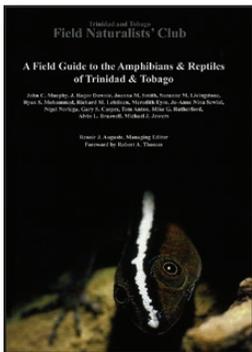


BOOK REVIEWS

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A Field Guide to the Amphibians & Reptiles of Trinidad & Tobago

John C. Murphy, J. Roger Downie, Joanna M. Smith, Suzanne M. Livingstone, Ryan S. Mohammed, Richard M. Lehtinen, Meredith Eyre, Jo-Anne Nina Dewlal, Nigel Noriega, Gary S. Casper, Tom Anton, Mike G. Rutherford, Alvin L. Braswell, and Michael J. Jowers. 2018. Trinidad & Tobago Field Naturalists' Club, P.O. Box 642, Port of Spain, Republic of Trinidad and Tobago (www.ttfnc.org). vii + 336 pp. Softcover. US \$43.00 (approx.), an international order form is available at <http://ttfnc.org/product/field-guide-amphibians-reptiles-trinidad-tobago/>. ISBN-978-976-8255-47-1.



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I really like field guides. Like many herpetologists, my first introduction to the relevant literature was a field guide. Since then, however, as I've exceeded the age when it's permissible (maybe even expected) to be a curmudgeon, I've become much more critical. I'm no

longer satisfied with brief descriptions, maps, and mere pretty pictures (although, like even the most hardened "professionals," I enjoy pictures that tell stories or provide new or interesting information). I also demand insights into the natural history of a species and I want more than a passing mention of habitats and conservation status. This most recent volume on the herpetofauna of Trinidad & Tobago, the product of an impressive collaboration led by John Murphy, lived up to my expectations.

A number of works have chronicled the extensive diversity of amphibians and reptiles on Trinidad & Tobago. Relatively recent comprehensive efforts include Kenny (1969, 1977), who addressed amphibians, and Boos (2001), who recorded the snakes. The entire herpetofauna has been covered in a previous book by Murphy (1997) as well as in an ongoing blog (<https://herpetologytt.blogspot.com/>), also by Murphy, and an online checklist maintained by the Department of Life Sciences, University of the West Indies at St. Augustine (<https://sta.uwi.edu/fst/lifesciences/amphibians-and-reptiles#Amphibians%20and%20Reptiles>). The most recent of these are updated in the current volume.

Although often considered an extension or even part of the Lesser Antilles (the chain of islands ranging from Sombbrero in the north to Grenada in the south), the biota of Trinidad & Tobago

is much more closely related to that of the South American continent than to those on the oceanic islands to the north. In fact, during the past 10 million years, the islands of Trinidad & Tobago "have been isolated, connected, and re-isolated from the mainland many times" (p. 6).

Because of small size, limited habitat diversity, and isolation from the nearest mainland and often from other islands, insular herpetofaunas often are considered depauperate when compared to those on continents. However, despite relatively small size—Trinidad (4828 km²) is larger than any of the Lesser Antilles, whereas Tobago (300 km²) is slightly smaller than Grenada—a diversity of habitats, at least in part attributable to the varied past relationships with South America, support a rather spectacular diversity of amphibians and reptiles. In addition to South American species that presumably established populations during periods when the islands were contiguous with the mainland, this island nation sports a surprising number of endemic species. Furthermore, like tropical islands throughout the world, the herpetofauna of Trinidad & Tobago has and continues to be augmented by human-mediated introductions from near and far.

This book provides accounts of 35 species of anurans in 12 families, four of which (*Eleutherodactylus johnstonei*; *Dendropsophus minusculus*; *Adenomera* sp., previously known as *A. hylaedactyla*; *Leptodactylus latrans*) are apparently human-mediated introductions. Ten species of native turtles (five of them sea turtles) in six families are described. In addition, records of adult *Trachemys scripta elegans* are indicative of multiple introductions, but no evidence of sustainable populations exists. Also, whether *Chelonoidis carbonarius* (listed as *C. carbonaria* in the book) occurs naturally on Trinidad is uncertain. Two species of caimans, including the recently discovered *Paleosuchus palpebrosus*, are the only known native crocodylians. Lizards are represented by 32 species in 11 major lineages, including two species of legless amphisbaenians. Introduced species are *Hemidactylus mabouia*, although trans-Atlantic rafting cannot be ruled out, *Gymnophthalmus underwoodi*, a unisexual species with an ever-expanding range associated with human-mediated dispersal that might have arrived naturally on Trinidad, and six species of anoles (*Anolis aeneus*, *A. extremus*, *A. richardii*, *A. sagrei*, *A. trinitatis*, and *A. watsi*), with all but the increasingly ubiquitous *A. sagrei* emanating from the Lesser Antilles. Fifty-one species of snakes (four of them venomous) in 10 major lineages are known to occur on Trinidad & Tobago. Surprisingly, *Indotyphlops braminus*, which has an almost circumtropical distribution, including a number of Lesser Antillean islands, apparently is not yet present on the archipelago.

A section titled "waifs & questionable species" (interestingly placed ahead of the accounts of taxa known to occur on the islands) includes brief mention of 13 species (one turtle, six lizards, six snakes) "erroneously reported" from Trinidad &

Tobago and a table lists an additional 16 species (one caecilian, three anurans, three turtles, two crocodylians, three lizards, four snakes) with “some support for their presence in the islands”; these include waifs, species known from museum specimens but not encountered in decades (or longer), museum specimens with questionable data or which have been lost or destroyed, and species reported but not documented as present. Some additional species purportedly from the islands but almost certainly mislabeled are not included. Interestingly, one species (*Anolis cf. lemurinus*) is included in both lists but is considered an “improbable member of the fauna.”

The book begins with a list of the coauthors detailing the affiliations and contributions of each. This is followed by a foreword by Robert Thomas, who characterized the pursuit of reptiles and amphibians on Trinidad & Tobago as “never a dull moment and always a challenge.” A preface emphasizes curiosity and mentions stories that engage the inquisitive. An anaconda known as “Big Annie,” a bioluminescent (?) lizard, and the “paradox” of the Paradox Frog (*Pseudis paradoxa*) do serve to capture the imagination—but I wanted more details and even more stories; what was included was too good for a mere mention in a section of the book many readers will skip. Acknowledgments precede a section on “how to use this book,” most of which is devoted to the organization of the species accounts.

The subsequent introduction addresses biodiversity, noting that “no one is sure how many forms inhabit the planet, but humans have applied about 1.9 million scientific names to species in the past 260 years, and the number of named species increases daily.” This in turn was followed by a fascinating calculation stating that “on average in 2014, one new species of frog was described every 2.1 days, one new species of lizard was described every 3.4 days, and one new species of snake was described every 17.3 days.”

The introduction continues with an overview of amphibians and reptiles, which includes some general information on diversity and natural history, and an all-too-brief section labeled “the extinction crisis & hidden diversity.” Although it lists all of the frightening statistics and essentially ends with a comment that “it will take more than legislation to slow the extinction crisis. The situation demands changes in human behaviour.” “Challenges” are included later in the introduction and many species-specific risks and some necessary “changes in behaviour” are detailed in the species accounts, but a topic this important deserves considerably more attention.

The next section on “the environment” is outstanding. Although I might have wanted a somewhat more detailed accounting in some instances, the authors provide an excellent (albeit brief) overview of “physiographic features & geological history” before describing the coasts (broken down into the Trinidad coasts and the Tobago coasts), savanna, freshwater habitats, and forests before moving on to “a tropical urban herpetofauna,” which increasingly characterizes such a large portion of today’s tropical biotas and arguably deserved more attention than given here, and “environmental challenges.” The latter include the ongoing conflict between development and sustainability. In Trinidad & Tobago this is aggravated by the economic reliance on fossil-fuel extraction, increasing demands of ecotourism (providing some hope of preserving at least bits of nature while simultaneously threatening it with too much attention), litter (although progress is evident in increased recycling efforts), and non-sustainable hunting (especially of

tegu, iguanas, and sea turtles). The last in particular benefit from legislation and the action of NGOs and local communities who patrol the beaches and provide some protection for nests and hatchlings. Next is another very brief but pointed discussion of the “climate issue,” followed in turn by sections on “conservation” (although much of the relevant information is in Hailey and Cazabon-Mannette [2011]; for the sake of emphasis, I would have liked to see all of the conservation-related content consolidated into a single section) and folklore (which might have been expanded in light of the statement that “amphibians and reptiles have an integral role in culture, folklore, and ecology of the island archipelago”).

