

Confirmation of the Presence of the Berthold's Bush Anole (*Polychrus guttuerosus*) on the Nicoya Peninsula, Costa Rica.

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Received: November 6, 2024; Revised: November 27, 2024; Accepted: November 29, 2024

Abstract: The Berthold's Bush Anole, *Polychrus guttuerosus* (Polychridae), is a rare lizard distributed from Honduras to Colombia and Ecuador, where it inhabits rainforests up to 800 m above sea level. In northwestern Costa Rica, it is found in the Guanacaste and Tilarán mountain ranges, with a single report from the Nicoya Peninsula in 2016. However, this locality was not included in the recent description of its distribution. The authors confirm the presence of the Berthold's Bush Anole in the Nicoya Peninsula with a juvenile found in Hojancha, Guanacaste, 8 km away from the former 2016 observation. This area is located within the Tropical Moist Forest, which means that the Berthold's Bush Anole has not yet been observed in the Tropical Dry Forest as previously reported. The area of the finding has various anthropogenic uses, with only small patches of vegetation remaining, mainly thorny scrubs.

Key words: Distribution, Lizards, Tropical dry forest, Tropical moist forest, Polychridae

Introduction

Polychrotidae is a small family of canopy lizards primarily found in South America, consisting of eight species within the single genus *Polychrus* (Uetz *et al.*, 2024). These lizards are characterized by a laterally compressed body, a very long tail, and green or grey dorsal coloration (Murphy *et al.*, 2017). These morphological traits and their ecology make them difficult to spot in the wild, resulting in limited knowledge about most species (Barquero *et al.*, 2024). Only

one species, the Berthold's Bush Anole, *Polychrus guttuerosus*, is found in Costa Rica (Savage, 2002; Uetz, 2024), and most of its biological information comes from sporadic observations (Barquero *et al.*, 2024).

The most conspicuous characteristic of the Berthold's Bush Anole is its long, round tail, which is more than three times the length of its head and body (Savage, 2002). This tail is used for balance and stabilization during arboreal movements (Leenders, 2019). The total length of this lizard is about 700 mm, with the females being significantly larger, measuring 125 to 170 mm in snout-vent length (SVL), compared to males which reach 83 to 135 mm (Savage, 2002). The limbs of the Berthold's Bush Anole are moderately long, and the upper head scales are smooth (Savage, 2002). Additionally, it lacks toe pads, as well as nuchal, dorsal, and caudal crests, a large subtympenic scale, and tail spines (Savage, 2002). The Berthold's Bush Anole is usually bright green in coloration, but it can change to a dull brown depending on its mood or other factors (Leenders, 2019). Most individuals have a distinct large light spot below the posterior margin of the orbit (Savage, 2002).

The Berthold's Bush Anole is a strictly diurnal and arboreal lizard, typically found in humid forests. It uses its hands and feet to grasp small branches and twigs, moving slowly and deliberately with alternating limb movements (Savage, 2002). These lizards can remain completely still for extended periods, often hanging in awkward or bizarre positions using one or more limbs and the tail (Savage, 2002; Leenders, 2019).

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As a sit-and-wait predator, it slowly advances on prey once spotted, feeding primarily on relatively large arthropods but also consuming leaves, flowers, fruits, and seeds (Savage, 2002).

The Berthold's Bush Anole is found at low and moderate elevations on the Atlantic slope, ranging from northwestern Honduras to northwestern Colombia, and from west-central Costa Rica to western Ecuador on the Pacific slope (McCranie, 2018). It is also marginally present on the Pacific slope in northwestern Costa Rica (McCranie, 2018), but not in the northwest Pacific slope's subhumid area (Savage, 2002). It is found from 6 to 800 m above sea level (Sasa *et al.*, 2010). Generally, the species has been reported from various localities across its range, although it is rarely seen (Savage, 2002; Abarca Alvarado, 2012). Despite its rarity, it can thrive in some disturbed areas, like roads and gardens near the forest edge (Savage, 2002).

