3.0 LARGE-SCALE OCEAN RESEARCH PROJECTS

3.1 Scientific Steering Committee on Global Ocean Ecosystem Dynamics (GLOBEC)
(Joint with IGBP and IOC)

Terms of Reference:

- To oversee the development and implementation of the Global Ocean Ecosystem Dynamics program in accordance with the published Science Plan.
- To develop a detailed Implementation Plan for GLOBEC for presentation to the sponsors and the larger scientific community.
- To recommend to the sponsoring organizations the necessary actions to be taken in accordance with the GLOBEC Science and Implementation Plans and to coordinate and manage the resulting activities.
- To collaborate, as appropriate, with other related global change programs and planning activities, such as JGOFS, LOICZ, WCRP, the IOC program on Ocean Science and Living Resources (OSLR), and the emerging Global Ocean Observing System.
- To establish appropriate data management policies to ensure sharing and preservation of the GLOBEC data set, taking into account the related policies of the sponsors.
- To report regularly to SCOR, IGBP, and IOC and to other bodies such as WCRP, ICES, and PICES, on the state of planning and accomplishments of GLOBEC.

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John Field	SOUTH AFRICA	Geir Ottersen	NORWAY
Roger Harris	UK	Ian Perry	CANADA
Eileen Hofmann	USA	Jeffrey Runge	USA
Patrick Lahodey	NEW CALEDONIA	Qisheng Tang	CHINA-Beijing

Executive Officer: Manuel Barange
Executive Committee Reporter: Akira Taniguchi

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GLOBEC: Global Ocean Ecosystem Dynamics

Report of the SCOR/IOC/IGBP GLOBEC International Programme for 2003/2004 to the SCOR Assembly. Venice, Italy 27-30 September 2004

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1. RECENT PROGRESS: Symposia and Working Group activities

1.1. GLOBEC-sponsored symposia

- **GLOBEC/ PICES/ ICES 3rd Zooplankton Symposium. Gijon, Spain, May 2003**

In May 2003 GLOBEC hosted the *3rd International Zooplankton Symposium- The role of zooplankton in global ecosystems dynamics: comparative studies from the world oceans* in Gijon, Spain. The OSM was attended by approximately 350 scientists from 53 countries. The main goal was to define the current 'state of the art' of zooplankton ecology, with a focus on the effect of climate variability and global climate change on zooplankton. Four workshops preceded the conference, and the Proceedings appeared in ICES J. Mar. Sci. 61 (Valdes et al. –Eds.- : 441-738p) in May 2004.

- **UK GLOBEC Open Science Meeting, London, February 2004**

This effort was the culmination of the main UK GLOBEC field programme, 'Marine Productivity', which is due to complete its work in March 2005. The meeting received extensive media coverage nationally and internationally (including Nature), and has significantly influenced a re-organisation of future funding for fisheries and ecosystem research, currently divided between Institutions and government departments.

- **SCOR/IOC Quantitative ecosystem indicators for fisheries management, Paris, April 2004**.

In support of the organisers GLOBEC contributed funds to sponsor speakers and participants to this meeting, in recognition of the symposium's relevance to GLOBEC objectives.

- **ICES Symposium on The Influence of Climate Change on North Atlantic Fish Stocks, Bergen , May 2004**

GLOBEC was a major sponsor of this symposium, inviting half of the guest speakers. The meeting was grouped into 3 main topics:
1 - The effect of climate variability on growth, maturity, recruitment and mortality
2 - The role of zooplankton in climate-fish relations
3 - Taking account of climate in the evaluation of the state of fish stocks
4 - Managing fish stocks under future climate scenarios and in the face of climatic uncertainty
This symposium is part of the synthesis efforts of the GLOBEC 'Cod and Climate Change' regional programme. The proceedings will be published in ICES J. Mar. Sci. in 2005.

- **GLOBEC symposium on Climate Variability and Sub-Arctic Marine Ecosystems, Victoria, Canada, May 16-20, 2005**

Part of GLOBEC's integration and synthesis effort will be along regional symposia, which will take the role previously delivered through Open Science Meetings. The main sessions of this symposium are:

1 - Regional Focus Session (Barents/Norwegian, Iceland/Greenland, Labrador/Gulf of St. Lawrence/ Hudson Bay, Bering Sea, Sea of Okhotsk, Oyashio)
2 - Physical Forcing & Biological Response in the Water Column
3 - Warming Impacts on Trophic Coupling
4 – Disciplinary sessions (Physics and Chemistry, Primary Production, Secondary Production, Fish, Shellfish, Seabirds and Mammals)
5 - Climate Change and the Structure of Ecosystems: the Potential for Trophic Cascades
6 - Recent Changes in Ecosystem Structure or Function
7 - Implications of Climate-forced Change for Management and Social Institutions

The symposium will also be used to develop an implementation strategy for the new GLOBEC ESSAS programme (see below). Registration and further details are available through www.globec.org.

- **PML/ NERC/ GLOBEC AMEMR (Advances in marine ecosystem modelling research) Symposium, Plymouth, UK, 27-29 June 2005**

This international symposium is being convened by the Plymouth Marine Laboratory as a forum for presentation and discussion of all aspects of model-based marine ecosystem research, encompassing numerical, conceptual, mathematical and statistical approaches. GLOBEC's Focus 3 WG is planning to further several of their integration and synthesis plans at this symposium, as well broadening GLOBEC's modelling networks.

1.2. Focus 1 working group: Retrospective Analysis and Long-term time series

The most salient developments of this working group in the recent past and future are:

- A large workshop on ecosystem comparisons, entitled "Climate Variability and Exploited Marine Ecosystems" will be organised for September 2005. The meeting will commission ca. 15 background papers to be published as part of a special issue.
- A paper by the group on interdecadal to multicentennial variability in marine ecosystems was published in the recent PAGES Newsletter, to assist in the development of links with the paleoceanographic community.
- The Focus 1/ SPACC Workshop on Long-term dynamics of Small Pelagic Fishes and Zooplankton in Japanese Waters was conducted in Tokyo, 9-10 Dec 2003 and Misaki, 10-11 Dec 2003, and will result in a special issue of *Oceanography*.
- The next Focus 1 WG will be in Honolulu, USA, 25-27 October 2004, following PICES XIII. The main objectives are:
    - to present papers at the CLIVAR special session of PICESXIII,
    - Develop synthesis plans of GLOBEC Retrospective Studies
    - Work on a joint paper on comparisons of regime shifts in the Humboldt and Kuroshio currents
    - Discuss how to interact with the proposed SCOR Working Group on Global Comparisons of Zooplankton Time Series
    - Continue preparations for the Ecosystem comparison workshop (see point 3.1 above)

1.3. Focus 2 working group: Process Studies

- The Focus is planning its next meeting in Rhode Island, USA, July 18 – 20 2004. The goal of the meeting is to develop synthesis plans for the group, including a review paper or collection of papers. Potential titles include:
    - Zooplankton reproduction, growth and mortality rates
    - Zooplankton trophodynamic strategies
    - Role of microzooplankton in food webs
    - Ocean physics and basic biological processes of individual organisms
    - Mesoscale physical-biological interaction
    - Large-scale physical-biological interaction

- Future plans for the group include three possible activities for 2005:
    - A meeting of the Focus 2 and Focus 3 working groups with emphasis on LTL models and to discuss the sensitivity of individuals and populations to variations in biological processes.
    - A joint workshop with SPACC on methods to estimate food fields for small pelagics.
    - A joint meeting with IMBER to develop the concept of "key processes".

1.4. Focus 3 working group: Prediction and Modelling

- Last year a subgroup of the Focus 3 working group (joined by a member of the JGOFS, PICES & IMBER networks) met twice in the UK to prepare a review paper on Basin Scale modeling (*Challenges of modelling ocean basin ecosystems*).The output appeared in *Science* (B De Young et al. 2004. Science 304: 1463-1466). Funding for this activity was primarily from SCOR and IOC, with contributions from GLOBEC, PICES and JGOFS.
- A subgroup of Focus 3 met in Bergen at the ICES Symposium on "The Influence of Climate Change on North Atlantic Fish Stocks", on May 9-10, 2004, to review progress of F3WG, to consider further developments of the 'Basin scale modelling" discussion and the outline and define the steps in the practical implementation of the GLOBEC modelling "rhomboid", designed to include fish, zooplankton and primary productivity into a single ecosystem model.
- A PICES CCCC Model TT and GLOBEC Focus 3 WG proposal has received funding for 2005 from the APN an "International Workshop on Climate Interactions and Marine Ecosystems: Effects of Climate on the Structure and Function of Marine Food-Webs and Implications for Marine Fish Production in the North Pacific Ocean and Marginal Seas".
- Finally, Focus 3 will host a full working group meeting in 2005, in a venue and date yet undecided.

1.5 Focus 4 working group: Feedback from changes in marine ecosystem structure

The main activities of the group over the last year include:

- A full Focus 4 working group in Banff, June 2003, following the IGBP Congress.
- A group presentation at the IHDP Open Meeting in Montreal, Canada, October 2003
- The co-sponsoring of a session at PICES XII, Seoul, Korea, October 2003.

An important plan for 2005 would be the development of an appraisal paper entitled "What are the impacts of marine ecosystem change on coastal communities, and what are the impacts of human communities responses on marine ecosystem change", as a Focus 4 group effort. Four case studies have been chosen: NW Atlantic (B. Neis), NE Pacific (S. Ebbin; M. McCammon; I. Perry), SE Atlantic (J. Field; R. Sumaila), SE Pacific (K. Broad).

In the medium term the group would like to focus its effort in organising a symposium in 2007 on "Natural and human system implications of large-scale changes in marine systems" (working title). In the short term they would like to have their next meeting in Spring 2005, to a) complete the appraisal paper, b) progressing the organization of the Symposium, and c) to integrate on-going activities.

The final composition of the Focus 4 WG has been approved. There is a two-tier membership structure, tier one members including: Rosemary Ommer (History, Canada), Ian Perry (Fisheries Oceanography, Canada), Kenneth Broad (Anthropology, USA), Patrick Lehodey (Fisheries Oceanography, New Caledonia), Barbara Neis (Sociology, Canada), John Field (Marine Ecology, South Africa), Ana Parma (Fisheries, Argentina), Renato Quiñones (Marine Ecology, Chile), Svein Jentoft (Socio-economics, Norway), Jiehua Lu (Demography, China)

2. REGIONAL AND NATIONAL PROGRAMME UPDATES (see Annex 1 for more details)

GLOBEC has currently 4 regional programmes, and has a further two in planning phase.

2.1 ICES-GLOBEC Cod and Climate Change project (CCC)

The activities of the group in recent months and in the future include the following:

- A workshop held to develop the CCC synthesis book (to appear in the IGBP Series in 2005), in New Bedford, US, May 2003
- A WG meeting focused on synthesis of past activities and a revised strategic plan for 2005-2009, New Bedford, US, May 2003
- A theme session on transport of cod larvae at ICES ASC, Tallinn, Estonia, Sept. 2003
- A WG meeting focused on furthering synthesis plans and in particular planning of synthesis workshops, in Bergen, Norway, May 2004
- The ICES Symposium "The Influence of Climate Change on North Atlantic fish stocks", Bergen, Norway, May 2004, already reported on above.

A major update of the programme has been the revision of the Programme Strategic Plan, originally published in 1998. The revision summarises the work of the group up to 2009, and describes its last phase (2004-2009) underpinned by the following proposed programme of workshops:

2005 - Impact of zooplankton on cod abundance and production (in collaboration with the ICES WG on zooplankton ecology)
2006 - Influence of climate on tropho-dynamics of cod ecosystems
- The decline (and recovery) of cod stocks in the N Atlantic
2007 - The future of cod in a changing climate
2008 - Implications of results from CCC for fisheries management
2009 - Synthesis II Workshop.

2.2. Small Pelagics And Climate Change (SPACC)

These are the main developments of the programme in the last year:

- A project involving IAI/ IRD/ CICESE/ IMARPE started coring off Peru in May 2004 to develop centennal time series of pelagic fish abundance off Callao and Pisco.
- An article on SPACC's paleoecological work has been published in the IGBP-PAGES Newsletter (2004)
- A multi-authored paper (F Koster, *et al*.) reviewing work conducted on "Use of environmental indices in fish stock assessment and management procedures: state of the art in pelagic fish stocks" will be presented at the World Fisheries Congress, Vancouver May 2004
- A SPACC workshop, "Characterizing and Comparing the Spawning Habitats of Small Pelagic Fish" held at the Univ. Concepcion, Chile, 12-13 January 2004. The workshop was followed by a SPACC meeting on "Small Pelagic Fish Spawning Habitat Dynamics and the Daily Egg Production Method", 14-16 January 2004 and received SCOR travel support.
- A meeting of the SPACC Executive Committee was held in Concepcion, Chile, 17-18 January 2004.
- An informal network of modelers sharing the same numerical code (ROMS-AGRIF) and tools and implementing comparable regional configurations in Eastern Boundary Currents has been

established, including IDYLE/IRD, LPO, LEGOS, LODYC, UCLA, UCT, M&CM, BCLME, JRC, IPIMAR, IMARPE, INRH, LPA.

A major activity for 2004 is the planned workshop on the "Economics of Small Pelagics and Climate Change" to be held in Portsmouth, UK, 13-15 September 2004, with support from GLOBEC, NOAA and SCOR. The meeting is organised by R. Hannesson, S. Herrick and M. Barange, and aims at publishing a special journal issue of case studies that would lead this research field in years to come.

In terms of SPACC's contribution to synthesis the Executive Committee of SPACC proposes:

- A workshop in 2007 and, thereafter, the publication of a book structured along the major research lines of SPACC.
- An international symposium in 2008 presenting in detail the achievements of SPACC along themes and regions, followed by a publication of the symposium proceedings in an international, peer-reviewed journal.

