Book Reviews

Source: Copeia, 104(4):965-976.
Published By: The American Society of Ichthyologists and Herpetologists
DOI: http://dx.doi.org/10.1643/OT-16-490
URL: http://www.bioone.org/doi/full/10.1643/OT-16-490

BOOK REVIEWS

Copeia 104, No. 4, 2016, 965–976

Western Indian Ocean Tortoises: Ecology, Diversity, Evolution, Conservation, Palaeontology. J. Gerlach (Ed.). 2014. SIRI Scientific Press. ISBN 9780992997908. 352 p. £37.99 (ca. $51.00) (soft cover).—A naturalist with a time machine and interest in tortoise diversity could hardly do better than to set a course for the islands of the western Indian Ocean (WIO). The grand tour might entail a visit to Madagascar about 2,000 years ago—sometime before settlement by Austronesian seafarers from the Greater Sunda Islands—when two giant tortoises (*Aldabrachelys grandidieri* and *A. abrupta*, and presumably four smaller species [not including the introduced *Kinyxis*]) that are still extant today roamed amidst the spectacular diversity of lemurs, elephant birds, and other endemic fauna and flora present at that time. On the return to the present, a visit to the Seychelles Islands and Aldabra Atoll would provide other forms of *Aldabrachelys* to admire. The icing on the cake for the time traveler in the early 1500s before European colonization, would be the opportunity to meet five species of *Cylindraspis* tortoises of the Mascarene Islands at the height of their diversity and incredible numbers. All the while the traveler would be hobnobbing with flocks of Dodos (*Raphus cucullatus*), Rodrigues Solitaires (*Pezophaps solitaria*), and other now-extinct endemic wildlife. All *Cylindraspis* and *Aldabrachelys*, with the exception of the population of *A. gigantea* on Aldabra, are essentially gone—driven to extinction by the incredible rapacity of humans and their introduced species (pigs, cats, rats, etc.) that decimated these tortoises. With the exception of the Aldabra tortoises, the only remaining natural populations of tortoises in the WIO islands are the four smaller, but equally impressive, Madagascar tortoises in the genera *Astrochelys* (two species) and *Pyxis* (two species), all critically endangered.

If you missed out on the voyage back to these islands for some reason, the book in review here, *Western Indian Ocean Tortoises: Ecology, Diversity, Evolution, Conservation, Palaeontology*, ably edited by Justin Gerlach, is a masterful account of the extinct and extant tortoises of these islands. It deserves a place in any herpetologists' or natural historian's library and we highly recommend it. The extensive references alone are worth the price of the book, as they compile a wealth of scattered, difficult-to-access literature. Eminent turtle and primate conservationist Russ Mittermeier wrote a short but eloquent preface, followed by 11 chapters authored by many of the recognized experts in WIO tortoise conservation and biology.

The first two chapters deal with some of the most controversial issues related to the tortoises. The first by Gerlach provides an overview of nomenclatural issues and recommends a controversial and contentious judgment by the ICZN to standardize the nomenclatural terminology used in this book (and admittedly "deplored" by some of the chapter contributors!).

Chapter 2, by Gerlach and S. Paquette, reviews current thinking concerning evolution, divergence, and biogeographical issues. Many of the ideas presented are no less controversial than those in Chapter 1. The problem is that different methodologies in separate studies of these issues have often yielded different or ambiguous conclusions concerning the relationships and/or timing of divergence in these tortoise groups. Indeed, the true status of some of the three surviving morphotypes of *Aldabrachelys* and their former and recent interactions (confounded by probable recent interbreeding) are particularly thorny problems. Interesting discussions are provided of the role of changing ocean currents in tortoise dispersal (and its timing) to the islands and the role of Madagascar rivers in the divergence of populations of *Pyxis*, as is a discussion of the role of conservation genetics in strategies to conserve endangered species.

Chapter 3 provides an overview of the discovery, exploration, and colonization of the WIO islands and the resulting complex interactions with resident tortoises. Authors A. Cheke and R. Bour assembled an impressive amount of widely scattered literature, much of it composed of older accounts by early observers of the islands, their people and wildlife, and weave together a fascinating, but ultimately tragic account of human-tortoise interactions. The chapter begins with an account of the megafauna-like roles larger tortoises play in island ecosystems. The authors then go on to discuss evidence (from paleontological and early literature sources) for the presence (or lack thereof) of tortoises on the various WIO islands and atolls, when they were likely present, and whether humans encountered them. Whenever tortoises were present they soon became a source of food for invading humans and a staple in trade with other islands. The latter became more important as tortoise stocks began to dwindle from overexploitation and other factors. In addition, ships began to harvest ever-larger numbers of living tortoises to feed their crews. These issues are discussed for each island, and beautiful old plates of WIO tortoises and artists' sketches of early explorers and colonists among tortoises and other wildlife in the Mascarenes of the late 1500s and 1600s provide additional historical flavor. The earlier an island was colonized and/or became a provisioning port for sailing ships, the sooner the demise of its resident tortoises. This ripple effect initially began with the peopling of Madagascar early in the Common Era (Lawler, 2016). Its giant tortoises were extinct by approximately 1,000 years ago. Next came the discovery and colonization of the Mascarenes in the 1500s and 1600s. Within 200 years their tortoises were extinct or nearly so. The Seychelles became the next source of giant tortoise exploitation, and by about 1800 the only tortoises abundant enough to be collected were on remote Aldabra Atoll.

The causes of tortoise destruction were the usual ones: direct consumption for food by colonists and sailors, and the tortoise trade, but also the introduction of predatory species such as bushpigs (*Potamochoerus larvatus*; Madagascar), feral domestic hogs (*Sus domesticus*), cats (*Felis catus*), and rats (*Rattus* sp.) as well as habitat alteration played destructive roles. The specific forces to blame are explained for each island and time period. This chapter, although necessarily

 DOI: 10.1643/OT-16-490 Published online: 19 December 2016

gloomy, provides interesting ecological and behavioral data. Some of this information was derived from paleontological work (Chapters 4 and 5) and modern research using advanced technology and techniques applied to study fossil and/or subfossil material (Burleigh and Arnold, 1986). In other cases (with the exception of Madagascar), more information was obtained from writings of contemporary observers of the living tortoises. Some observations by these (usually) untrained naturalists must be taken with a grain of salt (e.g., it is unlikely that nesting sites of Mauritius tortoises were in hollow trees as some early Dutch accounts suggested). Other observations of aggregations of tortoises, population size, elevational migrations, cold tolerance in the uplands, cave use to shelter during cyclones, diet, and capability to survive without food and water for months as a part of their normal ecology are probably true. Finally, another topic in this chapter is the rise of the first conservation ethic in colonists. Some observers of the levels of carnage on resident tortoises of the WIO islands realized that the slaughter was unsustainable, and tortoises were declining. The response was the establishment of laws and penalties designed to limit or completely prohibit tortoise collecting in some locations. These statutes were ultimately unsuccessful because enforcement was impossible and such forward thinking was often unpopular with the masses. For example, Réunion governor Vaubalon, banned tortoise hunting on Réunion in 1689 but was then imprisoned and poisoned by his subjects for his efforts. Nevertheless, numerous statutes and recommendations concerning tortoise protection and conservation continued to be formulated through the years as tortoises continued to decline and disappear. The exceptions were the giant tortoises on Aldabra, which were still heavily exploited in the early to mid-1800s. While Aldabra's "isolation and inhospitability" (p. 245) played fundamental roles, a series of serendipitous events in the latter part of the late 19th and early 20th centuries helped to ensure the population's survival. The authors describe in detail the complicated legal, political, conservation, scientific, ownership, and other influences that gradually reduced the collection of Aldabra tortoises. This resulted in the survival and increasing protection for this last-remaining giant tortoise population in the WIO islands. *Ex situ* populations of apparently native Seychelles and Aldabra Tortoises (*Aldabrachelys gigantea*) and Radiated Tortoises (*Astrochelys radiata*) from Madagascar began to be bred domestically in the Mascarenes and Seychelles in the early 19th century and continue to be maintained there. They were raised for private consumption, market sale, pets, sale to zoos, status symbols, and eventually for release in conservation projects. The chapter continues with a discussion of the exploration of minor atolls of the Seychelles, which did not have populations of native land tortoises when they were visited between the 16th and 19th centuries.

