

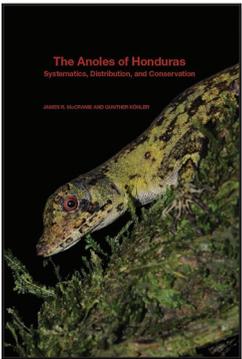
BOOK REVIEWS

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The Anoles of Honduras

James R. McCranie and Gunther Köhler. 2015. *Bulletin of the Museum of Comparative Zoology, Special Publications Series, No. 1* (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).



LEVI GRAY

Department of Biology and
Museum of Southwestern Biology,
University of New Mexico,
Albuquerque, New Mexico 87131, USA
e-mail: lgray@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 40th 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 one 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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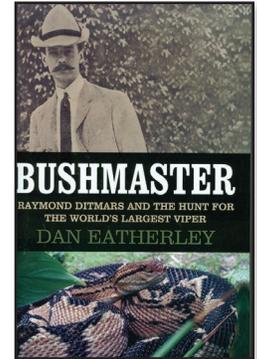
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Bushmaster: Raymond Ditmars and the Hunt for the World's Largest Viper

Dan Eatherley. 2015. Arcade Publishing, New York (www.arcadepub.com). 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, USA
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' "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. Is this perhaps his first introduction to the bushmaster? Eatherley accompanies Regina Alvarez of the Central Park Conservancy to Central Park and its Zoo, the first of many visits to Ditmars' haunts.

In "Pleased with a Rattler, Ticked with its Fang," in the library at the American Museum of Natural History (AMNH), Eatherley 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 Beutenmüller. 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, Eatherley succeeds in finding Edwin McGown of the Palisades Interstate Park Commission to escort him to Timber Rattlesnake (*Crotalus horridus*) dens RLD might have visited. The famous "Episode" is touched upon. RLD's fame begins as does his reporter position with *The New York Times*.

"A Snapping Turtle in a Tin Bath tub" opens with the American Inter-Continental Exhibition of Reptiles, a large event RLD assisted in organizing, that might have been another reason William Hornaday offered him a position at the New York Zoological Park. The origin of what came to be called the Bronx Zoo encompasses the bulk of this chapter. Eatherley peruses the scant Ditmars material in the zoo library, disappointed about not finding a single reference to bushmasters.

"A Decided Awakening of Unbiased Interest" revisits opening day of the Bronx Zoo, 8 November 1899, and delves into the early years. Eatherley visits the Reptile House, now rebranded "World of Reptiles" with collections manager Chris Hutson.

In "Reptilian Devilry of the World," RLD and head keeper Charley Snyder recapture two immense King Cobras accidentally released by animal dealer William Bartels. They later force feed a python. At the "best Italian restaurant in the Bronx" Eatherley visits Bronx Zoo retiree Peter Brazaitis, who regales him with stories, probably also published in his memoir, *You Belong in a Zoo!* The next day Peter takes him to the New York/Connecticut border where RLD likely searched for *Crotalus horridus*. Eatherley discusses RLD's attempts at veterinary work.

"A Sort of Freemasonry" opens with RLD and his family, keeper Snyder, and several others in South Carolina. The Pinelands Club there served as the base for collecting southeastern species for the zoo collection. His two teen daughters stayed back at a cabin during the hunt and with their grandfather, end up catching the biggest diamondback! With Ed McGowan, Eatherley returns to timber country and almost steps on one. We learn about the bite that Ed's colleague, William H. "Marty" Martin, survives.

RLD, with Snyder's assistance, milks a Fer-de-lance (*Bothrops asper*), which introduces "A Messy Business," a chapter about snakebite and its treatment both now and years ago. In the zoo archives again, Eatherley now reads over bushmaster records in bulletins and reports. None survives long. Curator Don Boyer explains the success of keeping them now.

