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BOOK REVIEWS

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Terralog 10. Geckos of Australia/Geckos Australiens.

F. W. Henkel. 2010. Edition Chimaira. ISBN 9783899733600. 160 p. €44.80 (approximately \$62.00) (hardcover).—Australia possesses one of the richest herpetofaunal assemblages on earth. Contributing to this diversity are 191 described species of geckos and flap-footed lizards (Uetz and Hošek, 2013), most of which are illustrated in Henkel's book. Photographs and maps make up the majority of this book, with 513 gecko photos, 27 habitat photos, and 68 range maps. The text is sparse; there are only 25 pages of text with half of that space taken up by the Table of Contents, Acknowledgments, and References. The book is in both English and German, with side-by-side columns in each language. The text was written in German and translated into English and, although the English is rough in some places, it is readable and does not cause any problems.

The book's strength lies in the photographs and they are indeed impressive. Australia's gecko fauna is spectacular and the photos collected by Henkel are among the best I have ever seen. Photographs by David Knowles, Gunther Schmida, and Steve Wilson comprise the majority of images and the work of these three photographers is of the highest quality. The bright colors and bold patterns of some of the species of *Strophurus* and *Oedura* are particularly remarkable. The photos have limited captions consisting of the species scientific name with author and description date, locality (if known), adult size (measured in mm from snout to tail tip), photographer's name, and a set of symbols providing very basic natural history and captive care information. Each photo also has a code number associated with it. A key at the back of the book explains, "A five-digit number then specifies that taxon, affording a unique code." This would suggest that all photographs of a particular species should share the same number, but this is not the case. The three photos of *Diplodactylus pulcher* (p. 66), for example, are numbered RG04931, RG04932, and RG04933. This appears typical for all of the photos in the book. The stated purpose of these numbers, which are apparently used in all Terralog volumes, is to facilitate "unvarying global communication" in the event that the "systematic status of the respective taxon changes." I fail to see the utility of such a scheme, particularly if the publisher fails to follow its own system.

The References section contains numerous papers and books dealing with gecko systematics, Australian geography, and some regional field guides. However, several titles have no apparent bearing on the current volume. This includes references to software used to estimate phylogenies, MrBayes (Huelsenbeck and Ronquist, 2001) and PAUP* (Swofford, 2002), and the DNA sequence alignment program Se-al (Rambaut, 1996). Because there are no phylogenies presented in Henkel's book, the inclusion of these and some other references is puzzling.

It is not immediately clear who the intended audience is for this book, but I think it is important to state what this book is not. This is not a field guide; it contains almost no written natural history information. Likewise, it is not a guide to captive care. I see only one role for this book, ogling beautiful

geckos. In this regard, it does not disappoint. Henkel's book could also serve as a supplement to existing field guides, which typically have space for only a single photograph of each species. The multiple photographs in Henkel's book can help illustrate the broad range of color and pattern variation that exists among individuals, providing a more complete visual representation of many Australian gecko species.

Another possible use for Henkel's book is the Table of Contents, which could serve as a taxonomic checklist of Australian geckos. Unfortunately, this potential utility is marred by the adoption of a recent "taxonomic" treatment of the legless geckos in the family Pygopodidae (Wells, 2007). Wells's (2007) arrangement, like much of his other work, is not scientific and creates confusion and instability (Shea and Sadlier, 1999; Williams et al., 2006; Kaiser et al., 2013). Specifically, in light of molecular phylogenetic evidence (Jennings et al., 2003; Lee et al., 2009), the adoption of Wells's (2007) taxonomy would render both Pygopodidae and *Aprasia* paraphyletic. Henkel claims that he followed the higher level gekkotan taxonomy outlined in Han et al. (2004) and Gamble et al. (2008), but neither of these papers divides Pygopodidae into two families as proposed by Wells (2007). Interestingly, Wells's (2007) paper is not included in Henkel's list of references. Instead an "in press" manuscript by Wells dealing with a generic revision of Pygopodidae is cited, which is apparently the same manuscript cited as "in press" by Wells (2007) that has still not been made public.

The aforementioned issues, while certainly problematic, affect only a small part of the book and do not detract from the primary focus, the photographs. I can recommend this book to anyone who wants to browse beautiful photographs of incredibly cool geckos or to supplement photographs of one or more of the field guides available for the continent. Anyone who needs more than that should probably look elsewhere as there are other books that address the natural history (Heatwole and Taylor, 1987; Greer, 1989; Cogger, 2000), captive care (Henkel and Schmidt, 1995; Swan, 2008; Brown, 2012), or species identification (Storr et al., 1990; Cogger, 2000; Swan et al., 2004; Wilson and Swan, 2013) of Australian geckos. For someone simply looking for a visual parade of Australia's most fascinating lizards, Henkel's book is a good option.

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- Press, ISBN 978-0-9573946-0-5. 528 p. £39.00 (hardcover).—**The Biology of Sharks and Rays.** Peter Klimley, with illustrations by Steven Oerding. 2013. The University of Chicago Press. ISBN-13:978-0-226-44249-5. 528 p. US \$40 (hardcover).—Two new books about sharks have been released in recent months, and though they differ in focus and intended usage, both are useful contributions to the field. *Sharks of the World* is the latest edition of a popular reference book, and contains the most up-to-date information on more than 500 species of sharks. *The Biology of Sharks and Rays* is an introductory textbook, and contains primers of the anatomy, physiology, and behavior of these animals.
- The organization and scope of *The Biology of Sharks and Rays* make it ideal as a textbook for beginning marine biology or ichthyology students. Each chapter contains many detailed illustrations and figures, and each ends with a series of questions designed to spur further thought and discussion. Throughout the book, Klimley works in stories from a lifetime spent studying sharks and rays, adding a personal touch to many subjects. Additionally, his experience as a public speaker and an author of popular nonfiction books is evident, as he makes even the most technical of subjects both interesting and easy to understand.
- Sharks of the World* is much more specialized and technical, and is intended to serve as a practical reference guide of every known species of shark. For each species, the book provides a description of relevant identifying features from the detail-oriented point of view of expert taxonomists, yet they are clearly explained enough that anyone can follow them. All entries also describe the ecology, distribution, and life history of every species, and are illustrated with line drawings showcasing relevant features. For many species, a photograph is also provided. Each family is introduced in some detail, including the number of species, which are all illustrated by a series of striking color plates. *Sharks of the World* also contains a thorough and detailed glossary of the many technical terms associated with fish taxonomy.
- One of the many differences between these books can be found in how they address the conservation and management of sharks and rays, a topic much in the news in recent years (Simpfendorfer et al., 2011). The final chapters of *The Biology of Sharks and Rays* provide a detailed summary of this topic, including fisheries management, shark bites, overfishing (e.g., Dulvy et al., 2014), and the growing field of SCUBA ecotourism (e.g., Gallagher and Hammerschlag, 2011). While these issues are briefly introduced in the opening sections of *Sharks of the World*, the focus is more on practical applications, such as suggestions on how to safely interact with sharks while SCUBA diving and a photo guide for identifying commonly traded shark fins in a fish market.
- It should be noted that while *The Biology of Sharks and Rays* is a well-written and detailed introduction to the field, previous reviews (Francis, 2013) have noted numerous minor factual errors. Additionally, it is not intended to be used as a thorough review of the state of current knowledge and research of chondrichthyan biology and ecology—for that, readers would perhaps be better served by the popular *Biology of Sharks and Their Relatives* series edited by Carrier et al. (2007, 2010, 2012).
- Although *Sharks of the World* is a technical and practical reference guide and *The Biology of Sharks and Rays* is an introductory textbook, both books are useful additions to the library of marine biologists, ichthyologists, and shark enthusiasts.

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Salamanders and Newts of Europe, North Africa and Western Asia. M. Staniszewski. 2011. Edition Chimaira. ISBN 9783899733693. Terralog Volume 21. 160 p. €39.80 (approximately \$53.15) (hardcover).—This recent addition to the Terralog: Herpetological Reference of the World series is a strangely packaged book with very little text. The Table of Contents (five pages) contains a list of taxa arranged in alphabetical order by family and including vernacular names in English and German, together with a statement of geographic range. Elsewhere in the book all names are in Latin. The text (only ten pages) is in two columns, left in English, right in German. There are two pages of literature references and a page of acknowledgments. The remainder of the book is filled with color photographs, from two to eight per page. Scattered throughout are full color maps showing the outlined distribution of all taxa treated. Habitat photos are also included, at least one per species and often more. The author is an accomplished photographer and many of his photos are used, but those of many other photographers are included as well. At the end of the book is a foldout page that provides the key to symbols. The front endpaper is a large color map spanning the Western Sahara thorough Iran, indicating topography (with no key). The back endpaper is a large color political map of the same area.

Despite my first impression that this is a book of photos, there is more to it than meets the eye. Under each animal

photograph is some highly concentrated information in the form of a codenumber (see below), scientific name and authority and date of description, location of the specimen (labeled “Habitat”), typical size of adult, typical size of mature larva, and life stage (i.e., eggs, larva, advanced larva, juvenile, adult) of the specimen shown. The codenumber, unfamiliar to me, is said to “allow international communication.” For example, a photograph of *Triturus pygmaeus* carries the codenumber AU05736-4, referring to Amphibia, Urodela, number (apparently of the photo, not the taxon), and finally, 4, referring to life stage (in this instance, a juvenile). Each photograph, including those of habitats, has a codenumber, extending from AU00011-5 (inexplicitly) through AU05741.

Under the caption of each photographed specimen is a series of symbols, which carry a great amount of information (although not attributed to specific publications). The first of these gives the dimensions of an appropriate vivarium for the species, and the second indicates the water depth. Next comes water type (still or flowing, speed of flow, and whether or not to include vegetation), followed by “Ecological parameters” (six categories, from terrestrial in cool forests to rocky outcrops of limestone). The next symbol refers to “Climate and habitat,” with eight categories (from cool, wet forest with high humidity, to rock faces and scree). Other symbols indicate preferred temperature range (three categories), dormancy period (four categories), activity (diurnal or crepuscular to nocturnal), reproduction (four categories), outdoor husbandry (whether recommended, possible, or not recommended), diet (five categories), and expertise required for successful maintenance in captivity. In light of this information, it seems the book’s main audience is herpetoculturalists.

The treatment of taxa is comprehensive for the geographic region covered, including subspecies (whose distributions are mapped). While geographic limits to the West (Atlantic Ocean), North (Arctic), and South (deserts) are clear, that to the East is treated sensibly. Salamanders occurring west of the Urals and the Iraq–Iran border are included, as are those extending into Iran. The only Iranian endemic included is *Neurergus kaiseri*; the hynobiids of northern Iran will be treated in “the Asian volume,” which apparently is forthcoming.

The book is attractively produced, but unorthodox in treatment. I find it useful in that it is the only book I know that maps all subspecies ranges. Furthermore, photos of all taxa are presented and are of high quality. However, the text is short and deals almost exclusively with taxonomic issues. The author provides reasons for the choice of names used, together with literature references. On the whole, I find this a useful addition to my library.

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Snakes of Zimbabwe and Botswana. D. G. Broadley and R. Blaylock. 2013. Edition Chimaira. ISBN 9783899734690. 387 p. €49.80, approximately \$68.00 (hardcover).—The bulk of this book was written by Donald G. Broadley, one of Africa’s most venerable herpetologists. Roger Blaylock, a medical doctor, also contributed a short chapter on snake venoms and snakebite. Don arrived in Zimbabwe from Britain in 1954, at the age of 22, and published his first herpetological paper in 1956. He has authored well over 200

papers, several books, and has described close to 100 taxa. His reliable, thorough, and exhaustive documentation of southern Africa's herpetofauna has smoothed the path for those of us who have followed him in the field. Despite his age, Don continues to publish. He also holds the post of Curator Emeritus at the Natural History Museum in Bulawayo, Zimbabwe, overseeing Africa's largest preserved herpetological collection.

The book opens with 40 pages of introductory material in Don's usual terse style. This includes several short but relevant essays on the environment, herpetological classification, anatomy and physiology, collection and preservation, maps, and habitat pictures. Clear dichotomous keys to the genera and all species are provided. The majority of the text, some 300 pages, describes the 95 species of snakes known from Botswana and Zimbabwe, two land-locked countries in southern Africa. A number of faunas are represented in the region: savanna forms (both pan-African and Zambebian), Afromontane species, specialized inhabitants of the extensive Kalahari sands, and species of the East African coastal mosaic; there are no endemics. Eighty-one species are listed from Zimbabwe, and 64 from Botswana, the numbers reflecting the greater diversity of habitats (and possibly the more thorough collecting carried out) in Zimbabwe. Each species is described under the following headings: description, size, color, distribution and habitat, and ecology, and for some species there are comments on conservation. The taxonomy is fully up to date and incorporates recent major revisions and the new arrangements of African snake genera, based on molecular data, by the talented Zimbabwean herpetological taxonomist Christopher Kelly. A short section on venoms, symptoms, and treatment accompanies the descriptions of medically significant species such as the elapids and vipers. Each species account includes 1–3 line drawings of head scalation, a map showing distribution by location for species with only a handful of records, and by line hatching for those with many records. There is at least one color photograph for every species, with the exception of *Rhinotyphlops boylei*, which is not illustrated. The photographs, most of which are good to excellent, were taken by a diversity of skilled herpetological photographers. The species descriptions are followed by Blaylock's 14-page chapter on venoms, antivenoms, and treatment, illustrated by his informative, but often gruesome pictures of victims. The book concludes with a quarter-degree square gazetteer, a glossary, indices for scientific and common names, and a brief bibliography listing about 80 references.

For the conservationists or naturalists wanting to know the snakes that occur in Zimbabwe and Botswana, this book is as sound as can be; one will find all the facts are here. The combination of keys, pictures, and maps should enable any field or museum worker to quickly and reliably identify any snake species from the region, and the book is also tough, well bound, and attractively produced. The pictures, full color and most half-page in size, are in some ways one of this book's strengths. The seven Botswana habitat pictures include the Kalahari and its dunes, the small stony hills of the southeast, the Okavango Swamps—a magical, astonishing place—and the great Chobe River on the northern border. The Zimbabwean habitat pictures show, *inter alia*, the high Chimanimani Mountains of the eastern border, and the magnificent granite inselbergs that characterize much of Zimbabwe. There are 324 snake pictures, often four or more of each species, and most specimens shown are from Zimbabwe, Botswana, or South Africa, which borders both countries. Many are extremely useful; the four pictures of the Zambezi Giant Blind Snake (*Megatyphlops mucroso*) all show a different color phase, seven different color varieties

of *Bitis caudalis* are shown, as are both adult and juvenile color phases for two species of African garter snakes (*Elapsoidea*). Several pictures illustrate species and color forms that have rarely or never appeared in print before, as far as I know. For example the *Psammophis* (formerly *Dromophis*) *lineatus* on page 195 and the red-striped form of the Bangweulu Swamp Snake (*Limnophis bangweolicus*).

Southern Africa is alone in Africa in having a decent herpetological canon, and this book is a worthy addition. However, it isn't really aimed at the naturalist. Chimaira's publications, excellent as they may be, are rarely to be found in African bookshops, but are usually obtained from specialist distributors. The price puts it beyond the reach of many citizen naturalists, and it cannot compete with the more comprehensive, less expensive, and more easily portable works produced by herpetologists such as Johan Marais (Marais, 2004), Richard Boycott and Orty Bourquin (Boycott and Bourquin, 2000), and Bill Branch (Branch, 1998). It is more of a reference work, useful for museums, educational and conservation institutes, and professional zoologists.

I detected a few shortcomings. The choice of pictures is curiously over-indulgent in places. There are seven photographs, all half page, of the Gaboon Viper (*Bitis gabonica*). Gaboons, as they are affectionately known by African herpers, are well-known snakes; one good shot (and possibly a close-up of the head) would suffice. On page 245 there are two half-page pictures of *Amblyodipsas ventrimaculata*; the upper one is in focus and adequate for identification, and the lower picture shows an identical snake, totally out of focus. This is a waste of half a page. There are six pictures of *Causus defilippii*, five of Forest Cobras (*Naja melanoleuca*), seven of the Mozambique Spitting Cobra (*Naja mossambica*), seven of the Black Mamba (*Dendroaspis polylepis*), five of *Gonionotophis nyassae* . . . the list goes on. The unmistakable Tiger Snake (*Telescopus semiannulatus*) is illustrated by five pictures when one good shot would do. A ruthless culling of unnecessary pictures would have produced a slimmer and possibly cheaper book, thus more attractive to the impoverished naturalist. There are a few typos. In my copy, the conservation account for the Rinkhals, *Hemachatus haemachatus* (a fascinating read; this snake may now be extinct in Zimbabwe) has been transposed into the account for *Naja annulifera*. There are seven maps, one or two more detailed ones would be enough. Some of the maps are in French ("Collines Matopos" instead of Matopo Hills; p. 15) and lack internal detail; none of them show the location of Victoria Falls, Zimbabwe's premier tourist destination. The final habitat picture does not show Khutse National Park, but the Mopane woodland on the edge of the Okavango Swamp. Dr. Colin Tilbury has published extensively on both Pan-African snakebite and snakebite in this region, including some excellent material on snakebite in Botswana, but none of his papers is mentioned in Roger Blaylock's snake-bite account. These are minor problems, however.

