

Discovery of the high-Andean anole *Anolis tetarii* (Squamata: Anolidae) in the Páramos of northern Colombia

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ABSTRACT - We present the fourth documented specimen and the first record of *Anolis tetarii* in Colombia, the least studied member of the *Phenacosaurus* clade of *Anolis* lizards. We showcase the first published photographs of the species, provide a succinct diagnosis, and discuss morphological variations compared to type specimens, and the species conservation status.

The genus *Anolis* Daudin, 1802 comprises the most diverse genus of terrestrial tetrapods, totalling 438 currently recognised species. These species are found across a geographical range that spans the south-eastern United States through Central America, South America and the Caribbean islands. Presently, 79 species of *Anolis* have been recorded in Colombian territory (Uetz et al., 2023). The *Phenacosaurus* series constitutes a clade of highland *Anolis* lizards within the northern Andes of Colombia, Ecuador and Venezuela. This group is characterised by distinct features including a large head, short limbs, varied scales on the flanks, a prehensile tail, a rectangular process of the ileum, and expanded toe pads extending from the base of the toes (Barbour, 1920; Dunn, 1944; Lazell, 1969; Moreno-Arias et al., 2023). This clade comprises 11 species, of which three were recently revalidated or described (Moreno-Arias et al., 2023). Previously, *Phenacosaurus* Barbour, 1920 was listed as a full genus, until Poe (1988) consolidated it within *Anolis* to maintain its monophyly. *Anolis euskalerreri* (Barros, Williams & Vilorio, 1996), *Anolis nicefori* (Dunn, 1944) and *Anolis tetarii* (Barros, Williams & Vilorio, 1996) constitute members of this species group that are found in the Serranía del Perijá. This region, forming the northern-most extent of the Andean mountain range, at its highest point marks the boundary between Colombia and Venezuela.

Anolis tetarii represents the most elusive member within the *A. heterodermus* group and is known solely through its type series, consisting of three specimens retrieved from the highest peaks of the Serranía de Perijá: Cerro Tetari or Cerro de la Teta (type locality) and Cerro Pintao or Cerro Pintado (paratype locality), situated on the Venezuelan side of the border. These specimens were collected at altitudes ranging from 2799 to 3020 m a.s.l. (Barros et al., 1996; Rivas et al., 2023). Records of this species are relatively old, with one paratype (MHNS 664; Museo de Historia Natural La Salle,

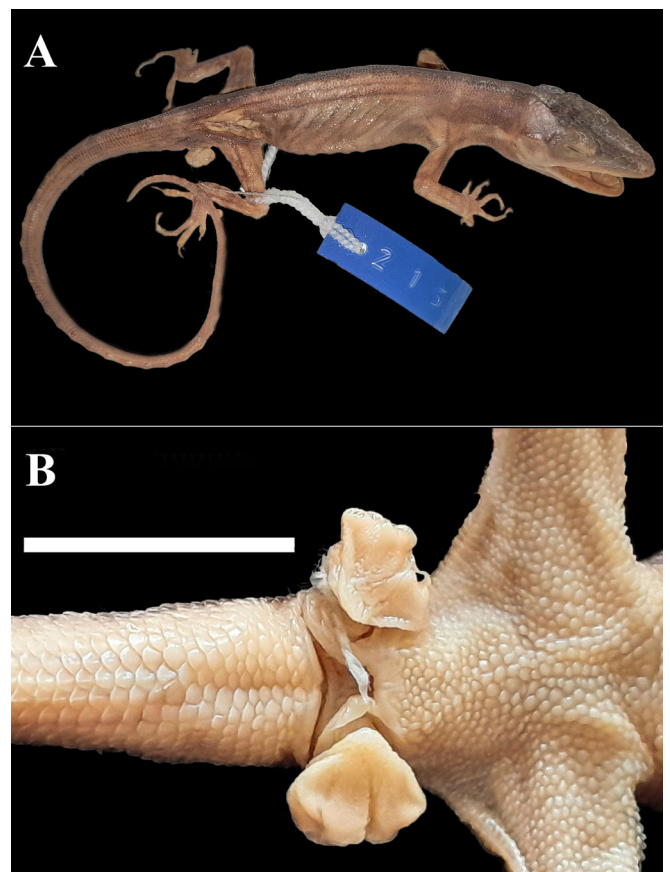


Figure 1. Holotype specimen of *Anolis tetarii* (MBLUZ-R-215) - **A.** Full body in dorsolateral view, and **B.** Postcloacal scales, scale bar = 10 mm

