5-1-1998

The Biology of Xenopus by R. C. Tinsley and H. C. Kobel

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Recommended Citation

de Sá, R. O. (1998). [Review of *The Biology of Xenopus*, by R. C. Tinsley & H. C. Kobel]. *Copeia*, *1998*(2), 528–530. https://doi.org/10.2307/1447460.

salamanders (genus *Hydromantes*) of California and southern Europe. Evolution 32:529–539.

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FISHES OF THE CONTINENTAL WATERS OF BELIZE. D. W. Greenfield and J. E. Thomerson. 1997. Available from University Press of Florida, 15 NW 15th Street, Gainesville, Florida 32611-2079. ISBN 0-8130-1497-2. 311 p. $49.95 (cloth).—Until now, anyone seeking an identification guide to freshwater fish of Central America would be forced to create one with an assemblage of reprints. After many years of using our photocopied assemblage, including draft manuscript sections of this reference, I am delighted to see the publication of this volume. It is hoped that this book ushers in a trend to produce more regional guides for other areas of Central and South America, to instill a wider public awareness of these incredibly rich fish faunas. The authors have wisely chosen to include in the book's coverage fishes that inhabit rivers, lagoons, estuaries, and mangrove forests, as well as the inland freshwater streams. The broad coverage of aquatic ecosystems makes this book a useful companion for identifying fishes from habitats on the numerous mangrove cays that comprise the Belize coastal system. In their preface the authors discuss the occurrences of various marine fishes that enter coastal water bodies and anticipate that in the future additional species will be captured from these habitats.

The introduction includes a synopsis of Belize geography, including how the Pliocene geological configuration influences and explains current characteristic region-specific habitats of the nation. The introduction also integrates a synopsis of the zoogeography of fishes of Central America, and the net result is a lucid summary of interest to all students of ichthyology. The first maps (indicating the location of Belize; geographic names; names of rivers, streams, and lagoons; and Pliocene geographic influence on present river drainage patterns) present an effective introduction and reference foundation for the remainder of the volume. Unfortunately, the editors of the publication missed a distracting error labeling "Honduras" on the southern border of Belize, instead of identifying Livingston and Puerto Barrios on Guatemala's Atlantic coast.

The book is enriched with over 275 drawings by the senior author which, as explained in the preface, are intended to demonstrate the specific characteristics or key characters of each species. These figures are integrated to rapidly and painlessly guide the reader to one of the appropriate 30 bony fish families where additional keys and descriptions distinguish species. Species are identified by scientific and common names, as well as references to appropriate figures and one of the 68 maps indicating collection sites known to the authors. A short glossary is provided to assist the utility of the keys. The literature cited provides references to a broad range of sources on biology of fishes through 1993. The style of writing and descriptions is equally useful and effective for both novice and trained ichthyological seekers. The book is bound with a North American climate in mind, and the publishers should consider strategies for making it suitable for sustained tropical exposure in future editions.

My first copy was field tested and provided us rapid identification of poeciliids captured in Belize mangrove cays during a recent survey. Our Belizean colleagues have been elated to acquire copies. I recommend this long needed and awaited edition to all students of Central American fish fauna. It will serve as well as a useful reference in the identification of many of the exotic fishes that have colonized and now comprise elements of south Florida's ichthyofauna.

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THE BIOLOGY OF *XENOPUS*. R. C. Tinsley and H. C. Kobel (eds.). 1996. Oxford University Press, New York, New York. ISBN 0198549741. 440 p. $78.00 (hardcover).—*The Biology of Xenopus* presents a summary of current knowledge about a single genus resulting from a symposium held at the Zoological Society of London in September 1992. This approach to summarizing available information has also been taken for other taxa, such as *Atelopus* (Lötters, 1996). However, the task of compiling data for *Xenopus* is enormous relative to any other amphibian group, because *Xenopus laevis* has become a model system for molecular and development research (Cannatella and de Sá, 1993). Unfor-

tunately, most of our knowledge of *Xenopus* is biased toward this single species. There are about 20 recognized species of *Xenopus,* most of which have been described in the last two decades. Tinsley and Kobel have assembled contributions from 26 authors into 22 chapters covering a wide range of information. The chapters vary in focus, extent, and depth of the material covered.

A short introductory chapter presents the characteristics of *X. laevis* that has made it an ideal laboratory animal. The second chapter presents a description of extant species, including morphology, vocalizations, DNA, and biochemical data. Overall the information provided is brief and mainly serves to point new researchers to previous research and available data. However, these data are not placed in an evolutionary context. It would have been interesting to speculate, for example, on the relationship of call characteristics and ploidy levels to speciation events. The taxonomic section attributes subgeneric status to the two main lineages of *Xenopus,* the *laevis* and the *tropicalis* groups, indicating that they "may more accurately reflect the respective relationships between various pipid taxa." No support is provided for this arrangement. Immunological (Bisbee et al., 1977) and nuclear ribosomal DNA sequence data (de Sá and Hillis, 1990) show a closer relationship between these two species groups among pipid taxa. Furthermore, in chapter 20, Graf states (p. 386) that "the available molecular evidence unequivocally supports the monopoly of the genus *Xenopus.*" The dichotomous key to African pipids at the end of this chapter is a useful tool for lab and fieldwork.

The data presented in chapter 3 are interesting because our understanding of ecological requirements for most species of *Xenopus* is limited. Furthermore, ecological requirements are related to present ranges of species distribution and historical events, such as climate and vegetation fluctuations that could explain the present pattern of species diversity. The next three chapters are biased toward a single taxon, focusing on *X. laevis.* Chapters 4 and 5 discuss hybridization between *X. laevis* and *X. gilli,* whereas chapter 6 is a brief description of the impact of *laevis* on other species in areas where it has been introduced.

