

Introduction

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The Baltic Sea is a landlocked intracontinental sea consisting of several basins of different depths, which are separated by sills (Fig. 1.1). Owing to the restricted water exchange with the North Sea and the location in a humid climate area, the Baltic Sea is brackish, water masses possess a long residence time, and thus the sea is particularly endangered by pollution of different kinds.

The Baltic Sea is perhaps one of the best investigated seas in the world for more than a century. Monitoring activities performed since the early 1950s by the Leibniz Institute for Baltic Sea Research, Warnemünde, and its predecessors contributed significantly to the present knowledge. First cruises from Warnemünde were restricted to the sea areas between Fehmarnbelt and the island of Bornholm. They had their roots in the Marine Hydrographic Service (SHD) of the German Democratic Republic (GDR) (cf. Chapter 3). In 1955, first expeditions were extended to the Gotland Sea and the Gulf of Finland. In 1957, the first regular seasonal cruises started; since 1959, the cruises were extended to the transition area between the North Sea and the Baltic Sea (cf. Fig. 3.1). The programme consisted temporarily of up to 100 hydrographic standard stations. Slight modifications took place over time, the core programme, however, remained unchanged. The key stations representing the different sea areas are given in Fig. 1.2.

Most cruises were performed by the research vessels “Professor Albrecht Penck,” “A. v. Humboldt,” and “Gauss”. Unfortunately, when this book will be published in 2008, none of these vessels will be in service anymore. The vessel “Professor Albrecht Penck” will be decommissioned by the end of 2008 after 57 years of scientific cruises, a period that is identical with the span covered by this book (see the front page). The authors of this book who spent many days measuring on the small and familiar “Penck” would like to dedicate their contributions to this traditional vessel and its friendly and helpful crew.

Aiming at providing advice on fisheries with respect to hydrographical conditions and eutrophication effects, the monitoring programme was and is until today Germany's contribution to the Baltic Monitoring Programme (BMP) of the Helsinki Commission (HELCOM). This programme came into force in 1979 and is aimed at the protection of the marine environment of the Baltic Sea from all sources of pollution through intergovernmental cooperation.

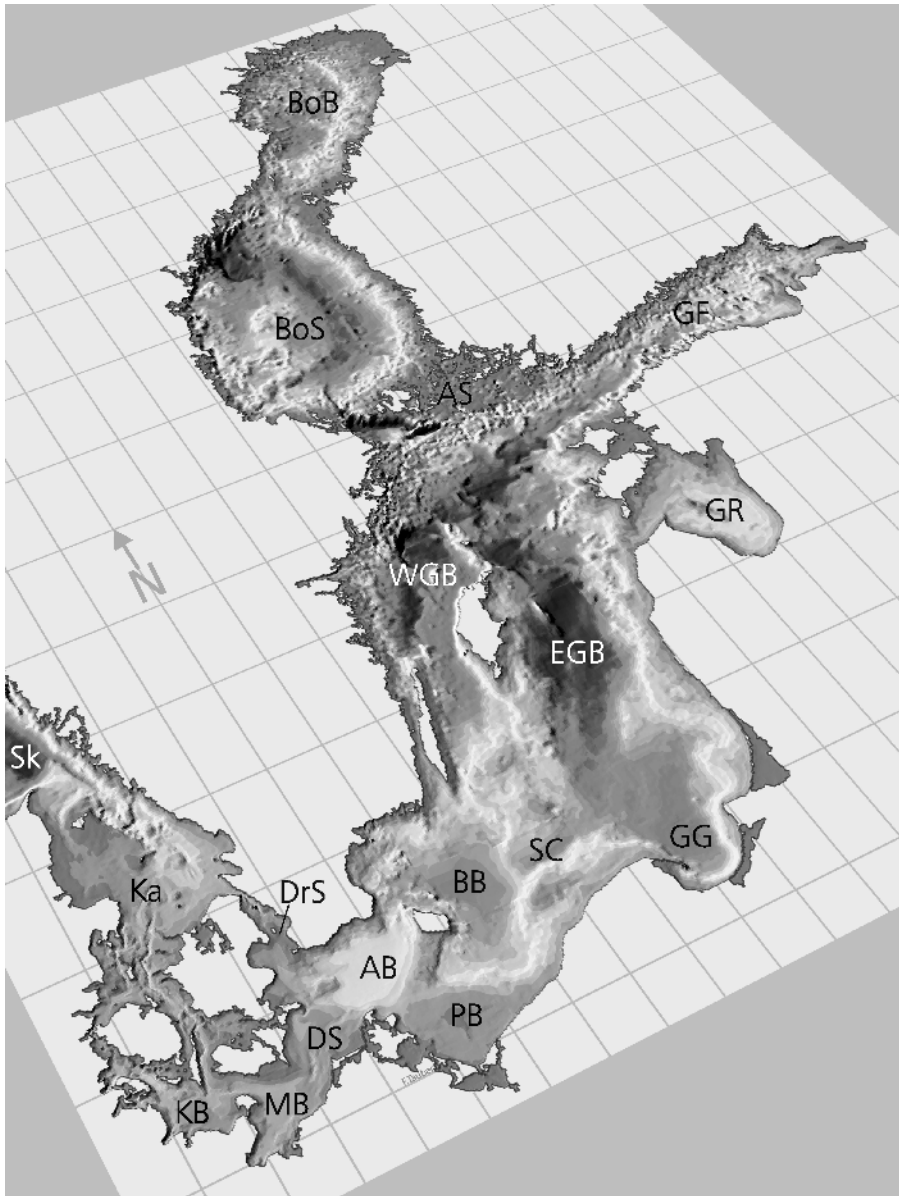


FIGURE 1.1 Topographic map of the Baltic Sea. Sk = Skagerrak, Ka = Kattegat, KB = Kiel Bight, MB = Mecklenburg Bight, DrS = Drogden Sill, DS = Darss Sill, AB = Arkona Basin, PB = Pomeranian Bight, BB = Bornholm Basin, SC = Stupsk Channel, GG = Gulf of Gdansk, EGB = Eastern Gotland Basin, WGB = Western Gotland Basin, GR = Gulf of Riga, GF = Gulf of Finland, AS = Archipelago Sea, BoS = Bothnian Sea, BoB = Bothnian Bay. (See color plate)

