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Exploration of the Sea

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Marine Environmental Quality Committee

REPORT OF THE FIFTH MEETING OF THE WORKING GROUP ON MARINE POLLUTION
BASELINE AND MONITORING STUDIES IN THE NORTH ATLANTIC

Lisbon, 15-17 May 1979

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The Chairman, Mr A. Preston, opened the meeting at 9.30 hrs on 15 May 1979 and formally welcomed the members. He expressed his appreciation and that of the Group to the Portuguese Delegate to ICES, Dr R. Monteiro, for inviting the Group to hold their fifth meeting at the Instituto Nacional de Investigaçao das Pescas in Lisbon. The Group considered and adopted the agenda as proposed (attached as Annex I) and appointed the ICES Environment Officer as Rapporteur. The list of participants is contained in Annex II.

1. REVISIONS TO THE ICES STRUCTURE, IN PARTICULAR THE ESTABLISHMENT OF THE MARINE CHEMISTRY WORKING GROUP

1.1. The Chairman reported that at the 1978 Statutory Meeting a Marine Chemistry Working Group had been established which had taken over the work of, among others, two Sub-groups of this Working Group, namely, the Sub-Group on Contaminant Levels in Sea Water and the Sub-Group on Analyses of Contaminants in Fish and Shellfish. The Chairman pointed out that the establishment of the Marine Chemistry Working Group had not changed the work of the Working Group on Marine Pollution Baseline and Monitoring Studies in the North Atlantic and emphasized that the Group will continue to carry out the work required under its terms of reference as an interdisciplinary team of chemists, biologists and scientists in other relevant fields. This Group could, moreover, derive benefit from the fact that many of its members are also members of the Marine Chemistry Working Group.

1.2. In the discussion, some members felt that there was a great deal of overlap in the work of the two Groups which created confusion as to their respective roles. Other members felt that this was a temporary problem because the Marine Chemistry Working Group had inherited so much work concerning marine pollution; additionally, topics on the analysis of pollutants in the marine environment are among the most important in the marine chemistry field within ICES at the present time.

1.3. In conclusion, the Group looked forward to the progressive clarification of the roles of the two groups. At the moment, it looked to the Marine Chemistry Working Group to develop the necessary chemical tools for the analysis of contaminant levels in biota, sea water, and sediments. The Working Group on Marine Pollution Baseline and Monitoring Studies in the North Atlantic will then take these tools and deploy them in a practical way in baseline studies and monitoring programmes.

2. ACTIONS TAKEN BY COUNCIL AND ACMP IN LIGHT OF THE WORKING GROUP'S FOURTH REPORT

2.1. The Working Group noted that, with one small exception, all of its recommendations from the previous meeting had been supported by Council. The plans for a fifth intercalibration exercise on trace metals in sea water had been approved in C.Res.1978/4:11. The recommendation encouraging member countries to study and report the appearance of new, possibly harmful substances in the marine environment had been adopted in C.Res.1978/4:13. However, only the portion of the Working Group's recommendation on the publication of the extended baseline study was accepted (C.Res.1978/1:5) because the input study had been considered too far from completion to be recommended for publication.

2.2. With regard to actions by the Advisory Committee on Marine Pollution on the basis of the Group's fourth report, the Group noted that the ACMP had found itself able to agree with nearly all of the Group's conclusions.

3. CONSIDERATION OF OTHER INTERNATIONAL ACTIVITIES

3.1. JMG

3.1.1. The Environment Officer reported that the Joint Monitoring Group of the Oslo and Paris Commissions had accepted most of the advice formulated by the ACMP in 1978. However, the JMG had not accepted the ACMP's recommendation that an intercalibration exercise on the analysis of PCBs in sea water should preferably be postponed until adequate background studies have been completed. Accordingly, the JMG was exploring other possibilities of conducting this intercalibration, possibly within the EEC.

3.1.2. The Working Group noted that the JMG had requested ICES to provide information on several other subjects and decided to consider these requests in detail under the applicable agenda items as they came up during the meeting.

3.2. Open Ocean Programme

3.2.1. The Environment Officer reported on the recent activities relevant to the cooperation between ICES and the Intergovernmental Oceanographic Commission on intercalibration exercises on trace elements and organochlorines in sea water. The Council had considered the proposed cooperation, as had been discussed by the Working Group at its previous meeting and recommended by the ACMP, and had agreed that ICES could assist the IOC with intercalibrations on the analyses of trace elements in sea water and would be willing to nominate qualified laboratories for participation in IOC intercalibration exercises on the analyses of organochlorines (including PCBs) in sea water.

3.2.2. It was noted that this cooperation had been discussed at the meeting of the Marine Chemistry Working Group the previous week and that Group had stressed the importance of close cooperation between ICES and IOC.

4. INPUT STUDY - REPORT ON PROGRESS

4.1. The Chairman reviewed the history of the study of the input of pollutants to the North Atlantic. He recalled that, after input information available in 1977 had been published in Coop.Res.Rep., No.77, it had been agreed that more recently available information should be published together with the results of the extended baseline study. However, given that the additional input data had not been available in time to keep the same publication schedule as for the results of the extended baseline study, he asked the Group's opinion on whether it would still be worthwhile to publish the additional input results.

4.2. Dr Pearce reported that, although only partial information was available at present concerning the input of pollutants to the North-west Atlantic from the United States, his attempts to gain such information have stimulated work on input studies. He stated that in one year he would be able to provide a more complete report containing accurate data on dumping and river inputs. He then provided the Group with a report on the inputs via dumping in the marine area off Philadelphia.

4.3. The Group agreed that it would be useful to publish the input information available at present from the United States, Canada, Greenland (for the west coast), and France. The Environment Officer agreed to prepare a preliminary report on this information for the 1979 Statutory Meeting. The Group agreed that additional information should be accepted until the time of the Statutory Meeting and asked the Marine Environmental Quality

Committee to approve publication of this extended input study, subject to final review by the Working Group at its 1980 meeting.

