

Book Reviews

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Advances in community ecology

Gido, Keith B., and Donald A. Jackson, editors. 2010. **Community ecology of stream fishes: concepts, approaches, and techniques.** American Fisheries Society, Symposium 73. American Fisheries Society, Bethesda, Maryland. xii + 684 p. \$79.00, ISBN: 978-1-934874-14-1 (acid-free paper).

Key words: *community ecology; fish ecology; long-term studies; stream ecology.*

It is rare that a book has a 25-year effect on a field, and this is especially true for an edited volume. However, the volume *Community and evolutionary ecology of North American stream fishes* (Matthews, W. J., and D. C. Heins. 1987. University of Oklahoma Press, Norman, Oklahoma) did just that. That book was the result of a symposium of the American Fisheries Society (AFS) a couple of years prior. The current volume is another AFS symposium, intended to do much the same thing: to guide work for the coming decades. I think it is likely to succeed. Were I early in a career and working in community ecology (or adjacent fields), I would buy this book, have it on my shelf, and refer to it frequently. It will also make a great sourcebook for graduate seminars. Here's why.

The book is divided into five main sections: (1) macroecology of stream fish communities; (2) stream fish communities in landscapes: importance of connectivity; (3) conservation challenges for stream fish communities; (4) structure and dynamics of stream fish communities; and (5) role of fishes in stream ecosystems.

These sections allow us to see that stream fish communities provide an excellent way to test many ecological ideas, to develop ecological methods, and to link terrestrial and water systems and thus provide a foundational approach for Ecosystem-Based Management (EBM).

This is a book about ideas in ecology, showing us how ecological communities are structured by the combination of deterministic and stochastic processes, which can be both biotic and abiotic, with habitat as the template. This recognition lets us move between the search for universal patterns (community convergence) and the specific effects of historical processes on given locations. The book includes experimental and observational studies and models. There is an emphasis on the importance of long-term ecological research and what we can learn from it.

The book showcases advances in modeling (conceptual, mathematical, statistical, stochastic, stoichiometric), technology, and genetics and molecular methods (including a small primer on molecular ecology). It also showcases the importance of linking across different levels of biological organization (one of my favorite topics, e.g., moving from behavioral ecology to biogeochemical cycles) and creating a synthetic framework. By doing so, we see that nature is indeed variable and complex, but that much of that variability and complexity can be understood

if one takes the correct approaches. There is a lot that I liked in the book, but I take special note of trait-based approaches to communities (species traits, individual traits), connecting hydrology and life histories, an attempt to move from metapopulation ecology to metacommunity ecology, migratory fishes as ecosystem engineers, and identification of research gaps.

The connections to applied ecology, as in EBM, are clear and important. Ecologists can contribute to conservation by studying basic ecological concepts, for which the audience is mainly other ecologists; by documenting human impacts on biota and ecosystem operation and condition, for which the audience is other ecologists and managers; by designing management strategies and actions to meet conservation objectives, for which the audience is managers and policy-makers; and by educating nonexperts, for which the audience is the general public. Each of these is an important task in the overall goal of more effective conservation. There are also specific chapters on predicting the effects of climate change and on invasion biology.

The editors save the last chapter for themselves, when they look forward and assess future directions. These include linking pattern with process and linking process with pattern; comparative macroecological studies; how technology will advance stream fish ecology; spatial and temporal connectivity of stream fish communities; confronting models with data (something I think is very important); and how stream fish ecology will advance general ecology.

The reference lists at the end of each contributed chapter are excellent and comprehensive. For example, I learned about a 1969 paper by K. R. Allen on stream fish ecology. Young scientists will be able to create a superb library just by collecting the references at the end of each chapter.

I conclude that great progress has generally been made in stream ecology, thanks to the 1987 volume (which many of the authors of the current volume clearly revere) and that this volume can provide a guidebook for the coming decades. That said, there is one disquieting aspect, which comes at the frontispiece of the book. The image shows the attendees of the symposium; of about 20 attendees only three were women. I am turning 60 this year, and hope that I am around in another 25 years to see the next volume and this imbalance corrected.

