

**SCIENTIFIC COMMITTEE ON OCEANIC RESEARCH**



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**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

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## REPORT OF THE TWENTY-THIRD MEETING OF THE SCOR EXECUTIVE COMMITTEE

Fiskebäckskil, Sweden

April 28 to 30, 1981

The twenty-third meeting of the Executive Committee of the Scientific Committee on Oceanic Research was held at the Kristineberg Marine Biological Station, Fiskebäckskil, Sweden, from April 28 to 30, 1981. A list of participants is given in Annex I.

The meeting was opened by Professor E. S. W. Simpson, President of SCOR, who welcomed the members of the Executive Committee and representatives of several national committees and international organizations. The new Chairman of the Swedish National Committee for SCOR, Professor Ivar Hessland, and the Director of the Kristineberg Marine Biological Station, Professor Jarl-Ove Strömberg, expressed their wishes for a successful meeting and welcomed the participants.

The death of Professor Klaus Grasshoff was noted with great regret. Professor Grasshoff had been a very active member of SCOR for many years especially as a former Chairman and member of WG 10, as a member of WG 42 and as the representative of SCOPE.

The President congratulated Professor Gotthilf Hempel on becoming the Director of the Alfred Wegener Institut für Polarforschung and Professor Eugen Seibold who has been named President of the Deutsche Forschungsgemeinschaft and of IUGS.

### 1.0 ORGANIZATION AND FINANCE

The Executive Secretary reported that a new *SCOR Handbook* will be published in mid-1981 to replace the July, 1979 *Supplement to the SCOR Proceedings*.

#### 1.1 MEMBERSHIP

National Members:

Canada: Professor S. E. Calvert and Dr. K. H. Mann have replaced Professor C. J. R. Garrett and Dr. D. V. Ellis as Nominated Members.

Chile: Capt. M. A. Sepúlveda has ceased to be a Nominated Member and Sr. B. Uccelletti has replaced Sr. R. Kelly.

Denmark: Dr. J. Bondam has replaced Dr. G. Henderson.

U. S. A.: The National Committee has informed the SCOR Executive Secretary that, as of July 1, 1981, the three Nominated Members will be Dr. D. J. Baker, Dr. W. W. Hay and Dr. J. H. Steele.

The question of broadening the membership of SCOR was discussed. In particular, the President will make contact with the oceanographers in the People's Republic of China and will encourage them to urge the appropriate national organization to seek membership in SCOR, hopefully, in time for Chinese oceanographers to attend JOA-82 and the XVI General Meeting of SCOR in Halifax. The potential membership of several other countries was discussed; it was agreed that oceanographers from these nations should be invited to attend JOA-82, but that national membership in the IOC was more appropriate than SCOR membership for many countries which do not yet have a clearly established expertise in oceanographic science. Following the meeting, notification of Egypt's intention to join SCOR was received.

Affiliated Members:

Professor Kenneth Hsü has replaced Professor E. S. W. Simpson as Chairman of CMG and Dr. Jørn Thiede is now Secretary of CMG.

Organizational Members:

Professor Gotthilf Hempel has replaced Mr. George Hemmen as the representative of SCAR.

## 1.2 PUBLICATIONS

Professor Henry Charnock has assumed the responsibilities of SCOR Publications Officer. The Executive Committee Reporters for all SCOR Subsidiary Groups should attempt to keep him informed of any plans for publications of working groups and committees.

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

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 a meeting of WG 62, November 1979. Published December 1980.

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

Future issues:

No's. 36-40: 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.

No. 41: Report and recommendations of the November 1979 meeting of WG 44, *Ocean-Atmosphere Materials Exchange*. To be submitted to UNESCO early 1981.

ii) *UNESCO Monographs on Oceanographic Methodology*

No. 7, *Mathematical Models in Biological Oceanography* arises from the meetings of WG 59. In press. This monograph is also being translated into Russian by UNESCO.

Future issues:

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

iii) *Other UNESCO/IOC Publications*

*River Inputs to Ocean Systems*, papers presented at the RIOS workshop, March 1979. In press. This volume is being printed for IOC by UNEP.

*Bibliography on Mangrove Research*. In press.

iv) *IOC Workshop Report Series*

The following issues have been published:

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) *Other Publications Arising from SCOR Activities*

SCOR Proceedings, Volume 17, No. 1 were published in April 1981 and comprise the record of the XV General Meeting, Woods Hole, Sept., 1980.

Approval was given to the publication of the report of the WG 52 workshop on *Estimation of Micro-Nekton Abundance* (April 1980) in the *Biological Oceanography Journal*. The manuscripts have been reviewed by Professor Lebrasseur and Dr. Tranter.

*Assault on the largest unknown - the International Indian Ocean Expedition 1956-1965* by Daniel Behrman : English version in press. Translation into Russian and printing in 1981. This book is not a joint UNESCO/SCOR activity but it is a history of such an activity.

The representative of UNESCO expressed some concern about whether the report of the SCOR/SCAR/IWC workshop on *Identification of Cephalopod Beaks* is an appropriate topic for the UNESCO Monographs on Oceanographic Methodology. A number of alternative publishers were suggested and it was felt that the convenor of the workshop, Dr. M. Clarke, should explore some of these, perhaps using advice from IABO.

### 1.3 FINANCE

An interim statement of income and expenditure for the first quarter of 1981 was presented (Annex II).

Since it was not expected that there would be another meeting of the Executive Committee before 1982, Professors Henry Charnock and Gerold Siedler were appointed as a Finance Committee to draft a budget for 1982.

The Executive Secretary reported that some arrears have been collected, but that the Spanish, Colombian and Indonesian National Committees are two or more years in arrears. The ICSU regulations regarding non-payment of national contributions will take effect. In addition, it was agreed that because of the high costs of printing and postage, national committees which are two or more years in arrears should receive only five copies of any SCOR publications issued until such time as the outstanding contributions are paid.

## 2.0 SUBSIDIARY BODIES

### 2.1 ARISING FROM FORMER WORKING GROUPS

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

A report from Professor Warren Wooster on progress with a publication entitled *Coastal Upwelling Processes* was presented. The University of Washington Press has agreed in principle to publish the volume and it is hoped that some financial assistance from the National Science Foundation (USA) will be available.

### 2.2 EXISTING WORKING GROUPS

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

A report from the Chairman, Professor A. R. Robinson (Annex III), was received. The Executive Committee was glad to note that good progress was being made on the volume *Eddies in Marine Science*, publication of which would be a major result of the work with which the group has been concerned over the last decade. It was noted that the manuscript was scheduled to go to a publisher in mid-1981 and the Executive Committee appreciated the work of the authors and the editor in its preparation.

The Executive Committee reviewed some of the correspondence related to WG 34, including a letter from the USSR SCOR National Committee. From these it was apparent that unless a mutually acceptable compromise could be reached, the volume *Eddies in Marine Science*, as presently envisaged, would not include contributions from Soviet authors. The President described the considerable efforts he had made, after consultations with interested parties, to make an arrangement with the Chairman of WG 34 by which contributions by Soviet authors could still be made to the volume in order to reflect the extremely important role played by the USSR scientists in the discovery and study of ocean eddies. Unfortunately, this had not succeeded.



After considerable discussion of the request of the USSR National Committee for SCOR for withdrawal of SCOR endorsement, it was agreed that the volume should be published with SCOR sponsorship only if the Chairman of WG 34 agreed to the inclusion of a preface by the President of SCOR. This would give a brief outline of the background to the work, including reference to important Soviet contributions to the knowledge of ocean eddies.

It was also agreed that, before termination of WG 34 at the XVI General Meeting, the final meeting proposed by the Chairman, should be held, and that the resulting final report should identify the best ways to promote further work on eddy dynamics and their interaction with other oceanic phenomena. This meeting is to be held in 1982 so that every effort can be made to ensure that scientists from the USSR are able to attend.

Although Soviet scientists had not found it possible to contribute to *Eddies in Marine Science*, it was hoped that they would cooperate in the preparation of a related volume. The Executive Committee, therefore, agreed to invite Professor A. S. Monin to act as Editor-in-Chief of an editorial board to prepare a SCOR volume on dynamics of ocean eddies. He was asked to select and appoint associate editors and members of the Board of his own choice and to prepare the material for publication as soon as conveniently possible.

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

A summary report of a meeting on the *Study of Pollution of the Baltic* held in Copenhagen in March 1981 was submitted by the Chairman of WG 42 (Annex IV). A full report of this meeting is available as ICES publication CMI981/E:6 from the office of the General Secretary of ICES.

A request from ICES for revision of the Terms of Reference for WG 42 was discussed and approved. The revised Terms of Reference are:

- i) identify, from the point of view of pollution, the need for appropriate scientific studies in the Baltic;
- ii) when so decided by ICES and SCOR, coordinate scientific activities in the Baltic;
- iii) undertake such tasks as ICES and SCOR may decide from time to time;
- iv) make proposals to ICES and to SCOR on matters on which the Working Group feels these organizations should take action;
- v) report to ICES and to SCOR on the progress and results of its work.

Approval was given for a three-day meeting of WG 42 in the first quarter of 1982 in Gothenburg to consider the following items:

- i) progress in the summary report of BOSEX results;
- ii) progress in the patchiness studies and results of national programmes;
- iii) papers on the biogeochemical cycling of selected substances in the Baltic and related modelling, and
- iv) the relationship between biological productivity and the CO<sub>2</sub> cycle in the Baltic.

If possible, the meeting should overlap with that of the ICES Working Group on Marine Pollution Baseline and Monitoring Studies in the North Atlantic for at least one-half day.

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

The workshop previously suggested by WG 44 (see *SCOR Proceedings* 17:1) will be given as Session A4 at JOA-82. A report of a WG 44 meeting held in 1979 will be published during 1981 in the series *UNESCO Technical Papers in Marine Science*.

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

The proceedings of a RIOS workshop held in Rome are being printed by UNEP. The working group was given support for a meeting in 1981 by the XV General Meeting when new Terms of Reference were approved. The Executive Committee encouraged the working group to hold this meeting of four or five individuals who should consider the new Terms of Reference and revise the membership of the group. The sponsorship of this working group will be revised if appropriate.

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

The final meeting of this working group (including all three panels) was held in Venice, 27-30 April. The Chairman will submit the final report of his working group which should include its recommendations for future work if appropriate.

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

A meeting of SCOR WG 51 has been arranged for 26-29 May at the Institut für Meereskunde, Warnemunde, DDR. The group will critically review the members' written contributions to the group's proposed publication on techniques and procedures in the evaluation of CTD data. The Executive Committee will receive a report from the working group after its meeting. It was suggested that the *UNESCO Technical Papers in Marine Science* would be an appropriate medium for the proposed publication.

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

Professor Parsons, Executive Committee Reporter for WG 52, reported that the manuscripts for the monograph on *Estimation of Micro-Nekton Abundance* have been reviewed by Professors Lebrasseur and Tranter. It is hoped to publish the monograph in one of the issues of *Biological Oceanography Journal*.

WG 54, *Southern Ocean Ecosystems and Their Living Resources* (with SCAR, IABO and ACMRR)

The Executive Committee received a report from the Chairman (Dr. S. El-Sayed) transmitted by Mr. George Hemmen, who explained the BIOMASS Data Centre, a Data Interaction Workshop, and new plans for FIBEX as being the most important current initiatives in the BIOMASS programme in the coming year.

#### FIBEX:

In February 1981, one of the largest multi-ship experiments in biological oceanography was mounted, the following vessels taking part:

In the Atlantic sector: *Eduardo Holmberg* (Argentina), *Itsumi* (Chile), *Walther Herwig* and *Meteor* (FRG), *Professor Siedlecki* (Poland), *Melville* (USA) and *Odysee* (USSR).

Unfortunately, *John Biscoe* (UK) was unable to participate due to severe metal fatigue which developed in December 1980. Fortunately, however, the *Odysee* extended her transects into the area originally assigned to *John Biscoe*.

In the Indian sector: *Nella Dan* (Australia), *Marion Dufresne* (France), *Kaiyu Maru* (Japan), *Umitaka Maru* (Japan), and *S. A. Agulhas* (S. Africa).

The majority of the ships undertook their survey between 1 and 25 February as planned, with several of them taking part in the krill patch study afterwards; the latter study lasted between 7 and 10 days. Patch studies and calibration experiments were limited by lack of time, by bad weather and vessels failing to rendezvous.

The cruise reports of the Chief Scientists all indicated productive cruises. Two hundred and ninety sets of hydrographic data were collected by the *Walther Herwig* from the participating vessels in the Atlantic sector, though no such sets of data have accumulated from the Indian sector. Krill seem very widespread over the Scotia Sea and the Indian sector and acoustic recordings provide an informative picture of krill distribution.

#### Data Interaction Workshop:

Arrangements are presently being made to hold a post FIBEX Data Interaction Workshop in Hamburg, FRG, between 22 September and 9 October. Dr. David Cram has been appointed convenor of that workshop. An extensive working document is being prepared by Dr. Cram in consultation with his associates. The workshop will be held under the auspices of the Fachbereich Informatik, Universität Hamburg, and the Alfred Wegener Institut für Polarforschung.

The Hamburg workshop will be of crucial importance for the future planning of SIBEX (Second International BIOMASS Experiment). In this respect efforts are being made to ensure that all key scientists of FIBEX attend the workshop. Strong expression has been made by key scientists for an early and elaborate planning of SIBEX after detailed analysis of FIBEX results.