SPACC appreciate SCOR's support to developing country scientists attending the Concepcion meetings in 2004.

2.3 Southern Ocean GLOBEC

Having completed the field programme for the USA part of SO GLOBEC, results are now being prepared for publication. Main achievements from the seasonal cruise programme are:

- Observed seasonality between winter- and summer-dominant species of birds and mammals. Affinities between species and water masses established.
- Observed mixing and formation of water masses (particularly the autumn to winter transition) using sensors located on seals and penguins.

Major programme developments in recent and coming months include:

- A joint Georges Bank, NEP and SO GLOBEC session at the 2004 Ocean Sciences Meeting in Portland, USA ("Understanding the Physical and Biological Coupling of Marine Population Dynamics, Chaired by E. Hofmann, P. Wiebe and T. Strubb), which received 155 abstracts, presented in 8 oral and 3 poster sessions.
- The Session on Southern Ocean Marine Ecosystems at the SCAR Open Meeting in Bremen, Germany, July 2004. The session will include 20 oral presentations and 14 posters.
- The imminent publication of the 1st SO-GLOBEC *Deep-Sea Research* special issue, including 22 papers from all the countries participating in the SO GLOBEC effort.
- The forthcoming announcement (fall 2004) of US NSF Polar Programme for SO GLOBEC synthesis and modeling activities. Funding expected for 2005.
- A follow-on of the successful SO GLOBEC programme under the GLOBEC and IMBER umbrellas. This new activity is named ICCED – Integrated analysis of Circumpolar Climate interactions and Ecosystem Dynamics in the Southern Ocean. ICCED will:
    - Encompass interdisciplinary studies to understand climate interactions in the SO and their implications for ecosystem function and feedbacks to biogeochemical cycles.
    - Be circumpolar, and will include field studies
    - Extend and further develop circulation, ecosystem, and biogeochemical models
    - Stimulate capacity building
    - Focus on whole ecosystem – including cetaceans
    - Provide an opportunity to obtain circumpolar information on cetacean distribution and abundance
    - Continue the partnership with the IWC.

2.4. PICES-GLOBEC Climate Change and Carrying Capacity (CCCC)

Forthcoming activities of the CCCC at PICES XIII (Honolulu, USA, October 2004) include:

- A 2-day BASS/REX/MODEL Workshop on "Linkages between open ocean and coastal systems II";
- A 1-day REX Workshop on "The seasonal cycle of plankton production in continental shelf waters around the Pacific Rim";
- A 1-day MONITOR/POC Workshop on "North Pacific GOOS: Needs and activities";
- A 1-day MODEL Workshop to prepare a strategy and products for future NEMURO and NEMURO.FISH training sessions;
- A 1.5-day CCCC scientific session on "The impacts of large-scale climate change on North Pacific marine ecosystems";

As CCCC moves towards its conclusion a number of programmatic decisions have been taken:

- To disband the existing BASS and REX Task Teams and merge them into a new Task Team titled CFAME (Climate Forcing and Marine Ecosystem)
- To extend the MONITOR Task Team, currently in CCCC, beyond the duration of the CCCC Program. MONITOR has assumed the primary responsibility for the evaluation (and perhaps future versions) of the North Pacific Ecosystem Status Report (NPESR), as well as providing guidance for present and future monitoring programs in the North Pacific. MONITOR is then expected to become a Technical Committee of PICES.

To pave the way to synthesis PICES CCCC has formed NEXT (**N**emuro **EX**perimental Planning **T**eam), with the goal to develop a strategy for accomplishing PICES-CCCC Synthesis. NEXT will be chaired by Hal Batchelder and will include other key participants (Gordon McFarlane, Akihiko Yatsu, Shin-ichi Ito, Bernard Megrey, Thomas Wainwright, Douglas Hay, William Peterson, Yoshiro Watanabe, Yukimasa Ishida).

The key step in this synthesis effort is the International North Pacific PICES/ GLOBEC CCCC Symposium (Honolulu, 19-21 April 2006).

2.5. New Regional Programmes: CLIOTOP (CLimate Impacts on Oceanic TOp Predators) and ESSAS (Ecosystem Studies of Sub-Arctic Seas)

With support from NSF-SCOR GLOBEC initiated a planning phase for a research activity on the impacts of climate variability and change in marine sub-arctic ecosystems. The goal of ESSAS (Ecosystem Studies of Sub-Arctic Systems) is to compare, quantify, understand, and thereby predict the impact of climate variability on the productivity and sustainability of sub-arctic marine ecosystems. The main field regions are the Bering Sea, Sea of Okhotsk, Oyashio Current, Barents Sea, the Newfoundland-Labrador Shelf and the West Greenland shelf, all of which experience seasonal ice cover. A draft science plan was presented at the recent GLOBEC SSC meeting, independently reviewed, and a revised plan is expected to be approved by the GLOBEC Executive in September 2004. The programme will be launched at the forthcoming GLOBEC symposium planned for 2005 in Victoria, Canada (see point 1 above).

In parallel GLOBEC has been fostering a new pan-equatorial research activity named CLIOTOP (Climate Impacts on Oceanic Top Predators). This activity will focus on populations of tunas, sharks and other large predators, and the ecosystem that sustains them. A draft science plan was recently evaluated and independently reviewed by the GLOBEC SSC, and a final draft is expected to be approved by the GLOBEC Executive in September 2004.

3. GLOBEC INTEGRATION AND SYNTHESIS

GLOBEC is embarking on an integration and synthesis phase that will lead the programme to its conclusion in December 2009. At the most recent GLOBEC SSC meeting the group initiated the development of a blueprint document to set up the goals, milestones and pathways to this I+S. The

following table provides a skeleton for this document, which will evolve over coming months (and will probably be much evolved by the time the SCOR Assembly meets in Venice)

GLOBEC I+S – What is it all about?

A. What is GLOBEC's Philosophy

- Multi/ interdisciplinary international collaboration
- Coupled models as integrative tools
- Multi-scale (time, space, institutional) analysis
- Enhanced understanding of the role of high trophic levels and top-down controls (hierarchical)

B. What constitutes GLOBEC's Body of Knowledge:

1. Ecosystem Structure and Function
    - Regional comparisons (High/Low latt., coastal/open)
    - Demonstrate the role of Climate variability in effecting marine ecosystem changes
    - Identify the relative role of ecosystem components (plankton, fish, humans) in ecosystem functioning
2. Forcings
    - Determine the space/time modes of variability in natural climate processes Highlight the mechanisms behind ecosystem teleconnections
    - Recognise the role of Humans as forces of change
3. Physical/ Biological/ Human interactions and Feedbacks

C. What Innovative methodologies has GLOBEC developed or contributed to?

1. Sampling and technological advances in support of GLOBEC science
2. Coupled Models (trophic, scale, time) to investigate structure, function and variability
3. Retrospective studies (particularly multidecadal to centennial) on past ecosystem states
4. Comparative approach (mostly regional)

D. What Management information transfer does GLOBEC strive for?

1. Policy (providing conceptual understanding of ecosystem function)
2. Managers (providing tools to incorporate climate-driven variability)
3. Communities (enhancing communication on GEC and marine sustainability)

E. What Education/ Outreach tools/activities does GLOBEC want to engage in?

1. Curriculum development
2. Web-based approaches
3. Animations (scenarios)
4. Lessons learned

This blueprint to I+S will be developed by identifying workshops, symposia and any other activities needed to implement it. Negotiations are underway with the UK's Natural Environment Research Council to provide seed funding for the I+S phase. It is envisaged that funds from SCOR to GLOBEC will be used for the same purpose, in addition to partially supporting the Scientific Steering Committee's annual meeting.

The following is a preliminary calendar of already identified synthesis symposia:

2004	2005	2006	2007	2008	2009	2010
			FOCUS4[1]			
CCC[2]						
		CCCC[3]				
				SPACC[4]		
	ESSAS[5]		US GLOBEC[8]			
						GLOBEC[6]
			4th ZOOPL.[7]		SO GLOBEC	

1- Natural and Human system implications of large-scale changes in marine systems, TBA
2- ICES/GLOBEC The influence of Climate change on North Atlantic fish stocks, Bergen, Norway. May 2004
3- PICES/GLOBEC Climate Change and Ecosystem impacts in the North Pacific, Honolulu, USA, 19-21 April 2006
4- Synthesis of the Small Pelagic Fish and Climate Change Programme, TBA
5- Climate variability and sub-arctic marine ecosystems. Victoria, Canada, 16-20 May 2005
6- Final GLOBEC Open Science Meeting, TBA
7- PICES/ICES/GLOBEC 5th Zooplankton Production Symposium. Hiroshima, Japan, June 2007
8- US GLOBEC Synthesis meeting, TBA

4. OTHER PROGRAMME NEWS

1. EUR-OCEANS Network of Excellence. - This activity was recently approved by the European Commission (ca. Є10M) as a Network of Excellence, linking about 75 Institutes involved in GLOBEC and IMBER research in Europe. EUROCEANS plans to initiate activities in 2005.
2. NSF/EU Transatlantic GLOBEC plans – A NSF-EU co-funding proposal to conduct a workshop focused on basin-scale GLOBEC research in the North Atlantic is being evaluated. The proposal is led by Peter Wiebe, and aims at contributing to GLOBEC's overall synthesis by linking some of the USA, Canada, UK, ICES, and other regional activities.
3. Zooplankton Production Symposium – GLOBEC has accepted a request from the organisers of the 5th Zooplankton Production Symposium to consider becoming co-sponsors of the event with PICES and ICES. The partnership was responsible for staging the 4th Zooplankton symposium in 2003.
4. GLOBEC is working with a UK company to develop an internet-based educational tool that highlights the role of zooplankton in marine ecosystems. The proposal would build on the educational legacy of GLOBEC, and will be developed in coming months.

5. GLOBEC IPO

Staff and infrastructure support for the GLOBEC IPO is provided by a grant from the Natural Environment Research Council of the UK (NERC) and by the Plymouth Marine Laboratory (PML). NERC's grant expires in March 2005. A proposal to renew the funding for the IPO was submitted in March 2004, and has been through independent evaluation. We are currently (June 2004) waiting for a response, both regarding its continuation and its level of support. The proposal would ensure that GLOBEC would have an IPO until its completion in Decmber 2009.

5.1. Publications

The GLOBEC publication list can be interactively searched at www.globec.org. Since 2000 the list includes a total of 551 peer-reviewed publications. This is expected to be an underestimate of the total publications of GLOBEC researchers, as they have to be logged in the website by the authors (or the IPO) and have to acknowledge their contribution to GLOBEC in the article. The real figure is likely to be at least an order of magnitude higher. The following list includes special issues of GLOBEC:

1. *Barange, M., Nykjaer, L.* (Eds.) 2004. ENVIFISH: Investigating environmental causes of pelagic fisheries variability in the SE Atlantic. Progr. Oceanogr., 59(2/3): 177-337.
2. *Batchelder, H.P., Powell, T.* (Eds.) 2002. Physical and Biological Conditions and Processes in the Northeast Pacific Ocean. Progr. Oceanogr. 53 (2/4), 105-411
3. *Beardsley, R.C., P.C. Smith, C.M. Lee* (Eds.) 2003. U.S. GLOBEC: Physical processes on Georges Bank (GLOBEC). J. Geophys. Res., Vol. 108, No. C11
4. *Bograd, S.J., D.A. Checkley, Jr. and W. S. Wooster* (Eds.) 2003. CalCOFI: a half century of physical, chemical, and biological research in the California Current System. Deep-Sea Research II 50: 2349-2594.
5. *Coombs, S., Harris R., Perry, I., Alheit, J. (*Eds.). 1998. Proceedings GLOBEC 1st Open Science Meeting. Paris, France. Fisher. Oceanogr. 7(3/4), 175-390.
6. *Fogarty M.J., Qinlan, J.* (Eds.) 2002. The US GLOBEC program. Oceanography 15(2), 1-89.
7. *Harris R., Barange M., Werner F.E., Tang Q.* (Eds.). 2003. Proceedings GLOBEC 2nd Open Science Meeting. Qingdao, China. Fisher. Oceanogr. 12(4/5), 221-522.
8. *Mackas, D.L. and B. de Young* (Eds.) 2001. GLOBEC Canada: Response of marine ecosystems to environmental variability. Can. J. Fisher. Aquat. Sci. 58(4): 645-761.
9. *Reid, P.C., J.B.L. Mathews and M.A. Smith* (Eds.) 2003. Achievements of the continuous plankton recorder survey and a vision for its future. Progr. Oceanogr. 58: 115-358.
10. *Sugimoto, T.* (Ed.) 2002. Long term variations in the Northwest Pacific Ecosystems. A Korea-Japan GLOBEC Symposium. Fisher. Oceanogr. 11 (6), 315-370.
11. *Tande, K.S. and C. Miller* (Eds.) 2000. Population Dynamics of *Calanus* in the North Atlantic: Results from the Trans-Atlantic Study of *Calanus finmarchicus.* ICES J. Mar. Sci. 57: 1527-1874.
12. *Valdes, L., R. Harris, T. Ikeda, S. McKinnell and W.T. Peterson (Eds.) 2004. The role of zooplankton in Global Ecosystem Dynamics: comparative studies from the world oceans.* ICES J. Mar. Sci. 61(4): 441-738.
13. *Wiebe, P.H., Beardsley.C.* (Eds.) 1996. Physical –biological interactions on Georges Bank and its environs. Deep-Sea Res. II, 43 (7-8), 1437-2006.
14. *Wiebe, P.H., Beardsley, R.C., Bucklin,A.C., Mountain, D.G.* (Eds.) 2001. Coupled biological and physical studies of plankton populations: Georges Bank and related North Atlantic regions. Deep-Sea Res. 48(1/3): 1-684.
15. *Zavatarelli, M. and N. Pinardi* (Eds). 2001. First SINAPSI Symposium. Archivio di Oceanografia e Limnologia 22.