Next is a section, critical for a field guide, on “measurements & identifying features” that includes a series of plates featuring excellent line drawings that illustrate the principle characteristics of frogs and toads, turtles, crocodylians, lizards, and snakes. This leads into the previously mentioned section on “waifs & questionable species,” which precedes the 255 pages devoted to the species accounts. These are followed by appendices on anuran reproductive modes (including line drawings of tadpoles), handling amphibians and reptiles (mostly a clear admonition to avoid contact and the reasons why), amphibian chytridiomycosis, snakebite, herpetological collections in Trinidad & Tobago, and a list of research stations and lodging for ecotourists. Unfortunately, the choice to move these sections to appendices will mean that many readers will never see them. I would have preferred to see the excellent section on anuran reproduction incorporated into the species accounts, that on the chytrid fungus into the conservation section (along with a discussion of other diseases affecting tropical herpetofaunas), and that on snakebite into the accounts of venomous snakes along with a reminder that most snakes are not capable of delivering a dangerous (although sometimes painful and bloody) bite that might have been prominently featured at the very beginning of the snake accounts. The book ends with a glossary, a list of references, and an index to common and scientific names.

The critical components of any field guide are the species accounts and the illustrations. Each species account begins with a common name, many of them based on local usage and consequently differ from names applied to those same species elsewhere, and the scientific name, some of which include trinomials, followed by the author of the name and the date of the original description. Because scientific names change, some are followed by previously used names and a few are very recent innovations (e.g., *Ameiva atrigularis*, which was until recently considered a subspecies of *A. ameiva*). These are not and were not intended to be complete synonymies, but explanations are provided for new combinations (e.g., *Adenomera* sp. instead of *A. hylaedactyla*, the name previously applied to what appear to be multiple species on Trinidad). Both snout-vent length (SVL) and total length (TL) are provided, when appropriate, plus sizes at hatching or birth, when sexual maturity is attained, and the maximum known. Brief but diagnostic descriptions are sometimes supplemented with more detailed information (e.g., scale counts or arrangements) when necessary to distinguish similar taxa. Similar species, those with which the species in question is most likely to be confused, also are listed and distinctive characters are noted.

Habitat is described briefly and lifestyles (e.g., arboreal, terrestrial, fossorial) often are included. This precedes a summary of what is known about the species’ life history;

these include activity, prey and predators, reproductive mode, breeding season, parental care, abundance, vocalization, and some aspects of behavior. Maps accompany the vast majority of accounts; localities are marked by colored dots indicating vouchers and unvouchered records since and before 1985 (the choice of 1985 is not explained). Accounts without maps address species for which locality data are not known, for species known from only a few sites the authors chose to protect, and for marine species.

Illustrations in species accounts and elsewhere are arranged in 180 plates, each containing one to several figures or photographs. I particularly liked the photo of a rainstorm in Caroni Swamp (plate 7) adjacent to an outline map of Trinidad & Tobago (plate 8) with graphics showing mean monthly rainfall at various locations throughout the islands. The authors have strived to illustrate at least some of the considerable variation in many species and plates dealing with taxa often include multiple life history stages, including eggs and larvae, although some photographs and detailed drawings of tadpoles are relegated to the introduction or Appendix I instead of being included in the relevant species account. In addition to the aforementioned line drawings (plates 17–21) included in the introductory section on measurements and identifying features, drawings and photographs showing diagnostic features are included in many accounts and, when appropriate, the introductory sections to families or sometimes genera (e.g., plate 96 with colored drawings illustrating the introduced species of anoles).

Other than my previously stated quibbles regarding organization, I have few complaints. Photographs range from excellent to adequate (those in the latter category frequently appear to be scanned slides, which often lack the sharp definition and contrast readers have come to expect from modern digital images). In plates comprised of multiple photographs, I would have preferred a distinct delineation between images (such as in plates 106 and 113, for example), rather than those in some plates that have quite similar color palates and tend to run together (e.g., plates 81 and 132a). As personal preferences, I would have enjoyed an overview of the history of herpetological research in the archipelago, the inclusion of a key, and a more detailed table of contents directing one to specific accounts (although that can be accomplished by consulting the index). I also would have liked more detailed natural history information, but I acknowledge that too much (as much as I wanted more) can detract from the utility of a field guide. I found only two errors, both rather technical (and possibly attributable to the fact that the collaborative efforts that resulted in this book began at least a decade prior to its publication). As mentioned previously, *Chelonoidis carbonarius* is listed as *C. carbonaria*, although Olson and David (2014) clearly demonstrated that the generic name is masculine. Also, the range of *Rhinella marina* is described as extending from the “southern USA through Central and South America,” overlooking the partitioning of that taxon into at least two and more likely three species (with the name *R. horribilis* applied to Mexican and Central American populations; e.g., Maciel et al. 2010; Vallinoto et al. 2010).

In summary (and despite my quibbles), this is an outstanding, educational, and entertaining overview of a complex insular herpetofauna. Sufficiently detailed and documented to meet the needs of professionals but adequately straight-forward and not too technical to serve readers using it solely as a means to identify species they encounter during a visit to the islands. This excellent guide is a must for the libraries of herpetologists with

an interest in insular herpetofaunas and for the backpacks of any naturalist fortunate enough to experience Trinidad & Tobago.

LITERATURE CITED

- BOOS, H. E. A. 2001. *The Snakes of Trinidad & Tobago*. Texas A&M University Press, College Station, Texas. 270 pp.
- HAILEY, A., AND M. CAZABON-MANNETTE. 2011. Conservation of herpetofauna in the Republic of Trinidad and Tobago. In A. Hailey, B. S. Wilson, and J. A. Horrocks (eds.), *Conservation of Caribbean Island Herpetofaunas. Volume 1: Conservation Biology and the Wider Caribbean*, pp. 183–217. Koninklijke Brill NV, Leiden, The Netherlands.
- KENNY, J. S. 1969. The Amphibia of Trinidad. *Studies on the Fauna of Curaçao and Other Caribbean Islands* 29:1–78.
- . 1977. The Amphibia of Trinidad—an addendum. *Studies on the Fauna of Curaçao and Other Caribbean Islands* 51:91–95.
- MACIEL, N. M., R. G. COLLEVATTI, G. R. COLLI, AND E. F. SCHWARTZ. 2010. Late Miocene diversification and phylogenetic relationships of the huge toads in the *Rhinella marina* (Linnaeus, 1758) species group (Anura: Bufonidae). *Mol. Phylog. Evol.* 57:787–797.
- MURPHY, J. C. 1997. *Amphibians and Reptiles of Trinidad and Tobago*. Krieger Publishing Co., Malabar, Florida. 245 pp.
- OLSON, S. L., AND N. DAVID. 2014. The gender of the tortoise genus *Chelonoidis* Fitzinger, 1835 (Testudines: Testudinidae). *Proc. Biol. Soc. Wash.* 126:393–394.
- VALLINOTO, M., F. SEQUEIRA, D. SODRÉ, J. A. R. BERNARDI, I. SAMPAIO, AND H. SCHNEIDER. 2010. Phylogeny and biogeography of the *Rhinella marina* species complex (Amphibia, Bufonidae) revisited: Implications for Neotropical diversification hypotheses. *Zool. Scripta* 39:128–140.

Herpetological Review, 2018, 49(3), 563–564.

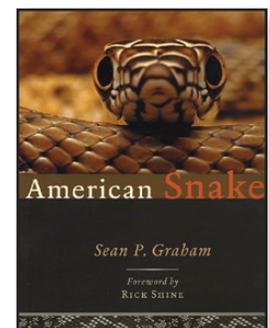
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American Snakes

Sean P. Graham. 2018. Johns Hopkins University Press, Baltimore, Maryland (<https://www.press.jhu.edu/>). xiii + 293 pp. Hardcover. US \$29.95. ISBN 978-1-4214-2359-3. E-Book, US \$29.95. ISBN 978-1-4214-2360-9.

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Books on the behavior and natural history of snakes have a long and distinguished history in herpetology. Texts such as “Snakes and Snake Hunting (Kauffeld 1957) and “Snakes: The Evolution of Mystery in Nature” (Greene 2000) have helped introduce generations of readers to the wonders of the natural history of snakes. To the author of the present book, however, the masterpiece by Rick Shine, “Australian Snakes,” was the inspiration for his attempt to summarize the “everyday lives” of the snakes that call the United States home (apparently the “American” in the title does not refer to Central or South America).

We reviewed this book from two rather different perspectives. One of us (NAS) can be described as an “interested amateur” and not a professional herpetologist. As such, she is likely

closest to the target audience for this book. RAS is an academic herpetologist and was interested in this book as a possible resource for undergraduates first becoming interested in working with or learning about snakes.