In "A Sympathetic Knowledge," after depicting a performance of the Bronx Zoo Reptile Circus at the Waldorf-Astoria, Eatherley sits in the New York Public Library and pores over articles featuring Ditmars, leading to a discussion of RLD's own writing, declaring it "precise, readable, and entertaining." He mentions something I've always cherished: President Theodore Roosevelt's praise for *The Reptile Book*, including an open invitation to the White House. Can you imagine that happening today? There's an overview of RLD's attempts at research in primate intelligence and his public speaking. His lectures, of course, always included live animals and photographic slides. Soon he would incorporate another medium.

"The Stage of Nature" begins with RLD, his wife Clara, and assistant "Andy," filming a Fer-de-lance at the Ditmars' residence. The scene, of course, goes awry with the serpent unexpectedly slithering off stage down to the floor. "Don't worry," laughs Clara struggling to her feet. "It missed!" Eatherley visits the Westchester County Archives where he studies a copy of the Ditmars' will: Approximately 270 cans of film, perhaps 300,000 feet and 150 hours of viewing, appraised at \$5000. Although few now survive, these enhanced his lectures and were even shown in movie theaters. "Andy" convinced RLD to add the emotion and humor the theaters demanded, resulting in "The Jungle Circus" eventually the ending of his six-reel masterpiece "The Book of Nature." Our author/filmmaker provides pages of details of RLD's work with film. He savors the existing films he views at the Library of Congress.

Finally to the tropics in "A Naturalist's Paradise"! The Ditmars family spends *muchas semanas en Honduras* battling mosquitos while searching for snakes. The author visits the Smithsonian's Museum Support Center and examines preserved specimens associated with RLD. He sees his first bushmaster, albeit pickled. After retelling the story of the Zoo's first-ever snakebite in 1916, which almost killed keeper John Toomey, he introduces the Antivenin Institute of America.

In "The Main Thing Is the Bushmaster," RLD searches successfully for vampire bats in Panama, accompanied by Arthur Greenhall, perhaps somewhat the son he never had, but yet again strikes out with *Lachesis*. Eatherley fares better during his visit with Dean Ripa at his Cape Fear Serpentarium in North Carolina, where he finally sees living bushmasters.

"Six Feet Long and Vicious" focuses on Trinidad. R. R. Mole had sent the bushmaster featured in the "Episode," and almost every other specimen exhibited at the Zoo, from there. Both RLD and Eatherley visit the island nation. Thanks to his colleague Friedrich William "Jangoon" Urich, RLD brings back the Zoo's first specimen in decades. Eatherley begins networking for advice about bushmasters. At the Emperor Valley Zoo, he talks with keeper Delbert Charleau, Jr. With his cousin's husband Ian, a native Trinidadian, they seek out Delbert's former supervisor, Hans Boos, author of *Snakes of Trinidad and Tobago*, and "Snake Man" Allan Rodriguez. No one offers a technique guaranteed to find a bushmaster.

Still on the island in "We Can Get All We Want Now," Eatherley rendezvous with long-time SSAR member John C. Murphy, a Chicago-based specialist of Trinidad and Tobago herps, his friends Gabriel Hast and Tom Anton, guides Mukesh Ramdass and Molly Calderon, and Abraham Diaz, a photographer for the *Trinidad Guardian*. They examine a recently killed bushmaster at the Asa Wright Nature Center and search for a live one. Were they successful?

In "Epilogue: My Happiest Hours" Eatherley overviews both the dubious future of the world's largest viper throughout its range and the remarkable career of its seeker.

To conclude, in "Author's Note: Meeting Gloria" Eatherley introduces us to RLD's only grandchild, describing her as inheriting her grandfather's physical features. She reminisces about her "Pop," ("...just *delicious*...A character, a dignified character.") playing at the zoo, and travelling to the West Indies.

I'm honored to be among the many listed people in the three pages of "Acknowledgements."

Toward the middle are eleven pages of contemporary color photographs of snakes and people, the final one is Gloria holding a large portrait of her beloved grandfather. Five more pages of black & white from RLD's era follow. I counted 17 similar images scattered throughout the text.

