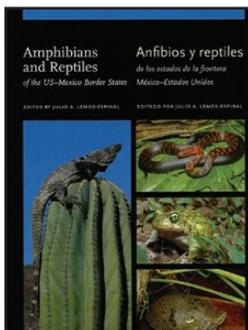


BOOK REVIEWS

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Amphibians and Reptiles of the US – Mexico Border States / Anfios y Reptiles de los Estados de la Frontera México – Estados Unidos

Edited by Julio A. Lemos-Espinal. 2015. W. L. Moody Jr. Natural History Series, No. 52, Texas A&M University Press, College Station, Texas. x + 614 pp. Hardcover. US \$90.00. ISBN 978-1-62349-306-6.



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Julio Lemos-Espinal has been prolific over the past 20 years with efforts to enhance our understanding of the amphibians and reptiles of Mexico. Lemos-Espinal's efforts typically are the results of collaborations with herpetologists north and south

of the US–Mexico border; his collaborators include, but certainly are not limited to, Royce Ballinger, David Chiszar, James Dixon, Raymundo Montoya-Ayala, Luis Oliver-Lopez, Geoffrey Smith, Hobart Smith, and Guillermo Woolrich-Piña. Several of his previous contributions have included checklists, keys, and distribution maps of the amphibians and reptiles from various Mexican states including some of those along the US–Mexico border (Lemos-Espinal et al. 2004; Lemos-Espinal and Smith 2007; Lemos-Espinal and Dixon 2013; Lemos-Espinal et al. 2014). These characteristics make Lemos-Espinal uniquely qualified to undertake the daunting task of synthesizing an annotated checklist of the 648 species (as of this publication) of amphibians and reptiles from the 10 states (six in Mexico: Baja California, Sonora, Chihuahua, Coahuila, Nuevo León, and Tamaulipas; four in the US: California, Arizona, New Mexico, and Texas). Those 648 species include 85 salamanders, 101 frogs, 2 crocodylians, 50 turtles, 213 lizards, and 196 snakes (including non-native species).

This book is bilingual with English text in the first half of the book, Spanish in the second. I reviewed the English portions only. The two sets of text are separated by 78 color plates (containing 600 pictures) that depict much of the borderland's herpetofauna. The book is well organized. Chapter 1 is an introduction that lets the reader know what information is included in the book, the contents of each chapter, and how each of the state-specific chapters is organized. Chapter 2 justifies the scientific and common names used in the book. Chapters 3–12 are state-specific chapters going from west to east, first south, and

then north of the US–Mexico border. The last, Chapter 13, is a discussion of diversity of the herpetofauna of the Border States using cluster diagrams generated from Jaccard's Similarity indices. Following the last chapter (Chapter 13) on diversity in the Spanish section, there is a large appendix, references by chapter, and, finally, indices in English then Spanish.

Chapter 1 indicates clearly that the book "... summarizes what is known about the distributions of amphibians and reptiles in each of the 10 states along the United States–Mexico border; provides a current list of amphibians and reptiles that have been recorded in each of these states; and analyzes which of those species are shared between the two countries..." This book does not contain identification keys or distribution maps for species. If you are looking for that information, you need to find state-specific treatments that exist for most of the states (Texas, New Mexico, Arizona, California, Baja California, Chihuahua, and Coahuila). Lemos-Espinal et al. (2015) have just published a book that includes distribution maps and keys for species in Sonora, Chihuahua, and Coahuila.

Chapter 2 reviews the scientific and common names used in the book. With many authors preparing state-specific chapters, this not only helps the reader, it helps maintain consistency across state chapters. Lemos-Espinal includes introduced as well as native species. Nomenclatural decisions affect the species richness of state herpetofaunas. For example, *Lampropeltis splendida*, *L. holbrooki*, and *L. californiae* are not used (contained within *L. getula*) due to inadequate assessment of taxa in Mexico. In this case, nomenclatural decisions reduced species richness in Texas, New Mexico, and Arizona. Most nomenclatural issues are straightforward and stated for the record. Many of the Spanish common named used by Lemos-Espinal differ from those designated by Liner and Casas-Andreu (2008) because of taxonomic changes or otherwise misleading common names. The one common name change that deviated from Liner and Casas-Andreu (2008) and Crother (2008) and seemed to be unnecessary was referring to the "Massasauga" as "Massasauga Rattlesnake."

State-specific chapters, 3–12, shared a common organization: general introduction, summary of previous herpetological work in the state, list (in table form) of type specimens from the state, discussion of major physiographic characteristics of the state including hydrology, limited geology, climate, biotic zones, and how amphibians and reptiles were distributed across those physiographic regions or biotic zones. Most state-specific introductions summarize the geographical boundaries of the state and the numbers of amphibians and reptiles (broken into traditional orders) found in the state. Some state authors include discussions of shared and endemic taxa (Baja California and California), while the remaining states include that information later in the chapter. The state-specific chapters include thorough histories of herpetology in each state, but as these chapters were written to stand alone, there is much overlap. Authors for each

state include their version of the impact that the US and Mexican boundary surveys of the 1850s had on the understanding of amphibians and reptiles in that state. Most addressed the important roles of Spencer, Girard, Cope, Kennicott, and others had in naming species, all associated with a thorough table of the type specimens from that state. The history of herpetology in this part of the world is great reading.

Authors for state-specific chapters dealt with the association of amphibians and reptiles with different physiographic regions or biotic communities in different ways. Authors of the Baja California chapter focused on “assemblages” of species that were restricted (found only in that biotic zone or physiographic region) to that region within the state. For example, in Baja California, 41 species of amphibians and reptiles were documented in the Coniferous Forest Region, but the assemblage for that region included only four species: *Rana boylei*, *Sceloporus vandenburgianus*, *Lampropeltis multifasciata*, and *Thamnophis elegans*. In Baja California, these were the only species found only in the Coniferous Forest Region. However, all four species are found outside the political boundaries of Baja California. *Sceloporus vandenburgianus* and *L. multifasciata* are also found in California. Unfortunately, there is not a Coniferous Forest Region in the California chapter. *Rana boylei* is also found in California and Oregon. *Thamnophis elegans* is one of the most widespread snakes in western North America. Other regions have inherently different types of assemblages. In the Central Gulf Coast Region of Baja California, the assemblage included nine species: *Crotaphytus insularis*, *Phyllodactylus partidus*, *Sauromalus hispidus*, *Callisaurus splendidus*, *Petrosaurus slevini*, *Uta antigua*, *Aspidoscelis cana*, *Crotalus angelensis*, and *C. lorenzoensis*. As in the former example, all are found only in this region within Baja California. But in this example, all are endemic to this region and are found nowhere else in the world. Assemblages from these two regions of Baja California represent two very different groups of species. If the point of delimiting assemblages is to identify unique components of the herpetofauna associated with different habitat types within states, this strategy seemed to miss the point. Perhaps more emphasis on the entire community of amphibians and reptiles found in a particular habitat type would have better captured herpetofaunal characteristics. Authors of other state-specific chapters seemed to have taken this approach and did not rely on discussions of habitat specific assemblages.

In general, state-specific chapters identified major habitat types found within the state and then listed species found there. Several state-specific chapters identified physiographic regions, but then went on to identify more and different biotic zones or provinces. For example, authors for the Arizona chapter identified three physiographic regions, Basin and Range, Transition, and Colorado Plateau. They then identified 14 biotic communities (following Brown and Lowe 1980). State chapters might have benefitted from common and consistent designations of biotic zones across states (in a similar manner to nomenclature). Biotic communities of Brown and Lowe (1980) might have been a good starting point, but the coverage of that map does not extend far enough to the north in California or to the east in Texas, Nuevo León, and Tamaulipas. State-specific chapters would have benefitted greatly from maps of each state depicting major mountain ranges, major rivers, and standardized biotic communities or zones. I realize that such maps are much easier to wish for than they are to produce.

Chapter 13 is entitled “Herpetofaunal Diversity of the United States–Mexico Border States.” This is a stimulating chapter. It

includes land surface areas, latitudinal and longitudinal limits, numbers of species by taxonomic group, numbers of endemics, and numbers of introduced species for each state. Authors then subjected species richness data (648 spp.) to Jaccard’s Similarity and cluster analyses. Jaccard’s Similarity values are generated in a pair-wise fashion for all combinations of states. Similarity coefficients are then subjected to cluster analyses. Cluster trees depict state-level assessments of herpetological community similarity. Authors conducted these analyses independently for major taxonomic groups, and, in turn, with introduced species and marine species removed. Eighteen species were introduced across states and seven species were marine (six sea turtles and one sea snake). The overall cluster tree depicted greatest similarity between four pairs of states, Arizona and New Mexico, Sonora and Chihuahua, Nuevo León and Coahuila, and California and Baja California. The California/Baja California cluster occupied a basal position (most different) on the tree. The remaining states formed two main clusters. One cluster was comprised of the Arizona/New Mexico and Sonora/Chihuahua pairs. The second cluster included the Nuevo León/Coahuila pair joined by Tamaulipas, and then Texas. Trees for all amphibians and reptiles generated with introduced and marine species removed produced the same patterns of herpetofaunal similarity. With introduced and marine species removed, cluster trees represent and stimulate a number of zoogeographic hypotheses that help to explain the patterns of herpetofaunal diversity in the US–Mexico border states. For example, salamanders exhibit a different pattern of community similarity compared to frogs or all amphibians or all reptiles. Such differences might be understood based on the Holarctic origins of salamanders compared to the greater affinity to the tropics of other groups. The chapter concludes with a pitch for greater collaborative conservation efforts due to the large number of shared species across the US–Mexico border. Authors add a cautionary note regarding the construction of the border fence, and the potential for more extensive border fencing. Fencing could adversely affect conservation of the border region herpetofauna.

A list of all border region species, with indications of which species can be found in which state and their conservation status, can be found in the excellent appendix. This appendix summarizes much of the book in table form. I detected a single error in that *Lithobates berlandieri* is listed as native in Arizona although it is an introduced species.

This book is a good introduction to the herpetofauna of a large geographical area that is the US–Mexico border states region. Lists of species with habitat affinities found in each state represent a valuable starting point for future herpetological research. The bibliography provides entry to the literature relevant to that region. Anyone working in the region or hoping to in the future will recognize the value of this book.

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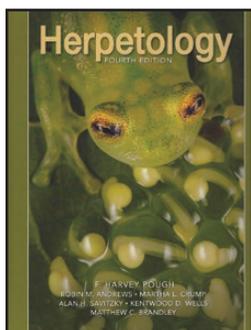
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Herpetology, Fourth Edition

F. Harvey Pough, Robin M. Andrews, Martha L. Crump, Alan H. Savitzky, Kentwood D. Wells, and Matthew C. Brandley. 2016. *Sinauer Associates, Inc., Sunderland, Massachusetts*. xv + 591 pp. (+ 128 pp. Glossary, Literature Cited and indices), 549 illustrations. Hardcover. US \$99.95. ISBN 978-1-60535-233-6.



