

COOPERATIVE RESEARCH REPORT

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REPORTS OF THE ADVISORY COMMITTEE ON MARINE POLLUTION
to
THE OSLO AND THE INTERIM HELSINKI COMMISSIONS 1976

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*Prevented from attending the meeting, 15-18 June 1976.

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Other activities in relation to the studies of pollution
which may be of interest to the Helsinki Commission*

Sea water quality: metals
Sea water quality: hypertrophication
Petroleum hydrocarbons
Biological effects
Sediments.

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* The following five sections are identical with those presented to the Oslo Commission (pp. 8 - 11). They were repeated to the Interim Helsinki Commission, because they give progress reports which might also interest that Commission; they are not repeated here.

REPORT OF THE INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA TO THE
OSLO COMMISSION, 1976

Introduction

1. The Advisory Committee on Marine Pollution has been established by the International Council for the Exploration of the Sea with the task to formulate on behalf of the Council, scientific advice on marine pollution and its effects on living resources, to member governments and to regulatory commissions. It is a firm procedure within the Council that reports of other subsidiary bodies must pass the Advisory Committee on Marine Pollution.

The Advisory Committee on Marine Pollution consists of a number of scientists acting - when they meet as a committee - in their personal capacity as scientists, responsible only to the Council. The membership of the Committee is such that it covers a wide range of expertise related to studies of marine pollution. The members are not national representatives. The present membership of the Committee is found on page 1.

2. The Advisory Committee has usually as a basis for its deliberations reports by Working Groups of the Council. Such reports will, when it is considered useful, be annexed to the Committee's own report. The Committee wishes to stress that by annexing the reports it does not necessarily endorse all statements or conclusions found in them. The Committee's own views are found in its own report and these views represent the advice that is given on behalf of the Council.
3. In the present report to the Commission the Advisory Committee on Marine Pollution has included information which it hopes the Commission may find useful in addition to items which the Commission itself has expressed the wish to be informed about.

Background information

4. In recent years substantial progress has been made under the auspices of the Council in applying relatively well known, or slightly modified, techniques to the conduct of baseline and monitoring exercises. The studies commented on later in this report represent the first completed phases of such exercises in the North Atlantic, as did the study in the North Sea (Coop.Res.Rep. No.39). However, both exercises are incomplete, even in the sense of deriving maximum benefit from the application of well-understood sampling and analytical techniques. Both also reveal the very considerable difficulties encountered in the conduct of such exercises, not by any means all of which are of a scientific nature. Nevertheless, in varying degrees, they represent the first successful attempt at such co-ordinated international exercises. Although there are some areas where continued surveillance and monitoring are required, these surveys show that over most of the area studied the levels of contaminating substances are well below those considered unacceptable by international health authorities. The surveys reveal of course many gaps in our knowledge and have taught us several important lessons in relation to the necessary planning, the need for close co-ordination and the crucial importance of correctly conceived, planned and executed intercalibration exercises.
5. Nevertheless these exercises represent the first and easiest tasks that could be addressed and their completion, with reasonable success, within a European framework was to be expected. The next set of tasks are of a somewhat more difficult, though equally important, nature and some of them have already been stated as requirements by such bodies as the Oslo Commission (Os.Com.(74),7), the ICG for GIPME, etc. Among the more important of these tasks are the monitoring of petroleum hydrocarbons, the role of sediments in the removal and/or cycling of pollutants and the need to develop methods for the direct monitoring of biological effects.

Actions have been taken by ICES in respect of all these concerns. A Workshop on "Hydrocarbons in the Marine Environment" has been held under ICES auspices in Aberdeen, 9-12 September 1975, which has highlighted the need to develop analytical techniques producing results capable of sensible interpretation in terms of contamination by petroleum hydrocarbons. An expert group has been asked to examine the sediment/pollutant problem, and a review of current knowledge on biological effects of marine pollutants has been undertaken within the framework of the Oslo Commission and ICNAF area baselines. All three problems are therefore now being tackled and the Committee attaches great importance to the prosecution of the necessary studies by the relevant national authorities.