At the American Museum of Natural History, Eatherley discovers two letters written by RLD's father to curator William Beutenmüller about a position for his son. He rightly declares these documents as a defining moment in RLD's career. While I appreciate the word-for-word transcriptions (pp. 22 and 24), photographs of John V. H. Ditmars' "elegant flowing hand" would have been even better.

I learned several new words, including "gormless" (page 23) for "stupid" and the possible origin of the name bushmaster, from *bosmeester* coined by Dutch explorers (p. 50).

I found few misspellings or factual errors, although I've never heard of "green chicken snakes" (p. 9). The statement about the lack of hearing in snakes (p. 178) might have been updated.

Common names are not consistent: On p. xix, rat snakes, yet coralsnakes; on p. 27, watersnakes, yet garter snakes. Perhaps consulting Crother (2012) would have been wise.

Eatherley corrects the error of the only prior Ditmars biographer (Wood 1944), C. *Stover* Allen to C. *Slover* Allen, a physician interested in snakebites. While on the subject of errors, I would like to discuss the dilemma of the birthdate of Raymond L. Ditmars; I hope not too trivial a point.

His obituaries stated his birthdate as 20 June 1876, as did Albert H. Wright (1949). The death record instead lists 22 June (I have my suspicions about the disparity). His biographer, Laura Newbold Wood Roper (1994), Kraig Adler (1989), and Eatherley all repeated the 22nd. As recently noted by Adler (2014), I obtained a document from the New Jersey Archives that substantiates the correct birthdate as June 20. So we'll wish a happy 140th birthday to RLD on the Summer Solstice 2016!

When I was fervently "following the Ditmars trail" (p. 275) especially at the turn of the century/millennium, it took a couple of years and couple of hundred dollars to locate his only grandchild, Gloria. "Pop" dedicated *Confessions of a Scientist* to her when she was about six and half years old, and she may be the only person still alive who knew him. I put Eatherley in touch with Gloria and I'm so happy he devoted four pages to her. To my inquiry whether her grandfather had a New York accent, she had said no, so Eatherley's observation after viewing/hearing a "talkie" titled *Killing the Killer*; "the New York inflection obvious" (p. 200) was quite a revelation.

Eatherley and I were in touch off and on during his project, but now I lament we did not collaborate more. Although he quotes me correctly about the family throwing everything away, at a later point I learned some specifics of a book sale in the late 1960s. What a tragedy for posterity that so few of RLD's "papers" survive.

Eatherley suggested visiting me, but I discouraged him from devoting the precious time and money because I wondered how much insight I had to offer. Upon reflection, and after reading about the others he met, I too could have shown him some snakes, taken him out to eat, to bond as kindred souls, and filled him in about how I've tried to lead a Ditmar-seque life in a so much more modest way in my Rust Belt city [look how my byline copies the "cadence" of Raymond L.(ee) Ditmars], and shared my cherished complete book collection. That might have merited one of his color photos?

A list of illustrations is often standard companion to a table of contents, but is lacking here. I liked how Eatherley often included RLD's age at the time of a given narrative and would have much appreciated a timeline about his life. If provided, I would have referred to maps of significant places such as "within 50 Miles of New York" and Honduras, Panama, and Trinidad, etc. But of course, I have atlases and Internet access.

Eatherley uses a storyteller style and paraphrases Ditmars' writing, and that of others, throughout. And that of others. For example, I immediately recognized familiar passages such as Adler (1989, 2014) on p. 173 and Kate Swan's 1897 newspaper article (pp. 63–64) that I annotated a century later (Novotny 1999). I wish that all the others were cited with notes and a bibliography. I began to search, with some success, for those in my Ditmars collection and *The New York Times* online archives, but this painstaking process would have held up this piece until the next issue of *Herp Review*.

In 1989, Kraig Adler wrote, correctly, that Ditmars had influenced many herpetologists still active. A decade later I expressed

concern that Ditmars was being forgotten. Dr. Adler assured me that, because of the continuing availability of his books, that was not the case at all.

