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Synthesizing stream fish community dynamics in the southern Great Plains and beyond

Matthews, William J., and Edie Marsh-Matthews. 2017. **Stream fish community dynamics: a critical synthesis.** Johns Hopkins University Press, Baltimore, Maryland. x+330 p. \$64.95 (hardcover), ISBN: 978-1-4214-2202-2; \$64.95 (e-book), ISBN: 978-1-4214-2203-9.

Key words: community ecology; fishes; loose equilibrium; time series; warm-water streams.

The field of stream fish ecology has received considerable contributions from William J. Matthews and Edie Marsh-Matthews during the past 40 years. This point is nicely highlighted in their new book *Stream fish community dynamics: A critical synthesis*. The purpose of this book seems three-fold. First, it provides an *overview* of the data and research Matthews and Marsh-Matthews conducted among streams in Arkansas, Oklahoma, and Virginia. Second, it provides a *review* of the places, fishes, methods, and findings associated with studies conducted by the authors. Finally, and perhaps most importantly, the book provides opportunity for *new views* on the subject by making the data available for future researchers through the Dryad Digital Repository (Matthews, William J., and Edie Marsh-Matthews. 2017. Data from: Stream fish community dynamics: a critical synthesis. Dryad Digital Repository. <https://doi.org/10.5061/dryad.2435k>). In achieving these purposes, Matthews and Marsh-Matthews provide a tangible manifestation of their legacy in stream fish ecology that will persist both in literary and digital formats.

The content of the book is organized into 10 chapters that should interest readers ranging from developing ecologists interested in basic principles of study design, data collection, and data analysis, to more advanced ecologists interested in how theory might be empirically applied to advance fish ecology and conservation. The introductory chapters provide a solid foundation of methods and tools used to study fish communities that prepares readers, particularly students, for the material that follows. Chapter 1 provides an overview of the methods used to study fishes, and Chapter 2 introduces 11 datasets from 31 streams where these methods were applied by the authors between 1972 and 2014. The use of data tables and site maps in Chapter 2 provides readers with clear overviews of the spatial and temporal contexts of the datasets. Chapter 3 covers methods for characterizing fish communities from univariate (e.g., species richness) and multivariate (e.g., principal component analysis) perspectives, and covers methods used to relate these measures of community structure to environmental variables.

The remainder of the book focuses on principles of stream fish community ecology. Chapter 4 introduces functional traits and their influences on communities, including environmental tolerances, habitat associations, dispersal characteristics, and ecomorphology of stream fishes. Chapter 5 covers biotic interactions that structure fish communities and provides empirical examples from the world of fish ecology for basic ecological interactions such as competition, predation, facilitation, and cases of no apparent interaction. This chapter illustrates these mechanisms by combining species traits with long-term community trajectories, and then reviews follow-up experiments the authors conducted in stream mesocosms. Chapter 6 introduces abiotic disturbances characteristic of southern Great Plains streams (e.g., flood and drought) and their role in regulating stream fish community dynamics. The authors emphasize themes in fish responses to replicated floods and droughts based on observations from long-term community datasets or stream mesocosm experiments. Chapter 7 moves towards synthesis of material presented in previous chapters by introducing the theory of loose equilibrium and then empirically testing this theory. Chapter 8 provides a spatial context for the temporal trajectories uncovered in Chapter 7, and includes an emerging topic in ecology concerning the decomposition of beta diversity into patterns of turnover and nestedness. Chapter 9 takes a brief break from strictly spatiotemporal considerations to review why ecologists should care about the dynamics of fish communities by highlighting the history and current progress in our understanding of how fishes structure ecosystems. Here, the authors use long-term changes in fish communities classified by trophic guilds to illustrate generation of hypotheses that were ultimately tested in stream mesocosms, and include an appendix documenting confirmed cases of fishes affecting stream ecosystems in the southern Great Plains. Chapter 10 synthesizes all of the previous text and integrates the major themes of the book within the broader trajectory of the field of stream fish ecology.

