Book Reviews

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Source: Copeia, 2014(4):762-775. 2014.
Published By: The American Society of Ichthyologists and Herpetologists
DOI: http://dx.doi.org/10.1643/OT-14-144
URL: http://www.bioone.org/doi/full/10.1643/OT-14-144

BOOK REVIEWS

Copeia 2014, No. 4, 762–775

A Checklist of North American Amphibians and Reptiles: The United States and Canada. Volume 1–Amphibians[1]. M. J. Fouquette, Jr. and A. Dubois. 2014. Self-published through Xlibris LLC print-on-demand. ISBN 9781493170340. 613 p. $34.99 (hardcover).—Although I am an unrepentant bibliophile, I don't usually look forward to reading taxonomic checklists. They often serve primarily to promote the particular taxonomic opinions of a limited set of authors, and people who produce checklists are often trying to promote a particular agenda. No one is required to follow these opinions, and many practicing biologists are more inclined to follow taxonomic changes when they are supported by peer-reviewed research in the primary scientific literature, rather than merely listed in a self-published checklist. But after seeing the coauthorship of this latest taxonomic checklist of North American amphibians, my curiosity was piqued. The senior author, M. J. Fouquette, has devoted his professional life to understanding the species status, isolating mechanisms, and biology of North American frogs. He has published a number of important and groundbreaking analyses on frog biology, and few people would describe him as a taxonomic rebel. In contrast, the junior author, Alain Dubois, is well known for his extensive coining of new taxonomic terminology and his iconoclastic approach to both taxonomy and nomenclature. What, I wondered, would a collaboration of these two very different individuals produce?

When I started studying herpetology in the 1970s, the field of taxonomy (the science of grouping and organizing biological taxa) was in a state of change. Oddly, though, nomenclature (the names of biological taxa) was relatively stable, especially for species names. Although taxonomists argued about the best criteria for recognizing higher taxa, nearly everyone seemed to recognize the benefits of making as few changes as possible in the binomial names used for species. Changes in species names were made conservatively—only when existing names were positively misleading about current biological understanding, or when they were necessitated by the International Code of Zoological Nomenclature (ICZN) rules of nomenclature. Today, however, the relative stability within the fields of taxonomy and nomenclature in herpetology has reversed. There is now almost universal agreement that we should base the recognition of taxa on phylogenetic relationships, and virtually no one argues against the principal that supraspecific taxa should be monophyletic groups on the Tree of Life. Simultaneously, though, nomenclature (at least in the field of herpetology) is in a state of chaos (as discussed by Hillis, 2007; Pauly et al., 2009). Many taxonomists seem to want to recognize ever-smaller monophyletic groups as genera and families, thus throwing the nomenclature of the world's amphibians into constant flux. Perfectly acceptable, monophyletic genera are split into smaller and smaller genera, thus changing the binomials of most of the species, and the meaning of established generic names, faster than any reasonable biologist could follow. This instability degrades the usefulness of scientific binomials to the point that many biologists prefer to simply use the more stable common names. In some groups, many species are now placed in monotypic genera, thus largely eliminating any unique information content of the generic names (see also Spinks and Shaffer, 2009). Such rapid and unnecessary changing of scientific names, and of the meaning of the remaining names, serves little purpose other than the self-indulgence of people who like to create new names. Communication about the Tree of Life, and of biodiversity in general, has suffered dearly as result.

How have Fouquette and Dubois handled this chaotic situation? I'll start with the good news. This checklist presents a mostly sensible, reasonable, and useful list of the binomial names of the species of North American (north of Mexico) amphibians. With a few exceptions, the binomial combinations preferred by these authors are refreshingly conservative. I use ''conservative'' here in the literal sense, meaning that the authors usually have followed traditional, widespread usage of species names. For the most part, they have only split traditional genera when there is good evidence that the putative taxon is not monophyletic. For example, they recognize a traditional genus *Bufo*, rather than splitting this taxon up into many smaller genera, and they follow Pauly et al. (2004, 2009) in using subgenera to recognize the various major species groups of *Bufo*. This system makes considerable sense. Under this system, the most familiar name (*Bufo*) does not change its traditional meaning, and the binomials of the many species within *Bufo* do not need to change, either. The vast literature on the species of *Bufo* thus retains its usefulness and ease of access, and no one has to learn new names for all the species. At the same time, the subgeneric names are available for those who wish to refer to smaller species groups within this well-known genus. All the names still apply to long-recognized monophyletic groups. This reasonable approach maximizes phylogenetic information content while retaining well-used and long-established names. The only people who object are those who just wish to create new names or new combinations for their own sake.

Fouquette and Dubois make extensive use of subgenera in other groups as well, but often with less effectiveness than they do with *Bufo*. For example, they change the meaning of *Lithobates* as a subgenus of *Rana*, using it to refer to a questionably monophyletic and very poorly supported group of eastern and southern species of *Rana* (following Frost et al.'s [2006] use of *Lithobates* as a genus). Virtually all of the support for this questionable clade comes from mitochondrial DNA, whereas nuclear DNA, immunological studies, and morphology argue against it (Hillis and Wilcox,

 DOI: 10.1643/OT-14-144

[1] Note added in press: This review was finalized on 30 May 2014. As the review went to press, I learned the very sad news that M. J. (Jack) Fouquette, Jr. passed away on 28 August 2014. As my review notes, Jack Fouquette had a long and productive career, and he had a huge positive influence on the field of herpetology. His many important contributions on the biology of North American frogs will have a lasting influence. Although we occasionally disagreed over our respective points of view on some minor scientific issues, I always had great respect for Jack and his contributions to science. I first corresponded with Jack as an undergraduate, and he was helpful and supportive to me throughout my career. He will be dearly missed, not only by me, but by a legion of friends, former students, and colleagues.

2005). At the same time, Fouquette and Dubois acknowledge the extremely well-supported species groups within North American *Rana* that are biologically quite distinctive. Unfortunately, they use informal names for these distinctive groups, such as the *palmipes* group, the *catesbeiana* group, the *tarahumarae* group, the *pipiens* group, etc. A more reasonable approach (as taken by the online checklist AmphibiaWeb.org) is to simply follow the primary literature on *Rana* and treat these distinctive groups as subgenera (some of which were even named as subgenera by Dubois!). Instead, they treat a group with weak and conflicting support as a subgenus, creating dozens of new name combinations in the process. Why would most biologists even need to refer to this questionable group (subgenus *Lithobates*, as treated by Fouquette and Dubois)? Wouldn't it make much more sense to treat the biologically distinctive species groups as subgenera within *Rana*, as suggested in the peer-reviewed literature (Hillis and Wilcox, 2005; Hillis, 2007; Pauly et al., 2009)? Why add to the confusion of names by changing the meaning of the subgenus *Lithobates*, which has a clear phylogenetic definition that ties it to the *Rana palmipes* group? Moreover, is a privately published, non-peer-reviewed book that includes no data or analyses the place to make novel taxonomic and nomenclatural changes?

Unfortunately, Fouquette and Dubois also use many other subgenera in novel ways that seem certain to cause taxonomic confusion. A good example is their use of the subgenus *Typhlomolge*. This taxon name has been applied consistently in the literature to a group of morphologically and biologically distinct troglobytic species (*Eurycea rathbuni, E. robusta*, and *E. waterlooensis*), either as a subgenus or as a genus. The only exception was the brief inclusion by a few authors of *E. tridentifera* (another cave form) in this group (e.g., Wake, 1966; Brame, 1967). However, once it was demonstrated that the morphological similarities of *E. tridentifera* were clearly a case of morphological convergence (Hillis et al., 2001; Wiens et al., 2003), the use of the name *Typhlomolge* (as a subgenus in the aforementioned sense) has been entirely stable and consistent. What reason, then, could Fouquette and Dubois have to completely change the meaning and content of this taxon name, especially with no new data or data analysis? Is it reasonable to lump not only the highly divergent subgenera *Typhlomolge*, *Blepsimolge*, and *Septentriomolge*, but also the even more distantly related non-paedomorphic species *E. chamberlaini* and *E. quadridigitata*, thus creating a completely new application of the name *Typhlomolge*? North American biologists have considerable need to refer to the traditional subgenus *Typhlomolge*, but very little need to refer to the group called *Typhlomolge* by Fouquette and Dubois. Moreover, it confuses the existing literature on the distinctive morphology and biology of *Typhlomolge*, none of which applies to species like *E. chamberlaini*. Nothing in the ICZN requires this change, and the change is not based on new phylogenetic information. Changes like this do not serve the needs of practicing biologists, nor do they follow conventions or even common sense.