Chapter 4 (by R. Bour, C. Mourer-Chauviré, and S. Ribes) and Chapter 5 (by J. Hume) are concerned with the paleontology of the extinct *Cylindraspis* tortoises of the Mascarenes. The Bour et al. chapter begins with comment on the superficial similarity of the giant tortoises of the Galápagos, Seychelles, and Mascarenes in historical times, even though they were derived from different evolutionary lineages. The authors then summarize the limited knowledge of the biology of Mascarene tortoises based on the accounts of early observers. Detailed histories of paleontological efforts in important locations and morphological, taxonomic, and biological knowledge, which resulted from these investigations are clearly presented and very interesting. The result is a clear picture of the species composition within *Cylindraspis* on Rodrigues (*C. vosmaeri* and *C. peltastes*), Mauritius (*C. inepta* and *C. triserrata*), and Réunion (*C. indica*). The morphological information and its relevance to the biology and ecology of each species is a particularly fascinating contribution of this chapter. For example, extreme size, cervical vertebrae structure, and shell-shape differences (much larger and saddle shaped with a raised front and elongated cervical vertebrae in *C. vosmaeri*; smaller and more typical domed carapace with shorter cervical vertebrae in *C. peltastes*) of the Rodrigues tortoises suggest probable sympatry allowed by dietary niche divergence (browsing in *C. vosmaeri* vs. grazing in *C. peltastes*, as seen convergently in several extant populations of Galápagos tortoises). The extremely light skeleton, thin carapace (~2 mm), and long bones with narrow shafts of both Rodrigues species are consistent with modifications that could conserve energy during movement. Elsewhere, adult tortoises would require a sturdier structure for protection from predators, which are absent on Rodrigues. On Mauritius, although the two tortoises were of similar size, striking differences in jaw structure suggest dietary differences that might have facilitated their presumed syntopy. *Cylindraspis inepta* had one maxillary ridge and two dentary ridges, while *C. triserrata* had two maxillary ridges and three dentary ridges. The latter specialization of two maxillary ridges is also known in the herbivorous Asian freshwater turtle *Batagur* and the presumably herbivorous North American fossil tortoise *Hesperotestudo impensa*. On Réunion, the dental ridges of *C. inepta* are massive (i.e., broad and very robust), suggesting their ability to crop coarse plant material. The chapter ends with an overview of phylogeny of *Cylindraspis* supported by morphology and molecular data, but which is contrasted by DNA distances and inferred rates of evolution that support a different evolutionary scenario. We applaud the high quality and relevance of the many illustrations in this chapter, which are helpful in interpreting, understanding, and appreciating the text.

Chapter 5 is a much shorter chapter that focuses on the important paleontological sites of Mauritius and Rodrigues that have yielded a great amount of information on *Cylindraspis,* as well as other contemporary wildlife. These include the Mare aux Songes marsh of Mauritius, which the author considers "…the most important and most productive fossil locality in the Indian Ocean" (p. 203), the caves of Mauritius (especially the few limestone caves), and the limestone caves of Rodrigues. As in the previous chapter, a history of the paleontological exploration of these sites is provided. At Mare aux Songes vast numbers of sub-fossil bones of endemic species (~95% *C. inepta* and *C. triserrata*) were recovered dating to ca. 4000 YBP, when the habitat was a lake. Researchers were thus able to reconstruct the main characteristics of the ecosystem before human colonization, which is beautifully portrayed in a painting (Fig. 12) by the author of the chapter. The site has also yielded the only articulated specimen of *C. inepta* (which unfortunately broke apart upon recovery). Mauritian caves yielded abundant, well-preserved tortoises, especially where roof collapse formed pitfall traps for tortoises. Similarly, the Rodrigues caves contain many tortoises in most growth stages, along with intact carapaces of both endemic species, which have been beautifully preserved. Also, important tortoise material was recovered from Rodrigues caves as recently as 2013, which includes extremely well-preserved small skeletal

elements from hatchling and juvenile tortoises and even adult scute fragments retaining original color. The François Leguat Giant Tortoise and Cave Reserve protects the aboveground ecosystem and caves within (other caves outside the boundaries are protected by federal law). As in the previous chapter, the illustrations are clear and sharp and enhance the reader's understanding and appreciation of the text.

Beginning with Chapter 6 by J. Gerlach, which concerns the ecology and status of *Aldabrachelys* in the WIO, the focus of the book shifts to a discussion of the extant tortoises (but not without a brief overview of current knowledge of the two extinct species of *Aldabrachelys* on Madagascar and a reprise of knowledge of the confusing *Aldabrachelys* morphotypes introduced in Chapter 2). Separate chapters are devoted to the status, ecology, and conservation of: the Aldabra Giant Tortoise, *Aldabrachelys gigantea* (Chapter 6); the Radiated Tortoise, *Astrochelys radiata* (Chapter 7) by R. Walker; the Ploughshare Tortoise, *Astrochelys yniphora* (Chapter 8) by A. Mandimbihasina and L. Woolaver; the Madagascar Spider Tortoise, *Pyxis arachnoides* (Chapter 9) by R. Walker; the Madagascar Flat-tailed Tortoise, *Pyxis planicauda* (Chapter 10) by R. Walker; and in the final chapter (11), an overview of rewilding projects in progress in the Indian Ocean by C. Griffiths. *Aldabrachelys* is relatively safe from human predation on protected Aldabra Atoll, with some 100,000 animals, and has been introduced elsewhere in numerous colonies. However, rising sea levels associated with climate change are a future threat (Gerlach et al., 2013). Furthermore, the four extant smaller species are critically endangered and declining as a result of multiple threats on their home island of Madagascar. These are relatively short chapters compared to Chapter 3 and 4, but the authors do a fine job in summarizing the ecological characteristics, survival threats, and conservation efforts for these species. The Madagascar species are distinctive in a number of ways. For example, the Radiated Tortoise, arguably the most beautiful living tortoise, is suffering one of the most precipitous declines of any chelonian; the Ploughshare Tortoise, the largest extant Madagascar tortoise with an extremely domed carapace and a remarkably extended gular scute (especially in males), is probably the rarest tortoise in the world, and currently the most threatened with extinction; the Spider Tortoise is one of the smallest tortoises in the world and the only species with an anterior plastral hinge; its close relative, the Flat-tailed Tortoise is the least studied of the Madagascar tortoises and whose range is limited to the western coastal region. The threats to these species include the usual litany of human exploitation for bush meat for local markets, national and international export for food (occurring for centuries), the live animal trade, habitat alteration and degradation from livestock grazing, mining, charcoal production, subsistence agriculture, introduction of harmful invasive species (plant and animal), and pathogens. The specific order of magnitude of threats varies among species, but it is probable that all are threatened by these and other factors. While laws exist to curtail these threats, inadequate enforcement due to graft and lack of political will, exacerbated by poverty and food insecurity, continue to drive population declines. It is sobering reading, but in chapters 7–10 subheadings have been standardized to allow the reader to easily obtain and compare current knowledge of distributional change, status, and ecology of the four focus species, to identify the threats and their magnitude, and to identify conservation measures taken and needed.