Chimaira has established a reputation for sound, thorough, regional herpetological handbooks. This book is a worthy addition to their list. The professional zoologists and conservationists whose business involves them with the herpetofauna of the area and those who need keys and photographs to make definite identification will find it essential.

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Ecology of North American Freshwater Fishes. Stephen T. Ross. 2013. University of California Press. ISBN 978-0-520-24945-5. 460 p. \$75.00 (cloth: alkaline paper).—North America has a rich fish fauna that is well studied, with a number of existing and emerging model systems for understanding the ecology and evolution of fishes. A variety of texts have addressed aspects of North American freshwater fish systematics, biogeography, and evolution (e.g., Mayden, 1992). An upcoming three-volume series on North American freshwater fish (Warren and Burr, in press) will cover these and other topics from a taxonomic perspective (family-based chapters). Other works have addressed broad patterns in fish ecology (Matthews, 1998), or more superficial coverage of fish ecology as part of a general biology of fishes text (e.g., Helfman et al., 2009). Ross's motivation for writing this book was to present the first text dedicated to the ecology of North American freshwater fishes. The result is a complete and current synthesis of all aspects of North American freshwater fish ecology. The book is aimed at advanced undergraduate or graduate students while still being an informative, and enjoyable, read for professionals.

As a highly integrated and unifying field within biology, ecology draws upon a variety of disparate topics. This can present some challenges when authoring a text focused on the ecology of one group of organisms. Ross assumes the reader has a basic understanding of the fundamentals in ecology and evolution. For the undergraduate reader who might need a refresher, many basic concepts are explained in text boxes that I thought were well done. For example, Ross's discussion of the relationships between assemblages and local environments invokes the river continuum concept, stream order, and multivariate analyses. Text boxes in those sections explain the pertinent fundamentals clearly for readers that need it. The end result is a very readable text for fish ecologists at a variety of levels. Another nice touch is the additional reading, typically in the form of supplementary papers or web resources, provided at the end of each chapter. The text is illustrated throughout with high quality grayscale figures (17 of which are duplicated in color plates) that include conceptual diagrams, maps, graphs from pertinent studies, or fish illustrations. The captions for all figures are all extremely thorough.

Ross partitioned the book into five sections. The first focuses on a summary of North American diversity and how it was shaped by global and local-scale processes. Chapters in this section describe overall diversity and how global and continental processes influenced major taxonomic groups and geographic regions over evolutionary time. Ross does a nice job of synthesizing a topic that can be difficult to present clearly at this level. The second section of the book focuses on local assemblages within a filters (regional to local scale) framework. The three chapters in this section

discuss population and assemblage responses to successively finer spatial and temporal scale phenomena. Ross reviews basic ecological concepts (e.g., landscape ecology, metapopulations, assemblage rules, response to perturbations) before applying them to what is known of fish ecology. Examples from some of the best studied freshwater fish assemblages are integrated throughout, including a table in Chapter 6 summarizing long term assemblage studies categorized by environmental stress level and latitude.

The third section addresses ecomorphology and is divided into chapters on morphology, feeding adaptations, and life history evolution. The morphological chapter takes a functional approach; starting with the physical properties of water, forms of locomotion and body plans, and culminating with a review of literature testing some ecomorphological hypotheses. The role of diversification in trophic morphology is well documented in many of the best studied radiations of fishes. This chapter summarizes broad evolutionary trends in morphology associated with various forms of prey capture. Ross then applies this to the evolutionary trends in functional feeding morphology among some of the dominant North American groups. The section culminates with a chapter on reproduction and life history. Ross reviews life history theory and current models classifying and predicting variability in life histories. The chapter concludes with a synthesis of mating systems, migratory behavior, and parental care.

The fourth section covers biotic interactions among fishes and contains chapters on communication, competition in resource acquisition, predator-prey interactions, and mutualism and facilitation. The information in each chapter is straightforward, first walking the reader through the underlying theory before a more detailed review of how that theory has been applied to North American freshwater fishes. The chapter on communication includes the mechanisms involved in chemosensory, visual, and acoustic senses in an aquatic setting. This is followed by a discussion of how sensory information is used in kin recognition, social interactions, and migration. The competition chapter is founded on niche theory and discusses classic examples of ecological (niche shifts) and evolutionary (character displacement) changes documented in some North American fishes. The third chapter introduces trophic ecology, optimal foraging, and ecosystem effects of predator-prey interactions. This chapter includes a nice synthesis of the vast feeding ecology literature. The final chapter in this section covers coevolution, ecosystem engineers, and mutualistic relationships.

The final section integrates earlier material in a topical discussion of some of the most pressing conservation issues in lotic and lentic waters. For lotic systems, Ross focuses on the impacts altered flow regimes, and the resulting habitat changes, have had on assemblages and sensitive species. Potential solutions (dam removal, fish passage, and other techniques to restore connectivity or natural flow regimes) are discussed as applied to some imperiled North America fishes. In lentic systems, the main focus of conservation issues is on littoral zone habitat alteration and species introductions. Overall, the section on conservation is an excellent addition as these issues are often not addressed or only discussed briefly in terms of rates of imperilment.

In summary, Steve Ross's new *Ecology of North American Freshwater Fishes* text is an excellent reference for anyone interested in North American fishes. I would strongly recommend it to anyone developing a course in fish ecology. The writing is clear and not excessively dense while still being comprehensive and current. The particular strengths of the text are the syntheses of fundamental

principles and what is an increasingly large literature dealing with freshwater fishes in North America. Most chapters contain tables summarizing pertinent literature by family (e.g., life history traits, feeding guilds, forms of communication) or system studied (e.g., long term assemblage datasets).

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Frogs of the United States and Canada. C. Kenneth Dodd, Jr. 2013. Johns Hopkins University Press. ISBN 9781421406336. 2 volumes. 1032 p. \$180.00 (hardcover).—This is an extraordinary two-volume set and the author is to be congratulated. The breadth of topics covered sets a new standard for works of this type. Inevitably, there will be comparisons to previous works such as *Salamanders of the United States and Canada* (Petranka, 1998) and *Amphibian Declines: The Conservation Status of United States Species* (Lannoo, 2005). There are many similarities among these three works. The volumes reviewed here and Petranka's book have the same objectives: to synthesize the literature on their focal species in the same geographic region. Despite the different publishers, the subsections of the species accounts are similar enough that any familiarity with the salamander volume will transfer to the frog volumes. Lannoo's edited volume shares many of the same species account subsections, but also includes essays and original research. The main differences, besides the number of volumes, are images; Dodd uses color throughout, Petranka, black and white in species accounts and color plates in a middle section, and Lannoo is limited to line drawings and range maps. Dodd's images are within the species accounts and Petranka's are grouped together.

The first volume starts with introductory material that covers anuran evolution, life history, and conservation, followed by the etymology of all the genera covered in the two volumes. In the next part of the Introduction, Dodd explains the purpose of the books and explicitly states that his work is not a field guide as there are no identification keys (cf. Petranka's book, which includes keys). The contents of each species account are then detailed and I will follow these subsections for the bulk of this review. Next is a section titled Measurements, Precision, and Generalizations, in which Dodd discusses several terms that are frequently confused in the literature (e.g., clutch size versus fecundity and calling versus oviposition). Dodd's intent here is to fix these terms with standard definitions. Consequently, this

section should be required reading for all serious students of herpetology. The Introduction ends with a section titled Further Information, which includes the subsections Books, Internet Sites, Herpetological Atlases, Sound Recordings, and Professional Herpetological Societies in North America. The species accounts are parallel and detailed, and range from a few pages to a whopping 32 pages for *Lithobates sylvaticus*.

Nomenclature.—Dodd follows Frost et al. (2006) for generic names, with most subsequent updates. One update that was not included is the priority of the generic name *Incilius* over *Ollotis*. There is no discussion of the confusion surrounding this issue in the accounts for *Ollotis* (*Incilius*) *alvarius* and *O. (Incilius) nebulifer*, even though this was settled in 2009 (Frost et al., 2009). Authorities for common names are given, but there is no indication of what authority was used for species and subspecies names. However, with a few exceptions, the species names follow the sixth edition of *Scientific and Standard English Names of Amphibians and Reptiles of North America North of Mexico* (Crother, 2008). Yet subspecies do not follow Crother (2008) and are treated inconsistently (see below under Systematics and Geographic Variation). Also in this section are synonyms, and although Dodd describes them as brief lists, many are quite complete. One issue I have with the list of synonyms is that author and date do not follow subjective junior synonyms and they do not appear in the index unless they are also discussed in the Systematics and Geographic Variation section. This makes it difficult to trace an unfamiliar name back to its current usage. Dodd does, however, refer the reader to sources for complete synonymies and some species accounts contain additional information on name changes or refer the reader to the most recent literature pertaining to nomenclatural history.

Etymology.—This section is straightforward, except for inconsistency concerning derivations for subspecies names. For example, subspecies are listed for both *Anaxyrus boreas* and *A. woodhousii*, but the etymology is given for the former subspecific epithet and not the latter. In addition, the etymology for *L. areolatus* may mistakenly refer to *L. a. aesopus* (*Rana areolata aesopus*, Cope, 1886). One of my favorite parts of this section is the biographical information included when the specific epithet is a patronym. While on the subject of subspecies, in some accounts the recognized subspecies are listed in the title (e.g., *A. boreas*, *A. woodhousii*), but not for others (*A. americanus*). This is despite the fact that *A. a. charlesmithi* is discussed as a subspecies in the account for *A. americanus*.

Identification.—This section is thorough for all species and includes comparisons to similar species and adult color variation, when warranted. For larvae, Dodd gives overall appearance and color, but forgoes lengthy descriptions or diagrams of oral anatomy, leaving that to the forthcoming book on amphibian larval biology by Altig and McDiarmid. Descriptions of eggs are excellent, including citations on clutch size and envelope morphology, when available.

Distribution.—The information on distribution was taken from "the latest field guides and primary systematic literature" (p. xxii). Very thorough text descriptions of the distribution of each species are given as well as historical distributions and introductions. Important references on distribution are also listed. The range maps are detailed, and all show the outlines of states and provinces as well as major

water bodies with the species ranges shaded. Isolated, peripheral populations are often mapped. Dodd's maps generally agree with those in Lannoo (2005), but are not depicted at the county level as are Lannoo's. A few range maps also depict locations of extirpated populations, introduced populations, hybridization, and areas where identification is uncertain. Range maps do not delineate subspecies boundaries, but the map for the account for *Pseudacris regilla* has labels for the "three genetic species," *P. regilla*, *P. sierrae*, and *P. hypochondriaca* (p. 402). The confusion surrounding these species is discussed in the account.

Systematics and geographic variation.—The detailed information on phylogenetic relationships (sister taxa and clade memberships) is an important component and something that all readers will find useful. The information on geographic variation as it pertains to subspecies was inconsistent across accounts, with some having a full review of all named subspecies and others almost nothing. However, the review of literature on morphological and molecular variation was much more consistent and thorough. Chromosome number is given in this section, but only for a subset of species. For example, this information was not provided for *P. crucifer*, even though it has been reported in the literature (Duellman and Cole, 1965). In addition, the literature citations for chromosome number are not consistently included. The standout portion of this section is the detailed and exhaustive data on hybridization among species. However, there are more than a few instances in which a literature citation should have been included in this section. For some of these the citation appears in previous sentences, and in others the appropriate citation can be inferred from subsequent sentences. I understand the monotony that can come from citing the same source in consecutive sentences, but in several cases there is no appropriate citation nearby.

Calling activity and mate selection.—Dodd wisely chose not to include figures of sonograms or spectrographs of male mating calls. Not only are these costly to reproduce, there are many websites that have sonograms and recordings of anuran mating calls. The text of this section does include call parameters (pulse rate, duration, etc.) from the literature. Again, the coverage of this literature is thorough.

The remaining sections in each species account are very thorough and supported by extensive literature citations. They are mostly self-explanatory and include: Adult Habitat; Terrestrial and Aquatic Ecology; Breeding Sites; Reproduction; Larval Ecology; Diet; Predation and Defense; Population Biology; Community Ecology; Diseases, Parasites, and Malformations; Susceptibility to Potential Stressors; and Status and Conservation. Of these, I was most impressed with the synthesis of the literature on Diseases, Parasites, and Malformations, and Susceptibility to Potential Stressors. Dodd includes so much material on the latter topic that a separate Index of Potential Stressors is included. These last two topics are not usually covered or are given brief mention in works of such broad geographic scale as this, so I am glad to see them given their due here. As the awareness of the importance of animal health to anuran conservation continues to increase, these two sections will become among the most valuable of these volumes. Finally, few accounts have extra sections, such as Commercial Use in the account for *L. catesbeianus* and Impact on Native Species in the six accounts for the Established Nonnative Species.

Photographs and line drawings.—With very few exceptions, the color photographs are excellent in that they are bright and illustrate diagnostic characters. Each species account includes at least one color photograph of an adult. For species that exhibit extreme color variation there are also photographs of the main variants. In the account for *Hyla gratiosa*, there is a photograph of the "spotted phase" (p. 285), but I could not find any elaboration of this in the text. In addition, over 80% of the accounts have photographs of larvae and habitat and one-half have photographs of eggs. There are also two types of line drawings sprinkled throughout the species accounts. For 11 species of toads there are simple line drawings of head patterns showing locations of parotoid glands and cranial crests. Detailed stipple drawings by Breck Bartholomew of the head, hind foot, or both are included for a few species.

Bibliography.—As mentioned above, the objective of this work was "to synthesize the literature on all frogs of North America north of the Mexican border through May 2011" (p. xx). Dodd admits that citing every paper on North American anurans is impossible, but at over 4500 references, I'll bet he comes very close.

Indices and supplemental material.—In addition to the Index of Potential Stressors, already mentioned, there is an Index of Scientific and Common Names, a glossary, and a list of abbreviations.

I highly recommend these two volumes to anyone interested in frogs and toads—from amateur naturalists and teachers of all levels to professionals. Some may be put off by the price; if so, ask your librarian to acquire this two-volume set, and be sure to reserve it ahead of time. In summary, Dodd has raised the bar for works of this type and I hope others will follow his lead.

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Lizards of the American Southwest: A Photographic Field Guide. L. L. C. Jones and R. E. Lovich (eds.). 2009. Rio Nuevo Publishers, ISBN 9781933855356. 567 p. \$24.95 (softcover).—This book deals with 96 species-level taxa native to the “American Southwest.” This region is defined as including the states of California, Nevada, Utah, Colorado, Arizona, New Mexico, and the southwestern corner of Texas in the US, as well as Chihuahua, Sonora, Baja California, and Baja California Sur in México—almost 2.4 million km². At nearly 1200 g and 567 pages, there is a lot of lizard biology packed into this volume. Production quality seems excellent: the covers are flexible and coated to resist the elements; the binding is sturdy; the plates are sharp and display accurate colors (I can attest to the latter, having been present when several of the lizard photos were taken in the field). Layout and design are excellent. Visually, the book is a treat, featuring color photos, charts, or maps on nearly every page. The font size and line spacing make for easy reading—a nice compromise between having to present lots of information, but also make it readable.

In the Foreword, eminent lizard ecologist Laurie Vitt places the study of lizards in a broader context, noting their utility for addressing numerous conceptual questions in biology, and pointing out that the American Southwest is blessed with a large number of species.

Several introductory sections offer the reader some background in lizard biology and help in understanding the book's layout and organization. In “About Lizards,” editors Lovich and Jones place the southwestern lizard fauna in a modern context. A photograph of an ancient Native American petroglyph depicting a lizard (p. 22) reinforces their point that lizards have long occupied a place in human culture and mythology. In “Lizard Habitat,” Jones and Lovich introduce a map depicting the 16 ecoregions represented in the book's coverage area. Photographs illustrate about half of these. They note the relationship between lizard species diversity and ecoregions (e.g., low in the Great Basin Desert Ecoregion, much higher in the Sonoran Desert Ecoregion), as well as latitude.