Caracas, Venezuela) having been collected in 1952, while the holotype (MBLUZ-R-215; Museo de Zoología de la Universidad de Zulia, Maracaibo, Venezuela) and the remaining paratype

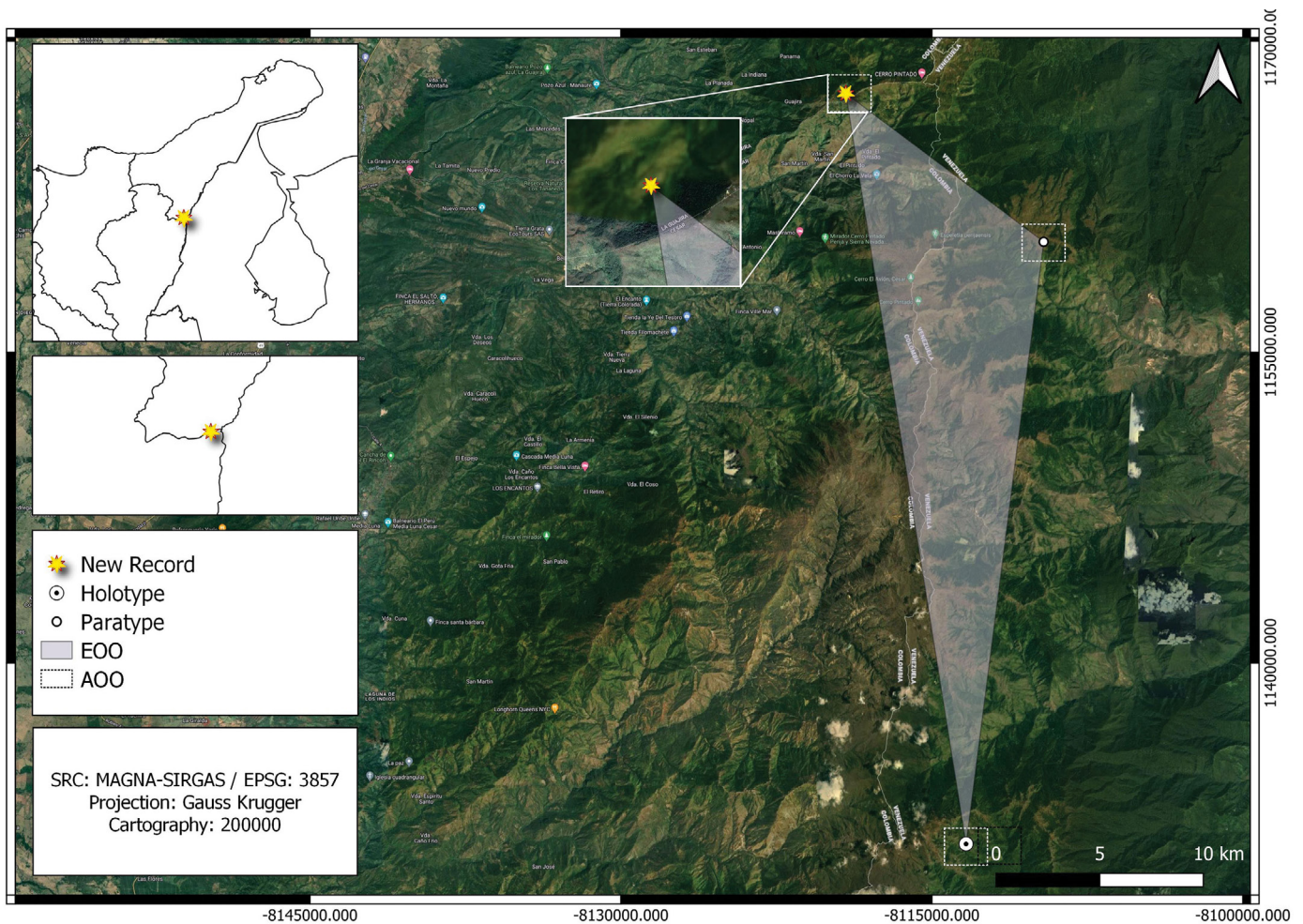


Figure 2. Known distribution of *Anolis tetarii*, EOO = extent of occurrence, AOO = area of occupation. The two line maps (top left) show the northern border of Colombia shared with Venezuela.

