

BOOK REVIEWS

Copeia, 2001(3), pp. 878–887
© 2001 by the American Society of
Ichthyologists and Herpetologists

THE CICHLID FISHES: NATURE'S GRAND EXPERIMENT IN EVOLUTION. George W. Barlow. 2000. Perseus Publishing, Cambridge, Massachusetts. ISBN 0-7382-0376-9. 351 p. \$28 (hardbound).—As a basic introduction to the “evolutionary celebrities” of the family Cichlidae, Barlow's book is compelling. It is hard to imagine that anyone who makes it through these richly illustrated 268 pages of text could come away from that reading without a profound sense of wonder at the mind-boggling versatility of these fishes. The exceptional taxonomic diversity of the family, possibly accounting for as much as 15% of all ray-finned fishes, coupled with some intricate morphological specializations and a stunningly complex behavioral repertoire, has elevated the family to the status of an evolutionary icon. Barlow does a grand job of introducing the uninitiated to the delights of the Cichlidae, already long familiar to “cichlidiots” around the globe.

George Barlow's outstanding academic career spans the past 50 years, and his ground breaking contributions to our understanding of cichlid behavior have earned him a hallowed place in the pantheon of “cichlidophiles.” His book is long awaited, and it proves to be an interesting hybrid; written perhaps primarily with the advanced cichlid hobbyist in mind, it has much to commend it to the broad biological community also. The pitch of the book is geared for lay readers, and an appropriately leveled glossary of scientific terms is provided. For the scientific audience, a substantial bibliography citing a full 600 research articles is appended. Although this bibliography is clearly skewed toward the recent ethological literature, there are some surprising omissions in other areas. For example, a recent synthesis by Galis and Metz (1998), which poses the central question, “Why are there so many cichlid species?” and whose conclusion runs directly counter to Barlow's, is missed. The absence of a recent summary by Kornfield and Smith (2000) is more readily explained and undoubtedly the result of its coincident publication date.

Presumably in an attempt to cut down on the book's length, reference to all citations is numerical by chapter. However, the result is a bit clumsy, and it is surprisingly irritating having to

repeatedly check which chapter you are in, before paging through the numerical guide to citations, and finally locating the cited article in the list of references at the back of the book.

Similarly unfortunate is the unremittingly folksy style that Barlow adopts throughout much of the book. Chapter titles like “Oh Yeah? Put Up Your Fins!,” “Mating Gets Personal,” or “Beauty Is Only Fin Deep,” presumably contrived to induce levity, rapidly had the converse effect on this reviewer. But these are minor quibbles and detract only marginally from the enjoyment value of the book.

After providing a general introduction and placement of the family within a broad framework of teleostean classification (soft vs spiny rays), aspects of trophic morphology and the renowned feeding diversification of the family are very nicely summarized. However, it is in the following chapters that the real focus of Barlow's interest and expertise is revealed. Coming through on his stated aim to “tell the story of how one family of fishes evolved the highest level of parental care known for any kind of fish—a level of care that rivals that found in birds and mammals and other animals we think of as good parents.” Barlow peppers the following eight chapters with a wealth of anecdotes and accounts of numerous experiments and behavioral studies geared at interpreting the sometimes bewildering body of data that has accumulated on these fishes. As an aside, in the preface to this work, Barlow notes that in the past 10 years BIOSIS lists some 3213 articles on cichlids! Perhaps not surprisingly given Barlow's years of work in the area, the great bulk of the book is devoted to an exploration of cichlid reproductive biology and the behavioral strategies exhibited in trumps by members of this singular family. He does a very good job, and as a result this book will become an invaluable text for students from all fields with an interest in fish behavior and reproductive biology.

The penultimate chapter of Barlow's book entitled “Cichlid Factories” is something of a disappointment although, as with so much of the book, it is replete with fascinating examples of the evolutionary exuberance so characteristic of cichlid fishes. In seeking to explain the possible mechanisms underlying the truly remarkable radiations of cichlid species particularly, although far from exclusively, in the large lakes of the African interior, Barlow adds little to the ideas expressed by his eminent forebears Fryer

and Iles (1972) in their classic treatment of the subject. His answer to the question, "Why are there so many cichlid species?" reflects the classical view in which speciation is always allopatric and is essentially a by-product of fidelity to patchy (micro)habitats resulting in localized differentiation into "unique gene pools." This answer differs from that of Galis and Metz (1998) for example, who draw heavily on the recent work of Seehausen and his colleagues (e.g., Seehausen et al., 1997, 1999; Seehausen and Alphen, 1998) in championing the potential importance of sympatric speciation accelerated by sexual selection as the motor for at least some cichlid speciation. Barlow disagrees, and that's fine, but the jury is still out.

"Fish at Risk," the final chapter deals with the depressing topic of endangerment and threats to freshwater biodiversity in general and to cichlids in particular. The irony of the fact that one of the greatest scourges to native communities in tropical freshwaters globally, introduced species, is exemplified perhaps most starkly by those icons of aquaculture, the tilapias or "aquatic chickens," should not be lost on readers. Despite their African origins, tilapias are now ubiquitous throughout the tropical freshwaters of the globe. Worldwide feral tilapias have probably caused the extirpation of more native species than any of the other exotics now legion in the world's freshwaters. Yet, it is also from within the ranks of the Cichlidae that one of the most profound examples of vertebrate species loss in the modern era is to be found. This loss is recounted in the sad tale of the decline of cichlid biodiversity of Lake Victoria, East Africa. And it is with a poignant accounting of that cautionary disaster that Barlow ends his thought-provoking and stimulating book. Although this may be something of a "downer" note to end with, Barlow's perspective is sound. Sadly I must agree that it really is most appropriate to end a discourse on what truly is one of the model groups for evolutionary study with a strong message of caution for their future in this increasingly human-dominated world.

