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SCOR Proceedings, Volume 36
REPORT OF THE 25TH GENERAL MEETING OF SCOR
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REPORT OF THE 25th GENERAL MEETING OF SCOR
U.S. National Academy of Sciences
Washington, D.C.
October 10-13, 2000

1.0 INTRODUCTION

1.1 Opening Remarks and Administrative Arrangements

The 25th General Meeting of the Scientific Committee on Oceanic Research (SCOR) took place at the U.S. National Academy of Sciences in Washington, D.C. SCOR President John Field opened the meeting by welcoming SCOR members to Washington, D.C. and remarked that this would be the final meeting of Elizabeth Gross as SCOR's Executive Director. This was also the first SCOR General Meeting in the United States since 1980. Field also introduced Ed Urban, the incoming SCOR Executive Director, who was to succeed Elizabeth Gross on October 16, 2000. The U.S. National Committee to SCOR hosted the General Meeting and Ed Urban, staff member for the U.S. National Committee, also welcomed members to Washington, D.C.

The General Meeting was accompanied by a symposium on nutrient over-enrichment in coastal waters, co-convened by the U.S. National Committee to SCOR, the American Society for Limnology and Oceanography, and the Estuarine Research Federation. SCOR participants attended the first morning session of the symposium, on October 11. Papers from the symposium will be published in a special issue of the journal *Estuaries* in 2001.

Later in the day, the chair of the U.S. National Committee to SCOR, Ken Brink, welcomed SCOR members and expressed his view of the importance of SCOR to the United States. John Field expressed his appreciation to the U.S. National Committee for hosting the General Meeting.

A list of participants in the General Meeting appears in Annex 1.

1.2 Approval of the Agenda

The meeting agenda (see Annex 2) was approved, with a few shifts in the timing of various presentations.

1.3 Report of the President of SCOR

John Field reported on major SCOR activities of the past year. Following the 1999 SCOR Executive Committee meeting in Goa, India, the first concern was to provide SCOR representation on a panel of the United Nations Environment, Science, and Cultural Organization (UNESCO) to evaluate the Intergovernmental Oceanographic Commission (IOC). IOC had not been evaluated by its parent organization in many years. The presidents of SCOR (John Field) and the World Meteorological Organization (WMO), with a member of the French Institut de recherche pour le Développement, comprised the review panel. The panel made a number of recommendations to the UNESCO Secretary General early in 2000, and John Field presented the panel's report to the IOC Executive Council meeting in June 2000.

Elizabeth Gross made it known at the time of the Goa meeting that she intended to retire at the time of the General Meeting in Washington, D.C. A selection committee of John Field, Bjorn Sundby, Robert Duce, and Tom Osborn (representing The Johns Hopkins University) was formed and the Executive Director position was advertised in a variety of locations. 23 applications were received and 5 individuals were selected for interviews. Three individuals were interviewed in mid-August 2000 and all three were considered appointable. Ed Urban was unanimously selected to succeed Elizabeth Gross as the SCOR Executive Director. Elizabeth Gross will stay on at 25% time as the SCOR Finance Officer.

SCOR has been active in science activities in the past year. 15 working groups and three major science programs are underway. JGOFS will finish in 2003, so SCOR and the International Geosphere-Biosphere Programme (IGBP) are working to identify an overarching framework and some number of individual science programs to answer the remaining important questions in ocean biogeochemical research. A meeting was held in Plymouth, UK a few weeks before the General Meeting to begin discussing a new framework for ocean biogeochemical research. An activity called the Surface Ocean-Lower Atmosphere Study (SOLAS) is under development and its science plan will be considered later in the meeting. The CO_2 Advisory Panel has been reconstituted under SCOR and IOC co-sponsorship, with Doug Wallace as the panel's chair, in recognition of the importance of this topic and growth in our understanding in the past decade of the ocean's importance in the global carbon cycle.

The Partnership for Observation of the Global Ocean (POGO) recently appointed its first Executive Director, Shubha Sathyendranath of Dalhousie University. POGO is an initiative of oceanographic institutions to facilitate implementation of the Global Ocean Observing System (GOOS) and systematic observations of the ocean worldwide.

SCOR will consider at this meeting some minor, but important, changes to the SCOR Constitution to avoid the future situation of the SCOR President and Secretary rotating off the SCOR Executive Committee at the same time, as is happening this year. Another change would allow the president of affiliated organizations to delegate their position on the SCOR Executive Committee to another member of their organization.

Finally, John Field mentioned that Nick McCave had been awarded the Canadian Huntsman Medal and S.S. Lappo was elected to the Russian Academy of Sciences. Field thanked Elizabeth Gross, Wesley Anne Ross, and the Executive Committee for their assistance over his term.

1.4 Report of the Nominations Committee

Vere Shannon reported on the actions of the SCOR Nominations Committee, comprised of Shannon (South Africa), Nick McCave (UK), and S. Krishnaswami (India). Shannon noted that the most recent SCOR President from the United States (Warren Wooster) finished his term in 1972. Since then, the post has been held primarily by Europeans and South Africans. The Nominations Committee considered various factors in developing the slate: gender, hemispheric geography, and developing nation status.

National Committees and all voting members of SCOR were informed of the slate proposed by the Nominations Committee by letter on August 9, 2000. The report from the Nominations Committee was tabled by Shannon for approval. The proposed officers will begin their terms at the end of the meeting, since no election has been called for under the terms of the Nomination and Election Procedures in the SCOR Constitution. The slate was approved by acclamation. The new officers are Robert Duce (President, USA), Julie Hall (Secretary, New Zealand), and Roberto Purini (Vice-President, Italy). Laurent Labeyrie (paleoceanography, France) was later appointed by the Executive Committee as a co-opted member and Cintia Piccolo (physical oceanography, Argentina) was reappointed as a co-opted member, to maintain disciplinary balance on the Executive Committee.

1.5 Appointment of an *ad hoc* Finance Committee

The SCOR Constitution requires that an ad hoc Finance Committee be appointed at every SCOR meeting. The committee must consist of at least three members of SCOR who are not members of the Executive Committee; in addition, anyone is welcome to sit in on Finance Committee meetings. The Finance Committee reviewed the administration of SCOR finances during 1999 and 2000. It also proposed a budget for 2001 activities based on the decisions taken during the meeting. The committee reported to the General Meeting under agenda item 4.3. A committee of Vere Shannon (chair; South Africa), Julie Hall (New Zealand), Ilana Wainer (Brazil), and Patrick Buat-Menard (France) was appointed.

1.6 Appointment of an *Ad hoc* Committee to Review the Disciplinary Balance of SCOR's Activities

The Executive Committee agreed at its meeting in 1999 that at future SCOR meetings, after the consideration of working group proposals is complete, the disciplinary balance among the set of SCOR science activities should be assessed. Disciplinary gaps should be identified and communicated to national committees when the next request for working group proposals is sent. A small group was appointed to do the assessment: Nick McCave (chair; geology), José Stuardo (biology), Fred Herms (chemistry), and Roberto Purini (physics). The group was asked to report to the meeting under agenda item 2.3.

2.0 WORKING GROUPS

2.1 Issues Arising from Former Working Groups

2.1.1 WG 99—Linked Mass and Energy Fluxes at Ridge Crests

The Executive Committee Reporter for this working group, Nick McCave, was unable to obtain information from the chair of this working group on its progress in preparing a brochure about ridge research and a report on the topic. The group produced a report in 1997.[1] No funding was requested or approved for additional activities of this working group.

[1] Paison, L.M., and M. Sinha. 1997. *Linked Mass and Energy Fluxes at Ridge Crests (SCOR Working Group 99) and BRIDGE Research Results*. Southampton Oceanography Centre, University of Southampton, United Kingdom.

2.1.2 WG 101—Influence of Sea State on the Atmospheric Drag Coefficient

Ian Jones, co-chair of the working group, reported that the group has been disbanded because all that remains of its work is the publication of its report. This report, approximately 400 pages in length, will be published by Cambridge University Press in 2001. SCOR has made a financial commitment to purchase books, although no contract has been received yet.

2.1.3 WG 102—Comparative Salinity and Density of the Atlantic and Pacific Ocean Basins

This working group was formed to investigate a discrepancy in measurements of the World Ocean Circulation Experiment in different regions. The conclusions of this working group were published in an article in the journal *Deep-Sea Research* by the working group chair, Frank Millero.[2] No further action was needed by SCOR and the group was disbanded.

2.2 Issues Arising From Current Working Groups

The SCOR Constitution and the Objectives and Procedures for SCOR Working Groups specify that the tenure of SCOR subsidiary bodies automatically expires at each General Meeting. Working group reports must demonstrate adequate justification for their reinstatement for an additional two years.

2.2.1 WG 103—The Role of Wave Breaking on Upper Ocean Dynamics

Executive Committee Reporter Wolfgang Fennel reported on the progress of this working group. The group was established in 1993 and had its final meeting in 1999, and thus has exceeded the normal lifespan of a SCOR working group (4 years). A review article from this working group was delayed, but the chair has promised that it will be submitted in early 2001. This delay has no implications for the SCOR budget. The group will be disbanded when the article is published.

2.2.2 WG 105—The Impact of World Fisheries Harvests on the Stability and Diversity of Marine Ecosystems

A report of the working group's activities was presented by its chair, Michael Sinclair. The working group organized a major symposium in Montpellier, France, attended by scientists from 44 different nations. The final product of the group was a special issue of the *ICES Journal of Marine Science* in June 2000, which was a broad-based synthesis of ecosystem effects of importance for fisheries management. The results of the working group have been presented to the GOOS Living Marine Resources Panel and Australia, Canada, and the United States have set up an informal network to implement the working group's recommendations. Two other activities arose from this working group: (1) the new working group proposal discussed under item 2.3.2 and (2) an activity on fisheries governance. Sinclair noted his enjoyment of working with SCOR and the positive aspects of SCOR's flexibility. The working group was disbanded with congratulations from John Field.

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[2] Millero, F.J. 2000. Effect of changes in the composition of seawater on the density-salinity relationship. *Deep-Sea Research I* 47:1583-1590.

2.2.3 WG 106—Relative Sea Level and Muddy Coasts of the World

Executive Committee Reporter Nick McCave told SCOR members that the working group held a successful meeting in 1997. The papers are virtually ready for publication, but the serious illness of a member of the working group responsible for the report has delayed publication. Funding is included in the 2001 SCOR budget for purchase of copies of the book resulting from this working group. The group will be disbanded when the book is published.

2.2.4 WG 107—Improved Global Bathymetry

Executive Committee Reporter Cintia Piccolo told the meeting participants that no report had been received from the working group. The Secretariat was asked to urge the working group chair to complete its work or to get help doing so from someone in the group.

2.2.5 WG 108—Double Diffusion

Executive Committee Reporter Sergei Lappo noted that this is an important topic that has been the subject of several conferences in the past year. The members of this working group are working on several articles to be published in the journal *Progress in Oceanography*. They are planning a final meeting in conjunction with the next meeting of The Oceanography Society in Miami, Florida in April 2001. The General Meeting approved financial support for this working group meeting.

2.2.6 SCOR/IUPAC WG 109—Biogeochemistry of Iron in Seawater

David Turner, a co-chair of the working group, made a presentation on behalf of the group. All chapters of the book resulting from the symposium held in conjunction with the 1998 SCOR General Meeting in Amsterdam are completed and will be given to the publisher, John Wiley & Sons, in late October-early November 2000. The working group identified a need for iron standards. A subgroup on iron standards was set up at the Amsterdam General Meeting and met at the 2000 Ocean Sciences Meeting in San Antonio, Texas; an intercalibration exercise was underway at the time of the General Meeting, including blind analyses by three laboratories. The working group may request SCOR support next year for a meeting in conjunction with the 2002 Ocean Sciences meeting in Honolulu, Hawaii to finalize the results of the intercomparison and produce a handbook on iron analysis.

2.2.7 SCOR/WCRP WG 110—Intercomparison and Validation of Ocean-Atmosphere Flux Fields

Serge Gulev, co-chair of the working group, presented a report of the group's activities. This cooperative effort between SCOR and WCRP began in 1997 and the group has met twice since then. The working group has organized three conferences and members have participated in a variety of other meetings on this topic. Its final workshop will be held in Washington, D.C. in May 2001. The 2001 SCOR budget includes funding for the workshop and completion of the group's activities, including publishing of its report, which is available in draft form. A proposal for a continued activity on air-sea fluxes is discussed in item 2.3.5. Gulev thanked SCOR for its support of the working group. He will report back to SCOR after the May 2001 workshop.

2.2.8 WG 111—Coupling Winds, Waves, and Currents in Coastal Models

The Executive Committee Reporter, Wolfgang Fennel, reported on the progress of this working group. The group is at a midpoint in its work and published a concept paper in the *SCOR Proceedings*, Volume 35. They plan on publishing a book as the product of the group's activities. The next meeting of the working group will be held in conjunction with a workshop following The Oceanography Society meeting in Miami in April 2001. The 2001 SCOR budget includes funding for the meeting. SCOR asked that the meeting organizers be sure to invite some Eastern Europeans to the meeting, as proposed in their report to SCOR.

2.2.9 SCOR/LOICZ WG 112—Magnitude of Submarine Groundwater Discharge and its Influence on Coastal Oceanographic Processes

The activities of this working group were reported on by one of its co-chairs, Evgeny Kontar. The group has held two meetings so far and will meet in conjunction with an IOC/LOICZ intercalibration experiment in Perth, Australia in December 2000. The group plans to conduct intercomparisons at five different sites to determine the best methods for management of submarine groundwater discharges. SCOR included funding for a working group meeting in Sicily, June 2001 in conjunction with a meeting of the International Atomic Energy Agency.

2.2.10 SCOR/IMAGES WG 113—Evolution of the Asian Monsoon in Marine Records: Comparison Between Indian and East Asian Subsystems

Executive Committee Reporter Nick McCave presented a report on this working group. The purpose of the group is to examine proxies of monsoons and compare Indian and East Indian monsoons. The activities of the group have been slowed by the wealth of new data relevant to their topic from the Ocean Drilling Program (specifically Leg 184 in the East China Sea). A meeting planned for 2000 was postponed until 2001. SCOR requested that the working group meet in conjunction with a major paleoceanographic conference in Sapporo in September 2001, rather than meeting in Beijing, and have a larger synthesis meeting in 2002 or 2003. This change would reduce expenses for the meeting and thus the budgeted amount for the meeting. Papers from the meeting will be published in a special issue of an international journal, probably *Marine Geology*.

2.2.11 WG 114—Transport and Reaction in Permeable Marine Sediments

The Executive Committee Reporter, Björn Sundby, noted the significance of permeable shelf sediments to the global carbon cycle. The group met once so far, in September 1999, and is planning its next meeting for January 2001. It has submitted an article to *EOS*. SCOR asked for clarification about how the next meeting will fit into fulfilling the group's terms of reference, and regarding the need to invite an outside speaker to the second meeting of the working group. SCOR included funding in its 2001 budget for the working group's proposed meeting.

2.2.12 WG 115—Standards for the Survey and Analysis of Plankton

Executive Committee Reporter Peter Burkill reviewed the status of this working group, which was approved in 1999 to build on 70 years of results from the Continuous Plankton Recorder (CPR). The purpose of the working group is to integrate data from the CPR with new technologies, different types of data, and other surveys, and to make suggestions for the CPR's evolution. In the past year, two

individuals were approached to chair the group, but both declined. These individuals may be appropriate members of the eventual working group. Ivan Heaney was suggested as a chair for the working group and accepted. The final membership will be determined in consultation between the new Executive Committee Report for the group (Julie Hall) and Ivan Heaney, and submitted to the SCOR Executive Committee for approval.

2.2.13 WG 116—Sediment Traps and ^{234}Th Methods for Carbon Export Flux Determination

Executive Committee Reporter, Nick McCave, noted that this working group will meet for the first time in Amsterdam, in July 2001, in conjunction with the IGBP Open Science Conference. Details of the meeting, including the budget, are still being worked out. Funding was included in the SCOR budget for the working group's activities in 2001.

2.2.14 SCOR/IMAGES WG 117—Synthesis of Decadal to Millennial Climate Records of the Last 80ky Years

Executive Committee Reporter Nick McCave told the SCOR meeting that the working group membership has not yet been identified and thus not yet approved. Funding was included in the SCOR budget for the working group's activities in 2001, pending approval of working group composition. The product of the working group will be a book based on an international workshop held in 2000. It was proposed that the working group hold a small meeting at the 2001 International Conference on Paleoceanography in Sapporo, Japan, and a larger meeting in 2002 or 2003.

2.2.15 WG 118—New Technologies for Observing Marine Life

Executive Committee Reporter Peter Burkill told SCOR members that this working group was proposed and accepted in 1999. Funding was supplied by the Alfred P. Sloan Foundation for this group. The first meeting of the group will take place on November 9-11, 2000 in Victoria, Canada, and will be a broad review of technologies for observing marine life. The group was given permission to meet twice before the SCOR Executive Committee meeting in 2001 and Van Holliday was approved as a co-chair for the group.

2.3 Proposals for New Working Groups

The following proposals for new working groups were received by the SCOR Secretariat before the deadline and circulated to all national committees for comments.

2.3.1 Sediment Fluxes and Budgets in Estuarine and Coastal Areas

This proposal was submitted by Gerardo Perillo (Argentina) and Björn Kjerfve (USA). It was presented by Björn Sundby. This working group proposed to promote the scientific investigation of sediment fluxes and budgets in estuarine and coastal areas with the aim of establishing their importance to local and global sediment cycling and their influence on biogeochemical processes. To achieve this aim, the working group would identify our present knowledge base and gaps in information available, and offer suggestions for changing the status of this knowledge base.

Much work can and should be done on the proposed topic. However, the terms of reference for the group were thought to be too broad for a SCOR working group (and perhaps too research-oriented)

and the proponents may consider re-submitting a more focused proposal. The proposal should mention the Land-Ocean Interactions in the Coastal Zone (LOICZ) program and potential interactions with it, not duplicating LOICZ activities. Coastal engineering and hydrology expertise should be considered for the proposed committee and the committee membership should reflect the importance of this issue in the tropics. The subject of this proposal is also related to the SCOR/IGBP Initiative on the Future of Ocean Research in Earth System Science.

2.3.2 Developing Quantitative Indicators for Marine Ecosystems from Environmental, Ecological, and Fisheries Perspectives

John Field and Michael Sinclair presented this proposal for a new working group. (Nick McCave assumed chair of the General Meeting during this presentation.) The proposal arose from a recommendation of the SCOR Working Group on The Impact of World Fisheries Harvests on the Stability and Diversity of Marine Ecosystems (WG 105) and was submitted by Philippe Cury (South Africa). The full text of the proposal is given in Annex 3.

The need for precautionary management of marine resources is both obvious and crucial for fisheries. Scientists and managers have recognized that management could be more effective if it evolved from a single-species basis to a multispecies or ecosystem basis. However, theory is lacking at the ecosystem level and development of such theory will require a paradigm shift in which the ecosystem level comes to be viewed as an integrative level for ecological studies; this approach was initiated in the 1980s by SCOR WG 73 on Ecosystem Theory for Biological Oceanography. However, the ecosystem scale has not received much attention in scientific studies even though an ecosystem strategy for the assessment and management of international coastal ocean waters now exists with the Global Environmental Facility's Large Marine Ecosystem initiative. The definition of quantitative indicators for marine ecosystems from environmental, ecological, and fisheries perspectives could provide a bridge among the different scientific disciplines and provide an efficient way to present results to fishery and coastal managers. The aim of this working group would be to promote a sound theory to underpin "ecologically sustained fisheries" and to develop a scientific approach for defining quantitative indicators to assess changes in marine ecosystems. Achieving this aim could yield new and refreshing insights, which will be essential for achieving political and management goals. Such a working group is timely because a number of models now exist that can use and/or generate quantitative indicators.

