Ecosystem-Based Fisheries Management

Confronting Tradeoffs

Responsible fisheries management is of increasing interest to the scientific community, resource managers, policy makers, stakeholders, and the general public. Focusing solely on managing one species of fish stock at a time has become less of a viable option for many reasons. Incorporating more holistic considerations into fisheries management by addressing the tradeoffs among the range of issues involved, such as ecological principles, legal mandates, and the interests of stakeholders, will hopefully challenge and shift the perception that ecosystem-based fisheries management (EBFM) is unfeasible. Demonstrating that EBFM is, in fact, feasible will have widespread impact, in both US and international waters. Using case studies, examining underlying philosophies, and exploring analytical approaches, this book brings together a range of interdisciplinary topics surrounding EBFM and considers these simultaneously, with the aim of providing tools for successful implementation and of furthering the debate on EBFM, ultimately hoping to foster enhanced living marine resource management.

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Preface

The subtitle of this book conveys the essence of what ecosystem-based management is all about: confronting tradeoffs.

Here is a question I have been asked, in one form or another, about once a month for the past five years: Will there be enough herring (i.e. a key forage fish species) left for all of the fisheries that target them, the whales that eat them, the piscivorous fish that also eat them, the plankton that are eaten by them to be cropped down, and the jellyfish that compete with them to be kept in check; all while nutrients and water temperatures are notably changing? This one example of a focal species makes the tradeoffs among a suite of issues readily apparent – and this is just one instance among a plethora of such examples.

It has become abundantly clear that we need to explore and address these tradeoffs. Ignoring them (particularly via focusing solely on one stock at a time) has become singularly less of a viable option, so allow me to explain how all these thoughts began to coalesce in my ponderings of these kinds of issues.

Some of the first formal stock assessments I sat in on were quite shocking to me, a scientist primarily trained as an ecologist with a particular interest in predator–prey interactions. Aside from the incredible stakes of the results, which led to palpable animosity from all attending stakeholders, what struck me were the assumptions of natural mortality. This term for mortality, M, was constant – both age and time invariant – and set at an amazingly low level for some stocks that were clearly a significant forage base for many other species. To make a long story short, this issue led to a series of discussions, reading groups, and presentations on what were, from my perspective, some basic ecological principles, and to a poor attempt on my part to contextualize those principles into an arena that was a hybrid of fisheries science and management. Over time these endeavors led to multiple discussions

and my publishing two articles (Link 2002b, 2002c) that attempted to note the importance of other factors that can influence fish stock dynamics. My hope was that those publications would be the harbinger of subtle change, leading to the ready uptake of ecological principles. Suffice it to say, this broad range of ecosystem issues has continued to escalate and the uptake of ecological principles in a fisheries context has remained perhaps a little less than escalated.

Throughout the past decade or so I have published several more articles, sat on scores of review panels, been involved in multiple working groups and workshops, and given countless talks around the world on the topics contained in this book. From those endeavors it became apparent that there was no one place that pulled together the various and myriad aspects of ecosystem-based fisheries management (EBFM) to foster its implementation in an operational, pragmatic manner. Clearly, continued discussions and shorter, focal articles would help at some level.

But it also became clear that such efforts would ultimately not achieve the fully desired effect. I kept waiting for various groups or individuals more august than I to pull a comprehensive tome on EBFM together. Although several excellent extant works have been produced that are related to the topic, there has never been anything that spanned the full range of issues, was not overly focused on more specific issues, nor was beyond more than general principles or "platitudinals" on the topic. In short, nothing seemed to capture the need and frustration that I and my global colleagues had expressed; there was nothing to provide a "how-to" manual for doing EBFM. Moreover, many of the stakeholders interested in fisheries management issues that I interact with also noted a need for a clear, concise treatment of the subject.

Thus this work ultimately resulted from my perception of a need to compile these composite ideas formed over many years into one such place. Having created one place to focus the debate and discussion for EBFM (although I certainly have not even remotely treated every topic fully, adequately, or perhaps even much beyond a naïve simplification), this will provide both the scientific discipline and the resource management applications based thereon a tool from which further implementation of EBFM can be expedited and facilitated.