In northwestern Costa Rica, the Berthold's Bush Anole has been recorded in the Cordillera de Guanacaste and the Cordillera

de Tilarán (Savage, 2002), but it was not known to inhabit the Tropical Dry Forest (Bringsøe *et al.*, 2016). However, two males were observed fighting in a low scrub vegetation in Hojancha, Guanacaste, Costa Rica in 2016 (Bringsøe *et al.*, 2016). This locality was incorporated in the "Reptiles of Costa Rica" guide (Leenders 2019), but it was not included in Leenders' later guide to the "Amphibians and Reptiles of Costa Rica" (Leenders, 2023). Herein, the authors report the presence of this species on the Nicoya Peninsula based on another observation in Hojancha, Costa Rica.

Materials and Methods

As part of a herpetological inventory in Hojancha in the Nicoya Peninsula, northwestern Costa Rica, the researchers found a juvenile Berthold's Bush Anole in an open area. The general habitat of the site consists of dry cultivated land and pastures with scattered human settlements, among which are patches of xerophytic scrub vegetation (Figure 1).

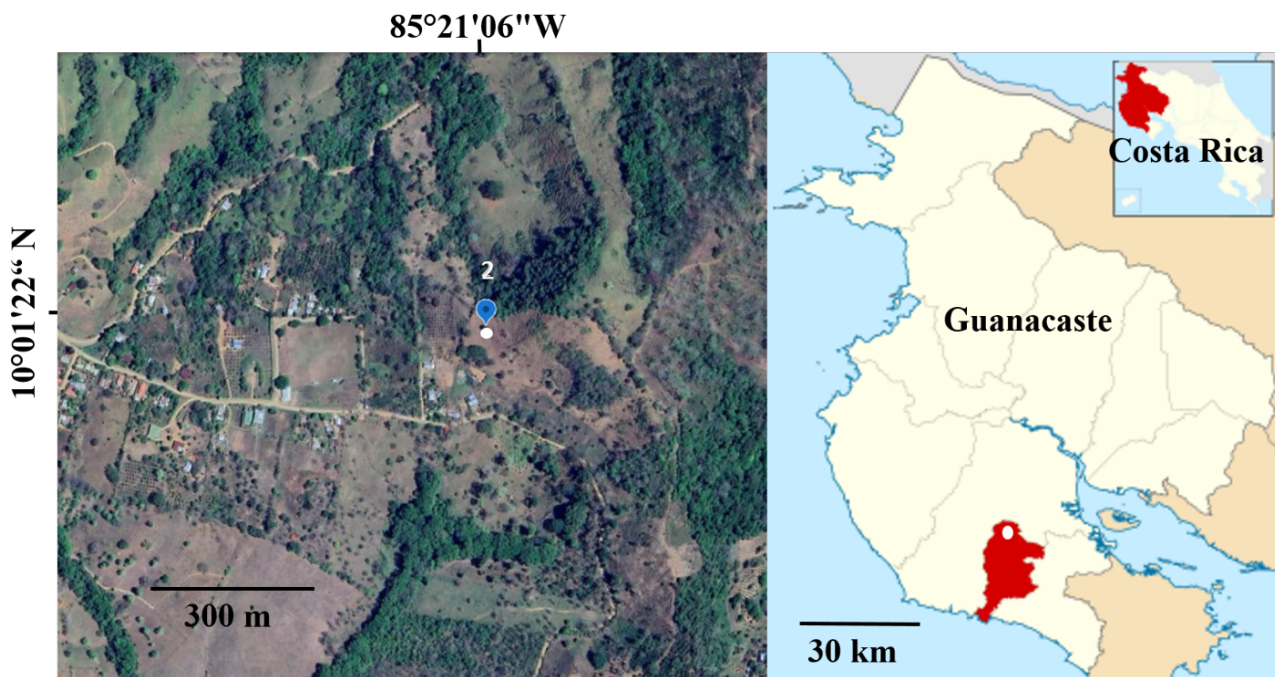


Figure 1. General habitat conditions (left) and the observation site (white dot under the blue marker) of a Berthold's Bush Anole, *Polychrus gutturosus*, in the Hojancha county (highlighted in red) in the Guanacaste province (outlined in white but shown in red on the map of Costa Rica). Figure prepared by José Manuel Mora based on Google Earth (left section) and Wikipedia under the Creative Commons Attribution-ShareAlike 3.0 license (right section).