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View New World vegetation through 100 million years

Graham, Alan. 2011. **A natural history of the New World: the ecology and evolution of plants in the Americas.** University of Chicago Press, Chicago, Illinois. xvi + 387 p. \$110.00 (cloth), ISBN: 978-0-226-30679-7 (alk. paper); \$40.00 (paper), ISBN: 978-0-226-30680-3 (alk. paper).

Key words: fossil plants; New World vegetation; paleobotany; plant ecology; plants evolution.

From his 50 years of studying the natural history of the New World, Alan Graham has concluded that time must be included in understanding present-day ecosystems. He opines, “the seamless integration of neobiology with paleobiology, and a knowledge of the environmental dynamics that drive the process of change” is necessary to fully understand their origin, current status, and even elements of their future.

Although Graham recognizes the Earth’s natural units are ecosystems, composed of communities of plants, animals, and microorganisms interacting with climatic and geologic processes, he focuses on plants and their environmental relationships in this book. He justifies this focus because plants are the most conspicuous component of ecosystems and hence most often used to characterize and classify them. Plant fossils are abundant and useful in establishing community relationships with paleo-environments. And plants, in a myriad of ways, are necessary for human existence, and increasing human usage has heavily impacted the structure and composition of ecosystems.

I am delighted to see Graham use his own enormously rich research, integrated with that of others, to resurrect the importance of plants in interpreting New World ecosystems in relation to environmental change through space and time. He is one of the few botanists today (that I am aware of) who could undertake such an unprecedented survey. I grew up professionally as an ecologist during the 1940s and 1950s when plant geography with related geological history was an integral part of ecological curricula. With emphasis on biological systems beginning in the 1960s, biogeography became prominent with a tendency to focus on the geography and changes through time in animals. As Graham points out, numerous recent books focus on fauna (especially mammals from the late Cretaceous to the Cenozoic) but not on plants.

Because Graham’s overall goal is to trace the origin and development of modern New World plant communities and the various events that guided this process, he provides background in early chapters to prepare his readers to understand it. In the first chapter he addresses the “thorny” issue of classifying vegetation. I agree with the difficult demands he tries to meet in describing vegetation through space and time: consistency across geographic and national boundaries amid different languages; accommodation of both analogues and modern derivations; and simple but adequate descriptions of paleovegetation. I do not agree, however, with his categorizing modern New World vegetation types by dividing them into Formations (not making clear the criteria he uses) and subdividing these into Associations based on characteristic species. I particularly question the use of these specific terms as they have a long, confusing, and controversial history in ecological research.

Graham may also confuse some readers who are being introduced to the geological term Formation. I found his table, listing these and other categories, purporting to be a guide to the numerous photographs illustrating the vegetation in this book (as well as his 1999 and 2010 summary publications), more of an enigma than a help. On occasion he just describes a broad vegetation type with its characteristic species and does not use hierarchical terms. I think his presentation would have been consistently better (especially with regard to illustrations from other sources) if he had done this throughout the book—a solution numerous ecologists have used for general discussions! This terminological criticism, however, constitutes only a blip in my admiration for Graham’s overall achievement in this book.

The second chapter’s title, “Location, location, location,” warns the reader of the difficulties in envisioning the diversity of vegetation types and their physical settings across the widespread area comprising the New World. The many excellent photographs greatly augment his text descriptions (not only here but throughout the book). Graham helpfully orients the reader geographically throughout North and South America and locates them physiographically with maps. I empathize with his struggle to provide adequate background for this complex scenario, but this long chapter (better than three times the length of other chapters) may be overwhelming to some readers—like a short course in plant geography in its traditional sense crammed into one chapter. Two chapters following “Locations...” provide valuable explanatory material—such as innovative techniques now available to scientists to interpret past and present environments, and how researchers decipher the plant fossil record.

Graham considers around 100 Ma to be a convenient starting point for his overview because this is when the outlines of today’s physical features, climate lineages, vegetation, and ecosystems can just be recognized. Angiosperms define most modern terrestrial plant communities today and at that time were in early stages of diversification and radiation. To bring us to the present, he uses a very helpful organizational framework of four geological time segments divided by three significant drops in temperature. He discusses each of these segments in a separate chapter: (1) early times from middle to late Cretaceous through early Eocene (100–50 Ma), (2) a transition period from middle Eocene through early Miocene (50–16.3 Ma), (3) a modernizing period from middle Miocene through Pliocene (16.3–2.6 Ma), and (4) the short Quaternary period (2.6 Ma–Present) encompassing the span of humans. Each of these eventful periods is characterized by significant recognizable changes in the flora, fauna, landscape, and climate. Although dense with detail, each chapter gives the reader a manageable take-away summary in preparation for a chapter on the bigger picture of the implications of past intercontinental environmental changes, which help explain such puzzling phenomena as disjunct distributions and refugia. Finally, Graham takes the reader on a pole-to-pole walk across the New World. In so doing, he pulls the overall New World natural history story into a special perspective—in fact, all previous chapters have been preparing the reader in various ways for this walk.