#### BIOMASS Data Centre

An *ad hoc* group of Dr. H. A. C. Jones (Canada), Dr. D. Cram (FRG) and an Australian data specialist was formed to advise on the planning and development of specifications for the BIOMASS Data Centre. Such details should be developed during the Hamburg workshop.

#### Future Meetings and Activities:

1981: Together with the Hamburg workshop mentioned above, the following meetings are planned:

- a) Technical Group on Data, Statistics and Resource Evaluation: after the Hamburg meeting - dates not yet fixed.
- b) Working Party on Fish Biology: Workshop on Identification of Early Life History Stages of Antarctic Fishes, Paris, September 1981.
- c) *ad hoc* meetings of these members of the working parties on krill abundance estimation and bird ecology attending the Hamburg workshop.

- 1982:
- a) Group of Specialists on Southern Ocean Ecosystems with other invited participants (to determine the future course of BIOMASS programmes, Tokyo, 28 May - 2 June, 1982.
  - b) SCOR/SCAR workshop on relationships between physical and biological oceanography (location and date to be determined but probably prior to (a) above).

#### Publications:

BIOMASS reports to No. 18, and Handbooks to No. 11 have been published and distributed, as has a volume containing the texts of selected contributions to the 1976 Woods Hole Conference on Living Resources of the Southern Ocean.

It should be noted that Dr. Torben Wolff has become the Executive Committee Reporter for WG 54.

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

A draft report of a meeting of WG 55 which was held in January, 1981, was presented to the Executive Committee and it is hoped that the final version of the report will be available as soon as possible. The recommendation that a biologist should be added to the working group in order to enhance interactions with other groups studying the El Niño phenomenon was accepted.

The working group requested a second meeting in 1981, however, the Executive Committee was of the opinion that the final report of the previous meeting should be submitted before such a request could be approved. This report should contain a clear statement of the future plans of the group in relation to its existing Terms of Reference. A meeting in 1982 was approved instead and note was taken of a suggestion that a major international conference on El Niño be held in South America in late 1984.

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

The Chairman's report indicated that the second plenary session of the SCOR WG 56 was to be held at UNESCO Headquarters, Paris, 4-7 May, 1981. It was expected that all members would participate except Drs. Barber and Walsh.

The main agenda items are:

- review of the paper by Dr. Vinogradov on the ecosystem of the equatorial upwelling;
- review by Dr. Voituriez of the main results of the French CIPREA programme of study of the equatorial upwelling in the Gulf of Guinea;
- review of the SEQUAL-FOCAL programmes;
- review of other programmes of equatorial studies in the Pacific and Indian Ocean;
- telemetry and satellite observations in equatorial studies;
- SCOR WG 56 sponsored equatorial experiments;
- activities of CCCO relevant to questions of interest to SCOR WG 56.

A bibliography of research on the phenomenon of upwelling has been prepared by Dr. A. F. Anto and Dr. V. V. R. Varadachari. It contains most of the publications on physical, chemical, biological and geological aspects of upwelling published between 1890 and 1977. Requests for this document can be made to Dr. A. F. Anto, National Institute of Oceanography, Dona Paula, 403 004 Goa, India.

A bibliography of research on the physical processes in the equatorial regions of the oceans has been compiled by Mrs. Janet Witte, Nova University Ocean Sciences Center, 8000 North Ocean Drive, Dania, Florida 33004.

The Chairman of the WG 56 has been invited to work with the panel on *Biological Effects of Ocean Climate Changes* of CCCO.

The Past-President noted that there should be liaison between WG 56 and the newly-established working group on *Remote Sensing of the Oceans from Satellites* especially with respect to telemetry and satellite observations useful for equatorial studies. He remarked upon the unexpected variability in surface layer temperature in tropical areas which has been uncovered through remote measurement techniques.

The report of the meeting being held in May, 1981, should clearly define the future activities of the working group.

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

A report from the Chairman is given as Annex V. This report outlines the plans for a series of monographs on coastal and estuarine regimes.

Professor J. Sundermann (FRG) has replaced Professor W. Hansen (FRG) who has retired.

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

A report from the Chairman of WG 58 (Annex VI) was discussed. The Executive Committee expressed some concern that the group was diverging from its original Terms of Reference. In particular, the first Term of Reference seems to have been adequately discharged as a result of the June, 1979 report of WG 58. The second Term of Reference has been modified to refer to the WCRP rather than to the POLEX programme of GARP. The group will be invited to discharge its responsibilities by identifying the needs for international co-operative efforts which would be relevant to WCRP. It is hoped that this will be done before the XVI General Meeting of SCOR in 1982.

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

A report from the Chairman is given as Annex VII. The working group will be asked to submit a report of its activities and of the conference on *Flows of Energy and Materials in Marine Ecosystems: Theory and Practice* to the next General Meeting of SCOR. Dr. Dale Krause, the UNESCO representative, was of the opinion that the group should not consider a revision of its monograph on *Mathematical Modelling in Biological Oceanography* in the near future as the series of UNESCO Monographs in Oceanographic Methodology is intended for work of a permanent or long-lasting nature.

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

The Chairman had accepted the decisions which were taken at the XV General Meeting regarding expansion of the Terms of Reference of WG 60. The Executive Committee Reporter, Dr. Torben Wolff, noted the excellent progress being made in the preparation of a monograph on *Mangrove Ecosystem Research Methods* which will be submitted to UNESCO in 1981.

The future of WG 60 after publication of the monograph was discussed by the Executive Committee. This publication, and the presentation by WG 60 of a symposium at JOA-82, will complete the present Terms of Reference. It was agreed that SCOR should maintain some involvement with activities in the field of mangrove research and the President of IABO suggested that this might best be done through the formation of a mangrove association within IABO which would be similar to the existing seaweed and coral reef groups.

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

A special symposium (session No. S.4) on *Sedimentation at Continental Margins* is being planned for JOA-82 in Halifax. Six speakers will deal with the topics of shelf sedimentation; sediment escape to canyons and the slope and rise, boundary layers on the continental rise, suspended sediments in deep boundary current systems; mass movement and soil mechanics of the slope, and carbonate production dissolution and sedimentation at continental margins.

As the reviews of our knowledge of sedimentation processes at continental margins being undertaken by members of the working group are taking longer than anticipated, it will not be suitable for the group meet in 1981. It is suggested that the WG 61 meeting be deferred to 1982 during the JOA at which time its recommendations can be considered along with completed reviews.

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

The report of the first meeting of WG 62 which was held in November 1979, was published as Number 34 in the *UNESCO Technical Papers in Marine Science* late in 1980. It was agreed that more effort should be made to effect liaison between WG 62 and CCCO and the suggestion was made that a carbon specialist be added to CCCO or that WG 62 be merged with CCCO. The proliferation of groups working on problems related to carbon dioxide was noted and the meeting emphasized that SCOR should be identified as the main body interested in the oceanic aspects of the CO<sub>2</sub> problem.

WG 63, *Marine Geochronological Methods* (CMG)

A meeting of WG 63 in September 1981, is being planned and it is expected that the presentation of a symposium at JOA-82 will conclude the activities of the group.

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

A meeting of WG 64 was held in Atlanta in November 1980, during the Geological Society of America annual meeting.

At this time the group presented a symposium which it had organized on the theme *Atolls and Reefs: Recorders of Vertical Tectonics*. The papers presented at this symposium are being prepared for publication (possibly in the GSA Memoir Series) by Professor Winterer and Professor Schlanger.

It is hoped that a result of the symposium is a growing awareness of the crucial role atoll drilling can play in deciphering diverse problems in tectonics, in eustatic sea-level changes, in carbonate diagenesis and in oceanic volcanism. The diversity of disciplines represented, not only amongst the speakers, but especially in the audience, suggests that there may be a sufficiently broad-base in the scientific community to support proposals for renewed drilling through atolls.

WG 65, *Coastal - Offshore Ecosystems Relationships* (with UNESCO) (IABO)

The first meeting of the working group on *Coastal-Offshore Ecosystems Relationships* will be held in September 1981, in Bordeaux in association with the UNESCO/SCOR symposium on *Coastal Lagoons*. Appreciation was expressed for the support for the WG 65 meeting which has been provided by UNESCO. The representative of UNESCO reiterated the importance of the activities of SCOR WG 65 in relation to the UNESCO Major Regional Project on Research and Training leading to the Integrated Management of Coastal Systems (c. f. item 3.2).

2.3 WORKING GROUPS APPROVED AT THE XV GENERAL MEETING

WG 66, *Oceanographic Applications of Drifting Buoys*

A report from the Chairman of WG 66 is given as Annex VIII. A report was also received from Professor Gerold Siedler who had attended the joint IOC/SCOR/ECOR Consultative Meeting on the IOC Drifting Buoy Programme. The conclusions and recommendations of this meeting, which was chaired by Dr. John Garrett, Chairman of WG 66, are given in draft form in Annex IX.

The establishment of this working group was approved at the XV General Meeting. The Terms of Reference, which were finalized after consultation with the Chairman, are given in *SCOR Proceedings*, Volume 17, No. 1. The members of the group are:

J. Garrett (Canada), Chairman	J. McWilliams (USA)
D. J. Baker (USA)	J. Meincke (FRG)
G. Cresswell (Australia)	W. Patzert (USA)
D. Hansen (USA)	P. Saunders (UK)
F. Madelain (France)	C. Stavropoulos (South Africa)

The Executive Committee approved a request received from the USSR representative that Dr. D. G. Seidov be added to the group. At the request of the representative of UNESCO, the Executive Committee expressed its strong support for the conclusions and recommendations of the joint IOC/SCOR/ECOR Consultative Meeting.

#### *WG 67, Oceanography, Marine Ecology and Living Resources*

While the establishment and Terms of Reference for this group were approved at the XV General Meeting, the membership was not finalized until early in 1981. The following individuals have agreed to join WG 67:

R. Barber (USA), Chairman
R. Lasker (USA)
R. Jones (UK)
J. Csirké (Peru)
M. Tomczak, Jr. (Australia)

Some suggestions for additions to this group had been received from IOC; the meeting agreed that these should be carefully considered by the Chairman and existing members of the working group. Two suggestions for additional members from the USSR were made by the Past-President and these will also be sent to the Chairman for his consideration.

It was agreed that the "OSLR" programme must be included in the submission to be sent by SCOR to ICSU for inclusion in the UNESCO Medium-Term Plan (c. f. item 4.3).

This working group is jointly sponsored by SCOR and ACMRR. While ACMRR has unfortunately not been able to participate fully in the formation and early planning for the work of the group, it is hoped that fuller participation by ACMRR in the activities of WG 67 will be possible in the near future. It is anticipated that ACMRR will nominate some members of WG 67.

A meeting of WG 67 is planned for June 1981. At this time work will begin on the formulation of a report on *Ocean Sciences in Relation to Living Resources* which will be presented to IOC in 1982, as requested in IOC Resolution XI-17. A second meeting (which will include the ACMRR members) will be held in early 1982 in order to complete the preparation of this report.

#### *WG 68, North Atlantic Circulation*

At the XV General Meeting it was agreed to request the approval of ICES for the Terms of Reference proposed for WG 68. ICES has agreed to cosponsor this working group which has the following Terms of Reference:



- i) To review and prepare a summary of recent important developments in the study of the North Atlantic circulation as a basis for planning work.
- ii) To identify the observational and modelling studies most relevant for an improved understanding of the circulation of water, heat and chemical tracers in the North Atlantic.
- iii) To identify the meteorological data requirements for the enhancement of such studies.
- iv) To facilitate the cooperation between research groups involved in studies of North Atlantic circulation.

The following individuals have agreed to join WG 68:

SCOR Nominees:

F. Schott (USA), Chairman  
 D. Anderson (UK)  
 W. Holland (USA)  
 W. Krauss (FRG)  
 J. Reid (USA)  
 C. Wunsch (USA)  
 F. Dobson (Canada), CAGE representative

ICES Nominees:

A. Clarke (Canada)  
 W. Gould (UK)  
 F. Madelein (France)  
 J. Meincke (FRG)  
 P. Richardson (USA)  
 M. Saldanha (Portugal)

No further nominations are expected from ICES. Two nominations were received from the USSR National Committee for SCOR in order to fill the needs for an observational expert and a modeller. The Executive Committee invited the Chairman to suggest an appropriate meteorologist with expertise related to problems of atmospheric forcing of oceanic circulation. He was also requested to select a geochemist for addition to the group. An attempt should be made to remedy the lack of any Norwegian scientists on the working group if it is possible to do this through the addition of the meteorologist or geochemist.

Approval was given for a meeting of WG 68 in Miami in early 1982.

## 2.4 COMMITTEES AND PANELS

### *SCOR/IOC Committee on Climatic Changes and the Ocean (CCCCO)*

Professor Charnock reported on the plans for CCCC II and on the current activities of some of the CCCC Panels. The second meeting of the CCCC will be held in the Hydrographic Department of the Maritime Safety Agency in Tokyo, Japan, from 18-23 May, 1981, and will be preceded by a scientific meeting on oceanic time series measurements jointly sponsored by CCCC and the Joint Scientific Committee of the WCRP. The principal items for discussion will be ocean monitoring, the CCCC heat

flux experiment (CAGE) and world ocean circulation experiments. Details of these, and other CCCO activities are given in Annex X.