The original forest of this area belongs to the Tropical Moist Forest, with annual precipitation ranging from 1800 to 4000 mm. It is characterized by high temperatures and a dry period lasting from zero to two months (Hartshorn, 1983). It is an evergreen or semi-deciduous forest with very high density and is characterized by the presence of four to five different strata (Bolaños *et al.*, 2005). The understory is abundant, predominantly with evergreen species (Hartshorn, 1983). The average height of the canopy can reach between 30 and 40 m, but some trees reach up to 50 m, with broad and elevated crowns, unbranched up to 25 or 35 m, having tall, slender, and smooth trunks with usually colored bark (Hartshorn, 1983). The sub-canopy has trees of 30 m in height, with narrow crowns, and palms that are abundant, except in the cold transition area (Bolaños *et al.*, 2005). The lower stratum is between 8 and 20 m in height, with round or conical crowns; the leaves often have elongated tips or apices (Hartshorn, 1983). The shrub layer consists of broad-leaved species, dwarf palms, and an abundance of lianas or vines, as well as epiphytes such as bromeliads, mosses, lichens, orchids, and vines (Bolaños *et al.*, 2005).

The authors reviewed data on Costa Rica in the GBIF database, looking for any specimens reported from the Nicoya Peninsula. The authors also reviewed the localities of the voucher specimens deposited at the Zoology Museum of the University of Costa Rica (MZ-UCR).

Results

On 5 July 2024 at 11:15 a.m., the researchers observed a Berthold's Bush Anole (Figure 2) near a small forest patch and a small belt of a dense scrub vegetation, about 80 m away from two small springs (10°01'22"N, 85°21'06"W, WGS84; 580 m elevation; Figure 1). The lizard was climbing a Kassod tree, *Senna siamea* (Caesalpinioideae), which is an introduced species native to southeastern Asia (Nsonde Ntandou *et al.*, 2010). This tree was planted and located in isolation within a pastureland (Figure 3).



Figure 2. A Juvenile individual of the Berthold's Bush Anole, *Polychrus guttuerosus*, observed in Hojancha, Guanacaste, Costa Rica. Photo by Gustavo Aguilera Castro.



Figure 3. The Kassod tree, *Senna siamea*, in the foreground on a pastureland where a Berthold's Bush Anole *Polychrus guttuerosus* was found in Hojancha, Guanacaste, Costa Rica. Gustavo Aguilera Castro.

The authors found ninety-eight records of the Berthold's Bush Anole in the GBIF database; however, none were from the Nicoya Peninsula. Additionally, no specimens of this species from this Costa Rican region were deposited in the MZ-UCR collection.

Discussion

This study reports the second individual of the Berthold's Bush Anole from the Nicoya Peninsula in northwestern Costa Rica. Two points are particularly noteworthy in this report. First, the confirmation of the extension of the distribution range of the Berthold's Bush Anole to the Nicoya Peninsula. Second, the information presented on the type of habitat in which this species has been observed on the Nicoya Peninsula.

Bringsøe *et al.* (2016) pointed out that the riparian habitat in Nicoya, although limited in extent during the dry season, is crucial for the survival of the Berthold's Bush Anole. They pointed out that populations of this species may most likely occur in other riparian areas of the peninsula. It is noteworthy that most of the Nicoya Peninsula is Tropical Moist Forest, not Dry Forest (Rodríguez-Ramírez and Mora, 2022). However, the authors agree that the riparian forests along rivers and streams in the peninsula constitute a more suitable habitat for the Berthold's Bush Anole because these areas are even more humid (Bringsøe *et al.*, 2016). There are some records of this species in riparian forests within the pine savannah ecosystems in Honduras (McCranie *et al.*, 2006).