The working group would

- review the current state of knowledge in different marine and terrestrial disciplines relevant to the development of quantitative indicators for marine ecosystems;
- review theories and quantitative indicators that have been developed in terrestrial ecology and assess their utility for marine ecosystems;
- develop new quantitative indicators (including socioeconomic ones) to study the functional role of species in ecosystems (including exploited species) using output of models or available time series, and using satellites and geographic information systems;
- apply these quantitative indicators in a comparative way to characterize ecosystem states, changes, and functioning; and

- assess the utility of these quantitative indicators for management purposes and for the sustainable utilization of renewable resources.

Two workshops would be organized in conjunction with working group meetings to promote and discuss the definition and use of quantitative indicators for ecologically sustained fisheries, resulting in a book in 2004.

The SCOR Executive Committee approved this working group proposal, pending a few changes to the proposal and revision of the composition of the working group. Specifically, the ecolabeling issue (see Annex 3) should not be included in the working group's activities because it is not a scientific issue and thus outside SCOR's scope. It is particularly important that bottom-up (energy and element flows) and top-down (ecosystem structure and function) modelers be included in the membership and that expertise in phytoplankton dynamics be included. SCOR would like to see the term "quantitative indicators" used instead of the word "metrics." The number of working group members needs to be reduced to 10. This working group should interact with GLOBEC, the Census of Marine Life (including the SCOR Working Group 118 on New Technologies for Observing Marine Life), and any ICES activities on this topic.

2.3.3 PREDICT - Predicting Resilience and Recovery of Disturbed Coastal Communities in the Tropics

This proposal was submitted by Miguel Fortes (Philippines) and presented by Fortes and Executive Committee Reporter Bjorn Sundby. This working group proposes to compile available data and information on the structure and dynamics of coastal ecosystems in the tropics and transform these into models predicting the resilience and recovery of such systems in response to human impacts. These models will be integrated in general models for the integrated management of coastal zone regions of the tropics.

To achieve the general goal of the project the following specific objectives are proposed:

- Document how the spatial fragmentation of disturbed plant populations of tropical coastal ecosystems affects their genetic diversity and their ability to recover from disturbance.
- Document the sediment conditions that allow the growth and recolonization of tropical coastal plant communities and the potential for resilience and recovery of these conditions in the region's coastal systems under pressure.
- Evaluate the importance of seagrass and mangrove carbon in sustaining the food webs of coastal ecosystems along a gradient of ecosystem deterioration and recovery.
- Integrate the knowledge acquired into a model predicting the resilience and recovery of tropical coastal ecosystems.

This working group would be the continuation of an existing group and activity. Although many SCOR members think this is an important topic, SCOR declined to accept the proposal at this time. It recommended that if this proposal is submitted at a later meeting, it consider the relevance of LOICZ. Both the working group's activities and its composition should recognize that mangrove and seagrass

systems are in peril worldwide and that a comparative approach among different areas of the world could be more informative than one focused solely on Southeast Asia. Rhizophoran mangrove species should be included and the effects of crustaceans and other benthic organisms should be considered. The economic impacts to be considered should be broadened.

2.3.4 Marine Phytoplankton and Global Climate Regulation: The Phaeocystis Species Cluster As Model

This proposal was submitted by W.W.C. Gieskes through the SCOR Committee of The Netherlands. It was presented by Dr. Robert Duce, the SCOR Executive Committee Reporter for the proposal. The full text of the proposal is given in Annex 4.

Scientific Rationale and Background

The ocean's microalgae play a key role in the cycling of elements that largely determine the global climate. For example, the ocean's uptake of carbon dioxide (CO_2), a "greenhouse" gas, is mediated significantly by photosynthetic fixation of carbon by marine phytoplankton and sequestration of algal biomass to the deep sea. Through this process, a portion of excess carbon emitted by fossil fuel combustion and burning of terrestrial plants is removed from the atmosphere. Another gas that influences climate, but which may mitigate predicted greenhouse warming—dimethyl sulfide (DMS)—is produced by marine phytoplankton. Once in the atmosphere, DMS is oxidized and the products of this process form cloud condensation nuclei. Over remote ocean areas most cloud condensation nuclei are derived from DMS; it is well known that clouds are "the wild card in the deck" in climate prediction. Fifty to sixty percent of Earth's total natural sulfur emission to the atmosphere is contributed by DMS, and ninety percent of this flux originates in marine environments.

One family (the *Prymnesiophyceae*) in the array of marine algae is the most important as an intermediary in the transfer of carbon and sulfur between ocean and atmosphere. Two species from this family are usually the focus of research because they can grow to such abundance ("blooms") that they become visible in satellite images of ocean color and reflectance: *Emiliania huxleyi* and *Phaeocystis globosa*. It is generally assumed that the role of these species in the biogeochemical cycling of climate-relevant elements, including trace metals that limit plankton growth, is in proportion to their abundance. Of the two species, *Phaeocystis* is probably the most influential; this species is estimated to be responsible for as much as 17% of annual DMS fluxes from sea to air. Many of the functions of *Phaeocystis*, and even details of its life cycle, remain enigmatic despite the significant knowledge that has been gathered to date.

It is clear from the foregoing that *Phaeocystis* is an ideal model organism for studies of the role of marine microalgae in global biogeochemical cycling and climate regulation. The carbon and sulfur cycles are intimately linked in *Phaeocystis*, and iron and manganese—metals now known to govern microalgal productivity over much of the ocean—accumulate to high concentrations in *Phaeocystis* colonies due to the specific microenvironment inside. In other words, the cycling of all the elements that are relevant in marine and atmospheric biogeochemistry and modeling thereof come together in this single species. *Phaeocystis* has gradually become the focus of an international group of scientists from a variety of

disciplines ranging from meteorology and atmospheric chemistry to ecophysiology. Groups have come together three times since the late 1980s—the last time in the Netherlands in September 1999—to discuss and evaluate progress on *Phaeocystis* research.

An integrated, multidisciplinary research plan is urgently needed, based on a description of the state of the science and modeling of the regional and global significance of *Phaeocystis* and of its role as a link in elemental cycles that are central to biogeochemistry of the ocean and the overlying atmosphere. Now is the time to create an inventory of challenging research issues, assess critical areas of ignorance, and design an action framework. A SCOR working group would be an appropriate mechanism to achieve these goals.

Terms of Reference

The proposal lists the following terms of reference for the working group:

- Establish a website to facilitate coordination of ongoing research worldwide and to create cohesion of efforts

- Make an inventory of aspects that relate to cycling of biogeochemically relevant elements, including

    - Factors regulating bloom inception
    - The grazing issue: bottom-up or top-down control
    - Cellular response to environmental factors
    - Distribution patterns (using molecular probes)
    - Genetics: pathways of distribution and biodiversity in the cluster
    - Biogenic fixation and emission of climate-relevant gases
    - Cloud inception and characterization of condensation nuclei over blooms

- Meet once a year to discuss progress and divide tasks to arrive at a series of chapters produced under the responsibility of members of the working group.

- In the last year, write a series of reviews covering the subjects mentioned under item 2, which will be the chapters of a book that will be the product of the working group. At least two of the working group members are responsible for each chapter.

SCOR approved this working group, pending some modifications to the tasks/approach and working group composition. SCOR members thought that the proposed tasks are well focused, address important questions, and bring together several disciplines to address the issues. The group should be broadened to include more members from developing nations and more physical oceanographic expertise, and should eliminate the multiple members from a single institution. The working group should develop linkages with SOLAS and with the new project on *Phaeocystis* being funded by the U.S. National Science Foundation. Other DMS-producing species could easily be added, providing a

comparative aspect to the study and making it easier to extrapolate from *Phaeocystis* (the model) to other phytoplankton species.

2.3.5 Variability of Ocean-Atmosphere Fluxes

The proposal for this working group arose from the recommendations of SCOR/WCRP WG 110 and was submitted by Sergey Gulev. The working group also would be cosponsored by WCRP. The proposal was presented by SCOR Reporter Wolfgang Fennel and Sergey Gulev. The proposed working group would

- review and quantify the uncertainties of the present knowledge of air-sea flux variability on different time scales;
- summarize the requirements of different scientific disciplines for the quantitative description of multi-scale variability of air-sea fluxes;
- establish an optimal strategy for the improvement of existing, and development of new, long-term time series of air-sea fluxes, including a strategy for the development of reconstructed flux products;
- catalogue available long-term local, basin-scale, and global time series of surface fluxes and evaluate these time series to provide different scientific communities with the knowledge of their strengths and weaknesses;
- keep the scientific community informed about the work of the group by the use of the World Wide Web, by publication of the final report and catalogue, and by convening, at a suitable time, a scientific workshop;
- keep SCOR informed of progress in the area and to present recommendations for action, as necessary.

The proposed working group has an interdisciplinary character with a strong climate component. Given the very successful cooperation of SCOR with WCRP on the subject of air-sea fluxes in the existing working group, it is proposed that the new working group be formed jointly between SCOR and WCRP.

SCOR members agreed that the existing working group has been quite productive, but noted that the group has not yet completed its tasks, pending completion of a major workshop in May 2001, so proposal of a new working group is premature. SCOR Members were concerned that the proposed working group would basically continue the existing group, violating SCOR operating principles. Members suggested that variability of air-sea fluxes is an important issue and that the proponents should consider proposing this idea as a continuing activity of SOLAS (e.g., part of its Focus 2), CLIVAR, GEWEX, or GOOS. In any case, approval of a new SCOR working group should wait at least until the existing working group's report has been evaluated by the community. If this idea is resubmitted as a SCOR working group, it should include a reconstituted set of members, with a greater number from developing countries, and with input from WCRP.

2.4 The Disciplinary Balance Among SCOR Working Groups

The Executive Committee agreed in 1999 that all future SCOR meetings should consider the disciplinary balance of SCOR groups (after new working groups are approved). Scientific gaps should be identified and communicated to national committees when the next request for working group proposals is sent.

The *ad hoc* committee appointed at the beginning of the General Meeting reported on this topic after decisions were made on the proposals for new working groups.

The committee found the disciplinary balance among the existing SCOR activities and affiliated programs was generally good. Chemistry is relatively underrepresented, particularly organic geochemistry, but this area could be strengthened by continued collaboration with IUPAC on new studies and through the new activity on the Future of Ocean Biogeochemistry. Members suggested that SCOR send a letter to IUPAC, telling them how much SCOR values their cooperation. Geology is strong through affiliated programs, but not in terms of direct SCOR activities. John Field mentioned the need to form strong links with CLIVAR.

3.0 LARGE-SCALE SCIENTIFIC PROGRAMS

3.1 Committees

3.1.1 SCOR/IGBP Joint Global Ocean Flux Study Scientific Steering Committee

The Chair of the international JGOFS SSC, Hugh Ducklow, made a presentation about JGOFS achievements and plans. An extensive written report (given in Annex 5) was presented by JGOFS, describing activities during the past year, including the Open Science Conference (held in Bergen, Norway, in April 2000), plans for products and publications arising from the JGOFS synthesis effort, plans for 2001, a proposal for reduction in size of the JGOFS SSC, information on the status of the International Project Office (IPO), a JGOFS meeting calendar, and budgetary information. A review of a JGOFS publication by Alan Longhurst included in the briefing book praises the role of SCOR in the planning and implementation of programs like JGOFS.

JGOFS has included the participation of 10,000 scientists from 20 countries, conducting 1,100 cruises, and publishing 2,000 journal publications altogether. So far, 17 special issues of *Deep-Sea Research* have focused on JGOFS research. Among other JGOFS accomplishments, Ducklow reported that the JGOFS Hawaiian time series (HOT) station has been instrumental in showing that a regime shift is occurring in the North Pacific Ocean. Dissolved inorganic carbon has increased in the surface ocean due to enrichment of atmospheric CO_2. A decrease in surface ocean dissolved inorganic phosphorus has occurred because of the increased activity of nitrogen-fixing species such as *Trichodesmium* which, along with coccolithophorids, has become more dominant in the past decade. The ocean in this area is no longer nitrogen limited; it is now phosphorus limited. Dissolved organic carbon concentrations have increased and vertical export of carbon has decreased, possibly due to increased cycling of carbon in surface waters in the microbial loop. These changes might be driven by changes in the frequency of the El Niño-Southern Oscillation phenomenon, which could cause changes in mixing intensities in the

surface ocean. JGOFS has demonstrated the importance of key species, although the program has largely aggregated all phytoplankton species in bulk values for analyses and modeling purposes. Remote sensing of ocean color was available too late to be very useful to JGOFS, but sea surface temperature measurements from satellites were important.

JGOFS has helped achieve a new understanding of the role of continental margins in carbon cycling and has been addressing the controversy (through the JGOFS Continental Margins Task Team) about whether the margins are a source or sink of carbon. A major achievement of the past decade has been the global CO_2 survey conducted by JGOFS scientists on WOCE cruises. There has been a new recognition of the importance of the Southern Ocean as a carbon sink. The Southern Ocean Iron Enrichment Experiment (SOIREE) tested John Martin's hypothesis about iron limitation in the Southern Ocean and demonstrated enhanced productivity upon iron addition.

JGOFS is conducting an Ocean Carbon Model Intercomparison Project (OCMIP) among 13 models, in cooperation with the IGBP Global Analysis, Interpretation, and Modeling (GAIM) project. The goal of this exercise is to understand the differences among the existing models. All models have similar global integrated uptake of CO_2, but differ in regional air-sea fluxes of CO_2. The models being considered use different grid levels and none include biology, instead using the Redfield Ratio. However, some biology is being incorporated in the newest version of one model. It is becoming increasingly obvious that it is important to pay attention to individual "keystone" species and ecosystem structure.

The major highlight of JGOFS activity over the past year was the Open Science Conference. More than 200 individuals attended the conference and participated in plenary sessions, poster sessions, and round-table discussions. The meeting featured a strong emphasis on synthesis of research results, which is also the focus of the remaining years of JGOFS activity. A book from the meeting will be produced in the Springer-Verlag IGBP book series in about two years. The next and final open science conference will be held at the U.S. National Academy of Sciences in 2003.

JGOFS finances are in relatively good shape, although only the United States is funding synthesis activities on a large scale. Ducklow made a plea for SCOR members to encourage their countries to fund synthesis, data management, and archiving, and to submit existing data. Not all individuals who have participated in JGOFS research have submitted their data. A Data Management Task Team has been formed to compile inventories of data. JGOFS data sets tend to be smaller than data sets from programs like WOCE, but with a greater number of variables and more metadata. JGOFS would like to find funding to compile the remainder of its data and put all data in the same format. Ducklow noted that JGOFS has a data policy, but that the newness of the computer revolution, the lack of mandatory data submission in some countries, and the large number of data and metadata has hampered the program's attempts to gather all existing data. JGOFS is seeking funding to collect the remaining data and put it into a single format.

Regarding membership, JGOFS proposed to let three members rotate off the SSC, without replacing them, since the project is in the synthesis phase. SCOR approved this request.

3.1.2 SCOR/IGBP/IOC Scientific Steering Committee on Global Ocean Ecosystem Dynamics (GLOBEC)

An extensive written report from GLOBEC (see Annex 6) was supplemented by a brief presentation by the Executive Director of the new GLOBEC IPO, Manuel Barange. Information was provided on implementation of the GLOBEC program through four Focus Working Groups and four Regional Program Groups. Links with complementary activities in IGBP, IOC, ICES, PICES, and other international organizations are discussed in the report, as are plans for 2001 and continuing concerns over adequate funding for the IPO. Nominations for new members of the SSC were presented.

Barange noted that the international GLOBEC Implementation Plan was completed in 1999, and focus groups began meeting in 2000. GLOBEC plans to convene an open science conference in 2002. The program recently published a new data policy. One GLOBEC working group has identified the need to rescue existing data. This group is also developing statistical rules for analyzing past data and long-term data series, considering auto-correlation and other confounding factors.

Following publication of the GLOBEC Implementation Plan in 1999, the GLOBEC SSC and IPO developed an ambitious program of activities for the next few years. The project is based on three pillars: foci working groups, regional programs, and national activities.

Focus 1 WG: Retrospective analysis and time-series studies—The general objective of this focus is to identify and understand the characteristic natural modes of physical forcing and marine ecosystem variability over a range of temporal and spatial scales. The first meeting of the working group took place in Sitges, Spain, on 18-19 May 2000, to set a calendar of activities and develop a working plan.

Focus 2 WG: Process Studies—Under Focus 2, GLOBEC will investigate specific mechanisms thought to link ecosystem responses with environmental variability. To initiate activities in this focus, the working group met in Roscoff, France on 11-14 September 2000.

Focus 3 Predictive and modeling capabilities—This focus is designed to understand and predict how populations of marine animals respond to natural and anthropogenic changes in global climate, by bringing together the expertise and the activities of regional and national programs in predictive modeling. The group was appointed early in 2000 and met in Chapel Hill, North Carolina, USA on 10-12 July 2000.

Focus 4 WG: Feedback from Changes in Marine Ecosystem Structure—At the GLOBEC SSC meeting in Spain during May 2000, two specific issues were identified for early activation in this focus: (1) effects of fishing and (2) natural and human system implications of large-scale changes in marine ecosystems. GLOBEC will not appoint a working group for this focus. Rather, because of the diversity and breadth of potential topics, it will convene ad hoc groups of experts to work on particular topics.

Regional GLOBEC Programs

***Small Pelagic Fishes and Climate Change Programme (SPACC)*—**A planning meeting to review the implementation of the program was held in La Jolla, California, USA in March 2000. At the meeting, four main lines of activity were identified: (1) long-term changes in ecosystems, (2) comparative population dynamics, (3) reproductive habitat dynamics, and (4) economic implications of climate change. SPACC has field activities in the Benguela, California, Humboldt, and Kuroshio currents, as well as the temperate environment of the Bay of Biscay. As part of the International GLOBEC support to developing regions, a SPACC workshop was held in Namibia in October 2000. An initiative to coordinate SPACC research in East Asia has been planned for 2001 with the support of the Asia-Pacific Network for Climate Change research.

***Southern Ocean GLOBEC*—**The SO GLOBEC field program intends to conduct year-round monitoring of krill habitat, prey, predators, and competitors, with emphasis on sampling in winter. Attempts are been made to fill possible sampling gaps in collaboration with International Whaling Commission. The program has two core sampling areas, the Antarctic Peninsula and the 70°E region, although additional sites may be added.

***ICES Cod and Climate Change Programme (CCC)*—**A basic hypothesis of this program is that the environment regulates the growth of cod larvae, both directly and through zooplankton growth and survival. The CCC is halfway through its 5-year plan. The 7 major components of the program are (1) incorporation of environmental information into fisheries management, (2) retrospective analysis, (3) zooplankton-cod linkages, (4) comparative analysis (between stocks and regions), (5) climate and atmosphere-ocean linkages, (6) data availability and management, and (7) synthesis.

The CCC held a workshop on the dynamics of growth in cod in May 2000, as well as their annual conference. In 2001, the CCC plans to initiate synthesis activities, possibly leading to the publication of a synthesis book in 2003.

***PICES Climate Change and Carrying Capacity (CCCC)*—**The CCCC consists of four task teams that are conducted jointly between GLOBEC and North Pacific Marine Sciences Organization (PICES). The task teams conducted several workshops at, and leading up to, the PICES Annual Science Conference in Hakodate, Japan, in 2000. Other task team activities include a delineation of ecozones in the North Pacific and planning of iron fertilization experiments in the western gyre (2001), Station P (2002), and the open ocean (2003); a compilation of relevant sampling strategies and methods; and assisting in planning a pilot Continuous Plankton Recorder project.

National Activities—Activities are carried out by 15 national GLOBEC programs: Angola/Namibia/South Africa, a consortium of Black Sea nations, Brazil, Canada, Chile, China, France, Italy, Japan, Mexico, Netherlands, Portugal, Spain, United Kingdom, and United States. To facilitate coordination and program development, the GLOBEC IPO is in the process of publishing a GLOBEC Report describing the activities of each national program.

GLOBEC IPO—The IPO is financially supported by the Natural Environment Research Council (UK) and the University of Plymouth. The former has extended its commitment until 2004, whereas the latter has an initial commitment until end of 2003. The U.S. National Science Foundation provides support for the GLOBEC SSC's planning and coordination activities, through SCOR. Attempts to secure additional funding for the program from the European Union have not yet been successful. Securing adequate, ongoing funding for the IPO operation remains an area of concern.