Fouquette and Dubois chose to disregard recommendations in the primary literature in making many other taxonomic changes as well. Just among North American frogs, they create over 80 new combinations of names. They describe a number of new subgenera and new higher taxa (including a new epifamily, see below), all without presenting new data or analyses. They also select weakly supported phylogenetic results from the primary literature and turn them into additional taxonomic changes. For example, Bonett et al. (2014) reported weak but conflicting support for a closer relationship between *Pseudotriton montanus* and species of *Gyrinophilus,* as compared to *P. montanus* and *P. ruber*, the only other member of *Pseudotriton*. Bonett et al. (2014) noted that the evidence linking *P. montanus* and *Gyrinophilus* was not statistically significant, and further noted that concatenated analyses of multiple nuclear and mitochondrial genes supported the monophyly of *Pseudotriton*. As a result, Bonett et al. (2014) did not recommend a generic change for *P. montanus*. However, Fouquette and Dubois transfer *P. montanus* into *Gyrinophilus*, citing the study by Bonett et al. (2014; although the citation for this reference lists the wrong year, no journal volume, and the wrong page numbers). It is possible that future analyses will support this taxonomic change, but clearly Bonett et al. (2014) considered it to be inappropriate and premature. A checklist is no place to counter such sensibilities.

Fouquette and Dubois argue that theirs is the first taxonomic checklist of North American amphibians since Schmidt (1953), and even describe their book as the seventh edition of Schmidt's checklist. They justify this by noting that other checklists that have appeared since then have either been more geographically inclusive (i.e., worldwide rather than regional), or have been available online rather than in print, or have not included extensive taxonomic synonymies. Most of these seem to be rather trivial points of distinction. Moreover, I found the synonymies of Fouquette and Dubois particularly hard to use, highly selective and inconsistent in the citation of the use of taxon names, and surprisingly incomplete. Fouquette and Dubois also use abbreviations of the unorthodox terminology of Dubois (2005) in the synonymies, which means that most users will have to repeatedly refer to the list of defined abbreviations (p. 30–32). For example, type localities are denoted using the abbreviation ''OT.'' This is an abbreviation for ''onymotope,'' which Dubois prefers to the standard name ''type locality,'' as used in the ICZN and by virtually every other taxonomist. Type species are indicated by the abbreviation ''NS,'' an abbreviation of Dubois's preferred term ''nucleospecies.'' Some abbreviations (e.g., ''NF'') are never defined. A few abbreviations are less confusing: ''H'' can reasonably stand for both the standard ''holotype'' or Dubois's preferred term ''holophoront.'' Nonetheless, I had to constantly look back to the beginning of the book to see what the abbreviations in the synonymies meant—not a very user-friendly feature.

The book gets even stranger when it comes to the higher taxonomy of amphibians. Fouquette and Dubois use obscure names or create new names for many groups. I doubt many herpetologists will have heard of names like Imperfectibranchia or Pseudosauria, nearly unused since the early 1800s. They are much more likely to use and recognize names such as Cryptobranchoidea and Salamandroidea, which is how most biologists refer to the same groups. Fouquette and Dubois make name changes based on unnecessarily imposing new ranks on established higher taxa, such as a new epifamily Eleutherodactyloidia for the unranked taxon named Terrarana by Hedges et al. (2008). Such esoteric and unnecessary changes are counter to clear communication about the Tree of Life.

Who should buy this book? On one hand, I think it presents one of the more reasonable recent lists of binomial species names for North American amphibians. As a result, perhaps some herpetologists will feel more comfortable using these sensible binomials because they appear in a recent checklist. On the other hand, almost everything else about the book (the higher taxonomy, some of the

subgeneric names, the taxonomic terminology, all the new names and name combinations) will likely produce more confusion than clarity. There appears to have been no copy editing of the book, as typos and inconsistencies are rampant. Much of the relevant taxonomic literature for North American amphibians is never cited, and some of the references that are included contain incorrect bibliographic information. As a result, this book will be used primarily by people who assemble taxonomic synonymies, because Fouquette and Dubois create so many new names and name combinations. I would be happy to see more people adopt the conservative use of binomials suggested by Fouquette and Dubois, but this is such an idiosyncratic book that I doubt it will be widely used. It would have been much more successful if the authors had simply reported on the current taxonomic status and controversies of North American amphibians in the primary literature, and refrained from introducing so many new names, unfamiliar and unnecessary terms, and unsupported taxonomic changes. As Fouquette and coauthor Kenneth Williams plan a companion volume on North American reptiles, I hope they will consider this alternative approach.

ACKNOWLEDGMENTS

I thank D. Cannatella, R. Espinoza, H. Greene, and D. Wake for useful discussions of this book and helpful comments on this review.

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The Complete *Oophaga pumilio*. Biology • Ecology • Captive Husbandry. F. Steinmann and C. van der Lingen. Edition Chimaira. ISBN 9783899734355. 220 p. €39.80 (approximately $54.00) (hardcover).—The Strawberry Poison Frog (*Oophaga pumilio*) is one of smallest and the most variable vertebrates on Earth. The variability mainly refers to the astonishing color polymorphism among, and in some cases, within populations, particularly along the Caribbean coast of Panamá on the islands and the mainland of the Bocas del Toro region. It is this diversity in color and pattern, in combination with the conspicuousness of most morphs and their complex reproductive behavior that has attracted the interest of terrarium keepers primarily in North America and Europe. Also, more recently an increasing number of students and scientists became aware of the incredible opportunity to study within-species diversity and its underlying evolutionary forces.

This book focuses on the biology, ecology, and captive husbandry of these amazing frogs. The book is organized into 12 main sections. The first sections provide detailed descriptions of the natural habitats (mostly secondary and primary rain forests, nature-like plantations), morphology, and phenotypic variation. This includes an overview of nearly 30 color morphs depicted in about 120 color photos of frogs ranging from bright red, orange, blue, yellow, green, or purple, and with and without a variety of patterns. There is also a section that tackles the question ''Why is this frog so colorful?,'' which has intrigued scientists for decades. That no clear answer to this questions has emerged is reflected in the text, which struggles with the different hypotheses for explaining color variation in these frogs: while some studies have suggested female preferences for local males driving the evolution of color diversity (e.g., Summers et al., 1999), others found evidence for selection for either more conspicuous or more cryptic strategies among populations, including

color, behavior, and toxicity (Saporito et al., 2007; Pröhl and Ostrowski, 2011; Maan and Cummings, 2012). The text concerning these topics is somewhat unclear and contradictory at times, reflecting the puzzling and, as yet, unresolved evolutionary origins and maintenance of this extreme phenotypic diversity. The answer might just be that drift and selective forces like preferences for sexual traits or predation pressure vary among populations and across the geographic range and have differently affected the evolution of coloration at different places and times.

The next section, Evolution and Phylogeny, presents an overview of the two genetic lineages, northern and southern, which have recently been characterized with molecular methods (Hagemann and Pröhl, 2007; Wang and Shaffer, 2008; Hauswaldt et al., 2011). Linking the molecular data to the geographic distribution of color morphs shows that color variability is low in the northern group (northern Costa Rica) where frogs are all dorsally red, but high in the southern populations (Panamá) where we find aforementioned color diversity. Interestingly, several other species of *Oophagas* (*O. arborea* and *O. speciosa*) included in the molecular analyses clustered either with the northern or southern group of *O. pumilio*, suggesting that speciation is in progress among these taxa.

The most important and longest part of the book, however, is the section on captive husbandry. It starts with cautionary notes for would-be hobbyists about what to know before acquiring poison frogs for a terrarium. It makes clear that keeping poison frogs is a time-, expense-, and space-intensive activity, which should be considered from ethical perspectives as well. Serious ethical issues to keep in mind include keeping wild animals in artificial environments, higher resource consumption (energy use), the problem of illegal export and import of wild-caught animals, and the risk of infection. Information about legal aspects and conservation status (Strawberry Poison Frogs are listed in Appendix II of CITES) is also given.

