Intergovernmental Oceanographic Commission
Reports of Meetings of Experts and Equivalent Bodies

IOC-UNEP Group of Experts on Methods, Standards and Intercalibration

Ninth Session

Villefranche-sur-Mer, 5-9 December 1988

Unesco

In this Series, entitled

Reports of Meetings of Experts and Equivalent Bodies, which was initiated in 1984 and which is published in English only, unless otherwise specified, the reports of the following meetings have already been issued:

1. Third Meeting of the Central Editorial Board for the Geological/Geophysical Atlases of the Atlantic and Pacific Oceans
2. Fourth Meeting of the Central Editorial Board for the Geological/Geophysical Atlases of the Atlantic and Pacific Oceans
3. Fourth Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of «El Niño» *(Also printed in Spanish)*
4. First Session of the IOC-FAO Guiding Group of Experts on the Programme of Ocean Science in relation to Living Resources
5. First Session of the IOC-UN(OETB) Guiding Group of Experts on the Programme of Ocean Science in relation to Non-Living Resources
6. First Session of the Editorial Board for the International Bathymetric Chart of the Mediterranean and Overlay Sheets
7. First Session of the Joint CCOP(SOPAC)-IOC Working Group on South Pacific Tectonics and Resources
8. First Session of the IODE Group of Experts on Marine Information Management
9. Tenth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies in East Asian Tectonics and Resources
10. Sixth Session of the IOC-UNEP Group of Experts on Methods, Standards and Intercalibration
11. First Session of the IOC Consultative Group on Ocean Mapping *(Also printed in French and Spanish)*
12. Joint IOC-WMO Meeting for Implementation of IGOSS XBT Ships-of-Opportunity Programmes
13. Second Session of the Joint CCOP/SOPAC-IOC Working Group on South Pacific Tectonics and Resources
14. Third Session of the Group of Experts on Format Development
15. Eleventh Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of South-East Asian Tectonics and Resources
16. Second Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean and Overlay Sheets
17. Seventh Session of the IOC-UNEP Group of Experts on Methods, Standards and Intercalibration
18. Second Session of the IOC Group of Experts on Effects of Pollutants
19. Primera Reunión del Comité Editorial de la COI para la Carta Batimétrica Internacional del Mar Caribe y Parte del Océano Pacífico frente a Centroamérica *(Spanish only)*
20. Third Session of the Joint CCOP/SOPAC-IOC Working Group on South Pacific Tectonics and Resources
21. Twelfth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of South-East Asian Tectonics and Resources
22. Second Session of the IODE Group of Experts on Marine Information Management
23. First Session of the IOC Group of Experts on Marine Geology and Geophysics in the Western Pacific
24. Second Session of the IOC-UN(OETB) Guiding Group of Experts on the Programme of Ocean Science in relation to Non-Living Resources *(Also printed in French and Spanish)*
25. Third Session of the IOC Group of Experts on Effects of Pollutants
26. Eighth Session of the IOC-UNEP Group of Experts on Methods, Standards and intercalibration
27. Eleventh Session of the Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans *(Also printed in French)*
28. Second Session of the IOC-FAO Guiding Group of Experts on the Programme of Ocean Science in Relation to Living Resources
29. First Session of the IOC-IAEA-UNEP Group of Experts on Standards and Reference Materials
30. First Session of the IOCARIBE Group of Experts on Recruitment in Tropical Coastal Demersal Communities *(Also printed in Spanish)*
31. Second IOC-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes
32. Thirteenth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of East Asia Tectonics and Resources
33. Second Session of the IOC Task Team on the Global Sea-Level Observing System
34. Third Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean and Overlay Sheets
35. Fourth Session of the IOC-UNEP-IMO Group of Experts on Effects of Pollutants
36. First Consultative Meeting on RNODCs and Climate Data Services
37. Second Joint IOC-WMO Meeting of Experts on IGOSS-IODE Data Flow
38. Fourth Session of the Joint CCOP/SOPAC-IOC Working Group on South Pacific Tectonics and Resources
39. Fourth Session of the IODE Group of Experts on Technical Aspects of Data Exchange
40. Fourteenth Session of the Joint CCOP-IOC Working Group on Post IDOE Studies of East Asian Tectonics and Resources
41. Third Session of the IOC Consultative Group on Ocean Mapping
42. Sixth Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of « El Niño » *(Also printed in Spanish)*
43. First Session of the IOC Editorial Board for the International Bathymetric Chart of the Western Indian Ocean.
44. Third Session of the IOC-UN (OALOS) Guiding Group of Experts on the Programme of Ocean Science in Relation to Non-Living Resources
45. Ninth Session of the IOC-UNEP Group of Experts on Methods, Standards and Intercalibration

Intergovernmental Oceanographic Commission
Reports of Meetings of Experts and Equivalent Bodies

IOC-UNEP Group of Experts on Methods, Standards and Intercalibration

Ninth Session

Villefranche-sur-Mer, 5-9 December 1988

Unesco

IOC-UNEP/GGE(MSI)-IX/3
Paris, 22 May 1989
English only

SC-89/WS/34

TABLE OF CONTENTS

SUMMARY REPORT

1. OPENING

1 The Chairman of the Group of Experts on Methods, Standards and Intercalibration (GEMSI), Dr. J.C. Duinker, opened the Session at 09.30 hrs., on 5 December 1988 and welcomed members and observers to the Ninth Session of the Group. He recalled the discussions at the Eighth Session of the Group regarding the broad interest of both co-sponsors and other programmes in the work of the Group (Doc. IOC-UNEP/GGE(MSI)-VIII/3).

2 The Technical Secretary, Dr. G. Kullenberg, welcomed the participants on behalf of IOC and explained that the meeting venue had been arranged by the courtesy of Professor A. Morel, Director of the Laboratoire d'Océanographie Physique, Station Marine de Villefranche, and expressed his appreciation both to the experts and to the host. Dr. M. Gerges welcomed the participants on behalf of UNEP, stressing the importance attached to the work of the Group by the Regional Seas Programme.

3 The Chairman invited all participants to briefly introduce themselves and their specific interests. The List of Participants is given in Annex III.

2. ADMINISTRATIVE MATTERS

2.1 ADOPTION OF THE AGENDA

4 The Group adopted the Agenda (Annex I).

2.2 DESIGNATION OF RAPPORTEURS

5 The Chairman adopted the approach used at earlier sessions that individuals be assigned to the reporting of specific Agenda Items, mainly based on the reporting responsibility of the ad hoc Groups' Chairmen to introduce the items and lead the discussions in the sessional ad hoc Groups.

2.3 CONDUCT OF THE SESSION

6 The documentation of the Session was introduced by the Technical Secretary, explaining that available working documents had been sent out in two despatches and that copies were available together with certain reference documents.

7 Members also brought additional reports for specific Agenda Items and these were copied and distributed during the Session.

8 The Chairman suggested that considerable time should be devoted to discussions in the ad hoc sessional Groups in order to make optimal use of the time so as to cover all items in depth. Plenary sessions would generally be held in the morning.

3. INTERSESSIONAL ACTIVITIES

9 The Technical Secretary referred to the documents IOC-UNEP/GGE(MSI)-IX/6 and IOC-UNEP/GGE(MSI)-IX/7 presenting an overview of intersessional activities within the GIPME Programme.

10 The Chairman subsequently invited the Chairmen of the ad hoc Groups to present their reports. He noted that considerable intersessional work had been carried out and all the recommendations of the Eighth Session had been completed.

3.1 ANALYSIS OF INDIVIDUAL ORGANIC CONTAMINANTS

11 Dr. K. Burns, Chairman of the ad hoc Group introduced the report. An intersessional meeting was held at the Bermuda Biological Station, 5-8 January 1988. Discussions at this meeting and during the GEMSI-IX Sessions followed the items summarized below. Details were reported in document IOC-UNEP/GGE(MSI)-IX/8.

3.1.1 Standards for Chlorinated Hydrocarbon Analysis

12 As intersessional work, the ad hoc Group tested the mixture of chlorinated biphenyl standards prepared for GEMSI by the Laboratory of Professor J. Duinker. The results from the laboratories of Drs. Burns and Farrington reported in Appendix 2 to the report confirmed the utility of the mixture as a quantitative standard but also noted specific problems related to the calibration of electron capture detectors.

13 The Intersessional work with the IOC/Kiel chlorinated biphenyl mixture has made clear that electron capture detectors mounted in different gas chromatograph instruments produce different relative response factors. Furthermore, at concentrations of 5 to 200 pg the response curve may be non-linear depending on the detector and/or the GC system. The response factor curve changes over time depending on the previous history of the use of the instrument and detector. Therefore, calibrations must be done routinely using standard mixtures of pure individual compounds for each compound to be quantified rather than relying on predetermined response factors normalized to any other compound. Each analyst must determine the linearity of the ECD system over the concentration range and instrument sensitivities used for sample analysis. If found to be non-linear then a multilinear calibration curve to each compound to be quantified must be determined. The problems will be further investigated in intersessional work in 1989. **The Group adopted Recommendation GEMSI-IX.1.**

3.1.2 Standards for Petroleum Hydrocarbon Analysis

14 The Group endorsed the proposal in document IOC-UNEP/GGE(MSI)-IX/8 Appendix 3 which requests funds to be made available for the preparation, testing and distribution of Quantitative Standard Solutions for analysis of petroleum hydrocarbons by gas chromatography and (GC) Mass spectroscopy. Details of the suggested compositions of the solutions and packaging procedures are provided in this document together with the amendments. In

view of the experience gained in the preparation and testing of the PCB standards, it is suggested that each compound be examined by two dimensional GC methods. **The Group adopted Recommendation GEMSI-IX/2.**

3.1.3. **Advances in Preparative Chemistry Procedures**

15 Drs. Burns and Duinker worked independently to test various high performance liquid chromatography (HPLC) columns, as to their usefulness in providing adequate separation of pesticides from the PCB fraction and separated from aromatic hydrocarbons in sample extracts. Details of the procedures using normal phase silica columns were reported in Appendix 4 of document IOC-UNEP/GGE(MSI)-IX/8. Based on intersessional testing of various HPLC protocols for use in the analysis of chlorinated and petroleum hydrocarbons, the Group suggests the inclusion of a description of an HPLC treatment in preparative chemistry manuals and the use of these techniques in the analysis of organic contaminants in marine samples.

3.1.4 **Reaction Product Chemistry**

16 On the basis of extensive data from various ocean regions it is confirmed that photochemical reaction products of petroleum compounds are present in concentrations in ocean water, equal to or greater than the concentrations of parent compounds, sometimes by an order of magnitude or more. The toxic effects of these compounds on marine organisms have not been extensively investigated. The few data on biological effects that are available provide cause for concern as to the severity of adverse effects of these compounds on marine biota using selected and chemically well defined reaction products. GEMSI is ready to assist and participate in these experiments. **The Group adopted Recommendation GEMSI-IX/3.**

3.1.5 **Strategy for Measuring Organics in Open-Ocean Baseline Study**

17 The Group confirmed recent advances in the ability to measure trace organics in seawater and endorsed the plan set out in document IOC-UNEP/GGE(MSI)-IX/9 for inclusion of measurements of selected chlorinated hydrocarbons in the exercise (see also Agenda Item 3.2).