Graham clearly loves telling this story. His skills as a long-time college professor are evident in the well-conceived organization and clarity of his presentation (despite the complexity and necessarily density of data), as well as his ability to enliven interest by incorporating personal anecdotes and historical tidbits about people who explored the New

World and contributed to our early understanding of its natural history. However, he chides the reader, as he probably did his students, in suggesting repeatedly that learning today has become too passive. I fully support his emphasis on the importance of active participation in the learning process—by turning to many available sources of increasing understanding, and in this case using the text as a “cooperative adventure.”

I foresee this book being used widely, but with some caveats. Researchers will appreciate the comprehensive summary accompanied by abundant references and direction to even more detailed publications and updates. Graduate students in ecology should be able to understand the long history of changes in vegetation and associated environments, and to use it to discuss what the future might hold for them. Although it could offer “eye-opening” material for motivated upper division undergraduates, it probably would require some additional botanical and/or geological background for them to digest such complicated data in the limited time frame of

most courses. The book also could appeal to a general, but educated, audience of those wanting to learn about how our landscapes got where they are today. All readers should take heed of Graham’s persistent plea to take time to ponder and to realize the satisfaction of expending effort to understand these historical changes and their important implications for the future of our Earth and its human occupants.

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Wildlife in Britain: can conservation measures within Britain save biodiversity?

Maclean, Norman, editor. 2010. **Silent summer: the state of wildlife in Britain and Ireland**. Cambridge University Press, New York. xxi + 765 p. \$49.00, ISBN: 978-0-521-51966-3.

Key words: anthropogenic altered landscapes; biodiversity; conservation; Great Britain; insect fauna.

Silent summer is a 36-chapter, contributed volume in three parts: Part I covers factors driving changes in wildlife, Part II discusses current and past conservation actions, and Part III provides case histories of specific taxa. Chapter authors range from academics to biologists with natural history museums, non-governmental organizations, private and public research centers, and ecological consultancies. This is an ambitious work designed for both the layperson interested in wildlife and as a reference text for undergraduates. Although there is a lot of information in this book, ultimately I found it an unsatisfying treatment of this topic. This stems in part from its goal to both appeal to a general layperson audience and provide a reference volume for students of the biological sciences. It does not quite succeed at either. With regard to access for the layperson, many specific terms go undefined throughout the volume. For example “fitness,” which encompasses both survival and reproduction of the individual, “maternal effect” in which the phenotype of a zygote is in part determined by the genotype of the mother, and “introgression” movement of genes from one species to another through hybridization and backcrossing are never defined. Secondly, discussions concerning individual species or taxa are rarely put into a larger ecological/ecosystem context.

Overall, this book will have most value for those that reside in Britain, but very little utility to a wider audience of conservation literature. Place names are used without reference to where they are and one of the biggest issues in this text is a lack of discussion of species distributions. The focus is entirely on what is happening within the borders of Britain and Ireland,

but many of the species which reside there are either migratory or have a wider distribution than just the British Isles, yet this is rarely acknowledged and therefore it is difficult to assess the true state of affairs for these species and the effectiveness of conservation actions taken within Britain.

Chapters (2–11) in first section, “Factors driving changes in wildlife,” hit on many of the threats to biodiversity: habitat loss, destruction, degradation, and fragmentation; invasive species (hybridization, competition, predation); bioaccumulation of pesticides; endocrine disruptors; and climate change. However, the treatment of these topics is uneven. I also got absolutely no feel for the ecosystems of Britain, their native vs. non-native organisms, and what measures if any are being taken to promote *natural ecosystem functioning*.