Chapter 11 concerns the theory and practice (as it is currently conducted in the WIO) of using extant Aldabra Giant Tortoises and/or Radiated Tortoises as megafauna proxies for the now-extinct tortoises on some islands in the region (i.e., "rewilding"). The theory is that the islands' giant tortoises once filled ecological roles that were similar to those of large (mainly mammalian) herbivores (megafauna) on continents. Extinction of these tortoises left gaps in the services they once provided as ecosystem engineers. Of course, introduction of non-native species has often led to catastrophic consequences for island ecosystems (one need look no further than the islands of the WIO for confirmation), so the proposals and introductions are controversial. This chapter describes a trend that could become an important conservation tool in these islands. As usual, the illustrations that accompany the chapter are sharp, clear, and enhance understanding of the text.

As we stated in our introductory remarks, this is a remarkable book that will be an extremely valuable source of information concerning the extinct and living tortoises of the WIO islands. Bringing all of this information, and the references it drew from, together under one cover is a great contribution, and we congratulate editor Justin Gerlach and the chapter authors for their impressive efforts. There is vital conservation work to be done if the extant species are to be saved, but this book will make it easier for biologists and conservationists to move forward. There is some overlap in subjects covered in various chapters, but we did not find it particularly egregious. Typographical and other errors are few. We do wish a more comprehensive (beyond taxonomy) index had been provided, because of the vast amount and disparate nature of information provided in the text. Structurally, the book is well bound, the type is easy to read, and as frequently mentioned throughout in our review, the illustrations provided are clear and sharp. The haunting and evocative photo of the Réunion Island Tortoise skull and mandible on the front cover is a perfect symbol for the book's epic, dramatic, and tragic content.

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Salamanders of the Old World: The Salamanders of Europe, Asia and Northern Africa. Max Sparreboom. 2014. KNNV Publishing, in cooperation with Naturalis Biodiversity

Center. ISBN 0789050114851. 431 p. €125 (approximately $142) (hardcover).—This is the third book dealing wholly or in large part with Old World salamanders that I have reviewed since 2014 (Wake, 2014a, 2014b). Of these three, this massive (23.5 × 29.5 cm, 3.7 cm thick; 2.2 kg), beautifully produced tome is the most familiar in style and scope to a professional audience. The author is a distinguished scholar who has served as Professor and Dean of the Faculty of History and Arts of Erasmus Rotterdam University. However, he has a second career as a dedicated student of Old World salamanders and has written numerous scientific papers, often dealing with reproductive behavior and biology. He has a great deal of field experience and is personally acquainted with most Old World salamanders. His book clearly shows that he is a master of his subject, and his book will have lasting value.

The book largely consists of species accounts, in a two-column format, accompanied by well-selected color photographs of sufficient size to be useful (half to full column, of varying heights). Many of the photos are of salamanders in their natural habitats. There are also a number of habitat photographs. While many of the photographs were taken by the author, he has also used (with attribution) photos from many other photographers. Species ranges are mapped in color as hatched polygons, usually one species to a map, but with occasional congeneric species shown in the region they collectively occupy. The maps, based on IUCN maps (modified by the author and Wouter Beukema from the most recent published data available to them), are attractive, uniform, and useful. Many salamandrids have been described recently from China and adjacent countries. Consequently, their ranges are not yet well understood, so Sparreboom offers generic maps of *Paramesotriton* and *Tylototriton* on which he shows ranges of a few relatively well-known species, but indicates type localities for the others.

Among the attractive features of the book are its nice cover, featuring a giant photo of *Hynobius glacialis* on the front, end papers showing and labeling features of external anatomy, mouth anatomy, and skull and full skeleton (by Bas Teunis), and delightful artwork by Bas Teunis scattered throughout the book. There are a few illustrations from rare publications of past centuries. The layout of text, photos, maps, and artwork has been carefully planned and makes the book a pleasure to use.

The book has been assembled with great care and attention to detail. Following the title page is the Colophon, rich in detail. This is followed by a detailed Table of Contents. A Foreword by J. W. Arntzen introduces the book. Next comes the Preface, which pays homage to the recently (2012) deceased Robert Thorn, whose 1969 book was the first to discuss all species of Old World salamanders (about 70 species known to him). The present book is unusual in that it started as an online catalogue, which evolved into a formal publication. The preface concisely and precisely describes the intent, organization, and content of the book. An Acknowledgements page is followed by the Introduction, which deals with the biology of salamanders. Trees of familial and generic phylogenetic hypotheses are presented, with general topologies based on the study of Pyron and Wiens (2011); no attempt is made to produce a time tree. May 2013 was used as the cut-off date for species counts. Naturally, there have been a few species described since this time (see below). The Introduction is a condensed but lucid 12-page overview of information about salamanders, starting with a general account of the biology of salamanders. Given the many contributions of the author, it is not surprising that the information is accurate, precise, and presented in an engaging style. Subject headings are: Development, Metamorphosis, Skin, Defence mechanisms, Temperature and activity, Feeding, Reproduction and courtship behaviour (organized by family), Parental care, Eggs, larvae and live-bearing, and Threats and conservation. I found the Introduction to be informative and very well written. It contains a box with a photo of the famous lithograph of the Japanese Giant Salamander, dating before 1849, and an entertaining account of how the salamander pictured came to Leiden and its fate.

The main body of the book presents the species accounts, organized in alphabetical order, first by family, then genus and species. Subspecies are usually but not always identified, especially for European taxa such as *Salamandra salamandra*, *S. atra*, and *Lissotriton vulgaris*, among others. The family accounts can be short (Cryptobranchidae), or long and rich in information (e.g., Hynobiidae, which contains a long, well-illustrated account of hynobiid eggs and breeding ecology). A typical species account starts with a detailed description of external anatomy and, when recognized by differences in color, subspecies. This is followed by a diagnosis, which can be long and very detailed. The distribution is described in writing and in reference to a map. Other topical headings are: Habitat, Behaviour, Threats and conservation, Observations in captivity, Comments, and References. Often these accounts are enriched by the personal observations and interpretations of the author. What emerges very strongly is that this is far more than a simple compilation of information. The book is a work of scholarship and passion.

Sparreboom (2014) is relatively conservative taxonomically. However, he accepts most of the taxonomic inflation that has occurred over the past couple of decades. The European plethodontids are placed in two genera, *Atylodes* and *Speleomantes*, which I have recommended be treated as subgenera of *Hydromantes*, arguing that the species form a very distinctive clade that is phylogenetically isolated and has many more unique synapomorphies than any other plethodontid genus (Wake, 2013). Because Sparreboom's organization is rigidly alphabetical, the account of *Speleomantes* is separated from its close relative *Atylodes* by an account for the Korean *Karsenia*.

