https://doi.org/10.22201/fc.25942158e.2025.2.1135

FIRST RECORD OF *DENDROPSOPHUS COLUMBIANUS* (HYLIDAE) USING BEE HOTELS AS SHELTER IN COLOMBIA

PRIMER REGISTRO DE *DENDROPSOPHUS COLUMBIANUS* (HYLIDAE) UTILIZANDO HOTELES PARA ABEJAS COMO REFUGIO EN COLOMBIA

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Received: 2024-09-14. **Accepted:** 2024-12-17. **Published:** 2025-04-22.
Editor: José Manuel Serrano, México.

Resumen.– *Dendropsophus columbianus* es una especie que es frecuente ver en listados de diversidad con hábitos urbanos. Se instalaron seis hoteles para abejas en un relicto de bosque del campus de la Corporación Universitaria Santa Rosa de Cabal-UNISARC, Colombia. Se reporta el primer encuentro de la rana *D. columbianus* haciendo uso de hoteles para abejas en un remanente de bosque en Risaralda, Colombia. También discutimos sobre la capacidad de esta especie a adaptarse a ambientes intervenidos. Estas observaciones indican que el uso de hoteles para abejas en Colombia podría servir para albergar otras especies, incluso vertebrados pequeños.

Palabras clave.– Nidos artificiales, hylidos, áreas intervenidas, rana arborícola.

Abstract.– *Dendropsophus columbianus* is a species that is frequently seen in diversity lists with urban habits. Six bee hotels were installed in a forest relict on the campus of the Corporación Universitaria Santa Rosa de Cabal-UNISARC, Colombia. We report the first encounter of the frog *D. columbianus* using bee hotels in a forest remanent in Risaralda, Colombia. We also discuss the ability of this species to adapt to intervened environments. These observations indicate that the use of bee hotels in Colombia could be used to house other species, including small vertebrates.

Keywords.– Artificial nests, hylids, intervened area, tree frog.

Artificial shelters have been studied in various biological groups (Pereira-Ribeiro et al., 2017), this is a common method used to keep some pollinator populations (Bortolotti et al., 2016). Bee hotels have been used to study nesting biology, to evaluate potential crop pollinators, to conduct species diversity studies, and provide additional information on nesting sites for the improvement and conservation of bee populations (Steffan-Dewenter, 2003; Sheffield et al., 2008). We here report the first case of an amphibian, *D. colombianus*, using artificial bee nests in a disturbed area in the Central Andes of Colombia.

Amphibians are considered to be the group of vertebrates most susceptible to urbanization, due to their ectothermic physiology, low vagility, dependence on water for reproduction, among others (Hamer & McDonnell, 2008; Vanegas-Guerrero et al., 2016). *Dendropsophus columbianus* is a species that is frequently seen in urban sites, even in intervened areas, such as pastures, forest relicts, temporary or permanent water reservoirs, periurban areas, etc. (Ramírez-Chaves et al., 2018). This tree frog is endemic to Colombia, and is found between 950-2,350 m a.s.l in the western Cordillera Central and eastern Cordillera Occidental (Agudelo-Valderrama et al., 2014).

There are few studies on bee hotels in the tropics (Wilson et al., 2020; Van Helden et al., 2024), and because ecological dynamics change between different latitudes, our goal was to determine the diversity of insect species that could reach bee hotels with and without bait in a neotropical forest remnant.

For this purpose, six bee hotels were installed 1.5 m above the ground in a relict of forest on the campus of the Corporación Universitaria Santa Rosa de Cabal-UNISARC, Risaralda, Colombia (4.912725° N, 75.624654° W, WGS84 and elevation 1,635 m a.s.l.). The hotels were 2,500 ml polyvinyl chloride (PVC) cylinders; bamboo branches, 3 cm in radius and ten 10 cm long, were inserted into them as cavities; wooden stakes were used as anchors to the ground; the hotels were established individually in separate sites 5 m apart, and three of them were baited with ripe plantain (*Musa paradisiaca*) and the remaining three without bait. The hotels were established on September 8, 2022, and were monitored for 11 days, this same was done on an eventual basis during the same week between 11:35-14:50 h.

Dendropsophus colombianus was observed occupying two different hotels (Fig. 1). There were seven records in six days and four different individuals were identified, and each was recognized because they had distinguishable coloration patterns and different sizes. On all occasions when this species was observed, the average ambient temperature was 20.1° C.