The next subsection of the book provides useful information about how to design and construct an optimal poison frog terrarium. Such enclosures differ from standard terraria by containing a false bottom, which is necessary for drainage, a rain system, and tropical plants for creating microhabitats with an optimal climate. Technical details are included on illumination, heating, and creating an automated rain system to maintain humidity. Special attention is given to furnishing the terrarium. Foremost, the authors stress accounting for the well-being of the frogs, and secondarily they encourage the creativity of the hobbyist for designing a natural and highly aesthetic terrarium.

The next subsection provides an overview of food and feeder animals and where to purchase or collect them, or how to breed them, followed by a section on frog reproduction, including parental care. The resources needed by the frogs for these activities include leaves for spawning and water-filled leaf axils (e.g., those of bromeliads) for raising the tadpoles. The authors also mention that these frogs have large home ranges in their natural habitats and the territorial and aggressive behavior of both sexes. Struggles for dominance make it impossible to keep more than one male, and possibly more than one female, per enclosure. The subordinate animal would suffer from limited feeding opportunities and permanent stress, so they recommend keeping these frogs in pairs only.

After some information about potential frog diseases and skin toxins, the book finishes with a section about the Panama *Pumilio* Protection Project established by Chris van der Lingen on the islands of Bocas del Toro in Panamá. There, some color morphs are endangered by habitat destruction caused by rapid and unsustainable development of tourism projects and so-called ''frog farms.'' Another serious risk is the expansion of agroindustrial areas for fuel production, which have recently expanded dramatically in Central America, while the usage of biocides directly accounts for massive amphibian declines. Chris van der Lingen set up the information center *Bocasranario*, where locals and tourists can learn about these beautiful frogs, and he also started scientific projects with students to support conservation activities. Simultaneously, he engaged in the battle against the above-mentioned frog farms, which apparently—instead of breeding frogs—illegally caught hundreds of wild *O. pumilio* for export into the US and Europe. Sadly, van der Lingen died suddenly in 2011, so the frog farms keep running and illegal frogs are still sold for high profits at US, German, and other European frog markets.

I like the book. It is well written, the content is presented in a logical sequence, and plenty of photos of colorful frogs and additional illustrations of tropical rain forest terraria and accessories (e.g., components of rain system or decorative plants) make it aesthetically pleasing. It is definitely worth its price. I feel that two aspects of this book make it particularly valuable and significant. The first is that the authors are well informed about the ecology and natural behavior of the frogs and integrate this knowledge into their creations of terrarium life, thereby reducing health problems and stress to the frogs. The second is that the authors repeatedly warn against irresponsible and ecologically unsustainable use or manipulation of the frogs and decorative objects in the terrarium. As noted above, illegal poaching and smuggling of Strawberry Poison Frogs might deplete entire populations, especially the rarer morphs. Moreover, the authors inform the reader about the negative ecological consequences of using natural products like the Xaxim Tree Fern (*Dicksonia sellowiana*) to cover the bottom of the terrarium, as well as other decorative objects made from tropical trees, mangrove, or savanna wood. Excessive use of these materials is often directly connected to the destruction of natural habitats. As an alternative, they propose hobbyists create artificial structures out of Styrofoam or well-dried hardwoods from native forests.

The book is principally directed toward terrarium keepers specialized on dendrobatid frogs. However it also contains beneficial information for all students of Strawberry Poison Frogs because it addresses many different aspects of their biology and because many studies require professional captive husbandry of the frogs. In fact, while writing this review my students and I are establishing several terraria with pairs of Strawberry Poison Frogs in our laboratory. Toward that goal, we are taking advantage of all the wonderful and long-term experiences that Steinmann has gathered in keeping dendrobatids.

Certainly, Strawberry Poison Frogs and their relatives exhibit incredible peculiarities that demonstrate evolution in action, making them fascinating for scientists and terrarium keepers alike. Hope remains that both groups can support each other to study and help *O. pumilio* and other frog species survive in the wild. As emphasized by the authors, conservation of their natural habitats and strict controls of illegal transport and trade are the main challenges in this regard.

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Amphibian Conservation: Global Evidence for the Effects of Interventions. R. K. Smith and W. J. Sutherland. 2014. Pelagic Publishing. ISBN 9781907807855. 255 p. $48.99 (paperback).—In addition to paperback and hardback versions, this book is available in ePub, Mobi, pdf versions, and in the online open access journal *Conservation Evidence*. This book is the fifth in a series that summarizes evidence from the scientific literature regarding the effects of conservation interventions on biodiversity (previously reviewed were: Birds, Bats, Bees, and Farmland). Dr. Smith is a postdoc at the University of Cambridge, with expertise in the conservation of mammals. Dr. Sutherland is a Professor of Conservation Biology, also at Cambridge, where he specializes in birds and conservation planning.

The book begins with six pages briefly describing the methods the authors used to identify and locate published studies, and to systematically quantify their results. The authors summarize evidence for nine threats (Residential and Commercial Development, Agriculture, Energy Production and Mining, Transportation and Service Corridors, Human Disturbances, Habitat Modification, Invasive Species, Pollution, and Climate Change) and four solutions (Habitat Protection, Habitat Restoration, Species Management, and Education and Outreach). All topics are focused on practical hands-on actions; the book does not reference any modeling studies, does not address policy efforts, and does not discuss ethical considerations. The book would have benefited from a summary chapter that gave an overview of success for each topic and taxonomic group. Skimming through the extensive examples, I concluded that we have had inconsistent results in our interventions to conserve amphibians, despite varied approaches in numerous systems. It was sobering to realize that even habitat protection efforts—considered as close to a sure thing as we get in conservation—are often not assessed, and are only partially successful.

To demonstrate how the book is organized, I summarize the chytridiomycosis abatement strategies, listed under the Invasive Species section. This section included 11 actions that attempted to reduce chytridiomycosis: two reducing geographic spread, three reducing amount of *Bd* in the environment, and six reducing infection load on amphibians. The authors provided (a) a short overview, (b) a statement of reported successes, (c) a brief background summary, (d) a few pages of text describing each article's findings, and (e) references. It would have been nice if the authors included some sort of gap analysis identifying actions that have not been tested. I thought readers would have benefited if the authors provided details on the original causes of declines, what kind of effort went into finding unreported and unpublished failures, and whether interventions were designed to address those original threats or were only able to assess net changes. It would also be helpful if the authors discussed whether effective interventions would likely work for other species or in other areas. As in most cases in conservation biology, the devil is in the details, and because many of the details are not included, it's hard to assess the assessment.

A good example of the importance of details is the section on Species Management. In this section, two approaches are described: translocations and *ex-situ* conservation (e.g., captive breeding, rearing, and releases). Translocations are organized by taxonomic group (i.e., frogs, toads, salamanders), which shows the incredibly small number of such studies and the bias toward three species: Wood Frogs (*Lithobates sylvaticus*), Natterjack Toads (*Epidalea calamita*), and Great Crested Newts (*Triturus cristatus*). Success was qualified by the type of persistence, the length of persistence, and the percent of attempts that persisted for some amount of time; only one study mentioned that a population was self-sustaining. The authors use the original study to define success rather than adopting a universal definition. Consequently, projects that they identify as successful may not actually result in self-sustaining populations. Sections on captive breeding and release are also organized into sections on frogs, toads, and salamanders, with most studies conducted on three other species: midwife toads (*Alytes* spp.), harlequin frogs (*Atelopus* spp.), and Green and Golden Bell Frogs (*Litoria aurea*). Here's where I'd want to know what the original threats were that led to captive breeding and also what has been done, but not published. For example, in the case of the harlequin frogs, we know they are in captivity because of chytridiomycosis, but the book does not mention this. Do they breed in captivity? Yes! Is it a success? Well, maybe. We don't really know how many species of *Atelopus* were brought in to create captive assurance colonies but failed and were never reported in the literature, or even the degree to which the facility tried to establish large captive populations. We also don't know why they failed; there are many practical reasons why organizations do not even attempt to breed their frogs (limited space, time, funding, interest). Negative results, details on causes of failure (lack of knowledge, resources, patience, policies), and what the stated objectives of holding captive assurance colonies were are what we need to determine effectiveness. The details of how we define success are critical to assessing the efficacy of our conservation efforts, and those details are glossed over here.

In terms of mechanics, the writing is simple, straightforward, and factual, but not especially engaging, as it avoids

any personal ideas or synthesis statements, focusing instead on reproducing the original information. I found few errors in the sections I read, and the presentation was balanced and uncontroversial. The layout is not especially attractive as the book completely lacks images, graphics, tables, figures, and color. The book also uses small fonts, and many styles and formats of headings and subheadings, but without figures or tables to break up the text, I found it easy to get lost. A more serious complaint is the lack of a combined literature cited for the whole book.

