

3.0 LARGE-SCALE OCEAN RESEARCH PROJECTS

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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.

Chair:

Francisco Werner
Marine Sciences, CB# 3300
Chapel Hill, NC 27599-3300

Tel: +1-919-962-0269
Fax: +1-919-962-1254
E-mail: cisco@unc.edu

Members:

Jurgen Alheit	GERMANY	Rosemary Ommer	CANADA
Ruben Escribano	CHILE	Geir Ottersen	NORWAY
John Field	SOUTH AFRICA	Ian Perry	CANADA
Roger Harris	UK	Jeffrey Runge	USA
Eileen Hofmann	USA	Marten Scheffer	NETHERLANDS
James Hurrell	USA	Qisheng Tang	CHINA-Beijing
Patrick Lahodey	NEW CALEDONIA		

Executive Officer: Manuel Barange

Executive Committee Reporter: Akira Taniguchi

GLOBEC: Global Ocean Ecosystem Dynamics

Report of the SCOR/IOC/IGBP GLOBEC International Project for 2004/2005
to the SCOR Executive Committee. Cairns, Australia, 29 August-1 September 2005

Manuel Barange, Director GLOBEC International Project Office
Plymouth Marine Laboratory, UK, m.barange@pml.ac.uk

1. RECENT PROGRESS: Symposia and Workshops

1.1. GLOBEC-sponsored symposia

- **GLOBEC/PICES CCCC synthesis sessions at PICES XIII, 15-24 October 2004, Honolulu, USA**

Four synthesis sessions for this regional activity were included in the programme of the PICES XIII meeting, on the following topics:

- a) “The impacts of large-scale climate change on North Pacific ecosystems”,
- b) “Modelling approaches that integrate multiple spatial scales and trophic levels between shelf and open oceans”,
- c) “The seasonal cycle of plankton production in continental shelf waters around the Pacific Rim” and
- d) “Linking open ocean and coastal ecosystems”.

- **EUR-OCEANS Symposium, 14-16 April 2005. Paris, France.**

EUR-OCEANS is a network of excellence funded by the European Commission, aimed at coordinating the delivery of GLOBEC and IMBER science at European level. The network gathers more than 60 research institutes and universities from 25 countries. The overall scientific objective of EUR-OCEANS is 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 first open meeting of EUR-OCEANS took place in April 2005, bringing together over 150 scientists. The GLOBEC IPO coordinates a work package on “Transfer of knowledge to socio-economic users”, and sits in the EUR-OCEANS Scientific Steering Committee. Recent activities of the network also include

- a) Co-sponsoring (with NSF) a GLOBEC-inspired workshop on the impact of basin-scale oceanographic and climate-related processes on the dynamics of plankton and fish populations in the North Atlantic Ocean. The ultimate objective of the workshop was to set up a North Atlantic research initiative named BASINS. The workshop was held in Iceland in March 2005, and was attended by about 50 scientists from Europe and North America.

- b) Sponsoring a North Sea modelling workshop following the AMEMR symposium (see below), in Plymouth in June 2005.
- c) Sponsoring a session at the ICES Annual Science Conference in Aberdeen in September 2005, on the application of the Ecosystem Approach to Marine Resources.

- **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, taking the role previously delivered through Open Science Meetings. This meeting was also used to launch the GLOBEC-ESSAS (Ecosystem Studies of Sub-Arctic Seas) regional programme. The symposium was held at the Victoria Conference Centre, and received financial support from GLOBEC, NSF, SCOR, North Pacific Research Board, NOAA Arctic, NOAA Alaskan Fisheries Science Centre, PICES, and Fisheries and Oceans Canada. The symposium was attended by 240 delegates. Two days of the symposium were devoted to plan the global implementation of ESSAS, and the U.S. implementation of BEST (Bering Ecosystems Study), the main US-ESSAS project. The Proceedings will be published as a quadruple issue of *Progress in Oceanography*. The co-chairs of ESSAS, Ken Drinkwater (Norway) and George Hunt (USA) co-convened the symposium. The GLOBEC IPO manned the Secretariat, with substantial support from PICES as the local host. The main sessions of this symposium were

- a) Regional Focus Session (Barents/Norwegian, Iceland/Greenland, Labrador/Gulf of St. Lawrence/ Hudson Bay, Bering Sea, Sea of Okhotsk, Oyashio)
- b) Physical Forcing and Biological Response in the Water Column
- c) Climate Warming Impacts on Trophic Coupling
- d) Disciplinary parallel sessions (Physics and Chemistry; Primary Production; Secondary Production; Fish, Shellfish, Marine Birds and Mammals)
- e) Climate Change and the Structure of Ecosystems: The Potential for Trophic Cascades
- f) Recent Changes in Ecosystem Structure or Function
- g) Implications of Climate-forced Change for Management and Social Institutions

Prof. R.T. Barber (Duke Univ., USA) delivered the invited keynote speech, on "How will ocean warming in the next 50 years affect sub-Arctic marine ecosystems". Prof. V. Smetacek (AWI, Germany) provided a symposium summary. Some of the presentations and the full programme of talks are available at www.globec.org.

