

## The Marriage of History to Ecology

**Shifting Baselines: The Past and the Future of Ocean Fisheries.** Jeremy B. C. Jackson, Karen E. Alexander, and Enric Sala, eds. Island Press, 2011. 284 pp., illus. \$35.00 (ISBN 9781610910019 paper).

**S**hifting Baselines: *The Past and the Future of Ocean Fisheries* is an attempt to investigate the feasibility and relevance of the idea introduced by Daniel Pauly of the University of British Columbia in his 1995 seminal paper “Anecdotes and the shifting baseline syndrome of fisheries.” This book is a collection of articles based on a conference held in 2003 at the Scripps Institution of Oceanography, and it claims to use a “historical perspective to determine the true magnitude of decline and the challenges for sustainability in the future.” Its overall objective is to show “how new perspectives on the past can alter our understanding of oceans today and change the future for the better.” The book first defines the problem—what we lose without marrying history to marine ecology—and then describes the many challenges of joining these two perspectives. Two sets of case studies are presented (one on sardines and anchovies, the other on cod), then a discussion follows on the methodologies used in historical marine ecology in all their variety and complexity and including their strengths and limitations. The book concludes by describing how *historical ecology* is, or could be, used today.

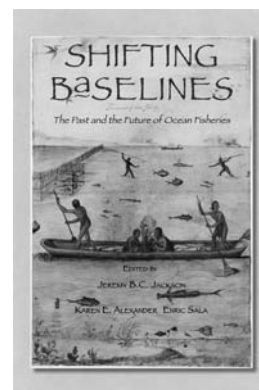
*Shifting Baselines* is decidedly more than a book on fisheries management. Edited by Jeremy B. C. Jackson (director of the Center for Marine Biodiversity and Conservation at the Scripps Institution of Oceanography in California), Karen E. Alexander (a historical fisheries scientist at the University of New Hampshire), and Enric Sala (head of National Geographic’s global

marine conservation initiative), the book’s contributions are broad in scope—from history and archaeology to marine biology and oceanography. Twenty-four authors bring their expertise to the relevant issues at hand, treating Pauly as a sort of godfather. The text is generally easy to read and conveys plenty of enjoyable insights from the authors’ professional and personal experiences (e.g., Safina’s lifelong relationship to Long Island, New York), making the book more introspective than most scientific volumes.

The value of the book resides foremost in its overall argument in favor of marrying history and ecology to study ocean fisheries management. The argument is well grounded, thorough, and illustrated. The book also provides numerous golden nuggets of information of historical depth within its pages. For example, Bolster and colleagues remind us in chapter 6 of how cod-fishing subsidies in New England were originally aimed at maintaining a capacity that would otherwise disappear: The fishing fleet was a nursery for seamen in case of future wars. The result is a book that is instrumental in raising awareness of the need to pay attention to history.

*Shifting Baselines* does have some weaknesses, however. First, although each chapter is valuable and although the introductions to each section add to the book’s coherence, the finished product still seems too much like a compilation of seminar papers. It is also a pity that the conference on which the book is based dates back to 2003, and no explanation is provided as to why there was such a delay or whether the research is still up to date. Second, limits to the approach are addressed, but their consequences are not clearly discussed. Is the knowledge produced by historical research robust enough to be tabled in international or stakeholders’ negotiations? Such a question

seems crucial for historical approaches that push the boundaries of ecological science. As Palumbi states it in chapter 9, there is “danger in using these data to answer questions for which they were not designed” (p. 163).



Another shortcoming of the book is that it does not provide a clear and synthetic discussion about why baselines should actually be shifted. What exactly can we do differently by knowing more about the past? Admittedly, the book does not ignore this issue. It is actually the purpose of the last section (“From fisheries management to ecosystems”), dedicated to “how... history [should] influence marine science, how... science [should] influence marine policy, and how... science and history leverage each other to greater effect” (p. 176). In chapter 11, editors Sala and Jackson, for example, show how the history of the bluefin tuna stock tells us that no fishing can be sustainable today (p. 195). But some examples are less explicit: In chapter 10, Rosenberg and colleagues report on thought-provoking management cases but are nevertheless unclear about the exact role that historical analysis plays (e.g., in whales and seals management; p. 188).