This book and online journal will be excellent resources for those looking to get up to speed on what actions have been attempted to conserve amphibians and the outcomes of those efforts. It will be a valuable guide for graduate students interested in evaluating evidence for effective amphibian conservation, and is sure to generate new approaches, critical analyses, and discussions. The free online version makes this especially valuable for conservation practitioners and students from all countries, and should facilitate real-time updates as new studies are published. More than anything, this book reveals the surprisingly large number of species, regions, and threats that have yet to be tested, the need for critical assessment and discussion of ''success,'' and a realization of how much work we have to do.

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Ecology of Australian Temperate Reefs: The Unique South. Scoresby A. Shepherd and Graham J. Edgar (Eds.). 2014. CSIRO Publishing. Collingwood, Australia. ISBN 978-1486300099. 520 p. $128.95 (hard cover).—The lion's share of attention paid to reefs in Australia has been focused on tropical reefs. And, while the Great Barrier Reef is invariably what most people think about when mentioning reefs in Australia, the country holds a rich, albeit cooler counterpart along her southern shores. These southern reefs are rich in productivity and biodiversity, and due to their proximity to the majority of the citizens of Australia, they face a unique suite of conservation threats. Shepard and Edgar's *Ecology of Australian Temperate Reefs* updates Andrews's (2001) *Under Southern Seas,* and in doing so provides scientists and resource managers interested in cool water reefs a thorough and excellently written resource. The text provides a wealth of information across broad phylogenetic and ecological topics and will be incredibly useful to those whose work or interests lie in these unique ecosystems.

The book approaches the southern reefs from a synthetic approach providing a rich and comprehensive evaluation of the region. It provides a thorough explanation of the geologic, physical, and planetary forces, which have created the unique southern reef systems. The organismal chapters are presented in a broadly trophic structure, with individual taxa presented phylogenetically. The synthesis chapters at the end zoom further out and present a broad overview that gets at the heart of management issues.

I found the first three chapters of this book, which cover the geology, physical and chemical oceanography, and historical biogeography of the region, to provide a strong opening. The current iteration of life on Earth we observe now is the culmination of millennia of forces, and this book takes pains to show the relationship between process and biotic distributions. The chapters are detailed but clearly written. The text is not bogged down in jargon or specifics and through the judicious use of tables and figures a comprehensive narrative emerges.

Chapters 4–15 work their way through the major taxonomic groups of plants and invertebrate animals that inhabit cool rocky reefs. The coverage is fairly broad and even, with chapters starting with Algae and working their way through Crustacea. In each chapter there is a general overview of major trends as well as nicely illustrated case studies outlining the autecology of representative groups. The chapters draw widely from studies of ecology, biogeography, and fisheries biology so that the reader understands how the species got there, how they interact with each other, and how they are commercially important.

In Chapters 16–18 we are introduced to marine vertebrates, although the organization of coverage changes from broadly phylogenetic to more ecological, with the authors choosing to arrange information trophically. Thus, Chapter 16 does not start with Elasmobranchii, but rather focuses on bottom-feeding fishes. The quality of the information presented is still extraordinarily high and readers looking for information on individual families are directed to the clearly delineated index.

The book ends with chapters on food webs and conservation. These later chapters revisit the themes made in the preceding chapters, drawing together multiple examples in a fashion that is synthetic not redundant. The conservation chapter is largely focused on marine protected areas, with little emphasis on gear or catch limits as tools. I found the conversations about protected areas were nuanced and in no means cursory.

No book can be 'all things to all people' and this book clearly has a very specific focus. The examples are almost exclusively from the region and the book is unapologetic about its geographically narrow focus. This specificity of focus is both a strength and a weakness to this text. The strengths lie in the exhaustive coverage of the biology, ecology, and biogeography of the region, providing a single reference text that allows the reader to obtain a true understanding of the natural history of the area. The weakness is that this arrangement limits the potential audience for this book. While researchers working in other temperate rocky reefs may find this book useful for comparisons, the text itself does not try to make those comparisons itself.

For example, any book on temperate reef ecology should deal with trophic cascades, and this one is no exception. Most books fall back on the classic work of Estes and Duggins (1995) and others, and subsequently the sea otters, sea urchins, and kelp triumvirate predominates many of our texts. In this book, however, the story of top-down community regulation instead takes a decidedly antipodal approach and instead evokes rock lobsters preying on urchins and abalone, whose increases in turn lead to an increase in macroalgae cover; moreover, this is put in a conservation context when viewed through the lens of lobster fisheries in Australia. I personally found these southern views refreshing as they provided alternative looks at community ecology; however, scientists or managers focusing on California's rocky shores, for example, may find this book too narrowly focused for it to be a regular reference for their work.

In order to provide context for individual natural history observations, as well as to tell the entire story of a region's biogeography, fisheries importance, and management, it is important to present a text that is truly synthetic and focuses on the natural history of a region. Roughly

two-thirds of Australia's population lies within 50 km of temperate coastal ecosystems (Australian Bureau of Statistics, http://abs.gov.au/Ausstats/abs@.nsf/Previousproducts/1301.0Feature%20Article32004). Because of this, both the threats to and benefits from healthy temperate reefs are tangible to millions of Australians. This book provides a well-written, synthetic guide to the science and management that will be necessary to protect the reefs of Southern Australia in the 21st century.

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Biology of Butterflyfishes. M. S. Pratchett, M. L. Berumen and B. G. Kapoor (Eds.). 2014. CRC Press, ISBN 978-1-4665-8289-7. 352 p. including 14 color plates. $99.95 (hardcover).—Butterflyfishes are conspicuous, brightly colored, and charismatic fishes that are important components of coral reef communities worldwide. Many species are monogamous, making their social behavior quite intriguing. They depend, to differing degrees, on coral as a food source, which makes their roles in the trophic structure of reefs of critical importance. These characteristics are also the factors that threaten their survival. Citing a paper by Lawton et al. (2011), the concluding chapter of this book offers a disturbing statement about the fate of butterflyfishes—" . . . coral-feeding butterflyfishes may be among the first species of reef fishes that go extinct due to global climate change, or alternatively may provide important insights into the mechanisms that prevent global extinctions despite increasing incidence of large-scale disturbances." Hoping that the latter is the case (while there are indications that the former is a distinct possibility), this book covers a range of topics that present a valuable portrait of this important group of coral reef fishes.

This edited volume is composed of 13 chapters by 23 different authors; nine of the 13 chapters are authored or co-authored by Pratchett and/or Berumen. They cover topics ranging from evolutionary origins and diversification (Chapter 1) and biogeography (Chapter 4) to functional morphology (Chapter 2), feeding biology and ecology and the relationship to coral diversity (Chapters 5, 6). Chapter 7 is a unique contribution in that it takes the perspective of the corals on the topic of corallivory. Other chapters deal with sociality and reproductive biology (Chapters 8, 13), occurrence and patterns of hybridization (Chapter 3), susceptibility to habitat disturbance (Chapter 9), and the role of butterflyfishes as "canaries" for reef health (Chapter 10). Two chapters review the demand for butterflyfishes and the harvesting of butterflyfishes for the global aquarium industry (Chapter 11), and best practices and limitations for their captive care and breeding (Chapter 12). A concluding chapter provides a perspective on major issues in butterflyfish biology and ecology with respect to emerging research topics and includes a brief treatment of chaetodontid larval biology and ecology (Chapter 13). Most of the chapters provide a comprehensive review of the literature, which in many cases includes a conceptual context for the material covered. In addition, several of the chapters provide new contributions, novel conceptual frameworks, or meta-analyses, which all make important contributions to the literature.

