

SCIENTIFIC COMMITTEE ON OCEANIC RESEARCH



proceedings
volume 5 / number 1

INTERNATIONAL COUNCIL OF SCIENTIFIC UNIONS

SCIENTIFIC COMMITTEE ON OCEANIC RESEARCH

THE EXECUTIVE COMMITTEE

President: Professor Warren S. Wooster, Scripps Institution of Oceanography, P.O. Box 109, La Jolla, California, 92037, U.S.A. Cable: SIOCEAN LAJOLLA CALIFORNIA

Retiring President: Captain Luis R.A. Capurro, Department of Oceanography, Texas A & M University, College Station, Texas, 77843, U.S.A.

Vice-President: Professor Trygve Braarud, Institute for Marine Biology B, Universitet i Oslo, P.O. Box Blindern 1069, Oslo 3, Norway

Professor A.S. Monin, Institute of Oceanology, USSR Academy of Sciences, 1, ul. Sadovaya, Ljublino, Moscow, J-387, USSR

Secretary: Dr. Klaus Voigt, Director, Institut für Meereskunde, Seestrasse 15, 253 Warnemunde, Germany, GDR

Ex Officio: Mr. Ronald I. Currie, The Marine Station, Millport, Isle of Cumbrae, Bute, United Kingdom

Professor G. Dietrich, Institut für Meereskunde, Universität Kiel, Niemannsweg 11, 23 Kiel, Germany, FRG

Professor Bruce C. Heezen, Lamont Geological Observatory, Columbia University, Palisades, New York, U.S.A.

MEMBERS OF SCOR

Prof. B. BATTAGLIA	(Italy)	Prof. N. JERLOV	(Denmark)
Prof. T. BRAARUD	(Norway)	Dr. V.C. JUAN	(China, Rep.)
Mr. J.W. BRODIE	(New Zealand)	Prof. J. KROG	(IUPS)
Sir Edward BULLARD	(IUPAP)	Prof. B. KULLENBERG	(Sweden)
Capt. L.R.A. CAPURRO	(Argentina)	Prof. J.K. MALLORY	(South Africa)
Mr. R.I. CURRIE	(IUBS)	Prof. A.S. MONIN	(USSR)
Dr. G.E.R. DEACON	(United Kingdom)	Dr. N.K. PANIKKAR	(India)
Prof. G. DIETRICH	(IUGG)	Prof. H. POSTMA	(Netherlands)
Dr. K.O. EMERY	(IUGS)	Prof. R. REVELLE	(IUGG)
Cmdr. Jose EMILIO DE ATAIDA	(Portugal)	Prof. J. ROCHE	(IUB)
Dr. T.F. GASKELL	(IUGS)	Lt.Gen.P. SALVIDHAN NIDES	(Thailand)
Dr. R.J. GATOT	(Indonesia)	Prof. E. SEIBOLD	(FRG)
Dr. Eliezer GILAT	(Israel)	Prof. R.W. STEWART	(Canada)
Dr. S. HAYAMI	(Japan)	Prof. S. SZYMBORSKI	(Poland)
Prof. B. HEEZEN	(IUGS)	Dr. E.O. TAN	(Philippines)
Prof. Ilmo HELA	(Finland)	Prof. Paul TCHERNIA	(France)
Capt. Raul HERRERA	(Chile)	Dr. K. VOIGT	(GDR)
Dr. G.F. HUMPHREY	(Australia)	Prof. W.S. WOOSTER	(USA)
Dr. C.O'D. ISELIN	(IGU)		

INTERNATIONAL COUNCIL OF SCIENTIFIC UNIONS

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

Volume 5, Number 1

15 April 1969
La Jolla, California

TABLE OF CONTENTS

Contents	Page
List of SCOR Members and Executive Committee	Inside Front Cover
Proceedings	
Annex I List of participants, Executive Meeting, Mexico City, 29-31 January 1969	
Annex II Estimate of SCOR Finances, Calendar 1968	
Annex III Membership and terms of reference of active SCOR Working Groups	
Annex IV Report of Working Group 24 on Zooplankton Laboratory Methods: Meeting in Southampton, 30 July - 1 August 1968	
Annex V Resolutions on Ocean Affairs adopted by United Nations General Assembly, 23rd Session	
Annex VI Proposal by U.S. National Committee on role of IOC in facilitating clearances for research vessels	
Annex VII Progress Report on International Biological Program, Section PM	
Annex VIII Meetings of SCOR and associated organizations in 1969	
List of Abbreviations Used	Inside Back Cover

PROCEEDINGS
of the
SCIENTIFIC COMMITTEE ON OCEANIC RESEARCH

Report of the Executive Committee Meeting
Mexico City, 29-31 January 1969

The meeting of the SCOR Executive Committee was held at the Universidad Nacional Autónoma de México in Mexico City, 29-31 January 1969 with the President, Professor Warren Wooster, in the chair. Local arrangements were made by Dr. Augustin Ayala-Castañares, Director of the Institute of Biology of the University; Dr. Ayala described to the meeting the activities of the University and of his Institute in the field of marine science. Other aspects of marine science in Mexico were discussed by Dr. Jorge Carranza, Vice-Chairman of the Intergovernmental Oceanographic Commission, and by Com. Gilberto López Lira (Navy) and Dr. Amín Zarur M. (Fisheries).

A list of those who participated in the Executive Meeting is given in Annex I. The agenda of the meeting serves as an outline for the report which follows.

1.0 ORGANIZATION AND FINANCE

1.1 ORGANIZATION AND STATUTES

Statutes - The following revised text for Article 4 (a) of the SCOR Constitution has been accepted by the ICSU Executive Committee:

" 4 (a). SCOR shall elect from amongst its members a President, two Vice-Presidents and a Secretary. The Retiring President shall also be considered an elected member of the Executive Committee. The maximum period of office of the President is 4 years, but the Vice-Presidents and the Secretary shall each be eligible for one further term of 4 years service. Normally no elected member should remain on the Executive for more than 8 consecutive years; when the President is precluded by this rule from accepting the office of retiring President, a third Vice-President shall be elected."

The ICSU Executive Secretary has advised that minor changes can be made in the Constitution without prior approval by ICSU. Such changes are necessary in Article 4 (b) to show the correct organizational names of the International Association for the Physical Sciences of the Ocean, and the International Association of Biological Oceanography.

Membership - During the Ninth General Meeting, the Executive Committee was instructed to attempt to increase national membership, through correspondence with marine scientists and organizations in non-affiliated countries, and through visits where desirable. Letters of invitation were subsequently sent to ICSU correspondents and scientists in the following countries: Cuba, Colombia, Ghana, Korea, Mexico, Monaco, Pakistan, Romania, Spain, Yugoslavia. An application for membership has been received from the Centre Scientifique de Monaco, and one is anticipated from an appropriate organization in Spain. During the present meeting, discussions on the possibility of Mexican affiliation were discussed with Mexican marine scientists.

It was agreed that a brochure should be prepared describing the history, purpose, function and accomplishments of SCOR; this could be a useful source of information for prospective members and others interested in the Committee and should be given wide distribution. Consideration should be given to the desirability of an IOC resolution encouraging the formation of national committees of oceanic research and their affiliation with SCOR; in preparing such a resolution, it would be necessary to distinguish clearly the responsibilities of SCOR from those of the Commis-

mission. It may also be useful to establish a class of corresponding member for those national committee or equivalent bodies that are not yet prepared to request full membership. Development of this proposal will require close coordination with IAPSO and IABO.

Several participants agreed to undertake further negotiations on membership with scientists in certain countries. Further discussions will be held with ICSU on the matter of nomination of their member on SCOR.

Symposium Volumes - Publication of the Rome variability symposium is planned for January 1969; it is understood that the Consiglio in Rome will purchase 175 copies of which 75 will be made available for distribution by SCOR. Papers of the La Jolla South Pacific symposium are in the hands of editorial staff of the U.S. National Academy of Sciences, and publication is anticipated in 1969. The symposium volume on micropaleontology of bottom sediments is scheduled for publication by the Cambridge University Press in mid-1969.

No specific action has yet been taken on the proposed review of modern navigational methods; the importance of such a review is increasing because of proposed activities of the Upper Mantle Program and the International Decade of Ocean Exploration. However, a symposium may not be the most effective way to prepare the review. The President was requested to discuss the matter with Professor Von Arx and to report to the Executive Committee.

1.2 BUDGET AND FINANCE

An estimate of SCOR finances for the calendar year 1968 is given in Annex II. Although the balance at the end of the year is somewhat larger than usual, substantial expenses are anticipated during the first half of 1969 in connection with various working group and other activities already planned. Ways and means to utilize the rupee balance should be explored.

2.0 WORKING GROUPS

2.1 ACTIVITIES RELATED TO PREVIOUS WORKING GROUPS

WG 12. Abstracts and Bibliographies of Use in Marine Sciences: It was agreed to ask Mr. Akyuz of the FAO secretariat to keep SCOR advised on the need for future action in this field.

WG 13. Zooplankton Sampling: The report of this working group, along with a series of papers reviewing various aspects of the problem, was published by UNESCO in UNESCO Monographs on Oceanographic Methodology No. 2, entitled "Zooplankton Sampling".

WG 17. Photosynthetic Pigments: Dr. Humphrey has been serving as rapporteur for this topic; he is now undertaking a review of the present state of knowledge and research activities, and will report to the next meeting of the Executive Committee.

WG 18. Biological Data: The IOC Working Group on International Oceanographic Data Exchange, at its 4th Meeting (Paris, 23-26 September 1968), recommended a review of the report of WG 18 (in Proceedings, vol. 1, no. 2) "with a view to arranging for the implementation of specific proposals in it, and to further development of proposals for dealing with the wide range of biological data records, materials, and related documentation. This might best be done by a new joint SCOR/ACMRR Working Group constituted in such a way as to ensure collaboration of experts connected with the WDC's and such NODC's as are actively considering the means of handling biological information". Action on this proposal is discussed under item 2.3 below.

WG 25. Nutrient Chemistry: The Chairman of this group, Professor Rakestraw, repre-

sented SCOR at the 56th Statutory Meeting of ICES (October 1968) to discuss the nutrient intercalibration experiment proposed at the last SCOR General Meeting. The Council accepted this proposal, with the experiment to be organized by the Working Group on Chemical Analysis of Sea Water, under the leadership of Dr. Koroleff and Mr. Palmork. SCOR will cover the costs of containers and shipping, estimated at \$1,100 for 50 participants. There should be further discussions among ICES, SCOR and UNESCO, to determine how best to elicit broad participation in the experiment. Professor Sugawara, who will manufacture the standard samples to be used in the experiment is preparing a detailed description of the samples for publication in a CSK report. Various technical details of the experiment have been discussed by Drs. Sugawara, Rakestraw, Grasshoff, Gieskes and Wooster, and their suggestions have been forwarded to Dr. Koroleff.

2.2 REPORT ON EXISTING GROUPS

A list of active working groups, together with their membership and terms of reference, is given in Annex III.

WG 10. Oceanographic Tables and Standards (with ICES, IAPSO and UNESCO): During the last General Meeting, it was proposed to replace this group with an Editorial Board for the "International Oceanographic Tables". This proposal was not acceptable to the other sponsors who considered that it would unduly restrict the function of this panel of experts. Accordingly, the Executive Committee decided to continue participation in this group at least until its next meeting.

The group had recommended publication in "International Oceanographic Tables" of oxygen saturation values for sea water. Some discrepancies have appeared among the various recent measurements, and it appears desirable for the chemists most directly involved to meet and resolve these discrepancies. Therefore, a meeting (27-28 February 1969 at Nova University, Florida) is being sponsored by SCOR and the U.S. National Committee to SCOR, under the chairmanship of Professor Carritt. Participants will include Drs. Benson, Carpenter, Gieskes, Grasshoff, Green and J.P. Riley.

