



## A new green anole lizard of the "Dactyloa" clade (Squamata: Dactyloidae) from the Magdalena river valley of Colombia

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### Abstract

We describe a new species of *Anolis* from the Magdalena river valley in Colombia. The new species is morphologically similar to *Anolis ibanezi* and *A. chocorum*, but differs in body and dewlap color, and head scalation. We performed an exploratory multivariate analysis based on 15 morphological characteristics of the new species and *A. chocorum* and found that differences between both species are mainly associated with head dimensions. A phylogenetic analysis based on morphological characters suggests that the new species is nested within the "Dactyloa" clade of *Anolis*. Finally, we discuss phylogenetic relationships and biogeographical affinities based in its distribution.

**Key words:** *Anolis*, taxonomy, Phylogenetics, morphology, Colombia, Magdalena river valley

### Resumen

Describimos una nueva especie de *Anolis* del clado "Dactyloa" que se distribuye en el valle del río Magdalena en Colombia con base en una combinación de caracteres morfológicos y de coloración. La nueva especie es morfológicamente similar a *A. ibanezi*, y *A. chocorum*, pero difiere en coloración del cuerpo y el pliegue gular y escamas de la cabeza. Elaboramos un análisis multivariado exploratorio con 15 caracteres morfométricos de la nueva especie y *A. chocorum*, encontrando que las diferencias entre estas dos especies están principalmente asociadas a las dimensiones de la cabeza. El análisis filogenético con base en caracteres morfológicos sugiere que *Anolis limón* **sp. nov.** se encuentra anidado dentro del clado "Dactyloa" de la radiación de *Anolis*.

**Palabras clave:** *Anolis*, taxonomía, filogenética, morfología, Colombia, valle del río Magdalena

### Introduction

The lizard genus *Anolis* (*sensu lato*) is composed of 388 species (Uetz & Hosek 2013), with many new species described every year (e.g., Ayala-Varela & Omar 2010; Vesely 2010; Lotzkat *et al.* 2011). In particular for South America, *Anolis* lizards are poorly known and many species are known from single specimens (e.g., *A. ibague* Williams 1975; *A. pronpiquus* Williams, 1984). Recent fieldwork and study of herpetological collections in South America has resulted in the discovery of new species (e.g., *A. otongae* Ayala-Varela & Velasco 2010, and *A. anoriensis* Velasco, *et al.* 2010) and improvement in our knowledge of species distributions (Torres-Carvajal *et al.* 2010; Ayala-Varela *et al.* 2011).

The anoline fauna in South America is composed of two clades, "Dactyloa" (Castañeda & de Queiroz 2011) and *Norops* (Nicholson 2002). Although these clades recently were recognized as genera by Nicholson *et al.* (2012), we reject this classification scheme because it leads to taxonomic instability, as was pointed out by Poe (2013). Instead, we prefer to use these names as clade names inside the *Anolis* radiation. "Dactyloa" is sister group

Our morphometric analyses suggested that the females of *Anolis limon* and *Anolis chocorum* differs mainly in head variables (see Table 2 and Figure 5). These morphological differences likely are associated to differences in diet and bite force (Herrel *et al.* 2001a; b), reflecting niche partitioning between species (Harmon *et al.* 2005).

The distribution of *Anolis limon* is restricted to the middle Magdalena region of Colombia (Figure 5). This restricted distribution provide additional support for the hypothesis that Magdalena region is an endemism area (Hernández-Camacho *et al.* 1992; Morrone 2001). Several species are known to be restricted to this region, like monkeys (e.g., *Saguinus leucopus* Günther 1877), birds (e.g., *Capito hypoleucus* Salvin 1897), frogs (e.g., *Agalychnis terranova* Rivera, Duarte, Rueda & Daza, 2013; *Allobates niputidea* Grant, Acosta & Rada 2007; *Dendrobates truncatus* Cope 1861), turtles (e.g., *Podocnemis lewyana* Duméril 1852) and other anole species (e.g., *A. ibague* Williams 1975).

The discovery of this new species highlights the need for extensive work with Colombian anoles. Additional research in Colombian herpetological collections supplemented by extensive fieldwork at several sites across the country likely will allow the discovery of new anole taxa. With the description of *Anolis limon* we have added another species to the Colombian anole fauna for a total of 75 species (Uetz & Hosek 2013). Despite limited sampling effort dedicated to anoles in Colombia, in comparison with other regions (e.g., Greater Antilles) Colombia has the highest anole diversity of any country (Uetz & Hosek 2013). The high diversity of *Anolis* species in Colombia offers an excellent opportunity for addressing evolutionary and ecological questions (see Molina-Zuluaga & Gutiérrez-Cárdenas 2007; Velasco & Herrel 2007; Calderón-Espinosa & Barragán-Forero 2011; Calderón-Espinosa *et al.* 2013; Moreno-Arias & Urbina-Cardona 2013). We encourage herpetologists to conduct biological studies focused on Colombian anole species. Such studies will contribute to a greater understanding of the ecological and evolutionary causes of the high diversity in Colombia.

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