6. The Committee will keep a careful watch on the progress in these areas and give advice where appropriate. It however takes the view that none of these studies has reached a stage where useful incorporation of measurements within internationally coordinated baseline and monitoring studies can yet be recommended.
7. The Oslo Commission at its first meeting accepted a recommendation, based upon the report of its Working Group on the Monitoring Requirements of the Commission, that ICES be invited to coordinate a baseline study in the Oslo Convention area. The report of the Commission's working group had indicated certain priority substances which should be measured within the baseline exercise. They were in order of priority:
 - (i) Organo-halogen compounds
 - (ii) Lead, mercury, cadmium, zinc, copper and chromium
 - (iii) Petroleum hydrocarbons
 - (iv) Nitrates, ammonia, total nitrogen, phosphate and total phosphorus
 - (v) Coliforms as indicators of pathogenic bacteria and viruses of sewage origin

It also drew attention to the need to address the problem of monitoring biological effects but recognised that the constraints imposed by facilities and manpower would be major factors in determining initial priorities. As a result it was suggested that first priority should be given to fish and shellfish quality for human consumption, followed by water quality requirements and inshore and shelf sediment in that order.

8. In responding to this request the Council allocated the task of planning and conducting the baseline survey to its Working Group on Pollution Baseline and Monitoring Studies in the Oslo Commission and ICNAF Areas. This Group drew up a plan at its first meeting in January 1975 which took account of the priorities indicated above. The plan provided for the execution of the first phases of the baseline between July and September 1975 and indicated actions on second order priorities. The plan provided for a survey of fish quality in the Oslo Commission and ICNAF areas to supplement the already completed survey in the North Sea (Coop.Res.Rep. No.39) submitted to the second meeting of the Commission.

The report on the baseline survey and its supporting intercalibration exercises will be published in a separate issue of the Cooperative Research Reports series.

The Baseline Survey

9. The Baseline Survey of contaminant levels in fish and shellfish in the remainder of the Oslo Commission and parts of the ICNAF area was carried out in 1975. The report dealing with the baseline study is in two parts. The first deals with intercalibration of analytical methodology

and the second with the actual results.

Intercalibration

10. The Baseline Survey was carried out by a number of laboratories in different countries using a variety of analytical techniques and with the exception of chromium all the priority substances were analysed by all participants. Chromium was only analysed by some laboratories due to difficulties over methodology. An intercalibration exercise was therefore conducted to establish how comparable the different sets of data are. Intercalibration was carried out separately for metals and for organochlorine pesticide and PCB residues using different materials. The report on the intercalibration exercise for metals includes a full statistical analysis of the results, and suggestions are made for further work on lead and cadmium immediately, and a full repeat exercise in about 2 years; these will be taken up by ICES and acted upon.
11. The results showed that for metals the data can be readily compared for copper, zinc and mercury. For lead and cadmium the laboratories fall into two broad categories, those which are able to positively identify the levels present by use of a sufficiently sensitive analytical technique and those which are not, and therefore report merely that levels are below a certain limit of detection. It should be recognised in the light of the much lower positive values that the true values are probably considerably lower than might appear from the quoted detection level. A few laboratories using less sensitive techniques for analysis did produce high positive values for both cadmium and lead, but these were clearly inaccurate and have been omitted from the report and tables.
12. The intercalibration for pesticide and PCB residue analysis showed that for the main residues, i.e. DDT, DDE, TDE, dieldrin and PCBs results could readily be compared, regardless of the laboratory which had carried out the analysis. Some difficulties had however been experienced with analyses of HCH isomers. Therefore, although results for these compounds are included in the tables, no attempt has been made to make comparisons on either a species or area basis. It can however be stated that all the levels reported were low.

Results of the Baseline Survey

13. The highest level of mercury found was 1.5 mg/kg in a plaice from the Irish Sea and the mean for the sample was 0.5mg/kg. The Committee noted with satisfaction that this area has been under surveyance for many years, and that this surveyance is to continue. Levels of copper and zinc in muscle tissue, although varying for different species, show no clear difference from area to area. Most of the reliable figures for lead and cadmium show levels to be very low (0.00X mg/kg for cadmium and 0.0X mg/kg for lead).

Livers were found to contain higher levels of copper, zinc, cadmium and lead, but lower levels of mercury than muscle tissues. However, because the liver levels reflect recent food intake, no attempts have been made to draw comparisons on an area basis since although contaminant levels in the food probably vary from place to place, the type of food taken varies with area and individual fish preference.

14. The results of analyses of fish from the open North Atlantic as opposed to those from the marginal seas of the European Continental Shelf do not highlight any particular area as meriting particular attention. Fish from Greenland contain low levels of mercury, lead and cadmium as do the fish

from the Norwegian and Barents Seas. There is an indication that levels of mercury are elevated off the east coast of Canada and that in the German Bight, the Bristol Channel, English Channel and Irish Sea levels are at least four to five times higher than in the open ocean areas. Levels of mercury in the mid and north North Sea are however similar or only slightly higher than in the open ocean. It should be noted that although some of the data for fish taken off the coast of Portugal may appear to indicate elevated levels for certain metals, e.g. copper and zinc, other data for the same area are comparatively low and a careful examination of the intercalibration data suggests that these higher values might be rather misleading.

