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## BOOK REVIEWS

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**Rivers of North America.** Arthur C. Benke and Colbert E. Cushing (editors). ISBN 0-12-088253-1. Elsevier Academic Press, 30 Corporate Drive, Suite 400, Burlington, Massachusetts 01803 USA. 2005. 1146 pp. \$99.95 (hard cover).

The goal of **Rivers of North America** is to “provide as much information about as many rivers as possible in a single volume” (p. 3). It is “first and foremost a reference volume for the researcher and river enthusiast alike and is devoted to presenting a compendium of *comparable* physical, biological and ecological information [emphasis added] about many rivers” (p. xxi). The editors have accomplished a monumental editing task in presenting the data for each chapter in an identical format so as to make access to the information truly comparable for such a large number of rivers. This mammoth book includes chapters on 22 river basins, with specific coverage for 218 rivers. It has been written in a style designed to please *Journal of the North American Benthological Society* (J-NABS) readers. Forty-seven of the 70 authors belong to the North American Benthological Society (NABS), and the author list includes 11 past-presidents of our society. Readers must keep in mind that this volume summarizes the *existing* information on North American rivers, and our knowledge of these systems often has gaping holes.

The editors contributed an introductory chapter (*Background and approach*) that explains the book format and provides a succinct overview of river ecology. The introduction is followed by 24 chapters on the major river basins of North America and a final chapter (*Overview and prospects* by Allan and Benke). The book is well illustrated with color photographs, usually one for each river. A large number of people contributed photos, but Tim Palmer (a professional photographer) took ~25% of the photographs.

The uniform format used for each river basin consists of an “Introduction” followed by a detailed examination of the most important (or most studied) rivers in the basin. Most chapters also contain an “Additional Rivers” section that consists of 1 paragraph of text per river. Introductions always include brief overviews of the history of human land use, going back to the Native Americans. For each of the major rivers, the authors provide data on: 1) “Physiography, Climate, and Land Use”; 2) “River Geomorphology, Hydrology, and Chemistry”; 3) “River Biodiversity and

Ecology” (subdivided into Algae, Plants, Invertebrates, Vertebrates, and Ecosystem Processes); and 4) “Human Impacts and Special Features.”

The reader’s initial impression may be that this book is very long, but examination of individual chapters will be more likely to give an impression of great brevity. This brevity is carried to the extreme in the special single-page summary for each river, which includes a basin map and monthly graphs of runoff, precipitation, and temperature. The colored basin maps were developed by the Cartography Lab at the University of Alabama and include basin boundaries, topographic features, major tributaries, major dams, major cities, and delineation of physiographic provinces. They do not include ecoregion boundaries, but these are listed in accompanying tables. The graphs will be familiar to NABS members from Art Benke’s presidential address, reflecting the editor’s view that flow regimes are critically important to understanding riverine communities. These graphs also have been annotated to illustrate periods of evapotranspiration, snow storage, etc.

The single-page summaries contain 24 text categories, from physical characteristics (relief, mean discharge, mean temperatures, etc.) to lists of the dominant taxa in a number of groups (fish, other aquatic vertebrates, benthic invertebrates, nonnative species, and riparian plants). Water-quality data generally appear as single-number averages for pH, alkalinity, and nutrient concentrations. Presumably, the physical and chemical information came from a site in the lower part of the basin, and readers should use these data with caution. Much of the biological data also were derived from downstream reaches.

Review of the “River Biodiversity and Ecology” sections in each chapter makes it clear that scientists studying invertebrate communities are far behind fisheries biologists in simple species inventories. The single-page summaries always include the number of fish species in the basin, but I doubt that we can make even an order-of-magnitude estimate for the invertebrates. The text often mentions “several hundred” invertebrate species for a river basin (e.g., *Preface*, p. xxi), but I suspect that this number should be closer to several thousand. Not all invertebrate groups are equally neglected, and mollusks (especially mussels) and crayfish appear to be studied more thoroughly (or to have better press agents) than aquatic insects. Conservation biologists working with the mussels

and crayfish have done an excellent job of mapping species distributions and identifying rare, threatened, and endangered taxa.