6. GLOBEC SSC 2004

The membership of the GLOBEC SSC is shown in the Table below.

Name	Gender	Country	Function	Term end
Dr Jürgen Alheit	M	Germany	Chair Focus 1, SPACC Exec	(Ex-Officio)
VACANT				
Prof John Field	M	South Africa	SSC	1st term 2004
Dr Roger Harris	M	UK	SSC Past-Chair, Focus 2	(Ex-Officio)
Prof Eileen Hofmann	F	USA	SSC, SO Chair	(Ex-Officio)
Dr Patrick Lehodey	M	New Caledonia	SSC, Focus 4	2nd term 2005
VACANT				
Prof Rosemary Ommer	F	Canada	SSC, Focus 4 co-Chair	2nd term 2005
Dr Geir Ottersen	M	Norway	SSC, CCC Co-Chair	2nd term 2005
VACANT	F	Argentina	SSC	1st term 2004
Dr Ian Perry	M	Canada	Focus 4 co-Chair	(Ex-Officio)
Dr David Runge	M	USA	SSC	1st term 2005
Prof Qisheng Tang	M	China	SSC	1st term 2005
Prof Francisco Werner	M	USA	SSC Chair, Focus 3	1st term as Chair 2005

Drs T Baumgartner (Mexico) and C Marrase (Spain) have both completed their second term and are thus not eligible for re-appointment. Dr A Parma (Argentina) and Prof J Field (South Africa) both complete their first term in 2004. Prof Field will be nominated for a second term, but Dr Parma will remain linked to GLOBEC through her participation in Focus 4 activities. Three new nominations will be made available to the co-sponsors of GLOBEC in due course.

7. CALENDAR OF ACTIVITIES (May 2004-June 2005)

- 9-10 May 2004: ICES/GLOBEC CCC Working Group Meeting, Bergen, Norway
- 9-10 May 2004: GLOBEC Focus 3 Working Group meeting, Bergen, Norway
- 11-14 May 2004: ICES-GLOBEC Symposium on 'The Influence of Climate Change on North Atlantic Fish Stocks'. Bergen, Norway
- 18-20 July 2004: GLOBEC Focus 2 Working Group meeting, Rhode Island, USA
- 26-28 July 2004: SCAR Science Conference: Antarctica and the Southern Ocean in the global system (including SO GLOBEC session). Bremen, Germany
- 26-28 August 2004 - 2nd GECAFS/ GLOBEC/ EPCOR planning meeting. Guayaquil, Equador
- 9 September 2004: GLOBEC Germany Open Meeting. Warnemuende, Germany.
- 13-15 September 2004: SPACC workshop on the economics of small pelagics and climate change. Portsmouth, UK
- 18-20 September 2004: GLOBEC Executive meeting. Plymouth, UK
- 22-25 September 2004. ICES ASC (incl. GLOBEC sessions). Vigo, Spain.
- 14-24 October 2004. PICES XIII (incl. GLOBEC CCCC sessions). Honolulu, USA.
- 22-26 October 2004: GLOBEC Focus 1 Working Group meeting, Honolulu, USA
- 26-28 October: IGBP IPO Executive Officers meeting. Plymouth, UK
- 27-29 November 2004: Second China-Japan-Korea Joint GLOBEC Symposium. Hangzhou, China
- May 2005. GLOBEC SSC meeting. TBA
- 16-21 May 2005: GLOBEC Ecosystem Studies of Sub-Arctic Seas (ESSAS) symposium Victoria, Canada
- 27-29 June 2005: AMEMR: Advances in Marine Ecosystem Modelling Research
  Plymouth, UK

Appendix 1. GLOBEC National, Multinational and Regional Programmes (Note: This is constantly evolving)

NATIONAL GLOBEC PROGRAMMES					
Country	**Duration**	**Name-code**	**Funding**	**Contact**	**Nature of Programme**
Brazil	1998-2002	DEPROAS	Conselho Nacional de Desenvolvimento Cientifico e Tecnologico	Y. Matsuura	3
Canada	1996-1999	GLOBEC Canada	Natural Sciences and Engineering Research Council Fisheries and Oceans Canada	B. de Young	1
Chile	1997-	FONDAP-Humboldt	Chilean National Commission for Science and Technology	R Escribano	3
China	1997-	China GLOBEC	National Natural Science Foundation of China Ministry of Science and Technology	Q. Tang	1
France	1999-	PNEC	Call for proposals, funded for 1 year. Proposals can be resubmitted each year. Mean duration ~4 years.	F. Carlotti	4
Germany	2000-	GLOBEC Germany	Waiting for funding to be approved by Federal Ministry for Education, Science, Research and Technology plus participating institutions	J. Alheit	1
Italy	2000-	SINAPSI	Ministero dell'Universita' e della Ricerca Scientifica e Tecnologica	M. Zavatarelli	
Japan	1997-	Japan GLOBEC	One project funded by Japanese Government, others seem to be institute/university funded	T. Sugimoto	4
Mexico	1997-	IMECOCAL	Consejo Nacional de Ciencia y Tecnologica IAI	T. Baumgartner	3
Netherlands	1993-	Several	Various loosely affiliated projects, various funding agencies	G Fransz	4
Norway	2002-2005	ECOBE, CLIMAR, ADAPT	EU funding, Norwegian Research Council, Norwegian Institutes and Institute of Marine Research	W. Melle/ S. Sundby	2
Portugal	1999-	GLOBEC Portugal	Portuguese Foundation for Science and Technology, IPIMAR	M. Santos	4
Spain	2001-	GLOBEC Spain	Ministerio de Ciencia, IEO, CSIC	C. Marrase	4
Turkey	1997-	Black Sea GLOBEC		T. Oguz	3
Ukraine	1997-	Ukraine GLOBEC	INTAS, UK DETR Darwin Initiative + others	V. Zaika	4
UK	2000-2005	Marine Productivity (largest)	NERC Thematic money – individual projects by proposal	P. Williamson	1
USA	1994-	US GLOBEC	NSF and NOAA – individual projects by submitted proposals	M. Fogarty	1

MULTI-NATIONAL PROGRAMMES

Name-Code	Start Year	Countries	Funding	Contact	Nature of programme
BENEFIT	1997-	South Africa, Namibia, Angola, Norway, Germany	Norwegian and German donor agencies, Governments of Angola, Namibia, South Africa	N. Sweijd	1
LIFECO	2000-2003	Norway, Germany, UK, Denmark	EU FP 5	M. St John	3
TASC	1996-1999	Norway, UK, Denmark, Iceland, Germany, France, ICES	EU MAST	K. Tande	3
ENVIFISH	1999-2001	EU countries, Angola, Namibia, South Africa	EU INCO	L. Nikjaer	3
VIBES	1997-2000	France, South Africa	ORSTOM	P. Freon	3
IDYLE I	2001-	France, South Africa	ORSTOM	P. Freon	3
IDYLE II	2004-	France, South Africa, Namibia, Chile, Peru	IRD (ex-ORSTOM)		
NATFISH	2002-	Norway, Morocco, Mauritania, Senegal, Italy	EU INCO	L. Nikjaer	3
OFCCP	2001-	USA, New Caledonia, Mexico, Australia, France, New Zealand, Japan, IATTC	National Funding agencies of participating countries, GEF.	P. Lehodey	3

REGIONAL PROGRAMMES

Name-Code	Start Year	Countries	Funding	Contact	Nature of programme
SPACC	1993-	Spain, France, Germany, Japan, Chile, Peru, Senegal, Mauritania, Portugal, USA, Mexico, and others	National	D. Checkley, C. Roy	4
ICES-CCC	1993-	ICES countries	National, ICES	K. Drinkwater, G. Ottersen	4
PICES-CCCC		Japan, China, Korea, Russia, Canada, USA	National, PICES	M. Kashiwai, H. Batchelder	4
SO		USA, Australia, UK, Germany, IWC, and others.	National	E. Hofmann	1, 4
CLIOTOP	(2005)	[USA, Australia, France, Spain, New Zealand, Japan and others]	National – Final approval by the GLOBEC SSC expected September 2004		
ESSAS	(2005)	[USA, Canada, Norway, Germany, Denmark, Russia, Japan and others]	National – Final approval by the GLOBEC SSC expected September 2004		

1- Specific GLOBEC call by national funding agencies, for individual scientists to bid against.
2- As for (1), but only affiliated to GLOBEC after funding has been allocated
3- Single project affiliated to GLOBEC post-funding (often with many PIs)
4- Group of relevant, independent projects under national funding, affiliated to GLOBEC as a group

3.2 Global Ecology and Oceanography of Harmful Algal Blooms (GEOHAB)
(joint with IOC)

Terms of Reference:

- To oversee the development of a Science Plan for the international SCOR/IOC program on the Global Ecology and Oceanography of Harmful Algal Blooms (GEOHAB) and to submit it within one year for the approval of the sponsors of the program and subsequent publication. The SSC should ensure that the Science Plan has input from the international HAB scientific community.
- To develop a detailed Implementation Plan for GEOHAB taking into account input from the scientific community, for presentation and approval by the sponsors and publication within two years.
- To coordinate and manage the resulting activities in accordance with the GEOHAB Science and Implementation Plans.
- To collaborate, as appropriate, with organizations such as ICES, PICES, etc. and related programs such as GLOBEC, LOICZ, and the emerging Global Ocean Observing System.
- To ensure effective communication between related national and regional HAB research efforts.
- To report regularly to SCOR and IOC, and to other bodies as needed, on the state of planning and accomplishments of GEOHAB.

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Allan Cembella	CANADA	Marina Levy	FRANCE
Einar Dahl	NORWAY	Dennis McGillicuddy	USA
Wolfgang Fennel	GERMANY	Robin Raine	IRELAND
Ken Furuya	JAPAN	Ming-Jiang Zhou	CHINA-BEIJING
Patrick Gentien	FRANCE		
Patricia Glibert	USA		

Ex-officio Member: Beatriz Reguera (IOC IPHAB)
IOC Staff: Henrik Enevoldsen
Executive Committee Reporter: Julie Hall

Activities 2003-2004

I Workshop on real-time coastal observing systems for ecosystem dynamics and HABs

This workshop was held in Villefranche sur Mer, France on 11-21 June 2003. The workshop was convened by Marcel Babin (a member of the GEOHAB SSC) and John Cullen. The meeting served to review real-time sensing systems applicable for observation, modeling and prediction of plankton dynamics, including HABs, in coastal waters. The meeting objective therefore coincided with the goal of GEOHAB to improve prediction of HABs through enhanced observation and modeling systems and was therefore endorsed by GEOHAB. The workshop was attended by approximately 90 participants, which included several members of the GEOHAB SSC. The proceedings of this meeting are available at http://www.HABWATCH.org.

II Publication of Implementation Plan

The GEOHAB *Implementation Plan* was published in November 2003. This document provides both an introduction and overview of implementation and a summary of implementation actions. A formal invitation to participate is also provided, accompanied by a description of the procedure for application and associated obligations and benefits. GEOHAB will encourage combined experimental, observational, and modeling approaches, using current and innovative technologies in a multidisciplinary approach that is consistent with the multiple scales and oceanographic complexity of HAB phenomena.

For the purposes of implementation, the GEOHAB SSC adopted a three-category system for defining and endorsing GEOHAB research:

Core Research is comparative, interdisciplinary, international, and directly addresses the overall goals of GEOHAB as outlined in the GEOHAB *Science Plan*. Core Research will directly address Programme Element 4 on Comparative Ecosystems and thus will cross-cut the other programme elements. Core Research will involve scientific co-ordination by the SSC and comprises oceanographic field studies conducted in, and application of models to, comparable ecosystems, supported by identification of relevant organisms; and measurements of the physical, chemical, and biological processes that control their population dynamics.

A major objective of Core Research is the integration achieved by the application of coupled biological/chemical/physical models to HAB dynamics in geographically distinct ecosystems sharing common features. Modelling activities within Core Research Projects may include the application of specified models to different ecosystems, testing and validation of different models within given ecosystems, and modification of existing models to fit current, emerging or hypothetical data sets. The extent to which HAB species respond in a similar way in ecosystems with similar characteristics will assist in defining the oceanographic processes that influence their population dynamics and community interactions. Interpreted via models, this comparative approach is ultimately expected to lead to an enhanced capability for HAB prediction.

The GEOHAB *Implementation Plan* specifies the formation of Core Research Projects (CRPs) related to four ecosystem types—upwelling systems, fjords and coastal embayments, eutrophic

systems, and stratified systems. These CRPs are to be initiated through small, focused open science meetings.

Targeted Research addresses specific objectives outlined in the GEOHAB *Science Plan*. Targeted Research may be solicited by the SSC as the need arises from Core Research Projects. Targeted research differs from Core Research in scope and scale. Whereas Core Research must be comparative, integrative and multi-faceted, Targeted Research activities may be more tightly focussed and directed to a research issue or element. It is expected that such studies of specific processes and mechanisms will facilitate the wider and larger-scale Core Research studies.

Regional/National Research is coordinated at a regional or national level rather than by the SSC, but may be endorsed by GEOHAB. For endorsement by GEOHAB, Regional/National Research activities must share objectives with GEOHAB in furthering the understanding of the ecological and oceanographic mechanisms underlying HAB population dynamics, but may have other overall objectives.

