Press Release

28/2018 | Please note the embargo until 9 May 2018, 20:00 CEST

The Baltic Sea as a Time Machine

A small sea as a model region for the global coastal ocean

***9 May 2018 / Kiel.* Warming, acidification, eutrophication, and the loss of oxygen—these are just a few examples of major changes being observed or expected for the future in coastal zones of oceans around the world. These processes are occurring in the Baltic Sea at a much faster pace than in other regions. At the same time, the Baltic provides useful lessons for how negative trends can be reversed by protective measures. In the international journal *Science Advances*, an international team of researchers led by the GEOMAR Helmholtz Centre for Ocean Research Kiel promotes the Baltic Sea as a time machine for coastal areas worldwide.**

At first glance, the Baltic Sea seems to be rather uninteresting for scientists working on global ocean topics. It is comparatively shallow, has a low salinity and only a very narrow connection to the North Atlantic. This impression is, however, deceiving. In the current issue of the international journal *Science Advances*, 26 authors from 21 scientific institutions in seven countries appeal to the greater scientific community and policy makers to use the Baltic Sea Region as a model for coming changes in the World Ocean. “This unique sea of brackish water can serve as a kind of time machine that allows us to better estimate future global changes,” says Prof. Thorsten Reusch from the GEOMAR Helmholtz Center for Ocean Research Kiel, one of the lead authors of the article.

The scientists argue that changes that are only expected for the future in the global ocean can already be observed in the Baltic today. “This is because the small volume of water and slow water exchange with the open ocean, behaves like an amplifier, allowing many processes and interactions to occur at a faster pace”, emphasizes Dr. Jan Dierking from GEOMAR, who initiated the study together with Prof. Reusch.

As examples, the oceans have warmed by an average of 0.5°C over the past 30 years, while in the same period, time-series measurements in the Baltic Sea have recorded warming of around 1.5°C. Likewise, there are large oxygen-free zones in the deep areas of the Baltic Sea, which have increased tenfold over the past century; and the pH - a measure of ocean acidification - of Baltic waters regularly reaches values that are expected in other ocean areas only in the next century.

On the one hand, these extremes are caused by the particular basin topography of the Baltic Sea. On the other hand, intensive use by humans continues to accelerate negative changes. Nine countries border on the Baltic Sea directly and all are highly industrialized, with densely populated coastal regions. Moreover, intensive agriculture in the interior ensures high nutrient runoff, while equally intensive fisheries puts pressure on the pelagic food-web.

But it’s not all doom and gloom. The Baltic Sea is one of the best-surveyed seas on Earth. Scientific observation and monitoring of physical and biological processes began around 1900. There is a strong tradition in scientific co-operation among many countries surrounding the Baltic, culminating in the implementation of the joint Baltic Sea research and development programme BONUS of the European Union, a dedicated macro-regional research agenda and funding scheme that also enabled the present study. These data provide a sound basis for science-based resource management - “on a level accomplished in only a few regions of the world," emphasizes Professor Reusch.

Among the management success stories: the bordering countries have managed to significantly reduce nutrient inputs since the 1980s, to reverse the decline of large predators, and to curb overfishing. This has been achieved through the binding agreements within the framework of the European Union, but also thanks to the ambitious goals of the Baltic Sea Action Plan (BSAP), which included the former Soviet Union, even before the end of the Cold War. In fisheries, the protection of capture fisheries, marine mammals and bird populations among the perimeter countries have led to measurable improvements of existing stocks.

“Overfishing, warming, acidification, pollution, eutrophication, loss of oxygen, intensive use of coasts—all these are phenomena that we observe around the globe. Because they have been particularly drastic in the Baltic, but also because some key problems were successfully addressed, the region can, for good and for bad, tell us what to expect and how to respond to the challenges of the future,” Prof. Reusch concludes, “The Baltic Sea, as a model region, can contribute to achieving the United Nation’s Sustainable Development Goal 14—the conservation and sustainable use of the oceans, seas and marine resources.”

Reference:

Reusch, T. H. B., J. Dierking, H. Andersson, E. Bonsdorff, J. Carstensen, M. Casini, M. Czajkowski, B. Hasler, K. Hinsby, K. Hyytiäinen, K. Johannesson, S. Jomaa, V. Jormalainen, H. Kuosa, S. Kurland, L. Laikre, B. R. MacKenzie, P. Margonski, F. Melzner, D. Oesterwind, H. Ojaveer, J. C. Refsgaard, A. Sandström, G. Schwarz, K. Tonderski, M. Winder, M. Zandersen (2018): The Baltic Sea as a time machine for the future coastal ocean. *Sci. Adv.* 2018;4: http://dx.doi.org/10.1126/sciadv.aar8195

Contributing institutions:

GEOMAR Helmholtz Centre for Ocean Research Kiel (Germany), Swedish Meteorological and Hydrological Institute, Norrköping (Sweden), Abo Akademi University, Turku (Finland), Department of Bioscience, Aarhus University, Roskilde (Denmark), Department of Aquatic Resources, Institute of Marine Research, Swedish University of Agricultural Sciences, Lysekil (Sweden), Faculty of Economic Sciences, University of Warsaw, Warsaw (Poland), Department of Environmental Science, Aarhus University, Roskilde (Denmark), Geological Survey of Denmark and Greenland, Copenhagen (Denmark), University of Helsinki, Helsinki (Finland), University of Gothenburg, Tjärnö Marine Station, Strömstad (Sweden), Helmholtz Centre for Environmental Research UFZ, Magdeburg (Germany), University of Turku, Turku, (Finland), Finnish Environment Institute (SYKE), Helsinki (Finland), Stockholm University, Stockholm (Sweden), National Institute of Aquatic Resources, Technical University of Denmark, Kongens Lyngby (Denmark), National Marine Fisheries Research Institute,Gdynia (Poland), Thuenen Institute–Institute of Baltic Sea Fisheries, Rostock, (Germany), Estonian Marine Institute, University of Tartu, Tartu (Estonia), Lulea University of Technology, Lulea (Sweden), Thuenen Institute of Farm Economics, Braunschweig (Germany), Linköping University, Linköping (Sweden)

Links:

www.geomar.de GEOMAR Helmholtz Centre for Ocean Research Kiel

Images:

At www.geomar.de/n5883-e images are available for download.

Contact:

Jan Steffen (GEOMAR, Communication and Media), Tel.:+49 0431 600-2811, presse@geomar.de