15. The levels of pesticide and PCB residues found in muscle tissue of most of the fish species were low, usually below 0.01 mg/kg (wet weight) and even in those species with high lipid content in the muscle, e.g. herring, the highest pesticide level was still below 0.1 mg/kg (0.076 mg/kg in a North Sea herring). Levels of most of the residues were in fact so low in most of the muscle tissue samples that little difference can be seen from one area to another, and all the residue levels in muscle tissue are very low. However, as was expected, the residue levels found in the fish livers were in general much higher than those found in the muscle, and differences can be seen from area to area. Of the pesticides analysed, only dieldrin has a high mammalian toxicity and the highest level of dieldrin found (0.41 mg/kg in a cod liver from the Southern Bight of the North Sea) exceeded the generally accepted safe level for foods (0.1 mg/kg). However, the level in the edible muscle tissue of the same fish was much lower and well below 0.1 mg/kg.
16. The only species for which a good geographical coverage was obtained was cod and the results for this species indicate that levels of DDT and PCBs were highest off the east coast of Canada and in the Southern North Sea. Data from the other species indicate that the Irish Sea is also contaminated relative to the open ocean such as off Greenland and the Barents Sea. PCB concentrations were generally higher than the total concentration of all pesticides in samples taken in the more enclosed areas such as the North and Irish Seas and in areas close to land. However, in samples taken in more open waters and in the northern part of the study area, PCB levels were either roughly the same as, or slightly lower than, the concentrations of pesticides.

Conclusions and further work to be undertaken

17. The baseline study as completed in 1975 gives adequate coverages of the study area and on the basis of the findings the Advisory Committee considered it unnecessary that any further observations need be carried out in much of the area within a period of about 5 years. However, in those areas where elevated levels were found steps are being taken to carry out regular observations as an extension to the conjoint monitoring studies and the results will therefore be available in the annual reports of such activities. There are, however, certain areas where coverage is not yet adequate, namely in the Bay of Biscay, off the west and south coast of Ireland and off the coasts of Portugal and the Azores. These gaps have been recognised by the Working Group on Pollution Baseline and Monitoring Studies and steps are being taken to rectify the situation. The results will be made available to the Commission in due course.
18. By way of conclusion in respect of the Baseline Survey of contaminant levels in fish from the Oslo Commission area the Advisory Committee draws attention to the remarks in the preface to the report on the Baseline

Survey. These indicate some of the difficulties encountered in the conduct of the Baseline Study even after very careful planning and illustrate the need for very careful preparations before any repeat exercise can be conducted. This fact and the very time-consuming nature of the sampling and analyses required reinforces the need for repeat surveys to be carried out only as necessary and at relatively infrequent intervals.

Other activities in relation to the Oslo Commission baseline

Sea Water Quality; Metals

19. The Working Group on Pollution Baseline and Monitoring Studies in the Oslo Commission and ICNAF areas at its first meeting recognised the importance of initiating studies on metal concentrations in sea water and noted the surveys already carried out in the North Sea. The Working Group has, however, recognised the very considerable problems of sampling, analysis and intercalibration which are involved in the conduct of a survey in a sea area as large as that of the Oslo Commission, and has set up a sub-group to consider the problems and draw up plans for the conduct of a survey. The sub-group has initiated a four-phase intercalibration exercise, the first two phases relating to an intercalibration of participants' standard metal solutions and an intercalibration of mercury in sea water, are under way. The third phase, leading to an intercalibration of other metals in sea water, is now being planned, and the final phase, still under consideration, may lead to a multi-ship workshop to intercalibrate sampling and storage procedures.
20. The successful completion of this exercise will take some time, but meanwhile the Advisory Committee has reviewed existing data in relation to selected metal levels in the North Atlantic and reported the results to the Commission at its 2nd Meeting (Coop.Res.Rep. No.50). The United Kingdom has also commenced the conduct of a pilot scale survey based on the analytical capability of a single laboratory which will provide an interim basis for comparing relative levels. The areas covered by the pilot scale survey are indicated in the map (Figure 1). When phase 3 of the intercalibration exercise is complete and the results of the United Kingdom surveys are known, it will be possible to take a firmer view of the need for, and scale of, any further sea water metal baseline requirements.
21. The results of the United Kingdom surveys should be available to the Commission by the time of its 4th Meeting. It is unlikely that the final phase of the intercalibration exercise could take place before late 1978. A larger scale baseline survey of metal in sea water could therefore not take place before 1979/80, when due allowance is made for the advance planning of research vessel time. The Advisory Committee therefore regards the United Kingdom's contribution as an important first step which can be made available to the Commission at a relatively early date.