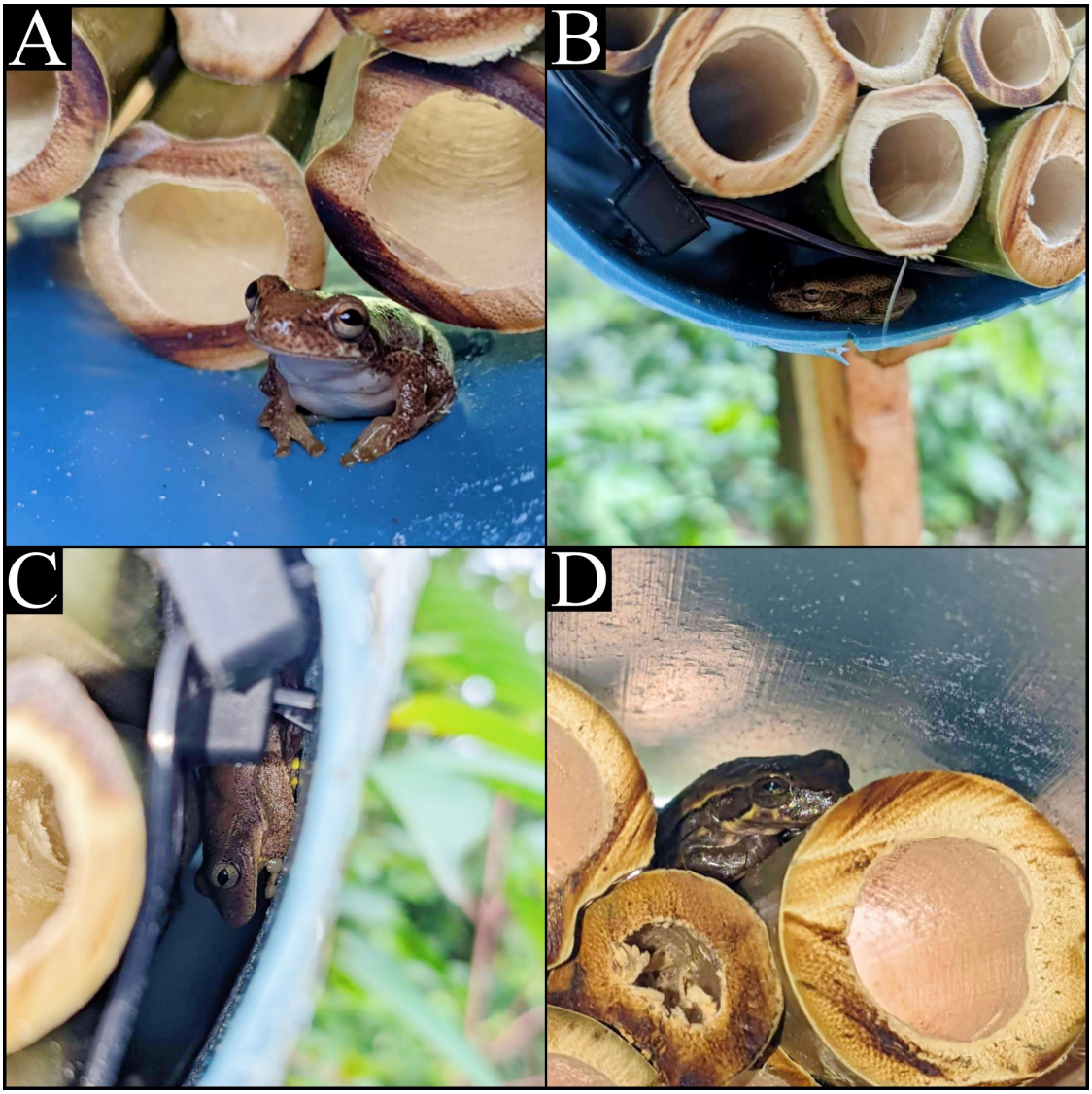

Figure 1. *Dendropsophus columbianus* in bee hotels in the campus UNISARC. (A, B) Record on September 1, 2022; (C) September 8, 2022; (D) and September 13, 2022. Photos: Diego Álvarez-Arellano.

Figura 1. *Dendropsophus columbianus* en hoteles de abejas en el campus UNISARC. (A, B) Registro del 1 de septiembre de 2022; (C) septiembre 8 de 2022; (D) y septiembre 13 de 2022. Fotos: Diego Álvarez-Arellano.

The diet of *Dendropsophus colombianus* includes mainly Coleoptera, Hemiptera, Hymenoptera, Araneae and Lepidoptera (Moreno-Barbosa & Hoyos-Hoyos, 2014). The arthropod diversity found in the bee hotels was 43 % Coleoptera and 36 % Hymenoptera, thus coinciding with the arthropod assemblage between the hotels and the diet of *D. colombianus*. There are records of some species of hylids that can occupy PVC pipes as artificial shelters (Ferreira et al., 2012), which may indicate that the presence of *D. colombianus* in bee hotels may be because it finds a thermally favorable location in addition to taking advantage of the safety of the crevices (Glorioso & Waddle, 2014), and largely because it takes advantage of the diversity of arthropods visited to prey, in addition to which it may give them an advantage by providing them with a refuge. However, to affirm the above, it is necessary to carry out more studies to statistically quantify if the hotels for bees really represent an advantage and if this species can take advantage of it and it can be reflected in their fitness.

This adaptive behavior could be related to the search for microhabitats that offer favorable thermal conditions and protection, where this type of artificial shelters could be potentially useful for tree frogs (Zacharow et al., 2003; Pereira-Ribeiro et al., 2017). Habitat modification can affect amphibians in different ways due to resource availability. It has been observed that several species of *Dendropsophus* can tolerate some degree of habitat modification (Piatti et al., 2012), as they usually breed in temporary ponds, so they can easily adapt in areas with some water availability (Warren-Thomas et al., 2013), in addition to presenting a good response to spatiotemporal changes in trophic resources, giving a great dietary plasticity to this genus (Lopez et al., 2015). The ability of this tree frog to use artificial shelters indicates that, although urbanization negatively affects amphibians, it can also create unexpected opportunities for some species.

These observations indicate that the use of bee hotels in Colombia could serve to shelter other species, including small vertebrates, thus constituting a novel record for a better understanding of urban ecology. In addition, it is important to highlight that this finding warns about the need to evaluate the relevance of using bee hotels for their conservation, since these same artificial structures can host predators, as in this case.

Acknowledgements.– We would like to thank Alejandra Rojas-Rivera and Manuela Londoño-Raigosa for their valuable contributions to the research process.

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