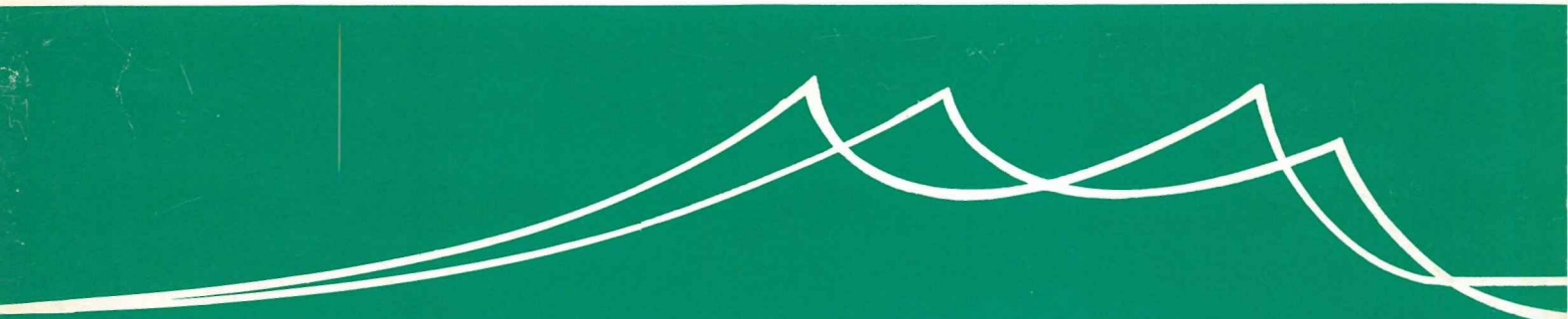


**SCIENTIFIC COMMITTEE ON OCEANIC RESEARCH**



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Vol. 17 No. 1*

**INTERNATIONAL COUNCIL OF SCIENTIFIC UNIONS**

SCIENTIFIC COMMITTEE ON OCEANIC RESEARCH

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INTERNATIONAL COUNCIL OF SCIENTIFIC UNIONS

**PROCEEDINGS**  
**OF THE**  
**SCIENTIFIC COMMITTEE ON OCEANIC RESEARCH**

April 1981

Halifax, Nova Scotia, Canada

SCOR Proceedings, Vol. 17, No. 1

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**Report of the Fifteenth General Meeting of SCOR**  
**Woods Hole, Massachusetts, U.S.A.**  
**26-28 September, 1980**

The Fifteenth General Meeting of SCOR was held at the Woods Hole Oceanographic Institution, Woods Hole, U.S.A., from 26 to 28 September, 1980. It was held in conjunction with a conference entitled "The Next Fifty Years in Oceanography", organized as part of the celebrations of the fiftieth anniversary of the founding of the Institution. The SCOR General Meeting was preceded by the Third International Congress on the History of Oceanography.

**A list of participants is given in Annex I.**

In the absence of the President, Dr. K. N. Fedorov, the meeting was held under the chairmanship of the Past-President, Professor H. Postma, who read a message from Dr. Fedorov conveying his good wishes for the success of the meeting and expressing his regrets for being unable to be present.

At the opening of the meeting, the Chairman reported the deaths of a number of distinguished marine scientists since the Fourteenth General Meeting. These included Dr. Walther Düing, Professor John Raymont, Sir Edward Bullard and Dr. John Isaacs.

## **1.0 ORGANIZATION AND FINANCE**

### **1.1 Membership**

A second amendment to the 1979 Supplement to *SCOR Proceedings*, giving further changes in membership, was issued with *SCOR Proceedings*, Volume 16. A revised Supplement will be issued in early 1981.

#### ***National Membership***

Canada: Dr. A. Longhurst has been added as the third nominated member from Canada.

Federal Republic of Germany: Professor G. Siedler has replaced Professor E. Seibold as one of the three nominated members.

Netherlands: Professor R. Dorrestein has ceased to be a nominated member.

South Africa: Mr. J. P deWit has replaced Dr. A. E. F. Heydorn as one of the three nominated members.

#### ***Represented Organizations***

The International Union of Radio Science (URSI) has nominated as its representative member, Dr. J. R. Apel, Director, Pacific Marine Environmental Laboratory, 3711-15th Avenue, N.E., Seattle, WA 98105, U.S.A.

### **1.2 Publications**

#### ***i) UNESCO Technical Papers in Marine Science***

No. 31, published in September 1980, entitled *Coastal Lagoon Surveys*, contains the results of a world-wide survey of coastal lagoon research undertaken by the SCOR/UNESCO *ad hoc* advisory panel.

No. 32, *Guidelines for research on coastal lagoons*. Report of a seminar sponsored by UNESCO/IABO/Duke University, September 1978, is in the process of final preparation.

No. 33, *Coastal lagoons: present and future research*. Proceedings of a seminar sponsored by UNESCO/IABO/Duke University, September 1978, also in final preparation.

No. 34, *The carbon budget of the ocean*. Report of meeting of WG 62, November 1979. Published December 1980.

No 35, *Determination of chlorophyll in seawater* is a report of intercalibration tests sponsored by SCOR and carried out by C. J. Lorenzen and S. W. Jeffrey, September-October 1978. Published December 1980.

**Future Issues:**

Report and recommendations of the November 1979 meeting of WG 44, *Ocean-Atmosphere Materials Exchange*. To be submitted to UNESCO early 1981.

Several issues including the report of the meeting of WG 10 (Joint Panel on Oceanographic Tables and Standards) in September 1980, and background papers relating to proposals for a new practical salinity scale and a new equation of state for sea water. To be submitted to UNESCO and printed 1981.

**ii) UNESCO Monographs on Oceanographic Methodology**

No monographs were published during 1980.

No. 7 — *Mathematical Models in Biological Oceanography*. The manuscript was submitted to UNESCO in February 1980 and arises from the meetings of WG 59. In press.

**Future Issues:**

*Estimation of Micro-Nekton Abundance*. This monograph is expected to be submitted to UNESCO in 1981, and will give the results of the April 1980 workshop given by SCOR WG 52.

*Mangrove ecosystem research methods*. This monograph arises from the meetings of WG 60 and will be submitted to UNESCO in 1981.

*Identification of Cephalopod Beaks*

The field of salinity methods may be the subject of a future monograph.

It was agreed that consideration of a revision of monograph No. 1, *Photosynthetic Pigments in Sea Water*, was not worthwhile.

**iii) Other UNESCO/IOC Publications**

*River Inputs to Ocean Systems*, papers presented at the RIOS workshop, March 1979. In press.

*Bibliography on Mangrove Research*. In press.

**iv) IOC Workshop Report Series**

No. 22 — Third IOC/WMO workshop on *Marine Pollution Monitoring*, New Delhi, February 1980.

No. 23 — WESTPAC workshop on *Marine Geology and Geophysics of the North West Pacific*, Tokyo, March 1980.

No. 24 — WESTPAC workshop on *Coastal Transport of Pollutants*, Tokyo, March 1980.

No. 25 — Workshop on the intercalibration of sampling procedures of the IOC/WMO/UNEP pilot project on monitoring background levels of selected pollutants on open-ocean waters, Bermuda, 11-26 January 1980.

No. 26 — Workshop on coastal area management on the Caribbean Region, Mexico City, 24 September-5 October, 1979.

No 27. — CCOP/SOPAC-IOC Second international workshop on geology, mineral resources and geophysics of the South Pacific, Nouméa, 9-15 October 1980.

No 28. — Workshop on the effects of environmental variation on the survival of larval pelagic fishes, Lima, 20 April-5 May 1980.

v) **GARP Publications**

Report of the Pilot Ocean Monitoring System planning meeting, Miami, October 1979, was published by the GARP Activities Office in March 1980. Copies of this report were distributed at the meeting.

vi) **Other Publications**

*Physical Oceanography of the Tropical Atlantic During GATE* (previously referred to as the GATE Atlas) was published by the University of Miami in September 1980, with the financial support of IOC and WMO (see also item 2.3).

Papers presented at the 1978 SCOR interdisciplinary discussion on Oceanic Fronts are to be published in *Progress in Oceanography*.

The final GATE Symposium on Oceanography and Surface Layer Methodology is to be published as two special supplements to *Deep-Sea Research*, Volume 26.

A list of SCOR publications since 1975 will be included in the next supplement to *SCOR Proceedings*.

The General Meeting urged the Secretariat to try to arrange for lists of SCOR publications to be published in selected scientific journals and in the *International Marine Science Newsletter*.

### 1.3 Finance

An interim statement of income and expenditure for 1980 was accepted. The final statement for the year appears as Annex II. It was noted that the anticipated balance-in-hand on December 31, 1980 would be \$41,000.00. Since this estimate did not include membership arrears outstanding and, as estimates of expenditures in the final quarter were given as maxima, it was noted that the actual balance at the close of the fiscal year would probably be higher.

On the advice of a Finance Committee consisting of Professor P. Tchernia and Mr. F. Anderson, the meeting noted that the decisions taken at the Fourteenth General Meeting (Brest, November 1978) have been effective and that the financial position of SCOR is now satisfactory. This was expressed in the financial report presented at the Executive Committee Meeting (Kiel, January 1980). The Finance Committee pointed out that SCOR expenses are not entirely covered by national contributions, even if these are received in full, and that, in addition, SCOR must rely on grants and contracts in order to have a balanced budget.

Owing to the adverse criticism of the large increase in national contributions agreed on for 1980, the first since 1971, the Finance Committee recommended that SCOR follow the ICSU practice of more regular, but smaller, increases to offset the effects of inflation. A 15% increase in national contributions in 1982 was approved.

Since working groups account for the largest portion of SCOR expenditures, chairmen of all working groups were urged to keep costs to a minimum. As a result of sustained efforts by the Secretariat, some arrears in national contributions have been recovered. Six countries are still two years or more in arrears, for a total of \$9,400.00. The draft budget for 1981 does not include this amount as potential income. The new Executive Secretary was encouraged by the Finance Committee to endeavor to recover these funds.

It was noted that funds from contracts and some of the ICSU grant are earmarked for specific purposes and cannot be redirected. It was also noted that CCCO will not spend all funds which were available to it in 1980 and that the draft budget for 1981 includes \$6,000.00 for CCCO which will be carried forward from 1980.

The draft budget for 1981 includes an estimated income of \$156,300.00 and estimated expenditures totalling \$155,500.00.

#### 1.4 Election of Officers

Following a proposal of the previous meeting of the Executive Committee, a Nomination Committee was established under the chairmanship of Professor Postma. The Nomination Committee also included Dr. Hurley, Dr. Marumo and Dr. Wooster.

The Nomination Committee met twice and put forward the following suggestions for new officers:

Professor Eric Simpson	—	President
Dr. Alan Longhurst	—	Secretary
Professor Henry Charnock	—	Vice-President
Professor Gerold Siedler	—	Vice-President
Dr. Torben Wolff	—	Vice-President
Dr. William Hay	—	Co-opted Member, responsible for the scientific program of the next Joint Oceanographic Assembly.

This proposal was unanimously approved by the General Meeting. Professor Fedorov remains a member of the Executive Committee as Past-President.

The *ex-officio* Executive Committee members are:

Dr. Warren Godson (IAMAP)  
Professor Kenneth J. Hsü (CMG)  
Professor Devendra Lal (IAPSO)  
Professor Timothy Parsons (IABO)

In a subsequent meeting of the Executive Committee, Professor Hendrik Postma was appointed as the second co-opted member, to act as adviser on relations with intergovernmental organizations.

#### 1.5 Future Structure and Working Procedures of SCOR

- i) To enable the SCOR Scientific Rapporteurs to be classified as members of SCOR, it was agreed, subject to the approval of ICSU, to amend paragraph 4 of the SCOR Constitution to read:

**'Representative Members'** are the elected Presidents and Secretaries of Affiliated Organizations (*ex-officio*), the Chairmen of active SCOR subsidiary bodies (*ex-officio*), the SCOR Scientific Rapporteurs (*ex-officio*), and the nominees of ICSU and of its Scientific Unions and its Scientific and Special Committees that wish to participate in SCOR.

- ii) To improve the involvement of National Committees in the activities of SCOR, the suggestions contained in paragraph 1 of item 1.4 of the report of the Twenty-Second SCOR Executive Committee meeting were confirmed. In particular, National Committees should be invited to comment on proposed terms of reference and to suggest members for new SCOR working groups before establishment is finalized. It was noted, however, that the Executive Committee must retain the right to act without such consultation when circumstances demand.

Reports of meetings of working groups should be sent to National Committees as they are produced.

National Committees should be invited to suggest topics which might justify the creation of new working groups before every General Meeting.

National Committees should be encouraged to send representatives to SCOR Executive Committee meetings. It was considered extremely important that national members play a full and active role in SCOR. It might be



pointed out that not only are participants at meetings aware of developments, but they also receive draft reports some months before the reports are published in *SCOR Proceedings*.

National Committees should be aware of their right to nominate Corresponding Members to working groups.

- iii) The U.S.S.R. National Committee had requested that at least one year's notice should be given of working group meetings. Although sympathizing with the needs of Soviet scientists for such long notice, the General Meeting of SCOR responded that Chairmen should bear this problem in mind and be encouraged to give as much notice as possible, but that it was not practical to rigidly enforce any predetermined period of advance notice.
- iv) It was noted that after the Fifteenth General Meeting, the SCOR Secretariat would be housed at the Department of Oceanography, Dalhousie University, Halifax, Nova Scotia, and that Mrs. E. Tidmarsh had been appointed to the position of Executive Secretary.
- v) The General Meeting stressed the importance to SCOR of maintaining effective communication with component bodies of ICSU, other than the affiliated bodies of SCOR and suggested that whenever possible the President should attend ICSU General Assemblies and other appropriate ICSU meetings.

## **2.0 SUBSIDIARY BODIES**

### **2.1 Arising from Former Working Groups**

#### **WG 36, Coastal Upwelling Processes**

The preparation of a review of physical aspects of coastal upwelling was proceeding slowly. This was largely due to the need to await completion of recent work and the outcome of a recent symposium. A number of publishers had expressed interest in the proposed review.

Professor W. S. Wooster was invited to undertake responsibility for pursuing, with the author, the early preparation of material and of keeping the SCOR Executive Committee informed of progress.

### **2.2 Existing Working Groups**

#### **WG 10, Oceanographic Tables and Standards (with ICES and UNESCO) (IAPSO)**

The General Meeting welcomed the preliminary report of the meeting of WG 10 held in Sidney, British Columbia, 1-5 September, 1980 (Annex III). Dr. N. P. Fofonoff presented the main results, emphasizing the careful work which had led to the new definition of the Practical Salinity Scale 1978 and the new Equation of State of Sea Water.

The meeting expressed its appreciation of the efforts by those who had contributed to this important work. Considerable discussion followed on the recommended values of Practical Salinity: though several members regretted the demise of the o/oo symbol and others would have preferred the Practical Salinity to have been expressed in kg/kg, it was finally decided to endorse the first recommendation of the working group.

After careful consideration, the General Meeting recommended that the new equation be called 'The International Equation of State of Sea Water, 1980'.

Arrangements for the orderly and simultaneous introduction of the Practical Salinity Scale and the new Equation of State of Sea Water were discussed. This had been made more difficult by the publication, in January 1980, of a special edition of the *IEEE Journal of Oceanic Engineering* devoted to the Practical Salinity Scale, 1978. It was agreed that efforts be made to get the new equations used for all values published on and after 1 January, 1982.

Editors would be asked to publish such a recommendation and to consider indicating, for an appropriate interval of time thereafter, that values published in their journals are given in the new scales. It might be possible to include such a recommendation in the packaging of ampoules of Standard Sea Water.

It was noted that UNESCO had agreed to publish in the *Technical Papers in Marine Science*, the final report of the Sidney meeting which will include the definitions of the new salinity scale and equation of state and the background material of published and unpublished papers and data reports, and this was welcomed by SCOR, since it will ensure a wider circulation to interested scientists.

In view of the likelihood that a group concerned with Oceanographic Standards would be needed permanently, the General Meeting agreed that WG 10 be reconstituted as a continuing standing committee of SCOR to be known as the Joint Panel on Oceanographic Tables and Standards to accord with the terminology used by ICES, UNESCO and SCOR. Drs. Gieskes (convenor), Millero, Poisson, Pytkowicz, Skirrow, Dyrssen and Bates were asked to serve as a nucleus of this panel, to recommend other members and to plan the future work of the panel. It was suggested that WG 51 might become a sub-group of this panel.

#### **WG 34, *Internal Dynamics of the Ocean* (IAPSO)**

The Chairman's report was received (Annex IV) and discussed at some length, together with communications which had been received from Dr. K. N. Fedorov and Professor Monin. However, in their absence it was not possible to resolve some of the points they had raised, and further discussion was deferred until the next meeting of the Executive Committee.

It was agreed that Professor Boris Nelepo (U.S.S.R.) and Dr. V. Kamenkovich (U.S.S.R.) be invited to become members of the working group.

#### **WG 42, *Pollution of the Baltic* (with ICES) (IABO and IAPSO)**

The report of the meeting of the group in Copenhagen from 20 to 21 February, 1980 has been produced by ICES as paper C.M. 1980/E:5. Copies of the full report can be obtained from ICES.

Following an invitation from the SCOR Executive Committee, the Chairman of WG 42 had provided a summary of the results of the study of the pollution of the Baltic, promoted by WG 42 (see Annex V). A final workshop on the Baltic Open Sea Experiment (BOSEX) will be held in Copenhagen in October 1980 during the ICES Statutory Meeting.

To reflect changes in emphasis to modelling, coastal dynamics and assessment of the marine environment, the group has recommended new terms of reference. These will be reviewed by ICES whose views will be transmitted, in due course, to the SCOR Executive Committee for consideration. Separate mechanisms may be evolved within ICES for long-term monitoring.

A meeting of the group in February 1981 was approved.

#### **WG 44, *Ocean-Atmosphere Materials Exchange* (IAMAP and IAPSO)**

The Chairman, Dr. R. Chesselet, reported that, with the help of Professor Prospero, the report of the 1979 meeting had been edited and would be submitted shortly to UNESCO for publication in the series *Technical Papers in Marine Science*.

The Chairman, after consulting a number of the members of WG 44 and the SCOR Executive Committee Reporter, had concluded that it would be more appropriate and timely for their proposed workshop to be held in 1982 than in association with the IAMAP Scientific Assembly in 1981. This proposal was approved.

The workshop, with about 25 participants, will concentrate on:

- a) Photochemistry at the Air/Sea Interface;
- b) Microbiology at the Air/Sea Interface; and
- c) Remote sensing, for the Air/Sea Interface.

**WG 46, *River Inputs to Ocean Systems* (with ECOR, IAHS, ACMRR and UNESCO) (CMG, IAPSO and IABO)**

Following a proposal by Professor D. Lal, the President had appointed Dr. J. D. Burton (UK), as Chairman. The General Meeting expressed thanks on behalf of SCOR to Professor Lal for his services as Chairman which had led to the successful workshop in March 1979.

SCOR urged IOC to do everything possible to ensure early publication of the proceedings of the workshop which have been edited by Dr. J. M. Martin, with the assistance of Messrs. J. D. Burton, D. Eisma and R. C. Griffiths.