Sea Water Quality; Hypertrophication

22. The Advisory Committee in noting the Oslo Commission's desire to use indices of primary production in its monitoring programmes and related measurement of nitrogen and phosphorous in sea water, has considered the problems involved and commented on them in the Report of the Advisory Committee on Marine Pollution (Coop.Res.Rep. No.50) submitted to the Commission at its 2nd Meeting.
23. In recent years ICES has been much concerned with the problems of hypertrophication in certain areas. Although such phenomena are unlikely to be significant in areas outside immediate coastal waters, it has taken the view that in order to safeguard areas of the sea to which nutrients have

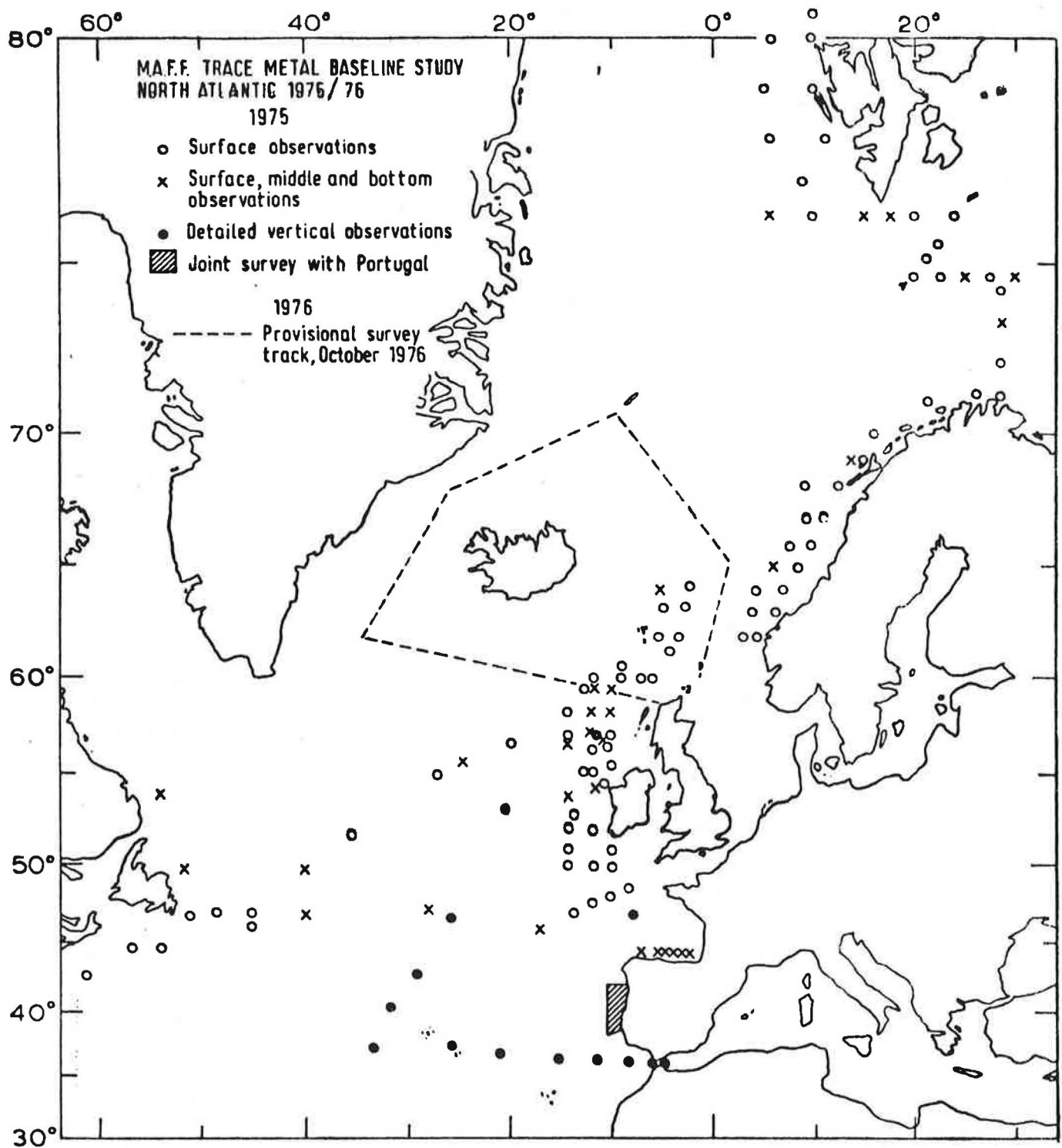


Figure 1.