LITERATURE CITED

- FRYER, G., AND T. D. ILES. 1972. The Cichlid fishes of the Great Lakes of Africa: their biology and evolution. Oliver and Boyd, Edinburgh, Scotland.
- GALIS, F., AND J. A. J. METZ. 1998. Why are there so many cichlid species? Trends Ecol. Evol. 13:1-2.
- KORNFIELD, I., AND P. F. SMITH. 2000. African cichlid fishes: model systems for evolutionary biology. Annu. Rev. Ecol. Syst. 31:163-196.
- SEEHAUSEN, O., AND J. J. M. V. ALPHEN. 1998. The effect of male coloration on female mate choice in

closely related Lake Victoria cichlids (*Haplochromis nyererei* complex). Behav. Ecol. Sociobiol. 42:1-8.

_____, _____, AND F. WITTE. 1997. Cichlid fish diversity threatened by eutrophication that curbs sexual selection. Science 227:1808-1811.

_____, _____, AND _____. 1999. Can ancient colour polymorphisms explain why some cichlid lineages speciate rapidly under disruptive sexual selection? Belg. J. Zool. 129:43-60.

MELANIE L. J. STIASSNY, *Department of Ichthyology, Division of Vertebrate Zoology, American Museum of Natural History, New York, New York 10024; E-mail: mljs@amnh.org.*

AMPHIBIANS AND REPTILES OF TEXAS. 2d ed. James R. Dixon. 2000. Texas A&M University Press, College Station, Texas. 421 p. ISBN 0-89096-920-5. \$39.95 (cloth), \$24.95 (paper).

TEXAS SNAKES. John E. Werler and James R. Dixon. 2000. University of Texas Press, Austin, Texas. 519 p. ISBN 0-0-292-79130-5. \$49.95 (cloth).—Even if I had been unaware of these two authors' long history of interest in Texas reptiles and amphibians, it would be evident from these books. These obviously are labors of love. James Dixon's revised edition of *Amphibians and Reptiles of Texas* is a massive gathering of information on the occurrence of these animals in a state with a rich herpetofauna. Although he may have started the effort as an updating of Raun and Gehlbach's 1972 listing of the Texas herpetological literature, it truly has become his publication. It now includes records from over 150 years for the 219 species of amphibians and reptiles found in Texas. The distribution maps for each include both expected statewide occurrence and county records, which allows for very quick determination of the importance of any specimen a collector might encounter. The species accounts numerically list the references in the Literature Cited section that deal with that particular species. Those citations are extraordinarily useful to one seriously interested in quickly learning the literature for an individual species. Dixon's comments at the end of each account, although short, provide useful information on changes he has observed over time, as well as other aspects of the biology and conservation of Texas amphibians and reptiles.

This compendium of literature, although very useful to researchers, will be less appealing to typical wildlife lovers. General readers also may be disappointed to find that only the rarer species of the state are illustrated and even then

only in black and white. In both regards, they will be very happy with the book on Texas snakes reviewed below. Serious students will be pleased with this book's very workable dichotomous key for the amphibians and reptiles encountered in Texas. Still, my current perception is that those willing to work through taxonomic keys are rarer than the endangered species they are hoping to find. The understanding of some of the characters and the patience required to determine the identity of a species unknown to them will likely limit much of the use of the key to professional biologists. The generic key for amphibian larva contributed by John Malone is very user friendly but nevertheless will be most useful to serious herpetologists.

The more visually attractive *Texas Snakes: Identification, Distribution and Natural History* by John E. Werler and James R. Dixon is much more likely to be picked up by amateur herpetologists perusing books in a bookstore. James Dixon is the junior author of this book, but his assembly of the massive amount of information on 109 species and subspecies was critical to its completion. However, it was the undaunted dedication of John Werler that kept the project moving. I first remember hearing about his efforts to put this volume together when I came to Texas over 20 years ago. In the preface, I learned the idea actually originated in the late 1940s. I am certain that he did not expect the continual input of new and revised distributional, taxonomic, and natural history information of this large and diverse fauna that occurred in subsequent years. The result of the collaboration of these two authors was worth the wait and is something of which both authors can be very proud. It is a success both in the beauty of the photography and appeal of the locality maps as well as the synthesis of so much valuable information on each species.

Texas Snakes is written primarily for the novice or amateur naturalist, and that audience will love such touches as the photographs of aberrant specimens. In addition, they will also enjoy the discussion of behavior, habitat, feeding, and reproduction of each species, as drawn from the knowledge of these two experts. However, the authors also draw upon the scientific literature to support their conclusions, and that integration of information will be valuable to professional herpetologists. In particular, researchers can readily ascertain the areas of study on snakes in Texas that are needed. I recommend this book to both groups not just because I love these animals myself but because of the wonderful job these authors did in presenting them to a broad audience. I also hope it will inspire

those Texans who do not love snakes to, at least, join in my fascination with them.

LITERATURE CITED

RAUN, G. G., AND F. R. GEHLBACH. 1972. Amphibians and reptiles in Texas. Dallas Museum of Natural History Bull. 2. Dallas, TX.