Included in the *Implementation Plan* are Framework Activities that are not research, but will facilitate the implementation of GEOHAB. They serve to enhance the value of research by ensuring consistency, collaboration, and communication among researchers, and include scientific networking and co-ordination of resources, data management, specification of protocols and quality control, capacity building, interaction with other programmes and projects, and resources and funding.

III Open Science Meeting: HABs in Upwelling Systems

The open science meeting on HABs in Upwelling Systems was hosted at the Instituto Nacional de Investigação Agrária e das Pescas (INIAP-IPIMAR), in Lisbon, Portugal on 17-20 November 2003. The meeting planning committee was co-chaired by Grant Pitcher (South Africa) and Teresa Moita (Portugal), and included Francisco Figueiras (Spain), Raphael Kudela (USA), Trevor Probyn (South Africa), and Vera Trainer (USA).

The CRP – HABs in Upwelling Systems is built on the premise that understanding the ecology and oceanography of HABs in upwelling systems will benefit from a comparative approach, which is the method of choice when controlled experimentation is not practical. To the extent that experimental control in the study of marine ecosystems is problematic, comparison presents a potentially powerful alternative for drawing scientific inference. Comparisons with respect to HABs will incorporate the grouping of species from upwelling systems. Assessment of the extent to which these HAB species respond in a similar way within these systems will allow the oceanographic processes that influence HAB population dynamics and community interactions to be established. Equally important will be identification of upwelling systems that have dissimilar HAB species or groupings. In addition, understanding the response of harmful algae to perturbations within upwelling systems will assist in prediction, and identification of divergences from predicted responses will also be informative.

The OSM served to identify interested participants and research regions and to bring together the international community to design core research. The meeting provided a general overview of HABs in the designated upwelling systems and meeting participants discussed a wide variety of research topics related to HABs in upwelling systems, which were distilled into 8 high priority research activities:

1. An ecologically based classification of the different harmful species based on their adaptation to the multiple sub-habitats characteristic of upwelling ecosystems. Included in this classification of HAB species in upwelling systems will be the functional role of morphological, physiological, behavioural and life-history characteristics, at the cellular level.

2. Identification of the seed strategies employed by HAB species within upwelling systems. Establishment of the sites of HAB initiation and characterisation of environmental influences on the life history stages of HAB species in upwelling systems is considered a priority in developing a predictive capability.

3. Determination of the influence of small-scale physical processes on the growth and dispersion of HAB species. Turbulent mixing determines much high-frequency environmental fluctuation and in so doing can control nutrient, irradiance, and phytoplankton patchiness, and is also known to affect plankton growth rates. Varying responses in terms of the succession of species within and among upwelling systems will allow inferences of the properties of the upper water column regulating species succession and the development of HABs.

4. An investigation of the nutritional physiology of target species as related to the natural variation in nutrient signals. Although time-series field measurements of nutrient concentrations can provide valuable insight to nutrient dynamics, provided that trans-boundary fluxes are quantified, direct measurements of regeneration and assimilation rates need also to be performed using isotope tracer methodology. These measurements will serve to provide meaningful input to biogeochemical models that can be employed in a predictive manner when coupled with the primary hydrodynamic forcing typical of upwelling ecosystems.

5. An assessment of genetic predisposition versus environmental conditions in the toxin production of target species in different upwelling systems. Variability in toxin production is likely caused by a combination of genotype and environmental conditions and elucidation of these respective roles in toxigenicity is critical in developing a predictive capability. Differences in the absolute toxicity of a given species in separate upwelling regions may be exploited to allow characterization of genes important in toxin synthesis.

6. Determination of the importance of coastal morphology and bathymetry on the dynamics of HABs in upwelling systems. These influences are responsible for creating alternating patterns of active and passive upwelling circulations along the coast which may serve in

creating sites favouring bloom initiation, retention, dispersion, etc. Characterisation of these sites will assist in understanding their role in the dynamics of HABs.

7. Field-based observations incorporating measurements of cross-shelf and along-shore advection and their role in the initiation, transport, accumulation and dispersion of HABs. These observations should be made with reference to both vegetative and resting stages of HAB species.

8. Identification of climate indicators as predictors of HAB events in upwelling systems. Evidence exists to suggest that variations in upwelling intensities and locations, and also ecosystems have occurred in concert with warming of the Earth's climate. Research is required to relate the effects of climate change, and associated variation in the predominant physical and chemical forcing mechanisms, on HAB species and communities that typify coastal upwelling environments.

Our understanding of and ability to predict HABs in upwelling systems over the next 5-10 years will reflect the extent to which the above questions are answered. A report of the Open Science Meeting has been completed and will be published by IOC as a GEOHAB document. An additional outcome of the OSM is a manuscript comparing HABs in the Californian, Iberian and Benguela upwelling systems, based on our present knowledge. The manuscript will be submitted for publication in the journal *Harmful Algae.*

The GEOHAB Scientific Steering Committee (SSC) will help provide international coordination for the CRP – HABs in Upwelling Systems, through the establishment of a GEOHAB CRP Subcommittee. This Subcommittee will commit to the promotion of comparative research and the involvement of individuals from the Californian, Iberian and Benguela upwelling regions, and from other major upwelling systems. The subcommittee will be responsible for working with scientists involved in the CRP to ensure that they coordinate their research, using the same measurement protocols, sharing data, and contributing to observation and model development. One or two members of the CRP Subcommittee will be members of the international GEOHAB SSC, to ensure a strong linkage between the Subcommittee and the SSC.

IV SCOR – IGBP Activity on Data Management for International Marine Research Projects

A meeting on Data Management for International Marine Research Projects was held at The Foresight Centre, University of Liverpool, United Kingdom, on 8-10 December 2003. The meeting objective was to produce a common strategy for managing and sharing marine data within and among IGBP and SCOR projects. GEOHAB was represented at this meeting by Wolfgang Fennel. A report of this meeting is posted on the Web [http://www.jhu.edu/SCOR/DataMgmt.htm] and includes the report of Wolfgang Fennel on data types and management within GEOHAB. A decentralized data management and distribution system with a centralized index is proposed for GEOHAB. The components, centralized under the supervision of an IPO, will include a comprehensive inventory of databases relevant to

GEOHAB, as well as meta-data, with links to their locations and contact persons. The GEOHAB SSC will discuss programme data management at its next meeting.

V Open Science Meeting: HABs in Fjords and Coastal Embayments

The Open Science Meeting on Harmful Algal Blooms in Fjords and Coastal Embayments took place in Viña del Mar, Chile on 26-29 April 2004 The meeting planning committee was co-chaired by Allan Cembella (Germany) and Leonardo Guzmán (Chile), and included Jorge Diogene (Spain), Bengt Karlson (Sweden), John Largier, (USA), and Suzanne Roy (Canada). The objectives of this meeting were fourfold: (1) to introduce the GEOHAB approach to Core Research to the international community; (2) to foster the development of national and international links to GEOHAB, specifically to Core Research; (3) to review and assess existing knowledge and future prospects for research on HABs in fjords and coastal embayments, and (4) to initiate the development of an action plan for implementation of the Core Research on fjords and coastal embayments.

The invitation to the OSM was issued to all prospective participants in the emerging international Core Research Project; strong participation from Latin America was particularly noteworthy. More than 60 participants attended at least part of the meeting, which featured 11 plenary presentations, more than 25 posters presented by participants and extensive and lively discussion and question periods following each theme. To stimulate maximal scientific interaction, all posters were presented orally, several times in rotation.

The programme was opened with short welcome addresses from Chilean dignitaries (including representatives of the Comité Oceanográfico Nacional of Chile), the SCOR Executive Director and the Coordinator of the IOC HAB Programme Communication Centre in Copenhagen. After the conclusion of the plenary key lectures, theme break-out workshop groups were formed to discuss comparative approaches and integration of physical versus biological and chemical factors, and the incorporation of hydrodynamic and ecosystem models into this research framework. A series of recommendations and considerations emerged from these theme workshop groups, such as the key importance of physical constraints in determining hydrodynamics and species outcomes in fjords and coastal embayments and the significance of benthic-pelagic coupling. The critical importance of water residence time was also noted.

On the day following the closure of the plenary meeting, the co-convenors met with the GEOHAB Chairman, the international Core Research Project Coordinating Committee, and representatives of the GEOHAB SSC to plan the research agenda and to prepare the forthcoming summary report. Specific issues addressed included (1) identification of key processes and mechanisms that must be studied in such ecosystems to define HAB dynamics; (2) determination of key questions and working hypotheses; (3) consideration of opportunities, differences and commonalities to be addressed in studies of coastal embayments; (4) discussion of potential key field study sites where research could be implemented; and (5) possibilities and constraints for national and international funding support for research initiatives. This information will be incorporated into a detailed OSM report to be delivered within the next few months.

At the request of participants, an *ad hoc* decision was made to include short summaries of the poster presentations in the OSM report. Invited speakers who presented key lectures were also invited to prepare a manuscript based upon their presentation, subject to peer review and publication in a special GEOHAB edition of the Elsevier journal *Harmful Algae*. The practical implementation of Core Research Project activities in fjords and coastal embayments is in the advanced planning stage and actual field work is anticipated by early 2005.

VI SCOR Meeting on Coordination of International Marine Projects

Supported by the Sloan Foundation, this meeting is scheduled for 23-24 September 2004 to bring together representatives of the major international ocean research and observation projects and programs to discuss common opportunities, issues and problems. GEOHAB will be represented at the meeting by Grant Pitcher and Henrik Enevoldsen. Discussions on the interactions with GOOS will be of particular importance to GEOHAB. Mechanisms to improve the way in which GEOHAB integrates with GOOS need to be addressed by establishing the measurements required from GOOS by GEOHAB and the potential for data from GEOHAB to enter GOOS data streams.

VII XI International Conference on Harmful Algae

A GEOHAB exhibit for display at the XI International Conference on Harmful Algae will be constructed to promote the strategy, mission and achievements of GEOHAB. The display will incorporate the GEOHAB brochure, *Science Plan*, *Implementation Plan*, the Open Science Meetings reports, *Harmful Algae News* reports, etc.

VIII Open Science Meetings: HABs in Eutrophic and Stratified Systems

The OSM on HABs in Eutrophic Systems will be held on 7-11 March 2005 in Baltimore under the leadership of Patricia Glibert. The OSM on Stratified Systems is also scheduled for 2005 under the leadership of Patrick Gentien. The date and location of this latter meeting have yet to be decided.

IX Next SSC Meeting

The next Scientific Steering Committee meeting will be held on 21-23 November 2004 following the XI International Conference on Harmful Algae in Cape Town, South Africa. The focus of this meeting will be on the Core Research Projects and their implementation and future management, the development of targeted research projects (specifically those related to modelling and observation systems), the development of standard measurement protocols within GEOHAB and the formulation of a GEOHAB data committee.

X ASLO meeting 2005

A special session on Comparable Ecosystem Studies of Harmful Algal Blooms has been organized for the next ASLO meeting in 2005. The three sub-sessions (1) HABs in Upwelling

Systems, (2) HABs in Fjords and Coastal Embayments, and (3) HABs in Eutrophic Systems, correspond to Core Researcj Projects of GEOHAB. It is intended that this session will serve to demonstrate and promote the comparative approach of GEOHAB.

GEOHAB Finances

Income	**2003**	**2004**	**2005**
Carry-over from previous year		$7,200	-$4,268.86
NOAA (through SCOR)		$24,000.00	
NSF (through SCOR)	$22,800	$30,000.00	$45,000.00
SCOR Support for LDC Travel	$2,621		
Registration Fees	$2,625	$2,525	
IOC	$20,000	$18,000.00	$20,000.00
Total	$50,159	$114,731.14	$35,731.14
Expenses			
Publications	$8,400		
SCOR Administrative Expenses	$1,328		
Other Meetings	$1,836		
SSC Meeting 1		$25,000.00	$25,000.00
Editorial Committee	$6,933.00		
LDC Travel	$2621		
HABs in Upwelling Systems	$37,151.00		
HABs in Fjords and Coastal Embayments		$35,000.00	
HABs in Stratified Systems			$35,000
HABs in Eutrophified Systems			$35,000
Total	$54,561.86	$115,000.00	$25,000
Remaining	$18,231.14	-$4,268.86	$10,731.14

3.3 Surface Ocean–Lower Atmosphere Study (SOLAS) (joint with IGBP, WCRP, and CACGP)

Terms of Reference:

- To develop the Surface Ocean - Lower Atmosphere Study (SOLAS) Science Plan and an Implementation Strategy, in accordance with guidance of the sponsoring organisations.
- To oversee the development of SOLAS in accordance with its Science Plan/Implementation Strategy.
- To collaborate, as appropriate, with other related projects, of IGBP, WCRP, SCOR and CACGP and related projects and programmes (e.g., IHDP, DIVERSITAS, IOC and the Global Ocean Observing System (GOOS), etc.)
- To establish appropriate data management policies to ensure access to, sharing of, and preservation of SOLAS data, taking into account policies of the sponsors.
- To report regularly to SCOR, IGBP, WCRP and CACGP on the state of planning and accomplishments of SOLAS.
- The SOLAS SSC, its subsidiary groups and International Project Office shall operate in accordance with the operating procedures for IGBP Projects and as required by other co-sponsors.

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Ken Denman	CANADA	Uli Platt	GERMANY
Barry Huebert	USA	Peter Schlosser	USA
Tim Jickells	UK	Shigenobu Takeda	JAPAN
Truls Johannessen	NORWAY	Mitsuo Uematsu	JAPAN
Dileep Kumar	INDIA	Osvaldo Ulloa	CHILE
Christiane Lancelot	BELGIUM	Doug Wallace	GERMANY

Executive Committee Reporter: Laurent Labeyrie
IGBP Liaison: Wendy Broadgate
Project Officer: Casey Ryan

SOLAS REPORT TO SCOR 2003/2004

Summary of Activities in 2003/2004

SOLAS Implementation

The publication on the Web of the SOLAS Science Plan and Implementation Strategy in Dec 2003 marked the end of the start-up phase of SOLAS and a move towards the implementation of the Science Plan.