been added, investigations should be made to establish the causes of eutrophication in such areas and in particular to examine the essential processes in such detail as to permit avoidance of the dangers of hypertrophication. An international programme is now under way to study such processes. The Advisory Committee has also recommended further development of methods for the measurement of primary production indices (Coop.Res.Rep. No.50).

Petroleum hydrocarbons

24. The Committee was informed that the ICES Workshop on Hydrocarbons in the Marine Environment, which was held in Aberdeen, 9-12 September 1975, and which was attended by 60 invited scientists, had reached certain conclusions which the Convenor, Dr A.D. McIntyre, has summarised as follows:

"The recognition of petroleum pollution in the sea was discussed at length. While this could be done readily in obvious cases, there was the general problem over most of the environment of distinguishing recent biogenic hydrocarbons from petroleum hydrocarbons, and no straight-forward solution to this emerged. There was agreement that no single method was suitable for determining the amount and source of hydrocarbons in the sea, but the relative values of several approaches (using n-alkanes, the unresolved envelope or naphthalenes) were discussed, and the need for further work on biogenic hydrocarbons was indicated.

In relation to studies of effects it was emphasized that the complexity of oil makes it difficult to identify specific toxic fractions and mechanisms of toxicity, and this difficulty was increased by the variety of methods which could be used to measure oil. Deficiency of knowledge on the availability of hydrocarbons to organisms was referred to, and the importance of considering the effects of metabolites of oil and possible synergism with heavy metals. The importance of aromatics was noted and the lack of good quantitative measures of their distribution. It was concluded that the significance of results of experimental work on sublethal effects of oil and its components was difficult to assess and that further work in this field was required.

In view of the great variability of petroleum not only from different areas but also from the same area at different times, it was felt that a stock of standard material (e.g. selected crude oils and main products) might be maintained at some appropriate centre and made available for experimenters to draw on.

On monitoring, it was recognised that in most open sea areas hydrocarbons tend to occur at low concentrations and the data show high variance, so that major efforts of routine monitoring would at present seem unfruitful. In some sensitive areas, however, monitoring would clearly be required to assess the wholesomeness of fish and shellfish as food, to ensure the protection of fish stocks, to detect deterioration of water quality and to protect amenity. Sampling and analysis in this context was discussed and the possibility of biological monitoring, using for example bivalve molluscs in cages, was raised".

The Advisory Committee on Marine Pollution endorses these views.

25. The Committee also noted and endorsed the views of the ICES Working Group on Pollution Baseline and Monitoring Studies in the Oslo Commission and ICNAF Areas, that more attention ought to be paid to the scientific basis for the number of ongoing programmes related to petroleum monitoring, and that attempts should be made to coordinate the various efforts. Inter-calibration should be encouraged and priority attention should be given to further development of methodology.

In this connection the Advisory Committee noted and wished to support the initiative taken by Norwegian and USA scientists concerning an inter-calibration exercise, and hoped that this would be expanded to include other interested laboratories.

Biological effects

26. In considering the need for biological monitoring the Working Group on Pollution Baseline and Monitoring Studies in the Oslo Commission and ICNAF Areas noted the reservations expressed by the Commission's own monitoring group on the complex programmes that might be required. It therefore decided to set up a small sub-group to consider the problems. This group has now submitted a preliminary report which has been considered by both the parent Working Group and the Advisory Committee, and is now being revised for submission to the next Fisheries Improvement Committee meeting at the 64th Statutory Meeting of ICES in October 1976 so that it can receive discussion in a wider audience within ICES. The Advisory Committee felt unable at this stage to recommend incorporation of measurements of effects in co-ordinated monitoring activities. There are numerous reasons for this, in particular the fact that many of the measurements proposed by the sub-group are labour intensive and interpretation of the results would not be conclusive. However, the Committee endorses the view that some of the more promising methods were worthy of investigation on a pilot scale by individual member countries of ICES. Consideration of publication of the report and transmission to the Commission will be taken after the final version is considered at the 64th Statutory Meeting of ICES.