I expect that *J-NABS* readers would be particularly interested in the sections on aquatic invertebrates, so my subsequent comments focus on this topic. The invertebrate section for each river is usually less than 1 page, so readers should not expect great detail, but references are provided to give an investigator a more comprehensive starting point. The authors attempt to list dominant genera, but at this level of taxonomy such lists do not always demonstrate the unique features of a river basin. Genera such as *Stenonema*, *Baetis*, *Caenis*, *Tricorythodes*, *Hydropsyche*, and *Cheumatopsyche* are often among the dominants for rivers throughout much of North America.

The brevity of many invertebrate sections tends to highlight how much is unknown about the biology of large rivers. Any data summary is limited by the quality of the existing data, and **Rivers of North America** often illustrates problems in the way we have studied riverine communities. Much of our inventory data for macroinvertebrates shows strong biases in the following areas:

1. *Small streams vs rivers*.—Data collection is much easier in wadeable streams, so the reader must look closely to see whether species lists include data from the mainstem or from just the tributaries.

2. *Large organisms vs small (and taxonomically difficult) organisms*.—We often are presented with lists of Ephemeroptera, Plecoptera, Trichoptera (EPT) organisms as the dominant macroinvertebrates, with limited attention paid to Oligochaeta, Chironomidae, and meiofauna. Chironomidae often make up >30% of the fauna in temperate streams, and this proportion is much higher in more northern systems. The text often mentions Chironomidae as being among the dominants (along with 3–4 listed genera), but the authors cannot summarize research that has not been conducted. Zooplankton data occur in a few chapters, but zooplankton have not been studied in most rivers.

3. *Hard substrates and fast water vs soft substrate and slow water*.—Riffle and snag fauna are most consistently mentioned in the text, whereas only a few chapters deal with the fauna of sand and silts. The data on invertebrates tend to emphasize fast-water fauna with little data on the fauna from bank areas, pools, etc. For this reason, many chapters have few data on Coleoptera (except elmids), Odonata, etc.

4. *Dominance vs diversity*.—Most invertebrate species are rare, and this part of the benthic community is extremely difficult to summarize. The authors of some chapters mention the number of species known to occur in major taxonomic groups, but only a few

chapters list rare aquatic insects. Riverine habitats often contain many rare species and these species can be highly vulnerable to pollution.

5. *Summer collections vs autumn, winter, and spring collections*.—Routine monitoring usually occurs at a single time of the year, often summer. In colder climates, summer may be the only time of the year when sampling can occur. In warmer climates, however, we miss a significant part of the aquatic fauna when collections are limited to a single season. Winter and spring stoneflies are sometimes absent from the lists of dominant aquatic insects, even in areas where we might expect these species to be seasonally abundant.

6. *Family/genus-level vs species-level identification of taxa*.—Much of the taxonomic similarity noted between river basins when taxa are identified at the genus level would not be observed were taxa identified at the species level. Moreover, for a few river basins, the need to sample large number of sites with a limited budget has resulted in the use family-level identifications.

7. *Rivers close to home vs remote rivers*.—The further a river basin is from the investigator's lab, the more difficult it becomes to census the macroinvertebrate community adequately. This phenomenon is particularly evident for northern rivers in Alaska and Canada, where travel is difficult and expensive. For 21 rivers within this region, the listing for major benthic invertebrates in the single-page summary is either "NA" or "unconfirmed." For an additional 14 rivers in Alaska and Canada, data are extremely limited or are available only at the family level. Bailey (p. 783) points out the relevance of this problem to the Yukon River: "... The Yukon River, as rivers in other remote areas of the world, might be altered by climate change or other human stressors before it is possible to conduct adequate ecological assessments."