I'm not sure if he fully convinced me, but with Dan Eatherley's labor of love now published, Raymond L. Ditmars is back in the news, and I hope it leads to a resurgence of appreciation. I enjoyed this book immensely and recommend it to everyone interested in him, herpetology, or a good story. Buy one for yourself and for those on your gift list. Every library in the English-speaking world should own it. And despite the judgment that RLD's writing is "peppered with behind-the-scenes anecdotes too topical to stand the test of time" (Goddard and Swope 1995), admirers of *Bushmaster* may want to delve into RLD's original works, too.

Recall that this project originated with Dan Eatherley's idea for a film featuring Raymond L. Ditmars. I'm sure he could make a movie just as good as his book. But who should be cast as the bushmaster hunter? Chris Pratt starred in last summer's blockbuster *Jurassic World* and is the rumored successor to Harrison Ford in the next installment of the *Indiana Jones* franchise. In the meantime, would he be willing to grow a mustache and don some leather puttees?

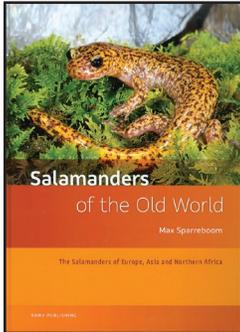
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Salamanders of the Old World

Max Sparreboom. 2014. KNNV Publishing, Zeist, The Netherlands (www.knnvpublishing.nl). 431 pp. Hardcover. € 125.00 (approximately US \$134.00). ISBN 978 90 5011 4851.



SEAN P. GRAHAM

*Department of Biology, Geology, and
Physical Sciences*

*Sul Ross State University,
Alpine, Texas 79832, USA*

e-mail: grahasp@tigermail.auburn.edu

If you are like me, you have a well-used copy of Petranka's (1998) *Salamanders of the United States and Canada* sitting bruised and loyal within arm's reach of your work desk. That book has been with

me on field trips to the Appalachians, the Northwest rainforests, and the swamps of south Georgia, but unfortunately it doesn't get used much anymore since I now live in the desert. But it is nice to know those thorough species accounts are there, and as a natural history editor for *Herpetological Review* I do get to flip it open every now and then to check up on somebody's facts. So, when I heard about the new book *Salamanders of the Old World* by Max Sparreboom (2014), I thought I should get it right away, even though I have never been to Europe or Asia. Maybe just having such a book would in some way transport me to misty Mediterranean cliff faces populated by *Speleomantes*, or tumbling splash zones of Colchian streams teaming with *Mertensia*. And it would possibly be a necessary reference for those occasional natural history observations sent from Eurasia. I bring up Petranka because the inevitable comparison between Sparreboom's book—especially for North American readers—will be to *Salamanders of the United States and Canada* (although, covering 160 versus 127 species, Sparreboom had a bigger task and certainly a much bigger geographic scope).

This hardcover book is wonderfully designed, with 431 glossy pages each laid out slickly, and richly illustrated with full-color photographs of adult and larval salamanders as well as egg sacs (only three species are not illustrated with photographs—one of which has not been seen since it was described in 1910), photographs of habitats and landscapes, illustrations from classic texts, line drawings, range maps, and a frontispiece showing salamander morphology. The book begins with an excellent introduction covering basic salamander biology, reproduction, evolution, and conservation. The book is then organized alphabetically by family, genus, and species names. Each family section has a detailed familial summary, and each genus is similarly (if a bit too technically) summarized. There are individual accounts for all the species covered with sections on their general description, diagnosis, eggs and larvae, distribution, habitat, behavior, threats and conservation, observations in captivity, and taxonomic comments. A reference section follows each account. Many of the species accounts are spare and repetitious, since only one or two of the species within any of the genera are well known. There is a glossary and thorough reference list.