Dozens of partial reasons are given as to why baselines need to be shifted, but there is no synthesis that unifies

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them: because historical baselines are needed to move beyond maximum sustainable yield (Jackson and Alexander, p. 3) and redefine targets in fisheries management (Bolster and colleagues, p. 103); because historical ecology helps combat the “collective amnesia that allows policymakers to commit the same errors over and over again without any clear awareness of how similar courses have proved disastrous before” (Vickers and McClenachan, p. 123); because “we cannot effectively restore degraded marine populations, communities, or ecosystems without historical baselines to use as reference points” (Lotze and colleagues, p. 137); because “together, knowledge and imagination give us back what is lost in living memory: a long-term vision of the history of nature and of ourselves.... We can use that vision to question our actions and their consequences for the ocean and to rethink and redirect our path into the future” (Lotze and colleagues, p. 161); because “the International Whaling Commission received a global mandate to monitor the current state and determine the past condition of whale populations in order to manage hunting in the future” (Palumbi, p. 165); because “history can provide a working model and act as a bridge between stakeholders who are often at odds” (Rosenberg and colleagues, p. 190); because “the concept of shifting baselines helps to neutralize denial” (Jackson and Alexander, p. 205).

Such a heterogeneous inventory has an advantage: Every reader can find an interest in the shifting baselines concept. It also makes it look too much like a Swiss Army knife—with many tools for many purposes—but apparent contradictions within the book are not addressed. Lotze and colleagues underline “that past... was ever changeable so that our baseline for comparison depends on when we choose to measure it” (p. 137). Rosenberg and colleagues assert that “frankly, managers have had enough of a struggle trying to reverse the downward spiral of fish stocks, let alone rebuild fully functional ecosystems” (p. 179) and

further remind us that “elected officials respond to the political pressure of the loudest voices engaged in an issue” (p. 181). Then how exactly is historical ecology supposed to be used? The point is not to question the fundamental interest of marrying ecology to history; *Shifting Baselines* offers a wealth of viewpoints, examples, and methodologies that make it an important milestone toward this end. However, a more elaborate concluding chapter discussing apparent internal contradictions and bringing a more coherent argument for the reader to take home would have been welcome.

An unfortunate characteristic of the book must be mentioned: Seventy pages of detailed and well-documented notes are neither numbered nor called out in the text. This issue may be corrected in later printings, but it considerably hampered the scientific robustness of the text I had in my hands. It also does not prevent reading and enjoying the book, but it will raise considerable frustration, especially for students and researchers.

Having said that, *Shifting Baselines* is a stimulating and necessary volume for anyone interested in the issues surrounding marine conservation, ecosystem-based management, or how societies may set ambitious but realistic targets for biodiversity. Shifting baselines in fisheries management will also meet concerns in other fields of environmental management, where scientists and authors have already demonstrated how history changes the way we see current action, as well as future opportunities and constraints—a perspective that remains too often marginal in the biodiversity conservation arena.

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#### DISTURBANCE AT THE CENTER OF ECOLOGY AND HUMAN LIVES

**The Biology of Disturbed Habitats.** Lawrence R. Walker. Oxford University Press, 2012. 360 pp., illus. \$59.95 (ISBN 9780199575305 paper).

In *The Biology of Disturbed Habitats*, readers will find a pithy but well-balanced review of the relevant research on ecological theory, but disturbance ecology is the focal point throughout the book. In reading, we view the whole of ecology through the lens of disturbance—as a modulator of biodiversity, ecosystem processes, and stability. I do not know of any previously published work more comprehensive in its inclusiveness of the types of natural and human disturbances, in spatial and temporal scales, within aquatic and terrestrial ecosystems, affecting both plants and animals. The interplay between the natural and anthropogenic disturbances and how they affect human use of the environment and sustainability is the book's key component. The statement “To survive, humans have adapted to disturbances that we cannot manage and manipulated those we can” (p. 211) captures its essence.

Author Lawrence R. Walker, a professor of plant ecology at the University of Nevada and a published writer of many classic papers, has addressed this book to ecologists, naturalists, and land managers. The prose is straightforward and readable by an audience with a wide array of specialties. Although the subject matter is vast, the book narrows in on the specifics with illustrative examples of disturbance within various ecosystems, showing how the small observable details fit into the much larger concepts. Tables and conceptual diagrams summarize major points, making the book useful for teachers who wish to introduce students to the variety of processes and effects of disturbance. I found the tables that show the chronological development of ecological concepts

over the last century to be particularly convenient, because I had forgotten certain items since graduate school.

