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## Preface



The Baltic Sea is a unique ecosystem characterised by pronounced environmental gradients, particularly with respect to salinity and climate. The biological and evolutionary features of *Mare Balticum* as a large meeting place for marine and freshwater organisms have fascinated scientists for centuries. The ecological interest in the Baltic Sea has been additionally fuelled by anthropogenic pressures on the ecosystem structure and functioning exerted by economic activities in the drainage area and by global-scale processes. The collective knowledge on Baltic Sea biology and ecology is available in a wealth of scientific journal articles and books, and the volume of this literature has been increasing almost exponentially over the last 50 years. Consequently, the Baltic Sea is renowned as one of the most intensively studied ecosystems in the world. It comes then as a paradox that a comprehensive international book on the basic biology and ecology of the Baltic Sea has not been available to generations of students interested in the Baltic Sea. The need for a modern science-based textbook has been discussed for more than 15 years, primarily within the Baltic Marine Biologists (BMB), a non-governmental organisation credited with arranging the biannual Baltic Marine Biologists symposia since 1968 (from 2001 under the umbrella of the biannual Baltic Sea Science Congresses). The idea born in the BMB has now materialised in the form of this textbook.

The sheer broadness of the subject matter makes it essentially impossible for only one or a few persons to write such a book. Therefore, the approach chosen was to pool the knowledge of 92 authors, with all of them active scientists and experts in their respective fields, and nearly all of them teaching at the universities around the Baltic Sea. Rather than writing a series of review papers, the overall objective was to create an integrated book that would introduce a student at the MSc and PhD levels to the basic knowledge, facts and processes important for understanding life in the Baltic Sea. This knowledge should, on the one hand, give a student (and an interested reader) an overview of the Baltic Sea ecosystem's structure and function and, on the other, become a starting point from which to begin exploring individual aspects of the Baltic Sea ecosystem structure and function in more detail.

Together we have made a concerted effort to produce a book we wished existed when we were students ourselves. Although the book's contents are based on our own perception of what is important to know about the biology and ecology of the Baltic Sea, the process of putting this book together was not only a matter of writing down what we teach our students. As scientists we are trained to not only generate new knowledge but also critically discuss scientific results. Although the knowledge presented in this book is mostly based on published peer-reviewed scientific literature, in the course of the editorial work many issues emerged that needed to be discussed, between the authors and between the authors and the editors. This is because we work in different parts of the Baltic Sea, as well as in nine different countries, with even more languages and with somewhat different scientific traditions. Given this background, it came as no surprise that many of the authors not only contributed with their respective parts of a book chapter but also participated in an "intercalibration exercise" with respect to the terminology used and scientific opinions expressed. Although it was not always possible to fully agree, the contents of the book have greatly benefitted from these fruitful discussions as well as from an extensive peer-review procedure applied to all the chapters.

The overall focus of the book is on knowledge about the conditions for life in brackish water and the functioning of the Baltic Sea ecosystem. It highlights biological variation along the unique environmental gradients of the brackish Baltic Sea Area (the Baltic Sea, Belt Sea and Kattegat), especially those of salinity and climate. Throughout the book, we follow an ecosystem approach. Rather than focus on separate topics regarding *e.g.* plankton, fish or birds, or environmental issues such as eutrophication or fisheries, the chapters focus on processes and subsystems. Ecological compartments and environmental issues are treated jointly with the processes and subsystems when relevant. Some overlap between chapters has been allowed when appropriate, *e.g.* with respect to an issue viewed from different angles or in a different context.

Part I of the book presents the challenges for life processes and ecosystem dynamics that result from the Baltic Sea's highly variable recent geological history and geographical isolation. Part II explains interactions between organisms and their environment, including biogeochemical cycles, patterns of biodiversity, genetic diversity and evolution, biological invasions and physiological adaptations. In Part III, the subsystems of the Baltic Sea ecosystem—the pelagic zone, the sea ice, the deep soft seabeds, the phytobenthic zone, the sandy coasts, estuaries and coastal lagoons—are treated in detail with respect to the structure and function of communities and habitats and consequences of natural and anthropogenic constraints, such as climate change, discharges of nutrients and hazardous substances. Finally, Part IV discusses monitoring and ecosystem-based management to deal with contemporary and emerging threats to the ecosystem's health.

In addition to the main text, the book also contains numerous figures, photographs and boxes with additional information about *e.g.* ecological principles, methodology or certain species. Each chapter ends with five review questions and five discussion questions for use in discussion seminars. The review questions serve as a control of how the subject matter of the chapter has been understood and assimilated by the reader. The discussion questions are designed to trigger critical thinking about the chapter contents in a wider perspective.

Throughout the book, the usage of geographical names is based primarily on the comprehensive version of the “Times Atlas of the World” (Times Books, London, 9th Edition 1994), in which the names are most often spelled in original languages for water bodies within countries but in English for international waters. This is the reason why we write about *e.g.* the river Wisła rather than “Vistula” and the Storebælt rather than the “Great Belt”, but we do use “Bothnian Bay” and not the Swedish or Finnish name for this water area because it is shared by Sweden and Finland. The taxonomy is based mainly on the following databases: World Register of Marine Species (WoRMS, <http://www.marinespecies.org>), the database of terrestrial, marine and freshwater alga “AlgaeBase” (<http://www.algaebase.org>), the plant species database “The Plant List” of the Kew Botanical Garden (<http://www.theplantlist.org>) and the bacterial database “Bacterial Diversity” of the Leibniz Institute DSMZ-German Collection of Microorganisms and Cell Cultures (<https://www.dsmz.de>).

We dedicate this book to all past, present and future Baltic Marine Biologists to honour all those people on whose work the contents of this book are based and to provide a strong encouragement to new generations of scientists who will discover things about the Baltic Sea we do not yet know today.

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