Despite the broad coverage of the chapters and their value for our collective understanding of these fishes, there are several points that need to be made about mistakes, omissions, and lost opportunities in this volume. First, the distinction within the Chaetodontidae of butterflyfishes (*Chaetodon, Prognathodes*) versus bannerfishes (the other eight chaetodontid genera) is defined well in Chapter 1, but in subsequent chapters, the term "butterflyfishes" is used without reference as to whether it refers to chaetodontids more generally or to butterflyfishes more specifically, which is confusing. Second, the first three chapters of the book present different phylogenies in their discussions of origins and diversification (Chapter 1), functional morphology (Chapter 2), and hybridization (Chapter 3). This makes it difficult for a chaetodontid novice to identify a starting point for the study of their diversity, and it also suggests that a stable hypothesis of relationships has not yet been constructed. In Chapter 1, phylogenies using morphological characters are dismissed in favor of molecular phylogenies, which dismantle long accepted sub-generic designations in *Chaetodon*. Tissue-level variations in the laterophysic connection and swim bladder are correlated with placement within those subgenera (Webb and Smith, 2000; Smith et al., 2003), but these phenotypes were not considered in the discussion of phylogeny. Regardless of which phylogenetic approach is favored, the Chaetodontidae provides the opportunity for discussion of the contrasts between morphological and molecular phylogenies, but this was not discussed.

With respect to coverage, discussions of the morphology and functional morphology of these fishes deal with easily observable external (but not internal) morphology, and with the feeding, locomotory, and social behaviors of these fishes. The omission of other aspects of their behavior or physiology is unfortunate, but perhaps this is due to limitations of the literature. Chapter 1 states that bannerfishes demonstrate variation in external morphology, but "what the [butterflyfishes] lack in phenotypic diversity they make up for in species diversity" (p. 12). The authors provide no evidence for how this generalization is supported. Interestingly, in Clade 3 (within *Chaetodon*), it is stated that there is little change in morphology with a shift to corallivory. However, the point that with corallivory comes territoriality, which requires different behaviors and demands responses to difference sensory stimuli, deserves more discussion (a short treatment of this topic is in Chapter 13).

The fact that hybridization among chaetodontids is not rare (Chapter 3) was a surprise, especially given the prevalence of monogamy (and paired spawning, see Chapter 8) and the presumed dependence on color pattern (and color vision) for mate recognition. One might ask how such "mistakes" are made at a behavioral level. The literature review provided indicates that hybridization is more prevalent in hybrid zones, with abundance disparities, environmental gradients, habitat disruption, and due to the introduction of species. This strongly suggests that the

frequency of hybridization will increase with ongoing global change, which is problematic for the future of butterflyfishes and for coral reefs on which they have such a major impact. The fact that hybridization is most common in Clade 4 of *Chaetodon* and is less frequent among obligate coral feeders in Clade 3 (which demonstrate territoriality, aggression, and strong monogamy) suggests that there is something about behavior (and underlying sensory capabilities) that allows interactions leading to hybridization among the non-obligate corallivores. A more thorough discussion of sensory and behavioral mechanisms promoting and preventing hybridization would have been a welcome addition.

With respect to accuracy and integration among chapters, it should be noted that Chapter 2 (in particular) includes factual errors concerning the function and functional differentiation of the ear and lateral line systems and the morphological variation in the swim bladder with respect to the laterophysic connection (pp. 23–25). This may be obvious due to this reviewer's familiarity with this material, but it is a problem, nevertheless. Whereas sensory biology (with reference to ear and lateral line system only) is briefly considered in this chapter, this topic is not integrated into any of the discussions of social or feeding behavior. Furthermore, the sensory bases for mate recognition (presumed to be visual) and predator avoidance (especially in obligate corallivorous species) are not considered. Integration of the proximate and ultimate aspects of these fundamental behaviors would have likely provided new insights into their evolution and ecological relevance, so this omission is a missed opportunity.

Finally, the chapter on captive care and breeding (Chapter 12) seems to be out of synch with the other chapters—it is the demand for butterflyfishes in the global pet trade that is one of the pressures that threatens their long-term survival. However, the other side of the argument is that the use of best practices to attempt to breed chaetodontids in captivity and to maintain them in aquaria to expose the public to these fishes will hopefully continue to generate enthusiasm for their protection and for that of coral reef habitats.

In general, this volume is a welcome addition to the list of similar volumes that treat particular taxa from a variety of perspectives. The combination of reviews, and the presentation of new conceptual frameworks and data syntheses will be useful to students and professionals interested in chaetodontids, coral reef fishes, and the ecology and evolution of fishes more generally. However, the lack of integration among chapters represents a lost opportunity, which is not uncommon among some edited volumes.

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North American Amphibians: Distribution and Diversity. D. M. Green, L. A. Weir, G. S. Casper, and M. J. Lannoo. 2013. University of California Press. ISBN 9780520266728. 340 p. $75.00 (hardcover).—This is a compact summary of the distribution and status of 293 species of salamanders and anurans in North America north of Mexico. The authors state that they set out to plot dot maps against a shaded relief map of North America to demonstrate, in a way that cannot easily be done with a map in a field guide, how the topography of the continent can shape the distribution of species. Aside from the maps, the biology of each taxon is presented in one-page species accounts that are mostly derived from more extensive accounts (Green, 1997; Lannoo, 2005). Unlike these previous books, however, the new effort includes a color photograph for all but one species. Each species account and range map is on its own page, which sometimes results in large areas of white space (no information). Families, genera, and then species accounts are sorted alphabetically. Thus, the user has to know which species occur in his/her geographic area of interest and what family to check, or flip through many pages for a best match.

Given the goals of the authors, I focus my review on the maps. The dot distribution maps in the USA are centroids of county occurrence (with subdivisions of large counties in the West) and, for Canada, stated to be (p. 318) " . . . grid cell of 3500 square meters, designed to be roughly comparable to US counties." However, these cells are likely an area of 3500 km^2, which would be 60 km on a side, or an order of magnitude larger than indicated. Some of the distribution maps could be merged or grouped. For example, Stebbins (2003) shows the ranges of 19 species of slender salamanders (*Batrachoseps* sp.) in one figure of California. This single map displays allopatric distributions and relative locations over a large area. Because of their small body size and concealing coloration of brown or black, most slender salamanders cannot be told apart without the use of a dissecting microscope or genetic analyses. Thus, the location of these endemics, and species with similarly restricted and non-overlapping ranges, would be more informative.

Perhaps more importantly given the focus of this book, it is difficult to understand the complex distributions of species groups or identify regional pockets of high species richness from single-page accounts each with its own range map. Examples include the allopatric ranges of slimy salamanders (*Plethodon glutinosus* group) with 16+ species in the eastern US and the endemic cavern and blind salamanders (*Eurycea* sp.) with 13 species in the hill country of central Texas. There is a map that summarizes species richness on a continental scale (p. 12), but frogs and toads are more prevalent in lowlands, whereas salamanders tend to have more species in montane areas; yet, such biologically informative differences are not evident. Other biogeographic considerations and diversity topics are limited to a few pages of discussion in the introductory chapter. There is a short but helpful section on how the maps were developed and some cautionary statements on their use. There is an index, but the reader has to jump from the scientific name to the common name to find a page number. Material appears to be up to date. There are few errors, but two

species of *Necturus* were incorrectly placed in the family Plethodontidae.

Conservation status is mentioned in the accounts for most taxa in the form of a sentence or two on Federal or State listing status. There is no mention of status in IUCN rankings. A table would have been a more efficient way to display this information because there are few amphibians on these lists. For information such as identification keys, diagnostic features, and natural history, regional field guides or recent tomes such as those for salamanders (Petranka, 1998) or frogs (Dodd, 2013) of North America should be consulted.

I found myself using *North American Amphibians* for a quick check on the distribution of several species, and it may serve well as a handy desk reference for distributional information. Some may purchase this book in hopes of having a field guide, which it is not. Biologists who have a firm grasp of species identification and taxonomy can use it as a handy overview of distributions. Nonspecialists may struggle to find a particular species they are interested in learning more about. I recommend that potential buyers first examine a copy (e.g., at a book store) to be sure this volume fits their needs.

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Collecting and Preserving Genetic Material for Herpetological Research. T. Gamble. 2014. Society for the Study of Amphibians and Reptiles, Herpetological Circular No. 41. ISBN 9780916984885. 50 p. $11.00 (soft cover).—Sampling, preserving, and storing genetic material has become routine in many subdisciplines of herpetological research, yet a one-stop resource for how to best perform these methods has been lacking. As such, most beginning investigators have to learn and refine their techniques from mentors, peers, or through personal experience, sometimes with painful lessons. This fine little guide aims to summarize the currently accepted best practices for sampling, preserving, and storing herpetological genetic material. As noted by the author, the guide complements Simmons's (2002) *Herpetological Collecting and Collections Management* by providing more and up-to-date detail in collecting and storing tissues. Although some of the methods are specific to herpetology, such as skin swabbing for the amphibian chytrid fungus *Batrachochytrium dendrobatidis* (*Bd*) or using autotomized tails of salamanders, lizards, and snakes as tissue samples, most of the methods covered in the guide are also applicable to other vertebrate taxa. The author achieved his aim to write the guide at a level appropriate for those with a basic background in biology, including advanced undergraduates and graduate students, professional scientists, and wildlife resource managers.