The SCOR Reporter for GLOBEC, Peter Burkill, noted that the program is now proceeding productively. The IPO is fully operational and national activities are working well. The number of nations involved is expanding, particularly in Asia, Africa, and Central and South America. The program has a solid component focusing on developing new measurement technologies. Concerns for the program include funding for the IPO, rotation of members off the SSC in 2002, and lack of Canadian involvement at a national level. The existing funding stream was developed before the establishment of the IPO. More funding is needed to develop new initiatives.

3.1.3 SCOR/IOC Scientific Steering Committee on Global Ecology and Oceanography of Harmful Algal Blooms (GEOHAB)

SCOR and IOC convened a workshop in 1998 to follow-up on the activities of SCOR Working Group 97 and to serve as input to a science plan for a new program. The GEOHAB SSC has been primarily concerned with the preparation of their science plan for approval by SCOR at the General Meeting. The plan was presented by GEOHAB SSC Member Patricia Glibert. Comments from an international set of three reviewers was presented by Björn Sundby, the SCOR Reporter for the activity.

Glibert noted that this activity was developed because there has been an increase in some human illnesses (e.g., paralytic shellfish poisoning) that are manifestations of harmful algal blooms (HABs) and the number of high-biomass blooms worldwide may be increasing. The draft science plan includes 5 program elements and expects to be linked with GOOS, LOICZ, and GLOBEC.

Sundby stated that the SSC has worked very rapidly and has developed a comprehensive plan. All three reviewers endorsed the program, although they also provided significant comments for improvement of the Science Plan. SCOR approved the Science Plan in concept, pending response to reviewers' comments and additional editing of the plan. Specific technical concerns included the need for a more balanced treatment of the role of nutrients in HABs, evidence for global increases in HABs, and phytoplankton ecophysiology versus ecology. SCOR members discussed the merits of condensing the plan, publishing it as part of the eventual GEOHAB Implementation Plan, and other potential approaches. In the end, members agreed that the Science Plan should be published as soon as possible, as a stand-alone document, because it could be useful immediately.

The GEOHAB SSC will meet in La Paz, Mexico one month after the SCOR General Meeting and will use that opportunity to work on responding to reviewers' comments. A major concern continues to be funding for a GEOHAB IPO. France has made an offer of partial support, but support for an executive director is still lacking.

3.2 Scientific Programs Under Development

3.2.1 SCOR/IGBP/CACGP Surface Ocean Lower Atmosphere Study (SOLAS)

Processes at the ocean-atmosphere interface govern the transfer of chemical species, momentum, and energy between the ocean and atmosphere. Ignorance of the magnitude and temporal variability of such transfers hinder our ability to develop a predictive understanding of global change. SOLAS will focus on understanding biogeochemical and physical interactions of the uppermost layer of the ocean (0 – 200 m) and the portion of the atmosphere immediately above the ocean surface (to about 1 km). An open science meeting was held in February 2000 in Damp, Germany. It included 250 participants from 22 countries. Twelve countries are now developing national activities.

A SCOR/IGBP/CACGP SOLAS Planning Group has completed its task of preparing a SOLAS Science Plan for approval by SCOR and IGBP. The plan was presented by a co-chair of the planning group, Robert Duce, and five external reviews were presented by Executive Committee Reporter Peter Burkill. All five reviewers were very supportive, with a few suggestions for improving the Science Plan. An important approach of SOLAS is using testable hypothesis to ensure that observations and experiments are relevant to understanding key interactions; the problem is divided into 3 foci. SCOR accepted the Science Plan and assembled a list of potential members of a Scientific Steering Committee for SOLAS. SCOR approved SOLAS as a formal SCOR program and awaits co-sponsorship by IGBP and the Commission on Atmospheric Chemistry and Global Pollution (CACGP) of IAMAS. Both the Science Plan and the potential members were to be transmitted to IGBP and CACGP for their review. The Science Plan will be revised based on IGBP comments. SOLAS will also involve WCRP.

3.2.2 SCOR/IGBP Initiative on the Future of Ocean Research in Earth System Science

The 1999 SCOR Executive Committee Meeting approved funding for an exploratory meeting to discuss a framework for the next generation of international research projects in the area of ocean biogeochemistry. The planning workshop was held in Plymouth in late September 2000, chaired by Patrick Buat-Menard and John Field. Buat-Menard presented a summary of the workshop and a draft summary report from it. Input was sought on how SCOR should proceed, in partnership with IGBP, to ensure that international efforts in this field are coordinated so as to address gaps in our understanding and to meet the objectives of IGBP, taking into account the results of the synthesis of JGOFS and results from other programs. A draft summary from the Plymouth meeting was distributed at the General Meeting.

SCOR approved the formation of a small international planning group to develop the foci and tasks of the plan in greater detail and to report back to SCOR and IGBP by the end of 2001. Some members felt that the report needs more detail on inorganic geochemistry and the sediment-ocean interface. Peter Burkill was approved by SCOR to chair the planning committee. The names of the chair and a draft committee slate will be forwarded to IGBP for their consideration.

3.2.3 Progress Report on a SCOR Initiative to Enhance Graduate Education in the Marine Sciences in Developing Countries, Using a Regional Approach

A workshop was held in 1998 to study the problem of underrepresentation of individuals from developing countries in ocean sciences. The workshop was funded by the Rockefeller Foundation and held at the Bellagio International Study Center. Additional Rockefeller funding was secured for surveys of (1) potential funding sources for continuation of this activity and (2) curriculum issues. The survey of funding sources has been completed and will be restricted to use by SCOR for at least 12 months. The survey of curriculum issues will be completed in a few months. Individual participants in the Bellagio meeting have reported some success in developing regional activities. A group of interested individuals met during the General Meeting. They recommended SCOR sponsorship of continuing activities of this group and search for financial support for the activities, including a 20% salary position. Most SCOR members agreed that SCOR should not endorse a process for certifying oceanography departments, because such a process would undermine existing university programs.

SCOR approved continuation of the group as a planning group and agreed to fund a 20% person (if support can be located), not necessarily at the SCOR Secretariat. The next activity of the project will be a meeting held in conjunction with the Executive Committee meeting in Mar del Plata, Argentina in October 2001. José Stuardo was approved to chair the planning group (which will be comprised of the individuals who attended the Bellagio meeting) and Cintia Piccolo will be the SCOR Executive Committee Reporter. SCOR members agreed that this would be a planning group that might eventually develop into an affiliated program.

3.3 Affiliated Programs[3]

General Meetings are the occasions at which these international programs are reviewed by SCOR. The main points considered are whether the quality of the scientific program remains excellent, and is sufficiently international in scope and membership to justify continuing affiliation with SCOR. Each program is asked to report on the benefits accruing to their organization and SCOR by a formal affiliation. All of the following programs were approved for continued affiliation.

3.3.1 Acoustic Monitoring of the Global Ocean (AMGO)

A written report was received from AMGO and included in the briefing book. Cintia Piccolo, the SCOR Executive Committee Reporter for this group, reviewed the report briefly. This program is the successor to the Acoustic Thermometry of Ocean Climate (ATOC) program and is an outcome of SCOR Working Group 96 on Acoustic Monitoring of the World Ocean. Its purpose is to monitor large-scale phenomena in the global ocean. Preliminary analyses of ATOC data indicate that acoustic thermometry is a powerful tool for making routine measurements of large-scale ocean variability and heat content. The program is in the preliminary planning stage for a new effort in the Indian Ocean, with a source off Cocos Island. The monitoring program will use hydrographic stations being installed in the Indian Ocean region by the Comprehensive Nuclear Test Ban Treaty Organization. The next meeting of the group will be in April 2001 at the Southampton Oceanography Centre in the United Kingdom.

[3] Written reports were presented for many of these programs, but are not included herein. Please contact the program offices for information.

3.3.2 PAGES/SCOR International Marine Global Changes Study (IMAGES)

A written report was submitted by IMAGES for the General Meeting briefing book. Nick McCave, SCOR Reporter for this activity, made brief comments about IMAGES and referred interested individuals to the project's Web site (http://images.pclab.ifg.uni-kiel.de/index.html). (IMAGES is the ocean component of PAGES.) McCave turned the discussion over to Laurent Labeyrie, who is the new chair of IMAGES. McCave noted that Labeyrie and France are to be commended on provision of a research vessel for IMAGES cruises. SCOR members agreed that it would be appropriate for the incoming SCOR President to write a letter of appreciation to the agency that provides the ship.

Labeyrie noted that IMAGES is still having problems gaining access to the coastal waters of some nations. This is a problem that IOC should be able to help solve, although the fact that IMAGES collects sediment cores makes some countries suspect that they are doing resource surveys. Some cruises have been funded by local coastal nations and the Ocean Drilling Program.

3.3.3 InterRidge - International, Interdisciplinary Ridge Studies

The InterRidge office moved from France to Japan since the last SCOR meeting, with Agnieszka Adamczewska assuming the role of Executive Director. A large number of SCOR member nations are also members of InterRidge. A written report was provided for the briefing book. SCOR Executive Committee Reporter Nick McCave reminded SCOR members that InterRidge is a collaborative program among national groups to study the global mid-ocean ridge system. InterRidge includes several focus groups. A new working group on Hotspot-Ridge Interactions is being formed. Other recent and upcoming activities include exploring the possibility of attaching instruments to unused undersea telephone cables and planning to instrument the Cascadia Plate off the coast of Washington State in the United States. InterRidge has also begun discussions in the science and management communities about the sustainable management of vent areas.

3.3.4 International Antarctic Zone (iAnZone) Program

A written report was submitted to SCOR by the iAnZone program and included in the briefing book. SCOR Reporter Cintia Piccolo noted that program scientists recently published a series of papers in the journal *Deep-Sea Research* and recommended continued affiliation of iAnZone with SCOR, which was approved.

3.3.5 International Ocean Colour Coordinating Group (IOCCG)

IOCCG submitted a written report for SCOR's consideration. John Field, SCOR Executive Committee Reporter, reminded members that IOCCG promotes coordination among space agencies in the area of collection of ocean color data. IOCCG became affiliated with SCOR in 1998 and SCOR currently handles finances for the group. IOCCG is interested in education in developing nations; it has held a number of training courses over the years. At the time of the meeting, IOCCG had produced two reports, with a third one in press (on satellite color measurements of Case II waters). Work groups focus on topics such as calibration of sensors and performance of atmospheric correction algorithms. Also in progress is a pamphlet for the general public on "Why Ocean Color?" Closer links are being developed between IOCCG and GOOS. Continued affiliation with SCOR was approved.

4.0 ORGANIZATION AND FINANCES

4.1 Membership

Elizabeth Gross reported on changes in SCOR membership since September 1999. The Japanese SCOR Committee is considering an increase in its level of membership in SCOR. In order for this to be presented to the responsible agencies in Japan, a formal resolution was presented for approval by the General Meeting. One action item from the 1999 Executive Committee meeting has not been completed: the Officers were to appoint a member of the Executive Committee to act as Membership Officer, to assist the Executive Director in the effort to persuade more countries to become involved in SCOR activities. Other changes are

AUSTRALIA: has very recently replaced John Parslow with Ian S.F. Jones as one of the nominated members of SCOR from Australia, making the present three nominated members Angus McEwan, Terry Done, and Ian Jones**.**

CANADA: Raj Murthy, along with Björn Sundby and Ken Lee, are the Canadian members of SCOR.

NEW ZEALAND: Julie Hall has be replaced Ron Heath as a New Zealand representative and joins Terry Healy and Keith Hunter.

RUSSIA: The two newly nominated members from Russia are V.V. Sapozhnikov and A.G. Zatsepin; S.S. Lappo stays on as the third.

SWEDEN: Agenta Andersson-Nordstrom and Edna Graneli replace Nils Holm and Jarl Stromberg as the new members from Sweden.

USA: Robert A. Duce and Nancy Rabalais join Ed Houde as the three nominated members to SCOR from the United States.

The following changes should be noted for representative members of other ICSU Bodies.

IUGG: Dr. Paola Rizzoli, USA

IUPAP: Suk WangYoon, Korea

URSI: Martti T. Hallikainen, Finland

It was decided by the SCOR Officers that the Past President would serve as the Membership Officer.

4.2 Publications Arising from SCOR Activities

Elizabeth Gross presented a report on publications arising from SCOR activities since the 34th Executive Committee meeting. These include the following:

JGOFS Reports and Publications

The Changing Ocean Carbon Cycle: A Midterm Synthesis of the Joint Global Ocean Flux Study. Edited by Roger B. Hanson, Hugh W. Ducklow and John G. Field. Published by the Syndicate of the University of Cambridge, Cambridge, UK, 2000.

JGOFS Report No. 30. Publications 1988-1999. January 2000.

GLOBEC Reports and Publications

GLOBEC Newsletter - Issues 6.1 and 6.2.

GLOBEC Report No. 14: Report of a workshop on the use of CUFES for mapping spawning habitats of pelagic fish.

GLOBEC Special Contribution No. 3: Report on a workshop on the assimilation of biological data in couple physical/ecosystem models (in press).

GLOBEC Special Contribution No. 4: Update of GLOBEC national activities in 2000 (in press).

Publications Arising from SCOR Subsidiary Bodies

SCOR Working Group 98. *Worldwide Large-Scale Fluctuations of Sardine and Anchovy Populations.* R.A. Schwartzlose, J. Alheit, et al. *S. Afr. J. mar. Sci.* 21:289-347. 1999.

Ecosystem Effects of Fishing. Proceedings of an ICES/SCOR Symposium held in Montpellier, France, 16-19 March 1999. SCOR Working Group 105. Guest Editor: C. E. Hollingworth. ICES Journal of Marine Science Symposium Edition. Vol. 57, no. 3, June 2000. Academic Press.

Publications Arising from Other SCOR Activities

The Freshwater Budget of the Arctic Ocean: Proceedings of the NATO Advanced Research Workshop on The Freshwater Budget of the Arctic Ocean, Tallinn, Estonia, 27 April-1 May 1998. Edited by Edward Lyn Lewis, Associate Editors, E. Peter Jones, Peter Lemke, Terry D. Prowse and Peter Wadhams. NATO Science Series. Kluwer Academic Publishers. Series 2. Environment Security - Vol. 70

ICSOS. *Satellites, Oceanography and Society.* Edited by David Halpern. Elsevier Oceanography Series, 63. First edition 2000.

The SCOR Web site was also a topic for discussion. Björn Sundby has found the Web site to be a useful entry point to the range of activities of the international oceanographic community. (See comments below from the incoming Executive Director regarding the SCOR Website.)

4.3 Finances

An *ad hoc* Finance Committee was appointed at the beginning of the meeting (chaired by Vere Shannon and including Patrick Buat-Menard, Julie Hall, and Ilana Wainer) and it met with Elizabeth Gross and Ed Urban to review the state of SCOR finances for the past and current fiscal years. The *ad hoc* Finance Committee reported to the General Meeting on this review and presented a budget for 2001 activities and recommendations regarding the levels of membership contributions to SCOR for 2002 (Annex 7).

The committee examined the auditor's report for the 1999 fiscal year and found it to be in agreement with the more detailed financial statements prepared by the Executive Director. The final (post-audit) financial statement for 1999 is given in Annex 8. The major task of the *ad hoc* Finance Committee was to review and revise a draft budget for 2001 activities, taking into account requests for support contained in the reports of subsidiary bodies that had been discussed during the meeting.

The budget proposed for 2001 included approximately $772,000 in income and nearly $766,000 in expenses, resulting in a surplus for the year of about $5,000. (The surplus provides a buffer for SCOR operations in the event of unexpected expenses and delayed receipt of grants.) The budget provides sufficient funds for meetings of two new working groups established by the Executive Committee (WGs 119 and 120). A new expense in the 2001 budget in the part-time salary for a Finance Officer (Elizabeth Gross will fill this position upon her retirement as the SCOR Executive Director.)

The committee expressed concerns that several working groups approved at previous meetings had not yet held their first meeting. This was favorable for SCOR's finances in 2000, but bad for SCOR otherwise. The committee expressed its expectation that the incoming Executive Director would be able to locate new sources of funding.

Finally, the *ad hoc* Finance Committee recommended that the levels of the five categories of SCOR membership dues for the year 2002 should only be increased by an amount equivalent to the increase approved by ICSU for its members, namely 1%. Many currencies have depreciated against the U.S. dollar, so many nations have already experienced significant increases in their dues because of exchange rate changes.

Participants in the General Meeting approved the report of the *ad hoc* Finance Committee. SCOR members also approved two authorized signatories for the two SCOR checking accounts (for SCOR and IOCCG): Elizabeth Gross and Ed Urban.

4.4 SCOR Secretariat

As reported in the President's comments, Ed Urban was appointed as the new Executive Director of SCOR, beginning immediately after the SCOR General Meeting, on October 16, 2000. Wesley Anne

Ross will continue as SCOR's Administrative Officer and Elizabeth Gross will become the SCOR Finance Officer, responsible for assisting the Executive Director with budgeting, financial tracking, and proposals and contracts.

Ed Urban described his goals for the coming years.

- Create a smooth transition between Executive Directors.

Elizabeth Gross and the individuals who have volunteered for the SCOR Executive Committee and its working groups over the years have created a well-run and successful organization. Urban considers it fortunate that Gross will continue indefinitely on a part-time basis to assist him in the transition and to help with financial management.

- Increase and diversify funding of SCOR activities.

Urban plans to seek funding from traditional sources, as well as new sources, including new member nations. He hopes to add three nations to the SCOR ranks in the coming year. This will help SCOR financially and will strengthen SCOR by bringing more diversity to the organization.

SCOR is presently highly dependent on U.S. sources of funding. Urban would like to explore new sources of funding within the United States and in other nations, from government agencies and private foundations. He also would like to enlist help from national delegates to raise funding for SCOR activities of interest to their nations.

- Use the SCOR Web site more effectively.

Urban stated his belief that SCOR could use the World Wide Web more effectively to communicate SCOR activities to the oceanographic community and among SCOR national committees. For example, the *SCOR Handbook* could be put on the SCOR Web site in a searchable format and including more information and links for each SCOR Working Group. Increasing use of the Web has an economic cost that must be balanced against the benefits obtained. Fortunately, work-study students are available at Johns Hopkins University to help SCOR with Web applications.

- Continue outreach to scientists from developing nations and develop new sources for funding SCOR capacity-building activities.

SCOR has received funding from the U.S. National Science Foundation for the past 17 years to help hundreds of scientists from developing nations and nations with economies in transition attend SCOR-related meetings. Urban believes this is an important program that could benefit from sponsorship by other nations.

- Explore new partnerships with intergovernmental and nongovernmental organizations.

SCOR is in a good position to provide independent non-governmental scientific advice to intergovernmental and nongovernmental organizations more frequently. Several different ICSU and intergovernmental groups deal with ocean topics, as evidenced by past and present collaborations. New partnerships with SCOPE, ICES, WCRP, and others could be fruitful.

4.5 Amendments to the SCOR Constitution

Changes in the SCOR Constitution are only allowed at General Meetings. A circular letter dated August 17, 2000 informed National Committees of two proposed changes to the SCOR Constitution (see Annex 9). One change would make it possible for the designated representative of the President of an Affiliated Organization to serve as an ex-officio member of the Executive Committee if the President of the affiliated organization does not wish to fulfill this role. The second change is intended to ensure that the President and Secretary of SCOR do not normally rotate off the Executive Committee at the same time. SCOR members approved these changes and they were forwarded to ICSU for approval.

5.0 RELATIONS WITH INTERGOVERNMENTAL ORGANIZATIONS

Reports were requested from the following organizations. In the absence of their representatives at the General Meeting, matters requiring action by SCOR, if any, were presented by the Executive Director.

5.1 Intergovernmental Oceanographic Commission (IOC)

SCOR and IOC cooperate in a number of different activities and cooperation has increased significantly in the past year. Elizabeth Gross, Umit Unluata (IOC's representative at the meeting), and John Field reported on the progress of these activities since the 1999 Executive Committee meeting, as well as some new developments.