Mexican rivers also are poorly studied, so I was pleased to see them included in the book. The best information from this region of the country appears to be for mollusks (especially snails), Crustacea, and Megaloptera. Specialists in these groups appear (from the information in the book) to be well ahead of specialists in other groups of invertebrates for Mexican rivers. Overall macroinvertebrate data seem to be limited for most of the rivers, and 2 rivers had NA listings in "Major Benthic Invertebrates."

The concluding chapter (*Overview and prospects*) attempts to summarize this mass of data. Allan and Benke point out the paucity of pristine rivers and the widespread impacts of water-quality problems, habitat degradation, dams (fragmentation), and nonnative species. Readers are invited to think about North

American rivers in the 21<sup>st</sup> century, at a time when both threats (including climate change) and attempts to restore rivers are increasing.

**Rivers of North America** is an excellent place to start an investigation by thinking about how river ecology (including benthos) is affected by hydrology, geology, and both past and present land use. Most *J-NABS* readers will want to have this volume on their bookshelf. The book will be particularly useful to individuals making comparisons between rivers. The book may contain too much data for a normal college class, but teachers should consider selecting contrasting rivers to illustrate the factors controlling the communities of streams and rivers in North America.

The authors often acknowledge the lack of good data for our rivers in many categories. I cannot emphasize too strongly that the problems I see when using this book are related to gaps in our knowledge and that these problems are not the fault of the authors. This group of authors includes most of the leading experts in the ecology of North American rivers. They have provided a starting point for investigating our rivers and given us the tools for understanding how our rivers function. Now it is time for us to get to work!

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**Methods to study litter decomposition: a practical guide.** M. A. S. Graça, F. Bärlocher, and M. O. Gessner (editors). ISBN 1-4020-3348-6. Springer, PO Box 17, 3300 AA Dordrecht, the Netherlands. 2005. 329 pp. \$159.00 (hard cover).

In temperate ecosystems, the vast majority of primary production enters the detrital pool (McNaughton et al. 1989). Leaf litter from deciduous vegetation provides a significant energy source to soil and aquatic food webs in low-order streams, ponds, wetlands, vernal pools, and lake littoral zones. Decomposition of senesced leaf litter is a critical ecosystem process involved with nutrient recycling and the liberation of energy to higher trophic levels. Studying the controls of decomposition rates has been the focus of ecological research for decades, mostly because of the complicated and correlated factors, both intrinsic/extrinsic and biotic/abiotic, that contribute to decomposition. **Methods to study litter decomposition: a practical guide**, edited by Graça, Bärlocher, and Gessner, brings together in a single volume a suite of techniques used to study litter decomposition in

aquatic ecosystems. The target audience is aquatic ecologists, but many of the methods will be of interest to terrestrial ecologists as well.

The strengths of the book lie in the manner in which it is organized, the thoroughness with which the methods are described, and the clear, concise summaries provided for each procedure. Overall, each method is presented well, prefaced by very comprehensive introductions, a materials list, solution preparations, and method steps. Key references are listed for each method and provide a crucial resource for exploring each technique. Some spelling and grammatical errors occur throughout the text, but such idiosyncrasies pale in comparison to the value of the text to researchers working in freshwater ecosystems. References to custom apparatuses appear in many of the methods, and illustrations of these apparatuses would have significantly aided the investigator.

The book is organized into 6 sections: *Litter dynamics*, *Leaf chemical and physical properties*, *Microbial decomposers*, *Enzymatic capabilities*, *Detritivorous consumers*, and *Data analysis*. *Litter dynamics* spans 7 topics, ranging from the major techniques used to estimate budgets for coarse particulate organic matter to the traditional litter-bag method to estimate leaf decomposition rate. Critical treatment is given to leaching processes and to the experimental approach to understanding streambed retentiveness of leaf litter.