4.4. The Group then restated its interest in studies on the input of pollutants to the marine environment, noting that it considered its main function to comment when appropriate on what data need to be acquired, both regarding geographical areas as well as substances.

4.5. The issue was raised concerning the problem of estimating inputs via rivers and it was queried whether some work should be carried out to develop sampling methodologies to obtain a more correct picture. Noting that there is work going on under other international organisations on this topic (e.g., the SCOR Working Group on River Inputs to Ocean Systems (RIOS)), the Group wished to point out to the Marine Chemistry Working Group that it considered this issue important. It requested the Marine Chemistry Working Group to review the international work being conducted on this subject and to report back on whether ICES should take any initiatives on this subject.

5. MONITORING OF FISH AND SHELLFISH

5.1. Consideration of Second Draft of Extended Baseline Report

The Group recalled that, at its 1978 meeting, it had considered a draft report of the results of the extended baseline study (containing data from Canada, Ireland, Portugal, and the United States) prepared by the ICES Environment Officer and had requested that several alterations be made. The Group had before it now the second draft of this report, which had recently been reviewed and approved by the ACMP, subject to any comments the Working Group might make. Several members suggested amendments to the text and the Group thereafter approved the report for publication.

5.2. Consideration of the 1977 and 1978 Coordinated Monitoring Reports

5.2.1. The Chairman introduced this topic and noted that 1978 represented the fifth year of the Coordinated Monitoring Programme. He reported the results of the ACMP discussion on this subject in which the ACMP had reiterated the importance it attaches to this programme, both because it covers a broader geographical area and more pollutants than newly-developing programmes (e.g., the Joint Monitoring Programme of the Oslo and Paris Commissions) and because it is proper for ICES to collect and evaluate data on marine environmental quality and human health risk. He also indicated that the ACMP would welcome a review of the results of the programme for this five-year period.

5.2.2. The Environment Officer introduced a draft report on the 1977 Coordinated Monitoring results, which contained data from Belgium, Canada, England/Wales, the Federal Republic of Germany, Ireland and Scotland. In the discussion, additional data were offered from France and the Netherlands which would require slight modification of some of the statements made in the draft report. After considering these new data, the Group agreed that they, as well as any other relevant data, should be incorporated into the report. Several suggestions were made to improve the text of the report and the Group then agreed that the amended report should be forwarded to the ACMP in early summer for final consideration by the ACMP at the 1979 Statutory Meeting.

5.2.3. Regarding the 1978 report, it was noted that results had been received so far from Belgium, Canada, England/Wales, the Federal Republic of Germany, Ireland and the United States. The draft report on these results would be prepared during the summer by the Environment Officer.

5.2.4. The Group then held an overall discussion on the aims and methods of the Coordinated Monitoring Programme, in which questions were raised concerning, inter alia, the study only of areas with elevated contaminant levels versus a comparison of results from areas with high levels and those with low levels, and the use of monitoring for trend assessment versus human health risk assessment. The Group concluded that the aims of the monitoring programme should be threefold:

- (1) to provide a continuing assurance of the quality of fish and shellfish for human consumption;
- (2) to survey wide geographical areas on an intermittent basis;
- (3) to provide an analysis of trends for selected pollutants in selected species from selected areas.

It was agreed that the first two aims could be achieved with existing methods, but that there still are problems concerning the best ways to carry out trend monitoring.

5.2.5. After some discussion concerning the best sampling and sample preparation methods to use for human health risk monitoring, the Group agreed that it would be prepared to specify in detail at the next meeting the way in which monitoring for this purpose as well as for overall area surveillance should be carried out. A small ad hoc group held a short meeting after the session of the full Group to consider this issue in greater detail. The report of this ad hoc group is contained in Annex IV.

5.2.6. In the discussion on trend monitoring, it was agreed that the objective was to detect changes in contaminant levels according to time and place which reflect changing rates of input to the system so that it could be determined whether levels are increasing, decreasing or remaining constant. For this type of monitoring, it is not necessary to study species used for human consumption, but rather to sample the species which provide the most reliable information concerning trends. However, to understand the relevant factors which affect the determination of trends, an in-depth statistical sampling study, using multiple regression analysis, should be conducted in each area in which trends are to be assessed. As these in-depth studies require a considerable amount of time and resources and as there are still questions concerning comparable methods of statistical analysis, the Group realised that trend analysis programmes cannot be implemented immediately. The Group emphasized the importance of continuing its work to develop the proper basis for trend monitoring and agreed that at its next meeting it would try to make recommendations concerning which pollutants should be monitored in which species and in which areas, according to the available information.

5.2.7. With regard to assistance from the Marine Chemistry Working Group on this project, it was agreed that advice could be requested on the types of substances which can be determined and the detection limits and precision of analysis, but that the actual work of developing the sampling programme is a task of this Working Group on marine pollution.

5.2.8. In concluding the discussion on the Coordinated Monitoring Programme, the Group considered whether an evaluation should be conducted of the results obtained over the past five years. It was noted that two members from the United Kingdom would be reviewing their own data of the last five years. The Group felt that this work should not be expanded at the present time, but rather that the United Kingdom review should be considered when

available, at which time the value of expanding this work could be judged. The Group agreed to continue the Coordinated Monitoring Programme as it is presently being conducted until the new programme has been fully developed. It was agreed that the deadline for sending the 1979 data to the ICES Environment Officer (with a copy to Dr Portmann) would be 31 May 1980.

5.3. Report on Trend Analysis Programme

5.3.1. The Group took note of the results of the discussion on this subject which had taken place in the Marine Chemistry Working Group the previous week. There it had been observed that an important problem in this work centred on the fact that each participating laboratory was utilizing different types of statistical analyses; statisticians had thus been requested to study the problem and arrive at agreement on one method to be used by all. The Marine Chemistry Working Group had also decided on the basis of these studies that the minimum change that could really be detected was 30%, and possibly 20% under optimum conditions. Finally, difficulties had been observed in one area in trying to resample a population of organisms over two successive years, as the population of an area may change or a resident population may change its feeding habits, thus causing differences in contaminant levels which might not be indicative of a real trend.