IOC organized a comprehensive review of the entire IOC science program called for by IOC's Twentieth General Assembly (June 1999). The President of SCOR participated in the review.

IOC, SCOR, and SCOPE are conducting an International Assessment of Ocean Science for Sustainable Development, based on a meeting held in Potsdam, Germany in 1999, called Oceans 2020. The meeting was attended by approximately 60 individuals and produced a wealth of information. Elizabeth Gross has been involved in coordinating production of the resulting book. The activity will also include a short booklet written by a science writer.

The General Bathymetric Chart of the Oceans (GEBCO) was last published in 1982 (5^{th} edition) and is transitioning to digital maps. These maps are important for all types of oceanography. GEBCO will celebrate its 100-year anniversary in 2003. The Guiding Committee for GEBCO is cosponsored by SCOR, and SCOR has been asked to co-sponsor the celebration. This matter

will be taken up at a later SCOR meeting. GEBCO appreciates the work of SCOR Working Group 107.

IOC has requested that SCOR, SCAR, and WMO assist it with a review of the needs for coordination of international Southern Ocean scientific programs. IOC will form an ad hoc group that will report to IOC at their assembly in June 2001. Elizabeth Gross suggested that appropriate SCOR representatives could include someone from the iAnZone program and someone from the Southern Ocean GLOBEC component.

IOC is attempting to develop a new policy on data exchange. This policy has been motivated by efforts in some European countries to commercialize ocean data. Such commercialization goes against ICSU and SCOR principles of unrestricted data exchange. Restrictions on data access would put GOOS and other ocean programs in jeopardy. The situation is presently at an impasse. IOC will convene a council of government representatives to try to resolve the issue. SCOR and ICSU will be invited to participate.

The JGOFS/IOC CO_2 Advisory Panel was re-formed as the SCOR/IOC CO_2 Panel. The terms of reference and membership were presented, as well as a draft report from the recent first meeting of the panel. Interest in this issue has increased over the past decade because of the accomplishments of JGOFS and WOCE in carbon measurements. Terms of reference were presented in the proceedings of the 1999 Executive Committee meeting. The approved committee includes:

Douglas W.R. Wallace (chair), Universitat Kiel (GERMANY)
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Jacqueline Boutin, Université Pierre et Marie Curie (FRANCE)
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Dileep Kumar, National Institute of Oceanography (INDIA)
Yukihiro Nojiri,, National Institute for Environmental Studies (JAPAN)
Corinne Le Quéré, Max-Planck-Institut für Biogeochemie (GERMANY)
Andrew Watson, University of East Anglia (UNITED KINGDOM)

In January 1999, IOC organized an Expert Consultation for the Coastal Ocean Advanced Science and Technology Studies (COASTS) Programme, which was chaired by Allan Robinson. The fundamental goal of the COASTS program is to develop the scientific and technical basis necessary for the management and health of the coastal oceans. The First COASTS Global Workshop (CGW-1) focused on physical processes and circulation and was co-sponsored by SCOR, the European Commission, and IOC. SCOR participated in the first IOC COASTS effort by co-funding the first workshop and two volumes (No. 10 and 11) of *The Sea*. SCOR is cosponsoring the new phase of the IOC COASTS effort and nominated Björn Sundby to its planning committee, chaired by Allan

Robinson. The new activity will result in two new volumes of *The Sea*, one on multi-scale interdisciplinary processes and another on regional studies. The latter will include 32 chapters focused on different regions, each written by 3 or 4 scientists. SCOR included funds in its 2001 budget to support the activity.

SCOR and IOC also cooperate in the previously described GLOBEC and GEOHAB programs, programs on submarine groundwater discharges (see SCOR Working Group 112), capacity building, and indirectly in GOOS (ICSU consults SCOR for nominations).

In recent years, many new developments in the Global Ocean Observing System (GOOS) have occurred. Two landmark documents, *Strategic Plan and Principles for GOOS* and the *GOOS 1998 Prospectus* were published in 1998 and have been important in guiding the planning and implementation as well as fund raising for various GOOS activities. These documents are available from the GOOS Support Office in the IOC Secretariat. Another development related to GOOS is the establishment of the Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM). A new regional IOC office has been established in Perth, Western Australia. Established with support from the government of Western Australia, this office will focus on GOOS-related matters in the Indian Ocean basin.

Following a review of the Training, Education, and Mutual Assistance (TEMA) Programme, IOC changed the structure of capacity-building activities within IOC. TEMA is no longer considered as a separate program but rather as an essential component of all three IOC sections: science, ocean services, and observing systems. IOC offered to help follow up on the SCOR Bellagio Workshop initiative that aims to establish graduate education in oceanography and environmental marine sciences in developing countries (see Item 3.2.3). The need for this was discussed in both the IOC/WESTPAC Sub-Commission meeting and the IOC General Assembly.

5.2 World Meteorological Organization

WMO submitted a short report, which was tabled, but no presentations were made.

5.3 International Council for the Exploration of the Sea (ICES)

No report was available from ICES. Elizabeth Gross reported that ICES cooperates with GLOBEC in the Cod and Climate Change program and has an interest in GEOHAB.

5.4 North Pacific Marine Science Organization (PICES)

Elizabeth Gross reported that PICES requested that SCOR co-sponsor the 10th Anniversary PICES meeting in Victoria, Canada. SCOR agreed to co-sponsor the meeting. SCOR funded a number of scientists from developing countries to attend the PICES "Beyond El Niño" Conference.

5.5 Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP)

GESAMP is an organization of the United Nations and is supported by 8 different UN agencies. It has existed for 30 years and the UN decided that now would be a good time to have it reviewed. Robert

Duce, the Chair of GESAMP, raised two issues for SCOR action. SCOR was requested to nominate two members to the review group. Julie Hall and S. Krishnaswami were nominated by SCOR (between meetings) for this duty, and the names have been accepted.

SCOR and GESAMP have been discussing collaboration to examine plans for fertilizing large areas of the ocean, either to draw down CO_2 or to increase productivity and eventually fishery yields. The American Society of Limnology and Oceanography (ASLO) also is planning activities on this topic and SCOR and GESAMP have decided to collaborate with ASLO at the present time, rather than developing a parallel effort.

6.0 RELATIONS WITH NON-GOVERNMENTAL ORGANIZATIONS

6.1 International Council for Science (ICSU)

No report was presented by ICSU. Larry Kohler assumed the role of Executive Director of ICSU in the past year. A new Committee on Scientific Planning and Review will conduct a limited review of all ICSU bodies, including SCOR, in the near future.

6.2 ICSU Programs

6.2.1 International Geosphere-Biosphere Programme (IGBP)

Most items of mutual interest to SCOR and IGBP were discussed under previous agenda items. Wendy Broadgate from IGBP described the emerging Phase II structure of IGBP and reminded SCOR of the IGBP Open Science Conference in Amsterdam in July. John Field noted that SCOR has had excellent collaboration with IGBP.

6.2.2 World Climate Research Programme (WCRP)

A written report provided information on WCRP activities relevant to SCOR (e.g., WOCE, CLIVAR, SCOR/WCRP WG 110 on Air-Sea Fluxes). The final WOCE conference is planned for 2002. CLIVAR is emerging and gaining momentum. The transition from WOCE to CLIVAR has been very smooth. Bob Duce noted that scientists from WCRP programs were involved in SOLAS planning.

6.3 ICSU Unions and Committees

Reports were requested from all ICSU organizations that have representatives to SCOR.

6.3.1 Scientific Committee on Problems of the Environment (SCOPE)

Elizabeth Gross reported on SCOPE**.** SCOR has considerable contact with SCOPE recently because of the Oceans 2020 activity. SCOPE focuses primarily on terrestrial environmental issues, although it has occasional activities related to the ocean. For example, SCOPE has a Working Group on Land-Ocean Nutrient Fluxes: Silica Cycle with LOICZ.

6.3.2 Scientific Committee on Antarctic Research (SCAR)

No written report was provided. As noted earlier, IOC has requested that SCOR, SCAR, and WMO assist it with a review of the needs for coordination of international Southern Ocean scientific programs.

6.3.3 Committee on Space Research (COSPAR)

No written report was provided.

6.3.4 International Union of Pure and Applied Chemistry (IUPAC)

IUPAC submitted a written report and David Turner represented IUPAC at the General Meeting. IUPAC is in the process of transitioning from a structure with 36 commissions that function as standing groups to project-based activities, with all commissions abolished in 2001. It is not clear how all existing functions, for example the IUPAC book series, will fare in the transition. Because of the success of the SCOR-IUPAC Working Group 109 on Biogeochemistry of Iron in Seawater, IUPAC is interested in collaborating with SCOR on another working group. They will have a better idea in 2001 what kind of project might be appropriate. One potential focus would be on estuarine particles. SCOR agreed to write a letter to IUPAC thanking the organization for their cooperation in WG 109 and stressing the importance of the IUPAC book series.

6.3.5 International Union of Pure and Applied Physics (IUPAP)

IUPAP did not submit a report.

6.3.6 International Union of Theoretical and Applied Mathematics (IUTAM)

IUTAM did not submit a report.

6.3.7 Union Radio Scientifique Internationale (URSI)

URSI submitted a written report. Elizabeth Gross noted that URSI seems to be interested in SCOR activities and SCOR should contact URSI to reciprocate. This organization has an interest in wave propagation and remote sensing.

6.3.8 International Union of Geodesy and Geophysics (IUGG)

IUGG did not submit a written report.

6.4 Affiliated Organizations

Each of the following affiliated organizations is represented on the SCOR Executive Committee with an ex-officio member.

6.4.1 International Association for Biological Oceanography (IABO)

IABO submitted a written report. IABO has a strong interest in the Census of Marine Life program, and thus in the SCOR Working Group 118 on New Technologies for Observing Marine Life.

6.4.2 International Association for Meteorology and Atmospheric Sciences (IAMAS)

IAMAS was represented at the meeting by Robert Duce. The primary activity of IAMAS has been preparation for its assembly next year, including a symposium on monsoons. IAMAS is co-sponsoring

a session at the IAPSO/IABO meeting on ocean-atmosphere biogeochemical coupling. Like SCOR, IAMAS has a capacity-building activity.

6.4.3 International Association for the Physical Sciences of the Ocean (IAPSO)

IAPSO was represented at the meeting by Vere Shannon. He related that IAPSO and IABO have developed a good scientific agenda for the meeting in Mar del Plata, Argentina in 2001. IAPSO has secured support for a new medal to recognize excellence in physical and chemical oceanography. SCOR was assured that its logo and name would appear on future announcements for the meeting, since SCOR is a co-sponsor. Shannon also pointed out that IAPSO would be participating in, and having symposia at, the IUGG General Assembly in Sapporo, Japan in 2003. SCOR co-sponsorship will be requested next year.

6.5 Corresponding Organizations

No written reports were received in response to requests sent to these organizations.

6.5.1 Arctic Ocean Sciences Board (AOSB)

AOSB has been a corresponding member of SCOR for many years. Lou Brown, the AOSB Director, made a short verbal presentation. AOSB is now involved in an activity on Arctic polyna. The organization recently organized (with SCOR assistance) the results of a North Atlantic Treaty Organization workshop inputs to the Arctic Ocean; the results will be published as a NATO volume. AOSB is promoting new observations of sea ice thickness and studies of Arctic-subarctic linkages. Lou Brown expressed thanks to John Field and Elizabeth Gross for their service to SCOR and cooperation with AOSB.

6.5.2 Engineering Committee on Oceanic Resources (ECOR)

No written report was received.

6.5.3 Confederation Mondiale des Activités Subaquatiques (Scientific Committee)

No written report was received.

6.6 Other Organizations

6.6.1 The Oceanography Society (TOS)

The TOS Scientific Meeting will take place in Miami in April 2001; SCOR is co-sponsoring the meeting. One SCOR working group (WG 111) will meet in conjunction with the TOS meeting.

6.6.2 Partnership for Observation of the Global Ocean (POGO)

POGO is based on the premise that institutions can and should be instrumental in implementing global ocean observations. POGO could serve as a means to get the academic community more engaged in implementing GOOS. POGO is also interested in capacity building and could help SCOR implement its Regional Graduate Schools of Oceanography Program. Elizabeth Gross represented SCOR at the first POGO meeting in December 1999. The second meeting will take place in late November and Ed

Urban will attend for SCOR. Dr. Shubha Sathyendranath (Canada) has recently been appointed as POGO's first Executive Director. POGO is moving in 2001 to being supported by member dues.

7.0 FUTURE MEETINGS

7.1 Future SCOR Meetings

The Thirty-fifth SCOR Executive Committee Meeting will take place in Mar del Plata, Argentina on October 29-30, 2001 in conjunction with *2001: An Ocean Odyssey*, the joint assembles of IAPSO and IABO. Ed Urban will work with local organizers such as Cintia Piccolo to select a meeting site and hotel. All delegates are welcome to attend Executive Committee meetings. Reports of affiliated organizations will be tabled.

The SCOR General Meeting should take place in 2002, between September and early November. The Japanese National Committee for SCOR has expressed an interest in hosting this meeting; SCOR has not held an annual meeting in Japan for some time. Preliminary arrangements were discussed.

7.2 Other Meetings of Interest to SCOR

Elizabeth Gross presented a list of international meetings of interest to SCOR during the next two years (see Annex 10). SCOR agreed to cosponsor and/or support a number of these events, particularly through a provision of travel grants to scientists from developing nations.

8.0 OTHER BUSINESS

8.1 International Conference on Satellites, Oceanography, and Society (ICSOS)

This conference was planned by David Halpern as a celebration of the 20th anniversary of space oceanography and the international Year of the Ocean. Twenty-eight countries were represented at the conference, which took place in Lisbon in August 1998 and was cosponsored by SCOR. Halpern presented his final report and a copy of the book resulting from the conference. The book contains 19 peer-reviewed contributions and was published by Elsevier.

ACRONYMS

AMGO	Acoustic Monitoring of the Global Ocean
AOSB	Arctic Ocean Sciences Board
ATOC	Acoustic Thermometry of Ocean Climate
CACGP	Commission on Atmospheric Chemistry and Global Pollution (IAMAS)
CCC	Cod and Climate Change (ICES and GLOBEC)
CCCC	Climate Change and Carrying Capacity (PICES and GLOBEC)
CLIVAR	Climate Variability Study (WCRP)
CMTT	Continental Margins Task Team (JGOFS and LOICZ)
COSPAR	Committee on Space Research (ICSU)
CUFES	Continuous Underway Fish Egg Sampler
DIS	Data and Information Services (IGBP)
DMS	dimethyl sulfide
DMTT	Data Management Task Team (JGOFS)
ECOR	Engineering Committee on Oceanic Resources
ENSO	El Niño-Southern Oscillation
EPSG	Equatorial Pacific Synthesis Group (JGOFS)
FAO	Food and Agriculture Organization (FAO)
FOBGC	Future of Ocean Biogeochemistry (IGBP and SCOR)
GAIM	Global Analysis, Interpretation, and Modelling (IGBP)
GCM	general circulation model
GCMD	Global Change Master Directory
GEBCO	General Bathymetric Chart of the Ocean (IOC)
GECFS	Global Environmental Change and Food Systems (IGBP, WCRP, and IHDP)
GEOHAB	Geography and Oceanography of Harmful Algal Blooms program (SCOR and IOC)
GESAMP	Group of Experts on the Scientific Aspects of Marine Environmental Protection (UN)
GEWEX	Global Exchange of Water Experiment
GLOBEC	Global Ocean Ecosystems Dynamics program (SCOR, IGBP, and IOC)
GLOCHANT	Group of Experts on Global Change in Antarctica (SCAR)
GODAE	Global Ocean Data Assimilation Experiment
GOOS	global ocean observing system
HNLC	high nutrient-low chlorophyll
IABO	International Association for Biological Oceanography (IUBS)
IAMAS	International Association for Meteorological and Atmospheric Sciences (ICSU)
iAnZone	International Antarctic Zone program
IAPSO	International Association for the Physical Sciences of the Ocean (IUGG)
ICES	International Council for the Exploration of the Sea
ICSOS	International Conference on Satellites, Oceanography, and Society
ICSU	International Council for Science
IGBP	International Geosphere-Biosphere Programme (ICSU)
IHDP	International Human Dimensions Programme (ICSU)
IMAGES	International Marine Global Changes Study (IGBP/PAGES and SCOR)
IOC	Intergovernmental Oceanographic Commission (UN)
IOCCG	International Ocean Colour Coordinating Group
IOSG	Indian Ocean Synthesis Group (JGOFS)
IPO	international project office
IRD	Institut de recherche pour le Développement
IUBS	International Union of Biological Sciences (ICSU)
IUGG	International Union of Geodesy and Geophysics (ICSU)

IUGS	International Union of Geological Sciences (ICSU)
IUPAC	International Union of Pure and Applied Chemistry (ICSU)
IUPAP	International Union of Pure and Applied Physics (ICSU)
IUTAM	International Union of Theoretical and Applied Mathematics (ICSU)
JCOMM	Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology
JGOFS	Joint Global Ocean Flux Study (SCOR and IGBP)
LOICZ	Land-Ocean Interactions in the Coastal Zone (IGBP and IOC)
LMR	living marine resources
NASG	North Atlantic Synthesis Group (JGOFS)
NOAA	National Oceanic and Atmospheric Administration (USA)
NODC	National Ocean Data Center (NOAA)
NPTT	North Pacific Task Team (JGOFS)
NPIW	North Pacific Intermediate Water
NSF	National Science Foundation (USA)
OCMIP	Ocean Carbon Model Intercomparison Project (JGOFS and IGBP)
ONR	Office of Naval Research (USA)
OPC	Optical Particle Counter
OSC	open science conference
Pg	Petagrams
PICES	North Pacific Marine Science Organization
P-JTT	Paleo-JGOFS Task Team (JGOFS)
POGO	Partnership for Observation of the Global Ocean
PORSEC	Pacific Ocean Remote Sensing Conference
SCAR	Scientific Committee on Antarctic Research (ICSU)
SCOPE	Scientific Committee on Problems of the Environment (ICSU)
SCOR	Scientific Committee on Oceanic Research (ICSU)
SOLAS	Surface Ocean-Lower Atmosphere Study (SCOR, IGBP, CACGP, WCRP)
SOSG	Southern Ocean Synthesis Group (JGOFS)
SPACC	Small Pelagics and Climate Change (GLOBEC)
SSC	scientific steering committee
Sv	Sverdrups
TEMA	Training, Education, and Mutual Assistance Programme (UN)
TOS	The Oceanography Society
UNESCO	United Nations Education, Science, and Culture Organization
URSI	Union Radio Scientifique Internationale
WCRP	World Climate Research Programme (WMO, IOC, and ICSU)
WG	Working Group
WMO	World Meteorological Organization
WOCE	World Ocean Circulation Experiment (WCRP)

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ANNEX 2 – Agenda

	Tues., October 10	Wed., October 11	Thurs., October 12	Friday, October 13
8:00	**CONTINENTAL BREAKFAST AVAILABLE FROM 8:00 - 9:00 IN OR NEAR THE MEETING ROOM**			
8:15				
8:30				
8:45				
9:00	1.1 Opening, Arrgmts.	SCOR participants join Opening Session of Symposium on Coastal Nutrient Enrichment	3.2.1 GLOBEC	6.3 ICSU bodies
9:15	1.2 Approval of Agenda			
9:30	1.3 President's Report			6.4 Affiliated Organizations
9:45			3.2.1 SOLAS	
10:00	1.4 - 1.6 Nominations,			6.5 Corresponding Org'ns
10:15	ad hoc Committees	**COFFEE**		6.6 Other Org'ns
10:30	**COFFEE**	Opening Session of Symposium on Coastal Nutrient Enrichment		**COFFEE**
10:45	2.1 Former WGs		**COFFEE**	6.6 Other Org'ns cont'd
11:00			3.2.2 FOBGC	4.3 Finance
11:15	2.2 Current WGs			
11:30				7.0 Meetings
11:45		**LUNCH**	3.3 Affiliated Programs	
12:00				**LUNCH**
12:15	8.1 - ICSOS wrap-up		**LUNCH**	
12:30	**LUNCH**			
12:45		2.3 WG proposals		
1:00				3.2.3 Regional Graduate Schools of Oceanography
1:15			3.3 Affiliated Programs (continued)	
1:30	2.2 Current WGs (continued)			
1:45			4.1 Membership	
2:00			4.2 Publications	2.4 Disciplinary Balance
2:15		**COFFEE**		
2:30		2.3 WG proposals (continued)	4.4 Secretariat	
2:45				8.0 Other Business
3:00			4.5 Constitution	
3:15			**COFFEE**	Closing
3:30	**COFFEE**	3.1.1 JGOFS	5.1 IOC	
3:45	2.2 Current WGs (continued)			
4:00			5.2-5.5 Intergovernmental Organizations	
4:15		3.1.3 GEOHAB		
4:30	Special Lecture on JGOFS Synthesis by Hugh Ducklow Chair, JGOFS SSC		5.5.1 GESAMP	
4:45				
5:00			6.1, 6.2 ICSU, IGBP WCRP	
5:15		**SYMP. RECEPTION Great Hall**		
5:30	**ADJOURN**		**ADJOURN**	
5:45				
6:00				
7:00			**SCOR RECEPTION Members' Room**	

ANNEX 3 - Working Group Proposal on Developing Quantitative Metrics for Marine Ecosystems from Environmental, Ecological, and Fisheries Perspectives

Background and Rationale

The need for precautionary management of marine resources is both obvious and crucial for fisheries. Undoubtedly, those having a realistic appreciation of species interactions that occur in the sea have realized that management on a multispecies or ecosystem basis should be a logical way to proceed. Given the practical and theoretical difficulties involved in such management, the conventional procedures, focusing on single species, have been a sensible initial approach. However, it is becoming ever more clear that these conventional procedures are not working consistently, and more attention to broader ecosystem aspects is required. A recent book entitled *Reinventing Fisheries Management* (Pitcher et al., 1998) emphasized the need to consider ecosystem restoration as a new objective for the management of marine resources. An international SCOR/ICES/IRD conference, held in Montpellier, France in 1999, on *Ecosystem Effects of Fishing* emphasized the need for considering a more global approach for fisheries sustainability at the level of the ecosystem. There is also increasing support and concern for eco-labelling of products from natural resources.