Supposedly, the Berthold's Bush Anole is a diurnal and arboreal species, inhabiting mainly the forest canopy (Savage, 2002). The Dry Forest characteristics would constrain perch availability and the selection of potential sleeping sites because deciduous trees leave individuals more exposed to predators during the dry season. Consequently, lizards are obliged to increase their search for proper sleeping sites or use unsafe perches (Barquero *et al.*, 2024). Therefore, the moist forest may be somewhat more favorable for the Berthold's Bush Anole in this regard.

The thermal environment is also important when choosing a sleeping site, especially for ectothermic animals (Mohanty *et al.*, 2022; Barquero *et al.*, 2024).

However, the survival of this species in the Nicoya Peninsula may not be the issue, but rather its secretive habits. The Berthold's Bush Anole is a slow-moving, completely arboreal lizard usually found at night trying to select a sleeping spot in low shrubs or trees (Leenders, 2019). The rarity of this species may be due to the height above ground at which it lives (Roberts 1997; McCranie *et al.*, 2006). During the day, it is generally active in the tops of trees, including the crowns of emergent canopy trees more than 35 m above the forest floor (Leenders, 2019). Additionally, most herpetologists conduct their research in protected areas or pristine habitats and not in the disturbed areas that are now more extensive (Mora *et al.*, 2019). Degraded and secondary forests constitute about 50% of the remaining tropical forest (Latta *et al.*, 2017).

Although the presence of the Berthold's Bush Anole in the Nicoya Peninsula extends its distribution range in Costa Rica, it is important to note that most of the original forest in the Nicoya Peninsula has been cut, which decreases the chances of the Berthold's Bush Anole to survive in the region. Nevertheless, this species is listed under the Least Concern of the IUCN Red List (Acosta Chaves *et al.*, 2017). However, the status of its population is unknown (Acosta Chaves *et al.*, 2017). This is an uncommonly seen species, and although it occurs in a relatively large number of localities, the Berthold's Bush Anole is found in isolated populations and has a discontinuous distribution (Acosta Chaves *et al.*, 2017). As a result, the conservation status of the Berthold's Bush Anole is potentially inaccurate or with limited data (Antúnez-Fonseca *et al.*, 2022). Moreover, using the Environmental Vulnerability Score (EVS), this species presents a score of twelve, which signifies medium vulnerability (Antúnez-Fonseca *et al.*, 2022).

There is yet a relatively favorable spot for this species. Although the Berthold's Bush

Anole is supposedly restricted to primary lowland humid forests and marginally along stream courses (Savage, 2002), it also inhabits disturbed areas in some regions (McCranie *et al.*, 2006; Acosta Chaves *et al.*, 2017). Furthermore, this species is not utilized or traded to any significant degree (Acosta Chaves *et al.*, 2017). As a result, the main localized threat is deforestation (Acosta Chaves *et al.*, 2017).

The Berthold's Bush Anole may be more tolerant to habitat alteration than is currently thought. Due to its secretive behavior and excellent camouflage, this species is difficult to detect and is most likely underreported. The Berthold's Bush Anole is capable of considerable color change and can match its coloration with that of its backdrop (Savage, 2002). Its behavioral traits can further camouflage the species, as individuals mask their presence by superimposing a rocking motion on their forward movement to mimic wind-blown vegetation (Leenders, 2019).

Information on natural history, including perch height in the Berthold's Bush Anole, is scarce (Antúnez-Fonseca *et al.*, 2022). Some anecdotal data and basic information have been published recently by Antúnez-Fonseca *et al.* (2022) and Barquero *et al.* (2024). However, the record presented in this study helps understand the use of somewhat marginal habitats for this lizard and confirms its presence in the moist forest of the Nicoya Peninsula.

Acknowledgments

The authors acknowledge the information on the localities of the Berthold's Bush Anole deposited at the MZ-UCR provided by Gerardo Chaves (Cachí). JMM acknowledges Emilce Rivera of GEC, UTN Alajuela, while LIL is thankful to Daniel Tobías, UCB, and Uriel Rojas, ITA, both from UTN Atenas, for their invaluable academic support.

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