Sediments

27. The problem of monitoring sediments was also discussed at the first meeting of the Working Group on Pollution Baseline and Monitoring Studies in the Oslo Commission and ICNAF Areas where it was felt that insufficient understanding of the role of sediments in the retention and cycling of pollutants existed to usefully incorporate such observations into co-ordinated monitoring programmes. An ad hoc meeting has therefore been convened to consider these problems and report back.

Input study

28. The Working Group on Pollution Baseline and Monitoring Studies in the Oslo Commission and ICNAF Areas had, in its design of the Baseline Study for the Oslo Commission, included as an integral part the conduct of a survey of inputs of pollutants to the area by land run-off (including both rivers and pipelines), dumping and atmospheric input. The intention is then that the results of the Baseline Survey of contaminant levels in fish and shellfish could be interpreted in the light of the knowledge on inputs and other factors.

A questionnaire had been sent out to all participating countries early in 1975 but not all the countries had been able to submit their replies in time

for a report to be prepared and considered by the Working Group at its May 1976 meeting. All the replies are expected shortly, however, and a report will be considered by the Advisory Committee as soon as possible.

Coordinated Monitoring Programmes

29. Following completion of the Baseline Survey of Pollution in the North Sea, it had been decided that the more contaminated areas of the North Sea should be kept under surveillance and a system of conjoint monitoring was established, based upon existing national efforts. The report on 1974 activities is now complete and will be published in a separate issue of the Cooperative Research Reports series. The Working Group on Pollution Baseline and Monitoring Studies in the Oslo Commission and ICNAF Areas had originally hoped to prepare a similar report on 1975 activities for submission at the 1976 Statutory Meeting of ICES for eventual transmission to the Commission. However, it has proved impossible for many of the national laboratories to submit the results by the agreed deadline of 30 April and some still had not done so by mid-June. It was therefore concluded that if an annual report on monitoring is desired by a Commission, and especially if it relates to the previous year's results, it will then be necessary for higher priorities to be assigned to it at a national level. In this connection the Commission might be able to assist by requesting national authorities to submit their information in good time to ICES. The Commission may also wish to consider whether it needs these reports so soon after the sampling year, or if a time lag of 18 months would be acceptable. Such reports would be of most value if they could be written in the light of data on changes in input, details of which the Commission might, in the future, be in a better position to collect.

Future actions

30. A number of actions have been taken to ensure development of the scientific and technical basis to complete various parts of the Baseline Survey in the Oslo Commission area as it was originally conceived by that Commission's Working Group on Monitoring. The actions on petroleum hydrocarbons, metals in seawater, sediment, hypertrophication and biological effects have already been referred to.

Certain aspects of the fish and shellfish baseline still need further attention, i.e. further intercalibration exercise for lead and cadmium, and further data collection from the southern area, and these will be attended to. Suggestions are also made for continued surveillance of some areas by adding them to the existing conjoint monitoring effort centered on the North Sea.

The Committee is also preparing a report dealing with some aspects of the monitoring of dumping grounds which will be reported to the Commission in due course.

REPORT OF THE INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA TO THE INTERIM

HELSINKI COMMISSION, 1976

Introduction

1. The Advisory Committee on Marine Pollution has been established by the International Council for the Exploration of the Sea with the task to formulate on behalf of the Council, scientific advice on marine pollution and its effects on living resources, to member governments and to regulatory commissions. It is a firm procedure within the Council that reports of other subsidiary bodies must pass the Advisory Committee on Marine Pollution.

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2. The Advisory Committee has usually as a basis for its deliberations reports by Working Groups of the Council. Such reports will, when it is considered useful, be annexed to the Committee's own report. The Committee wishes to stress that by annexing the reports it does not necessarily endorse all statements or conclusions found in them. The Committee's own views are found in its own report and these views represent the advice that is given on behalf of the Council.
3. In the present report to the Commission the Advisory Committee on Marine Pollution has included information which it hopes the Commission may find useful in addition to items which the Commission itself has expressed the wish to be informed about.

Background information

4. The ICES/SCOR Working Group on the Study of Pollution of the Baltic was established in 1971. Scientists from all countries bordering the Baltic (Denmark, Federal Republic of Germany, German Democratic Republic, Poland, USSR, Finland and Sweden) have taken part in the Group's work. There have, so far, been four meetings of the Group as a whole; in the inter-sessional periods there have been several meetings of sub-groups with different specified tasks. The last meeting of the full Group was held in Tallinn from 5-7 May 1976, at the invitation of the Academy of Sciences of the Estonian SSR.