The implementation of SOLAS will be led by 3 Implementation Groups (IMPs), each responsible for implementing one of the SOLAS Foci.

Implementation Groups 2 and 3 have already met and are drafting the SOLAS Implementation *Plan*, and IMP 1 will do so in October. These Plans set out the detail of what SOLAS hopes to achieve and will initially be available on the Web. When all 3 are complete, they will be published in hard copy. Many countries have SOLAS activities in the planning stages or already underway. With the establishment of an international project office, funded for 5 years by the UK NERC, it can be expected that SOLAS coordination and networking will move forward rapidly over the coming years. However, activities are already underway in many countries. Some highlights are presented below.

- Canada, where the C-SOLAS network was funded in 2001 for 5 years. Fieldwork included an Fe enrichment experiment in the N.E. Pacific during July 2002, and a spring bloom cruise in the N.W. Atlantic in 2003 along with 5 other cruises (178 total days at sea during 2002-03) and a mooring in each ocean to collect temporal data for coordination with linked ocean-atmosphere models. The July 2002 iron addition expedition to Station Papa (called SERIES: the Subarctic Ecosystem Response to Iron Enrichment Study) involved three ships: the Canadian vessel, *J.P. Tully*, the Mexican vessel, *el Puma*, and the Japanese vessel, *Kaiyo-Maru*. The first SOLAS publication in a high-profile journal (Boyd et al., 2004) resulted from this work.
- United Kingdom. The NERC-directed programme UK SOLAS began in Feb. 2004. It will last for 5 years and has $20M funding. It is coordinated from the UK SOLAS Project Office, which is co-located with the SOLAS International Project Office at the University of East Anglia, Norwich, UK.
- China (Beijing) has recently obtained approximately $1M funding for SOLAS work. This will commence shortly. The SOLAS Science Plan and Implementation Strategy will be translated into Chinese.
- France has several projects that are endorsed by SOLAS. These are part of the PROOF programme (acronym for Biogeochemical processes in the Ocean and Fluxes) that represents the major French contribution to SOLAS. One such French project is FLEMENCO$_2$, which aims to improve estimates of CO_2 fluxes in the Southern Ocean, a historically under-sampled region.
- Japan already has many SOLAS-type activities funded (see below), including the SEEDS I and II iron fertilisation studies. As these come to their conclusion, the national committee will submit a proposal for dedicated SOLAS funding.

- Australia and New Zealand SOLAS conducted the Fe Cycle cruise in Feb 2003, attempting to close the Fe budget using a Langrangian approach. A dual tracer (SF_6 and ^3He), iron enrichment experiment, entitled SAGE (SOLAS-ANZ Dual Tracer Gas Exchange Experiment) in March 2004 produced some interesting high wind speed gas transfer measurements.
- The EU. Several Integrated Projects and other proposals have been submitted as part of the Framework VI 2nd call. In particular, proposals for carbon research in the North Atlantic and on aerosols can be expected to provide strong contributions to SOLAS. The 3rd call also presents some opportunities for SOLAS and the IPO is facilitating consortium building.
- The USA has many funded SOLAS-type projects (approx 50). A US SOLAS Implementation Plan is being drafted.
- Germany has recently submitted a proposal for major funding for a national SOLAS network.
- Brazil has 4 SOLAS projects that are coordinated by a national committee.
- Norwegian SOLAS has just submitted a proposal titled BioGeoChemClim as a contribution to SOLAS.
- Other countries where SOLAS coordination is beginning are India, South Korea, China (Taipei), Russia, and Chile

Other Activities

The first SOLAS Summer School was organised by Corinne Le Quéré and Véronique Garçon in June 2003. 75 students and 24 lecturers attended and we received very positive feedback. We are submitting a proposal to run further summer schools in 2005 and 2007.

SOLAS Open Science Conference: SOLAS Science 2004, the first open science conference to present the results of SOLAS, will run from the 13th to 16th of October 2004 in Halifax, Nova Scotia. This is being organised by the Canadian SOLAS secretariat and will provide a forum for further community building and networking within the SOLAS field.

The Task Team on Organic Aerosols (IGAC/SOLAS/iLEAPS) met in Hyytiala, Finland in May 2004. A report will be circulated in the autumn.
The Task Team on Halogens in the Troposphere (SOLAS/IGAC) held its first meeting in May. A full report will be available by the SOLAS Open Science Conference.
The Atmosphere-Ice Chemical Interactions (AICI) Task Team will start to move forward after the SOLAS and IGAC open science conferences.
The Ocean-Atmosphere-Sea Ice-Snow (OASIS) project has been endorsed by SOLAS. This has links with the International Study of Arctic Change (international SEARCH) and may be complemented by the work of the CliC Arctic Panel.
The International Polar Year could provide a platform for OASIS, HitT and many other areas of SOLAS, including an "armada" of pCO_2 measurements, to be implemented.

Capacity Building and Inclusion of LDC scientists

The main capacity-building activity of SOLAS is the biennial SOLAS Summer School. 10 young scientists from developing countries attended the 2003 school, supported by the IOC and SCOR.
The SOLAS IPO is developing the lectures from the summer school into an online learning tool. Currently, the presentations are available on the summer school Web site, but these will be expanded into an online reference. These will be sent on CD to all those who applied for the summer school, and to anyone else who requests a CD. It will also be available on the Web. The IPO will also provide free hard copies or CDs of the SOLAS Science Plan and Implementation Strategy to anyone who requests one.

There is also travel funding (~30k USD) available for young scientists from developing countries to attend SOLAS Science 2004, provided by APN, SCOR and IAI.

Casey Ryan,
July 2004

3.4 Integrated Marine Biogeochemistry and Ecosystem Research (IMBER) (joint with IGBP)

Terms of Reference:

- To develop a new IGBP/SCOR activity in ocean biogeochemistry and ecosystems within the IGBP II Vision for the next 10 years of ocean research. The new activity should be developed in harmony with the Global Ocean Ecosystem Dynamics (GLOBEC) project and be designed and implemented in close collaboration with GLOBEC.
- To revise the Draft Framework Report in Biological and Chemical Aspects of Global Change Research in the Oceans to form the intellectual basis for an Open Science Conference (planned for December 2002).
- To organise an Open Science Conference to generate new ideas for the development of the science and implementation of the Ocean Biogeochemistry and Ecosystems project.
- To use both the Framework Report and community input from the Open Science Conference to produce a Science Plan/Implementation Strategy for the new activity by the end of 2003.
- To cooperate with GLOBEC, the Land-Ocean Interactions in the Coastal Zone (LOICZ) project, the Surface Ocean-Lower Atmosphere Study (SOLAS), and other relevant projects and programmes in the development of the Science Plan/Implementation Strategy.

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IGBP Liaison: Wendy Broadgate

IMBER: Integrated Marine Biogeochemistry and Ecosystem Research

Report 2003/2004

Submitted by Julie Hall, IMBER Chair
On behalf of the IMBER Scientific Steering Committee

Contents

Development of the IMBER Science Plan and Implementation Strategy (SP/IS)
Since the Open Science Conference in Paris, the IMBER Transition Team has produced a draft Science Plan and Implementation Strategy (SP/IS) for the IMBER project. On completion of the first draft of the IMBER SP/IS, comment from the scientific community was invited, with a copy of the IMBER SP/IS posted on the World Wide Web on October 31, 2003.

An editorial meeting was held in November 2003 (Johns Hopkins University, Baltimore, USA) at which the comments on the draft received from the scientific community were discussed and used to revise the draft SP/IS. The resulting completed version of the IMBER SP/IS (Appendix 1) was submitted to IGBP and SCOR on January 15, 2004, for review and approval. Following a joint review of the SP/IS by IGBP and SCOR by a panel of 9 scientists from various disciplines, a summary review was provided by IGBP and SCOR to give guidance for revision of the draft SP/IS. The draft SP/IS was approved by IGBP in principle, subject to revision, at the March IGBP SC meeting, and by SCOR by email.

Formation of SSC
An International IMBER Scientific Steering Committee (SSC) was formed in April/May 2004. The members of the SSC include:

Julie Hall	New Zealand	*Chair*
Dennis Hansell	USA	*Vice-Chair*
Patrick Monfray	France	*Vice-Chair*
Ann Bucklin	USA	
Jay Cullen	Canada	
Wilco Hazeleger	The Netherlands	
David Hutchins	USA	
Arne Körtzinger	Germany	
Carina Lange	Chile	
Jack Middelburg	The Netherlands	

Coleen Moloney	South Africa
S. Wajih A. Naqvi	India
Raymond Pollard	UK
Hiroaki Saito	Japan
Carol Turley	UK
Jing Zhang	China-Beijing

SSC Meeting
The first IMBER Scientific Steering Committee (SSC) meeting will be held in August 2004 (Plymouth Marine Laboratory, UK). The main aims of the meeting are to:

- Review and revise the IMBER SP/IS
- Identify key national and regional IMBER Programmes and linkages with other research programmes
- Develop a plan for implementing IMBER

International Project Office
Since the November 2002, a Research Officer has been employed part time in the Interim International Project Office (IPO) for IMBER based at the National Institute of Water and Atmospheric Research Ltd (NIWA), Hamilton, New Zealand with funding from IGBP, SCOR and NIWA. In August 2004, the Interim IPO (employing one person part-time), moved to Plymouth Marine Laboratory United Kingdom, and is funded by Plymouth Marine Laboratory.

There are ongoing discussions with Plymouth Marine Laboratory, the First Institute of Oceanography in Qingdao, China, and in France (CNRS and IRD) about funding for the IMBER International Project Office.

Links with Other Projects
SOLAS—To ensure a close and effective collaboration between the two projects in the area of ocean carbon cycle research, IMBER and SOLAS have agreed to develop a joint implementation plan for carbon research. Development of this document is underway, with a meeting planned for September 2004.

Other Projects—Ongoing discussions to develop collaborative relationships are being undertaken with the GLOBEC, LOICZ, GEOTRACES, DIVERSITAS and PAGES projects.

Development of IMBER Research
Several research initiatives that will contribute to IMBER are already underway or are in the planning phase. These include EuroOceans and ICCED.

EUR-OCEANS—The European Network of Excellence (NoE) EUR-OCEANS aims to achieve lasting integration of European research organisations on global change and pelagic marine ecosystems, and to develop models for assessing and forecasting the impacts of climate and anthropogenic forcing on food-web dynamics (structure, functioning, diversity and stability) of pelagic ecosystems in the open ocean. The NoE will favour the progressive integration of research programmes and facilities of major research institutes all over Europe (69 Member Organisations

from 25 nations). The long-term goal of the NoE is to create a multi-site Institute for European Research on Ocean Ecosystems under Anthropogenic and Natural Forcings. The international context is provided by GLOBEC and IMBER.

EUR-OCEANS is organised around a Joint Programme of Activities (JPA). The JPA comprises:

- Integrating activities on networking, data, and model integration;
- Jointly executed researchorganised around four broad modelling tasks (together with observations and experiments), on pelagic ecosystems end-to-end, biogeochemistry, ecosystem approach to marine resources and within-system integration);
- Activities to spread excellence, including training of researchers, and spreading excellence to socio-economic users and to the European public (through the Association of Aquariums for EUR-OCEANS public outreach).

ICCED: Integrated analyses of Circumpolar Climate interactions and Ecosystem Dynamics in the Southern Ocean, A Southern Ocean Initiative for the OCEANS Programme

Ad Hoc Planning Group:
Eileen E. Hofmann and Walker Smith, USA
Eugene Murphy, United Kingdom
Ulrich Bathmann, Germany
Steve Nicol and Deborah Thiele, Australia
Evgeny Pakhomov, Canada

During the past decade multidisciplinary national and international studies of Southern Ocean ecosystems were undertaken to understand the processes controlling marine population variability and biogeochemical cycling. These programmes encompassed the whole ecosystem, including environmental structure, and will provide the basis for synthesis and modelling activities and additional focussed studies in the coming years. An emerging result from these studies is the importance of circumpolar climate variability and connections in the regional dynamics of Southern Ocean ecosystems, which implies that climate must be an integral focus of future research programmes developed for this region. The Integrated analyses of Circumpolar Climate interactions and Ecosystem Dynamics in the Southern Ocean (ICCED) initiative proposes a coordinated circumpolar approach to understanding climate interactions in the Southern Ocean and implications for ecosystems and the impacts on biogeochemical cycles. The initiative will be composed of circumpolar remote instrumentation and monitoring, an internationally coordinated circumpolar field effort and enhancement of World Ocean Circulation Experiment (WOCE) transects for ecosystem studies, and focussed process studies in key regions. The initiative will extend existing circulation and biological models and further develop modelling efforts directed at an integrated circumpolar view of the operation of the whole ecosystem. An important objective will be to develop international expertise and capability through focussed training courses, workshops, and personnel exchanges. The ICCED initiative directly addresses the questions put forward as a science focus for IMBER and is related to programmes with a Southern Ocean focus including Climate Variability (CLIVAR), Committee for Conservation of Antarctic Marine Living Resources (CCAMLR), International Marine Global Change Study (IMAGES), Global Ocean Ecosystems Dynamics

(GLOBEC) project, Global Ocean Observing System (GOOS), the Scientific Committee for Antarctic Research (SCAR), and the International Whaling Commission (IWC).