Professor Charnock also discussed the work of the panel on Sea Ice Variability Studies (Chairman, Dr. A. Foldvik) which had been established because modelling results had shown that doubling CO<sub>2</sub> enhanced temperature increases in polar regions. The Preliminary Plan for the WCRP (Geneva, January 1981) identifies the study of the physical processes affecting interactions between air, ice and sea at the sea ice margin and the development of methods for their adequate representation in climate models as specific needs. To satisfy these needs, 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 polynyas as loci for the convection of deep and surface waters.

Dr. Longhurst discussed the formation of the CCCO Panel on *Biological Effects of Climatic Change* and explained that this panel expected to hold its first meeting at the next CCCO meeting and to work by correspondence until that time. A series of areas of concern to the Panel, which would be addressed sequentially, had been identified: the most immediate problem would probably be the clarification by biologists of the physical oceanographic data required but currently obtainable only in the form of proxy data from meteorology.

The Executive Committee viewed with satisfaction the appointment of the full-time Secretary of CCCO but commented on the general lack of inter-sessional information on the activities of CCCO which they felt should be more widely disseminated, perhaps in the form of a Newsletter. This was felt to be especially important in view of the fact that the budget of CCCO would become such a major charge on the SCOR budget in the coming years. For the same reason the Committee felt that it was most important that the programme of CCCO should be confirmed as part of the UNESCO Medium-Term Plan.

The Executive Committee approved Professor Revelle's request that M. Jacques Merle be appointed as a member of CCCO.

The representative of WMO, Dr. R. Bates, reported on the JSC meeting on satellite plans which had been held in Chilton, UK. It is expected that with the advent of a new generation of satellites, equipped with advanced instrumentation for remote sensing, a great deal of new data on temperature, winds, density fields, etc., will be available for use in studies relevant to the CCCO.

#### *Review Group for Antarctic Oceanography*

This group met during the SCOR Executive meetings at Woods Hole on 27-28 September, 1980. A preliminary agenda for a half-day symposium at JOA on Antarctic Oceanography was agreed upon and it will include review papers on physical and biological oceanography and on their interaction in the Southern Ocean. The proposal to hold a workshop to discuss how best to enhance the interaction of physical, chemical and biological oceanographers working in the Southern Ocean was supported by SCOR, and SCAR has accepted the invitation from SCOR to collaborate in promoting this workshop. Thus, a joint SCAR/SCOR committee should be established to plan the details of the workshop, such as designating the time, place and agenda. It was agreed that it would be most appropriate if this workshop were to be held immediately before the meeting of WG 54 in Japan in May, 1982. Since the present group will be arranging the JOA symposium and participating in the workshop planning, it is recommended that the review group be continued at least until 1982.

*Joint Panel on Oceanographic Tables and Standards (JPOTS) (with UNESCO/ICES)*

A report from the Chairman was received. Dr. Selim Morcos (UNESCO) is presently occupied with the final compilation of the various background data documents as described in *SCOR Proceedings*, Volume 17, No. 1, Annex III. It is expected that the publication date of September 1981 will be met. It is also anticipated that tables of data will be published at about the same time.

Professor Henry Charnock had drafted an announcement which would be published with the approval of the Presidents of ICES, SCOR and IAPSO and the Director of the Division of Marine Sciences of UNESCO. This one page notice about the introduction of the Practical Salinity Scale, 1978 and the International Equation of State of Seawater, 1980 will be widely circulated through the distribution lists of the organizations involved and it should appear in the major oceanographic journals. While the Chairman has requested that the statement be accompanied by the document prepared by JPOTS at its meeting in September 1980, this was not felt to be practical owing to the length of the document (ten pages). The representative of UNESCO suggested that this paper could be made readily available through UNESCO and that the announcement should contain a statement to this effect. There was also some discussion about the application of Practical Salinity Scales below certain low salinity levels and it was proposed that the announcement should be clearly addressed to oceanographers working with oceanic salinities.

A meeting of the CO<sub>2</sub> subcommittee of JPOTS is being planned for August 1981. It was not expected that a full JPOTS meeting would be held before 1983 when the task of the CO<sub>2</sub> group will have been completed. The future plan of action and membership of JPOTS is being considered in the meantime. The Chairman specifically proposes to retain Drs. E. L. Lewis, C. K. Ross, W. Kroebe1 and F. Culkin as members of JPOTS in addition to Drs. F. Millero, A. Poisson and J. Gieskes who are also active on the CO<sub>2</sub> subcommittee.

A new formula for the financial support of JPOTS members was drafted by representatives of ICES, UNESCO and SCOR and was approved by the SCOR Executive Committee.

*Editorial Group for the Ocean Modelling Newsletter*

Dr. Gill had reported that the *Ocean Modelling Newsletter* continues to be successful and that over thirty-six issues have now been published. It was agreed that SCOR encouragement should be given when the Editorial Group approaches the ONR for further funding for this publication when the current contract expires in June 1982.

## 2.5 PROPOSALS FOR NEW WORKING GROUPS

Three proposals for new working groups which were submitted at the XV General Meeting had been considered by the Executive Committee and then circulated to all SCOR National Committees for comments.

*Small Scale Oceanic Turbulence*

The establishment of this working group, which will be WG 69, was approved with the following Terms of Reference:

1. To review the results of *in-situ* measurements of small-scale oceanic turbulence in the light of the design and performance of the instruments used.

2. To review conjectures relating various characteristics of the space-time distribution of small-scale turbulence in the ocean interior to specific sources of energy available there under various typical conditions of stratification and motion.
3. To consider the overall effects of small-scale turbulence on larger scale oceanic transports.
4. To design and encourage the implementation of experiments aimed at:
  - a) comparing the performance of different instruments,
  - b) finding ways to remove instrumental biases,
  - c) providing statistically significant tests of the most plausible conjectures.
5. To organize in 1983-84 an international symposium on the small-scale turbulence in the interior of the ocean and to publish a carefully edited book containing its proceedings.

Dr. K. N. Fedorov (USSR) will serve as Chairman of this working group and it was agreed that the following individuals should be invited to join this group:

C. Cox (USA)  
 C. Garrett (Canada)  
 C. Gibson (USA)  
 M. Gregg (USA)  
 T. Osborn (Canada)  
 R. Ozmidov (USSR)  
 S. Panchev (Bulgaria)  
 J. Turner (Australia)  
 J. Woods (FRG)

In addition to the above list of proposed members, nine other suggestions had been received from various National Committees. These committees will be invited to appoint corresponding members from this list.

*Remote Sensing of the Oceans from Satellites*

The Terms of Reference for this new working group which were originally proposed at the XV General Meeting were revised in light of comments received from several SCOR National Committees and were approved as follows:

1. To assess critically resolution and precision requirements for satellite instrumentation systems to ensure adequacy of remotely sensed data for various oceanographic tasks.
2. To review the present status of methodology and requirements for "ground truth" measurements of oceanic variables needed to assess and/or calibrate the results of measurements from satellites.
3. To consider the most effective means of making satellite data available in useable form to working scientists.

4. To make recommendations for coordination of traditional and satellite techniques required to optimize ocean observations.
5. To prepare a report with recommendations taking into account the outcome of the symposium on *Oceanography from Space* to be held at the JOA in 1982.

This will be WG 70.

In view of the large number of suggestions for membership in WG 70 which had been received in addition to the twelve names in the original proposals, it was agreed that the Chairman, Dr. J. Apel, and the Vice-Chairman, Dr. J. Gower, should be asked to select the members from the names submitted. The group should not have more than ten members.

It is hoped that WG 70 will be cosponsored by COSPAR and URSI and that sponsorship and support may also be available through UNESCO. The first meeting of WG 70 might be held in conjunction with the symposium *Oceanography from Space* which will be held at JOA-82; otherwise, the group will probably begin its work by correspondence and plan for its first meeting in early 1983.

#### *Particulate Biogeochemical Processes*

A proposal for a working group on *Particulate Biogeochemical Processes* was submitted at the XV General Meeting and was subsequently circulated for consideration by National Committees. It was not felt that this proposal should replace a previous proposal made by Drs. Chesselet and Gieskes for a workshop on the same topic. The original suggestion for a workshop was presented at the XIV General Meeting in 1978 and may have resulted in a symposium which was to have been presented at the IAPSO General Assembly in Canberra in December 1979.

In view of the confusion surrounding these two proposals and because of the possible overlap between them, it was agreed that Professor Postma would correspond with Drs. Chesselet and Gieskes to ascertain what they now see as the current requirements in this field.

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

Professor Parsons reported that IABO has considered a suggestion received at the XV General Meeting from the Netherlands National Committee that SCOR should establish a working group to compile a world list of marine plants and animals. IABO had decided that the establishment of such a working group should not be encouraged in view of the nature of the task which was felt to be more appropriate for UNESCO. The suggestion has, therefore, been postponed and further consideration of this topic should be deferred until the publication of a list of all living organisms, being undertaken by McGraw-Hill.

## 2.6 GENERAL MATTERS RELATED TO SCOR SUBSIDIARY BODIES

Dr. E. M. Kukharkov, the representative of the USSR National Committee, discussed the desirability of SCOR paying close attention to normal ethics and principles of scientific cooperation in conduct of its international activities. These principles, as it is well known, should ensure:

1. A fair distribution of participants from various SCOR countries in working groups.
2. Equal opportunities for participation in scientific discussions.
3. Adequate and fair reflection in publications of SCOR of the actual contribution of all national scientific groups and individual authors independently of these contributions being or not being a part of the activities of SCOR.

The Executive Committee fully agreed with the principles formulated by the USSR National SCOR Committee which, as was pointed out, correspond to some of the provisions of the ICSU Statutes.

The Executive Secretary reminded the Executive Committee that the costs of meetings of SCOR working groups and committees are escalating rapidly. Chairmen of all subsidiary bodies of SCOR will be referred to the *Objectives and Procedures* which state that meetings of working groups are regarded as a decisive and/or final point of the activities of the group. It is expected that future requests for approval for meetings will be accompanied by clear statements regarding the need for a meeting and anticipated expenses. Chairmen will be encouraged to make better use of "conferences of opportunity" whenever possible in order to reduce the cost of meetings and to consider whether the work proposed for a meeting could not be carried on by correspondence.

It was agreed that a revision of the *Objectives and Procedures* for SCOR Subsidiary Bodies would be desirable and the Executive Secretary will draft such a revision for presentation at the next Executive Committee meeting.

## 2.7 PROPOSALS FOR A CONTINENTAL MARGINS PROGRAMME

The President of SCOR, Professor E. S. W. Simpson, presented a proposal for a long-term, multi-disciplinary programme of studies on continental margins. His suggestion arose from recent developments in relation to UNCLOS and the declaration of large Exclusive Economic Zones by many coastal states. The establishment of EEZ's may well restrict access to these areas for scientists although our knowledge is clearly inadequate with respect to many important scientific problems.

A lively discussion of this proposal ensued, especially with regard to Professor Simpson's personal definition of continental margins (or "ocean margins") in which he included estuaries, coastal lagoons, shorelines, coastal areas and continental shelves to the foot of the continental rise. It was felt that such a proposal was too ambitious in view of the variety of scientific problems requiring investigation. On the other hand, there is a well recognized need for coordinated, multi-disciplinary scientific investigations in the areas of the ocean margins and it was agreed that a detailed statement of these requirements should be included in SCOR's submission (through ICSU) to the UNESCO Medium-Term Plan.

## 2.8 SCOR SCIENTIFIC RAPPORTEURS

### *Marine Pollution*

A brief report from Dr. B. I. Dybern, the SCOR Scientific Rapporteur on *Marine Pollution*, was received. It referred to his extensive report submitted to the XV General Meeting and reiterated the importance of including marine pollution problems in the scientific programme of JOA-82. In addition, mention was made of the tenth anniversary of the Stockholm Conference on the Environment in 1982 and of plans, now in the early stages, for a similar global conference involving UNEP. The GESAMP Working Group *Review of the Health of the Ocean* will present its final report at this conference; the preliminary draft contains much valuable information on marine environmental issues.

### *Coastal Research*

Professor Hendrik Postma reviewed current SCOR activities in the field of coastal research. The accomplishments of Working Groups 46, 57 and 65 have been discussed elsewhere (c. f. item 2.2).

The international *Symposium on Coastal Lagoons* will be held in Bordeaux in September 1981 and is being cosponsored by UNESCO and SCOR. The papers presented at this conference will be published in *Oceanologica Acta*.

## 3.0 RELATIONS WITH INTERGOVERNMENTAL ORGANIZATIONS

### 3.1 IOC

The representative of SCOR on the IOC Scientific Review Board, Professor H. Postma, presented a report on the first SRB meeting which was held in February 1981. The general task of the SRB is to review ongoing programmes of the IOC and to assign priorities for them. Two main items are being considered: how to strengthen the relationship between the IOC and its advisory bodies, and long-term planning for the IOC.

The Executive Committee reiterated that SCOR should continue to be the principle IOC advisory body on marine sciences. It was not felt that the structure for provision of advice to the IOC should be broadened by the establishment of formal relationships between the IOC and other scientific organizations, but that advice should be channeled through SCOR as has been suggested by the SRB. The present structure means that SCOR is the ICSU focal point for advice to IOC in the area of marine science.

The IOC invited the SRB to consider the question of long-term planning and the SRB will recommend to the Fourteenth Session of the IOC Executive Council that the Commission request its advisory bodies to undertake a study similar in concept and scope to that of the Ponza report, with a view to issuing a comprehensive report on the expected major trends in ocean research up to the end of this century. This effort will be known as "Ocean Science for the Year 2000" or FORE (Future Ocean Research).

