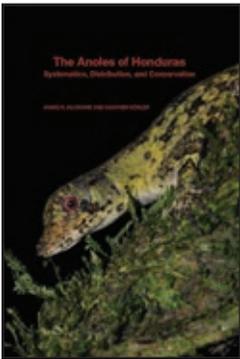


## BOOK REVIEWS

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### The Anoles of Honduras

James R. McCranie and Gunther Köhler. 2015. *Bulletin of the Comparative Zoology, Special Publications Series, No. 1* ([www.hup.harvard.edu](http://www.hup.harvard.edu)). [iv] + 292 pp. Softcover. US \$24.95. ISBN 9780674504417 (electronic version available free of charge at [http://mczbase.mcz.harvard.edu/specimen\\_images/publications/Bulletin\\_SPS1.pdf](http://mczbase.mcz.harvard.edu/specimen_images/publications/Bulletin_SPS1.pdf)).



#### LEVI GRAY

Department of Biology and Museum of Southwestern Biology,  
University of New Mexico, Albuquerque, New Mexico 87131, USA  
e-mail: [lngray@unm.edu](mailto:lngray@unm.edu)

Although anoles might be better known as a remarkable example of adaptive radiation in the Caribbean, the dirty secret is this: the mainland has greater diversity. Our knowledge of mainland anole biology lags behind that of island species (Losos

2009), though various workers, Gunther Köhler and Randy McCranie included, have worked tirelessly to make up some of that ground. While basic ecological studies are still sorely needed for most species, large strides have been made in our alpha taxonomic knowledge in the mainland.

Which brings us to Honduras and this book. That *The Anoles of Honduras* can exist in its current form is a testament to McCranie, Köhler, Larry David Wilson, and colleagues. Thanks to these researchers, herpetologists now have access to several books detailing the herpetological diversity in this Central American country (McCranie and Wilson 2005; McCranie et al. 2006; Köhler 2008; Townsend and Wilson 2008; Köhler 2011; McCranie 2011). Much of what makes Honduras special is its location. Although the majority of Honduras lies within what is commonly known as Nuclear Central America, it differs from the other countries in the extent of biogeographic overlap with lower Central America. The book is therefore generally useful for the Nuclear Central American region as well as Nicaragua, and, to some extent, Costa Rica. Most major Central American anole species groups are represented in the Honduran anoline fauna, and this book is a solid place to become familiar with the morphology and basic natural history of Central American anoles. And, as far as anole expertise goes, the authors had a hand in describing 16 (out of 40, or 40%) of the species known from the country, which likely explains why the species accounts contain such detailed information. Clearly, McCranie and Köhler have spent countless hours in the field and looking at specimens, and this book would not have been possible without such dedication.

The book begins with an Introduction, a Materials and Methods section, and a brief overview of the history of anole work in Honduras. These sections are short and informative. After explaining their decision to use the Nicholson et al. (2012) taxonomic classification for anoles (discussed below), they briefly address the “ecomorph” vs “ecomode” topic that was also raised in the Nicholson et al. work (2012). I agree with the authors on this topic that the term “ecomode” was not well defined and that most of Nicholson et al.’s (2012) assignments were both subjective and based on very little information. McCranie and Köhler’s decision to describe their direct ecological and morphological observations for the anoles of Honduras is much more useful than “ecomode” assignments would have been, and ecomorph assignments would have been equally inappropriate given the evidence that the well-defined island ecomorph classes are by and large unsuitable for describing the ecomorphological diversity of mainland anoles (Schaad and Poe 2010).

The authors made their case for the use of Nicholson et al.’s (2012) taxonomy for anoles as part of their Materials and Methods. I find their arguments to be misleading—the focus is mostly on Poe’s (2013) statements on taxon sampling, data limitations, and monophyly among the proposed genera. Yet the most important arguments put forth by Poe (2013) for maintaining *Anolis* as a single, large genus lie in the fact that there are no scientific reasons to split up the genus that everyone acknowledges is monophyletic. There are numerous interpretations of the same phylogeny (i.e., generic divisions) that would be equally viable, and there is no objective reason to accept any particular arrangement over another. Alternative arrangements are presented in Poe (2013: fig. 1), along with a discussion for each. Nicholson et al. (2014) have made clear their purpose for dividing *Anolis* into eight genera: they want recognition of the genus *Norops* (Nicholson et al. 2012: p. 117), demonstrating the subjectivity highlighted by Poe (2013). Some will use the Nicholson (2012) classification for anoles but the majority of anole researchers have stuck to the one-genus arrangement for the time being. It should be noted that a rankless taxonomic system (PhyloCode: de Queiroz, 2006) would allow use of clade names without the problems that go along with the Nicholson et al. (2012) treatment.