WG 15. Photosynthetic Radiant Energy (with UNESCO and IAPSO): This group has continued work on completing its report of the May 1968 sea trials. A data report has been issued by Mr. Tyler; similar reports are expected from other participants. Mr. Tyler, as chairman of the group, has received a contract from UNESCO to cover expenses in connection with preparation of the overall report. The U.S. Environmental Science Services Administration will make R/V DISCOVERER available out of Miami during the second quarter of calendar 1970 for the more extensive sea trials planned by the group. No decision was reached about a replacement for Mr. Steele; the President was requested to discuss this question further with Mr. Tyler and the UK National Committee.

WG 21. Continuous Current Velocity Measurements (with IAPSO and UNESCO): A meeting is scheduled for 19-20 May at the National Institute of Oceanography (UK). It is hoped that arrangements can also be made for the group to meet in Dublin at the time of the ICES Symposium on Physical Variability in the North Atlantic (25-27 September 1969).

WG 23. Zooplankton Laboratory Methods (with UNESCO): The work of this group has continued, with some travel and correspondence by its Chairman, and with extensive activity by Dr. Steedman who is supervising pertinent investigations at the Smithsonian Institution; expenses have been provided jointly by that Institution and by SCOR. Dr. Steedman is also receiving support from the National Environmental Research Council (UK). If additional funds are required, it may be possible to obtain a contract from UNESCO. No meeting of WG 23 is planned for 1969.

WG 24. Estimation of Primary Production under Special Conditions (with IBP/PM): This group met in Southampton, 30 July - 1 August 1968; agreement was reached on studies to be made by each of the various members, a preliminary report was completed, and a second meeting was

proposed for early 1970. The report is given in Annex IV.

WG 27. Deep-Sea Tides (with IAPSO and UNESCO): Success has now been achieved in obtaining tidal records of long duration from the deep ocean. In order to develop methods for the analysis of these records, SCOR is providing travel expenses for Dr. Cartwright to spend two weeks working in La Jolla with Professor Munk, chairman of the group.

WG 28. Air-Sea Interaction (with IAMAP and IAPSO): Agreement has finally been reached on SCOR sponsorship of what will be known as the IAMAP/IAPSO/SCOR Joint Committee on Air-Sea Interaction, under the chairmanship of Professor Henry Charnock. Membership and terms of reference of the group are given in Annex III. The Joint Committee is advisory to WMO through the Joint Organizing Committee for GARP, and to IOC through SCOR. A meeting was held in Princeton, 21-23 January 1969; the final report of that meeting is not yet available.

WG 29. Continuous Monitoring in Biological Oceanography (with ACMRR, UNESCO and IBP/PM): A list of members was proposed by Professor Braarud, and the President was requested to invite their participation.

WG 30. Scientific Aspects of International Ocean Research (with ACMRR and WMO): The meeting of this group is scheduled for 28 April - 3 May in Ponza, and 5-6 May in Rome. Membership of the group is not yet complete; a tentative list is given in Annex III.

Since establishment of this group was approved, discussions in the United Nations General Assembly, and Resolutions adopted there (see Annex V), have given particular importance to its work. The Bureau of the IOC, in its Ninth Meeting (Woods Hole, 3-7 February 1969) noted that the report of WG 30 would provide a basis for the discussions of the IOC Working Group on the same topic and should be promptly disseminated to Member States and to the appropriate bodies of interested agencies. The Bureau formulated the following specific questions for the group to consider:

1. What are the most important oceanic research problems that should receive particular attention in the near future?
2. What types of research programs can best contribute to solving these problems?
3. In what geographical areas of the world's ocean will increased research efforts make the best contributions in solving these problems?
4. What kinds of supporting facilities, services, and manpower will be needed to carry out these programs?
5. How can ocean exploration and research best contribute to the particular needs of the developing nations?
6. How can results of the above exploration and research programs best contribute to various peaceful uses of the ocean, its floor and its resources?
7. How can increased ocean research activities by the developing countries contribute to their social and economic development?

WG 31. East Atlantic Continental Margins (with UNESCO and IUGS): Terms of reference and membership of this group are given in Annex III. The first meeting took place on 26-28 February 1969 in Kiel.

At that meeting, the group proposed to organize an international symposium on "Geology of

the East Atlantic Continental Margin", to be held in England during the spring of 1970. Participants should be limited to 150-200; the program would consist of about 25 invited papers and about 20 shorter contributions. A first circular will be issued in April 1969. Publication of all invited papers and of selected special papers is proposed.

2.3 CONSIDERATION OF NEW WORKING GROUPS

WG 32. Biological Data Inventories: As noted in item 2.1 above, the IOC Data Exchange Working Group had proposed that SCOR and ACMRR give further consideration to biological data problems. The Executive Committee agreed that a new working group jointly sponsored by SCOR and ACMRR would be useful. Emphasis should be on inventories of biological data resulting from expeditions and other scientific programs, including fishery development programs of FAO/UNDP. Commercial fishery statistics should not be included. Consideration should also be given to reference collections of marine organisms and catalogs thereof. It was decided to invite ACMRR to join in establishing WG 32 on Biological Data Inventories with the following terms of reference:

1. To review the present status of biological data inventories and information retrieval in national, regional and world data centers;
2. To propose standard forms and procedures for inventory of marine biological and related biochemical data (exclusive of commercial fishery statistics);
3. To review present procedures in cataloging reference collections of marine organisms and to consider means for speedy retrieval and exchange of information contained in such catalogs.

Membership might include representatives of national oceanographic data centers in U.S., Canada and Japan, WDC-B in Moscow, and the Smithsonian Institution, as well as several marine biologists representing the users of such inventories.

WG 33. Phytoplankton Methods: Professor Braarud pointed out the need for consideration of phytoplankton methods other than those involving pigment and other chemical analysis. Widely different methods are used in different countries and laboratories, and it is increasingly difficult to compare the results. The IOC Working Group on Training and Education has commented on the need for modern textbooks and manuals, and a review of phytoplankton methods could result in a manual on the subject.

The Executive Committee decided to establish WG 33 on Phytoplankton Methods with the following terms of reference:

1. To review the methods now used for quantitative phytoplankton studies (exclusive of pigment and other chemical methods);
2. To select the most satisfactory methods for various purposes, such as the description of species composition of communities, studies of special components, and biomass estimation;
3. For the selected methods, to recommend detailed procedures for sample collection, preservation and laboratory examination;
4. To prepare a report that might serve as a basis for a manual, including references to literature on taxonomy of the main groups and on methods for using quantitative phytoplankton data in ecological studies.

A list of potential members of the group was established. Professor Hempel indicated that

IABO might agree to cosponsor.

3.0 RELATION WITH UNITED NATIONS ORGANIZATIONS

3.1 ADVISORY MATTERS CONCERNING UNESCO/IOC

International Directory of Marine Scientists: The Secretary reported on his analysis of the national lists of oceanographers already received. Approximately 50 countries had submitted lists so far; the previous edition contained information from 99 countries. Some of the lists submitted a year or more ago are already out of date. Indexes by name and by specialty would add much to the utility of the directory. After some discussion of the present status of the project, the following recommendations were made:

1. A consultant should be hired by UNESCO to prepare the available lists for publication;
2. The possibility of computer processing and printing of the lists should be carefully considered, in consultation with appropriate specialists of the FAO secretariat;
3. Available lists should be published in loose leaf form, thus permitting updating and addition of new lists as received;
4. UNESCO should consider forming a board, consisting of representatives of UNESCO and FAO, the Secretary of SCOR, and the consultant, to decide how to proceed most effectively with this project.

Formulation of Advice: The advice of SCOR is usually requested by IOC in the form of resolutions or recommendations, while UNESCO requests are usually communicated by letter. On occasion, SCOR may offer unsolicited advice to either organization. SCOR advice may be submitted in a formal document to an IOC Session or Bureau Meeting, or may be transmitted informally in correspondence. The representative of IOC and UNESCO presented his view that some requests for advice had not been adequately satisfied. Of course, it may not always be possible to formulate useful advice, but failure to do so should not be inadvertent. It was suggested that UNESCO and IOC requests should be as specific as possible, and that the UNESCO/IOC secretariat should occasionally remind SCOR of outstanding requests.

Indian Ocean Biological Center: Because of SCOR's historical role with respect to IOBC, and because of the discussions at the last SCOR General Meeting, it was agreed to ask Dr. Humphrey to represent SCOR at the next meeting of the IOBC Consultative Committee, scheduled for 24 February - 2 March 1969 in Cochin. It was also noted that Professor Krey would complete his term of membership after this meeting, and that SCOR had already nominated Professor Hempel as his replacement.

Impediments to Research : During its Ninth General Meeting, SCOR adopted a statement on freedom of scientific research. Since then, the IOC Working Group on Legal Questions Related to Scientific Investigations of the Ocean has met, with Professor Tchernia representing SCOR; ICES has also discussed the matter. A letter was received from the U.S. National Committee to SCOR recommending an appropriate role for IOC in facilitating clearances for research vessels undertaking fundamental scientific research (see Annex VI). The Executive Committee agreed to bring this to the attention of the Ninth Meeting of the IOC Bureau and Consultative Council.

Research on the Deep Ocean Floor: Much of the recent international controversy over the potential resources of the deep ocean floor appeared to be based on inadequate information. Scientific investigations relating to the deep ocean floor and its potential resources are being conducted

by a number of laboratories in various parts of the world. It would appear feasible to publish annually a volume of collected reprints of papers resulting from such investigations. The widespread distribution of such volumes might introduce a more realistic note into future international discussions of the deep ocean floor. The Executive Committee recommended that UNESCO consider the desirability and feasibility of implementing this proposal.

Training and Education: Professor Braarud represented SCOR at the first meeting of the IOC Working Group on this subject (Paris, 2-4 December 1968). In a discussion of the report, it was agreed that SCOR should retain an active interest in the activities of this group, and should seek for ways to make an effective contribution. Particular interest was shown in the fellowship recommendations and in the need for modern textbooks and manuals; in some cases, the latter could result from SCOR working groups.

Marine Geology and Geophysics: Particular attention was paid to this topic during the Ninth General Meeting. Since then, the Royal Society has decided to hold a Symposium "Petrology of Igneous and Metamorphic Rocks of the Ocean Floor" in London, 12-14 November 1969; SCOR has agreed to provide travel funds for several invited speakers. It was also agreed to cosponsor the Upper Mantle Committee Symposium "Inland Seas" to be held in Madrid, 4-6 September 1969. The 8th Meeting of INQUA will be held in Paris during the period 30 August - 5 September 1969; it was agreed to encourage the UNESCO/IOC secretariat to look for opportunities to interrelate the meeting with that of the IOC Sixth Session which occurs at about the same time.

The IOC Data Exchange Working Group has established panels to look into problems related to the preparation of indexes of bottom photographs and cores. SCOR should offer to assist these panels as necessary and desirable. It was suggested that an index of ocean floor rocks would also be useful.

IOC Resolution V-12 invited Members to contribute to the carrying out of transoceanic geophysical traverses; to contribute to this activity, it was proposed at the last SCOR General Meeting that an appropriate working group be established. Dr. Maxwell reported that recent results of the deep-sea drilling program will necessitate reconsideration of such plans. An ad hoc committee of IUGG and IUGS, under the chairmanship of Professor Drake, is meeting in Paris (19-22 February 1969) to discuss a long-range program of solid-earth studies to follow the Upper Mantle Program (scheduled to finish in 1970). Subsequently, it may be desirable for the appropriate IAPSO Commission to meet; SCOR and UNESCO support for such a meeting would be desirable. Dr. Maxwell was asked to keep SCOR informed on developments in this area.

Other Matters: Dr. Fedorov reviewed the problems faced in UNESCO regarding the publication of scientific volumes such as proceedings of symposia, and suggested that SCOR might develop a mechanism for assisting in the solution of such problems. It was agreed to explore possible alternative publishing arrangements. UNESCO has appointed Dr. Tait as a consultant to revise the "General Scientific Framework" which has been renamed "Perspectives in Oceanography 1968"; although the original report was prepared by SCOR and ACMRR, the new version need not be attributed to these organizations.

In accordance with IOC Bureau Recommendation 8.4, the President of SCOR met in Paris, 10-12 October 1968, with a small group of consultants to formulate the required framework of future administrative arrangements for the work of the broadened IOC and its secretariat. A report was prepared for consideration by the IOC Bureau and Consultative Committee at their Ninth Meeting.

