of the distress call is longer (343.6 ms for distress call versus 60 - 90 ms for release call), and the energy of the distress call is focused at wider frequency bandwidth 375.0 - 3984.3 compared with release call 430 - 516 Hz. The distress call of *T. “vermiculatus”* is similar in duration and fundamental frequency to the call described during hand manipulation at the Palo Verde Field Station, Guanacaste Province in Costa Rica (Leary and Razafindratsita, 1998). Dominant frequency is different from Palo Verde hand manipulation, being Palo Verde’s call higher than reported for this predation event (3270 - 5670 Hz and 4750 - 7080 Hz in Palo Verde’s call versus 743.3 - 2359.4 Hz here).

Heterospecific distress calls are similar in structure among frog species, with the majority resembling a loud and high-pitched scream (de Toledo & Haddad, 2009). Distress calls may warn other frogs (the same and different species) in the presence of potential predators, causing them to react more readily to visual and/or tactile stimuli (Hödl & Gollmann, 1985). Distress calls may also alert nearby frogs by interfering with predation attempts (Forti et al., 2017). Leary and Razafindratsita (1998) reported 17 individuals emerging within a 3 m radius from a predation event and orienting towards the distressed individual, presumably in response to distress call vocalizations.

Although both species are common and widespread, predation reports are still scarce. Frog predation events by *L. ahaetulla* are reported from Central America, Guiana Shield and Amazonas (Prado 2003; Solé et al., 2010; Gava & Viana, 2016; Yeager et al., 2019; Chaloupka & Rodríguez, 2021; Oliveira et al., 2021; Hernández-Sánchez & Guevara-Alvarado, 2022) while for *T. “vermiculatus”* and *T. typhonius*, predation reports are done in Central America, Antillean islands, Atlantic forest, and Amazonas (Leary & Razafindratsita, 1998; Yeager et al., 2019; Hernández-Sánchez & Guevara-Alvarado, 2022; Barrio-Amoros & Güell, 2023; Hayes, 2023; Villalaz et al., 2024). This record constitutes the first predation event of *Trachycephalus* by *Leptophis* species reported for Magdalena Valley, filling the gap in information on both genera in the cis-Andean region of South America.

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