NEIL B. FORD, *Department of Biology, University of Texas at Tyler, Tyler, Texas 75701; E-mail: nford@mail.uttyl.edu.*

TROPICAL ESTUARINE FISHES—ECOLOGY, EXPLOITATION AND CONSERVATION. Stephen J. M. Blaber. 2000. Blackwell Science Ltd., Osney Mead, Oxford OX2 0EL, U.K. Distributed in the United States by Iowa State University Press. ISBN 0-632-05655-X. 372 p. \$128.95 (hardcover).—This book, the seventh volume in Blackwell's *Fish and Aquatic Resources Series* (series editor, Tony J. Pitcher), provides a summary of recent and historical literature on the assemblages, life history, ecology, exploitation, and conservation of tropical estuarine fishes. Covered in great detail are the subjects in the title, with numerous examples from estuarine systems in a variety of geographic areas, using a wide range of fish taxa. The same species and estuaries are used as examples in a number of chapters, allowing the reader to become acquainted with entities that might otherwise be unfamiliar. Extensive taxonomic, geographic, and subject indices are provided to assist the reader.

This review is quite timely, because traditional subsistence fisheries are rapidly expanding as a result of human population growth in developing tropical countries, and habitat destruction is increasing. Consequently, nontraditional management measures such as marine reserves are being considered to manage habitats and species assemblages subject to exploitation. The Blackwell Series purpose is to provide peer-reviewed texts on multidisciplinary approaches in applied science with the intent of finding commonality in the diversity of species and life histories that can be used to develop concepts and strategies to reconcile conservation and extractive uses of natural resources. The author states that the book should be useful to biologists, fisheries scientists, managers, planners, conservationists, and all concerned with the fate of estuaries. He succeeds in reviewing existing data to find common concepts that can be used in conservation and management, and he high-

lights areas where additional research is needed. The intended audience is well served.

Blaber presents an expansive literature review of the diversity of tropical estuarine fishes, life-history strategies, human impacts, and conflicting uses associated with fisheries and coastal development. A chapter is devoted to possible solutions to these problems. A central theme of the book is that overexploitation of estuarine resources is occurring even at "low-tech" scales and is occurring at higher rates along with increasing human population, coastal development, and introduction of new technology to catch fishes and alter environments. The author emphasizes that the balance of conservation and exploitation (including aquaculture) is critical to sustainability and that understanding habitats and species is basic to development of management plans.

The author begins with a review of the nature of estuaries, with examples from around the world and draws on his considerable experience in Australia and southern Africa for examples, only in a few cases using examples from the Northern Hemisphere. Each chapter builds on geographic, life-history, taxonomic, and other information presented in previous chapters, and each is abundantly illustrated with maps, photographs of habitats, and graphs or tables of data referenced in the text.

Chapter 1 defines the scope of the book and provides background definitions. This chapter and others draw extensively on gray literature, often the only literature available on estuaries in developing tropical countries. An important piece of gray literature, which was not cited but could have led to more discussion of new world tropical estuaries, is Sullivan Sealey and Bustamante (1999).

Subsequent sections cover the assemblages of fishes and the adaptations they have for living in estuarine habitats. Chapter 2 covers the diversity of types of tropical estuaries, from African coastal lakes to the Orinoco Delta, with detailed descriptions and illustrative photographs. Many features and characteristics are described in terms of mangrove distribution (covered more extensively in Chapter 7). This Chapter could have included discussion of the Indian River Lagoon area and other east-Florida lagoonal estuaries, especially since they have tropical faunas, have some fringing mangroves, include areas that are under complete "no-take" protection, and are otherwise considered "hot spots" because of the imperiled fishes that live there (Johnson et al., 1999; Musick et al., 2000). The map of coastal lakes does not include those on the east coast of Florida (although those at

comparable latitudes in the Gulf of Mexico are included).

Chapter 3 describes faunas and communities, and the subsequent two chapters review aspects of the life history of some species. The very useful taxonomic index allows one to look up a genus mentioned in the text and be referred to its family for a list of species cited in the book. This is helpful for those who may be familiar with the family and its fishery or ecological importance but who may not be familiar with the local species. Again, there is less coverage of New World systems in spite of the fact that many of these systems (e.g., in Louisiana, Cuba, Puerto Rico, and Guadeloupe) have received extensive study (e.g., Darnell, 1958; Claro et al., 1974; Valdéz-Muñoz, 1981; Louis et al., 1985; Stoner, 1986). Estuarine fishes include a diversity of estuarine-dependent species, estuarine opportunists and diadromous species, and examples of each type are included. Chapter 4 on trophic ecology includes a variety of studies but overlooks a very large literature on the feeding of fishes in Cuba, such as the many studies done in Golfo de Batabanó, a large mangrove area. This section emphasizes the importance of estuaries as feeding grounds for juveniles of many tropical marine fishes, which switch feeding modes in moving from juvenile to adult offshore habitats.

In Chapter 5 on reproductive strategies, Blaber reviews typical and unusual reproductive strategies, with numerous examples, and discusses those tropical estuarine fishes that change sex. Unusual reproductive modes (e.g., protandry in centropomids; self-fertilizing hermaphroditism in *Rivulus marmoratus*) are reviewed in relation to the complexity of habitats, assemblages, and the difficulty in managing such complex and diverse systems.