It has been proposed that fishery products could apply for certification that they come from sustainably managed fisheries and production systems, both in terms of the resource and its environment. Currently, few eco-labelling schemes for fish are in operation, though according to FAO it seems evident that over the near to medium term this practice will become common in fish markets. Scientific research must play an important role by addressing these questions and this should be viewed as a new challenge and opportunity to develop a framework for the exploitation of marine resources. This represents a paradigm shift, in which the ecosystem level should be viewed as an integrative level for ecological studies, that was initiated by the SCOR Working Group 73 on Ecosystem Theory for Biological Oceanography in the 1980s. However, the ecosystem scale is not a scale that has received much attention in scientific fishery studies even though an ecosystem strategy for the assessment and management of international coastal ocean waters now exists with the Global Environmental Facility's Large Marine Ecosystem initiative. The definition of quantitative metrics for marine ecosystems from environmental, ecological, and fisheries perspectives could provide a comprehensive bridge among the different scientific disciplines, but also could constitute an efficient way to communicate those results for management purposes. The exploitation of renewable resources must respect marine diversity and ecosystems and we must direct our efforts, as scientists, toward reconciling long-term environmental, ecological, economic, and social objectives. The aim of this working group will be to promote a sound theory to underpin ecologically sustained fisheries and to develop a scientific approach for defining metrics to assess marine ecosystems. This will give new and refreshing insights, which will be essential for achieving political and management goals.

Objectives

The general objective is to develop theory to evaluate changes in marine ecosystems (both states and processes) from environmental, ecological, and fisheries perspectives.

This means

- To define generic metrics that can be used in marine environments, fisheries, or for assemblage of exploited fish populations or marine ecosystems.
- To formulate these metrics in mathematical or statistical terms.
- To assess when values of a metric are meaningful both statistically and/or ecologically (i.e., to test null hypothesis and apply sensitivity analysis).
- To apply these metrics to specific data sets or using specific models (such as Ecopath, Ecosim, Ecospace, Osmose) in order to evaluate their usefulness.

Challenges

- To establish an international network of scientists interested in developing ecosystem metrics in different fields and disciplines for the marine environment.
  This follows the recommendations of several recent international symposia on the functioning and exploitation of marine ecosystems.

- To develop theoretical research on ecosystem metrics for application to marine ecosystems.
  Ecosystem metrics have mainly been developed in terrestrial ecology and a substantial effort is still needed for marine ecosystems.

- To develop a scientific basis for "eco-labelling" marine products.
  Fishery products could apply for certification that they originate from sustainably managed fisheries and production systems, both in terms of the resource and its environment.

Terms of Reference

- To review the current state of knowledge in different marine and terrestrial disciplines relevant to the development of metrics for marine ecosystems (environmental, ecological, and fisheries).

- To review theories (hierarchy, cascade) and metrics that have been developed in terrestrial ecology and to assess their utility for marine ecosystems.

- To develop new metrics to study the functional role of species in ecosystems, exploitation, and environment using output of models (Ecopath, Ecosim and Osmose) or available time series (i.e., fish catch statistics), and using satellites and GIS (Geographic Information System) (see the addendum for details).

- To apply these metrics in a comparative way to characterize ecosystem states, changes, and functioning.

- To assess the utility of these metrics for management purposes and for the sustainable utilization of renewable resources.

The project should start in year 2001 for a 4-year period if accepted as a SCOR working group in 2000. Two workshop groups will be organized to promote and discuss the definition and use of ecosystem metrics for ecologically sustained fisheries during the next four years. An edited book that will cover those topics will be published in 2004.

Proposed Membership

Some names of scientists who are actively working in this field and who will be willing to participate are proposed. Different disciplines are proposed to adequately cover topics and appropriate geographic distribution.

Suggested Chairpersons

- France: Dr. Philippe Cury[4] (IRD) Contact person (Marine ecologist-Modeller)
- Philippines/Malaysia: Dr. Villy Christensen[5] (ICLARM) Contact person (Modeller)

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Possible Funding

Preliminary contacts made with FAO, IRD (Institut de Recherche pour le Développement), GLOBEC-SPACC, and FAC (French fond de Coopération) have been very positive and if the present proposal is accepted by SCOR, it appears that ancillary supplementary funding will be obtained from these agencies.

- SCOR for two workshops
- IRD (France), Fond d'Aide et de Coopération & French-South Africa joined project "Vibes"
- GLOBEC/SPACC (Small Pelagic and Climate Change)
- FAO (Food and Agriculture Organization-Rome)

Conclusion

This project will address

- The need to develop a multidisciplinary approach for marine ecosystems.
- The need to quantify ecosystem status, function, and changes.
- The need to define "eco-labelling" for marine products on an objective scientific basis tractable for managers and decision makers.
- The need to use these metrics to better define the health and the level of exploitation of the ecosystems.

ADDENDUM

Constraints

The ecosystem metrics should

- be reasonably simple to compute and understand,
- have an intuitively reasonable interpretation,
- be discussed and argued in a comprehensive way (statistically, mathematically, and/or ecologically),
- have some appropriate foundation in terms of an ecological theory, statistics, or mathematics, and
- be applicable to marine ecosystems.

Environmental Metrics

Using satellite imagery (particularly in upwelling and coastal areas):

- spatial statistics of the upwelling event/region/system,
- habitat structure (heterogeneity and complexity at different scales), and
- triad metrics (i.e., how to quantify retention, concentration, and production processes).

Ecological Metrics

- Diversity and functioning metrics: Diversity index, similarity index, richness, evenness, dominance, keystone, redundancy, community importance, functional similarity, functional redundancy, functional complementarily, functional impact, functional strength
- Multivariate methods : Ordination, Tree, PCA, CA, or other statistical analyses
- Aggregated indicators of ecosystem status: Size spectra
- Emergent property metrics: Food web from mass balanced models, primary production required to sustain the fisheries, mean trophic level, transfer efficiency between exploited trophic levels, FIB index

Fisheries Metrics

- Using catch time series: Changing regimes in ecosystem dynamics (change in means and variance structure)
- Using fishing effort: Characterize fishery activities, biomass distribution, and catch distribution
- Using acoustic surveys: Characterize biomass distribution and overlap between biomass distribution and catch
- GIS Metrics: Using GIS to determine ecosystem metrics

Socio-Economic Metrics

- ecosystem value/fisheries value, ecosystem services, economic value of non-consumptive versus consumptive uses, ecosystem health, and ecosystem integrity.

References

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ANNEX 4 - Working Group Proposal on Marine Phytoplankton and Global Climate Regulation: The *Phaeocystis* Species Cluster as a Model

Scientific Rationale: Background

The ocean's microalgae play a key role in the cycling of elements that determine, to a large extent, the global climate. The ocean's uptake of carbon dioxide (CO_2), the "greenhouse" gas that is held responsible for most of the global warming that is discussed so widely today, is mediated significantly by photosynthetic fixation of marine phytoplankton and subsequent sequestration after sinking of algal biomass to the deep sea. Thus, excess carbon emitted by fossil fuel combustion and burning of terrestrial plants is removed from the atmosphere. Another gas that influences climate, but one that may mitigate predicted levels of global change due to greenhouse warming, is dimethyl sulfide (DMS), produced biogenically during interactions between components of the plankton system in seas and oceans. Once in the atmosphere, DMS (the gas that causes "the smell of the sea") is oxidised and the products of this process form cloud condensation nuclei. Over remote ocean areas most cloud condensation nuclei are derived from DMS; it is well known that clouds are "the wild card in the deck" in climate prediction. Fifty to sixty percent of Earth's total natural sulfur emissions to the atmosphere is contributed by DMS, and ninety percent of this flux originates in marine environments.

There is one family in the large taxonomic array of marine algae that is by far the most important as an intermediary in the transfer of carbon and sulfur between ocean and atmosphere and vice versa, and of this family (the *Prymnesiophyceae*) only two species (*Emiliania huxleyi* and *Phaeocystis globosa*) are usually targeted as the focus of research because they can grow to such abundance ("blooms") that they become visible in satellite images of ocean color and reflectance. It is generally assumed that their role in the biogeochemical cycling of climate-relevant elements, including trace metals that limit plankton growth, is in proportion to their abundance. Of these two, *Phaeocystis* is probably the most influential, although *Emiliania* hits the headlines most often because it is present more prominently, in marine sediments and most spectacularly as massive fossil deposits of their calcium carbonate microshells in coastal rock formations.

A recent estimate of the contribution of *Phaeocystis* to annual DMS fluxes from sea to air on a global scale suggests that this genus alone is responsible for up to 17% of this flux; there must be times of the year when this percentage is much higher. Carbon fluxes mediated by the *Phaeocystis* species cluster, blooms of which can be found from pole to pole, are probably comparably high. In spring, by far the most carbon injected into the ecosystem of many ocean and shelf sea regions by primary producers is derived from the polysaccharides of the large mucous colonies of *Phaeocystis* species. This result has been found in many sea and ocean areas: in the North Sea, in Arctic seas, and in the Southern Ocean around Antarctica. Elsewhere, even in the open ocean, *Phaeocystis* may also be prominent as single cells, but since colonies are far more easily detected (even with the naked eye) most investigations have been done with colonies in the nutrient-rich regions where they dominate.

Significance

It is clear from the foregoing that *Phaeocystis* is an ideal model organism for studies of the role of marine microalgae (responsible for 90% of marine primary productivity) in global biogeochemical cycling and climate regulation. However, in the research plan of several international programmes that have been implemented recently (SOLAS; the French PROOF) and in proposals submitted to NSF and the European Commission it is pointed out that "phytoplankton" should no longer be treated as a bulk property in biogeochemical models. *Phaeocystis* is ideal to single out in this respect. The carbon and sulfur cycles are intimately entangled in *Phaeocystis*, and iron (Fe) and manganese (Mn), metals now known to govern microalgal performance over much of the ocean, accumulate to high concentrations in *Phaeocystis* colonies due to the specific microenvironment inside. In other words, the cycling of all the elements that are relevant in marine and atmospheric biogeochemistry (and modelling thereof) come together in this single phytoplankter. It is now known that the fluxes of these elements vary by orders of magnitude on spatial and temporal scales, and we are only beginning to understand the meteorological, physical, biological, and chemical factors that regulate this variation. It cannot come as a surprise that *Phaeocystis* has gradually become the focus of an

international group of scientists from a variety of disciplines ranging all the way from meteorology and atmospheric chemistry to ecophysiology.

Work plan

A working group, first with representatives from European countries, later enriched with scientists from Asia, Australasia, and the Americas, has come together three times now since the late 1980s, the last time in The Netherlands in September 1999, to discuss and evaluate progress. It was decided that now is the time to make an inventory of what is still challenging, assess critical areas of ignorance, and design an action framework. There is an urgent need for an internationally integrated, multidisciplinary research plan based on a description of the state of the art and modeling of the regional and global significance of this primary producer and of its role as a link or sink in elements that are central to biogeochemistry of the ocean and the atmosphere above.

Many of the functions of *Phaeocystis*, and even details of its life cycle, remain enigmatic in spite of the fact that much knowledge has been gathered until now thanks to funding from national and international agencies; the European Commission alone supported two consecutive Europe-wide projects with a focus on *Phaeocystis*, and two symposia were organised, one in 1995 in the United States (sponsored by NSF and ONR), one recently in The Netherlands. All this external support suggests that the importance of *Phaeocystis* is widely recognised. After the last symposium (August 1999) a recommendation was adopted by all the participants of the symposium: to start a procedure to obtain the status of a SCOR Working Group. The working group would exist for a period of 3 years. The membership of the working group should reflect all the science disciplines that come together in the species cluster: from physiology at the cellular level to understand the wide variety of functions of *Phaeocystis* in marine systems, all the way to atmospheric chemistry to assess the consequences of conversions in the biotic chain of events for climate regulation.

Terms of Reference

1. Establish a website to facilitate coordination of ongoing research worldwide, and to create cohesion of efforts.
2. Make an inventory of aspects that relate to cycling of biogeochemically relevant elements. These aspects are

    - Factors regulating bloom inception
    - The grazing issue: bottom-up or top-down control
    - Cellular response to environmental factors
    - Distribution patterns with molecular probes
    - Genetics: pathways of distribution and biodiversity in the cluster
    - Biogenic fixation and emission of climate-relevant gases
    - Cloud inception and characterisation of condensation nuclei over blooms
3. Meet once a year to discuss progress, and divide tasks to arrive at a series of chapters produced under the responsibility of members of the Working Group.
4. In the last year, write a series of reviews covering the subjects mentioned under 2, which will be the chapters of a book that will be produced as the product of the Working Group. At least 2 working group members will be responsible for each chapter.

The working group's activities will be focussed on the biological and biogeochemical processes governed by marine microphytoplankton, specifically, the species cluster *Phaeocystis*, because these determine significantly the ocean-atmosphere interactions that are central in climate models; in these models the biotic component has too long been overlooked.

Submitted by the future convener,
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ANNEX 5 – Report from the Joint Global Ocean Flux Study (JGOFS) Annual Progress Report (1999/2000)

Roger B. Hanson, Executive Director
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Submitted on behalf of the JGOFS Scientific Steering Committee, 8 September 2000

I. Introduction

The goal of JGOFS is to expand our knowledge of the ocean carbon cycle and feedbacks between the atmosphere and the deep ocean/sediments. This has been accomplished as reported at the JGOFS Open Science Conference in April 2000 and major achievements from the field work will appear in the *IGBP Science Series* (Fall 2000). This report provides a few recent scientific highlights, summarises the activities of the Scientific Steering Committee over the past year (September 1999 through August 2000) including future activities of the synthesis and modelling phase, and lastly summarises a few specific activities of the International Project Office (IPO).

II. Scientific Highlights

A. Continental Margins: Source or Sink for Anthropogenic CO_2

Early studies and models of the global carbon cycle ignored carbon fluxes in continental margins. Recently revised air-sea CO_2 flux (2.2 Pg C/year) is as large as the estimated oceanic uptake of anthropogenic CO_2. If this is true, it means that continental margins are sources of CO_2 to the atmosphere due to riverine input of carbon and have little influence on the carbon budget in the open ocean. However, over the past decade, continental margin studies have revealed new information on the ocean carbon cycle, and it has now emerged that the world's ocean margins are probably weak CO_2 sinks.[6] The possible biogeochemical and physical processes contributing to the sink include active biological uptake of CO_2 in the summer, high CO_2 solubility in the winter, and effective shelf transport and shelf-edge exchange of particulate and dissolved carbon species, otherwise referred to as the "continental shelf pump." However, continental margins are more complicated and heterogeneous than the open ocean and cannot be adequately represented by biogeochemical provinces or coarse gridded maps of global ocean carbon fluxes. Nevertheless, the emerging view is that continental margins function as a weak net CO_2 sink (~0.1 PgC/year) by passing on some of the riverine carbon flux to the open ocean and exporting 10% of the shelf primary production, which represents as much as 20% of the global ocean biological pump. These findings throw doubt on the new estimate of air-sea CO_2 fluxes of 2.2 PgC/year. Otherwise, the oceanic uptake rate of anthropogenic CO_2 would be more than 2.8 PgC/year.

B. Equatorial Pacific Biological Pump

The Equatorial Pacific Synthesis and Modelling Group is presently synthesising the emerging views from the Equatorial Pacific study, and the new views will appear in *Deep-Sea Research II* in 2001 (Le Borgne, pers. comm.). One highlight is that the amounts of carbon dioxide outgased to the atmosphere are related to climate and vary by a factor of four between non-El Niño and strong El Niño years. These variations are linked to extension of the upwelling, deepening of the thermocline by propagating Kelvin waves, and weakening of winds in the eastern half of the Pacific during El Niño events. The biological pump is also dependent on the geographical extent of the upwelling, but it undergoes less variation than the CO_2 outgassing due to the HNLC (High Nutrient-Low Chlorophyll) condition, which prevails in the equatorial upwelling. The HNLC paradox was studied intensively, and debates continue regarding the paradox over micronutrient limitation and grazing pressure. Primary production

[6] K.-K. Liu, L. Atkinson, C.T.A. Chen, S. Gao, J. Hall, R.W. Macdonald, L. Talaue McManus, and R. Quiñones. Are continental margin carbon fluxes significant to the global ocean carbon budget? Submitted to *EOS, Transactions,* American Geophysical Union, August 24, 2000.

within the equatorial upwelling region undergoes mid-term (weeks) and short-term (diurnal) variations, which are on the time scales of equatorial and tropical instability waves that affect micronutrient inputs for photosynthesis, and zooplankton grazing that controls phytoplankton biomass, respectively. With new and greater number of measurements, higher primary production values were confirmed than reported in the past. In addition to the active (diel migrants) and passive (particle sinking) carbon fluxes, emerging models provide strong evidence for horizontal advection of dissolved organic carbon in the export flux. Finally, a number of studies considered the oligotrophic warm pool in the western equatorial Pacific region, and the results provided a new view on the El Niño-Southern Oscillation (ENSO) phenomenon and short-term variabilities. In this region, the depth of the nutricline depends on the ENSO, and during El Niño events and subsequent wind events, productivity increases due to the shallow nutricline and the temporary wind forcing of nutrients into the euphotic zone. Such biogeochemical and physical mechanisms affect the carbon cycle as well as the intensity of the biological pump in equatorial Pacific waters.