3.2 RELATION WITH FAO/ACMRR

During the Ninth General Meeting, a proposal of the Soviet National Committee to establish a group of experts on transplantation and reconstruction of marine fauna and flora was referred to

ACMRR for consideration. Dr. Ruivo reported that FAO had contracted with Drs. Karpevich and Walford to prepare reviews on this subject. These reviews will be made available to SCOR when completed, after which consideration can be given to further SCOR action.

At the Fifth Session of ACMRR, a proposal was considered for an international cooperative study of the eastern central Atlantic Ocean (Gibraltar to Dakar). SCOR was invited to comment on the proposal. Subsequently, ICES agreed to cooperate with FAO and IOC in the planning of extended research activities in the region. The IOC Bureau, at its Ninth Meeting, decided to place the proposal on the agenda of the Sixth Session and to invite ACMRR, SCOR and ICES to furnish further details and background information. The Executive Committee agreed to circulate the proposal and to participate in further discussions on the matter.

3.3 RELATION WITH WMO

Through SCOR sponsorship of the IAMAP/IAPSO/SCOR Joint Committee on Air-Sea Interaction (WG 28), there is now an indirect advisory link with WMO. In addition, WMO is cooperating with SCOR and ACMRR in the sponsorship of WG 30 on Scientific Aspects of International Ocean Research.

3.4 OTHER MATTERS

The Joint Group of Experts on the Scientific Aspects of Marine Pollution, sponsored by IMCO, FAO, UNESCO and WMO, will hold its first meeting in London on 17-21 March 1969. SCOR has been invited to be represented by an observer at this meeting; Professor Postma has agreed to serve in that capacity.

4.0 RELATION WITH ICSU AND CONSTITUENT BODIES

4.1 RELATION WITH ICSU

ICSU has established a Panel on World Data Centers (Geophysical and Solar) to take over CIG responsibilities in this area. In addition to a six-member Bureau, the Panel will have members from various specialized groups, including two representatives of oceanography, one to be nominated by UNESCO/IOC, the other by SCOR and IAPSO in concert. SCOR and IAPSO have agreed to nominate the SCOR Secretary, Dr. Voigt, in this capacity.

4.2 RELATION WITH IAPSO

During the June meeting, it was decided to hold the Tenth General Meeting in Tokyo, 14-27 September 1970, together with IAPSO which will hold its Fifteenth General Assembly and IABO which will hold its Second General Meeting. Meetings of the IUGG Commission on Marine Geology, and of IAVCEI and IAGC will also take place. It is planned that many of the scientific sessions will be jointly organized, that each organization will hold its own business meeting, and that there will be a joint session to discuss the desirability and feasibility of organizing an International Union of Marine Sciences (IUMS).

A joint announcement of the meeting should be issued by the various organizations concerned, and representatives of SCOR, IAPSO and IABO should meet with the Japanese organizing committee in the near future. In order to facilitate consideration of IUMS, a background paper setting forth the advantages and disadvantages of such an organization should be prepared and distributed well in advance of the Tokyo meeting.

4.3 RELATION WITH SPECIAL AND SCIENTIFIC COMMITTEES

Antarctic Research : The Symposium on Antarctic Oceanography was held in Santiago, Chile on 13-16 September 1966, under the sponsorship of SCAR, SCOR, IAP0 and IUBS. Papers of this symposium have now been published and are available from the Scott Polar Research Institute (Cambridge, England) at a cost of 2 pounds 5 shillings (\$5) post free. Copies will be distributed to SCOR members. The publication contains 17 main review papers and 40 shorter contributions in sections on surface and upper layers, deep water, ocean floor, coastal waters, pack ice regime and productivity, as well as a section of comments and recommendations on future work on Antarctic oceanography.

International Biological Program: A progress report on the activities of IBP/PM has been prepared by the section convener, Mr. Glover, and is given in Annex VII. At the last SCOR General Meeting, it was decided to stimulate the preparation and publication of a review of present methods and ideas on statistical design and analysis of plankton sampling programs. Dr. H. Barnes (Millport) has agreed to undertake this task. Sir Maurice Yonge, Scientific Coordinator of IBP/PM, has proposed SCOR support for a Symposium on the Eastern Mediterranean to be held in the second half of 1970 (see Annex VII). It was decided to defer action on this proposal until more information is available.

As a result of the continuing discussions between Dr. Humphrey and Professor Krey, it has been tentatively decided to hold a Symposium on Indian Ocean Biology and the IIOE at the Institut für Meereskunde in Kiel in March or April 1971. Potential sponsors include SCOR, IBP/PM, UNESCO, IABO and FAO. The symposium would cover research during the IIOE including subsequent examination of material, plus more recent biological investigations in the region. The purposes would include the summary and discussion of the biology of the Indian Ocean, presentation and discussion of short papers, discussion of how the investigations might have been better carried out and coordinated, and consideration of desirable future investigations. It is anticipated that 50-100 scientists might participate. Dr. Humphrey proposes to visit a number of potential participants and section chairmen in June-July 1969 in order to finalize the program.

Announcement has been received of a Symposium on Indian Ocean and Adjacent Seas - Their Origin, Science and Resources, being organized by the Marine Biological Association of India in Cochin, 12-18 January 1971. Although the subject matter of this symposium is much broader than that proposed for Kiel, and participation is likely to be significantly different, the dangers of overlap were recognized, and Dr. Humphrey was asked to discuss the problem with Professor Krey and with appropriate Indian authorities during his visit to India at the time of the IOBC Consultative Committee meeting in late February.

5.0 RELATION WITH OTHER INTERNATIONAL ORGANIZATIONS

Joint action with ICES with regard to an international intercalibration experiment is referred to above. SCOR has agreed to co-sponsor the ICES Symposium on Physical Variability in the North Atlantic, to be held in Dublin, Ireland on 25-27 September 1969. Dr. Voigt represents SCOR on the Scientific Organizing Committee for this symposium. SCOR has agreed to support its nominees on WG 21 which will meet in Dublin at that time; funds may also be required for other invited speakers.

6.0 OTHER BUSINESS

The Sixth Session of IOC has been scheduled for 2-13 September 1969 in Paris. The SCOR Executive Committee should meet in late August in an appropriate location in northern Europe. Professor Braarud agreed to investigate possibilities in Norway and Sweden.

A list of meetings of SCOR and associated organizations in 1969 is given in Annex VIII.

SCOR EXECUTIVE MEETING
Mexico City, 29-31 January 1969

List of Participants
MEMBERS OF THE EXECUTIVE COMMITTEE

Professor Warren S. Wooster	(U.S.A.)	President
Captain Luis R.A. Capurro	(Argentina)	Retiring President
Professor Trygve Braarud	(Norway)	Vice President
Dr. Klaus Voigt	(Germany, GDR)	Secretary

OTHER PARTICIPANTS

Dr. A. Ayala-Castañares (Institute of Biology, UNAM)	Dr. A.E. Maxwell (IAPSO)
Dr. John Calhoun (U.S. National Committee)	Dr. M. Ruivo (FAO/ACMRR)
Dr. J. Carranza (IOC)	Professor E. Seibold (SCOR Member from Germany, FRG)
Dr. W.M. Chapman (ACMRR)	Professor K. Sugawara (Japanese National Committee)
Dr. J.L. Cifuentes-Lemus (Secretaría de Industria y Comercio, Mexico)	Mr. N.L. Veranneman (WMO)
Dr. K.N. Fedorov (UNESCO/IOC)	Dr. Amín Zarur M. (Instituto Nacional de Investigaciones Biológico Pesqueras, Mexico)
Professor G. Hempel (IABO)	Professor V.P. Zenkovich (Soviet National Committee)
Com. Gilberto López-Lira (Secretaría de Marina, Mexico)	

ANNEX II

ESTIMATION OF SCOR FINANCES, CALENDAR 1968
(1 January through 31 December)

BALANCE as of 1 January 1968

In Rome	\$ 3,916.00 *
In La Jolla	15,301.29
* 1,132.38 in Indian Rupees	\$ 19,217.29

INCOME

UNESCO Contract	12,632.90	
National Contributions	19,424.27	
NAS Symposium Support	5,415.16	
Interest on Savings Account	528.98	38,001.31
		\$ 57,218.60

EXPENSES

Publication	908.30
Office	3,644.86
Working Groups (WG 15-\$5,466.91; WG 19-\$683.20	15,339.31
WG 21-\$100.55; WG 23-\$4,468.45; WG 24 -	
\$1,876.55; WG 25-\$2,060.45; WG 27-\$683.20)	
Executive	3,856.35
SCOR Symposium	5,187.57
Representatives, Other Meetings	486.90
	\$ 29,423.29

BALANCE as of 31 December 1968

In Rome	\$ 4,733.63 *
In La Jolla	23,061.68
	\$ 27,795.31

* 1,633.63 in Indian Rupees

SCOR WORKING GROUPS
MEMBERSHIP AND TERMS OF REFERENCE

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

Terms of Reference: To carry out all the necessary preparatory work for publishing new oceanographic tables; to advise on the certification of the standard sea water; to advise on such further investigations as may be desirable.

Members: nominated by ICES: F. Herman, Denmark (Chairman); O. Saalen, Norway. nominated by UNESCO: G.N. Ivanoff-Frantskevich, USSR; M. Menache, France. nominated by IAPSO: N.P. Fofonoff, USA; W. Kroebel, FRG. nominated by SCOR: F. Fisher, USA; K. Grasshoff, FRG.

WG 15. Photosynthetic Radiant Energy (with UNESCO and IAPSO).

Terms of Reference: To identify exactly what measurement of irradiance is required by biological oceanographers; to recommend apparatus and procedures for measuring the variable defined above.

Members: nominated by IAPSO: J. Tyler, USA (Chairman); N. Jerlov, Denmark. nominated by UNESCO: A.A. Ivanoff, France; Y.E. Ochakovsky, USSR. nominated by SCOR: H.R. Jitts, Australia; Y. Saijo, Japan; E. Steemann Nielsen, Denmark: ex-officio: T.R. Parsons, Canada (Chairman, WG 24).

WG 21. Continuous Current Velocity Measurement (with IAPSO and UNESCO).

Terms of Reference: To design, and propose means of carrying out an intercomparison at sea of the principal current measuring systems now employed for the continuous recording of current velocity on moored stations.

Members: nominated by SCOR: J.C. Swallow, UK (Chairman); K.A. Chekotillo, USSR. nominated by IAPSO: T. Kvinge, Norway; G. Siedler, FRG. nominated by UNESCO: N.P. Fofonoff, USA; B. Shekhvatov, USSR.

WG 23. Zooplankton Laboratory Methods (with UNESCO).

Terms of Reference: To suggest methods for preserving zooplankton samples for taxonomic study and for biomass determination.

Members: nominated by SCOR: V. Hansen, Denmark (Chairman); J. Beers, USA; H. Flugel, FRG; E. Paasche, Norway (Consultant); H.F. Steedman, UK. nominated by UNESCO: B. Kimor, Israel; T. Tokioka, Japan; M. Vinogradov, USSR.

WG 24. Estimation of Primary Production under Special Conditions (with IBP/PM).

Terms of Reference: To review and suggest the best methods for estimating primary production under special conditions, such as those found beneath the polar ice, and the turbid conditions found in estuaries, heavily polluted waters and exceptionally eutrophic or oligotrophic waters.

Members: nominated by SCOR: T.R. Parsons, Canada (Chairman); S. Ichimura, Japan; O. Koblentz-Mishke, USSR. nominated by IBP/PM: S.Z. Qasim, India; P.D.V. Savage, UK.

WG 27. Deep-Sea Tides (with IAPSO and UNESCO).

Terms of Reference: To encourage and assist with the design of instruments for measuring tides on the continental shelf and in the deep sea; to establish criteria concerning precision, sampling times and related considerations; to coordinate the observational programs and ultimately to bring about some uniform analyses of the deep sea data.