Chapter 6 covers the effects of structure and hydrology on fishes and notes the relationship between fish diversity and the structure provided by mangroves, reeds, and seagrasses. In Chapter 7, there is further discussion of the importance of mangroves in tropical estuaries, and the concept of "estuarine dependence" and the role of estuaries in offshore fisheries production are examined. Quantitative assessment of the importance of mangroves to fish production is said to be too difficult to evaluate, and the author recommends an area-by-area and species-by-species evaluation for determining mangrove dependence. There is continuing destruction of mangroves, particularly for use as firewood and in the production of charcoal, and mangrove swamps are often the sites for the construction of ponds for aquaculture. Although mangrove

loss resulting from aquaculture is documented in Chapter 10, some additional discussion of the role of mangroves in aquaculture versus production of wild fish (e.g., Naylor et al., 1998) would have been interesting, even though the author states that aquaculture is beyond the scope of this book. It is uncertain whether construction of culture ponds in developing tropical countries results in greater food production and food security than does sustainable fishing of mangrove-supported wild stocks.

Chapters 8–10 cover direct (fishing) and indirect (e.g., industry, agriculture) human interactions with tropical estuarine fishes. Chapter 8 emphasizes the importance of tropical estuarine fisheries in developing countries; however, poor fishery statistics and incomplete knowledge exist for many areas. Tropical estuarine fisheries are examined through 11 case histories of single-species and multispecies fisheries in developed and developing countries, including traditional and technologically advanced fisheries. Some examples address the conflict among user groups (subsistence, artisanal, commercial, and recreational fishers) and document the negative impacts of technological advancements such as monofilament gillnets and powered vessels on populations of estuarine fishes. With little information presented from the Caribbean, I wonder about the extent of estuarine fisheries along the Gulf of Honduras, the Mosquito Coast and the Greater Antilles. Fishery management aspects are also discussed in Chapter 8. Management of single stocks in temperate waters is difficult, and management of multispecies fisheries in the tropics, particularly in developing countries, is extremely difficult—perhaps impossible with present knowledge and approaches. Lack of data and inadequate enforcement have plagued management, and biological complexity has complicated understanding of population dynamics. Lack of management, coupled with a need for food and foreign exchange have resulted in overfishing of many systems. There is a great need for community-based management, because the fishing community possesses most of the knowledge about the fishes, and governments often have little enforcement capabilities or will to enforce.

In Chapter 9 on the effects of fishing, there is an impressive array of catch and life-history statistics. The data presented support concern for bycatch problems, declining catches, and reduced habitat. The author documents the many signs of overfishing in tropical estuaries, including altered trophic structure, lowered diversity, reduced fish size, and altered size and age at maturity. Chapter 10 addresses some of the oth-

er human impacts, including dams, weirs, dredging, sewage, agriculture, “reclamation,” chemical and petroleum pollution, and other human activities along the coast. Chapter 11 is devoted to conservation and rehabilitation of estuaries and the effects of global climate change on low-lying estuarine habitats in the tropics. Many conservation problems (other than climate change) are addressed in other chapters, and this one reviews some of the conservation dilemmas (e.g., overfishing vs food security; conservation of fish habitat vs mangrove harvesting; subsistence vs commercial fishing) and conservation strategies such as protected areas and endangered species legislation and protection.

Few errors were noted, considering the length of the book. Most appeared to be typographical, and none was of any consequence in understanding the author’s intent. The author made several references to “trash fish,” an unfortunate term that implies a negative value judgment for certain species.

My reading indicates that this book will be a valuable reference for those interested in the current status of tropical estuarine systems and our knowledge of them. The book will also serve as a benchmark against which to measure future negative impacts and conservation efforts.

ACKNOWLEDGMENTS

H. Ivy provided library assistance. This is Contribution 462 of the South Carolina Marine Resources Center.

LITERATURE CITED

- CLARO, R., D. V. RADAKOV, Y. S. RESHETNIKOV, AND A. SILVA. 1974. Algunas características de la ictiofauna de la plataforma Cubana. *Academia de Ciencias de Cuba Serie Oceanológica* 20:1–10.
- DARNELL, R. M. 1958. Food habits of fishes and larger invertebrates of Lake Pontchartrain, Louisiana, an estuarine community. *Publ. Inst. Mar. Sci. Univ. Tex.* 5:353–416.
- JOHNSON, D. R., N. A. FUNICELLI, AND J. A. BOHNSACK. 1999. Effectiveness of an existing estuarine no-take fish sanctuary within the Kennedy Space Center, Florida. *N. Am. J. Fish. Manage.* 19:436–453.
- LOUIS, M., T. L. HOAI, AND G. LASSERRE. 1985. Résultats préliminaires sur le recrutement en poissons dans deux lagunes des mangroves de Guadeloupe: Belle-Plaine et Manche-à-Eau. *Rev. Hydrobiol. Trop.* 18:249–265.
- MUSICK, J. A., S. A. BERKELEY, G. M. CAILLIET, M. CAMHI, G. HUNTSMAN, M. NAMMACK, AND M. L. WARREN JR. 2000. Protection of marine fish stocks at risk of extinction. *Fisheries* 25:6–8.