Noting that the new Chairman had proposed that the group should now direct its attentions to specific objectives, such as the evaluation of present knowledge and the identification of future priorities, possible new terms of reference were approved as follows, subject to discussion with the other sponsors:

1. To assess those processes that alter the river-borne materials in the estuarine zone, such as inorganic precipitation and biological transformations.
2. To identify gaps in knowledge about fundamental processes in river-ocean systems such as the proper determination of river fluxes to the oceans, and the need to analyze particularly important rivers for such information.
3. To propose a strategy for annual collection of data on dissolved and particulate river fluxes and to promote international co-operation in these pursuits.

The membership and sponsorship of this group will be changed to accord with these terms of reference but it was recommended that the new group interact appropriately with the IAPSC Marine Chemistry Commission.

**WG 47, *Oceanographic Programmes During FGGE* (IAMAP and IAPSO)**

The Chairman, Professor H. Stommel, supported by representatives of the Atlantic and Indian Ocean panels, presented a brief review of the achievements of the oceanographic programs during FGGE. A report from the Chairman is given in Annex VI.

A proposal by the working group to hold a final four-day workshop of all three panels in late April 1981, probably in Venice, was approved. It was noted that this final meeting might propose that SCOR establish a mechanism, possibly a new working group, to permit continued consultation on scientific problems of the equatorial regions of the oceans.

SCOR commended highly the effectiveness of planning of oceanographic programs during FGGE by WG 47, and agreed that the group might be disbanded after its final workshop.

Dr. S. Morcos, the representative of IOC, drew attention to the report of the April 1980 Joint IOC/WMO meeting on the evaluation of IGOSS support to FGGE, particularly to recommendations 16, 17 and 25 of that meeting, and to a recent IOC/WMO publication entitled *A critical review of IGOSS activities during FGGE*.

**WG 51, *Evaluation of CTD Data* (IAPSO)**

The group's first objective is to produce for CTD users a systematic account of the sensors, their characteristics and their errors, the methods of *in-situ* and laboratory calibration, as well as a guide to methods of data analysis.

Draft chapters developed by individual members, and outlined in a previous report, are being critically read by other members. These are to be revised prior to a meeting of the group, at present planned for 1982.

There has been no meeting this year although the Chairman has worked with several of the members during a visit to Canada and the U.S.A.

#### **WG 52, *Estimation of Micro-Nekton Abundance* (with ICES, SCAR and ACMRR) (IABO)**

A successful symposium on the Estimation of Micro-Nekton Abundance was held in Idyllwild, U.S.A. from 28 to 30 April, 1980. The proceedings of this symposium are being prepared for publication in the UNESCO series *Monographs on Oceanographic Methodology*. UNESCO was asked to make every effort to ensure publication as early as possible after receiving the manuscript.

It was agreed to recommend to UNESCO that Dr. D. Tranter (Australia) and Dr. R. J. Lebrasseur (Canada) be invited to serve as reviewers on behalf of SCOR.

As it appeared that this group had completed its terms of reference, it was agreed that it be disbanded, but that the members be invited to assist as necessary with the preparation of the publication.

#### **WG 54, *Southern Ocean Ecosystems and Their Living Resources* (formerly *Living Resources of the Southern Oceans*) (with SCAR, IABO and ACMRR)**

A progress report was received from the Chairman, Prof. El-Sayed, (Annex VII).

The change of title in this group was approved as indicated above.

The General Meeting of SCOR noted the great effort that had gone into planning the first BIOMASS experiment (FIBEX) in early 1981 which will be the largest multi-ship experiment in biological oceanography ever mounted. It was also noted that the group still had to resolve the problems of handling the mass of biological data that would result from the program and the need to plan, for the first time, an international biological data system. SCOR stressed the importance of this question, which would receive further consideration within SCAR.

SCOR again supported the scientific importance of the BIOMASS program but proposed that, after preliminary consideration of the results of FIBEX, it would be desirable to develop new scientific concepts and a new program plan for future years. It was noted that the workshop proposed under item 2.3 should help in this respect.

SCOR noted that at a diplomatic conference in May 1980, a *Convention on the Conservation of Antarctic Marine Living Resources* was signed. After ratification, which might be achieved in about two years, SCOR (and SCAR) should maintain liaison with the Commission to be set up under the Convention.

#### **WG 55, *Prediction of El Niño* (IAPSO and IAMAP)**

A progress report was received from the Chairman, Professor D. Stuart. No formal meetings were held in 1979, but approximately half of the working group members met while attending the IUGG meeting in Canberra in December 1979. It was decided that WG 55 should work with the SCOR/IOC Committee on Climatic Changes and the Ocean (CCCO), but that WG 55 should remain separate from CCCO as El Niño is a distinct problem. It was further decided at Canberra that the archiving of one sea surface temperature value per day for each grid box ( $\frac{1}{4}^{\circ}$  lat  $\times$   $1^{\circ}$  long) from  $5^{\circ}$  N to  $15^{\circ}$  S over the Pacific was a manageable request.

In Canberra WG 55 determined that its members would not be able to arrange a meeting during 1980 although the SCOR Executive had given approval for a meeting to be held in Florida. A full meeting of WG 55 in January 1981 in San Diego, California, during the First Conference on Climate Variations was approved instead. The agenda for this meeting will deal with the topics defined for future work in the December 1979 meeting and with reports on interactions with related groups. In November 1980, the Chairman will be attending the First Session of the ERFEN Scientific Committee in Lima, Peru, and the Second Session of the Joint IOC/WMO/CPPS Working Group on Investigations of "El Niño" in Guayaquil, Ecuador. Other members attended the recent EPOCS-NORPAX Data Display Workshop in La Jolla, California.

### **WG 56, *Equatorial Upwelling Processes* (IAPSO, IAMAP and IABO)**

A report of the meeting in Seattle, 11-13 February 1980 is given in Annex VIII. A report submitted by the Chairman, Dr. H. Rotschi, drew attention to the main conclusions of the meeting.

It has been proposed to IAMAP and IAPSO, on behalf of WG 56, that a symposium on Low-latitude Coupled Ocean-Atmosphere Circulations be convened at the XVII General Assembly of IUGG in Hamburg in 1983 on the following topics:

- a) Upwelling processes occurring along the equator.
- b) Dynamics of monsoon-wind regimes.
- c) Stability of tropical currents.
- d) Eddies and waves in the tropical ocean and atmosphere.
- e) Large-scale ocean-atmosphere interactions.
- f) Present and future instrumentation.

A meeting of WG 56 in Paris in April 1981 was approved.

### **WG 57, *Coastal and Estuarine Regimes* (with UNESCO and ECOR) (IAPSO)**

The working group met in December 1979 in conjunction with the IUGG meeting in Canberra, Australia. The report to the Kiel meeting published in *SCOR Proceedings*, Volume 16, gives full details. Members are progressing with plans for the publication of the monograph series on coastal and estuarine regimes. They are planning to hold a meeting in 1981 as approved at the Kiel meeting. It was proposed to hold the meeting in conjunction with another meeting in order to hold costs to a minimum, possibly at the IAMAP Hamburg meeting or at the symposium on lagoons in Bordeaux in September 1981. The group also planned to arrange discussion with the authors of the monographs at the same time.

These proposals for a meeting in 1981 were approved but the group should be asked to provide a list of the proposed titles and authors of the monograph and to outline more clearly its plans for the future, taking into account the activities of WG 46 and 61.

### **WG 58, *Arctic Ocean Heat Budget* (IAPSO and IAMAP)**

The Chairman, Dr. Foldvik, wrote that he had received a number of comments on the group's report of June 1979. Two major field experiments, YMER-80 and EUBEX, relevant to the interests of WG 58, were underway or planned. WG 58 is co-operating with ICES in studying problems of Arctic bottom water formation and spreading. It was agreed to continue the group for two years.

### **WG 59, *Mathematical Models in Biological Oceanography* (IABO)**

The manuscript of *Mathematical Models in Biological Oceanography* had been submitted to UNESCO for publication in the series *Monographs on Oceanographic Methodology*.

As a result of endeavours by members of the group to secure financial support for the proposed symposium in 1982 on *Flows of Energy and Materials in Marine Ecosystems: Theory and Practice*, the NATO Science Committee had agreed to provide up to \$40,000. The format of the meeting is to be an Advanced Study Institute.

SCOR agreed to support the 1982 meeting and to provide financial support to enable the organizing committee to invite contributors from non-Nato countries.

### **WG 60, *Mangrove Ecosystems* (with UNESCO) (IABO)**

The report of the meeting of the group in Port Moresby in May 1980 is given as Annex IX.

SCOR was pleased to note the progress with the production of the handbook, entitled *Mangrove Ecosystems Research Methods*, which will be included within the UNESCO series *Monographs on Oceanographic Methodology*.

The group was reminded that SCOR had earlier stated that if the group chose to develop a questionnaire for the identification of current research work this could be done within the original terms of reference. Therefore, a third term of reference had been considered unnecessary (see *SCOR Proceedings*, Vol. 15).

Although SCOR recognized the importance of the application of research to management and conservation, it was not considered that this was a task appropriate for SCOR, but that it lay more within the competence of UNESCO. SCOR was of the opinion that a Mangrove World Atlas was a matter for consideration by UNESCO. Thus, the proposals of the group for additional terms of reference were declined. The group was, however, encouraged to complete the preparation of the handbook and thus discharge its present terms of reference.

Subsequent to the General Meeting, the Chairman, Professor Snedaker, reported with great regret, the death of Professor Valentine J. Chapman, who had made extraordinary contributions to the mission of Working Group 60.

#### **WG 61, *Sedimentation Processes at Continental Margins* (CMG)**

Professor Simpson reported that this group is preparing for a symposium to be held at the JOA which will review existing knowledge on sedimentation processes at continental margins. The working group will hold a meeting in 1981 to prepare for this symposium. Four new members have been invited to join the group.

#### **WG 62, *Carbon Budget of the Ocean* (IAPSO and IAMAP)**

The report of this working group is in press at UNESCO. It was agreed that the group should remain in existence until this publication appears.

#### **WG 63, *Marine Geochronological Methods* (CMG)**

The Chairman, Dr. W. Hay, noted several advances in methods and instrumentation, particularly the development of hydraulic piston corers which are yielding a great deal of new geochronological information. The working group is planning a symposium on this subject for the JOA and requested financial support for an organizational meeting in 1981. This request was approved.

#### **WG 64, *Oceanic Atoll Drilling* (CMG and IABO)**

It was noted that this working group is organizing a symposium in November 1980 in Atlanta during the Geological Society of America annual meeting. The title of the symposium is "Atolls as recorders of sea-levels and the vertical tectonics of lithospheric plates". The working group will prepare a final report after this meeting.

#### **WG 65, *Coastal Off-Shore Ecosystems Relationships* (with UNESCO) (IABO)**

The following terms of reference for this working group were approved:

- i) To review and compare the energetics of coastal (littoral and estuarine) and offshore pelagic and benthic populations.
- ii) To suggest methods for improving knowledge of energy conversion between coastal and offshore pelagic migratory and benthic populations and to determine what further research is needed.

The members of the group, chaired by Dr. J. J. Zijlstra (Netherlands), are:

Professor B. -O. Jansson (Sweden)  
Professor P. Lasserre (France)

Dr. A. D. McIntyre (UK)  
Dr. R. C. Newell (UK)  
Professor S. W. Nixon (U.S.A.)  
Dr. M. M. Pamatmat (U.S.A.)  
Professor Dr. B. Zeitzschel (F.R.G.)

The working group will begin its work by correspondence, but has requested support for a meeting in September 1981. It was suggested that this could be combined with the UNESCO Symposium on Coastal Lagoons in Bordeaux and the UNESCO also be asked to support the working group meeting.

UNESCO has been added to the list of sponsoring organizations for this working group.

### **2.3 Committees etc.**

#### ***SCOR/IOC Committee on Climatic Changes and the Ocean (with IOC) (IAMAP and IAPSO)***

Dr. Revelle introduced his status report on the activity of CCCO (Annex X). The General Meeting welcomed the increasing activity being devoted to this important subject and hoped that commensurate funding would be made available, partly by the co-sponsorship of IOC and partly by ICSU, possibly through the proposed agreement between ICSU and UNESCO which ICSU had agreed to pursue. Appreciation was expressed to ICSU for its grant of \$20,000.00 for CCCO activities in 1981.

The General Meeting welcomed the appointment of Mr. B. Thompson as secretary to CCCO and expressed its appreciation of the U.S. agencies who had made his services available. The WMO representative expressed the hope that the oceanographic and the meteorological aspects of the WCRP would be fully integrated and thought that Mr. Thompson could appropriately be based at WMO in Geneva. There was, however, another view that IGOSS and other IOC activity would benefit from having the CCCO Secretary at IOC in Paris. The IOC representative expressed the hope that Dr. Revelle would discuss the facilities that would be needed by the secretariat with Dr. Ruivo in the near future.

In view of the possible overlap between WCRP related programs of CCCO and SCAR, it was agreed to invite SCAR to nominate a member of the CCCO Sea-Ice panel, to effect liaison.

It was noted that the POMS report of the October 1979 meeting is now available and that a report of the CCCO meeting in Miami in October 1979 can be expected soon.

In view of the overlapping spheres of interest between CCCO and a proposed new working group on North Atlantic Circulation (see item 2.4) SCOR suggested that the chairman of this new group should be a corresponding member of CCCO.

#### ***Review Group for Antarctic Oceanography***

A report was received from the convenor, Dr. T. D. Foster. The group will be discussing the content of an interdisciplinary half-day symposium at JOA but also wished to arrange a separate workshop of a few days in 1982 or 1983, specifically to discuss how best to enhance the interaction between physical, chemical and biological oceanographers in studying the Antarctic marine environment. SCOR supported strongly this proposal and agreed to invite the collaboration of SCAR in promoting the workshop.

#### ***GATE Atlas Editorial Board***

Dr. F. Ostoppoff displayed advance copies of *Physical Oceanography of the Tropical Atlantic During GATE* (previously referred to as *GATE Oceanography Atlas*) and reported that printing would be completed by the end of 1980. Copies will be available from IOC.

Dr. Ostoppoff and the members of the Editorial Board were warmly thanked for all their work in producing the material for this publication. Appreciation was expressed to IOC and WMO for having financed the printing.

## 2.4 Proposals for New Working Groups

### *Oceanic Turbulence*

Details of terms of reference and proposed membership for a new working group on turbulence in the ocean will be circulated to National Committees for consideration.

### *Oceanographic Applications of Drifting Buoys*

The establishment of a working group with the following terms of reference was approved:

- i) To review and summarize the existing technological knowledge on drifting buoys.
- ii) To identify the technological problems needing further investigations, in the laboratory as well as at sea, and the oceanographic institutions willing to work on them.
- iii) To advise on the standardization of buoy and sensor characteristics in order to obtain comparable results under comparable conditions at sea.
- iv) To review and summarize the oceanographic results obtained with the drifting buoys method since circa 1972.
- v) To advise on the best ways of using this method for the study of oceanic surface circulation on meso and planetary scales.
- vi) To advise on regions of the world ocean where drifting buoy data is most needed to supplement observations of other types.

Several comments were received on the composition of this working group and a final decision on its membership was referred to the Executive Committee which will encourage this group to begin its work as soon as possible. Note was taken of IOC Resolution EC-XIII-10 and the possibility of support for this working group through IOC. This will be WG 66.

### *North Atlantic Circulation*

The National Committee of the Federal Republic of Germany presented a proposal for a new working group on North Atlantic Circulation. The membership suggested for this group includes several members of other groups with overlapping interests (CAGE, CCCO, WG 47, ICES, etc). It was agreed that this group should be established by SCOR and that the Executive Committee would forward the proposed terms of reference and membership to ICES, IAPSO and IAMAP with invitations to co-sponsor, and to the National Committees of SCOR for consideration and comment. This will be WG 68. Mr. Tambs-Lyche suggested that ICES may be able to provide some secretarial support for this group.

### *World List of Marine Animals and Plants*

A proposal by the Netherlands National Committee for a working group to compile a world list of marine plants and animals is being considered by IABO. Response to the proposal has been largely favourable but concern has been expressed about whether this task is appropriate for a SCOR working group. IABO will consider the proposal further and will inform the SCOR Executive Committee of its decision.

### *Particulate Biogeochemical Oceanic Processes*

The President of IAPSO presented a draft proposal for terms of reference for a new working group on Particulate Biogeochemical Oceanic Processes. It will be circulated to National Committees for comment and suggestions as to membership before the next meeting of the Executive Committee.



### ***Remote Measurement of the Oceans from Satellites***

The formation of a new working group on this topic was suggested jointly by the representatives of URSI and COSPAR. Their written draft for terms of reference and a proposal for membership will be circulated to National Committees before the next Executive Committee meeting. Dr. Apel (URSI) noted that many of the suggested members already meet quite frequently on other matters.

### ***Oceanography, Marine Ecology and Living Resources***

In response to IOC Resolution XI-17, entitled "*Ocean Sciences in Relation to Living Resources*", immediate formation of a new working group was approved, with the following terms of reference:

- i) Assess present understanding of the mechanisms through which variability in the physical-chemical marine environment affects the biological productivity of the ocean and the abundance and distribution of living marine resources.
- ii) Based on this assessment, identify promising directions and possible priorities for relevant research.
- iii) Consider appropriate regional research projects and related activities that could interest and benefit countries of those regions.
- iv) Formulate advice from SCOR to the Intergovernmental Oceanographic Commission on the above aspects of the IOC Resolution XI-17 *Ocean Sciences in Relation to Living Resources*.

Professors Wooster and Hempel and Dr. Longhurst agreed to meet as soon as possible to resolve the question of membership and a plan of action for this working group to be known as WG 67.

## **2.5 Executive Committee Reporters**

At an Executive Committee meeting held immediately after the XV General Meeting, the following reporters were appointed:

Professor Henry Charnock	34, 51, CCCO
Professor Gerold Siedler	47 (66) (68)
Dr. Torben Wolff	42, 60, Antarctic Review Group
Dr. Alan Longhurst	54 (67)
Professor Timothy Parsons	52, 59, 65
Dr. Warren Godson	44, 55, 58
Professor Devendra Lal	JPOTS
Professor Hendrik Postma	46, 57, 62
Professor Kenneth Hsü	61, 63, 64
Dr. K. Fedorov	56, Editorial Panel on Physical Aspects of Upwelling

## **2.6 SCOR Scientific Rapporteurs**

### ***Marine Pollution***

A written report from Dr. B. Dybern, the SCOR Scientific Rapporteur on Marine Pollution, on the XIth Meeting of GESAMP, Dubrovnik, February 25, to March 1, 1980 was approved and is given in condensed form as Annex XI. A brief report on general aspects of marine pollution is given in Annex XII.

### ***Mathematical Modelling***

Since the *Ocean Modelling Newsletter* is now well established, the General Meeting agreed that it is no longer

necessary to have a Rapporteur for the subject of Mathematical Modelling. Strong support for continuation of this valuable newsletter was expressed.