Professor Simpson informed the meeting of developments related to FORE since the SRB meeting. The committee which will produce this report will be chaired by Professor Eugen Seibold and Professor Warren Wooster has agreed to serve as rapporteur. A preliminary organizational meeting is to be held in May at which the structure of the committee will be established and leading individuals in each of the four major sub-disciplines of oceanography will be identified. These individuals might then form groups to compile reports in each area of specialization. It is anticipated that the FORE report will be made available for broader discussion and feedback at JOA-82.

The Fourteenth Session of the IOC Executive Council will be held from 22-27 June at Tenerife, Canary Islands. SCOR will be represented by Professors Simpson and Postma.

### 3.2 UNESCO

Dr. Dale Krause, Director of the UNESCO Division of Marine Sciences, gave a summary of the various ways in which UNESCO supports and contributes to the activities of SCOR. He also reviewed the status of UNESCO publications (c. f. item 1.2) and the accomplishments of JPOTS (c. f. item 2.4).

The SCOR President, Professor E. Simpson, visited UNESCO in early 1981 and had discussions with the Division of Marine Sciences and the IOC Secretariat on the existing joint programmes and on new initiatives. Much of the discussion focussed on the coastal region and on the relevant UNESCO/SCOR working groups, of which there are several.

Over the next several years there will probably be a convergence of the interests of UNESCO, IOC and SCOR on the broad coastal region out to 200 miles. UNESCO has recently formalized its coastal programme into its Major Regional Project on Research and Training leading to the Integrated Management of Coastal Systems. UNESCO will organize a Consultative Panel for advice on the implementation of the Project (the general coastal programme).

In discussing areas of strengthening UNESCO/SCOR cooperation, Professor Simpson felt it premature to sponsor jointly the Major Regional Project but that joint sponsorship for the Consultative Panel might be advantageous to both bodies. For instance, SCOR would have a direct interest and access to vigorous research programmes and marine scientists in the developing world.

Bearing in mind the objectives of the programme for research and development of the coastal systems, the purpose of the Consultative Panel is to assist UNESCO in reviewing the conceptual planning status of development and future development of this programme.

It was agreed that UNESCO would draw up the Terms of Reference for the panel and invite SCOR to cosponsor the panel.

Terms of Reference are:

1. To review the present status and to advise on the conceptual planning in order to meet the objectives of the Inter Regional Project on Research and Training leading to the Integrated Management of Coastal Systems.



2. To review and advise on the scientific quality of the programme, and recommend, if appropriate, actions to improve knowledge on the coastal systems.
3. To review and recommend strategies to transfer the scientific knowledge in view of an integrated management of the coastal systems.
4. To review and advise on the implementation of the various regional components of the Major Inter Regional Project.

With regard to choosing the membership, UNESCO proposed that Professor H. Postma be the SCOR representative on the panel and that UNESCO, in consultation with SCOR, appoint the remaining panel members to be drawn from scientists active in the Major Regional Project and other scientists with expertise in the relevant scientific fields. UNESCO will bear the travel costs associated with meetings of the panel. These proposals were accepted.

### 3.3 ACMRR/FAO

The Executive Committee was pleased to note that ACMRR is being reorganized and that it is expected that the first meeting of the new ACMRR group will be held in September 1981. SCOR looks forward to the renewal of contacts with ACMRR and to cooperative efforts in areas of common interest, especially OSLR.

### 3.4 ICES

Mr. Tambs-Lyche, the representative of ICES, commented on the good working relationship which exists between SCOR and ICES. He drew attention to the ICES/SCOR *Symposium on the Biological Productivity of Continental Shelves in the Temperate Zone of the North Atlantic* which will be held in Kiel from 2-5 March, 1982. The symposium will focus on the efficiency of whole ecosystems and will emphasize comparative studies.

## 4.0 RELATIONS WITH NON-GOVERNMENTAL ORGANIZATIONS

### 4.1 AFFILIATED ORGANIZATIONS

#### CMG

The Chairman of CMG, Professor Kenneth Hsü, made his first report as an ex-officio member of the SCOR Executive Committee. He reviewed the many recent advances in marine geology which have resulted from deep sea drilling activities and especially from JOIDES. However, many of the member countries of CMG are not involved in JOIDES and many other stimulating lines of research exist in marine geology. CMG is, therefore, organizing a major marine geoscience workshop which will provide a forum for discussion of various new methods and themes in marine geology. It is expected that a paper identifying significant problems in this area will result from this workshop. Interest in the plans for the workshop has been expressed both by the IOC and by the Deutsche Forschungsgemeinschaft. Some topics which may be discussed at the workshop include warm polar oceans, marine geochronology, anoxic events, ocean fluxes, applied marine geology, etc. The workshop will probably be held in May or June, 1982; a preliminary planning meeting will take place in Paris in June 1981.

Professor Simpson reviewed recent progress with the fifth edition of GEBCO which, it is hoped, will be completed in early 1982. He pointed out the usefulness of the GEBCO charts as a planimetric base for the presentation of many other types of data and reported that the bathymetric data used in GEBCO will be available in computer tape form for transfer to charts drawn from any projection. It was agreed that the production of GEBCO is a continuing effort which will not cease with the completion of the fifth edition. Professor Simpson was encouraged to attempt to have GEBCO included in the UNESCO Medium-Term Plan.

#### IABO

A report on the activities of IABO was presented by Professor Parsons (Annex XI), who also noted that the next General Meeting of IABO will be held during JOA-82.

#### IAMAP

Dr. W. L. Godson reminded the meeting of the Third Scientific Assembly of IAMAP which is being held in Hamburg from 17-28 August, 1981 and which includes several symposia of interest to oceanographers. The next General Assembly of IUGG (the parent organization of IAMAP) will also be in Hamburg, in 1983. Plans for symposia for presentation at this meeting will be formulated at a meeting of the IUGG Executive Committee which will be attended by Dr. Godson.

#### IAPSO

The President of IAPSO, Professor Devendra Lal, was unable to be present, however, he sent a written report on IAPSO activities which is given as Annex XII.

### 4.2 CORRESPONDING ORGANIZATIONS

#### ECOR

The Fourth General Assembly of ECOR was held in London from 6-9 April, 1981. A brief summary of the past, present and future activities of ECOR which was prepared for this assembly was submitted to SCOR by the ECOR representative and is given as Annex XIII.

#### CMAS

It was reported, on behalf of Dr. N. C. Flemming, the President of CMAS, that plans for Session A.11, *Experiment design in submarine scientific observation by divers* at the JOA-82 are progressing well. A call for papers has been issued.

### 4.3 ICSU

The meeting was informed of the establishment, by ICSU, of a Climate Coordinating Forum (CCF). This group will have as its mandate to assess the various climate related activities of ICSU groups, advise ICSU on climate matters, identify gaps in ICSU climate programmes, recommend ways in which climate activities within ICSU can be coordinated, and make recommendations on the role of ICSU in the WCP. The CCF is chaired by Dr. J. Smagorinsky and the Executive Committee approved the appointment of Professor Roger Revelle as SCOR's representative.

The President requested the assistance of the members of the Executive Committee in the preparation of a paper from SCOR to ICSU for incorporation into the UNESCO Medium-Term Plan. ICSU organizations have been asked to identify the "priority problems which can be expected to preoccupy the scientific community in the period up to the end of the decade." It is expected that the Medium-Term Plan will largely govern the priorities of UNESCO up to 1990.

Several suggestions were received and it was agreed that the report from SCOR should concentrate on the following areas which are likely to be of significance during the period of the Medium-Term Plan (1984-1989): Ocean Science and Living Resources, Ocean Science and Non-Living Resources, Ocean Margins, Oceanic Processes, GEBCO, CCCO (previously submitted) and Training for Marine Administrators.

Following the meeting the SCOR submission was prepared by Professor Simpson and was transmitted to ICSU. It appears as Annex XIV.

#### 4.4 ICSU UNIONS

##### *IUPAC*

A request has been received from IUPAC for liaison between SCOR and IUPAC with the aim of identifying topics which are of common interest to chemists and marine scientists and which would benefit by cooperation between the two organizations. A preliminary list of topics had been drawn up by Dr. E. Hamilton of IUPAC in correspondence with Professor E. Goldberg. IUPAC is also considering a proposal to convene a conference on "Chemistry of the Oceans". It was agreed that SCOR should attempt to give more attention to the field of chemical oceanography and that an informal meeting between Dr. Hamilton and representatives of SCOR should be held to discuss these proposals. Dr. Burton and Professor H. Postma will be invited to participate in such a meeting which will be arranged at the convenience of those involved.

##### *IUTAM*

A symposium on *Sea-Bed Mechanics*, to be held in 1983 is currently being organized by IUTAM. It will deal with problems associated with the stability of the sea-bed from the point of view of both soil mechanics and geophysics, and with the mechanics of the interaction of the foundations of off-shore structures with the sea-bed. The meeting agreed that SCOR should accept the invitation of IUTAM to co-sponsor this symposium.

#### 4.5 ICSU COMMITTEES

##### *SCAR*

Mr. G. Hemmen, Executive Secretary of SCAR, reported that the Fourth Antarctic Biology symposium, to be held in South Africa in 1983, will concentrate on the theme of nutrient cycles and food chains in the Antarctic. The meeting agreed that it would be appropriate for SCOR to consider cosponsoring some sessions of this symposium when more details of the programme are known.

## 5.0 FUTURE MEETINGS

### 5.1 24th EXECUTIVE COMMITTEE MEETING

An invitation from the Indian National Committee for SCOR to hold the next meeting of the Executive Committee in Mysore, India, in January 1982, in conjunction with the Indian Science Congress was discussed at length. It was felt that there would not be a clear need for a full Executive Committee meeting before the JOA and that the cost of holding such a meeting in India would be too large a drain on SCOR's financial resources. The meeting expressed its sincere appreciation for the invitation of the Indian National Committee and regretted that it could not be accepted at this time. Unless compelling reasons for holding a full Executive Committee meeting in early 1982 arise, a meeting of the officers (President, Secretary and Executive Secretary) will be held instead. National Committees and other interested organizations will be invited, as usual, to send representatives to this meeting.

### 5.2 XVI GENERAL MEETING AND JOA, HALIFAX, AUGUST 1982

Dr. W. W. Hay, Chairman of the Scientific Programme Committee for the JOA, presented the programme and list of convenors who had accepted the invitation of the committee to organize and chair sessions. The General Symposia will each have four speakers while the Special and Association Symposia will have six. The convenor of each session will be responsible for the selection of papers and it is hoped that the entire programme will be complete for inclusion in the third circular which is to be issued in late September 1981.

Poster sessions will be held during two days in each week of the Assembly. Participation in the poster sessions will be encouraged by letters to all respondents to the second circular about the JOA. Dr. Hay received several comments and suggestions on the scientific programme and Mr. Tams-Lyche noted that ICES may wish to consider cosponsoring some symposia with special relevance for that organization.

A report from the National Steering Committee was presented by Mr. Leo O'Quinn, Executive Secretary for the JOA. He also provided copies of the second circular which was published in April 1981 and will have as wide a distribution as possible.

It was agreed that a three-day Executive Committee meeting will be held on 29-31 July and that a report from the Executive Committee will be prepared for presentation to the XVI General Meeting on 7 and 8 August.

The twenty-fifth anniversary of the founding of SCOR, in 1957, will be noted at the opening ceremonies of the JOA.

Dr. Krause clarified the role of the IOC/UNESCO Logistics Committee for the JOA. This committee will make funds available to allow scientists from developing nations to attend the JOA. Funds will also be given to assist some convenors who would not otherwise be able to participate in the Assembly.

### 5.3 OTHER MEETINGS

SCOR/SCAR/IWC Workshop on *Identification of Cephalopod Beaks*, 1-14 June, 1981, Plymouth, United Kingdom.

XX General Meeting of URSI, 10-19 August, 1981, Washington, D. C.

XXIV Plenary Session of COSPAR, 17 May - 3 June, 1982, Ottawa, Canada.

*Applications of Aerospace Remote Sensing in Marine Research*, a one-day symposium being presented during the ICES Statutory Meeting, 6-10 October, 1981, Woods Hole, USA. Dr. John Apel is the convenor of this symposium.

### 6.0 OTHER BUSINESS

The President introduced Dr. Olof Tandberg of the Royal Swedish Academy of Sciences. Dr. Tandberg spoke to the meeting in his capacity as Executive Secretary of the ICSU Committee on the Free Circulation of Scientists. This committee has six members representing France, Switzerland, Sweden, United Kingdom, USSR, and USA. A booklet of advice to organizers of international scientific meetings has been prepared and the committee is building an archive of cases of difficulties with international travel experienced by scientists. These would include problems related to refusals and delays of exit and entry visas. The committee has, happily, been able to assist in solving many of the cases presented to it. A proposal is presently being considered for a short-term international travel document issued by a neutral state to scientists acting as "international servants" which would be of assistance in this matter.

The Executive Committee expressed great interest in the presentation by Dr. Tandberg and agreed unanimously to support and encourage the work of the ICSU Committee on the Free Circulation of Scientists.