The book includes accounts for 175 species in 33 genera and five families. Since the book went into production, 13 new species have been named, 12 of them in eastern Asia and one (*Triturus anatolicus*) in Turkey (Weilstra and Arntzen, 2016). If these are all accepted as valid, the 188 species represent a substantial increase since the initial effort of Thorn (1969), who recognized 16 genera and about 70 species. With so many new taxa, how many represent true novelties not known to exist, under any name, when Thorn wrote his book? Alternatively, how many of these are subdivisions of taxa known to Thorn? Most of the new genera are examples of taxonomic inflation, some of it justified by renaming clades recovered as paraphyletic. He continues to recognize *Paradactylodon* for hynobiid species from Afghanistan and Iran, implicitly rejecting without comment the argument of Dubois and Raffaëlli (2012, which I also reject) that this taxon is a *nomen nudum*, which Dubois and Raffaëlli (2012) proposed replacing with two generic-level taxa *Iranodon* and *Afghanodon*. Some of the new taxa of European and western Asian salamanders constitute novelties (e.g., I accept *Salamandra lanzai* as one; however, new

species of *Triturus* and *Hydromantes* are essentially subdivisions, often elevated ranks, of taxa known to Thorn). Multiple species of *Lyciasalamandra* from southwestern Turkey have been described as species, but they are all very close relatives, and Sparreboom (2014) does not recognize three of the taxa. He is also conservative with regard to taxonomy of *Lissotriton*, not recognizing several taxa as species (e.g., *L. vulgaris graeca*, *L. vulgaris kosswigi*) that are recognized by some authors and websites. It is unclear what taxonomy was published too recently to be included, but at least one, *Triturus anatolicus*, was until 2016 subsumed within *T. ivanbureschi*, which itself represented a 2013 subdivision of what Thorn (1969) knew as *T. cristatus karelinii*. There has been extensive subdivision and elevation of ranks of taxa in Europe. An exception is *Ichthyosaura alpestris*, for which Thorn (1969; as *Triturus alpestris*) recognized nine subspecies. There still is only a single species, but Sparreboom (2014) recognizes only four subspecies. The situation in eastern Asia is different, with many relatively recent discoveries of novel taxa, but only two of them at the generic rank, *Pachyhynobius,* with a single species, and *Pseudohynobius,* with six species, were unknown to Thorn. Whereas Thorn (1969) recognized only two species of *Onychodactylus*, Sparreboom (2014) recognizes eight. Among the east Asian salamandrids, *Paramesotriton* has grown from three to 12 species, *Pachtriton* from one to eight species (Sparreboom, 2014 recognizes seven), and *Tylototriton* has been split into two genera (*Echinotriton* is relatively new but one of its species was known to Thorn), and Thorn's six species have ballooned to 25 (several described since Sparreboom completed his text). He does not accept the splitting of *Cynops* into a Chinese *Hypselotriton* and a Japanese *Cynops* as proposed by Dubois and Raffaëlli (2012). In the Middle East, Iranian hynobiids were unknown to Thorn.

This book represents an enormous amount of thought, planning, and effort. The author knows these salamanders intimately, and has extensive experience in the field, as evidenced by his published field observations and numerous photos of field sites. I think the term authoritative is appropriate, given the level of personal knowledge that is evident in this truly outstanding work. I am pleased to have this book in my library and I recommend it without reservation.

Following acceptance of the manuscript of this review, I learned of the unfortunate death of Max Sparreboom (January 18, 1951–August 30, 2016).

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Snakes of the Southeast. Revised Edition. J. W. Gibbons and M. E. Dorcas. 2015. University of Georgia Press. ISBN 9780820349015. 266 p. $28.95 (soft cover).—I am a huge fan of regional field guides—especially those that do more than merely identify an animal and map its distribution. I want insights into a species' natural history that can be provided only by authors who know the animals about which they write. Whit Gibbons and Michael Dorcas fill that bill for the snakes of the southeastern United States. Both are scholars (see, for example, their monograph on North American watersnakes; Gibbons and Dorcas, 2004) who aren't afraid to get dirty—and Whit, especially, can wax rather eloquently about his experiences, as anyone who has had the pleasure of hearing him speak or reading the classic *Their Blood Runs Cold: Adventures with Reptiles and Amphibians* (Gibbons, 1983). The authors are frequent collaborators, including the first (2005) edition of this book, a companion volume in the same series of guides published by the University of Georgia Press on the frogs and toads of the Southeast (Dorcas and Gibbons, 2008), and *Frogs: The Animal Answer Guide* (Dorcas and Gibbons, 2011). In short, they combine the knowledge and experience to bring this book to life.

The southeastern United States supports a diverse ophidian fauna. This book describes 52 species, and several more of the more-than-thirty exotic forms that have been recorded in Florida (Krysko et al., 2016a) might have established breeding populations. Reading this book brought back fond memories of trips to the region that include a gravid Scarlet Kingsnake (*Lampropeltis elapsoides*, although considered conspecific with the Eastern Milksnake, *L. triangulum*, in this book) emerging from in a rotten log in South Carolina, a large Pinesnake (*Pituophis melanoleucus*), also in South Carolina, that threatened to eat me after I disturbed its quiet retreat, a tiny Cornsnake (*Pantherophis guttatus*) in the Florida Keys that valiantly held its ground against an oncoming car, and many more. I imagine most snake lovers who are fortunate enough to live in or have ventured into the southeastern US have had similar memorable experiences.

This volume is aimed at a diverse but general readership. The book is sufficiently detailed and insightful that a professional herpetologist will benefit from (and enjoy) reading it, but not so comprehensive and filled with scholarly references to discourage the amateur naturalist. If anything, the book leans to the latter with "Did you know?" factoids inserted throughout and "How do you identify a …" summarizing the key features of each species, including size, which is presented graphically and includes sizes of neonates, typical individuals, and the maximum known size on an easily read scale.

The layout begins with an introductory section titled "All About Snakes," which includes general information on diversity and natural history and ends with instructions on how to identify the snakes that occur in the region (in effect, how to make the best use of the species accounts). The

species accounts compose the bulk of the book. Organized into small terrestrial snakes, mid-sized terrestrial snakes, large terrestrial snakes, watersnakes, venomous snakes, and introduced species, each account includes the common and scientific name, a description (accompanied by the aforementioned "How do you identify a …"), an unusual entity labeled "What do the babies look like?," distribution and habitat, behavior and activity, food and feeding, reproduction, predators and defense, conservation, and, for some accounts, a comment on scientific nomenclature. Sometimes similar snakes (e.g., Smooth and Rough Earthsnakes, *Virginia valeriae* and *Haldea striatula*, respectively) are grouped into a single account. Accounts are copiously illustrated and include maps showing the total distribution of the species and a more detailed map of the southeastern states with color-coded subspecific ranges where applicable. The accounts are followed by the final section titled "People and Snakes," which includes subsections on "What is a herpetologist?," backyard snakes, snakes as pets, snake conservation, and attitudes about snakes. The latter eloquently compares attitudes toward snakes (distinctly bipolar, with some people despising them and others finding them fascinating) with those toward turtles (leaning heavily toward fascinating) and lizards (emphasis on neutral). A glossary, further reading, acknowledgments, credits, and indices to scientific and common names complete the book.