5.3.2. The Group observed that the results of these recent regression analysis studies (see Annex V) reaffirmed the conclusions it had reached the previous year on the basis of earlier studies. The Group affirmed its support of the Marine Chemistry Working Group's plans to obtain agreement among statisticians on methods of handling the data, which work Dr Uthe agreed to coordinate. Finally, it was agreed that at the next meeting the issue of handling statistical variations in the data should be coupled with the task of choosing pollutants, species, and areas for trend analysis studies and appropriate recommendations should be made.

5.4. Report on Intercalibration Exercises

5.4.1. The Group was informed of the consideration of the results of the two intercalibration exercises on analyses of contaminants in biological material which had taken place in the Marine Chemistry Working Group. The results of the intercomparison of analyses of trace elements in fish flour showed good agreement for mercury, copper and zinc. For cadmium and lead, the results indicated that most laboratories are still not able to obtain true values at the low levels of these metals in fish muscle. A new exercise has been planned for the analysis of these last two metals at somewhat higher levels. The intercomparison exercise on the analysis of organochlorine residues in fish oil showed no improvement in results over those obtained in the previous exercise, four years earlier. It had therefore been recommended that a new intercalibration be conducted for PCB group analyses only.

5.4.2. The Group was further informed that the rate of return of results had been low for both exercises, particularly for organochlorines in which fewer than 50% of the laboratories requesting samples had returned the results of their analyses to the Coordinator by the set deadline. The Working Group deplored this poor response rate, particularly as only a few laboratories in a few countries have borne the burden of coordinating the exercises. The Group felt that in future intercalibrations samples should be distributed with first priority to laboratories who intend to return their results and with second priority to those who wish to use the samples as internal standards only. It was agreed that in future intercalibrations, laboratories should indicate their intention to fully participate in the exercise in a letter to the Coordinator, with a copy to the ICES Secretariat and the applicable national intercalibration contact person (as given in the Marine Chemistry Working Group report, C.M.1979/C:1).

5.4.3. The Group expressed its appreciation to the Coordinators of the two intercalibrations, Dr Topping for trace metals and Mr A.V. Holden for organochlorines, for their excellent work in carrying out these exercises.

5.4.4. The Group then discussed views concerning the analytical accuracy which should be required for the various monitoring programmes, particularly given the finding that most laboratories do not have adequately sensitive methods to detect the low levels of cadmium and lead found in fish muscle tissue. A number of members felt that, in terms of monitoring for public health purposes, the levels of cadmium and lead are so low as to pose no health risk and thus these analyses need not be conducted. For trend monitoring purposes, it was suggested that instead of muscle another organ be chosen, according to where the metal has its highest concentration. The Working Group agreed, however, to ask the Marine Chemistry Working Group to decide, on the basis of the results of the intercalibration exercises on trace metals, how to make known the best methods for analysing low levels of cadmium and lead in biological samples.

5.5. Development of the Sampling Manual

5.5.1. The Group reviewed the recommendations of the Marine Chemistry Working Group which had been made in response to an informal request for further information on sampling procedures by the Secretary of the Oslo and Paris Commissions (see paras. 8A.3.4 to 8A.3.6, Doc. C.M.1979/C:1). The Group did not have any additions to these recommendations, nor to the small change the Marine Chemistry Working Group had proposed to the sampling guidelines for monitoring contaminant levels in fish and shellfish in the North Atlantic, contained in Annex II to the 1978 ACMP report (Coop.Res.Rep., No.84).

5.5.2. Regarding a question on the identification of the right side of a flounder or other flatfish (as relevant to the sample preparation methods contained in Appendix I of Annex II, Coop.Res.Rep., No.84), the Group agreed that the muscle to be sampled should be from the dorsolateral filet of the upper (dark) side of the flounder.

5.6. The Role of Biological Indicators in Pollution Monitoring

5.6.1. The Group was reminded that one session of the Marine Environmental Quality Committee meeting in 1978 had been devoted to discussing the use of marine organisms, including mussels, for the detection and monitoring of pollutants. The Committee, however, had decided not to draw any overall conclusions at that time, preferring to await the outcome of discussions at the International Mussel Watch Workshop (Barcelona, December 1978).

5.6.2. The Group felt that it would be very valuable to have an overall review of the results of the 1978 (and 1979) Statutory Meeting papers to the Marine Environmental Quality Committee on this subject as well as any results of the Mussel Watch Workshop which are available. It was thus agreed that an evaluation should be conducted of the use of marine organisms to determine trends in the levels of organochlorine compounds, petroleum hydrocarbons, and heavy metals in the marine environment. Dr Portmann agreed to coordinate this work and Drs Uthe, de Barros, Topping and Kerkhoff agreed to assist him. Dr V. Dethlefsen will also be asked to take part in this work.

5.7. Tissue Banking

5.7.1. Dr Pearce reported on the outcome of the International Workshop on Monitoring Environmental Materials and Specimen Banking (Berlin, October 1978), which had been jointly sponsored by the United States

Environmental Protection Agency, the Commission of the European Communities, and the Federal Environmental Agency of the Federal Republic of Germany. He informed the Group that this Workshop had discussed the development of tissue banks for environmental specimens from fresh and marine waters, as well as from terrestrial environments. The use of organisms as a monitoring tool and sampling guidelines had also been considered. A report on the Workshop is being prepared and will be available in due course.

5.7.2. Dr Pearce also informed the Group that the US National Bureau of Standards has recently published a report on specimen collection and preservation, entitled "A Survey of Current Literature on Sampling, Sample Handling, and Long Term Storage for Environmental Material" (NBS Technical Note 929).

6. ANALYSIS OF SEA WATER

6.1. Report on Considerations at Marine Chemistry Working Group Meeting

6.1.1. The Chairman reminded the Group of the progress in the programme of intercalibration exercises on the analyses of trace elements in sea water. He noted that this programme has achieved very worthwhile results and that many people have expressed their satisfaction at the results obtained in the course of the four completed intercalibration rounds.

