SCOR WORKING GROUP 42 (WITH ICES)
STUDY OF POLLUTION OF THE BALTIC

Plan for Baltic Open Sea Experiment 1977 – BOSEX-77

1. Background

In ICES Cooperative Research Report, No. 42 (ICES 1974) the Working Group on the Study of Pollution of the Baltic, established jointly by the International Council for the Exploration of the Sea and the Scientific Committee on Oceanic Research, proposed a number of research tasks which were considered to be essential for increasing our understanding of the Baltic Sea system in relation to pollution problems. Seven tasks were specified which require interdisciplinary and international cooperation in order to be successfully accomplished. They focus on the study of processes, physical, chemical, and biological. The tasks are: (1) Exchange of water and dissolved materials with the North Sea, (2) Open Sea Experiment, (3) The Baltic Circulation Model, (4) The Coastal Water's Dynamics Experiment, (5) The Open Sea, Multi-disciplinary Continuous Stations, (6) Year-round Biological Observations designed to optimize monitoring of future changes, and (7) Determination of Toxic Substances throughout the Food Chain.

Three to four years have passed since the formulation of these proposals and considerable progress can be reported in major fields of research related to the pollution problem. The exchange with the North Sea is being studied intensively in a five-year programme carried out mainly by Denmark. Vertical transport, mixing and advection have been studied in several joint experiments during 1975 and 1976. The effects of eutrophication, as well as coastal zone dynamics, are being investigated in several national experiments. The input of pollutants has been further assessed and the distribution and levels of certain pollutants in fish have been determined (Coop. Res. Rep., No. 63, ICES, 1977). Although much of this work has developed independently of the ICES/SCOR Working Group, some elements have been carried out directly by the Working Group.

At its meeting 5-7 May 1976 in Tallinn, the Working Group agreed that the time had now come when it would be appropriate to carry out a joint, inter-disciplinary open sea experiment in the Baltic. There all the Baltic States would participate, pooling their resources in order to achieve the necessary coverage of the various disciplines. The experiment would include elements of Tasks 2, 5, and 7, with emphasis on the biological and pollution parts. It was thus agreed to pool resources in the international experiment BOSEX-77, to be carried out during 3-4 weeks in September in the southern Gotland Basin.

Since the Working Group meeting, a Coordination Group proposed a framework for the experiment which was discussed during the ICES Statutory Meeting in 1976. This proposal was circulated to a large number of scientists, both within and outside the Baltic area. Comments were received,and, by the end of 1976, all the Baltic countries had sent proposals on their own contributions to the experiment. In order to integrate these proposals and carry out the detailed planning, a Workshop was held in Copenhagen, 17-20 January 1977, where about 20 participants discussed the experiment. The Workshop resulted in a complete programme with a fairly good coverage of all basic requirements.

2. Objectives

The objectives of BOSEX-77 can be summarised as follows.

General: to obtain simultaneous observations of physical, chemical, and biological parameters covering basic parts of the ecosystem, which will facilitate the interpretation of the biological observations in particular and which will make it possible to advance simulation modelling. In addition, observations at the same time of levels of pollutants in practically all compartments (water, plankton, fish, seston, sediments) will greatly advance our means to interpret and understand the distribution of pollutants in the ecosystem. The observations will be tied to the Baseline Study (Coop. Res. Rep., No. 63, ICES 1977) by analysing as far as possible samples from the same species (cod, sprat, herring) as used in the Baseline Study. The conditions in the BOSEX area will also be connected to coastal zones by hydrographic sections to be worked before, during and after the experiment. Such experiments as these form part of the studies required before a meaningful Baltic Sea monitoring programme can be established.

Specific: to study transfer between the various layers in the water column; to study small and medium scale dispersion simultaneously in different parts of the water column; to study aspects of the current structure, the coupling between the various layers, and the kinetic energy distribution; to study in some detail the conditions in and structure of the halocline layer; to study primary production in relation to composition of phytoplankton communities as well as to nutrients, light and turbulence; to study secondary production and grazing and other aspects of turn-over; to study decomposition and sedimentation rates of various kinds of particulate matter in the water column; to study some processes at the water/sediment interface; to study the transfer of certain pollutants in the ecosystem.

Recent studies in the Baltic, e.g., *Baltic 75*, have clearly shown that supporting physical and chemical observations are necessary for interpreting the biological, in particular, but also some of the chemical observations. The aim has, therefore, been to specify the programme according to the available resources and divide the tasks so that as good a coverage as possible is obtained of basic requirements in all disciplines. This will make it possible to interpret the observations within an ecosystem model.

3. Programme

The experiment will be carried out in September 1977 in the southern most part of the Gotland Basin at a depth of ca. 110 m. The studies will concentrate on a square area with 30 km side 'the box'.

a) Stationary ships positioned in center of the box: CTD profiling, oxygen, nutrients, chlorophyll, pH, alkalinity, particulate and dissolved organic carbon, primary production, light levels, transparency, scattering, plankton sampling, sedimentation rates, microbiological studies.

b) Environmental mapping of the conditions in the box and its immediate vicinity is carried out by 4 moving ships with similar observation programme as the stationary ships.

c) Special experiments are carried out by additional moving ships. The experiments include dispersion studies by dye tracing and drogue tracking, as well as special biological studies.

The meteorological conditions are recorded by standard meteorological observations on the ships and by a meteorological buoy for profile measurements.

The currents are observed by means of about 50 moored current meters distributed at 10 stations, with 5 meters at each, in the center, the corners of the box and along the diagonals so that scales in the range 3-50 km are covered.

The pollutant measurements include analysis for trace metals, petroleum and chlorinated hydrocarbons in water, plankton, fish and sediments.

In all, 12 ships will participate in BOSEX-77, representing all Baltic countries. The ship times are planned so that two stationary ships are always in the center of the box. The position of the box has been adjusted so that the International Baltic Year Station No. 9 (56°05'N, 19°10'E) is the easternmost corner station.

Provided the plans as now laid down are carried out, BOSEX-77 will be a major international exercise. The fact that all Baltic States are participating is very encouraging.

Participating Institutions

Country	Institution	Ship
Denmark	Danish Environment Protection Agency, Kampmannsgade 1, 1604 Copenhagen V.	*Martin Knudsen*
Federal Republic of Germany	Deutsches Hydrographisches Institut, Bernhard-Nocht Strasse 78, 2000 Hamburg 4.	*Gauss*
	Institut f. Meereskunde an der Universität Kiel, Düsternbrooker Weg 20, 23 Kiel.	*Poseidon, Alkor* *Littorina*
Finland	Institute of Marine Research, P.O. Box 166, 00141 Helsinki 14.	*Aranda*
German Democratic Republic	Institute of Marine Research, Academy of Sciences of the GDR, Seestrasse 15, 253 Warnemünde.	*Prof. A. Penck*
Poland	Institute of Meteorology and Water Management, Waszyngtona 42, Gdynia.	*Hydromet*
	Sea Fisheries Institute, Aleja Zjednoczenia 1, 81 345 Gdynia.	*Birkut*

Sweden	Fishery Board of Sweden, Box 4031, 400 40 Göteborg,	*Argos*
	Institute of Oceanography, University of Göteborg, Stigbergstorget 8, Box 4038, 400 40 Göteborg.	*Svanic*
USSR	Institute of Thermophysics and Electrophysics, Academy of Sciences of the Estonian SSR, Paldiski Street 1, Tallinn 200 105.	*Aju-Dag*