Obvious strengths of this book are related to its application as a teaching and research tool. Each chapter contains references to pertinent literature, including contributions by the authors as well as highly-cited “classic” references documenting where the field has been and contemporary references illustrating where the field is going. These references provide direction for supplemental readings for students and scholars of fish ecology. The authors conclude each chapter with a summary of topics covered, and these summaries are excellent tools for keeping classroom discussions on track. The educational and research

value of the digital data accompanying the release of this book cannot be overstated. When coupled with the text, these data allow educators to target students along a gradient of educational experience. For example, Matthews and Marsh-Matthews provide the basic facts (Chapters 1–3) and concepts (Chapters 4–7) students new to stream fish ecology should remember and must understand; they provide opportunity for advanced students to evaluate their understanding of complex ideas (Chapter 8–9); and they challenge even the most advanced students to create their own work by providing new directions that might be pursued using the data (Chapter 10). This means students of fish ecology can read the text, download the data, run the analyses, compare their results with those presented in the text, and then apply the entire process to their own data (i.e., learning by doing). From a research perspective, long-term data collections are costly in terms of budgets, effort, and commitment, yet generally return relatively little when measured by the number of publications and student theses or dissertations generated. However, these same datasets become increasingly valuable to basic and applied research with every addition of new collections, and Matthews and Marsh-Matthews have set the stage for future ecologists to build on previous discoveries.

Some weaknesses of the book are evident. The use of a seemingly dated photo on the cover may give the appearance of dated material to those judging the book by its cover. The content has a limited scope compared to other recent texts (e.g., Ross, Stephen T. 2013. *Ecology of North American freshwater fishes*. University of California Press, Berkley, California), though the authors differentiate their contribution in the preface by acknowledging the focus is on their own work and data. The application of the loose equilibrium concept, borrowed largely for the field of plant ecology, paints a picture of stable fish communities unaffected by the devastating effects humans can afflict on streams. However, readers should be

cautious in drawing conclusions regarding the status of stream fish communities in other regions, including those as close as western Oklahoma where groundwater depletion has almost certainly pushed communities into alternate states outside the boundaries of historical equilibria. Finally, although the synthesis chapter (Chapter 10) provides some direction for applications of the provided data, there is minimal effort devoted to discussion of data limitations and no direction is provided for generation of relevant and testable hypotheses. These caveats, perhaps most appropriately and as with most meta-analyses, are left for the reader to decide.

Throughout the book the authors make good use of 31 color plates to illustrate the people, fish, and habitats included in the text. These plates illustrate another benefit of this book inherit in its documentation of the status and trajectories of fish communities in relatively pristine streams not-yet affected by community-altering threats. Given the imperiled nature of streams and their fish biota (e.g., Fausch, Kirt D. 2015. *For the love of rivers*. Oregon State University Press, Corvallis, Oregon, United States), these baseline data will be invaluable as we progress into the Anthropocene, intact streams become as increasingly rare as the rigorous long-term datasets provided by Matthews and Marsh-Matthews, and the field of fish ecology advances to meet these challenges. In the preface, Matthews and Marsh-Matthews comment on the progress made in stream fish ecology during their lifetimes, and this book provides a critical synthesis of their collective and impressive contributions to this progress.

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The curious nature of a raptor researcher

Bildstein, Keith L. 2017. **Raptors: the curious nature of diurnal birds of prey**. Cornell University Press, Ithaca, New York. xi + 324 p. \$35.00 (hardcover), ISBN: 978-1-5017-0579-3 (acid-free paper).

Key words: conservation; ecology; migration; ornithology; raptors.

There is certainly no shortage of books for bird aficionados. The available niche for new arrivals is narrow, with competitors occupying just about every linear inch

of space on the bookshelf. Keith Bildstein's latest entry onto the shelves claims—and quite effectively holds—a secure space on that ledge, creating a resource that synthesizes significant historical and recent peer-reviewed publications on raptor biology, ecology and conservation for those for whom such literature may be either academically or financially inaccessible. Written for a broad audience, from ecologists to lay people interested in birds, *Raptors: the curious nature of diurnal birds of prey* is one of the many recent publications that also serves to elevate scientific literacy using a charismatic