

RECORD OF UNUSUAL NOCTURNAL ACTIVITY OF *ATELOPUS VARIUS* AT LAS TABLAS PROTECTED ZONE, COSTA RICA

REGISTRO DE ACTIVIDAD NOCTURNA INUSUAL DE *ATELOPUS VARIUS* EN LA ZONA PROTECTORA LAS TABLAS, COSTA RICA.

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Abstract.— The harlequin frog, *Atelopus varius*, is a diurnal species, critically endangered, and distributed in Costa Rica and Panama. Herein, we report an unusual nocturnal activity for this species at Las Tablas Protected Zone, Costa Rica. We observed an individual on an herbaceous plant at night, performing slow movements while feeding on ants. Despite *A. varius* being one of the most well-known species of the genera, there are still poorly studied aspects of its natural history. Therefore, we propose to lead research efforts on the behaviour of *A. varius*, with the purpose of filling knowledge gaps for this important species of conservation concern.

Keywords.— behavior, critically endangered, feeding, harlequin frog, natural history.

Resumen.— La rana *Atelopus varius* es una especie diurna, críticamente amenazada y distribuida en Costa Rica y Panamá. Aquí, reportamos un avistamiento de actividad nocturna inusual para esta especie en la Zona Protectora Las Tablas, Costa Rica. Observamos un individuo sobre una planta herbácea por la noche, realizando movimientos lentos y comiendo hormigas. A pesar de que *A. varius* es una de las especies más conocidas del género, aún hay aspectos de su historia natural pobremente estudiados. Por lo tanto, proponemos dirigir esfuerzos de investigación acerca del comportamiento de *A. varius*, con el fin de llenar vacíos de conocimiento de esta especie de importancia para la conservación.

Palabras clave.— alimentación, comportamiento, críticamente amenazado, historia natural, rana arlequín.

The variable harlequin frog (*Atelopus varius*) faced severe population decline and extinction during the 1980's and 90's (Lips 1999; Pounds et al. 2010). This species is considered critically endangered according to IUCN red list (Pounds et al. 2010). Recently, remnant populations have been rediscovered (González-Maya et al. 2013; Perez et al. 2014; Barrio-Amorós & Abarca 2016) and these should be a major target of conservation and research efforts.

Despite *A. varius* being a relatively well known species in the *Atelopus* genus (Lötters 1996; La Marca et al. 2005), knowledge-gaps remain in regards to its natural history. We have been studying a remnant population of the variable harlequin frog at Las Tablas Protected Zone (LTPZ) for the past five years (González-Maya et al. 2013). LTPZ is located in southeastern

Costa Rica, with a mean annual precipitation between 2000 and 3000 mm, and a mean annual temperature of 19°C, corresponding to premontane wet forest. During our studies in LTPZ with *A. varius*, we have observed natural history aspects not reported before. Herein, we report the observation of an unusual nocturnal activity of *A. varius* at LTPZ, Costa Rica.

During a nocturnal survey on July 16th, 2014, from 19:00 h to 22:30 h, we observed an adult variable harlequin frog perched 20 cm above the ground, near the Cotón River, LTPZ (altitude 1337 m). This individual was active (Figure 1A) and we recorded slow movements while feeding on ants. Other individuals found at night had been observed with no apparent activity. For example, on April 23rd, 2015, at 21:05 h, we found an individual perched on an herbaceous plant with its ventral surface in contact with the

leaf and seemingly inactive (Figure 1B). Likewise, on April 24th, at 18:04 h, we found two individuals among roots on a riverbank with no apparent activity (Figs. 1C y 1D).

The species belonging to the *Atelopus* genus are mainly diurnal (Lötters 1996, Lötters 2007), and *A. varius* in particular is active during all the day, at least during reproductive season. At night, these harlequin frogs can be observed among rocks and roots, as well as perched on vegetation above the ground (Lötters

adds *A. varius* as the third species in the genus with an unusual nocturnal-feeding behaviour. Therefore, we recommend further research in order to understand the ecological implications of this behaviour. Also, it will be necessary to determine if *A. varius* uses similar vibration cues for prey location as *A. laetissimus*, described by Rueda and Warkentin (2016).