The species accounts make up the majority of the book, and are more than worth the price of admission. This section is where the book shines and will prove valuable to researchers in Central America for the foreseeable future. There is a wealth of information on scale traits and coloration, useful for anyone in need of a data set for analyses involving morphology. There are figures, distributional information, and photographs for all 39 species from Honduras known to the authors (a 40<sup>th</sup> species, *Anolis wermuthi*, was reported from near the Nicaragua border shortly before proofs were finalized; Sunyer et al. 2013). Before this book, identifying anoles in Honduras required a fair amount

of knowledge and experience. Now a researcher or enthusiast can travel to Honduras and with a little investigative work, identify male anoles without too much trouble. The photos of the male dewlaps provided for each species are a key inclusion. Although some of the images are less than stellar, it's impressive enough that the authors were able to compile photos of all 39 species. This fact alone makes the book quite valuable.

I came across occasional mistakes in the species accounts but none were especially problematic. For example, in the *Anolis beckeri* account, the authors describe the distribution as occurring from the Mexican state of Tabasco to Nicaragua. The actual distribution of this species begins considerably farther to the north and west, into the states of Veracruz and Oaxaca, at the very least. The species account even references a population from Veracruz in the natural history section. Most mistakes were similarly small and of little importance.

The later sections of the book include a dichotomous key, assorted information on the distribution and biogeography, and conservation status. I found these sections to be generally informative, with some caveats. For one, anyone who has used (or attempted to use) Köhler's dichotomous key for anoles in *Reptiles of Central America* (Köhler 2008) is aware that this type of key is likely to test the patience of even the most level-headed herpetologist. There are too many species and many of the traits used are not easily scored, so that someone without much anole experience has no chance of effectively navigating through the key. The key in this book deals with fewer taxa and has more figures to help with scoring traits, but I must offer a word of warning for anyone attempting to use it alone as a way of identifying individuals: prepare for frustration. This is not the fault of the authors, of course—the species diversity and limited number of useful traits for identification are the true culprits. The best advice I can give for an inexperienced researcher/traveler is to find an adult male. Juveniles and even adult females are often remarkably similar between species. It's all about the dewlaps and the quicker you learn that, the better.

Unlike in much of Nuclear Central America, the mountain ranges in Honduras tend to be lower and less connected to each other, with the geographic separation perhaps producing a stronger pattern of isolation in the various reptiles and amphibians inhabiting the region. A number of endemic species have been described from Honduras in the past 20 years, and the rate at which they are being described has not slowed. This book offers considerable information on these endemics, allowing interested researchers an opportunity to pursue a multitude of questions relating to diversification in the region. For instance, why are there endemic species related to *Anolis laevis* in Honduras? *Anolis laevis* is currently considered to be a widespread species (from Panama to Mexico) and the presence of diagnosable microendemic species of this form only within Honduras seems odd. Phylogeography of the *A. laevis* group would be quite illuminating, as would further work on any of the anole groups generally considered to be composed of mid- to high-elevation isolates such as *Anolis pijolense* and *A. purpurularis*.

One thing readers of this book may notice is the high number of subtly-diagnosed Honduran species that have small distributions and are presumed to be isolates of more widely distributed species (e.g., *Anolis bicaorum*, *A. morazani*, *A. roatanensis*, *A. rubribarbaris*, *A. utilis*, *A. wampuensis*, *A. zeus*). I am hoping that this book will trigger further taxonomic work on these groups so that we can get a better handle on whether these

purportedly isolated lineages are indeed legitimate species. For instance, the account for *A. wampuensis* states that the only major difference between this form and *A. tropidonotus* is an "extreme" difference in habitat—the latter has never been found in Honduras in "undisturbed broadleaf rainforest." The explanation seems strange, considering *A. tropidonotus* is found in a wide variety of lowland habitats (based on personal experience in both Mexico and Honduras) and there is likely to be very little undisturbed broadleaf rainforest left in the country. According to the book, *A. tropidonotus* is found in more departments than any other species in the country, has a wider elevational distribution than any other species, and occurs in the most "physiographic" areas as defined by the authors. And looking at the distribution maps, it appears *A. wampuensis* simply fills a small gap in the range of the more widespread, nearly continuously distributed *A. tropidonotus*. Minor dewlap differences have been reported, but that would be more consistent with some form of clinal variation in dewlap coloration, adaptation to local conditions, individual variation, or between-population variation. Complicating matters even further was the designation of *A. wampuensis* as one of the two most vulnerable anole species in the country, a bold assessment considering how likely this population is to simply be a representative of one of the least vulnerable anole species in Honduras (by any estimation), *A. tropidonotus*. While going through the species accounts, I was surprised by the number of species described with similarly limited evidence.