### ***Coastal Research***

The need for Rapporteur on Coastal Research problems will be reviewed after the UNESCO/SCOR meeting on Coastal Lagoons in Bordeaux.

## **3.0 RELATIONS WITH INTERGOVERNMENTAL ORGANIZATIONS**

### **3.1 IOC**

Resolutions of the IOC Executive Council, 13th session, 23-28 June 1980 of interest to SCOR were noted. IOC Resolutions EC XIII-7 and EC XIII -9 related to CCCO had been previously dealt with (c. f. item 2.3).

IOC Resolution EC XIII-10 was considered and the General Meeting approved the formation of a new SCOR working group (c. f. item 2.4) entitled *The Oceanographic Applications of Drifting Buoys*.

IOC Resolution EC XIII-6 invites SCOR to designate a member of the IOC Scientific Review Board currently being reconstructed. Dr. Strömberg, who was Chairman of the nomination committee for the board, explained that identification of membership had been postponed mainly because the IOC Executive wanted an opportunity to consider a better geographical distribution of membership. Members of the former Scientific Advisory Board were subsequently asked to serve as an interim Scientific Review Board. SCOR accepted the invitation to send a representative to the meeting of the board to be held in Paris from 2-6 February, 1981, but identification of a SCOR member was postponed until more information was available about the members of the board being appointed by IOC.

SCOR thanked IOC for having drawn to the attention of SCOR the proposed revised terms of reference for the IOC programme group for the Southern Oceans which were noted.

In response to IOC Resolution XI-17, SCOR approved the formation of a new working group (c. f. item 2.4) entitled *Oceanography, Marine Ecology and Living Resources*.

It was noted that the Chairman of IOC is intending to invite the Presidents and Secretaries of the IOC advisory bodies to a meeting in Paris to discuss ways of improving future cooperation between the IOC and its advisory bodies.

### **GIPME**

At the invitation of the Executive Committee, as a consequence of a request to SCOR from the IOC WC GIPME, Dr. A. D. McIntyre through ICES, had provided a statement related to actions which might usefully be taken by SCOR and/or other international organizations to promote the monitoring of marine pollution through the analysis of its effects on various parameters including biological tissues, sediments, seawater, etc. (Annex XIII).

SCOR agreed to advise IOC that at this stage no single monitoring method had been identified as being reliable. The 1979 ICES workshop had identified some 40 possible techniques and Dr. McIntyre proposed that the most useful contribution that could now be made would be to encourage laboratories to apply these suggested techniques extensively and for appropriate international bodies to organize a workshop in about two years to synthesize and assess the results.

Appreciation was expressed to Dr. B. Dybern for his prompt report on the 8-12 September 1980 meeting of the IOC/GIPME Group of Experts on Methods Standards and Intercalibration (GEMSI). Annex XIV.

SCOR will ask IOC to accept Dr. Dybern as a permanent SCOR nominee on this group of experts. If that is not possible IOC should be asked to ensure that all GIPME papers are sent to Dr. Dybern.

### 3.2 UNESCO

i. With the approval of the Executive Committee, the President has accepted an invitation from UNESCO for SCOR to co-sponsor the International Symposium on Coastal Lagoons which will be held in Bordeaux, 8-14 September 1981. Professor Postma is the President of this symposium.

ii. With financial support from UNESCO a second phytoplankton course for experienced participants was held at the University of Oslo from 21 July to 9 August 1980.

iii. The UNESCO/IOC representative explained the reasons for some of the delays which have been experienced in the publication process at UNESCO. He requested that authors give more attention to the careful preparation and editing of manuscripts before submitting them to UNESCO so that extensive correspondence is avoided.

iv. The question of a distinction between the scientific research program and the technical assistance programs undertaken by the UNESCO Division of Marine Science was again discussed. Recent correspondence had helped to identify those activities of SCOR which were of particular interest to the Division of Marine Sciences. SCOR re-stated its willingness to assist at any time with the formulation of scientific programs. The President of SCOR will establish and maintain the closest possible personal contact with the Director of the UNESCO Division of Marine Sciences.

### 3.3 ACMRR/FAO

The new Executive Committee was urged to explore ways in which SCOR might work with ACMRR on areas of common interest. The representative of FAO was asked to communicate this concern to the President of ACMRR.

### 3.4 WMO

The Executive Secretary will provide the WMO with an appropriate distribution list for the WCP Newsletter.

### 3.5 ICES

The first prospectus of the ICES/SCOR symposium on Biological Productivity of Continental Shelves in the Temperate Zone of the North Atlantic has been distributed.

The General Meeting approved the principle of an exchange of letters between the Presidents of SCOR and ICES which would formalize the working relationship between the two organizations. A draft of this letter proposed by ICES was subsequently approved, with minor changes, by the incoming Executive Committee.

### 3.6 UNCLOS

Professor Currie drew attention to the fact that the latest revision of the Informal Composite Negotiating Text was headed 'Draft Convention' and apart from very minor amendments it was likely to be the basis of the Convention which would be signed at the final session of UNCLOS in 1981. He suggested that SCOR now consider what assistance, if any, it could provide to marine scientists to facilitate research under the new regime. He reported that the British National Committee was considering preparing a summary and interpretation of the text as it would affect oceanographers and Professor Wooster reported that a more extensive study of the text was being initiated in the U.S.A.

It was agreed that the Executive Committee should consider carefully what role SCOR might play to minimize difficulties for marine scientists both on its own and in collaboration with IOC which, by resolution EC-XIII-16 was establishing an *ad hoc* task team to undertake a study of functions appropriate for IOC. These might include preparation of an annotated table of the provisions of the Draft Convention relevant to the Commission.

Professor Revelle, Sir George Deacon and Dr. D. E. Hurley noted the important influence of administrators in the marine affairs of many developing nations where scientific expertise may be unavailable for advising local governments. The importance of training programmes for these administrators should not be overlooked and these might

include particular emphasis on the value of marine science to the developing countries whether undertaken by themselves or not. It was agreed that IOC and UNESCO might give greater attention to this although Dr. U. Lie, Chairman of IOC Working Committee for TEMA, reminded the participants that IOC has a programme of fellowships in marine affairs for administrators.

#### 4.0 RELATIONS WITH NON—GOVERNMENTAL ORGANIZATIONS

##### 4.1 Affiliated Organizations

###### *CMG*

A verbal report on the activities of CMG was given by the Chairman, Professor E. S. W. Simpson. A report from CMG is given as Annex XV.

###### *IABO*

A report on the activities of IABO was presented by Professor Parsons (Annex XVI). The next general meeting of IABO will be held in conjunction with JOA '82 in Halifax. It was hoped that future contacts between SCOR and the IUCN could best be made through the representative of IABO to IUCN.

###### *IAMAP*

A report to SCOR from IAMAP was presented by Dr. W. L. Godson (Annex XVII). A first circular for the Third Scientific Assembly of IAMAP to be held in Hamburg from 17-28 August 1981 has been prepared. This assembly includes several symposia of interest to oceanographers.

###### *IAPSO*

The President of IAPSO, Professor D. Lal, reported on recent activities of interest to SCOR. These include planning for the International Liège Colloquia for 1981 and 1982 on the Hydrodynamics of Semi-enclosed Seas and the Marine Hydrodynamics of the Equatorial Oceans respectively. IAPSO is co-sponsoring the Hamburg symposium on North Sea Dynamics and is involved in planning for the JOA '82 and the IUGG meetings in 1983.

##### 4.2 Corresponding Organizations

###### *ECOR*

SCOR members were invited to participate in the following meetings being planned by ECOR:

First Pan American Congress on Ocean Engineering/International Workshop on Coastal Engineering, 20-23 October 1980 — Mexico City.

ECOR Fourth General Assembly, 7-9 April 1981 — London. Technical session is entitled "*The Management of Oceanic Resources — The Way Ahead*".

*Directional Wave Spectra '81*, 14-16 September 1981 — Berkeley, California.

International Coastal Engineering Conference, November 1982 — Cape Town, South Africa.

###### *CMAS (SC)*

A report on the activities of CMAS is given in Annex XVIII.

### 4.3 ICSU

SCOR was represented at the 18th General Assembly of ICSU, in Amsterdam, September 1980, by Professor Postma. Note was taken of resolutions arising from this meeting which are of particular interest to SCOR.

Detailed consideration was given to Resolution 9 regarding ICSU's role in development and to possible action which SCOR might undertake in order to encourage marine science for development. In view of ICSU's action in strengthening programs in science and technology for development, the question of whether SCOR has directed enough attention to this problem was raised. Participants were reminded of detailed consideration on Training, Education and Mutual Assistance undertaken by the SCOR Executive Committee and by the Twelfth General Meeting of SCOR in 1974 (see *SCOR Proceedings*, Volume 10, No's. 1 and 2). The General Meeting confirmed the view, already expressed in correspondence with ICSU, that while SCOR wishes to encourage the development of marine science in all countries, it does not actively seek to foster such development because this can be better done by intergovernmental bodies, notably the IOC and the Division of Marine Sciences of UNESCO. SCOR assists, advises and cooperates with both of these bodies and includes scientists from developing countries in its activities whenever possible. In particular, attempts are being made to include them in the activities of CCCO.

Dr. Godson (President, IAMAP) suggested that whenever possible, SCOR should use its influence with UNESCO, the IOC and ICSU to ensure a high priority for marine science and in particular to specify those areas which are particularly relevant for development. In addition, the concerns and initiatives of SCOR should be clearly visible to the Third World nations so that they will be encouraged to increase their participation to SCOR activities.

### 4.4 ICSU Unions

Professor Goldberg reported that he and Dr. E. I. Hamilton (IUPAC) are identifying areas of common interest to SCOR and IUPAC and of groups in which SCOR might be represented. Professor Goldberg is a member of the IUPAC Division of Analytical Chemistry which is preparing a volume on the chemistry of natural waters which will appear in 1981.

### 4.5 ICSU Committees

#### **COSPAR**

The COSPAR/SCOR/IUCRM *Symposium on Oceanography from Space* was held in Venice in May 1980. The Proceedings of this symposium will be published by Plenum Press in early 1981 and are to be dedicated to the work of Gifford Ewing.

Dr. Gower was thanked for his efforts on SCOR's behalf and the use of the unspent balance of funds which were originally committed for support of the symposium, to offset costs of publication of the Proceedings was approved.

Dr. Gower noted that increased international cooperation in satellite programs could result in even greater benefits for scientists and expressed the hope that the proposed new working group (see item 2.4) would help achieve this goal.

#### **IUCRM**

A meeting entitled "Wave Dynamics and Radio Probing of the Ocean Surface" will be held in Miami, 13-20 May 1981. Sir George Deacon is Honorary Chairman of the organizing committee for this meeting. It was agreed that SCOR should offer to co-sponsor this symposium.

#### **SCOPE**

Professor Goldberg reported that the SCOPE project on coastal zones proposes to use a variety of marine organisms as monitors of change in the chemical composition of coastal waters as a result of the entry of land-based pollutants into these areas. This was seen to be an extension of the previous "mussel watch" program and will

include the organization of a symposium on the project in about two years time. The earlier view of the SCOR Executive Committee was repeated: SCOR need not be involved in this program, but hopes to be kept informed by SCOPE as plans for the symposium develop.

## **SCAR**

Following a request from governments for advice on certain environmental problems, SCAR had sought guidance from ICES, GESAMP, IOC and SCOR on methods for determining baseline levels of pollutants in the Antarctic marine environment. It was agreed that should SCAR decide to proceed with establishing a program, SCOR would be pleased to assist.

A number of SCOR members would be attending the XVI meeting of SCAR in October 1980 and would represent SCOR's interests.

## **IAHR**

A symposium on the mechanics of oil slicks will be held in Paris, 7-9 September 1981.

## **5.0 FUTURE MEETINGS**

### **5.1 SCOR Executive Committee Meetings in 1981**

The incoming Executive Committee agreed that it will be desirable to hold two Executive meetings before the JOA in Halifax in 1982. The first will be held in April or May, 1981, the second in January, 1982.

### **5.2 XVI General Meeting and JOA Halifax, 2-13 August 1982**

Professor Simpson presented a detailed plan for the scientific program for JOA '82 which incorporated a basic list suggested by Dr. Fedorov and suggestions received from Affiliated Organizations and National Committees.

The draft plan conformed to that outlined by the Executive Committee at its January 1980 meeting and includes general, special and association symposia. The special symposia should provide a forum for SCOR working groups to present the results of their activities, while the association symposia should provide an opportunity for reports of new developments in oceanography by active scientists. Special mention was made of the excellent facilities for poster displays at Dalhousie University and it was agreed that symposium convenors and speakers should be encouraged to take advantage of them.

A Scientific Program Committee consisting of Dr. W. W. Hay as Chairman, the Presidents of the Affiliated Organizations of SCOR, a representative of the Canadian National Steering Committee (Dr. C. J. R. Garrett) and the Chairman of the IOC Logistics Committee (Dr. M. Ruivo), was established. ICES was invited to appoint a liaison representative.

Mr. G. N. Ewing reported that the Canadian government will undertake publication of the abstracts for the JOA and that consideration is also being given to publication of the conference Proceedings by the same office.

It was agreed that Dr. Hay will act as the representative of SCOR on the IOC Logistics Committee for the JOA. Note was taken of the fact that 1982 will be the centenary of the first International Polar Year, the fiftieth anniversary of the second Polar Year and the twenty-fifth anniversary of the International Geophysical Year. These events will be commemorated at the JOA in an appropriate manner.

### **5.3 Other Meetings**

A symposium on North Sea Dynamics will be held at Hamburg from 31 August to 4 September 1981. It was approved that this symposium will be co-sponsored by SCOR. Other proposed sponsors include IAPSO, IABO and ICES.

A draft first circular announcing a symposium entitled *Sandy Beaches as Ecosystems* was presented by the South African representative. This symposium is to be held in Port Elizabeth, South Africa, probably in April 1982 and approval was given to SCOR co-sponsorship.

A workshop on *Identification of Cephalopod Beaks* is to be held from 1-14 June 1981 in Plymouth, U.K., with support from SCOR, SCAR and the International Whaling Commission.

#### **5.4 International Liège Colloquia**

A request from Professor J. C. J. Nihoul for SCOR co-sponsorship for these colloquia was discussed. It was agreed that adequate representation of SCOR already exists through the sponsorship of the International Liège Colloquia by IAPSO.

In closing the meeting, Professor Postma expressed the appreciation for the hospitality and facilities provided by the Woods Hole Oceanographic Institution and its Director, Dr. John Steele.

The incoming President, Professor E. S. W. Simpson, extended thanks to all members of the outgoing Executive Committee for their services to SCOR. Special mention was made of the many contributions of Professors R. I. Currie, K. N. Fedorov, W. S. Wooster, and H. Postma and by Mr. G. E. Hemmen, during his eight years as Executive Secretary.

## ANNEX I

### FIFTEENTH GENERAL MEETING OF SCOR

#### Participants

#### Members of the Executive Committee

*Professor H. Postma	Netherlands	Past President
*Professor G. Hempel	FRG	Vice-President
*Professor E. D. Goldberg	USA	Vice-President
*Professor P. Tchernia	France	Vice-President
*Professor Henry Charnock	UK	Secretary
*Professor R. I. Currie	UK	Co-opted Member
*Professor W. Wooster	USA	Co-opted Member
*Professor E. S. W. Simpson	IUGS/CMG	Ex-officio
*Professor T. R. Parsons	IUBS/IABO	Ex-officio
*Dr. W. L. Godson	IUGG/IAMAP	Ex-officio
*Professor D. Lal	IUGG/IAPSO	Ex-officio
Mr. G. E. Hemmen	UK/SCAR	Executive Secretary

#### Other Participants

*Mr. F. Anderson (South Africa)	*Dr. R. Marumo (Japan)
*Dr. John R. Apel (URSI)	Dr. J. Merle (France)
Professor D. J. Baker (USA)	Dr. S. Morcos (UNESCO/IOC)
*Professor B. Battaglia (Italy)	Mr. L. D. O'Quinn (Canada)
*Professor S. Calvert (Canada)	Dr. F. Ostapoff (USA)
*Professor R. Chesselet (France)	Dr. B. Patel (India)
*Mr. J. P. deWit (South Africa)	*Professor P. Polk (Belgium)
Sir George Deacon (UK)	Dr. J. L. Rasmussen (WMO)
Mr. G. Ewing (Canada)	*Professor R. Revelle (USA)
Dr. M. Fieux (France)	Admiral G. S. Ritchie (IHB)
*Dr. N. Flemming (CMAS)	Dr. B. Saint-Guily (France)
Dr. T. D. Foster (USA)	Mr. G. D. Sharp (FAO)
*Professor C. J. R. Garrett (Canada)	Dr. H. Sheets (ECOR)
Dr. J. Gower (COSPAR)	*Professor G. Siedler (FRG)
*Dr. W. W. Hay (USA)	Dr. J. H. Stel (Netherlands)
Dr. T. C. Hung (Taiwan)	*Professor J.-O. Strömberg (Sweden)
*Dr. D. E. Hurley (New Zealand)	Dr. J. C. Swallow (UK)
Dr. I. S. F. Jones (Australia)	Mr. H. Tambs-Lyche (ICES)
*Dr. V. C. Juan (Taiwan)	Mr. B. J. Thompson (CCCO)
Dr. K. Kitano (Japan)	Mrs. E. Tidmarsh (Canada)
*Dr. E. LaFond (IAPSO)	Professor J. S. Turner (Australia)
Dr. M. U. Lass (GDR)	*Dr. J. Van der Land (Netherlands)
*Dr. A. S. Laughton (UK)	Dr. R. C. Vetter (USA)
*Dr. U. Lie (Norway)	*Ing. F. Vila (Argentina)
*Dr. A. Longhurst (Canada)	*Dr. T. Wolff (Denmark)
	*Professor R. Wollast (Belgium)

\* = SCOR members



## ANNEX II

**SCIENTIFIC COMMITTEE ON OCEANIC RESEARCH  
STATEMENT OF INCOME AND EXPENDITURE  
(1 January to 31 December 1980)**

BALANCES 1 January 1980		\$	\$
London		31478.60	
Paris		9565.52	41044.12
INCOME			
National Contributions: Arrears	7120.00		
1980	65800.00	72920.00	
Contracts:			
IOC Contract 1979 (Final)	2000.00		
UNESCO Contract 1979 (Final)	10000.00		
IOC Contract 1980 (First)	18000.00		
UNESCO Contract 1980 (First)	9000.00	30000.00	
Grants:			
From UNESCO subvention through ICSU	4000.00		
ICSU grant	8000.00	12000.00	114920.00
			<u>\$155964.12</u>
EXPENDITURE			
Working Groups:			
10		5177.78	
42		1916.23	
47		6238.30	
52		12058.01	
54		7428.34	
56		4486.52	
59		1728.72	
64		1788.74	
CCCO		4506.83	
COSPAR/IUCRM/SCOR Space Symposium		1977.17	47306.64
Meetings:			
Ex 22		9614.55	
SCOR XV		14330.73	23945.28
Representation:			
GESAMP		894.76	
GIPME/GEMSI		2055.47	
GEBCO Guiding Committee		872.26	
Antarctic Convention Conference		491.25	4313.74
Publications:			
Vol 15 Supplement		86.60	
Proceedings Vol 16 No 1		522.31	
Proceedings Vol 16 No 2		3921.61	
Postage		1520.52	6051.04
Administration:			15795.23
			<u>97411.93</u>
Balances 31 December 1980			
Halifax		46193.60	
Paris		2355.16	
London		10003.43	58552.19
			<u>\$155964.12</u>

## ANNEX III

### WORKING GROUP 10 (with, ICES, IAPSO and UNESCO) JOINT PANEL ON OCEANOGRAPHIC TABLES AND STANDARDS (JPOTS)

The following constitutes the preliminary report of the meeting of the UNESCO/ICES/SCOR/IAPSO Joint Panel on Oceanographic Tables and Standards, held at the Institute of Ocean Sciences, Sidney, B.C., Canada, 1-5 September 1980.