I really like this book, and it certainly will be in my backpack whenever I visit the Southeast. The abundant photographs often illustrate the considerable variation typical of many species and are of consistently high quality (and even "professional" herpetologists like pretty pictures). The maps are sufficiently detailed to be used effectively in the field. The grouping of accounts by size and habitat facilitate access to the proper account by readers unfamiliar with taxonomy, and the inclusion of details on juveniles helps clarify uncertainties regarding encounters with small snakes (e.g., are they young of a large species or adults of a small species?). The "Did you know?" features not only point to interesting facts but seem to anticipate the questions that inevitably arise when people unfamiliar with snakes encounter one. For example, the feature on p. 157 states that "Sometimes snakes congregate around a particularly suitable habitat, but unless they are mating, they do so because of the environmental conditions, not because other snakes are there," clearly addressing the commonly held belief that snakes (especially watersnakes and cottonmouths) aggregate solely to attack the unfortunate waterskier who falls in their midst (see also the account in *Lonesome Dove* of the ill-fated cowboy whose demise resulted from being thrown from his horse into a "nest" of cottonmouths (McMurtry, 1985).

I do have a few quibbles. The introduction to the accounts on venomous snakes might have been more effectively included in the general introductory section, allowing the actual accounts of, for example, the Timber Rattlesnake (*Crotalus horridus*) to be placed in the section devoted to large terrestrial snakes, and the Cottonmouth (*Agkistrodon piscivorus*) in that dealing with watersnakes. Nevertheless, the advice offered to readers who might encounter a potentially dangerous snake (usually in boxed features titled "How dangerous are they?") is both accurate and temperate, basically boiling down to using common sense and not doing anything foolish, while avoiding the sensationalism that all too frequently accompanies discussions of venomous snakes. I also like the fact that the authors clearly note that the admonition "red touch yellow, kill a fellow" (p. 215) applies only in North America.

Although the authors include comments on scientific nomenclature in individual accounts and "A Word about Taxonomic Controversies" in the introductory section (p. 7), they miss the opportunity to educate readers about why names sometimes change, focusing instead on the differences in interpretations. For example, in the account of the Ratsnake (*Pantherophis obsoletus*), they explain that some herpetologists continue to assign the species to the genus *Elaphe* without stating why that treatment represents a very small minority these days. They also state (p. 118) that genetic studies "suggest that the current species *P. obsoletus* may comprise three distinct species … with no recognized subspecies," and use the fact that those species are not necessarily consistent with color and pattern variation to justify the use of traditional subspecies. I would argue that this merely avoids the admittedly difficult concept that color and pattern (the basis for traditional subspecies) might reflect common selective pressures rather than a relationship implied by formal taxonomic recognition. Because scientific (and common) names will inevitably continue to change (and several changes have been proposed since this book went to press; see, for example, Burbrink and Guiher, 2014; Krysko et al., 2016b), mentioning disagreements without explanation only adds to the confusion for readers with little or no experience with systematics or taxonomy.

Common names can also be problematic. For example, when should words in a name be combined and when should they remain separate? In this book, for example, "Ratsnake," "Kingsnake," and "Watersnake" are combined, whereas "Pine Snake" and "Corn Snake" are not. Although not a big deal in the greater scheme of things, I've always tried to promote consistency. If, in the future, the authors decide that another update is warranted, I'd urge them to follow the guidelines in Crother (2012) that deal with this and similar minutiae.

Maybe most importantly, especially in light of the authors' considerable efforts in snake conservation (both of their institutions are listed as contacts on the webpage of PARC; Partners in Amphibian and Reptile Conservation: http://www.parcplace.org/) and despite the inclusion of conservation in each account, I believe that a much stronger emphasis on conservation is necessary in a modern guide. The discontinuity resulting from including conservation notes in the individual accounts dilutes the dramatic anthropogenic effects humans impose on wild snake populations. Also neglected are strong statements on the negative impact of commercial collecting for the live-animal trade and rattlesnake roundups. In addition, the authors make no mention of the potential effect of snake fungal disease, which is spreading in many populations and might be much more widespread than currently documented. Ultimately, I think the authors missed an opportunity to promote the many worthwhile conservation and education efforts worthy of support by readers interested in snakes.

Compared to the first edition (Gibbons and Dorcas, 2005), most changes are relatively minor. The new edition has some new (and better) photographs, but most images remain the same. The taxonomy has been updated (but see my comments above about the ever-changing nature of scientific and common names). Most species accounts have changed very little, although the new information provided is worthwhile and, in some instances (e.g., the account of the endangered Eastern Indigo Snake, *Drymarchon couperi*), fairly extensive.

One new account (Kirtland's Snake, *Clonophis kirtlandii*), based on a single record in northern Tennessee, has been added. The most dramatic change is the expansion of the section on introduced species, which now includes full accounts of four species (Brahminy Blindsnake, *Ramphotyphlops* [=*Indotyphlops*] *braminus*; Burmese Python, *Python* [*molurus*] *bivittatus*; Boa Constrictor, *Boa constrictor*; African Rock Python, *Python sebae*), whereas the first edition had only single paragraphs on the first two species. So, should readers who own the first edition invest in this revised edition? For those who merely want to identify an occasional snake, no; but for readers who want the most current and accurate information possible, I believe the investment will be worthwhile.

In summary (and despite my quibbles), this is an excellent guide to the snakes of the region, well worth the price, and worthy of finding a home in the libraries (and backpacks) of herpetologists and all naturalists.

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Herpetofauna Mexicana 1: Snakes of Mexico. P. Heimes. 2016. Edition Chimaira. ISBN 97833899731002. 571 p. $129 (hardcover).—In the Introduction to this physically impressive volume, Peter Heimes (2016:10) proposes to present a "compilation of widely scattered information on Mexican snakes." A book-length review/compilation, as Heimes promised, requires considerable effort and Herculean levels of scholarship. My frustration with the volume began immediately because this book was obviously not intended as a field guide, given its large format, but also falls short as a scholarly monographic because it lacks new data. Heimes (2016:12) stated, "Most of the material on which this book is based was gathered during my stay in Mexico in the years 1997 to 2004." He goes on to gratefully acknowledge a long list of field companions. Yet, evidently no museum specimens were examined (none are listed or cited) and no data beyond photographs were gathered in the field. So, despite abundant opportunities to contribute to our knowledge of Mexican snakes, Heimes (2016) presents no new information in this book. Heimes (2016:10) acknowledges, in bulk form, many of the classic monographs from which he drew the information for this book and individual papers are cited throughout the book. The style of the text includes some in-line citations, but sources for the data presented are not clearly identified. This troubles me in terms of ethics, attribution, and transparency in publishing (Perry, 2016), and it also creates a situation of seriously flawed scholarship, by virtue of inconsistent use of previously published literature and data, as my examples below will highlight.

By not attributing data—meristic data, for example—to the original authors, I found it very difficult to identify the sources of the information presented here. Disturbingly, the sources of those data seem to have been randomly selected and inexplicably combined from multiple sources such that meristic data in a single species-account was drawn from different sources. This shortcoming will undoubtedly confuse users of the book, whether they be academic or popular in their pursuits of the amazing snake fauna of Mexico.

With regard to the pre-existing literature, the amount of plagiarism in this book is shameful. In the first four pages (p. 13–16) of the section titled "The Natural Environment of Mexico," I flagged 12 sentences copied verbatim from Campbell and Lamar's (2004:19–21) review of Mexican ecogeography. I let slide innumerable suspiciously similar turns of phrase and sequencing of topics shared between the chapters in both books. I stopped counting verbatim text-drops at that point, but they are evident throughout the book if one knows the original literature or endeavors to make the side-by-side comparisons.