C. Completion of the last JGOFS Process Study

The North Pacific Task Team completed the coordination of the North Pacific Process Study in February 2000, which included (1) extensive surveys (SAGE: Subarctic Gyre Experiment), (2) intensive biogeochemical process studies, (3) time-series station KNOT (44ºN, 155ºE), (4) ocean color from satellites, and (5) modeling.[7] The SAGE program focused on the formation and dispersion of the North Pacific Intermediate Water (NPIW), which is characterised by a salinity minimum around the sigma-t of 26.8. Using temperature, salinity, and potential vorticity, transport and mixing processes were followed from the Sea of Okhotsk through the Kuril Islands and into the Oyasio Water, before moving southward and mixing with the Kuroshio Water. The transport of Oyasio Water was large in winter-spring (20-30 sverdrups [Sv]) and small in summer-autumn (3-4 Sv), and the large annual transport variability correlated with the wind fields over the western subarctic Pacific. Distribution of anthropogenic ^{14}C showed a pattern of surface water intrusion into the NPIW. CFC measurements suggested a decrease in the surface mixing from the 1980s to 1990s and hence a reduced anthropogenic CO_2 input to the western subarctic Pacific. In the vicinity of Station KNOT, the seasonal variability in nutrients (NO_3, PO_4, and Si) and dissolved inorganic carbon was larger than at Station Papa, HOT, and BATS. Primary productivity also showed large temporal variability (100-500 mg C m^{-2} d^{-1}), high in spring, but similar to that of Station Papa in the eastern subarctic Pacific. However, pigment analyses showed little variability in the eastern subarctic Pacific, but significant seasonal variability occurred in the western subarctic Pacific due to diatoms. In the summer, phytoplankton growth, which appeared to be iron-limited to greater degree in the eastern subarctic Pacific, was almost balanced by micro-zooplankton grazing in the entire subarctic North Pacific.

III. Other Highlights

A. The Second JGOFS Open Science Conference

The Second JGOFS Open Science Conference (OSC) focused on 10 years of field research on understanding better the role of the ocean in the global carbon cycle, the ocean's response to increasing concentrations of atmospheric carbon dioxide, and pending climate changes. The conference was organized around ten JGOFS biogeochemistry themes. More than 215 people participated in the conference, which included invited keynote presentations, contributed oral papers, and poster presentations. The invited keynote speakers were challenged in advance with reviewing the wide-ranging ocean literature and presenting the emerging JGOFS views of ocean biogeochemistry and carbon cycling under those themes. Attending JGOFS scientists were able to present their results and discuss their views on ocean biogeochemistry and carbon cycling among themselves and other members of the broader ocean, atmosphere, and terrestrial science communities. The conference also supported major discussion sessions on Earth System Science and Future Ocean Biogeochemistry. A concern emerging from the conference was that improved global models of the ocean carbon cycle are desperately needed to extrapolate point measurements and integrate regional estimates to global scales.

The OSC received some media coverage, including an interview on NRK1 radio program *Ut I Naturen*[8], interviews on a television series *Schrödingers Katt,*[9] and a report in a scientific magazine *Nature*.[10] Several international newsletters have also included

[7] Saino, T., and M. Kusakabe (eds.). 2000. In the *Proceedings of the International Symposium on Carbon Cycle in the North Pacific: JGOFS Studies on Carbon Cycle in the North Pacific* (in press). Institute for Hydrospheric-Atmospheric Sciences, Nagoya University.

[8] NRK1 Radio, Ut I Naturen, Interview with Prof. Egil Sakshaug, April 12, 2000

[9] NRK1 TV, Schrödingers Katt, May 16, 2000. Interviews with Prof. Andrew Watson (UK); Prof. Hugh Ducklow (U.S.A); and

highlights from the conference. Next year, a textbook will document the conference, and will be edited by Michael Fasham, John Field, Trevor Platt, and Bernt Zeitzschel. It will be entitled *Ocean Biogeochemistry and Carbon Cycling* and will be published by Springer-Verlag.

IV. Scientific Steering Committee

A. 15th SSC Meeting

The 15th Meeting of the Scientific Steering Committee was held before the JGOFS Open Science Conference in Bergen, Norway.

Highlights from the Meeting

1. Scientific Steering Committee (SSC): On January 1, 2000, three at-large members, Hugh Ducklow (Chair), Peter Haugan (Norway), and Toshiro Saino (Japan) joined the SSC with new 3-year terms. On December 31, 2000, five at-large members are scheduled to rotate off the SSC at-large. Those members are Fasham (UK, Past Chair), Lochte (Germany), Liu (China-Taipei, Vice-Chair), Hong (China-Beijing), and Quiñones (Chile). In the future, SSC nominations will be based on maintaining the continuity of the synthesis and modeling efforts throughout the remaining 3 years of the project.

a) **The Synthesis Groups and Task Teams:** These activities will continue until they complete their Terms of Reference and disband. The SSC approved or recognized several changes. The SSC accepted the resignation of Graham Shimmield (Scotland) and approved Karin Lochte (Germany) as the new JGOFS co-chair of the Palaeo-JGOFS Task Team. The SSC recognized Doug Wallace (Germany), who is replacing Andrew Watson as the new Chair of the SCOR-IOC Carbon Dioxide Advisory Panel. The SSC approved Joachim Herrmann (Germany), who is replacing Thomas Mitzka as a new member of the Data Management Task Team, and Robie Macdonald (Canada), who is replacing Julie Hall as a new member of the Continental Margins Task Team. Finally, the SSC approved the recommendation of the North Pacific Task Team to change the status of the co-chairs Alexander Bychkov (Canada) and Toshiro Saino (Japan) to chair and vice-chair, respectively.

b) **New joint task team:** The JGOFS-GAIM Task Team was formed to support global synthesis efforts on ocean carbon modeling. The Terms of Reference and membership are in the process of being finalized. The SSC approved Patrick Monfray (France) as the JGOFS co-chair.

c) **SSC Membership:** With these changes (actions), the 15th SSC was reduced from 22 to 20 members: 12 at-large members and 8 chairs. The 2000 Executive Committee is Ducklow, Fasham, Tilbrook, Lochte, Saino, and Anderson.

2. **Funds for 2000 Activities:** The SSC spent considerable time discussing the budget and JGOFS functions in 2000. We expect approximately $110K from SCOR and IGBP for the current year. At present, the largest unknown expenses are the SSC Meeting and the Open Science Conference (OSC) in Norway. The decision to support additional activities was postponed until late May/early June. In light of JGOFS 2000 finances, the SSC recognized the LOICZ commitment to fund CMTT's first synthesis workshop (USA) this year and JGOFS' commitment to support CMTT synthesis workshops in 2001.

3. **Future Meetings:** The SSC also heard from the Synthesis Group and Task Team chairs about synthesis activities planned for 2001 and beyond. The IOSG is planning a small meeting in Miami; NASG is planning a meeting with PROOF in Paris; CMTT is planning two workshops jointly with LOICZ and JGOFS; JGTT is planning a large modeling workshop (50 participants); and an independent small group is planning a joint JGOFS-WOCE Ocean CO_2 Transport workshop (50 people). The dates for these and other JGOFS meetings are listed in APPENDIX A.

Dr. Truls Johannessen (Norway)

[10] Gillon, J. 2000. Carbon fixation. *Nature* 405:412.

4. **Phase I of Synthesis:** In April 1998, the SSC took on the added responsibility of coordinating future synthesis and modeling efforts. In support of this new responsibility and with IGBP funds, the SSC held its first Synthesis Workshop in Southampton in October 1998 and structured the first phase of JGOFS synthesis. Workshop participants agreed to produce a color brochure of JGOFS Highlights from its 10 years of field campaigns, arrange its second Open Science Conference with a focus on national and regional syntheses, and publish a synthesis textbook on the new ideas and concepts emerging from the field campaigns under several ocean biogeochemical themes. The first phase is well underway and planned to be completed in July 2001. This leaves the organization of the final synthesis and modeling phase (2001-2003).

a) **IGBP Science Series (JGOFS Highlights):** The editors and science writer are near completion of the full color layout. The JGOFS IPO is handling the coordination and printing, and the IGBP Secretariat in Sweden is handling the technical layout and distribution of the IGBP Science Series. Expected time for publication is Fall 2000.

b) **IGBP Book Series (JGOFS Synthesis Volume):** Fasham informed the SSC that several chapter authors have prepared drafts and that others plan to complete their task following the OSC. Spring-Verlag is the new publisher for the *IGBP Book Series* and the IGBP Secretariat is providing the guidelines for preparing volume chapters. For fast publication (4-6 months), the book editors will require a managing editor to handle the formatting for camera-ready publication. The IGBP Secretariat will now provide funds to cover some of the cost of a managing editor at Springer-Verlag.

5. **Phase II of JGOFS Synthesis:** The SSC discussed the course for the final synthesis phase for JGOFS (2001-2003). However, it became obvious to all present that progress could not be made at the SSC Meeting. The SSC commented that the timeline for the out years now consists mainly of random regional meetings and workshops and that is not a meaningful final synthesis plan. The SSC needs a synthesis of syntheses or global synthesis of the regional syntheses. Thus, the SSC must give this topic considerable thought and develop a meaningful synthesis plan beyond 2001.

6. **The International Geosphere-Biosphere Programme (IGBP):** The most significant news from the recent IGBP-SC meeting is the new direction for IGBP research. Although the Core Projects will remain the heart of IGBP, the focus will shift to a fully integrated program of Earth System Science with strong partnerships from IHDP and WCRP. The global biogeochemical cycles will remain the core of IGBP research. However, it will evolve to a system science approach, with major activities in oceans, land, atmosphere, and their interfaces. To enhance this shift, several "futures" meeting are planned to provide a bridge for the Core Projects toward Earth System Science. These "futures" meetings will define the main science questions in the 3 compartments and interfaces for the next decade of research; see Scientific Committee on Oceanic Research (SCOR) below.

a) **Crosscutting Activities:** IGBP-SC is also developing 3 crosscutting activities on carbon, food/fiber, and water. These activities are being planned as joint projects with IHDP and WCRP. The Carbon Joint Project, when fully developed, will provide the ocean community with an international framework for future biogeochemistry programs that are now emerging from many countries. In the near future, these meetings plan to develop a common international framework for ocean, terrestrial, and atmosphere research, which addresses the entire global carbon cycle in an integrated fashion. IGBP is holding the Global Carbon Synthesis Workshop in the United States, 16-20 October 2000. Ocean biogeochemists and modelers plan to attend this workshop.

b) **IGBP Open Science Conference:** IGBP is planning "A Global Change Open Science Conference" in Amsterdam. This conference will present the latest scientific understanding of natural and human-driven changes on our planet. The IGBP-SC is trying to make this conference as easy and convenient to attend by all IGBP Core Projects (CP). So, they encouraged CP SSCs to hold their annual meetings with the Conference. The SSC viewed this as an unique opportunity and agreed to hold the 16th Meeting of the SSC at the Dutch Academy of Sciences, 8-9 July 2001.

7. **Scientific Committee on Oceanic Research (SCOR):** The most relevant news to the JGOFS community is the Meeting on the Future of Ocean Biogeochemistry (FOBGC) hosted by SCOR and IGBP. The meeting will be held at the Plymouth Marine Laboratory in the UK, 22-26 September 2000. John Field (South Africa) and Patrick Buat-Ménard (France) are the co-chairs. The purpose of the meeting is to discuss progress and uncertainties regarding key processes in the ocean carbon cycle

emerging from JGOFS, WOCE, PAGES, GLOBEC as well as those being planned for SOLAS, CLIVAR, etc., and to identify ocean research priorities for the next decade of global carbon cycle research.

8. **Communication and Outreach:** During the concluding remarks, the topics of communication and outreach were again emphasized. Regarding communication, the general results of JGOFS field campaigns need to be communicated with the public more effectively. In addition, the SSC must develop community outreach programs that go beyond ocean biogeochemists and include governmental and non-governmental organizations, other global change research programs, and the public.

B. Nominations and requests

Regarding 2001 SSC Nominations, Ducklow decided that there would be no new at-large nominations to replace the five at-large members rotating off the SSC this year. This decision was based on (1) the actions from the 15th SSC meeting, (2) two of the five rotating at-large members taking on new roles as co-chairs of the P-JGOFS (Lochte) and CMTT (Quiñones), and (3) reducing the financial burden of future SSC meetings. However, there will be an effort to recruit an additional biogeochemical modeler for the 17th SSC in 2002. With the proposed changes, we request SCOR approval to reduce the SSC from 22 members in 2000 to 17 members in 2001 (APPENDIX B). The proposed composition of the 16th SSC will be 7 at-large and 10 activity chairs. We also request letters of appreciation from SCOR and IGBP for the service rendered by two rotating at-large members: Michael Fasham (Past Chair) and K.-K Liu.

V. International Project Office

A. University of Bergen

The International Project Office (IPO) completed 4 successful years at the University of Bergen, and secured funds for the staff and offices from 1 January 2000 until 31 December 2003. Since the last report, the IPO staff focused a considerable effort and time on recent SSC synthesis activities, for example, the JGOFS Open Science Conference, the *IGBP Science Series*, and the textbook for the IGBP book series. Moreover, the IPO staff maintained the same level of effort on the daily business, SSC activities, and the Regional Synthesis Groups and Task Teams.

B. Financial Matters

In 1999, JGOFS and the IPO received income of about $281K from the Research Council of Norway, SCOR, University of Bergen, and IGBP (APPENDIX C). These funds covered administration costs, overhead for the facilities and projects, SSC and group meetings and workshops, and publications. In 2000 and 2001, the IPO and JGOFS activities expect operating and expense budgets of about $320-400K.

C. Other activities

1. **Participation in the Norwegian JGOFS database project.** This project, fostered by the IPO and financed by the Research Council of Norway, was launched this year with the aim to centralize all JGOFS data gathered by Norway at the Institute of Marine Research (IMR) and further publication on CD-ROM. Quality controlled data sets derived from JGOFS-Norway research in the Greenland, Iceland, and Norwegian Seas between 1990 and 1997 will be archived in a database developed by IMR. Datasets to be included are carbon profiles in the Nordic Seas (CARNOR); carbon dioxide and deep water formation circulation in the Nordic Seas (CARDEEP); the carbon cycle in the Greenland Sea of ESOP-2; carbon time series in the Norwegian Sea at Station M, and the Norwegian contribution to Continental Margins Studies (OMEX I). A steering group will supervise the database project with representatives from IMR, the Norwegian JGOFS Committee, and the IPO. The IPO will also assist IMR in the collection of data sets.

2. **Research projects.** The IPO has been compiling all JGOFS research projects and cruises from each contributing country since 1988. This compendium also includes aspects of national data management, that is, the whereabouts and archiving of JGOFS data collected during fieldwork. This information will also assist the Data Management Task Team in their activities directed at securing the long-term stewardship of the JGOFS data sets.

3. **Metadata catalogue.** The IPO is currently building a metadata catalogue for JGOFS datasets from those national activities lacking data management support. The metadata will be archived at NASA's Global Change Master Directory (GCMD). The SSC is giving top priority to building this catalogue because it manifests the goals of the synthesis phase.

3. **IGBP Science Series.** *Ocean Biogeochemistry and Climate Change: JGOFS Research 1988-1999* will be published in the *IGBP Science Series*. The IPO supported the editing and preparation of all graphical material for this document. Its release is expected during the last quarter of 2000.

4. **Communication.** The IPO is continuing its involvement in the IGBP internal and external communication strategy. These include (1) development of a 3-year working plan for IGBP's Data and Information Services (DIS) by its steering group and (2) participation in a Webmaster expert group with the aim to create an integrated Web system with distributed Core Project components. This group will eventually evolve into a liaison group, representing both scientists and information managers within IGBP, to strengthen communication through the Internet.

5. **Organization of meetings.** With administrative help from the IPO, several JGOFS meetings and related meetings were organized and/or supported. These include: JGOFS Executive Meeting, Baltimore, USA; Data Management Task Team, Kiel, Germany; Paleo-JGOFS/PAGES Task Team, Hamburg, Germany; Southern Ocean Synthesis Group, Brest, France; and the Ocean Carbon-Cycle Model Intercomparison Project-2, Princeton, USA. After the conclusion of the successful JGOFS conference in Bergen, the IPO has been asked by the U.S. JGOFS office to assist in organizing of the final JGOFS Conference to be held in the United States in 2003.

For further information about JGOFS or any of the activities discussed in this report, please contact Roger B. Hanson, Executive Officer, Joint Global Ocean Flux Study, Centre for Studies of Environment and Resources, University of Bergen, Bergen High-Technology Centre, 5020 Bergen, NORWAY, Tel: +47-5558-4244, FAX: -9687, E-mail: roger.hanson@jgofs.uib.no.

Appendix A: List of Planned and Proposed Meetings (2000-2003)

Year 2000

8-10 February	*International Symposium on Carbon Cycle in the North Pacific*, NPTT, Nagoya University, Japan.
10 February	5th Meeting of the North Pacific Task Team, Nagoya, Japan. Contact Toshiro Saino, Institute for Hydrospheric-Atmospheric Science, Nagoya University, Furo-cho, Chigusa-Ku, Nagoya 464-01, Japan
11-12 (17) April	15th JGOFS Scientific Steering Committee, Bergen, Norway.
13-17 April	Second JGOFS Open Science Conference, Bergen, Norway *Theme: Ocean Biogeochemistry: A New Paradigm.*
5-6 June	Data Management Task Team Meeting, Kiel, Germany.
16-18 June	IGBP IPO Webmasters Meeting, Bern, Switzerland.
5-7 July	OCMIP-2 Workshop. Princeton, New Jersey, USA.
6-7 July	Southern Ocean Synthesis Group Meeting, Brest, France.
8-12 July	Southern Ocean Symposium, Brest, France. *Theme: The Southern Ocean: Climatic Changes and the Cycle of Carbon. An International JGOFS symposium*,
18-21 September	International JGOFS-Workshop, Bremen, Germany. *Theme: "Biogeochemical Cycles: German Contributions to the International Joint Global Ocean Flux Study"*
22-26 September	IGBP-SCOR Ocean Biogeochemistry Workshop, Plymouth, UK
16-20 October	IGBP Global Carbon Synthesis Workshop, Durham, New Hampshire.
21-22 October	JGOFS Executive Committee Meeting, Durham, New Hampshire.
18-19 October	Symposium on North Pacific CO_2 Data Synthesis, Tsukuba, Japan.
20-21 October	6th Meeting of the North Pacific Task Team (jointly with PICES WG 13 and PICES TCODE), Hakodate, Japan.
24-25 October	PICES-JGOFS Session on North Pacific Carbon Cycling and Ecosystem Dynamics, Hakodate, Japan.
27-29 November	Continental Margins Task Team (JGOFS/LOICZ) Workshop I on the Western and Eastern Boundary Currents, Virginia, USA.

Year 2001

January/February	Continental Margins Task Team (JGOFS/LOICZ) Workshop II on Marginal Seas, Taipei, Taiwan
27-29 June	JGOFS-WOCE CO_2 Transport Workshop, Southampton, UK.
8-9 July	16th JGOFS Scientific Steering Committee Meeting, Amsterdam, The Netherlands.