- NAYLOR, R. L., R. J. GOLDBURG, H. MOONEY, M. BEVERIDGE, J. CLAY, C. FOLKE, N. KAUTSKY, J. LUBCHENCO, J. PRIMAVERA, AND M. WILLIAMS. 1998. Nature's subsidies to shrimp and salmon farming. *Science* 282:883–884.
- STONER, A. W. 1986. Community structure of the demersal fish species of Laguna Joyuda, Puerto Rico. *Estuaries* 9:142–152.
- SULLIVAN SEALEY, K., AND G. BUSTAMANTE. 1999. Setting geographic priorities for marine conservation in Latin America and the Caribbean. Nature Conservancy, Arlington, VA.
- VALDÉZ-MUÑOZ, E. 1981. Estructura y diversidad de la ictiofauna de los manglares de Punta del Este, Isla de la Juventud. *Ciencias Biológicas* 6:111–124.

GEORGE R. SEDBERRY, *Marine Resources Research Institute, South Carolina Department of Natural Resources, P.O. Box 12559, Charleston, South Carolina 29422-2559; E-mail: sedberryg@mrd.dnr.state.sc.us.*

THE HERPETOFAUNA OF NEW CALEDONIA. Aaron M. Bauer and Ross A. Sadlier. French Translations by Ivan Ineich. 2000. Society for the Study of Amphibians and Reptiles, Ithaca, New York. In cooperation with the Institut de recherche pour le développement. ISBN 0-916984-55-9. 310 p. \$60.00 (cloth).—New Caledonia is more than an island of giant geckos and skinks with strange names. Over 75% of the vascular plant species are endemic, and among some arthropod groups it approaches 100%. As with Pacific islands generally, New Caledonia was largely ignored by 20th-century herpetologists until recent decades. Now the reptile diversity is much better known, and *The Herpetofauna of New Caledonia* brings this unique fauna from obscurity to prominence.

The natural history of New Caledonia had a lagging start. British hegemony had claimed most of the prized real estate in the region (Australia, Tasmania, New Zealand), and the Dutch were ensconced in the East Indies. New Caledonia remained more or less up for grabs until it was annexed by France in 1853. Afterward, the peculiarity of the flora and fauna was soon recognized. The first catalog of New Caledonia's reptiles was produced by Arthur Bavay in 1869. Collections and new species continued to be added into the first decade of the 20th century, but thereafter herpetology languished. This "early period" came to a close with the publication of Jean Roux's monograph in 1913. More than half the species now recognized in greater New Caledonia had yet to be discovered.

Bauer, Sadlier, and colleagues began their fieldwork in the late 1970s. The result has been a series of papers on the terrestrial squamates that now tally 71 species of skinks and geckos. It was time for a modern overview, and this book is it.

New Caledonia is a French territory located in the Coral Sea, about 1500 km east of Queensland and approximately half-way from there to Fiji. The territory includes New Caledonia itself (sometimes referred to as Grand Terre) plus its satellites, the Loyalty Islands 110 km to the east, the D'Entrecasteaux Reefs, and the Chesterfield Reefs farther to the west. The cigar-shaped main island dominates in size and complexity. At over 16,000 km², it is the largest island in the South Pacific excluding New Guinea (including New Britain) and New Zealand. Many mountain peaks exceed 1000 m whose slopes are drained by numerous river systems that dissect the humid evergreen forests and lowlands. Parts of the island are characterized by a heath/scrub (called *maquis*) composed of low trees and shrubs, and a remnant, sclerophyll forest of *Acacia*, and *Leucaena* occurs in patches along the drier west coast. Today, extensive tracts of native forest have been lost to agriculture and mining, and over 30% of the island is savanna dominated by the fire-resistant naiouli (*Melaluca* sp.).

New Caledonia has a Gondwana origin, unlike most Pacific islands that arose as volcanoes in the middle to late Tertiary. It was isolated beginning in the late Cretaceous with the opening of the Coral Sea and the eastward drift of the Indo-Australian/Pacific plate boundary. Hence, at least some of the herpetofauna is probably vicariant with potential links to Australia and the inner Melanesian Arc islands from New Guinea to New Zealand. The Loyalty Islands are separated from New Caledonia by a 2000-m-deep basin and rest on a volcanic base overlain by Miocene reefs. They may not have been emergent before the Pleistocene, and the herpetofauna accordingly is recent. In fact, excluding a couple of endemics, there is as much faunal similarity with island groups to the north (Vanuatu) and east (Fiji, Tonga) as there is with New Caledonia proper.

Overall, the terrestrial fauna of New Caledonia is strikingly endemic at 86% of the species. Diplodactylid geckos comprise 20 species assigned to three distinctive genera: *Bavayia*, *Eurydactylodes*, and the spectacularly large species of *Rhacodactylus*. By contrast, there are only six species of Geckonid geckos, five of which are widely distributed in the tropical Pacific (e.g., *Hemidactylus frenatus*, *Lepidodactylus lugubris*). The lygosomine skinks are represented by 40

endemic species, and two others with extralimital distributions. Several species had been referred to "*Leiopisma*" and "*Lygosoma*," but Sadlier's (1986) revision placed practically all of them into endemic New Caledonian genera (e.g., *Caledoniscincus*, *Lioscincus*, *Marmorosphax*, *Sigaloseps*). Others are the product of Bauer and Sadlier's fieldwork (e.g., *Graciliscincus*, *Lacertoides*, *Simiscincus*).

