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Shifting Baselines: The Past and the Future of Ocean Fisheries

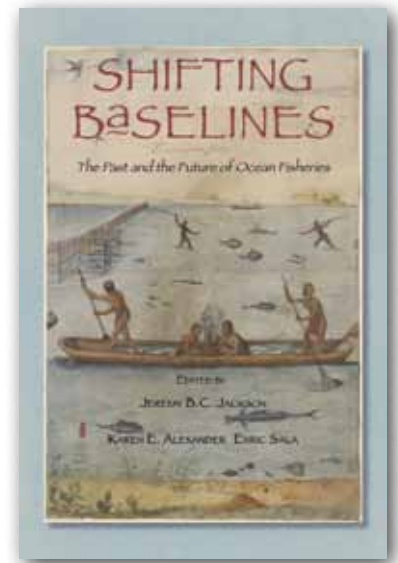
Jeremy B.C. Jackson, Karen Alexander, and Enric Sala, editors, Island Press, 2011, 284 pages, ISBN 978-1-61091-001-9, Hardcover and E-Book, \$35 US

REVIEWED BY ALISTAIR J. HOBDAV

The term “shifting baselines” refers to the way in which significant changes to an ecosystem are measured against previous baseline states, which themselves are significantly different from the original state of the system. Daniel Pauly (1995) popularized the term, which refers to fisheries management where scientists sometimes fail to identify the correct “baseline” population size (i.e., how abundant a fish species population was before human exploitation), and thus use a shifted baseline when evaluating unfished population size. A species that was abundant hundreds of years ago may have experienced declines over that whole period, but the population status in recent past decades is incorrectly considered as the appropriate reference point for current population management. In this way, large declines in species over long periods of time can be masked, with each human generation ignorant of previous conditions.

There is growing recognition that significant human impact on the ocean has a much longer history than just since the “industrial period” (~ 1850). Evidence of pre-industrial impact on terrestrial species, particularly mega-faunal extinction associated with native peoples entering the Americas, Australia, New Zealand, and the Pacific islands

(~ 40,000 BCE to 1000 CE) is now widely recognized. Despite this understanding, many people have believed that ocean life was protected from such impacts, and any change to the ocean is only recent. Part of this ocean “myopia” is perceived to result from an absence of “scientific data”—if it was not on a data sheet, it could not be useful. Thus, many nontraditional historical sources of population data, such as fisher logbooks, market receipts, and artist representations, have been ignored. Recent efforts have sought to redress this temporal bias in understanding history. For example, the decade-long Census of Marine Life program (2000–2010) included a project that focused on documenting the history of marine animal populations (HMAP) using a range of traditional and nontraditional sources (e.g., Figure 1). The goal was to document a more original (pre-human exploitation) state of the ocean. From this research initiative and others, clear signals of human impact have emerged: Basque whaling dating back almost 1,000 years dramatically reduced populations of right and bowhead whales, while in northeastern North America, Atlantic cod were greatly reduced by European fleets beginning around the year 1500. With regard to shifting baselines, fisheries have attracted particular attention, not least of which is for their recent (post-1950s) impacts on many species around the world. In fact, substantial fisheries have operated for hundreds of years, with evidence of open-ocean fishing activity dating back 40,000 years (O’Conner et al., 2011).



Over time, increased human population and improved technology have allowed orders of magnitude reductions in population sizes for many marine species, although we are only now becoming aware of just how modified the present-day ocean is.

These issues are expertly and clearly presented in *Shifting Baselines: The Past and the Future of Ocean Fisheries*. This multi-author volume, edited by Jeremy Jackson, Karen Alexander, and Enric Sala, provides a unique historical perspective on the evolution of knowledge and scientific thinking around shifting baselines. Editorial overviews preceding each of the five sections of the book do an outstanding job of contextualizing the chapters that follow. Citations are not in-text, but are provided as a series of comprehensive notes at the end of the book. The authors, who in many cases have also contributed to the original primary literature, discuss the process of historical discovery and any surrounding controversy—insight not generally available in peer-reviewed papers. The contributions in the book emphasize the multidisciplinary

approach to reconstructing baselines, requiring a variety of data-harvesting methods and an understanding of the social, economic, and historical context to correctly interpret the data.

In the first section, Carl Safina recounts a personal insight into his own shifting baseline experience, as he witnessed the effects of overfishing along the same shoreline of Long Island over many years. Given pervasive overfishing in all regions of the world's ocean, pristine areas are extremely rare. Thus, Safina contends, the past represents the only comprehensive "control" for comparisons to present conditions. To create historical baselines for fisheries, he advocates greater scrutiny of nontraditional records, such as logbooks from early explorers, and challenges scientists to remember that the world did not begin on their first day of graduate school. However, even the best studies of shifted baselines and the changing ocean will do little without a strategy for communication. In one of the chapters in this section, biologist-cum-filmmaker Randy Olson decries the limited attention that many research programs give to the dissemination of their efforts—a busy world will not come knocking to read even the best scientific papers. Olson provides a colorful, insightful, and sometimes sad set of anecdotes about failures to communicate science that should have changed societal attitudes toward marine conservation. He contends that without being communicated and valued by societies, conservation objectives will not be realized—and the shifting baseline paradigm will persist.

This book does not aim to be comprehensive in documenting past population changes for marine fisheries;

rather, it explores in detail several well-known case studies—overfishing of the sardine-anchovy complex (Section 2) and Atlantic cod (Section 3). Unraveling the mechanisms for late-1940s population declines in California sardine led to a longer-term perspective on marine population dynamics and an understanding of the relative importance of fisheries and environmental drivers. In the first sardine chapter, Alec MacCall presents a historical perspective on the study of this system, and touches on some institutional biases that colored early interpretations of the fishery-environment debate.