(MCZ: Herp:R-176474; Museum of Comparative Zoology, Cambridge, USA) were obtained in 1989. Despite the age of the records and the scarcity of available data, *A. tetarii* holds a classification of Least Concern on the IUCN Red List (Rivas & Schargel, 2020). However, it is important to exercise prudence in interpreting this categorisation, as many of the evaluation criteria for its conservation status remain undisclosed.

In September 2015, during an expedition to the Colombian side of the Serranía del Perijá, a single specimen from the *Phenacosaurus* clade was captured. This unidentified specimen was subsequently preserved and placed within the Reptile Collection of the Centro de Colecciones Científicas de la Universidad del Magdalena in Santa Marta, Magdalena, Colombia (CBUMAG:REP:00798). Upon closer examination, aided by the descriptions provided by Barros et al. (1996) and the morphological characterisation by Köhler (2014) concerning the genus *Anolis*, as well as the comparison with photographs of the holotype specimen (Fig. 1), we were able to definitively ascertain the identity of this lizard as the fourth recorded specimen of *A. tetarii*. This contribution serves a twofold purpose: to document, for the first time, the presence of this species within Colombian territory, and to describe certain facets of its external morphology, distribution, natural history, and conservation.

The specimen CBUMAG:REP:00798 was collected in the department (equivalent to state) of La Guajira, specifically in the municipality (analogous to county) of La Jagua del Pilar, within the village of El Espejo (coordinates: 10° 25'45.8" N, 72° 56'6.6" W; elevation: 2800 m a.s.l., as shown in Fig. 2). This location lies within the shrubland transitional zone that marks the interface between the high-Andean forest and páramo biomes. Notably, by the end of the 20th century, this area had undergone substantial degradation due to the illicit cultivation of opium poppy. Although these activities have purportedly ceased, the region still bears the brunt of degradation attributed to extensive cattle ranching. The specimen was encountered around 08:00 h while basking on a slender branch of a bush, positioned at a height of 230 cm.

This lizard was determined as *A. tetarii* by the following combination of characters: (1) the relatively large size (75 mm in snout-vent length), (2) heterogeneous dorsal squamation with (3) small granules surrounding the big and flattened scales, (4) continuous nuchal crest, (5) enlarged supralabials do not extend to the commissure of mouth, and (6) small yellow dewlap (note that this is visible even with the dewlap unextended, Fig. 3A). The count of canthals, loreals and postrostrals of the Colombian specimen (Fig. 3B, C) agree with that reported by Barros et al (1996). In the original description of the holotype it is stated that there is