3.1.6 **Interaction with GEEP**

18 GEMSI, through the ad hoc Group, with the support of IOC, collaborated with GEEP and provided the support-chemistry for the IOC/GEEP Second International Workshop on the Effects of Marine Pollution, Bermuda Biological Station for Research, 10 September - 2 October 1988. Preliminary reports from GEEP and GEMSI were presented (see Agenda Item 9.1). Further collaboration with GEEP was anticipated to evaluate the environmental risk of contaminants amenable to both biological and chemical monitoring methods. Recognizing the continual advancement in biotechnology-related methods for the detection of certain contaminants that overlap with chemical measurements, for example the development of monoclonal antibodies to detect fecal bacteria and viruses compared with the determination of fecal sterols to assess sewage contamination, the Group suggested that the Chairman of GEMSI explored via the Chairman of GEEP, the interest of GEEP in

a joint workshop to evaluate the state of knowledge of the utility of these techniques with respect to marine pollution studies.

3.1.7 **Use of Marine Mammals in Global Monitoring Programmes**

19 The Group conducted extensive discussion on the use of marine mammals in global monitoring programmes. It was suggested that as, a first approach to developing a global mammal study, one laboratory be supported to address the questions of residue stability and to formulate a sampling plan. This laboratory should be able to analyze a whole range of CHC contamination on an individual component basis. The use of one laboratory would minimize the problems of analytical variability between laboratories. Ongoing regional programmes should be contacted to establish collaboration with this laboratory which could also serve to examine extracts screened by the regional laboratories. The programme should remain exploratory in nature until these collaborations were working smoothly and a free exchange of samples and data had been established.

20 Furthermore, based on the review of the literature (reported to GEMSI-VIII (Document IOC-UNEP/GGE(MSI)-VIII/3)) on the levels of chlorinated hydrocarbon contaminants in the tissues of marine mammals, the Group recommended that GESAMP consider developing a standard reference material for the analysis of chlorinated hydrocarbons in seal blubber as a first priority and seal brain tissue as a second one.

3.1.8 **Review of UNEP Reference Methods**

21 The ad hoc Group intersessionally reviewed UNEP Reference Methods No. 17 (analysis of chlorinated hydrocarbons in sediments) and No. 20 (analysis of petroleum hydrocarbons in sediments). Neither manual passed GEMSI review and thus neither could be recommended for use in the monitoring programmes. Under contract by IOC, Dr. Burns, with input from Drs. Ehrhardt, Farrington and Palmork, produced a new draft of the PHC method. The Co-ordination Committee for the International Musselwatch (Drs. Dawson, Duinker and Burns), produced a draft manual for CHCs in bivalve tissues. The Sub-group recommended the completion and use of these revised reference methods as Nos. 17 and 20 respectively.

3.1.9 **Other Organic Contaminants**

22 Toxaphene: The Group considered the controversy of the occurrence of toxaphene in the global environment. The complexity of source materials, lack of adequate quantitative standards, relatively low response factors on ECD were problems which had to be solved before quantitative analysis was possible. As a first step towards assessing this situation, the Group suggested that appropriate experts be invited to prepare a summary for the next session and Dr. Ehrhardt was designated to co-ordinate this information.

23 Organo-chlorines and Reaction Products: Noting that a vast array of chlorinated organics are formed during the chlorination of natural, industrial process and sewage waters, and noting that many low boiling ECD active compounds are incorporated into the tissue of marine organisms, the

Group recognized that chlorinated reaction products may be considered as environmentally harmful. To date few compounds had been identified and no widely accepted analytical methods existed. Dr. J. Readman (MESL/ILMR Monaco) provided a draft of a report for an Organo-Halogen Workshop (IAEA-UNEP-IOC-FAO) for MEDPOL that reviewed and reaffired the extreme complexity of all organohalogens of possible environmental concern. The Group suggested that GEEP gave some consideration to assessing the toxicity of model compounds that were representative of the compounds as groups.

24 Organotonins: Dr. Readman produced an overview on the analysis of organotonins (Document IOC-UNEP/GGE(MSI)-IX/8 Appendix 8).

25 Herbicides and Fungicides: Dr. L. Mee pointed out the increasing use of herbicides and fungicides as agrochemicals world-wide. He agreed to provide an overview for discussion at the next session.

3.1.10 **Other Matters**

26 Steam Distillation: Responding to a request from the Organics ad hoc Group, Dr. P. Donkin wrote a review paper entitled "The Application of Steam Distillation to the Analysis of Organic Contaminants in the Environment (Document IOC-UNEP/GGE(MSI)-IX/8 Appendix 7). The Group recognized the value of the method for analysis of volatile organic contaminants and recommended the inclusion of a steam distillation procedure as an alternative extraction procedure in Methods Manuals for the Analysis of Volatile PHCs and CHCs in marine organisms.

27 Sea surface Microlayer: The ad hoc Group discussed the importance of the sea surface microlayer, especially for PHCs on the transfer of organic material between the ocean and atmosphere and in the accumulation of elevated concentrations of hydrophobic compounds of environmental concern. The Group agreed to undertake intersessional work on this subject and present to the next Session of GEMSI information on the sampling, analysis and data interpretation of the sea surface microlayer as it pertained to organic contaminants.

3.2 OPEN OCEAN BASELINE STUDY

28 The Chairman introduced the item referring to Document IOC-UNEP/GGE(MSI)-IX/9 and explained that presently the planning of one leg of the open ocean baseline study covering four stations in the Eastern South Atlantic was proceeding on the basis of a Meteor cruise in early 1990. He also referred to Document IOC-UNEP/GGE(MSI)-IX/8, stating that the evaluation of the present state of development of analysis of selected organics was considered adequate for inclusion in the open ocean baseline study.

29 Comments expressed the view that IOC/GEMSI should now press on for the implementation of the open ocean baseline study in a step-wise manner and that the opportunity must be used to initiate the exercise.

3.3 MONITORING OF CONTAMINANTS IN MARINE SEDIMENTS

30 Dr. H. Windom reported on the intersessional activity of the ad hoc Group on Monitoring of Contaminants in Marine Sediments. This included a visit to China during March 1988 by Drs. Windom, Dawson and Duinker in preparation for the proposed Workshop on the Use of Sediments in Marine Pollution Research and Monitoring. Three potential sites for conducting the Workshop were visited: The Second and Third Institutes of Oceanography in Hangchow and Xiamen respectively, and the Institute for Marine Environmental Protection in Dalian. At each site equipment and laboratory facilities were considered as was the respective staff. All were found to be adequate for the purposes of the workshop. However, after due consideration, it was concluded by the Group that the Institute of Marine Environmental Protection at Dalian was the best choice as the site of the Workshop because of its proximity to Dalian Bay. The sediments of Dalian Bay are enriched with both inorganic and organic contaminants and well established gradients exist. There was little evidence that the sediments in the vicinity of the other institutes were significantly contaminated.

31 Based on the conclusion that Dalian be the site for the IOC Workshop on the Use of Sediment in Marine Pollution Research and Monitoring the Group proposed the following:

(i) The Workshop be conducted between May and October 1989.

(ii) Approximately 30 participants be invited to attend; 15 each for trace metals and organic contaminants.

(iii) A co-ordinating Group should include 4-5 GEMSI members/ experts and 2-3 staff members from the host institute.

(iv) The Workshop should include intercalibration and methodological aspects but could also include exercises involving data interpretation.

32 It was pointed out that the report of the visit to China was discussed at IOC Headquarters in April by Drs. Windom, Bewers, Kullenberg and Gray (representing GEEP), and on the basis of those discussions preparatory work had commenced.

33 During the ensuing discussion of this Agenda Item, it was suggested that it would be advantageous to hold the chemical and biological exercise simultaneously. It was finally concluded, however, that the inclusion of a GEEP exercise might complicate the achievement of the objectives of the GEMSI exercise.

34 The Chairman of GEMSI suggested that the ad hoc Group sessionally prepare a prospectus for the Workshop which would include objectives and basic design. He also requested the ad hoc Group to report back its recommendations in order to proceed with this project.

3.4 MONITORING OF CONTAMINANTS IN MARINE ORGANISMS

35 The Chairman referred to the progress report on the implementation of the IOC-UNEP Sentinel Organism Monitoring (Musselwatch) project and invited Dr. Dawson to present the subject to the Group (Document IOC-UNEP/GGE(MSI)-IX/11). Dr. Dawson reported that the International Musselwatch Committee had met in June 1988 in Solomons, Maryland to review the overall strategy for the monitoring of bivalves for organochlorine pesticides on a global scale. A number of GEMSI members were present. Two manuals were prepared, combining the relevant elements of applicable reference methods, to describe the definitive methods for specimen collection and ancillary parameter recording, together with a detailed analytical protocol.

36 It was noted that selected chlorobiphenyls had now been included in the list of compounds to be monitored and that the procedure now recommended an HPLC clean-up.

37 The Manual on the biological sampling strategy was in a more preliminary stage of development. GEMSI was invited to assist in the review of these manuals.

38 Some effort had been expended by the international Musselwatch Committee to identify sampling sites around the globe. The criteria for choosing locations were designed to avoid obvious discharge points and had mainly been placed at the outer reaches of major estuaries with a contrasting "pristine" area away from river discharges.

39 A total of 325 stations had been suggested. In addition the US would monitor the entire coastline in the course of the National Status and Trends programme of NOAA. Japan as well as the ICES community would be invited to provide similar data.

40 The major concern for the project which was widely seen as a very worthwhile undertaking, was the question of funding of the project, at the two million dollar level. Efforts are underway to solicit funds from foundations and organizations. A brochure describing the objectives of the International Musselwatch had been prepared. Fundamental to shipping bivalve tissue samples from locations around the world to 3 or 4 central analytical facilities, was the development of a method of preservation which would be acceptable for postal and customs considerations. Dr. Farrington provided a report on the testing of a method proposed by the International Musselwatch Committee.

41 Preservation techniques, involving various ratios of Na_2SO_4 methylene chloride and wet tissue, were being tested to determine the best techniques to be utilized for presentation and shipping of samples from remote coastal areas of the world without compromising the integrity of the sample for analysis of total lipids, selected chlorinated pesticides and selected chlorobiphenyls. The testing of techniques was scheduled to be completed at the end of January 1989.

42 Both Drs. Dawson and Farrington stressed that, while they were satisfied with progress being made in the technical aspects of the exercise, they felt that major guidance was required from IOC and UNEP with regard to the selection of the major analytical laboratories (termed Regional Laboratories) which would have to complete some intercalibration work in the near future. It was recognized that this could very well be dependent on the source of funds.

43 If the fund-raising effort became protracted an attempt should perhaps be made to develop regional programmes in regions where networks of laboratories had similar co-operative programmes (e.g. the CPPS region).