6.1.2. The Chairman also recalled the project to review trace element levels in open ocean and coastal waters and pointed out that the general agreement in ICES is that studies of trace elements should be concentrated in coastal waters, as there do not appear to be pollution problems in the open ocean.

6.2. Progress on Intercalibration

6.2.1. The Group was informed about the discussion in the Marine Chemistry Working Group on the results of the fourth round intercalibration on the analyses of trace elements in sea water, which had been designed to determine analytical precision in the analysis of replicate natural sea water samples. The results had shown that there has been a great improvement in analytical capability since the last intercalibration. For many metals, except zinc and lead, a number of laboratories are now able to obtain comparable results at concentrations close to those found in offshore sea water.

6.2.2. The Coordinator of this intercalibration, Dr Bewers, reported that, on the basis of the results of this exercise, he was confident that a number of laboratories have now developed methods capable of detecting levels of certain trace elements very close to their true levels in sea water. The analyses are becoming so reliable that it is almost possible to detect differences in concentrations in different water masses. He indicated that he would carry out a further interpretation of the data, including a more detailed assessment of the results for frozen samples versus acidified samples, and would report the final results to the 1979 Statutory Meeting.

6.2.3. The Group agreed that the good results obtained in this fourth round intercalibration were very encouraging. They congratulated Dr Bewers on the excellent work he had done in coordinating the exercise and working up the results.

6.2.4. The Coordinator of the first and third intercalibration exercises on trace elements in sea water, Dr Jones, reported that he was now conducting an overall statistical analysis of the results. He hoped to have the final report completed at the end of the year.

6.2.5. The Group then considered the fifth round intercalibration, which is intended to determine the influence of different samples, sampling methods and sample preparation techniques on trace metal measurements in sea water. It was noted that the outline plans for this exercise had been approved by the Council (C.Res.1978/4:11) and that more detailed planning had been conducted by means of a questionnaire survey, coordinated by Professor H. Windom. The Group was informed that the Marine Chemistry Working Group had reviewed and approved the detailed plans and had created a Coordinating Group, under the Chairmanship of Professor Windom, to carry further the work on the fifth round exercise, including the identification of qualified laboratories (on the basis of the results of the fourth intercalibration) who should be invited to participate. The Marine Chemistry Working Group had also recommended that all efforts be made to take advantage of an offer by the IOC to conduct the fifth round intercalibration off Bermuda 10-25 January 1980, in conjunction with a similar IOC exercise on chlorinated hydrocarbons in sea water.

6.2.6. Noting these developments, the Group agreed that the fifth round intercalibration was a necessary next step to enable full benefits to be obtained from the work which had gone into the first four rounds. The Group discussed the recommendation that the fifth round be held with the Bermuda Biological Station as the staging point and was informed that this is an excellent location from the scientific standpoint, due to the availability of a well-characterized, homogeneous water mass located a short distance from the Bermuda laboratory. After additional discussion, mainly dealing with the number and selection of participating laboratories, the Working Group endorsed the plans for the fifth round intercalibration and agreed that, if possible in the short time frame, it should be conducted at Bermuda in conjunction with the IOC exercises. If it is not possible to organise all details in time for the Bermuda exercise, however, the Group urged that efforts be made to find another offer of a research vessel and staging area as soon as possible.

6.2.7. In summing up the discussion on the four completed intercalibration exercises and the planned fifth round, the Group felt that it would be very useful to have an overview prepared of the experience gained during this programme of intercalibration. It was agreed that the results of the fifth round will be needed to allow the most meaningful overview. Thus, after the fifth round is completed, the Group agreed that the persons who have coordinated these exercises should be asked to take an overall look at the entire programme and provide an analysis and overview of the experience gained and the lessons learned.

6.2.8. The Group noted that the Environment Officer had prepared an information paper in October 1978 entitled "ICES Intercalibration Exercises", which had listed the intercalibration exercises relevant to marine pollution studies and had given a brief amount of information about each exercise. The Group felt that this document provided a valuable overview of the intercalibration programme and asked the Environment Officer to update this document on an annual basis, providing references to the reports where the results of each exercise could be found.

6.2.9. Finally, the Group was informed about the progress, as reviewed by the Marine Chemistry Working Group, in two intercalibration exercises being conducted for the Joint Monitoring Group, one on mercury and the other on cadmium in sea water.

6.3. Consideration of Report "Review of the Past and Present Measurements of Selected Trace Metals in Sea Water in the Oslo Commission and ICNAF Areas"

6.3.1. Dr Topping presented this report, which had been prepared by himself, Dr Bowers and Dr Jones, and summarized the main conclusions. The work had initially begun as a review of data obtained in studies of trace metal levels in open ocean waters. This revealed that, due to differences in sampling techniques and sample preparation methods, the data from different sources were not comparable. Thus, no picture of trace metal distributions in the open North Atlantic could be obtained. Dr Topping reported that data on trace element levels in coastal waters were then studied and it was found that, not only are the data from different sources not comparable due to sampling and other differences, but also the dynamic physical and chemical processes create such a complex situation that it is difficult to interpret the data adequately. River inputs of trace metals were also considered in the paper, based on a model for calculating amounts due to natural sources alone. Dr Topping stressed the importance of understanding the dynamic processes in estuaries - physical and biological processes, as well as chemical - to be able to determine the true input of trace metals to the marine environment via rivers. Four conclusions had been put forward in the paper and these had been accepted with minor amendments by the Marine Chemistry Working Group.

6.3.2. After some discussion of the report and its findings, the Group thanked the three authors for their excellent work, noting that the report more than met its request of the previous year and would provide a unique and valuable contribution to the literature. The Group recommended that the paper be published in the Cooperative Research Report series (see Rec.1).