In “Life History and Behavior,” Stanley Fox tries to convey the sense of wonder that lizard biologists know well, noting the diversity of behaviors, reproductive cycles, body-size variation, activity cycles, foraging strategies, etc., represented in southwestern species. For example, natural longevities range from less than one year for Texas populations of *Uta stansburiana*—effectively these are “annual” lizards—to *Sauromalus* and *Heloderma* with lifespans estimated at 20–30 years. Fox notes that nine of the 21 species of *Aspidoscelis* occurring within the book's coverage area are all-female parthenogens, reproducing without the need for fertilization. He describes the polymorphic throat color of central California populations of *U. stansburiana*—the subject of numerous papers by Sinervo and colleagues (e.g., Sinervo and Lively, 1996), who have elaborated the “rock-paper-scissors” male mating and territorial defense strategies in this species.

In “External Anatomy and Identification,” Jones and Babb review the essentials that form the basis for field identification of lizards. A diagram prepared by Babb (p. 43) neatly illustrates the potential range of color patterns and

markings of the species covered in this book. They also review key diagnostic features and characteristics of each of the lizard families represented: Crotaphytidae, Iguanidae, Phrynosomatidae, Eublepharidae, Gekkonidae, Teiidae, Xantusiidae, Scincidae, Anguillidae, and Helodermatidae. The Bipedidae, represented by *Bipes biporus* of Baja California, is not included here.

In “Non-native Species,” Jones and Lovich provide a brief overview of the relative handful of species known to have established breeding populations in the American Southwest. This is in stark contrast to the situation in Florida and Hawaii, which are now home to numerous exotic lizard species. The most ubiquitous of the southwestern newcomers is the Mediterranean House Gecko (*Hemidactylus turcicus*). A number of others are represented by highly localized populations and do not appear to be expanding their ranges. Subsequent to the publication of this book, an established population of the Italian Wall Lizard (*Podarcis siculus*) was reported from southern California (Deichsel et al., 2010).

A chapter on “Observing Lizards” by Jones and Lovich offers advice on where to go, when to go, and what to do when you get there. A recurring theme, introduced here, is to tread lightly when looking for lizards. This is particularly important when searching for species that occupy specific microhabitats that are easily damaged even by well-intentioned naturalists. Species like the Sandstone Night Lizard (*Xantusia gracilis*) and Sierra Night Lizard (*X. sierrae*), both rock-crevice specialists with very small ranges, fall into this category. In “Public Lands for Observing Lizards,” Jones provides a list of publicly accessible places for lizard hunting within the US states covered in this book.

Kim Lovich (“Lizards in Captivity”) suggests that lizards are best observed at a nature center or zoo, if access to wildlands is not an option. She discourages collection of wild lizards for captivity, but if that is to occur, the would-be collector is admonished to do his/her homework well in advance. She offers solid, albeit general, advice for successful maintenance of lizards in a captive setting.

In “Conservation and Legal Issues,” Lovich and Jones address the actions of those whose interests in wild lizards can have negative consequences. Principally, this means commercial collectors, poachers, and those whose efforts at finding lizards result in habitat damage. They note that habitat loss associated with human population growth is by far the most significant source of the decline of lizard populations, but also discuss the roles of global climate change, invasive species of insects (e.g., fire ants) and plants, among other stressors.

As explained by the editors in “Taxonomy and Nomenclature,” this book adopts the taxonomy of de Queiroz and Reeder (2008) for US species, and Liner and Casas-Andreu (2008) for Mexican taxa. Recent taxonomic changes are detailed, indicating where consensus remains elusive (e.g., *Holbrookia*) or where certain questions are unresolved (*Sceloporus undulatus* complex, *Plestiodon “gilberti”*).

The 63 authors are a veritable who's who among lizard biologists in the American Southwest. By and large, the species accounts were prepared by workers intimately familiar with the animals and who were able to weave existing published information with their own field experiences. These accounts occupy 410 pages and consist of the following sections: Description (including subsections for Sexual Variation and Juveniles), Similar Species, Habitat/s, Natural History, Range, Viewing Tips, Taxonomy, Subspecies and Variation, with a Remarks section for some accounts. The lack of literature citations will likely frustrate professional herpetologists wanting to track down specific

information, but certainly makes the text easier to navigate for non-specialist readers. Readers of a certain vintage will appreciate Dan Beck's line in his account of *Elgaria multicarinata* (p. 487): "A record in the 1970s of 'alligator lizards in the air' along southern California's Ventura Highway has not been substantiated."

The shaded range maps are small, and lack political boundaries or other markers beyond state/country lines to help orient readers. For the most part, the maps take a broad-brush approach, rendering distributions as continuous even for species with known disjunct ranges (e.g., *Sceloporus uniformis* at its western range margin in California; populations of *Heloderma suspectum* at the northwestern edge of the range in California and Nevada). Some maps (e.g., *Coleonyx reticulatus*, *Aspidoscelis gularis*) seem more "fine-tuned" than others. Other maps present clear challenges for field herpetologists. For example, the map for *Aspidoscelis xanthonota* depicts the small range (entirely within Arizona) as ending abruptly at the Arizona–Sonora border, with only a question mark on the México side; surely those lizards disregard the US–México border.

Although the range maps cover the entire Baja California peninsula, as well as the Mexican states of Sonora and Chihuahua, species that occur in northwestern México, but which do not range north into the US, are not mapped nor are species accounts provided. This is unfortunate, given the substantial species diversity south of the US–México border, including such novelties as *Barisia* spp., *Bipes biporus*, *Crotaphytus dickersonae*, *Ctenosaura macrolopha*, *Elgaria velasquezii*, *Heloderma horridum*, *Petrosaurus thalassinus*, *Uma paraphygas*, among many others. Perhaps these southern species can achieve full membership in a future edition, as intimated by the editors. These Mexican endemics are accorded some recognition in sections that follow the main species accounts. "Lizards of Baja California (Norte) and Baja California Sur, México" by Lovich and Grismer, "Lizards of Sonora, México" by Rorabaugh and Enderson, and "Lizards of Chihuahua, México" by Lemos-Espinal provide overviews of the lizard fauna occurring in those areas. Individual species are not discussed for the most part, but many are allocated to ecological assemblages. Here, I note that Lemos-Espinal continues (Lemos-Espinal and Smith, 2007) to recognize *Gerrhonotus taylori* as a distinct species despite contravening evidence presented by Good (1994), who regarded *G. taylori* to be a junior synonym of *G. infernalis*. More recently, *G. taylori* was not considered a valid taxon by Liner and Casas-Andreu (2008) or Lavín-Murcio and Lazcano (2010), and even elsewhere in this volume (p. 522) *G. infernalis* is used to the exclusion of *G. taylori*.

A species checklist, for both the US and México states included in the book, follows the species accounts. Unlike the species accounts, species whose ranges are confined to México are included in the checklist. English and Spanish vernacular names are provided for species whose ranges occur in México, with English-only standard names for US endemics.

In "References and Other Resources" the editors list contact information for the major North American herpetological societies, and provide a short list of publications—mainly regional treatments or general works. This is followed by a glossary of terms, with definitions crafted to reflect their usage in the book. The book concludes with an index of scientific and common names.

The book's subtitle, *A Photographic Field Guide*, accurately suggests that photography will be an important element of this volume. Indeed, there are an enormous number of color photographs of lizards, beginning with the book's cover,

featuring a spectacular adult male Greater Earless Lizard (*Cophosaurus texanus*, photographed by Jones) in full breeding colors. By my count, there are about 380 images of lizards by 37 photographers. Among this group, Tom Brennan, Troy and Marla Hibbitts, Larry Jones, Jim Rorabaugh, and William Wells contributed the largest number. Photographs range in quality from functional-for-identification purposes to superb. Among the latter, in particular, are those of an Eastern Collared Lizard (*Crotaphytus collaris*) gracing the frontispiece (p. 2, Charles Rau, photographer), and a gaudy and gravid female Common Lesser Earless Lizard (*Holbrookia maculata*, p. 157, Larry Jones, photographer; what a spectacular lizard!). The photos are mostly of the standard "field guide portrait" style, typically showing variation (sexual, juvenile, intrapopulation, geographic), but occasionally depart from this format to show some aspect of natural history. Examples include an aggregation of Yarrow's Spiny Lizards (*Sceloporus jarrovi*) emerging from their winter hibernaculum to bask (p. 36, Cecil Schwalbe, photographer); a female Texas Alligator Lizard (*Gerrhonotus infernalis*) guarding her clutch of eggs (p. 34, Troy Hibbitts, photographer); and a Great Basin Collared Lizard (*Crotaphytus bicinctores*) in magnificent sentry pose (p. 103, Will Wells, photographer).

My criticisms are minor. Although the majority of lizard images are accompanied by locality information—essential for works like this—a few are not, and thus fall into the category of "just another pretty herp photo" (e.g., p. 117, *Gambelia copei*). Other figure captions offer only vague locality attribution (e.g., "Central Valley, CA" for several photos of *Gambelia sila*, making it impossible to glean knowledge about regional color/pattern variation, as described by Montanucci [1967]). On p. 30, a figure depicts habitat in the California Central Valley Ecoregion, Mono County. However, Mono County is located east of the Sierra Nevada in California, within the Great Basin Desert Ecoregion and most definitely not in the Central Valley. The beautiful *Crotaphytus bicinctores* on p. 102 is a male, not a female. On p. 173, *Phrynosoma ditmarsii* is mentioned as having been elevated from a subspecies of *P. douglasii*, but the former has never been regarded as a subspecies of the latter. On p. 318, the distribution map for *Phyllodactylus nocticolus* should not include the distribution of *P. xanti* within the Baja California Cape region (see Grismer, 2002; Blair et al., 2009). On p. 440, the distribution map for *Xantusia wigginsi* should not include the ranges for *X. sherbrookei* and *X. gilberti* (see Grismer, 2002; Bezy et al., 2008). Although *X. sherbrookei* was recently described, *X. gilberti* (or *X. vigilis gilberti*) of the Baja Cape region was described over a century ago (Van Denburgh, 1895). The photo caption for an *Elgaria coerulea* (p. 478) incorrectly attributes the specimen to Plumas County, Nevada instead of California. The name for a Mexican subspecies of *Elgaria kingii* is given as *E. k. "ferrea"* instead of *E. k. ferruginea* (Webb, 1962). On p. 491, *Elgaria panamintina* and *E. kingii* are stated to be sister taxa. That might be the case, but published analyses are ambiguous. Allozyme data support a sister-taxon relationship between these two species (Good, 1988). However, more recent molecular studies based on mitochondrial gene sequences (Macey et al., 1999; Feldman and Spicer, 2006) and mtDNA + nuclear gene sequences (Pyron et al., 2013) recovered a clade comprised of *E. kingii* (*E. panamintina* + *E. multicarinata*). On p. 507, *Sceloporus graciosus* is listed as part of a Montane Assemblage for Baja California, inclusive of the Sierra Juarez and Sierra San Pedro Mártir, but that species is present only in the latter range (Grismer, 2002). On p. 538, *Anolis nebulosus* is listed as

belonging to the Phrynosomatidae rather than Polychrotidae (now Dactyloidae). I should point out that my review was based on the first printing of the book and that some of the errors noted above, mainly those in the figure legends, have been corrected in the second printing. The photos and layout of the front and back covers and spine of the second printing also differ from those of the original.

Editors Larry Jones and Rob Lovich are to be congratulated for pulling off the monumental task of bringing so many authors together to produce this impressive volume. The target audience for this book is broad—from ecotourist/birdwatcher types to professional herpetologists. The large collection of outstanding photos alone should warrant purchase of this book. Publication was subsidized by several herpetological societies and other organizations, resulting in a remarkably affordable book. Commendably, all royalties from the sale of the book will support research on herpetofauna of the American Southwest and adjacent México. This is a must-have title for anyone with an interest in the reptile fauna of the southwestern US and northwestern México.

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Beaded Lizards & Gila Monsters. Captive Care & Husbandry.

B. Eidenmüller and M. Reisinger. 2011. Edition Chimaira. ISBN 9783899734980. 157 p. €39.80 (approximately \$55.00) (hardcover).—The helodermatid lizards (Gila Monsters and Beaded Lizards) are among the most difficult reptiles to propagate, and the authors provide an extensive overview of all that is required for successful captive breeding. The authors share extensive details of their more than 20 years of experience and, throughout the book, personal experiences and anecdotes are woven together to present an efficient plan for herpetoculturists interested in breeding helodermatids.

As expected, the book is focused on the care and husbandry of *Heloderma*, although aspects of the distribution, natural history, and ecology of these unique lizards are presented for context as well. Although the biological background information is appropriate for the target audience (reptile hobbyists and breeders), readers with more academic interests in *Heloderma* would be better suited to read the larger and much more detailed works of Bogert and Martín del Campo (1956) and Beck (2005).

Perhaps one of the most striking aspects of the book is the generous inclusion of color figures throughout, including photographs, distribution maps, and charts. With more than 190 color figures, the beauty and diversity of the helodermatids is wonderfully displayed. The authors provide a good balance of photographs of specimens in the field, including their habitats, and photographs of animals used in captive propagation, including their breeding enclosures. However, in some sections the repeated use of photographs that are only subtly different from one another becomes redundant. We see page after page of unhatched eggs under different types of incubation, hatching lizards emerging from eggs, and nearly every possible scenario for

housing the lizards in terraria. Additionally, many of the photographs are not of the best quality or composure, and even photographs designed to be showpieces are sometimes blurred and out of focus. For example, figure 150 (pp. 126–127) is a two-page spread showing *Heloderma suspectum suspectum*, and the entire photograph is out of focus. I was somewhat puzzled why such valuable space would be dedicated to such an unattractive presentation.

The information contained within the book is largely accurate and supported by references to both the scientific literature and to herpetocultural publications. However, there was one major exception in that the section dedicated to discussing the venom biology of helodermatids (pp. 31–38; written by Dietrich Mebs) included citations that were omitted from the references section of the book. This is not a trivial oversight, as Dr. Mebs cites dozens of studies detailing venom biology. Consequently, the utility of the venom section in providing reference material to readers is much reduced.

Additionally, some minor typographic and grammatical errors can be found throughout, including headings and figure axis legends in German (climatic charts pp. 86–87). The copyright page gives a clue to this issue with the statement that the text was translated into English by a third party. Thus, these minor errors seem somewhat forgivable as they might not be the fault of the authors, although certainly the publisher should have detected these issues.

The two clades of *Heloderma* are largely treated separately throughout the book, but early on the authors use the term “beaded lizards” in reference to both *H. suspectum* (Gila Monsters) and *H. horridum* (Beaded Lizards), the latter of which is now recognized as four distinct species (Douglas et al., 2010; Reiserer et al., 2013). The use of “beaded lizard” as an umbrella term for both clades is somewhat confusing and becomes additionally muddled as the authors switch between the use of common names and specific and subspecific epithets when referring to particular groups of helodermatids.

One aspect of the book that I found particularly well done was the balanced coverage that was given to the ecology and natural history of free-ranging *Heloderma*, with the care and propagation of captive animals. This particular balance is often lacking in books on captive propagation, and it should make the book appealing to novice reptile keepers as well as seasoned herpetologists and academic researchers. There are other good books that focus on the captive propagation of *Heloderma* (Gila Monsters in particular; Seward, 2002), but this one provides a comprehensive overview of all that is required to become a successful breeder of Gila Monsters and Beaded Lizards. The book is an easy read and the price seems competitive, especially given the large number of color figures. The book should become an important reference for those interested in the reproductive biology of the helodermatids and will be essential to anyone interested in breeding these reptiles in captivity.

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Reptiles and Amphibians of the Mojave Desert: A Field Guide.

J. M. Parker and S. Brito. 2013. Snell Press. ISBN 9780985577117. 184 p. \$19.00 (softcover).—The herpetofauna of the western United States has been the subject of a number of field guides covering the entire area (e.g., Stebbins, 1966, 1985, 2003), individual states (e.g., Degenhardt et al., 1996; Stebbins and McGinnis, 2012), and even centered on individual counties (e.g., Lemm, 2006). When assessing these guides, I am biased, as I purchased my first “Stebbins” (as all good herpers refer to his first edition) in 1966. All subsequent guides are compared to this almost legendary production: how can one expect a better-illustrated field guide than the ones produced by Robert C. Stebbins (1966, 1985, 2003), perhaps the best herpetological illustrator of the 20th Century? That said, in *Reptiles and Amphibians of the Mojave Desert*, the numerous photos and engaging layout will draw in many readers, and the slim construction will please those who appreciate a field guide for its “portability.” Illustration quality and overall size are critical issues when evaluating any field guide: exceptional photographs of live specimens might match the line drawings and paintings, the strong points of the recently passed master (Stebbins, 2003). Parker and Brito, who formerly lived, conducted research, and taught in southern Nevada, have apparently adopted this tactic: they offer 201 photographs for the 64 taxa addressed in their field guide, an average of more than three per species. The senior author has considerable experience with rattlesnakes of Utah and Wyoming, where he has worked on conservation of Midget Faded Rattlesnakes (*Crotalus oreganus concolor*).