The brief Introduction rightly points out that the field of herpetology has been at the forefront of using molecular genetic tools in biological research. Collectors should appreciate the author's plea to properly preserve and store tissue samples, as an enormous amount of effort and money may have gone into obtaining these samples, many of which are irreplaceable owing to population declines and extinctions. In this era of online museum collection databases, when one can search for and request to use a tissue sample in only minutes, it is easy to forget that weeks or more of effort, thousands of dollars, and personal sacrifices by the collector may have gone into getting that sample from the field to the collection freezer. In addition to the effort, cost, and irreplaceability, I would add that we have an ethical responsibility to properly care for and maximize the utility of these samples after, in most cases, having euthanized the animals for this purpose.

Chapter 1 asks why we need to collect genetic material. Some parts are redundant with the Introduction, such as how molecular data have revolutionized biology, including herpetology, and these should probably have been combined. The author identifies and discusses three emerging research trends in herpetology that are rapidly increasing the amount of available genetic data and the number of studied individuals. These are genomics, the study of amphibian pathogens such as *Bd*, and species identification with DNA barcodes such as the mitochondrial cytochrome c oxidase subunit 1 (COI) gene. The author did not mention the generation of large, multilocus datasets for resolving evolutionary relationships (e.g., Frost et al., 2006) or delimiting species (e.g., Leaché and Fujita, 2010). He makes an important point that field herpetologists should consider opportunistically sampling genetic material other than the taxa that he or she may currently be studying. When permitted to do so, this is particularly important when encountering species that are difficult to find, such as fossorial species, or when working in geographic areas that are difficult to access for logistical or political reasons. After all, one never knows how useful these opportunistic samples may become to future researchers.

My favorite part of this chapter is Box 1, which asks if DNA can be obtained from fluid preserved museum specimens of amphibians and reptiles. Based on my experience (e.g., Stuart et al., 2006), I agree that it is sometimes possible to obtain useable, but usually degraded and fragmented, DNA from formalin-fixed specimens or specimens that have been stored in ethanol at near room temperature for a long period of time. I also agree with the author that these successes, including very recent and exciting advances using next generation sequencing technology, do not justify neglecting newly collected tissues because degraded DNA can be rescued later. I will add that the process of extracting and amplifying degraded DNA from fluid-preserved museum specimens is prone to contamination by exogenous DNA, and that these efforts need to be undertaken with the same precautions as required in ancient DNA protocols. I usually recommend only trying to extract DNA from fluid museum specimens when no other options exist, such as the when the species has gone extinct. The effort and cost to obtain fresh samples, even if very challenging, will often still be lower than if working with formalin-fixed samples, and of course, the yield and quality of DNA will be much higher.

Chapter 2 provides an overview of the science of preserving genetic material. Unfortunately, this chapter occupies less than one page in length, and the content is redundant with Chapters 3 and 4, making it unnecessary.

Chapter 3 describes sources and methods for collecting genetic material from amphibians and reptiles. The chapter title is ''Methods for Collecting and Preserving Genetic Material,'' but sample preservation is actually covered in Chapter 4. In a brief section on permits and ethics, an important point is made that genetic material sampled from wildlife may also be regulated by wildlife laws, as it is technically a part of the animal, even if a voucher specimen is not taken. A few years ago, I queried a law enforcement officer of the U.S. Fish and Wildlife Service and was told then that even amplified DNA (PCR product) of protected species is regulated in the same manner as the animal itself, as technically a very small portion of the PCR product consists of the original, sampled DNA. Thus, I concur with the author that caution is warranted with permitting of genetic samples, and that this discussion on permits is relevant to readers of the guide. In a brief section on humane euthanasia, the only new information for experienced collectors might be intracoelomic injection of tricaine methanesulfonate (MS-222) in reptiles.

Most collectors and curators of genetic material have experienced the heartbreak of encountering a tissue tube with the identification information lost due to smudging of the writing, ethanol dissolving ink, an adhesive label falling off, or a myriad of other reasons. The greatest methodological variation among researchers who handle samples of genetic material may be in how tubes are labeled, and so I read this section with great interest. The author was thorough here, and covered all of the labeling methods that I am aware of, although there are undoubtedly others. I appreciated his recommendation to include an internal tube label as insurance against losing the external label. The author promotes VWR lab markers (VWR International, Radnor, PA) as being ethanol resistant, but I would urge users to first test any marker on multiple surfaces of the tube while also rubbing ethanol onto the writing. Be aware that even if a tube contains a non-solvent preservative, such as a high-salt solution, other tubes housed adjacent to it in a genetic resources collection might contain ethanol that spills. I agree with the author that etching an identification number onto the outside of the tube with an engraving drill, diamond-tipped pen, or, in my preference, a very heavy gauge hypodermic needle, may be the only way to ensure long-term identification.

There are some gems of information in a section on sampling tissues from specimens. For example, the author cautions against breaking the gall bladder when sampling liver tissue, which is commonly used, as the bile contains nucleases that degrade DNA and RNA. This leaves me to wonder how much bile nuclease I have detrimentally introduced into my tissue samples over the years. The author gives the important, but often neglected, recommendations of cutting tissue into small fragments so that preservative fluid can fully permeate the material, and ensuring that the ratio of tissue to preservative fluid in a tube is not too high. I will add that a secondary benefit of mincing the tissue at the time of sampling is that it enables one to later rapidly retrieve only the small amount of tissue that is needed for an extraction or tissue loan, without having to handle (and potentially contaminate) the remainder of the sample.

Non-lethal sources of genetic material of amphibians and reptiles are also reviewed, including buccal and cloacal swabs, blood, biopsies, tail and toe clips, shed skin, and some rather novel sources such as dried snake venom and mosquito blood meals. Missing here is mention of handling samples for the rapidly emerging field of environmental DNA analysis (e.g., Thomsen et al., 2012). The author briefly reviews how sources of genetic material described above also enable the study of DNA of the sampled animal's pathogens and parasites. Figure 7 illustrates a live treefrog having its skin swabbed, but unfortunately shows the frog being swabbed on its dorsolateral surface rather than on the ventral surface, as recommended in the *Bd* sampling protocol in Box 3. (Also, a spacing error places the title of Box 3 against the box outline, and there are problems with word wrapping in three lines of the second footnote.) The final section of this chapter, and Box 4, are devoted to sampling tissues of amphibians and reptiles for the purpose of initiating tissue cultures. The author uses tissue cultures in his research on the evolution of lizard sex chromosomes, and some potentially helpful tips based on the author's personal experience are provided in Box 4.

Chapter 4 covers preservation, storage, and transportation of genetic material. The take-home message of this chapter is the colder the storage temperature, the better, even for samples that are in fluid preservative. The author suggests that cryopreservation (flash freezing) in liquid nitrogen is the best method for preserving genetic material, but rightly recognizes the difficulties in finding liquid nitrogen in the field and transporting samples preserved in liquid nitrogen. Tissues are more commonly preserved in fluid preservatives, and these can also serve as backup to flash-frozen tissues in case the liquid nitrogen supply becomes exhausted (such as delays in customs during transportation) or a freezer fails. Ethanol (95–100%) is regularly used to preserve genetic material, but I have wondered why this is still the case when, as pointed out by the author, ethanol poses noteworthy challenges to both collectors and curators. These include the need to replace the ethanol a day or two after preserving the tissue because water extracted from the tissue will dilute the ethanol concentration, difficulties in purchasing full-strength ethanol in many countries, and shipping regulations resulting from ethanol being considered a hazardous (flammable) material. In my experience, ethanol can evaporate from cryovials with internally threaded caps and a silicone gasket. Fortunately, the author provides alternative fluid preservatives to consider, including high-salt solutions such as RNAlater (Life Technologies, Grand Island, NY) and salt-saturated DMSO/EDTA solution. Useful and up-to-date suggestions for packing and shipping tissue samples are also given. Finally, the author identifies real challenges that museum tissue collections face that differ from traditional museum collections. These include the difficulty in maintaining a link between tissues, vouchered specimens, and published DNA sequences, and the fact that tissues are consumed when they are used, making them finite resources.

