

## Book Review

### **In a Perfect Ocean: the State of Fisheries and Ecosystems in the North Atlantic Ocean**

By Daniel Pauly and Jay L. Maclean

Island Press, Washington, DC, USA. 2003. 160 pp. US\$25.

This book presents some of the main findings of a project, entitled 'The Sea Around Us', intended to measure the impact of fishing on North Atlantic marine ecosystems. It promises a comprehensive assessment of fishery impacts in this domain based on a compilation and synthesis of historical information, from primary to grey literature as well as existing fishery databases, compiled during the past 50 yr. Consequently, the information is not new but the authors argue that the information has not been presented on such a grand spatial and temporal scale, utilizing a mapping approach that forms the basis for much of the book. The book is proposed to serve as a model of tested methodologies for analysing and assessing the 'health' of other seas and ecosystems and a 'report card' is presented that grades the North Atlantic relative to a perfect state, hence the title. Recommendations for mitigating fishery impacts are also given. The book contains four chapters dealing with a history of the North Atlantic and its resources, the decline of North Atlantic fisheries, how the decline in fisheries occurred, and what to do to reverse the situation.

Chapter 1 provides a very brief and general account of marine ecosystem structure and function along with a description of the domain of interest, as defined by FAO areas, LMEs and Longhurst's biogeochemical provinces. Accounts of past abundances of fish (both marine and freshwater), sea turtles, whales, shellfish, and a variety of other invertebrates within this area are given. This is followed by sketches of the development of fisheries (including technological changes) in the north-east and north-west Atlantic from day 1 to present, and wraps up with the conclusion that the primary cause of ecosystem disruption is overfishing. Overall this is quite an effective chapter, stressing the importance of understanding past conditions to fully appreciate the magnitude of change that has taken

place. But, given the brevity of evidence presented at this stage in the book, the conclusion is too strong, particularly given the absence of any discussion of climate effects on fisheries in terms of influences on changes both in the geographical distribution of fish populations and their dynamics, either in the North Atlantic or other marine ecosystems. For example, a sudden intrusion of cold Labrador Current water in March/April of 1882 was believed responsible for the sudden death of hundreds of millions of tilefish along the edge of the US north-east continental shelf (Marsh *et al.*, 1999). This event clearly had a major impact on this and other species, as well as its supporting ecosystem prior to the advent of industrialized fisheries.

The reader is given a first taste of the mapping approach in Chapter 1 and here we refer specifically to Figure 3, where a map of the domain is depicted in red (= danger everywhere!) to illustrate that there are few no-take marine reserves, with red referring to cells (30 × 30 miles) where at least some fishing is permitted. It is difficult to determine on what type of data the figure was drawn. It implies that all areas are subjected to fishing when, in fact, the majority of the North Atlantic basin area has experienced significantly less fishing pressure and, in some areas, none at all.

Chapter 2 presents evidence for the decline of North Atlantic fisheries, not only in terms of time trends of how much was caught, with attendant discards, but, as well, in terms of where they are captured. The transformation of time trends of geographically coarse (FAO fisheries areas), species-aggregated, commercial fisheries data into highly resolved maps of catch rates is based on a rather simple model of species-specific depth distributions. Combined with the use of a food web model (ECOPATH), further geographical depictions of biomass of large predatory fishes and relative F (catch divided by biomass) are presented. Declines of selected fish populations and changes in associated fishing mortality across the North Atlantic are presented as independent evidence to confirm the aggregate trends. Economic issues are also touched upon and the important point is made that, while the catch