6.3.3. The Group was informed that the Marine Chemistry Working Group had discussed the requests for advice made by the Joint Monitoring Group through the Oslo and Paris Commissions and had particularly focussed on the request that ICES "examine the physical, chemical, and biological processes which control the movement of contaminants between the various compartments in the marine environment from the point of input to the ultimate sink, and provide advice to the Commissions on the principles underlying these processes." The Marine Chemistry Working Group had decided to initiate work by reviewing studies of chemical processes in the coastal zone which influence the transport of mercury and PCBs; cadmium will also be considered after a relevant review has been published in the United Kingdom.

6.3.4. The Group welcomed this initiative of the Marine Chemistry Working Group and affirmed its support of this work. Noting that this is an interdisciplinary project, the Group encouraged the Marine Environmental Quality Committee and the Hydrography Committee to discuss the project at their next meetings and determine whether additional initiatives are needed to provide a wider approach to the issue. It was felt that papers resulting from this project should be reviewed in a forum with representation by a broad range of expertise in biology, physical oceanography, and chemistry.

7. REPORT FROM MARINE CHEMISTRY WORKING GROUP, OTHER THAN ITEMS 5 AND 6 ABOVE

7.1. New Contaminants

7.1.1. It was reported that the Marine Chemistry Working Group had considered an overview paper on this subject by Mr A.V. Holden and had received information concerning French studies of phthalate esters in the environment. It was anticipated that expanded papers on both of these topics would be presented at the 1979 Statutory Meeting.

7.1.2. The Group then discussed kepone, which is being studied by some countries as a new contaminant in the environment. It was pointed out that, because it is very difficult to analyse for kepone, it was not discovered in the environment for a long period of time.

7.2. Petroleum

7.2.1. The Group was informed that the Marine Chemistry Working Group had discussed whether coordinated work should be started on the determination of petroleum hydrocarbons in the marine environment, both in response to C.Res.1978/2:27(b) and in recognition of the growing need for such work. The Marine Chemistry Working Group had concluded that there is an immediate need for coordinated action on environmental monitoring so that there may be some possibility of comparing results from the various on-going studies. Thus, a three-part project was planned to intercompare analyses of petroleum hydrocarbons in sediments and marine organisms, as well as crude oil samples and fractions thereof. As availability of some of these samples will be limited, a priority list for distribution of samples was developed, with first priority given to laboratories conducting routine analyses of petroleum hydrocarbons using a gas chromatography - mass spectroscopy system. It was reported that, in addition to this intercalibration work, a questionnaire survey will be conducted on the analytical methods presently in use to determine petroleum hydrocarbons.

7.2.2. The Group welcomed the initiation of this intercalibration exercise. It noted that this new project was important both to begin ICES work on environmental studies of petroleum hydrocarbons and because the Paris Commission may possibly wish advice on the comparability of sampling and analytical techniques for monitoring the marine environment around oil platforms. The Group further noted that C.Res.1978/2:27(b) was worded in such a way that the Marine Chemistry Working Group was requested to consider basic analytical aspects, whereas it should handle the more general problems itself, such as the origin and transformation of oil in the marine environment.

7.3. Biochemical Studies

It was reported that the Marine Chemistry Working Group had not considered this topic but would do so when the applicable results from the Workshop on Monitoring the Biological Effects of Marine Pollution (Beaufort, N.C., February 1979) became available.

7.4. Any Other Matters

7.4.1. It was noted that the Marine Chemistry Working Group had considered the IOC invitation to ICES to nominate qualified laboratories to participate in an intercalibration of PCB analyses in sea water and had identified several laboratories competent to take part.

7.4.2. The Group was informed that the Marine Chemistry Working Group had initiated a review of studies in which radiological techniques had been used to study basic processes in the marine environment. It was emphasized that this review concerns the use of radionuclides as research tools in studying marine processes and not the possible effects of radioactive substances in the marine environment.

7.4.3. Finally, the Group was briefly informed of other work undertaken by the Marine Chemistry Working Group, including nutrient studies and a consideration of the carbon dioxide problem in the environment.

8. EFFECTS STUDIES

8.1. Report on the Beaufort Workshop on Monitoring Biological Effects of Marine Pollution

8.1.1. Dr McIntyre, Workshop Convenor, reported on the outcome of the Workshop, which had been held as a result of the recommendation of a former sub-group of the Working Group. The Workshop had taken place at Duke University Marine Laboratory, Beaufort, North Carolina, from 26 February to 2 March 1979. About 60 invited scientists had participated and 35 specially commissioned papers had been prepared. Biological effects monitoring techniques had been discussed under seven main themes: biochemistry, physiology, pathology, behaviour, genetics, ecology, and bioassay. Small panels had considered each theme in detail and had prepared recommendations on the most promising monitoring techniques. Dr McIntyre stated that he was presently compiling the seven panel reports and would prepare an overall summary of the recommendations for discussion at the 1979 Marine Environmental Quality Committee meeting.

8.1.2. The Group looked forward to seeing the report of the Workshop and reviewing the discussions of the Marine Environmental Quality Committee on this subject.

8.2. Links with Working Group on Pathology and Diseases of Marine Organisms

8.2.1. The Chairman reported that the subject of a possible relationship between pollution levels and disease conditions had been considered by the Working Group on Pathology and Diseases of Marine Organisms at its recent meeting and a portion of its report (C.M.1979/F:61) will be devoted to this subject. He indicated that there is a growing understanding of disease etiology regarding marine organisms and in one case, at least, this has led to the implication of a virus as the causative agent rather than previously suspected chemical carcinogens.

8.2.2. The Group agreed to consider this subject in greater detail at its next meeting on the basis of the relevant portion of the above-mentioned report and on the pathobiology section of the report of the Biological Effects Monitoring Workshop.