Until 1973 the Group was chaired by Professor I. Hela, since then Dr G. Kullenberg has been Chairman.

One of the SCOR members of the Group, Dr C.H. Mortimer, has provided a most useful liaison with similar work undertaken in the Great Lakes of North America.

Close liaison has also been kept with a number of other organisations active in the area. IOC has been represented by observers at two of the meetings.

5. From the beginning, the Group has organised its own work along three different lines:
 - a) a study of the input of pollutants to the Baltic;
 - b) a baseline study of the level of contaminating substances in living resources of the Baltic; and

- c) a co-ordinated scientific programme, aiming at an understanding of the processes governing the distribution and fate of pollutants in the Baltic.
6. The study of input of pollutants to the Baltic could use as a basis a similar study which had been undertaken by an ICES Working Group in 1968-1969 (Cooperative Research Report, Ser. A, No.15 (1970)).

Study of the input of pollutants to the Baltic

7. The report on the input study, which will be published in a separate issue of the Cooperative Research Reports series was considered and adopted by the ICES/SCOR Working Group on the Study of Pollution of the Baltic at its meeting on 18-19 July 1975. The report represents a follow-up of an earlier input study, carried out by ICES (ICES 1970). It corroborates the earlier findings, and in some areas advances our knowledge, e.g. regarding the estimates of BOD and phosphates. Although the report probably represents all that can at present be achieved, it illustrates the considerable difficulties in getting beyond the first obvious step of assessing input in an overall way. Many gaps are pinpointed in both geographic coverage and in research, e.g. atmospheric input, composition of sewage and industrial inputs, methods and analytical techniques, conversing factors, and sedimentation in the coastal zone as well as transfer from the coastal boundary layer to the open sea.
8. The Advisory Committee on Marine Pollution in this connection endorses the following statement in the report.

"The reasons for this incomplete picture are firstly lack of national investigations; secondly, the possibility exists that not all available information has been reported due to lack of national co-ordination; and, thirdly, that some national activities on evaluation of input data have been started only recently and data series of a preliminary character may not have been reported."

Despite the shortcomings of the input study, it is, however, at present the most up-to-date and the best available.

9. The Advisory Committee on Marine Pollution therefore endorses the view expressed by the ICES/SCOR Working Group on the Study of Pollution of the Baltic, that no repeat study should be made immediately. However, it also felt that the necessary repeat survey should be possible in 3-5 years time. In order that this repeat survey shall provide data of an improved quality and with more comprehensive coverage, the Advisory Committee recommends that a co-ordinated effort should be made to assess atmospheric inputs by common methods of sampling and measurement, and that serious attention should be paid to the assessment of inputs of contaminants through sewage, sewage sludge and dredging spoil. Further it recommends that in order for the possibility to interpret input data in terms of the risk to the marine environment, the activities initiated within ICES on transfer of pollutants from the estuarine and coastal environment to the open sea, and on sediment and pollution interchange, should be intensified.

Baseline Study of selected metals and organochlorine residues in fish and shellfish in the Baltic Sea

10. The study planned by the ICES/SCOR Working Group on the Study of Pollution of the Baltic included intercalibration, input studies, and a baseline survey of the level of contaminating substances in fish and shellfish, based on agreed field sampling specifications as regards time and species, and size and age composition of the species. The sampling instructions

are given in the report on the Baseline Study.

11. A draft report on the Baseline Study was presented by its co-ordinator to the ICES/SCOR Working Group at its meeting in Tallinn, 5-7 May 1976, and a revised draft was presented to the Advisory Committee on Marine Pollution in June 1976. It has subsequently been further revised by inclusion of additional data, and will be published in a separate issue of the Cooperative Research Reports series.
12. The Advisory Committee noted that it has not been possible to organise the sampling in complete uniformity with the plan. This especially applies to the requirements for restricted periods of sampling, as well as to the defined size and age composition of the organisms sampled. In this connection attention is drawn to the comments to the sampling as given in the report. The exercise may therefore rather be regarded as a co-ordinated survey than as a completed baseline study. Consequently, the Advisory Committee felt that the results did not allow an evaluation of significant differences in geographical distribution within the Baltic.

Intercalibration

13. Two trace metal intercalibrations were made. For the first and second trace metal intercalibration exercises, laboratories participating in the Baltic Baseline Study were supplied with fish flour which also served for the second intercalibration exercise within the "ICES Working Group for the Study of the Pollution of the North Sea" and for the first intercalibration exercise within the "Working Group on Pollution Baseline and Monitoring Studies in the Oslo Commission and ICNAF Areas".