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This latest update of Pough et al.'s "Herpetology" should be a most welcomed addition to any herpetologist's bookshelf. For decades now, there have been two competing textbooks on herpetology available at any particular time, in two distinct

lineages. The older lineage, let's call it Lineage "G," began with Goin and Goin's (1962) "Introduction to Herpetology," which has proceeded through a total of seven editions, several changes in authorship, two variations of the title, and one change of publisher, all the while retaining "introduction" or "introductory" someplace on the front cover. The latest avatar of Lineage G is Vitt and Caldwell (2014) "Herpetology, an Introductory Biology of Amphibians and Reptiles" (Fourth Edition). The second lineage of textbooks, Lineage "P," can be thought to have begun with Porter's (1972) "Herpetology." Porter's book, which had no subsequent editions, eventually slid further and further out of date until it was superseded by the first edition of "Herpetology" by Pough et al. in 1998. The Fourth Edition of "Herpetology" clearly shows its direct descent from its immediate ancestors, though with one change in authorship: John Cadle has been replaced by Matthew Brandley.

I have long thought that Lineages G and P were somewhat complementary as textbooks of herpetology. Although both explore the same overall knowledge landscape, certain topics have tended to be discussed in more detail and lucidity by one, and other topics better by the other. A particular strength of Pough et al. relative to the competition, for example, has long been in

functional morphology and physiology (in the current book's "How do they work?" section) and this remains true in the new edition. In general, though, the coverage in the latest versions of both of these books is now comprehensively broad, even if not particularly deep in some areas. As such, their value for learning about herpetology is that they can provide students with the basics that a professor can expand upon, and or that the students can delve into more completely on their own using primary sources. They are not really books that would invite anyone to read cover-to-cover; they are references, and perform very well in that role. As all textbooks tend to do, they have grown larger, edition by edition, with the addition of new knowledge on top of the old, more illustrations, and assorted fresh elements of design. Thus the current editions are now near equal in breadth, and in heft: Vitt and Caldwell (2014) has 757 pages and is 42.2 mm thick, while Pough et al. (2016) is a bit slimmer but still runs to 719 pages, if you count them all up, and is 28.4 mm thick. You can weigh them if you want to.

In aid of introducing students to the basics, Pough et al. has two excellent chapters on the systematics and diversity of extant amphibians and reptiles (Chapters 3 and 4). They are well laid out, profusely illustrated, and have lots of maps. And they are big, together taking up 161 pages. I like them as a supplementary means of introducing students to the diversity of the animals so that when they later learn about particular aspects of the animals' biology, they may at least have heard of the animals before and might better place the information in context. Only a rare few herpetology students are natural-born herp nuts who come to class already knowing how to pronounce *Ptychoglossus* and *Bothriechis*, and can rhyme off the names of all 52 families of frogs. For most everybody else, taxonomy is a formidable quagmire of incomprehensible, italicized, Latinate polysyllables, dauntingly impossible to memorize. Yet they do need to know which animals we're talking about. A particularly sadistic professor might demand that students actually intently study these chapters but exposure and context, together, will cement at least some of these names, and the diversity they represent, into students' brains. These chapters, then, are a good place to start from and refer back to.

Not quite so successful is the opening chapter "Why Study Herpetology," which is really mostly an abstract of material presented in more depth later on in the book. Why, really, do herpetologists study herpetology? Certainly there is an illustrious history of significant contributions to knowledge based on studies of amphibians and/or reptiles and, as we invariably need to say on job applications and grant proposals, the animals can be excellent study systems for testing the predictions of theories about whatever subject it is that you want to test the theories of. This is the prosaic approach that this chapter takes, pointing out that this is a diverse bunch of animals, that it's interesting to consider ectotherms, that amphibians and reptiles are important components of ecosystems, and that a lot of them are in trouble for anthropogenic reasons. But, really, ask any bunch of herpetologists candidly why they study amphibians or reptiles and their answers are going to be, more or less, because they've loved them since they were toddlers and that the joy of having figured out something about them that they didn't know before is the enthralling delight of doing science. Can't a textbook say that? Or at least allude to it?

I am also not that fond of Chapter 2, which is an uneasy marriage between the principles of phylogenetic systematics and the fossil history of amphibians and reptiles. I suppose there

are those who think that a discourse on cladistic methodology in general is essential in a herpetology book, but I see this part of Chapter 2 as largely a holdover from earlier editions written when cladistics was fresh and exciting, and not yet in freshman biology curricula or even (gasp) high school. Besides, you would be hard pressed to find worse examples of the power of cladistic analysis than the origins of the Lissamphibia and the relationship of turtles to other amniotes. Phylogenies from fossils are problematic enough without contemplating the huge gaps in the fossil record that make the phylogenetic resolution of these particular problems so difficult. And then, rather amusingly and despite its overtly cladistical tone, the chapter still presents the configuration of temporal fenestrae as the defining character states of the Amniota despite recent evidence that, aside from the Synapsids, these states may have been more labile than classically thought. Personally, I think the paleontology would fit rather well into Chapters 3 and 4.

Chapter 5, on the biogeography of amphibians and reptiles does an excellent job of introducing the complementary principles of dispersal and vicariance in relation to the distribution of modern taxa. It explains very well the large-scale distribution patterns resulting from the breakup of Pangaea, the subsequent drifting apart of the continents, and the occasional collisions between those drifting continents. Although its discussion of the effects of the Pleistocene glaciations is a bit too brief, at least in the opinion of a northerner like me, it does satisfactorily introduce the process of post-glacial dispersal and range expansion in response to long-term climate change. The final part of the chapter, on island biogeography, is very good, especially with the Antillean *Anolis* as the star examples of adaptive radiation on islands.

As I have already mentioned, Chapters 6–11 (Part II, How do they work?) are the real strengths of the book. The coverage is excellent, the explanations are lucid and the examples are right on target. I especially appreciate the chapters on ectotherm physiology (Chapters 6 and 7) since this is the one aspect of their biology that really unifies them in contrast to mammals (including us) and birds. A major hurdle, I think, for students of herpetology to truly understand the animals, is to think like an ectotherm, for which heat is a resource rather than a metabolic product. These chapters make this exceptionally clear. I also highly recommend Chapters 10 and 11 on locomotion and feeding, respectively, and Chapters 8 and 9 offer very thorough coverage of reproduction and life history in these animals. It is somewhat surprising, though, in a book that very carefully balances its emphasis on amphibians versus reptiles, that these topics are discussed separately for each order in different chapters. True, there are deep differences in the reproductive biology of amphibians compared to reptiles but, by dividing them, the book misses the chance to broadly compare, for example, mechanisms of sex determination or modes of parental care. Although all sexually-reproducing species require the presence of both males and females, it is remarkable the variety of ways they manage to go about ensuring that. Among amphibians and reptiles, as a whole, there are female heterogametic genetic sex determination systems, male heterogametic genetic sex determination systems, and temperature-dependent sex determination systems (not to mention an assortment of truly crazy unisexual systems). Yet, at heart, the underlying genetic pathways leading to the expression of maleness or femaleness remain largely the same, according to recent work. It's such a great topic that it's a shame it isn't all brought together. Similarly, in discussing the incidence of parental care,

the book introduces the explanatory principle of cost (to the parent) vs. benefit (to the offspring) twice, separately for amphibians and for reptiles. This means that when it offers examples for reptiles, it can only contrast crocodylians, for which the costs and benefits of parental care are both rather low, with the one turtle that also has parental care, rather than to the oodles of terrestrial breeding amphibians for which both the costs and benefits of parental care are very high, all the while without fully linking the examples to the major principle.

Chapters 12–16 (Part III, What do they do?), while still remarkably good, pose some organizational problems for the book. These chapters are about aspects of behavior and ecology, but many of the topics within them have strong conceptual links with topics discussed elsewhere. For example, dispersal is discussed in Chapter 5 in the context of biogeography but migration and dispersal strategies, i.e., what the animals actually do that results in this biogeography are way back in Chapter 12. Similarly, reproduction is treated at length in Chapters 8 and 9, whereas reproductive behavior and mating systems are far away in Chapters 13 and 14, respectively. Feeding is in Chapter 11, diets are in Chapter 15. I appreciate that these organizational issues are not easily resolved.

The book ends, naturally enough, with a discourse on conservation and the future prospects for amphibians and reptiles (Chapter 17). This chapter is superb. It is timely, balanced, and even guardedly optimistic. It presents the expected horror stories of decline and destruction but then, quite remarkably, it weaves in the complex realities of the human presence on the lives and habitats of these animals. It explores these for both amphibians and reptiles systematically, cogently, and succinctly. It presents options, current hot-button issues, and uplifting bits of good news. Above all, and unlike many new books and news items about amphibians and/or reptiles, with conservation placed in context, the book makes it clear that the most interesting thing about these animals is not that there are progressively fewer of them.

The artwork in the book is of very high quality throughout and the book, overall, has an appealing look to it. The book's diagrams and figures are mostly all redrawn from the published originals, which is a key element in maintaining this consistently high visual appeal. Often, this leads to greatly improved clarity and presentation. For instance, Tyrone Hayes' busy diagram showing the interconnectivities of factors affecting population decline (Hayes et al. 2010) gets a beautiful do-over that shows even better how everything imaginable is related to everything else. But sometimes, the redrawing of figures has resulted in mistakes. The illustration of sea turtle swimming (fig. 10.17), for instance, shows a sequence of drawings representing non-sequential video frames of a single locomotor cycle and indicates that the whole sequence takes 16 s. In the original paper by Davenport et al. (1984), the 18 individual video frames of the sequence were 0.087 s apart, the whole cycle lasting 1.48 s. Also incorrectly, fig 10.17 depicts the turtle's flipper as moving in a symmetrical figure-8 motion, whereas Davenport et al. clearly showed that it does not. With regard to the sense of hearing in frogs, fig. 13.15, redrawn from Wilczynski et al. (1984), is thoroughly confusing since the right side of the x-axis scale of the lower graph goes from 20 to 100 kHz (far beyond the range of hearing). In fact, the scale should read 2.0 to 10.0 kHz, which makes much more sense. In looking up these references, I found I had to contend with the book's chapter-by-chapter Literature Cited section that requires that you know not only the name(s) of the authors to

find something, but also the book chapter it's mentioned in first. I found this cumbersome.

When I started teaching herpetology years ago, the “-ology” courses (mammalogy, ornithology, ichthyology, etc.) were decidedly out of vogue. I was allowed to teach herpetology provided it didn't cost much. So I set out to teach a course that set the curriculum of the day on its head. Rather than teach principles of one aspect of biology using examples drawn from all over the animal and plant kingdoms, I began to teach principles of many aspects of biology, with all my examples being amphibians and reptiles so that students could see how all these various principles come together at one point of focus: the organism. The book provides plenty of examples for almost everything it deals with. To some extent, these examples can be simply “cool things about herps,” but I value them as the means to illustrate biological principles in an organismal context. In this, and in many other ways, this is a very good book. It can be used as a course book for a mid-level course, or as background knowledge for an advanced course, or as a reference at any level. The writing is very good, the text is largely error-free, and it shines a spotlight on the animals, who deserve it.