Members: nominated by IAPSO: W.H. Munk, USA (Chairman); L.R.A. Capurro, Argentina; G.C. Dohler, Canada. nominated by SCOR: D. Cartwright, UK; J.R. Radok, Australia; T. Teramoto, Japan. nominated by UNESCO: W. Hansen, FRG; M. Eyries, France; S.S. Voit, USSR; W. Horn, FRG.

WG 28. Air-Sea Interaction (with IAMAP and IAPSO).

Terms of Reference: To review the requirements and foster research within the field of atmosphere-ocean interaction; to provide advice on this subject, on request, to individuals as well as to national and international organizations; to consider the need for an international symposium on atmosphere-ocean interaction to be held at or before the next General Assembly, and to organize such a symposium; to ensure coordination with governmental organizations (WMO and IOC) and with non-governmental organizations outside of IUGG on subjects related to the work of the Joint Committee, and in particular to solicit their participation or co-sponsorship of any future symposium (organized under preceding term) for which such participation appears advantageous.

Members: H. Charnock, UK (Chairman); K. Bryon, USA; E.L. Deacon, Australia; A.S. Monin, USSR; J. Namias, USA; R.W. Stewart, Canada; P. Welander, Sweden; S.S. Zilitinkevich, USSR (sponsorship of individual members as yet undetermined).

WG 29. Continuous Monitoring in Biological Oceanography (with ACMRR, UNESCO and IBP/PM).

Terms of Reference: Using the outcome of various relevant working groups of SCOR and other organizations, to review critically the present status of devices for (a) continuous observation of parameters such as pigments, particles, transparency, submarine irradiance, primary production, nutrients, and (b) continuous or intermittent sampling of organisms, and to list suitable techniques and instruments for such measurements. The WG would work, where relevant, with the Chairman or Rapporteurs of other SCOR WG's.

Members: Membership being determined.

WG 30. Scientific Aspects of International Ocean Research (with ACMRR and WMO).

Terms of Reference: (1) To develop the scientific content of a comprehensive program of international cooperation in exploration and research in the ocean and its resources, taking into account the survey and proposals of the UN Secretary-General in connection with UN Resolution 2172, and also the report on International Ocean Affairs, the existing national and international programs of cooperation in ocean exploration and research, and other relevant programs and reports. (2) To comment on the practical problems of implementing such a program, including priorities and timing, taking into account the likely funds, facilities and personnel required.

Members (tentative): nominated by SCOR: A.J. Lee, UK; E.D. Goldberg, USA; R. Revelle, USA; E. Seibold, FRG; H. Stommel, USA; G. Udintsev, USSR; S. Uyeda, Japan. nominated by ACMRR: A.S. Bogdanov, USSR; W.M. Chapman, USA; D.H. Cushing, UK; L.M. Dickie, Canada; B. Diop, Senegal; J.M. Pérès, France; S. Tanaka, Japan; M. Vannucci, Brazil. nominated by WMO: V.A. Bugaev, USSR; G.P. Cressman, USA; M. Hanzawa, Japan; P.J. Meade, UK. ex-officio: B. Bolin (WMO), C.E. Lucas (ACMRR), W.S. Wooster (SCOR).

WG 31. East Atlantic Continental Margins (with UNESCO and IUGS).

Terms of Reference: To organize a symposium to review present knowledge and plans for investigation of the east Atlantic continental margin between Novaya Zemlya and South Africa; to identify gaps in knowledge that could be filled by coordinated national or international marine research programs.

Members: nominated by SCOR: E. Seibold, FRG (Chairman); G. Boillot, France; E.S.W. Simpson, South Africa. nominated by UNESCO: A.P. Lisitzin, USSR; A.S. Laughton, UK. nominated by IUGS: K.O. Emery, USA; H. Holtedahl, Norway.

WG 32. Biological Data Inventories (with ACMRR).

Terms of Reference: To review the present status of biological data inventories and information retrieval in national, regional and world data centers; to propose standard forms and procedures for inventory of marine biological and related biochemical data (exclusive of commercial fishery statistics); to review present procedures in cataloging reference collections of marine organisms; to consider means for speedy retrieval and exchange of information contained in such catalogs.

Members: Membership being determined.

WG 33. Phytoplankton Methods (with IABO).

Terms of Reference: To review the methods now used for quantitative phytoplankton studies (exclusive of pigment and other chemical methods); to select the most satisfactory methods for various purposes, such as the description of species composition of communities, studies for special components, and biomass estimation; for the selected methods, to recommend detailed procedures for sample collection, preservation and laboratory examination; to prepare a report that might serve as a basis for a manual, including references to literature on taxonomy of the main groups and on methods for using quantitative phytoplankton data in ecological studies.

Members: Membership being determined.

REPORT OF SCOR WORKING GROUP 24
ON
ESTIMATION OF PRIMARY PRODUCTION UNDER SPECIAL CONDITIONS
(SCOR-IBP/PM)

REPORT OF MEETING IN SOUTHAMPTON, 30 JULY-1 AUGUST 1968

Members present:

T.R. Parsons (Canada), Chairman
S.Z. Qasim (India)
O.I. Koblentz-Mishke (USSR)
Shun-ei Ichimura (Japan)
P.D.V. Savage (UK), Rapporteur

Professor Raymont (UK) was also present at one meeting as an observer.

Preface

The following account of the meeting is primarily a set of working instructions for the group, rather than a final report on our conclusions. It is anticipated that when the necessary action has been taken in respect to this report, a final report of the working group will be prepared for circulation through our sponsors, the Scientific Committee on Oceanic Research (SCOR) and the International Biological Programme (IBP). This final report should be available following a second meeting of the group in approximately 18 months time.

Introduction

It was considered that the problems of this working group were so diverse that discussion should be divided into sections dealing primarily with (1) General problems concerning all environments and methods and (2) Specific problems dealing only with certain environments or methods.

1. General Problems

(1) In many environments, and especially in estuaries, eutrophic waters and polluted waters, the problem of obtaining a representative sample becomes very difficult. Where possible, therefore, it was recommended that a turbidity meter should be employed to locate patches of plankton and other suspended matter, and that samples from these patches should be collected along with samples taken at standard depths or light intensities.

(2) The integration of primary production values per unit volume per hour to units per m^2 per day could be carried out in a variety of ways to give different results. It was therefore recommended that all studies be carried out in situ (at least until such time as SCOR WG 15 could recommend the use of a standard incubator) and that the following procedure be used for integration, whenever possible:

Bottles should be placed at standard light intensity depths of 100, 60, 30, 10, 5 and 1% T_l or at some fewer number of depths in cases where light attenuation was very rapid. Incubations should be carried out for half a day and multiplied by a factor of 2 to obtain the daily production.

1 A table of depths from Secchi disc measurements is to be given as an annex to the final report.

Integration of production values at different depths should be carried out by obtaining the sum of the average production between depths, times the depth interval.

In cases, where tidal range is large and where half day in situ incubations are not possible, 2 hour² in situ incubations should be carried out and the relative production with depth should be determined. The production for the water column should then be obtained from the absolute production of a surface sample incubated for half a day in a water cooled incubator exposed to natural light, and the relative production obtained from the 2 hour in situ incubation. For production estimates within intertidal areas, the final production figure ($\text{mgC}/\text{m}^2/\text{day}$) should be corrected to give the production for the average depth of water covering the area during the day.

In another special case where it is known that the mixed layer depth (D_m) is greater than the compensation depth (D_c), the final integrated value for primary production per m^2 per day should be multiplied by D_c/D_m to give the production for the water column (Cushing, 1962, J. Cons. Int. explor. Mer 27: 131-140). Finally in the absence of a turbidity meter (see item 1 of this section) it is recommended that samples be collected from immediately below, in the middle and above the mixed layer, in addition to those being collected at depths of standard light intensity.

(3) Although the ^{14}C -method has received wide use in measuring primary production, in certain circumstances it may not be the best method to employ. These circumstances will be dealt with in the section on "Specific Problems". However, carbon dioxide uptake is the only exact measure of primary production, as defined in Supplement 1. The use of derived methods (e.g. the oxygen technique, changes in standing stock) must therefore be considered, by definition, as being less accurate measures of photosynthesis except in such circumstances as may be described below.

(4) The working group recommended that in general the description of procedures given by Strickland and Parsons (A Handbook of Seawater Analysis, 3rd Edition, 1968) would be those to which any modification, or use referred to in the following text, would apply.

(5) While it might have been desirable for the group to review all published material connected with the special conditions, it was felt that this was impractical and instead it was decided that a list of supplementary references to certain aspects of the final report should be prepared. Members of the working group would send all their reference material to Dr. Parsons for the preparation of this bibliography.

(6) It was felt that readers should have adequate information on the availability of certain types of apparatus connected with this report and for this purpose a list of apparatus and suppliers will be prepared as an annex to the final report. Members of the working group would send all information which they had on apparatus to Dr. Savage who would compile this section of the report.

2. Specific Problems

I Use of the ^{14}C -technique for measuring primary production.

The working group noted that there already had been another WG concerned with the broad aspects of the ^{14}C -technique (SCOR WG No. 20). It was felt therefore that in general the recommendations of SCOR WG No. 20 should be adopted with the following additional comments on the general use of this method.

(1) Standardization of ampoules and counting.

It was agreed that either standardised ^{14}C ampoules, on which the activity is stated, should

2 A period of 2 hours is suggested here as being the most probable period at high water during which the bottles would not be subject to strong tidal currents. In some estuaries longer incubation may be possible.

be obtained from an agency or that ampoules prepared by an individual experimenter should be standardised using a scintillation counter. It was felt essential, however, that with each batch of ampoules, the standard deviation of the activity of each batch of ampoules should be given. In reporting results of counts it was further recommended that authors should always specify the type of counter used and give some value for the efficiency of their counting system.

(ii) Determination of total CO₂ in sea water.

For all truly oceanic environments, total carbonate estimation could be based on pH and chlorinity tables. For all other areas, however, the only satisfactory method to be recommended was direct manometric determination of carbon dioxide. Convenient instruments for this determination are the Van Slyke apparatus (North America and Europe) and the Productometer made by Nikko K.K. (Japan).

(iii) Loss of material on filters during filtration.

This effect was concluded to be highly variable but could in part be avoided by low suction pressures (1/3 - 1/2 vacuum). An approximate check on its magnitude can be made by filtering different volumes of the same sample and plotting the results (Arthur and Rigler, 1967, *Limnol. Oceanogr.* 12: 121-124).

(iv) Size of incubation bottles.

Participants were not in complete accord on the effect of bottle size on production. It was agreed, however, that experiments on this effect would be done both by Dr. Qasim and Dr. Savage on tropical and temperate environments respectively and the results communicated to Dr. Parsons so that they could be discussed at the next meeting.

II Use of the ¹⁴C technique for measuring primary production in estuarine environments.

(i) Self-absorption.

In turbid inshore samples, self-absorption can present considerable problems in counting the activity of the filters. The amount of self-absorbing material on a filter can be reduced, however, by reducing the volume of sample filtered (e.g. for turbid waters containing 100 mg seston/l, the activity lost from a 40 ml sample on a 5 cm²* filter will be approximately 4%). In eutrophic waters, however, subsampling from large (e.g. 250 ml) volumes of incubated samples was generally recommended, particularly when the ratio of plant to total particulate material was large. In oligotrophic waters it was recommended that large volumes of samples should be incubated, but if such waters happen to contain a large amount of non-photosynthetic material it was suggested that the activity should either be measured with a liquid scintillation counter or by total combustion and recovery of active CO₂ (Jenkins, 1965, *J. Water Poll. Cont. Fed.* 37: 1281-1288). Finally it was decided that the effect of different amounts of materials on the self-absorption of estuarine samples (both oligotrophic and eutrophic) should be found by experiments to be carried out by Drs. Qasim and Savage and reported at the next meeting.

(ii) Uptake of ¹⁴CO₂ in the dark.

Generally the uptake of CO₂ in the dark will be less than 5% of uptake in the light. Under turbid conditions, however, dark assimilation may amount to more than 25%, and up to 50% of the light bottle uptake. Under these conditions the assumption that the uptake of CO₂ in the dark is the same in both dark and light bottles may lead to erroneous results.