44 Based on the criteria prepared by the International Musselwatch Committee (IMW) and the discussions in GEMSI, it was recommended by the Group that the following laboratories be contacted to ascertain their willingness to participate in an initial inter-comparison exercise (Document IOC-UNEP/GGE(MSI)-IX/11).

- MESL/ILMR, Monaco (Dr. L. Mee)
- IMER, Plymouth, UK (Dr. J. Readman)
- Barcelona, Spain (Dr. J. Albaiges)
- Japan (Dr. Tanabe)
- Perth, Australia (Dr. Kagi)
- Indonesia (Dr. Reutergarrd)
- Batelle, USA (Dr. Boehm)
- Bermuda (Drs. K. Burns and A. Knap)
- Nantes, France (Dr. C. Alzieu)

The IMW had recommended that Drs. Farrington and Duinker be responsible for conducting the intercomparison exercises and for carrying out any necessary scientific confirmations.

3. 5 BIOLOGICAL EFFECTS

45 The Technical Secretary reported briefly on the Second IOC Workshop on Biological Effects Measurements (Bermuda, 10 September - 2 October 1988) explaining that a preliminary report was available on some of the activities (benthic studies, bioassays) at the Workshop (Document IOC-UNEP/GGE(MSI)-IX/12), giving the general impression of a successful exercise. Dr. K. Burns reported on the chemical work carried out during the Workshop through the participation of GEMSI members and with the facilities and personnel at the Bermuda Biological Station (Document IOC-UNEP/GGE(MSI)-IX/8) and the chemical part of the exercise had been very successful.

46 The Group commented on the reports, specifically emphasizing the need for an extended period of preparation for activities of this type and a closer interaction between GEEP and GEMSI from the start of the planning. Joint planning was suggested.

47 The Group also concluded that evaluations of the two Workshops as to results and outputs would be valuable, and that the Group would be willing to help review, if appropriate, Draft Manuals expected to be

produced by GEEP in the near future as one type of output.

4. REVIEW OF METHODOLOGICAL DEVELOPMENTS AND PREPARED REFERENCE METHODS

4.1 STATE OF DEVELOPMENT OF REFERENCE METHODS

48 A review was presented of the development of Reference Methods for Marine Pollution Studies since GEMSI-VIII. A total of 21 documents (including new methods, revisions and translation) had been published during this period. One significant step had been the joint IAEA-IOC-UNEP initiation of a new project entitled "Development of New Methodologies and Provision of Comprehensive Technical Support for Regional and Global Marine Pollution Assessment". The joint project which commenced in July 1988, is implemented by IAEA and IOC as co-operating agencies and is co-ordinated from the Marine Environmental Studies Laboratory (MESL) of ILMR, IAEA. It includes as its principal elements: the development and testing of Reference Methods and Materials; the provision of the best available expert advice (from IOC-UNEP Group of Experts, including GEMSI); quality assurance (including intercalibration exercises); and training. The Reference Methods component of the project responds to Regional Seas and GIPME requirements. New chemical methods were designed on the basis of recommendations made by GEMSI-VIII (Document IOC-UNEP/GGE(MSI)-VIII/3). Full details of the new project together with a catalogue of 83 methods were given in the draft RM Zero entitled "Reference Methods and Materials: A programme of comprehensive support for regional and global marine pollution assessments" (Document IOC-UNEP/GGE(MSI)-IX/15). Particular emphasis was placed in this document on the wider aspects of this programme in which GEMSI is involved, particularly in the presentation and implementation of guidelines for the quality assurance of marine pollution monitoring data.

49 The Group welcomed this new development and noted that the recommendations of GEMSI-VIII had been closely followed when designing the project.

50 The implementation of the Reference Methods review mechanism developed during GEMSI-VIII was discussed and it was agreed that this had proved adequate and should continue. During the period since GEMSI-VIII, seven methods for inorganic parameters and three for organic parameters had been reviewed. Some of the methods had been found unacceptable in their first drafts and in one case (RM20) (Document IOC-UNEP/GGE(MSI)-IX/8 Appendix 4), the GEMSI ad hoc Group on Individual Organic Contaminants had formulated an entirely new draft.

4.2 THE ANALYSIS OF INDIVIDUAL ORGANIC CONTAMINANTS

51 The ad hoc group on individual organic contaminants discussed the desirability and feasibility of designing and implementing studies on trace organic contaminants in the tissues of marine mammals in the context of global monitoring efforts. The ad hoc group concluded that marine mammals would be a useful addition to the study of CHCs but that several sampling,

storage and analytical methodology problems should be addressed before a global study could be launched. These included an assessment of the stability of CHC residues in rotting tissue and further studies on the compositional distribution of residues between tissues, as well as differences between the mammals and their food. Attention was drawn to many regional programmes that sample dead, and in some cases, living animals and the care that must be exercised in implementing such studies so as to be consistent with the FAO/UNEP Marine Mammals Action Plan.

4.3 REACTION PRODUCTS AND NEWLY RECOGNIZED ORGANIC CONTAMINANTS

52 Based on the data that had become available intersessionally, especially in conjunction with the IOC(GEEP) Workshop on Biological Effects Techniques held at the Bermuda Biological Station for Research 10 September - 2 October 1988, the ad hoc group on individual organic contamination discussed the relevance of measuring oxygenated environmental transformation products of petroleum hydrocarbons. Although their formation by sensitized photo oxidation of petroleum components had been determined experimentally and concentrations were elevated in oil contaminated waters, it could not be ruled out at the present time that other organic constituents in seawater (for example marine humics) may be additional source materials. This possibility would be tested intersessionally. On the basis of the discussion **Recommendation GEMSI-IX.3 was adopted.**

53 Dr. Ehrhardt reported on finding products of fossil hydrocarbon in the Chao Phraya River as well as other industrial chemicals. Concentration of the latter exceeded those of fossil hydrocarbons by orders of magnitude (IOC-UNEP/GGE(MSI)-IX/14).

54 The Group discussed progress and problems in identifying and quantifying the biologically mediated reaction production of hydrocarbons in marine organisms and sediments. The Group reconfirmed that the analysis of reaction products cannot yet be recommended for inclusion in routine monitoring programmes. The Group suggested the support of continued research efforts to investigate photochemical and biochemical degradation, to measure kinetics and the stability of the products of these reactions so that relevant compounds could be selected for inclusion in future monitoring efforts.

55 With respect to chlorinated hydrocarbon reaction products, the Group reiterated the necessity of reporting both the presence and the absence of individual PCB isomers as this information would aid in assessing the relative reactivities of the congeners and toxicological significance of the mixtures.

4.4 METHODOLOGICAL ASPECTS OF THE OPEN OCEAN BASELINE STUDY

56 The report of the logistic planning group on the open-ocean baseline study (Document IOC-UNEP/GGE(MSI)-IX/9) was introduced by the Chairman. The results of the sessional deliberations are given in Annex IV.

5. FUTURE DEVELOPMENT OF MANUALS AND REFERENCE METHODS

5.1 GENERAL

57 The Group undertook a systematic review of the new methods prepared for the Reference Methods series and of those requiring revision. As in the Eighth Session of GEMSI, (Document IOC-UNEP/GGE(MSI)-VIII/3 and IOC-UNEP/GGE(MSI)-IX/13) it was concluded that a 3-5 year review cycle should be adequate for the update of existing methods. The Group, however, expressed concern that the magnitude of the editorial work involved was considerable and would require a large sustained effort on the part of responsible Secretariats. The Group suggested that, should resources permit, the level of financial support to the project be considerably augmented.

58 During the review of the methods proposed in the Draft Reference Methods Catalogue (Document IOC-UNEP/GGE(MSI)-IX/13), particular emphasis was placed on chemical methods within GEMSI's mandate and a series of specific comments were made on individual methods in which GEMSI is to be involved. These are summarized in Annex V. Some of the methods considered can be formulated by consolidating previous documents or documents supplied by co-operating agencies in order to minimize consultant costs and concentrate the limited funding on the development of new methodologies for priority contaminants which are not currently being determined in a satisfactory manner.

5.2 TRACE ELEMENT SPECIES

59 The Chairman introduced a discussion on the importance of trace element speciation and asked the Group to consider whether it was appropriate to propose an intersessional activity to assess the need for reference methods for the determination of trace element species. In the subsequent discussion it was pointed out that:

(i) in the context of the proposed open-ocean baseline study for those elements that exist predominantly in more than one species, the proposed analysts were competent to make the measurements;

(ii) separation of particulate from soluble trace element concentrations is an important first step in determination of species in the water and sediment columns;

(iii) studies of speciation of trace elements in sediments may provide the most useful information for many environmental problems.

60 The Group then discussed whether there might be other issues in different regions which were important and relevant to trace element species analyses. In order to address this matter, the Group agreed to establish an intersessional ad hoc group to use the regional reports of the State of the

Marine Environment under preparation for several regions in a co-operative project of UNEP, IOC and FAO to identify possible priority activities for GEMSI. Dr. Farrington agreed to co-ordinate the intersessional work.

5.3 CONSIDERATION OF IMPLEMENTATION STRATEGY

61 Following discussions during GEMSI-VIII, the Group had invited Dr. Bewers to formulate a scientific basis for the implementation of selected regional programmes so as to provide a sound scientific approach on which to base the work of GEMSI in this connection. The study had been broadened by the formulation of the terms of reference jointly by the IOC and UNEP Secretariats.

62 Dr. Bewers verbally presented a summary of his progress. He explained that his initial perceptions were that there existed a scientific basis for rationalizing the Regional Seas Programmes with the GIPME programme. The elements should include:

(i) a way of inter-relating conditions in regional areas, ideally within a global context, particularly that of the GIPME programme;

(ii) a way of increasing application of the concepts and approaches adopted within the GIPME programme at the regional levels;

(iii) a way of increasingly bringing the types and quality of the data in regional and global programmes on a common footing.

These, in turn, would logically result in a need to deal with flux measurements in regional programmes both as regards inputs and offshore (cross shelf/slope) transports. A framework within which to achieve this had already been provided by both the transect proposal in the GIPME Open-ocean Baseline Study Programme and in the formulations for the Joint Global Ocean Flux Study (JGOFS) as regards the horizontal boundary exchange.

63 Dr. Bewers stated that he intended to complete his report to the Director of UNEP OCA/PAC and the Secretary IOC by the end of December 1988. The report would contain primarily a basis for the scientific rationalization of the respective UNEP and IOC marine pollution programmes. It would also deal, to a more limited extent, with any relevant procedural and administrative adjustments and arrangements that might be desirable but the nature of these was not pertinent to the present discussions.

64 The Technical Secretary pointed out that Dr. Bewers' report had been commissioned by the UNEP and IOC Secretariats and it would first be submitted to them. Thereafter, the report might be considered by the Scientific Committee for GIPME with the purpose of reviewing its own future programme and that of GEMSI, GEEP and GESREM.

65 Finally, Dr. Bewers noted that once the report had been accepted, with or without revision, by the two agencies, it would be useful for GEMSI to develop a long-term strategy for its activities in the context of serving both co-sponsors.

66 During the discussion that followed it was generally accepted that the preparation of this type of strategic plan was very desirable and could best be achieved through intersessional work.

