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Eutrophication in the Baltic Sea

Present Situation, Nutrient Transport Processes, Remedial Strategies

Springer

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Prologue

In April 2008, we published a book entitled "Tools and criteria for sustainable coastal ecosystem management – examples from the Baltic Sea and other aquatic systems". In that book, we stated that in spite of the fact that we gave several examples related to the conditions in the Baltic Sea, our intention was not to write a book about the Baltic Sea, but rather to try to give a compilation of methods that could be of interest for coastal management and science more generally. With this book, we have precisely the intention we did not have in the previous book, i.e., to focus specifically on the conditions in the Baltic Sea. Since we try to take a holistic ecosystem scale view of the eutrophication in the Baltic Sea in this book, there is a certain overlap between this book and the previous one. The reader of this book should be able to understand the structuring of the model used (CoastMab) without consulting other publications.

In 2002, members of our research group at Uppsala University (Lars Håkanson, Andreas Gyllenhammar and Magnus Karlsson) also published a book in Swedish with the title "The Baltic Sea – as it is, how it should be and how to get there". From that title and from the title of this book, one might think that this is a translation to English of a book published several years ago, but that is not the case. The book from 2002 is actually more of a debate book, where we tried to stress that the strategy to "save the Baltic Sea" adopted by HELCOM (the Helsinki commission) in those days had failed and that it was necessary to carry out structured process-based mass-balance modeling in order to develop a remedial strategy that could "save the Baltic Sea". In this book, we present such a process-based mass-balance model applied and tested for the entire Baltic Sea with its main five sub-basins and we try to present and motivate a remedial strategy that could "save the Baltic Sea".

Today, HELCOM has adopted another strategy, which says that 133,000 tons of nitrogen and 15,000 tons of phosphorus should be removed from the present annual (mainly riverine) nutrient input from the Baltic Sea countries and that strategy also stipulates how much of that reduction each of the Baltic Sea countries should contribute with. In this book, we will also challenge that strategy!

It should be stressed that much has been written on many aspects related to the eutrophication in the Baltic Sea, and eutrophication of other aquatic systems on this planet, and that our aim here is not to try to write a literature review on "who did what" related to the conditions in the Baltic Sea and eutrophication. Instead, this

is a book on "how it works" with a focus on the conditions in the Baltic Sea at the ecosystem scale and related to monthly quantifications of nutrient transport processes to, within and from the Baltic Sea. In spite of the fact that so much has been written on the eutrophication in the Baltic Sea and on strategies to "save" the Baltic Sea, surprisingly few studies address the quantification of the transport processes that actually describe the dynamic response of the system to changes in nutrient loading. So, as surprising as it may seem to many persons, this book fills a niche, since our focus is on the fluxes, the transport processes that do – categorically – regulate the response of the system to changes in nutrient loading.

The ecosystem scale is an important scale in aquatic science and management, e.g., in contexts of impact assessment and when remedial measures are discussed. Few people are interested in the content of a sampling bottle and most people in science and management are interested in what this content may actually represent. There is, however, no contradiction between work at this larger ecosystem scale and sampling and work at smaller scales, since, e.g., the mean or median values characterizing ecosystem conditions of necessity must emanate from sampling at individual sites.

Most of the data discussed in this book come from comprehensive "data-mining" of public sources available via the Internet. Several persons in our group at Uppsala University have participated in the data-mining and the work discussed in this book, especially Dan Lindgren, Jenny Eklund, Julia Hytteborn, Thorsten Blenckner and Maria Stenström-Khalili.