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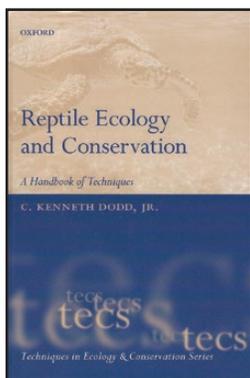
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Reptile Ecology and Conservation: a Handbook of Techniques

C. Kenneth Dodd, Jr. (ed.) 2016. Oxford University Press, Oxford, United Kingdom. xxviii + 462 pp., 62 figures (including 28 black and white photograph composites), 19 tables. Softcover. US \$59.95. ISBN 978-0-19-872614-2. Hardcover. US \$125.00. ISBN 978-0-19-872613-5.



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“The primary objectives of management should always focus on the species or community of concern, and not...political motivations.”

—D. A. Pike (p. 419, chapter 29)

The quote above, from the penultimate chapter of this book, is an ideal that often

goes unrealized. In the arid Southwest, political motivations are commonly primary in conservation and management of reptiles—especially given the move toward empowerment of local stakeholders, whether they farm grazing ungulates or solar panels. The complexity of merging science and conservation policy aside, this useful book summarizes methods to help insure sound science in this contentious political climate. It is a compilation edited by C. K. Dodd, Jr., representing the 14th contribution to Oxford techniques in ecology and conservation series (series editor, W. J. Sutherland).

This collection of 30 short contributions comprises six parts: introduction, individuals, sampling, communities, experiments, and conservation, independent of a short preface of two pages. The last provides hints as to the intended audience and purpose of the book: “...an urgent need for field research on reptile species and their community interactions” (p. vii), and “...to delineate important new developments...what the techniques tell or do not tell a researcher” (p. vii). The 30 chapters, unlike those of many multi-authored volumes, are all 10–15 pages in length, with 25–55 citations, though the genetics contribution has 129 citations. A short index, 13 pages in length, closes this relatively small book—over 450 pages are confined to a rectangle 155 mm × 235 mm (24 mm thick). Given the absence of a compelling rationale for economy of space, a larger format (200 mm × 300 mm) allows rapid assimilation of information in figures (especially for photograph composites) and tables. The editor did an excellent job of confining authors to a uniform space limit, but the authors might have been more uniform in clearly stating their chapter level goals.

The introductory section, Part I, consists of three chapters (diversity and life history, planning field studies, data collection) and a total of 40 pages. The phylogenetic and ecological diversity of reptiles is admirably introduced in Chapter 1 which is followed by an outline of experimental design in Chapter 2. Sampling scale and independence are both considered in Chapter 2 (and subsequent chapters), but I was surprised the issue of pseudo-replication was not stressed to a greater degree. The ease of application of programs like PRESENCE (discussed in detail in a subsequent chapter) has led to instances in which users subdivide sites into a large number of small plots rather than more biologically relevant population units. The last of the introductory chapters addresses data collection, an increasingly unappreciated art. I would put even more “field” in the “fieldnotes” advice section of Chapter 3 while simultaneously stressing that information retrieval is facilitated by moving away from exclusively hard-copy approaches to fieldnotes.

The second section of the book comprises six “individual level” chapters in 75 pages (Part II: marking, digital identification, preserving specimens, reproduction, diet, movement and telemetry). These are relatively standard contributions, covering well-worn ground, but nonetheless required reading. Two novel chapters, titled simply “diet” (chapter 8) and “reproduction” (chapter 7), both fill long-standing gaps—how does one become familiar with these issues (e.g., dissections, stomach flushing, statistical analyses) and learn the ropes? I must note that many of these topics, as well as those in parts III and IV, are covered in McDiarmid et al. (2012).

The central core of ecology, and by extension, conservation, is sampling. Beginning with a chapter (10) on sampling of “surface dwellers,” Part III devotes 100 pages to this topic. This first chapter has sections on visual encounter surveys (VES), pit fall trap arrays, drift fences, funnel traps, road riding—all the usual

methods. This same chapter addresses a number of statistical concerns, and surprisingly, it does so in the usual number (11) of pages. I was happy to see repeatability, or comparability of sampling events, addressed in some detail. Results from road riding studies, for all their limitations, can be highly repeatable, especially in the arid Southwest (Jones et al. 2011; Sullivan 2012), although these recent reviews were not cited.

Six more chapters on sampling methodology complete Part III: arboreal and fossorial forms, sea snakes, freshwater turtles, terrestrial turtles and tortoises, sea turtles, crocodylians. The first three chapters of this section (10–12) overlap one another with topics such as noosing and coverboards (10, 11) or stomach contents and blood samples (10–12) covered more than once. So many forms are threatened or endangered, it is perhaps no surprise that freshwater turtles (Chapter 13), and terrestrial turtles and tortoises (Chapter 14), warrant separate chapters even though similar methods are addressed for both groups (statistical issues, mark-recapture, VES). My own bias would have been to expand the section in chapter 14 on indirect sampling: that is, surveys for sign of organisms such as refuges, tracks, nests, fecal pellets (recently reviewed in McDiarmid et al. 2012). In light of their increasing use with tortoises, sea turtles, and lizards, comparison of indirect and direct survey methods would repay the effort. Indirect surveys are used to document presence (e.g., Sullivan et al. 2014a) and even as a crude index of abundance in some especially well-studied systems (Sullivan and Sullivan 2008).

Following sampling methodology, the next level, “community” (Part IV), consists of six chapters across 90 pages (plots and transects, rapid diversity assessments, measuring microhabitats, water quality, diversity measures, landscape ecology and GIS). These chapter headings reveal that there is continued overlap between Part III (sampling) and Part IV (community): Chapter 17, plot and transect censuses, covers much ground addressed in the prior sampling contributions (e.g., VES, transects, plots, effort tradeoffs). There is additional (and valuable) discussion of statistical issues, including a refreshing evaluation of independence (in practice and in principle). Figure 17.3, a flow chart, does the reader a service by integrating contributions from other chapters—this volume could have benefited from additional efforts along these lines.

The relative absence of citations to work from arid environments, such as the Southwest deserts (e.g., Germaine and Wakeling 2001; Sullivan 2012), was notable in the chapters on survey methods in parts III and IV. Consider the suggestion that “8 × 8 m plots are common” (plot size for reptiles, Chapter 17); my arid-land bias causes me to view this as far too small. In open deserts (rather than rain forests) 100-m² plots are used for many lizards, including *Phrynosoma* and *Sauromalus* (Barrows et al. 2008; Sullivan and Sullivan 2008). Chapter 18 covers “rapid diversity estimates,” but given this is simply a rapid application of previously described methods (especially chapters 10 and 17), it might have been more efficient to combine this with a similar sampling chapter. Chapter 19 takes up microhabitats, although it is placed in the community section; there is considerable discussion of non-desert environments in which thermoregulation is paramount. The discussion of frequently measured habitat variables had few examples from the arid landscapes, nor of organisms like *Sauromalus*, *Sceloporus*, or *Aspidoscelis* for which anti-predatory rather than thermoregulatory concerns might be critical to habitat preferences (Sullivan and Sullivan 2008; Rosenblum and Harmon 2011).

Diversity measures are reviewed in Chapter 21; a number of useful tables assist the reader in sorting through these contentious and oft-debated metrics. Deserts as reptile diversity hot-spots, including allusions to Pianka’s fabled “40 species of lizards at a site” in Australia, are explicitly acknowledged. As one increasingly impressed by the plethora of modeling efforts attempting to predict how any number of reptiles will respond to changes in habitats over the coming decades, I eagerly anticipated a critical assessment of these efforts in Chapter 22 (landscape ecology and GIS methods). The absence of attention to the source of data for these analyses is striking—often the data on distribution of various forms are taken uncritically from museum collections, acknowledged but largely accepted “as is.” The degree to which these models are biased by such data distributions (e.g., huge numbers of road-killed snakes, absence of collections reflecting abundance, regional bias near museums) is an ongoing concern, taken up briefly in this chapter.

Three chapters, a total of 40 pages, make up Part V, but they cover some of the most important methods used in reptile ecology and conservation today. Chapter 23 covers experimental populations—what was once termed the “University of Michigan approach.” The explicit discussion (including subheading) of “selecting a species,” indicates that contributors varied in their position as to organism or question-oriented research programs. Regardless, the mesocosm approach is vital to both experimental ecology and conservation translocation (supplementation, reintroduction) programs. Physiological ecology (Chapter 24) is an exhaustive review of the field, and includes the easily assimilated graphs—if still a bit small—for which the field is rightly famous. Chapter 25 on genetic issues was perhaps the most exhaustive, with three times as many citations as other contributions. Nonetheless, I was struck by the absence of any consideration of species boundaries or evolutionarily significant units, or recent moves toward ecosystem level management efforts instead of individual taxa (Sullivan et al. 2014b).

The final chapters, five covering 75 pages, occupy Part VI and they concern more sampling (occupancy, abundance, disease samples), and philosophical issues (management, education). The chapter (26) on occupancy models reads as something of a defense of PRESENCE, a reply to the many criticisms of this useful modeling approach. This program is widely used by agency personnel, and lauded because so many aspects of sampling can be assessed—researchers can evaluate the degree to which different observers impact surveys. It does suffer when sampling units are limited (e.g., ten preserves are too few, perhaps accounting for the over-subdivision of plots alluded to above). Given that it is intimately related to chapters 10 and 17, as all three concern sampling individuals of populations, it might have been conjoined with other contributions. Chapter 29, covering conservation and management broadly, touches on many topics all too briefly, including urban environments and translocation (see below); some of these topics easily could have warranted chapter-level coverage.

I have only two concerns with this book. First, coverage of one of the most important issues facing conservation biologists today: translocation. I am sympathetic to the authors of the present volume. Like me, they desire a return to past definitions, but continued use of RRT (relocation, repatriation, translocation; pp. 431–432) is counter-productive. As currently defined by the IUCN, the over-arching term for all animal relocations and introductions is translocation (see review in Sullivan et al. 2015). Mere semantics? Of course—but it continues to confuse and

confound workers when different terms are used for similar actions, especially in review articles (see citations in Sullivan et al. 2015). Historically, translocations (= relocation of old, mitigation translocation of the current IUCN) involved the movement of a single individual (often an adult) to a nearby area with an unknown (but assumed) resident population, to mitigate some human-animal conflict. Thus, mitigation translocation concerns assimilation of an individual not the establishment of a population. By contrast, introductions (repatriations, supplementations) typically involve the release of many individuals, often including juveniles (or eggs) to an area devoid of a resident population. Hence, herpetologists working in these two distinct domains of conservation biology pursue dramatically different goals; this is why we must maintain clarity in terminology. Confusion has led to inaccurate estimations of “success,” which continue to this day to confound and compromise any number of conservation efforts with reptiles (Sullivan et al. 2015).