6. REVIEW OF TRAINING AND INTERCALIBRATION ACTIVITIES

6.1 INTERSESSIONAL AND ON-GOING ACTIVITIES

67 The Technical Secretary introduced the Item referring to Documents IOC-UNEP/GGE(MSI)-IX/6, 7, 10 and 14 and mentioned specificially the on-going activities in the WESTPAC, Caribbean, Southeast Pacific and IOCINDIO regions. Reference was also made to the marine pollution courses at the Bermuda Biological Station. GEMSI had given input in the form of advice and expert participation to all these activities and was continuing to do so.

68 In the subsequent discussion, the recently initiated ICES-IOC Intercomparison Exercise on Analyses of Individual Chlorobiphenyls was described as a step-by-step activity involving several elements of training over several years. Considerable discussion followed concerning the dificulties in preparing the standards, in identifying individual organics and other overall quality control and assurance problem.

69 Dr. L. Mee presented the quality assurance programme initiated in the Mediterranean as part of the Mediterranean Action Plan - MEDPOL Programme in 1988. Dr. Mee also reported on on-going work concerning substances, other than those identified in existing conventions, that had recently given rise to concern in several areas, in particular certain organic compounds and chemicals used for agricultural purposes.

70 The Group agreed that it ought to become more involved in evaluating and assessing potential concerns or problems, and possibly also in preparing assessments based on a scientific evaluation of data on levels and properties of substances (e.g. speciation, reaction processes influencing transformation and availability in the marine environment). It was agreed that Dr. J. Farrington would take the lead in an intersessional activity in this area (see also Agenda Items 5.3 and 11). One part of such an exercise could be the preparation of brief overview statements on selected substances, and Dr. L. Mee was invited to consider the preparation of an overview on selected organochemicals to the next GEMSI Session.

71 The following intersessional activities were carried out at the Marine Environmental Studies Laboratory of IAEA/IAEA in Monaco, in part in co-operation with IOC:

(i) In association with the MEDPOL Programme, workshops on the 'new' contaminant groups were conducted:

a) Two methodological and intercalibration exercises were organized for organotin determination in the Mediterranean region. An intercalibration exercise was conducted between five laboratories by splitting a homogenized sample from Monaco (on the first occasion) and Erdemli, Turkey (on the second). Results are presently being evaluated and a Reference Method is currently being tested.

b) A workshop on the determination of organophosphorus pesticides was held and a methodological strategy was agreed. Both bioassays (wide spectrum) and GC techniques (specific compounds) were considered.

c) A workshop was held on the organohalogen compounds not usually considered in monitoring programmes. A preliminary draft of the report of this meeting was distributed to the Group.

(ii) Quality assurance support programmes were developed at MESL since GEMSI-VIII. In the MEDPOL and KAP areas, the programme consists of providing training and expert advice to monitoring laboratories performing poorly (or not yet contributing) in intercalibration exercises. Following an initial group training period in Monaco, a staff member of MESL and the UNEP service engineer travel to each of the trainee's laboratories, and participate in a monitoring exercise, prepare and contribute internal reference material and set up a quality control chart. Close contact is maintained in each case in order to assess the success of the exercise. During 1988, the programme addressed the monitoring of organic contaminants in Egypt, Morocco and Algeria. The project is currently being extended to the Gulf States and (on a limited scale) to the WACAF Region.

(iii) New world-wide intercalibration exercises were initiated on pelagic sediments (trace metals and chlorinated hydrocarbon) and Mediterranean tuna fish homogenta (trace metals and chlorinated hydrocarbons). Over 300 samples had already been distributed for these parameters (plus petroleum hydrocarbons) in the KAP Region. Samples were also prepared for regional workshops including quality assurance.

6.2 PLANNED FUTURE ACTIVITIES

72 The Technical Secretary introduced the Item referring to Agenda Items 4, 5, 8 and 9 and referred to documents presently under consideration by the Group, as well as to Documents IOC-UNEP/GGE(MSI)-IX/7, 8, 10 and 15. Specifically, the planned IOC-UNEP Regional Workshop to Review Priorities for Marine Pollution Monitoring, Research, Control and Abatement in the Wider Caribbean Region (San José, Costa Rica, May 1989), was mentioned, for which the participation of one or two selected members of GEMSI would be desirable, in order to provide direct advice on the formulation of a joint programme covering all four aspects of the Workshop. This should be the main output of the Workshop.

73 He also mentioned plans for a regional training workshop for the IOCINDIO and possibly IOCINCWIO Regions in order to initiate regional marine pollution components in these regions. Advice would be required from GEMSI in due course.

74 The Observer from CPPS, Dr. J. Cortez, presented workshop activities planned for the CPPS region during 1989, dealing with petroleum hydrocarbons in sediments and biological tissue, trace metals in sediments and organisms (especially Hg, Cd, Cu), and organochlorine pesticides in sediments and organisms. For all these technical assistance was requested from IOC/GEMSI. Special emphasis would be given to quality assurance aspects.

75 The Group agreed to endeavour to provide the requested advice, help identify relevant Spanish speaking experts and that the quality assurance document presently being finalized should be translated into Spanish.

76 Dr. Windom informed the Group on the status of the planning for the Workshop on the use of sediments in marine pollution research and monitoring. It was proposed that the number of participants be limited to 30, of which approximately half would represent institutes and monitoring programmes in the PRC. It is expected that half the participants would have training in trace metal analysis and half in the trace organic contaminant analysis.

77 The workshop would serve the wider WESTPAC, COBSEA, SPREP regions where practical, and a suggested list of qualified individuals/institutions had been provided to the Technical Secretary for guidance. The criteria for selection of participants in the Workshop was considered by GEMSI based primarily on previous participation in intercalibration exercises, and commitment to environmental monitoring programmes.

78 The Individual Organic Contaminant Sub-group discussed a possible strategy for the upcoming Workshop. It was suggested that the minimum requirements should be verification of the Strategy Manual for Sediment Monitoring as well as verification of the Manual and Guides No. 11 (UNEP Reference Method No. 20). The sampling strategy should investigate a

possible pollution gradient using UVF 'hot spot' detection techniques with verification of the 'hot spots' HPLC separation and capillary gas chromatography for individual PAH. There should also be a training component, a component for distribution of standards and a "take home" intercalibration exercise. The Group adopted Recommendation GEMSI-IX.4.

79 Dr. L. Mee informed the Group about planned new activities in Central America, in particular concerning agro-chemicals.

6.3 REVIEW OF EFFECTIVENESS AND EXPERIENCE IN RELATION TO THE EXERCISES

80 Dr. Knap presented progress made in his review of the effectiveness of training and intercalibration exercises. He had distributed questionnaires to the GEMSI participants in the exercises and most of these had been completed and returned. Discussions with GEMSI members at this session allowed for comments on the approach taken for the conduct of this review. Some of the exercises were designed to answer specific questions such as PANCAL 89 (investigation of sampling procedures for trace metals). All had had some sort of training component and had included a discussion on how to evaluate success of training exercises. Some exercises took place in developed countries others in developing countries. The main key to success appeared to be long-term planning of the exercise and many of the exercises were designed to test methods or method manuals.

81 The group provided input to the type of study that should result from this exercise and it was decided that a good product would be a model for future exercises. Dr. Knap agreed to finish the first draft by March 1989 and distribute it to Drs. Bewers, Duinker, Farrington, Topping and Windom for comment. He would then integrate the comments and prepare a final draft report for consideration by GEMSI-X.

82 Dr. Topping informed the Group that a report on the Second IOC-UNEP/WESTPAC/SPREP/COBSEA Intercomparison Exercise of Trace Metals in Marine Organisms had been prepared intersessionally. He reminded GEMSI that this exercise, which began in 1986, was the logical and planned step following the first Australian Workshop on trace metals in marine organisms in Victoria in 1983. At this Workshop, training had been given in those apsects of analytical procedures which had been identified as problem areas from the results of the first intercomparison exercise in 1982.

83 The results from the second exercise were most encouraging. A significant improvement in the analysis of mercury and cadmium had been obtained by a number of participants who had taken part in the first exercise. In general, the analysis of copper and zinc continued to be good for most analyses. Although some analysts (Ca. 10%) are able to produce accurate data for lead at concentrations in the range 0.1-1.0 ppm most laboratories still experience problems in the analysis of this element.

84 Dr. Topping informed the Group the the final version of the report would contain an assessment of any improvement in performance of the 17 laboratories which had participated in both exercises. The report would be published by IAEA, jointly with IOC, in its intercalibration series as well as in the open literature. A draft of the report tabled at the meeting would be distributed by IAEA to participants in the exercise, for their comments, which would then be taken into account, as appropriate, in the final version.

85 A review was presented of the progress of the past 15 years of large-scale intercalibration activities by IAEA (in association with other agencies) and ICES. The review included data on trace metals, radionuclides, chlorinated hydrocarbons and petroleum hydrocarbons. The principal conclusions of the review are:

(i) Provided that adequate Quality Control measures are taken, present data quality allows us to screen for 'hot spots' and related major spatial trends.

(ii) Data is in many cases not good enough to measure and compare background levels on a global scale.

(iii) Quality assurance measures can be applied simply and effectively for most parameters.

(iv) Quality assurance for organic contaminants needs much more attention.

(v) Some important parameters have not been adequately evaluated by intercalibration exercises. These include TBT, nutrients, and total CO_2. Preliminary results of some limited exercises for these parameters are poor.

7. MASS BALANCE AND FLUX STUDIES

86 Dr. Knap presented an overview on GESAMP Working Group No. 22 on Land to Sea Transfer of Pollutants which demonstrates recent advances in understanding atmospheric fluxes of contaminants to the ocean. He informed about meetings organized through GESAMP in which GEMSI was well represented. It was suggested that atmospheric fluxes to the open ocean as well as to the coastal zone are very important. It was felt that as GEMSI members were very well represented in other activities, it would be sensible for those members to maintain a working brief on the subject of atmospheric contaminants as well as addressing methodological questions in the present GEMSI ad hoc groups.

87 Dr. Windom presented an overview on GESAMP's land to sea Working Group No. 22 which also had considerable GEMSI representation. It was recognized that far more information needs to be gathered on the relative contribution of atmospheric versus riverine transport of contaminants to the coastal zone and the ocean.

88 The Group discussed the fate of contaminants from ocean incineration and as this was felt to be an important item, a new ad hoc group was set up under the leadership of Dr. Farrington to prepare a report intersessionally for consideration by the next Session of GEMSI.

89 The Group discussed the two important inputs to a global mass balance namely atmospheric and river inputs. To date, GEMSI had addressed the latter subject by encouraging the development of expertise on a regional basis and in this respect had already initiated these activities through the conduct of a Workshop in Thailand. In due course, it would be appopriate to assess the extent of such measurements in the WESTPAC region by participants in the workshop.

90 The Group saw the need to contact other regions to establish whether measurements of river inputs were appropriate to their region. In this respect the Chairman of the ad hoc group dealing with River Inputs agreed to prepare a document on the experiences of the Bangkok participants and distribute it to other regions where river inputs may be important.