The text is divided into 11 chapters of 20–33 pages each. These include an Introduction that centers on taxonomic diversity, a chapter on snake functional morphology and physiology (“Form and Function”), two chapters on snake activity cycles (“A Day in a Life of a Snake” and “A Year in the Life of a Snake”), and then seven chapters on snake sex, food, predators (“eaters”), defense, dangerous snakes, snake invaders, and snake conservation. Each chapter contains numerous color photos, maps, and line art. The quality of the photos ranges from mediocre (e.g., the illustration of lateral undulations on p. 53, the thermal profile graph on p. 76) to superb (e.g., the Rough Green Snake photo on p. 178, the photo of the Diamondback Rattlesnake on p. 127, and the sequenced photos of a Bobcat attacking a Western Diamondback Rattlesnake on p. 161 were especially striking). Finally, most chapters have a 1–2 page profile of the background of snake biologists, including such notables as Henry Fitch, Harry Greene, and Rick Shine. The text also has a useful subject and taxonomic index.

Overall, both of us felt that the book achieved its goal of being an accessible, interesting, and entertaining book about snakes. The author has an engaging writing style and strikes a reasonable balance between being “chatty” and overly technical. We especially liked the story of Rick Shine’s first encounter with the famous garter snake dens in Manitoba (pp. 100–102), which combined the excitement snake scientists feel when going to a new study site with some solid information about snake biology, especially snake sex. The author, does, however, occasionally use colloquiums that we found questionable, especially the division of animals into “bad” and “good” parents (p. 122) based on their degree of parental care.

From the perspective of the interested amateur, we thought the book worked fairly well. This would be a great book to buy for interested high school students, early undergraduates, and nature enthusiasts. The author’s personal stories make for great entertainment and are quite memorable. The tongue-in-cheek advice on snake-proofing your yard (complete with cost estimates) was especially enjoyable. The insert regarding snake bites and how to handle them was very well written and should be mandatory reading for those who venture into the field, especially since so many myths about “dangerous snakes” and snake bite remedies continue to proliferate even though they have been disproven. Finally, the story about the founding of the Orianne Society and its impact on snake conservation was an upbeat way of ending the book and showing readers what one individual’s efforts can accomplish.

NAS was less taken with the short personal biographies of snake biologists, finding their placement in the middle of chapters distracting. While they lend an interesting twist to the text, neither of us felt their loss would have detracted from the book.

Although we clearly enjoyed the book quite a bit, we would be remiss to not point out that there were some errors and inconsistencies that detracted from its usefulness. Some of the more important examples are indicated below:

1. The discussion of the difficulties in getting venomous snakes placed on the US Endangered Species list is interesting reading but contains a serious error. On p. 251 the author states that the New Mexico Ridge-Nosed Rattlesnake is the only venomous snake protected by ESA. This

is, however, incorrect, as Eastern Massasauga Rattlesnakes were listed as Threatened in 2016 (<https://www.fws.gov/midwest/endangered/reptiles/eama/faqFinalListEMR.html>). Perhaps the Eastern Massasauga had not been listed when the book was submitted for publication, but then this should have been corrected in page proofs.

2. In the Preface, the author notes that the scientific literature is “dense, snooty stuff...off limits to general readers” (pp. xi). One has to wonder then why there is a 25-page reference section that is filled with this “dense, snooty stuff.” While this would be valuable information for undergraduates and beginning graduate students, it seems out of place in a text directed at the audience discussed in the Preface to the book.
3. The SSAR Common Names list (which the author indicates he is following for the text) mandates that the English common names of reptiles and amphibians should be capitalized, but that was not done in the text.

These issues aside, Sean Graham has produced a handsome, useful book that can be recommended to both interested amateurs and undergraduate students alike. What’s more, the price is an absolute stunner—US \$22.00 on Amazon.com as of this writing is nothing short of remarkable in an age when most books with extensive color plates go for over US \$100. At this price, this is an easy book to recommend.

LITERATURE CITED

- GREENE, H. W. 2000. *Snakes: The Evolution of Mystery in Nature*. University of California Press, Berkeley, California. 365 pp.
- KAUFFELD, C. 1957. *Snakes and Snake Hunting*. Hanover Press, Garden City, New York. 266 pp.
- SHINE, R. 1995. *Australian Snakes: A Natural History*. Cornell University Press, Ithaca, New York. 224 pp.

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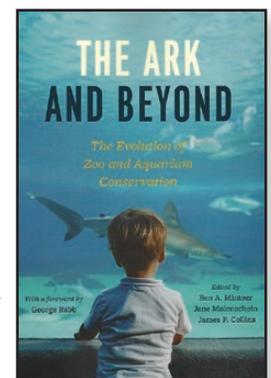
The Ark and Beyond. The Evolution of Zoo and Aquarium Conservation

Ben A. Mintner, Jane Maienschein, and James P. Collins (editors). 2018. The University of Chicago Press, New York and London (<http://press.uchicago.edu>). x + 454 pp. Softcover US \$35.00. ISBN: 978-0-226-53846-4; Hardcover US \$105.00. ISBN: 978-0-226-53832-7.

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Although zoos have had some involvement with species recovery efforts since at least the late 18th and early 19th centuries, it was not until the latter half of the 1980s that zoos (and some aquariums) began viewing conservation as a major component of their diverse programming. Faced with the reality of regulatory barriers preventing collection and importation of many species identified as being at risk, and a new altruistic realization of the shocking decline in many



wild populations of animals, the questions of zoo conservation rapidly became existential ones: Why are we here and what is our purpose? *The Ark and Beyond* explores the evolution of zoos and aquariums from postage-stamp menageries to modern institutions with multifaceted programming designed to foster educational outreach, scientific endeavor, recovery of species at risk, and (of course) recreation.

The editors of this volume, Ben A. Minter, Jane Maienschein, and James P. Collins, all faculty members of Arizona State University with extensive backgrounds in wildlife conservation, attempt to explore the evolution of zoo conservation programs in six sections ranging from the historical antecedents of zoo collections, the science and challenge of recent zoo conservation efforts, and alternative models and futures for zoo conservation programs. The book is an outgrowth of two symposia hosted by Arizona State University's Marine Biological Laboratory and the Phoenix Zoo in 2014 and 2015 funded by the National Science Foundation and a Carnegie Investment Fund Grant. The contributions of more than two dozen authors who were participants in these events make up the 30 chapters in this volume. The contributors represented a wide range of institutions ranging from zoos and aquariums, museums, and universities. The wide diversity of the contributions is both a strength and weakness of this 454-page book.

The first section, entitled "Protoconservation in Early European Zoos," traces the history of zoos from the Roman arena through the improvements to animal care and welfare up to the *fin de siècle* of the 20th century. By the authors' own admissions, there was *no* zoo conservation during this period, and the inclusion of this section adds very little to our understanding of the evolution of zoo and aquarium conservation programs. Happily, in Part 2 entitled "The Rise of Zoo and Aquarium Conservation in the Nineteenth and Twentieth Centuries," the historical and cultural foundations of zoo conservation are explored. For those not familiar with the stories, the attempts at species recovery of the Passenger Pigeon by the Cincinnati Zoo and the American Bison by the New York Zoological Park make for some interesting reading. Not only are the zoo efforts described, but the historical events that led to their imperilment are related in scholarly detail. This section would have been even more engaging for the herpetologist if the renaissance in herpetological husbandry and conservation breeding in the 1970s would have been explored a bit. Fueled in no small part by the European journals *Salamandra* and *Lacerta*, there was an explosion of breeding—primarily in Texas zoos—of many exotic reptile species as curators (Jim Murphy, Rick Hudson, and the late Joe Laszlo come to mind) switched to naturalistic exhibits and appropriate thermal regimes for species in their care. Another apparent success story in Chapter 6, "Reintroducing the Przewalski's Horse," describes the salvage of the only remaining wild horse species from the Mongolian Steppes. Although the account relates many historical facts regarding the initial recovery efforts at the New York Zoological Park, there is scant mention of the considerable hurdles this species faces before real recovery is secure: explosive population growth of Mongolian herdsmen and the subsequent overgrazing by domesticated animals, increased desertification, and increased frequency of extreme weather events. More positive news also could have been included, such as the increased participation in the recovery effort by foreign zoos, such as the Prague Zoo, the Cologne Zoo, and the Gansu National Breeding Center near Wuwei, China. The last chapter in this section gives some interesting historical background on the

evolution of aquarium conservation from cooperative hatchery projects to participation in stranding networks and marine mammal rehabilitation.

Part 3 has the greatest fidelity to the title of the volume. There is an overview of current cooperative Aquarium and Zoo Association (AZA) programs paired with some impressive examples of AZA programs that have coupled *in situ* efforts with field conservation efforts. How wonderful it would have been to have had some background history on the many zoo conservation programs—Taxon Advisory Groups (TAGs), Species Survival Plans (SSPs), Faunal Interest Groups and several others—that blossomed under the leadership of William G. Conway and the late Michael Hutchins during the 1980s and 1990s. A candid discussion of the problems faced by TAGs and SSPs in space limitations and lack of cooperation in animal transfers would have been welcome, as well as some of the more recent accomplishments of aquariums: freshwater mussel propagation at the Columbus Zoo, hellbender and lake sturgeon head-starting at the Toledo Zoo, and many others. Unfortunately, within Part 3 there is scant mention of any conservation programs dealing with amphibians and reptiles—except for a brief mention of the Kihansi Spray Toad and the Western Pond Turtle's inclusion within the SAFE (Saving Animals from Extinction) program. The most thought-provoking essay within this section is by Rick Barongi who, in a "come to Jesus"-style admonition, exhorts zoos to commit more resources to conservation programs that have a connection to wild nature. He makes an interesting observation—all too true—that nearly every successful zoo conservation program has had a champion that shepherded it to success.