The authors open with 28 pages of introductory material, including an introduction to amphibians and reptiles, as well as a brief discussion of physiology (primarily thermal biology), and venom and poison, although in the latter we do not learn anything of the exquisite function of rattlesnake venom in prey capture and digestion. Two short (four pages total) sections cover evolution (overly simplistic), paleontology (largely irrelevant), and classification (dated and confusing at times), and a longer (seven pages) pair of sections addresses habitats of the Mohave Desert, as well as sites to visit. This ends with a two-page section on conservation, another two pages that explain the layout of the species accounts, and a non-traditional, eight-page, flow-chart style species key. This last device works poorly. A number of the terse descriptions left me stumped, unable to proceed without an explanation of the term. For example, “Does it have a short face with a strong ridge around the mouth?” (p. 28). I do not know what this describes.

The species accounts occupy 125 pages (almost 70% of the book). They have a number of novel aspects, such as page borders of different colors for the major taxonomic groups (i.e., Sauria, Serpentes, etc.), and two colored tabs, one for venom status (“harmless,” “mildly venomous,” or “danger-

ously venomous”) and one for conservation status according to the IUCN (“not yet assessed,” “least concern,” “vulnerable,” or “endangered”). My primary concern is that the space devoted to these accounts is poorly used. The photographs, which vary in quality from excellent to fair (e.g., portions of many subjects are out of focus), dominate 50% of each account, and the distribution map takes another 20%, leaving only about 30% for text.

The photographs are central to each account in this field guide: one page of text and range maps opposite 2–5 panels depicting different life stages (e.g., eggs and larvae of amphibians) or color variants (e.g., geographic variation or male and female dimorphic lizards) are the essence of each species account. Perhaps the best use of the photographs occurs with the Amargosa Toad (*Anaxyrus nelsoni*) account in which two strikingly different adult color patterns are shown, along with a metamorph, two larvae, and an egg strand (p. 57). These five good-quality photographs help the reader appreciate the variation in color and life-history stages of this taxon. By contrast, the use of two similarly colored adults for the Panamint Alligator Lizard (*Elgaria panamintina*) account is less effective, and the lack of a photograph of the strikingly banded juvenile allows the authors to mistakenly infer that in color the young are “. . . miniature versions of the adults . . .” (p. 71). In some instances, there are multiple pictures of the same individual from different perspectives, some of which offer little additional information content. In the light of the brief accounts, this space could have been better spent on additional natural history information. Only a small number of the accounts include photos of adults of both sexes and juveniles; those that do are generally well done. I was troubled by the lack of explanation regarding the geographic origin of the subjects in the photographs. On page 89, the individuals pictured in the Greater Short-horned Lizard (*Phrynosoma hernandesi*) account look very much like Pygmy Short-horned Lizards (*P. douglasii*). I would have preferred some indication of the origins of the animals appearing in photographs.

One troubling image is the photo of the first author with his face very close to a rattlesnake (p. 11). Although the sentiment expressed is laudable (rattlesnakes are generally inoffensive), it is unnecessary to demonstrate that fact in this fashion—even with the requisite disclaimer (“don’t try this at home!,” or words to that effect). The associated legend notes that rattlesnakes are “benign” depending on the viewer’s relationship to the snake’s “strike distance.” A brief description of the evolution of the venom delivery system, its primary role in prey capture and digestion rather than defense, and summary statistics on “illegitimate” bites (i.e., those caused by handling), would do more to put the reader at ease while enjoying the Mojave Desert.

The text for each species account is divided into two parts: a paragraph introducing the taxon, and then brief (a few words at most) comments placed within ten subsections: size, distinguishing features, similar species, subspecies (if applicable), habitat, activity period, diet, reproduction, young, and likelihood of encounter. The introductory paragraph, distinguishing features, and similar species sections are often highly redundant, especially because most of the text for each account is dedicated to identification. Some accounts offer nothing more than a mere listing of the differences between the species in question and similar species. Very little is devoted to natural history or interesting ecological or behavioral information, which is often helpful information for those searching for or attempting to identify species with any guide. For example,

the account for Common Chuckwallas (*Sauromalus ater*) only mentions that they have “crevice retreats,” but nothing is mentioned about their unique antipredatory tactics. Likewise, given so much is known about their social behavior, the lack of any mention of this seems puzzling. Similarly, the account for Western Zebra-tailed Lizards (*Callisaurus draconoides rhodostictus*) mentions “. . . tail-waving display for predators . . .” and a “. . . tail gesture . . .” (p. 86) without any additional explanation, leaving the reader wondering what this may look like, and how it might function.

For amphibians, the accounts include descriptions of the calls, yet these are often idiosyncratic and completely at odds with previously published accounts. Woodhouse’s Toads (*Anaxyrus woodhousii*), a species with which I am very familiar, are described as having a call that is: “. . . short, fast, rough trill, from low to high frequency” (p. 62). This description gives the reader much less of an impression than the “nasal waaah” adopted by others to describe their call (Stebbins, 1966; Stebbins and McGinnis, 2012). Similarly, for Great Basin Spadefoots (*Spea intermontana*), I do not know what a “. . . slow transition from high to low tone . . .” (p. 64) sounds like. Simple sounds often have simple descriptions, and there are only a few means by which to convey the essence of these calls. In a somewhat similar vein, use of terms such as “granular pigmentation” (consulting their glossary was little help) to distinguish Western Diamond-backed Rattlesnakes (*Crotalus atrox*) from the “solid pigmentation” of Northern Mohave Rattlesnakes (*C. scutulatus*), left me struggling to determine how these snakes differ in color, something that had never confused me previously.

The accounts are followed by a four-page glossary, and ten pages of references, many of which are obscure, and few of which seem clearly related to the subject of Mojave Desert amphibians and reptiles. These are followed by a two-page checklist and a four-page index, which, strangely, includes entries such as the major sections of the book (i.e., those listed in the table of contents).

This latest volume covering the herpetofauna of the Mojave Desert falls on the heels of Stebbins and McGinnis (2012) for all of California, and Lemm (2006) for the San Diego area. Inevitable comparisons of the three will leave many asking for more, especially because the existing guides provide so much more natural history information without sacrificing portability. The present book is only 200 pages, yet is roughly the same size as these other guides (reduced thickness of the former achieved via the larger format: 15 × 23 cm). Stebbins (2003) and Stebbins and McGinnis (2012) are both more than 500 pages, but occupy approximately the same book “volume” in terms of linear dimensions. Stebbins (2003), Lemm (2006), Stebbins and McGinnis (2012), as well as *Reptiles and Amphibians of the Mojave Desert*, can all fit into a large pocket; however, after the subject has been identified, what next? Owners of the first three field guides have a wealth of additional detailed information available to them at a small cost of space. In my view, *Reptiles and Amphibians of the Mojave Desert* would have benefited from a similar approach.

Those who have kept up with the long-standing debate over the spelling of “Mohave” will be disappointed by finding “Mojave” adopted in this field guide (although both are correct, Mohave is appropriate for an English guide). Thankfully, the authors do follow Crother (2012) in using Mohave for the standard English names of the appropriate amphibians and reptiles therein. Although Crother (2012) is explicitly referenced for nomenclature, there are some departures such as Desert Rosy Boas (*Lichanura trivirgata*

gracia) for Northern Three-lined Boas (*L. orcutti*). The description of amphibian reproduction as “primitive” relative to other tetrapods is disappointing; one hopes that herpetologists are working to dispel notions of “lower” and “higher” organisms.

There are a large number of issues with the range maps. For example, I have collected Common Chuckwallas (*Sauromalus ater*) well south and west of the boundary shown along the southern and western edge of its depicted range (p. 84). For Tiger Whiptails (*Aspidoscelis tigris*), two subspecies are included, the Great Basin Whiptails (*A. t. tigris*) and Sonoran Tiger Whiptails (*A. t. punctilinealis*), the latter erroneously shown to occupy the eastern portion of the Mohave Desert in southwestern Utah and northwestern Arizona. The subspecies contacting Great Basin Whiptails in southwestern Utah and extreme northern Arizona (north of the Colorado River) are Plateau Tiger Whiptails (*A. t. septentrionalis*) and Sonoran Tiger Whiptails occur only in central and southern Arizona (Sullivan, 2009). Likewise, I am not aware of Mohave Fringe-toed Lizards (*Uma scoparia*) occurring in the vicinity of interstate highway 5, near the town of Lebec, Kern County, California. The range depicted for this lizard is far too broad, even allowing for the fact that the authors note its narrow habitat preference. Further, range maps for both Great Basin Collared Lizards (*Crotaphytus bicinctores*) and Long-nosed Leopard Lizards (*Gambelia wislizenii*) show absences along the southern edge of their respective distributions, although their ranges extend into the northern edge of the Coachella Valley (Stebbins, 2003; pers. obs.). Both species also occur sympatrically throughout much of the region along interstate highway 40 and north of Flagstaff in northwestern Arizona, but the range maps do not show this overlap. All of these problems led me to wonder: How were the maps generated? This is a critical, indeed perhaps the most important, aspect of any field guide. On page 27 the authors state that “. . . distribution maps are merely estimates of a species’ range,” but this is no excuse when more accurate information is available with even a cursory examination of Stebbins (2003) and Stebbins and McGinnis (2012).

Trivial errors include: “IUNC” for “IUCN” (p. 26); “paratoid” for “parotoid” (p. 28; how this error persists is troubling); switching between use of species names in singular and plural form within otherwise identical sentence structures (whether one considers it appropriate to regard species as individuals or not grammatically, consistency is problematic; e.g., “. . . *S. o. longipes* is . . .” on p. 96, followed by “. . . *S. tristichus* are . . .” on p. 98); a period instead of a comma on line 7, p. 120; and the title is missing from the Woodbury and Hardy (1948) citation.

There are puzzling omissions and inclusions as well. For example, both Western Yellow-bellied Racers (*Coluber constrictor mormon*) and Arizona Toads (*Anaxyrus microscaphus*) are included, although both occur on the fringe of the Mohave Desert, if at all in the former instance, and yet Arroyo Toads (*Anaxyrus californicus*) are absent. As a youngster who grew up exploring the Mohave Desert near Barstow, and searching along the Mojave River near Victorville for this endangered bufonid, this omission is inexplicable. I think the author(s) of a field guide benefit by conveying a sense of familiarity with a region, but that has not been achieved in this instance.

In closing, at \$19 the book is nicely priced in this day of \$50 field guides. It will appeal to those who prefer photographs of living animals to assist in identification. I imagine that many amateurs could use the photographs alone to identify an amphibian or reptile they encounter in

the Mohave Desert. That said, I fear the serious herpetologist will be disappointed with the many issues identified above, especially in the light of so many well-designed field guides for the Southwest US in general, and California in particular, already available.

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Chelonian Library 3 South American Tortoises. *Chelonoidis carbonaria*, *C. denticulata* and *C. chilensis*. S. Vinke, H. Vetter, T. Vinke, and S. Vetter. 2008. Chimaira. ISBN 9783899736038. 355 p. €29.80 (approximately \$41.00) (hardcover).—Only three tortoises inhabit continental South America, all belonging to the genus *Chelonoidis* (whose other member or members are restricted to the Galápagos Islands), and it has been my honor and pleasure to meet all three in the wild: Red-footed Tortoises (*C. carbonaria*), Yellow-footed Tortoises (*C. denticulata*), and Chaco Tortoises (*C. chilensis*). They are the subjects of this monograph, the third of four in the Chelonian Library published by Chimaira between 2005 and 2008, each covering two or more of the world’s tortoise species.

The book begins with a thorough treatment of the historic taxonomic debates, convoluted by misunderstandings and misidentifications involving both Darwin and Napoleon, through to the victory of *Chelonoidis* over synonyms familiar to most researchers including *Testudo* and *Geochelone*. With

indigenous parabiologists in the Bolivian Chaco we suffered through those very debates: we were trying to teach them scientific names as a more reliable alternative to the wide variety of local Spanish and indigenous names (long lists of indigenous and European names for all three species are provided in the book), particularly over neighboring regions and countries. But we were forced to admit that scientific names change as well, and the team was compelled to relinquish *Geochelone* for *Chelonoidis*. Fortunately, the epithets remained the same. Further undermining the sanctity of scientific nomenclature is the case of poor Chaco Tortoises (*C. chilensis*), which were named for a country where they do not occur, but from where the first specimen was acquired and erroneously attributed. Alas, the geographically more appropriate name *Testudo argentina* (Sclater, 1870) was published a few months too late, and the International Code of Zoological Nomenclature dictates the earlier name remains valid (just one more of the numerous dictatorships these tortoises have known). The authors present and evaluate the various perspectives on the taxonomic debates. Despite the morphologically distinguishable populations of *C. carbonaria*, and the occasional occurrence of very large individuals within populations of *C. denticulata*, no subspecies have been named for the two tortoise species from northern South America. Proposals of two additional species in Argentina—*C. donosobarrosi* and *C. petersi*—have been rejected by most experts, who consider these synonyms of *C. chilensis*. The authors have also examined specimens over much of their respective distributions to support their conclusions that the three species named in the title are the only valid ones, and that some populations of *C. carbonaria* may warrant subspecies recognition.

Separate chapters are devoted to distribution (including maps for each species and a discussion of the natural and/or assisted colonization of several Caribbean islands), description, fossil record, habitat, population density and structure, diet, reproduction, growth, and parasites. Each of these chapters provides information about each species based on the published literature as well as on the authors' field experience, which they readily admit are biased toward the Guayanas and Gran Chaco habitats, where they have spent the most time. The vividly detailed descriptions of copulation may not be appropriate for under-18 readers and may make the sensitive adult reader blush, but the illustrations are less graphic. Such scenes are fascinating and spellbinding, particularly when two male Chaco Tortoises are fighting over a single female, as I was fortunate to witness on a hot October (spring) day in Bolivia's Kaa-Iya del Gran Chaco National Park. The authors provide entertaining descriptions of the differences between the head-bobbing movements of male Red- and Yellow-footed tortoises, clucking and squeaking, respectively, and of experiments subjecting naïve males to a variety of "objects of courtship."

Although additional research has been conducted on these species, much of it remains in unpublished undergraduate theses (Ayala Crespo, 1997; Gonzáles, 2001), NGO reports (Etacore et al., 2000), or difficult-to-find conference proceedings (Cuéllar, 2000; Soria and Noss, 2000), and the literature grows very slowly. I could find only a few new items, mostly about Red-footed Tortoises: geographic and commercial origins (O'Malley, 2010), phylogeography (Vargas-Ramírez et al., 2010), diet (Wang et al., 2011), ranging (Montaño et al., 2013), and activity (Noss et al., 2013). For such widespread, familiar, and widely exploited species, this dearth of published research is alarming, yet offers many opportunities for students and researchers in South America.

The chapter on captive care provides nitty-gritty details, again for each of the three species, on the appropriate enclosure, feeding, captive breeding, incubation, hatching, raising offspring, as well as diseases and parasites. The focus is on facilities in central Europe (Austria, Germany, Switzerland), which may be applicable to other parts of the world with minor adjustments. Red-footed and Yellow-footed tortoises have been successfully bred in captivity in many places, but Chaco Tortoises have not been captive bred even in their native Paraguay. The authors suggest a combination of factors, including peculiar dietary requirements (*Opuntia* cactus pads and fruits), vulnerability to stress, and the need for exposure to periods of cool and especially dry conditions as challenges to breeding Chaco Tortoises in captivity. Despite their reputation as resilient pets for beginners, and their increasing popularity in the US pet trade, even Red-footed Tortoises require a complex set of captive conditions (diet, temperature, humidity, lighting, substratum, and furnishings) for the species to remain healthy.

The book concludes with relatively brief chapters on cultural history, threats, and conservation measures. In cultural terms, *Chelonoidis* has progressed from being sold alive for food in a remarkable 17th Century painting by Franz Snyders of a European fish market with "two beautifully rendered Red-Footed Tortoises in the foreground," to serving as a 20th Century icon for endangered species in a postage stamp issued by the Gambia for *C. chilensis*. The authors note the appearance of tortoises (*C. carbonaria* or *C. denticulata*) in indigenous South American folk tales, wherein they are characterized as intelligent, cunning, and able to outwit the wild and "stupid" Jaguar (*Panthera onca*). These cultural aspects should be investigated more in depth and used to promote conservation measures with indigenous and other local communities. As the authors mention, many indigenous groups do not consume these tortoises, although some, including the Ioseño-Guaraní in the Bolivian Chaco, will collect the occasional animal to use the fat for medicinal purposes (Cuéllar, 2000; Soria and Noss, 2000; Pezzuti et al., 2010).