91 The Group then discussed atmospheric input from the viewpoint of the following:

(i) Was there agreement among the experts on the methods to be used for the sampling and analysis in relation to atmospheric depositon.

(ii) In which region was it timely to consider measurements taking into account available expertise on such activities.

92 The Group agreed that ideally such measurements should be carried out in all regions. However, in view of the existence in and commitment to such measurements in the Mediterranean region, it was agreed that encouragement should be given to assessing atmospheric input in this region. This Group underlined the alarming paucity of data concerning the riverine and atmospheric fluxes of organic contaminants and suggested that regional areas be encouraged to provide such data.

8. QUALITY ASSURANCE OF REPORTED DATA AND DATA MANAGEMENT

93 Dr. Topping reported on his intersessional activity, supported by IOC, of compiling guidelines on quality assurance in relation to marine pollution monitoring programmes involving organisms following the structure agreed on at the Eighth Session of GEMSI (Document IOC-UNEP/GGE(MSI)-VIII/3). The document consisted of four main sections and five appendices. Each of the main components of a quality assurance programme - sampling

strategy and collection of samples; pre-treatment and storage of samples, analytical quality control and assessment (including use of reference materials and control charts) and the documentation, assessment, reporting and storage of data are addressed in the body of the document.

95 The five appendices deal respectively with criteria for selecting organisms for monitoring; accuracy, precision and limit of detection of analytical measurements; a list of relevant reference materials; intercomparison exercises and quality control charts. Within the section dealing with storage and analysis, reference is made to the existing Reference Methods which deal in more detail with such aspects. The document is specifically aimed at laboratories in developing countries which are unfamiliar with quality assurance and which need a resumé of the main component within one document.

96 Dr. Topping informed the Group that time was available for minor revisions to the draft document and comments from GEMSI colleagues or anybody else on approach, content and style would be welcomed. Following discussion of the report, it was agreed to include a section on data assessment.

97 The GEMSI ad hoc Group on Quality Assurance considered the next phase of the programme, namely to encourage the application of quality assurance practices in regional laboratories, and identified two objectives. Firstly, to convince regional co-ordinators of monitoring programmes of the need for quality assurance in order to ensure that the quality of data met its intended purposes. Secondly, to provide analysts with a more detailed document to assist them with the application of quality assurance practices. The first objective could be met through a meeting of regional co-ordinators of UNEP and GIPME programmes and representatives of GEMSI. The suggested date and venue of this meeting were 1989 at ILMR, Monaco. The guidelines on quality assurance would form the basis of the discussion at the meeting.

98 The second objective could be met by arranging for experts to prepare a monograph that would provide more details on the content and application of quality assurance practice. It would include specially selected case studies to illustrate programmes of quality assurance by expert laboratories. It was agreed that the document should be reviewed by other experts and by nominated analysts in regions. The culmination of the review might consist of a meeting of a small group of these analysts and contributions to finalize the draft prior to its publication by IOC-UNEP-IAEA. The document should be distributed to regional analysts for testing and use. Both IOC and UNEP might subsequently send a GEMSI member to meetings, on an appropriate basis, of regional laboratories where they could monitor results of the use of this document by analysts and deal with any problems that had arisen in the implementation. The Group adopted Recommendation GEMSI-IX.5.

9. INTERACTION WITH OTHER GIPME GROUPS OF EXPERTS

9.1 INTERACTION WITH THE GROUP OF EXPERTS ON THE EFFECTS OF POLLUTANTS (GEEP)

99 Following the presentation of the preliminary reports on the Second IOC Workshop on Biological Effects Measurements (Bermuda, 10 September - 2 October 1988 (Documents IOC-UNEP/GGE(MSI)-IX/12 and IOC-UNEP/GGE(MSI)-IX/8 Annex 6) and an outline of future activities of GEEP by the Technical Secretary (Document IOC-IMO-UNEP/GGE(EP)IV/3), GEMSI briefly discussed the study of biological effects in the field and under controlled experimental conditions, particulary the input of GEMSI members to these multi-discipline studies. It was agreed that biological effects measurements should be carried out in areas where there was a well documented strong gradient of contaminants(s), and these field studies should be complemented by concommittant experimental studies in which concentrations and mixtures of contaminants were well controlled (i.e. along the lines taken at the First IOC-GEEP Workshop). Dr. Burns explained that financial and time constraints prevented extensive experimental studies at Bermuda, but that some selected experimental exposures were conducted.

100 GEMSI reaffirmed its interest and willingness to participate in GEEP workshops. However, it emphasized that such participation (i.e. to assist in the establishment of gradients, provide on-site analytical support and advise on the design and conduct of experimental and field studies) would require GEEP to give GEMSI adequate warning of such exercises. This would enable GEMSI to assess its involvements, to identify individuals who could contribute and to seek the necessary financial support for this work.

101 The Technical Secretary informed the Group about the work on the development of a scientific basis for identification of vulnerable (or particularly sensitive) sea areas, the interest of IMO in this work, and the proposition of GEEP to create an ad hoc joint group between GEEP and GEMSI on this matter. Contacts had been established with the Chairman and Dr. Bewers on this matter, and the GEEP members involved were in the process of developing a progress report for mutual consideration. A meeting of a joint ad hoc group could possibly be generated immediately prior to the next GEEP session. Dr. Bewers informed the Group of on-going work in Canada on testing the draft criteria developed by the Marine Environmental Protection Committee of IMO on which GEEP had been requested to provide further scientific advice.

9.2 INTERACTION WITH THE GROUP OF EXPERTS ON STANDARDS AND REFERENCE MATERIALS (GESREM)

102 The Chairman of GESREM, Dr. W.D. Jamieson, reported on inter-sessional activities in GESREM which followed from the First Session of GESREM (Document IOC-IAEA-UNEP/GGE(SRM)-I/3) held in Paris, February 1987 and also referred to the Report of the Fourth Session of the GIPME Officers Meeting, Paris, 2-4 March, 1988 (Document IOC-UNEP/GGE(MSI)-IX/7).

103 Activities, since 1988, had included responses from reference materials producers supplying the international community of some of the information needed to revise a catalogue of available reference materials, published in 1986 to be reprinted by IOC with updated information. These efforts would continue, with the planned revision to include information available up to the time of the next meeting of GESREM, which would probably occur in the first half of 1989.

104 In other recent intersessional activities, there had been extensive consultation with the SCOR Scientific Planning Committee for JGOFS, involving advice on the sources and types of reference materials relevant to planned extensive JGOFS activities to measure pigments and nutrients in seawater, and the total carbon and dissolved organic carbon (DOC) contents of seawater. National projects were in progress to produce reference materials for the first three measurements, but new doubts about the reliability and significance of DOC measurements had delayed plans to produce reference materials for DOC determinations

105 The Chairman of GESREM also reported on some other reference materials which had become available recently, and on projects in progress to produce others. These included two marine harbour sediment reference materials, one for organic and the other inorganic constituents, and alkyltin, two mussel tissue reference materials (one for organic marine contaminants, the other for the diatom-produced neurotoxin domoic acid), cod and dog fish liver oil reference materials for chlorinated biphenyls and pesticides, eight instrument calibration standards (six for PAH, chlorinated pesticides and 26 chlorinated biphenyl congeners, all at 2 concentration levels; one for domoic acid determinations; one a ^{13}C-labelled hexachlorobiphenyl internal standard for GC/MS use), a seawater reference material for elemental mercury determinations, the first high lipid homogenized biological tissue reference material for trace metal determination to be distributed as an unfrozen wet slurry, and an estuarine seawater reference material for trace metal determinations. He also reported some new certification of older reference materials, such as methylmercury content of a biological tissue reference material. Also being studied was the feasibility of producing the suite of six or more purified paralytic shellfish poison (PSP) neurotoxins needed to calibrate HPLC instrument systems used to measure PSP, and to allow development of such new PSP analytical methods as field tests, immunochemical methods and less costly HPLC methods.

106 The Chairman of GESREM also noted with concern that production of the IAPSO sea water standard (Copenhagen water) for salinity and chlorinity measurements might soon be done commercially rather than continue as the responsibility of a government agency. He believed there was uncertainty about the assurance of continuing supplies and stability of prices, though those responsible for this IAPSO standard seemed determined a stable commercial operation would be established.

107 In response to specific questions from the GESREM Chairman, GEMSI members advised GESREM:

(i) preparation of a calcareous marine sediment reference material preferably from a tropical or sub-tropical area was very important, particularly for the determination of trace metals;

(ii) preparation of a pelagic clay sediment reference material for trace metal determinations would be very useful, though less important than (i);

(iii) though the preparation of reference materials for the determination of dissolved/dispersed organic species in seawater is of high priority, there did not seem to be any way to prepare solutions/dispersions which would be acceptably stable for use as reference materials.

In further discussions it was concluded:

(i) new GEMSI recommendations to GESREM about needs for reference materials and standards would be as stated elsewhere in the report and will be explained further to the next GESREM meeting by participation there of at least one GEMSI representative;

(ii) needs for reference materials, standards and internal standards for use with Reference Methods would be determined by a review and made known to GESREM;

(iii) plans for NRCC (Canada) MACSP programme to produce a seawater reference material for determination of mercury; this would meet an important need, and such a specialized reference material would be used.

10. FUTURE INTERSESSIONAL ACTIVITIES

108 The Group reviewed the planned intersessional activities on the basis of deliberations within the ad hoc Groups. Details are presented in Annex VI. **The Group adopted Recommendation GEMSI-IX.6.**

11. OTHER MATTERS

109 The Chairman raised the question of a rotating membership of the Group and the Group endorsed that the membership should be reviewed between the joint Secretariats and the Chairman and Vice-Chairman so as to secure the most appropriate distribution and renewal.

110 No other matters were raised.

12. ELECTION OF OFFICERS

111 The Chairman referred the meeting to the Technical Secretary who invited nominations for Chairman for the coming intersessional period and the Tenth Session of GEMSI. Dr. A. Knap was nominated and was elected with acclaimation. The Chairman retained the Chair and invited nominations for Vice-Chairman. Dr. J.M. Bewers was nominated and elected with acclaimation.

13. ADOPTION OF THE SUMMARY REPORT

112 The Draft Summary Report and Recommendations were adopted by the Group giving editorial licence to the Chairman and the Secretariat in order to develop the final version.

14. CLOSURE

113 The Technical Secretary, on behalf of the co-sponsors, expressed appreciation to the members of the Group for their strong involvement and work during the Session as well as intersessionally. He also thanked the retiring Chairman, Dr. J. Duinker, for his stimulating leadership during both the sessional and intersessional periods in his term of office and noted that during Dr. Duinker's Chairmanship the Group had developed a very considerable amount of activities and had strengthened and broadened the basis for co-operation between IOC and UNEP.