In the first exercise, each laboratory received a reference solution in addition to the fish flour. The fish flour was intended for analysis by both standard procedure and the analytical procedure adopted by each laboratory.

In the second exercise, participating laboratories received standard stock solutions for each element under study in addition to the fish flour. Calibrations had to be performed by the laboratories utilising their own methods on the submitted standards; a standard procedure was not obligatory during this exercise.

14. The Advisory Committee endorses the views of the ICES/SCOR Working Group that the results of the intercalibration exercises for fish flour in the cases of copper, mercury and zinc showed good agreement between the different participating laboratories. The results for cadmium were not equally good, and for lead the results were of doubtful value.
15. In the intercalibration of organochlorine analyses ICES reference samples based on maize oil were analysed. One sample was unspiked and the levels present were below the limits of detection of the used methods. The other was spiked to levels above those commonly found in environmental samples.
16. The Advisory Committee noted that for DDT, its metabolites and PCBs, all the participating laboratories reported, and the results were encouraging, since they show an overall conformity. For the other organochlorine compounds, only a limited number of laboratories reported. It is felt that for these substances further efforts are needed in order to reach sufficient agreement between laboratories, to allow for identification of significant difficulties in the analytical results.

Results of the Baseline Study

17. The studies included cod, herring, flounder, and to a certain extent sprat and plaice. Only two laboratories reported analysis of shellfish. The data, as reported by the different laboratories, are contained in the numerous tables in the report.

These data should only be used for an overall indication of the situation of pollution by the reported elements and living resources of the Baltic. They are comparable with, and do not differ much from, those found in the North Sea study (Coop.Res.Rep. No.39). However, the tables illustrate that there are significant gaps in the coverage of the area, and inconsistencies in the time of sampling. The accompanying intercalibration shows that the analytical results are reliable and comparable, but the unsatisfactory coverage in time, space and age-groups of the samples do not yet allow a meaningful detailed intercomparison between the regions. In the Baltic, where the natural environmental variations are much larger than f.i. in the North Sea, the greatest possible precautions should be taken in the sampling procedure.

18. The Advisory Committee on Marine Pollution agrees with the ICES/SCOR Working Group that an evaluation of the data obtained in this study, as compared with those from the North Sea, and supplemented by available information from other sea areas will be of value, and is considering how this can best be done. The evaluation should include detailed and careful analyses of the chemical data in relation to the results of the intercalibrations and the sampling patterns.
19. The Advisory Committee on Marine Pollution realises that this study has been very complicated to carry out and wishes to emphasize that it is a very valuable step towards a monitoring scheme for the Baltic.

Studies of the processes governing the dispersal and fate of pollutants in the Baltic

20. The Advisory Committee took note of the report of the ICES/SCOR Working Group on the Study of Pollution of the Baltic and observed with satisfaction the considerable progress in the International Baltic Pollution Study (Coop.Res.Rep. No.42). This programme was drafted in 1973. Seven tasks of high priority were listed, with the objective to clarify important aspects concerning the input, transfer, accumulation and elimination of pollutants and nutrients in the Baltic. These tasks are all important for the understanding of processes governing the dispersal and fate of pollutants in the Baltic, and a better knowledge of them is essential in order to assess the present situation and predict future events.
21. The tasks include measurements of exchange of water, organic matter and pollutants between the Baltic and the North Sea, between inshore and offshore regions, between upper and deeper layers and between water and sediments. The transport through the Danish Straits is presently being thoroughly investigated and processes in near-shore zones are also under investigation by various laboratories; physical studies of vertical transport are being carried out and are supplemented by the development of circulation models, which were also the theme of an ICES Special Meeting in 1974. Toxic substances are being studied in different components of the ecosystems.
22. The Advisory Committee shares the opinion of the ICES/SCOR Working Group that the work has now reached a stage where further development requires a joint, internationally co-ordinated study on the vertical transport of organic matter and pollutants in the open Baltic. The Committee therefore endorses the

plans for the international experiment BOSEX-77 where presumably all Baltic countries will join forces in a four weeks' programme in the southern Gotland Basin. This programme will constitute an important part of the high priority research projects of the International Baltic Pollution Study. The Advisory Committee therefore stresses the importance of the complete research programme as a key to the understanding of the pollution situation as observed in the Baseline Study, and further emphasises its importance for the development of monitoring exercises.