The editors decided to include several submissions on "wellness" and "animal welfare." These are presented in Part 4—"Caring for Nature: Welfare, Wellness, and Natural Connections." As lofty as the principles behind these submissions are, they have little relevance to species recovery unless they in some way enhance the *fitness* of the populations we are seeking to recover. Too often animal transfers necessary to preserve genetic diversity in the captive population have been thwarted by well-meaning zoo staff or animal rights groups seeking to place the "welfare" of individual zoo animals above the genetic needs of a managed population. Instead, I would have liked to have seen a section of submissions about the outstanding contributions zoo veterinarians have made to true conservation initiatives, many of them involving endangered reptiles and amphibians.

Some of the most outstanding zoo conservation work has been in the fields of molecular and population genetics and assisted reproductive technologies such as gamete banking, cloning, and *in vitro* fertilization. Fortunately, some of these efforts are showcased in Part 5 that explores the "Science and Challenge of the Conservation Ark." There is a brief nod to herpetology as well. Chapter 24 by Joseph Mendelson examines the zoo response to the global amphibian crisis.

The last section of this book examines alternative trajectories for zoos in an age of unprecedented threats to wild animal populations directly traceable to human overpopulation and activity. How can zoos effectively contribute to conservation when they consistently struggle to genetically manage their own populations? Some suggestions are forthcoming in this section: expansion of management expertise and scientific endeavor, augmentation of exhibit and holding space to facilitate genetic and reproductive management of captive populations, embracing a regional focus, and enhancement of "wildness" in management activities. All of these deserve thoughtful consideration by zoo

directors and curatorial staff. One contribution urges zoos to embrace “sustainable development”—a fantasy if there ever was one—in our conservation programs.

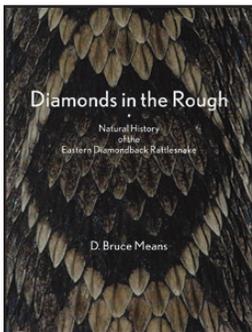
The price of this volume—US \$35.00 paperback—is a value for those who wish to explore *some* of the historical aspects of zoo conservation. With the lower price, however, the reader gets a coarser grade of paper and grainy black and white photographs. After reading this book, however, one wonders—as the late Kevin Wright (a wonderful zoo amphibian and reptile veterinarian) did so many years ago, “If it don’t have hair, do people care?” Numerous zoo amphibian and reptile conservation projects—many of them involving successful reintroductions—have been ignored. As examples I could point to the rescue of several endangered populations of West Indian rock iguanas (*Cyclura carinata*, *collei*, *lewisi*, and *pinguis*) by zoo members of the IUCN Iguana Specialist Group, the successful reintroductions of the Virgin Islands Boa and the Antigua Racer, the rescue of the Puerto Rican Crested and Kihansi Spray toads, and many others. For this reason, zoo herpetologists may want to look elsewhere for inspiration before they invest the time and money to access the information presented in this book.

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Diamonds in the Rough. Natural History of the Eastern Diamondback Rattlesnake

D. Bruce Means. 2017. Tall Timbers Press, Tallahassee, Florida (www.talltimbers.org). 390 pp. Hardcover. US \$100.00. ISBN: 978-0-9703886-5-0.



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I have always been a fan of larger monographs tackling the autecology of a species, such as the classics by Fitch (1960) and Legler (1960). I also have a great appreciation for synthesis volumes examining specific taxonomic groups such as the box turtles (Dodd 2001) and gartersnakes (Rossman et al. 1996). Such monographic treatises focusing on the fine-scale ecology of a single species are becoming rare and not often undertaken by single authors. Such volumes often represent years to decades of concerted work and in some cases, a lifetime of research. I had expected *Diamonds in the Rough* to follow the path of those classic autecological works using a lifetime of research on *Crotalus adamanteus*. Although the book does contain some excellent information, its presentation and organization are lacking. In addition, it carries a hefty price tag of US \$100.00.

The book is arranged into 24 chapters covering a range of topics from the general study sites and methods all the way through human-snake interactions and anthropogenic impacts. I found it odd the author did not adhere to the standard common name, Eastern Diamond-backed Rattlesnake, which has been in use since 2008 (Crother 2008, 2012, 2017) throughout the book.

Chapter transitions are faced with images depicting study sites, habitats, the focal species in relevant pictures, and humorous field anecdotal shots (Chapter 4’s “Jimmy” conducting radio-telemetry from a motorcycle). The book has numerous illustrations of both color photographs and line drawings peppered among the chapters. In total, there are more than 140 figures that include full-color photographs, x-radiographs, original data graphs, and reprinted data graphs. The book also summarizes a great deal of original information in more than 50 tables and is solidly referenced with more than 500 citations.

There are problems with many of the photographs. Some of the full-color images appear washed out, blurry, or too low in resolution. For example, fig. 7.2 is blurry, and the colors are off, and both images in fig. 5.21 are completely washed out. I think this may be the result of using old film images converted to a digital format. In some cases, it may be difficult to have recent images of behavior on hand, and that one must resort to older images. Some images are also blown up too large for their resolution, as is the case for fig. 5.20. The number of blurred lower resolution images appears to outnumber those that are newer and crisp. Although I do not see this as a major detraction from the book, I feel a better effort could have been made to use more updated photography, get higher resolution scanned images, and work with the color balances and curves of the existing photos.

The book includes many figures presenting original data. As a quantitative person who has dealt with many graph-generating programs, I can tell many of the figures are stock from Microsoft Excel. I have never been a fan of Excel stock graphics without some necessary tweaks. For example, in fig. 10.2 the axis lines, tick marks, and tick labels are by default gray instead of black, making them difficult to read. In addition, all graphs have the default border around the entire graph and upper and right borders around the plot areas. To me, graphs look much cleaner and more professional when these elements are removed. Finally, most of the graphs were reduced too far, which made axes tick labels difficult to read. A perfect example is fig. 10.3. Either the graph sizes or the font sizes should have been increased. Finally, some graphs are even in different fonts (e.g., fig. 11.10 and fig. 11.11 on p. 127). These fonts are not only different from each other but different from the text. Some figures (e.g., 6.3) lack axis labels leaving the reader to wonder whether the y-axis is days between sheds and the x-axis are individual snakes? Overall, I think the author, copy editor, and publisher could have done a better job with the data figures.

Nearly every chapter brims with data tables ranging from the maximum sizes of individuals (table 5.1) to estimates of pre-settlement habitat area occupied (table 20.4). In general, the layout of the tables also reminds me of stock Microsoft Excel tables. Although it is nice to have the alternating rows colored, the extent distracts from the data presented within. Most of the tables are clear, and the reader can quickly grasp the concepts. However, there are a few tables in which the focal columns appear out of order. For example, in table 6.1 the litter summaries are averaged by site by sex. Thus the site is how the data are first partitioned, but the site does not appear until the sixth column. Such an organization causes some confusion with the table. In addition, it is not clear why the author summarizes snakes by sex from sites A–F and G–K separately. Why not just an overall summary? Aside from a few oddities, I found most of the data tables informative and useful for illustrating points made in the text.

Although the 24 chapters of the book cover “major topics,” their arrangement and content could have been organized better.

The first four chapters are mainly to set the stage *per se*, detailing the history of the rattlesnake in our culture to site descriptions and methodology used. From there, the remainder of the book focuses on the natural history and ecology of Eastern Diamond-backed Rattlesnakes. An example of the odd organization is that the geographic distribution does not appear until Chapter 13, which I feel should have been placed immediately after morphology. In addition, habitat-related items are a little disorganized and spread across multiple chapters. For example, Chapters 8 and 9 are solid together, but then additional habitat information appears isolated in Chapter 13. The remainder of the book uses a composite of data and anecdotal information to detail the ecology and natural history of the rattlesnake. To some extent, the author achieves a good mixture of this, whereas in other cases the long quotes of field notes are excessive.

Overall, the writing is good. However, I feel the text could have used more of an editorial hand to clear wordy phrases and streamline the writing. Not only would additional editing have benefited the writing, but it probably would have cleared up the issues associated with the plates, figures, and tables, thus making the information more presentable and digestible. Finally, one of the oddest things I found in the book was figure 5.8. I am not a fan of displaying unsafe handling techniques with venomous reptiles. I feel the two images of the author holding rattlesnakes by their head and draping them down to show their length is an improper message to send; add to that the author in one of the pictures is handling a venomous snake without proper footwear and solely in shorts!