Plagiaristic use of text in dichotomous keys is, of course, unethical but also represents poor scholarship. It is not possible to draft a key without sharing couplets such as "subcaudals divided vs. subcaudals undivided" with previously published keys; this is not plagiarism—it is just how snakes appear. But here is an example of the risks of copy-and-paste pseudoscholarship. The key leading to *Rhadinaea decorata* presented by Myers (1974:44–47, part I. North America, couplet 32) reads:

> "No distinct line in middle of vertebral row, although wider dark streak often present (covering one or more scale rows); ventrals 110–134"

Heimes (2016:288, couplet 6b) reads:

> "No distinct dark vertebral line, although an ill-defined dark stripe often present (occupying one or more scale rows); ventrals 110–134"

Ignore the superficial attempt to avoid plagiarism here and consider the overlying scientific issues. As Myers (1974) discovered and exhaustively documented, *R. decorata* is a remarkably variable snake across its Mesoamerican range, and his key was designed to accommodate that variation. The key presented by Heimes (2016:285, 288), and the information presented in his species account (Heimes, 2016:289, 292), presumably should be specific to Mexico, but they are not. This is despite the fact that Myers (1974) provided data for specimens solely from that country. Myers (1974:74) reported that "Mexican specimens have, on the average, several more ventral plates than do individuals from lower Central America…" and then presented the ranges for Mexican *R. decorata* as males 112–127 ventrals and females 116–134 ventrals. In contrast to the key for this species, in the species account for *R. decorata*, Heimes (2016:292) wisely took advantage of Myers' (1974) keen eye and presented these same ranges for the sexes; yet, the key and the text clearly are in disagreement. For the same taxon, the problem extends also to color pattern. Heimes (2016:289) wrote:

> "...postocular pattern usually comprised of discrete whitish ocelli with dark margins, one behind the eye and one on the side of the neck (ocelli rarely continuous with dorsolateral body stripe)…"

The problem here is that this description of the cephalic and nuchal color patterns in *R. decorata* encompasses the variation that Myers (1974) documented across its range from Mexico to Panama. While Myers (1974:69–71, figs. 14, 15) pointed out that Mexican specimens invariably have two discrete ocelli, Heimes' (2016:289) repetition of Myers' (1974) data explicitly suggests that the color variant "ocelli rarely continuous with dorsolateral body stripe" occurs in Mexico, whereas Myers (1974) made it clear this pattern does not. Unsurprisingly, the specimen presented in the gorgeous image (Heimes, 2016:fig. 354, by L. Canseco-Márquez) shows the pattern that Myers (1974) described as invariant among Mexican specimens, a taxonomically useful character that Heimes (2016) has now obscured. This example, albeit considering only two characters for one species, illustrates how Heimes' (2016:10) goal to present a "compilation of widely scattered information on Mexican snakes" is actually more of a mishandled and poorly packaged assemblage of data for this taxon from both within and outside of Mexico. The same general class of problems applied to the few species accounts of *Geophis* where I compared them to Downs (1967).

Likewise, for other geographically widespread and variable species, Heimes (2016) again inconsistently, and without transparency, adopted the numerical values and descriptions of previous workers. For other remarkably widespread species it took considerable effort for me to locate the sources of the data presented by Heimes (2016). When I could identify the sources, they were not always the most appropriate choices. Consider *Boa constrictor*, a notoriously variable and widespread species. I know of no summary of meristic data and color variation for this species specific to Mexico. Variation that occurs in Peru, for example, is irrelevant here and could potentially make accurate identifications of Mexican specimens difficult. Populations of *Boa constrictor* evidently are capable of dramatic and rapid morphological adaptation in response to ecological conditions, and physiological color change in individuals has been documented (Boback, 2006; Boback and Siefferman, 2010). Yet none of this information on their remarkable variation is presented here. Especially troubling, with respect to those two publications, is that images herein (Heimes, 2016:figs. 19–21) show a boa from an island and two others from the same locality with dramatically different coloration. In the case of *B. constrictor*, I found that the source of the scalation data presented by Heimes (2016:37–38) was Campbell (1998:188); however, the numerical variation in number of blotches in the dorsal pattern did not come from Campbell's volume. In fact, I could not identify the source of those data and could not conjure a rationale for drawing meristic data from different sources (= regions). The problems here are multiple: Campbell (1998) covers northern Guatemala and the Yucatan Peninsula. I would not assume variation from that restricted region would apply to specimens from Sonora or Tamaulipas, Mexico. By failing to reveal the source(s) of his data, Heimes (2016) appears as an authoritarian and comprehensive summation of variation of *B. constrictor* across all of, and only, Mexico, which is not the case. This exemplifies the scholarly paradox here: if this is a field guide, then the data presented should be (as best as possible), specific to Mexico, but if this is a monographic treatment, then new data and a list of specimens examined should be presented. This paradox is perhaps best highlighted by Heimes' (2016:196) treatment of *Agkistrodon contortrix,* a species that barely ranges into Mexico. The ventral scale counts were taken from Campbell and Lamar (2004:270); however, subcaudal scale counts were taken from another source that I could not identify. Campbell and Lamar's (2004) account was written to cover variation across the entire eastern half of North America. By choosing this as his source for some, but not all, of the meristic data, Heimes (2016) overlooked the most appropriate data available. Gloyd and Conant (1990:table 12) presented data from specimens restricted to the two counties in Texas that are adjacent to the only known Mexican populations of *A. contortrix*. In this case, Heimes' (2016) approach to data selection is both inconsistent and inappropriate. While he did use Campbell (1998) for some of the data for *Boa*, he did not use that source for other widespread species (e.g., *Senticolis triaspis*, *Spilotes pullatus*, *Scaphiodontophis annulatus*). With regard to *Sp. pullatus*, although Heimes (2016:162) did not use the scalation data from Campbell (1998:245), he did use the data for color pattern and he did so by virtually copying Campbell's (1998:245) description (text in brackets deleted from Campbell [1998:245]):

> "There are 25–32 dark crossbands on the body, which [often] tend to be ill defined on the neck, and 12–16 [well-defined] dark bands on the tail. The dorsal pattern of crossbands is more distinctive in juveniles. The top of the head is mostly black. […]."

With regard to *Sc. annulatus*, I conducted a non-exhaustive search of the literature, which revealed a report of a male specimen of *Sc. annulatus* from Oaxaca, Mexico (Brattstrom and Adis, 1952:60) with 148 ventral scales (vs. 132–140

ventrals in males; Heimes, 2016:389). If you argue that no one would ever need to actually use ventral scale counts to identify *Scaphiodontophis*, or that you do not need meristic data to correctly identify a *Boa constrictor*, then you have missed my point.