The objectives of the ICCED initiative are to:

1. develop a circumpolar, interdisciplinary approach which will provide a framework for understanding climate interactions in the Southern Ocean, and its implications for ecosystem functioning and impacts on biogeochemical cycles;
2. implement circumpolar (remote) instrumentation that will include large-scale surveys and monitoring, internationally coordinated field efforts, enhanced CLIVAR transects, and focused process studies in key regions;
3. extend and further develop existing circulation and biological models and facilitate the development of integrated circumpolar coupled biogeochemistry-ecosystem models;
4. stimulate capacity building through focused training courses, workshops, and personal exchange; and
5. collaborate with international programmes and organizations, such as CLIVAR, IMAGES, GLOBEC, GOOS, CCAMLR, IWC, and SCAR.

The ICCED initiative is an international effort. It builds upon the scientific results and experiences from the Southern Ocean Joint Global Ocean Flux Study (JGOFS) program, the Southern Ocean GLOBEC program, the WOCE and CCAMLR efforts, and earlier programs, such as the Biological Investigations of Marine Antarctic Systems and Stocks (BIOMASS). As a result of these programs, the Southern Ocean science community is well poised to undertake a circumpolar effort. It is anticipated that the ICCED initiative will form a partnership with the Southern Ocean initiative that is developing through the EUR-OCEANS effort.

Acknowledgements
I would like to thank Ed Urban, Wendy Broadgate and Claire Hamilton for their excellent support during the development of the Science Plan and Implementation Strategy. Special thanks must also go to IGBP, the National Institute of Water and Atmospheric Research (NIWA), SCOR and Plymouth Marine Laboratory for supporting the Interim IMBER International Project Office.

Funding
IGBP and SCOR combined funds for Ocean Futures/ Biogeochemistry and Ocean Ecosystems

INCOME	**2003**	**2004**	**2005**
SCOR - NSF	$92,114	$41,667	50000
SCOR Carry-over from Previous Year		$4,845	$19,124
IGBP		20000	$20,000
IGBP (staff support)	$4,000		
IGBP Ocean Vision			
SCOR	$100		
ICSU	$50,000		
Registration Fees	$38,462		
Total Income	$184,675	$66,512	$89,124
Expenses			
2000 Plymouth Meeting			
2001 Baltimore Ocean Futures Meeting			
2001 Chilworth Ocean Futures Meeting			
2001 Barcelona Ocean Futures Meeting			
2002 Potomac OCEANS Transition Team Meeting			
Representation at other meetings		3603	
Ocean Vision meeting			
Open Science Conference in Paris	$138,388		
TT meeting in Paris	$25,622		
Side Meeting at JGOFS OSM	$5,458		
Other SCOR Admin	$2,103	351	
NIWA Expenses			
IGBP Congress in Banff	5,655		
SP/IS Editorial Meeting	$8,619	5219	
2004 SSC Meeting		25715	
SSC Executive Committee Meeting		12500	
Subgroup Meeting 1			
Subgroup Meeting 2			
Subgroup Meeting 3			
Total Expenses	$185,844	$47,388	$0
Remaining Balance	**-$1,169**	**$19,124**	**$89,124**

APPENDIX 1: Executive Summary of the IMBER Science Plan and Implementation Strategy Document

The last decade of internationally coordinated marine research has greatly increased our ability to describe and model the ocean's many biological, chemical and physical processes. We have quantified the global fluxes of the major elements, such as carbon, and we continue to identify the organisms and processes central to the functioning of marine ecosystems. A newly emerging challenge, one dictated by society's needs to understand and prepare for the impacts of global change on the Earth System, is to bridge and merge the knowledge bases of the marine biogeochemical and ecosystem disciplines. In response to this need, the Integrated Marine Biogeochemistry and Ecosystem Research (IMBER) project is being formed as an activity jointly sponsored by International Geosphere-Biosphere Programme (IGBP) and the Scientific Committee on Oceanic Research (SCOR). The IMBER project goal is:

> *To understand how interactions between marine biogeochemical cycles and ecosystems respond to and force global change.*

To achieve this goal it will be important to understand the mechanisms by which marine biogeochemical cycles control marine life and, in turn, how marine life controls biogeochemical cycles. In this light, IMBER research aims to identify key feedbacks from marine biogeochemical cycles and ecosystems to other components of the Earth System. IMBER will focus on processes within, and interactions between, the euphotic and mesopelagic layers of the ocean, the continental margins, and high-latitude and polar ocean areas. An interdisciplinary approach to this research, bringing together the biological and biogeochemical communities, as well as utilising long-term sustained observations, will be important. Embedding process studies within long-term observatories and surveys is required for assessing the changing ocean. An even greater challenge will be drawing together the natural and social science communities to study some of the key impacts and feedbacks between the marine and human systems.

The challenge to the scientific community is to understand interrelationships between biogeochemical cycles and food web dynamics, quantify and predict responses of the marine system to natural and anthropogenic perturbations, (e.g., changes in temperature, stratification, pH and nutrient loading), and estimate feedbacks from the ocean to the Earth System. Critical to our progress will be consideration of the marine system as a continuum from the inshore continental margins to the open ocean and of food webs from microorganisms to top predators. This approach will require an effort much larger than any single nation can mobilise to answer the broad interdisciplinary questions, which require multiple investigators from a range of disciplines and intercomparisons of data from a wide range of systems. IMBER will collaborate with and build on other projects that provide the physical, chemical, and biological context that will support the focus of IMBER research.

To address the IMBER goal, four scientific themes, each including several issues, have been identified for the IMBER project. The themes of IMBER are broad; however, their context is narrowed by the issues and priority questions identified. The eventual content of IMBER will be focused further as detailed implementation plans are developed for each theme and individual nations fund specific research.

Theme 1. Key Processes: What are the key marine biogeochemical cycles, ecosystem processes, and their interactions, that will be impacted by global change?

Issues

- Sources and sinks in marine biogeochemical cycles and how these impact macro- and micronutrient stoichiometry;
- Relationships between biodiversity, structure, function, and stability of marine food webs; and
- Interactions between biogeochemical cycles and the structure, function and dynamics of marine food webs.

Theme 2. Sensitivity to Global Change: How will key marine biogeochemical cycles, ecosystems and their interactions, respond to global change?

Issues

- Impact of climate-induced changes in circulation, ventilation and stratification on marine biogeochemical cycles and ecosystems;
- Response of marine biogeochemical cycles, ecosystems and their interactions, to increasing anthropogenic CO_2 and changing pH; and
- Response of marine biogeochemical cycles, ecosystems, and their interactions, to changes in inputs of macro- and micronutrients.

Theme 3. Interactions with the Earth System: What is the role of the ocean biogeochemistry and ecosystems in regulating climate?

Issues

- Oceanic storage of anthropogenic CO_2;
- The role of hypoxia/anoxia in the oceanic nitrogen cycle; and
- Direct ecosystem feedbacks on ocean physics and climate.

Theme 4. Responses of Society: What are the relationships between marine biogeochemical cycles, ecosystems, and the human system?

Issues

- Human lifestyle effects on the state of the ocean; and
- Mitigative and adaptive policies that could reduce the impact of global change on society.

IMBER will encourage investigations in four key domains of the ocean: the euphotic zone, the mesopelagic layer, the continental margins and high-latitude and polar ocean areas.

IMBER will take advantage of new and innovative approaches to conducting marine research, ranging from new molecular techniques to sustained in situ and remotely sensed observations. The development of sustained observation sites will be an important part of the implementation strategy for IMBER, which will be complemented by targeted field-based process studies, in situ mesocosm studies, and both field and laboratory experiments. A suite of hierarchical models will be developed to investigate hypotheses, analyse and extrapolate data in space and time, and identify crucial gaps to be filled by new observations to reduce uncertainties in our knowledge. Extrapolation to the global scale will require integration of data from basin-wide global surveys. To support the modelling and synthesis efforts, interconnected databases of biological, geochemical and physical variables will be constructed, extended and updated in near real time.

The following outcomes are anticipated over the ten-year life of this project.

- An understanding of key marine biogeochemical and ecosystem processes and their sensitivity to global change;
- An increased understanding of the role of biodiversity and food web structure on the cycling and storage of carbon in the ocean;
- Establishment of new high-technology systems for sustained measurements;
- A hierarchy of integrated models that link the mechanisms of biogeochemical cycles with ecosystem processes and provide predictions of the impacts of global change on the ocean system;
- Internationally shared, publicly available data sets and assimilated data products of ocean biogeochemical and ecosystem state variables;
- Identification of potential adaptive and mitigative policies to address the impacts of global change on the ocean system;
- A new generation of marine scientists from developed and developing countries trained in interdisciplinary research and using a systems approach; and
- Sound scientific knowledge to assist policy makers in making informed decisions.

IMBER will encourage the development of collaborative activities that will draw on the expertise of other projects and programmes to avoid unnecessary duplication and ensure that IMBER takes an interdisciplinary scientific approach. These collaborative associations will involve other IGBP/SCOR marine projects and IGBP integrative projects and programmes such as the World Climate Research Programme (WCRP), the International Human Dimensions Programme (IHDP), global observing programmes such as the Global Ocean Observing System (GOOS). A close collaborative relationship with GLOBEC (Global Ocean Ecosystem Dynamics) will be particularly important to ensure that fully integrated biogeochemistry and ecosystems research is undertaken across the entire food web. After 2009 the IGBP II structure will contain a single marine project.

3.5 GEOTRACES

Terms of Reference:

- Organize national and international planning workshops as well as special sessions at international conferences to obtain community input on the design and implementation of GEOTRACES.
- Establish priorities for research on the sources, sinks, internal cycling, transport, speciation and fate of TEIs, and develop this information into an International Science Plan.
- Promote intercalibration of analytical methods, and the development of standard reference materials.
- Identify new instrumentation and related infrastructure that will help achieve GEOTRACES objectives.
- Define a policy for data management and sample archival.
- Forge scientific linkages with other research programs holding overlapping interests to create synergies where possible and avoid duplication of efforts. To the extent practical, this will involve cross-membership between the GEOTRACES Planning Group and the Planning Groups and Science Steering Committees of other programs.
- Interact with SCOR Working Groups that share common interests including, but not limited to, SCOR/IMAGES WG 123 on Reconstruction of Past Ocean Circulation (PACE) and SCOR/IMAGES WG 124 on Analyzing the Links Between Present Oceanic Processes and Paleo-Records (LINKS).

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Reiner Schlitzer (Germany)

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Executive Committee Reporter: Robert Duce

GEOTRACES Report to SCOR - 2004

The international GEOTRACES Planning Committee met for the first time in Oxford, UK, on 31 May-June 3 2004. All 11 Full Members of the committee attended, as well as 7 of the Associate Members. The meeting began with introductions by meeting participants, followed by a presentation about the evolution of large-scale ocean research projects by Ed Urban (including a description of how SCOR would interact with the group, in terms of oversight, funding, and services provided). Presentations were made about the four national GEOTRACES meetings held to date, as well as relevant activities in Japan:

- USA (Bob Anderson)
- UK (Gideon Henderson)
- France (Catherine Jeandel)
- Germany (Martin Frank)
- Japan (Toshi Gamo and Jing Zhang)

The plans of other international ocean science projects were discussed, to determine what makes a good Science Plan and what GEOTRACES is trying to achieve with the plan. The major goals of project were discussed, as well as its major selling points, how to focus the project on key questions, and how to structure the science plan around these questions. Following this discussion, the group developed an outline for the science plan. It will be built around two themes:

- **Theme 1—Modern cycling of TEIs:** micronutrients, contaminants, baseline, particle cycling, global change present). That is, everything we want to learn about modern processes.

    - Interfaces: atmosphere, freshwater, ocean margins, mid-ocean ridges
    - Internal cycling: biogeochemical, physical (circulation, particles),

    The research proposed will cross-cut the research being planned/conducted by other international projects (e.g., SOLAS, IMBER, LOICZ, InterRidge, MARGINS, ODP, CLIVAR), so the GEOTRACES plan will be careful to specify how GEOTRACES research can contribute to the research being planned/conducted by related projects. The GEOTRACES Planning Committee includes one Full Member who is a member of the SOLAS SSC and another who is a member of the IMBER SSC. Formal liaisons will be established with other international research projects.

- **Theme 2—Development of Proxies:** helping to understand the past environment, global change past

    - What controls the proxies in the water column?
    - How are the proxies recorded?
    - Coring

One member of the GEOTRACES Planning Committee is a member of the SCOR/IMAGES WG 124 on Analyzing the Links Between Present Oceanic Processes and Paleo-Records (LINKS). Formal liaisons will be established with SCOR/IMAGES WG 123 on Reconstruction of Past Ocean Circulation (PACE) and with IMAGES.

Based somewhat on the international SOLAS *Science Plan and Implementation Strategy*, the group agreed to a structure for each of the science sections with five subheadings:

1. Present understanding
2. Areas for advance (i.e., general area where more understanding is desirable)
3. Specific Objectives (i.e., deliverable goals of a 5-10 year programme)
4. Implementation (brief suggestions only - this is not designed to be a full implementation document)
5. Interaction with other programmes

The plan will also include sections on modeling (enabling and synthesis); standards, sampling protocols and intercalibration; data management; sample archiving (water, aerosols, cores); project structure and management; working groups and standing committees; education and outreach, relationships with other projects; timeline; and deliverables. For other sections there is no need to conform to a particular format. The approximate timeline for writing of the science plan was agreed to be

End June:	Those tasked with writing up sections to complete task and return to co-chairs.
End July:	Chairs complete first draft and return to planning group members
End Aug:	Comments on full draft from planning group members
Sept:	Continued improvement of draft and presentation at SCOR meeting in Venice
Sept-Oct:	Feedback sought from wider marine chemistry community
Nov:	Sub-group of planning group meets to finalize draft plan and identify any areas still requiring work.

