Ecosystem Approaches to Fisheries

A Global Perspective

Inspired by the work of the renowned fisheries scientist Daniel Pauly, this book provides a detailed overview of ecosystem-based management of fisheries. It explores the complex and interdisciplinary nature of the subject by bringing together contributions from some of the world's leading fisheries scientists and conservationists.

Combining both research reviews and opinion pieces, and reflecting the breadth of Pauly's influence within the field, the book illustrates the range of issues associated with the implementation of the ecosystem approach and the challenge of long-term sustainability. Topics covered include global biodiversity, the impact of human actions on marine life, the implications for economic and social systems, and the role of science in communicating and shaping ocean policy to conserve resources for the future.

This book provides a complete and essential overview for advanced researchers and for those just entering the field.

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Contents

V. Impacting policy

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Foreword

Less than two centuries ago, it did not seem silly for Byron to write "Man marks the earth with ruin, his control stops with the shore." Today, as this volume makes clear, the situation is grimly different.

Byron's observation about human impacts on terrestrial species and ecosystems was brought into sharp scientific focus by Vitousek *et al*'s (1986) analysis, suggesting that roughly 35–40% of the products of photosynthesis on land were taken, directly or indirectly, for our use. The corresponding careful analysis for fisheries came 10 years later, finding that although the overall fraction of aquatic primary production required to support all fisheries was around 8%, this did not really capture the essentials. Essentially all the fish we eat comes from fresh water or from oceanic upwelling or shelf systems, and here we took 24–35% of primary production in the years just before 1995 (Pauly and Christensen, 1995); significantly more is taken today.

Even more important was Pauly's emphatic recognition that most fisheries are managed – if you can call it that – on a single stock basis. The present volume is largely devoted to the many and varied developments in fisheries science, subsequent to the recognition that single species management is ultimately nonsense. To take just one example, if you sought to maximize sustainable yield of krill in the Southern Ocean, you would eliminate krill-eating whales, and conversely if you wished to maximize sustainable yield of whales you would not harvest krill at all (the first draft of the Treaty of the Southern Ocean entirely failed to realize this!). Daniel Pauly has played a central role in putting the management of multispecies fisheries on a rational basis, and this volume is a fitting tribute to him.

Not only is Daniel a hugely influential scientist, but he is also a most thoughtful person who expresses himself – both in speech and prose – with clarity and force. I particularly remember his epigrammatic

illumination of the contrast between the essential adequacy of our scientific understanding of fisheries and the often distressing inadequacy of our machinery for translating this understanding into effective action: to pursue excellent research that is then disregarded is, he said, like "using a large, modern hospital only for diagnosis, and not for treatment."

In short, this book is timely and important both in itself, and as appropriate recognition of Daniel Pauly's contributions to fishery science.

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Vitousek, P. M., Ehrlich, P. R. and Ehrlich, A. H. (1986) Human appropriation of the products of photosynthesis. *BioScience*, **36**, 368–373.

Preface

The need to move from a sectoral to an ecosystem approach in the management of fisheries has become compelling in recent years. Many elements of ecosystem-based management (EBM) of fisheries have been identified but implementing them has proven to be elusive. Management of the oceans' fisheries on an ecosystem basis entails ecosystem-based management of the oceans themselves and, given the diversity of fisheries and marine ecosystems, there is no single recipe toward this end. In this book, we present a broad collection of the elements and some of the recipes for ecosystem-based management. We believe it is one of the first books to deal with this approach to management of the oceans.

This book was inspired by a founding father of research on ecosystem-based management, Daniel Pauly. When he was awarded the 13th International Cosmos Prize late in 2005, Amanda Vincent and Villy Christensen obtained support from the University of British Columbia (UBC) – where Pauly was Director of the Fisheries Centre – for a symposium to honor him for receiving the Cosmos Prize and to be held at the Fisheries Centre on the occasion of his 60th birthday, May 2, 2006. With UBC's generous support, we were able to invite a number of prominent scientists and policymakers with whom Pauly has worked during his career to give presentations at the one-day symposium, which was titled, "Thinking Big: A Global Look at Fisheries Science."

Presenters were asked to write an essay related to their contributions, and to do so without it becoming "an ode to Daniel," while a focus on aspects that related to his work was preferable. The intention was to provide an overview that combined research reviews and opinion pieces. We realized that Pauly's career has spanned many of the elements that are involved in conceptualization, methodology development, and implementation of ecosystem-based management of

living resources, and that we were covering a large part of this at the "Thinking Big" symposium. Therefore, we decided to frame the book around the concept of ecosystem approaches to fisheries management, and invited additional contributions to provide a more complete coverage of the topic.

The various chapters describe global biodiversity, the impact we have on life in the oceans, how we evaluate fisheries impact, what consequences these impacts may all have for economic and social systems, what is needed in terms of communication and in scientific capacity building, and how science can influence ocean policy in order to ensure that there may be ocean resources for future generations to enjoy.

We intend the book to give readers a broad view of the elements required for successful implementation of ecosystem-based fisheries management and the long-term sustainability that is implied. Managing at the level of the ecosystem calls for considering a wide range of issues, and it is impossible for any one person to be an expert in all. One can be deep and narrow, or less deep but wide ranging. We hope that the chapters in the book together will give the reader the more wide-ranging perspective on the topic.

Acknowledgments

The editors wish to thank the authors in this book for their contributions and patience during the production phase. The University of British Columbia (UBC) funded and hosted the symposium "Thinking Big: A Global Look at Fisheries Science" on which most of the essays herein are based. We thank UBC, and especially Vice President John Hepburn, for support as well as for opening the symposium. The "Thinking Big" symposium was held as a tribute to Daniel Pauly's achievements, his 60th birthday, and winning the 13th International Cosmos Prize.

We wish to note the passing of one of the authors contributing to this book, John Munro, the pioneer of tropical fisheries science. John Munro was a colleague and great friend of ours for many years, and he will be dearly missed.