To be sure, widespread, variable species are problematic for all taxonomists and authors. Accordingly, endemic species and especially micro-endemic species should be more tractable. Such might be the case, but it would be helpful if Heimes (2016) had made clear that some of the data he presented were more than 40 years old, and he made no attempt to contribute new data. The age of the data, of course, is not the point. The problem is that older data sets likely were based on small sample sizes, and thus probably not representative of actual variation in a species. I selected one example here: Myers (1974:59, 62–65) described *Rhadinaea bogertorum* on the basis of a single male and single female specimen; thus, no information on overall variation or sexual dimorphism was available at the time. In every species account I checked (except *A. contortrix*, for inexplicable reasons, other than copying from Campbell and Lamar [2004]; see above), Heimes (2016) presented scalation ranges separately for males and females. However, in the account for *R. bogertorum*, Heimes (2016:289) presented counts simply as "158–163 ventrals and 65–80 divided subcaudals." These are the data from the two type specimens available to Myers (1974). If Heimes (2016) had presented these in the format used for other species in his book (e.g., ventrals in male = 158), he would have alluded to the fact that variation in this species is unknown and explicitly stated why so. Rather, he obscures this fact, with the result that book users may have difficulty reconciling scale discrepancies between a specimen in hand and Heimes' (2016) account. Even more frustrating is the fact that Heimes (2016:289, fig. 353) has first-hand experience with this species. A query on VertNet (vertnet.org; accessed 22 July 2016) indicated that at least 89 additional specimens of *R. bogertorum* are available for study. Noting this might have encouraged a student seeking a tractable and important research project.

In yet another example of inconsistency and inattention to detail, the meristic and color-pattern data for *Micrurus latifasciatus* were partially taken from Campbell and Lamar (2004:174), but are inexplicably different, or altered, in a manner suggesting that Heimes (2016:337) included data on additional specimens. But the logic does not add up here: Heimes presented ventral and subcaudal counts identical to Campbell and Lamar (2004), yet presented size data that are different from theirs (max. TL 114.0 cm commonly 65–85 [Campbell and Lamar, 2004] vs. max. 114, commonly 60–90); it is unclear if this discrepancy represents different data sets from the literature, new data from the author, or simply rounding the numbers. The descriptions of the color pattern in this species differ between the two works, so the source of this information is unclear as well. In any case, both works agree on the diagnostic feature of the nuchal band beginning posterior to the parietal scales. However, the specimen in Heimes (2016:figs. 402, 403, same individual) clearly shows the nuchal band including the posterior tips of the parietal scales. I am not sufficiently familiar with this species to determine whether the snakes in the figures were misidentified, or if Heimes (2016) missed an opportunity to contribute to our knowledge of variation in a putative diagnostic character for this species.

I have presented sufficient examples to convince myself, at least, that inconsistent use of the literature and poor scholarship pervade this book, unacceptable ethical issues of plagiarism notwithstanding. As a herpetologist with a deep interest in Mexican snakes, I do not know how to use this book in any scholarly context. It is a poorly researched regional monograph that happens to include some very nice images of species that most herpetologists have not have seen in life. Indeed, many of the images are spectacular, well reproduced, and unique in the literature; Heimes himself seems to have taken most of the photos, and all images are properly credited as are the handful of nice line drawings. Only a few images are poor, but their inclusion is still valuable. It is not clear why one species (*Tantilla robusta*) is presented as a museum specimen, whereas species also unavailable for photographs in life (e.g., *Tantilla shawi* or *Tantillita lintoni*) were not also presented as specimens. A few images are duplicated, for unclear and non-contributory reasons. For example, Figures 16 and 17 clearly show the same individual of *B. constrictor*, but one of them has been flipped horizontal, giving us the identical perspective. The habitat images are few yet useful, but sometimes framed in uninformative or uninspired contexts. For example, Figure 18 shows the base of some unidentified trees and background of verdant foliage. The caption reads: "Habitat of *Boa constrictor* and *Drymarchon melanurus*: Tropical evergreen seasonal forest near Zanatepec, Oaxaca [photo by the author]." The image fails to capture the nature of the vegetation of that region and, by citing *Boa* and *Drymarchon* as typical of the region, Heimes (2016) implies something is unique of this floral and faunal association. In fact, the same faunal caption could be used for any image, regardless of flora, from virtually anywhere in the lowlands of Mexico. Perhaps it would have been more intriguing to mention that this specific spot represents the known range of the poorly known, and possibly micro-endemic, species *Ficimia ramirezi*.

With respect to geographic or individual variation, the taxonomic coverage presented among the images is widely inconsistent, appearing to emphasize subjectively popular or attractive species rather than variation inherent in a species. In what I will define as the "Cool Snake Index (CSI)," I note that the variable species *Crotalus lepidus* has a CSI of $n = 14$ images, whereas the notoriously variable species *Ninia sebae* has a CSI of $n = 1$ (and the comprehensive treatment of variation in this species by Smith [1995] is not cited). Unsurprisingly, *Lampropeltis mexicana* garners CSI, $n = 10$ (including two images of the same specimen) vs. *Sonora semiannulata* CSI, $n = 2$, or *Masticophis* (not *Coluber*, with no comment) *flagellum* CSI, $n = 4$.

This is a lengthy and frustrating volume to read in its entirety. Nevertheless, I found few typos (e.g., trees that "loose their leaves, p. 16) and only a few grammatical errors. While I certainly did not assess the entire massive text for errors of citation, I noticed only one omission from the Literature Cited (Flores-Villela and Smith, 2009). A Glossary is included that appears to be useful to non-specialists. Creating comprehensive maps to the snake fauna of Mexico is a daunting undertaking; consequently, I was pleased to see that the maps included herein (contributed by C. Grünwald) were clearly predicated and qualified as being provisional and limited by the graphical scale of presentation. Nevertheless, more information regarding the information basis for the maps and credit to previous authors would have been appropriate. Despite these shortcomings, the maps are useful and informative at the level to which they are intended. I did not closely assess the Index.

I did not have the specimens or a crew of Mexico-naive colleagues available to objectively test the dichotomous keys. Given all of my examples and reservations above, I have real concerns about the utility and accuracy of the keys. Having criticized and struggled through the keys in other monographs, and having realized the level of attention and consistency required to draft keys of my own, I worry greatly that the copy-and-paste approach employed in this volume may impact the usefulness of some of the keys. My recommendation to colleagues with interests in Mexican snakes is to enlist a cohort of students in a lab with access to Mexican snake collections to test these keys. This may sound like an extraordinary second-round of evaluation of this volume, but my point is that I did not conduct those exercises and, given the potential influence of this volume, the academic community may be at risk of some numbers of misidentified specimens being submitted to outlets such as *Herpetological Review* in the form of Natural History or Geographic Distribution notes. For all the contributions that this book appears to promise, I worry that the poor scholarship herein may do more harm than good. I fault not only the author for this, but also to the publishers: Edition Chimaira. Indeed "a thing that is hoped or wished for but in fact is illusory or impossible to achieve" (Knowles, 2006).

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The Fishes of New Zealand. Volumes 1–4. Clive D. Roberts, Andrew L. Stewart, and Carl D. Struthers (Eds.). 2015. Te Papa Press. ISBN: 978-0-9941041-6-8. 2008 p. $191.65 (hard cover).—In Richard Flanagan's 2001 novel, *Gould's Book of Fish*, a tortured prisoner in 1820s Van Diemen's Land (Tasmania) finds peace only when painting local fishes. If only old Billy Buelow Gould could have had a copy of *The Fishes of New Zealand*, he would have had ten lifetimes worth of inspiration, and also a serious weight-lifting tool for staying fit. Each of the four volumes is almost the length of my arm, and together they weigh close to 25 pounds. In its dimensions, *The Fishes of New Zealand* reminds me of the folio editions of classic fish books from Bloch, Lacépède, or Boulenger. Each volume is stylishly covered in color images of dozens of fishes artistically arranged. Volume 1 is a very readable introduction, history, and overview: Volumes 2–4 are less readable, but are straightforward and informative species accounts and keys written by the experts of each group. The set comes in a beautiful and sturdy cardboard slipcase that is adorned, like each of the volume covers, with lovely color images of fishes. These images and the sheer size of the work call you in like a siren to flip through its contents. Nearly everyone who walked into my office when the volumes sat on my desk felt obligated to comment on its size, and then asked to look at them.