8.3. Studies by Member Countries

8.3.1. Dr Pearce and Dr Thurberg reported on a broadly based environmental monitoring programme, called OCEANPULSE, which is being carried out in coastal waters off the northeastern United States. A part of this programme is utilizing certain of the biochemical, physiological and other techniques recommended at the Biological Effects Monitoring Workshop. The results obtained so far have confirmed that no one technique is adequate to indicate pollution problems, but rather that a suite of different techniques

is necessary, as has been recommended by the Biological Effects Monitoring Workshop. Dr Thurberg stated that in the course of the development of the OCEANPULSE programme a number of biological effects parameters had been considered but discarded because the data could not be adequately interpreted. For those parameters now included in the programme, a large data base is being built up and analysed by computer in the hope that the responsible pollutant(s) could be associated with the observed effects. Results of the studies will be presented at Working Group meetings and Statutory Meetings as they become available.

8.3.2. Dr McIntyre reported briefly on the PRIMA Programme, in which certain physiological and biochemical parameters are being studied in several selected species of marine organisms in an effort to identify the effects of organic pollutants.

8.3.3. The COST-67 project, under the EEC, on baseline studies in coastal benthic ecology was mentioned by Dr Parker. The aim of this programme is to identify the major natural environmental variables which cause changes in benthic communities in unpolluted areas.

8.3.4. Dr Uthe summarized the results of Canadian experiments on the effects of feeding PCBs to cod, reported earlier in Docs. C.M.1978/E:17 and E:18. These results showed that the levels of certain hormones in the blood changed in response to PCB exposure, however, nine out of twelve enzymes studied showed no effect whatsoever. It was thus concluded that enzymes, or at least those studied, are not good indicators of PCB pollutant effects.

9. STUDIES ON SEDIMENTS

9.1. Progress on Symposium

The Group noted that the Symposium on Sediment and Pollutant Interchange in Shallow Seas will take place in Texel on 24-26 September 1979 with Professor H. Postma as Convenor. At present, 34 scientists have accepted an invitation to participate and 19 papers have been announced. The Group looked forward to information on the outcome of the Symposium at its next meeting.

9.2. Pilot Studies by Member Countries

9.2.1. Dr Vale reported on a sediment study conducted in the Tagus estuary during a period of spring flooding. The sediment transport increased greatly with the increased river flow. Studies on trace metal levels were still underway, but some copper and zinc values were much higher than normally found. The levels of trace metals and organochlorines in fish and other organisms are also being studied to determine whether any changes have occurred due to the sediments and dissolved substances carried by the flood waters.

9.2.2. Dr Jensen informed the Group of a sediment study taking place on the west coast of Jutland, in which contaminant levels are being measured in top-layer sediments and the sedimentation rate is being determined.

9.2.3. Dr Topping mentioned a tank experiment being carried out in the Firth of Forth in which the uptake of mercury from contaminated sediments is being monitored.

9.2.4. Dr Schmidt gave further information to that of the previous year on the sediment monitoring programme being conducted in the Federal Republic of Germany. Among the results obtained so far, it has been found that high levels of contaminants may occur in sea bed sediments in areas where sea water monitoring had not indicated elevated levels of these

contaminants. Further results of the programme will be presented in Texel.

9.2.5. Professor Lange reported on a Norwegian programme in which sediment cores are taken from the Norwegian to the Danish coast along the dividing line between the Kattegat and the Skagerrak. Analysis of these cores has shown a definite increase in the levels of certain contaminants in recent years.

9.2.6. Dr Bewers stated that a Canadian intercalibration of analyses of dumped dredge spoil material had indicated that improvements still need to be made to attain better comparability of results among laboratories. Additional lack of comparability is caused by the fact that there is no overall agreement on which materials in the sediments should actually be analysed. On the basis of these comments, the Group briefly considered whether an intercalibration of sediment analyses should be conducted in the near future. It was agreed that further consideration of an intercalibration should await the outcome of the Sediment Symposium.

10. TRANSPORT AND FATE OF POLLUTANTS IN ESTUARIES

10.1. Noting that this subject has been under consideration by the Group for several years, the Chairman reported that the Council had agreed to stimulate further work on the topic by arranging a mini-symposium at the 1980 Statutory Meeting on "Transport Processes in Estuarine and Near Shore Zones" (see C.Res.1978/2:18). A planning group has been established to make proposals on the detailed arrangements for the mini-symposium and the ACMP has invited the Working Group to express its views on what should be included.

10.2. It was pointed out that some of the work being carried out for the SCOR project River Inputs to Ocean Systems (RIOS) would be very relevant to the aims of this mini-symposium.

10.3. No members had any other relevant studies to report to the Group.

11. CONFIRMATION OF DEADLINES AND APPROVAL OF RECOMMENDATIONS

In reviewing its recommendations from the meeting, the Group reaffirmed the importance it attached to having all efforts be made to carry out the ICES fifth round intercalibration exercise for trace metals in sea water in conjunction with the IOC exercises on Bermuda in January 1980. Realising that it would be too late to adequately plan participation if the decision must be postponed until the Council Meeting in October, the Group agreed that the Chairman should communicate the Group's views to the ICES President in time for them to be considered by the Bureau at its mid-term meeting. Accordingly, the Group asked Mr Preston to transmit the following statement to the President, with a copy to the General Secretary:

ICES 5th Round Intercalibration Exercise for Trace Metals in Sea Water

The Working Group on North Atlantic Baseline Studies, noting that the Marine Chemistry Working Group endorses the IOC (GEMSI) plans for a joint ICES/IOC intercalibration exercise for trace metals in sea water, approves the detailed plans for the ICES 5th stage intercalibration exercise for trace metals in sea water (approved in outline by Council Resolution 1978/4:11) which will be carried out jointly with IOC.

It notes that it will not be possible to submit the detailed plans for approval of the full Council at the 1979 meeting because of the stringencies

of time-table imposed by the offer of research vessel facilities based on Bermuda in January 1980 which require detailed preparation through a series of activities beginning in July 1979. The Bureau is therefore asked to consider this matter for interim approval both in relation to the ICES requirement for a 5th round intercalibration exercise and especially the role of ICES in relation to monitoring activities in the North Atlantic but also the approved collaboration with IOC where such an exercise is also required as part of the preparation for an "Open Ocean" baseline exercise. It should be noted that the planning and conduct of this exercise will be without financial penalty to the participating laboratories except for the cost of the time committed to participation in planning activities, the actual conduct of the exercise and the writing of the report.