Although this book contains some good information on Eastern Diamond-backed Rattlesnakes, it just has too many issues for a positive recommendation. I would not add this book to my collection at US \$100.00, a high price considering that *Diamonds in the Rough* received a substantial financial subsidy from Tall Timbers as well as 215 pre-publication subscribers, many of whom are no longer with us in the 25-years since subscriptions were first solicited. I recommend persons interested in rattlesnakes examine the book first before purchasing a copy.

LITERATURE CITED

- CROTHER, B. I. (ed.). 2008. Scientific and Standard English Names of Amphibians and Reptiles of North America North of Mexico. SSAR Herpetological Circular 37. 84 pp.
- . 2012. Scientific and Standard English Names of Amphibians and Reptiles of North America North of Mexico, With Comments Regarding Confidence in Our Understanding. SSAR Herpetological Circular 39. 92 pp.
- . 2017. Scientific and Standard English Names of Amphibians and Reptiles of North America North of Mexico, with Comments Regarding Confidence in Our Understanding. SSAR Herpetological Circular 43. 102 pp.
- DODD, C. K., JR. 2001. North American Box Turtles: A Natural History. University of Oklahoma Press, Norman, Oklahoma. 231 pp.
- FITCH, H. S. 1960. Autecology of the copperhead. Univ. Kansas Publ. Mus. Nat. Hist. 13:85–288.
- LEGLER, J. M. 1960. Natural history of the ornate box turtle, *Terrapene ornata ornata* Agassiz. Univ. Kansas Publ. Mus. Nat. Hist. 11:527–699.
- ROSSMAN, D. A., N. B. FORD, AND R. A. SEIGEL. 1996. The Garter Snakes: Evolution and Ecology. University of Oklahoma Press, Norman, Oklahoma. 332 pp.

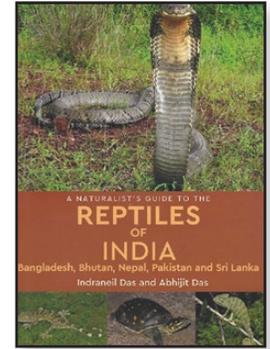
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A Naturalist's Guide to the Reptiles of India, Bangladesh, Bhutan, Nepal, Pakistan and Sri Lanka

Indraneil Das and Abhijit Das. 2017. John Beaufoy Publishing Limited, Oxford, England (<http://johnbeaufoy.com/>; available through Amazon.com [US] or Natural History Book Service [UK]). 176 pp. Softcover. £11.99, US \$17.95. ISBN 978-1-909612-81-5.

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The Indian subcontinent is one of Earth's most recent major geological features (Karanth 2006; Chatterjee et al. 2017). With an area of about 4.4 million km², it is home to a nearly endless array of biodiversity. Politically, the Indian subcontinent consists of the Republic of India, the Islamic Republic of Pakistan, the Federal Democratic Republic of Nepal, the Kingdom of Bhutan, the People's Republic of Bangladesh, and the Democratic Socialist Republic of Sri Lanka. These countries not only include pristine habitats within their political boundaries, but also are cradles of an exploding human population. Nearly 50% of world's population resides in South and Southeastern Asia. Such an increasing population demands more space, hence forests face the brunt of habitat loss within this region. At the same time, the Indian subcontinent is home to approximately 700 species of reptiles.

The biogeography of the South Asian fauna and flora is limited by mountains and the sea, with only narrow corridors linking the landscape with adjacent regions. South Asia is isolated by the Himalayas to the north and by the Arabian Sea and the Bay of Bengal surrounding the triangular Indian peninsula, with the island of Sri Lanka to the south. The western limits of South Asia are defined by the arid zones of Baluchistan and Sind (parts of Pakistan) and the Indus River; the eastern limits are delineated by the Chittagong Hill Tracts and the wetlands of Bangladesh.

The herpetofauna of South Asia is not well-studied, especially in the tropical regions (Dubois 1999). Many new species have been described recently (e.g., Agarwal et al. 2016; Agarwal and Ramkrishnan 2017) and there is much more systematic work to be done. At a unique time like this, with decreasing natural habitats and increasing knowledge of new taxa, *A Naturalist's Guide to the Reptiles of India, Bangladesh, Bhutan, Nepal, Pakistan and Sri Lanka* is most welcome. The book offers immediate access to photographs and life history information on 280 reptile species of South Asia. Although this number is less than half of the total reptile fauna, the species covered are important medically as well as taxonomically.

The cover of the book has an imposing and impressive photograph of a King Cobra. Below, the title and authors are presented above images of a Tokay Gecko, Indian Flapshell Turtle, and an Indian Chameleon. The text of the book opens with a clear and precise 'Introduction.' The next chapter, 'Climate and Vegetation,' aptly describes the physiographic features of

the region and more or less follows Das (1996). 'Conservation of Reptiles' is a general summary of anthropogenic effects. This section is followed by 'Snake-Bite Management' that discusses how to deal with snake bites. The importance of this chapter increases the value of the book, as South Asia is home to many potentially lethal snakes. Moreover, this rapidly developing region lacks access to snake anti-venom in remote areas. *A Naturalist's Guide* appreciably covers more than 30 such potentially lethal snakes. These venomous snakes are widespread within their respective distribution ranges, generally in good numbers. Moreover, these snakes are found in close approximation to humans, be it in agricultural fields, along coastlines, or in rural residences. To round out the introductory material, the authors present accurate and clear color diagrams of snake and lizard scale nomenclature and a short glossary of important terms.

The species accounts begin with tortoises and turtles. As many as 30 species of tortoises and turtles, referable to four families (Testudinidae, Geoemydidae, Trionychidae, and Cheloniidae), are discussed. Generic names and distributional ranges have been updated. Five species of the family Testudinidae are included, of which the endemic *Indotestudo travancorica* is a highlight. Fourteen species of the family Geoemydidae are covered. Information on the rare Arakan Hill Turtle (*Heosemys depressa*) and a pictorial presentation of sexual dimorphism in *Batagur* species are noteworthy. Seven trionychid species are amply discussed, and the Indian Flapshell account includes a fine plastron photograph that will aid in identification. Lastly, four species of marine turtles (family Cheloniidae) are covered along with information on their reproductive biology. Tortoises and turtles of South and Southeast Asia are subject to poaching and illegal trade. Moreover, their extremely secretive life histories make them difficult to study.

The lizard accounts begin with the agamids, a very diverse group. As might be expected, covering all species of this family within South Asia would be impossible. Singular and long-used common names are applied to "species" that are actually composed of multiple species hidden within species complexes. The agamid section begins with information on the identification and natural history of the monotypic taxon *Bufo niceps laungwalaensis* and is well done. This account is followed by accounts of the highly diverse genus *Calotes*. Nine species are presented covering the type species *C. calotes* and the widespread *C. versicolor* complex (Zug et al. 2006). Adequate coverage of endemic species from the Western Ghats, Sri Lanka, and northeast India is included. However, *Calotes rouxii*, a widespread peninsular endemic, and *C. grandisquamis*, a Western Ghats endemic, could have been addressed here. Three of the five described species of the insular endemic Sri Lankan genus *Ceratophora* are included. *Cophotis*, another endemic genus of same region, has only been covered by its type species (*C. ceyalnica*); adding *C. dumbara* would have completely summarized this genus. The Bay Island endemic genus *Coryphophylax* is represented by a single species, *C. subcristatus*. However, *C. brevicaudus* should have been used as a general account. Nevertheless, information on the identification and ecology of this endemic genus has been neatly presented.

Only a single account covers the genus *Draco*, *D. norvillii*, thus missing the widespread peninsular endemic *D. dussumieri*. The genus *Japalura* is covered by three species (*J. andersoniana*, *J. kumaoensis*, and *J. planidorsata*); much of the diversity within *Japalura* is Tibetan and southern Chinese, which is beyond South Asia. The single species *Laudakia tuberculata* aptly

represents this Palearctic genus, as *L. tuberculata* is widespread in the western and central Himalayas. Another Sinhalese endemic, *Lyriocephalus scutatus*, is covered properly, giving due descriptive justice to this flamboyant lizard. Only one species of three known endemic kangaroo lizards, *Otocryptis weigmanni*, is covered. Another Palearctic element, *Paralaudakia caucasia*, is also included. Two peninsular species of *Psammophilus* are known, both of which are covered in this volume. The genera *Ptyctolaemus* and *Saara* are correctly represented by one species each, *P. gularis* and *S. hardwickii*. *Salea horsfieldi* is endemic to the Western Ghats, but another species of this genus, *S. anamallayana*, has been unduly overlooked. The genus *Sitana* is covered by the widespread species *S. ponticeriana* and an insular (Sri Lanka) endemic, *S. bahiri*. *Trapelus* is represented by two species, both Palearctic. The family *Chamaeleonidae*, with a single species (*Chamaeleo zeylanicus*) throughout the region, is naturally included.