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In closing the meeting, the President, on behalf of the entire Executive Committee, expressed his sincere appreciation to Dr. Strömberg for his hospitality and for the excellent facilities which were provided at the Kristineberg Marine Biological Station. In addition, gratitude was expressed to the Royal Swedish Academy of Sciences for its invitation to SCOR and for the reception hosted by representatives of the Academy.

## ANNEX I

### TWENTY-THIRD EXECUTIVE COMMITTEE MEETING OF SCOR

Fiskebäckskil, Sweden, 28 - 30 April, 1981

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#### Participants

##### Members of the Executive Committee

* Professor E. S. W. Simpson	South Africa	President
* Dr. K. N. Fedorov	U. S. S. R.	Past President
* Professor H. Charnock	United Kingdom	Vice-President
* Professor T. Wolff	Denmark	Vice-President
* Professor G. Siedler	Fed. Rep. of Germany	Vice-President
* Dr. A. R. Longhurst	Canada	Secretary
* Professor T. R. Parsons	Canada / IABO	Ex-officio
* Professor K. Hsü	Switzerland / CMG	Ex-officio
* Dr. W. L. Godson	Canada / IAMAP	Ex-officio
* Professor H. Postma	The Netherlands	Co-opted Member
* Dr. W. W. Hay	U. S. A.	Co-opted Member
Mrs. E. Tidmarsh		Executive Secretary

#### Other Participants

Mr. G. E. Hemmen	United Kingdom
Dr. D. Krause	UNESCO
Dr. R. Bates	WMO
Mr. H. Tambs-Lyche	ICES
* Dr. J. Van der Land	The Netherlands
Dr. E. M. Kukharkov	U. S. S. R.
Mr. L. D. O'Quinn	Canada
* Professor J.-O. Strömberg	Sweden
Professor I. Hessland	Sweden
Professor T. Ganelius	Sweden
Dr. O. G. Tandberg	Sweden

\* = SCOR members

## ANNEX II

SCIENTIFIC COMMITTEE ON OCEANIC RESEARCH  
STATEMENT OF INCOME AND EXPENDITURE

(1 January to 31 March, 1981)

BALANCES: 1 January 1981	\$	\$	\$
Halifax		46,193.60	
London		10,003.43	
Paris		<u>2,355.16</u>	58,552.19
INCOME: 1 January to 31 March 1981			
Arrears	3,200.00		
National contributions	<u>21,000.00</u>	24,200.00	
ICSU grant	10,000.00		
UNESCO subvention to ICSU	<u>10,000.00</u>	<u>20,000.00</u>	44,200.00
Gain on exchange			<u>1,611.46</u>
			\$ 104,363.65
			<u><u>                    </u></u>
EXPENDITURES: 1 January to 31 March 1981			
WG 42	196.66		
WG 47	7,000.00		
WG 55	5,310.75		
WG 56	1,379.00		
CCCO	<u>13,000.00</u>	26,886.41	
Representation	1,019.33		
E.C. - 23	2,563.33		
Cephalopod Beak workshop	<u>3,500.00</u>	7,082.69	
Administration:			
Office expenses	641.65		
Salaries	5,347.71		
Bank charges	<u>3.00</u>	<u>5,992.36</u>	
TOTAL EXPENDITURES			39,961.46
BALANCES: 31 March 1981			
Halifax		25,088.96	
London		10,161.07	
Paris		<u>29,152.16</u>	<u>64,402.19</u>
TOTAL: BALANCE ON HAND PLUS EXPENSES			\$ 104,363.65
			<u><u>                    </u></u>

## ANNEX III

### WORKING GROUP 34

#### INTERNAL DYNAMICS OF THE OCEAN

Report from Chairman: Professor A. R. Robinson

This report covers the activities of WG 34 during the period September 1980 - April 1981. Work has continued on the volume *Eddies in Marine Science*. The Table of Contents is now organized into five sections:

- I. Introduction;
- II. Regional Kinematics, Dynamics and Statistics;
- III. Models;
- IV. Effects and Applications;
- V. Observational and Experimental Techniques.

An editorial status report to authors (April 9, 1981) has been made available to the Executive Committee of SCOR. Most manuscripts are now under review, and the book should be submitted for publication in early summer of 1981.

The intended meeting of WG 34, described in our last report, in order to review the status of eddy dynamics, to define the most important next scientific problems and to consider the arrangements necessary for their accomplishment, should be scheduled for the last quarter of 1981 or the first quarter of 1982. A report to the SCOR Executive Committee on directions for future research will be prepared. To enable the meeting to have a broad international participation financial support is requested from SCOR to supplement money from national sources.



## ANNEX IV

### WORKING GROUP 42

#### POLLUTION OF THE BALTIC

Report from Chairman: Dr. G. Kullenberg

Summary report of the meeting of the joint ICES and SCOR WG 42 on the *Study of the Pollution of the Baltic*, Copenhagen, 2-3 March, 1981.

1. A number of papers on results from the Baltic Open Sea Experiment 1977 had been published and the working group was now undertaking to prepare an overall report on the BOSEX results which, however, would probably not give an interdisciplinary interpretation, mainly due to the scarcity of biological results from the experiment.
2. Plans for coordinated, interdisciplinary studies of the physical, chemical and biological patchiness of the Baltic are being developed, and as a result of the work to date, at the 1980 Statutory Meeting of ICES, the following resolution was passed:

"it was decided, that pilot studies on patchiness of physical, chemical and biological parameters should be carried out in different regions of the Baltic, in the next two years with the aim to get a better overview on critical spatial and time scales for preparation of cooperative investigations in 1984. The Council should be informed in 1983 on the results and proposed actions to be taken".

The working group would welcome from SCOR a similar positive attitude to these studies.

During the year a number of studies will be carried out and, in 1982, the working group will devote time to a penetrating discussion of the results. For 1983 a workshop is proposed on the patchiness problem, with the possible aim of planning a joint effort for 1984. It was noted that one of the goals with these patchiness studies is related to the question of how representative are the low-frequency observations at a very limited number of stations over the Baltic and how series of such observations can be interpreted.

3. Although biological effects studies of various types are being carried out in different parts of the Baltic, the attempt to establish contact between these research groups had so far not given results. The working group would, however, continue its efforts in this direction, and had also decided to collaborate with the ICES working group MPNA on collecting information regarding results of ongoing activities in the Baltic on pathobiological effects, recognizing that a number of relevant programmes are being carried out.
4. The working group would attempt to formulate biogeochemical cycles for some selected substances in the Baltic, working by correspondence between interested scientists.

5. The working group would give specific consideration to the CO<sub>2</sub> cycle and budget in the Baltic, bearing in mind the special nature of the brackish water system and its potentially limited buffer capacity.
6. Nutrient supplies, eutrophication and an increased primary production were unresolved issues in the Baltic Assessment Document and the working group had agreed to consider the use of flow diagrams linking physical, chemical, biological and ecological processes, inputs and productivities as an attempt to elucidate the inter-relationships, again working intersessionally by correspondence.
7. The working group had emphasized that an overview presentation of PCB's and DDT in Baltic marine mammals ought to be presented at the coming statutory meeting and initiatives were being taken to implement this.

ANNEX V

WORKING GROUP 57

COASTAL AND ESTUARINE REGIMES

Report from Chairman: Professor J. B. Matthews

The monograph series has been slow in starting. Authors are now writing their contributions and working closely with their editors. A meeting of the working group is planned for Fall, 1981, in conjunction with the meeting of the American Geophysical Union in San Francisco. It is anticipated that editors and authors will meet during those meetings to discuss progress and iron out problems. Notes are given on individual volumes.

*Circulation Models* - edited by Dr. Norman S. Heaps

Six contributions: 1) J. Backhaus  
2) A. M. Davies  
3) V. P. Kochergin  
4) Z. Kowalik and Y. Hsueth  
5) J. C. J. Nihoul  
6) N. S. Heaps

are anticipated being completed by 1 August, 1981. The original three chapters have been doubled with the same authors contributing. This was done to allow geographically widely separated authors to write complete chapters.

The volume on *Tides and Surges* edited by Dr. B. J. Noye is progressing more slowly. The authors are writing contributions but no date for draft submission is available at this time.

The editors of the remaining volumes are working with their authors. These volumes are:

*Large Scale Physical Processes* - edited by Prof. C. N. K. Mooers  
*Waves and Turbulence* - edited by Prof. Aitsam and Osmidov  
*Small Scale Physical Processes* - edited by Prof. J. Imberger  
*Observational Techniques* - edited by Prof. J. Imberger  
*Transport of Particulate Material* - edited by Prof. J. Sundermann

The series will be published by the American Geophysical Union in its existing monograph series. It is hoped to have the first volume ready for the American Geophysical Union meeting in December 1981. The main emphasis of the Working Group 57 meeting will concentrate on making progress with the ambitious monograph series.

The papers and abstracts of the IUGG interdisciplinary symposium Number 4, *Problems of Coastal and Estuarine Zones*, appeared as Volume 6 of *Ocean Management* 1981. This symposium was organized by Working Group 57. The proceedings were edited by B. J. Noye and J. B. Matthews. Work on this contribution has been partly responsible for the delay in the monograph series.

## ANNEX VI

### WORKING GROUP 58

#### ARCTIC OCEAN HEAT BUDGET

Report from Chairman: Dr. A. Foldvik

Following the preparation of the WG 58 report, *The Arctic Ocean Heat Budget*, members of the group have been instrumental in the planning and execution of field experiments as recommended in the report. Among these activities are:

The YMER-80 expedition. During this expedition high-quality CTD, chemical and current measurements were obtained over the southern slopes of the Eurasian Basin and the adjacent areas between Greenland and Franz Josef Land. A monitoring programme of the transports into the Arctic Ocean from the Barents Sea was initiated in addition to the ongoing monitoring of the West Spitzbergen Current.

The Eurasian Basin Experiment 1981, EUBEX, is now under-way. Despite an accident which limited the area to be covered by the field programme, the measurements will undoubtedly be crucial for our further study of the Arctic Ocean.

Also, field studies of bottom water formation in the Greenland Sea and deep water exchange between the Greenland Sea and the Norwegian Sea/Arctic Ocean have been initiated.

The discussion of future activities which would significantly increase our understanding of the Arctic Ocean heat budget and some of its controlling processes is now focusing on experiments in the Fram Strait. Long-term monitoring of the total transports of sensible and latent heat are very much needed here complementing the monitoring of the West Spitzbergen Current already initiated.

Arrangements for a meeting to work out plans for a Fram Strait long-term field project are being considered as is the possibility of arranging a workshop on modelling processes in the Arctic Ocean.

## ANNEX VII

### WORKING GROUP 59

#### MATHEMATICAL MODELS IN BIOLOGICAL OCEANOGRAPHY

Report from Chairman: Dr. K. H. Mann

The manuscript of the WG 59 monograph *Mathematical Models in Biological Oceanography*, to be published in the UNESCO series *Monographs on Oceanographic Methodology*, has been in the hands of UNESCO staff since March, 1980. It is hoped that proofs will be sent to the editors (Platt, Mann, Ulanowicz) in April, 1981 and that the book will appear before the end of the year. Since the book is required reading for a conference to be held in May 1982 (see below) UNESCO has agreed to mail copies directly to participants.

Arrangements for the conference on *Flows of Energy and Materials in Marine Ecosystems: Theory and Practice* are proceeding steadily. A planning meeting, chaired by Dr. Fasham of WG 59, and attended by Drs. Platt, Radach, Ulanowicz and Wulff of WG 59, as well as by Dr. M. Angel and Professor P. Lasserre, was held in Arles, France, 5-8 October, 1980. Two objectives for the proposed conference were identified: to introduce marine biologists to some of the more recent developments in holistic modelling which were reviewed in the WG 59 monograph mentioned above, and to provide an opportunity for the assessment of present capability to measure fluxes in marine ecosystems. It was decided to hold the meeting in May, 1982 at Bombannes, near Bordeaux; to limit the attendance to no more than 80; to have 20-25 lectures and several working groups.

Working Group 59 requests the Executive Committee of SCOR to give financial assistance towards the travel and subsistence costs of SCOR WG 59 members and other invited participants. Although the conference will not be held until May, 1982, it is asked that the funds be committed in 1981 to permit offers of financial support to be made.

The role of WG 59 up to May, 1982 is clear. Beyond that time we see a role for the working group in editing and refereeing the conference proceedings, following up the recommendations of the working groups, and possibly in preparing a second edition of the monograph *Mathematical Models in Biological Oceanography*. There has been a great deal of interest in the manuscript version, and the field is changing rapidly. We, therefore, recommend that WG 59 be kept in existence for the foreseeable future.

## ANNEX VIII

### WORKING GROUP 66

#### OCEANOGRAPHIC APPLICATIONS OF DRIFTING BUOYS

Report from Chairman: Dr. John Garrett

Letters inviting the proposed members to join the working group have been sent but only a few replies have been received so far. One change in the membership list suggested by the SCOR Executive was recommended by the working group Chairman who felt that it would substantially broaden the coverage of the group.

The preliminary proposal for the plan of work involves three main objectives:

1. Compilation of annotated bibliographies and historical reviews listing published and unpublished reports and containing brief summaries of unreported work. One would cover technical developments, including performance and reliability of buoys, sensors, drogues and systems of position determination and data recovery, while another would cover the scientific applications of drifting buoys during the last 10 years, including techniques for display and interpretation of Lagrangian data.
2. Preparation of topical reviews consisting of collections of short articles presenting the ideas of different experts on important problems. Topics proposed so far include the question of what can be deduced about ocean currents from drifting buoy tracks obtained in the presence of waves and wind, and methods of displaying, analyzing and interpreting Lagrangian drifter data.
3. Review of potential oceanographic and meteorological applications of drifting buoys for the purpose of assessing technological and organizational needs. This would include both projects already planned and more forward-looking ideas.