However, the major threats to these tortoises are probably urban consumers in South America, keeping them as pets or consuming their meat, given that the legal international trade has been controlled or eliminated by national as well as international regulations. In fact, only Suriname and Guyana continue to export Red-footed and Yellow-footed tortoises. The second major threat to tortoises is large-scale habitat destruction as forests and savannas across South America are degraded by cattle or converted to croplands. Combined with generally poor data on the status of these species across most of their respective ranges, the intensification of these two threats means that international and national Red Book listings may well underestimate the deteriorating conservation status of all three species. Very few conservation programs targeting any *Chelonoidis* exist, and most of the breeding farms in the past and present are of dubious means and objectives. The release of abandoned or confiscated animals into the wild may pose additional threats to wild populations by mixing gene pools and spreading disease because the origin of each animal is usually unknown and health measures are rarely implemented. On the positive side, all three species occur in numerous protected areas, of which the authors list a few in Argentina, Colombia, Paraguay, and Perú. A comprehensive list of these protected areas by country across the entire range, together with confirmation of tortoise presence in each

protected area, would be a valuable addition to this monograph. For example the vast (34,400 km²), virtually uninhabited, and well-protected Kaa-Iya del Gran Chaco National Park likely provides a tremendous refuge for Red-footed and Chaco tortoises in Bolivia, although thorough population studies in many such protected areas represent enormous undertakings.

The bibliography is extensive and covers all three species. An even more comprehensive version is available on the publisher's website (<http://daten.chimaira.de/CHL3/BIBLIO.pdf>), both versions covering the period up to the publication date (2008). More recent publications, as well as some earlier ones, can be found on the Reptile Database (<http://reptile-database.reptarium.cz>). The book also provides a selection of websites (in several languages) as an overview of what is available on the Internet (as of 13 April 2008) with respect to biology and captive care of the three tortoises, and a short list of relevant institutions, associations, and publishing houses (principally in Europe). A curious addition is a selection of climatic charts (mean, maximum, and minimum temperatures, mean precipitation, days with precipitation) from 30 weather stations, which provide an overview of the climates experienced by the three species over their collective distributional range.

The writing style is engaging, effectively mixing facts and figures from the work of the authors and other researchers with anecdotes and personal observations from the authors' vast experience with all three species in the field and in captivity. Each section of the book is lavishly illustrated with excellent photographs (285 color photos in all), again covering a range of wild and captive scenarios. Considering the length of the book, the number of images, and the attractive presentation, the price is very reasonable. Its content is appropriate for a broad audience, from students and more specialized researchers, to conservationists, to pet owners, to zoo caretakers, to people interested in general natural history. The breadth and depth of the material also makes it suitable as a textbook and as a library reference volume. Certainly no other single volume integrates so much information on any of these three species, and the comparative presentation of the three species together is extremely valuable, enriched further by the authors' style and wealth of in-depth knowledge.

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Tadpoles of Africa: The Biology and Identification of All Known Tadpoles in Sub-Saharan Africa. A. Channing, M.-O. Rödel, and J. Channing. 2012. Frankfurt Contributions to Natural History, Vol. 55. Chimaira. ISBN 9783899734485. 404 p. €49.80 (approximately \$68.00) (hardcover).—The global inventory of living amphibians remains a work in progress, but one of great urgency given that a substantial portion of the world's species may go extinct in our lifetime (Wake and Vredenburg, 2008). Whereas the fauna is well known in certain geographic regions, such as Europe and North America, the same cannot be said for others, notably Africa, where inaccessible field sites, the small number of scientific specialists, and violent political conflict—sometimes even wars—have combined to impede even basic assessments of species diversity. In such places, there is a need for up-to-date, authoritative reference guides to facilitate identification of all life-history stages, to organize existing data, and to target critical areas that require further study. Hence, the present volume is both welcome and timely. Indeed, it represents a landmark contribution to our knowledge and understanding of a marvelous and unique amphibian fauna.

The authors are renowned specialists of African amphibians who have considerable field and laboratory experience studying larval anuran biology. Their task, however, is not an easy one; by necessity, their treatment is incomplete. First, the tadpole (indeed, anything about reproductive

biology) is unknown for more than half—58%—of the species they consider. The lack of information is particularly acute for two large genera, *Phrynobatrachus* (75 species) and *Hyperolius* (124 species), in which tadpoles are known for only 15% and 26% of their species, respectively. Second, although tadpoles “are recognized as the larval forms of frogs in most parts of Africa . . . they are rarely associated with the correct adults” (p. 10). Third, many newly discovered species remain undescribed, and many species whose current taxonomic placement is considered valid were once lumped with other species or previously recognized by a different name. Consequently, some tadpoles initially described under one species name may now belong to a different species, while others may not (yet) be accurately assigned to any named species. To the authors’ credit, they approach this situation with extreme candor and explicitly define the limits of the current knowledge base. For example, “Not all specimens [examined] were raised from known parents, or their identification confirmed using DNA. There may be some misidentifications, but we have been careful to omit specimens that we consider to be incorrectly identified” (p. 88).

The book begins with brief reviews of the geology, topography, ecological zones, and tadpole habitats of Africa. This section continues with an effective overview of anuran life histories and anatomy, which focuses on metamorphosing species, but also describes alternate life histories, especially direct development. The Introduction concludes with a discussion of tadpole biology, but especially ecology, behavior, and even sound production. The book ends with comments about tadpole identification, a binary identification key to genera, an extensive bibliography (with citations as recent as 2012), and the (mostly taxonomic) index. I did not test the key, and while the distinguishing characters seem appropriate and reasonable, surely some, such as the number and size of enlarged denticles on the anterior jaw sheath, will require use of a binocular microscope (although perhaps someone with steadier hands than mine could get away with a hand lens).

The real meat of the book—284 pages—comprises individual descriptions of the tadpoles of all 633 species of sub-Saharan frogs. Most species accounts are based on one or more published studies or constitute original descriptions prepared by the authors. Moreover, nearly all are linked to individual voucher specimens. Such precision is extremely important, insofar as it will (eventually) help fill remaining gaps in taxonomic coverage and resolve problems in assigning individual tadpoles to particular species. That being said, it’s unfortunate that not all vouchers appear to be deposited in institutional collections; the rest are either referenced to a collector’s field tag series or simply sourced to a general locality and/or a particular collector. Verbal descriptions of each tadpole are accompanied by numerous and helpful illustrations, which are provided in a consistent format. These include high-quality (halftone) drawings of tadpoles examined by the authors, line drawings of tadpoles reproduced from the literature, and close-up drawings of mouthparts, which are of great use in taxonomic identification. Many species are additionally illustrated with attractive color photos of living tadpoles and adult frogs. Each account is rounded out with brief notes regarding geographic range and habitat preference. Geographic distributions are based on data from the IUCN Red List website, v. 2011.2, occasionally supplemented by the authors’ own field observations. No explicit source is declared for the taxonomy adopted overall; presumably, the IUCN Red List was followed here as well,

although the accounts include at least one species described in 2012.

The volume is well produced in a compact format (21.8 × 15.2 × 3.3 cm). Both the cover and internal pages are prepared with a glossy surface, which should offer at least some resistance to rain and mud if the book is taken into the field. At slightly over 400 pages, however, the book weighs more than a few tadpoles—day hikers beware. I noted relatively few stylistic errors or other editing mistakes, and all were minor: e.g., “The tail and fins are botched [sic] with black” (p. 110). The writing style is crisp and lean, as is appropriate for a field guide, and the content is enlivened by some wonderful natural history observations, as in the account for *Acanthixalus sonjae*: “The tree hole where many clutches and adults were found, was shared by a large cobra *Naja melanoleuca* . . .” (p. 183).

The Global Amphibian Assessment, first completed in 2004, revealed the extreme plight of amphibian populations worldwide (Stuart et al., 2004). That paper reported several “important concentrations of threatened species” (p. 8 of supporting online material), which included the Upper Guinea forests of western Africa, the forests of western Cameroon and eastern Nigeria, the Albertine Rift of eastern central Africa, the Eastern Arc Mountains of Tanzania, and Madagascar. Tanzania, Cameroon, and Madagascar were among the 20 countries with the highest number of threatened species, although reliable estimates and comparisons were difficult to obtain because of the very incomplete understanding of the African amphibian fauna and its biology. Metamorphosing anurans pose a particularly difficult challenge because tadpoles and adults of the same species look so different from each other and are frequently misidentified. Going forward, new molecular approaches, such as DNA barcoding, that can rapidly link dissimilar life-history stages within a species (Che et al., 2012; Vences et al., 2012; Cruz et al., 2013) will be increasingly utilized to solve such puzzles. To be truly effective, however, such approaches require a comprehensive morphological and taxonomic foundation. *Tadpoles of Africa* provides such a foundation for future studies that seek to further document the rich diversity of African amphibians and reliably assess the threats to their survival. It is an essential guide for anyone who seeks to identify larval anurans on the African continent and explore their biology.

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Amphibians of Malawi. An Analysis of Their Richness and Community Diversity in a Changing Landscape. V. Mercurio. 2011. Edition Chimaira. ISBN 9783899734959. 393 p. €49.80 (approximately \$68) (hardcover).—Habitat change and loss are important drivers of worldwide faunal change and significant threats to amphibians in sub-Saharan Africa (Stuart et al., 2004). However, because longitudinal surveys are lacking, it is often difficult to evaluate temporal patterns of faunal diversity in Africa, and thus determine the effects of habitat change. While detailed long-term surveys will likely remain difficult in many areas of Africa, efforts to develop baseline surveys in different ecosystems in regions with well-known faunas are important for interpreting the broad-scale effects of habitat change. This recent volume focused on the amphibians of Malawi provides detailed accounts of its amphibian species and an excellent snapshot of amphibian diversity in many habitats across this small southeastern African country. Those interested specifically in African herpetology or more broadly in the relationship between habitat type and species richness will find this an interesting work.

The book is a valuable up-to-date and authoritative work on the amphibian diversity of Malawi, which has at least 82 frog and two caecilian species according to the author. It builds upon the important summaries of the fauna provided for Malawi by Arthur Loveridge (1953), Margaret Stewart (1967), John Poynton and Donald Broadley (e.g., 1985), and Alan Channing (2001), and provides the first detailed summaries of the natural history of several species in Malawi. More so than previous works, the author focuses explicitly on the relationship between specific habitats and amphibian species diversity. Malawi contains a mélange of habitats typical of south-central Africa, and the author focuses his attention on both Zambezi and transition woodlands, deciduous forests and thickets, evergreen forests in the mountains and lowlands, and the grasslands, which can contain extensive areas inundated with water. The author presents the result of research conducted during the course of his Ph.D., which included approximately six months of field survey days in Malawi from 2006–2008. This fieldwork included opportunistic and visual encounter surveys at 25 localities in seven principal study areas spread across the length of this narrow country. These surveys comprise the most recent comprehensive study of Malawi's amphibian fauna and will provide critical baseline data for assessing patterns of faunal change in the coming decades.

The book begins with a helpful introduction to Malawi, its geological history, habitats, and protected areas, and a concise history of research on the country's amphibian and reptile fauna. Following a compelling case for the need to understand the effects of habitat change on African amphibians, the author lays out his field methods, sites surveyed during the work, and the ways in which patterns of species diversity were subsequently analyzed. Next are the systematic accounts, which comprise approximately 60% of

the text, and an interesting summary of the diversity of reproductive modes exhibited by Malawian amphibians complete with photographs of habitats, eggs, and tadpoles. The keys to both genera and species generally rely on characters that are easy to observe in the field and should prove useful even to non-specialists. The author then presents results for the diversity of species at each site, complete with species accumulation curves and calculations of different diversity indices. The book concludes with a discussion of the effects of habitat types on amphibian species richness that touches on a range of topics including how both reproductive modes and water bodies may serve to structure patterns of diversity. The bibliography will certainly be of interest to those studying the amphibian fauna of Malawi and neighboring countries. The book is relatively free of typographical errors, and the few I found are unlikely to cause much consternation to the reader.

For each species, the systematic account provides details on its external morphology and coloration, distribution (in both Malawi and other countries), habitat types and elevational ranges within which it is found, as well as assorted remarks (often related to taxonomy or intraspecific variation) and sometimes advertisement calls. These accounts are supplemented with excellent color photographs of most species in life, maps showing the distribution of localities in Malawi, and sometimes figures depicting sonograms, oscillograms, or even bivariate plots from ordination analyses. For a number of taxa, such as that recognized here as *Hyperolius viridiflavus nyassae*, multiple photographs nicely reveal intraspecific variation in coloration and pattern. Species encountered by the author during his field surveys had the most detail and provide excellent short summaries that will be of use to those working in Malawi and neighboring countries.

The systematic accounts generally synthesize information in the literature well. In some cases, the evaluation of previously published work remains unclear. For example, *Amietia* cf. *fuscigula* is listed as occurring in the Misuku Mountains of northern Malawi based, in part, on specimens referenced also by Loveridge (1953). However, Loveridge (1953) also reports this species from Nchisi and Chowe in central and southern Malawi, respectively, but these localities are not reported for this species. The account for *Phrynobatrachus perpalmaris* notes ambiguity in the three localities mapped and that the source of these localities (mapped in Channing, 2001) was not traceable. Yet two of these localities are cited by Loveridge (1953) in his account for this species and the third is surely based on specimens (MCZ A-27877–80) collected by Archie Carr in 1952, and likely determined by Loveridge. While the systematic and faunal inventory literature can provide excellent sources for distributions, published databases from scientific collections also provide an important resource that could have been utilized more extensively. For example, the account for *Scolecophorus kirkii* (p. 306) notes that "Malawian records are old and no other specimen has been collected recently," which presumably is based on the most recent records (from 1946 and 1949) cited by Loveridge (1953). Yet a specimen of *S. kirkii* was collected in Zomba in 1975 by Lynn Robbins (CM 61021). By including information on the last date of collection of many species, the author might have provided important additional information relevant to the effect of changing habitats, including potential population declines.

There is rather limited information in the accounts on Malawi's threatened amphibian species, their conservation status, and current threats. Currently, four Endangered frog species occur in Malawi (IUCN, 2013): *Arthroleptis franciei*,

Amietia johnstoni, *Nothophryne broadleyi*, and *Ptychadena broadleyi*. While the account for *A. francei* does note that the species is Endangered and that forest loss continues on Mt. Mulanje, the accounts for the other three species mention neither that these too are threatened nor that there are reports that some are distributed more broadly (e.g., Broadley, 2008). Mount Mulanje is an important center of amphibian diversity, including hosting all four threatened Malawian amphibian species, as well as is a principal place where declining habitat quality is a serious threat to species diversity. Thus, it is unfortunate that montane sites on this massif could not be included in these field surveys. Yet, this only serves to highlight the need for baseline data (such as these) and longitudinal surveys in this and other regions southern Africa with high endemic and threatened amphibian diversity.

The book makes for a rather dense field guide, but its relatively small size, color photographs, and keys suggest that more than a few travelers to Malawi and southern Africa might bring it along. It is an excellent summary and useful reference, and we can only hope that a comparable volume on Malawi's reptiles is soon to follow.

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Perú: Cerros de Kampankis. Rapid Biological and Social Inventories Report 24. N. Pitman, E. Ruelas Inzunza, D. Alvira, C. Vriesendorp, D. K. Moskovits, A. del Campo, T. Wachter, D. F. Stotz, S. Noningo Sesén, E. Tuesta Cerrón, and R. C. Smith (eds.). 2012. The Field Museum, ISBN 9780982841921. 454 p. \$30.00 (paperback).—Determining criteria for conservation decisions is a difficult process when there are multiple stakeholders and vast natural resources. In an area that has been poorly studied, such as northwestern Peru, the difficulty is amplified because an adequate list of the species present has never

been assembled. This new book, based on a rapid assessment conducted in August 2011, takes the first step in rectifying the lack of knowledge for the Cerros de Kampankis area near the Ecuadorean frontier. This zone lies between the Amazonas and Loreto regions of Peru on a unique mountain range separated from the Andes by low valleys. The assessment included examining the geology, flora, fishes, herpetofauna, some mammals, and the human communities of the zone. Two factors make this study particularly important: (1) very few biological surveys have been conducted in the area, and (2) the native Wampis and Awajún communities have a long history of natural resource conservation, which has preserved the area despite centuries of human habitation.