The Fishes of New Zealand is certainly an impressive scientific work. All 1,262 New Zealand fishes are given full descriptions (keys cover an additional 100 species) from 245 families. Forty-four experts from around the world, mostly from New Zealand but also several members of the ASIH (Drs. Chris Kenaley, Jeff Leis, Bill Smith-Vaniz among others) made contributions. Notably, despite the many international contributors there is a great deal of continuity in the writing and style (most of which is technical)—a credit to the editing. The work covers fishes known from the 200-nautical-mile boundary of the New Zealand Exclusive Economic Zone, which is an area of ocean 20 times that of the landmass of New Zealand. But don't think this work would only be useful to kiwis. Anyone working in the Indo-West Pacific or in marine fishes in general would find this work useful. Of course, mostly marine fishes are covered, but New Zealand's freshwater fishes are also included (e.g., eleotrids, galaxiids, along with introduced catfishes, salmonids, and cyprinodontiforms).

Sections on liparid snailfishes and deep-sea fishes including anglerfishes are very well done with detailed keys and good summaries of what is known for these poorly studied creatures. The sections on elasmobranchs are particularly stellar; beautiful images of almost every species are included, which isn't the case with many of the sections (see more on that below).

Although color-coded tabs and other features allow you to find the different sections relatively easily, the volumes are so large that you likely won't be taking them into the field. Flipping through the volumes, I wondered how many large books like this will be published in the future. The prevalence

of mobile apps (such as Robertson and Allen's "Fishes: Eastern Pacific") and online databases like FishBase will make it less likely that there will be much of a market for giant books like *The Fishes of New Zealand* in the future. Although I'm glad these exist, I wish there were a complementary online version so that it could be more easily used in the field.

Most of the references in these volumes are from pre-2012, so more recently described species and taxonomic changes are excluded. Many of the images in the species accounts could have been better, and that is the only place I was really disappointed. Each of the species accounts designate about 1/4 of the page to an image—for elongate animals like cornetfishes there is a laughable amount of empty space (luckily they only show the front half of the oarfish, *Regalecus glesne*). I would have liked some of these images to include close-ups of the head or diagnostic features (few did). Some of the images of fish species are drawn based on color photographs (like the Frigate Mackerel *Auxis thazard* and Swordfish *Xiphias gladius*), and those are not bad but don't have the appeal of photographs. Very few of the images are of living specimens observed in their natural habitat. For *in situ* live images and for giving a broader context for each species and family, see the fabulous three-volume *Reef Fishes of the East Indies* by Allen and Erdmann. That 2012 compilation is the gold standard for Indo-West Pacific fishes, but *The Fishes of New Zealand* is an excellent complement to that book, given that they don't have as much overlap geographically or in terms of the fish fauna as one might think (particularly with the present volume including deep-sea and freshwater species). The text in the species accounts is mostly written in the telegraphic style, and I sometimes wished there were a little more there to appeal to a novice.

The most useful part of the volumes will probably be the keys. These are easy to follow and there are excellent drawings with arrows accompanying the text for each family. There are also sketches of the families, a checklist, a glossary, and several indexes to help you navigate the books.

The Fishes of New Zealand is so big, bold, and beautiful, I can imagine it being the only possession of mine that will be passed down from generation to generation. Even assuming that future generations have forgotten that they had an ancestor that was an ichthyologist, if any curiosity survives in these generations they will be as intrigued by this work as I am today. Although it is in places uneven, I can't imagine this set being a disappointment to anyone who owns it. I certainly recommend it to anyone living or working in, or adjacent to, the region. But I also recommend it to the book-collecting naturalist; there might not ever be a volume matching this work in scope and size ever again.

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Introductory Fisheries Analyses with R. D. H. Ogle. 2016. CRC Press. ISBN 9781482235203. 317 p. $79.95 (hardcover).—The R programming language (R Core Team, 2016) has rapidly become the standard for fisheries scientists and ecologists to manage their workflow from data input to analysis, statistics, and the creation of beautiful graphics. The key reasons for its success are that R is free and open source, and well-written R scripts allow anyone to completely and easily reproduce your results. Indeed, I tell people that between coauthor revisions, finding mistakes, and reviewer comments, they will certainly rerun their entire analysis at least ten times before it is published—and this is easy to do when the entire analysis is coded in R. The main drawback to R is the somewhat steep learning curve, especially for those scientists who have never programmed before. Nevertheless, R programming is becoming such an essential skill that in our school we offer introductory R courses to our incoming fisheries graduate students (and many from other departments take these courses too). However, despite good online sources, there really is not a good textbook for beginners that covers the range from the skimpy and introductory Beckerman and Petchey (2012) to the more advanced Matloff (2011). The newest claimant to fill this gap is *Introductory Fisheries Analyses with R* by Derek H. Ogle, a professor of mathematical sciences and natural resources at Northland College, Wisconsin.

The book itself aims to teach practicing fisheries scientists and graduate student how to conduct a suite of introductory fisheries analyses, which it does well. One feature of the book is extensive reliance on the author's own R package FSA, which has the benefit of simplifying analyses but the cost of being tailored to offering specific solutions to specific problems. The book goes through an all-too-brief introduction to R, a great overview of data loading and manipulation, gives some instruction on plotting, and then moves to fisheries-specific topics: age validation, age-length keys, length frequencies, length-weight relationships, fish condition, mark-recapture abundance, mortality, individual growth rate, and recruitment.

Of particular interest to me was the section on data loading and manipulation, which makes extensive use of the R package dplyr, as well as magrittr and tidyr. The author excels at clearly explaining and demonstrating how to use the %>% operator from dplyr to combine data manipulations together using intuitive syntax. For example, he presents a single easy-to-read R command over several lines that does all of the following: read in a data frame, extract the rows for a particular species, remove unneeded columns, calculate log-length, store log-length in a new column, and sort the data by ID and length. Reading this chapter left me convinced that data manipulation should be taught first using dplyr instead of my current focus on teaching this using base R functions.

Another area of great value is the last half of the book with estimation of various fisheries quantities such as length-weight, individual growth, mortality, and recruitment. Here there is a good blend of examples, statistical background, and how to solve each problem in R. In some places, though, there is considerable reliance on using the functions in FSA instead of teaching readers how to code and solve questions in general.

My hope in getting this book was that I would be able to hand it out to students with no prior programming or R knowledge and let them teach themselves R. Here the introductory chapters could have been greatly expanded. In my experience, R novices struggle most with how to get started, and later with writing loops and functions. These topics are only briefly described. Later in the book, I wished

that two advanced topics had been covered so that I could use this as a textbook for my advanced fisheries modeling class: how to model marine protected areas with fishing, and how to calculate maximum sustainable yield. These additional chapters would have taught the skills and intuition to understand how fisheries management works, as well as advanced programming skills involving nested loops, user-defined functions calling other functions, and the judicious use of large matrices.

Nevertheless, this book is a valuable addition to add to the arsenal of budding fisheries scientists, even if (very selfishly speaking) it does not quite meet my needs for an introductory book suitable for R novices in fields outside fisheries.

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