Elepfandt's chapter 7 is an excellent summary of sensory mechanisms by which *Xenopus* relates to its environment. Except for a brief comment on *X. muelleri,* the chapter is focused on *X. laevis.* This chapter should stimulate further study of mechanoreception and chemoreception in other species of *Xenopus.* Chapter 3 showed that *Xenopus* species live in a wide range of microhabitats, and it would be interesting to analyze correlations between habitat and sensory biology. The combined information in chapters 8 and 10 provide a solid understanding of acoustic communication and a clear interpretation of morphological and behavioral adaptations for underwater communication.

Chapters 9 and 12 cover developmental biology and focus on *X. laevis.* The first chapter discusses sexual differentiation, and the second addresses endocrinological aspects of metamorphosis. The developmental biology of *X. laevis* has been studied extensively, and a summary of all organogenesis and development is beyond the scope of this book. Those interested on other aspects of organogenesis will find references to *Xenopus* in Fox (1983) and Nieuwkoop and Faber (1994). Data on musculoskeletal development and structure are prime candidates for morphological and evolutionary studies. Those interested in osteological development will have to rely on the detailed descriptions presented by Trueb and Hanken (1993). Patterns of myoblast and muscle development are reported to be unique in *X. laevis* among studied amphibians (Radice et al., 1989).

Larval biology is reviewed in chapter 11. Although this chapter has a strong morphological approach, Wassersug does an excellent job framing the available data for *Xenopus* in an evolutionary context. The book would have benefited from an additional chapter describing the diversity of *Xenopus* larvae and their ecological requirements, ending with a key to *Xenopus* larvae. The section on infection and disease is a mixed assemblage of chapters. Tinsley's chapter on parasites (chapter 13) presents a summary of current knowledge of *Xenopus* parasites and, at first glance, is of interest mainly to parasitologists. In fact, the chapter would be valuable to a wider audience, because it provides examples of how *Xenopus* can be considered a model system for a variety of other studies. This chapter must be read in association with chapter 22, where Tinsley presents a more comprehensive evolutionary discussion of *Xenopus* parasites. Chapter 14 is focused on the biochemistry of skin secretion of *X. laevis.* Chapters 15 and 16, although focused on *X. laevis,* provide an excellent summary of the organization and functioning of the immune system. The references to the evolution of the immune system (chapter 16) in polyploid species, together with the chapter on allopolyploid speciation (chapter 21), present possible outcomes of the relationships

of polyploidy and speciation at the molecular level.

The two chapters covering the available paleontological data (chapters 18 and 19) complement each other nicely. Sanchiz and Rocek briefly discuss the fossil record of Pipidae within a larger framework of the anuran paleontological record. Although a good introduction of anuran history, I thought this chapter was somewhat beyond the main focus of the book. On the other hand, Baez's chapter focuses on the fossil record of the Pipidae and provides valuable information for understanding the evolutionary history of *Xenopus*. Chapter 19, by Trueb, has a broader scope, presenting an excellent review and evaluation of morphological evolution in pipids. Indeed, it is the only chapter in the book that discusses testable hypotheses of relationships (e.g., cladograms). Trueb's chapter would be of interest to anyone working on amphibian morphology and evolution and to evolutionary morphologists in general. However, this chapter is focused on the morphological diversity among pipids and makes few references to the morphological diversity within *Xenopus*. Chapter 20, by Graf, summarizes all available molecular data for the genus *Xenopus*. I found this chapter clear and focused, presenting an excellent summary of our current knowledge from different molecular sources. Furthermore, the molecular data are used to address the major questions about the phylogeny of *Xenopus*, such as monophyly of the genus, species relationships, and the role of polyploidy in speciation.

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MOLECULAR SYSTEMATICS OF FISHES. Thomas D. Kocher and Carol A. Stepien (eds.) 1997. Academic Press, Inc. San Diego, California. ISBN 0-12-417540-6. xi + 314 p. $79.97 (hardcover).—Molecular approaches are now being used by a variety of ichthyologists to address a rather wide range of questions in fish systematics and evolutionary biology. These questions range from issues of higher level relationships among fishes to questions that focus on the dynamics of individual populations. Although many of the datasets currently being employed to address such questions are composed of mitochondrial DNA sequences, other techniques such as microsatellites, restriction site, or fragment studies and randomly amplified polymorphic DNAs (RAPDs) constitute a significant portion of methods currently used. The editors of *Molecular Systematics of Fishes* state their intention that the "book illustrates the broad utility of molecular approaches for addressing fish systematic questions." My appraisal is that the editors have done an admirable job of achieving this goal and have put together a 17-chapter volume written by 38 prominent researchers that spans an array of molecular techniques and analytical approaches.

Each of the chapters is written in a readable fashion that is of utility to those who use molecular approaches in their research as well as those who seek only to understand how the techniques can be used to address specific questions in systematic biology. The book is well illustrated with approximately 130 figures that aid in clarifying everything from the phylogenetic relationships among the organisms being studied to more subtle concepts related to the analysis of the molecular data themselves.

The first chapter, which was coauthored by the editors, provides an overview of the book as well as a concise history of the development of molecular techniques and their application to studies of fish systematics. The remaining 16 chapters are arranged in a somewhat hierarchical fashion beginning with an excellent chapter