This work is published in both Spanish and English and was produced with pages of different colors so readers can easily locate their preferred language; the English version begins on p. 189. In addition to the full-length bilingual text, executive summaries are also provided in the Awajún and Wampis languages. Thirteen one- or two-page figures are printed on color plates that include photographs of the landscape, geology, rivers, plants, vertebrates, local human communities, and the rapid assessment team, in addition to detailed maps. The expedition was carried out by the Field Museum of Natural History and several Peruvian organizations, in close collaboration with the local communities.

The Cerros de Kampankis is a mountain range that is geographically isolated. This range was uplifted as an anticline parallel to the ranges in the central Andes during two events 10–20 and 5–6 Mya, and lies 40–60 km from the nearest range, the Cordillera del Cóndor. The Kampankis extend northward into Ecuador, where they are known as the Cordillera de Kutukú. The Morona River valley lies to the east of the Kampankis, the Santiago River valley to the west, and the Manseriche Gorge of the Marañón River lies to the south. Thus, the Kampankis range, which rises to 1465 m, is isolated on three sides by low valleys. This range is home to some unusual habitat types, including exposed sandstone cliffs and limestone outcrops. The Kampankis range has been the focus of one published biological inventory (Dosantos, 2005), which examined the herpetofauna, birds, and mammals, whereas the Cóndor and Kutukú mountains have received more biological attention, including a rapid assessment conducted in 1993–94 (Schulenberg and Awbrey, 1997).

The Kampankis Mountains form a portion of the boundary between the Amazonas political region to the west and the Loreto region to the east. This range lies in the center of the Santiago-Comaina Reserved Zone, which was established in 2000 and encompasses 398,449 ha. The biological communities of the area are a mix of Amazonian lowland species and Andean higher elevation species. Although most of the reserve is below 300 m in elevation, the biological survey team focused their efforts on the higher elevations of the reserve, with the exception of the fish team, because few bodies of water occur in the higher elevations of the Kampankis.

One of the aspects of this expedition that makes it quite different from other rapid assessments is the intense involvement of local communities who have deep ties to the land and its natural resources. The Wampis and Awajún peoples have long-standing cultural traditions to protect the fauna, flora, and watersheds of their areas. Their local governance is a key factor in the area's conservation, which is not always in alignment with the Peruvian government's wishes for land management. In fact, the local communities opposed the formation of the Santiago-Comaina Reserved

Zone, not because they wanted to exploit the area, but because they wished to have the authority to manage it according to their own practices. In the area near the reserved zone, the Peruvian government has sanctioned oil, gas, and timber concessions, gold mining, hydroelectric dam construction, and an international fluvial highway, all of which may impact the local human and natural communities.

The technical report begins with a discussion of the regional panorama and a description of the four campsites that were visited by the biological team in August 2011 (additional riverine sites were visited by the social team). The report then proceeds with specific chapters, each with Introduction, Methods, Results, Discussion, and Recommendations for Conservation. The (unnumbered) chapters include: Geology, Hydrology, and Soils; Vegetation and Flora; Fishes; Amphibians and Reptiles; Birds; Mammals; Communities Visited: Social and Cultural Assets; and Resource Use and Traditional Ecological Knowledge. My review will concentrate on the Fishes and Amphibians and Reptiles chapters.

Fishes, by Roberto Quispe and Max H. Hidalgo, concentrated on the goal of gathering data to help the local communities in their continuing management of the aquatic ecosystems. No previous ichthyological studies had been conducted in the Kampankis mountains, but investigations of the ichthyofauna of the Morona, Santiago, and Marañón watersheds (Cope, 1872; Eigenmann and Allen, 1942; INADE, 2001; Talisman, 2004; Luján and Chamon, 2008) gave the team a baseline from which to begin. Unlike the other biological survey teams, the ichthyology team was confined to elevations from 194–478 m, because bodies of water are scarce in the higher elevations of the Cerros de Kampankis. The team surveyed for 15 days at 17 sampling stations near the four campsites, which included collecting in the Morona, Santiago, and Marañón watersheds. All sampling was conducted in lotic habitats, most of which were small pebble-bottomed streams with slow currents. The ichthyology team recorded 60 bony fish species belonging to six orders, with the bulk belonging to Ostariophysi, particularly species in Characiformes and Siluriformes, with the former being dominant in the lower elevations and the latter dominant at higher elevations. Many of these species were suspected to be endemic to the Kampankis region. In addition, one freshwater stingray (*Potamotrygon*) was identified from a photograph. The authors attributed the relatively low diversity of fish species compared to previous rapid assessments (e.g., Hidalgo and Ortega-Lara, 2011) to the foothill elevations that were sampled. They stated that the diversity of Peruvian fishes increases with decreasing elevation. However, for sites with similar elevational characteristics, the Cerros de Kampankis has higher fish species richness than all other Peruvian mountain ranges that have been surveyed, despite the smaller sampling area. Being between the Andes and the Amazonian lowlands means the Kampankis share fauna from both zones, creating higher diversity. Based on species accumulation curves, the authors estimated that 85 fish species occur in the Kampankis mountains, with 300–350 species predicted to occur in the entire study region. According to the Fishes chapter, six undescribed species were encountered, including three characids (in the genera *Creagrutus* and *Hemigrammus*) and three silurids (in the genera *Astroblepus*, *Chaetostoma*, and *Lipopteryichthys*). But there is discrepancy between the Fishes chapter and the Report-at-a-Glance, which lists different genera for the new species. The authors also suspected that the single *Synbranchus* specimen that was

collected belongs to a new species. Recommendations for conservation included (1) continuing the history of conservation of the aquatic habitats, (2) strengthening local enforcement of regulations on the use of poisons for fishing, and (3) conducting a fisheries survey to provide a baseline of which species are hunted and the quantities of catch.

Amphibians and Reptiles, by Alessandro Catenazzi and Pablo J. Venegas, covers 20 days of sampling at the four campsites. Captures, observations, recordings of anuran calls, and the collection of 444 museum specimens were completed through opportunistic sampling for a total of 251 person-hours. The herpetofaunal team recorded 687 individuals of 108 species (60 amphibian species and 48 reptile species). Species accumulation curves estimated that 90 species of each class occur in the montane area that was sampled. If the lowland areas within the Santiago-Comaina Reserved Zone are included, this estimate rises to 200 species. All three major clades of amphibians were encountered, including ten families and 27 genera. The best-represented families were Strabomantidae and Hylidae. Three major clades of reptiles were reported, representing one species each of Crocodylia and Testudines, and 46 species of squamates (15 families and 37 genera). Reptile families representing the most diversity were Gymnophthalmidae (five genera, eight species) and Dipsadidae (16 genera, 23 species). The numbers listed in my review differ from those in the report because the counts in the herpetofauna chapter did not match the species list, and snake taxonomy has changed since this book was published (i.e., recognition of Dipsadidae as distinct from Colubridae). As was reported for the ichthyological survey, the herpetofauna of the Kampankis is a mix of Amazonian and Andean foothill species. According to the authors, one snake species (in the genus *Tropidophis*) and eight frog species (in the genera *Allobates*, *Colostethus*, *Hyloscirtus*, *Hyloxalus*, and *Pristimantis*) appear to be undescribed. The ranges of five species known from Ecuador were extended into Peru by this study, including *Chimerella mariaelenae*, *Osteocephalus verruciger*, *Pristimantis katoptroides*, *Enyalioides rubrigularis*, and *Potamites cochraniae*. The Recommendations for Conservation section discussed the threats of hydrocarbon and mining exploration and extraction, and the harvest of Yellow-footed Tortoises (*Chelonoidis denticulata*), Smooth-fronted Caimans (*Paleosuchus trigonatus*), and several frog species. Research recommendations included (1) implementing a search for *Atelopus* frogs, which are highly endangered and not recorded in the study area; (2) conducting a rapid inventory of the Kampankis in the rainy season (August is one of the driest months); and (3) surveying the lower elevation habitats in the Morona and Santiago valleys, which were not investigated in the rapid inventory. Conservation recommendations included (1) officially recognizing the integrated management of the indigenous communities; (2) connecting the protected areas of the Kampankis to Kutukú and Manseriche mountain preserves in the north and south; (3) excluding oil, gas, and forestry concessions from the Kampankis Mountains; and (4) providing long-term protection of the nearby watersheds.

The book contains 12 Appendices, with Appendix 3: Fish Sampling Stations, Appendix 4: Fishes checklist, Appendix 5: Amphibians and Reptiles checklist, and Appendix 10: Common Names of Plants and Animals being the most relevant to ichthyologists and herpetologists. Unfortunately, the appendices are not numbered, except in the table of contents, which makes locating them difficult when flipping back and forth from the report.

Although this is not the sort of book that one would necessarily choose to read cover to cover, it contains much valuable information for researchers interested in species distributions, conservation, and indigenous management of natural areas. The species lists alone make this book an important one for biodiversity scientists. This book also provides a view into successful integrated management by local communities, which is something that is generally lacking in natural areas of Peru and many other countries. In fact, this rapid assessment presents a hopeful story of a history of sound conservation and a likelihood that it will continue into the future.

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cover).—Cyprus is the third largest island after Sicily and Sardinia in the easternmost Mediterranean Sea. Geographically, this young island (ca. 22 Ma) is characterized by two mountain ranges, the Troodos and the narrow Keryrneia Range, which are separated by the central Mesaoria Plain. Although Cyprus supports a rich diversity of flora and fauna, the island has not been as well studied by herpetologists as other Mediterranean islands.

About 13% of the species and 35% of the subspecies of amphibians and reptiles inhabiting Cyprus are endemic. Furthermore, the coasts of the island are also among the most important nesting sites for sea turtles (*Caretta caretta* and *Chelonia mydas*). Of the three endemic species, Cyprus Water Frog (*Pelophylax cypriensis*), Troodos Lizard (*Phoenicolacerta troodica*), and Cyprus Whip Snake (*Hierophis cypriensis*), the former two are distributed on the whole island, whereas the latter is limited to the Troodos Mountains. For several taxa (*Testudo* spp., *Eirenis levantinus*, *Natrix natrix cypriaca*, and *N. tessellata*) either their occurrence on the island or population status remain uncertain. The most obvious threats to Cypriot amphibians and reptiles are habitat destruction, poor land use, and the shortage of freshwater, which is of particular concern in the northern part of the island. The species composition of Cyprus closely resembles that of Anatolia, which was connected to the island during the Messinian Salinity Crisis (5.96–5.33 Ma). However, several species may have been introduced to the island from Anatolia by humans, a notion supported by molecular data for some (e.g., Carranza et al., 2008; Gvoždík et al., 2010; Plötner et al., 2012).

The Amphibians and Reptiles of Cyprus introduces the three frog, five turtle, 11 lizard, and 11 snake species inhabiting the island and contains more than a typical field guide. Basic information on the biology and ecology of each species is included, along with potential threats and reasonable solutions to the sustainability of the populations. A detailed literature survey was conducted, and the authors distill this into information that is accessible to not only those interested in herpetology, but also the general explorer or naturalist. The first edition of this book was published in 2009 and drew great attention. In this, the second, revised edition, some shortcomings in the first edition were eliminated, additions and updates were made, and the Cyprus Water Frog, first recognized in 2012 (Plötner et al., 2012), was added. Thus, the book represents the most comprehensive publication on the amphibians and reptiles of the island.

The book consists of six chapters. The first chapter describes the geographic, climatic, and floral features of Cyprus. The amphibian and reptile species inhabiting the island, information on their biology, photographs, and distribution maps are in chapters 2 and 3. The fourth chapter addresses the zoogeography of the island, the history of separation from the mainland, and amphibian and reptile endemism. The fifth chapter deals with the impressions amphibians and reptiles have made on the culture of the islanders, illustrated with photographs. In the final chapter (6), the potential threats facing the amphibians and reptiles of Cyprus are evaluated and conservation studies are described. An identification key is provided at the end of the book.

A weakness of the book is the limited data available for populations of amphibians and reptiles occurring in the northern portion of the island. Most of the data from this region are based on a book by Atatür and Göçmen (2001) and other publications by the Cypriot herpetologist B. Göçmen. I hope this encourages future research in northern

The Amphibians and Reptiles of Cyprus. F. Baier, D. J. Sparrow, and H.-J. Wiedl. 2013. Edition Chimaira. ISBN 9783899734768. 362 p. €49.80 (approximately \$68.00) (hard-

Cyprus so future editions of the book can address this shortcoming. The writing is clear and accessible to a broad audience, and the text is supplemented with effective and interesting photographs selected to attract the attention of its readers. In a few photographs, human-made objects (e.g., a pool or vehicle) are more evident than the habitats of the species. These small details have been overlooked. The price is reasonable compared to the market for similar books and the publication quality. This book, which will make great contributions to the promotion of the amphibians and reptiles of Cyprus, is a handy reference that will be of interest to scientists as well as curious naturalists and interested islanders. Such publications play an important role in introducing amphibians and reptiles, raising awareness, and launching initiatives for conservation studies. I enjoyed reading this book and reflecting on the faunal richness of Cyprus. I hope it will encourage similar studies of other forms of natural beauty on this island.

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Amphibians of Ohio. R. A. Pfungsten, J. G. Davis, T. O. Matson, G. J. Lipps, Jr., D. Wynn, and B. J. Armitage. 2013. *Ohio Biological Survey*. ISBN 9780867271645. 916 p. \$90.00 (hardcover).—You may have noticed while driving along rural highways that automobile traffic is never evenly spaced; cars bunch into clusters of three or four or half a dozen, with big gaps in between. Pioneer ecologist Ed Ricketts noted this pattern and offered a metaphor for excellence in scholarship. He said (paraphrasing), you may think that centers of excellence tend to persist, the old duffer passing on his knowledge to his disciples and so on, but it almost never happens this way. Excellence arises like a mutation, peaks, then slowly dies out as the founder ages and disciples either move away to establish their own centers or fail to reach their intellectual potential.

There are, of course, as many examples of this phenomenon in herpetology as there are in any other field, and that's why exceptions prove so interesting. Roger Conant (based at the Toledo Zoo) and Charles Walker (University of Michigan) kick started the modern era of herpetology in Ohio with statewide surveys (often accompanied by Reeve and Joe Bailey) in the 1930s and 40s. Their successors—second-generation, mid-twentieth century Ohio herpetologists—are now so familiar to US herpetologists that I only have to cite their last names: Bishop, Netting, Mittleman, Duellman, Ashton, Brandon, Seibert, Adler, Dennis, and Collins. A subset of these gentlemen—the “Ohio Mafia”—transformed the Ohio Herpetological Society into the Society for the Study of Amphibians and Reptiles (SSAR), with Adler serving as its first President.

Amphibians of Ohio continues this legacy of excellence into a third generation—Conant and Walker would be proud. The editors, Pfungsten, Davis, Matson, Lipps, Wynn, and Armitage have assembled, in a massive 900+ page volume, almost everything we know about the 25 or 26 species (depending on how you treat unisexual *Ambystoma* taxonomically) of salamanders and 14 species of frogs and toads found in Ohio. Ohio's amphibians are curiously representative of North America, hosting roughly one eighth of all salamander species and about one eighth of all frog and toad species found north of the Rio Grande.

Amphibians of Ohio has 33 contributors and is organized into 12 sections, two appendices, a glossary, literature cited, and two versions of a township map, one divided into quadrants bound into the volume and a complete map included as a separate. The 12 sections include a history of herpetology in Ohio, ecosystem features, systematics, salamander species accounts, frog and toad species accounts, possible species inclusions and exclusions, conservation priorities, field techniques, and methods for specimen preparation. Each account contains a representative color photograph of the species plus numerous additional color photographs representing habitats, life-history stages, and/or color variants. Each account also contains a color topographic relief map divided into counties with species occurrences—separated into pre-1952, 1952–89, and post-1989 timeframes—represented at the township level. Narratives include taxonomic information such as etymology, synonyms, type specimen, taxonomic status, common names, a formal species description, species distribution, Ohio distribution, natural history, age at first reproduction, social behaviors, reproductive behavior, growth, conservation, and locality records. Information specific to species, such as food habits, life-history parameters, or special distribution features, is depicted in additional tables, figures, and maps. The conservation sections following the species accounts include threats to amphibians such as habitat loss, disease, invasive plant and animal species, variations in weather patterns being driven by climate change, and priority listings. It's a spectacular book reflecting a deeply impressive effort, and credit must not only go to the authors, but also to the Ohio Biological Survey, which has made big, buck-stops-here books about natural history its trademark.