I thought it was a good attempt by Sparreboom to include the "observations in captivity" section to simultaneously appeal to

the herpetoculture crowd and also demonstrate that much of our knowledge of the interesting courtship rituals of many salamanders comes from captive observations. The taxonomy is up-to-date and follows recent work by Pyron and Wiens (2011); a phylogram is provided showing familial relationships and the generic relationships within the largest Eurasian family Salamandridae. The book is ambitious in scope both in terms of geography, topics, and the number of species involved. Sparreboom admits the book is an attempt to update Robert Thorn's treatise on Old World Salamanders (1969), and pays appropriate homage to this author and work. So how does Sparreboom's book measure up?

I have to point out that I am no expert on Old World salamanders so I can't be trusted to determine the overall accuracy of the book. And while I cannot say how well the book replaces Thorn (that book is in French), I should mention that my comparison to Petranka (1998) is not entirely fair. Sparreboom does not set out to write a book as comprehensive and detailed as Petranka's. For me this was frustrating, but then again I am an inveterate salamander nerd. Although not written at a juvenile level, the book for the most part could be understood by a student, which is probably for the best. It could easily be argued that Sparreboom's approach—a richly and beautifully illustrated book spare on details but filled with references guiding true nerds to the published literature—is actually superior to the more thorough approach of Petranka. But I personally would have rather had a more complete summary of the literature. And in some cases Sparreboom mentions interesting details and does not expand upon them, instead referring us to citations. This was his worst offense, and the best example of this is found on p. 161 when Sparreboom mentions tantalizingly that *Speleomantes sarrabusensis*, a plethodontid, might be viviparous. He mentions this bombshell only in passing and refers the reader to a reference that is not in English, leaving the poor English reader (for the record, the book is in English) to wonder about this incredible fact and why it is suspected to be true. Something like this needs to be covered in a book like this, not simply mentioned and cited.

In other cases, Sparreboom appears to simply be reiterating every detail from another account (e.g., the descriptions for many *Hynobius* rely heavily on Thorn), or worse yet, from an online source (e.g., amphibiaweb.org; salamandersofchina.org). Sparreboom mentions that this book grew out of an attempt to archive natural history information on Old World salamanders on a website, thus the web citations and thin species accounts; for the book, primary literature should have been used.

In terms of illustrations, Sparreboom's book is certainly far superior to Petranka's. All but a handful of the salamanders covered are illustrated with large, full cover photographs of living individuals, most of them taken *in situ*. These include gorgeous photographs of gorgeous salamanders taken from some rather unreachable locations, such as Syria, northern Iraq, and Iran. Many of the photographs were taken by Sparreboom himself, who must have racked up some serious frequent flyer miles and must have some great stories to tell about his travels.

This brings me to another disappointing aspect of the book. Sparreboom presumably has extensive first-hand experience with many of the salamanders he covers (in the field and in captivity), but this is not conveyed in the writing. It is certainly evident from his photographs, which include pictures of living salamanders and also their habitats (a very nice touch). Sparreboom has presumably seen more of these species firsthand than anybody else alive, or at least anybody else alive who has tried to write a book about them. But this firsthand knowledge does not bleed into the

species accounts. Many are instead spare and based on sketchy sources, and are inordinately preoccupied with mating behavior. It made me wonder if a much better book could have been written by Sparreboom had he kept detailed field notes of his encounters during his travels. Or, if a better book could have been written by a team of European, Chinese, and Japanese authors, since many of the Asian species have an extensive, un-translated literature that Sparreboom tells us about but does not attempt to summarize. A bias toward the European species is definitely evident, although this was both inevitable and forgivable. The species accounts for European species are much more thorough and well researched, and this is where Sparreboom's book becomes more comparable to Petranka's.

Another area where the book is definitely weak is the range maps. The maps are topographic but not at a scale where this was warranted. At the scale of the entirety of China, showing topography just muddles the picture. The distributions of most species are plotted with hashed lines that are too similar in color to the topographic lines, so most of the maps are difficult to interpret. Although there are maps in the back of the book that allow the unfamiliar reader to refer to various regions of southeast Asia and Europe, I doubt if even a resident of Turkey would be able to locate themselves relative to the range maps of *Lyciasalamandra* found on p. 241. An inset showing the relationship of the distribution to a larger, more recognizable region (all of Asia, or Europe) was needed for nearly all the maps, and a fully grey-shaded distribution blob (as in Petranka) would have been much better.