My other concern, as alluded to above, is overlap. For any techniques book, organization is key; many readers will open this volume with a specific question about a method, hoping to find a chapter that addresses the issue from start to finish (making the index important, too). My preference: reduce redundancy by avoiding taxonomic chapters (e.g., “sea snakes” and “sea turtles”), but regardless, adopt a theme and stick to it. Taxonomic groupings, although expedient, lead to repeated instances of overlap as exemplified by the fact that VES are covered as a major chapter section (i.e., by a subheading, and from 1–3 pages of text) in four different chapters (p. 128, Ch 10; p. 185, Ch. 14; p. 232, Ch 17; p. 245, Ch. 18), and are not dramatically divergent (i.e., tailored to the taxon at hand). Readers benefit when they can read accounts of a method, such as VES, fully described at the outset, and then qualified by example via the unique applications as they vary taxon by taxon. On the other hand, the approach taken here allows the reader to quickly locate methods used with their study organism, and avoid wading through what they might view as extraneous material.

Overall, I think that most will find little to quibble about with this volume, save for the obvious overlap with the collection of McDiarmid et al. (2012)—in fact, a number of authors contributed to both works. Given the enormous effort currently underway with investigations of ecology and conservation of reptiles around the world, I think the field can support two edited volumes on these methods. I close by noting that the present book not only contains a wealth of information, but is extremely well produced. I was hard pressed to find any issues aside from the small size of some figures described above; a trivial error includes: “*Helodermia*” for “*Heloderma*” (p. 130). This is an important collection of methods for all students of reptile ecology and conservation.

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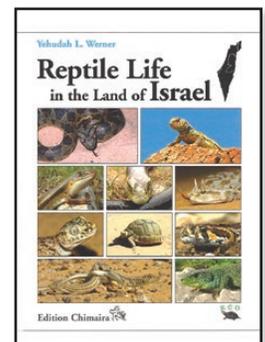
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Reptile Life in the Land of Israel

Yehudah Werner. 2016. Edition Chimaira, Frankfurt am Main (www.chimaira.de). Available in North America from ECO Publishing (www.ecouniverse.com). 494 pp., 844 figures. Hardcover. US \$150.00. ISBN 978-3-389973-104-0

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I have followed Prof. Werner’s work for roughly 50 years. Even if he doesn’t consider this book the capstone of his career, it certainly serves as such. It is unarguably the most complete coverage of the natural history of Israeli reptiles imaginable. Considering that the book was first published in Hebrew and written again in English, it is easy to imagine the devotion given to this project. It is the culmination of a lifetime of personal experience and gathering of pertinent literature. Werner is not only a museum curator, although he is that, but an active field biologist, as I can attest, having accompanied him in the field years ago in Turkmenistan. He is also a keen observer of captive animals in the lab.

This could be regarded as two books, as the first lengthy section is essentially a general herpetology, using Israeli reptiles as examples when possible, but extending beyond Israel in its global coverage. Thus, it could serve as a textbook for zoology students or for naturalists not completely familiar with reptiles. The real meat of the book (or the “second” book) is the complete coverage of the natural history of each Order, Family, Genus, and Species of reptile occurring within the borders of Israel/Palestine. Although I don’t find this specifically stated, the coverage of this book includes the Sinai Peninsula (now Egypt).

Although it contains all the necessary components of a field guide in addition to everything else, that is, keys, illustrations, range maps, etc., it is far too bulky to carry in the field, and far too precious to submit to the hazards of the outdoor environment.

The author has tried to include every fact known about every species that occurs in Israel, so most accounts cover at least two pages. Each species account contains a line drawing illustrating dorsal, lateral and ventral aspects of the head; each of these illustrations represents an actual specimen and includes the museum registry number. He even devotes three pages to the Nile Crocodile, *Crocodylus niloticus*, which has been extinct in Israel for more than a century. Each account is accompanied by at least one photograph, usually in color, always of live animals, and often showing some aspect of the natural history, mating, feeding, shedding, and so on. Some of the photos of captive animals have been taken on a mirror, thus showing both dorsum and venter. This is a technique adopted by Werner and used extensively in his publications. As the title indicates, this is a book on the life history of reptiles, not specifically on taxonomy, although this is covered necessarily. As a consequence, the species accounts do not include synonymies, although alternative generic names are sometimes mentioned. This might be seen as a shortcoming, as access to the literature may require searching for older names, some of which have been changed only recently, and many were of long standing. Such information is particularly important to students and newcomers to the region.

Topics included in the species accounts cover all aspects so far known of life history, development, behavior, sexual dimorphism, color variation and changes in color as adjustment to temperature, nuptial coloration and the like. Where any topics are missing, opportunity for future research is indicated, at least by implication. A particular strength of the coverage is that information is drawn from the entire range of distribution of the species and is not restricted to Israel. As this is not a work devoted to taxonomy, the ever-popular cladograms of such recent works are not included.

The text ends with a discussion of biogeography. This discussion is limited to a descriptive and ecological geography, with no real discussion of historical biogeography or phylogeography. These latter two approaches are in any case hypothetical and phylogeography is based almost entirely on molecular phylogenetics, expressed cladistically. The Levant in general is an interesting region in phytogeography as well as zoogeography. Its climate and topography are varied enough that it supports Mediterranean, Irano-Turanian, Saharo-Arabian, and Anatolian influences. A number of taxa of African predominance find their northern limits in Israel, and several of northern affinities find their southern limits here.

There is little mention of molecular systematics in this book, which is fair enough, considering that morphology offers the best explanations of the biological adaptations that are the real subjects of this book. Although it is becoming possible to identify the genes that produce some of this morphology, that in itself tells us nothing of the adaptations, which are identified by their morphological functioning.

Several appendixes follow the discussion of biogeography. These consist of the history of reptile research in Israel, research objectives and methods in herpetology, the profession of herpetology, literature and journals, the relationship between people and reptiles, snakebite, nature conservation, and Hebrew names of the reptiles (including transliteration into Roman script). It is

not clear why most of these topics are in appendixes rather than in the introductory text on herpetology.

A final appendix was added by the publisher. It consists of color photographs of all or most of the species discussed in the text. Because the text itself is so well illustrated, these photographs add little to the utility of the book, and must have raised the production costs considerably, as presumably the photographers were compensated. Necessarily, these costs must be reflected in the price of the book. There are multiple photographs of most of the species. I suppose this was thought to enhance the attractiveness of the book to potential buyers who purchase any pretty book on herpetology. Having said that, on the positive side, most of the photographs are excellent. They were taken in Israel, as indicated by the localities given in the captions, or from Jordan or Syria, and they serve to illustrate the variation in color and pattern of the species shown.

Any reviewer can come up with some sort of negative criticism; indeed, some consider it an obligation. It is difficult to know whether any shortcomings in this book are attributable to the author or to the publisher's policies. I suspect the latter in most cases. What I find are sins of omission rather than errors of fact. There is an index of Latin names, but no subject index, although the detailed contents help to compensate for this. Professional zoologists are used to having citations in the format of the authors' names and dates in parentheses, rather than the format used here, which is by numbered reference to the alphabetically arranged bibliography. My copy has several bookmarks and sticky notes in the list of references as a consequence. An extensive glossary would have been very useful, especially for the introductory part of the book.

In an apology, Werner compares his book unfavorably in contrast with John Anderson's herpetological volume in the *Zoology of Egypt*. I absolutely disagree with this apology. John Anderson's book was a model for its time, but its time was the 19th century and Anderson had not spent his entire life in Egypt. Werner's book is a synopsis of the 20th century. In saying that, I do not mean to imply that the coverage ends with 1999. Indeed the references and personal observations continue until the time of publication. I know of no other regional herpetological book that comes close to this one in its quality and scope.

Reptile Life in the Land of Israel belongs in the library of every museum that maintains a herpetological collection international in scope and every personal library of those concerned with the Western Palearctic. I know that my copy will be a continuing source of reference. The extensive bibliography alone (1702 references) is a valuable treasure. Unfortunately, the price will keep it out of the hands of all but the most serious researcher.

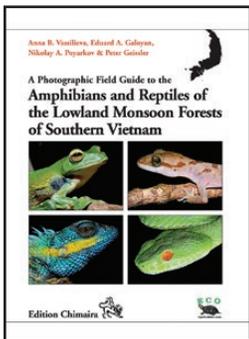
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A Photographic Field Guide to the Amphibians and Reptiles of the Lowland Monsoon Forests of Southern Vietnam

Anna B. Vassilieva, Eduard A. Galoyan, Nikolay A. Poyarkov, and Peter Geissler. 2016. Edition Chimaira, Frankfurt am Main. 324 pp. Hardcover. 49.80 Euros (approximately US \$56.50). ISBN 978-3-89973-465-2.



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This superb new book has been co-authored by a team of Russian and German herpetologists. Its solid binding and hard cover, with good quality glossy paper, make it easy to bring in the field. It covers 142 species (41 amphibians and 101 reptiles). Eight of the amphibian species and ten of the reptile species (respectively 19.5 and 9.9 %) covered by the guide were described in the 21st Century. Four of the amphibian species and three reptile species have even been co-described in previous contributions by the authors, who have an extensive field experience within the area. The guide includes a foreword by the Vietnamese herpetologist Nguyen Van Sang; an introduction (pp. 14–28) with information on herpetological history and geography of the region covered; a chapter on the reintroduction of the Siamese crocodile (pp. 29–31) that would have been more logically placed within the crocodile section; a chapter on how to use the guide (pp. 32–41) that provides clear and extremely useful illustrations of the diagnostic characters for each taxonomic group; the amphibian (pp. 43–127) and the reptile (pp. 129–308) species accounts; a checklist of the reptiles and amphibians of Cat Tien National Park and their conservation status (Vietnam Red List, IUCN Red List, CITES); a glossary; and a reference section. At the end are 11 pages of ads for other books published by the same publishing house, which thus represent more than 3 % of the total number of pages.

Besides the four beautiful reptile and amphibian photographs on the front cover and the authors' photographs on the back cover, the guide presents three maps, 14 biotope photographs, and 378 photographs of individuals, eggs or tadpoles (137 for amphibians, 241 for reptiles), all in color. All photographs, without any exception, are of remarkable quality. The authors have mostly presented whole-body photographs, which are most useful for species identification, and they were generally taken *in situ*. Some photographs deserve special mention, like the ones illustrating predator-prey interactions, such as on page 216, showing an *Ahaetulla prasina* (Boie, 1827) preying on a *Hemidactylus frenatus* Duméril & Bibron, 1836 (not "Schlegel, 1836" as indicated in the guide) (unfortunately the latter was

erroneously identified as a "flat-tailed house gecko", i.e., *H. platyurus* [Schneider, 1797]). A photograph shows the recently described pitviper *Trimeresurus rubeus* preying on an unidentified tree frog, which is actually *Polypedates megacephalus* (Poyarkov, pers. comm.). Eleven amphibian species are shown in amplexus. All photographs are accompanied by a mention of the Vietnamese province in which they were taken, which greatly increases their value, even if it would have been much better to have precise localities. The vast majority of the photographs were taken in Vietnam, which decreases the risk of illustrating populations that might be later shown to belong to a different taxon than the one found in the area covered by the guide. There are just a few exceptions: a *Varanus salvator* from "Indonesia," captive *Python bivittatus* without locality, a *Gonyosoma oxycephalum* from "Thailand," a *Ptyas mucosa* from Hainan, and *Heosemys annandalii* from "Cambodia". The Indonesian monitor was more precisely photographed in Ujung Kulon National Park, western Java (A. Vassilieva, pers. comm.). Some photographs show species never illustrated alive before, such as *Oligodon saintgironsi*, which had been described in 2008 based on long-preserved museum specimens. All species were illustrated by at least one photograph, often several.