The diverse cosmopolitan family Gekkonidae is represented by 35 species. All species are aptly described with respect to their identification characters. Highly diverse genera such as *Cnemaspis*, *Cyrtodactylus*, *Cyrtopodion*, *Gehyra*, *Gekko*, *Hemidactylus*, *Hemiphyllodactylus*, *Lepidodactylus* and *Phelsuma* are discussed, and their respective accounts are accurate. The family Eublepharidae is represented by two broadly distributed species, *E. macularius* and *E. hardwickii*. The family Lacertidae is represented by five species referable to four genera: *Acanthodactylus*, *Eremias*, *Ophisops*, and *Takydromus*. *Acanthodactylus* and *Eremias* are represented by a single species each, *A. cantor* and *E. acutirostris*; *Ophisops* includes two species, *O. jerdoni* and *O. leschenaultii*. The diverse genus *Takydromus* is represented by only a single species, *T. khasiensis*. *Takydromus sikkimensis* and *T. sexlineatus* should have been included, as both are found in the eastern Himalayas. The family Scincidae has been nicely done, covering 27 species. The natural history of skinks is little-known and they are one of the least studied groups taxonomically among South Asian terrestrial reptiles. The greatest diversity of scincid species is found in the genera *Eutropis*, *Lygosoma* and *Sphenomorphus* on the mainland and *Lankascincus* endemic to island of Sri Lanka. However, even lesser known skinks such as *Ophiomorus raithmai* have been covered. After the Scincidae, two additional families, Anguillidae and Dibamidae, are documented by accounts of a single representative species. The section on the family Varanidae covers the three widespread and common species: *V. bengalensis*, *V. flavescens*, and *V. salvator*.

The section on snakes is the most extensive part of this book, with snake accounts comprising nearly half of the species. Presenting information on the more than 300 species of snakes within the region is not possible in a single field guide. Still, the authors have carefully accounted for all the widespread species. More than 140 species referable to 15 families are included and cover the ophidian fauna in almost all habitat types within this region. There is a justifiable emphasis on the family Colubridae, and the guide adequately covers the common and regionally important species. Accounts of the families Boidae, Pythonidae, and Xenopeltidae include all the known species from South Asia. As mentioned earlier, medically important snakes of families Elapidae and Viperidae are covered, although I think that accounts of *Echis carinatus sochureki* (or *Echis sochureki*) and *Naja oxiana* should have been added. Both taxa are medically important and are not restricted in range. Lastly, the crocodile section is complete with all three species known from this region.

The taxonomy of the species discussed in the book is accurate, due no doubt to the authors' expertise in this field. A green text box that provides a short but specific introduction to each family/group and gives the major characters and global diversity of that taxon is helpful. The very last section before the index provides a comprehensive checklist of the reptiles known from this region. This compilation of all species names with updated generic placements and the latest IUCN status is commendable. It is very intriguing to see that so many taxa in this checklist are assigned a NE (not evaluated) status. This is because of a paucity or unavailability of any data on these taxa. At the same time, India, Pakistan, Nepal, Bhutan, Bangladesh and Sri Lanka are home to diverse types of natural habitats, sadly being lost to deforestation.

The last complete treatise on the reptiles of the Indian subcontinent was by Malcolm A. Smith (1931, 1935, 1943). This series still forms the basis for taxonomic and systematic research on South Asian herpetology. An increasing awareness of species concepts and newly available technologies warrant new surveys and well-planned systematic research. Still, there are many areas within this region about which we know little of the herpetofauna. Biological inventories offer fresh insights to species' distribution and diversity, especially in a biologically rich region such as South Asia. *A Naturalist's Guide to The Reptiles of India, Bangladesh, Bhutan, Nepal, Pakistan and Sri Lanka* will come in handy in developing an inventory and assessment of reptiles because of its clear photographs, ample identification characters, and behavioral and ecological notes. The size of the book is perfect to carry in the field; good color photographs and a well-written text add to the virtue of this field guide. This book delivers what promises in its title and stands as a ready answer to the identification of reptiles for both present and upcoming generations of field biologists. I highly recommend it for all reptile enthusiasts, book collectors, 'in field' scholars, libraries of faunal research institutes, and academic faculty members who teach herpetology.

LITERATURE CITED

- AGARWAL, I., AND U. RAMAKRISHNAN. 2017. A phylogeny of openhabitat lizards (Squamata: Lacertidae: *Ophisops*) supports the antiquity of Indian grassy biomes. *J. Biogeogr.* 44:2021–2032.
- , Z. A. MIRZA, S. PAL, S. T. MADDOCK, A. MISHRA, AND A. M. BAUER. 2016. A new species of the *Cyrtodactylus* (*Geckoella*) *collegalis* (Beddome, 1870) complex (Squamata: Gekkonidae) from Western India. *Zootaxa* 4170:339–354.
- CHATTERJEE, S., C. R. SCOTSE, AND S. BAJPAL. 2017. The restless Indian Plate and its epic voyage from Gondwana to Asia: its tectonic, paleoclimatic, and paleobiogeographic evolution. *Geological Society of America* 529:1–147.
- DAS, I. 1996. *Biogeography of Reptiles of South Asia*. Krieger Publishing Company, Malabar, Florida. 87 pp. + 16 pl.
- DUBOIS, A. 1999. South Asian Amphibia: a new frontier for taxonomists. *J. South Asian Nat. Hist.* 4:1–11.
- KARANTH, P. K. 2006. Out-of-India Gondwanan origin of some tropical Asian biota. *Current Sci.* 90:789–792.
- SMITH, M. A. 1931. *The Fauna of British India, Including Ceylon and Burma. Reptilia and Amphibia. Volume I. Loricata and Testudines*. Taylor and Francis, London. xxviii + 185 pp. + 2 pl.
- . 1935. *The Fauna of British India, Including Ceylon and Burma. Reptilia and Amphibia. Volume II. Sauria*. Taylor and Francis, London. xiii + 440 pp. + 1 pl.
- . 1943. *The Fauna of British India, Including the whole of Indo-Chinese Region. Reptilia and Amphibia. Volume III. Serpentes*.

- Taylor and Francis, London. xii + 583 pp. + 1 map.
- ZUG, G. R., H. H. K. BROWN, J. A. SCHULTE II, AND J. V. VINDUM. 2006. Systematics of the garden lizards, *Calotes versicolor* group (Reptilia, Squamata, Agamidae), in Myanmar: Central Dry Zone populations. *Proc. California Acad. Sci.* 57:35–68.

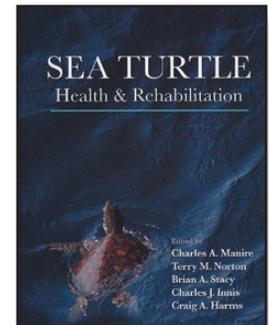
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Sea Turtle Health and Rehabilitation

Charles A. Manire, Terry M. Norton, Brian A. Stacy, Charles J. Innis, and Craig A. Harms (editors). 2017. *J. Ross Publishing, Plantation, Florida* (<http://www.jrosspub.com/sea-turtle-health-and-rehabilitation.html>). 1045 pp. Hardcover. US \$295.00. ISBN: 978-1-60427-099-0.

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Sea Turtle Health & Rehabilitation is a comprehensive text covering sea turtle husbandry, medicine, and surgery. The book presents information on life history, rescue, medical diagnostics, care, and rehabilitation of sick and injured sea turtles. In-depth information is provided on the physiological systems of sea turtles, causes and sources of illness and injury, diagnostic procedures, and medical and surgical treatments. There are chapters on important subjects related to sea turtle health and conservation, such as mortality investigation, fisheries interactions, oil spills and other environmental toxins, pathogens, cold stunning, and harmful algal blooms.

Prior to the publication of this unique work, the sea turtle community relied on scattered presentations, chapters, and papers to obtain information on sea turtle biology, care, and rehabilitation. Available references focused more on anatomy and biology (Eckert et al. 1999; Wyneken 2001; Wyneken et al. 2013). Of these, none had the in-depth medical information available here. The contents range from the life history of sea turtles to the more detailed and complex issues related to the diagnosis and treatment of conditions that are frequently encountered in sea turtles. Richly illustrated, the material is designed to provide value to the reader facing their first sea turtle or their thousandth. This is an important volume for veterinarians, veterinary students, sea turtle rehabilitators, biologists, and conservationists who work with sea turtles. The book is medically-focused, so topics in life history and conservation, while presented here, are best referenced from other sources.

The five-man editorial team represents leaders in the field of sea turtle medicine, pathology, and management. Each editor also contributes significantly as an author. As each oversees a section that directly relates to their area of specialization in sea turtle medicine, they create a balance that flows through the text providing maximum benefit to the reader. As authors, they clearly demonstrate both the breadth and depth of their experience. The contributor list includes material from 49 additional experts. This team extends the editors' contributions

to present a global base of information and depth of material in areas like toxicology, ophthalmology, nutrition, clinical pathology, and the intricacies of the stranding response networks.