Since 1969–1970, the institute in Warnemünde has formulated annual assessments of the Baltic Sea state on the basis of these regular seasonal monitoring cruises and related observational data. The corresponding studies are written in German and published in reports hardly accessible for the general public. Only the latest versions are available online, see

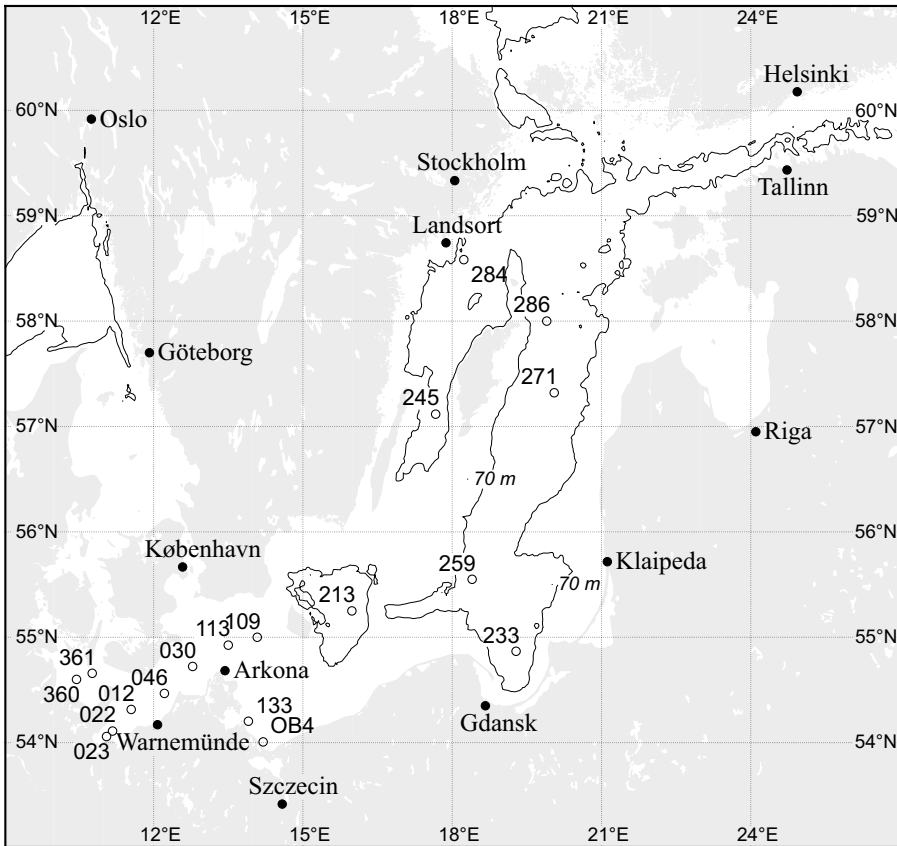


FIGURE 1.2 The Baltic Sea with recently sampled key stations.

http://www.io-warnemuende.de/research/en_zustand.html. This book is intended as an extended summary of these reports, that is, an interdisciplinary comprehensive description of the development of the Baltic Sea during the last 50 years, based on long-term observational data. The chapters will reflect the most important features ranging from meteorology and climate over physics and chemistry to plankton and fish. They are written by well-known experts in their fields as responsible authors, who are in part already on pension after decades of research. Although the focus will be on the work and the data of the Leibniz Institute for Baltic Sea Research, other colleagues from the marine institutes around the Baltic Sea have agreed to participate, contributing essential features from outside the institute's actual scope.

Recent changes in ecosystems are of high socioeconomic concern. The anthropogenic impact on the environment of the Baltic Sea has been systematically investigated by long-term data series for about 50 years. This valuable data basis has not been compiled and evaluated in a comprehensive book as yet. This book concentrates on long-term changes in the Baltic Sea. It will contribute to the understanding of long-term water-exchange processes, eutrophication, and climatic effects.

This book explicitly supports an "open data" policy for the Baltic Sea region, in particular by its "Digital Supplement" CD with a large number of key parameters provided as long-term series, together with reference data, such as shorelines, bottom topography, or the equations

of state of seawater and ice, and in particular with the first version of the gridded monthly hydrophysical and hydrochemical “BALTIC” data set compiled from more than 10 million samples measured in the Baltic Sea during the past century. The real problems of the Baltic Sea and the problems of understanding, modeling, and predicting its complex behavior deserve the joint action of many Baltic oceanographers on an open observational database that is as comprehensive as possible. Several scientists and institutions from the riparian countries have kindly supported this concept by providing their data and permitting to use their publications. The editors would like to express their indebtedness to this generous attitude, presumingly also in the name of all those who will benefit from these data in their future scientific work.

This book is dedicated to those researchers who spent most of their scientific lives observing and analyzing the processes in the Baltic Sea, very often under difficult natural, technical, political, or personal circumstances. We also acknowledge those scientists, technicians and vessel crew who never gave in under harsh conditions at sea to perpetuate the regularity and continuity of spatial and temporal sampling, who carefully validated and stored the painstakingly acquired data, and who created in this way the valuable knowledge about the Baltic Sea that we highly appreciate to possess and comfortably explore today.