114 The Chairman closed the Session at 12.00 hrs. on Friday 9 December 1988.

ANNEX I

AGENDA

1. OPENING OF THE SESSION

2. ADMINISTRATIVE MATTERS

   2.1 ADOPTION OF THE AGENDA
   2.2 DESIGNATION OF RAPPORTEURS
   2.3 CONDUCT OF THE SESSION

3. INTERSESSIONAL ACTIVITIES

   3.1 ANALYSIS OF INDIVIDUAL ORGANIC CONTAMINANTS
      3.1.1 Standards for Chlorinated Hydrocarbon Analysis
      3.1.2 Standards for Petroleum Hydrocarbon Analysis
      3.1.3 Advances in Preparative Chemistry Procedures
      3.1.4 Reaction Product Chemistry
      3.1.5 Strategy for Measuring Organics in Open-Ocean Baseline Study
      3.1.6 Interaction with GEEP
      3.1.7 Use of Marine Mammals in Global Monitoring Programmes
      3.1.8 Review of UNEP Reference Methods
      3.1.9 Other Organic Contaminants
      3.1.10 Other Matters

   3.2 OPEN OCEAN BASELINE STUDY

   3.3 MONITORING OF CONTAMINANTS IN MARINE SEDIMENTS

   3.4 MONITORING OF CONTAMINANTS IN MARINE ORGANISMS

   3.5 BIOLOGICAL EFFECTS

4. REVIEW OF METHODOLOGICAL DEVELOPMENTS AND PREPARED REFERENCE METHODS

   4.1 STATE OF DEVELOPMENT OF REFERENCE METHODS

   4.2 THE ANALYSIS OF INDIVIDUAL ORGANIC CONTAMINANTS

   4.3 REACTION PRODUCTS AND NEWLY RECOGNIZED ORGANIC CONTAMINANTS

   4.4 METHODOLOGICAL ASPECTS OF OPEN OCEAN BASELINE STUDY

ANNEX II

RECOMMENDATIONS

Recommendation Number	Title
GEMSI-IX.1	Quantitative Reference Mixture of Individual Chlorobiphenyls
GEMSI-IX.2	Quantitative Calibration Standard for Petroleum Hydrocarbons
GEMSI-IX.3	Adverse Effects of Photochemical Reaction Products of Petroleum Compounds
GEMSI-IX.4	The Use of Marine Sediments in Marine Pollution Research and Monitoring
GEMSI-IX.5	Quality Assurance Programme
GEMSI-IX.6	Convening of the Tenth Session of the IOC-UNEP Group of Experts on Methods, Standards and Intercalibration

Recommendation GEMSI-IX.1

QUANTITATIVE REFERENCE MIXTURE OF INDIVIDUAL CHLOROBIPHENYLS

The Group of Experts on Methods, Standards and Intercalibration (GEMSI),

Being aware of the considerable difficulties in analyzing and separating individual chlorobiphenyls in marine matrices,

Considering the need for reliable data quality assurance and information together with reporting data on chlorobiphenyls in the marine environment in general and individual chlorobiphenyls in particular,

Noting the proven utility of the IOC/Kiel PCB-1 as a quantitative reference mixture of individual chlorobiphenyls,

Recommends that an extended quantitative reference mixture of individual chlorobiphenyls be prepared with support from IOC, to be used, serving as a standard, in the implementation of marine pollution and basic research and monitoring programmes as part of the required data quality control.

Recommendation GEMSI-IX.2

QUANTITATIVE CALIBRATION STANDARD FOR PETROLEUM HYDROCARBONS

The Group of Experts of Methods, Standards and Intercalibration,

Being aware of the requirement to obtain reliable quality controlled data on the level of petroleum hydrocarbons in marine matrices by gas chromatography, **inter alia** for fulfillment of the regional monitoring programmes,

Realizing that quantitative calibration standards for the analysis of petroleum hydrocarbons by gas chromatography are one element of data quality control,

Noting the need to secure the production of reliable standards,

Recommends that appropriate resources be made available for the preparation and production of such standards.

Recommendation GEMSI-IX.3

ADVERSE EFFECTS OF PHOTOCHEMICAL REACTION PRODUCTS OF PETROLEUM COMPOUNDS

The Group of Experts on Methods, Standards and Intercalibration,

Noting on the basis of extensive data from various ocean regions that photochemical reaction products of petroleum hydrocarbons compounds are present in ocean water at concentration levels equal to or greater, by order of magnitude, than the levels of the parent compounds,

Realizing that the toxic effects of these compounds on marine organisms are not well known,

Noting that the limited data available on biological effects give rise to concern as to the adverse effects on marine organisms,

Suggests that the Group of Experts on Effects attempt to investigate further the adverse effects of these compounds on marine biota using selected and chemically well defined reaction products.

Recommendation GEMSI-IX.4

THE USE OF MARINE SEDIMENTS IN MARINE POLLUTION RESEARCH AND MONITORING

The Group of Experts on Methods, Standards and Intercalibration,

Noting the progress made in the planning of the workshop on the use of sediments in marine pollution research and monitoring,

Recommends that the workshop be organized as planned in China at the Institute for Marine Environmental Protection in Dalian, in the fall of 1989,

Recommends further that the planning group prepare the final programme in consultation with the local organizing committee through a visit early 1989 to the relevant institutions in China.

Recommendation GEMSI-IX.5

QUALITY ASSURANCE PROGRAMME

The Group of Experts on Methods, Standards and Intercalibration,

Noting the progress made in developing the quality assurance programme in the form of guidelines for the requirements of the GIPME/MARPOLMON and UNEP

Regional Seas Programme, as recommended by GEMSI-VIII,

Noting also the need for a proper introduction of the quality assurance guidelines and the associated concepts to the users,

Recommends that a seminar be arranged with appropriate representation from the GIPME/MARPOLMON and UNEP Regional Seas Programmes and participation of selected GEMSI members, with the aim of introducing the quality assurance programme to the selected participants and co-ordinators of regional programmes and that the guidelines be published;

Noting also that a more detailed document on data quality assurance practices would eventually be required by analysts in participating laboratories, since the guidelines produced are insufficiently detailed to meet long-term requirements,

Recommends that IOC and UNEP consider the preparation of such a document through appropriate support to, and use of, GEMSI expertise,

Recommends further that the draft document be reviewed at the next session of GEMSI.

Recommendation GEMSI-IX.6

CONVENING OF THE TENTH SESSION OF THE IOC-UNEP GROUP OF EXPERTS ON METHODS, STANDARDS AND INTERCALIBRATION

The Group of Experts on Methods, Standards and Intercalibration

Noting the amount of intersessional work in progress and the plans for major activities which are under development,

Noting further that the Workshop on the Use of Sediments in marine pollution research and monitoring is planned for September 1989,

Recommends that the Tenth Session of GEMSI be convened in early 1990 possibly in IOC, Paris.

ANNEX III

LIST OF PARTICIPANTS

INVITED EXPERTS

Dr. J.M. Bewers
Head, Marine Chemistry Division
Department of Fisheries and Oceans
Bedford Institute of Oceanography
PO Box 1006
Dartmouth
Nova Scotia B2Y 4A2
CANADA
Tel: (902) 426 2371
Tlx: 019 31552

Dr. K. Burns
Bermuda Biological Station for Research
17 Biological Station Lane
St. Georges
BERMUDA
Tel: (809) 297 1880
Tlx: BA 3246
Fax: (809) 297 1843

Dr. D. Cossa
IFREMER
Rue de l'Ile d'Yeu
PB 1049
F44037 Nantes Cedex
FRANCE
Tel: 4037 41 84
Tlx: 40374001
Fax: 711196

Dr. R. Dawson
Chesapeake Biological Laboratory
University of Maryland
Box 38
Solomons
Maryland 206088
USA
Tel: (301) 326 6226

Dr. J.C. Duinker **(Chairman)**
Institut für Meereskunde
Universitat Kiel
Duesternbrooker Weg 20
2300 Kiel 1
FEDERAL REPUBLIC OF GERMANY
Tel: (0431) 5973810
Tlx: 292619 IFMK D

Dr. M. Ehrhardt
Institut für Meereskunde
Universitat Kiel
Duesternbooker Weg 20
2300 Kiel 1
FEDERAL REPUBLIC OF GERMANY
Tel: (0431) 597 3814
Tlx: 292619 IFMK D

Dr. J.W. Farrington
Environmental Sciences Programme
University of Massachusetts-Boston
Harbor Campus
Boston, MA 02125-3393
USA
Tel: (617) 929 8255

Dr. W.D. Jamieson **(Chairman GESREM)**
Atlantic Research Laboratory
National Research Council
1411 Oxford Street
Halifax, Nova Scotia B3H 3Z1
CANADA
Tel: (902) 426 8279
Tlx: 019 21653

Dr. A.H. Knap **(Vice-Chairman)**
Director
Bermuda Biological Station for Research
17 Biological Station Lane
St. Georges,
GE01 BERMUDA
Tel: (809) 297 1880
Tlx: 3246 BA
Fax: (809) 297 1843

Mr. K. H. Palmork
Institute of Marine Research
PO Box 1870
N-5024 Bergen Nordnes
NORWAY
Tel: (475) 32 7760
Tlx: 42297 Ocean N
Fax: (475) 321359

Dr. R. Weber
Instituto Oceanografico da
Universidad de Sao Paulo
Praca do Oceanografico 191
Sao Paulo 05508
BRAZIL
Tel: 210 2122 Ext: 526
Tlx: 038118359 USPO

Dr. H. Windom
Skidaway Institute of Oceanography
PO Box 13687
Savannah
Georgia 31416
USA
Tel: (912) 356 2490
Tlx: 7407530 HERB UC
Fax: (912) 356 2751

Dr. R.F. Wollast
University of Brussels
Laboratory of Chemical Oceanography
Bld du Triomphe CP 208
1050 Brussels
BELGIUM
Tel: 640 6172
Tlx: 23069 UNILIB BRUX
Fax: 649 8774

Dr. J. Zhou
Director, Institute of Marine
Environmental Protection
State Oceanic Administration
PO Box 303
Dalian
PEOPLE'S REPUBLIC OF CHINA

Tel: (0411) 471429
Cbl: 3152

Dr. G. Topping
Department of Agriculture and Fisheries
for Scotland
Marine Laboratory
PO Box 101
Victoria Road
Aberdeen AB9 8DB
UNITED KINGDOM

Tel: (0244) 876544
Tlx: 73587 MARLAB G

UNITED NATIONS ENVIRONMENT PROGRAMME

Dr. L. Mee
IAEA/ILMR
2 Av. Prince Héréditaire
Albert
MC 9800 Monaco

Tel: (93) 504488
Tlx: 479378 ILMR
Fax: (93) 257346

Dr. M. Gerges (Technical Secretary)
OCA/PAC
UNEP
PO Box 30552
Nairobi
KENYA

Tel: 333930/520600
Tlx: 25164 UNEP RS KE
22068 UNEP KE
Fax: (2542) 520711

Dr. H. Ronde
GEMS
UNEP
PO Box 30552
Nairobi
KENYA

Tel: 333930/520600
Tlx: 22068 KE
Fax: (2542) 520711

INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION

Dr. G. Kullenberg (Technical Secretary)
IOC
7 Place de Fontenoy
75700 Paris
FRANCE

Tel: 4568 3983
Tlx: 204461 PARIS
Fax: 43061122
45671690

Dr. Y. Jiang
Associate Expert
IOC
7 Place de Fontenoy
75700 Paris
FRANCE

Tel: 4568 3990

OBSERVERS

Dr. J. Readman
IAEA (ILMR) Laboratories
2 Avenue Prince Héréditaire Albert
MC9800 Monaco

Tel: (93) 504488

Dr. J. Cortes
Comision Permanente del Pacifico Sur
Calle 76,9-88
Bogota
COLOMBIA

Tel: 2355145/2488680
Tlx: 41299 CPPS CO

ANNEX IV

REQUIREMENTS FOR OPEN-OCEAN BASELINE STUDY: FIRST LEG

Trace Metal Sampling

On the basis of the list of elements recommended by the logistic planning group actual or potential individuals/laboratories which might analyze seawater for each of these elements were identified by the Group. Table 1 below shows the results of the evaluation. It was recognized that the inclusion of Sn and Fe would be, to a large extent, dependent upon the availability and use of suitable sampling bottles and hydrowire. It was also recommended that Cu be added to the primary list of elements. This element has probably been omitted through oversight. It was further suggested that Mo be included in the secondary list particularly because of the common combination of the analytes V and Mo.