I don't get much satisfaction from reading lists of slight errors in book reviews, but I will mention that there were some (as one might expect from a book with 431 pages), but not many. After going through the whole thing I only found around twenty. These ranged from obvious formatting errors (such as p. 144 where the illustration overlaps the figure legend text) to redundancies (p. 311, column 2, line 11, the color description of *Salamandra salamandra* is stated twice within the same section), and simple mistakes (pp. 126 and 130, Sparreboom mentions that *Paradactylodon* are active at night outside caves "where the difference between day and night is not apparent").

On the other hand, for every slight error like this, I probably learned one or more remarkable facts that I was not aware of before reading this book. The line drawings of hynobiid egg sacs are weird and terrific. The description of hynobiid males pulling eggs out of the female while simultaneously kicking her away, so that he may fertilize them in privacy, is hilarious and a strange curiosity of natural selection. The book has nuggets of intrigue and mystery: the lost *Hynobius* of Turkestan, and the presumably extinct *Cynops wolterstorffi*—a salamandrid endemic to a single lake in China that was once common but has not been seen in decades. Strange reproductive features I was unaware of are described and illustrated: the hypertrophied thighs of *Onchodactylus* used in amplexus, and the spectacular dorsal tail knobs of *Lyciasalamandra* and *Mertensiella*, which are used during courtship to stimulate the female cloaca while males hold them on their backs in ventral amplexus. *Echinotriton* males secrete a wispy spiderweb of mucous from their cloaca as they court females, possibly tying them down for positioning the spermatophore. For me, these wonderful natural history stories and their accompanying illustrations make the book worth the exorbitant US \$134 price. As I told one interested but reluctant colleague: relax, you are simply paying less than a dollar for each species account.

That price will probably cost this book most of its potential readership. But libraries across Eurasia and North America should have this book, as well as some die-hard collectors like me. The information on captive husbandry undoubtedly will be useful to the thriving salamander herpetoculturalist crowd in Europe. But I'm not sure if this book will become a dog-eared and battered field companion for anyone in Eurasia, much less for curious readers in North America looking to plan their next vacation. So maybe there is room for improvement and there might still be a book waiting to be written that could aim to be a well-illustrated "Petranka for the Old World." But for now Max Sparreboom's nice book will do just fine if you can afford it.

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Roads and Ecological Infrastructure. Concepts and Applications for Small Animals

Kimberly M. Andrews, Priya Nanjappa, and Seth P.D. Riley (editors). 2015. Johns Hopkins University Press, Baltimore, Maryland (www.press.jhu.edu). xiii + 281 pp. Hardcover. US \$75.00. Hardcover. ISBN 978-4214-1639-7.

JOSEPH C. MITCHELL

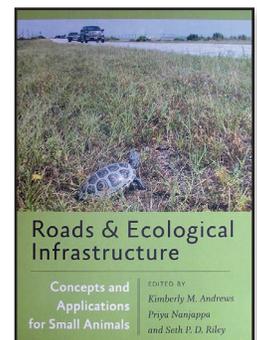
Florida Museum of Natural History
University of Florida,
Gainesville, Florida 32611, USA
e-mail: dr.joe.mitchell@gmail.com

"America is proud of her magnificent record in road building, but nothing has been so destructive of wild life as our good roads."

—Thomas Barbour, 1944

This book is for people seeking ways to lessen the impact of roads and vehicular traffic on amphibians, reptiles, and mid- to small-sized mammals (i.e., "small animals" in the editors' parlance) and their habitats and populations. The text on the back cover states that this is the first book to focus on "improving outcomes where transportation needs and small animal habitats overlap." Well, not exactly. Langton (1989) published the first book of which I am aware on resolving and mitigating conflicts between amphibians and roads, and made it available to participants of the First World Congress of Herpetology in England that year.