The "guide structure" section of the book explains that it "includes the illustrated accounts of 142 common or reliably documented species of amphibians and reptiles inhabiting the forests of Cat Tien National Park and adjacent lowland and hilly areas of southern Vietnam." Given this explanation, the absence of accounts for many species is surprising. Among them, numerous species recorded from lowland or hilly forested localities directly adjacent to the park or in neighboring provinces, such as *Cyrtodactylus dati* Ngo, 2013, *C. huynhi* Ngo & Bauer, 2008, *C. takouensis* Ngo & Bauer, 2008, *Gekko russelltraini* Ngo, Bauer, Wood & Grismer, 2009, *Takydromus madaensis* Bobrov, 2013 (still known only by its holotype but regarded as a valid species in the guide, although the authors couldn't find any additional specimens at the type locality; Poyarkov, pers. comm.). The list of species would have been greater if it included all species living in southern Vietnam, especially the offshore islands, i.e., the entire geographic area shown in the guide's map (fig. 2) extending from Dak Lak Province in the north to the southern tip of Ca Mau Province and all the associated islands in Rach Gia Bay. The herpetofauna of this region is diverse and contains a number of endemic species (Grismer and Ngo 2007; Grismer et al. 2008, 2011, 2015; Ngo et al. 2008). The inclusion of the Phu Quoc Island and the Con Dao Archipelago hundreds of kilometers from each other and hundreds of kilometers south of any of their other study sites emphasizes the absence of coverage throughout the entire Lower Mekong basin. Only some of these species are listed in the "confusing species" section of each species account. In this respect, the title of the guide is misleading, as it should have stated that it covers mostly Cat Tien National Park, not all the lowland monsoon forests of southern Vietnam. The global distribution indicated for each species is generally correct, rarely incomplete, like in the case of *Ptychozoon trinotaterra*, said to occur in "Thailand, Vietnam, possibly Cambodia," although it has been documented from Cambodia (Hartmann et al. 2014) and Laos (Teynié et al. 2014).

According to a taxonomic revision published after the guide (Yuan et al. 2016) and co-authored by one of the guide's authors, the population of *Microhyla fissipes* in southern Vietnam is actually referable to the recently described *M. mukhlesuri* (Hasan et al. 2014).

The appendix providing a list of the amphibian and reptile species known thus far from Cat Tien National Park shows an asterisk near the species that were recorded in literature sources but whose “presence in Cat Tien was not confirmed during the long-term survey by the authors.” These 21 species marked with an asterisk are not included in the species accounts, except for five (*Glyphoglossus molossus*, *Hylarana macrodactyla*, *Lygosoma bowringii*, *Python bivittatus* and *Oligodon fasciolatus*). On the other hand, *Rhacophorus helenae*, *Dixonius vietnamensis*, *Hypsiglossus plumbea*, *Ahaetulla nasuta*, *Dendrelaphis subocularis*, *Rhynchophis prasinus*, and *Amphiesma stolatum*, not listed for Cat Tien National Park, are included in the species accounts. The decision to include or exclude species from the species accounts is thus a bit arbitrary and forces the reader to be equipped with more general reptile or amphibian guides to make sure that all the species present in the area are envisaged before attempting identification.

The text for each species account includes the English and Vietnamese common names (the latter written without the Vietnamese accents), and sections on size, identification, global distribution, morphological and color description, ecology and habitat, activity, reproduction, confusing species, references, and for some species additional notes.

We note that the proper taxon authorship of *Boiga siamensis* is “Nootpand, 1971,” not “Nutaphand, 1971” (Pauwels et al. 2005). There is no indication why the Red-tailed Ground Skink has been referred to as “*Scincella* cf. *rufocaudata*” and the Buonloi Forest Skink as “*Sphenomorphus* cf. *buenloicus*.”

The maximum total length of *Xenochrophis flavipunctatus* is indicated as 1100 mm. The largest documented specimens are 1275 mm in total length, and extrapolations based on individuals with broken tail indicate a possible total length of 1368 mm (Chanhome et al. 2001). Following the recent description of *Malayemys isan* by Sumontha et al. (2016), we confirm the identification of the individual shown on pages 296–297 as *M. subtrijuga* based on its possession of six nasal stripes and the contact between the infra- and the supraorbital stripes. A few more words could have been added to the glossary, in particular paravertebral, pentadactyl, postoccipital, presubocular, and subocular that are used in various species accounts.

We have only two regrets for the guide. First, the absence of identification keys, even to family level, especially given the extensive herpetofaunal knowledge of the authors and the relatively limited number of species treated. Second, the non-exhaustive literature cited. We would have preferred that the literature provide an extensive list of works published on the reptiles and amphibians of the area covered by the guide, including those in Vietnamese and Russian. In our opinion, the literature cited (146 references) includes too many general works that are not bringing specific information on the region covered.

These few shortcomings should not obscure the fact that this new book is a remarkable piece of work, resulting from extensive field survey, an extensive knowledge of the local species, and great photographic skills. It is a most useful tool for field workers in the area and a beautiful book to consult for all naturalists. We strongly encourage our colleagues and natural history libraries to purchase it.

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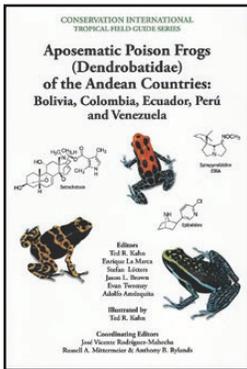
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Aposematic Poison Frogs (Dendrobatidae) of the Andean Countries: Bolivia, Colombia, Ecuador, Perú and Venezuela

Edited by Ted R. Kahn, Enrique La Marca, Stefan Lötters, Jason L. Brown, Evan Twomey, and Adolfo Amézquita. 2016. Conservation International, Arlington, Virginia (Available through Natural History Book Service at <http://www.nhbs.com/series/40786/conservation-international-tropical-field-guides>). xxii + 588 pp., 123 color photos, 164 color illustrations, 74 color distribution maps. Softcover. £34.99 (ca. US \$46.00). ISBN 978-1-934151-27-3.



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Poison frogs (Dendrobatidae) truly are living jewels of the forest. Hopping about in daylight as though to taunt predators, these frogs sporting stripes, spots, and reticulations of red, orange, yellow, blue, and green go about life with abandon. So, too, *Aposematic Poison Frogs (Dendrobatidae) of the Andean Countries: Bolivia, Colombia,*

Ecuador, Perú and Venezuela is a gem.

Aposematic Poison Frogs (Dendrobatidae) of the Andean Countries is the most recent book in the Tropical Field Guide series published by Conservation International (CI). The stated goal of this series is “the consolidation of existing knowledge on target groups of organisms, especially flagship species, as a stimulus to promote ecotourism.” In 1994, when the first field guide in the series (*Lemurs of Madagascar*) was published, CI regarded ecotourism as “one of the best economic-based solutions to the biodiversity crisis.” Two decades later, CI remains steadfast in this belief.

Poison frogs of the family Dendrobatidae are regarded as “mini-flagship” species already popular with ecotourists who walk forest trails by day and frequently encounter these dazzling frogs. This comprehensive volume will inform and delight readers; serve as an authoritative summary of dendrobatid biology; stimulate further interest among biologists and non-biologists alike in these amazing amphibians; and contribute to the survival of dendrobatids and protection of their habitats. Much has been written about poison frogs, including scientific reviews (e.g., Weygoldt 1987; Santos et al. 2003; Vences et al. 2003), articles for the general reader (e.g., Myers and Daly 1983; Walls 1994), and husbandry advice for hobbyists (e.g., Lötters et al. 2007; Sihler and Sihler 2007), but until now there has never been a field guide focused on these frogs.

This volume represents the experience and knowledge of more than 100 researchers worldwide. It reflects a massive amount of work and took the authors nearly 10 years to compile. The book is dedicated to John W. Daly (1933–2008), who spent much of his life studying dendrobatids and their alkaloids and the potential medicinal applications of those compounds. In his foreword, John D. Lynch writes that the authors are experts and students “effectively bridging the gap between ‘pioneers’ in the

field, and the next generation of up and coming students that soon will replace them.” Lynch commends the authors for communicating technical scientific studies in a way that will engage anyone interested in nature and for accurately conveying the life history, conservation, and diversity of these frogs. I wholeheartedly agree.

The layout of the book is attractive and user-friendly, and the organization is impeccable. A useful “How to Use This Field Guide” briefly describes the subsections of the accounts (10 chapters): genus description, species accounts, authors, names, taxonomic comments, identification and description of the adults, identification and description of larvae and froglets, similar species, alkaloid profile, natural history and ecology, calls and vocalizations, reproduction, distribution, threats, and conservation status. Throughout the book, subheadings and spaces between paragraphs allow for easy reading. The multi-colored maps of biomes and species distributions and black & white line drawings are functional and esthetically pleasing. Unfortunately, many of the color photographs of frogs and habitats are dark. Ted Kahn’s paintings of frogs based on photographs are stunning. The editors did an outstanding job of transforming more than 100 authors into a uniform voice.

Chapter 1, “Recent Progress in the Systematics of Poison Frogs and Their Relatives (Dendrobatoidea),” written by Taran Grant and Darrel R. Frost, begins with a clear discussion of the tasks of systematics and the reason for flux in species’ scientific names. Over the past several decades, the number of known species of dendrobatids has increased from about 70 (in one family, Dendrobatidae) to 306 (Frost 2016). Currently, two families within the Dendrobatoidea are recognized: Aromobatidae (122 species, all of which are non-toxic, as far as we know) and Dendrobatidae (184 species, including all of the toxic species of poison frogs, plus some that are non-toxic). This field guide focuses on the family Dendrobatidae. Tables and diagrams enhance the chapter. It ends with a caveat that the new taxonomy of dendrobatoids “is based on the analysis of an unprecedented amount of evidence but is far from the last word on the systematics of this group.” Never mind, for now we have an outstanding discussion of the current state of dendrobatoid taxonomy.

Chapter 2, “Amphibian Conservation in the Tropical Andes and Amazon Basin,” written by Adolfo Amézquita, Ted R. Kahn, Kristopher Kraus, Enrique La Marca, Ricardo A. Medina-Rengifo, and Giovanni Alberto Cháves-Portilla, provides a comprehensive synthesis. The Tropical Andes Hotspot (Colombia, Ecuador, Perú, Venezuela, and Bolivia) is considered the most important and most endangered of the world’s Hotspots (Mittermeier et al. 2004). Only a small fraction of the region is protected, and no functional biological corridors connect protected areas. After a brief summary of amphibian declines and the threats facing that group, the authors focus on why poison frogs are vulnerable to these threats. The chapter includes discussion of *in situ* and *ex situ* conservation and highlights several reserves that protect dendrobatids. The authors cover a lot of information, but it is all presented clearly and concisely.