The committee determined that, in addition to the editorial meeting, it would be useful to plan meetings of subgroups for data management, and for standards and intercalibrations. SCOR has informed the co-chairs that NSF has approved funding for these meetings. The next meeting of the full planning committee will be held in May or June 2005.

3.6 Land-Ocean Interactions in the Coastal Zone (LOICZ) (an IGBP and IHDP project)

Activities of LOICZ in its first 1.5 transition years 2003/2004
The principal activities during 2003/2004 had been focussed on facilitating completing the SP/IS for submission to the IGBP and IHDP, the relocation of the IPO post-December 2005 and, finally, the completion of the LOICZ Synthesis volume. However, in addition, the IPO has also been engaged in a number of other activities:

- Contributing to the ELOISE synthesis that has been a parallel activity of the ELOISE Secretariat of the 60 projects started since 1995.
- Facilitating the final Lead Authors meeting in December 2003 convened to distill the main outcomes of LOICZ I for Chapter 5 and describe the future vision for LOICZ.
- Funding issues that had resulted in securing the activity of the IPO at NIOZ, Texel during the transition phase of LOICZ I to LOICZ II.
- Negotiating co-sponsorship by SCOR, subject to identification of mutually appropriate activity, which would include capacity building, research on Theme 4 issues and interaction with other IGBP "wet" projects (i.e., IMBER, GLOBEC, partly SOLAS) and external institutions. This has led to a joint SCOR/LOICZ working group (No. 122) co-sponsored by IAPSO on sediment retention in estuaries with has its first meeting scheduled for September 2004. Funding will be provided for three years (2004-06).
- Addressing the problem of capturing information from existing LOICZ-badged projects. At the same time, the IPO is actively trying to identify projects that can be LOICZ affiliated. This has led to 5 LOICZ regional projects during the last year:
    - LOICZ Yellow River and Bo Hai Sea project that will contribute to Themes 3 and 4.
    - Arctic Coastal Dynamics Programme, which is an international circum-arctic project cluster.
    - Catchment2Coast that is exploring river drainage and effects on coastal resources into Maputo Bay.
    - Carbon cycles in the fluvial and oceanic systems in Southeast Asia.
    - LaguNet project in Italy.
- Co-ordinating the production of two special publications/issues.
- Closely following the movement of IGBP into its second phase and the implications for LOICZ, as well as looking for opportunities to collaborate with new IGBP and joint ESSP projects.
- Actively pursuing collaboration with IHDP
- Distributing the IPO by setting-up Regional Nodes. The Regional Nodes open up options for activities and sponsorship from other regional programmes. This has led to the establishment of the Singapore Node; a German Node about to be formally established; strong likelihood of a Node in Sri Lanka; and identification of possible options in Africa and Australia/Oceania. Possibilities in the Americas are being explored.
- Considering the options for relocation of the Central IPO*.

* Discussion with the SSC confirmed the need for a central IPO as well as a distributed Regional IPO because of the global nature of LOICZ activity exploring global patterns of global environmental change (GEC) whilst recognising that these impact on policy at local to national scales. It is therefore important that LOICZ has a structure that is able to respond to all scales. Additional issues were discussed in context of links and liaison that identified that:

- Links and liaison with other projects had become a major issue both during and since the last IGBP meeting in Banff where it was important to identify productive collaboration between projects during the 2nd phase of IGBP.
- Generally within ESSP projects it was realised that between joint and core projects there was a need to determine how to interact rather than compete with each other. LOICZ has been involved in working groups to discuss options particularly with: GLOBEC Focus 4; IMBER; SCOR (data management); IGOS (coastal theme development) and which fits with the new GEOSS system of systems.
- The coastal panel between LOICZ and IHDP projects met at Montreal HD Open Congress and decided on some joint activity to explore how well collaboration would work.

Issues in detail - SPIS: At the last IGBP SC in Moscow in March 2004 the first official draft Science Plan and Implementation Strategy (SP/IS), for LOICZ II was approved, in principle, subject to revision by the IGBP. A set of reviewers' comments has been collected and were considered during the recent SSC 15 (see below). A revised draft of the SPIS is expected to go to the IGBP for final circulation in July. The IHDP has approved the plan and acknowledged in particular its involvement during the drafting period.

Synthesis: Following from a final lead-authors meeting for the LOICZ Synthesis volume in late 2003, where key findings from the chapters were distilled in order to feed them into a concluding chapter, the text of all chapters will be ready by end of July for peer review. The synthesis will focus on the global and regional levels, providing global assessments and delivery of findings related to the 5 LOICZ (I) objectives. The changes brought by the human dimension experts are increasingly evident in the assessments, and both qualitative and quantitative data are providing firm support for this milestone in LOICZ contribution to the IGBP Global Change evaluation.

Funding: A broader funding base has been achieved through the official approval by the SCOR General Meeting to become a thematic sponsor of LOICZ concentrating on the natural science aspects of estuarine and shelf processes. The cooperation between LOICZ and SCOR has led to a joint sponsorship for the new working group WG 122 "Mechanisms of Sediment Retention in Estuaries" during the years 2004-06. Future work with SCOR will aim to facilitate the further development of biogeochemistry of continental shelves, the further development of data management, and exploitation and the advancement of a coastal typology. Thus, it will concentrate on activities in the LOICZ II Theme 4 and related cross-cutting activities. We expect that through our links with SCOR there will be a chance to enhance the involvement of related activities and organisations in the United States.

Publications

A number of regional assessments of changes in the coastal zone, namely on South Asian Estuaries, Italian Lagoons and Estuaries and the Russian Arctic river-coast interaction, were fully or almost completed throughout the recent past. The information has attracted considerable attention from international agencies with interests in river catchment management, in the case of LaguNet the EU Commission in particular, and has led to further opportunities for research support at national and regional levels. Because of its focus on fundraising, restructuring of the IPO and SSC and in particular on developing the Science Plan and Implementation Strategy, the LOICZ IPO had a reduced output in scientific publications. However, the year 2003/2004 has seen 4 issues of the Newsletter produced, 2 peer-reviewed journal special issues, 2 key peer-reviewed publications and 1 software/manual product.

Summary of LOICZ publications
(A – active; **C** – commenced**. ( )* -** in preparation. # - publications from about 50% of projects and contained in LOICZ database. na – not available)

	1999	**2000**	**2001**	**2002**	**2003**
LOICZ Newsletter	3	4	4	4	4
LOICZ Reports and Studies (incl. CD ROMS)	2	3	4	8 (1)*	(3)*
Open Science Meetings	1			1	
Websites					
LOICZ	A	A	A	A	A
Biogeochemical budgets & Modelling	A	A	A	A	A
South Asia Coastal Fluxes			C	A	
Sea Level (SURVAS) and DINAS Coast	C	A	A	A	A
Typology Database and Tools		C	A	A	A
River Catchments & Basins		C	A	A	A
Deltas		C	A	A	A
ELOISE		A	A	A	A
Publications					
Books	2		3	1(1)*	(3)*
Special issue peer journals	1		3	1 (3)*	2 (1)*
Key peer publications	8	7	4	8 (1)*	1 (3)*
Contributed projects peer publications#	151	107	88	na	na
Software & Manuals					
CABARET – Budget estimation program (web)	1				
LOICZ Biogeochemistry Procedures		1			
Budgeting and modelling tools (web)		4			
Typology tools and databases (web)		1	1		
Basins assessment methods (web)			1		
DINAS Coast – DIVA(Vulnerabilty indicator assessment tool)					1

LOICZ: List of key publications (1998-2003)

	LOICZ Reports and Studies		**Date**
No.			
11	Towards Integrated Modelling and analysis in Coastal Zones: Principles and Practices	122 pp.	1998
12	Australasian Estuarine Systems: Carbon, Nitrogen and Phosphorus Fluxes	182 pp.	1999
13	Mexican and Central American Coastal Lagoon Systems: C,N & P Fluxes	115 pp.	1999
14	Estuarine Systems of the South China Sea Region: C,N & P Fluxes	156 pp.	2000
15	Estuarine Systems of the South American Region:C,N & P Fluxes	87 pp.	2000
16	Estuarine Systems of the East Asia Region: C,N & P Fluxes	127 pp.	2000
17	Biochemical and Human Dimensions of Coastal Functioning and Change in South East Asia	165 pp.	2001
18	Estuarine Systems of Sub-Saharan Africa: C,N & P Fluxes	83 pp.	2001
19	Coastal and Estuarine Systems of the Mediterranean and Black Sea Regions: C,N & P Fluxes	101 pp.	2001
	Literature Review: Trace Gases in the Coastal Zone (Jozef Pacyna & Oystein Hov, NILU)	38 pp.	2001
20	Estuarine Systems of Africa (Regional Workshop II):C,N & P Fluxes	81pp	2002
21	South American BASINS: LOICZ Global Change Assessment and Synthesis of River Catch – Coastal Sea Interaction and Human Dimensions	212 pp.	2002
22	LOICZ/UNEP Regional Synthesis Workshops: Australasia-Asia, the Americas, Africa-Eu Summary Report and Compendium	77 pp., inc ROM	2002
23	Estuarine Systems of the Latin American Region and Estuarine Systems of the Arctic Region & P Fluxes	103 pp.	2002
24	The role of the coastal zone in the disturbed and undisturbed nutrient and carbon cycles	83pp, incl ROM	2002
25	African BASINS: LOICZ Global Change Assessment and Synthesis of River Catchment – C Sea Interaction and Human Dimensions	306 pp.	2002
26	East Asia BASINS: LOICZ Global Change Assessment and Synthesis of River Catchm Coastal Sea Interaction and Human Dimensions	226 pp.	2002

27	Caribbean & Oceania BASINS: LOICZ Global Change Assessment and Synthesis of I Catchment – Coastal Sea Interaction and Human Dimensions	174 pp.	2002
28	Russian Arctic BASINS: LOICZ Global Change Assessment and Synthesis of River Catchm Coastal Sea Interaction and Human Dimensions		In preparation (publ. summer 20
29	South Asian Estuaries and Basins		In preparation
	Special Issue Journals		
	Science of the Total Environment - LOIS Vols. 210/211		1998
	American Zoologist- Coral Reefs and Environmental Change Vol. 39		1999
	Journal of Sea Research - LOICZ Vol. 46 (2)		2001
	Science of the Total Environment - LOIS		2001
	Regional Environmental Change – LOICZ		2002
	River catchment–coastal sea interaction and human dimensions, Regional Environmental Cha		2003 e-pub. hard copy
	Submarine Groundwater Discharge: Its Measurement, Modelling and Globalisa Biogeochemistry Vol 66 1-2		2003
	Supply and Flux of Sediment along Hydrological Pathways: Anthropogenic Influences a Global Scale; Global and Planetary Change Vol 39 Nos. 1-2		2003
	Sea Level Changes – SURVAS		In preparation
	Books		
	Scientific Report on Socio-economic Aspects of Fluxes into the Marine Environment. Pa J.M., Kremer, H.H., Pirrone, N and Bartherl, K.G., eds. EU Monograph Series EUR 19089 Commission, Brussels		1999
	Perspectives on Integrated Coastal Management. Salomons, W., Turner, R.K., de Lacerde, and Ramachandran, S., eds. Springer, 386pp + CD-ROM.		1999
	85th Dahlem Workshop on Science and Integrated Coastal Management. Dahlem von Bodu B and Turner, R.K., eds. University Press, Berlin, 378pp.		2001
	Managing a Sea: The Ecological Economics of the Baltic. Gren, I.m., Turner, R.K. and Wul Earthscan Publications Ltd., London, 138pp.		2001
	A Systems Analysis of the Baltic Sea. Wulff, F.V., Rahm, L.A. and Larsson, P., eds. Ecolo Studies 148, 455pp. Springer, Berlin		2001
	Managing European coasts: past, present and future, (ELOISE) Springer		In preparation
	CMTT Synthesis		In preparation
	LOICZ (I) Synthesis		In preparation
	LOICZ II		
	Science Plan and Implementation Strategy		Under review
	Key Thematic Research Paper		
	Listed in LOICZ Annual Reports (1998-2002; 2003)		

Links and liaison

Following the Banff Congress in 2003, where LOICZ through different working groups was engaging actively with a variety of relevant partners within IGBP and the ESSP, various follow-up activities were generated. LOICZ contributed to the further development of the IMBER SP/IS, including arrangements for two-way collaboration, *ditto* with SOLAS and LOICZ; and participated in the Data Management workshop in late 2003 supported by SCOR. The report of the Coastal Theme for IGOS is currently in preparation.

The engagement with IHDP representatives during the SSC scoping team and during the Banff WGs has led to discussions with GLOBEC and GECAFS, nourishing earlier plans to set up a joint IHDP, ESSP, LOICZ coastal panel at the HD Open Meeting in Montreal in October 2003. This panel "Global Environmental Change and Coastal Systems: A Microcosm of Coupled Human-Environmental Systems" was the first joint activity involving GECHS, GLOBEC, IDGEC and IGBP-LOICZ and has agreed on a few key questions that shall be addressed in a joint publication effort starting 2004.

LOICZ was also engaged with JGOFS in the vital synthesis being prepared by the Continental Margins Task Team – a joint initiative of the two IGBP core projects.

In the following we provide a summary of the findings and decisions of the recent LOICZ II SSC 15 held in Singapore, which shows the relevant future directions of the LOICZ II transition:

15th LOICZ SSC and 1st Regional Nodes Meeting, Singapore 4-6 June 2004
Kindly hosted by the LOICZ Regional IPO Node in Singapore, the 15th SSC Meeting followed by the first Regional IPO Nodes Meeting took place at the Executive Centre of Nanyang Technological University. As expected the Meeting played a ground breaking role in shaping the next 10 years of LOICZ activity.

