



<http://dx.doi.org/10.11646/zootaxa.3774.3.1>

<http://zoobank.org/urn:lsid:zoobank.org:pub:FD288677-4560-47B9-AC34-2819F318F11F>

Characters of external morphology used in *Anolis* taxonomy—Definition of terms, advice on usage, and illustrated examples

GUNTHER KÖHLER

Forschungsinstitut und Naturmuseum Senckenberg, Senckenberganlage 25, 60325 Frankfurt a.M., Germany.

E-mail: gkoehler@senckenberg.de

Abstract

With the aim of establishing a reference for taxonomists, I describe and discuss characters of external morphology that have been used widely in descriptions of *Anolis* (sensu lato) species. For most characters, images are provided to illustrate the terms and definitions. Where appropriate, I give advice on how the counts and measurements should be done.

Key words: Reptilia, *Anolis*, external morphology, definition of terms

Resumen

Con la importancia de establecer una referencia para los taxonomistas, describo y discuto caracteres de morfología externa que han sido utilizados ampliamente en las descripciones de las especies de *Anolis* (sensu lato). Para la mayoría de los caracteres, proporciono imágenes para ilustrar los términos y definiciones. Según necesidad brindo asesoramiento sobre cómo se deben hacer los conteos y las mediciones.

Introduction

Anolis are important research organisms and many articles are published every year dealing with different aspects of the biology of these lizards. However, at this point we still lack detailed and standardized descriptions of all recognized species of *Anolis*. The species descriptions found in original descriptions, reviews of species groups, or faunal treatments are extremely heterogeneous in regard to content, usage of terms, semantic issues, and characters included. For example, some authors (e.g., Underwood & Williams 1959; Savage & Villa 1986; Köhler 2008) count the number of subdigital lamellae under Phalanges II–IV whereas others (e.g., Schwartz 1973; Williams 1995; Poe *et al.* 2012) report only the lamellae under Phalanges II and III. Even when the same characters are reported, often differences in definitions are evident with different authors scoring the same character differently, i.e., having different threshold levels for scoring qualitative characters (e.g., whether to consider a scale to be smooth, faintly, or weakly keeled, or not, slightly or distinctly enlarged relative to adjacent scales). Also, the way the data are generated can differ widely depending on the applied methodology.

In 1995, Williams provided definitions for 37 morphological characters intended for usage in a computerized key for anoles. Williams' (1995) approach aimed mostly to bring definitions and encodings of morphological characters usable in a computer program. Therefore, he was forced to simplify many of the included character states thereby masking the extent of variation actually observed in the genus *Anolis*.

This article aims to provide definitions of external morphological characters that are useful in *Anolis* taxonomy with the goal of establishing a reference for future taxonomic work with these lizards. I am confident that a description containing the set of characters defined here will be reasonably complete for the majority of species. In species that show special morphological differentiations (such as the rostral appendage in *A. proboscis*), these special features need to be addressed of course. I have included many images illustrating the variation in the

References

- Fitch, H.S. & Hillis, D.M. (1984) The *Anolis* dewlap: Interspecific variability and morphological associations with habitat. *Copeia*, 1984, 315–323.
<http://dx.doi.org/10.2307/1445187>
- Köhler, G. (2008) *Reptiles of Central America*. Second edition. Herpeton, Offenbach, 400 pp.
- Köhler, G. (2011) A new species of anole related to *Anolis altae* from Volcán Tenorio, Costa Rica (Reptilia, Squamata, Polychrotidae). *Zootaxa*, 3120, 29–42.
- Köhler, G. (2012) Taxonomic status of two enigmatic Mexican anoles: *Anolis cumingii* Peters 1863 and *Anolis guentherii* Bocourt 1873 (Reptilia, Squamata, Dactyloidae). *Zootaxa*, 3551, 82–88.
- Köhler, G., Dehling, M. & Köhler, J. (2010) Cryptic species and hybridization in the *Anolis polylepis* complex, with the description of a new species from the Osa Peninsula, Costa Rica (Squamata: Polychrotidae). *Zootaxa*, 2718, 23–38.
- Köhler, G. & Vesely, M. (2003) A comparison of *Norops petersii* (Bocourt) and Central American *N. biporcatus* (Wiegmann), with notes on the holotype of *D.[actyloa] biporcata* Wiegmann (Reptilia, Squamata: Polychrotidae). *Senckenbergiana Biologica*, 82, 223–233.
- Lazell, J.D. (1972) The anoles (Sauria, Iguanidae) of the Lesser Antilles. *Bulletin of the Museum of Comparative Zoology*, 143, 1–115.
- Lotzkat, S., Hertz, A., Bienentreu, J.-F. & Köhler, G. (2013) Distribution and variation of the giant alpha anoles (Squamata: Dactyloidae) of the genus *Dactyloa* in the highlands of western Panama, with the description of a new species formerly referred to as *D. microtus*. *Zootaxa*, 3626 (1), 1–54.
<http://dx.doi.org/10.11646/zootaxa.3626.1.1>
- McCranie, J.R., Cruz, G.A. & Holm, P.A. (1993) A new species of cloud forest lizard of the *Norops schiedei* group (Sauria: Polychrotidae) from northern Honduras. *Journal of Herpetology*, 27, 386–392.
<http://dx.doi.org/10.2307/1564824>
- Poe, S. (2004) Phylogeny of anoles. *Herpetological Monographs*, 18, 37–89.
[http://dx.doi.org/10.1655/0733-1347\(2004\)018\[0037:poa\]2.0.co;2](http://dx.doi.org/10.1655/0733-1347(2004)018[0037:poa]2.0.co;2)
- Poe, S. (2013) 1986 Redux: New genera of anoles (Squamata: Dactyloidae) are unwarranted. *Zootaxa*, 3626 (2), 295–299.
<http://dx.doi.org/10.11646/zootaxa.3626.2.7>
- Poe, S., Ayala, F., Latella, I.M., Kennedy, T.L., Christensen, J.A., Gray, L.N., Blea, N.J., Armijo, B.M. & Schaad, E.W. (2012) Morphology, phylogeny, and behavior of *Anolis proboscis*. *Breviora*, 530, 1–11.
<http://dx.doi.org/10.3099/530.1>
- Sabaj Pérez, M.H. (2010) Standard symbolic codes for institutional resource collections in herpetology and ichthyology. an online reference. Version 1.5 (4 Oct 2010). Available from: <http://www.asih.org/> (accessed 07 June 2013)
- Savage, J.M. (2002) *The amphibians and reptiles of Costa Rica. A herpetofauna between two continents, between two seas*. University of Chicago Press, Chicago, xx + 934 pp.
- Savage, J.M., & Villa, J. (1986) Introduction to the Herpetofauna of Costa Rica. Society for the Study of Amphibians and Reptiles, *Contributions to Herpetology*, 3, 1–207.
- Schwartz, A. (1973) A new species of montane *Anolis* (Sauria, Iguanidae) from Hispaniola. *Annals of Carnegie Museum*, 44, 183–195.
- Smith, H.M., Burley, E. & Fritts, T. (1968) A new anisolepid *Anolis* (Reptilia: Lacertilia) from México. *Journal of Herpetology*, 2, 147–151.
<http://dx.doi.org/10.2307/1563115>
- Underwood, G. & Williams, E.E. (1959) The anoline lizards of Jamaica. *Bulletin of the Institute of Jamaica, Science Series*, 9, 1–48.
- Williams, E.E. (1995) A computer approach to the comparison and identification of species in difficult taxonomic groups. IV. The morphological characters used in the Anolekey described, defined, and illustrated. *Breviora*, 502, 15–37.