At the invitation of the Executive Secretary of IOC, a small meeting was held in conjunction with the ECOR Technical Conference in London in early April, to consider the extent to which WG 66 would meet the needs of IOC and similar agencies and whether it would be appropriate to consider it as a joint exercise. Dr. Garrett and Professor Siedler attended. The proposed plan for the working group was outlined, and the composition and objectives of the group were discussed. The conclusion of this meeting was that while WG 66 could satisfy requirements for technical advice, the international community had other needs which would require different responses. The need for exchange of information concerning buoy deployments and recoveries might best be satisfied by establishment of a quasi-operational centre, perhaps within the secretariat of one of the inter-governmental agencies. The preparation of general descriptive documentation might be an appropriate task for a consultant. The co-ordination of large-scale programmes could best be done by groups established specifically for that purpose. The potential contribution of ECOR both in presenting the needs of the engineering community with respect to drifting buoy applications and in making the engineering community aware of the technical problems to be solved, was recognized. It was felt that the connections between SCOR and COSPAR could be beneficial to exchanges of information relating to new developments in satellite tracking systems.

## ANNEX IX

### IOC/SCOR/ECOR CONSULTATIVE MEETING ON DRIFTING BUOYS

London, 9 April, 1981

#### Conclusions and Recommendations (Draft)

1. One conclusion of the meeting was that each of the agencies involved could contribute in a definite and specific way. SCOR clearly has the best possibilities for dealing with questions relating to scientific applications of drifting buoys and the scientific basis for measurements made using this technique. ECOR has the potential to involve the industrial sector, both from the point of view of determining the needs of the engineering community and the point of view of bringing scientific needs for improved buoys and sensors to the attention of engineers. The intergovernmental agencies, such as IOC and WMO, offer the capabilities for organizing and coordinating the international aspects of the applications of drifting buoys to oceanographical and meteorological problems.
2. In view of the needs for exchange of timely information on buoy deployments, possible drift of buoys into regions of interest to agencies other than the deployer, and possible assistance with buoy recovery, the meeting recommended that the establishment of a small, quasi-operational buoy information centre at an oceanographic laboratory or within the secretariats of IOC, WMO should be investigated.
3. Now that practical ways of recovering satellite-tracked drifting buoys are becoming available, which will lead to an increasing interest in buoy recoveries, particularly in the case of experimental systems, the meeting recommended that IOC, SCOR, and WMO remind all groups involved in planning programs using drifting buoys that recovery plans should be included from the beginning and that such groups cannot always expect to rely on the generosity of other agencies downstream of their experimental area without having consulted such agencies during the planning of the experiment.
4. Taking into account the evolution of drifting buoy techniques and the increasing number of buoys being used for scientific purposes, together with the multinational nature of many projects now being planned, the meeting suggested that the idea of an "Argos users' club" for the purpose of combining needs to obtain the lower rates associated with large numbers of platforms, should be re-examined. The meeting felt that IGOSs might provide an appropriate framework for this, although other agencies might serve equally well.
5. One of the problems identified by the meeting was that of conveying the requirements and wishes of oceanographers to the groups concerned with designing and planning future satellite systems, as well as helping the oceanographic community to become aware of the technological possibilities under consideration by the satellite developers. It was felt that the existing links between SCOR, COSPAR, and WMO might be useful for this, provided efforts were made to ensure that this area was covered.

6. The transfer of buoy technology among users and between the research and operational communities needs to be improved. It was felt that ECOR might be able to play a significant role in this. One recommendation of the meeting was that general documentation for the information of potential buoy users should be prepared, perhaps using a consultant employed by IOC or WMO.
7. The meeting took note of the potential problems associated with encounters between drifting buoys and other marine vehicles. It was felt that it would be helpful if IOC could consult with appropriate international bodies to obtain information on the relationship between site of floating bodies and the degree of navigational hazards they might pose.
8. Taking into account the different objectives and capabilities of the various agencies currently involved with drifting buoys, such as SCOR, IOC, IGOSS, WMO, and ECOR, it was felt that occasional informal consultative meetings, such as organized in London, would be of great value in discovering areas of common interest where cooperation or coordination might be beneficial.



## ANNEX X

### REPORT OF THE SCOR/IOC COMMITTEE ON CLIMATE CHANGE AND THE OCEAN

#### OCEAN MONITORING:

The committee has been requested by IOC (Resolutions XI-3 and EC-XIII.7) to lead in the identification and development of requirements for long-term ocean monitoring, and in consultation with the working committee for IGOSS, to:

- i) consider the feasibility of starting an ocean monitoring programme immediately in selected geographic areas, and
- ii) prepare a programme for the preparatory studies required for eventual comprehensive ocean monitoring, taking into account:
  - the scientific basis of the programme;
  - standards for procedures, degree of precision, and frequency of sampling;
  - the use of monitoring platforms (research ships, ships-of-opportunity, satellites, aircraft, buoys, etc.);
  - the system and the procedure for the collection, exchange and dissemination of the observational data;
  - the analysis and processing of the results of observations;
  - an operational plan;
  - proposals for assistance to developing countries;
  - proposals for the operational management and co-ordination of the project by IOC and WMO.

Member States were also invited to submit proposals for ocean monitoring for consideration by CCCO.

The experimental investigation of the climate of the ocean, including the regular seasonal cycle and interannual variation will inevitably involve the collection of data sets extending over several years. This is true for some existing programmes, such as NORPAX, and for the proposed WCRP oceanographic experiments: CAGE and WOCE. Such experiments are designed to collect data sets that constitute time series of clearly defined duration (about five years). In other cases, the experimental data sets may have a longer, sometimes unspecified, duration; such efforts are commonly described as monitoring, or more specifically, as research monitoring.

Looking further into the future, it may become feasible to monitor the ocean on a more permanent basis for operational forecasting purposes, as proposed by the Soviet Union. Previous JSC-CCCO meetings (at Kiel and Miami) concluded that there were no generally agreed criteria for specifying such monitoring. The Pilot Ocean Monitoring Study (POMS) was started by CCCO and JSC to prepare the way towards rational specification of future research monitoring and operational monitoring by encouraging:

- the development of new cost-effective techniques suitable for the collection of data sets extending over several years,
- collection of data at POMS recognized sections, and
- regional studies.

The status of the following POMS activities will be discussed by the meeting:

1. Time Series of Ocean Measurements:

The report of the meeting on Time Series to be held in Tokyo from 11-15 May will be submitted to the committee for information and consideration of any recommendations contained therein.

2. Pilot Ocean Monitoring Study Sections:

The committee will be informed of the monitoring activities which have taken place along the designated POMS sections since September, 1979. The committee is invited to review the designation of the existing POMS sections, as well as others, taking into account the recommendations of the Time Series meeting.

3. Regional Studies:

The committee will be informed of regional monitoring studies that may prove of value to the WCRP. These include the IOC's WESTPAC program and the North Atlantic Pilot Ocean Monitoring Study.

4. New Methods:

The meeting will discuss new methods for cost-effective collection of data sets extending over several years for the WCRP purposes.

**CAGE EXPERIMENT:**

The JSC and CCCO formed a working group to study the feasibility of performing a detailed heat budget study of an ocean (the North Atlantic, for instance) on climatological time scales (weeks to decades), with a goal of estimating the meridional ocean transport of heat to an accuracy of  $\pm 20\%$ .

The working group intends to produce a feasibility assessment by the summer of 1981. It has met twice and reached a number of preliminary conclusions.

- the budget should be estimated by a number of different techniques:
  - a) directly by oceanographic measurements;
  - b) indirectly by northwards area integration of the air-sea fluxes;
  - c) from a residual of the global total and the atmospheric heat transport budgets; and
  - d) from combined atmosphere/ocean models.
- A number of pre-CAGE validation and calibration experiments will be necessary.
- To measure the oceanic storage, to separate the long-term mean from the annual cycle, and to estimate the interannual variability, a time period of 4-6 years is required for the experiment.

## WORLD OCEAN CIRCULATION EXPERIMENT (WOCE):

At its first session, CCCO requested the JSC/CCCO Liaison Panel to establish a design study for an experiment to determine the global ocean circulation using a combination of physical oceanographic methods and the geodetic/altimetric satellite techniques which are now under development and which are expected to be available during the latter part of the 1980's. When the panel examined this request at its June, 1980 meeting, it concluded that the situation was less clear than had appeared at the time of CCCO-I, and that a more careful consideration of the feasibility of such an experiment was required than was possible in the time and with the individuals available during the meeting. In August, 1980, WOCE was further discussed and Professor C. Wunsch (USA), was invited to prepare a paper which would clarify certain aspects and, in particular, discuss the question of the accuracy to be expected from TOPEX, a planned U. S. altimetric satellite. An analysis of satellite altimetry was independently carried out by IOS (Wormley) and the Rutherford Appleton Laboratory for the European Space Agency (ESA). These examinations substantially increased confidence in the feasibility of some version of WOCE. The question was then debated at JSC-II, March 1981, and JSC recommended that a joint JSC/CCCO Working Group be formed to conduct a WOCE design options study, to be reported to the 1982 JSC/CCCO Study Conference on *Large-Scale Oceanographic Experiments in the WCRP*.

## ANNEX XI

### REPORT OF IABO TO SCOR

#### General items:

1. On the invitation of SCAR, IABO will be a co-sponsor of the first full-scale BIOMASS scientific symposium; Dr. W. Pearcy (USA) has been suggested as the IABO representative on the steering committee for this symposium.
2. Correspondence between the President of IABO and Drs. Gieskes and Menaché on the physical definition of salinity (JPOTS) as applied by biologists to highly estuarine situations is currently under review and will probably result in an exchange of published notes on the subject.
3. An *International Symposium on Coastal Lagoons*, co-sponsored by a number of national and international agencies, including IABO, will be held in Bordeaux, France, 8-14 September, 1981. The President of IABO attended the last Steering Committee meeting in Bordeaux, November 1980.
4. The fourth in the IABO series of international Coral Reef Symposia will be held 18-24 May, 1981, at the Philippines International Convention Centre, Manila. The theme of the symposium is *The Reef and Man*, and the proceedings will be published.

#### Finance:

IUBS Executive Committee has given IABO a grant of \$1,000. This money will be used to cover the cost of publishing IABO proceedings in 1981.

#### Membership:

IABO has established a correspondent in the People's Republic of China. Dr. Wu Baoling of the Institute of Oceanology, Academia Sinica, in Qingdao has agreed to serve as the national representative.

## ANNEX XII

### REPORT OF IAPSO's ACTIVITIES (1979-1981)

IAPSO held its General Assembly in Canberra, Australia, 2-15 December, 1979, together with the General Assembly of the International Union of Geodesy and Geophysics. The proceedings of the meeting were reported in the IAPSO *Procès Verbaux*, No. 15, issued in 1980. This document contains the minutes of the business meetings; resolutions; reports of Commissions, Committees and Working Groups; and reports by IAPSO representatives to other organizations. In addition, the proceedings include all the abstracts and a few full papers which were presented at the 12 symposia organized by IAPSO. The abstracts of the 11 inter-association symposia co-sponsored by IAPSO were published in the IUGG *Proceedings*.

The IAPSO Working Group on Symbols, Units and Nomenclature in Physical Oceanography, chaired by Maurice Menaché has completed its task of converting many of the commonly used symbols, units and nomenclature into Systeme International d'Unités (S.I.). Many familiar items that have been picked up along the way, such as ‰  $\sigma_t$ , sverdrup, etc., do not conform to the more accepted S.I. system. The IAPSO working group has issued a document, IAPSO Publication Scientifique No. 31, *SUN Report*, explaining the new units, which have been adopted by IAPSO and are expected to be adopted by IOC in June, 1981. They will then be sent to marine science publishers.

The IAPSO Committee on Tides and Mean Sea Level has issued a publication entitled *Pelagic Tidal Constants* as IAPSO Publication Scientifique No. 30. It gives analysis of deep sea tidal observations from 108 locations, mainly in the North Atlantic and Eastern North Pacific, with a few in the Antarctic Ocean. The resulting tidal constants are presented.

IAPSO is planning to co-sponsor a number of symposia:

*The Role of the Oceans and Volcanoes in Atmospheric Chemistry*, Hamburg, Germany, August, 1981.

*Radiation Transfer in the Oceans and Remote Sensing of Ocean Properties*, Hamburg, Germany, 1981.

*Climate Fluctuations and Relations to the Tropical Atlantic*, Hamburg, Germany, 1981.

*North Sea Dynamics*, Hamburg, Germany, August-September, 1981.

*Hydrodynamics of Semi-enclosed Seas*, Liège, Belgium, May, 1981.

The next IAPSO/IUGG General Assemblies will be held in Hamburg, Germany, 15-26 August, 1983. IAPSO Circular No. 40 has been sent to all IAPSO correspondents in the 78 countries adhering to IUGG for dissemination in each country. The circulator invites suggestions for symposia topics and other IAPSO programmes for the General Assembly. Final selections of inter-disciplinary symposia topics will be made 25-26 July, 1981 at an IUGG Executive Committee meeting in London, Canada.