Again, most of the publications, review panels, workshops, and presentations I participated in were part of the professional duties of my job. Therefore, it is hard to separate out and attribute the development and generation of many of the thoughts, concepts, and ideas put

forth in this book, as I thought about these topics while at work. Yet I also need to be clear: the thoughts and ideas contained herein are my own and do not necessarily represent those of my employer (even though I give my professional affiliation). Since I firmly believe in living a life of integrity, I note that although at times I used a laptop from my employer to craft this book, I wrote it on my own time – in hotels at odd hours while fighting jet lag; before going into the lab many mornings; while on vacation – in short, anytime I could spare an hour or two. I need to reiterate that this book was written by me as a private individual and does not necessarily reflect the views of my employer, the National Marine Fisheries Service (though I legitimately hope they and similar resource management agencies will eventually adopt many of these views). I also must admit this distinction because although I do not (and mostly did not feel the need to) directly say things such as "the agency messed up on that one" or "that was stupid," I felt I needed the freedom to be able to challenge instances where it was appropriate to question or point out areas that need improvement – particularly as it referenced institutional and philosophical items – from my limited and humble perspective. Having this work be a product of "on-the-clock" work efforts could potentially subvert any integrity in doing it, from both the agency's or an external observer's perspective. And as it had to be done in this way, on my own time, some of my professional friends who have known about this effort for years will note that it has taken longer than I hoped to complete this work. For that I apologize.

On that note, allow me to provide a disclaimer: portions of this book were written in what may be an atypical scientific style. It's not that the material is unscientific or not technically solid; rather the presentation at times can tend towards levity, subtlety, or a conversational style not typical in scientific writings. I do so because the topic can be emotionally charged with high-stakes outcomes, and I find that a relaxed presentation and well-placed humor can diffuse such tense situations. Furthermore, I as the author and you as the reader might as well enjoy the presentation of this material in what could otherwise become a set of quite dry and boring theses. I have attempted always to be respectful of positions, perspectives, and persons, but also have no problem gently pointing out silliness in logic or practice, if appropriate.

Another disclaimer is that my primary professional experience has been in the USA and particularly the north Atlantic. I have attempted to be as inclusive of other examples, perspectives, and situations as I could be. I have traveled to panels abroad and reviewed a wide range of global efforts on the topic, but although familiar with

other situations, I do not work there day-in and day-out. The obvious focus here is on marine ecosystems, but I clearly recognize the appropriateness of the application of these concepts to freshwater systems as well. Thus I readily admit and strongly suspect that my biases have shaped how I view the implementation of EBFM (as compared, for example, to spending my time working in a remote, developing nation with a small fishery) and as such, I want to acknowledge my perspective and my potentially limited view, all up front.

This book, like most others, was not written in a vacuum. I admit to drawing heavily on my colleague Steve Hall's 1999 book and the multiple combinations of Simon Jennings' and Michel Kaiser's books/review papers (e.g. 1998) on the topic. My colleague Tim Smith's (1994) history of fishes notably enlightened my view of how fisheries are prosecuted and how fisheries science has been conducted. Another book by Charles (2001) was also quite helpful, filling in many of the gaps in my knowledge of fisheries management systems. I consider my effort here as a natural extension and merger of those prior works, and thank those authors for their concepts.