#### 1. Purpose of the meeting

The meeting of the panel was called in order to draft a document on the "Practical Salinity Scale and the International Equation of State of Seawater". This work did occupy the bulk of the time of the meeting. Whereas during the meeting of the panel in Paris in 1978 (UNESCO 1979) there still were apparent discrepancies in the data for the one atmosphere equation of state, these differences have been resolved. Reports on the background data for the definition of practical salinity (Dauphinee 1980) as well as for the international equation of state will shortly be available in the form of UNESCO Technical Reports.

In addition to the drafting of the above-mentioned document, the meeting was intended to briefly review the panel's previous recommendations on various physical and chemical properties of seawater, as well as to outline further areas where attention should be focussed on more precise data or formulations of such properties.

#### 2. Conductivity and Salinity Definition

During the earlier meeting of the panel in Paris, 1978 (UNESCO 1979) the new definition of Practical Salinity was adopted, however, some further discussions on this topic were held during this meeting in order to refine the definition.

In particular the numerical values to be assigned to the Practical Salinity were considered. Although the panel realizes that absolute salinity in terms of SI units should be reported, for instance, as  $0.03523$  or  $35.23 \times 10^{-3}$ , the practical salinity can be most conveniently expressed as  $35.23$  rather than  $0.03523$ , thus yielding values 1000 times larger than salinities based on previous scales. A major reason for this decision was that the numerical values of Practical Salinity would be similar to the numerical values of previous salinity data.

The panel unanimously passed the following Recommendation:

##### ***Recommendation No. 1***

For reasons of simplification, the Joint Panel on Oceanographic Tables and Standards, during its meeting held at the Institute of Ocean Sciences in Sidney, B.C., Canada, from 1-5 September 1980, considers it more advantageous that the values of Practical Salinity will be expressed by numbers one thousand times larger than those used in previous definitions. Thus, in the new scale, which has been defined, the value of a practical salinity will be written, for instance, as  $34.527$  in place of  $0.034527$  which would have been obtained under previous usage.

The Joint Panel on Oceanographic Tables and Standards submits this rule for adoption by its sponsor organizations and requests that these organizations recommend the strict use of this concept in the future.

After some further discussion the definition as presented in an accompanying document was accepted.

#### 3. Equation of State of Seawater

Dr. F. Millero presented his efforts, together with Dr. A. Poisson, to resolve small differences in the one atmosphere equation of state of seawater (UNESCO 1979). These differences have now been overcome, and the definition of the International Equation of State of Seawater was presented.

#### 4. UNESCO Reports

The publication of the background data reports, as well as future Tables, was discussed and the following resolution was passed unanimously:

##### ***Recommendation No. 2***

The Joint Panel on Oceanographic Tables and Standards, during its tenth meeting, 1-5 September 1980, Sidney, B.C., Canada.

**Having adopted** the new definition of Practical Salinity Scale 1978 and the International Equation of State of Seawater, and recommended their use in future oceanographic work,

**Being aware** of the importance of communicating, as soon as possible, to the scientific community, the background and details of the research work involved, as well as the procedures, formulae and tables required for the application of the new Definition of Salinity and Equation of State:

##### **Recommends to UNESCO:**

- (1) The publication of future volumes of the International Oceanographic Tables comprising the following:
  - a) Conductivity ratio conversion to Practical Salinity
  - b) Derived properties from International Equation of State of Seawater.
- (2) The reproduction of the following papers in the series *UNESCO Technical Papers in Marine Science*:
  - Special Issue on the Practical Salinity Scale 1978, *IEEE Journal of Engineering*, Vol. OE-5, No. 1, January 1980.
  - Poisson: Technical report on concentration and conductivity measurements of KCL and seawater solutions (unpublished report).
  - Lewis and Perkin (1981): The Practical Salinity Scale 1978: Conversion of Existing Data, submitted to *Deep-Sea Research*, July 1980.

The publishers of the above journals are requested to give their approval to the reproduction of these papers by UNESCO.

- (3) The printing of the following Data Reports on the Equation of State of Seawater in the series *UNESCO Technical Papers in Marine Science*:
  - a) Summary of data treatment of one atmosphere equation of state by Millero and Poisson.
  - b) Summary of data treatment of high pressure equation of state by Millero, Chen, Bradshaw and Schleicher.

#### 5. Other Definitions/Equations

The panel reconfirmed its proposals on the following items:

##### (a) **Oxygen Solubility**

The formulae and tables (UNESCO 1970) for the solubility of oxygen in seawater are still recommended by the panel.

##### (b) **Freezing Point**

The panel supports the equation developed by F. Millero as published in UNESCO (1978).

(c) **Entropy of Seawater**

The panel noted the work of Millero and Leung (1976) on this matter (*Am. J. Science* **276**, 1023-1077). As little time was available nor extensive data sets, the panel could not discuss this matter in detail.

Other items were considered appropriate problems for consideration by the panel in the future, i.e.,

- a) Refractive index
- b) Heat capacity
- c) Adiabatic lapse rate
- d) Speed of sound — the latter especially because Professor Kroebel's laboratory will have more precise data available in the near future (about 2 years).

**6. Future Activities**

In addition to the above items, the panel will consider the thermodynamic information necessary for calculations in the oceanic CO<sub>2</sub> — CaCO<sub>3</sub> system. A working party has already been constituted (Drs. Gieskes, Millero, Poisson, Pytkowicz, Skirrow, Dyrssen, Bates) for these purposes and a meeting on this subject by this group plus, perhaps, a Japanese and Soviet representative, in July or August 1981 was proposed.

**7. Membership**

The panel proposes that the panel membership be re-constituted **after** the acceptance of its work on the definition of Practical Salinity and the International Equation of State of Seawater. The new membership should then represent the further interests and mandates of the panel.

8. The panel adjourned on September 4; the reports were written September 5 and subsequently checked by the membership.

9. A full report on the meeting is in preparation.

## ANNEX IV

### WORKING GROUP 34 INTERNAL DYNAMICS OF THE OCEAN Report from Chairman —/Professor A. R. Robinson

The major project being carried out at this time under the auspices of WG 34 is the preparation of the volume *Eddies in Marine Science*. The Table of Contents is presently organized into six sections: I. Introduction; II. Regional Kinematics, Dynamics and Statistics; III. Local Kinematic and Dynamic Experiments; IV. Models; V. Effect and Applications, and VI. Observational and Experimental Techniques. These sections contain 28 subsections or chapters in all. Progress is generally excellent towards the production of an authoritative contribution which will be substantially useful to the international scientific community. An editorial status report to authors (15 Sept. 1980) has been made available for information purposes to the Executive Secretary of SCOR. Several first draft manuscripts are in hand and most should be with the editor by the end of September. These will be circulated among all authors in order to facilitate critical comments, co-operative scientific developments, and revisions. Final submission of all manuscripts for publication is scheduled for the late spring of 1981. Because several authors of Section III have not as yet accepted invitations to contribute, it may be necessary to omit Section III from the volume. The resultant somewhat shortened volume would constitute a comprehensive and balanced volume dealing with the phenomenology of eddies throughout the world's oceans, the modelling of eddy currents, measurement techniques, and the effects and implications of eddy currents on marine science generally.

The working group plans a meeting of members and some co-opted experts in the late summer or early fall of 1981, in order to review the status of eddy dynamics, to define the next most important scientific problems and to consider the arrangements necessary for their accomplishment. A report to the SCOR Executive Committee on directions for future research will be prepared. The basis for the meeting's discussion and report will include the results of POLYMODE (a bilateral scientific program being conducted under the auspices of the U.S.-U.S.S.R. agreement for co-operative study of the world ocean and under the guidance of a Joint U.S. -U.S.S.R. Organizing Committee), the results of NEADS (the North East Atlantic Dynamics Study, a subgroup of WG 34) and the studies prepared for *Eddies in Marine Science*. To enable the meeting to have a broad international participation, financial support is requested from SCOR to supplement money from national sources.

## ANNEX V

### WORKING GROUP 42 POLLUTION OF THE BALTIC Report from Chairman:/Dr. G. Kullenberg

The working group was set up as a result of a joint ICES/SCOR *ad hoc* meeting in 1971 and had its first meeting in May 1972. The original terms of reference were:

- a) to identify from the point of view of pollution the need for further basic hydrographical, biological, biochemical and biogeochemical studies;
- b) to co-ordinate appropriate surveys of the open Baltic, making use of existing groups of experts whenever possible;
- c) to co-ordinate and develop programs for biological monitoring stations with such indicators of changes in the environment as
  - i) benthic micro-organisms
  - ii) benthic macro-flora and fauna
  - iii) plankton
- d) to develop plans for co-ordination of the studies of the level of toxic substances in food fish and the marine environment;
- e) to co-operate with the corresponding North Sea Group in ship-board and laboratory intercalibration tests of sampling, storage and analysis methodology for toxic substances;
- f) to develop a scheme for continuous collection and analysis of all pertinent information on input of pollutants into the Baltic Sea and on the changes in its degree of stagnation brought about by organic waste,
- g) to report to the 60th Statutory Meeting of ICES and to the next General Meeting of SCOR, both in September 1972, on the progress of their work.

For the first four years the working group devoted itself to the following primary tasks: assessment of the input of pollutants to the Baltic, inventory of sampling and analytical methods and capacities in the Baltic countries, base-line study of the concentration of certain pollutants in biota, and formulation of research programs for investigations of the Baltic as a natural resource with special reference to pollution problems.

The input study was accomplished through a questionnaire. The results showed that basic research is required in relation to river input for clarifying how much material is retained in the near-shore zone and transferred to the open sea areas, respectively, and that research is required as regards the atmospheric input. Almost all the existing data on atmospheric input are derived from land-based observations. The results were published in ICES Coop Res. 63 (1977).

The questionnaire used in this input study was revised on the basis of the experience gained and the improved questionnaire has been accepted by IOC Working Committee for the Global Investigation of Pollution in the Marine Environment (GIPME) as a model for investigations of inputs of pollutants to other parts of the ocean.

The survey of sampling and analytical capacities showed that although the capacities were relatively large, a great variety of methods and techniques were being used. Before the baseline study, the different methods were examined and a meeting of analysts was held, leading to proposals for analytical methods to be used during the baseline study. In 1975 a workshop on methods for analyses of potential pollutants in sea water, marine organisms and sediments was organized in Kiel. These activities have made it clear that periodic intercalibrations of analytical techniques are necessary and have shown that sampling methodologies and storage procedures must be carefully considered. A separate report was compiled on analytical methods used for certain pollutants (K. Kremling and W. Slazka, Kiel 1975).

The baseline study was organized in the same way as the study carried out by the ICES North Sea Working Group. Heavy metals and organo-chlorine compounds were analysed in cod, herring, flounder and mussels, plus some optional organisms.

The study was carried out during 1975 and 1976, and the results were published in ICES Coop Res. Rep. 63 (1977). The coverage obtained was not complete but the results clearly show that in most areas the concentration levels in Baltic Sea organisms were comparable to those found in the North Sea organisms. No really 'hot spots' were identified although elevated concentrations were found in some coastal areas.

The experience gained from carrying out this baseline study, and those in the North Sea and North Atlantic, has been used to assist IOC in the development of baseline study guidelines for use in the GIPME Comprehensive Plan. These guidelines have been published in IOC Technical Series No. 14 (UNESCO 1976).

The research Program ICES Coop Res. Rep. 42 (1974) was formulated during 1973-74 and suggested seven tasks of high priority, with the objective to clarify important aspects concerning the input, transfer, accumulation and elimination of pollutants and nutrients. The working group subsequently concentrated on a more detailed planning of three of these tasks, namely:

- i) an open sea experiment aimed at an understanding of physical processes, in particular, vertical transfer processes;
- ii) a study of the Baltic circulation, including modelling and observational efforts;
- iii) the establishment of open sea multi-disciplinary continuous stations aimed at improving our understanding of the chemical and biological processes occurring in the Baltic.

A meeting on the modelling of water circulation in the Baltic was held 26-27 September 1974 where about 18 papers on modelling were presented showing considerable ongoing work. On the basis of this the working group decided not to push this subject area for the time being.

The detailed planning of co-operative research projects was carried out inter-sessionally by correspondence and *ad hoc* group meetings. It became clear that although the interest from most Baltic Sea scientists was considerable, the best way to initiate a field study was to combine the physical with the chemical and biological studies. The plans for a combined field experiment were finally formulated in detail at a workshop in early 1977.

In September 1977 the joint Baltic Open Sea Experiment (BOSEX) was carried out. All the Baltic countries participated and 12 ships were working in the southern part of the Gotland Basin. The weather during the experiment did not permit much biological work, but the physical and chemical parts were successful. Some sediment studies were also carried out, as well as trawling. Several hydrographic sections connecting the BOSEX area with the Baltic coastline were run before and after the experiment.

BOSEX results have been presented at the XI and XII Conferences of Baltic Oceanographers in 1978 and 1980 and at the ICES Statutory Meetings in 1978 and 1979. A workshop which should yield an overview of the results and experiences is being planned. A BOSEX Atlas has been generated where data and results have been circulated through ICES Service Hydrographique.

BOSEX results include considerable information on the effects of passing of strong meteorological fronts on the water column, on the time development of inertial motion in the water column, on the time and space variability of chemical parameters, especially nutrients, during strong wind conditions, on the intercomparability of chemical observations from different ships, on horizontal homogeneity and current correlations. These results are of general interest. The experiences gained from BOSEX are also of interest for the planning of similar studies in other areas.

Since 1978 the working group has also focussed on:

- i) Modelling work and the use of models in pollution assessment work. A bibliography on modelling work in the Baltic has been prepared (as of 1978/79);

- ii) The coastal dynamic project, since the problem of the exchange between the coastal zone and the open sea is a basic one, and although considerable work is going on in the field it appeared difficult to get a good overview of the results. The ongoing work was reviewed in 1979 and 1980 and papers were invited for presentation at the 1979 ICES Statutory Meeting, when a special Baltic session was held, as well as for the 1980 meeting;
- iii) Assessment of the marine environment where results from recent studies are being used to reconsider the basic scientific principles involved in an assessment. This problem was discussed in 1979 and 1980.

These three issues are of basic importance for the understanding of the natural processes and man's possible impact on the environment in any coastal area.

As a result of these and other discussions it was in 1980 agreed to advance the problem area along three lines using *ad hoc* groups for intersessional work. These groups are dealing with the patchiness problem, to a large extent on the basis of the BOSEX results, the biogeochemical circulation of substances (in particular pollutants) in the Baltic, and the ongoing work as regards biological effects monitoring in the Baltic. Intersessional discussions will be held at the 1980 Statutory Meeting and the *ad hoc* groups plan to report to the working group in its 1981 meeting. The report from the 1980 meeting of the working group is available as a separate document (ICES, C.M. 1980, E:5).

In concluding this brief summary it can be stated that the working group has been successful in catalyzing scientific discussions and work in the Baltic Sea on important environmental problems, relevant not only for the Baltic Sea area but also for other regions, that the working group well fills its place as the only purely scientific group working within the framework of intergovernmental organizations in the Baltic, and that there is a great need for such a purely scientific group attempting to tackle various marine pollution problems in a scientific way. The involvement of various scientific groups within the Baltic Sea as well as the close contact with groups outside the area, which has been achieved through the association with SCOR, has been and is invaluable for the work of this working group.



## ANNEX VI

### WORKING GROUP 47 OCEANOGRAPHIC PROGRAMMES DURING FGGE Report from Chairman: Professor H. Stommel

All three panels of WG 47 have held scientific meetings during the summer of 1980: the Indian Ocean Panel met in Wormley in June, the Atlantic Ocean Panel also met in June, in Paris, and the Pacific Ocean Panel met in La Jolla in August. Reports are available for the first two meetings from the Chairman and are summarized below.

The Pacific and Indian Ocean Panels would like to hold a three-panel joint meeting in the spring of 1981 in order to conclude the activities of WG 47. While the Atlantic Ocean Panel expressed a desire to postpone this final meeting to a later date, it will be recommended that the General Meeting approve a meeting of WG 47, tentatively scheduled for April 27-30, 1981. An invitation to meet in Venice has been received from Dr. Frassetto.

#### Atlantic Ocean Panel

The Atlantic Ocean Panel (SCOR WG 47) met in Paris from 11 to 13 June, 1980. The general objectives for the meeting included providing input to the wrap-up meeting for FGGE and establishing mechanisms for future co-operation. The many contributions of Dr. Walther Düing to the development of an oceanographic experiment in the equatorial Atlantic were recalled. Dr. Düing died in March, 1980. Dr. Voigt was congratulated on the 21st anniversary of the first direct measurements of the Atlantic Equatorial Undercurrent which he made on the R.V. "M. Lomonosov".

In the first presentation, Dr. Hisard, Chairman of the Atlantic Ocean Panel, described the large-scale meteorological conditions observed during FGGE, noting the severity of the 1978-79 winter in the U.S.A. and Europe. The severity of the winter over the northeast U.S.A. was not predicted by a weather-forecast-predictor model, a model which does not take into account the SST Field of the Atlantic Ocean. In fact, the SST Field of the Atlantic was anomalous, with a large pool of cold water found to the southeast of Newfoundland. The cold water pool may be linked to a strongly negative trough in the atmospheric pressure field.

Concurrently, it appears that the intensity of the coastal upwelling along the Canary Current was low, as indicated by positive SST anomalies at Dakar. Similarly, the anomaly of air temperature at Alexander Bay (28°34'S, 16°34'E) along the Benguela Current, was +2°C. The relation of these anomalies to each other and other features such as hurricane development, warm water in the tropical North Atlantic, tuna captures and Solar Maximum years (79-80) is still unknown.

The following topics for the April, 1981 meeting were suggested to the Chairman of WG 47 by the Atlantic Ocean Panel:

- Eastern Boundary and Equatorial Upwelling
- Western Boundary Currents
- Equatorial Undercurrents
- South Equatorial Current and Equatorial Countercurrents
- Equatorial Waves
- Deep Equatorial Currents
- Surface Forcing and Heat Budgets
- Special Lectures

To ensure dissemination of FGGE results, each participant was requested to produce data reports including graphical displays of data as soon as possible and to forward these to other participants. In addition, a collected data volume will be produced at ORSTOM (France) and forwarded to the other SCOR WG 47 panels.