The species accounts are the heart of the *Amphibians of Ohio*, comprising two-thirds of its pages. They are written in an easy-to-understand narrative style and are uniformly pitched (not an easy task in a multi-authored volume); they will, therefore, be useful to people of all backgrounds and levels of experience. The accounts are big, comprehensive, accurate, and individualized in such a way that represents the distinctiveness of each species. There are roughly 70

pages of citations with 50 citations/page. Divide 3500 (70 × 50) citations by 40 accounts, and the average of slightly fewer than 90 citations/account will give you some idea of the level of detail contained in this book. The choice of using a general account format modified to represent the unique features of each species subconsciously communicates to the readers the idea that each of these species is different—not cookie-cutter variations on some salamander or frog theme—and that these species are therefore important and worthy of occupying a secure place in the world. To add perspective to the size and detail of these species accounts, if the authors of *Amphibians of Ohio* had chosen to tackle each of the ~300 species of US amphibians using the same narrative approach with the same level of detail, their effort would have comprised six 1000-page volumes.

A note about the maps: It's been my observation that there are people who make species distribution maps and people who criticize species distribution maps, and these two populations are nearly mutually exclusive. Once you realize the amount of information necessary to make a good, reliable distribution map, you never again question decisions underlying anyone else's good, reliable, distribution map. Scale matters, landscape matters, and if conservation is involved, political boundaries matter. Here, the distributions of Ohio species are depicted at the township (subcounty) level superimposed on a color, shaded relief map. They are perfect for the task at hand, which happens to be the same presentation, albeit at a finer scale, used in our North American amphibian atlas (Green et al., 2013).

There is an arms race occurring among our state-level herpetology books. In the past few decades, we have experienced the evolution from single-authored, instruction-manual type presentations with black-and-white line drawings, through intermediary types, to the present-day multi-authored tomes with detailed and very much appreciated fact upon fact upon fact, and color plate after color plate, of which *Amphibians of Ohio* is perhaps the best example. The authors have met, in spades, their goal of putting between two covers most of what is currently known about the biology of Ohio's amphibians. My history with big amphibian species account volumes and book reviews compels me to note that *Amphibians of Ohio* is not a field guide—it was not designed and never meant to be thrown into a backpack and taken out to a wetland. But, because it is big and comprehensive, workers over a broad geographic region including much of the Upper Midwest, Central Appalachians, and the Northeast, extending into Canada will find much of value here. At \$90 *Amphibians of Ohio* will not be something everyone can afford, but librarians in and around Ohio may be convinced to acquire a copy for their holdings. The editors should consider a follow-up, laminated pocket field guide using the color photographs on the title page of each account. Such a portable and affordable derivative would generate additional interest in the parent book.

Much to the credit of the editors of *Amphibians of Ohio*, they do not see their job as completed. Wrapping up his section on the history of herpetology in Ohio, Armitage writes, with a great deal of pride and only slight hyperbole (p. 11–12):

“Ohio's herpetological knowledge is not complete. This book represents the most thorough and up-to-date treatment so far for amphibians. It is hard to imagine a state, province, or country in the Western Hemisphere with a more extensive documentation of amphibians

than Ohio. We've been at it longer, with more repetitive consistency and with more industry and leadership than anyone else. Yet, there are still things to learn and gaps to fill. Alas, given the additions of new habitats we will never reach an endpoint. However, this compilation provides a very solid and comprehensive base from which to gauge our future progress and success.”

To this, I can only add: “Amen, brother.”

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Lissemys punctata. The Indian Flap-shelled Turtle.

D. Gramentz. 2011. Chimaira. ISBN 9783899734966. 278 p. €49.80 (approximately \$67.00) (hardcover).—Quick, what turtle is the scientifically best-known species in the world—the model from which we have derived the most basic morphological, physiological, and ecological knowledge? Does the Slider (*Trachemys scripta*) come to mind, or perhaps the Painted Turtle (*Chrysemys picta*)? Certainly, the extensive research conducted on these two ubiquitous North American species has resulted in a great deal of attention and scientific literature. For these reasons their contribution to our knowledge of turtle biology is indisputable. But who thought first of the Indian Flap-shelled Turtle (*Lissemys punctata*)? Not me, certainly, with my admittedly biased familiarity with the North American turtle literature (and, I presume, not too many of my North American colleagues). But, after reading this remarkable book by Dieter Gramentz, I have come to appreciate the Indian Flap-shelled Turtle as a contender, at least, for this honor. The author has done an excellent job of assembling and summarizing the surprisingly vast literature that exists concerning this turtle. In his Foreword, Gramentz states that he is reasonably optimistic that he has accounted for most of the essential works related to the Indian Flap-shelled Turtle. Based upon his skillful summarization of the various facets of the biology of this species (not to mention the voluminous Literature Cited section of the book), I believe he is right.

As a result of the author's thorough review of its biology, not to mention the myriad of scientists whose work served as his sources, a strong case for its important contribution to biological knowledge in general, and to turtle knowledge in particular, is also indisputable. This contribution is due in part to this turtle's appeal as a unique species unto itself, but also to a great extent its accessibility for study as a result of its abundance, widespread distribution across the Indian subcontinent, and traditional availability in the wild and in markets throughout this vast region. In addition, as Gramentz states, the Indian Flap-shelled Turtle happened to be in the right place at the right time to serve as a model for an explosion of research on endoparasites, which resulted from improvements in compound microscopes

beginning early in the Twentieth Century. Consequently, this species is known to host more parasites than any other softshell (trionychid) turtle.

There are only a few modern, book-length, published studies as single-mindedly devoted to recounting everything known about a single turtle species as this one. Gramentz's earlier (2005) book, *Die Nilweichschildkröte. Trionyx triunguis*, is another example. Books such as *The Alligator Snapping Turtle: Biology and Conservation* (Pritchard, 1989), *Life History and Ecology of the Slider Turtle* (Gibbons, 1990), and *Biology of the Snapping Turtle (Chelydra serpentina)* (Steyermark et al., 2008) also come to mind, although they are less slavishly devoted to completely recounting basic anatomical and physiological studies of the species in question. Such studies are valuable in bringing a great deal of information and related references together under one cover, but I will offer a caveat concerning such an approach in its strictest sense (as displayed by the Gramentz books), which I elaborate upon below.

This book begins its coverage of the Indian Flap-shelled Turtle with chapters and sections related to its identification, nomenclature, and taxonomic classification. A significant number of chapters and sections in the rest of the first half of the book are devoted to recounting the basic external appearance, coloration, external and internal anatomy, and related physiology of this species. Although unflinching in citing his sources, the author transferred the anatomical and morphological descriptions nearly unchanged from their original sources. The reasons for this are understandable, and explained by Gramentz in the Foreword. Most of the rest of the book is devoted to describing the sexual dimorphism, development, ecology, and behavior of Indian Flap-shelled Turtles. It may be surprising to some that more gaps exist in the fields of ecology and behavior, especially in such a widespread and common species, but field studies of turtles have lagged behind laboratory studies (as is the case for many other organisms). Gramentz remarks upon the surprising dearth of knowledge of some basic ecological and behavioral characteristics of this species (e.g., reproductive biology, basking behavior). In the final chapter, Gramentz discusses conservation concerns and efforts related to this still widespread and common species. In his final analysis, the author is concerned about the effects of mass slaughter, national and international commercial trade, and habitat destruction throughout its range on the long-term survival of this species. Given what we know concerning the vulnerability of long-lived, late-maturing organisms such as turtles to chronic, unnatural mortality (e.g., Congdon et al., 1993, 1994) this concern is not misplaced, and is a fitting way to conclude the book.

This book is well produced and well written. Within the limitations imposed by some of the subject matter (there are limits to the excitement that can be generated by anatomical descriptions of, say, the renal portal system), the book is interesting to read and typographical errors are few. I noted very little awkwardness in grammar and phraseology that might be attributable to German-English translation issues. The tables, line drawings, and especially the beautiful photographs of turtles and habitats are all clear, sharp, and well produced. Tables and figures are usually referred to in the text by number, but not consistently so throughout the book. Although it is usually easy to determine what graphic information the text is referring to in the latter cases, I found these discrepancies mildly disconcerting. The book is expensive and this may be a drawback to novice turtle biologists attempting to assemble a library with the latest scholarly contributions. The quality of the book, its

graphics, and its undoubtedly small production volume, inevitably and justifiably resulted in a higher price. I hope and recommend that research libraries purchase the book to increase its availability to turtle researchers.

My last point is not a criticism, but more a statement of my viewpoint. As stated in the Foreword, it was not the author's objective to compare aspects of the biology of the Indian Flap-shelled Turtle with those of other turtles in general, or with other softshells in particular. His objective was to compile an encyclopedic reference to the known biological attributes of this species solely, and in that he has succeeded admirably. As I read the book, however, I frequently found myself wracking my brain to try to remember how this fact or that description compared with those of other turtles I had read about previously, or had published on myself. I began to better appreciate that the acquisition of facts is admirable and valuable, but the placement of those facts in a comparative context (e.g., the guiding principle of comparative anatomy and physiology, etc.) is even more enlightening. This compilation on this interesting species will probably be ultimately most useful in providing a single source for a wealth of data that can eventually be integrated into a broader, comparative picture of chelonian biology. My challenge to the next generation of turtle biologists is to use this book to make this happen sooner rather than later.

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The Case of the Green Turtle: An Uncensored History of a Conservation Icon. A. Rieser. 2012. Johns Hopkins University Press. ISBN 9781421405797. 352 p. \$29.95 (hardcover).—Although the old adage that one should not judge a book by its cover is usually good advice, *The Case of the Green Turtle: An Uncensored History of a Conservation Icon* by Alison Rieser could be considered an exception. In this “case,” the book's cover actually reflects its contents—both good and

not so good—quite well. As the title states, the book is indeed a “case,” steeped in details and heavy on conservation laws and policies. But the book’s depiction of the Green Turtle (*Chelonia mydas*) as an “icon” is better characterized by the murky, unattractive, confusing cover portrait: unclear and un compelling. To understand why the case of the Green Turtle became a watershed for the international conservation movement and launched 50-plus years of debate about “conservation through commerce,” one needs to understand how and why sea turtles achieved “iconic” status. Rieser does a fantastic job of making the “case,” but falls short of providing a deeper understanding of how Green Turtles were—and are—conservation icons, and what this means for conservation more broadly. Despite this shortcoming, the book is a worthwhile resource for any sea turtle specialist interested in how, when, and by whom the seeds of sea turtle conservation were first planted, and for anyone with a strong interest in wildlife management and policy.

This book’s strengths are in describing the origins of sea turtle conservation, as well as the major players and their various conservation philosophies, motivations, and biases that are evident today in publications, conferences, and policies regarding sea turtle conservation and biology. It is indeed a case; it reads like a thesis or legal document, with a linear, facts-based approach that stops short (for the most part) of editorializing or opining. But what the narrative lacks in rhetorical flourish, vivid imagery, and gripping action and suspense, it more than makes up for with a coherent and carefully constructed narrative that tells the story of how Green Turtles became global research subjects and management targets at the same time that the world was trying to figure out how to assess and protect species, particularly in the face of complex and wide-reaching wildlife trade issues. Rieser’s painstaking detective work weaves together countless letters, books, interviews, and other resources describing the history of Green Turtle management long buried in personal and institutional archives. This impressive effort provides the reader with a vivid picture of the people involved and the discussions that took place, all of which is important context for current efforts to address threats to sea turtles and other shared wildlife resources.

For any sea turtle specialist, this book should be required reading. As a current member of the IUCN Marine Turtle Specialist Group (MTSG), and one who is intimately involved in the MTSG’s present-day efforts to assess sea turtle status under the Red List, I devoured Rieser’s recounting of the origins of the MTSG. She transports the reader back to the MTSG’s initial meetings, which showed how individual experiences and perspectives, personality differences, and behind-the-scenes machinations among meeting participants influenced discussions about fundamental issues facing sea turtle conservation. Having participated in several MTSG meetings in recent years, it’s safe to say that some things haven’t changed (much). Similarly, I couldn’t help but smile sympathetically while reading about how Archie Carr, often recognized as the founding father of sea turtle biology and conservation, and a main protagonist of Rieser’s case—“had difficulty applying IUCN’s endangerment classification scheme” (p. 130), and struggled to shoehorn what he felt was relevant information about exploitation rates and recommended protection strategies into IUCN’s rigid headings. He would not be surprised (but perhaps a bit disappointed) that the MTSG continues to debate internally and with the IUCN about the (in)appropriateness of the Red List criteria and categories for

assessing sea turtle conservation status (see Seminoff and Shanker, 2008 for review).

There are so many other fascinating anecdotes in these pages that sea turtle specialists will enjoy: the first efforts to apply tags to sea turtles to figure out whether they nest annually, multiple times per season, show site fidelity, and migrate away from breeding areas; professional competition and ego clashes boiling over to cause internecine rifts in the sea turtle conservation community; the always sensitive use of scientific data to defend sometimes contradictory management strategies; and even basic aspects of sea turtle biology that were focus of great speculation then and continue to elude scientists decades later, such as age at maturity.

In addition to those of us with a special affinity for sea turtles, this book provides a fabulous history of the origins of some of the most consequential conservation laws and frameworks ever created, namely the Convention on International Trade in Endangered Species (CITES), the International Union for the Conservation of Nature and its Red Data Book (which evolved into the modern-day Red List of Threatened Species), and even the US Endangered Species Act of 1973. Many readers might be surprised to learn the central roles that sea turtles—Green Turtles in particular—played in how each of those policies or assessment frameworks were constructed and applied. For example, the present-day, interagency coordination framework used by the US government to manage sea turtle populations—the US Fish and Wildlife Service (USFWS, Department of the Interior) is responsible for terrestrial life stages (e.g., nesting, eggs, nests, and hatchlings), while the National Marine Fisheries Service (NMFS, Department of Commerce) is responsible for marine environments—actually arose as a compromise between the two agencies while trying to decide how to list Green Turtles on the US Endangered Species List. Rieser adeptly describes the roots of this confusing arrangement, which persists today and continues to complicate sea turtle management issues.

Of course, the main theme of the book—whether turtle farming could be a viable conservation strategy—should be interesting and thought-provoking reading for anyone interested in wildlife trade and management. Arguments for and against are presented throughout, typically in the words of those scientists involved in the original debate. The benefits and drawbacks of each side are characterized fairly enough that an open-minded reader can understand why this issue was—and is—so difficult to resolve whenever it arises. Indeed, the question of whether “conservation through commerce” (i.e., limited, legal, commercialization of animal products to reduce pressure from illegal harvest on wild populations of the same species) remains highly relevant. The recent auction of a single permit to hunt a Black Rhinoceros (*Diceros bicornis*) in Namibia raised international debate and attracted global press around the question of whether a threatened species should ever be the subject of a legal hunt, even if there are benefits to the overall population. In this case, proponents of the hunt pointed out that the single animal to be killed is an older male, which can be a threat to other individuals in the population, and the auction for the permit raised thousands of dollars to support efforts to protect Namibia’s remaining rhinos from illegal poaching (<http://www.cnn.com/2014/01/16/us/black-rhino-hunting-permit/>). Even in the sea turtle community, the question of whether to allow harvest of Hawksbill Turtles (*Eretmochelys imbricata*) for their commercially valuable carapace material, or bekko, to be sold to

generate revenue for conservation in countries where such harvest is legal was argued vigorously in recent years (Bowen et al., 2007a, 2007b; Godfrey et al., 2007; Mortimer et al., 2007).

Then, as now, the arguments against turtle farming, and the somewhat related issue of sustainable use, particularly from the perspective of organizations and conservationists from developed countries, are not necessarily rooted in objective evidence from population modeling that demonstrates declines in a species' numbers if trade or use were permitted under regulated circumstances. Such evidence rarely exists for any management strategy, although it should be noted that we now have several examples of sea turtle population declines owing at least in part to (illegal and/or unregulated) exploitation. Rather, the perennial lack of comprehensive population data is actually used as support for "using the simplest and least risky techniques of conservation," as David Ehrenfeld advised the World Conference on Sea Turtle Conservation in 1979 (p. 251). In other words, we shouldn't try to manipulate populations, or the market forces driving exploitation patterns, because we just don't know enough about how populations might respond. So, it's better to stick to conservative approaches to conservation, like protection, preservation, and, of course, ever more research. One wonders if such conservative conservation approaches always won out, whether we might have discovered temperature-dependent variation in sex ratios by dissecting the gonads of hatchling sea turtles, or attached satellite transmitters to track sea turtles across expanses of open ocean, among other high-risk, high-reward endeavors.

It is precisely in these discussions about turtle mariculture and sustainable use, and why the precautionary principle should prevail over all others in a data-poor world, that understanding how and when the "iconic" status of sea turtles and other species came to be is so important. Why was (and is) there such fervent opposition to conservation through commerce, even if—as in the case of the Black Rhino—doing so would benefit the population as a whole, both in terms of population growth as well as resources to protect the remaining individuals? If these biases reflect value judgments based on the intrinsic "charisma" of certain species, then why did sea turtles become lightning rods for debates about how to manage over-exploitation of marine resources, rather than sharks or tuna?