Table 1 shows potential contributions to the analysis of seawater for the entire list of metals suggested by the logistic planning group plus Cu and Mo. There was some question as to the suitability of the intended sampling devices for collecting samples uncontaminated with Sn. This will be discussed under the heading 'equipment' (see below).

The Group agreed that it would be most desirable to have included among the laboratories representation from each region that might be able to conduct independent sampling at the remaining open-ocean baseline stations. Furthermore, it would be desirable to have several laboratories involved in the independent measurement of each element. These requirements should result in multiple laboratory assignments to each element and also that these laboratories be in different regions. Four of the laboratories had already made a commitment to participate in the first stage of the open-ocean baseline survey in 1990. These were the Free University of Brussels (R. Wollast), the Bedford Institute of Oceanography (P.A. Yeates), the University of Goteborg (S. Westerlund) and the German Hydrographic Institute (D. Schmidt). The remaining laboratories would need to be invited to join the baseline survey in a letter that clearly spelled out the conditions and benefits of participation.

There was no discussion in the report of the logistics planning group about sample filtration. It was, however, concluded during the GEMSI discussions that it would be desirable to obtain both filtered and unfiltered samples from depths above the main thermocline. There would be little advantage in filtering samples obtained below the main thermocline since differences between filtered and unfiltered sample analyses will, in the main, be insignificant (i.e. within the uncertainty of the measurements).

Table 1

Element	Potential Participants				
Cd	BIO	DHI	IFMD	UG	USM
Co	BIO?	SIO	UFG	UG	USM
Fe	FSU	JUL	UCSC?	URI	USM
Hg	BIO	DHI	IFMD	IFR	UC
Cu	BIO	DHI	IFMD	UG	USM
Mn	BIO	FSU	IFMD	USM	USK
Ni	BIO	DHI	UFG	UG	USM
Pb	CNRV	JUL	UG	USM	UCSC
Zn	BIO	IFMD	JUL	UG	USM
Al	BIO?	IOS	MIT	UEA?	UFG
Cr	BIO*	CNRT	IFMD	JUL	
Sn	MPI	SIO			
V	BIO	CNRT	USK		
Mo?	USK				
Se	ENS	MIT	ODU		
As	MPI	SIO	USK		

This list has been limited to five laboratory entries per element. It may, therefore, be neither complete nor a faithful representation of the capabilities of the laboraories concerned. It is a guide only.

BIO	Bedford Institue of Oceanography, Dartmouth	P.A. Yeats
BIO*	Bedford Institute of Oceanography	R. Cranston
CNRT	CNRS, Toulouse	J-F. Minster
CNRV	CNRS, Villefranche-sur-Mer	Coreau
DHI	German Hydrographic Institute, Hamburg	D. Schmidt
ENS	Ecole Normale Superieure, Paris	J-M. Martin
FSU	Florida State University, Tallahassee	W.M. Landing
IFMD	Institute for Marine Research, Rostock-Warnemunde	L. Bruegmann
IFR	IFREMER, Nantes	D. Cossa
IOS	Institute of Ocean Sciences, Wormley	D.J. Hydes
JUL	Nuclear Research Centre, Julich	L. Mart
MIT	Massachusetts Institute of Technology, Cambridge	C. Measures
MPI	Max Planck Institute, Stuttgart	M.O. Andraea
ODU	Old Dominion University, Norfolk	G.A. Cutter
SIO	Skidaway Institute of Oceanography, Savannah	J. Byrd
UC	University of Connecticut, Groton	W.F. Fitzgerald
UCSC	University of California at Santa Cruz	A.R. Flegel
UEA	University of East Anglia, Norwich	T. Jickells
UFG	Free University of Brussels, Brussels	R. Wollast
UG	Chalmers University of Gothenburg, Gothenburg	S. Westerlund
URI	University of Rhode Island, Narragansett	D. Kester
USK	University of Southampton, Southampton	D. Burton
USM	University of Southern Mississippi, Hattiesburg	G. Knauer

Organization

Supporting Analyses. The Group agreed that primary basic measurements advocated the logistic planning group (salinity, nutrients, silicate, nitrate, phosphate, dissolved oxygen) were all essential. It was felt that the conduct of these measurements on board should only require one skilled operator with on-station priority assigned to oxygen. The need for the inclusion of alkalinity and tracer measurements was also discussed. The options considered were primarily freons and tritium. It was considered desirable but not essential to include both alkalinity and a trace, probably freon.

In terms of staffing on the cruise, the organic activities would require 5 berths. This would leave a balance of 11-13 berths of which one or two would be used for the individuals conducting the oxygen, salinity and nutrient requirements. This would leave approximately 10 berths available for the trace metal operations.

The Group agreed that it would be desirable to organize three sampling teams to permit maintenance of sampling operations during the intensive periods of station sampling. Ideally, the sampling teams should comprise those participants who need to assure the integrity of samples collected during the cruise for subsequent analysis in their home laboratories. Therefore, selection of shipboard participants would have to await responses from invited participants but would include representatives of the four core laboratories.

Equipment

Sources of much of the equipment required for this exercise has already been identified by the logistic planning group. The Group questioned whether it might be possible to use non-PVC bottles in the rosette to permit samples for Sn determination to be obtained. This should be considered by the logistic group. The Group agreed that oxygen analyses should be based wholly on Winkler methods. It was felt reasonable to ask participants to supply their own bottles for storing of samples for return to their home laboratories. It was also agreed that the installation of atomic absorption or polorographic instruments on board was unnecessary and only in cases where analyses had to be carried out on board (e.g. for Hg) would installation of analytical equipment be necessary.

The logistic planning group identified several types of equipment which would need either to be purchased for the cruise or donated by participating laboratories. These were as follows:

Hydrowire: The logistic planning group had suggested the purchase of a Kevlar hydrowire for the cruise. Two observations were made in response to this conclusion. It was not clear why the 4000m of plastic-coated stainless steel available from DHI would not meet the cruise requirements or, failing that, why it would not be possible to use stainless steel cable even if this meant excluding Fe determinations. Nevertheless, Dr. Windom agreed to determine the costs of Kevlar rope and to provide this information to the logistic planning group.

Go-Flo Samplers: Dr. Bewers offered to load 10 12-litre Go-Flo samplers from BIO for the exercise assuming that shipments costs could be covered from the IOC budget. A further 10 samplers might be obtained from European sources and Dr. Wollast agreed to investigate this.

Messengers: The Group agreed that it might be necessary to purchase plastic messengers. If the costs associated with the purchase of the above equipment could be reduced, the total budget for the exercise would be comparable with that currently being considered by the IOC.

Organic Sampling Activities

The Group discussed the inclusion of organic contaminants in the open ocean baseline study in the context of current ship plans and recent advances in analytical methodology for specific organics. The Group agreed to give highest priority to the determination of selected individual organics in deep ocean water column profiles. Concurrent measurements of complementary water mass tracers (e.g. Freons) was also recommended. Due to the importance of long-range atmospheric transport and deposition of organic contaminants to the ocean, it would also be useful to collect high volume air samples and precipitation during the cruise.

The organics selected for inclusion emphasized the chlorinated hydrocarbons which had unambiguous anthropegenic sources and for which previous data on ocean distributions and physical properties (such as solubility, Henry's Law constants etc.) existed. This would allow further assessment of the fate of the compounds in seawater. The compounds selected were a and γ hexachlorocyclohexanes, a and chlordanes, dieldrin, the DDT Series (pp DDE, pp DDT and pp DDT), HCB and the chlorinated biphenyls.

The Group required space for 5 participants, space for 2 in-situ smaplers and 2 large volume samplers, space to mount an atmospheric hi-volume sample and precipation collector at the bow or foremast. A laboratory for changing filters and resins was required as well as space for storage of solvents and space to mount a gas chromatograph and gases. IFM Kiel would provide the GC, BBSR/V.Mass. Boston would provide the in-site sampler, IFM Kiel would provide seawater sampler, BBSR would provide the atmospheric sampling systems. The group would need 32 hours of wire time (3/15" std. hydrowire as a minimum requirement - stainless steel would be preferable).

Further Planning

The Group agreed that the logistics planning group would need to have at least one further meeting to carry out further detailed planning. This meeting should probably take place in mid 1989 as soon as responses to invitations to additional participants had been received. Letters of invitation should be sent out in January 1989 and the responses should be available by March or April. The logistic planning group could, therefore, meet in May and, in addition to preparing more detailed cruise plans, solicit additional participation as needed to cover inorganic analytes.

Finally, the Group considered it reasonable to expect the North Atlantic baseline stations to be occupied by participants in the South Atlantic baseline cruise at some time after the collation and evaluation of results from this latter cruise. Occupation and sampling of the Western South Atlantic Stations would have to await either time available on a ship transiting between Europe and Antarctica or time on a South American research vessel. In this context Dr. R. Weber agreed to investigate the possibility of obtaining shiptime on a Brazilian research vessel after 1991. Even if the baseline stations other than Nos 4, 5, 7 and 9 could only be occupied on cruises having a small representation of the participants in the first cruise in 1990, it should still be possible, on the basis of the intercomparison of results from the first cruise, to achieve adequate quality assurance in the results.

ANNEX V

REVIEW OF THE STATE OF THE DEVELOPMENT AND REFERENCE METHODS AND STRATEGY FOR PRODUCTION OF NEW ONES WITH GEMSI INVOLVEMENT

METHOD "AC (Determination of selected neurotoxins in marine organisms):
Dr. Jamieson noted his laboratory's close involvement in this field (including the preparation of standards for individual toxins). It was agreed that method AC should be a general introduction to marine neurotoxins and include a non-specific bioassay for screening purposes. More specific assays should be prepared in the future and Dr. Jamieson would be consulted in this matter.

METHOD 13 (Determination of methyl-mercury in selected marine organisms):
A recent review of this method at MESL had shown it to be obsolete and an updated version is being tested. This will be submitted to the usual review procedure.