A list of possible subjects for papers to be submitted to *Science* was drawn up. Each topic was assigned a leader and other interested individuals whose goal is to write an article. Dr. E. Katz agreed to coordinate this effort and to work with the editor of *Science*. It was proposed that manuscripts be written by January 1, 1981. The list of topics and "leaders" is

given below:

Keynote paper	Hisard
Equatorial Undercurrent: Transports and Time Series	Katz
Equatorial Undercurrent: Pressure Gradient	Lass
Equatorial Undercurrent: Water Mass Properties	Ostapoff
Satellite Imagery: Gulf of Guinea	Citeau
Satellite Imagery: Large Scale	Speth
SST and Wind Observations from Ships	Hisard
Gulf of Guinea: Biology	Voituriez
Nutrients	Mesquita
Times and Sea Level	Cartwright
Current Meter Time Series	Fahrbach
Meridional Sections	Molinari
Wind Buoy Data	Speth
Gulf of Guinea Coastal Stations	Picaut

A last recommendation was adopted:

- whereas there are in motion multi-national plans to continue co-operative research in the tropical Atlantic, and
  - whereas we foresee a need for continued co-operation in the analysis of FGGE Atlantic data for several years, and
  - whereas the tropical ocean is an acknowledged region of primary interest in the growing international climate programs,
- a working group be initiated to co-ordinate and make recommendations for future works in the tropical Atlantic. Consideration might be given by SCOR WG 47 to expand this recommendation to include all tropical oceans.

### **Indian Ocean Panel**

The Indian Ocean Panel of WG 47 met at the Institute of Oceanographic Sciences, Wormley, on June 26 and 27, 1980.

The main purpose of the meeting, and most of the time, was devoted to brief accounts by everyone concerned of the present state of work on their Indian Ocean results. Theoretical contributions were included as well as observational ones. It was an opportune time to meet, with the equatorial moorings having been recovered in the previous month by the "Marion Dufresne" and some preliminary examination of their results being just ready.

1. Ideas about the proposed meeting of all three panels in Venice were discussed at some length in a small group (Leetmaa, Molinari, Schott, Swallow) before the panel meeting, and the statement given below was drafted as a result. It was recognized that some attempt should be made to synthesize results from different oceans, at least for some topics, and that some statement of "what needs to be done next" might be expected. But there was general agreement that the greatest benefit would come from hearing people talk at first hand about what interests them most in other equatorial oceans.
2. It was agreed that closer links between Monsoon Experiment and the Indian Ocean Panel should be encouraged, and that one method would be to offer a contribution to the Conference on Scientific Results of MONEX, scheduled to take place in Indonesia in October, 1981. Dr. J. Luyten said he would be willing to review the work of the Indian Ocean Panel, at that meeting. It is hoped that funds can be found to enable him to attend.
3. No problems were foreseen in submitting data to National Data Centres. The delay in production of temperature maps for the region off Somalia for the summer of 1979 by NODC, Washington, is becoming increasingly serious. It was agreed that those most concerned would write again to the Director of NODC.
4. There is an obvious need for much of the recent Indian Ocean work to be written up co-operatively. Several possible topics were discussed, and the following tentative list of titles emerged:

- a) Somali Current transports
- b) Water mass analysis
- c) Evolution of near surface features
- d) Time series observations (Somali)
- e) Time series (Equatorial)
- f) Equatorial drifters
- g) Historical data
- h) Biological and nutrient distributions
- i) Acoustic shear profiling

These are all very provisional. Some of the potential authors named were not at the meeting and have not yet been consulted. Work on some topics is already well advanced, others less so. It does not seem necessary, or feasible, to aim at having all these papers published together, though some will naturally be closely related. It was agreed that a real effort should be made to finish these papers before the Venice meeting. First drafts should be ready by November, 1980.

### **Proposals for Final Meeting**

The most useful function of the Venice meeting would be to have a joint presentation of results taken during 1979 from the equatorial regions of the three oceans to facilitate exchange of ideas between investigators from the different oceans. How can this be most effectively done? It seems to us that to achieve this, the structure of the meeting should consider the following points:

1. There should be plenty of time for informal discussions and meetings.
2. There should be the best possible, concise, formal presentation of the results from each ocean.

This might best be done by structuring the meeting as follows:

- Formal presentations in the morning perhaps limited to a total of 3 hours — one morning per ocean — the number and type of presentations during each session would be determined by the panel of each ocean to best display their results;
- The afternoons would be free for poster sessions and informal discussions;
- The poster presentations would be up for the duration of the meeting;
- There could be a fourth morning session to discuss advances that were made in theoretical studies of the equatorial oceans;
- One session could be organized to summarize the observed similarities between phenomena in the three oceans.

### **What is the Future of the Indian Ocean Panel of SCOR WG 47?**

1. At the end of the April 1981 Venice meeting, this panel will have served its function for the FGGE program, and at that time it should be dissolved. However, needs for co-operation in analysis of previously collected data and planning for future experiments, dictate the need for the formation of a new SCOR working group.
2. A proposal for the formation of a new SCOR working group, "The Monsoon Response of the Western Equatorial Indian Ocean", will be presented to the Executive Committee of SCOR. Such a group should be able to extract from the present still diffuse body of information about seasonally varying circulations in the Western Indian Ocean, a clear plan for future studies in this area, and to assist in the design of the proposed CINCWIO program. It should also plan and co-ordinate studies of the effects of time-varying equatorial phenomena on the generation of currents along the East African coast. A program needs to be designed to study the circulation patterns during the NE Monsoon about which little is known at present. The need for such a group is dictated by the following considerations:

Studies conducted during the past five years suggest a radically different picture of the circulation patterns that was set forth on the basis of the IIOE results. A thorough study of all existing data needs to be conducted to come up with a uniform picture. Future studies require co-ordination between investigators from different countries (including the USSR) and help in obtaining permission to work with and in the waters of the coastal states along the East African coast.

## ANNEX VII

### WORKING GROUP 54 SOUTHERN OCEAN ECOSYSTEMS AND THEIR LIVING RESOURCES Report from Chairman — Dr. Sayed Z. El-Sayed

Considerable progress has been made in BIOMASS related matters during the past few months in preparation for the implementation of the First International BIOMASS Experiment (FIBEX) in February 1981. This is reflected in the activities of the Group of Specialists on *Southern Ocean Ecosystems and their Living Resources* and its subsidiary Technical Groups and Working Parties.

#### Meeting of the Group of Specialists in Krakow, Poland, September 1979

One of the main objectives of that meeting was to discuss plans and to co-ordinate research activities of the nations who will participate in FIBEX. At that meeting the Group recommended the establishment of an *ad hoc* Group on FIBEX Acoustic Survey Design whose primary objective is to draw up detailed cruise programs (including cruise tracks, allocation of areas to individual research vessels, etc.). Also, at the Krakow meeting the Group of Specialists recommended the re-constitution of the International Survey of Antarctic Seabirds as the Bird Ecology Working Party within the BIOMASS structure. Also at that meeting the Group endorsed the importance of establishing a BIOMASS Data Centre for the duration of the BIOMASS Program (8-10 years).

The Report of the Krakow meeting was published as BIOMASS Report Series No. 7.

#### Activities of the BIOMASS Working Parties and Technical Groups

##### 1. Working Party on Fish Biology

This Working Party held a Workshop on Age Determination of Antarctic Fishes, in Cambridge, U.K., in August 1979. Members of the WP met in Dammarie-les-Lys, France, 27-31 May 1980 and came up with a series of recommendations regarding research in fish biology to be carried out during FIBEX.

Chairman D. Sahrhage's report of that meeting was published as BIOMASS Report Series No. 12.

##### 2. Working Party on Krill Biology

This Working Party has not met; its business has been transacted by correspondence. The report of the WP (Chairman: J. Mauchline) was published in November 1979 as BIOMASS Report Series No. 10. It included several recommendations for implementation during FIBEX. The group also has prepared for publication four Handbooks on Krill Biology. These are:

- "Studies of patches of krill, *Euphausia superba* Dana"
- "Measurement of body length of *Euphausia superba* Dana"
- "Stages of sexual maturity of *Euphausia superba* Dana"
- "Identification of Antarctic Larval Euphausiids".

##### 3. Working Party on Krill Abundance

Chairman O. Mathisen arranged to hold a calibration course (funded through a grant from the Norwegian Department of Fisheries) in Horten, Norway, in September 1979. The Working Party met in Hamburg, F.R.G., 30-31 May 1980. The report of that meeting was published as BIOMASS Report Series No. 11.

##### 4. Working Party on Physical/Chemical Oceanographic Observations

This Working Party elected to carry on its business by correspondence. Chairman A. de C. Baker is expected to release his report in late 1980 and it will be available through the SCAR Secretariat, Scott Polar Research Institute.

### **5. *ad hoc* Group on FIBEX Acoustic Survey Design**

The group (Chairman: I. Everson) met in early June 1980 in Dammarie-les-Lys, France, and recommended high priority areas for Krill Acoustic Survey in Southwest Atlantic and Indian Oceans during FIBEX. This report will soon be published as BIOMASS Report Series No. 14.

### **6. *Technical Group on Program Implementation and Co-ordination***

The group (Chairman: G. Hempel) met in Dammarie-les-Lys, France, 4-6 June 1980, with the chief scientists of a number of ships which will participate in FIBEX. The group allocated areas in the Southern Ocean to the FIBEX participating countries (see Figure below), and adopted several recommendations detailing the physical, chemical and biological parameters to be studied during FIBEX. A report of that meeting was published as BIOMASS Report Series No. 13

### **7. *Technical Group on Data, Statistics and Resource Evaluation***

The group (Chairman: G. Newman) held its second meeting in Cambridge, U.K., 28 July - 2 August 1980. The group proposed a Data Measurement Plan for BIOMASS and the Southern Ocean Data, and strongly endorsed the early establishment of a BIOMASS Data Centre. The report of the Cambridge meeting will be published as BIOMASS Report Series No. 16.

### **Other Activities**

#### **1. *BIOMASS Data Management Workshop***

A Krill Acoustic Data Management Workshop (Chairman: D. L. Cram) was held at the University of Hamburg, F.R.G., 27-29 May 1980. The meeting, attended by thirty-two participants from 11 countries, was sponsored by the Fachbereich Informatik of the University of Hamburg. It was recommended that a full-scale data evaluation post-FIBEX workshop be held in Hamburg in August 1981. Steps are being taken to approach the Fachbereich Informatik to ascertain if they could provide the necessary facilities.

#### **2. *BIOMASS Publications***

a) BIOMASS Report Series

Ten reports in this series have so far been produced. Four more reports (of the recent Hamburg and Dammarie-les-Lys meetings) will soon be published.

b) BIOMASS Handbook Series

The first six Handbooks in this series will be available in late 1980. Manuscripts of six other Handbooks are now being reviewed and will be published in early 1981.

c) BIOMASS Newsletter

The BIOMASS Newsletter is now published at least three times per year.

d) BIOMASS Vol. II: Selected Contributions to the Woods Hole Conference will be published in February, 1981.

e) Mary Alice McWhinnie Memorial Volume

Several of the late Dr. McWhinnie's colleagues will contribute articles to this special krill-related volume which will be dedicated to the memory of Dr. McWhinnie.

### 3. *BIOMASS Plankton Sorting Centre*

The desirability of having such a centre has been expressed by members of the Group of Specialists. The location and cost of operating such a centre are presently being discussed among the group.

### 4. *BIOMASS Data Centre*

Strong endorsement for establishing such a centre has been received from the BIOMASS community. The Technical Group on Data, Statistics and Resource Evaluation recently proposed a BIOMASS Data Management Plan and outlined the specifications and responsibilities of the BIOMASS Data Centre.

### 5. *Relations with Intergovernmental Oceanographic Commission (IOC)*

The Group of Specialists is most pleased to note the increasing interest IOC is showing in support of the BIOMASS activities. The Group has identified several activities where further support from IOC could be useful:

- a) facilitation of fellowships on board vessels participating in FIBEX and related follow-up activities in the joint scientific studies;
- b) support for general evaluation of FIBEX as a kind of pilot in the field of ocean sciences and living resources; and
- c) help with the translation of several important documents, particularly from Russian, Japanese and Spanish contributions.

### 6. *Change of the Name of SCOR Working Group 54*

Acting on a proposal from SCOR, SCAR Executive, following consultation with the Chairman of WG 54 agreed to change the name of the working group to "Southern Ocean Ecosystems".

### 7. *Future Meetings of the Working Group and its Specialized Bodies*

The following meetings are planned for 1981:

Group	Location	Dates
W. P. on Krill Abundance	Hamburg, F.R.G.	late August 1981
Post-FIBEX Data Workshop	Hamburg, F.R.G.	late August 1981
W. P. on Bird Ecology	(Meeting place & dates still under consideration)	
T. G. on Data, Statistics & Resource Evaluation	Cambridge, U.K.	July or August 1981

(The above list does not include possible meetings of several *ad hoc* groups which the Chairman of WG 54 or the Chairmen of the Technical Groups and Working Parties may wish to hold, e.g., an *ad hoc* group to develop plans for the Data Handling Workshop, etc.).

### 8. *BIOMASS Financial Needs*

With the BIOMASS program now moving towards the operational phase, need for financial support for meetings, a data handling system, etc., is ever-increasing.

The Group of Specialists iterated its recommendations made at the Kiel meeting (May 1978) about the need for adequate financial support from SCAR, SCOR, other appropriate international organizations and the Antarctic Treaty governments for BIOMASS-related activities. Concern has been expressed in regard to the inadequate level of support for the BIOMASS program. Funds are needed to support participants in the several meetings planned in 1981 (listed above) together with meetings of *ad hoc* groups, for example, to prepare for the Data Workshop to be held in Hamburg next year. An estimate of the travel and subsistence expenses to support the meetings of the Technical Groups and Working Parties together with the post-FIBEX Workshop is in the range of \$90,000 — \$100,000.

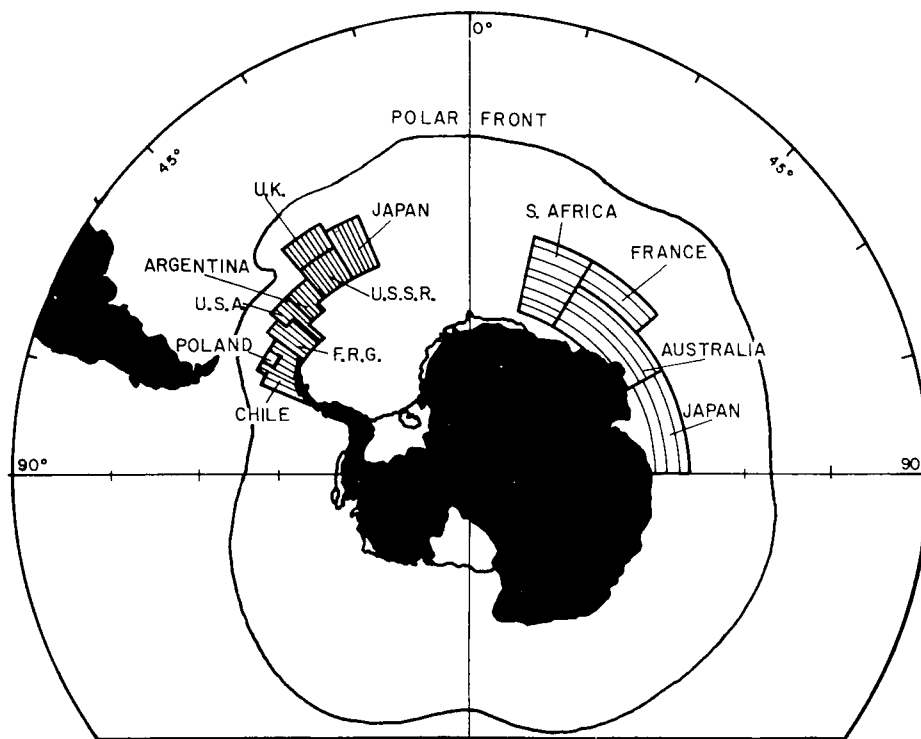
Other funds are needed to:

- a) publish the BIOMASS Report Series;
- b) contract typing of BIOMASS Handbook Series;
- c) do the preparatory work needed before establishing a data handling system;
- d) cover the cost of FIBEX data handling at the 1981 Hamburg Workshop (this includes computer time, the Fisheries Data base, clerical facilities, accommodations and personnel time, etc.).

The aforementioned items do not include our need for a central plankton sorting facility and a BIOMASS Secretariat. While SCAR will be discussing these financial problems closely at XVI SCAR meeting in Queenstown, N.Z., in October 1980, we will look forward to SCOR's continued support of the BIOMASS program by financial contributions from its 1981 budget.

### 9. Recommendations for Retaining the Working Group and Its Specialized Bodies

In view of the fact that Working Group 54 and its specialized Technical Groups and Working Parties have not completed their task, it is recommended that they be allowed to continue with their work. Exception is made in regard to the activities of the *ad hoc* Krill Survey Design Group which will be disbanded after it submits its report to the Chairman of WG 54.



Areas to be investigated in the S.W. Atlantic and Indian sectors of the Southern Ocean by the nations participating in FIBEX.



## ANNEX VIII

### WORKING GROUP 56 EQUATORIAL UPWELLING PROCESSES Report of Chairman:/Dr. H. Rotschi

The first plenary session of the SCOR WG 56 "Equatorial Upwelling Processes" was held at Batelle Conference Center, Seattle (Wash.), 11-13 February 1980. All the members attended except Drs. Vinogradov and Walsh, who were unable to be present. Participants in attendance were Dr. Henri Rotschi, Chairman; Drs. Otis Brown, David Halpern, Denis Moore comprised the Physical Panel, and Drs. Richard Barber, Rolf Boje, Roberto Jimenez and Bruno Voituriez comprised the Biological Panel.

#### 1. Scientific Presentations — Review of Recent Results of Equatorial Upwelling Research

A review of our understanding of equatorial processes emphasizes a need to clarify several issues. The relatively low productivity of the equatorial region as compared to its potential based upon its nutrient content, and the observed differences in productivity between the three oceans are striking features of the equatorial regions.

What processes determine the unique distributions of properties observed in surface waters of equatorial regions? Future studies need to determine the relative importance of upward motion in producing variations of nutrients and temperature in the euphotic zone compared with other processes such as air-sea exchanges, wind mixing, current shear mixing, horizontal advection, and excretion and recycling.

The working group recognizes that large temporal and spatial variations of properties occur in these regions and the necessity for their measurement using optimal sampling techniques. Temporal and spatial scales of the distribution of properties need to be determined. Such observations could provide a basis for improvement of equatorial modelling.

#### 2. Co-ordination with Other SCOR Working Groups

The possibility of co-sponsoring equatorial experiments with other SCOR working groups has been examined. With regard to the WG 55 it appeared that in the near future it would be difficult to initiate any experiment, until the results of SCOR WG 47 are known. Nevertheless, it was felt that it was desirable to start an experiment of monitoring the SST from satellite data, in a selected region of interest to WG 55.

It was also noted that the attention of WG 59 should be drawn to the need for a model of equatorial production.

#### 3. CCCO Draft Report

Since the inter-annual variability in equatorial regions is equal to, or larger than, the seasonal variability, these regions are the best places to detect changes in ocean processes on climatic time scales.