## ANNEX XIII

### REPORT OF ECOR

#### PAST, PRESENT, FUTURE:

ECOR was founded a decade ago as an international non-governmental, professional engineering body with the objective to provide an international focus for engineering interests in the marine field. The emphasis of this effort was intended to be on:

1. establishing and maintaining international professional engineering communication in marine affairs;
2. providing advice, from an engineering viewpoint, on policy, programme, and organizational matters to international and intergovernmental organizations concerned with marine affairs, or providing such advice directly to individual nations on behalf of these organizations; and,
3. assisting the engineering profession in the enhancement of the quality of the marine environment, while recognizing that engineering is practiced within legitimate proprietary interests.

The purpose of this article is to convey to the adhering bodies a view as to how well ECOR has performed in its efforts to attain these objectives and to provide recommendations for future initiatives.

ECOR's activities through 1978 have been reported in the proceedings of the past three General Assemblies. These activities ranged from the triennial technical sessions held in conjunction with the business sessions of the assemblies to workshops and working groups conducted by various combinations of adhering bodies, consultations with the Intergovernmental Oceanographic Commission and individual tasks of international concern taken on by individual adhering bodies. In addition, a newsletter was promulgated periodically to report on work of the adhering bodies and other events of possible interest to the membership.

During the past three years ECOR has continued to respond as an advisory body to various international bodies. This response has taken two forms. ECOR has designated specific representatives to a number of organizations. These representatives attend meetings of these organizations whenever possible. ECOR has also designated special representatives to specific meetings of international groups when an engineering input was in order. In addition to these activities ECOR adhering bodies have generated information for the compilation of a report on international ocean engineering training. A draft of the report, authored by Professor Adrian Richards for UNESCO, will be discussed informally with selected individuals from ECOR adhering bodies during the ECOR 4th General Assembly.

In October 1980, ECOR supported an international workshop on coastal engineering in México City by helping to obtain speakers from the international engineering community. This workshop, held in conjunction with the First Pan American Congress on Ocean Engineering, was sponsored by COMIRO, the ECOR adhering body in México.

In 1980 also, ECOR, through its Norwegian adhering body, arranged for the one-year appointment of a petroleum data expert to ESCAP/CCOP.

A number of major reports have been prepared by ECOR and its adhering bodies during the past three years. Another publication, containing abstracts of papers given at the international workshop on coastal engineering in México City, October 1980, is in preparation.

In addition to major reports, ECOR, of course, publishes a newsletter on a quarterly basis and provides papers and articles on a periodic basis to other organizations.

Among ECOR activities being planned for the future are a workshop on *Directional Wave Spectra*, jointly sponsored by U. S. ECOR and the ASCE, to be held in Berkeley, California, in September 1981; the Joint Oceanographic Assembly in Halifax co-sponsored with SCOR, CMG, IABO, IAMAP, IAPSO, and CNC/SCOR; and a joint effort with IOC and SCOR on *Oceanographic Applications of Drifting Buoys*. This latter subject will be taken up at the ECOR Council/Officers Meeting on Future Plans, to be held on 6 April, 1981, just prior to the 4th General Assembly.

The ECOR 4th General Assembly will be held 6-9 April, 1981, in London. The theme for the technical session of the Assembly is *The Management of Oceanic Resources - The Way Ahead*. Proceedings of both the business and technical sessions will be published and distributed to adhering bodies. British ECOR has organized this important conference.

ECOR has welcomed four new members since the last General Assembly; Poland, represented by the Institute of Hydroengineering of the Polish Academy of Sciences, has joined as an adhering body; the Comité Colombiano de Ingeniería de Los Recursos Oceanicos has joined with observer status; and Mr. Gerard de Froberville (Tahiti) and Dr. C. D. diCenzo (Canada) have joined as associate members. Australia, unfortunately, has dropped out.

While the past, present, and future planned activities of ECOR are substantial, it must be said that, for whatever reason, ECOR has not yet succeeded in attracting an adequate number of developing countries to its ranks. We perceive this to be in part because these countries have not as yet reached a stage of development wherein a standing group of engineers exists and in part as a lack of recognition of the value of international communications among engineers on a nongovernmental level. There is also the fact that ECOR, as an institution, has not been able to convincingly demonstrate its potential value to the international engineering community.

Operating with a limited number of members on a marginal budget, ECOR can only provide for limited support to the triennial ECOR technical assemblies, occasional travel assistance for experts to attend specific technical sessions of IOC and other international bodies and publish a quarterly newsletter.

We believe that if ever ECOR is to attain its full potential, adhering bodies must take the initiative to establish ties with other adhering bodies and potential members in order to forge communication links, establish engineering needs of the international community which might profitably be looked at by a non-governmental body, and assist in the resolution of these needs thereby increasing our corporate knowledge and improving our capability to do useful work in the sea.

## ANNEX XIV

### SCOR SUBMISSION FOR INCORPORATION INTO ICSU

#### PROPOSALS FOR UNESCO MEDIUM-TERM PLAN 1984-1989

Within ICSU, SCOR acts as the focus of the numerous and wide variety of marine science interests of the several ICSU Unions, Committees and other bodies. It has links with many non-ICSU organizations. The strong relationship of SCOR with IOC and the UNESCO Division of Marine Sciences (OCE) brings directly to the appropriate UNESCO divisions links with the ocean science interests and expertise of the ICSU family as a whole. The IOC Scientific Review Board performs an important function in reviewing IOC programmes and identifying priorities, and SCOR assists with this task. The President of SCOR, and members of both SCOR Secretariat and Executive Committee, have established, and will continue to maintain, a close personal working relationship with both the IOC and the UNESCO Division of Marine Sciences.

SCOR is primarily concerned with basic research in marine science and technology. It is also concerned with applied science and technology and with the transfer of this wide range of expertise to marine scientists and technologists everywhere.

All of the areas listed below are considered by SCOR to deserve inclusion as priority items in the UNESCO Medium-Term Plan 1984-1989. The first two, plus a third (study of coastal environments) which is now incorporated into item 4, have already been identified in the 1981-83 UNESCO Programme. All of the areas identified below deserve immediate attention and certain aspects of some of them are already receiving close attention by SCOR Working Groups, of which many have been formed at the request of UNESCO or IOC.

SCOR has recently taken the initiative, with the assistance of UNESCO, and IOC, to organize in early 1982 a discussion, by a carefully-selected group of marine scientists, of the present status of marine science and technology and to make recommendations concerning critical areas and important problems for study during the coming decade, not omitting the development of new instrumentation and techniques which will be required. This exercise will supplement the Ponza Report which was published in 1969, and now requires revision.

The areas identified below for inclusion in the UNESCO Medium-Term Programme 1984-1989 are described with brevity in the interests of clarity and ease of reference at this stage.



## I CLIMATIC CHANGES AND THE OCEAN

The ocean has already been identified by the Joint Scientific Committee for the World Climate Research Programme "as one of the two elements amongst the climatically significant processes which are critical and call for special attention because of their scientific importance and because there is an immediate need to organize programmes for their solution".

The Terms of Reference of the joint SCOR/IOC *Committee on Climatic Changes and the Ocean* (CCCO) require that the Committee collaborate closely with JSC and give priority attention to the time scales of WCRP. SCOR/ICSU welcomes the agreement of IOC to accommodate the secretariat for CCCO in Paris not only because of the need to develop close working links and joint programmes with the ocean services activities such as IODE and IGOSS but also because the CCCO programme will draw upon and integrate relevant aspects of other marine science disciplines of biological oceanography, marine chemistry and marine geology.

The activities of CCCO will ultimately extend to time scales beyond those of WCRP, and the Medium-Term Plan of UNESCO should not lose sight of the importance of attempting to elucidate the history of ocean basins and climatic changes on the geological time scale.

## II OCEAN SCIENCE RELATED TO LIVING RESOURCES

The management and expansion of world fisheries will require special attention from ocean scientists during the remainder of the decade for the following reasons:

1. the increase in world catch, which was sustained for almost two decades, ceased during the late 1970's and it is the consensus of marine scientists that growth in landings can only be renewed if unconventional resources can be exploited;
2. the classical single-species, maximum sustainable yield basis for the management of conventional fish stocks is now universally recognized to have been of use only in the early period of light exploitation of fish stocks and is rapidly being replaced by management techniques, as yet unproved, which recognize fish ecosystem complexity and the realities of fisheries economics;
3. it is now clearly seen that fish stocks must be regarded as a time-varying resource whose variability is presently unpredictable, yet without an ability to predict the consequences of environmental and ecosystem variability it is now recognized that sustained constant yield management is unrealizable;
4. the presently-evolving legal regime for the oceans places a far larger proportion of global fish resources under individual national jurisdiction than previously and this responsibility must be borne almost immediately by many nations with little previous experience in fisheries management.

SCOR, with other ICSU bodies, has responded to an IOC resolution by the establishment of a working group on *Ocean Sciences Related to Living Resources* to address some of these problems. This group is charged with:

- assessing our present understanding of the mechanisms through which variability in the marine environment affects biological productivity and the abundance and distribution of living marine resources;
- identifying promising directions and priorities for relevant research;
- considering appropriate regional research projects and related activities.

SCOR will transmit the advice of this working group to IOC on the occasion of the 1982 IOC Executive Council's meeting in the form of a draft report.

The composition of the working group will reflect both the ability of the scientific community to respond to the problems outlined above, and to the consensus of less-developed countries.

It is anticipated that the advice of the working group on OSLR will include comment on the following topics:

1. the extent to which the fisheries of low latitudes require the development of new management techniques distinct from those currently evolving in higher latitudes;
2. the reversibility of changes in the specific composition of fish stocks imposed on them by heavy fishing pressure and which usually (but not always) result in the replacement of desirable by less-desirable species;
3. the prediction of time-dependent natural variability in recruitment and abundance and the separation of the effects of climatic change from those of inter-species ecological interactions;
4. the reality of the sustained-yield concept in fisheries in view of the long-term consequences of changes in fish population genetic and age-structure compositions;
5. the distribution of stocks of unconventional fishery resources (e. g., krill, squid, mesopelagic fish) in concentrations above thresholds needed for commercially-viable fisheries, and the development of useful products from them;
6. the general development of management techniques for living marine resources based on natural ecosystem relationships and on bio-economic models of relevance to a variety of fishery situations.

The working group will doubtless refer in its advice to the use and development of suitable methods for ocean science related to living resources and will doubtless make reference to:

- numerical ecological simulation models;
- interactive economic-biological models;
- ecological simulation in microcosms;
- large-scale, long-term collaborative experiments at sea;
- regional research programmes involving several coastal states;
- application of instrumental and other new methods to fisheries science, especially as they refer to stock assessment.

Summary:

This important topic will require increased attention during the remainder of the decade. SCOR, in collaboration with other ICSU bodies, has, mainly in response to an IOC resolution, established a group charged with assessing present understanding of the mechanisms through which variability in the marine environment affects biological productivity, the abundance and distribution of living marine resources and with considering appropriate regional research projects. IOC should undertake responsibility for promotion and implementation of such new regional studies as are identified and indeed has already embarked on planning activities in the Western Indian Ocean, the El Niño area, the Caribbean and elsewhere. Support for these and new regional activities, which will increasingly involve coastal states in studying the scientific problems of their own area, should receive strong encouragement.

### III OCEAN SCIENCE RELATED TO NON-LIVING RESOURCES

Apart from the continental margins (which are covered in item IV) the deep sea floor is the repository of poly-metallic nodules containing abnormal concentrations of manganese, cobalt, nickel and copper which are of more than academic interest and may prove to be economically exploitable in the future.

Certain plate boundaries (e. g., Galapagos Rise, Baja California, and the Red Sea rift) show abundant evidence of being the modern sites of primary mineralisation and hydro-thermal activity at high levels within the earth's crust. If these and other localities still to be discovered and studied do not prove to be of intrinsically economic value, they nevertheless provide extremely important guides to the tectonic control of mineralisation in older geological terrains exposed on land. Moreover the associated heat and chemical fluxes have proved to be of more than passing relevance to marine biology, chemistry and physical oceanographic anomalies. Other economic mineral deposits of potential importance include concentrations of heavy minerals both onshore (in dunes on beaches and in covered bedrock gullies and raised beaches) and offshore. Common examples are ilmenite, monazite, zircon, tin and gold: less common are placer deposits of diamonds, and uranium-rich muds in euxinic environments.

The non-living resources of the ocean include the energy reserves of wind-induced waves, tides, and of vertical temperature differences, which require continued study and evaluation of exploitability.

#### IV OCEAN MARGINS

The ocean margins as here perceived include the earth's crust and overlying water column extending shorewards from the continental rise (4 000 to 5 000 metres depth) to include the oceanographic regimes of the continental slope, continental shelf, coasts, estuaries and embayments, not omitting the atmospheric regime above and air/sea energy interactions.

This is the area, probably not more than 20% of the total area of the oceans, which is the most important and the most easily accessible to man. The largest fraction of world fisheries as well as the greatest impact of industrial pollution occurs in the ocean margins. Current exploration for oil and gas is concentrated here and reserves of fresh water, so much in demand by many nations, are contained within the sediments. Here, deep ocean physical and chemical processes interact with and greatly influence those which control the rate of biological productivity, longshore currents, coastal erosion and deposition, weather regimes and the fate of dissolved and suspended material discharged by rivers into the sea.