Section 3 on the history of Northwest Atlantic cod emphasizes the importance of social factors in interpreting historical patterns. Jeff Bolster and his co-authors embed their detailed and enthralling

description of their approach to the estimation of cod biomass in the 1850s within the social context of the fishery and life in the Northwest Atlantic. Nowhere is the importance of the multidisciplinary approach clearer than in this modern-day detective story, as historic, economic, management, and policy influences on catch data are explained, and then quantitative methods used to generate a biomass estimate. Their 1850s estimate of Scotian Shelf cod biomass (~ 1,200,000 tons) dwarfs the 2002 adult cod estimate for the same region (~ 3,000 tons). This baseline has well and truly shifted, and can now guide management and policy in setting definitions for healthy and recovered systems, or for judging future options.

Section 4 discusses a variety of methods that can be used to reconstruct

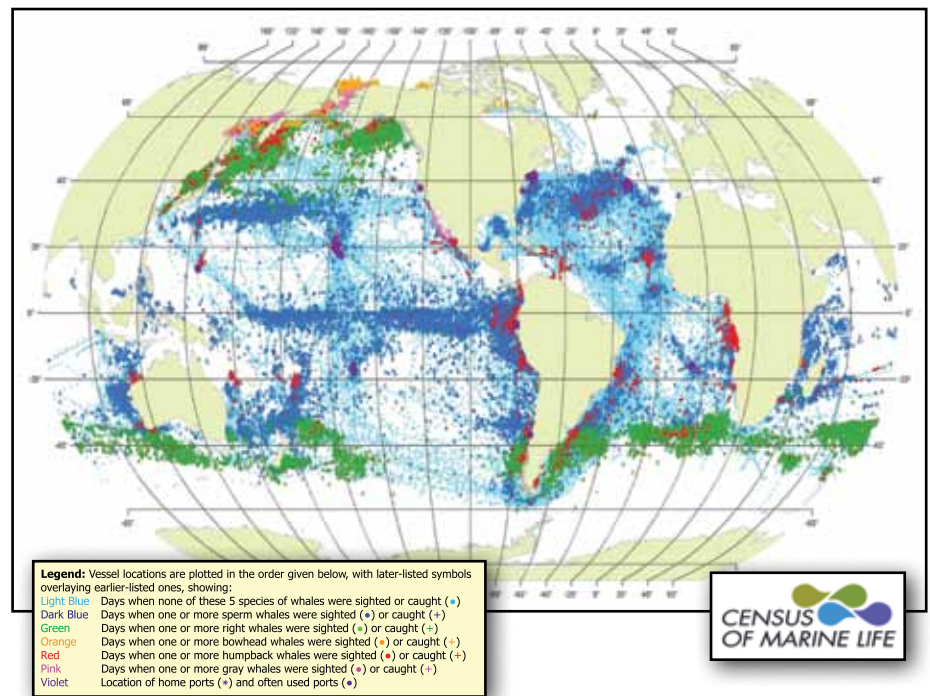


Figure 1. Location of American whaling vessels on days with and without encounters of five species of whales from 1780 to 1920. The data are recorded or interpolated locations of American whaling vessels extracted from logbooks of 1,381 of the roughly 14,000 voyages made over 450,000 days. Examination of historical whaling logbooks can reveal the relative abundance of the great whales, important as a baseline in evaluating the recovery of modern populations. *Modified from Smith et al. (2010)*

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the ocean's ecological history, noting that use of multiple methods can lend confidence to results from disparate sources. Heike Lotze and co-authors provide examples, using methods ranging from paleontology to modern genetics, to show how the abundance of marine species has changed over a range of time scales. In my favorite chapter, Steve Palumbi illustrates how apparently precise historical data might be misinterpreted if social factors at play in the society are not considered. This discussion segues into methodological alternatives for estimating pre-exploitation whale numbers, complete with simple population dynamics equations. Unanswered questions and the importance of further investigation of the historical status of populations are emphasized throughout.

The book concludes with a section on the relevance of baselines to ongoing ocean management and policy. These personal accounts, while reporting a somewhat dismal state of affairs, argue that considerable progress has, in fact, been made for species recovery and habitat restoration. Andy Rosenberg notes that efforts in the United States have been aided by an improved "baseline" understanding and recognition that the current state of ecosystems is unacceptable. Baselines are used in some places to argue, set, and evaluate conservation and management goals; however, they have not been used in most regions due to additional challenges. Jeremy Jackson and Enric Sala highlight the ongoing threats of pollution and overfishing that, when coupled with climate change, make recovery of Caribbean coral reefs a wicked problem. The contributions in this book do not

generally discuss the potential for a system to return to a previous baseline or the societal value of "pristine" ecosystems. Instead, as the editors note, they demonstrate that historical approaches and multidisciplinary makeup for study teams are important first steps toward improved fisheries and ocean management.

Although the baseline concept might imply a static past equilibrium state, a richer historical perspective will likely reveal different levels of natural variability, and will further improve our ability to understand past and potential future change. Understanding how marine systems vary in space and time remains a key research area, and the five broad challenges posed in the conclusion of the book should generate exciting ecological research in the coming years—not just for fisheries. Overall, this book is a great effort by the editors and their team of authors, and it makes for compelling reading.

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