Each member agreed, therefore, to review the draft report of the CCCO meeting in Miami (10-12 October 1979), and to send their comments to the Chairman of WG 56 who summarized them for Roger Revelle.

#### 4. Equatorial Upwelling Newsletter

WG 56 was informed of a publication financed and sponsored by EPOCS and entitled *Tropical Ocean — Atmosphere Newsletter*. The working group considered this to be a potentially important means of transmission of information pertinent to research made in the equatorial regions and recommends that scientists involved in equatorial studies should systematically use this Newsletter to inform their colleagues.

#### 5. Sea Surface Temperature

The working group discussed the requirement for SST on a daily basis with a resolution of 1° in longitude and ¼° in latitude, between 5°N - 10°S in the Atlantic, 10°N - 15°S in the Pacific and 15°N - 5°S in the Indian Ocean. The working

group is very pleased to note that various national agencies are providing SST maps in equatorial regions. It recommends that the quality of the different SST products be evaluated for use in equatorial studies.

## **6. Directory of Equatorial Upwelling Researchers**

The working group is very pleased that many journals publicized the request for respondents for the Directory of Equatorial Upwelling Researchers. The Directory has been compiled and will be distributed by Duke University.

The bibliography on equatorial oceanography originally prepared as part of the FINE Workshop report is being updated by Mrs. Jan Witte at Nova University. She has agreed to circulate a draft of the revised bibliography to the members of SCOR WG 56 in March 1980; if necessary, corrections and additions will be made. When the revised bibliography is available, an announcement will be made in the *Tropical Ocean — Atmosphere Newsletter*.

## **7. Equatorial Upwelling at the IUGG/Canberra Meeting**

The working group commends Drs. C. Colin and F. Jarrige for responding to the request for a review of equatorial upwelling in the Pacific and Atlantic Oceans. The working group hopes that a similar review will be prepared for the Indian Ocean.

## **8. SCOR WG 56 Sponsored Equatorial Upwelling Experiment**

After a review of past and present equatorial studies (e.g., CIPREA, NORPAX, EPOCS, INDEX, FATE, ERFEN) and of continuing and proposed equatorial studies (ERFEN, EPOCS, SEQUAL, BEED, FOCUS, PEQUOD), it was decided that the preparation of a SCOR WG 56 sponsored equatorial upwelling experiment be postponed. The working group strongly endorses the ongoing and proposed equatorial programs and recommends that (1) close co-operation be established between programs operating in adjacent geographic regions, (2) close communication be encouraged between all equatorial programs, e.g., through the *Tropical Ocean — Atmosphere Newsletter*, (3) IOC support of present and future equatorial studies be sought by SCOR.

The working group notes with interest the excellent documentary film of the CIPREA multi-disciplinary program on equatorial upwelling.

The working group encourages development of research towards the determination of chlorophyll and winds by satellites. It encourages the measurement of biological and chemical variables in equatorial regions during programs related to climate research. Techniques now allow the storage of water samples for subsequent chemical analyses, chlorophyll determination, and phytoplankton species counts at the conclusion of the cruises.

## **9. Date and Place of Next Meeting**

It is proposed to hold the next meeting of the SCOR WG 56 in Paris, at UNESCO Headquarters, during the week following the April 1981 SCOR WG 47 meeting.

## **10. Other members**

The working group regrets that Dr. Peter Hughes has resigned and considers it essential that he be replaced and that geographical diversity be maintained. Several potential candidates were discussed and the Chairman will propose a replacement to the Executive Committee.

## ANNEX IX

### WORKING GROUP 60 MANGROVE ECOSYSTEMS Chairman:/Dr. S. C. Snedaker

The Second International Meeting of the SCOR/UNESCO Working Group 60 on Mangrove Ecosystems was held in Port Moresby, Papua New Guinea, 7-9 May 1980 inclusive, at the Loloata Island Hotel.

#### Present:

Dr. F. Blasco	France
Dr. H. Chansang	Thailand
Prof. V. Chapman	New Zealand
Dr. F. Pannier	Venezuela
Dr. S. Snedaker (Chairman)	United States
Dr. A. Sasekumar	Malaysia
Dr. B. Thom	Australia

#### Absent (with apology):

Dr. A. Lot-Helgueras	Mexico
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#### Observer:

Mr. Kembi Watoka	Papua New Guinea
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All arrangements for the meeting were handled by Dr. John L. Munro of the University of Papua New Guinea and included necessary transportation, accommodations at the Loloata Island Hotel, meetings with Government officials, and a tour of the Motupore Island Research Centre. The working group extends to Dr. Munro its sincere appreciation for his assistance and hospitality.

## REPORT OF MEETING

### Terms of Reference I and II

- I. To produce a general scientific framework for mangrove ecosystem studies, including the need for research on structure, geographic range and ecosystem dynamics.
- II. To identify the subject content of a methodological handbook such as would be required to carry out the program identified in (I) above.

The primary purpose of the meeting of the working group was to discuss progress being made toward the completion of the first two Terms of Reference, with special attention being given to the Handbook. It was decided earlier that the Handbook would combine the objectives of the Terms of Reference and it was along these lines that members had prepared draft materials. Each member discussed, in detail, their developing contribution and the subsequent open discussion centered on the content and organization of the Handbook with respect to its potential intended use.

### Proposals for Additional Terms of Reference

- III. To develop a survey sheet (questionnaire) for the identification of current research workers and research problems which could serve for interpretation and for publishing a world-wide directory on the subject of mangrove research.

At the 1978 meeting of the working group this third Term of Reference was discussed and accepted. The Chairman accepted the major responsibility for carrying out the work. In 1979, the Chairman obtained a grant from the U.S. Forest Service, as part of the U.S. Man and Biosphere Program, to conduct a world-wide survey as defined above but also including a solicitation of mangrove forest inventory data and present status. A modified questionnaire was prepared in English and translated into French and Spanish by UNESCO/Paris, and into Portuguese by the Federal Public Service of Brazil. A total of 575 questionnaires have been distributed with a return rate approximating 40 percent. The initial results emerging from the survey were discussed, particularly the fact that mangroves world-wide are under very heavy destructive pressure. The Chairman acknowledged that there was still a paucity of information for certain countries and the members agreed to assist with the distribution of questionnaires to principals in those countries; the Chairman will provide a listing of inadequately-covered countries to the members. Professor Chapman agreed to provide data from his files to be included in the survey results.

Publication of the results of the survey was discussed. The Chairman as grant recipient will prepare a summary paper for publication in a major journal. This is in addition to the formal report submitted to the U.S. Forest Service at the termination of grant. Dr. Blasco will prepare a paper based on the information obtained from item #16 (utilization of mangroves), and Dr. Pannier will write a paper based on item #13 (responsible government agencies). Dr. Pannier also agreed to Professor Chapman's request that he (Pannier) prepare a paper for delivery at the 13th International Botanical Congress (Sydney, August 1981) based on items #21 & #22 (destructive exploitation of mangrove lands). Professor Chapman will prepare a paper using the information from items #17, #18 & #24 (conservation). The Chairman agreed to send copies of completed questionnaires to each member for their independent or collective use; distribution will be in the Fall of 1980.

- IV. To consider the ways in which scientific research can be applied to problems of management and conservation of mangrove ecosystems.

This Term of Reference was discussed but it was agreed that it was premature at this time to proceed with further work toward its completion. It was concluded that the results of the survey questionnaire, particularly the information on inventory, status and management/conservation should be the basis for work on this Term of Reference. In addition, it was felt that more information was needed, than is currently available in summary form, in order for the working group to make recommendations linking scientific advances to management.

During discussions of the various matters before the working group, it became apparent that the collective expertise of the members should be applied to preparing a Mangrove World Atlas as this task seemed to be beyond the interests or ability of any single individual or institution. Furthermore, the preparation of a thematic mangrove atlas was considered to be a logical outgrowth of the wealth of information, reports, and maps being obtained through the biosphere survey. The members of the working group were unanimous in agreeing to the fifth Term of Reference:

- V. To prepare a Mangrove World Atlas containing spatial information in map form of the relationship between mangroves and (1) climate, (2) soils, (3) landforms, (4) geographic distribution, (5) human utilization, (6) fisheries, (7) evolutionary trends, and (8) biological and structural characteristics.

The working members agreed to begin accumulating maps and information suitable for mapping. Sources of maps in the world were discussed. The Chairman will initiate a search for funds to support this activity.

#### **UNESCO/UNDP Training and Research Pilot Program on the Mangrove Ecosystems of Asia and Oceania**

The matter of the forthcoming UNESCO/UNDP Project was of concern to the working group and the topic was discussed in great detail. Specifically, the members strongly endorsed the program but expressed concern about its timing and management. From the discussions, a series of recommendations were set forth for consideration by the proper authorities. These are elaborated below.

- I. A UNESCO regional officer should assume full-time liaison responsibilities for the program as an expeditor and diplomat. That person should be thoroughly acquainted with the internal workings of UNESCO and UNDP, and the bureaucratic motivations of the participating countries.

2. If a Training and Research Center is created within one country, it should have as its leaders a Science Director and a Local Administrator. In any event a Science Director, with excellent credentials, is a requirement for a successful program.
3. To the extent that university students and scientists are involved in the program, southern hemisphere vacation times must be considered in the scheduling of activities.
4. Planning and organization of the program should begin immediately but the actual program should not commence before January 1982. Both local and expatriate participants and instructors require a long lead time to gain permission for leaves of absence from their regular duties and obligations.
5. The Science Director should be hired in early 1981, and no later than 1 June 1981, to have sufficient time to organize the details of the program prior to its commencement.
6. A Science Advisory Board should be appointed to critique training courses and research projects, and in general to help maintain the highest scientific quality in the program. The working group offers its services and expertise in this regard.
7. The emphasis of the program should be based on a core course offered twice each year and lasting for two to three months. The content of the core course should be based on the working group's Methodological Handbook (50%), on the principles of mangrove forest management (25%), and principles of nearshore fisheries management, including pond culture (25%). In addition to the core courses, a variety of shorter term courses should be taught in the participant countries that have a demonstrated ability in particular fields.
8. Opportunities should be made available for non-UNESCO supported academic research and "good" students should be given the opportunity for advanced study in their field of interest.
9. There is a serious need within the region to establish an excellent mangrove library at one central location. The program budget should make provisions for the acquisition of the library materials.

The members of the working group wish to go on record as being highly favorable toward the direction, scope and intent of the program, and are concerned only that the highest scientific quality be maintained.

#### **Other Business**

Recently, the IUCN Commission on Ecology created a Mangrove Ecosystem Working Group with Drs. Blasco, Pannier and Snedaker as invited members. That working group's core leadership consists of E. J. Hegerl, G. B. K. Baines, J. Davie and P. Saenger, of Australia. Concern was expressed by the SCOR/UNESCO working group that the activities of the two groups be co-operative and non-overlapping. A member of the IUCN leadership group was invited to attend the Papua New Guinea meeting of the working group as an observer; apologies were sent. It was agreed that Professor Chapman should stop over in Brisbane following the SCOR WG 60 meeting and discuss topics of mutual interest with Mr. Hegerl. Professor Chapman consented and promised to prepare a written report on the outcome of the meeting.

Although several members of the working group had been asked to present papers at the II International Symposium on Biology and Management of Mangroves (Papua New Guinea, July 1980), the organizer recently announced that travel support would not be available. The working group felt it was important that it be represented; Professor Chapman and Dr. Pannier were identified as likely candidates, and following the meeting, arrangements were made which would enable them to attend. The two delegates will present papers, review the recent activities of the working group and UNESCO, meet with the IUCN leadership group and distribute additional questionnaires for the biosphere mangrove survey.

Throughout the course of the meeting, members discussed new publications and reports dealing with mangroves. As some of these are limited in their availability, members with access agreed to provide copies to the other members. Professor Chapman apologized that the working group members had not already received the four reports on the mangroves of New Zealand from the New Zealand Lands Department.

With respect to the UNESCO/UNDP Training and Research Program, the recently released "Preparatory Assistance Document" was reviewed and discussed. Professor Chapman, and Drs. Blasco, Chansang, Pannier, and Thom stated that they would like to visit certain countries to promote the activities of the NATMANCOMS and the forthcoming pilot program. Specifically, Dr. Blasco could visit Sri Lanka, Dr. Chansang, Thailand; Professor Chapman, India; Dr. Pannier, Pakistan; and Dr. Thom, Australia. Members would be available for additional assistance later in the year as well.

## ANNEX X

### STATUS REPORT OF THE SCOR/IOC COMMITTEE ON CLIMATE CHANGE AND THE OCEAN Report from Chairman — Prof. R. Revelle

Most of the activity of SCOR/IOC/CCCO since the committee's meeting in Miami in October 1979 has been carried on through its Liaison Panel with the WMO/ICSU Joint Scientific Committee (JSC) for the World Climate Research Program. Dr. Robert Stewart is Chairman of this panel and other members are: Adrian Gill, John Woods, Francis Bretherton and G. P. Kurbatkin. The panel has organized a working group headed by Fred Dobson to study the feasibility of the CAGE experiment for determination of meridional heat transport in the oceans; it has begun to explore the possibilities for worldwide satellite observations of sea-level, ocean surface temperatures, wind stress on the sea surface, and surface ocean currents, and it is involved in helping to organize a symposium on ocean time series to be held in Japan in 1981, with a preliminary meeting in Oban in 1980.

Other CCCO efforts have been devoted to laying the ground work for full IOC participation in the world climate research program with scientific guidance from the committee and its panels. Under the almost-completed draft of the new international Convention on the Law of the Sea, the consent of coastal states must be obtained for any ocean research conducted within their 200-mile economic zone and, of course, also in their territorial sea. However, if a member state of a "competent intergovernmental organization" agrees to take part in a scientific program arranged by that organization, it is deemed to have granted its consent for research under the program within its economic zone. Development of the program of ocean monitoring, which is the backbone of the oceanic aspect of the world climate research program, will be greatly facilitated if it can become an integral part of IOC's co-ordinating activities.

SCOR has proposed, and the 18th General Assembly of ICSU has endorsed, the negotiation of an ICSU/UNESCO agreement for joint support of the Committee on Climate Change and the Ocean. This would be similar to the ICSU/WMO agreement for joint support of the Joint Scientific Committee for the World Climate Research Program. It could result in a considerable increase in funds contributed by UNESCO for the activities of the CCCO, provided the member states of UNESCO perceive that these activities will serve their interests.

Most of the member states of UNESCO are developing countries in Asia, Africa and Latin America. It would, therefore, seem important that the World Climate Research program encompass climatic phenomena on a worldwide basis that may directly affect these regions. This would also appear to be a sound approach from a scientific point of view, because some of the principal forcing functions for variations in ocean climate must be related to changes in the behavior of tropical waters and of the southern ocean. The tele-connection called the "Southern Oscillation" in which apparently related phenomena occur from the west coast of South America to the east coast of Africa may be the principal known example of climatic variability in which the ocean seems to play a dominant role. On a somewhat smaller scale the intensity and timing of the monsoon in South Asia seems to be related to cooling in the Arabian Sea, which, in turn, reflects the strength, duration, velocity, and transport of the Somali current off the Horn of Africa.

Variations in climate have economic and societal impacts on the developed countries of Europe, North America, Japan, and Oceania, but they may be matters of life and death for the poor, less-developed countries of Africa and Asia. Failures of the monsoon have devastating effects on food production in India, and droughts in the Sahelian Zone of Africa have brought misery and death to millions of people from Senegal to Ethiopia. If these anomalous climatic conditions could be predicted even a few months in advance, many of the worst consequences could be greatly mitigated. The problem is to convince the developing countries, which form the overwhelming majority of most United Nations Organizations, that the World Climate Research Program could lead to a new level of skill in climate prediction and that, therefore, it merits their participation and support.

Some parts of the ocean monitoring system for climate research must be mainly the responsibility of the developed countries. These include the deployment of drifting, telemetering buoys and the use of fleets of opportunity for carrying out repeated XBT sections across the oceans. Sea-scanning satellites will be constructed and operated by the United States, Japan, the European Space Agency and possibly the Soviet Union. But some receiving stations for satellite data need to be located in the developing countries and much of the "sea truth" must be provided by them. In particular the installation and operation of recording tide gauges to measure variations in sea level on islands throughout the world

ocean will require developing country co-operation, even though the cost of these installations may be borne by the rich countries.

As pointed out in the report of the Pilot Ocean Monitoring Study, problems of maintaining and improving the quality and completeness of ocean data sets and of ensuring their timely availability for trial climatic forecasting purposes should be a major concern of the CCCO. Consideration must be given to ways in which IGOSS may be modified to solve these problems.

During 1981 it is contemplated that all five panels of CCCO will have at least one meeting, as will the committee itself. Planning will go forward for the CAGE experiment and for the use of sea-scanning satellites for the later Global Circulation Experiment. Development of drifting buoys which will measure water temperatures and conductivities down to a desired depth beneath the sea surface will be encouraged. Attempts will be made to establish more trans-ocean tracks along which repeated XBT observation can be taken by fleets of opportunity. Remote sensing of subsurface ocean conditions will be encouraged. This may eventually involve the establishment of an ocean-wide acoustic receiving network dedicated to scientific purposes.

A major effort in ocean-atmosphere modelling has been emphasized by the WMO/ICSU Joint Scientific Committee (JSC). One aspect of this modelling effort may be of special importance in oceanography and climate. This is the identification and location of oceanic areas which warrant intense monitoring because variations in conditions in these areas may have critical climatic importance. Some of the standard sections defined in the POMS Report are believed to have those characteristics. But further analysis by the CCCO panel on theory and modelling, chaired by Adrian Gill, is needed. This panel works closely with the JSC working group on numerical experimentation, in which Kirk Bryan represents CCCO.

The Joint Planning Staff of the World Climate Program has taken up the problem of the needs, users, and practicable kinds of data on sea-ice, with the ultimate objective of organizing an international data bank. The CCCO panel on sea ice, under the chairmanship of Dr. A. Foldvik, is helping with this initiative. One of the problems is the retention and storage of data from satellites in polar orbits, particularly in the Southern Ocean. Much research is needed on the dynamics of sea-ice formation, movement, and dissolution, on the exchange of heat between the underlying ocean waters and the overlying atmosphere, on the transport of heat, water, and salt into and out of the Arctic basin, and on the role of polynias as loci for the convection of deep and surface waters. The panel on sea-ice will undoubtedly play a part in international co-ordination of this research, but its role in relation to other bodies is not clear.

The panel on high-resolution climatology, under the chairmanship of Jørn Thiede, is charged with the development of a relatively new aspect of ocean paleo-climatic studies — the attempt to determine interannual and decadal climatic variations in ice cores, sediment cores laid down under anaerobic conditions, and other materials, such as the growth rings of corals and large mollusks. Statistical analysis may show the existence of periodicities in these records, related to solar and tidal phenomena, as well as other statistical characteristics of the climatic signals. The most difficult problem is likely to be the time correlation of paleo-climatic records from different areas.