These are the kinds of questions that *The Case of the Green Turtle* was uniquely positioned to explore, but for some reason did not. While the cover's description of the book as being a "case" is spot-on, Rieser's effectiveness in characterizing Green Turtles as "conservation icons" is also very well reflected by the cover photo: a murky, underwhelming image that does not do its subject justice. (Of course the author cannot be blamed for the cover art, but bear with my comparison.) After reading "the transformation of the green turtle from food to icon . . ." in the book's final pages, I felt as though I missed a significant portion of the book that described that transformation. It was never quite clear to this reader that Reiser's history revealed how sea turtles came to be considered "icons" in the first place, or how their supposed "iconic" status influenced management decisions about their fate, let alone those of other species. Were sea turtles not considered "icons" by coastal communities that consumed turtle eggs and meat, long before Western notions of preservation arrived on the scene? Were they not "icons" that appeared on labels on cans of turtle soup, representing not only food, but status

and wealth? By describing the Green Turtle as "a conservation icon," did Rieser mean that many conservation policies came of age because of or in relation to the Green Turtle mariculture debate? Or was she confusing the term "icon" with one of the other myriad terms for charismatic species that receive disproportionate amounts of resources and attention from the international conservation community (e.g., flagship species, umbrella species)? Not exploring these questions while telling the story of how Green Turtles went from the highly exploited source of a multinational, commercial food trade to a symbol of protectionist conservation movements seems like a missed opportunity.

However, these flaws are minor compared to the great service that Rieser has done in adroitly summarizing the legacy of "a generation of scientists who sought divergent ways to prevent the green turtle from becoming rare or even extinct" (p. 12), not just for those currently following in their footsteps and engaging in the same debates, but for future conservationists as well. Rieser's *Case* is a superb reminder that wildlife conservation depends on science, but perhaps even more so, on scientists, their human experiences, visions, and values.

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Bryan P. Wallace, *Nicholas School of the Environment, Duke University, Box 90328, Durham, North Carolina and IUCN/SSC Marine Turtle Specialist Group Red List Focal Point, Boulder, Colorado 80303; E-mail: bwallace@duke.edu.*

Discovery, Diversity, and Distribution of the Amphibians and Reptiles of Sulawesi and Its Offshore Islands. A. Koch. 2012. Edition Chimaira. ISBN 9783899734324. 374 p. €49.80 (approximately \$68.00) (hardcover).—Sulawesi and its offshore islands are located on the western margin of the biogeographic region of Wallacea, spanning the Banda, Molucca, and Celebes seas. Comprised of the major islands of Sulawesi, the Lesser Sundas, Timors, Moluccas, and Celebes (as well as a number of smaller, associated islands), this region is effectively a filter zone between the major Oriental and Australian faunal regions. Consequently, islands of this

region are home to diverse and unique assemblages of plants and animals, with varying and complex evolutionary histories. Reptile and amphibian diversity, in particular, has shown to be exceedingly diverse on Sulawesi and its offshore islands, with an ever-growing body of literature highlighting newly described taxa, systematic relationships, and historical biogeography of the island.

Andre Koch has assembled a comprehensive list of the known (both published and unpublished) herpetofaunal diversity inhabiting Sulawesi and more than a dozen adjacent islands or island groups, and as such, has achieved his goal of providing a long-needed checklist of the reptiles and amphibians of the region. Additionally, and perhaps most impressive, is the inclusion of extensive historical accounts of collection efforts dating back to the early 18th Century, which sets the stage nicely for the species accounts to follow. It was surely no small feat to compile, translate, and summarize this information. Along with providing a historical context, the author also includes a concise summary of the abiotic processes (geological and climatic) that have undoubtedly shaped the herpetofaunal diversity in the region.

Despite the high regional diversity, the author provides thorough taxonomic accounts in a logical and cogent manner. These accounts not only provide basic information about each taxon (range, type locality, etc.), but also a complete bibliography and taxonomic history when possible. In total, the author provides accounts for 41 frogs, 65 lizards, 59 snakes, six turtles, and one crocodylian, comprised of both published species or subspecies and identified, yet unpublished putative lineages. Additionally, when possible, reference is given to the unconfirmed or questionable taxonomic status of historical records, highlighting the need for future validation. The author also cites numerous taxonomic and systematic studies that are currently underway. The detail included in individual species accounts provides a much-needed reference for future researchers, and will undoubtedly be a useful resource for anyone interested in the herpetofauna of the Sulawesi region.

While unfortunately not present for all taxa, there are numerous color plates included, highlighting some of the more charismatic and unique Sulawesi herpetofauna. These photos are of high quality, generally with the entire animal in focus, but occasionally (lizards and snakes) just the head is in focus. Photo subjects appear to be naturally lit and photographed in their preferred habitats. Only rarely are multiple images provided for taxa that exhibit color polymorphisms, and these overwhelmingly illustrate geographic variation among islands for the species, rather than sexual dimorphism or ontogenetic variation (but there are examples of the former for some accounts of *Draco*). The photos appear to be exclusively of uncataloged material, as no institutional or collection numbers are provided, and include 28 anuran, 54 lizard, 23 snake, six turtle, and one crocodylian image.

The writing is generally engaging, although it becomes clear early on that English is not the author's primary language. There are a number of inconsistencies with word usage (South-east Asia vs. Southeast Asia), and in my opinion, questionable word choices as well (e.g., "herptiles"). These issues, while subtle and relatively minor, were often distracting, diminishing the overall quality of the piece. These errors would have been detected by a native-tongue, English editor, and the publisher is encouraged to enlist such services for non-native English authors in the future.

This work will be most useful to professional herpetologists or anyone who is generally interested in the biodiversity of Southeast Asia or the Indo-Australian region. Herpetoculturists may also find the images useful for identifying some taxa. When compared to other recent publications focused on the herpetofaunal diversity of Southeast Asia, namely Grismer's (2011) *Lizards of Peninsular Malaysia, Singapore, and Their Adjacent Archipelagos*, this text is noticeably lacking in range maps and ecological data in the taxonomic accounts. Those unfamiliar with the region will be forced to refer back to the only map in the book when reading the individual accounts, rather than having easily accessible range maps for each species or genus. Additionally, while the author does a good job of providing a geological background for the region, there is no information about the habitat variability of Sulawesi or the adjacent islands. It would seem beneficial to have included metrics related to habitat type, level of degradation, and even contemporary threats (logging, agriculture, pollution, etc.), both generally and as these issues relate to specific taxa.

Given Sulawesi's geographic placement, geological history, and the region's historical status in biodiversity studies, this work represents a great attempt to summarize the breadth of herpetological knowledge that has been growing for more than a century. As our knowledge and understanding of this megadiverse region continues to grow, this work will undoubtedly require revision. But, in its current state, this book provides a glimpse into the history of herpetological diversity, research, and discovery in the Sulawesi region.

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Mesozoic Fishes 5: Global Diversity and Evolution. G. Arratia, H.-P. Schultze, and M. V. H. Wilson. (Eds.). 2013. Verlag Dr. Friedrich Pfeil. ISBN 978-3-89937-159-8. 560 p. €200 (hardcover).—The latest installment in the Mesozoic Fishes series—now well within its second decade—*Mesozoic Fishes 5* (MF5) shows that there is no sign that the franchise is winding down. This remarkable endurance is a testimony to the energy and enthusiasm of Gloria Arratia, who initiated the Mesozoic Fishes meetings over 20 years ago and has dutifully served as the principal editor for each of the five proceedings to date (collectively totaling just short of 3,000 pages!).

Stemming from a 2010 meeting of the same name in Saltillo, Mexico, MF5 contains 22 original contributions by more than 40 authors. Like its predecessors, the phylogenetic scope of MF5 is enormous, ranging from chondrichthyans to coelacanths to cods. The style and scope of individual papers is similarly broad. These include historical summaries (González-Rodríguez et al., 2013a on the fossil fish record of Mexico, Martín-Abad and Poyato-Ariza, 2013 on fossil amiiforms from Spain and Portugal), reviews of diversity within specific anatomical systems (Mickle, 2013 on preoperculars, Liston, 2013 on gill rakers, and Schultze

and Arratia, 2013 on caudal-fin skeletons of anatomically primitive teleosts), paleohistological analyses of growth (Liston et al., 2013 on the giant filter-feeding *Leedsichthys*), descriptions of new taxa (Amaral et al., 2013 on a new gonorynchid, Murray and Wilson, 2013 on two new primitive clupeomorphs, and Newbrey et al., 2013a on a new paracanthopterygian) or new specimens (Yabumoto and Brito, 2013 on the coelacanth *Axelrodichthys*), reinterpretations of old material (Arratia and Schultze, 2013 on the pachycormid *Orthocormus*, Gouric-Cavalli and Cione, 2013 on a Jurassic "*Pholidophorus*" from Argentina, Newbrey et al., 2013b on isolated fish remains from the Cretaceous of Mongolia), faunal reviews (Irwin and Fielitz, 2013 on ichthyodectiforms from the Late Cretaceous of Arkansas and Murray et al., 2013 on a Late Cretaceous assemblage from Morocco), inferences of depositional environment and climate based on fossil remains (Kemp and Berrell, 2013 on lungfishes and Cumbaa et al., 2013 on a Late Cretaceous marine bonebed from Saskatchewan), and descriptions of new methodologies (Tischlinger and Arratia, 2013 on ultraviolet imaging of fossil specimens).

Most of these papers, of course, target Mesozoic fossils, but those working on extant fishes shouldn't be put off. With reports on Cenozoic and Recent fishes, there is much in MF5 that should be of keen interest to a broad ichthyological audience. Here I will review four such contributions: González-Rodríguez et al. (2013b) on ancient, tiny armored acanthomorphs from Mexico, Davis et al. (2013) on a fossil kneriid from Tanzania, and paired chapters by Grande et al. (2013) and Borden et al. (2013) on morphological character evolution within paracanthopterygians. Focusing on Mesozoic, Cenozoic, and Recent material, these studies give a taste of the volume as a whole.

Mid-Cretaceous (ca. 100 million years old) deposits from around the world record the earliest appearance of acanthomorphs, or spiny-rayed teleosts, a major group that includes nearly one in three living vertebrate species. As might be expected, the vast majority of acanthomorphs known from this time are anatomically generalized species aligned with deeply diverging modern lineages: polymixiids, paracanthopterygians, trachichthyoids, and holocentroids (Patterson, 1993). However, mid-Cretaceous rocks also yield weird and wonderful spiny-fins that defy straightforward placement. Such is the case with the intriguing fossils reported from the Muhi quarry of Hidalgo, Mexico by González-Rodríguez et al. (2013b). These three new early acanthomorph genera are all tiny—none exceeds 45 mm in standard length—and each is clad in armor composed of large, overlapping bony shields. Two of these genera (*Pseudomonocentris*, *Handuichthys*) share many features with monocentrids (pinecone fishes), and the authors make a reasonable case that these Cretaceous examples are beryci-forms. The third genus (*Dalgoichthys*) looks very similar to the first two, but here the most extensive comparisons are drawn with agonids (poachers), a group classically identified as scorpaeniforms. This is an anachronistic affiliation, given that agonids are highly nested within percomorphs and likely have substantially younger evolutionary roots, so the conclusion that *Dalgoichthys* is best left as an incertae sedis acanthomorph comes as some relief. While these fossils are interesting in and of themselves, it is their implications for other small, armored Cretaceous acanthomorphs that are arguably more significant. With their large tuberculated dermal plates, deep bodies, narrow caudal peduncles, ventral spines making jointed articulations with body plates, and lack of dorsal-fin spines, sclerotic ossicles, and supramaxillae, the Mexican specimens bear more than a

passing similarity to *Plectocretacicus*, from rocks of comparable age in Lebanon (curiously, this similarity is not mentioned by the authors). Identified as the earliest tetraodontiform (Sorbini, 1979; Patterson, 1993; Tyler and Sorbini, 1996), *Plectocretacicus* has achieved considerable prominence for a Cretaceous acanthomorph by virtue of its nomination as a key fossil calibration in the animal tree of life (Benton and Donoghue, 2007; Benton et al., 2009). As stem tetraodontiform in mid-Cretaceous seas otherwise bereft of percomorphs, *Plectocretacicus* has always seemed a bit out of place. It seems that the very different systematic interpretations made for these otherwise similar Mexican fossils should motivate restudy of *Plectocretacicus* and other potentially important armored Cretaceous taxa.

Kneriids—commonly known as shellears—are a clade of gonorynchiforms native to freshwaters of Africa. This family dominates modern gonorynchiform diversity: roughly four out of every five living gonorynchiform species is a kneriid. Given this comparative richness of extant forms, it perhaps comes as some surprise that kneriids have an abysmal paleontological record. Fossil representatives have been entirely unknown, while closely related but taxonomically depauperate modern groups like chanids (milkfishes) and gonorhynchids (beaked salmons) are represented by numerous extinct species from both freshwater and marine deposits (Fara et al., 2010). It is into this conspicuous gap that Davis et al. (2013) insert *Mahengichthys*, the first fossil kneriid. Represented by half a dozen specimens, *Mahengichthys* derives from the same remarkable 45-million-year-old Tanzanian crater-lake deposit of Mahenge that has yielded a range of important fossils, including some of the oldest fossil cichlids (Murray, 2001). Despite its antiquity, *Mahengichthys* does not seem to be an especially primitive kneriid. Instead, it is highly nested within the crown as the immediate sister taxon of *Kneria*. This placement carries with it implications for the timing of major evolutionary events in gonorynchiform history, which Davis et al. evaluate with a series of timetree analyses. They estimate the age of the gonorynchiform crown as Middle to Late Jurassic (ca. 165 million years ago), while kneriids themselves seem to have Early Cretaceous (ca. 135 million years ago) roots. This implies a long history of kneriid diversification in Africa following their probable derivation from a marine ancestor.

Perhaps the greatest change to occur in systematic ichthyology over the lifetime of the Mesozoic Fishes series is the emergence of numerous densely sampled (with respect to sequences, taxa, or both), well-supported molecular hypotheses for the shape of the actinopterygian tree of life (Near et al., 2012, 2013; Betancur-R. et al., 2013; Broughton et al., 2013; Faircloth et al., 2013). While these studies have supported many patterns of relationships first proposed on the basis of morphology, they have also produced unanticipated phylogenetic placements. Such corroboration and reshuffling is apparent at a variety of scales throughout the ray-fin tree, but is particularly conspicuous among Paracanthopterygii, the core membership of which remained more-or-less similar over nearly 50 years of morphological investigation (Rosen and Patterson, 1969; Patterson and Rosen, 1989; Johnson and Patterson, 1993). Molecular trees have upheld the status of some principal groups (e.g., gadiforms and percopsiforms), but have removed others (e.g., lophiiforms) and made some surprising additions to the paracanthopterygian stable (e.g., zeiforms and the bizarre *Styleophorus*). Now an established motif of contemporary molecular analyses of acanthomorph relationships, it is clear that this reconfigured Paracanthopter-

ygii is more than an ephemeral quirk of first-generation studies (e.g., D'Erchia et al., 1996). There has been resistance to these new trees in some ichthyological circles (Mooi and Gill, 2010a, 2010b), but Grande et al. (2013) present their molecular phylogeny of Paracanthopterygii as a provocative hypothesis that demands careful consideration—rather than dismissal—in the light of morphological evidence. Through a mapping exercise using published characters, they find traits potentially supporting the reconstituted Paracanthopterygii and more restricted clades. It is clear that their molecular phylogeny demands considerable morphological homoplasy. Unfortunately, the added 'cost' of this tree shape is not clear because an exclusively morphological solution indicating the minimum number of anatomical changes is lacking. Similar patterns are recovered by a companion chapter by the same authors (Borden et al., 2013), which mines the paracanthopterygian caudal fin skeleton and associated musculature for additional characters. There is much to build on here, with these studies opening the door to more comprehensive examination of molecular and morphological character sets in light of one another, something that has only been applied sparingly to the many vexing questions of acanthomorph systematics (e.g., Wiley et al., 2000; Friedman, 2012; Chanet et al., 2013).

MF5 goes for just south of \$300 at today's exchange rates, so hard copies are destined to remain something of a rarity on office and library shelves. This is a great shame, given the outstanding production quality of the book, which is typical of volumes produced by Pfeil. However, I am happy to report that the lofty pricetag of MF5 is not a barrier to its contents: all but two chapters are available for free download in .pdf format from the publisher's website (<http://www.pfeil-verlag.de/ef1.html>). I would strongly encourage all of those interested in fishes—Mesozoic and otherwise—to browse through these contributions. As has been written of earlier volumes in the series (Britz, 2010), there is something here for everyone.

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