A dozen sea snakes inhabit New Caledonia's reefs, but for terrestrial species, there are only three. Two of these are blindsnakes. The pantropical Braminy blindsnake, *Rhampotyphlops braminus*, was first recorded in 1986 but may have been established for at least a decade. *Rhampotyphlops willeyi*, on the other hand, is endemic to the Loyalty Islands. In greater New Caledonia the Pacific boa, *Candoia bibroni* is restricted to the Loyalty Islands where some people think that it might have been introduced. The only amphibian present is *Litoria aurea* (Lesson), which is assumed to be an interloper from southeast Australia. New Caledonia is oddly free of the widely introduced cane toad, *Bufo marinus*.

The book begins with a physical description of New Caledonia and discussions on biogeography, diversity, ecological patterns, conservation issues, and a history of herpetological investigation. Each of these sections is accompanied by a complete French translation. The species accounts follow a conventional format that includes identification keys, line drawings of scalation, descriptions, natural history notes, range maps, and remarks on systematics and other points of interest. Ineich also provides a *Sommaire Français* for each. Nearly every species is represented by a quality color photograph on one of the collected plates. The bibliography is exhaustive, and a gazetteer of New Caledonia place names is appended. It is a quality production and essentially error-free.

The vertebrate fauna of New Caledonia is a subset of what was present before human arrival around 3000 years ago. The island has not experienced much exploration for late Quaternary fossil deposits, but the few reptile bones that are known suggest a pattern of late Holocene extinction similar to that of other Pacific islands. Gone is the bazaar, horned meiolanid turtle, a mekosuchian crocodile, and a varanid lizard (Gaffney et al., 1984; Balouet 1987; Balouet and Buffetaut 1987). Possibly other lizards and maybe even snakes also disappeared following first human contact, with losses continuing through European settlement and expansion. Habitat deterioration was inevitable, as was the introduction of alien predators, competitors,

and disease carriers. But the conservation effort presently is aggressive, and continued fieldwork is a recognized component. If you thought that New Caledonia was only an R&R destination for *McHale's Navy*, then read the eloquent forward to this book by Jean Chazeau and proceed from there.

LITERATURE CITED

- BALOUET, J. C. 1987. Extinctions des vertébrés terrestres de Nouvelle-Calédonie. *Mém. Soc. Geol. France*, n.s. 150:177–183.
- , AND E. BUFFETAUT. 1987. *Mekosuchus inexpectatus*, n. g., n. sp., crocodylien nouveau de l'Holocène de Nouvelle-Calédonie. *Comp. Rend. Acad. Sci. Paris*, sér. 2, 304:853–856.
- BAVAY, A. 1869. Catalogue des reptiles de la Nouvelle-Calédonie et description d'espèces nouvelles. *Mém. Soc. Linn. Normandie* 15:1–37.
- GAFFNEY, E. S., J. C. BALOUET, AND F. DE FROIN 1984. New occurrences of extinct meiolaniid turtles in New Caledonia. *Am. Mus. Novit.* 2800:1–6.
- ROUX, J. 1913. Les reptiles de la Nouvelle-Calédonie et des Îles Loyalty, p. 79–160. *In: Nova Caledonia, Zoologie*. Vol. 1(2). F. Sarasin and J. Roux (eds.). C. W. Kreidel Verlag, Wiesbaden, Germany.
- SADLIER, R. 1986. A review of the scincid lizards of New Caledonia. *Rec. Aust. Mus.* 39:1–66.
- GREGORY PREGILL, *Department of Biology, University of San Diego, San Diego, California 92110-2492. E-mail: pregill@sandiego.edu.*

NATIONAL AUDUBON SOCIETY FIELD GUIDE TO TROPICAL MARINE FISHES OF THE CARIBBEAN, THE GULF OF MEXICO, FLORIDA, THE BAHAMAS, AND BERMUDA. C. Lavett Smith. 1997. Alfred A. Knopf, Inc., New York. ISBN 0-679-44601-X. 720 p., many color plates. \$20.00 (softcover).—As is usual with field guides, this one begins with an explanation of the organization of the book (emphasizing information appearing in the species accounts), follows with a 10-page introduction to the biology of fishes (including comments on classification, life history, morphology, and counting and measuring), then supplies summaries of the marine habitats and biogeography of the region, and finally presents a short, but important, "Conservation Note."

Beyond the preliminary topics, the text is divided into two parts. Part I (p. 33–240) consists of a short section on fish identification, 28 well-chosen color photographs depicting habitats, a pictorial family key, a thumb-tab key, and 389

color plates of fishes. The vast majority of the color plates are of very high quality, for some species probably the best photographs ever published. I found only two plates mislabeled; the names with Plates 233 and 234 (sea bream and pinfish) should be swapped. The legend for each fish plate has, in addition to the plate number, a common name, maximum length (width for some batoids) in inches and feet, the page number on which the species is covered in the text, and, if known, the sex or life-history phase of the individual shown.

It is unfortunate that the scientific names were not included in the legends for the plates. In my opinion it is a great leap backward to use a common name without a nearby reference to the corresponding scientific name, particularly for uncommon or poorly known species. It is one thing to use a name such as "grouper" or "marlin" for which many people can conjure up mental images but quite another to use "lancer dragonet" or "Mrs. Agnes' porch floater" for animals rarely or never seen. Both common and scientific names are important. Common names allow the general public to talk about organisms and to gain, one can hope, some comprehension for the bewildering diversity of life on this planet; but common names, as is well known, have their drawbacks. A particular common name may be applied to numerous species, and a single species may have many common names, frequently leading to confusion. Consequently, it is important to have standards on which to rely, and scientific names (i.e., binomina) are the standards that deliver us from chaos.