The Literature Cited accounts for more than a quarter (28%) of the length of the guide, but is thorough and worth the space. The author assembled numerous useful references that support the methods presented in the guide. I was unaware of many of the references until reading the guide, and am keen to track them down.

My primary criticism of this short guide is that it should be made available in electronic format, such as pdf, rather than only in hardcopy. The text length is not longer than that of many scientific journal articles. Availability only in hard copy seems rather non-progressive for a book in such a

modern and rapidly advancing field. Perhaps the publisher will consider also distributing it electronically. On a more positive note, the short text length keeps the guide small and lightweight, and easily transportable into the field. I hope this useful guide is only the first of more editions to come. Future editions might be even better served as an online resource, such as the list of standard symbolic codes for institutional resource collections in herpetology and ichthyology that evolved from hardcopy published in *Copeia* (Leviton et al., 1985) to a regularly updated Internet version (Sabaj Pérez, 2014). Readers will find places where the methods can be supplemented or improved based on their personal experiences or new publications, and online availability would allow the resource to be easily updated. After all, this science has not been around long enough to know for certain which methods will best preserve genetic material in the long term, and the sooner that challenges can be remedied, the better for all.

In conclusion, this guide provides a fine summary of current best practices for sampling, preserving, and storing genetic material of amphibians and reptiles. The redundant text, errors, and missing points identified above are relatively minor, and do not seriously detract from the guide. Beginners and non-beginners alike should read this guide, as I suspect even the most experienced collectors and curators of genetic resources will find useful information contained within it. The low cost of the guide makes it readily accessible, even to students. Hopefully, a future electronic version will make it even more readily available. Properly preserved and curated genetic samples benefit us all, and future researchers, and the author should be commended for providing this service to the herpetological community.

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Medical Care of Turtles and Tortoises—Diagnosis • Surgery • Pathology • Parasitology. J. Hnízdo and N. Pantchev (Eds.). 2011. Edition Chimaira. ISBN 9783899734935. 559 p. €128.00 (approximately $173.50) (hardcover).—*Medical Care of Turtles and Tortoises* is the first new book on the veterinary care of turtles and tortoises since McArthur et al.'s (2004) *Medicine and Surgery of Tortoises and Turtles*. The new book was originally published in Czech, later translated into German, and is now available in English (translation by Donald W. Stremme). The book's eight chapters cover anatomy and physiology, biology and husbandry, general medicine, parasites, medication administration, anesthesia and surgery, turtle diseases, and an appendix. Contributors with expertise in their respective field have authored each section. This new title provides a good starting point for any veterinarian or herpetologist beginning to work on tortoises and turtles. It delivers short and concise sections that are useful for quick reference and everyday use. The book's primary focus is on freshwater and terrestrial chelonians, and even brings in examples and pictures of rare species; however, it does not include any specific sections on sea turtles. Fortunately, comparable information is available on sea turtles (e.g., Wyneken et al., 2013; and chapters in Mader, 2005).

The first chapter covers anatomy and physiology and provides brief descriptions of each organ system with color pictures and black-and-white illustrations. The intent of this chapter is to review the differences between chelonians and other reptiles. This section focuses on gross anatomy. More in-depth descriptions of chelonian gross and microscopic anatomy are beyond the scope of this book. Each subsection has basic physiological mechanisms integrated into the anatomical descriptions, such as blood flow through the heart; however, the only section to focus specifically on physiology is dedicated to body temperature. This section briefly reviews behavioral thermoregulation and how species have adapted to specific temperature requirements; however, this section would benefit from a more in-depth discussion of the different thermoregulatory strategies employed by chelonians to exchange heat.

One of the highlights of this text is the second chapter, which reviews the general biology and husbandry of turtles. Topics covered in this chapter include chelonian evolution, taxonomy, biology, keeping turtles, hibernation/brumation, and protecting turtles. The taxonomy section within this chapter covers each family and the genera included within each family, in addition a detailed description of anatomical variations among families, family-specific characteristics, life-history traits, and biogeography are provided. Understanding species-specific traits is beneficial when treating a diversity of species. The section about keeping turtles covers the basic husbandry requirements of captive chelonians, but does not delve into the specifics of each species.

The third and longest chapter in the book is dedicated to general chelonian medicine. It spans subjects from nutrition, physical examination, advanced imaging, diagnostics, and laboratory testing, to necropsy and histopathology. In the clinical nutrition section, different genera are grouped by their dietary preferences, which will serve as a quick reference for anyone working with an unfamiliar species. Later in the chapter, the authors break down the main sources of energy for herbivorous and carnivorous species, including a section on supplementation; however, the authors are hesitant to endorse any specific products. The physical examination section is very systematic in its approach, evaluating the animal by body systems. The advanced imaging section primarily focuses on radiography and endoscopy; additional information on ultrasound, computed tomography, and magnetic resonance imaging would have been helpful. The radiographic images used in the text are quite useful; however, the ultrasound images were too small to appreciate any significant detail, and the text surrounding each image was too small to read, making it a distraction. Despite the ultrasound section being photographically the weakest section of this book, there are good pictures showing proper placement of ultrasound probes.

The fourth chapter focuses on chelonian parasitology, which we found to be excellent. Eighty-six pages provide a thorough discussion of turtle parasites. Each parasite covered has an extensive description, including the causative agent, clinical signs, diagnosis, and treatment. The photographs accompanying the description of each parasite (at both gross and microscopic levels) will aid any clinician, veterinary technician, or herpetologist in identifying parasites in turtles and tortoises. The photographs and descriptions within this chapter alone make this book worth owning because parasites are such a common cause of morbidity in chelonians.

Chapter five is brief, only covering the different methods to administer medications. One section is devoted to the topic of euthanasia, and some professionals will disagree with some of the statements made by the authors. For example, they state freezing small turtles or tortoises is an acceptable means of euthanasia. According to the American Veterinary Medical Association's Guidelines for the Euthanasia of Animals (Leary et al., 2013), hypothermia is considered inappropriate unless performed as a rapid-freeze procedure (i.e., via liquid nitrogen) on small (<4 g) reptiles or amphibians. This technique is not mentioned in the book.

Chapter six covers the topics of anesthesia and surgery. Overall, this section is brief and could be expanded by providing specific anesthetic drug protocols and dosages. The analgesic section offers only broad statements regarding pain and the efficacy of pain medications in turtles and tortoises. The author does not refer to several controversial pain studies (e.g., Sladky et al., 2007). At the end of this chapter the author describes his preferred anesthetic protocol for chelonians as a quick reliable reference. The surgical section briefly covers simple and more complex procedures, such as the approach to the coelomic cavity, phallus amputation, cloacal reduction, and shell fractures. The author provides several intraoperative images of a ventral plastronotomy, in addition to a good description of the technique. The author also mentions a plastron wedge osteotomy approach to the esophagus, trachea, and larger blood vessels; however, he does not describe the technique in much detail, which would have been useful for nascent surgeons. Treatment of traumatic injuries is well covered with sections on both long bone fractures and shell fractures, and the author takes into consideration the anatomical variations that alter therapy. Within the shell fracture section, the author does a good job of describing some of the techniques used for fracture reduction, and also covers the different techniques and devices used for external coaptation.

Chapter seven systematically goes through each body system, anatomically dividing each system (i.e., upper vs. lower airway for respiratory disease), and describes selected diseases. The specific details of each disease are described; however, most of the diseases are grouped by body system. Each section covers etiologic agents, history, clinical signs, diagnosis, and treatment for quick reference. The formulary within the appendix appears to be reasonably accurate; however, each drug that is listed is not accompanied by a reference. At least one error does exist within the listing: the authors list sucralfate as a therapeutic for euthanasia, although it is generally used to treat gastrointestinal ulcers. Some doses are listed in ml or IU without consideration of the patient's body mass. No mention is made of any pharmacokinetic studies previously performed in chelonians.