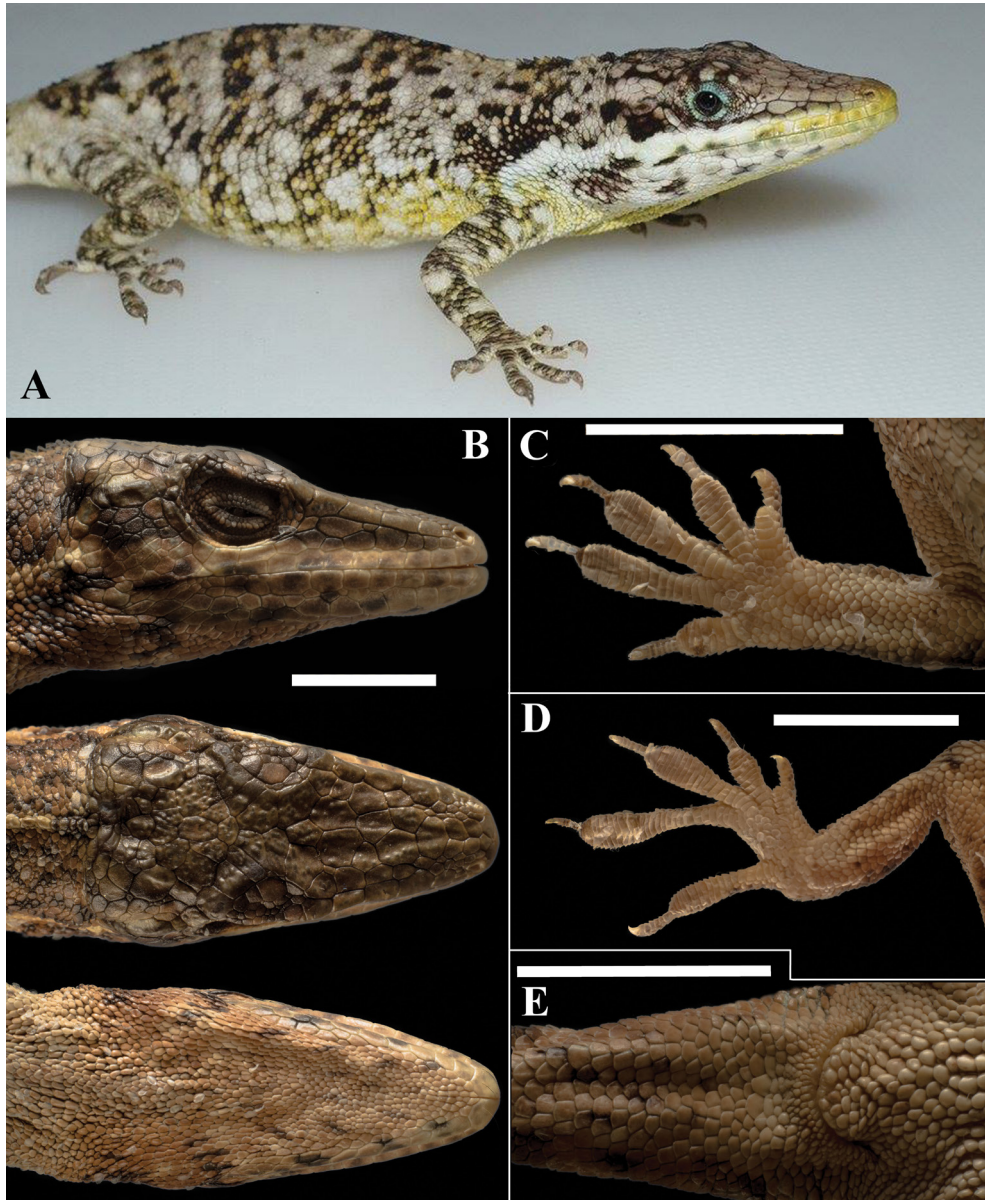


Figure 3. Detailed morphology of *Anolis tetarii* in life and of the specimen after preservation (CBUMAG:REP:00798) - **A.** Photograph in life, **B.** Head in lateral, dorsal, and ventral view, **C.** Right hand, **D.** Left leg, and **E.** Postcloacal scales, scale bars = 10 mm

a count of 21 lamellae under the entire fourth toe but a subsequent examination (made by Gilson Rivas, MBLUZ, correspondence dated 29 August 2023) determined that there are 35–36 lamellae under the fourth toe (phalanx I = 5, phalanx II–IV = 30–31, count for both feet), which is closer to the count of our specimen CBUMAG:REP:00798 for this character (phalanx I = 5, phalanx II–IV = 31, count for both feet; Fig. 3D). The preserved specimen was recognised as male by the direct test with a probe. Nevertheless, the significantly large postcloacal scales typical of male *Anolis* were not observed, neither in the holotype (Fig. 1B) nor in the Colombian specimen (Fig. 3E).

This lizard is easily distinguishable from the other two species of the *Anolis heterodermus* group which occur in the Serranía de Perijá, *A. euskalerrari* and *A. nicefori* (Lazell, 1969; Barros et al., 1996; Moreno-Arias et al., 2023), by the presence of dorsal crest (absent in *A. euskalerrari*),

heterogeneous dorsal squamation (homogeneous in *A. euskalerrari*), small granules between flattened dorsal scales (absent in *A. nicefori*), and fewer canthals (four in *A. tetarii*, six in *A. euskalerrari*, six to eight in *A. nicefori*). In addition, *A. tetarii* can be distinguished from *Anolis richteri* (Dunn, 1944), which is the most similar species from the Cordillera Oriental (equivalent of Eastern Andes) of Colombia, by the dewlap coloration in males (white-cream to pink coloured dewlap), a greater count of supralabials at centre of eye (8–10 in *A. tetarii*, 7–8 in *A. richteri*) and the smaller size of postcloacal scale in males (enlarged in male *A. richteri*).