The material is divided into six sections. The introduction is edited by Terry Norton and presents identification, taxonomy, natural history, and a big picture perspective on sea turtle rehabilitation. This is a small section and designed to set the stage—not to serve as a comprehensive reference on the taxa or the process of stranding response. Blair Witherington is the best possible author to select for this well-presented overview of the taxa. Norton provides perspective on the expanding efforts of rehabilitation and the introduction rolls seamlessly into the second section, Husbandry, again edited by Norton. Here, the nuts and bolts of a rehabilitation facility, including water quality and biosecurity, are reviewed with gold standards suggested. Norton teams up with two professional nutritionists to address husbandry, including an extensive presentation on nutrition. The nutrition chapter includes information on growth rates and body scoring to assess condition. Body scoring is presented in multiple areas in the book and might better have been focused in the clinical examination section. The in-depth material in this chapter includes tables of dietary evaluations. In spite of this, I searched in vain for a recipe for hand feeding formula or simple diet formulation. This material is available in the appendices and Web Added Value material associated with this chapter. Tables of blood and tissue vitamin and mineral concentrations are awkward because healthy animals are intermixed with values from unhealthy animals and the tables fail to identify the sample sizes used to create the values presented.

Section three, Basic Veterinary Techniques, edited by Charles Manire, thoroughly depicts techniques from clinical examination to necropsy with lovely chapters on imaging and clinical pathology. These chapters present the material in a “how to” fashion laying out unique anatomical features as well as common injuries and descriptions of illnesses. The imaging chapter details positioning techniques for radiographs and ultrasonography and includes examples of results from these modalities as well as CT, MR, and nuclear scintigraphy exams. The clinical pathology chapter by Nicole Stacy and Charles Innis is an extraordinary compilation of hematologic and biochemical data along with excellent plates illustrating blood cells and cytological preparations of disease states. The section wraps up with a discussion of how to and what to expect related to the necropsy exam of sea turtles. As with the nutrition chapter, the “what can I use today” materials such as a necropsy report form are available in the appendices and on line.

Sections four and five edited by Brian Stacy and Charles Innis present the meat of the text. Here, medicine and surgery are organized by system (section 4) and as current therapies (section 5). This structure affords easy presentation of foundational material as well as current best practices. Each systemic chapter describes normal anatomy, revisits the clinical exam, and provides well-illustrated overviews of diseases and injuries. This section will be the most valuable to anatomic pathologists working with material from sea turtles. The Current Therapy section begins with emergency medicine, therapeutics, and analgesia/anesthesia. Appendix 7 tabulates therapeutics in a formulary for ease of reference. Unfortunately, therapeutics related to analgesia and anesthesia are not included in this table and the reader must refer to chapter

22 for this information. A more comprehensive therapeutics table would be appreciated. Surgical techniques such as hook removal and shell repair (the sea turtle doctor's bread and butter) are well illustrated to encourage clinicians facing these common concerns with step-by-step instructions and images.

Section 6, Special Topics, is edited by Craig Harms and enhances material introduced in many of the previous chapters. The chapters vary from categories of pathogens such as parasites, toxins, and viruses, to field techniques, fisheries issues, oil spill concerns, and management and mortality investigations. As in prior sections, the appendices provide supporting materials for use in incidents of strandings. The web-based appendices provide links for downloading of forms.

The table of contents is in the expanded form including the chapter headings and subheadings. Normally, I am not a fan of this style as it generally adds pages but not value. In this case, the chapters cover so many topics that having the subheadings is appreciated. In the appendices this is not the case; the format is redundant. Likewise, the Quick Reference Index Citations for Other Relevant Chapters provides an unnecessary internal reference. In a book of this size, trimming the excess is critical.

Overall, the text is a great advance to those working with sea turtles, most specifically those employed in the field of medicine for sea turtle care and conservation. Unfortunately, the price for this text at US \$295.00 when purchased direct from the publisher is a bit of a punch in the gut. Comparative texts such as *Reptile Medicine and Surgery* edited by Doug Mader and *Invertebrate Medicine* edited by Greg Lewbart sell at less than half this price. Although the book is excellent and cost is reasonable for the veterinary professional, students and international organizations will be hard pressed to lay down this amount for a single text. The publisher has contacted non-profit organizations committed to wildlife medicine to encourage purchasing and donating books. I am hopeful that they can find a reasonable way to make the material available. Those working with sea turtles have become accustomed to snapping up the latest volume of the *Biology of Sea Turtles* every few years to remain current in this area at a cost around \$100. Future editions of *Sea Turtle Health and Rehabilitation* should consider limiting the focus to current therapies and special topics to provide a collection of materials from at a more reasonable cost.

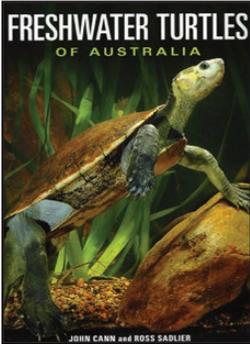
LITERATURE CITED

- ECKERT, K. L., K. A. BJORNDALE, F. A. ABREU-GROBOIS, AND M. DONNELLY (EDS.). 1999. Research and Management Techniques for the Conservation of Sea Turtles. IUCN/SSC Marine Turtle Specialist Group Publication No. 4. 235 pp.
- WYNEKEN, J. 2001. The Anatomy of Sea Turtles. U.S. Department of Commerce NOAA Technical Memorandum NMFS-SEFSC-470. 172 pp.
- , K. J. LOHMAN, AND J. A. MUSICK. 2013. The Biology of Sea Turtles, Volume III. CRC Press, Boca Raton, Florida. 457 pp.

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Freshwater Turtles of Australia

John Cann and Ross Sadlier. 2017. CSIRO Publishing, Clayton South, Victoria, Australia (www.publish.csiro.au) and ECO Publishing and Distribution, Rodeo, New Mexico (www.ecouniverse.com). 448 pp. Hardcover. US \$100.00. ISBN: 978-1-938850-19-6. Leather bound edition US \$169.95. ISBN: 978-1-938850-24-0.



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Freshwater Turtles of Australia is a substantially updated and expanded version of *Australian Freshwater Turtles* (Cann 1998) and a welcome addition to the literature. The title is somewhat deceiving in that the book also reviews the turtles of

New Guinea. A great deal of new research has focused on turtles in Australia and New Guinea since the earlier publication, and it is nicely summarized in this updated book. Cann's first book on Australian turtles was preceded by two other attempts to review what was known about Australian turtles (Goode 1967; Cann 1978), but in much smaller books. Otherwise, publications on Australian turtles lagged behind earlier attempts to produce sizeable compendia of turtles at continental (e.g., Pope 1939; Carr 1952; Ernst and Barbour 1972; Ernst et al. 1994) and global scales (e.g., Pritchard 1979; Ernst and Barbour 1989).

As Cann and Sadlier explain in the Introduction to their new book, the lack of a more complete review of Australian turtles was partly due to the fact that for several decades, research on Australian turtles "...stood under the shadow of priority by [a] US turtle worker...", now deceased, who had amassed a huge collection of chelids from that country. For whatever reason, the expected grand synthesis on Australia's turtles never came out of that university laboratory. Australian naturalists stopped waiting patiently in the 1990s and there was a resurgence of publications on their own turtles. A measure of the increase in knowledge of Australian turtles during that time is provided by a quick scan of my bibliographic database of over 8000 turtle citations as of mid-2018 (see Lovich and Ennen 2013). Prior to 1998, there were 23 citations that had the words "turtle" and "Australia" in the bibliographic entry. From 1998 to the present, there were 63 matching those words. Although these numbers are relatively small, they nevertheless reflect a strong resurgence in interest.

At 32.4 × 24 cm and over 2.6 kg, the publication is essentially a coffee table book that would not be easy to use as a field guide. However, another turtle book by Cann (2008) fills the field guide niche due to its smaller size. *Freshwater Turtles of Australia* is printed on heavy, high gloss paper and is a worthy addition to any herpetologist's library. It is well-written and well-organized, starting with a foreword by Chuck Shaffer that reviews the fascinating history of discovery of Australia's turtle fauna starting in the late 1700s. Highlights of more recent findings since Cann (1998) are nicely summarized by Cann and Sadlier in the Introduction, especially as they relate to conservation, taxonomy, and systematics. The taxonomy of Australian turtles has been

especially fluid, and Cann and Sadlier recognize 29 species in Australia and 18 in New Guinea, including one in the former and five in the latter that do not yet have scientific names. Of the 47 species included in the new book, only about 40 are recognized in the most recent checklist of turtles (Turtle Taxonomy Working Group 2017), and not always in the binomial combinations used by Cann and Sadlier. Clearly, more work needs to be focused on the taxonomy of turtles in Australia and New Guinea.