10-13 July	IGBP Open Science Conference, Amsterdam, The Netherlands. Theme: Challenges of a Changing Earth.
Fall	JGOFS Executive Meeting (TBD). Contact Roger Hanson, JGOFS International Project Office, Center for Studies of Environment and Resources, Bergen High-Technology Centre, University of Bergen, Norway. Tel: (+47-555) 84244, Fax: (+47-555) 89687, Email: Roger.Hanson@jgofs.uib.no
21-28 October	Symposium session at the Joint IAPSO-IABO Assembly, 2001, Mar del Plata, Argentina. *An Ocean Odyssey*. Contact Hugh Ducklow, School of Marine Science, The College of William and Mary, Box 1346, Courier: Rte. 1208, Greate Road, Gloucester point, VA 23062-1346, USA, Phone: 804-684-7180, Fax 804-684-7293, Email: duck@vims.edu, or Karin Lochte, Email: karin.lochte@io-warnemuende.de
	Continental Margins Task Team (JGOFS/LOICZ) Workshops III on Polar Margins, Taipei, Taiwan. Contact. Kon-Kee Liu, Institute of Oceanography, National Taiwan University, Taipei, Taiwan, Tel.: (886-2) 3631810, fax: (886-2) 3626092, Email: kkliu@ccms.ntu.edu.tw
	1st JGOFS-GAIM Ocean Carbon Modelling Task Team Meeting. Prepare plans for 3-D modeling and analysis (TBD). Contact Patrick Monfray, Laboratoire des Sciences du Climat et de l'Environnement, UMR CEA-CNRS 1572, CE Saclay, Orme des Merisiers, 91191 Gif sur Yvette, FRANCE, Phone: (33) 1 69 08 77 24, FAX: (33) 1 69 08 77 16, Email: monfray@cea.fr
	Year 2002
Spring	17th JGOFS Scientific Steering Committee Meeting. Contact Roger Hanson, JGOFS International Project Office, Center for Studies of Environment and Resources, Bergen High-Technology Centre, University of Bergen, Norway. Tel: (+47-555) 84244, Fax: (+47-555) 89687, Email: Roger.Hanson@jgofs.uib.no
Spring	SOSG synthesis workshop, held with the AGU/ASLO 2002 conference. Contact Uli Bathmann and Paul Tréguer. Pending
Fall	JGOFS Executive Meeting. Contact Roger Hanson, JGOFS International Project Office, Center for Studies of Environment and Resources, Bergen High-Technology Centre, University of Bergen, Norway. Tel: (+47-555) 84244, Fax: (+47-555) 89687, Email: Roger.Hanson@jgofs.uib.no
	Year 2003
Spring	18th JGOFS Scientific Steering Committee Meeting
Summer	Third JGOFS Open Science Conference (TBD)
Fall	JGOFS Executive Meeting

Appendix B: Proposed SSC Membership for Year 2001

Name	Country	Function	Status	2001	2002	2003
Ducklow, Hugh	USA	SSC Chair	At-large	SSC	SSC	
Saino, Toshiro	Japan	SSC 2nd Term	At-large	SSC	SSC	
Anderson, Robert	USA	SSC	At-large	SSC		
Tilbrook, Bronte	Australia	SSC 2nd Term	At-large	SSC		
Falkowski, Paul	USA	SSC	At-large	SSC		
Haugan, Peter	Norway	SSC, OOPC	At-large	SSC	SSC	
Hong, Huasheng	C-Beijing	SSC	At-large	SSC	SSC	
Wallace, Douglas	Germany	SSC, CO_2 Ad. Panel	At-large	SSC		
Lochte, Karin	Germany	P-JTT cChair		Chair	Chair	Chair
Quiñones, Renato	Chile	CMTT cChair		Chair	Chair	Chair
Bathmann, Ulrich	Germany	SOSG Chair		Chair		
Burkill, Peter	UK	IOSG Chair		Chair		
Bychkov, Alex	Canada	NPTT Chair		Chair	Chair	Chair
Conkright, Margarita	USA	DMTT Chair		Chair	Chair	
Garçon, Veronique	France	NASG Chair		Chair		
LeBorgne, Robert	France	EPSG Chair		Chair		
Monfray, Patrick	France	JGTT cChair		Chair	Chair	Chair
Platt, Trevor/Represent.	Canada	IOCCG Chair		Chair		

Appendix C: Funds and Expenses (1999 closed)

Income		**US Dollars**
Norwegian Research Council		150,000
SCOR Secretariat		95,000
IGBP Secretariat		20,145
University of Bergen		15,875
	Subtotal	**281,020**
Expenses		
International Project Office (Administration)		143,445
SSC Meeting (Yokohama Meeting)		45,902
Executives (Baltimore Meeting)		15,373
GSMTT (Bangalore Meeting)		15,000
JGOFS publications (Printing and Mailing)		14,822
IOSG (Bangalore Meeting)		12,899
Conference publications (Printing and Mailing))		12,500
NPTT (China-Taipei Meeting)		10,469
University Overhead for Offices		3,750
SSC Workshop (Southampton, 1998 expenses)		3,023
Project Overhead on Funds		2,642
DMTT (Silver Spring Meeting)		1,484
		281,308
		Overall balance: (288)

ANNEX 6 - Report from the Global Ocean Ecosystem Dynamics (GLOBEC) Project

Report of the SCOR/IOC/IGBP GLOBEC International Programme for 2000

To the Scientific Committee on Oceanic Research

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Following publication of the GLOBEC Implementation Plan in 1999, the Scientific Steering Committee and the International Project Office are developing an ambitious programme of activities for the next few years. The programme is based on three pillars: Foci working groups, Regional programs, and National activities. In this report we provide information on the achievements of these and their future plans.

Focus 1 WG: Retrospective Analysis and Time Series Studies

The general objective of Focus 1 is to identify and understand the characteristic natural modes of physical forcing and marine ecosystem variability over a range of temporal and spatial scales. The first meeting of the working group took place in Sitges, Spain on May 18-19, 2000, under the chairmanship of Ian Perry, to set a calendar of activities and develop a working plan. The following action items have been selected from the minutes of the meeting. A full report is available through the GLOBEC website (www.globec.org):

- A task team of this WG is to develop a proposal to compare long-term, large-scale ecosystem responses throughout the world's oceans. Particular issues to address include documentation of the large-scale fisheries changes that have been observed, when they began, how long they endured, the synchrony between basins and components of the ecosystem, and the probability that they were forced by climate variability. The proposal will be discussed at the next meeting of the group.
- GLOBEC will establish a Data Management Task Team to develop recommendations on data formats and units, and deal with issues related to accessibility and preservation of GLOBEC data, with special attention to be given to biological data. In addition to drawing upon the regional and national GLOBEC expertise, other groups such as the World Data Centre, IGBP-DIS, and the JGOFS IPO will be contacted for assistance (this was also a Focus 3 WG recommendation).
- A task team of this WG will develop an outline for an overview paper that describes the value of, and the extra information gained from, long time-series data. Collaborations with key participants outside GLOBEC with the CLIVAR Data WG will be sought, and the document will be tabled at the next meeting of the group.
- A meeting to activate a GLOBEC/PAGES/CLIVAR Intersection proposal will be held in Sidney, BC, Canada, in September 2000. The Chairs of each program have formally supported the proposal, and have included this activity in their research agenda.
- B. Planque will take the lead in writing a set of articles for the *GLOBEC Newsletter*, identifying common and significant analytical problems and recommending “best practices” when dealing with retrospective and time-series data. The first article will appear in the October 2000 issue.

Focus 2 WG: Process Studies
Population process studies are of critical importance for understanding the functioning, and thereby the structure, of marine ecosystems. Under Focus 2, GLOBEC expects to investigate specific mechanisms that are thought to link ecosystem responses with environmental variability. The design of these studies should be based on, and closely linked to, the retrospective studies under Focus 1, and the modeling and observational work of Focus 3. Close integration is essential. Process studies are an integral part of regional and national programs, and should be cross-linked appropriately at the foci working group level. To initiate activities, the recently appointed members of the working group (see Appendix 2) met in Roscoff, France, 11-14 September, under the chairmanship of Serge Poulet (GLOBEC SSC). The group was asked to:

1. Define core parameters and methods for key process measurements, fill the gap between the present state of the art and future needs for GLOBEC within the scope of the process studies identified in the Implementation Plan, and follow zooplankton and fisheries modeling requirements.

2. Review the achievements of Process Studies within the Regional and National GLOBEC Programs and identify gaps between what has been achieved and the goals laid out in the Implementation Plan.

At the meeting these questions were addressed with respect to the following topics:

- Multiscale physical-biological interactions
- Zooplankton and fish interactions
- Life histories and trophodynamics in ecosystems
- Field/experimental approaches and perspectives
- Biological processes directly linked to physical variability
- Diagnostics of healthy zooplankton in ecosystems: key species and parameters
- Incorporation and diffusion of pathogens by zooplankton to higher trophic levels

A review of the WG actions will be provided as soon as the minutes of the meeting are made available.

Focus 3 Predictive and Modeling Capabilities
This WG is expected to understand and predict how populations of marine animal species respond to natural and anthropogenic changes in global climate, by bringing together the expertise and the activities of Regional and National programs in the field of predictive modeling. The group was appointed early in the year and met in Chapel Hill, North Carolina, USA, 10-12 July 2000, led by Francisco Werner. The following are selected decisions and actions taken at the meeting.

- The group decided to inform National Programs of the need to consider the issues of spatial and temporal integration in their modeling activities. Some programs (UK-GLOBEC) are already explicitly addressing the issue of sensitivity to model spatial resolution, and initial results indicate strong sensitivity.
- The Focus 3 WG supports a GLOBEC workshop on the use of optical particle counter (OPC) and particle size instrumentation, and in particular on the issues relevant to integrating size spectra from different instruments in order to span the full range of taxa in the ecosystem.
- The group agreed to have a discussion topic at their next meeting on "adaptive (genetic algorithms and dynamic programming) techniques" as a way of representing behavior of higher trophic levels in models. The group is developing a position paper.
- The possibility of hosting a workshop or study session on population models of zooplankton as a mechanism to allow intercalibrations and intercomparisons between systems and models will be explored.
- The group will initiate plans to host a meeting on model comparisons in Eastern Boundary Currents (SPACC regions). Potential donor agencies will be approached, while a position paper will be made public before the next meeting of the group, possibly through the *GLOBEC Newsletter*.
- A Position Paper will also be developed over the next year defining a synthesis or grand challenge question to be considered by the Focus 3 WG on possible changes to marine ecosystems in response to global changes on both long and short time scales.

Focus 4 WG: Feedback from Changes in Marine Ecosystem Structure
The GLOBEC Implementation Plan has defined three activities for Focus 4:

- Ecosystem-Climate Interactions on Multiple Scales and their Influences on Basic Biological Processes throughout the Food Web
- Earth System Impacts from Changes in Marine Ecosystems
- Social Impacts of Changes in Marine Ecosystems

These activities cover a broad domain of study and will require important interdisciplinary effort, particularly by developing cooperation with other ocean, atmosphere, and social global change research programs. At the recent GLOBEC SSC meeting in Spain, two specific issues were identified for early activation:

1. Effects of Fishing. This activity is related to the GLOBEC objective of "developing methods to apply marine ecosystem information into management of marine resources," and would rely on other non-GLOBEC activities, such as the SCOR WG on The Ecosystem Effects of Fishing (WG 105), and its successors.
2. Natural and human system implications of large-scale changes in marine ecosystems. This issue would include interactions with IHDP and GECFS, such as the GEC and Food Systems initiative (see below).

The SSC agreed that a working group needs to be appointed to follow these lines. However, because of the diversity and breadth of potential topics, it might be better to convene a group of experts to work on a particular topic, rather than having a group work on several topics simultaneously.

Regional Programme: Small Pelagic Fishes and Climate Change Programme (SPACC)
A planning meeting to review the implementation of the program was held in La Jolla, USA in March 2000. At the meeting, four main lines of activity were identified:

1. Long term changes in ecosystems (leaders: J. Alheit/T. Baumgartner)
2. Comparative Population Dynamics (leader: M. Barange)
3. Reproductive Habitat Dynamics (leaders: C. Roy /D. Checkley)
4. Economic Implications of Climate Change (J. Hunter)

To oversee the implementation of these four lines of research an executive committee has been appointed, including the leaders of each Theme, and Drs. L. Motos (Spain), L. Castro (Chile), and H. Nakata (Japan).

In the last year a number of projects in Portugal (GLOBEC Portugal), Southern Africa (VIBES, ENVIFISH), and Mexico (IMECOCAL) have requested official affiliation to GLOBEC-SPACC. The European Union project PELASSES will also be affiliated. Following these links, SPACC has now active field activities in the Benguela, California, Humboldt, and Kuroshio currents, as well as the temperate environment of the Bay of Biscay. A German national GLOBEC program, strongly built around SPACC objectives, is also receiving attention. As part of the International GLOBEC support to developing regions, a GLOBEC-SPACC cruise on the R/V *Meteor* will take place in Namibia in October 2000. An initiative to coordinate SPACC research in East Asia has been planned for 2001 with the support of the Asia-Pacific Network for Climate Change Research. The IOC has offered extensive support to SPACC in the next few years. The offer consists of an agreement to support activities of SPACC under Theme 2 for 2001 and beyond, provided they are built around developing countries' needs, and the possibility of hosting a SPACC Secretariat at the IOC headquarters in Paris. The former is currently under discussion with all GLOBEC's sponsors.

Finally, the program has hosted a workshop on the use of the Continuous Underway Fish Egg Sampler (CUFES), in San Sebastian, Spain, in February 2000.

Regional Programme: Southern Ocean GLOBEC
Funding for the U.S. projects of the Southern Ocean (SO) GLOBEC program was allocated late last year, and all principal investigators met in May 2000 to plan activities. The SO field program aims to have a year-round coverage of krill habitat, prey, predators, and competitors, with emphasis on winter. Attempts are been made to fill possible sampling gaps in collaboration with International Whaling Commission. The program has two core sampling areas, the Antarctic Peninsula and the 70°E region, although additional sites are presently encouraged. The U.S. sampling plan will take place in April/May and July/August in 2001 and 2002, although conversations are being held with Argentina and Brazil to provide additional research platforms for 2002. A

coordinator for the U.S. SO GLOBEC program is being sought through the U.S. National Science Foundation, perhaps linked to the International Project.

A regional planning meeting will take place in fall 2000 to further coordinate the sampling of the different participating nations. At the same time, the SO Modelling working group is likely to meet toward the end of the year to agree on data formats, storage, and stewardship, with the support of the GLOBEC IPO.

Regional Programme: ICES Cod and Climate Change Programme (CCC)
The CCC is half-way through its 5-year plan. The 7 major components of the program are

1. Incorporation of environmental information into fisheries management
2. retrospective analysis
3. zooplankton-cod linkages
4. comparative analysis (between stocks and regions),
5. climate and atmosphere-ocean linkages,
6. data availability and management,
7. synthesis

A basic hypothesis behind the program is that the environment regulates cod larvae growth, both directly and through zooplankton growth and survival. The CCC held a workshop on the dynamics of growth in cod, in May 2000, as well as their annual conference. In 2001, the CCC plans to initiate synthesis activities, possibly leading to the publication of a synthesis book in 2003.

Regional Programme: PICES Climate Change and Carrying Capacity (CCCC)
The CCCC consists of 4 Task Teams (TT): BASS (Basin Scale Study), REX (Regional Experiment), MODEL, and MONITOR. The activities in 1999/2000 and plans for 2000/2001 for each TT are briefly described as follows:

- BASS. In 1999, the TT initiated the delineation of ecozones in the North Pacific Ocean, and reviewed the results of the Iron Fertilization Experiment. In 2000, the TT will continue the delineation, and will plan iron fertilization experiments in the western gyre (2001), station P (2002), and the open ocean (2003). Sessions and workshops on BASS issues at the 2000 PICES Annual Meeting in Hakodate are planned.
- REX. A workshop on "herring and euphausiids" took place in Vladivostok, and will be followed up by a workshop on "trends and trophodynamics in herring populations" at the PICES Meeting in Hakodate. A compilation of relevant sampling strategies and methods has been produced, and will be discussed at the REX TT meeting in Hakodate.
- MODEL. This TT conducted a workshop on "lower trophic level modeling," in Nemuro, Japan, to be followed by a second workshop on "strategies for coupling higher and lower trophic level models" in Hakodate, at the PICES Meeting.
- MONITOR. This TT met with GOOS in Oct. 1999 in Vladivostok, to define an implementation plan for GOOS in the North Pacific. They also established an advisory panel on CPR (Continuous Plankton Recorder) to assist in a pilot CPR project. A workshop on "progress in monitoring the North Pacific" will be held at the PICES Meeting in Hakodate.

Integration and interaction between the four TTs is a current priority of PICES-CCCC, emerging from the recognized importance of interactions between coastal and open-ocean processes. At the next PICES Annual Meeting in Hakodate, Japan, a session on "GLOBEC and GLOBEC-like programs in the North Pacific" will be held, with co-sponsorship from GLOBEC.

National Activities
Four new national programs—in Italy, Mexico, Portugal, and the United Kingdom—initiated activities in 1999, name-coded SINAPSI, IMECOCAL, GLOBEC-Portugal, and Marine Productivity, respectively. The latter is particularly relevant, as funding to the GLOBEC IPO is linked to its success. The program has support until 2004.

GLOBEC scientists in Spain will meet in 2001 to combine their activities into a national program. Scientists from the Korean and Japanese GLOBEC national programs met in Pusan, Korea, in August 2000, to coordinate their field activities and research projects. Angola, Namibia, and South Africa have requested affiliation of their regional oceanographic program (BENEFIT) to GLOBEC, to be the major contributor of GLOBEC research in the region. It is also reported that a national GLOBEC program in Argentina may be activated in 2001. Finally, a recent request from Canada-GLOBEC for support for a 2nd phase of the program was unsuccessful. This is not likely to end their activities, but it is envisaged that the 2nd phase of the program will be more focused than previously anticipated.

These developments bring the number of active GLOBEC national programs to 15 (BENEFIT, Black Sea, Brazil, Canada, Chile, China, France, Italy, Japan, Mexico, Netherlands, Portugal, Spain, United Kingdom, and United States). To facilitate coordination and program development, the IPO is in the process of publishing a GLOBEC Report describing the activities of each national program.

Data Management
There are large data management concerns for GLOBEC, including:

- Data rescue/data recovery
- Exchange and archiving of time-series data, including palaeoceanographic data and summarized data-series products
- Data exchange among researchers participating in integrated process studies
- Specifications of metadata requirements for existing and emerging data types to allow for proper archiving and retrieval of data
- Preparation of standardized datasets to force, test, and validate numerical models
- Assuring the GLOBEC legacy through the submission of data to organizations that can ensure long-term data stewardship.

To address these issues GLOBEC appointed Ms. Hester Willson as Data Manager for International GLOBEC in December 1999. Over the last few months Ms. Willson has developed a widely distributed data policy (*GLOBEC Newsletter* 6.1). The policy recommends data and inventory formats and suggests the use of the Global Change Master Directory (GCMD) as ultimate steward of GLOBEC data.

At the request of the Foci WGs, a Data Management Task Team will be implemented and will be expected to work through e-mail. A Data Management working group for the Southern Ocean-GLOBEC program has also been appointed. As the fieldwork of SO-GLOBEC will start in 2001, this group will spearhead the implementation of the program's data policy. Ms. Willson will participate in the activities of this group in an ex-officio capacity.

The IGBP/IHDP/WCRP Global Environmental Change and Food Systems (GECFS) Project
The question of how Global Environmental Change (GEC) will affect our ability to meet the food demands of a rapidly expanding human population is an issue of global importance. The three major international research programs on Climate Change—IGBP, IHDP and WCRP—have agreed to support a new project that will estimate the impacts of Global Environmental Change on food production, availability, and accessibility, across biophysical and socio-economic systems, from regional to global scales. The project will also analyze the effectiveness of adaptive strategies to reduce societal vulnerability, and has the ultimate objective of identifying the policy-relevant or institutional contributions that can be used to maximize the effectiveness of adaptations to GEC.

GLOBEC has actively participated in the planning phase, culminating at a meeting in Reading, UK in July 2000. GLOBEC is likely to provide input on issues such as the following:

- Overexploitation of marine resources to support production of land-based food systems (e.g., use of pelagic fish for animal feeds).
- Destruction of habitats due to GEC (e.g., coral reefs).
- Destabilization of ecosystems due to adaptations to the above (e.g., eutrophication due to intensive aquaculture practices).

In turn, the initiative will catalyze GLOBEC activities on the consequences of maintaining or increasing current fish exploitation levels, the development of prognostic models of long-term changes in zooplankton and fish stocks, and ultimately our studies on Earth System impacts from changes in marine ecosystems. GLOBEC and GECFS will work together on the development of scenarios of future adaptations to increase food supply regionally and globally. The planning phase will continue, with the input of GLOBEC, and the project will be unveiled at the IGBP Open Science Conference in Amsterdam, July 2001.

Relations with LMR-GOOS

GLOBEC was represented at the 3rd and 4th meetings of the Living Marine Resources panel of Global Ocean Observation System, held in Chile (December 1999) and Hawaii (May 2000). The LMR panel has now completed its mandate and will soon merge with the coastal ocean panel. At the Chile meeting it was agreed to form a GOOS/LMR-GLOBEC liaison group, to ensure that GOOS monitoring systems include variables and processes needed to carry out GLOBEC research. The proposed composition of the liaison group is L. Hutchings (South Africa), M. Sinclair (Canada) and T. Sugimoto (Japan), from GOOS/LMR, and I. Perry (Focus 1), S. Poulet (Focus 2), and C. Werner (Focus 3), from GLOBEC.