Chapter 3, “Reproduction and Larvae of Aposematic Andean Poison Frogs,” written by Ted R. Kahn, is a short overview of dendrobatid life histories and tadpoles. Four tables summarize information on amplexus, egg and clutch size, parental care, and larval characteristics at the generic level. The black and white illustrations of tadpole mouthparts and body plan will be helpful for readers attempting to identify larvae (best accomplished with a microscope). Unfortunately (from my perspective), the

chapter is missing discussion of some of the fascinating aspects of dendrobatid reproduction (e.g., evolution of parental care; environmental correlates of biparental care, male versus female care, and tadpole deposition sites).

Chapter 4, “Discovery of Bioactive Alkaloids in Dendrobatid Frogs: Traditional and Medicinal Uses,” was written by John W. Daly shortly before he passed away in 2008. I wish I could tell Daly how much I enjoyed his chapter, written as the story of how we know what we know about dendrobatid toxins. Daly discusses indigenous use of three species of poison frogs for poisoning blowgun darts, arthropod sources for batrachotoxins, medicinal and research use of alkaloids, and the fact that regulatory difficulties related to “bio-prospecting” may prevent us from fully benefitting from alkaloids before the frogs and their habitats are gone. A table categorizes dendrobatid alkaloids into the various classes of these compounds. Daly’s lifetime collaborators compiled a 13-page appendix of alkaloids identified from Andean poison frogs and the dietary sources of those alkaloids (when known). The appendix lists every species of Andean poison frog (all the species included in this volume) and includes not only published information, but also Daly’s hand-written notes, transcribed and reviewed. The appendix lists virtually everything known to date concerning dendrobatid alkaloids and will be indispensable to those working with dendrobatid skin toxins.

The last 10 chapters, comprising 72% of the book, are species accounts organized by genus: *Adelphobates*, *Amereega*, *Andinobates*, *Dendrobates*, *Epipedobates*, *Excidobates*, *Minyobates*, *Oophaga*, *Phyllobates*, and *Ranitomeya*. These accounts were written by many dozens of authors, including many non-native-English speakers, yet the text reads as though one native English-speaking person (a skilled writer, well versed in grammar) penned them. Ted Kahn is a common denominator on many of the accounts, so I assume we have him to thank for a job extremely well done. The accounts are engaging and informative, although I found it odd that the volume contains no dichotomous keys to the species, as readers might find them useful. The reasoning may have been that the combination of distribution maps, color photographs and paintings of the frogs, and the entries under “Similar Species,” allows readers to identify species easily.

A seven-page glossary, two pages of useful websites, an extensive bibliography, and an index round out the volume. The book ends with six lined pages for field notes and a page with a 220-mm ruler. The page states, “Place Frog Here and Photograph for Scale Using Margin Ruler. The frog should be in a clean transparent plastic bag to prevent possible disease spread.” This sums up the spirit of the book. Readers are encouraged to take an active role in their own learning experience, but not at the expense of the frogs.

This book truly is a gift to biologists, ecotourists, nature-lovers, and to the frogs themselves. The authors, editors, and Conservation International deserve kudos for a beautifully written and produced volume. The book is definitely worth the price, but be forewarned: It is printed on high-quality paper and is 588+ pages, so it is heavy. I encourage all herpetologists, especially those interested in dendrobatids, and all ecotourists exploring the Andean countries of Bolivia, Colombia, Ecuador, Perú, and Venezuela to give this book a prominent place on your nature bookshelf—except when you carry it in your backpack in hopes of watching these colorful jewels boldly go about their business in the open, protected by a diverse pharmacopeia of alkaloids.

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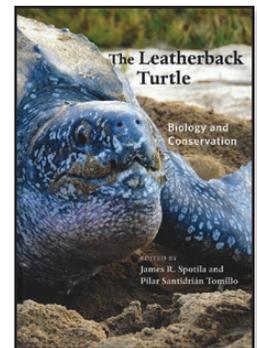
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The Leatherback Turtle: Biology and Conservation

James R. Spotila and Pilar Santidrian Tomillo (eds.). 2015. Johns Hopkins University Press, Baltimore, Maryland. xii + 219 pp. Hardcover. 9 black & white photographs, 70 line drawings, 16 color plates. US \$70.00. ISBN: 978-1-4214-1708-0.

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In their preface, Spotila and Santidrian Tomillo describe the impetus for this book as the timely filling of a need to compile the collective knowledge on this unique species of sea turtle for science, conservation, and general education. As two of the premier researchers on leatherbacks, they’ve capitalized on their access to the top levels of the sea turtle research and conservation community and solicited equally qualified colleagues for treatises on all aspects of the biology and ecology of *Dermodochelys coriacea*. The resulting volume consists of 18 chapters, which are distributed among five theme-based “Parts.” Part I- *Biology*, Part II- *Life History and Reproduction*, Part III- *Population Status and Trends*, Part IV- *From Egg to Adulthood*, and Part V- *The Future of the Leatherback Turtle* each consist of three to four relevant chapters.

The *Biology* section of the book opens with a succinct review of the phylogeny and evolutionary history of leatherbacks by well-known turtle biologist Peter Pritchard. He provides a history of the family Dermochelyidae and summarizes the morphological, physiological, and behavioral adaptations that distinguish the single extant genus from all other modern sea turtles (Cheloniidae), and offers brief comments on leatherback distribution and population trends in face of current threats. Chapter 2 follows with a synopsis of current phylogenetic and phylogeographic knowledge of leatherbacks, and describes ongoing projects to further elucidate population structure and vital rates using genetic techniques. Characterization of their extreme diving behaviors and the physiological adaptations that provide these capabilities are the subject of Chapter 3. The *Biology* section closes with a very comprehensive chapter on leatherback anatomy. Of particular utility here are the comments that distinguish specific anatomical features of *Dermochelys* from those of the hard-shell sea turtles.

The next section of the volume, entitled *Life History and Reproduction*, covers adult reproductive inputs and some of the factors influencing hatchling production and contributions to the population. Chapter 5 reviews endocrinology and the gonadal cycle, again providing and contrasting information from other species where relevant. The following chapter describes nest site selection, nesting behavior and clutch frequency, and joins the previous chapter in noting the relative paucity of knowledge on leatherback mating behavior. Chapter 7 briefly presents the environmental factors that affect clutches on the beach and summarizes the stages of incubation and hatchling emergence, and known geographic patterns of leatherback. Pivotal temperatures and the transitional range of temperatures for sex determination are communicated in Chapter 8. The two latter chapters provide a more complete view of climate change outcomes by citing both temperature and precipitation effects. Authors in this section noted the greater plasticity in site fidelity of leatherbacks along with the possible impacts of climate change on sex ratios. This is one of the places in the book where it would have been interesting to see a synthetic closing statement, perhaps discussing the effects of population-level integration of these two factors.

The *Population Status and Trends* section comprises three chapters that cover the Atlantic and Pacific Basins and the Indian Ocean. The authors provide population data from literature reviews, current studies, and their own work, covering in-water and nesting beach information, seasonality, genetic relationships, biometry, threats and trends. The section could have benefited from some standardization in presentation, as some of the information categories are not given for all three oceans. This is likely the combined result of the chapters originating as three independent manuscripts, and a lack of collecting effort and/or published reports on those data. All three chapters do well in populating the global threat radar for leatherback populations, and the section ends with eight pages of very nice color photographs of leatherbacks.

The editors made an interesting choice in their placing of the next four chapters into a separate section entitled *From Eggs to Adulthood*. At first glance it appears that much of the material covered would have folded neatly into the chapters of the *Biology* or *Life History and Reproduction* sections. However, as one reads further into each of these particular chapters, it is evident that the scope, depth, and number of concepts being discussed benefit from the clarity afforded by their separation. Chapter 12 alone expands from a review of egg structure and composition,

through effects of clutch structure and the role of shelled albumin gobs (erroneously known as “yolkless eggs”), and on to intrinsic and extrinsic factors affecting embryonic development and hatching success. Extrinsic factors, particularly temperature, hydric regimes, and respiratory gas concentrations are given even more detailed treatment in the second half of the chapter. Chapter 13, leading with a section appropriately sub-titled “How leatherbacks work,” takes a similar approach and provides succinct reviews of all the animal’s major homeostatic and growth functions. These build toward the concept of energy budgets and the role of physiological constraints in setting life history parameters. A compelling call is made to utilize the toolbox of “conservation physiology” to guide critical thought in efforts to sustain leatherback populations.

Dermochelys coriacea is the most wide-ranging of sea turtles, and Chapter 14 presents information on the possible orientation mechanisms used to navigate on their long nesting and foraging migrations. Satellite telemetry tracks are provided, illustrating general movement patterns within ocean basins, and examples of finer scaled foraging and internesting movements are cited. The limited knowledge we have of leatherback hatchling movement and dispersal is discussed using information from particle drift modeling, dispersal simulations, and genetic data. The last chapter in this section outlines the role of marine productivity and climatic oscillation in determining not only the distribution of foraging leatherbacks but growth and fecundity as well. The authors provide some interesting insights on how and why highly productive areas may be bypassed for regions with lower productivity, and how this affects survival.

The book’s final section, *The Future of the Leatherback Turtle*, directly addresses what are commonly considered two overarching threats to leatherback populations: suboptimal and lost aquatic and terrestrial habitat, exacerbated by climatic cycles and change and fisheries interactions. The *Warming Climate* chapter gives a summary of the possible physiological outcomes of water temperature increases for leatherbacks, then goes on to complement the preceding chapter’s discussion on the effects of climatic cycles on marine productivity by detailing the observed and predicted ENSO effects on the reproductive ecology (output and migration) of the important leatherback nesting aggregation at Playa Grande, Costa Rica. Moving to the nesting beach, the authors provide a synopsis of the consequences of warmer beaches for sex ratios and persistence of populations. It is important to note their suggestions for use of caution and a measured approach in employing interventions such as relocation and hatcheries. A brief mention of the sea level rise associated with global climate change includes the interesting observation that its effect of eliminating nesting habitat may be integrated as a mechanism to shift turtles to higher latitude, cooler beaches. Chapter 17 carefully explains the types of data needed to effectively evaluate fisheries impacts on leatherbacks, then presents striking numbers for reported leatherback bycatch in longline, net, and trawl fisheries over a 21-year period. The efficacy of technological solutions such gear modifications is discussed, and techniques such as telemetry of non-target species and partnership-building among stakeholders are suggested as means of addressing the bycatch issue at a scale required to preserve leatherback populations. By way of closing, the editors focus the final chapter broadly yet accurately on our vastly improved yet still deficient current knowledge, and rally the reader to accept the challenges posed by existing and expanding data gaps.

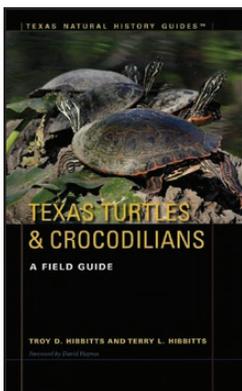
Spotila and Santidrian Tomillo have done a very commendable job of initiating and shepherding the tremendous effort required to produce this book. As might be expected from a compilation of topical manuscripts, there is some overlap of subject matter between the chapters and the sections—this despite the fact that one or both editors contributed to seven of the 18 chapters. In most cases, however, these instances provide further explication and detail rather than redundancy. The literature cited for each chapter is comprehensive, referencing current work at the time of publication as well as seminal papers. *The Leatherback Turtle* provides a global reference for a globally distributed species and fills any number of data gaps for biologists, managers and citizen-scientists, especially in places such as the southeastern United States that are documenting an increasing trend in leatherback nesting. While doing so, the book clearly points the way towards much needed research and conservation efforts for this unique animal.