SCOR (with UNESCO, ECOR, ICES and others) already has seven working groups concerned with ocean margin problems, and more will be required in the near future to provide fundamental information which is required before exploration and exploitation of this valuable and important zone can be rationally carried out without serious disturbance of the natural equilibrium conditions which are in many cases so delicately balanced.

Because of its relevance to coastal states in relation to living and non-living resources and because of its increasing importance in relation to the Law of the Sea, the total width of ocean margins (from estuaries to continental rise) should be included in comprehensive multidisciplinary investigations in which IOC, OCE and SCOR each has an important and distinctive role to play in close collaboration with the others. With the conclusion of the United Nations Conference on the Law of the Sea and the establishment of a new legal regime covering all activities at sea, including marine scientific research, IOC and OCE will be required to undertake increasingly vital roles in providing the intergovernmental focus for marine science affairs. Even before 1984 serious attention will have to be given to the future roles of IOC, OCE and SCOR in relation to UNCLOS which must include assisting developing countries to build up their own capabilities in relevant fields of marine science and technology and providing them with ready access to services. These include training programmes, intercalibration of methodology, joint research exercises, to mention only a few.

In oceanic margins the activities of one coastal state will frequently have effects upon its neighbours. The ocean does not recognize artificial boundaries, and the fostering of international cooperation at all levels will be of far greater importance in the future if basic and applied marine science and technology are to continue to advance, particularly in the important areas covered by the Exclusive Economic Zone. IOC has already established an *ad hoc* task team to identify the functions of IOC in relation to the new Law of the Sea and these functions should be recognized in the Medium-Term Plan.

## V OCEANIC PROCESSES

Improved understanding of oceanic processes in a wide range of scientific disciplines (physics, chemistry, biology, geology and geophysics) and their interaction is of great importance in many programmes of global significance. Despite the advance in knowledge of recent decades and the high level of scientific talent devoted to the study of the sea, there remains an underlying problem that knowledge of the complex marine system is still inadequate. Even though priority areas for attention have been identified much of what appeared in the first medium-term plan remains valid and sight must not be lost of the ever present need to continue to advance basic understanding of all marine processes and to improve measurement/observation techniques. The following two items are examples of those which, among many others, deserve mention for inclusion in the Medium-Term Plan:

- a) To promote better understanding of physical and chemical processes in the ocean, especially those concerned with the formation of ocean fronts, oceanic turbulence on all scales, mesoscale phenomena in the deep oceans, the mechanisms of deep poleward currents, and the effects of the continental shelf upon internal waves.
- b) To undertake detailed studies of the crustal structure of deep ocean basins and aseismic ridges and plateaux, with special reference to evaluating the dynamics of plate motion and the hydrothermal, chemical and biological activity at plate boundaries.

It is never possible to forecast whether advances of, say, the developments in the 1960's of the theory of plate tectonics and sea floor spreading or the understanding reached in the 1970's of the energy of mesoscale eddies, will lie. In most instances such advances will result from the intuition of individuals or small groups of research scientists. Such persons or groups should be encouraged by UNESCO and support given for the discussion and development of ideas. This concept should be reflected in the Medium-Term Plan. Meanwhile SCOR/ICSU, with the active support of IOC, is organizing in 1981/82 a meeting of a small, but high level, expert group of scientists to give critical thought to identifying the more important areas of ocean science that will warrant attention by the end of this century, but with particular emphasis upon problems of significance during the 1980's. This group will be selected to produce innovative, stimulating and far-reaching ideas which will subsequently be the subject of wider discussion within the marine science community during the Joint Oceanographic Assembly, August, 1982.

## VI SOUTHERN OCEAN

The Southern Ocean presents an array of unique characteristics in all areas of marine scientific research and its application. Its economic living resources have proved to be considerable; the dynamics of ocean and atmosphere are far from being well understood but clearly have far-reaching consequences for global climatic changes and southern hemisphere weather; physical and chemical processes at Antarctic and Sub-Tropical Convergences require detailed study; and Antarctic continental margins show many unusual features which deserve more detailed studies.

These and other targets for scientific research require SCOR and IOC initiatives and close collaboration with SCAR: the BIOMASS programme is a highly successful example.

## VII IMPROVEMENT OF BASIC SKILLS

The study of many problems in marine science has reached a standstill because further progress is inhibited by the lack of adequate or appropriate instrumentation and techniques necessary to gain more data or more precise objective measurements, supplemented of course by human insight.

For example, a revolution in the earth sciences took place during the 1960's with the development of ideas which could be tested by magnetic and other measurements at sea which until then had lacked coherent interpretation: the ensuing development of Plate Tectonic theory has been rigorously tested by the specially designed Deep Sea Drilling Programme, which continues apace but now requires reorientation and even more specialised sampling and deep-drilling techniques and capabilities. Yet another good example is provided by the great strides made in physical and biological oceanography through the synoptic view of the ocean obtained by remote sensing from aircraft and satellites. Again, the use of deep submersibles has led to the discovery of sulphide plumes, mineralization and colonies of giant organisms associated with active accreting plate boundaries in the Pacific Ocean.

As the boundaries of human understanding of the complex marine environment and its processes advance, so will there be an increasing need for devising new and better methods for their quantitative study. The ability to detect and to measure is inextricably bound up with the advance of marine science, and proper emphasis should be accorded to the development of basic skills.

## VIII OCEAN SERVICES

Continued collaboration between SCOR, IOC and OCE in developing specifications and procedures for the central storage, retrieval and processing of oceanographic data will be of increasing importance due to larger volume and greater complexity and more specialised nature of the data. Data Inventories should be recognized as being a very important and relatively simple first stage in the provision of ocean services, being complementary to the more complex and difficult task of storage of actual data.

In this connection it should be pointed out that the full set of eighteen sheets of the General Bathymetric Chart of the Oceans (GEBCO) is due for publication by April 1982. These sheets (largely Mercator Projection, scale 1 : 10 000 000) will provide a most useful morphological base and plotting format for the accumulation of marine scientific data which is related to sea-floor morphology (e. g., geoscience data, areas of upwelling and primary productivity, currents, etc.).

## IX CONCLUDING STATEMENT

Oceanography is a rapidly advancing and evolving multi-disciplinary scientific study directed towards better understanding of the complex marine environment and both the exploration for and exploitation of its useful resources.

This document is a generalised statement of problems which require international and intergovernmental collaboration and close scientific cooperation. Individual problems will be readily identified in connection with local or regional studies.

Close collaboration between SCOR, IOC and OCE needs to be maintained at all times, each body having its own special role to play in the advancement of marine science and its application.

I wish to acknowledge the assistance received from past and present members of the SCOR Executive Committee in the preparation of this document at short notice. Comment and constructive criticism will be both welcome and useful in the near future when new directions, methods, objectives and requirements of marine research are to be discussed.

E. S. W. Simpson  
President, SCOR

22 May 1981

ANNEX XV

Future Meetings of SCOR and Affiliated Organizations

1981

17-28 August	Hamburg	IAMAP General Assembly
31 Aug.-4 Sept.	Hamburg	SCOR/IAPSO <i>Symposium on North Sea Dynamics</i>
7-9 September	Paris	IAHR - <i>Mechanics of Oil Slicks</i>
8-14 September	Bordeaux	UNESCO/SCOR/IABO <i>International Symposium on Coastal Lagoons</i>
14-16 September	Berkeley	ECOR - <i>Directional Wave Spectra</i>
September	Bordeaux	WG 65 - <i>Coastal-Offshore Ecosystems Relationships</i>
September		WG 63 - <i>Marine Geochronological Methods</i>
October	San Francisco	WG 57 - <i>Coastal and Estuarine Regimes</i>

1982

January/February	Paris	WG 67 - <i>Oceanography, Marine Ecology and Living Resources</i>
January/February	Miami	WG 68 - <i>North Atlantic Circulation</i>
1-5 March	Split	CCCO Third Session
2-5 March	Kiel	ICES/SCOR <i>International Symposium on the Biological Productivity on Continental Shelves in the Temperate Zone of the North Atlantic</i>
May	Bordeaux	WG 59 - <i>Workshop: Flows of Energy and Materials in Marine Ecosystems: Theory and Practice</i>
10-20 May	Tokyo	CCCO. <i>Study Conferenee on Large Scale Oceanographic Experiments</i>
25-27 May	Tokyo	SCOR/SCAR <i>Workshop on the Enhancement of Interactions Between Biological, Physical and Chemical Oceanographers Working in the Southern Ocean</i>



1982 (continued)

28 May-1 June	Tokyo	WG 54 - BIOMASS meeting
29-31 July	Halifax	24th Executive Committee meeting
7-8 August	Halifax	16th General Meeting
2-13 August	Halifax	Joint Oceanographic Assembly
August	Halifax	WG 44 - <i>Ocean-Atmosphere Materials Exchange</i>
August	Halifax	WG 60 - <i>Mangrove Ecosystems</i>
August	Halifax	WG 61 - <i>Sedimentation Processes at Continental Margins</i>
August	Halifax	WG 63 - <i>Marine Geochronological Methods</i>
August	Halifax	CCCCO Fourth Session
To be arranged	-	WG 34 - <i>Internal Dynamics of the Ocean</i>
To be arranged	-	WG 42 - <i>Pollution of the Baltic</i>
To be arranged	-	WG 46 - <i>River Inputs to Ocean Systems</i>
To be arranged	-	WG 51 - <i>Evaluation of CTD Data</i>
To be arranged	-	WG 55 - <i>Prediction of El Niño</i>

## ANNEX XVI

### ABBREVIATIONS

ACMRR	Advisory Committee on Marine Resources Research (of FAO)
AGU	American Geophysical Union
ASCE	American Society of Civil Engineers
BIOMASS	Biological Investigations of Marine Antarctic Systems and Stocks
BOSEX	Baltic Open Sea Experiment (1977)
CAGE	CCCO Proposed Experiment in the North Atlantic
CCCO	Committee on Climatic Changes and the Ocean
CCF	Climate Coordinating Forum (of ICSU)
CCOP/SOPAC	Committee for Co-ordination of Joint Prospecting for Mineral Resources in South Pacific Offshore Areas
CIPREA	Circulation et Production en Zone Equatoriale Atlantique
CMAS	Confédération Mondiale des Activités Subaquatiques
CMG	Commission on Marine Geology (of IUGS)
CNC	Canadian National Committee (of SCOR)
COMIRO	Mexican adhering body for ECOR
COSPAR	Committee on Space Research (of ICSU)
CTD	Conductivity Temperature Depth
DDT	Dichlorodiphenyltrichloroethane
ECOR	Engineering Committee on Oceanic Resources
EEZ	Exclusive Economic Zone
ESA	European Space Agency
ESCAP	Economic and Social Commission for Asia and the Pacific
EUBEX	Eurasian Basin Experiment
FAO	Food and Agriculture Organization of the UN
FGGE	First GARP Global Experiment
FIBEX	First BIOMASS Experiment (WG 54)
FOCAL	French Equatorial Atlantic Ocean Climate Programme
FORE	Future Ocean Research
GARP	Global Atmospheric Research Programme (of WMO/ICSU)
GEBCO	General Bathymetric Chart of the Oceans
GESAMP	Group of Experts on the Scientific Aspects of Marine Pollution
GSA	Geological Society of America
IABO	International Association for Biological Oceanography (of IUBS)
IAHR	International Association of Hydraulic Research
IAHS	International Association of Hydrological Sciences
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
ICSU	International Council of Scientific Unions
IGOSS	Integrated Global Ocean Station System
IOC	Intergovernmental Oceanographic Commission
IODE	International Oceanographic Data Exchange (Working Committee of IOC)
IOS	Institute of Oceanographic Sciences
IUBS	International Union of Biological Sciences (of ICSU)
IUGG	International Union of Geodesy and Geophysics (of ICSU)
IUGS	International Union of Geological Sciences (of ICSU)
IUPAC	International Union of Pure and Applied Chemistry (of ICSU)

IUTAM	International Union of Theoretical and Applied Mechanics (of ICSU)
IWC	International Whaling Commission
JOA	Joint Oceanographic Assembly
JOIDES	Joint Oceanographic Institutions for Deep Earth Sampling
JPOTS	Joint Panel on Oceanographic Tables and Standards
JSC	Joint Scientific Committee (WMO/ICSU)
MPNA	Marine Pollution in the North Atlantic (an ICES working group)
NORPAX	North Pacific Experiment
OCE	Division of Marine Sciences (UNESCO)
ONR	Office of Naval Research
OSLR	Ocean Science in Relation to Living Resources
PCB's	Polychlorinated biphenyls
POLEX	Polar Experiment North Hemisphere
POMS	Pilot Ocean Monitoring Study
RIOS	River Inputs to Ocean Systems
SCAR	Scientific Committee on Antarctic Research (of ICSU)
SCOPE	Scientific Committee on Problems of the Environment (of ICSU)
SCOR	Scientific Committee on Oceanic Research (of ICSU)
SEQUAL	Seasonal Equatorial Atlantic Experiment
SIBEX	Second BIOMASS Experiment
SRB	Scientific Review Board (IOC)
TOPEX	Topographic Experiment
UNCLOS	UN Conference on the Law of the Sea
UNEP	United National Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
URSI	International Union of Radio Science (of ICSU)
WCP	World Climate Programme
WCRP	World Climate Research Programme
WESTPAC	Western Pacific
WMO	World Meteorological Organization
WOCE	World Ocean Circulation Experiment