This was the first SSC meeting with an SSC whose membership reflected the joint scientific sponsorship of LOICZ by the IGBP and the IHDP that better reflects the re-orientation of LOICZ to more wholly include human-dimension elements of coastal zone change. In recognition that LOICZ is among the very few GC projects to test and run a distributed Project Office structure, the new SSC Chair, Liana Talaue McManus, particularly welcomed representatives of established and potential Regional Nodes. She underlined the important role they have to play in determining how to facilitate regional LOICZ activity, as well as linking with other regional institutes and programmes.

The SSC underlined that with regard to the SP/IS, LOICZ needs to ensure that future activities build upon the successful outcomes from LOICZ I and encompass an element of continuity from LOICZ I to LOICZ II. However, equally important in context of the second phase of the IGBP and, more broadly, ESSP, is to provide a clear and detailed vision of the LOICZ II niche and how this could attract funding and science to the project. The integration of human-dimension elements across the whole of LOICZ science is the major new element of LOICZ II compared to LOICZ I. However, this brings new challenges to LOICZ because the up-scaling of local observations to global perspectives, which have been the focus of much of LOICZ I activity, is often difficult for the human dimension and its policy goals because of the heterogeneity of human society: resolving this dichotomy is a particular test for LOICZ. In conclusion, the SSC sees the LOICZ niche to be centred on four areas:

1. LOICZ is global.
2. LOICZ can provide a broader context for coastal zone change outside of traditional natural and social science boundaries. This challenges LOICZ to become a major reference point for coastal change and use scenarios providing the typologies that capture the multiplicity of scales of forcing functions (Drivers) and institutional and human dimensions of state change, impact and response.
3. LOICZ provides a synthesis across disciplines, geography and global, regional, national and local scales.
4. LOICZ can generate different outputs appropriate for communication beyond its immediate peer group.

One way that LOICZ might fulfil its niche is through the development of a global coastal portal that could be scenario-based, providing a service as a scientific communication tool. Obviously, the interdisciplinary character of the LOICZ II research requires each of the Themes to have leadership from both IGBP and IHDP communities. In response, the SSC decided to

a) install a second Vice-Chair position and we are glad to announce that Felino (Ino) Lansigan duly accepted his nomination. Recognising his links with LUCC and experience of

working in projects with joint affiliation we are looking forward to his support in the SSC; and
b) to have joint Theme coordination drawn from IGBP and IHDP SSC members for each Theme with one designated as the main coordinator. At least one Theme coordinator selected from our new IHDP colleagues will join the Executive Group within the SSC.

The SSC also decided that Theme coordinators should be supported by a wider task group from the SSC, but that individual members should not be confined in their contribution to just one Theme. This is seen as a mechanism for promoting wide ownership of LOICZ II and fulfilling the LOICZ niche. Based on these decisions the SSC suggested the following Theme membership and coordination:

Theme Title (followin from LOICZ II draft SI	Theme Coordinator	Main SSC Support	Additional SSC Suppo
1. Vulnerability	**Dennison/ Lansigan** (Vice Chair)	Saito, Gilbert	Burbridge, *Whitfield*
2. GC and Land and Sea Use	**Forbes/*Andreeva***	*David, Whitfield*	Shu Gao, *Snoussi*
3. Catchment/Coast	**Restrepo/Gilbert/Meybeck**	Pacyna (Vice Chair), Forbe Wikramanayake, *Snoussi*	Koike, Newton, Rabalais
4 BGC Shelf processes	**Parslow/Rabalais**	Talaue McManus (Chair), Gao, Huang, Koike, Syvits	Pacyna (Vice Chair), Forb Meybeck, Saito, *David*
5 Sustainability/ Management	**Roth/Burbridge**	Newton, *Andreeva*	Talaue McManus (Chair), Parslow, Dennison, Huang Meybeck, Wikramanayake Lansigan (Vice Chair)
cross cuttings/core activ	**Newton/Chair/IPO**	All	All

NOTE: in *Italics* we have highlighted names and designations of those colleagues who were absent during the SSC 15 in Singapore – therefore their membership/task designation need confirmation. Underlined names are the MAIN coordinators. Main Support = SSC members' first priority as expressed during the SSC 15. Additional Support = SSC members' second priority as expressed in SSC 15). The Catchment/Coast Theme has been provided with three coordinator names following suggestions of the SSC.

To become functional within LOICZ II, Terms of Reference for the implementation of the Themes have been drafted:

- To provide a scientific framework for the project lifetime (broad scope, inclusive);
- To provide an enabling platform for assessment and synthesis;
- To provide a focus for a flexible agenda of research topics that inform across the scales of the Earth System questions as well as national and local management needs;
- To operate as an integration and synthesis mechanism of:

    - Existing research (identify, evaluate, include and network; feed into the LOICZ database of relevant, regional and if appropriate core activities),
    - Promote upcoming research,
    - Create new innovative research;

- Provide a home for a flexible group of scientists and disciplines; this includes taking responsibility to operate issue-driven science and to find a critical mass of contributing disciplines, experts, institutes, and (assisted by the IPO)

    - to establish and maintain networks to source critical funding,

- to generate and supervise science dissemination, including a portal that targets different user groups,
- to engage with users and scientists to revise the agenda periodically and deliver related products in a time bound fashion.

A further mechanism to achieve the LOICZ II goals is to ensure that there are strong collaborative links with, not only the human dimension community, but also with the broader IGBP/ESSP projects with designated members of the SSC fulfilling liaison roles. The following list shows who in the current SSC agreed to function as a liaison to the various projects external to LOICZ; the terms of reference of these liaisons will need to be determined on a case-by-case basis:

SOLAS	Pacyna/TBA (Thomas as CM)
IMBER	Parslow/Rabalais
GLOBEC	Roth, Burbridge, Forbes
LAND/LUCC	*Lansigan/Restrepo*
PAGES	*Saito*
GECHS	Burbridge/
IDGEC	Gilbert/Andreeva
IT	Gilbert
URBANISATION	Lansigan
GECAFS	Roth/Forbes
GWSP	Meybeck/Lansigan
C-GOOS	Nalin/Forbes/Dennison/Rabalais
NEAR-GOOS	Huang
IGOS	McManus
GCP	Koike
GEO/GEOSS	McManus/Huang/IPO
EU	IPO (+SSC as appropriate)
UN-Bodies and sponsors)	IPO (+SSC as appropriate)
SCOR	IPO (+SSC as appropriate)
MA	Restrepo
Global-NEWS	Meybeck

As indicated, the important links with the main and scientific sponsors such as the GC programmes and for example UNESCO/IOC and IHP and, in particular, SCOR, will be with various SSC members as appropriate and maintained on a continuous basis, including reporting by the IPO.

The SSC also considered the structure and types of membership categories available for individual contributions to the SSC. It was recognised that the structure and composition of the SSC must allow an optimal and effective implementation of LOICZ II and capture of appropriately experienced and representative scientists. In order to involve both more experienced senior individuals and also young active scientists contributing science to LOICZ, as well as their organisations, institutional backing and regional networks, a category of "Corresponding Membership" would be appropriate. This is in accordance with earlier exchange and final approval (during the Banff SSC 14) by the IGBP. This category will recognise that there are many people who have much to contribute to LOICZ but who might not be able to devote the time and energy required as an active full SSC member. This type of membership will also build a pool of scientific experts from which to recruit full SSC members who then look back to experiences made within the wider LOICZ framework. In order to expedite continuity in LOICZ, and to keep earlier SSC members and their invaluable contributions to LOICZ involved, a second category will be established – the "Ex-Officio Member". Both Ex-Officio and Corresponding members will be

recommended by the SSC. An SSC Executive Group will be formed out of the three Chairs and Vice Chairs together with the 5 leading Theme Co-ordinators.

The SSC also addressed the legacy of LOICZ I and its implications for the second phase. LOICZ II currently faces a complex situation of maintaining and further developing outputs from LOICZ I, in particular the coastal typology and its supporting visualisation and clustering tools and budget datasets, without substantial mechanisms for continued funding. Not withstanding that it is preferential that their maintenance should ideally be self-supporting from external funding, this is a very important area, especially with the need to incorporate social and economic sciences into the data management for LOICZ II, as well as the biogeochemical data. As a consequence, further development of the typology is seen to be a key cross-cutting activity that needs to be promoted and support mechanisms identified. The SSC resolved that a workshop on the future direction and development for data management and typology needs and options should be convened as soon as possible to include representation from a variety of existing data management and typology projects as well as the expertise from LOICZ. Since this has substantial implication in particular for Theme 4 (BGC Shelf Processes), we will be engaging with SCOR and IOC to investigate options for collaboration for the workshop and beyond.

The funding situation was reviewed and it was noted that LOICZ continued to attract support from sponsoring organisations but that more effort was required to diversify the funding base available to LOICZ. Although the IPO can source funding opportunities and has been successful in the past, the onus should be on the wider LOICZ community to secure funds for projects that could support the basic needs of LOICZ II. However, funding submissions should be more driven from the science needs in the Themes so that LOICZ science is not beholden to proposals from individuals and the "hope" that the resulting project can be aligned to one of the LOICZ Themes. In addition, the LOICZ SSC supported by the IPO should take an active role in preparing and submitting research proposals for centrally supported activities within and between the Themes. Individual members of the SSC were requested to explore further funding opportunities from within their own networks, in particular foundations and the private sector, where LOICZ has a weak record. Sourcing funding is likely to be a critical role for the Regional IPO Nodes, since many funders only fund at a regional level, in their support for LOICZ II.

In the same context the SSC addressed the need to relocate the Central IPO post-2005 after termination of the generous Dutch funding over the last 13 years. Though initial efforts have been undertaken by the IPO to explore options in Europe and North America, the meeting adopted the recommendation that individual SSC members explore opportunities for hosting and funding of the IPO post-December 2005 in their home countries and report back to the IPO by December 2004 at the latest. This includes the Regional IPO Nodes which were asked to explore options in their localities.

During the following first Regional IPO Nodes Meeting it was reaffirmed that there is a need for these Nodes to be able to facilitate the greatest buy-in to LOICZ II in their region, both from a funding as well as science perspective, and that ToRs need to be established to enable this to take place. However, although research is the bread and butter of LOICZ, and therefore the most important activity, addressing Regional and National interests will also be important to ensure that LOICZ has the widest support. A role of the Central IPO will be to facilitate the association of possible Node locations to LOICZ as each region requires a different level of formality to the association. One major advantage of these Nodes as compared to, for instance, regional projects was seen in the fact that their operations within the regions won't be limited to usual project lifetimes and cycles.

It was concluded that the operation of Regional IPO Nodes should offer an opportunity for LOICZ to more effectively engage scientists with LOICZ and each other regionally to provide prospects for work within National, Regional and International arenas. A barrier to realising this goal is funding, although with the establishment of Regional IPO Nodes, it might lead funders to perceive LOICZ to have a greater regional relevance to secure funding. In this context, it is important that the Regional IPO Nodes establish themselves as organisations that represent the wider regional science community and forge links from that community into user groups.

To achieve this goal, it will be important for LOICZ to determine a Regional Implementation Strategy that is based on a close association between Regional IPO Nodes and their "local" SSC members so that networking is not confined to the immediate funded project base. Within the SSC the Regional IPO Nodes will have a voice making sure that LOICZ functions as a single unit. The Central IPO will follow up with options in Australia/Oceania, Sri Lanka, Africa and explore new ones in China, US/Canada and Latin America. The Nodes Meeting agreed on the following task list for Regional IPO Nodes:

- *Synthesis* of patterns of change and trajectories in the region's coast and implications to policy and management (Mandate of the Regional Node). This provides a context for articulating a regional implementation based on the scientific framework provided by the Science Plan.

- Activities to operationalize this regional mandate:
  - Regional Needs and SWOT Analysis,
  - Provide multilingual thematic packages (information),
  - (newsletters, web-sites, IS, publications),
  - Regional workshops to define regional priorities using the SPIS as starting point,
  - Link with START to develop regional coastal modules for the new ESSP integrated studies (supported by SSC and IPO),
  - Maintain a directory and database of existing, planned and needed projects (part of the LOICZ database),
  - Directory of coastal scientists,
  - To provide regionalised training and education materials.

- To explore options and modalities for hosting the Central IPO Node in the region.

- Promote inter-Node interaction (e.g., North-South, South-South exchanges).

- Expectations to network among relevant national, regional activities in and beyond the IGBP:
  - This includes establishing linkages with regional and national committees,
  - Providing value-added services to scientists (scientific and aiming to reduce individual search costs),
  - Identifying thematic regional experts to support Themes (also the inaugural meeting of LOICZ II),
  - Linking with other regional GC projects,
  - Linking with regional funding agencies including, for example, approaching GEF,
  - Encourage regional/national LOICZ activities.

Finally, the SSC resolved to adopt the recommendation that the Inaugural meeting of the LOICZ II be held in the Netherlands between 27 June and 1 July 2005 associated with the 16th SSC Meeting. This congress is expected to take stock and point to the future directions of LOICZ II.

Implications for our collaboration with SCOR

LOICZ will follow the SCOR invitation to the Venice Project Coordination Conference engagement (Parslow, Kremer).

IPO and Chair to explore options with SCOR and IHDP and finally draft a proposal (with support of the Theme co-ordinators) to co-sponsor a LOICZ database and typology futures workshop across all the themes.

Seek options for collaboration with SCOR and support for the LOICZ II Inauguration and Open Science Meeting 2005

Investigate options to foster links with U.S. agencies and projects and the remote sensing community