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Texas Turtles & Crocodylians: a Field Guide

Troy D. Hibbitts and Terry L. Hibbitts. 2016. Texas Natural History Guides. University of Texas Press, Austin, Texas (<http://utpress.utexas.edu>). xvi + 276 pp., 117 photos, 36 maps. Softcover. US \$24.95. ISBN 978-1477307779.



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Many of us recollect our field guide as the trusted companion to many adventures. Yet many kids now have more digital experiences rather than muddy ones, keeping a digital tether of constant access to information and people. This makes a quality field book into a critical tool, often the only reference on hand for review when users are outdoors having the encounters

the book seeks to inspire. The new field guide for Texas turtles and the American Alligator delivers the right content to its users the majority of the time, has a couple of things that might have been better alternatives, and has at least one area that is factually misleading. Overall, this is a useful guide to the turtles of Texas and completes the herpetological field guide series for the state.

Texas has a remarkable diversity of reptiles, including more than 30 species of turtles, representing a bit more than half of the total turtle species diversity found in the United States. This field guide seeks to enable identification and provides brief information on each of the native species and established non-native (*Pseudemys nelsoni*) species, while noting several exotic taxa that are often found across the state (e.g., *Centrochelys sulcata* or *Caiman* sp.). The authors of this volume are life-long herpetologists with an enviable amount of time spent in active field herpetological pursuits. I examined the hardcopy and e-book version of

this contribution for its use as a practical field guide by having it along during our own fieldwork in early 2016.

While there is a previously published identification pamphlet (Franklin 2015) and a more comprehensive volume that addresses both reptiles and amphibians (Dixon 2013), there are no other books that are designed to enable a person to identify and learn something about the turtles observed while in the field in Texas. The new volume completes a series of herpetological field guides that addresses the amphibians (Tipton et al. 2012), lizards (Hibbitts and Hibbitts 2015), and snakes (Dixon and Werler 2005) of Texas. While each is generally in the same format, the current volume introduces a broad array of material before proceeding to the taxon-specific accounts. The accounts themselves are fairly standard fare among modern guides and across the herpetological series for Texas.

I consider field guides to be as critical a piece of fieldwork machinery as hoop nets, especially given the nature of my employment and mentoring goals. Working with students in the field and watching them use and learn from field guides can be very insightful to how well the machine (i.e., field guide) functions in its everyday tasks. I am not embarrassed to report that talking about a field guide as a muted smart phone seems to strike a useful bridge from their world to my own. Here the physical book is well constructed and quite usefully printed on somewhat water tolerant paper (i.e., most of our Texas species are aquatic) in a solid binding. Its overall size format is the sweet spot for portability but with the attendant sacrifices to viewability (e.g., maps). The book withstood truck camping, the bottom of a dry bag, beaches, the edges of resacas, and just being used for the months up to this review. It is happily scuffed and a little crumpled, but has held up well to cautious field use.

The introductory materials are suitable to a general audience and cover a fairly broad array of topics. The authors begin the book with the broad context of turtle and crocodylian origins, evolution, and diversity. The introduction to the Crocodylia begins with coverage for the American Alligator and enables it to be integrated and consistently addressed within the volume. The natural history sections group the two clades and seek to broadly address aspects of ecology, reproduction, and behavior for both groups. I found these sections to provide a suitable middle ground for conveying information broadly but with sufficient detail to engage the reader, yet I think keeping the turtles and alligator information in discrete sections may have been preferable.

The next two sections introduce the reader to the physical environments inhabited by these animals in Texas and the potential anthropogenic impacts to habitats and species. The approach enables a watershed level introduction to the state with relevant species noted for each of these regional areas. Representative images depict features of the watersheds, and descriptions enable the reader to match the differing physical aspects of these to the types of turtles present. The impact sections include the normal litany of impacts (e.g., habitat loss, pollution, introduced species and so on), but also some turtle specific aspects such as predator control against nest predation and the consequences of turtle bycatch from recreational and commercial fishing. These sections conclude with a pragmatic review of the successful recovery of the American Alligator from a historically endangered species to a modern sport hunting novelty. The authors address the declines of aquatic turtles caused by the meat trade, but appear to diminish the potential impacts of pet trade collections on wild populations. The basis of the argument for minimal impacts

appears to be derived from the magnitude difference between the meat trade and pet trade animal shipment volumes, which is understandable. However, it is far less clear from the available data exactly what represents the actual pet trade volume. Further, the impacts of pet trade collection have not been clearly analyzed, despite calls to correct the regulatory reporting issues (Schlaepfer et al. 2005; Mali et al. 2014).

The final introductory sections address aspects of field herpetology for the new practitioner, but also includes a useful series of reminders for all of us. These include tips on finding and observing these animals, photographing them, and then the practical and legal aspects of physically collecting and retaining individuals. This is all appropriately prohibitive for discussions with regard to the alligator, but also cautionary with regard to maintaining private collections of turtles, living or preserved. There is a brief section on capture, handling, and the potential hazards this can mean to the unskilled. Unfortunately, this section also includes a discussion that is factually wrong regarding reptile zoonoses, restricted here to infections from the bacteria, *Salmonella* sp. The authors mistakenly convey that human infections require mouth contact with a turtle, and further, that concerns over this zoonotic are “overblown.” This is a very misleading section for the book and is badly misinformed. I suggest that errata be sent with the book that point to the Centers for Disease Control (CDC) website links for relevant modern cases, and that the authors review the relevant literature before a comprehensive revision of these paragraphs is completed. Succinctly, salmonellosis is seldom a serious issue, but it can be life threatening and does not require oral contact with a turtle. Like all zoonotics, it can be deadly serious and should not be minimized (nor exaggerated). Here it would have been appropriate to note the suitable precautions (e.g., gloves, hand-washing, decontamination of surfaces) that are easy and are not appreciably different than handling raw chicken from the supermarket.

The remainder of the book is the core of the field guide as a tool. The authors introduce taxonomy, note its fragility in an era of too many DNA sequencers and not enough systematists (my words, not theirs), and then proceed through the individual species accounts. It would benefit the printed volume to maximize the font used in the illustration figures of turtle shell morphology, and I would similarly suggest that an illustration or skeletons demonstrating the differences in morphology for Cryptodira and Pleurodira would better serve than photographs of a representative from each group. The authors include a dichotomous key and full glossary to cover the majority of terms that novice users questioned. I would note that the maps themselves are difficult simply by nature of the distributions for many taxa and the relative size of the maps in the printed volume. All of the maps for animals with disjunct distribution segments (e.g., p. 103; *Chelydra serpentina*), limited distributions (e.g., p. 145; *Chrysemys picta*), or coastal occurrences (i.e., p. 127; *Malaclemys terrapin* and all sea turtle maps) are not functional for fieldwork in the printed volume. Those maps are useable in the electronic version where the maps have excellent enlargement by zooming. The decision to keep the maps monochromatic rather than making the distributions colored in blue has exacerbated the problem significantly in both versions of the book.

Overall, the species accounts are complete and engage the reader with quality images both in hand and in habitat. Many of the accounts specifically link information back to the introductory sections on conservation or regulatory issues. I consider many of the images to be high quality as evidenced by the cover

image and that of many of the accounts. There are images that should be revised or replaced to better depict the organism (i.e., p. 112; male *Graptemys caglei* much tighter cropped to the animal), be less visually confusing (e.g., p. 134; *Pseudemys gorzugi*), or simply have the legend revised to note two taxa are present in the photo (i.e., p. 152; *Trachemys gaigeae* basking with *Apalone*). These are critiques, but are not intended to be critical as the vast majority of images by the authors clearly depict the species and multiple images of each are provided. Use in the field of both the paper and electronic versions proved these images to be accessible, and where confusion arose, the account was often able to resolve the characters between taxa. I would note that the majority of those characters likely require the animals in hand rather than at spotting scope or camera distances. Unfortunately, unlike the maps, these images do not zoom in the e-book edition, which seems another place for improvement. I found the supporting bibliography to be very brief for the curious, especially as a third of the volume is dedicated to wide ranging topics briefly addressed and without clear source information. I did find the inclusion of herpetological societies (names but no contact information), professional societies, and online resources to be quite valuable to the users of the book.

The new book on Texas turtles and the alligator was designed to help both experienced and novice individuals to understand what they have seen, what they have found in their yards, or what they have found dead-on-road (DOR). It is constructed in print as a durable book for use outside and also works for us on tablets and smart phones as a tool for both amateurs and professionals. I conclude that some changes to the volume would be needed before I would recommend the printed version to my students, but I believe that the most critical improvements could be quickly and easily completed for the e-book version and those revisions pushed out to the electronic platforms. This book completes the herpetological field guides for Texas with an appropriate focus on clearly depicting animals, providing brief data for each species, and allowing the next generation to start planning trips to find these animals in the big backyard that is Texas.

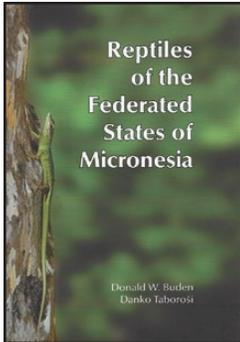
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Reptiles of the Federated States of Micronesia

Donald W. Buden and Danko Taboroši. 2016. Island Research and Education Initiative (<http://www.islandresearch.org>). 312 pp., > 300 photos, 35 maps. Hardcover. US \$25.00. ISBN 978-982-9123-94-7.



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Encompassing one-third of the earth's surface, the Pacific Ocean is the largest geographic feature of our planet. The thousands of oceanic islands scattered across this great ocean are so far distant from each other that these far-flung islands were the last part of the globe to be colonized by humans. The vastness of the Pacific acts as an organic filter for terrestrial species, and this biological sieve has produced fantastic simple natural evolutionary experiments that have provided some of the greatest early insights into evolutionary biology. The remoteness of Pacific islands makes travel and scientific collections difficult and this combined with the numerous governing, and sometimes warring, nations has long hindered a comprehensive coverage of the reptile diversity. The first real attempt to describe the reptile fauna of the Pacific did not occur until after World War II with Loveridge's excellent *Reptiles of the Pacific World* (1946). Since then, there has been a slow trickle of outstanding books including *Herpetofauna of New Caledonia* by Aaron Bauer and Ross Sadler, *Snakes of Papua New Guinea* by Mark O'Shea, *Reptiles and Amphibians of the Solomon Islands* by Mike McCoy, *Herpetofauna of Fiji* by Clare Morrison, and recently, the most comprehensive volume to date, *Reptiles and Amphibians of the Pacific* by George Zug.