Despite the unevenness of the volume, some chapters were very good, e.g., Chapter 2 (Sparks et al.) on climate change, and Chapter 3 (Norris) entitled “Agriculture, woodland and semi-natural habitats.” Norris states, “Some conservationists have expressed concern that an ecosystems approach might compromise protection for individual species...an ecosystems approach forces us to acknowledge and address the multiple functions our landscapes perform, and to develop solutions to conflicts we identify.” This is an important point that is lacking in discussions of individual species and conservation measures in other chapters. Chapter 9 (Tyler and Goodhead) on hormone disruptors is one of the best chapters. It is well written, well referenced, and logical. It clearly outlines the issues associated with endocrine disruptors. Hughes and Sayer (Chapter 10) discuss the ecological quality of river systems, which is affected by changes in flow, water quality, habitat availability, and channel geomorphology. The authors distinguish between point source and diffuse pollution and show how these different sources of pollution influence the eutrophication process. They suggest that focusing on the interaction between eutrophication and other stressors will be important in assessing the impact of specific pollutants on aquatic ecosystems.

However, other chapters are less satisfactory. For example, in Chapter 5 Lack suggests the New Zealand willowherb doesn’t compete with other plants, but ignores potential food web impacts, including impacts on soil characteristics. There is

some discussion of non-native impacts on native plants but very little ecological context, and no mention of real or potential life history impacts to birds, insects, or mammals. Scientific names are not consistently used and the author does not include citations to back up many statements made about impacts. In Chapter 7, Sharp focuses on hunting and contrasts areas where predators are controlled and where they aren't. Not surprisingly he finds that abundance goes up where predators are controlled but does not ever address whether this is sustainable in terms of resources (food and nesting) for these species released from predation. Nor is there a discussion of native vs. non-native predators. Sharp concludes that hunting is an important conservation activity in that it controls animal numbers and that hunters work to protect habitats. The author concludes that without hunting many species would be impacted but does not discuss hunting in the context of habitat constraints (either habitat fragmentation or habitat loss) and impact on species numbers and recruitment.

Sharp and Maclean (Chapter 8) address fish conservation entirely within context of the fishing industry. Terms are often not defined. Sampling sites are classified as A–F but no explanation of what this classification system entails is provided. Differences among rivers in size and characteristics are not discussed. There is not much discussion of native vs. non-native fishes. The section on trout does not discuss the stocking programs other than saying that most anglers catch stocked fish. It discusses health of fisheries in terms of numbers without making any distinction between stocked and wild fish. The authors also discuss farmed salmon—not the impact of farmed salmon on estuary ecosystems—but rather escapees from farms and their interbreeding with wild fish. This is a problem similar to concerns about stocked salmon in Pacific Northwest and recruitment of hatchery raised fish into wild populations, but the discussion of the impact of escapees from salmon farms on wild stocks is entirely anecdotal, with the authors concluding there is no impact. The authors are advocates for managing rivers for angling. To reach this conclusion, they use a case study of the Itchen River, which they state has increased biodiversity in the river system without a single reference cited to support this claim other than to allude to a survey by Maclean. They provide no details on

methodology and do not explain if the survey was done once or over multiple years. The authors list the amount of money spent on angling and then use this as evidence that fisheries are well managed, an entirely unsubstantiated claim.

In Chapter 11, Maclean discusses what he calls 25 key questions in ecology. However the questions poised here are conservation/management questions not questions about the ecology of organisms.

Chapters 15–35 cover case histories of individual species, entire taxa, or groups of taxa such as grey partridge, bumble bees, and freshwater fishes, but again with mixed results. Chapter 18 on grey partridges and Chapter 22 on riverflies are from hunting and angling perspectives. Detailed data exist for birds and butterflies that have captured the public interest for over several centuries. Many other taxa have far fewer data available for conservation assessment.

The conservation movement started and continues to a large extent with preservation of native ecosystems via creation of parks and reserves. This strategy is not really effective in Britain as the landscape has been highly modified by humans over 1000s of years. The biodiversity of the British Isles is then tightly correlated with the habitats that have been modified by humans to some degree or another. The question becomes what to preserve and how to do it on this landscape. Although there is a tremendous amount of information in this volume, the book would have benefitted from a chapter pulling the various species specific conservation measures together and assessing their impact by encompassing the interconnections among the diverse taxa of the British Isles.

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