Part II (p. 241–687) has the species accounts. Each species represented by a photograph is given a "complete" description with habitat notes and a range map included. Most species accounts have a number (occasionally two numbers) preceding the common name that corresponds to the number(s) on the color plate(s) for that species. The book concludes with a four-page glossary, photo credits, and a 21-page index.

This guide covers almost 1200 species—from gobies to the whale shark, with more than 400 species, arranged phylogenetically, being given full coverage, that is, with a "complete" description, photograph or full-body illustration, and range map. Those given full coverage are mainly the "more common and/or conspicuous species that are likely to be encountered by snorkelers and divers to depths of about 150 feet (45 m)" (p. 10). A complete description includes short sections entitled "Identification," "Habitat," "Range," and "Notes," and for many spe-

cies additional comments that facilitate identification follow the rubric "Similar Species."

Anyone writing a guide to the fauna of a large region such as that covered by Smith must rely on the literature, frequently much of the pertinent data being scattered in journals and taxonomic monographs. For western Atlantic shore fishes, there have been very few recent comprehensive studies of well-defined geographic areas, the most recent and most comprehensive being on the fishes of Bermuda (Smith-Vaniz et al., 1999). Based on Smith-Vaniz et al. (1999), there are 35 species reported in Smith's book as occurring at Bermuda that do not have populations established there. Among those species are *Carcharhinus leucas*, *Anchovieta lyolepis*, *Synodus saurus*, *Stongylura notata*, *Diplectrum bivittatum*, *Grama loreto*, *Apogon binotatus*, *Selene vomer*, *Lutjanus jocu*, *Anisotremus virginicus*, *Haemulon plumieri*, *Pareques acuminatus*, *Chaetodipterus faber*, *Scomberomorus maculatus*, and *Lactophrys bicaudalis*. For most of the fishes in this category, the author has perpetuated errors entrenched in the literature, all the more reason to note the misinformation in order that it not be repeated in future publications.

At least 59 species treated by Smith that occur at Bermuda are not mentioned in the distributional statements or shown on the maps as being found there. Some of those established fishes are *Megalops atlanticus*, *Heteroconger longissimus*, *Synodus foetens*, *Scorpaena albifimbria*, *Diplectrum formosum*, *Apogon planifrons*, *Lutjanus synagris*, *Calamus bajonado*, *Pareques umbrosus* (the only sciaenid resident at Bermuda), *Chaetodon ocellatus*, *Microspathodon chrysurus*, *Parablennius marmoratus*, *Gobiosoma macrondon*, *Acanthurus chirurgus*, and *Bothus robinsi* (Smith-Vaniz et al., 1999).

My comments regarding the discrepancies between Smith's guide and Smith-Vaniz et al. (1999) should not be construed as denigrating the quality of the work in review but as a caveat to those who may use it. To be completely fair to Smith, it must be emphasized that he published in 1997, two years before Smith-Vaniz et al. (1999) appeared. Most of all, the differences noted between the two books point out in bold-face how inadequate our knowledge of the fishes of a relatively well-studied region, the western North Atlantic, really is. Most of the information on these fishes is limited to alpha taxonomy—with data on subjects like life-history strategies, reproductive biology, trophic interactions, and symbiotic relationships being almost nonexistent. When one reflects upon other taxa, particularly many of the invertebrate groups, and on other segments of the world

ocean, the realization of how little is actually known about the marine environment is almost overwhelming. Biodiversity remains a buzz word, but when are the decisionmakers and funding bodies going to learn that the time to study it is now while there is still biodiversity to investigate? There is a crying need for comprehensive biotic surveys and detailed ecological studies of most of the marine world—particularly estuarine and near-shore environments.

Accounts are provided (p. 435–437) for five species of the serranid genus *Hypoplectrus* (the hamlets), and six other members of the genus—including two undescribed species [one of which in reality had already been described by Acero P. and Garzón-Ferreira (1994)]—are mentioned in passing as being similar species. This is a considerable departure from the interpretation of Graves and Rosenblatt (1980), who maintained that their molecular data supported the theory of a single western Atlantic species, *H. unicolor*, composed of a number of color morphs, but is consistent with the view of Dom-eier (1994:103) “that the different color morphs warrant full species rank.” Smith (p. 437) does acknowledge that “there is considerable controversy over whether *Hypoplectrus* comprises one highly variable species, or separate species differing only in color.” Because the various morphs of *Hypoplectrus* display almost no gross differences beyond those of patterns of coloration, an understanding of exactly what constitutes a species within the genus is elusive, and the genus remains an enigma.

A few other things seem worthy of mention. A minor error, but one that occurs too frequently in faunal studies, is the misuse of the term “species name.” Smith wrote (p. 11) that “the first word in the scientific name is the genus name; the second is the trivial or species name.” According to Article 5.1 of the International Code of Zoological Nomenclature (International Commission on Zoological Nomenclature, 1999:4), “The scientific name of a species . . . is a combination of two names (a binomen), the first being the generic name and the second being the specific name [not the species name].”

The author stated (p. 14) that “there are about 20,000 known fish species worldwide. . . .” Eschmeyer (1998:7) estimated “that the number of valid species of fishes is about 25,000. . . . and . . . could reach 30,000 or 35,000 as poorly sampled geographic areas are studied and new equipment becomes available, such as wider use of submersibles.”