METHOD "V" (Guidelines for the determination of organohalogen contaminants (other than DDTs or PCBs) in selected marine organisms):
The draft report of the UNEP (MEDPOL) sponsored IAEA/FAO/IOC workshop on this subject was submitted to the organics sub-group requesting their advice on how to proceed developing the guidelines on the basis of this document.

METHOD "V" (Determination of organotin compounds and total in selected marine organisms).
Suitable techniques will shortly undergo testing at MESL and a method should be ready in 1990.

METHOD "AE" (Organophosphorus compounds in marine organisms).
This is still at a very early stage of development and a draft method will not be available until 1990.

METHOD 16 (Determination of DDTs, PCBs, PCCs and other hydrocarbons in sea water by gas chromatography).
This is still a research method and no reference method can be recommended until at least 1990.

METHOD 18 (Determination of total dissolved cadmium in sea water by differential pulse anodic stripping voltametry).
This method was withdrawn in 1987 following the recommendations of GEMSI VIII. A new version can be developed if funds become available but this is considered a low priority;

METHOD "B" (Monitoring of petroleum hydrocarbons in seawater).
It was agreed that this should be prepared on the basis of IOC Methods and Guides 13 (by the RM editor) incorporating some methodological improvements recommeded for RM 20 (see below).

METHOD "T" (Determination of organotin in seawater).
The draft version of this method is currently being tested at MESL and will be submitted for review in March 1989.

METHOD "AB" (Determination of methyl-mercury in seawater).
Although techniques have been developed for this parameter, they are still not widely available and, as yet, can only be applied at a research level. The group felt that work on this manuscript should be postponed until 1990.

METHOD "R" (Guidelines on the sampling and preparation of sediments for marine pollution monitoring).
This method will be developed as a direct consequence of the forthcoming (1989) workshop on sediments in China.

METHOD 17 (Determination of DDTs and PCBs in marine sediments by gas-liquid chromatography).
The GEMSI organics sub-group will define the scope of this document and identify potential authors.

METHOD 20 (monitoring of petroleum hydrocarbons in sediments).
This document has now been completed and will be reviewed during GEMSI-IX by the sub-group.

METHOD "W" (Determination of organohalogen contaminants (other than DDTs or PCBs) in marine sediments).
See comments under Method "V".

METHODS 27-39 (Determination of trace metals (Cd, Zn, Pb, Cu, Cr, Co, Ni, V, Mn and Fe) in sediments by atomic absorption spectrophotometry).
To be consolidated in one document at the MESL and submitted to the GEMSI inorganic sub-group for review.

METHOD 7 (Determination of trace metals (Cd, Zn, Pb, Cu, Cr, Co, Ni, V and Fe) in selected marine organisms by atomic absorption spectrophotometry).
To be consolidated as for methods 27-39.

METHOD "Z" (Determination of aluminium in sediments).
To be prepared by a consultant recommended by the GEMSI inorganic sub-group (funding pending), prior to the sediments workshop in 1989.

METHOD ""AA"" (Determination of methyl-mercury in sediments).
This method will be prepared by MESL and reviewed by GEMSI (1989).

METHODS 52 and 53 (Determination of phosphorus and nitrogen in suspended matter and sediments).

This method will be prepared at MESL on the basis of other, currently available standard methods and reviewed by GEMSI.

METHOD "G" (Determination of BODs and COD in estuarine waters). The value of COD and BOD measurements was discussed in some detail by the group. It was felt that a "cook book" method could be misleading as it is important to discuss the data application. A wider test was therefore considered necessary by the co-operating agencies.

METHOD "X" (Guidelines for identifying and quantifying persistant synthetic materials which may float, sink or remain in suspension).
This method is to be prepared by IOC/FAO as a consequence of their pilot monitoring activities in the MEDPOL programme.

METHOD "P" (Determination of halogenated hydrocarbons in aerosols and in wet precipitation).
The consultant contracted for this work will be urged to complete the manuscript for review.

METHOD "Q" (Sampling of dry deposition). There has been considerable discussion with potential consultants for this method and they have expressed their unwillingness to commit themselves to any specific collection technique. The group recommended that a set of more general guidelines should be developed when funds become available to contract a consultant.

METHOD "QA to QD" (Guidelines for quality assurance procedures). An extensive document was presented to GEMSI-IX in draft from and it was agreed that this should form the basis of these methods.

METHOD "AD" (Guidelines for monitoring the presence of used hibricating oils in the marine environment).
This method is extremely difficult to prepare as an analytical technique but will be done in the form of general guidelines to be formulated by R. Weber in consultation with M. Ehrhardt.

METHOD "AF" (Reagent and laboratory ware clean-up procedure for low level contaminant monitoring).
This will be prepared as a working document for the QA workshop proposed for 1990, providing funding becomes available.

<u>Reference Methods not considered in the draft catalogue: The following additional methods were proposed by the sub-group:</u>

METHOD "AI" (Determination of petroleum hydrocarbons in selected marine organisms). This method will be prepared by the organics sub-group on the basis of RM 20 (during the first semester of 1989.

METHOD "AJ" (Guidelines for the use of sediments for marine pollution monitoring programmes). This method will be prepared by G. Topping during December 1988. It will provide a useful introduction to the Reference Method for monitoring contaminants in marine sediments.

METHODS "AK" (Guidelines for monitoring marine dump sites). This should be prepared along the lines of Annex 3 of the London Dumping Convention. The Chairman of the inorganic sub-group agreed to approach IMO on this matter intersessionally.

METHOD "AL" (Guidelines for asseesing the impact of point sources). Dr. G. Topping agreed to prepare a detailed proposal for this method intersessionally.

One additional revision was also proposed:

METHOD 14 (Determination of DDTs and PCBs). This should be modified to incorporate new sample work-up techniques using HPLC. The title should be changed to reflect this modification (and that the method provides work-up techniques for subsequent application of RM 40). The sub-group will be consulted intersessionally and methods will be tested at MESL.

Production strategy for new methods.

RM. N°.	Provisional date	Publication	Priority
AC	6.89	12.89	Ra
13	1.89	5.89	Ra
V	10.89	3.90	R/I a
U	10.89	1990	Rb
AE	7.89	10.89	Rb
16	1990	1990	Ib
18	1990	1990	Ib
E	1.89	4.89	Ia
T	3.89	5.89	Ra
AB	1990	1990	Rb
R	12.89	4.90	Ia
17	10.89	12.89	Ia
20	12.88	2.89	Ia
W	1990	1990	Rb
27-39	3.89	6.89	Ra
7	3.89	6.89	Ra
Z	6.89	9.89	Ia
AA	8.89	12.89	Ra
52/53	6.89	10.89	R/I b
G	10.89	4.90	Ib
X	10.89	1.90	I/M a
P	1.89	4.90	Ra
Q	9.89	3.90	I(+WMO) b
QA/QD	12.88	3.89	I/R a
AD	4.89	11.89	R/M a
AF	1990	1990	Ia
AI	6.89	9.89	Ia
AJ	12.88	3.89	Ra
AK	9.89	3.90	Ia
AL	9.89	3.90	Ia
14	9.89	3.90	I/R a

Priority: Relative priority is shown by a or b;
Documents will be prepared initially in consultation with IOC secretariat (I) or MESL/IAEA secretariat (R).

ANNEX VI

FUTURE INTERSSESSIONAL ACTIVITIES

Individual Organics

1. Further assessment of problems inherent in the calibration of electron capture detectors for the analysis of chlorinated hydrocarbon contaminants using the IOC/GEMSI, standard mixture (Drs. J. Duinker, J. Farrington, K. Burns and K.H. Palmork).

2. Further development of deep water sampler, as funding permits, with the aim of participating in the open ocean baseline project (Drs. J. Farrington, K. Burns and A. Knap).

3. Assessment of methods for the analysis of carbamate pesticides (Dr. R. Dawson).

4. Completion of reference method for analysis of petroleum hydrocarbons in sediments (Dr. K. Burns).

5. Completion of reassessment of the state of methods for analysis of metabolites of organic contaminants (Dr. J. Farrington).

6. Further development of methods and standards for the analysis of photochemical oxidation products of organic contaminants (Dr. M. Ehrhardt).

7. Assessment of the use of herbicides and fungicides and the problems of environment toxicity and persistence plus methods for residue analysis (Dr. L. Mee).

8. Review of the Workshop on Organochlorines in the light of assessing the feasibility of developing analytical guidelines (Dr. J. Duinker).

9. Assessment of current methods to determine the atmospheric flux to the ocean of organic contaminants (M. Erhardt).

10. Sea surface microlayer sampling methods.

11. Continuing assessment of methods for toxaphene.

12. Due to recent international concerns of marine debris, the Group recommended the participation in the upcoming meeting on Marine Debris in Hawaii. Dr. Wollast agreed to attend and report his findings to GEMSI on this subject.

ANNEX VII

LIST OF WORKING DOCUMENTS

Document Code	Title
IOC-UNEP/GGE(MSI)-IX/1	Provisional Agenda
IOC-UNEP/GGE(MSI)-IX/2	Annotated Provisional Agenda
IOC-UNEP/GGE(MSI)-IX/3	Draft Summary Report
IOC-UNEP/GGE(MSI)-IX/4	List of Documents
IOC-UNEP/GGE(MSI)-IX/5	List of Participants
IOC-UNEP/GGE(MSI)-IX/6	Report on Intersessional Activities in the Field of Marine Pollution Research and Monitoring (Extracts from Secretary's Report to EC-XXI, March 1988 and EC-XXI Report)
IOC-UNEP/GGE(MSI)-IX/7	Report of the Fourth Session of the GIPME Officers Meeting, Paris, 2-4 March 1988
IOC-UNEP/GGE(MSI)-IX/8	Report of the ad hoc Group on Individual Organic Contaminants 4-8 January 1988
IOC-UNEP/GGE(MSI)-IX/9	Report of Planning Consultations on an Open Ocean Baseline Study, Kiel FRG, February 1988
IOC-UNEP/GGE(MSI)-IX/10	Report of Preparatory Expert Mission for the Workshop on the Use of Sediments in Marine Pollution Research and Monitoring, China April, 1988
IOC-UNEP/GGE(MSI)-IX/11	Progress Report on Sentinel Organisms Monitoring (Musselwatch) project

IOC-UNEP/GGE(MSI)-IX/12	Preliminary Results and Experiences from the Second IOC Workshop on Biological Effects Techniques, Bermuda 10 September -2 October 1988
IOC-UNEP/GGE(MSI)-IX/13	State of Development of Reference Methods
IOC-UNEP/GGE(MSI)-IX/14	Further Results from River Input Workshop, Chulalongkorn University, Bangkok, Thailand: Individual Organic Constituents
IOC-UNEP/GGE(MSI)-IX/15	Reference Methods for Marine Pollution Studies No:Zero
IOC-UNEP/GGE(MSI)-IX/16	Results and experiences from Regional and Global Inter-calibration exercises carried out through IAEA/ILMR with UNEP support in various regions of the UNEP Regional Seas