This discovery marks the first documented record of *A. tetarii* in Colombia and represents the fourth known specimen of this species. The locality of the Colombian specimen is at a distance of 11.6 km in straight line from the paratype locality and 35.8 km in straight line from

the holotype locality. When combined, these localities delineate an extent of occurrence (the area occupied by the convex polygon formed by the outermost points of the distribution range) spanning 146 km² and an area of occupation (the number of 2 km² plots containing at least one record of the species when the distribution map is gridded) covering 12 km². Based on the new evidence, the Least Concern classification proposed by Rivas & Schargel (2020) should be reconsidered. While they assert that the species thrives in remote, unpopulated and well-preserved regions, this dynamic changes markedly within Colombian populations. Notably, the Colombian páramos of Perijá experience a greater degree of degradation compared to their Venezuelan counterparts due to higher population densities, increased disturbance and a lack of protected areas (Rangel-Ch., 2007; Instituto Alexander von Humboldt, 2017). Furthermore, the lack of quantitative assessments concerning potential habitat loss and population status exacerbates the situation. In light of this, the known distribution does not provide sufficient information to support the current classification, prompting us to advocate for a more fitting categorisation of Data Deficient (DD) for the conservation status, as supported by the newfound evidence. Notably, this finding also contributes to a milestone for Colombian herpetology as it constitutes the 80th confirmed *Anolis* species within the country.

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REFERENCES

- Barbour, T. (1920). A note on *Xiphocercus*. *Proceedings of the New England Zoölogical Club* 7: 61–63.
- Barros, T., Williams, E.E. & Vilorio, A.L. (1996). The genus *Phenacosaurus* (Squamata: Iguania) in western Venezuela: *Phenacosaurus tetarii* new species, *Phenacosaurus euskalerriari*, new species, and *Phenacosaurus nicefori* Dunn, 1944. *Breviora* 504: 1–30.
- Daudin, F.M. (1802). *Histoire Naturelle, Générale et Particulière des Reptiles*, Vol. 4. F. Dufart. 397 pp.
- Dunn, E.R. (1944). The lizard genus *Phenacosaurus*. *Caldasia* 3: 57–62.
- Instituto Alexander von Humboldt. (2017). *Recomendación para la delimitación, por parte del Ministerio de Ambiente y Desarrollo Sostenible, del Complejo de Páramos Perijá a escala 1:25.000*. Instituto de Investigación de Recursos Biológicos Alexander von Humboldt, Fondo Adaptación. 132 pp.
- Köhler, G. (2014). Characters of external morphology used in *Anolis* taxonomy - Definition of terms, advice on usage, and illustrated examples. *Zootaxa* 3774: 201–257.
- Lazell, J.D. (1969). The genus *Phenacosaurus* (Sauria, Iguanidae). *Breviora* 325: 1–24.
- Moreno-Arias, R.A., Méndez-Galeano, M.A., Beltrán, I. & Vargas-Ramírez, M. (2023). Revealing anole diversity in the highlands of the Northern Andes: new and resurrected species of the *Anolis heterodermus* species group. *Vertebrate Zoology* 73: 161–188.
- Poe, S. (1998). Skull characters and the cladistic relationships of the Hispaniolan dwarf twig *Anolis*. *Herpetological Monographs* 12: 192–236.
- Rangel-Ch., J.O. (2007). *Colombia Diversidad Biótica V La alta montaña de la Serranía de Perijá*. Instituto de Ciencias Naturales, Universidad Nacional de Colombia. 472 pp.
- Rivas, G. & Schargel, W. (2020). *Anolis tetarii*. The IUCN Red List of threatened species 2020: e.T67609886A67609907. <https://www.iucnredlist.org/species/67609886/67609907>. Accessed on 16 August 2023.
- Rivas, G.A., Sibira, L.E. & Barros, T.R. (2023). Catalogue of type specimens in the amphibians and reptiles collection of the Museo de Biología, Universidad del Zulia (MBLUZ), Maracaibo, Venezuela. *Anartia* 35: 14–21.
- Uetz, P., Freed, P., Aguilar, R., Reyes, F. & Hošek, J. (2023). The Reptile Database, <http://www.reptile-database.org>. Accessed on 16 August 2023.

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