Some of these questionable species are diagnosed primarily based on limited observations of hemipenes, an increasingly common practice in anole systematics that I believe needs to be carefully evaluated and perhaps reconsidered. My concerns stem from a few observations made from published works, conference talks, and my own experiences working on the *Anolis sericeus* group. To begin with, it has been noted that hemipenes evolve much faster than other measured morphological traits in anoles (Klaczko et al. 2015). This fact alone can mean that differentiation in hemipenial traits can occur prior to speciation, and many species will be polymorphic for these traits. Furthermore, there is no evidence that reproductive isolation results from closely related populations with differentiated hemipenes. For example, Köhler and colleagues presented evidence against such reproductive isolation in follow-up work on *A. osa* (Köhler et al. 2012), which was described entirely on differences in hemipenial morphology (Köhler et al. 2010). Given the evidence from Köhler et al. (2012), the obvious conclusion is that *A. osa* should not be recognized as a distinct species. Results from a recent systematic study of the *A. humilis* group using molecular data (Phillips et al. 2015) were not consistent with Köhler et al.'s (2006) findings that relied heavily on hemipenial morphology. Finally, my own work on silky anoles (*A. sericeus* group) is in agreement with the *A. humilis* findings—evolutionary lineages, as deduced from multigene evidence (Gray, unpubl. data), are not at all concordant with the distributions of forms associated with hemipenes (Köhler and Vesely 2010). I worry that these traits have little to do with species differentiation and many species are being described under false assumptions. Even if hemipenial traits are found to be fixed within populations in anoles (a doubtful proposition given the rapidity of evolution in hemipenial morphology), intraspecific variation and interpopulation differentiation exist for many traits. The observation that a particular population can be diagnosed morphologically is not sufficient grounds for describing a population as a distinct species under any widely used species concept currently in practice.

To be clear, the issues I raised concerning species limits and taxonomy are largely the result of reading this volume, which contains a wealth of information. The authors present an account of the Honduran anole fauna that is more thorough than any previous summary of anole diversity for any country. *The Anoles of Honduras* is a must-have for any anole researcher in Central America and would be a good pickup for anyone with a general research interest on anoles. And I haven't even gotten to the best part—the price! Although can order a hard copy for a very reasonable price, an electronic copy is free. The bar has now been set—it would be fantastic if someone could take on an even more challenging country such as Panama!

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## Bushmaster: Raymond Ditmars and the Hunt for the World's Largest Viper

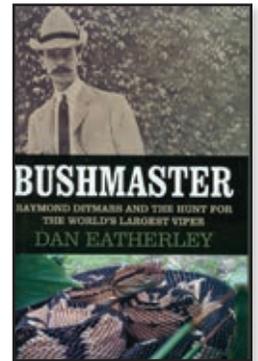
Dan Eatherley. 2015. Arcade Publishing, New York ([www.arcadepub.com](http://www.arcadepub.com)). xxiv + 303 pp., 16 pp. pls. Hardcover. US \$24.99. ISBN 978-1-62872-511-7.

### RAYMOND J. NOVOTNY

Ford Nature Center, Mill Creek MetroParks

Youngstown, Ohio 44511

e-mail: raynovotny@yahoo.com



JUST LIKE A COFFIN. So begins this part biography and part personal quest, sprinkled with just a bit of danger and death. Dan Eatherley immediately grabs the reader with his retelling of a scene from Raymond L. Ditmars's "Episode of the Bushmaster" from *Thrills of a Naturalist's Quest*, a 1932 classic I first read nearly 40 years later. In the prologue, "His Unwavering Grip," readers learn that the author is a British zoologist and filmmaker who discovered Ditmars while working on a project with Rom Whittaker in Costa Rica. He first wanted to make a film, but after 9/11 the industry changed drastically, eliminating that possibility. In his book, the bushmaster serves as a sort of "MacGuffin," the device filmmakers use to drive a story.

The author's approach, in fifteen chapters, each of which begins with a pithy Ditmars quote, is to alternate between his odyssey and a paraphrasing of stories Ditmars shared in his many books, or that appeared in *The New York Times* and other newspapers.

In "Working up Snakes" (the chapter titles are also Ditmars quotes found within the chapter. You'll have fun trying to find them!) a teenage Raymond L. Ditmars (RLD) meets "Professor George O'Reilly" at the Central Park Zoo, perhaps his first introduction to the bushmaster? Dan accompanies Regina Alvarez of the Central Park Conservancy to Central Park and its Zoo, the first of many visits to Ditmars's haunts.

In "Pleased with a Rattler, Ticked with its Fang," in the library at the American Museum of Natural History, Dan delves into how RLD's first association with science and scientists began. With several local herp enthusiasts, Peter Warny, Steve Ricker, and Erik Zeidler, he seeks snakes "within 50 miles of New York City" (also the title of RLD's first publication).

"Silent Death of the Black Night" begins with what is likely RLD's first long trip, by ship to Florida with John Bernhardt Smith, an entomological associate of his AMNH supervisor William Beutenmuller. RLD's family allows snakes in their new home, and he strives to fill up the attic. R. R. Mole of Trinidad, who would supply the original bushmaster, appears.

In "The Master of Snakes," after much difficulty, Dan succeeds in finding someone to escort him to Timber Rattlesnake dens RLD might have visited: Edwin McGowan of Palisades Interstate Park Commission. The famous "Episode" is touched upon. RLD's fame begins as does his reporter position with the *New York Times*.