- **PML 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. AMEMR is supported by GLOBEC. Sessions and post-symposium workshops are being designed to further GLOBEC's Focus 3 (Modelling) objectives.

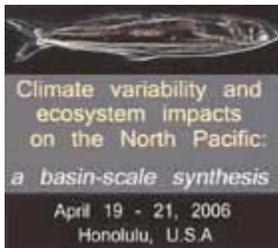
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- **GLOBEC/PICES CCCC synthesis sessions at PICES XIV, Vladivostok, Russia, September 29-October 9 2005:**

The GLOBEC-PICES CCCC regional programme is organising four sessions to be run during PICES XIV:

- a) 1-day topic session on “The comparative response of differing life history strategists to climate shifts”. Co-convenors: Hyung-Ku Kang (Korea) and Gordon A. McFarlane (Canada)
- b) ½-day topic session on “Modeling climate and fishing impacts on fish recruitment”. Co-convenors: Jacob Schweigert (Canada) and Yury I. Zuenko (Russia)
- c) ½-day topic session on “Modeling and iron biogeochemistry: How far apart are we?”. Co-convenors: Fei Chai (U.S.A.) and Jun Nishioka (Japan)
- d) 1-day workshop on “Filling the gaps in the PICES North Pacific Ecosystem Status Report”. Co-convenors: Vyacheslav B. Lobanov (Russia), Phillip R. Mundy (USA), R. Ian Perry (Canada) and Sei-Ichi Saitoh (Japan)

- **PICES/ GLOBEC Symposium on Climate variability and ecosystem impacts on the North Atlantic. Honolulu, USA, 19-21 April 2006.**



This symposium is designed to continue the programme of GLOBEC symposia along regional lines by synthesising the knowledge acquired as part of the PICES-GLOBEC Climate Change and Carrying Capacity in the North Pacific (CCCC). The programme of the symposium is being drafted by the steering committee, chaired by Dr Harold Batchelder (Corvallis, USA) and Prof. Suam Kim (Pusan, Korea). The themes are

- a) Regime shifts, especially examination of the ocean and ecosystem responses to known strong, infrequent changes in the North Pacific, such as those that occurred in 1977, 1989, and 1998;
- b) Ecosystem productivity and structural responses to physical forcing, with an emphasis on shorter than inter-decadal time-scales-interannual (El Niño-La Niña), seasonal and event scales; and
- c) Pan-Pacific comparisons, with an emphasis on comparisons of similar species or processes from multiple coastal ecosystems and of open ocean-coastal linkages and climate connections.

The Proceedings are to be published as a special volume of *Progress in Oceanography*. The GLOBEC Scientific Steering Committee will meet in Honolulu in 2006, to facilitate their engagement in the symposium.

1.2. GLOBEC workshops

- ***GLOBEC-SPACC workshop on the “The economic implications of climate change-driven changes in pelagic fish stocks”, Porstmouth, UK, September 2004.***

Small pelagic fish species (anchovy, sardine, herring, capelin, etc.) fluctuate significantly on short and long time scales. The focus of the workshop was on the economic implications of these fluctuations. Authors of papers both backward looking, that is, analyze how people have coped with major resource displacements, and papers that are theoretical or forward looking, describing likely implications of climatic variations and how these could or should be dealt with, were invited to participate. Twenty four participants attended (most of them funded through NOAA, GLOBEC and SCOR. A collection of 12 articles have been selected, reviewed and accepted in a book in the series “*New Horizons in Environmental Economics*” by Edward Elgar in 2005. The editors of the book are R. Hanesson, M. Barange and S. Herrick.

- **Japan/Korea/China annual GLOBEC. 27-29 November. Hangzhou, China**

The 2nd Japan/Korea/China annual symposium gathered 62 scientists, and consisted of 25 oral presentations and 27 posters. The symposium continued the tradition of these three national GLOBEC programmes to coordinate their research and contribute to GLOBEC’s overall synthesis. The two area of focus in this year’s meeting were

- a) ecosystem structure and food-web trophodynamics, and
- b) physical-biological processes and models.

The next tri-national meeting will take place in Japan in 2007.