IGBP Open Science Conference

The IGBP will host an Open Science Conference in Amsterdam, The Netherlands, July 2001, to highlight the increasingly integrated research across the IGBP community. The conference will present the latest scientific understanding of global environmental change at three levels:

1. the integrated level of the IGBP core projects and the IGBP as a whole
2. cross-cutting research involving the WCRP and IHDP, as well as regional research coordinated by START and other groups; and
3. the individual level of the research projects that contribute to IGBP/WCRP/IHDP networks and provide the broad, substantive base on which the integrating activities of the three programs are built.

Although GLOBEC is one of the newest Core Projects of IGBP, and we are less involved in synthesis than other IGBP projects, we have been active in assisting with the development of the conference program.

GLOBEC IPO

Since the last meeting of SCOR, the Director of the IPO, Dr. Manuel Barange, and the Data Manager of the program, Ms. Hester Willson, have taken their posts at the Plymouth Marine Laboratory, UK. In September 2000, Ms. Charlotte Ireland will be appointed as Office Manager, in place of Ms. Andrea Watson, presently Media Coordinator of the program. Ms. Watson is returning to the University of Plymouth for further training. The IPO is financially supported by the Natural Environment Research Council (UK) and the University of Plymouth. The former has extended its commitment until 2004, while the latter has an initial commitment until end of 2003. The continuation of the NSF contribution to the running of the IPO is presently under negotiation through SCOR. Attempts to secure additional funding for the program from the European Union have not yet been successful. **Securing adequate, ongoing, funding for the IPO operation remains an area of concern.**

In the last year the IPO has published two *GLOBEC Newsletters* (Issues 6.1 and 6.2) and one report (Report of a workshop on the use of CUFES for mapping spawning habitats of pelagic fish, GLOBEC Report 14). Two more reports (Report on a Workshop on the Assimilation of Biological Data in Coupled Physical/Ecosystem Models, GLOBEC Special Report 3; and Update of GLOBEC National Activities in 2000, GLOBEC Special Report 4) are in press.

The IPO has also registered the domain www.globec.org, coinciding with a major revamp of the program's Web site. Apart from downloadable PDF documents, GLOBEC reports, newsletters, and minutes of meetings, the site includes presentation material on GLOBEC and will be the site of GLOBEC data inventories during the implementation phase of the program.

Provisional calendar of GLOBEC activities, September 2000-2001

11-14 September 2000	- Roscoff, France - GLOBEC Focus 2 WG
21-23 September 2000	- Sidney, Canada - GLOBEC/ CLIVAR/ PAGES Intersection group.
Fall 2000 – TBA	- SO GLOBEC Planning team meeting
5-6 October 2000	- Plymouth, UK - GLOBEC Executive Committee meeting
20-28 October 2000	- Hakodate, Japan - GLOBEC session at the PICES OSC
16-20 October 2000	- Cape Town, South Africa - SPACC-Envifish/Vibes Annual meetings
6-24 November 2000	- Noumea, N. Caledonia - GLOBEC/IRI Workshop on Climate Prediction and pelagic fish variability
November 2000 (TBC)	- TBA - SO Data Management WG meeting
January 2001	- Swakopmund, Namibia - SPACC African Long-term data series
January 2001	- P.R. China - GLOBEC-Regional meeting on real-time observational systems
March 2001	- Lima, Peru - SPACC American Long term data series
March 2001	- Lima, Peru - VI GLOBEC SSC meeting
March 2001	- Swakopmund, Namibia, GLOBEC-BENEFIT Annual Forum
August 2001	- Nagasaki, Japan - APN meeting on SPACC activities in S and SE Asia
Fall 2001	- TBA - SPACC meeting on the use of environmental indices for pelagic fish stock assessment
October 2001	- Cape Town, South Africa - SPACC meeting on spatial variability in pelagic fish populations
21-28 October 2001	- Mar del Plata, Argentina - IAPSO/IABO/GLOBEC meeting

Other Activities pending final approval

GLOBEC/ICES-CCC - Cod Book Drafting meeting
SPACC meeting on the economic consequences of fish stock fluctuations
GLOBEC meeting on the use of Optical Plankton Counters
GLOBEC/GEOHAB meeting on Real-time observational system
GLOBEC/GODAE meeting on modeling issues in Eastern Boundary currents

ANNEX 7 – Ad Hoc Finance Committee Report

Members: Vere Shannon (Chair), Patrick Buat-Menard, Julie Hall, Ilana Wainer, Liz Gross (ex officio)
Co-opted: Ed Urban (Executive Director in waiting), Bob Duce (President-Elect)

- The Ad Hoc Finance Committee met on 11 and 12 October to review the state of SCOR finances for the past and current fiscal years (1999 and 2000) and to prepare a draft budget for consideration for consideration by SCOR.
- The Committee examined the auditor's report for the 1999 fiscal year and found it to be in agreement with the more detailed financial statements prepared by the Executive Director.
- The Committee also reviewed the modifications to the 2000 budget approved by the 34th Executive Committee meeting of SCOR in Goa, India, in 1999, taking into account various changes in existing income items, in new income and in working group meetings. Good for finances, but bad for SCOR, in that funding approval for some existing and two new working groups was not taken up.

<u>The Draft SCOR Budget for 2001</u>

This budget is for consideration and approval by the General Meeting. It takes into account the various commitments and requests for support contained in the reports/presentations of the working groups and SCOR activities that were considered at the present General Meeting.

The following should be noted:

- Discretionary funds form a small part of SCOR's budget (approximately US$250,000).
- Where possible and appropriate, an overhead fee is levied on new grants to cover administrative costs.
- The budget does not take into account new sources of funding that the Executive Director in waiting has been tasked to find!

The Committee recommends that the levels of the five categories of SCOR membership dues for 2001 should only be increased by an amount equivalent to the increase approved by ICSU for its members (1%).

The budget proposed for 2001 includes approximately US$771,000 in income and approximately US$766,000 in expenses, which should result in a surplus of about US$5,000 for the year. The budget provides funding for one meeting for each of two new working groups (i.e., two meetings in total of WGs 119 and 120) approved by the SCOR 25th General Meeting. The budgeted surplus should return the accumulated balance to a level above US$140,000 by the end of 2001.

ANNEX 8 – Post-Audit Financial Statement for SCOR (1999)

	BUDGET	ACTUAL	
INCOME			
Membership (assuming 100% payment)	239,350	239,350	
less all outstanding dues, all years	(10,000)	(10,770)	
ICSU Grant / JGOFS	15,000	15,000	
ICSU Grant / GLOBEC	15,000	15,000	
ICSU Grant / GEOHAB	40,000	40,000	some used to prepay 02/00 costs
IOC Contract to SCOR	35,000	35,000	
less - transfer to IOCCG	(15,000)	(15,000)	
IOC Contract for training course	20,000	20,000	
START grant for training course	25,000	25,000	
NSF Grant / Travel Awards	50,000	32,172	
NSF Grant / Science Activities	180,000	192,142	includes income for GLOBEC IPO
Rockefeller Foundation / Graduate Education	16,000	-	received, deferred to 2000
Income for WG 105	8,089	8,089	
NASA grant / GEOHAB	-	4,500	
Miscellaneous	-	26	
Total SCOR Income	**618,439**	**600,509**	
SCIENTIFIC EXPENSES			
Sea State WG - book purchase	-	-	
Salinity WG - report review	-	-	
Wave Breaking	13,300	13,306	
Fish Harvest Impacts	24,780	24,964	
Muddy Coasts WG - book purchase	-	-	
Double Diffusion	10,000	5,244	
Air-Sea Fluxes	9,000	9,000	
Iron WG - standards sub-group	-	-	
Coastal Models	5,960	5,959	
Groundwater	10,300	10,289	
Asian Monsoons	7,184	7,184	
Permeable Sediments	15,000	13,194	
JGOFS	95,000	84,320	
less funds to training course	(6,650)	-	
GLOBEC	75,000	117,000	including funds to IPO not in budget
GEOHAB	40,000	33,033	
SOLAS	-	-	
Total SCOR Subsidiary Bodies	**298,874**	**323,493**	
Other Scientific Activities			
Training course, Bangalore, 1/99	51,650	51,648	
Travel Awards	50,000	32,172	
SCAR GLOCHANT Symposium	4,000	2,500	
Misc. NSF-funded activities	2,071	2,071	
AOSB Symposium support	-	1,886	
Total	107,721	90,277	
TOTAL SCIENTIFIC EXPENSES	**406,595**	**413,770**	

RELATED SCOR EXPENSES			
Representation	6,500	6,954	
Publications	10,000	9,503	
Executive Committee meeting, Goa, 10/99	25,000	20,509	
Total	41,500	36,966	
TOTAL NON-ADMIN. EXPENSE	**448,095**	**450,736**	
SCOR SECRETARIAT EXPENSES			
Salaries and Benefits	130,000	126,197	
less allocated to programs		(23,000)	
Communications	5,000	4,790	
Office Equipment	1,000	1,071	
Audit and Accounting Services	6,000	10,131	$3,070 credited to SCOR in 2000
JHU overhead charges	19,500	19,481	
Bank charges	200	276	
Miscellaneous, office supplies,	3,500	4,036	
TOTAL SECRETARIAT EXPENSES	**165,200**	**142,982**	
TOTAL SCOR EXPENSES	**613,295**	**593,718**	
Accumulated Balance 12/31/98	**137,371**	**137,371**	
Excess of Income over Expenses	**5,144**	**6,791**	
Accumulated Balance 12/31/99	**142,515**	**144,162**	

In addition to the basic SCOR budget, the following funds are administered by the Secretariat on behalf of the International Conference on Satellites, Oceanography and Society (1998) and the International Ocean Colour Coordinating Group

ICSOS INCOME	
US Agencies	13,292
Non-US Agencies	45,000
	58,292
ICSOS EXPENSES	58,292
ICSOS Excess of Income/Expenses	-
IOCCG INCOME	
NASA Support	32,306
Non-US Agencies	92,128
from IOC in contract to SCOR	15,000
	139,434
IOCCG EXPENSES	139,434
IOCCG Excess of Income/Expenses	-

ANNEX 9 – Amendments to the SCOR Constitution

August 17, 2000

To: National Committees, Nominated Members, Affiliated Organizations
cc: SCOR Executive Committee
From: Elizabeth Gross, Executive Director

Re: **Proposed Amendments to SCOR Constitution**

During the past year two weaknesses in the SCOR Constitution have become apparent and the Officers wish to propose amendments for consideration at the 25th General Meeting in October.

Clause 8(c) states: AThe President of each Affiliated Organization shall be an *ex officio* member of the Executive Committee.@

Proposed Change: *The President of each Affiliated Organization, or his or her nominee, shall be an ex officio member of the Executive Committee.*

Explanation: The Affiliated Organizations are the 3 disciplinary groups currently affiliated to SCOR, namely: the International Association for Biological Oceanography (IABO), the International Association for the Physical Sciences of the Ocean (IAPSO) and the International Association for Meteorology and Atmospheric Sciences (IAMAS). IAMAS in particular, while it includes many scientists in the field of air-sea interactions among its members, does not often have a President who is involved in the ocean sciences. The current President of IAMAS, for example, has asked to be represented in SCOR, especially on our Executive Committee, by someone with expertise more relevant to SCOR.

Clause 9 states: AThe term of office of the President is four years and he is not eligible for re-election for a consecutive term. The terms of office of the Vice-Presidents and Secretary are two years and they are eligible for re-election provided that not more than two terms of office are served consecutively.@

Proposed Change to take effect on January 1 2002:
The terms of office of the President and Secretary are four years and they are not eligible for re-election for a consecutive term. The terms of office of the Vice-Presidents are two years and they are eligible for re-election provided that not more than two terms of office are served consecutively.

Explanation: The intent of this amendment is to stagger the terms of the President and Secretary which are now most likely to expire at the same time every four years. Therefore this amendment should come into effect in preparation for the election of new officers at the General Meeting in 2002. Thus at the General Meeting in October, a new President will be elected for four years and a new Secretary for a two year term. In two years time, either a new Secretary can be elected, or the incumbent Secretary could be re-elected for a second term of four years. In either case, the result would be that the terms of these two Officers of SCOR would no longer coincide. The amendment also removes the only gender-specific reference in the Constitution.

ANNEX 10 – List of SCOR-Related Meetings (2000-2003)

2000

January 28-29	WG 109, Iron Certification Workshop	San Antonio, USA
February 1-4	International Ocean Colour Coordinating Group	Hobart, Australia
February 7-11	9th International Conference on Harmful Algal Blooms	Hobart, Australia
February 8-10	JGOFS North Pacific Synthesis WG	Nagoya, Japan
February 8-11	International Workshop on the Carbon Cycle in the North Pacific Ocean	Nagoya, Japan
	JGOFS North Pacific Task Team	Nagoya, Japan
February 9-11	SPACC, Underway Data workshop	San Sebastian, Spain
February 13-14	GEOHAB Science Plan editorial meeting	Hobart, Australia
February 20-24	SOLAS Open Science Meeting	Damp, Germany
February 20-24	SC-IGBP	Mexico City, Mexico
February 25-27	IGBP IPOs	Mexico City, Mexico
March 22	GLOBEC SPACC Planning Meeting	La Jolla, USA
March 23-26	PICES Beyond El Niño	La Jolla, USA
April 11,12	JGOFS SSC	Bergen, Norway
April 13-17	JGOFS 2nd International Science Conference	Bergen, Norway
April 17	JGOFS Executive Meeting	Bergen, Norway
April 24-28	6th International Coastal Symposium	Rotorua, New Zealand
May 10-12	GOOS Scientific Committee	Paris, France
May 14-17	SOLAS editorial meeting	Cloudcroft, USA
May 15-17	GLOBEC SSC	Barcelona, Spain
May 18-19	GLOBEC Focus 1 WG	Barcelona, Spain
May 18-19	GLOBEC/CLIVAR/PAGES Intersection	Barcelona, Spain
May 30-31	IOC Science Program Review	Paris, France
June 1-4	GEOHAB SSC	Copenhagen, Denmark
June	IGOS Partners	Geneva, Switzerland
June 5-6	JGOFS Data Management Task Team	Kiel, Germany
June 5-8	Gas transfer at Water Surfaces	Miami, USA
June 13-14	JGOFS Paleo JGOFS Task Team	Kiel, Germany
June 19-29	IOC Executive Council	Paris, France
July 9-13	JGOFS Southern Ocean Symposium	Brest, France
July 16-23	COSPAR Assembly	Warsaw, Poland
July TBD	GLOBEC Focus 2	Roscoff, France
August 1-3	100 Years of Science Under ICES	Helsinki, Finland
August 10-12	SCOR Search Committee	Baltimore, USA
August 21-23	GEOHAB Editorial Group	Baltimore, USA
September 4-7	SCOR/IOC CO_2 Panel	Paris. France
September 22-26	Future Ocean Biogeochemistry	Plymouth, UK

September	GLOBEC Focus 3	Durham, USA
October	1st Latin American School in Ocean and Climate Modeling	Concepcion, Chile
October 9-13	SCOR General Meeting and Symposium	Washington, D.C., USA
October 20-28	PICES-2000	Japan
October	GLOBEC CCCC session @ PICES	Japan
November 9-11	WG 118—Technologies for Observing Marine Life	Victoria, Canada
November 13-17	GEOHAB SSC	La Paz, Mexico
Nov 24-Dec 8	WG 112—Groundwater Intercalibration Experiment & WG meeting	Perth. Australia
Nov 29-Dec 1	POGO	Sao Paulo, Brazil
December 5-8	PORSEC	Goa, India

2001

January 8-10	Southern Ocean GLOBEC Planning Team Meeting	Arlington, USA
January 15-17	WG 114 - Permeable Marine Sediments	Honolulu, USA
January 23-26	IOCCG	La Jolla, USA
February 12-16	SPACC: Turning Points in the Benguela System	Cape Town, South Africa
February 20-23	SC-IGBP and IPO meeting	Chiang Mai, Thailand
March 11-16	GRC on Polar Marine Science - Physical-Biological Coupling	Ventura, USA
April 3-7	GEOHAB SSC Meeting	Shanghai, China
April 2-5	The Oceanography Society Scientific Meeting	Miami, USA
April 6-11	WG 111 – Coastal Models Workshop	Miami, USA
April 23-25	ASLO Workshop to Identify the Scientific and Legal Questions Behind Fertilization of the Ocean to Sequester Atmospheric Carbon Dioxide	Washington, D.C., USA
May 7-11	WG 113 - Asian Monsoons	Beijing, China
May 20-25	Indo-Pacific Fish Conference-2001	Durban, South Africa
May 21-25	WG 110 - SCOR/WCRP Workshop on Air-Sea Fluxes	Washington, D.C., USA
May 23-26	GLOBEC SSC	Lima, Peru
May 23-27	WG 117 – Decadal to Millennial Climate Records	Santa Barbara, USA
May 27-28	GLOBEC Focus 1 Working Group Meeting	Lima, Peru
May 29-31	1st Meeting of the Intergovernmental Working Group on IOC Oceanographic Data Exchange Policy	Brussels, Belgium
May 29-June 1`	SPACC: Retrospective Data Analysis Meeting	Lima, Peru
June 11-15	WG 112 – Groundwater Discharges	Sicily
June 24-26	Ocean Futures Planning Committee	Southampton, UK
July 3-7	IOC Assembly	Paris, France
July 8-9	JGOFS SSC	Amsterdam, The Netherlands
July 8-9	WG 116 – Sediment Traps & ^{234}Th	Amsterdam, The Netherlands
July 10-13	IGBP Open Science Meeting	Amsterdam, The Netherlands
August 8-11	IOC COASTS Workshop	Paris, France
September 3-5	IOC/SPACC Workshop on the Use of Environmental Indices in the Management of Pelagic Fish	Cape Town, South Africa

September 6-8	SPACC: Spatial Approaches of the Dynamics of Coastal Pelagic Resources and Their Environment in Upwelling Areas	Cape Town, South Africa
September 16 - 21	International Conference on Paleoceanography	Sapporo, Japan
October 1-5	6th International CO2 Conference	Sendai, Japan
October 5-6	WG 119 – Quantitative Indicators	Reykjavik, Iceland
October 5-13	PICES Tenth Anniversary Meeting	Victoria, Canada
October 10-23	SPACC: Workshop on Paleoceanography	Munich, Germany
October 21-28	IAPSO/IABO joint meeting	Mar del Plata, Argentina
October 27	WG 118 – New Technologies for Observing Marine Life (subgroup meeting with Census of Marine Life Pilot Project Leaders)	Mar del Plata, Argentina
October 27	Regional Graduate Schools of Oceanography	Mar del Plata, Argentina
October 29-30	SCOR Executive Committee	Mar del Plata, Argentina
November	IRI/GLOBEC: Climate, Ecosystems, and Fisheries in the Pacific: Seeking Fresh Approaches to Key Research Issues	Honolulu, USA
November 4-8	Estuarine Research Federation	St. Petersburg, USA
November 27-29	POGO-3	Nova Scotia, Canada

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Feb 11-15	Ocean Sciences Meeting	Honolulu, Hawaii
Feb.	WG 109 – Biogeochemistry of Iron in Seawater	Honolulu, Hawaii
First 2 weeks of June	IOC Executive Council	Paris
mid-year	WG 119 – Quantitative Indicators	Vancouver, Canada
Sept. 20-22	ICSU Capacity Building Conference	Rio de Janeiro, Brazil
Sept. 24-28	ISCU General Assembly	Rio de Janeiro, Brazil
Oct. 1-5	SCOR General Meeting	Sapporo, Japan
Oct. 15-18	2nd GLOBEC Open Science Meeting	Qingdao, China

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mid-year	WG 119 – Quantitative Indicators (Workshop)	Cape Town, South Africa
May 5-8	Third JGOFS Open Science Conference	Washington, D.C., USA