Despite being the most recent book published within the veterinary literature specifically on chelonian medicine, this text includes many of the references that will be familiar to reptile veterinarians (e.g., Girling and Raiti, 2004; McArthur et al., 2004; Mader, 2005; Jacobson, 2007; Mader and Divers, 2014, although the latter was not available to the authors of the book under review at the time of publication). Although this book does not introduce many novel ideas to turtle and tortoise veterinary medicine, it does provide a good basic amalgamation of well-known references of the veterinary literature, and selected material is published for the first time in English. So while it serves as a solid basic introduction for those beginning to work on chelonians, it does not provide the extensive detail a reptile veterinarian would need to be considered a specialist. The flow of the book is logical and appropriate for an introductory veterinary medicine text, although readers may have different opinions concerning which topics should be included where. For example, the endoscopy section could have been included in either the surgery section or the advanced imaging section. Likewise, many statements could be questioned, although they may be the preferred methods or personal observations of the authors, who are experienced reptile clinicians. There are many excellent pictures that will help novice herpetoculturists or veterinarians evaluate an animal based on its clinical presentation; however, more thorough descriptions in the picture captions would enhance their utility. Occasional typographical and formatting errors are present, including ''pene'' being used rather than ''penis'' and ''*Enteroccus*'' rather than ''*Enterococcus*.'' Herpetologist or researchers working with chelonians may find this publication to be invaluable when determining which techniques to use to accomplish their goals as they write proposals and design experiments. Veterinarians who treat chelonians should consider purchasing this book; however, if they own one of the other reptile veterinary medicine texts cited above, this book is not a necessary addition to their library.

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Les Urodèles du Monde, 2e Édition. J. Raffaëlli. 2013. Penclen Édition. ISBN 9782952824613. 480 p. €80 (approximately $110; available from the author: jean.raffaelli@laposte.net) (hardcover).—This impressive book has its origin in a simple, small handbook by Robert Thorn (1968). Years later, Raffaëlli joined Thorn in a revision (Thorn and Raffaëlli, 2000). Next, Raffaëlli (2007) extended the concept by producing the first edition of the book reviewed here. That book received little notice and few reviews, and gave the impression of being hurriedly written, but it was the first modern book to include all species of salamanders in the world. Now Raffaëlli has produced an updated, much expanded, and very useful second edition. This attractively produced book, written completely in French, is well bound and printed on high-quality, glossy paper. It was self-published and should be evaluated not for its scientific value, but for its interest and utility.

Raffaëlli is a well-known French journalist and his journalistic approach is evident in this book. The emphasis is on communication rather than adherence to some idealistic model of presentation. The author is widely known in the herpetocultural community, and the species accounts often contain information about husbandry. The overall approach is informal, yet it is effective.

Introductory sections of the book include prefaces of the first (by Robert Thorn) and second (by Alain Dubois) editions, general information about the presentation and the background for taxonomy, information on declines, and an account of salamander origins. There is an 11-page section on maintaining salamanders in captivity, including many photos, and featuring friends and leaders in salamander herpetoculture (all European). Following a remembrance of Robert Thorn (who died in 2012 at age 87), the main section of the book begins. A colorful chart displays the taxonomy of salamanders that is followed in the book. This is heavily influenced by Alain Dubois, whose nomenclatural studies are not well known to North American herpetologists. Following Dubois, Urodela rather than Caudata is used for the name of the order (for a fully referenced discussion of the controversy, see Frost, 2014). Suborders are Ichthyoidea (everything except sirens) and Meantes. Infraorders, superfamilies, epifamilies, subfamilies, tribes, subtribes, and infratribes (in addition, in the text, subgenera) are used; many of the names will be unfamiliar to North American readers. Ten families are recognized. Accounts are given for all families, tribes, genera, subgenera (and occasionally for subtribes and superspecies), but the bulk of the book is the species accounts.

There are accounts for 850 species and subspecies (at the time of this writing AmphibiaWeb [amphibiaweb.org] recognizes 665 species, but does not list subspecies), starting with Sirenidae. General descriptive and informative comments are given for each order, suborder, and family, and more abbreviated comments for each genus. Comments on maintenance in captivity may apply to families, species, or subspecies. The taxonomy represents almost the extreme of splitting. In addition to the named taxa, many forms are discussed as currently unnamed or to-be-named species. For example, while AmphibiaWeb and Raffaëlli both recognize 32 species of *Hynobius*, Raffaëlli also refers to three undescribed Korean species, suggests that *H. peropus* be recognized from within *H. tokyoensis*, and suggests that there are two undescribed species within *H. stejnegeri*; he discusses them all. North American readers will find some surprises in the taxonomy. *Necturus lodingi* (usually synonymized with *N. punctatus*) and *N. louisianensis* (usually considered a subspecies of *N. maculosus*) are recognized as full species, as are *Pseudotriton diasticus* and *P. flavissimus* (both usually treated as subspecies of *P. montanus*), and *Siren netting* and *S. texana* (usually treated as subspecies of *S. intermedia*, or not recognized at all). *Desmognathus melianus* and *D. aureatus* are treated as full species, both resurrected from synonymy with *D. marmoratus*.

Nearly all species are represented in color photographs, but there are also photos depicting habitats, people, and miscellaneous other subjects (more than 1500 in all), as well as occasional figures taken from published papers. The full color maps (138) merit special comment. All species are mapped. The colors of the topography and the pastel range maps sometimes are so close as to make it difficult to discriminate; yellow tones are especially difficult for me. The ranges of many species often are shown on a single map; one map of *Plethodon* includes 16 species in 16 different colors. This example is not especially unusual. Not only are subspecies mapped, but all candidate species and even clades of populations within species are mapped. This is the only book I know that maps so many salamander ranges. Some of the maps are too small to be useful, but most are fine.

The book concludes with a two-page glossary, a very useful bibliography, and an index of scientific names. The last is essential for effective use of the book, because the treatment of taxa is unusual. The author has arranged the taxa phylogenetically by perceived closeness of relationship, which makes the book a little difficult to use, even by someone like me, who has been responsible for generating many of the unidentified phylogenetic hypotheses that were used.

This is a book that anyone interested in salamanders should own. It is filled with information, much of it based on personal field experiences of the author, and there are

many suggestions for research and predictions concerning taxonomy. While one might quibble with his liberal splitting of some taxa, the treatment has the advantage of being all inclusive. The author made the text of species accounts from the first edition freely available to the public on AmphibiaWeb, and text from the second edition will soon be posted on the site.

Jean Raffaëlli has performed a great service to the entire community of herpetologists by producing this inviting, informative, and up-to-date book. He promises to maintain its currency by sending regular updates to those who purchase the book. In fact, I already have the first printed sheet containing a few small corrections and a full color map with one addition. This is more than a book—it is a project.

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Amphibian Biology, Volume 11 Part 3: Status of Conservation and Decline of Amphibians: Eastern Hemisphere: Western Europe. H. Heatwole and J. W. Wilkinson (Eds.). 2013. Pelagic Publishing, ISBN 9781907807527. 108 p. £59.99 (approximately $103.00) (softcover).—The worldwide decline of amphibians is a matter of fact that has been reported and described in hundreds of scientific publications. The causes of the declines are many and complex. For this reason it is important to get a general overview of the conservation status and measures taken to mitigate the decline of this important group of animals. To achieve this knowledge, one could start by reading this volume of *Amphibian Biology*, edited by the eminent biologists Harold Heatwole and John W. Wilkinson. This volume summarizes the information on amphibian decline issues in Western Europe. The volume opens with the list of contributors (30) and eight sections follow. The first section summarizes infectious diseases that may threaten Europe's amphibians, and is followed by seven sections documenting country-specific declines and conservation issues for amphibians in Ireland, Britain, The Netherlands, Belgium, France, Spain, and Portugal.

The experts who contributed to this volume condense, into 108 pages, the vast information essential to obtain a general idea of the extent of amphibian declines and how to deal with the thorny issue of conservation. The first contribution in particular, which is on infectious diseases, was written by authors whose skills range from zoological to medical science. It provides, in 41 pages, a comprehensive summary of the pathogens that threaten Western European amphibians: viruses, bacteria, fungi, oomycetes, mesomycetozoeans, protozoans, and metazoans and their relative subcategories. In this section alone, more than 300 articles concerning amphibian pathology, ecology, biology, and environmentally related issues are summarized from the literature.

The subsequent contributions are devoted to amphibian declines and conservation in the Western European countries noted above. These articles, although not always consistent in content (e.g., not all contributions provide a homogeneous annotated list of species), typically include a short introduction to the country's geography, a brief history of local herpetological studies, useful information on amphibian legal protection and conservation status, threats and monitoring activity, as well as country-specific rates of declines. A detailed index is also given.

For these reasons, I strongly recommend adding this volume to your collection of the previously published books in the series, which are essential for those who wish to update their knowledge on the biology of amphibians.

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