

**Book Review****The Ecology of North American Freshwater Fishes**

By Stephen T. Ross, *University of California Press*, Berkeley and Los Angeles, 2013, ISBN 978-0-520-24945-5, Hardcover USD 75.00, GBP 52. Graphs and Figures, pp.480.

Despite being the most thoroughly studied and largest temperate fish fauna, there are surprisingly few resources for scientific audiences that summarize our current knowledge of North American freshwater fish. *The Ecology of North American Freshwater Fishes* helps to fill this void, providing an accumulation of knowledge on freshwater fish, passionately summarized and explained in an ecological context. Over fifteen chapters divided into five parts, Ross presents the book as an overview appropriate for graduate students or upper-level undergraduates in a fish ecology course. This review is a collaborative effort by a group of biology graduate students. We conclude that this book is best as an excellent reference tool for grasping the concepts and research methods used to study fish ecology, rather than as a course book to work through front to back.

Part 1 of *The Ecology of North American Freshwater Fishes*, 'Faunal Origins, Evolution and Diversity' (chapters 1, 2, 3), provides a broad introduction to the origin of North American freshwater fish fauna, including an overview of their evolution in the context of major geologic and climatic events, emphasizing interesting global distribution patterns. Part 2, 'Formation, Maintenance and Persistence of Local Populations and Assemblages' (chapters 4, 5, 6), explores the influences of regional faunas, landscape and habitat on fish assemblages, beginning with a summary of metapopulation concepts and an introduction to useful statistical models. Ross expands on the theories, study methods, major findings and controversies pertaining to the formation, maintenance and persistence of fish assemblages in response to physical

and biotic perturbations at various temporal and spatial scales. In part 3, 'Form and Function' (chapters 7, 8, 9), Ross moves away from the 'phenomenological' approach of the previous section, instead exploring the influence of morphology, ecology and evolution on fish populations and assemblages. Ross emphasizes the value of ecomorphological approaches that aim to relate morphology to ecology, transitioning to the relationship between head morphology and feeding. Chapter 8 contains an excellent summary of the skeletal and muscular structures involved in mouth and head mechanics and clearly links them to feeding modes and prey processing in fishes. Following this, in chapter 9, Ross links form and function to reproduction and the role of selective pressures in shaping life-history patterns. Here, Ross provides an overview of the tools used to study aspects of life-history patterns, such as fecundity, migration and mating, including life tables, catch curves and life-history models. Part 4, 'Interactions Among Individuals' (chapters 10, 11, 12, 13), explores the role of communication, competition, predation, mutualism and facilitation in fish communities. This section focuses on food webs and the use of models to investigate how the aforementioned interactions affect food acquisition. In Part 5, 'Issues in Conservation' (chapters 14, 15), Ross focuses on a few primary conservation issues concerning freshwater fish populations of lotic and lentic systems, highlighting the influences of abiotic and biotic factors on fish communities, and the consequences of anthropogenic activities which disrupt these interactions.

The book's layout is intuitive and easy to navigate. Each section begins with a couple of paragraphs linking it to the previous section and provides a brief introduction of the material to be covered in the following chapters. Similarly, each chapter begins with a list of contents and a brief message that serves to describe the significance of the chapter and how it pertains to the rest of the

book. A concise summary can be found at the end of each chapter, in addition to a short list of additional reading and resources. The segregated structure is helpful to readers scanning for information on specific topics. Additionally, information boxes interspersed throughout the chapters provide useful supplementary notes on topics that may require additional explanation. These boxes are effectively separated from the main text as to not disturb the reading flow. While we felt that most of the figures and tables in this book greatly enhanced comprehension, a few were non-descript and seemed present only to break up text. We recommend online access to figures and tables if this book is to be used as the basis of a course.

One of the greatest strengths of this book is Ross' use of examples and his in-depth discussion of study methods and models. These serve to further the reader's understanding of the concepts and give a useful overview of techniques that could be utilized in ecological research. For example, chapter 9 outlines three models that have been used to study the life-history types of fish: the r- and K-selection model, a cluster analysis model and an alternative method that models allometric growth and links it to the timing of life-history events. Ross excellently summarizes the research methods used to generate the knowledge presented, exploring the advantages and disadvantages of each technique. This summary offers readers unfamiliar with the methods or models a unique opportunity to think critically about the studies or topics presented. Similarly, Ross presents various theories on particular topics, addressing the fact that a given ecological question is often associated with differing opinions. For example, when discussing predator avoidance in chapter 12, Ross begins with early theories describing how predator avoidance in shoaling fish was a function of apparent rarity. He follows this with a newer theory that states reduced predation while shoaling is primarily a result of crypsis. Understanding that theories are in constant motion is an important concept to keep in mind for emerging biologists developing their knowledge on any topic.

While single authorship lends books of this nature unparalleled continuity, a potential trade-off is uneven coverage of the topics based on the author's areas of interest and expertise. Such is the case with *The Ecology of North American Freshwater Fishes*. Although it is to be expected in a broad field like ecology that some concepts will

be covered in greater depth than others, we found the richness of detail provided for some topics in this book, while interesting and informative, often distracted from the major concepts and goals of the chapter. For instance, Ross devotes a section of the book to the geological history of North America, exploring various examples in great detail, while never clearly relating it back to the broader topics of fish ecology covered in the book. One of our primary concerns is that such rich coverage of certain topics may have been to the detriment of others. For example, in chapter 7, Ross reviews the mechanics and anatomical qualities involved in swimming, yet never mentions geometric morphometrics, an increasingly used tool to assess morphological data. Similarly, Ross's discussion of predation focuses on processes at the organismal level, providing only a very brief overview of population and community consequences of predation. Another concern was the lack of recent literature cited within this book. The majority of studies included were published prior to 2000. While we understand that a book of this breadth would have been a lengthy undertaking, we feel that Ross's coverage of freshwater fish ecology could have benefited from more contemporary theories and publications. Another notable concern was the coverage of conservation issues in the final section of this book. While Ross is clear that he chose to discuss only a few select conservation concerns of the many pertaining to freshwater fish, we feel that there were issues missing from these chapters that, at the very least, warranted mention. For instance, climate change, overfishing and pollution, all of which are considered to be among the main threats to freshwater biodiversity, are not discussed. Finally, as a resource for fish ecology courses, we feel that this book could have benefited significantly from the use of terms in bold text and a larger glossary.

Overall, Ross maps out a comprehensive overview of ecological concepts regarding freshwater fishes, drawing more specifically on North American examples. As a single author, Ross was able to present everything in one voice, allowing for general themes, such as the developing nature of ecological research and transitions from broad to fine concepts, to be carried throughout the book. Although the information presented was of high quality, we found the disproportionate detail provided for some focal topics to be distracting and

feel that there were other concepts that warranted more attention. Nevertheless, the broad range of examples accompanying Ross's in-depth discussion exposes emerging biologists to a considerable number of studies that can be referenced for future learning and thought. The concepts discussed are not exclusive to the study of freshwater fish and can be useful to those learning about fish ecology in general. Although we felt that some more recent concepts were overlooked, we acknowledge the value of exposure to early research in providing a holistic understanding of theory development

and shaping future research. Overall, we recommend the book as an excellent starting reference for emerging researchers and a good source for selected course readings on fish ecology.

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