Acknowledgements.— This project was partially funded by Phoenix Zoo, Mikelberg Family Foundation, Finca Las Alturas

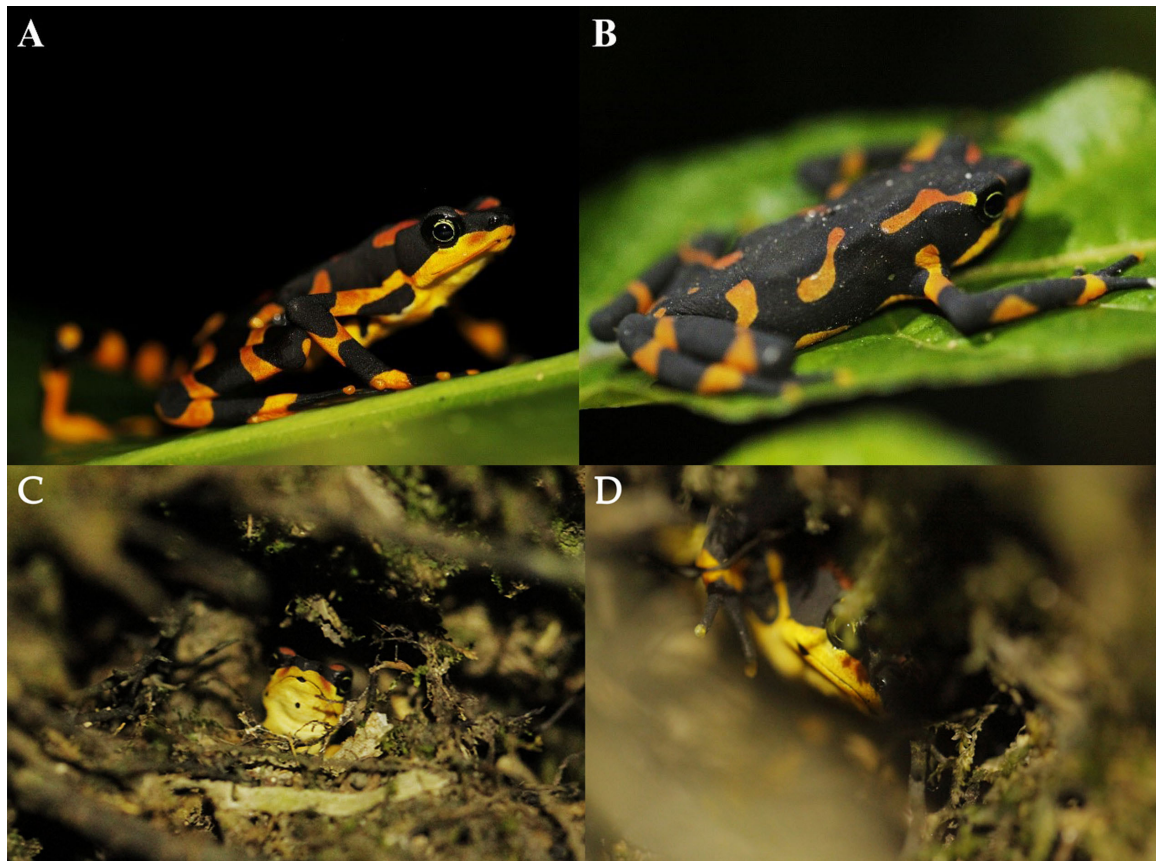


Figure 1. Individuals of the variable harlequin frog *Atelopus varius* found at night near the Cotón River, Costa Rica. Individual active at night and feeding on ants (A); perched individual with its ventral surface in contact with the leaf (B) and two individuals resting among roots (C, D). Photo: Diego A. Gómez-Hoyos.

Figura 1. Individuos de la rana arlequín variable *Atelopus varius* encontrados en la noche cerca del río Cotón, Costa Rica. Individuo activo por la noche y alimentándose de hormigas (A); individuo encaramado con su superficie ventral en contacto con la hoja (B) y dos individuos que descansan entre las raíces (C, D). Foto: Diego A. Gómez-Hoyos..

1996). The use of these microhabitat during the night have been generally reported as resting sites (Crump 1986; Lötters 1996; Lindquist et al. 2007). However, species such as *Atelopus nocturnus*, *A. nahumae* and *A. laetissimus* have also been observed active at night (Bravo-Valencia & Rivera-Correa 2011; Rueda & Warkentin 2016), although nocturnal foraging activity has only been reported for *A. nahumae* and *A. laetissimus* in a montane wet forest (Rueda & Warkentin 2016). Our current contribution

del Bosque Verde and ProCAT International. We thank Thomas Stokely for the English review.

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