Finally, the Group was informed that the ICES/SCOR Working Group on the Study of the Pollution of the Baltic had recommended that the two groups plan meetings with one overlapping day so that items of mutual interest could be discussed. The Group agreed that this was a good idea and noted that its next meeting would probably be in Copenhagen in February 1980, to fit in with the new schedule of ICES working group meetings.

12. REPORT AND ACTION LIST

12.1. The Environment Officer informed the Group that, due to the severe load placed on the Secretariat which now services nearly 55 working groups, all reports must be completed within ten days of the close of the meeting. This meant that draft reports could no longer be circulated for comment by the members. However, changes or additions could be made by members after they receive the final report; these changes would be attached as an annex to the report.

12.2. Several members expressed their concern over this new procedure because they felt the Group would not be able to properly agree to the report. They were also concerned that the increasing load on the ICES Secretariat may cause a decreased level of service; they felt that additional resources may be needed for the Secretariat and requested that this concern be specifically stated in the report.

12.3. In closing the meeting, the Chairman again expressed the appreciation of the Group to Dr Monteiro for providing such excellent facilities and also to Dr M. de Barros for her assistance during the meeting. He declared the meeting closed at 17.30 hrs on 17 May.

WORKING GROUP ON MARINE POLLUTION BASELINE AND MONITORING STUDIES IN

THE NORTH ATLANTIC

Lisbon, 15 to 17 May 1979

AGENDA

1. Revisions to ICES structure and in particular the establishment of the Marine Chemistry Working Group and its relationship to other ICES Working Groups and Committees.
2. Actions taken by Council and ACMP in light of Working Group's 4th report.
3. Consideration of other international activities.
 - 1) JMG
 - 2) Open Ocean
4. Input study - Report on progress.
5. Monitoring of Fish and Shellfish.
 - 1) Consideration of the 2nd Draft of the extended baseline report (Canada, Portugal, Ireland and USA data)
 - 2) Consideration of 1977 and 1978 Coordinated Monitoring reports; question of common formats for data reporting
 - 3) Report on trend analysis programme
 - 4) Report on Intercalibration including status of JMG exercise and links with IAEA
 - 5) Development of the sampling manual
 - 6) The role of biological indicators in pollution monitoring
 - 7) Tissue banking - Report on Berlin meeting and comments on value of these in pollution studies
6. Analysis of Sea Water.
 - 1) Report on the Sub-Group on Sea Water Analyses
 - 2) Progress on Intercalibration
 - 3) Consideration of report "Review of the past and present measurements of selected trace metals in sea water in the Oslo Commission and ICNAF Areas"
7. Report from Marine Chemistry Working Group other than items 5 and 6 above.
 - 1) New contaminants
 - 2) Petroleum
 - 3 Biochemical studies
 - 4) Any other matters
8. Effects studies.
 - 1) Report on the Beaufort Workshop on Monitoring Biological Effects of Marine Pollution
 - 2) Link between W.G. on the Pathology and Diseases of Marine Organisms and W.G. on Marine Pollution Baseline and Monitoring Studies in the N-Atlantic
 - 3) Unilateral studies by member countries

9. Studies on sediments
 - 1) Progress on Symposium
 - 2) Pilot studies by member countries

10. Transport and Fate of Pollutants in Estuaries - Reports on National Contributions.

11. Confirmation of Deadlines and Approval of Recommendations.

12. Report and Action List.

WORKING GROUP ON MARINE POLLUTION BASELINE AND MONITORING STUDIES IN THE
NORTH ATLANTIC

Lisbon, 15-18 May 1979

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RECOMMENDATION 1:

It is recommended that the report "A Review of the Past and Present Measurements of Selected Trace Metals in Sea Water in the Oslo Commission and ICNAF Areas" by Dr G. Topping, Dr J.M. Bowers, and Dr P.G.W. Jones be published in the Cooperative Research Report series.

RECOMMENDATION 2:

It is recommended that the next meeting of the Working Group be held in the first quarter of 1980 at ICES Headquarters and that the dates be selected so that, if possible, there could be some overlap with the meeting of the ICES/SCOR Working Group on the Study of the Pollution of the Baltic.

AD HOC GROUP TO CONSIDER THE AIMS AND FUTURE IMPLEMENTATION OF THE COORDINATED MONITORING PROGRAMME

1. Persons interested in this topic met after the close of the Working Group meeting on 16 May. Dr J. Portmann chaired the meeting and Dr M. Parker acted as Rapporteur. No attendance list was taken.
2. The ad hoc group agreed that the aims of the programme are:
 - a) to provide a continuing assurance of the quality of marine foodstuffs with respect to human health;
 - b) to provide, over a wide geographical area, an indication of the health of the marine environment in the ICES area;
 - c) to develop a means of providing an indication of trends in pollutant levels.
3. The third objective will be the subject of inter-sessional activity by another ad hoc group and so was not considered further at this time.
4. The first two objectives may be grouped together as "watchdog" objectives. Efforts applied to these programmes should be minimised to allow for the development of the third objective (trend analysis).
5. The number of analyses may be minimised by the use of homogenised samples of fish or shellfish of a pre-selected size range.

Accordingly, the group agreed that:

- (i) fish should be selected according to the median size (± 1 s.d.) of the stock in the first year of this programme. The same size will then be taken in each successive year;
 - (ii) mussels should be selected as before (that is between 20 and 50 mm in size, preferably from the lowest end of this range that is practicable);
 - (iii) a sample will consist of 25 fish or 50 shellfish. From each of the fish, an equal quantity of muscle tissue (including red and white muscle) will be taken. For large fish, a portion from the side, below the front dorsal fin will be used; for small fish, a complete fillet;
 - (iv) sampling will take place once annually, prior to spawning of the species under consideration.
6. The areas in which sampling is undertaken should be chosen according to national requirements; ICES should also specify areas of importance, on the basis of previous experience, in order to give good geographical coverage.
 7. Species will be selected according to national requirements; in addition the ICES standard list of species will be included (cod or hake, Mytilus).