Walker's message is clear: Disturbances are constantly affecting all life, everywhere, in an integrative fashion. This point of view is likely to be eye opening for many students and researchers who believe that it is possible to experimentally isolate one factor of interest, one disturbed element, in field study. Carcasses create nutrient pulses; sand dunes move across the landscape. Floods, tsunamis, treefalls, insect infestations, fires, volcanoes, and landslides are all considered and then put in a larger temporal and spatial context. Anthropogenic disturbances, including forestry, mining, agriculture, dams, urbanization, and military activities—which are novel compared with the evolutionary history of most species and ecosystems—are given a particularly thorough treatment. An estimate of the proportion of the Earth's surface affected by each disturbance type is given when data are available.

The book is not flawless, however. For example, fire intensity is measured in kilowatts (not temperature); tornadoes and thunderstorm downbursts, which probably affect areas as large as cyclones (*hurricanes* in North America), are absent; and large herbivores are not discussed in chapter 2 ("Terrestrial habitats") but curiously appear later, in chapter 8 ("Temporal dynamics"), where they are certainly relevant but lack the necessary introduction that should have occurred earlier.

The usefulness and limitations of ecological theory are given reviews throughout the book. For example, Clements's theory on climax vegetation is put in the proper perspective with a discussion steering between the extreme viewpoints that have often been voiced elsewhere and the more indulgent approach, which allows it to mingle with the supposedly opposing individualistic theory. Discussions of ecological function, biodiversity, landscape ecology, patch dynamics

(including interface interactions, such as along shorelines), and restoration ecology appear in various chapters; these are like miniature textbooks on each of these topics and are among the highlights of the book. Chapter 8, on temporal dynamics, has a truly grand integrated discussion of the history, mechanisms, and trajectories of succession and how they are influenced by interactions with disturbance, plant-animal interactions, and environmental factors. This is the most readable discussion of the complexities of succession that I have encountered.



Some books in this genre have an anticlimactic ending that merely summarizes the earlier chapters of the book—not so here. Chapters 9 and 10 (the last two chapters) cover management concerns and future scenarios in the context of disturbance and maintain our interest until the end. These chapters highlight humans as managers of disturbance, degradation of the environment, and the possibilities and limitations of ecological restoration. Humans variously leave natural disturbance alone, try to restore it, try to mimic it, try to eliminate it, or—if none of those options fit the situation—try to adapt to it. These choices depend on views of nature that differ regionally and with the human population needs and size. Intentionally introduced disturbances can have unintended consequences, covering such a large area that ecosystems are undercut. The same applies to a number of disturbances that are unintentionally introduced, such as tree diseases like chestnut blight.

In these last chapters, Walker also intertwines his personal message regarding the balance among natural areas, exploitive uses of biodiversity such as forestry and fisheries, and urban areas in a changing climate. The vulnerability of humans to disturbance grows as population increases, putting more people in the line of fire with natural disturbances. We both enhance natural disturbance through climate change and desertification and create others ourselves, which come back to haunt us. Possibilities of using technological, cultural, and ecological knowledge to deal with these problems bring the book to a conclusion. This leaves us to ponder intangible questions such as whether a certain quality of life can be maintained in a world with rapidly changing climate and growing population, what balance of human exploitation and native species is needed to maintain that quality of life, whether we are smart enough to obtain the necessary knowledge of ecosystem functions, and if so, whether impartial science will be used, given the cultural divergences within our society.

*The Biology of Disturbed Habitats* shows us why disturbance is fundamentally tied to all of these questions.

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## THE BIG-TENT VIEW OF BIOLINGUISTICS

**Phonological Architecture: A Biolinguistic Perspective.** Bridget D. Samuels. Oxford University Press, 2011. 272 pp., illus. \$55.00 (ISBN 9780199694365 paper).

Attempting to unify biology and linguistics is not a new idea. George Zipf's work in the 1930s (e.g., Zipf 1935) demonstrated that

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there is a strong correlation between the frequency of an item in language and its size or complexity. Zipf interpreted this result to reflect a biological difficulty of production in language. Eric Lenneberg's work in the 1960s (e.g., Lenneberg 1964) compared language acquisition with biologically determined (e.g., walking) and culturally determined (e.g., writing) behaviors for the purpose of highlighting the importance of understanding the biological aspects of language. In the book *Phonological Architecture: A Biolinguistic Perspective*, author Bridget D. Samuels delivers a contemporary Chomsky-like interpretation of how linguistics—specifically *phonology*, the study of sound patterns in human language—can benefit from a biologically informed point of view.