I also must thank a broad host of professional colleagues who have worked, conversed, or corresponded with me over the years and in so doing have challenged, disagreed with, encouraged and stimulated my thinking and efforts for this book: Tim Smith, Tony Smith, Beth Fulton, Alida Bundy, my favorite doctor bill – Bill Overholtz, Mike Fogarty, Marc Mangel, Keith Sainsbury, Lance Garrison, Lisa Methratta, Hassan Moustahfid, Megan Tyrrell, Brian Smith, Rob Gamble, Janet Nye, Jon Hare, Kevin Friedland, Jon Brodziak, Sarah Gaichas, John Field, Tom Miller, Ed Houde, Beth Babcock, Fabio Pranovi, Simone Libralato, Marta Coll, Tony Pitcher, J J Maguire, Ken Sherman, Michel Kaiser, Bjarte Bogstad, Eva Plagányi-Lloyd, Anne Hollowed, Libby Logerwell, Villy Christensen, Steve Martell, Kerim Aydin, Howard Townsend, Jay O'Reilly, Jack Green, Vince Guida, Joe Vitaliano, Deb Palka, Laurel Col, Robin Griswold, Peter Auster, my good friend the late Steve Edwards, Dan Georgianna, John Walden, Jeremy Collie, Rob LaTour, Mike Ford, Phil Levin, Isaac Kaplan, Chris Harvey, Bern Megrey, Andy Payne, Steve Mackinson, Julia Blanchard, Simon Jennings, Yunne Shin, Philippe Cury, Nancy Shackell, John Pinnegar, Mariano Koen-Alonso, Andy Belgranno, Buck Stockhausen, George Watters, Steve Cadrin, Marie Joelle-Rochet, Verena Trenkel, Jake Rice, Jae Choi, Ken Frank, Andy Rosenberg, Les Kaufman, Steve Murawski, and so many others who have helped in discussions on the topic. I particularly thank Marc Mangel and Les Kaufman who have been extremely encouraging of my efforts to

write this book. I also warmly thank my friends and colleagues at the Waquoit Bay National Estuarine Research Reserve who allowed me to hole up in a spare room during my Christmas holiday and a slow point in their calendar to help finish up some of the final steps needed for completing this book. Additionally, I have presented a trial run of this material in graduate courses I have taught at the University of Massachusetts Dartmouth's School for Marine Science and Technology (SMAST), at the Venice International University, and at the University of Venice; to the students in those classes whose insightful and probing questions helped to sharpen my focus on particular points and issues, I particularly extend my thanks.

I also thank the many fisheries scientists who take a different, usually more classical and single-species perspective on the topic. These individuals and institutions may have disagreed with some of the thoughts in this book over the years, but in so doing have forced me to evaluate those concepts more rigorously than I otherwise would have. To all who have made a professional and institutional contribution, I provide a hearty thank you.

I thank my editors, Dominic Lewis, Janice Robertson, Sabine Koch, Lynette Talbot, and Rachel Eley, at Cambridge University Press. Their cheerful dedication and assistance have been extremely helpful in the completion of this project. I thank Lillian Lomba who helped to compile some of the materials contained in this book from a wide variety of my notes, lectures, and reprints. I especially thank Jessie Gunnard who provided notable and very much appreciated assistance in the preliminary compilation, organization, and preliminary editing of this book.

These interactions have all been invaluable to the development of the concepts presented in this book. Yet as much as I acknowledge the contributions of my many professional and editorial colleagues, I take full responsibility for the contents of this book. Any errors herein are mine.

This book, also like many others, was the result of due diligence and patience by the many longsuffering individuals in my life. I especially thank my wife and children for allowing me to work on this during portions of family vacations, weekend afternoons, and at all odd hours when I probably should have been doing other familial duties. I appreciate their patience and understanding. Finally, I acknowledge that I am a man of faith and as such want to thank God for allowing us to enjoy, study, and research the fascinating fishes and creatures of the world's oceans. I also want to thank God for trusting those of us engaged in the topics of this book enough to be

stewards of these great oceans and their inhabiting life. May we be found to be faithful stewards of such resources.

My last disclaimer is that if I have omitted something in this book, or have inaccurately represented a situation, or have otherwise missed the point on a particular topic, I apologize now and ask for your indulgence. Given the highly interdisciplinary nature of the topic, I would be surprised if I did *not* make such mistakes. That is, I am not sure if I have gotten the treatment of this topic entirely right and it is with a spirit of humility that I present the material herein. I trust that the value of this book is seen in its interdisciplinariness – not being exhaustive or conclusive on any topic, but rather being representative of a range of topics pulled together and considered simultaneously. I trust that you will view this effort in the vein in which it was intended; if there are such errors, misperceptions, oversimplifications, or miscommunications, let us allow this book to stimulate further dialogue among those interested parties so that we can continue to advance the scientific discipline and management practice of EBFM.