It was decided that certain experiments could be performed to test the effect of light on the chemosynthetic uptake of CO₂. These experiments would be carried out by Dr. Parsons.

* The actual surface area of the filter should match the area of the detecting head used for counting.

It was further recommended that in turbid estuarine waters it was necessary to have one dark bottle for each light bottle since variations in dark bottle uptake are generally quite large. It was reported that dark bottle uptake may vary with time and depth and the extent of these changes will be the subject of some experiments to be performed by Dr. Parsons.

The retention of carbonate by certain types of membrane filters was commented on and it was decided that this source of error could be readily checked.

(iii) Difficulties of carrying out ^{14}C in situ incubations in tidal areas.

Where the tidal range was small it was decided that in situ incubations for half a day should be carried out. In areas where estuaries are subject to strong tidal influence, incubations should be carried out for 2* hours at slack water and the results integrated, using a surface sample incubated on shore (see General Problems, item 2).

The possibility of using unmoored buoys which could float in and out with the water mass during a period of tidal exchange was also considered. In general, however, it was felt that these would constitute a navigational hazard in most estuarine areas.

(iv) Measuring of primary production of benthic algae in estuaries.

Much of the primary production in estuarine environments may be caused by attached macrophytes or algal "mats" on mud or sand surface. For the measurement of the primary production of these organisms it was decided that special techniques would be necessary such as had been described for macrophytes by Wetzel (Verh. Internat. Verein. Limnol. 15: 425-436, 1964) and for algae at the sediment surface by Brock and Brock (Limnol. Oceanogr. 12: 600-605, 1967) and Steele and Baird (Limnol. Oceanogr. 13: 14-25, 1968). It was recommended that some procedures for such measurements should be extracted from these references and further that the following people might be approached by correspondence in order to obtain further information on this subject:

Macrophytes	(Dr. Bellamy - U.K. to be contacted by Dr. Savage (Prof. Katada - Japan to be contacted by Dr. Ichimura
Algal mats	(Dr. Steele - U.K. to be contacted by Dr. Parsons (Dr. Marshall - U.S.A. to be contacted by Dr. Parsons (Dr. Round - U.K. to be contacted by Dr. Savage

As an ultimate result of this correspondence and by the use of published material it is hoped that recommended procedures for these conditions would be included as part of the working group's final report. Dr. Parsons would coordinate these efforts and circulate drafts of the recommended procedures.

III Use of the ^{14}C -technique for measuring primary production in polluted environments.

After some discussion of this problem it was decided that the effect of pollutants was generally highly specific and that particular methods might be formulated only when the particular pollutant was identified from among the very large number of substances discharged into marine environments. However, in cases where pollution resulted in eutrophication of the environment, a few considerations given in the next section (IV), might be applicable.

IV Use of the ^{14}C -technique for measuring primary productivity in eutrophic environments.

(i) Two problems immediately associated with eutrophic environments were the tendency for filters to clog after small volumes had been filtered and self-absorption due to the quan-

* See footnote, page 15.

tity of material on the filters. Since both these problems are interconnected, it was decided that in general small aliquots of incubated samples should be taken for filtration, but that experiments would be done by Drs. Qasim and Savage to obtain some guidelines on the amount of material to be filtered, in order to avoid appreciable self-absorption and to give satisfactory filtering times (less than 5 minutes if possible). These experiments would be carried out primarily with different phytoplankton cultures.

(ii) In exceptionally eutrophic waters ($\text{Chl } a$ 200-400 mg/m^3) it was recognized that carbon dioxide could become a limiting factor for growth and that an alternative technique to the addition of ^{14}C -carbonate should be employed*.

(iii) The possibility was noted that waters heavily eutriched with amine groups, might cause, through bacterial action, the production of ammonia which in turn could lead to local precipitation of carbonate (Sieburth, 1965. J.Gen.Microbiol. 41: XX). In such situations it was recommended that filters should be placed briefly in fumes of concentrated HCl before the commencement of counting.

V Use of the ^{14}C -technique for measuring primary production in oligotrophic waters.

(i) It was reported that in some oligotrophic areas where microscopic examination showed that the bulk of the primary production was due to blue-green algae, the measured ^{14}C -production was found to be considerably lower than was to be expected from visual examination of the standing stock. It was believed that this may have been caused either by the blue-green algae being exceptionally fragile to handling operations or that the inclusion of gas bubbles within the cells of these species causes a poor exchange of ^{14}C -carbonate with the cellular material. No immediate solution was suggested for these problems beyond the possible use of cell counts (either visual or electronic) as a method for measuring primary production.

(ii) It was recognized that in some oligotrophic environments the chemical precipitation of carbonate (as CaCO_3) might lead to erroneous results during the course of incubations. It was believed that brief treatment of filters in fumes of concentrated HCl would remove this possible source of error.

VI Use of the ^{14}C -technique for measuring primary production under the ice.

(i) Reports had been received from Dr. Kawamura (Japan) and Dr. Bunt (USA) on procedures for measuring primary production under ice. Members of the working group were most grateful to these persons for their assistance and it was decided that the 'précis' of Dr. Bunt's report should be included in this report and that further details of methodology should be requested from both the above mentioned authors and other workers in this field, as well as from reports that might be obtained from the literature (e.g. Fogg, G.E. (1967) "Observations on the snow algae of the South Orkney Islands: Phil. Tran. Roy. Soc. Lond. B, Vol. 252, 279-287. Burkholder, P.B. and E.F. Mandelli (1965) "Productivity of microalgae in Antarctic Sea Ice". Science, 149, 872-874).

Précis of Dr. Bunt's report:

"In the ice 6-20 feet thick, holes are cut and metal liners are installed through the floor of sledge-mounted-huts. Immersion heaters are placed in these holes to slow down ice formation. A diver collects samples of ice in hand-held Van Dorn samplers. The ice samples thus collected are immediately transferred to the base camp laboratory for incubation, as in situ measurements are not possible. Generally the phytoplankton organisms are found in tiny spaces in between the ice crystals and therefore draining off the melted ice is not desirable. Sub-samples are taken from the partially melted ice for incubation, and these are placed in a specially designed incubator in which the source of illumination is from below. This is important as many of the cells are heavily silicified and soon settle to the bottom. The incubator is placed in a refrigerated bath which

* This problem is discussed further under the oxygen technique with respect to Trichodesmium blooms.

maintains a temperature of -2°C , as the organisms are very susceptible to an increase in temperature. The intensity of light is another important factor to be considered. The organisms are markedly shade adapted and therefore they should not be exposed to bright illumination. During incubation the use of neutral density-filters to bring the light source almost equal to natural illumination is extremely important.

In winter, as the environment becomes oligotrophic, a concentration of cells becomes necessary. In summer the water becomes highly eutrophic and therefore dilution (or incubation of small samples) is recommended. After incubation the ice crystals are allowed to thaw and the samples are filtered in a partially melted state."

Finally it was noted that the outline of a procedure submitted by Dr. Bunt included the use of an incubator which had not been considered for any other procedure in this report. In order to return to the concept of carrying out all primary production measurements in situ it was decided that the use of an oxygen electrode might be convenient in some circumstances and Dr. Koblentz-Mishke would look into this possibility.

VII Use of the oxygen technique for measuring primary production.

(i) It was noted that under certain circumstances it may be preferable to measure primary production by the oxygen technique. This included the fact that it was, in practice, the simplest way to measure primary production, particularly in such laboratories where facilities for other methods are not available. It was emphasized, however, that the oxygen technique would generally only be valid when the level of primary productivity was greater than $5 \text{ mgC/m}^3/\text{hr}$. In other circumstances it was noted that for macrophytes, under the ice (electrode), and in exceptionally eutrophic waters, the oxygen technique was probably as satisfactory as other methods, particularly when in situ measurements are sought.

(ii) In carrying out the oxygen technique it was recognised that there were certain precautions which could be added to the procedure already described in the Handbook of Seawater Analysis. These were as follows:

(a) For eutrophic waters and with certain species of algae (e.g. *Trichodesmium*) the possibility of bubble formation requires the use of a special incubation bottle having a bubble trap on or near the neck. This can be used to entrap any bubble when reagents are added at the end of the incubation period.

(b) Chemical oxidation may not be the same in light and dark bottles when samples contain large amounts of soluble organic substances. The role of photo-oxidation under these circumstances does not appear to have been well investigated and some experiments using organic pollutants will be performed by Drs. Qasim and Savage and will be reported on at the next meeting.

(c) Certain modifications may be necessary in the composition of the oxygen reagents added when dealing with eutrophic and/or polluted waters. Published material on these modifications will be reviewed by Drs. Qasim and Savage and some experiments may be done in this respect.

VIII Other methods for the measurement of primary production.

A brief discussion was held on the use of other methods for the measurement of primary production. It was noted in particular that while dealing with problems related to marine food chains and trophodynamics, it would be more suitable to employ methodology which could be used to describe both an increase in plants by photosynthesis and their decrease as a result of grazing. In such situations the ^{14}C and oxygen techniques may be of limited use. In contrast, therefore, methods which directly measured an increase in standing stock, such as chlorophyll *a* determination or direct counts of particles (Sheldon and Parsons, 1967. Coulter Electronics (Canada) 66 p.)

would be preferable. In the former case it was noted that recent refinements in the methodology of distinguishing between living and dead chlorophyll (Lorenzen, 1967. Limnol.Oceanogr. 12: 343-346) and increasing the sensitivity of the method by the use of a fluorometer (Holm-Hansen et al., 1965. J.Cons.int.explor.Mer, 30: 3-15), would be of considerable help in determining small changes in the concentration of chlorophyll a. In the latter case it was noted that the size spectrum of particles gave more information on changes in the standing stock than estimates of total production (e.g. the ^{14}C -technique). However, it was concluded that in general these newer techniques had not become sufficiently well established to warrant their discussion in greater detail. Their inclusion for further discussion at the second meeting of the working group was recommended.

ANNEX IV
Supplement 1

Definitions (The following definitions are only intended for the purpose of clarifying terms used in the text of this report).

1. Primary production is the photosynthetic production of organic carbon in which carbon dioxide is the only source of carbon (units: $\text{M.L.}^{-3} \text{ T}^{-1}$ or $\text{M.L.}^{-2} \text{ T}^{-1}$).

2.	Highly Eutrophic	50-100 $\text{mgC/m}^3/\text{hr}^*$
	Eutrophic	10-50 $\text{mgC/m}^3/\text{hr}$
	Oligotrophic	4-10 $\text{mgC/m}^3/\text{hr}$
	Highly Oligotrophic	$< 4 \text{ mgC/m}^3/\text{hr}$

3. Limit of sensitivity (approximate values)

	$\text{mgC/m}^3/\text{hr}$
^{14}C method	0.01
Oxygen	5.0
Chlorophyll <u>a</u>	5.0
Electronic particle counting	1.0

4a. Exact measurements of primary production:

Carbon dioxide uptake per unit time measured by the loss of dissolved CO_2 , or the uptake of radioactive CO_2 .

4b. Derived measurements of primary production:

Measurement of plant growth in which the property measured can be directly related to uptake of CO_2 by photosynthesis. Methods which may be included here are measurements of (I) oxygen evolved per unit time, and (II) changes in the standing stock per unit time (e.g. chlorophyll a).

