

# GROUPED PERCHING BEHAVIOR IN MALES OF *INCILIUS CONIFERUS* (ANURA: BUFONIDAE).

## CONDUCTA DE PERCHAMIENTO COLECTIVO EN MACHOS DE *INCILIUS CONIFERUS* (ANURA: BUFONIDAE).

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**Abstract.**— The Evergreen Toad, *Incilius coniferus*, was found perching in groups near the breeding site, suggesting that this rarely observed behavior can serve as an antipredatory strategy.

**Keywords.**— Reproduction, behavior, antipredator, natural history.

**Resumen.**— El sapo verde, *Incilius coniferus*, fue encontrado perchando en grupos cerca del sitio reproductivo, se sugiere que este comportamiento raramente observado puede servir como estrategia antidepredatoria.

**Palabras clave.**— Reproducción, comportamiento, antidepredación, historia natural.

The Evergreen Toad *Incilius coniferus* (Cope, 1862) occurs from Eastern Nicaragua -through Costa Rica and Panama on both Pacific and Caribbean slopes- to the Pacific lowlands of Colombia and Northern Ecuador, ranging from sea level to 1550 m a.s.l. (Frost, 2018; Mendelson III et al., 2011; Savage, 2002). *Incilius coniferus* (Bufonidae) is a common species usually found in undisturbed forest and often perched several meters above the ground on shrubs and trees, although it calls and breeds in shallow ponds or streams (Savage, 2002). This arboreal behavior is rare in the Bufonidae family (Chaparro et al., 2007; Granda-Rodríguez et al., 2008; Matsui et al., 2012; Vitt & Caldwell 2014), which are terrestrial or fossorial (Savage, 2002).

Although during the night males of *I. coniferus* are commonly found perching in the vegetation at two or three meters height, they are usually found alone (Fig. 1; Savage, 2002). However, on March 8, 2015, during an expedition (supported by the Waitt Grants Program of National Geographic Society and Lewis and Clark Foundation), to the confluence of Lari and Pare Rivers (9.43351°N, 83.04867°W; elevation 390 m a.s.l.; WGS 84 datum), in Cordillera de Talamanca, Costa Rica, we observed 12 males sharing the same shrubs around a breeding pond. For two consecutive days, we found 13 males vocalizing in a pond

formed from a small stream with slow runoff. Males called only during the first hours of the night (18:00 to 20:00 h). At around 20:00 h most individuals abandoned the pond and climbed to the vegetation over the water to rest. During the second day, we observed 12 males perching above the vegetation. Despite the availability of many similar perches in the area, nine of them grouped in the shrubs at the edge of the pond, at heights from the ground between 30 and 290 cm. Males were distributed in one trio and three pairs perched in four shrubs. The other three males were perched alone in different shrubs, one of them 10 m away from the border of the breeding area. The males were perched at a similar height and normally in the same branch, with an average distance of  $28.33 \pm 26.39$  cm (mean and one standard deviation) between males perches in the same shrubs.

This group perching behavior is not reported for *I. coniferus* in the literature and has never been observed during the several surveys made by the authors. Then, we hypothesize that it may occur only under particular conditions during the breeding period of *I. coniferus*. In this case, the treefrog *Smilisca phaeota* and the toad *Rhaebo haematiticus* used the breeding site, which is interesting due that both species could use streams for reproduction purposes (Savage, 2002). These aggregations



**Figure 1.** Male of *Incilius coniferus* perching alone.

**Figura 1.** Macho de *Incilius coniferus* perchando solo.

of anurans in small areas attract some species of frog-eating snakes (Solórzano, 2004). During our survey we observed one Vine Snake (*Imantodes inornatus*) and two Cat-Eyed Snake (*Leptodeira septentrionalis*) around the breeding site. In the same breeding site was recorded the predation of *R. haematiticus* by *L. septentrionalis* (Arias et al., 2016). Clustering behavior has been proposed as an antipredator strategy based whether on the risk dilution (Hamilton, 1971), early detection of predators (Pulliam, 1973) or the collective detection hypotheses (Lima, 1994). The idea of collective detection suggests that all members of the group are unambiguously alerted to an attack as long as it is detected by at least one group member (Lima, 1994). Based on our observations, we proposed that individuals in the cluster might benefit by being alerted to a prospective risk by the escape response of the first individual, in agreement with the collective detection hypothesis. Although clusters in many cases are just a fortuitous consequence of short-term temporary aggregations, individuals may still benefit from such grouping behavior (Martín et al., 2006).

## CITED LITERATURE

Arias, E., C. Chaves, A. García-Rodríguez & M.J. Ryan. 2015. Predation of *Rhaebo haematiticus* (Anura: Bufonidae) by *Leptodeira septentrionalis* (Serpentes: Dipsadidae) in Costa Rica. *Mesoamerican Herpetology* 2: 563–566.

Chaparro, J.C., J.B. Pramuk & A.G. Gluesenkamp. 2007. A new species of arboreal *Rhinella* (Anura: Bufonidae) from cloud forest

of southeastern Peru. *Herpetologica* 63: 203–212.

Frost, D.R. 2018. Amphibian Species of the World: an Online Reference. Version 6.0. <http://research.amnh.org/herpetology/amphibia/index.html>. American Museum of Natural History, New York. [Download on July, 2018].

Granda-Rodríguez, H.D., A.G. del Portillo-Mozo & J.M. Renjifo. 2008. Uso de hábitat en *Atelopus laetissimus* (Anura: Bufonidae) en una localidad de la Sierra Nevada de Santa Marta, Colombia. *Herpetotropicos* 4: 87–93.

Hamilton, W.D. 1971. Geometry for the selfish herd. *Journal of Theoretical Biology* 31: 295–311.

Lima, S.L. 1994. Collective detection of predatory attack by social foragers: fraught with ambiguity? *Animal Behaviour* 50: 1097–1108.

Martín, J., J.J. Luque-Larena & P. López. 2006. Collective detection in escape responses of temporary groups of Iberian green frogs. *Behavioral Ecology* 17: 222–226.

Matsui, M., K. Nishikawa, S.T. Yeo & K. Eto. 2012. Notes on a rare Bornean bufonid *Ansonia latidisca* Inger, 1966, with special reference to its phylogenetic position. *Herpetology* 31: 87–96.

Mendelson III, J.R., D.G. Mulcahy, T.S. Williams & J.W. Sites Jr. 2011. A phylogeny and evolutionary natural history of Mesoamerican toads (Anura: Bufonidae: *Incilius*) based on morphology, life history, and molecular data. *Zootaxa* 3138: 1–34.

Pulliam, H.R. 1973. On the advantages of flocking. *Journal of Theoretical Biology* 38: 419–422.

Savage, J.M. 2002. *The Amphibians and Reptiles of Costa Rica: A Herpetofauna between two Continents, between two Seas*. University of Chicago Press, Chicago.

Solórzano, A. 2004. *Serpientes de Costa Rica: Distribución, Taxonomía e Historia Natural*. INBio, Heredia.

Vitt, L.J. & J.P. Caldwell. 2014. *Herpetology. An Introductory Biology of Amphibians and Reptiles*, 4th Edition. Elsevier, Amsterdam, Boston, Heidelberg, London, New York, Oxford, Paris San Diego, San Francisco, Sydney and Tokyo.