The CCCO panel on biology, under the chairmanship of Alan Longhurst, is the only ocean-oriented group concerned with the impact of variations in climate. It is commonly believed that variations from year to year in the spawning, recruitment and distribution of fish populations are related to variations in ocean climate, but the space and time scales of the relevant variations are not understood. The problem of this panel is to determine, and if possible to enhance, usefulness for biologists of existing and future time series of ocean observations.

So far as can be foreseen at present, the World Climate Research program will consist mainly of more or less well co-ordinated series of national programs. It is therefore desirable that the national SCOR Committees establish close working relationships with the agencies responsible in each country for climatic studies and uses of climate information. The Ocean Science Board of the National Academy of Sciences, which is, among other functions, the U.S. National Committee for SCOR, has established a panel under the chairmanship of James Baker to assist in the development of oceanic aspects of the U.S. National Climate Program, and as the POMS report indicates, several other countries are also establishing ocean climate programs.



### **Some Tasks of the CCCO and its Panels and Secretariat**

1. Assist with organization of workshops, e.g.,
  - a) "Experience with Long Time Series"
  - b) "Impact of the Oceans on Climate"
2. Compile information on Long Time Series of Ocean Measurements available from national and international organizations, e.g., ICES, NODCs, oceanographic institutions and WDCs.
3. Maintain liaison with the Joint Planning Staff of the World Climate Program and ensure dissemination of relevant information about the World Climate Program to interested marine scientists.
4. Working through national SCOR committees, obtain and disseminate information on oceanographic aspects of national climate programs.
5. Communicate with COSPAR, national space agencies and national environmental agencies on ocean satellite observing capabilities, orbits, and data archiving and retrieval.
6. Assist in preparation of internationally agreed performance specifications for drifting oceanographic buoys; and obtain and disseminate information on buoy development programs.
7. Communicate with relevant SCOR and ACMRR working groups on climatic aspects of their work.
8. Develop the program of standard oceanographic sections for ocean climate studies and other purposes.
9. Work with consultants and national oceanographic and meteorological institutions in determining the observational programs required to measure meridional heat transport in the ocean and in planning an ocean-wide experiment (CAGE Experiment) for this purpose.
10. Advise IGOSS and other IOC bodies on ocean observing programs required for climate studies.
11. Stimulate installation and operation of tide-gauges-particularly island stations-for measurements of seasonal and inter-annual variations in sea level; and encourage near-real-time distribution of sea level data.
12. Maintain a continuing review of progress in development and use of remote sensing instruments for studies of ocean circulation.
13. Assist in co-ordination and promotion of national programs of sea-ice studies, with special emphasis on interactions between sea-ice and the underlying ocean waters.
14. Foster development of high-resolution paleo-climatic studies of sediment and ice cores and other appropriate materials including methods of statistical analysis of time spectra and spatial climatic variations revealed by these studies.
15. Study the impact of interannual and decadal variations in ocean and atmosphere climate on the ecology of marine organisms, including spawning, recruitment, and distribution of fish populations.
16. Foster development of mathematical models of ocean circulation and of interacting ocean-atmosphere-cryosphere models.

## ANNEX XI

### REPORT ON XIth MEETING OF IMCO/FAO/UNESCO/WMO/WHO/IAEA/UN/UNEP JOINT GROUP OF EXPERTS ON THE SCIENTIFIC ASPECTS OF MARINE POLLUTION (GESAMP) HELD IN DUBROVNIK, 25 FEBRUARY-1 MARCH 1980 Received from SCOR Observer — Prof. D. Dybern

#### 1. Composition of GESAMP

GESAMP is composed of up to three members from each of the eight sponsoring organizations and provides scientific information and advice to these. In the meetings Technical Secretaries for GESAMP from each organization also take part. Almost all practical scientific work is carried out by a number of working groups. At the present meeting 10 such groups were of current interest. The table below gives a list of them, including also the names of the Chairman and, where appropriate, of those members who are affiliated with SCOR or SCOR working groups.

Working Group	Chairman	'SCOR Members'
Review of the Health of the Ocean	G. Kullenberg	G. Kullenberg R. Chesselet T. Balkas D. Lal G. Needler
Oceanographic Model for the Dispersion of Waste Disposal in Deep Sea (new group)	G. Needler	G. Needler
Monitoring of Biological Variables Related to Marine Pollution (disbanded)	A. McIntyre	A. R. Longhurst
Marine Pollution Implications of Coastal Area Development (disbanded)	H. Cole	G. Kullenberg
Criteria for the Selection of Sites for Dumping of Wastes into the Sea (new group)	A. McIntyre	
Review of Potentially Harmful Substances	A. Jernelöv	
Evaluation of the Hazards of Harmful Substances Carried by Ships	J. Portmann	
Biological Effects of Thermal Discharges in the Marine Environment	V. Pravdic	
Interchange of Pollutants between the Atmosphere and the Ocean	W. C. Garrett	R. Chesselet R. A. Duce R. W. Stewart
Marine Pollution Implication of Ocean Energy Exploitation (new group)	R. D. Gerard	G. Kullenberg

#### 2. Recent GESAMP Achievements

Since the scientific work is carried out by the working groups the ordinary meetings of GESAMP are mainly a scrutinizing of the reports of the working groups.

##### *2.1 Review of the Health of the Ocean*

This working group is divided into a number of task groups. The combined results will lead to a report to be

presented to UNEP's meeting in 1982, 10 years after the Stockholm Conference on the Human Environment. The time schedule for the work is very tight and the group seems to have first priority status. Several SCOR scientists are attached to the work.

### ***2.2 Oceanographic Model for the Dispersion of Waste Disposed in Deep Sea***

This working group was set up on the initiative of IAEA and will involve quite a lot of basic oceanographic work. The Chairman, Dr. G. Needler, is member of both SCOR WG 34 and of the Committee on Climatic Changes and the Ocean.

### ***2.3 Monitoring of Biological Variables Related to Marine Pollution***

This group submitted its final report which will be printed in the series *GESAMP Reports and Studies*. The group proposed a set of approaches involving biochemical, physiological, morphological and ecological procedures. The group noted that biological monitoring is possible in coastal waters but more difficult in the open ocean. The group was disbanded and its Chairman will edit the report.

### ***2.4 Marine Pollution Implications of Coastal Area Development***

The final report was submitted, constituting a comprehensive survey of damage which may be caused to coastal areas when "developed" and advice on how to avoid this. The study is mainly directed to planners and decision-makers and will be published in *GESAMP Reports and Studies*. The group was disbanded.

### ***2.5 Criteria for the Selection of Sites for Dumping Wastes into the Sea***

This group was set up on the initiative of IMCO to develop further the scientific criteria for the selection of dumping sites so as to minimize the effect on the marine environment.

### ***2.6 Review of Potentially Harmful Substances***

This working group has for several years worked on scrutinizing and classifying substances considered to be harmful to man or the environment. No report was available at the meeting.

### ***2.7 Evaluation of the Hazards of Harmful Substances Carried by Ships***

The working group produced a partial report and will continue its work on a more comprehensive report which will substitute or update the original *Hazard Profile Rationale* published some years ago (GESAMP IV/19, supp. 1).

### ***2.8 Biological Effects of Thermal Discharges in the Marine Environment***

This working group had been suspended for some time. Meanwhile, a FAO Consultant produced a paper on the item which was presented to the meeting. With the paper as a basis for its future work, the group was reactivated. The main aim would be to study discharges in coastal waters and their effects, especially on the living resources and fisheries.

### ***2.9 Interchange of Pollutants Between the Atmosphere and the Ocean***

A rather comprehensive report was presented to the meeting containing information on air/sea exchange mechanisms, exchange fluxes, biological data, modifications of pollutants and guidelines for a measurement program (WMO Interpoll II/Doc II). It was decided that the group continue its work with the aim, e.g., to investigate life cycles of selected atmospheric pollutants involved in air/sea transfer, assessment of possible impact of ocean pollutants on the atmosphere and development of future international research programs, including a pilot project for the Mediterranean (Interchange of Pollutants Between the Atmosphere and Semi-enclosed Seas, INTERPASES). Members of SCOR WG 44 and the Committee on the Climatic Changes and the Ocean take part in this GESAMP working group.

### ***2.10 Marine Pollution Implication of Ocean Energy Exploitation***

This working group was set up on the initiative of the UN with the main aim of reviewing literature and results of ongoing research and describing the implications arising from new ways of obtaining energy from the ocean (e.g., OTEC activities). With the setting up of this group GESAMP felt "up-to-date". The results of the survey will certainly be of interest to the whole marine scientific community.

### **3. General Impressions**

During the history of GESAMP there has been a switch from the group serving as a forum for scientific discussions on marine pollution problems to being a forum for discussion of working group reports, not so much from the scientific viewpoint as from more formalistic viewpoints.

At present there are about 15 members of GESAMP. There is a rule that a Chairman of a GESAMP working group must belong to this membership. There are now eight working groups which means that every second member of GESAMP is a Chairman. There is also a rule that at least some of the members of a working group shall be members of GESAMP. This, again, means that most members of GESAMP belong to at least two working groups. The working groups cover very different aspects and I doubt that these are dealt with in the most effective way with such a small core of scientists responsible for the outcome. Several GESAMP members have to work very hard and, in fact, act as almost "free-of-charge consultants" to the sponsoring agencies. I do not think this fact always stimulates all of them to do their utmost best. There seem to be excellent people refusing to join GESAMP because of the heavy workload.

The working groups work under financial restraints. This limits the number of members, the number of meetings and sometimes makes the whole work uncertain. The consequences may be delayed and out-of-date reports.

Perhaps the results of GESAMP would be of a higher class if the group confined itself to work with a few, well-defined areas.

### **4. Relationship between GESAMP and SCOR**

From the list at the beginning of this report it is evident that several scientists working both for GESAMP and SCOR form important links between the two bodies. This is especially valid for items like oceanographic models, interchange between the atmosphere and the ocean, the health of the ocean and ocean-energy exploitation. I suggest SCOR finds a practical way of avoiding double work especially between its WG's 34 and 44, and the GESAMP working groups mentioned under 2.2 and 2.9. The work in the GESAMP working group on the Health of the Ocean might be of great interest to most people involved in SCOR.

During the Dubrovnik meeting I had the opportunity to inform GESAMP members about SCOR activities.

### **5. Next Meeting of GESAMP etc.**

The XIIth session of GESAMP will be held in Geneva 19-28 October 1981. The first part (19-21 October) will be devoted to a discussion on the results of the working group on the Health of the Ocean.

The Chairman, until after the next session, is Dr. V. Pravdić, Zagreb, and the Vice-Chairman is Dr. A. McIntyre, Aberdeen. The Technical Secretaries for GESAMP of the sponsoring agencies will have an inter-sessional meeting.

## ANNEX XII

### MARINE POLLUTION

#### Report of the Scientific Rapporteur: Dr. Bernt Dybern

##### General

The problem of marine pollution has increased rather than decreased during recent time. Among the reasons for this are a series of troublesome tanker accidents with large oil spills, the increasing knowledge of cadmium and some other "new" agents as pollutants, which are at least equal in toxicity to mercury and PCB, and the likewise increasing knowledge of the importance of pollutants carried through the atmosphere to the sea, e.g., pesticides transported from tropical to temperate regions.

At the same time research possibilities and abatement measures seem to be increasingly hampered in many countries, both industrialized and developing ones, the reason being the economic crisis. If a country is in economic difficulties, environmental protection measures seem to be among the very first things to be cancelled. A striking example is Poland where the conditions in the River Vistula and the Bay of Gdansk rapidly become worse because the nation cannot afford measures to arrest the deterioration. The increased costs for fuel have hampered expeditions with research vessels even in such a rich country as Sweden.

##### International Co-operation on the Global Scale

Marine pollution problems are dealt with by a great number of international organizations, e.g., ICES with which SCOR sponsors WG 42 (see report from the Chairman). At the 14th European Marine Biological Symposium on Helgoland, September 1979, devoted to 'Protection of Life in the Sea', it was established that marine pollution abatement must be improved and increased. At the UN Conference of Science and Technology for Development (UNCSTD), Vienna, August 1979, it was pointed out that pollution abatement must not be treated separately but should be an integrated part of all development activities.

At the XIth Session of the IOC Assembly in Paris, spring 1980, it was agreed that the GIPME program should be accelerated along the lines recommended at the Third GIPME meeting in Malta, in 1979. A better co-operation between GIPME, IGOSS, IODE and TEMA was anticipated. It was further confirmed that the overall responsibility for marine pollution activities within IOC should rest with GIPME, including the leadership of any future global marine pollution monitoring programs, e.g., the new MARPOLMON (Marine Pollution Monitoring). MARPOLMON is initially intended to deal with oil pollution, but later on other parameters may be added.

GEMSI (the GIPME Group of Experts on Methods, Standards and Intercalibration) will meet in September 1980. The importance of standardization and intercalibration of methods is well recognized. Repeated exercises within ICES, in the Mediterranean Program, at the IOC/WMO/UNEP Bermuda Workshop in January 1980, and in other connections, have shown the difficulties in achieving comparable results. It is to be hoped that GEMSI can solve some of the related problems. The outcome of the group's work is probably fundamental for the success of GIPME. The effectiveness of GIPME will also be enhanced if a closer co-operation with GESAMP is established, as suggested from other quarters. (A report on GESAMP's XIth meeting in Dubrovnik, February 1980, has been forwarded by the Rapporteur.)

UNEP has designated the ocean environment as a priority area. The oceans are partly covered by 8 regional programs, summarized as the 'Regional Seas Program'. The most advanced of the regional programs is the one for the Mediterranean, where results from joint investigations now are being put together, showing parts of the area are very polluted. The remaining regional programs are in more preliminary stages. One of them, in the Gulf between Iran and the Arabian Peninsula, has had special difficulties.

There is still overlap between the global IOC/GIPME and UNEP activities related to marine pollution, and SCOR is recommended to carefully watch the development in this respect, especially in its capacity of advisory body to IOC, but also because much of what is achieved by SCOR working groups has a bearing on the activities of both the other organizations and those of GESAMP. SCOR can certainly contribute both data and expertise of value for various pollution studies. Therefore, it is also very suitable that SCOR, among the preliminary suggestions for the JOA program, has included points directly dealing with marine pollution. The intended cross-section of marine sciences would not be complete without these points.

## ANNEX XIII

### EFFECTS OF POLLUTION ON MARINE ORGANISMS Report prepared by Dr. A. D. McIntyre

#### Background

During the last decade there has been extensive national and international activity aimed at developing programmes to monitor marine pollution. It was recognized early, for example by ICES, that for many reasons (including technical and public health considerations) the most convenient and appropriate environmental compartment for monitoring heavy metals and organochlorines was the biota. The major efforts were therefore initially focussed on measuring chemical residues in biological tissue, and an international programme based on extensive intercalibration exercises has been under way for some time in the North Atlantic (ICES Co-operative Research Report No. 67, 1977). Other environmental compartments were not neglected, however, and although routine determination of concentrations of contaminants in sea water presented additional difficulties, relevant studies on metals are now well advanced (e.g. ICES Co-operative Research Report No. 84, 1978) while the problems of organochlorines in sea water and of open ocean monitoring in general are being examined, particularly through GEMSI. Attention is also being directed to sediment monitoring, for example, by ICES and by the Joint Monitoring Group of the Oslo and Paris Commissions. For oil the most significant advances are probably associated with the IGOSS Pilot Project on Marine Pollution (Petroleum) Monitoring, involving studies of surface oil and water column analysis.

#### Biological Effects

While these programmes were being developed it was recognized that the study of biological effects presented greater difficulties and a number of initiatives have been taken to assess the problems. The 1973 report of SCOR Working Group 29 on Monitoring Life in the Oceans is relevant, and a number of later publications by, *inter alia*, ICES, GESAMP and several UN agencies have dealt with aspects of the subject. These are reviewed in GESAMP Reports and Studies No. 12, 1980 (in press).

Two recent initiatives from ICES and GESAMP should be noted. ICES focussed on the feasibility of effects monitoring and the report of a small subgroup (ICES Co-operative Research Report No. 75, 1978) led to a workshop which met early in 1979 to identify appropriate techniques and recommend further studies. The GESAMP Working Group was charged with formulating a rationale, determining the scientific requirements, and assessing the feasibility of establishing practical procedures for monitoring biological variables related to marine pollution. Both reports are in press and will be published in the second half of 1980 (Rapp. P.-v. Réun. Cons. int. Explor. Mer, 179, 1980; GESAMP Reports and Studies No. 12, 1980). Finally, for oil, ICES in 1977 established a group to plan a programme of scientific studies to investigate the effects of oil spills and to identify the observation, expertise and resources needed. The group's report is in the process of final editing.

#### The Current Position

During the several years in which these reports were in preparation there has been an increasing awareness of the need to consider biological effects. Extensive experimental work, such as the IDOE PRIMA Project (Pollution Responses in Marine Animals) has been coupled with attempts to put biological effects monitoring into practice in international exercises (e.g. the UNEP regional seas programmes) and in national studies, notably the Ocean Pulse Programme in USA (see p. 85, Rapp. P.-v. Réun. Cons. int. Explor. Mer, 179, 1980). It is expected that the publication of the ICES and GESAMP reports will further encourage and extend such activities.

It could therefore be argued that further basic discussions at the present time are not called for. Instead, what seems to be required is a period of testing, in which the methodology and techniques identified are fully evaluated at sea and attempts are made to integrate them into monitoring programmes. The most useful current contribution that could be made by international agencies would be to draw attention to the techniques which have been recognized, and to urge that they be extensively applied. After a period of perhaps two years it would be desirable to synthesise results and assess accumulated expertise in some appropriate international forum. In the near future it will be reasonable to begin considering how best to arrange such a meeting.

## ANNEX XIV

### REPORT ON THIRD MEETING OF THE IOC/GIPME GROUP OF EXPERTS ON METHODS, STANDARDS AND INTERCALIBRATION (GEMSI) HELD IN MONTEREY, U.S.A, 8-12 SEPTEMBER, 1980 Received from SCOR Observer — Prof. B. Dybern

At the Third GIPME meeting on Malta in 1979, it was recommended that the GIPME Group of Experts on Methods, Standards and Intercalibration (GEMSI) be re-named the GIPME Group of Experts on Marine Scientific Investigations (GEMSI) with wider terms of reference and a larger number of members. The last IOC Assembly did not approve this for financial reasons and the Monterey meeting was, therefore, a meeting of the old GEMSI. The group felt, however, that it could not accomplish its task without a revision of its terms of reference and suggested a new *modus operandi* of future activities (see Appendix I) which will be included in the forthcoming GEMSI report. The terms of reference are similar to those suggested by GIPME at its third meeting. Co-operation with SCOR, as well as other organizations, when appropriate, is included in the *modus operandi*. (A sub-group for discussing surface microlayer samplers was set up and may make contact with SCOR WG 44).

GEMSI has up to now mainly been concerned with methods, standards and intercalibration for investigations of sea water. It is now suggested to widen the number of parameters to include some biological ones.

The Bermuda Workshop on intercalibration of methods for organochlorines (PCB's) and trace methods was considered a success, but gave rise to new questions to be solved. Two sub-groups will work with this during the next two years before a real monitoring program is practically possible. The Bermuda Workshop was an IOC/WMO/UNEP undertaking.