Litter chemistry can be a significant factor influencing litter decay, and 11 methods are superbly presented in *Leaf chemical and physical properties*. The presentation of these methods ranges from a description of the structural nature of leaf tissue (e.g., toughness, fiber components) to the estimation of nutrient content, protein fractions, and secondary compounds. The introduction to each method is thorough, fair with respect to any shortcomings, and highly informative given the complexity of leaf-tissue chemical composition.

*Microbial decomposers* addresses techniques with which to study the ecology of fungi and bacteria. The section includes culturing techniques, taxonomy of fungi, estimation of fungal community structure and biomass, and methods for assessing microbial activity (e.g., radiolabeling, ATP extraction, and respirometry). *Microbial decomposers* does a thorough job of summarizing the many techniques used for estimating the microbial contribution to decomposition, a necessary and critical step in understanding nutrient recycling in detritus-based systems. The key to the common aquatic hyphomycetes is particularly unique and is appreciated.

Decomposition of leaf litter is mediated by a suite of enzymatic activities, and no set of techniques to study litter decay would be complete without a thorough

treatment of these processes. *Enzymatic capabilities* covers 8 methods that focus on a range of enzyme assays, including the enzymes that degrade cellulose, pectin, lignin, phenolics, and proteins, and provides the reader with complete instruction on how to conduct such tests.

Two sections are less developed than the other sections in the book. *Detritivorous consumers* focuses on a method for maintaining leaf-chewing invertebrates (i.e., shredders) in the laboratory and on the design of feeding-preference experiments. The important role of consumers in mediating litter decay is well established. However, given the inherent difficulty in separating consumer effects from other factors influencing decay in the field, a description of how diverse laboratory, field, and theoretical methods could be used together (e.g., Hieber and Gessner 2002, González and Graça 2003) would have been helpful to have as a resource.

*Data analysis* is a brief treatment of the statistical analyses pertaining to the methods presented in the book, with substantial focus on randomization techniques using the software package Resampling Stats. A presentation of the rarefaction technique, used to make accurate estimates of species richness, is included. The methods for rarefaction and randomization tests are explained nicely and include enough introductory material to get a novice started. The section provides the information needed for readers to seek out other resources, such as Manly's (1997) text. However, restricting examples to those based on the Resampling Stats software package (\$199 for an individual license) makes implementing the analyses difficult for those without this software package. I look forward to seeing these sections more developed in a future edition, especially in light of how well the rest of the text is done.

The topics discussed in this book span a significant

and realistic range of techniques used to study the role of leaf litter in aquatic ecosystems and are the result of a valuable graduate course coordinated by the editors. I had the pleasure of participating in this course and find that the book reflects the quality of the methods presented there. **Methods to study litter decomposition: a practical guide** found a place on my bookshelf shortly after it was published, and I anticipate that any ecologist with even a tangential interest in the role that senesced leaf litter plays in their system, be it aquatic or terrestrial, will find this book a worthwhile investment. Graduate students will appreciate the well-written introductions to each technique, and seasoned researchers will certainly reach for it often to refresh their own knowledge on this complicated, but critical ecosystem process.

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#### Literature Cited

- GONZÁLEZ, J. M., AND M. A. S. GRAÇA. 2003. Conversion of leaf litter to secondary production by a shredding caddis-fly. *Freshwater Biology* 48:1578–1592.
- HIEBER, M., AND M. O. GESSNER. 2002. Contribution of stream detritivores, fungi, and bacteria to leaf breakdown based on biomass estimates. *Ecology* 83:1026–1038.
- MANLY, B. F. J. 1997. Randomization, bootstrap and Monte Carlo methods in biology. 2<sup>nd</sup> edition. Chapman and Hall/CRC, Boca Raton, Florida.
- MCCAUGHTON, S. J., M. OSTERFIELD, D. A. FRANK, AND K. J. WILLIAMS. 1989. Ecosystem-level patterns of primary productivity and herbivory in terrestrial habitats. *Nature* 341:142–144.