* There are wide differences in the definitions of these items and this appears to be in part related to the range of production values encountered by different investigators (e.g. coastal or oceanic). For Soviet scientists, however, the generally accepted classification is as follows:

< 0.2 $\text{mgC/m}^3/\text{hr}$ oligotrophic
 0.2 - 0.5 $\text{mgC/m}^3/\text{hr}$ transitional
 0.5 - 1.0 $\text{mgC/m}^3/\text{hr}$ mesotrophic
 1.0 - 10.0 $\text{mgC/m}^3/\text{hr}$ transitional
 > 10 $\text{mgC/m}^3/\text{hr}$ eutrophic

UNITED NATIONS
GENERAL
ASSEMBLY



Distr.
GENERAL

A/RES/2413 (XXIII)
24 December 1968



Twenty-third session
Agenda item 41

RESOLUTION ADOPTED BY THE GENERAL ASSEMBLY

[On the report of the Second Committee (A/7394)]

2413 (XXIII). Exploitation and conservation of living
marine resources

The General Assembly,

Recalling its resolution 2172 (XXI) of 6 December 1966 requesting the Secretary-General to prepare proposals for ensuring the most effective arrangements for an expanded programme of international co-operation to assist in a better understanding of the marine environment through science, and for the development of marine resources, with due regard for the conservation of fish stocks,

Having considered the report entitled "Resources of the sea beyond the continental shelf"^{1/} prepared by the Secretary-General under Economic and Social Council resolution 1112 (XL) of 7 March 1966 and the report entitled "Marine science and technology: survey and proposals"^{2/} prepared by the Secretary-General under General Assembly resolution 2172 (XXI),

Recalling Economic and Social Council resolution 1381 (XLV) of 2 August 1968,

Taking into account the valuable and extensive work accomplished and being carried out in this field by the Food and Agriculture Organization of the United Nations and its Committee on Fisheries, and by other specialized agencies and intergovernmental organizations concerned, striving towards an increase in the world's food production,

1/ E/4449 and Add.1 and 2.

2/ E/4487 and Corr.1-6 and Add.1.

A/RES/2413 (XXIII)
Page 2

Deeply concerned that a large proportion of the world's population continues to suffer from malnutrition and notably from lack of protein,

Mindful of the importance of the living resources of the sea as one of mankind's most important food resources,

Realizing the increasing importance of maximizing the sustainable yield of living marine resources through conservation and rational development,

Aware of the grave danger of the over-exploitation and depletion of these resources, to which the rapid progress in fisheries technology is contributing,

1. Invites Governments of Member States to increase international co-operation in the field of development and exploitation of living marine resources outside the limits of national jurisdiction, having regard to the special needs and interests of the developing countries and with particular emphasis on the need for rational exploitation and conservation of fish stocks, taking into account the valuable work of the Food and Agriculture Organization of the United Nations and its Committee on Fisheries and also of regional and other specialized fishery bodies;

2. Urges the United Nations specialized agencies and other intergovernmental organizations concerned to take measures for the further improvement of international collaboration, in relation to fisheries development and conservation, and of technical assistance, where requested by developing countries;

3. Requests the Secretary-General, in collaboration with the Director-General of the Food and Agriculture Organization of the United Nations and in consultation with Governments of States Members of the United Nations and with other international organizations concerned, to report to the Economic and Social Council at its forty-ninth session on the specific measures which have been taken by Governments of Member States and by the international organizations concerned in implementation of the present resolution, and requests the Economic and Social Council to report thereon to the General Assembly at its twenty-fifth session.

1745th plenary meeting,
17 December 1968.

UNITED NATIONS
GENERAL
ASSEMBLY



Distr.
GENERAL

A/RES/2414 (XXIII)
27 December 1968



Twenty-third session
Agenda item 41

RESOLUTION ADOPTED BY THE GENERAL ASSEMBLY

[On the report of the Second Committee (A/7394)]

2414 (XXIII). International co-operation in problems
related to the oceans

The General Assembly,

Reaffirming the considerations set forth in its resolution 2172 (XXI) of 6 December 1966,

Considering the growing interest of the world community in problems related to the oceans, as they hold promise of providing a rapidly developing world with increasingly needed resources,

Being aware that the present knowledge of the ocean and its resources and of the marine environment is limited and incomplete,

Recognizing the need for extensive exploration and research in order to develop the wealth of the sea for the benefit of all mankind, irrespective of the geographical location of States, taking into account the special needs and interests of developing countries,

Having given preliminary consideration to the report entitled "Marine science and technology: survey and proposals"^{1/} prepared by the Secretary-General under General Assembly resolution 2172 (XXI),

Taking into account the comments of the Advisory Committee on the Application of Science and Technology to Development,^{2/}

Recalling Economic and Social Council resolutions 1380 (XLV), 1381 (XLV) and 1382 (XLV) of 2 August 1968,

^{1/} E/4487 and Corr.1-6 and Add.1.

^{2/} See A/7264.

A/RES/2414 (XXIII)
Page 2

Recalling the report of the Ad Hoc Committee to Study the Peaceful Uses of the Sea-Bed and the Ocean Floor beyond the Limits of National Jurisdiction,^{3/}

Taking into account the activities in this field at present being carried out by the United Nations, the United Nations Educational, Scientific and Cultural Organization and its Intergovernmental Oceanographic Commission, the Food and Agriculture Organization of the United Nations and its Committee on Fisheries, the World Meteorological Organization and its Panel on Meteorological Aspects of Ocean Affairs, the Inter-Governmental Maritime Consultative Organization, the International Atomic Energy Agency and other specialized agencies, and also intergovernmental organizations, various Governments, universities, scientific and technical institutes and other non-governmental organizations,

1. Takes note with appreciation of the report of the Secretary-General entitled "Marine science and technology: survey and proposals";
2. Requests the Economic and Social Council to review further this report at its forty-seventh session taking into account such views as may be expressed by Governments of Member States, by the Advisory Committee on the Application of Science and Technology to Development and by the proposed competent organ of the United Nations;
3. Endorses the concept of a co-ordinated long-term programme of oceanographic research designed to assist in a better understanding of the marine environment through science and to increase, in the interests of world economic development, the resources available to all the people of the world;
4. Requests the Secretary-General to present to the Economic and Social Council at its forty-seventh session a comprehensive outline of the scope of this long-term programme taking into account such scientific recommendations as may be formulated by the Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization within its terms of reference and in co-operation with other interested international organizations;
5. Recommends that the United Nations Educational, Scientific and Cultural Organization and its Intergovernmental Oceanographic Commission should consider strengthening the existing marine educational and training programmes and initiating new programmes in connexion with the implementation of the long-term programme of oceanographic research;

^{3/} Official Records of the General Assembly, Twenty-third Session, document A/7230.

6. Recommends further improvement of international co-operation in relation to fisheries development and conservation, taking into account the important role played by the Food and Agriculture Organization of the United Nations and its Committee on Fisheries as well as the work of regional and other specialized fishery bodies;

7. Invites Member States and organizations dealing with marine pollution, especially the Inter-Governmental Maritime Consultative Organization and the International Atomic Energy Agency, to promote the adoption of effective international agreements on the prevention and control of marine pollution as may be necessary;

8. Recognizes the importance of the meteorological aspects of ocean science and calls upon the World Meteorological Organization to continue its activities in this field in close co-operation with other interested organizations.

9. Invites the Secretary-General, in consultation with the United Nations Development Programme, to consider the possibility of extending technical assistance services to the Governments of Member States which may request them in relation to the development of mineral resources of their continental shelf areas;

10. Calls upon the Secretary-General to pursue the task of collecting and disseminating available information regarding the mineral and other resources of the sea-bed and ocean floor beyond the limits of national jurisdiction and techniques appropriate for their development and of providing the assistance which the proposed competent organ of the United Nations may request for the solution of related issues;

11. Requests the Secretary-General, in co-operation with the United Nations Educational, Scientific and Cultural Organization and its Intergovernmental Oceanographic Commission, the Food and Agriculture Organization of the United Nations and its Committee on Fisheries, the World Meteorological Organization, the Inter-Governmental Maritime Consultative Organization, the International Atomic Energy Agency and other organizations concerned, to report, through appropriate channels, to the Economic and Social Council and to the General Assembly, at its twenty-fifth session, on the progress achieved in the implementation of the present resolution.

1745th plenary meeting,
17 December 1968.

UNITED NATIONS GENERAL ASSEMBLY



Distr.
GENERAL

A/RES/2467 (XXIII)
14 January 1969

Twenty-third session
Agenda item 26

RESOLUTIONS ADOPTED BY THE GENERAL ASSEMBLY

[On the report of the First Committee (A/7477)]

2467 (XXIII). Examination of the question of the reservation exclusively for peaceful purposes of the sea-bed and the ocean floor, and the subsoil thereof, underlying the high seas beyond the limits of present national jurisdiction, and the use of their resources in the interests of mankind

A

The General Assembly,

Recalling the item entitled "Examination of the question of the reservation exclusively for peaceful purposes of the sea-bed and the ocean floor, and the subsoil thereof, underlying the high seas beyond the limits of present national jurisdiction, and the use of their resources in the interests of mankind",

Having in mind its resolution 2340 (XXII) of 18 December 1967 concerned with the problems arising in the area to which the title of the item refers,

Reaffirming the objectives set forth in that resolution,

Taking note with appreciation of the report prepared by the Ad Hoc Committee to Study the Peaceful Uses of the Sea-Bed and the Ocean Floor beyond the Limits of National Jurisdiction,^{1/} keeping in mind the views expressed in the course of its work and drawing upon its experience,

Recognising that it is in the interest of mankind as a whole to favour the exploration and use of the sea-bed and the ocean floor and the subsoil thereof, beyond the limits of national jurisdiction, for peaceful purposes,

1/ Official Records of the General Assembly, Twenty-third Session, agenda item 26, document A/7250.

69-00780

/...

Considering that it is important to promote international co-operation for the exploration and exploitation of the resources of this area,

Convinced that such exploitation should be carried out for the benefit of mankind as a whole, irrespective of the geographical location of States, taking into account the special interests and needs of the developing countries,

Considering that it is essential to provide, within the United Nations system, a focal point for the elaboration of desirable measures of international co-operation, taking into account alternative actual and potential uses of this area, and for the co-ordination of the activities of international organizations in this regard,

1. Establishes a Committee on the Peaceful Uses of the Sea-Bed and the Ocean Floor beyond the Limits of National Jurisdiction, composed of forty-two States;

2. Instructs the Committee:

(a) To study the elaboration of the legal principles and norms which would promote international co-operation in the exploration and use of the sea-bed and the ocean floor, and the subsoil thereof, beyond the limits of national jurisdiction and to ensure the exploitation of their resources for the benefit of mankind, and the economic and other requirements which such a régime should satisfy in order to meet the interests of humanity as a whole;

(b) To study the ways and means of promoting the exploitation and use of the resources of this area, and of international co-operation to that end, taking into account the foreseeable development of technology and the economic implications of such exploitation and bearing in mind the fact that such exploitation should benefit mankind as a whole;

(c) To review the studies carried out in the field of exploration and research in this area and aimed at intensifying international co-operation and stimulating the exchange and the widest possible dissemination of scientific knowledge on the subject;

(d) To examine proposed measures of co-operation to be adopted by the international community in order to prevent the marine pollution which may result from the exploration and exploitation of the resources of this area;

3. Also calls upon the Committee to study further, within the context of the title of the item, and taking into account the studies and international negotiations being undertaken in the field of disarmament, the reservation exclusively for peaceful purposes of the sea-bed and the ocean floor without prejudice to the limits which may be agreed upon in this respect;

4. Requests the Committee:

(a) To work in close co-operation with the specialized agencies, the International Atomic Energy Agency and the intergovernmental bodies dealing with the problems referred to in the present resolution, so as to avoid any duplication or overlapping of activities;

(b) To make recommendations to the General Assembly on the questions mentioned in paragraphs 2 and 3 above;

(c) In co-operation with the Secretary-General, to submit to the General Assembly reports on its activities at each subsequent session;

5. Invites the specialized agencies, the International Atomic Energy Agency and other intergovernmental bodies including the Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization to co-operate fully with the Committee in the implementation of the present resolution.

17252nd plenary meeting,
21 December 1968.