8. A list of "core" contaminants to be analysed will be specified by ICES but should include mercury, cadmium, and PCBs.
9. The requirements of JMG's Joint Monitoring Exercise concerned with human health risk are covered by this programme.

These changes are preliminary proposals and will be reviewed and finalized by the Working Group at its 1980 meeting. Thus, these proposals do not apply to the 1979 monitoring programme.

ICES WORKING GROUP ON
MARINE POLLUTION BASELINE AND MONITORING STUDIES IN THE NORTH ATLANTIC

Regression analysis of cadmium and zinc residue concentrations in a statistically sampled population of flounder (Platichthys flesus L.)

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In October 1978 samples of flounder (*Platichthys flesus* L.) were collected from river Elbe estuary (ICES area N6) following the sampling protocol as presented at the 1977 meeting (Annex IV).

The fish were aged, measured and weighed prior to being analysed for their cadmium and zinc content in the liver.

The sample of 55 fish ranged in age from 2 to 3 1/2 years, in length from 357 to 98 mm, and in weight from 490.5 to 8.7 g.

A linear regression analysis was made between cadmium and zinc concentrations in liver and different biological parameters as shown in table 1.

Table 1: Calculated regression coefficients for linear regression of individual contaminant concentrations in liver on biological variables.

	age	weight	length	F ^{x)}	Cd	Zn
age	-	0.206	0.242	-0.178	0.099	0.065
weight	0.206	-	0.940	-0.562	0.374	0.279
length	0.242	0.940	-	-0.649	<u>0.417</u>	<u>0.384</u>
F ^{x)}	-0.178	-0.562	-0.649	-	<u>-0.552</u>	<u>0.547</u>
Cd	0.099	0.374	0.417	-0.552	-	0.497
Zn	0.065	0.279	0.384	0.547	0.497	-

x) F = ratio wet weight: dry weight of liver tissue

From the results reported in table 1 it appears that a loose, but significant relationship exists between concentration levels of cadmium and zinc and length of the animals and between the element levels and the ratio wet weight/dry weight of liver tissue.

Figure 1 illustrates the regression between cadmium and zinc in liver and length of the animals analysed.

The correlation between heavy metal residue concentrations and the ratio wet weight/dry weight suggests that there is an effect of lipid content in the liver on both metals analysed. This point requires further detailed investigations.

For multiple linear regression analysis it was decided to fit a relationship of the form

$\frac{\Delta \text{ Cd}}{\text{Cd}}$	=	1.01	$\frac{\Delta \text{ l}}{\text{l}}$	-	0.10	$\frac{\Delta \text{ w}}{\text{w}}$	-	0.0023	$\frac{\Delta \text{ a}}{\text{a}}$

$\frac{\Delta \text{ Zn}}{\text{Zn}}$	=	0.74	$\frac{\Delta \text{ l}}{\text{l}}$	-	0.16	$\frac{\Delta \text{ w}}{\text{w}}$	-	0.063	$\frac{\Delta \text{ a}}{\text{a}}$

l = length in mm, w = weight in g, a = age in years.
Cd and Zn concentrations in $\mu\text{g/g}$ wet weight.

On the basis of this equation the multiple correlation coefficient is for cadmium

$$\underline{R_{\text{Cd}}(l,w,a) = 0.42}$$

for zinc

$$\underline{R_{\text{Zn}}(l,w,a) = 0.45}$$

ACTION LIST

1. The Environment Officer to prepare a report on the input information available from Canada, France, Greenland, and the United States for presentation at the Council Meeting 1979 and Dr J. Pearce to provide any additional data from the United States at the same time. Final report to be presented at next Working Group meeting (ref. para. 4.3.).
2. The Environment Officer to amend report of 1977 Coordinated Monitoring results and forward to ACMP in early summer (ref. para. 5.2.2.).
3. The Environment Officer to prepare draft report of 1978 Coordinated Monitoring results (ref. para. 5.2.3.).
4. Dr Portmann to coordinate work on evaluation of the use of marine organisms in the assessment of trends of organochlorines, petroleum hydrocarbons and trace metals in the marine environment, with the assistance of Drs Uthe, de Barros, Topping and Kerkhoff. Dr V. Dethlefsen should also be invited to assist in this work (ref. para. 5.6.2.).
5. All members with 1979 data for the Coordinated Monitoring Programme to submit them to the Environment Officer, with a copy to Dr Portmann, by 31 May 1980 (ref. para. 5.2.8.).
6. Dr Uthe to coordinate the correspondence among statisticians working on multiple regression analysis programmes to obtain agreement on the proper statistical methodology (ref. para. 5.3.2.).

REQUESTS TO OTHER GROUPS

1. The Marine Environmental Quality Committee is requested to review the draft report of the extended input study and approve it for publication, pending final review by the Working Group (ref. para. 4.3.).
2. The Marine Chemistry Working Group is requested to review the international work being conducted on the development of sampling methodologies to obtain a correct estimate of the input of contaminants to the marine environment via rivers and to report back to the Group on whether ICES should initiate any activities on this subject (ref. para. 4.5.).
3. The Marine Chemistry Working Group is requested to determine, on the basis of the results of the intercomparison exercise on the analyses of cadmium and lead in biological material, how to make known the best methods for analysing low levels of cadmium and lead in biological samples (ref. para. 5.4.4.).
4. The Marine Environmental Quality Committee and the Hydrography Committee are encouraged to discuss the review project on the dynamic processes in the coastal zone which influence the transport of mercury, PCBs, and cadmium and determine whether additional initiatives are needed to provide a wider approach to the issue (ref. para. 6.3.3. and 6.3.4.).