On page 441, there is mention of *Serranus incisus*, a species that Johnson and Smith-Vaniz

(1987) assigned to *Parasphyraenops*. The binomen *Epinephelus inermis* is used for the marbled grouper (p. 443). In contrast, Heemstra and Randall (1993) recognized the genus *Dermatolepis* as being distinct from *Epinephelus* and included *inermis* in *Dermatolepis*, an action supported by Baldwin and Johnson (1994). Both the legend for the plate (170) and the species account (p. 453) of the small peppermint bass (*Liopropoma rubre*) show the maximum total length as 3'3", whereas other sources show it to reach about one-tenth that length (e.g., “attains 90 mm” total length, Smith-Vaniz et al., 1999: 213).

Symphysanodon (p. 493, 494) is included in the Lutjanidae, perhaps following Anderson (1970), but more recently a number of authors (including this reviewer) have realized that it is misplaced in that family. Johnson (1981, 1984) considered the genus as *incertae sedis* in the Percoidae, whereas some others have relegated it to the Symphysanodontidae, a family name apparently first used in print by Fourmanoir (1981).

Carping (perhaps appropriate for the review of a fish book) aside, I hasten to say that the author has produced a very useful guide to the fishes inhabiting the tropical waters of the western North Atlantic, a guide that can be profitably referred to when examining specimens from adjacent subtropical and warm temperate waters to at least as far north as Cape Hatteras, North Carolina. I recommend it highly to anyone diving in these waters or involved in identifying western Atlantic fishes. Fishers, divers, students, and professionals will all find it to be a ready and accurate source for identification and basic information on the species covered. The bottom line is, buy the book; the color photographs alone are well worth the cost.

ACKNOWLEDGMENTS

W. F. Smith-Vaniz read a draft of the manuscript and made a number of valuable suggestions. This is Contribution 181 of the Grice Marine Biological Laboratory, College of Charleston.

LITERATURE CITED

- ACERO P. A., AND J. GARZÓN-FERREIRA. 1994. Descripción de una especie nueva de *Hypoplectrus* (Pisces: Serranidae) del Caribe occidental y comentarios sobre las especies colombianas del género. An. Inst. Invest. Mar. Punta Betin No. 23:5–14.
- ANDERSON JR., W. D. 1970. Revision of the genus *Symphysanodon* (Pisces: Lutjanidae) with descriptions of four new species. Fish. Bull. 68:325–346.
- BALDWIN, C. C., AND G. D. JOHNSON. 1994. Review:

- FAO species catalogue. Vol. 16. Groupers of the world (Family Serranidae, Subfamily Epinephelinae). An annotated and illustrated catalogue of the grouper, rockcod, hind, coral grouper, and lyretail species known to date. By P. C. Heemstra and J. E. Randall. *Copeia* 1994:1058–1061.
- DOMEIFER, M. L. 1994. Speciation in the serranid fish *Hypoplectrus*. *Bull. Mar. Sci.* 54:103–141.
- ESCHMEYER, W. N. (ed.). 1998. Catalog of fishes. Vol. 1. Introductory materials, species of fishes A-L. California Academy of Sciences, San Francisco.
- FOURMANOIR, P. 1981. Poissons (première liste). Résultats des campagnes MUSORSTOM. I. Philippines (18–28 Mars 1976):85–102.
- GRAVES, J. E., AND R. H. ROSENBLATT. 1980. Genetic relationships of the color morphs of the serranid fish *Hypoplectrus unicolor*. *Evolution* 34:240–245.
- HEEMSTRA, P. C., AND J. E. RANDALL. 1993. FAO species catalogue. Vol. 16. Groupers of the world (Family Serranidae, Subfamily Epinephelinae). An annotated and illustrated catalogue of the grouper, rockcod, hind, coral grouper and lyretail species known to date. FAO Fisheries Synopsis. No. 125, Vol. 16. Food and Agriculture Organization of the United Nations, Rome.
- INTERNATIONAL COMMISSION ON ZOOLOGICAL NOMENCLATURE. 1999. International Code of Zoological Nomenclature. 4th ed. The International Trust for Zoological Nomenclature, London.
- JOHNSON, G. D. 1981. The limits and relationships of the Lutjanidae and associated families. *Bull. Scripps Inst. Oceanog., Univ. Calif., La Jolla* 1980, 24:1–114.
- . 1984. Percoidae: development and relationships, p. 464–498. *In: Ontogeny and systematics of fishes.* H. G. Moser, W. J. Richards, D. M. Cohen, M. P. Fahay, A. W. Kendall Jr., and S. L. Richardson (eds.). American Society of Ichthyologists and Herpetologists, Spec. Publ. 1. Allen Press, Inc., Lawrence, KS.
- , AND W. F. SMITH-VANIZ. 1987. Redescription and relationships of *Parasphyraenops atrimanus* Bean (Pisces: Serranidae), with discussion of other Bermudian fishes known only from stomach contents. *Bull. Mar. Sci.* 40:48–58.
- SMITH-VANIZ, W. F., B. B. COLLETTE, AND B. E. LUCKHURST. 1999. Fishes of Bermuda: history, zoogeography, annotated checklist, and identification keys. American Society of Ichthyologists and Herpetologists, Spec. Publ. 4. Allen Press, Inc., Lawrence, KS.
- WILLIAM D. ANDERSON JR., *Grice Marine Biological Laboratory, College of Charleston, 205 Fort Johnson, Charleston, South Carolina 29412-9110; E-mail: andersonwd@cofc.edu.*