B

The General Assembly,

Recognizing that it is in the common interest of all nations that the exploration and exploitation of the resources of the sea-bed and the ocean floor, and the subsoil thereof, should be conducted in such a manner as to avoid infringement of the other interests and established rights of nations with respect to the uses of the sea,

Mindful of the threat to the marine environment presented by pollution and other hazardous and harmful effects which might result from exploration and exploitation of the areas under consideration,

Desiring to promote effective measures of prevention and control of such pollution and to allay the serious damage which might be caused to the marine environment and, in particular, to the living marine resources which constitute one of mankind's most valuable food resources,

Recognizing the complex problem of ensuring effective co-ordination in the wide field of environmental pollution and in the more specific area of prevention and control of marine pollution,

Noting with satisfaction the measures being undertaken by the Inter-Governmental Maritime Consultative Organization to prevent and control pollution of the sea by preparing new draft conventions and other instruments for that purpose,

Recalling, in this regard, the progress achieved towards such concerted action by intergovernmental bodies and the establishment, by the Food and Agriculture Organization of the United Nations, the United Nations Educational, Scientific and Cultural Organization and its Intergovernmental Oceanographic Commission, the Inter-Governmental Maritime Consultative Organization and the World Meteorological Organization, of a joint group of experts on the scientific aspects of marine pollution,

Recalling further the competence and continuing valuable contributions of the other intergovernmental organizations concerned,

1. Welcomes the adoption by States of appropriate safeguards against the dangers of pollution and other hazardous and harmful effects that might arise from the exploration and exploitation of the resources of the sea-bed and the ocean floor, and the subsoil thereof, beyond the limits of national jurisdiction, notably in the form of concrete measures of international co-operation for the purpose of realizing this aim;

2. Considers that, in connexion with the elaboration of principles underlying possible future international agreements for the area concerned, a study should be made with a view to clarifying all aspects of protection of the living and other resources of the sea-bed and ocean floor, the superjacent waters and the adjacent coasts against the consequences of pollution and other hazardous and harmful effects arising from various modalities of such exploration and exploitation;

/...

3. Considers further that such a study should take into consideration the importance of minimizing interference between the many means by which the wealth of the ocean space may be harvested, and that it should extend to the examination of the circumstances in which measures may be undertaken by States for the protection of the living and other resources of those areas in which pollution detrimental to those resources has occurred or is imminent;

4. Requests the Secretary-General, in co-operation with the appropriate and competent body or bodies presently undertaking co-ordinated work in the field of marine pollution control, to undertake the study referred to in paragraphs 2 and 3 above and to submit a report thereon to the General Assembly and the Committee on the Peaceful Uses of the Sea-Bed and the Ocean Floor beyond the Limits of National Jurisdiction.

1752nd plenary meeting,
21 December 1968.

C

The General Assembly,

Having considered the item entitled "Examination of the question of the reservation exclusively for peaceful purposes of the sea-bed and the ocean floor, and the subsoil thereof, underlying the high seas beyond the limits of present national jurisdiction, and the use of their resources in the interests of mankind",

Reaffirming that exploration and exploitation of the resources of the sea-bed and the ocean floor, and the subsoil thereof, should be carried out for the benefit of mankind as a whole, taking into special consideration the interests and needs of the developing countries,

Recalling that international co-operation in this field is of paramount importance,

Bearing in mind its resolution A above establishing the Committee on the Peaceful Uses of the Sea-Bed and the Ocean Floor beyond the Limits of National Jurisdiction, and the mandate entrusted to it,

1. Requests the Secretary-General to undertake a study on the question of establishing in due time appropriate international machinery for the promotion of

/...

the exploration and exploitation of the resources of this area, and the use of these resources in the interests of mankind, irrespective of the geographical location of States, and taking into special consideration the interests and needs of the developing countries, and to submit a report thereon to the Committee on the Peaceful Uses of the Sea-Bed and the Ocean Floor beyond the Limits of National Jurisdiction for consideration during one of its sessions in 1969;

2. Calls upon the Committee to submit a report on this question to the General Assembly at its twenty-fourth session.

1752nd plenary meeting,
21 December 1968.

D

The General Assembly,

Convinced that the nations of the world should join together, with due respect for national jurisdiction, in a common long-term programme of exploration of the ocean as a potential source of resources, which should eventually be used for meeting the needs of all mankind with due recognition of those of developing countries and irrespective of the geographical location of States,

Recalling also that in its resolution 2172 (XXI) of 6 December 1966 the General Assembly requested the Secretary-General to prepare proposals for ensuring the most effective arrangements for an expanded programme of international co-operation to assist in a better understanding of the marine environment through science, and for initiating and strengthening marine education and training programmes,

Recalling further the proposals made by the Secretary-General in his report,^{2/} pursuant to resolution 2172 (XXI), as well as the various views expressed during the consideration of this subject by the General Assembly at its twenty-third session,

Noting that the Bureau and Consultative Council of the Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization considered the proposed International Decade of Ocean

^{2/} E/4487 and Corr.1-6, and Add.1.

Exploration a useful initiative for broadening and accelerating investigations of the oceans and for strengthening international co-operation,

Endorsing the objectives expressed in Economic and Social Council resolutions 1380 (XLV), 1381 (XLV) and 1382 (XLV) of 2 August 1968 and recalling particularly the invitation to the General Assembly to endorse the concept of a co-ordinated long-term programme of oceanographic research, taking into account such initiatives as the proposal for an International Decade of Ocean Exploration and international programmes already considered, approved and adopted by the Intergovernmental Oceanographic Commission for implementation in co-operation with other specialized agencies,

Aware of the consideration given to the proposal in the Ad Hoc Committee to Study the Peaceful Uses of the Sea-Bed and the Ocean Floor beyond the Limits of National Jurisdiction, arising from the contribution which the International Decade of Ocean Exploration would make to scientific research and exploration of the sea-bed and ocean floor, as an important part of a co-ordinated long-term international programme of oceanographic research,

Seeking to enrich the knowledge of all mankind by encouraging a free flow of scientific information on the oceans to all States,

1. Welcomes the concept of an International Decade of Ocean Exploration to be undertaken within the framework of a long-term programme of research and exploration, including scientific research and exploration of the sea-bed and the ocean floor, under the aegis of the United Nations on the understanding that all such activities falling under the national jurisdiction of a State shall be subject to the previous consent of such State, in accordance with international law;

2. Invites Member States to formulate proposals for national and international scientific programmes and agreed activities to be undertaken during the International Decade of Ocean Exploration with due regard to the interests of developing countries, to transmit these proposals to the United Nations Educational, Scientific and Cultural Organization for the Intergovernmental Oceanographic Commission in time to begin the Decade in 1970, and to embark on such activities as soon as practicable;

/...

/...

3. Urges Member States to publish as soon as practicable the results of all activities which they will have undertaken within the framework of the International Decade of Ocean Exploration as part of a long-term co-ordinated programme of scientific research and exploration, and at the same time to communicate these results to the Intergovernmental Oceanographic Commission;

4. Requests the United Nations Educational, Scientific and Cultural Organization that its Intergovernmental Oceanographic Commission:

(a) Intensify its activities in the scientific field, within its terms of reference and in co-operation with other interested agencies, in particular with regard to co-ordinating the scientific aspects of a long-term and expanded programme of world-wide exploration of the oceans and their resources of which the International Decade of Ocean Exploration will be an important element, including international agency programmes, an expanded international exchange of data from national programmes, and international efforts to strengthen the research capabilities of all interested nations with particular regard to the needs of the developing countries;

(b) Co-operate with the Secretary-General, in accordance with paragraph 4 of General Assembly resolution 2414 (XXIII) of 17 December 1968 on the resources of the sea in the preparation of the comprehensive outline of the scope of the long-term programme of oceanographic research of which the International Decade of Ocean Exploration will be an important element, making available its views as to the appropriate relationship between the several international programmes already considered, approved and adopted by the Intergovernmental Oceanographic Commission for implementation, the Decade, and the long-term programme;

(c) Keep the Secretary-General informed of all proposals, programmes and activities of which it is informed in accordance with paragraphs 2 and 3 above together with any comments it may consider appropriate;

(d) Report through appropriate channels to the General Assembly at its twenty-fourth session on progress made in the implementation of the present resolution.

1752nd plenary meeting,
21 December 1968.

*
*
*

/...

In accordance with the decision taken by the First Committee at its 1648th meeting, on 19 December 1968, the Committee on the Peaceful Uses of the Sea-Bed and the Ocean Floor beyond the Limits of National Jurisdiction, established under paragraph 1 of resolution A above, will consist of the following Member States: Argentina, Australia, Austria, Belgium, Brazil, Bulgaria, Cameroon, Canada, Ceylon, Chile, Czechoslovakia, El Salvador, France, Iceland, India, Italy, Japan, Kenya, Kuwait, Liberia, Libya, Madagascar, Malaysia, Malta, Mauritania, Mexico, Nigeria, Norway, Pakistan, Peru, Poland, Romania, Sierra Leone, Sudan, Thailand, Trinidad and Tobago, Union of Soviet Socialist Republics, United Arab Republic, United Kingdom of Great Britain and Northern Ireland, United Republic of Tanzania, United States of America and Yugoslavia.

Letter of 8 January 1969 from Chairman, U.S. National Committee to SCOR,
to
President of SCOR

The U.S. National Committee to SCOR has examined in detail the proposed role of the Intergovernmental Oceanographic Commission in facilitating clearances for research vessels. At this time we wish to offer the following statement for consideration by SCOR.

The U.S. National Committee to SCOR recommends that the most useful role for the Intergovernmental Oceanographic Commission in facilitating clearances for research vessels undertaking fundamental scientific research would be passive in nature. In the exercise of this limited function, the IOC upon receipt of requests from member states for research clearances, would immediately transmit them to the concerned coastal state, certifying (when such is found to be the case) that statements are included in compliance with the following:

- 1) Data from such research programs will, upon request be made available as soon as practicable to the coastal state; any data or samples not feasible to duplicate will, upon request, be made accessible to the coastal state;
- 2) The results of such research programs will be published in a timely fashion in an open scientific publication; and
- 3) The coastal state shall have an opportunity to exercise its right to participate in such research programs by at least one representative, and the proposed arrangements for this participation should be included in the notice.

In addition, it is our belief that other means for facilitating ocean research will be required and should be explored and undertaken as necessary. These may include diplomatic discussions and occasionally the conclusion of bilateral or multilateral agreements.

PROGRESS REPORT TO SCOR EXECUTIVE
ON
INTERNATIONAL BIOLOGICAL PROGRAM,
SECTION ON PRODUCTIVITY OF MARINE COMMUNITIES

SCIENTIFIC PROGRAM

The program is aimed at the improvement of understanding of the basic ecological mechanisms controlling the abundance, distribution and productivity of marine organisms. The main emphasis lies in studies of those regions which are most accessible to man, including the continental shelves, inshore waters, coastal regions and estuaries.

An index of national participation in the program will be published in the near future. There are 250 national projects divided into the following themes:

A. Comparative Ecology. (Coordinator to be appointed).

The aim is to contribute towards the study of production and turnover between different trophic levels with an emphasis on the analysis of seasonal and spatial variation. A feature of the program is the development of joint projects of bilateral collaboration between laboratories in different climatic zones.

B. Modification of the environment by man's activities.

(Joint Coordinators: L.A. Walford and J.B. Pearce,
Sandy Hook Marine Laboratory
Highlands,
New Jersey, 07732, U.S.A.)

This includes studies of actual as well as potential modification of the environment, including the effects of pollution, with an emphasis on the establishment of ecological base-lines against which the effects of man-made changes may be measured or predicted.

C. Cultivation of marine organisms. (Coordinator to be appointed).

This is concerned, not with the direct exploitation of resources, but with fundamental studies of organisms which are cultivated and, especially, those which might eventually prove amenable to development as new resources.

D. World-wide studies of selected organisms.

The objectives are to coordinate studies and to generate new work on organisms which (a) have widespread distributions, (b) present problems of fundamental importance within the objectives of the IBP and (c) are not the subject of world-wide study by other international organizations. The following have been selected for special study:

- i. The Grey Mulletts (Coordinator: O.H. Oren,
Sea Fisheries Research Station.
P.O.B. 699,
Haifa, Israel.)
- ii. Mytilus (Coordinator: Sir Maurice Yonge.)
- iii. Corals (Coordinator: Sir Maurice Yonge.)

- iv. Marine mammals (Coordinator to be appointed, but correspondence may be addressed to: E.A. Smith,
Monks Wood Experimental Station,
Abbots Ripton,
Huntingdon, England.)