The IOC/WMO Workshop on pollution monitoring in New Delhi earlier in 1980, had suggested to transform the MAPMOPP program into the MARPOLMON program (Marine Pollution Monitoring) which could include other parameters than oil. GEMSI suggested surface microlayer monitoring to be included as soon as possible.

This work on a procedures manual had not advanced very far but will be continued.

#### Some General Impressions and Recommendations

- (1) GEMSI is the "active branch" of GIPME. It is evidently too small; expertise lacking in several fields that may be included in regional/global monitoring of pollution on the future (e.g., in MARPOLMON). Whenever possible, SCOR should advise IOC to increase the membership of GEMSI, to at least the number suggested in the proposed *modus operandi*.
- (2) The methods recommended by GEMSI are generally of high scientific level and demand sophisticated equipment. Some members of GEMSI do not seem to be aware of the practical difficulties to carry out very sophisticated investigations in developing areas, and they hesitate to consider more simplified programs which could be carried out parallel to the others with methods intercalibrated against the more sophisticated ones. Inclusion of a few members from developing countries in GEMSI would be valuable to bring some discussions down to earth.
- (3) The technical discussions and achievements within GEMSI, show that the value of the results of previous monitoring attempts may be shown to be rather questionable in many cases.
- (4) The development of the GEMSI activities is slow, but there is an evident trend forwards. If GEMSI can be strengthened the development will naturally be faster for the benefit of GIPME and IOC. I recommend that SCOR continue to follow what happens within the constellation GIPME/GEMSI and that SCOR give support whenever asked for it.

## APPENDIX 1

### Modus Operandi and Proposai for Future GEMSI Activity

**1. The group should advise on:**

- a) the global intercalibration and monitoring of the pollutants of sea-water, marine biota, and marine sediments by petroleum hydrocarbons, chlorinated hydrocarbons, trace metals, and other substances (MARPOLMON);
- b) regional needs and progress in analytical methods, standards, intercalibration and baseline studies regarding marine pollution (co-operation with UNEP Regional Seas Program);
- c) training in marine pollution study (TEMA aspect).

**2. Composition of the group:**

To be composed of not more than 15 ordinary members and correspondent members.

**3. Method of the Work:**

- a) small task groups, as needed;
- b) by visits of GEMSI experts to various regions;
- c) by correspondence.

**4. Meetings of the Group:**

A core group of GEMSI composed of the Chairman of the group and the leaders of the task groups should meet once per year. The group should meet every other year before the session of the working committee for GIPME.

**5. Reports:**

The task groups should report to the core group of GEMSI. The biennial report of the core group should be approved by GEMSI. GEMSI should report to the working committee for GIPME in accordance with its Terms of Reference.

**6. Co-operation with Other International Organizations:**

The group may be requested to co-operate with such organizations as ICES, SCOR, IAEA, UNEP, FAO; such contacts will normally be through the Secretary, IOC.

**7. Co-operation with Other IOC Subsidiary Bodies:**

The group should co-operate closely with working committees for IGOSS, IODE and TEMA as appropriate, as well as with IOC regional bodies; IOCARIBE, WESTPAC, CIM.



ANNEX XV  
REPORT OF CMG

A meeting of the Commission was held in Paris on 9 July 1980 during the XXVI International Geological Congress.

The following revised membership has been approved by the Council of IUGS:

Chairman: K. J. Hsü (Switzerland)  
Secretary: J. Thiede (Norway)

E. M. Davin (U.S.A.)  
E. D. Goldberg (U.S.A.)  
E. S. W. Simpson (South Africa)  
T. H. Jordan (U.S.A.)  
Charlotte Keen (Canada)  
A. S. Laughton (U.K.)  
L. Montadert (France)  
R. A. Scrutton (U.K.)  
G. B. Udintsev (U.S.S.R.)  
C. M. Urien (Argentina)  
S. Uyeda (Japan)  
C. C. von der Borch (Australia)

Associate Members are: T. F. Gaskell (U.K., Associate Secretary),  
H. M. Bolli (Switzerland)  
J. M. Harrison (Canada)  
T. W. C. Hilde (U.S.A., IAPSO Liaison).

The Commission was responsible, wholly or in part, for organization and/or sponsorship of the following activities during the period 1978-80:

- a) ICG/CMG Symposium on *Coastal Properties across Passive Continental Margins*, Halifax 1978 (Convenor: Charlotte Keen).
- b) University of Witwatersrand/CMG Workshop on *Reunite Gondwanaland*, Johannesburg 1979 (Convenor: L. O. Nicolaysen).
- c) IAPSO/CMG Symposium on *Fluxes and Chemistry of Particulate Matter in the Oceans*, XVII IUGG, Canberra 1979 (Convenor: J. Gieskes).
- d) IUGG/IAPSO/CMG Symposium on *Origin and Nature of the Southern Ocean*, XVII IUGG, Canberra 1979 (Convenor: Sir George Deacon).
- e) ICG/CMG Symposium on *Tectonics of South West Pacific Margins*, XVII IUGG, Canberra 1979 (Convenor: W. Johnson).
- f) ICG/CMG Symposium on *Continental Margins of the Indian Ocean*, XVII IUGG, Canberra 1979 (Convenor: C. C. von der Borch).
- g) ICG/CMG Symposium on *Geology of Continental Margins*, XXVI IGC, Paris 1980 (Convenors: R. Blanchet, L. Montadert).
- h) ICG/CMG Symposium on *Geology of Oceans*, XXVI IGC, Paris 1980 (Convenors: J. Debysier, X. le Pichon, F. Vine).

- i) ICG/CMG Symposium on *Marine Geology, Sedimentology, Sedimentary Petrography*, XXVI IGC, Paris 1980 (Convenors: G. Boillot, M Vigneaux, E. Seibold).

Together with the Lamont-Doherty Geological Observatory, CMG is organizing for publication by John Wiley Inc., a volume of contributed papers in honour of the late Dr. Bruce Heezen.

CMG is assisting the Commission for the Geological Map of the World (CGMW) to devise legends and criteria for the compilation of geological maps which extend across coastlines and continental margins. At present the Third Edition of the Geological Map of Africa is under compilation and will include geological data extending out to the limits of each sheet.

The IUGS/IUGG Geodynamics Project of the 1970's has been succeeded by an Inter-Union Project entitled *Dynamics and Evolution of the Lithosphere: the Framework for Earth Resources and the Reduction of Hazards*, of which the shortened title will be *The Lithosphere Project*. This will contain a strong component of marine geology, geophysics and geochemistry with particular emphasis upon the continental margins. CMG has, therefore, proposed (to the Lithosphere Project Bureau), the establishment of two working groups to study the evolution of the oceanic environments, and (b) magmatic and tectonic processes. CMG has emphasized that these processes have prime importance in their own right, and that they provide data relating to the abundance of the largely unexplored oceanic earth resources, and to an understanding of recent and modern processes without which the geological record incorporated into the continents cannot be properly interpreted.

## ANNEX XVI

### REPORT OF IABO

1. Dr. van der Land (Netherlands) has proposed a working group to compile a world list of marine animals and plants. This proposal was circulated to IABO correspondents.
2. The IUCN Special Marine Review Meeting was postponed until September 1980. Dr. Martin Angel is expected to attend this meeting on behalf of IABO. The meeting will consider IUCN's role in marine conservation.
3. At the invitation of Dr. M. Steyaert, (UNESCO), IABO will co-sponsor a symposium on Coastal Lagoons to be held in Bordeaux, September 1981. Dr. H. Postma (Netherlands) is Chairman of the organizing committee.
4. A symposium on *Controlled Experimental Ecosystems* jointly sponsored by NSF (USA) and NSERC (Canada) was held at the Institute of Ocean Sciences, Sidney, B.C. Canada. Approximately 60 scientists from 15 countries, including four scientists from the Republic of China took part in the three-day symposium. The symposium papers will be published by Springer-Verlag and edited by Dr. G. Grice and Dr. M. Reeve.
5. Dr. N. C. Fleming (U.K.) World Confederation of Underwater Activities has circulated a draft manuscript on a *Code of Practice for Scientific Diving*.
6. Volume 4 of *IABO Proceedings* is in preparation for release in 1981.

**ANNEX XVII**  
**REPORT OF IAMAP**

The Third Scientific Assembly of IAMAP will be held in Hamburg, F.R.G. 17-28 August 1981. The Second Circular, containing all details on program, registration, accommodation and paper submission, can be obtained from:

S. Ruttenberg, Secretary General, IAMAP  
NCAR  
P.O. Box 3000  
Boulder, CO 80307, U.S.A.

A number of sessions have been designed to be of interest to oceanographers, namely:

1. Climate fluctuations and relations to the tropical Atlantic — co-sponsored by IAPSO; one full day (first week) dealing with the coupled ocean-atmosphere system and related teleconnections.
2. Radiation transfer in the oceans and remote sensing of ocean properties — co-sponsored by IAPSO and COSPAR; two full days (second week).
3. The role of oceans in atmospheric chemistry — co-sponsored by IAPSO; two full days (second week), dealing with precipitation chemistry, marine aerosols and air/sea exchange of trace gases and aerosols.
4. Boundary-layer dynamics and air-sea interaction; one full day (second week), dealing with transfer processes at the air-sea interface and relevant recent experimental programs over oceans.

Members will recall that the following week in Hamburg is the period of the SCOR/IAPSO/IABO/ICES Symposium on North Sea Dynamics (see under agenda item 5.3). During the previous week there has been scheduled, in Oxford, U.K., the IAMAP/IAHS Symposium on Variations in the Global Water Budget, including consideration of rainfall over oceans and long-term fluctuations in ocean water balance. Additional sessions during the first week of the IAMAP Assembly deal with the Dynamics of Atmospheric General Circulation; Solar Spectral Irradiance; Climate Variations Over the Last 1,000 Years; Volcanic Input to Atmospheric Chemistry.

## ANNEX XVIII

### REPORT BY CMAS SCIENTIFIC COMMITTEE

1. With reference to the Proceedings of the 22nd meeting of the SCOR Executive Committee at Kiel, January 1980, work has proceeded with compilation of a Manual of Underwater Scientific Techniques. An explanatory letter and questionnaire has been circulated to several hundred diving scientists asking for standardized information on equipment, designs, patents, and specialized methods used by divers in their laboratories. The circulation will be expanded for a further six months, and the replies sorted, classified, and cross-indexed, as well as subject indexed.
2. Fifteen countries have contributed sections to the International Code of Practice for Scientific Diving. There will be sections grouped to cover the special problems of diving in different climate zones, indicating hazards, and precautions to be taken. There will be sections to recommend procedures for diving with pure oxygen and mixed gases other than air. A comparative section listing all alternative decompression schedules in use has been compiled. The legal regulations concerning scientific divers have been correlated for eight countries and will be summarized in the Code. During the last six months there have been particular problems with new draft government regulations in France and Italy.
3. Initial plans are being made for a small publication to describe the ideal lay-out and facilities to support scientific diving in laboratories of different sizes, with different frequencies of diving. The report will cover storage, maintenance, washing of equipment, water supply, repair facilities, compressors, air storage, compressed air vessel inspection, air intakes, regulator maintenance, re-compression chamber installation, portable re-compression chambers, and the best methods of transporting gear to and from vessels.
4. The Sixth Symposium of the Scientific Committee of CMAS was held at Heriot Watt University from 14-18 September 1980. The opening speech was delivered by H. R. H. Prince Charles, Prince of Wales, who remained to hear the first half-day of papers. The symposium was attended by 120 registrants from 17 countries. There was an exhibition of equipment, including 3-dimensional diver tracking and location systems, remote-controlled vehicles, diver-transport vehicles, and new breathing sets with automatic adjustment of buoyancy and controlled rates of ascent.
5. The General Assembly of the Committee was held on 18 September, and resolutions adopted for the program for the next two years. Joint field programs are continuing in geological surveys in the northern Adriatic, archaeological excavations in Britain and Israel, and coastal pollution studies. A working group was appointed to invite papers for the associated organization session at the JOA 1982.

## ANNEX XIX

### Future Meetings of SCOR and Affiliated Organizations 1981

21-23 January	San Diego	WG 55 — Prediction of El Niño
2-3 March	Copenhagen	WG 42 — Pollution of the Baltic
17-26 March	Vienna	JSC Meeting
6 April	London	IOC/ECOR/SCOR Oceanographic Applications of Drifting Buoys
7-9 April	London	ECOR 4th General Assembly
27-30 April	Venice	WG 47 — Oceanographic Programmes During FGGE
28-30 April	Sweden	SCOR 23rd Executive Committee Meeting
4-7 May	Paris	WG 56 — Equatorial Upwelling Processes
11-15 May	Tokyo	CCCO — Time Series of Ocean Measurements
13-20 May	Miami	IUCRM — Wave Dynamics and Radio Probing of the Ocean Surface
18-22 May	Tokyo	CCCO — Second Meeting
1-14 June	Plymouth	SCOR/SCAR/IWC Workshop on the Identification of Cephalopod Beaks
17-28 August	Hamburg	IAMAP General Assembly
31 Aug-4 Sept.	Hamburg	SCOR/IAPSO Symposium on North Sea Dynamics
7-9 September	Paris	IAHR — Mechanics of Oil Slicks
8-14 September	Bordeaux	UNESCO/SCOR/IABO International Symposium on Coastal Lagoons
14-16 September	Berkeley	ECOR — Directional Wave Spectra
To be arranged	Bordeaux	WG 65 — Coastal Off-Shore Ecosystems Relationships
To be arranged	—	WG 57 — Coastal and Estuarine Regimes
To be arranged	—	WG 61 — Sedimentation Processes at Continental Margins
To be arranged	—	WG 63 — Marine Geochronological Methods

**1982**

8-10 January	India	SCOR 24th Executive Committee Meeting
April	South Africa	Sandy Beaches as Ecosystems
May	France	WG 59 — Flows of Energy and Materials in Marine Ecosystems: Theory and Practice
2-13 August	Halifax	Joint Oceanographic Assembly and XVI General Meeting of SCOR
November	Cape Town	ECOR — International Coastal Engineering Conference
To be arranged	—	WG 44 — Ocean-Atmosphere Materials Exchange
To be arranged	—	WG 51 — Evaluation of CTD Data

## ABBREVIATIONS

ACMRR	Advisory Committee on Marine Resources Research (of FAO)
BEED	Biology and Eastern Equatorial Dynamics
BIOMASS	Biological Investigations of Marine Antarctic Systems and Stocks
BOSEX	Baltic Open Sea Experiment (1977)
CAGE	CCCC Proposed Experiment in the North Atlantic
CCCC	Committee on Climatic Changes and the Ocean
CCOP/SOPAC	Committee for Co-ordination of Joint Prospecting for Mineral Resources in South Pacific Offshore Areas
CMGW	Commission for the Geological Map of the World
CIM	Co-operative Investigations in the Mediterranean; Joint IOC/FAO (GFCM)/ICSEM International Co-ordination Group for CIM
CINCWIO	Cooperative Investigation in the North and Central Western Indian Ocean
CIPREA	Circulation et Production en Zone Equatoriale Atlantique
CMAS (SC)	Confédération Mondiale des Activités Subaquatiques, Scientific Committee
CMG	Commission on Marine Geology (of IUGS)
COSPAR	Committee on Space Research (of ICSU)
ECOR	Engineering Committee on Oceanic Resources
EPOCS	Equatorial Pacific Ocean Climate Studies
ERFEN	Estudio Regional del Fenómena "El Niño"
FAO	Food and Agriculture Organization of the UN
FATE	FGGE Atlantic Tropical Experiment
FGGE	First GARP Global Experiment
FIBEX	First BIOMASS Experiment (WG 54)
FINE	FGGE / INDEX / NORPAX Equatorial
FOCUS	French Ocean Climate Studies
GARP	Global Atmospheric Research Programme (of WMO/ICSU)
GESAMP	Group of Experts on the Scientific Aspects of Marine Pollution
GEMSI	Group of Experts on Methods, Standards and Intercalibration
GIPME	Global Investigation of Pollution in the Marine Environment
IABO	International Association for Biological Oceanography (of IUBS)
IAEA	International Atomic Energy Agency
IAHR	International Association of Hydraulic Research
IAHS	International Association of Hydraulic Sciences (of IUGG)
IAMAP	International Association of Meteorology and Atmospheric Physics (of IUGG)
IAPSO	International Association for the Physical Sciences of the Ocean (of IUGG)
ICES	International Council for the Exploration of the Sea
ICG	Inter-Union Commission on Geodynamics (of IUGG/IUGS) and also used with reference to International Coordination Groups of IOC
ICSU	International Council of Scientific Unions
IDOE	International Decade of Ocean Exploration
IEEE	Institute of Electrical and Electronics Engineers
IGC	International Geological Congress
IGOSS	Integrated Global Ocean Station System
IHB	International Hydrographic Bureau
IIOE	International Indian Ocean Expedition
IMCO	Inter-Governmental Maritime Consultative Organization
INDEX	Indian Ocean Experiment
INTERPASES	Interchange of Pollutants Between the Atmosphere and Semi-Enclosed Seas
IOC	Intergovernmental Oceanographic Commission
IOCARIBE	IOC Association for the Caribbean
IODE	International Oceanographic Data Exchange (Working Group of IOC)
IUBS	International Union of Biological Sciences (of ICSU)
IUCN	International Union for Conservation of Nature



IUCRM	Inter-Union Commission on Radio Meteorology
IUGG	International Union of Geodesy and Geophysics (of ICSU)
IUGS	International Union of Geological Sciences (of ICSU)
JOA	Joint Oceanographic Assembly (1982)
JPOTS	Joint Panel on Oceanographic Tables and Standards
JSC	Joint Scientific Committee (WMO/ICSU)
MAPMOPP	Marine Pollution (Petroleum) Monitoring Pilot Project (IGOSS)
MARPOLMON	Marine Pollution Monitoring
MONEX	Monsoon Experiment
NATMANCOMS	National Mangrove Committees
NCAR	National Centre for Atmospheric Research (USA)
NEADS	North East Atlantic Dynamics Studies (WG 34)
NODC	National Oceanographic Data Centre
NOAA	National Oceanographic and Atmospheric Administration (USA)
NORPAX	North Pacific Experiments
NSF	National Science Foundation (U.S.A.)
NSERC	Natural Science and Engineering Research Council (Canada)
ORSTOM	Office of Overseas Scientific and Technical Research (France)
OTEC	Ocean Thermal Energy Conversion
PCB's	Polychlorinated biphenyls
PEQUOD	Pacific Equatorial Ocean Dynamics
POLYMODE	Joint US-USSR Mid-Ocean Dynamics Experiment
POMS	Pilot Ocean Monitoring Study
PRIMA	Pollution Responses in Marine Animals
SCAR	Scientific Committee on Antarctic Research
SCOR	Scientific Committee on Oceanic Research
SEQUAL	Seasonal Equatorial Atlantic Experiment
SST	Sea Surface Temperature
TEMA	Training Education and Mutual Assistance
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNCSTD	United Nations Conference on Science and Technology for Development
URSI	International Union of Radio Science
WDC	World Data Centre
WESTPAC	Western Pacific
WHO	World Health Organization
WMO	World Meteorological Organization
XBT	Expendable Bathy Thermograph