Finally there is a book that covers in detail the lizards, snakes, and turtles from the Federated States of Micronesia (FSM). Scattered northeast of Australia and New Guinea lie more than 600 islands (from west to east) of the archipelagos of Yap, Chuuk, Pohnpei, and Kosrae. The isolation of these islands in the western Pacific has led to a wonderfully endemic and isolated reptile fauna. Donald Buden and Danko Taboroši have produced an outstanding 312-page book, *Reptiles of the Federated States of Micronesia*, that covers the diverse aquatic and terrestrial reptile fauna of the FSM. The book provides details on the classification, ecology, and natural history of 41 endemic species, as well as established and non-established invasive species. The book includes >300 photographs, 35 distribution maps, and numerous keys and very useful distribution tables at the end of the text. The printing quality is excellent, with vibrant color photographs, maps, and tables. Buden and Taboroši have extensive experience in the FSM. Buden, as a Professor of Biology at the College of Micronesia-FSM, has dedicated a large component of his career to understanding the distribution, ecology, and natural history of Pacific reptiles. Taboroši, an excellent photographer and director of the Island Research and Education Initiative based in Pohnpei, has extensive experience across the widespread islands of the FSM.

The book begins with a very informative and important introduction to Micronesia, including sections on geography, geology, climate, place names, and details of the 10 different habitat types found across Micronesian archipelagos. The individual species accounts provide an excellent overview and include sections on distribution, status, description, habits and habitat, and for some species accounts, an additional remarks section that addresses aspects of phylogenetic relationships and morphology. The inclusion of primary literature references greatly enriches the use of the book for professional herpetologists. A fantastic aspect of this book, atypical for most guides, is that there are multiple photographs for each species allowing the reader to get a good feeling for intraspecific color pattern and morphology. The authors have more personal experience in this part of the world than any other living vertebrate biologists, and as such their insights into the ecology and natural history of this fauna is terribly important for current and future generations of biologists and Micronesians. The book ends with a section on non-established exotics (established invasive species are included in the main species accounts), and a resource and reference section with very useful distribution tables.

In summary, the collaborative effort by Buden and Taboroši shines through with clear writing, beautiful photographs, and in-depth details on the ecology and natural history of all species. The guide allows easy species identification by professional and amateur biologists, and the physical book itself is of excellent quality and should withstand the rigors of being carried around in a backpack in the steamy tropical Pacific. This reasonably priced guide will be useful to scientists and eco-travelers, as well as conservation managers, and is a pleasing addition to the literature of the Pacific.

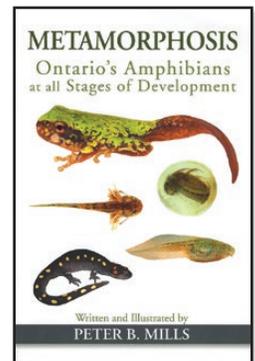
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Metamorphosis: Ontario's Amphibians at all Stages of Development

Peter B. Mills. 2016. Privately published, printed and bound by SLG Group, Brampton, Ontario (<http://www.peterbills.com/metamorphosis.html>). 104 pp. Softcover, US \$21.80. ISBN 978-0-9950603-0-2.

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Three field guides cover the Province of Ontario's amphibians (Johnson 1989; MacCulloch 2002; Gillingwater and MacKenzie 2015). Each of these was well received, but like most field guides they tended to focus mostly on adult stages. Johnson (1989) did provide some text descriptions of eggs and larvae. MacCulloch (2002) and Gillingwater and MacKenzie (2015) also provided limited descriptions, but the former provided photographs of larvae for most species. These books, like the herpetological literature in general, simply reflected the

unbalanced knowledge among life stages—it's much easier to identify and study adults. With only 27 species of amphibians known to have occurred in Ontario, and 23 extant species, it is not too difficult to learn to distinguish among adults of species as it is in most regions. However, Ontario is bigger than any state and many countries with habitats ranging from tallgrass prairie to Carolinian and boreal forests, and ultimately tundra. Consequently, considerable variation among populations or developmental plasticity (Relyea 2001) can make species identification challenging among adults and more difficult, or even a “nightmare,” among larvae if one works in more than one region. The extent of this problem became evident decades ago on a conference field trip when three eminent herpetologists from different regions of North America were arguing over the identification of a captured tadpole. Fortunately, a young local herpetologist managed to solve the dispute. Earlier in my career when surveying among multiple regions in Ontario, I often had to raise larvae in the lab for accurate identification.

Mills' book takes up the challenge and makes its contribution by giving more balanced coverage to the “first half” of the dual life of amphibians. Mills takes the traditional approach for figures, arguing that illustrations are far superior to photographs and quotes Roger Tory Peterson who noted that a “composite of your experience” can be captured in an illustration. Mills used “hand-done, but rendered digitally” painted images. The images of both adults and larvae in each species account are definitely of better quality than the small black and white photographs in Altig and McDiarmid's (2015) book, but they are not quite as sharp or contrasting as traditional painted images. However, the overall quality of the images and restricted regional coverage addresses two of the criticisms of Altig and McDiarmid's exhaustive book on amphibian larvae (see Wassersug 2015). The images largely succeed in capturing key distinguishing features of the species. Based on my experience working with amphibians in multiple regions of Ontario, the book works well, especially for larvae.

The book is organized well by first briefly going through the basics in the Introduction using short sections under the headings: Things to Know, Breeding and Metamorphosis, Eat and Be Eaten, How to Identify Amphibians and Their Larvae, Plasticity, How to Find Amphibians and their Larvae, Rearing Amphibian Larvae, and Ethical Considerations. A short section on Ontario follows with a simplified map showing only part of central and southern Ontario. This is of course where most people live in Ontario, but most of the province's land area is in the north. Next is a simple introduction to salamanders and anurans, each of these being followed by individual species accounts. The species accounts are usually four pages long covering some of the basics for each species. These sections could be a bit more detailed benefiting individuals first learning the amphibians. For example, there is discussion about using the vent characteristics to distinguish male from female Spotted Salamanders, but no mention of using the vent in Mudpuppies or tympanum size for sex determination in Green Frogs or American Bullfrogs. Some species such as Boreal and Western Chorus Frogs are lumped together because the author considers that they look identical. My own experience indicates that the dorsal stripes are much more broken up and the limbs are relatively shorter in Boreal compared to Western Chorus Frogs in Ontario. There are also differences in behavior, habitat selection, and activity patterns not discussed. It is stated that chorus frogs call loudly for only a brief period in the spring. This is true for Western Chorus Frogs in southern Ontario; however,

Boreal Chorus Frogs often call for a prolonged period in northern Ontario. I was also surprised that when Mills discussed symbiotic algae associated with Spotted Salamander eggs, he did not mention their greenish color. Likewise, Eastern Newt efts were described as being bright orange or orange-brown, but there is no mention of red individuals. Habitat descriptions could also have been better. Perhaps the most contentious statement was “Eastern Red-backed Salamanders can be found in the same habitat (and may indeed live in streams where Two-lined are absent and there is no competition)”. Although I have found redbacks in some seepage areas, I am not aware of any accounts of this terrestrial salamander living in streams.

Three short sections end the book providing additional information under the headings: Frogs and Toads – Extensions, Extirpated and Questionable Species, Further Reading, and Keywords. As in most field guides, the font size of the text is a bit small, but the images of eggs, several larval stages, and adults are of a good size. The overall dimensions of 15 x 23 cm and thick glossy pages suggest that the book will be both portable and durable in the field.

The information covered is kept simple and limited to some basic characteristics of each species and features for identification. The author uses few technical terms and uses early, mid, and late stages instead of Gosner's (1960) or Harrison's (1969) developmental stages for anuran or caudate larvae respectively. Accounts are listed under standard common names. Current scientific names are also given but not listing the former taxonomy will not help inexperienced users connect with reference sources. Experienced herpetologists may like to see a bit more detail than is given, but as written, the book will be easy to use by novices and it can still be used by more seasoned herpetologists.

While I like most of the “paintings” of larvae and the more balanced attention among life stages, I thought that the book could have been better. A more clear writing style may help future revisions (fewer dangling participles). There were a few typos, for example, “compliment” instead of “complement,” and “parotid” instead of “parotoid” glands. There were also a few words that appear “coined” if the reader is an Oxford or Webster user, but they appear in trendy online dictionaries. Examples include “girther” hind limbs where “thicker” works, and “mouldering” logs where “decayed” would do fine. The fact that the author is quite young and primarily a naturalist/artist comes across when reading the book. While the book largely succeeds in its goal of providing a more balanced regional field guide, it would have clearly benefited from being edited by an experienced herpetologist and proofread by others.

Being restricted to just Ontario's species will limit the book's audience, but considering the wide overlapping ranges of northern temperate amphibian species, it should also be of some use in adjacent jurisdictions such as Manitoba, Michigan, Minnesota, Ohio, Pennsylvania, New York, and Québec. For more thorough accounts of biology and ecology one can consult three excellent reference books (Petranka 1998 for salamanders, Dodd 2013 for anurans, or Wells 2007 for amphibian ecology and behavior). For in-depth accounts describing and keying out amphibian eggs, embryos, and larvae for all species in the United States and Canada, one can seek out the recently published *Handbook of Larval Amphibians* (Altig and McDiarmid 2015) or the earlier thorough volume dealing with tadpoles (McDiarmid and Altig 1999). Although several improvements could be made, Mills' small book may find use as a field guide for professional biologists, herpetologists, and naturalists in and near Ontario. It

will likely inspire others to write future improved guides to other regions of North America.

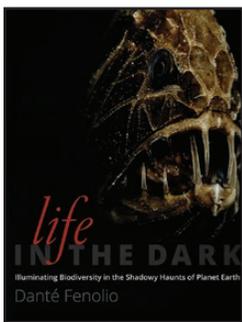
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PUBLICATIONS RECEIVED

Life in the Dark. Illuminating Biodiversity in the Shadowy Haunts of Planet Earth

Danté Fenolio. 2016. Johns Hopkins University Press, Baltimore, Maryland (www.press.jhu.edu). 312 pp. Hardcover. US \$39.95. ISBN-978-1-4214-1863-6.



Life in the Dark is a richly illustrated compendium of animal life in the dark reaches of the Earth, whether in the abyssal regions of the ocean, in the perpetual darkness of caves, or in deep freshwater habitats; the book even discusses fossorial species that rarely if ever venture above ground or into the sunlight, such as certain frogs, caecilians, and amphisbaenians (pp. 32–35, 42–43, 153–170). Fenolio also includes chapters providing an introduction

to life in darkness, a section on parasites of species dwelling in the dark, and a plea for the conservation of a biodiversity that is mostly never seen, especially by non-biologists. Not surprisingly, much of the book features invertebrates and fishes, but it embraces both amphibians and reptiles in a number of chapters (especially pp. 199–209), particularly cave salamanders. Of specific interest to herpetologists are the outstanding photographs of eggs and adults of rare salamanders, including a photo of the only known specimen of *Eurycea robusta* and an artist's rendition of how the animal may have appeared in life (p. 182), a discussion of the potential importance of amphibian skin secretions in human medicine (pp. 255–262), and a short bibliography of papers on such species (pp. 275–276). The book is intended for naturalists, but the more than 200 dazzling photographs of little-seen animals should excite both a professional and general audience. Danté Fenolio is Vice President for Conservation and Research at the San Antonio Zoo.