JOINT WORKING GROUPS WITH SCOR

WG 24. (Estimation of primary production under special conditions).

Two members of this group are nominated by IBP/PM; they are S.Z. Qasim (India) and P.D.V. Savage (U.K.). The group has produced its first report, including proposals for special investigations by the members of the group. The second meeting of the group will be held in 1970.

WG 29. (Continuous monitoring in biological oceanography).

This group has not yet been formed but it is agreed that IBP/PM will nominate one member. The Convener of IBP/PM (R.S. Glover) was invited to be Chairman of this group but has been compelled to decline because of the pressure of work. The objectives of the group are very close to those of an earlier proposal by IBP/PM for a Technical meeting on "Automatic recording of the marine environment". This proposal will now be deferred pending the outcome of the discussions of the new WG 29. However, IBP/PM is likely to support any proposal for a Symposium or Technical Meeting, and would be eager to participate in such a meeting.

RECENT TECHNICAL MEETINGS

The PM Section collaborated in the following meetings held in 1968:

Design and Analysis of Plankton Sampling

(jointly with IABO: Woods Hole, U.S.A.; 21 to 24 May).

Marine Food Chains

(jointly with FAO, ICES, ICNAF, UNESCO: Aarhus, Denmark; 23 to 27 July).

Methods for studying the Benthos

(Arcachon, 9 to 11 September);

(This was an open meeting of the Working Group formed by IBP/PM for the production of a handbook, see below).

PROPOSED TECHNICAL MEETINGS

Environmental and biological changes in the Eastern Mediterranean Sea.

In 1967, the PM Committee of the IBP proposed that a symposium should be held and undertook to investigate means of arranging a meeting in cooperation with other international organizations.

For reasons outside our control, it has been necessary to defer the Symposium which, it is now hoped, will be held in the second half of 1970 somewhere in the Mediterranean region. Professor Gunnar Thorson of the University of Copenhagen has agreed to be the Chairman of a small organizing committee of scientists drawn largely from the countries directly concerned.

A notice to be circulated in the near future, will include a short statement of the background to the proposed Technical Meeting (attached).

Correspondence on this subject should be addressed to Sir Maurice Yonge.

Indian Ocean Biology and the IIOE

This Symposium has been proposed as a joint endeavour between SCOR and IBP. Although, obviously, the IBP played no part in the IIOE, it was hoped that the Symposium would stress work at present under way in the Indian Ocean region, some of which forms part of the IBP. In particular, the Symposium would provide an opportunity for consideration of possible schemes of bilateral collaboration, such as those between the UK and India; the PM Committee has repeatedly stressed the potential value of such schemes. It has been proposed that the Symposium should be held in Kiel in 1971.

OTHER PROJECTS

i. Course on zooplankton

As an extension of the Danish Advanced Course in Marine Biology in 1969, a course on marine zooplankton will be held in the Department of Oceanography in the University of Southampton. The Course, which will be financed partly by UNESCO, will be organized by J.E.G. Rayment with lectures from his own department, the Edinburgh Oceanographic Laboratory and the Dunstaffnage Marine Research Laboratory.

ii. Handbook - Methods of studying the Benthos

The PM Committee undertook the preparation of this handbook when it was realized that no other international organization had plans to do so. A working group under D.J. Crisp was formed with financial support from the UK committee for the IPB, as well as SCIBP.

Following the Technical Meeting at Arcachon in September 1968, a typescript has been produced, the chapters being written by members of the group. This will be edited by R.A. Holme and A.D. McIntyre for publication in the series of Blackwell's handbooks of the IBP. It is hoped that the text will be ready for printing in mid-1969. Negotiations have been started for the preparation and publication of French and Spanish translations by FAO.

In addition, a bibliography will be printed and circulated by FAO.

We are greatly indebted to the staff of the Fisheries Division of FAO who have given valuable assistance in this project.

iii. Plankton Statistical Project

The PM Committee has taken a special interest in this proposal which forms project PM/7 of New Zealand. The project, under R.M. Cassie in the University of Auckland, will be concerned with the application of statistical methods to research on the zooplankton. Dr. Cassie and his colleagues will publish the results of their researches in the usual journals. Towards the end of the IBP in, say, 1972, an assessment will be made of the desirability and feasibility of preparing a handbook, perhaps based on a compilation of papers published by various authors, including participants in the New Zealand project.

Financial support for this project is provided from New Zealand, augmented by UNESCO (as part of the UNESCO contribution to SCIBP). It is expected that Research Fellowships will be awarded in the near future.

iv. Joint Group of Experts on the Scientific Aspects of Marine Pollution (FAO, UNESCO, WMO, IMCO)

The Convener will attend the first meeting of this Group in March 1969, as an observer on behalf of SCIBP. At an earlier stage, when FAO planned to hold a Symposium, it had been agreed that IBP/PM would be responsible for organizing a session of papers, largely by IBP participants, with an emphasis on the ecological aspects of the problem and the contribution to research which could be made by universities and other non-governmental institutions. In consequence of the formation of the Joint Group, this plan has been abandoned but IBP/PM would welcome the opportunity to participate in such new activities as may be proposed.

prepared by R.S. Glover, Convener IBP/PM, Edinburgh, January 1969

PROPOSED TECHNICAL MEETING ON ENVIRONMENTAL AND BIOLOGICAL CHANGES IN THE EASTERN MEDITERRANEAN SEA

The events of the last 100 years may be regarded as a large-scale ecological experiment, starting with the cutting of the Suez Canal. This linking of the Indian Ocean and the Mediterranean Sea has resulted in extensive biological changes in the Levant Basin, involving the migration of plants and animals through the Canal. It is essential that these changes should be recorded as fully as possible before the opportunity of studying them is lost.

The Levant Sea, with its high temperature and salinity, differs in many respects from the western Mediterranean which has many affinities with the Atlantic. Organisms from the west, however, have colonized the Levant region where they may now come under competitive pressures from the species which are known to have invaded the Levant from the Red Sea. Many of these tropical organisms, with their adaptation to high temperatures and salinity, are likely to have little difficulty in establishing themselves in the Mediterranean.

Conditions in the Suez Canal, also, have changed; for example, there has been a decrease of the salinity of the Great Bitter Lake which, in the past, was thought to have been an obstacle to the migration of many species.

It seems probable that the completion of the Aswan High Dam will introduce yet another pattern of biological change in the Eastern Mediterranean. Certainly, the Nile floods will no longer constitute such major environmental events, bringing with them the nutrients which were considered to contribute to the biological productivity of the coastal waters of Egypt and neighboring countries.

All these changes, introduced by man, offer a unique and exciting opportunity to analyse ecological processes on a dramatic scale. Obviously, it is highly desirable that there should be adequate field and laboratory programs to ensure that the opportunity is not lost. Indeed, it may be that some elements of the biological chain of events may have gone unobserved. The situation is urgent and invites the cooperation of scientists from many countries. Not only will it be necessary to study the ecological changes but an attempt must be made to forecast their effects on productivity, including the yield of fisheries, in the Eastern Mediterranean Sea. The understanding of events in this region could well provide a valuable basis for the prediction and interpretation of the effects of similar large-scale engineering projects in other parts of the world.

In planning the Symposium, it is expected that the region of most concern will prove to be that bounded by the coasts of Turkey, Syria, Lebanon, Israel, Egypt and Lybia, and by a line from

south-west Anatolia via Rhodes, Scarpanto and Crete to the North African coast near Benghazi. Any study of this sea area would be incomplete without a consideration of its relationship with the Black Sea and it is hoped that scientists from this region, also, will take a full part in the Symposium.

ANNEX VIII

MEETINGS OF SCOR AND ASSOCIATED ORGANIZATIONS IN 1969

21 - 23 January	Princeton	IAMAP/IAPSO/SCOR Joint Committee on Air-Sea Interaction (WG 28)
27 - 31 January	Paris	WMO/IOC Group of Experts on Telecommunication
29 - 31 January	Mexico City	SCOR Executive Committee
3 - 7 February	Woods Hole	IOC Bureau and Consultative Council, 9th Meeting
24 - 28 February	Geneva	IOC IGOSS Working Committee and WMO Executive Committee Panel on Meteorological Aspects of Ocean Affairs
24 February - 2 March	Cochin	IOBC Consultative Committee, 7th Meeting
26 - 28 February	Kiel	SCOR WG 31 on East Atlantic Continental Margins
27 - 28 February	Fort Lauderdale	SCOR WG 10, <u>ad hoc</u> group on oxygen tables
17 - 21 March	London	IMCO/FAO/UNESCO/WMO Joint Group of Experts on Scientific Aspects of Marine Pollution
23 - 26 April	Paris	IOC WG of Governmental Experts on Statute Revision
28 April - 3 May	Ponza, Rome	ACMRR/SCOR/WMO Working Party on Scientific Aspects of International Ocean Research (WG 30)
19 - 20 May	Wormley	SCOR WG 21 on Continuous Current Velocity Measurements
9 - 12 June	Paris	IOC WG on Legal Questions

16 - 21 June	Paris	IOC WG on Expanded Program
28 - 30 August	Bergen (?)	SCOR Executive Committee
1 September	Paris	IOC Bureau and Consultative Council, 10th Meeting
2 - 13 September	Paris	IOC, Sixth Session
4 - 6 September	Madrid	UMC/IASPIE/IAGA Symposium on Inland Seas
25 - 27 September	Dublin	ICES Symposium on Physical Variability in North Atlantic
29 - 30 September	Dublin	IOC Group of Experts on Ocean Variabil- ity
29 September - 3 October	Dublin	ICES, 57th Statutory Meeting
? November	Miami	SCOR WG 15 on Photosynthetic Radiant Energy
12 - 14 November	London	Royal Society Symposium on Petrology of Igneous and Metamorphic Rocks of the Ocean Floor
1 - 6 December	São Paulo	Symposium on Fertility of the Sea, Oceanographic Institute of the University of São Paulo

ABBREVIATIONS

ACMRR	Advisory Committee on Marine Resources Research (of FAO)
CIG	Comité International de Géophysique
CSK	Cooperative Study of the Kuroshio
FAO	Food and Agriculture Organization of the United Nations
FRG	Federal Republic of Germany
GARP	Global Atmospheric Research Program (of WMO/ICSU)
GDR	German Democratic Republic
IABO	International Association of Biological Oceanography (of IUBS)
LAGA	International Association of Geomagnetism and Aeronomy
IAGC	International Association of Geochemistry and Cosmochemistry
IAMAP	International Association of Meteorology and Atmospheric Physics (of IUGG)
IAPSO	International Association of Physical Oceanography (now IAPSO)
IAPSO	International Association for the Physical Sciences of the Ocean (of IUGG)
IASPEI	International Association of Seismology and Physics of the Earth's Interior
IBP/PM	International Biological Programme/Productivity Marine
ICES	International Council for the Exploration of the Sea
ICNAF	International Commission for Northwest Atlantic Fisheries
ICSU	International Council of Scientific Unions
IGU	International Geographical Union
IIOE	International Indian Ocean Expedition
IMCO	Intergovernmental Maritime Consultative Organization
INQUA	Union International pour l'Etude du Quaternaire
IOBC	Indian Ocean Biological Center
IOC	Intergovernmental Oceanographic Commission
IUB	International Union of Biochemistry
IUBS	International Union of Biological Sciences
IUGG	International Union of Geodesy and Geophysics
IUGS	International Union of Geological Sciences
IUMS	International Union of Marine Sciences
IUPAP	International Union of Pure and Applied Physics
IUPS	International Union of Physiological Sciences
NAS	National Academy of Sciences
NODC	National Oceanographic Data Center (U.S.A.)
SCAR	Scientific Committee on Antarctic Research
SCIBP	Special Committee for the International Biological Programme
SCOR	Scientific Committee on Oceanic Research
UMC	Upper Mantle Committee
UN	United Nations
UNAM	Universidad Nacional Autónoma de Mexico
UNDP	United Nations Development Program
UNESCO	United Nations Education, Scientific and Cultural Organization
WDC	World Data Center
WG	Work Group
WMO	World Meteorological Organization