The editors seem to imply in the Introduction that the term "ecological infrastructure" is novel; they provide no evidence to the contrary. The term was first used in a 1984 report by the Man and Biosphere Program to the United Nations Educational,



Scientific and Cultural Organization (UNESCO) (Wang et al. 2008). It was used initially to represent the habitat network and emphasized the biodiversity conservation functions of many landscape components, such as corridors. There are several other definitions usually associated with urban ecology (Banzhaf and Netzband 2011). The editors of this book define ecological infrastructure as “*the basic habitat components and their connections necessary for species survival, and for natural populations, communities, and ecosystems to function properly.*” A primary goal of the editors is to broaden the reader’s view of road impacts on small animals by providing the ecological context within which the public infrastructure (roads, bridges, etc.) functions. Information presented in the book demonstrates the many ways they are intertwined. The book is a call to action for researchers, engineers, landscape planners, and others involved with road ecology to collaborate better than they usually do to reach common goals.

Road construction and the resulting mortality of small vertebrates has been abundantly described from early in the 20th century onward. Efforts to do something about it began with the use of signs in the early 1960s in Europe. Underground passages appeared in the late 1960s. Underpasses in the United States were first constructed in the late 1960s along I-75 which cuts across the Everglades between Ft. Lauderdale and Naples. Nearly all of the examples of road and wildlife conflicts in the book are from Europe and the United States. Projects in other regions such as South Africa are rarely mentioned.

Following a review of the history of road ecology, three chapters address the natural history of small vertebrates, direct effects like roadkill, and how habitat modification, in turn, affects their survival and persistence. Information and examples focus mostly on amphibians and reptiles. There are substantially fewer examples and discussions on mammals. Chapter 2 includes a long list of topics on animal behavior, movements, physiology, and other aspects of species biology. Chapter 3 on direct effects includes the important topics of road mortality, roads as barriers, road density, habitat fragmentation, and landscape genetics. How roads affect habitat quality, covered in Chapter 4, focuses on effects of chemicals such as heavy metals, road salt, and other forms of pollution, environmental stressors such as moving and stationary lights, habitat modification, human access, and animal behavior.

Chapters 5–12 cover numerous practical topics ranging from public education to road construction specifications. The authors in these chapters include a breadth of subjects within their topics: planning and design, funding, mitigating road effects with structural modifications, modifying structures on existing roads, construction and maintenance, and monitoring and adaptive management. Numerous case studies and photographs illustrate specific points. This is not a technical manual, although design specifications for culverts, underground passageways, and barriers appear in Chapter 9. The authors provide realistic descriptions of processes and challenges, background where needed, and evaluations of problems and solutions pertinent to their topic. One comes away realizing there are many complexities involved with solving any road and wildlife problem. In the last chapter, Andrews lays out a general, multifaceted overview of where future efforts should be made, but offers few specific targets.

Each of these chapters ends with a section of bulleted Key Points that reviews the highlights and messages the authors consider important. Fortunately, literature citations are provided

at the end of each chapter making it easier to connect a point of discussion with its corresponding literature. There are two lengthy practical examples on road problems and solutions by guest authors. One focuses on turtle mortality on a causeway to a barrier island and the other on the effectiveness of New York State’s first amphibian tunnel. Embedded within each chapter are one or more short case studies by other authors. The index covers topics but not species.

This is a handsome, well-constructed book, although I was annoyed with the low quality of the black-and-white photographs. The layout includes three layers of section subtitles that break up the text into manageable units to enhance readability. I would not buy the eBook version because it costs as much as the hardcover version.

Everything humans do with and on roads causes a long list of problems for small vertebrates. This book provides information on and solutions for many of them. Some of the same topics are explored in Forman et al. (2003), as well as others not discussed in *Roads and Ecological Infrastructure*. The latter does not establish the background on road densities and mortality statistics needed by newcomers to understand why this is such an important subject critically in need of resolution. People interested in road-vs-wildlife issues should read both of these books to get a thorough overview of the seemingly intractable problems roads create for small animals.

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