Chapter 1 covers turtles in Aboriginal culture with an excellent collection of photographs showing Aboriginal art and rock paintings depicting turtles. This cultural element adds a human dimension to the book, often missing in scientific treatises. With a traditional cultural knowledge extending back over 60,000–80,000 years, this is an important part of the story of Australia's turtles. An Acknowledgments section follows. The remaining chapters are systematic accounts of the various taxonomic groups: Chapter 2—Long-neck turtles genus *Chelodina*; Chapter 3—Snapping turtles genus *Eseya*; Chapter 4—Saw-shell turtles genus *Wollumbinia*; Chapter 5—Fitzroy River turtle *Rheodytes leukops*; Chapter 6—Mary River turtle *Elusor macrurus*; Chapter 7—Short-neck turtles genus *Emydura*; Chapter 8—Western swamp turtle *Pseudemydura umbrina*; Chapter 9—Pig-nose turtle *Carettochelys insculpta*; Chapter 10—New Guinea freshwater turtles. Species accounts include detailed subsections on description, distribution, and natural history. Following these chapters is a section of References with over 280 citations. By comparison there are over 1000 citations in Cann (1998), presumably because mostly newer research is summarized in the new edition. The concluding chapter contains short bios of the authors.

The authors are highly qualified natural historians with very interesting personal histories. John Cann was born into a family of "reptile-show people" who entertained and educated the public about reptiles for years at their home in La Perouse (near Sydney). Details on their family show, "Snake man," are featured on Wikipedia (https://en.wikipedia.org/wiki/Snake_Man_of_La_Perouse). His father George was the Curator of Reptiles at the Taronga Zoo for 20 years, where John developed his lifelong interest in turtles. A little-known fact is that John's athletic prowess as a young man allowed him to represent Australia and compete in the Olympics (decathlon) in Melbourne in 1956. His physical prowess undoubtedly contributed to his field stamina over many years of catching turtles and other reptiles throughout Australia. Ross Sadlier also grew up in the Sydney area and, like John, his father instilled a passion for animals in his son. Ross worked at the Australian Museum in the Herpetology section for 36 years. Additional details on their careers are given in the book.

The only issue of note that I identified in the book was the authors' use of yet another terminology describing the scutes of the turtle carapace and plastron that are unlike those used in previous publications. Different terms are already used by herpetologists throughout the literature. Dundee (1989) tried to standardize usage but his terminology was not generally accepted (e.g., Ernst and Barbour 1972; Ernst et al. 1994; Ernst and Lovich 2009). What Dundee called costal scutes are pleural scutes in the Ernst publications, and laterals in Cann and Sadlier. Both Dundee and Ernst refer to the large central carapace scutes as vertebrals, but Cann and Sadlier call them centrals. These inconsistencies continue to challenge morphological descriptions of turtle shells and a common terminology remains to be presented and widely accepted.

The book is richly illustrated throughout with high quality photographs of each species, including examples of geographic variation. There are also very good photographs of turtle habitats and a smattering of photos showing people catching turtles in the field allowing the reader to see what it was like for Cann and Sadler to collect turtles in the bush over the years. This is a great book written by people who know how to both present detailed data on natural history and do so in an engaging and readable fashion. If you are interested in Australian natural history, especially about turtles, you will want to buy and read this book.

Acknowledgments.—I thank Whit Gibbons, Jenna Norris, and Shellie Puffer for reviewing an earlier draft of this review.

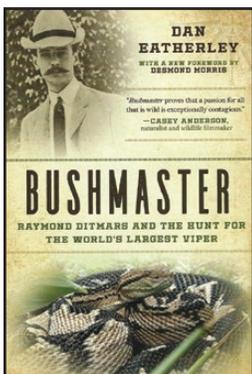
LITERATURE CITED

- CANN, J. 1978. *Tortoises of Australia*. Angus and Roberson Publishers, Sydney, New South Wales, Australia. 79 pp. + 92 plates.
- . 1998. *Australian Freshwater Turtles*. Beaumont Publishing Pte Ltd., Singapore. 292 pp.
- . 2008. *Freshwater Turtles*. Wild Australia Guide. Steve Parish Publishing, Archerfield, Queensland, Australia.
- CARR, A. E., JR. 1952. *Handbook of Turtles: The Turtles of the United States, Canada, and Baja California*. Comstock Publishing Associates, Cornell University Press, Ithaca, New York. 542 pp.
- DUNDEE, H. A. 1989. Inconsistencies, inaccuracies, and inadequacies in herpetological methodology and terminology, with suggestions for conformity. *Herpetol. Rev.* 20:62–65.
- ERNST, C. H., AND R. W. BARBOUR. 1972. *Turtles of the United States*. University Press of Kentucky, Lexington. 347 pp.
- , AND ———. 1989. *Turtles of the World*. Smithsonian Institution Press, Washington, D.C. 313 pp.
- , AND J. E. LOVICH. 2009. *Turtles of the United States and Canada*. Second edition. Johns Hopkins University Press, Baltimore Maryland. 827 pp.
- , ———, AND R.W. BARBOUR. 1994. *Turtles of the United States and Canada*. Smithsonian Institution Press, Washington, D.C. 578 pp.
- GOODE, J. 1967. *Freshwater Tortoises of Australia and New Guinea (in the Family Chelidae)*. Lansdowne Press, Melbourne, Victoria, Australia. 160 pp.
- LOVICH, J. E., AND J. R. ENNEN. 2013. A quantitative analysis of the state of knowledge of turtles of the United States and Canada. *Amphibia-Reptilia* 34:11–23.
- POPE, C. H. 1939. *Turtles of the United States and Canada*. Alfred A. Knopf, New York. 343 pp.
- PRITCHARD, P. C. H. 1979. *Encyclopedia of Turtles*. T.E.H. Publications, Inc. Ltd., Neptune, New Jersey. 895 pp.
- TURTLE TAXONOMY WORKING GROUP (A. G. J. RHODIN, J. B. IVERSON, R. BOUR, U. FRITZ, A. GEORGES, H. B. SHAFFER, AND P. P. VAN DIJK). 2017. *Turtles of the World: Annotated Checklist and Atlas of Taxonomy, Synonymy, Distribution, and Conservation Status (8th ed.)*. In A. G. J. Rhodin, J. B. Iverson, P. P. van Dijk, R. A. Saumure, K. A. Buhlmann, P. C. H. Pritchard, and R. A. Mittermeier (eds.), *Conservation Biology of Freshwater Turtles and Tortoises: A Compilation Project of the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group*. Chelonian Research Monographs 7:1–292.

PUBLICATIONS RECEIVED

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

Dan Eatherley. 2017. Arcade Publishing, New York (arcade@skyhorsepublishing.com). 302 pp. Paperback. US \$16.99. ISBN 978-1-62872-766-1, e-book ISBN 978-1-62872-555-1.



For generations of budding herpetologists, the books by Raymond Ditmars (1876–1942), particularly *The Reptile Book* and *Snake-Hunter's Holiday*, were inspirational. Traipsing through exotic regions hunting for snakes filled the daydreams of many of our colleagues growing up from the 1920s through the 1950s. Although often perceived as more of a popularizer than scientist by many of his contemporaries (he had no formal scientific training), Ditmars' contributions to what is now termed public outreach have had a long-lasting impact on our science and

the ways we perceive the animals we study and the humans on whose support we depend for their conservation.

Bushmaster is the story of Raymond Ditmars, from his early childhood catching snakes in the vicinity of his New York City home to more adventurous excursions seeking the legendary

Bushmaster (*Lachesis muta*; now considered a complex of four species) in Central and South America and Trinidad. The title focuses on the Bushmaster quest, but the book is equally about Ditmars' career as curator, filmmaker, lecturer, and educator through his long association with the New York Zoological Society. The book re-counts the developmental history of the zoo as well as Ditmars' pivotal role in the growth of its reptile, insect, and mammal programs. Much of the narrative is thus about history rather than exciting tales of catching snakes oriented toward amateur snake-catchers. It presents Ditmars' persona as a clear-headed but enthusiastic ophiophile rather than as a thrill-seeker.

Dan Eatherley provides a readable narrative, alternating between the late 1800s to mid-1900s following Ditmars' career and present-day journeys, as Eatherley retraces Ditmars' steps from New York to the tropics, stopping along the way to see live and preserved Bushmasters and the habitats in which the should be found. Alas, neither actually sees a live Bushmaster in its natural habitat. Captive husbandry has improved substantially since Ditmars' era, even as the snake's habitat succumbs to human onslaught and Bushmasters face unrelenting persecution.

Historians of herpetology, zoo biologists, and naturalists will enjoy this book. Originally published in hardback in 2015, the 2017 paperback edition contains a new Foreword by Desmond Morris. Dan Eatherley is a writer, environmental consultant, and filmmaker based in Exeter, United Kingdom.