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50 years of long-term observation in the Baltic Sea: Striking evidence of long-lasting changes in the Baltic Sea were documented in a recently published book.

The Baltic Sea is one of the best-investigated seas; data on the status of its marine environment have been recorded over several decades at numerous sites. The resulting valuable long-term data sets encompass a time span of 50 years and in some case even more. This treasure, which was scattered over several databases, was now brought together in one comprehensive documentation as a monograph published by John Wiley & Sons and edited by the Warnemünde scientists Rainer Feistel, Günther Nausch and Norbert Wasmund. The book includes a CD containing the largest common data set of the Baltic Sea area, encompassing more than 14 million single readings for meteorology, climate, physics, chemistry and biology of the Baltic Sea.

The long-term data set unravels the existence of unpredictable changes in the physico-chemical basic conditions of the Baltic Sea ecosystem, such as in oxygen supply: Although of high importance for the ventilation of the Baltic Sea deep water, almost no inflow of oxygen-rich saltwater from the North Sea occurred during the whole period of the 1980s, while the salinity in the deep water decreased to a minimum in the early 1990s. Ten years later, these effects were also measured in surface water samples. Actually, this is the time scale required for a drop of deep water to make it to the surface.

At the beginning of the 1990s, salt water inflows became more frequent again. But, on the contrary to the events before the 1980s, they now predominantly occurred during the late summer and autumn instead of winter. This seasonal shift is indicated by much higher temperatures of the deep water of the Bornholm and Gotland Basins since 1997. But not only the temperature is influenced by this change: in late summer, inflowing North Sea waters contain much less oxygen than in winter. But, surprisingly, it still can ventilate the deep areas in case they get in contact with the cold and oxygen-rich so called winter water at certain topographical positions in 40 – 60 m depth. This leads to a clear coexistence of ventilated areas and zones of severe oxygen depletion, but also to frequent transitions among these states and related nutrient fluxes.

Nutrient data from the surface water show a drastic increase of nitrate and phosphate in the 1970s, which is predominantly caused by a rapidly growing consumption of fertilizers in agriculture during that time. Later, the nutrient

concentrations stabilize at a level twice as high as the natural background values. This „over-fertilization“ is reflected by an increase in phytoplankton biomass, however, with a certain time lag. In the Baltic Proper, phytoplankton reached a peak level in the mid 1990s.

The largest part of this wealth of information is represented by the data set available at the Leibniz Institute for Baltic Sea Research. Several generations of researchers of the IOW and its precursor institutions have contributed essentially to our present knowledge. After first expeditions in 1955, a regular observation programme was established comprising five cruises per year with 80-100 stations worked in the southern and central Baltic Sea since then. The results from these monitoring cruises represent the German contribution to the Baltic Sea Monitoring Programme of the Helsinki Commission for the Protection of the Baltic Sea (HELCOM), but provide at the same time a fundamental data pool for the research of the institute in Warnemünde.

Under the auspices of the IOW, in total 64 scientists from Germany, Denmark, Finland, Poland and Sweden contributed on more than 700 pages with their knowledge on meteorology, climate, physics, chemistry and biology of the Baltic Sea. Without such a collection of measurements, the shifts in the physico-chemical basic conditions of the Baltic and the complexity of the processes could hardly be recognized. A profound understanding of these basics allows to assess future scenarios of the ecosystem development. Even the best-investigated sea of the world still can surprise and intrigue scientists.

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John Wiley & Sons, Hoboken, USA (Feistel, R., Nausch, G., Wasmund, N., State and Evolution of the Baltic Sea, 1952 – 2005. A detailed 50-year survey of meteorology and climate, physics, chemistry, biology and marine environment, Wiley 2008).