may have declined significantly, the value has not, as fishing effort has moved from depleted populations of larger fish to lucrative invertebrate fisheries. Another interesting point regards energy efficiency: less protein is coming from the sea at a time when more energy is being expended to obtain it. Thus, we are incurring higher and higher real costs for that protein. Most of the remainder of the chapter addresses the lead author's signature work on fishing down marine food webs and several compelling graphics are used to make the point that, because fisheries have eliminated the larger, predatory fish at the top of the food chain, smaller species at progressively lower trophic levels are being exploited. Finally, a report card with five subjects listed is presented on the health of the North Atlantic ecosystem, with grades ranging from C to F. We had some questions about this chapter. Creating the high resolution, geographical distributions of exploited fish species from the much coarser fisheries data is an unproven method whose acceptance remains to be determined by the broader fisheries scientific community. It is well known, however, that the vast majority of demersal fisheries take place on the continental shelves, at depths of <200 m. Another main conclusion of this chapter is that the North Atlantic Ocean is in a downward spiral with respect to the overall abundance of marine life. However, in many of the component areas, dramatic *switches* in abundance of stocks have occurred. On Georges Bank, cod have been replaced by dogfish and mackerel and recent estimates of herring biomass are at an historical high (Collie and DeLong, 1999). Off Newfoundland, flatfish, then crustaceans, became abundant after cod declined (Myers and Worm, 2003) and on the Scotian Shelf, sand lance, capelin and herring have reached unprecedented high levels of abundance in the wake of the groundfish collapse (Zwanenburg *et al.*, 2002). In addition, Bundy (2004) has shown that the average trophic level of many fish species (even the depleted ones) on the Scotian Shelf has increased recently due to increased piscivory. Collectively, this information suggests that ecosystem productivity has increased.

Chapter 3 is an attempt to determine how the North Atlantic fisheries reached their present 'impoverished' state. The authors begin an analysis, via the medium of anecdote and caveats, of the societal, economic, political, scientific, legal and institutional causes of overfishing. They describe how each has, even with the best of intentions, been unable to dampen the tide of human overexploitation of fish stocks. One of the main arguments made is that,

because the fishing industry has been heavily subsidized, we (the taxpayers) are, as a consequence, subsidizing the destruction of marine ecosystems. Arguments are also made for the need to reduce the scale of fishing fleets by doing away with multinational corporations and localizing the scale of fishing activities. The demise of selected key resources, under the responsibility of the various management systems throughout the North Atlantic, is given as further evidence of unsustainable management. The authors call upon further involvement of individuals at local levels, including society at large and the fishers themselves. NGOs are seen as the only type of institution with accountability at the global scale (i.e. protection of the earth system).

The final chapter in the book provides solutions to rehabilitate impoverished ecosystems. These basically involve reversing of all the negative trends and tendencies that led to the present state. The authors are optimistic that past trends can be reversed, but reversal time is difficult to estimate. No one will argue for the need to reduce fishing effort and the various ways this might be accomplished, including the implementation of marine reserves. It is hoped that 20% of oceans will be protected in this manner by the year 2020. In this chapter and the others, depleted demersal fisheries and degraded ecosystems are considered one in the same.

The numerous endnotes tend to disrupt the flow of the main body of the text and, in some cases, do not provide supporting evidence. For example, it was stated on p. 17 that overall fishing effort in the area (Gulf of Maine and Georges Bank) was still increasing in the late 1990s. However, the endnote (no. 41) refers to archaeological evidence about the average size of cod landed from the Gulf of Maine and how it has changed, with further commentary on a developing fishery for sea cucumbers.

In summary, the book is really about the state of North Atlantic fisheries and mainly demersal fisheries and 'keystone' predatory species, with less attention given to invertebrate or pelagic fisheries. While it is understood that fish stocks and ecosystems are inseparable, it does not necessarily follow that ecosystem status can be sufficiently characterized only by these relatively few component populations or species. How do we rate this book? In keeping with the report-card style favoured by the authors, we give the book a solid C+. The book is not comprehensive but highly selective in terms of the examples chosen, literature reviewed and approach taken. We had many questions about the mapping methodology and ecosystem 'health' is really never assessed. However, the authors

present some excellent ideas on the way forward and give many striking schematics that illustrate the concepts of fishing down food webs. The scope of the book is large and, while the authors did not do justice to their subject, perhaps no one individual is yet able to take on such a challenge.

## REFERENCES

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