*Biolinguistics* is the current buzzword adopted by linguists pursuing a particular branch of generative grammar closely associated with Noam Chomsky's Minimalist Program (Chomsky 2005). This word refers to a combination of aspects of biology and linguistics that varies depending on the particular researcher and the particular moment. Samuels's interpretation of the term echoes what was defined by Chomsky as pursuing linguistics through the investigation of three factors: genetic endowment, experience, and additional factors that are not specific to language. *Genetic endowment* is the innate capacity for the acquisition of human language referred to as *universal grammar*. *Experience* is the interaction between a child and the speech community that the child grows up in that determines which and how many languages the child acquires. According to Lenneberg, an adequate understanding of human language requires proper attention to both factors, in addition to knowledge of how they interact with each other. Neither nature nor nurture is sufficient on its own to explain human language.

The book's biolinguistic investigation of phonology begins with a review of the evolutionary basis of sound patterns in human language. This survey clearly demonstrates that much of phonology has precursors

in nonhumans. Samuels considers research on many different species to demonstrate that categorical perception of sounds is not unique to humans and, therefore, does not need to be explained by phonologists, nor should it be questioned.



Considering patterns of sounds that other species can learn is more of a mixed bag of results. A debate exists as to whether patterns of sounds found in different animal communication systems have *syntax*. Much of this debate is a confusion over nomenclature, however. If *syntax* is used to mean patterns among sequential elements, reasonable parties should agree that all communication systems have it. If *syntax* is used to mean patterns that demonstrate a complexity based on hierarchical generalizations, the question is more complicated and empirical in nature. Both human phonology and different animal communication systems have this type of hierarchical structure in at least a limited fashion, where smaller units of sound are grouped into larger chunks that have distinct patterns of their own. Samuels is correct in suggesting that our understanding of human phonology can benefit from a better grasp of what we know about the cognition of sound in animals and about the sound structure of animal communication systems.

Whether other animal communication systems are equivalent to human speech is another question. Samuels believes that the answer is clearly *no*, because there is a tight connection between human syntax and human phonology, wherein phonological

domains are directly derived from syntactic structure. This is where we have to recognize a third distinct meaning of the word *syntax*. Samuels and many other generative linguists reserve the use of the term for dependencies among different elements that are more than a simple hierarchical structure. The particulars of these dependencies are defined in contemporary syntactic theories, and it is at this point in *Phonological Architecture* where the book is written strictly for generative linguists.

The remainder of the book and the arguments therein are “inside baseball” for linguists only (e.g., arguing for phase-theory-deriving domains in phonology, being in favor of similar algorithms for processing syntactic and phonological structures, voicing against markedness theory in phonology)—for better or worse. Samuels is explicit enough in her arguments so that linguists can evaluate and argue with them, which always helps to push the field forward. However, when the analysis of human language becomes so narrowly technical, the connections to other fields of study or to other animal behaviors become completely opaque. If Samuels and linguists are interested in new collaborations with other researchers, especially biologists, it is incumbent on linguists to work on building these relationships and making their work more accessible.

It is difficult to accept all of Samuels's arguments off the shelf. The strong connection between syntactic (as it is narrowly defined by theoretical linguists) and human phonological structure that she proposes runs immediately into two complications. First, human phonology appears to lack syntax in the technical sense (Heinz and Idsardi 2011), which makes the interface between syntax and phonology more indirect than what Samuels proposes. Second, the structure of human phonology and those found in other animal communication systems are quite similar. If the structure of human phonology is so connected with human syntax, why

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do other animal communication systems resemble human phonology?

If we gain nothing from *Phonological Architecture* other than the motivation to work on a better understanding of the relation between human syntax and human phonology and an understanding of what is viewed as common and what is species specific across animal vocal communication systems, Samuels should be very happy. Additional technical points are made in the book that linguists should pay attention to, and specific claims are stated about possible computations in phonology and about the relationship between variation and language change. As with the rest of the book, these topics are presented in a clear and decisive manner, which allows them to be evaluated and argued by specialists in the field.

More credit will be given to Samuels's work if scientists heed her call to be more collaborative and cross-disciplinary in the study of human language. If we interpret *biolinguistics* as a research program that is dedicated to understanding the relationship between the genotypes and phenotypes responsible for explaining human language, the benefits of collaborations among biologists, linguists, psychologists, cognitive scientists, and zoologists are clear. Each scientific field provides a unique perspective of the content within this expansive definition. It is the message of *Phonological Architecture* that only with this big-tent view of biolinguistics will phonology research be a fruitful endeavor.

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