- **GLOBEC-CLIOTOP planning workshops for working groups 2, 4 and 5. Hawaii, 1-3 December 2004.**

CLIOTOP is a new regional GLOBEC activity synthesising the ecology of ecosystem top predators (see below). CLIOTOP is organised in a number of working groups. Working groups 2 (Physiology, behaviour and distribution), 4 (Synthesis and modelling) and 5 (Socio-economic aspects and management strategies) met in parallel to define their work plans, timelines and milestones; identify people and running projects to follow the proposed activities; identify future projects; and define synthesis plans and interactions with other WGs. CLIOTOP is planning a major OSM in Mexico in 2006.

- **GLOBEC/ICES CCC-WGZE Workshop on the Impact of Zooplankton on Cod Abundance and Production. Copenhagen, Denmark, 7-9 June 2005.**

This workshop will (a) determine the zooplankton species in the diets of cod, their temporal and spatial changes; (b) determine the variability in zooplankton populations and their relationships to cod; (c) examine the vital rates of zooplankton that are relevant to cod life histories; (d) determine how the timing of zooplankton production and spatial dynamics of nauplii relates to the spawning, distribution and survival of early stages of cod; (e) establish the links between zooplankton and later stages of cod; and (f) study long-term changes in phenology, abundance and size composition of zooplankton and possible consequences for cod. An ICES Cooperative Report is expected.

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- **GLOBEC-IOC Study Group on Ecosystem Regime Shifts. Rome, June 2005 and TBA, Fall 2005.**

This study group has been set up to write a review paper that would exemplify the process of identifying and detecting regime shifts, and applying the knowledge to management and governance of marine resources. The example would be used to design observational systems that would operationalize the process. This small group will meet twice in 2005, leading to a major paper in 2006. The group is co-funded by IOC, PICES and GLOBEC.

- **GLOBEC-SPACC workshop on "Image analysis to count and identify zooplankton", San Sebastian, Spain, 1-3 November 2005.**

To understand fish biomass fluctuations we need appropriate biological information on the prey field. The difficulty is to extract the information from the thousands of samples collected routinely. However, new systems based on image analysis have become available, allowing quick counting and sizing of the zooplankton. The workshop is intended to evaluate these new systems and provide feedback for the manufacturers. The final objective is to have a network of laboratories using the same approach to count and identify zooplankton. A group publication is expected.

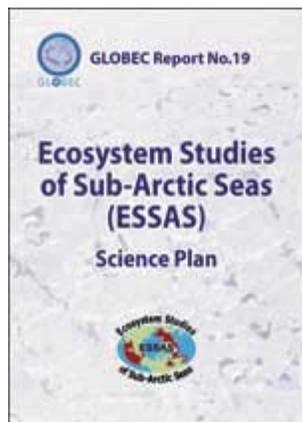
- **GLOBEC-SPACC workshop on "Fluctuations of sardines and anchovies and impact on coastal fishing communities", Tokyo, Japan, 14-17 November 2005.**

This workshop will be used to fit the NEMURO-FISH ecosystem model (an NPZ model with compartments for pelagic fish) to data from several areas that have large populations of anchovy and sardine, with the objective to ascertain if the replacement between both species could be explained as driven by decadal-scale climate variability that permeates through the food web. The workshop is a GLOBEC Focus 4 and SPACC activity, and funding is provided by APN, IAI, Japanese Fisheries Agency, PICES and GLOBEC.

In addition, GLOBEC conducted meetings of their Focus 1 working group (Hawaii, USA, 23-24 October 2004), Focus 2 working group (Rhode Island, USA, 18-20 July 2004) and Focus 3 working group (Bergen, Norway, 9-10 May 2004). In 2005, meetings of the following working groups are planned and funded: Focus 4 (Sidney, Canada, August 2005), Focus 2 (Dartington, UK, September 2005), and Focus 3 (Aberdeen, UK, September 2005). More information is available on the GLOBEC Web site.

2. RECENT DEVELOPMENTS AND PUBLICATIONS

2.1. GLOBEC-ESSAS

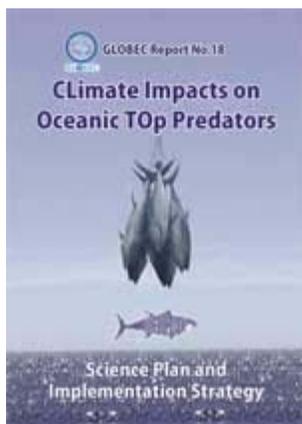


The GLOBEC Executive Committee approved a new regional programme on the impacts of climate variability and change on marine sub-arctic ecosystems, in October 2004. The approval was the culmination of a process that included the appointment by GLOBEC of a committee to draft a Science Plan (funding provided by NSF and the Norwegian Research Council), the anonymous review process by independent scientists, and the revision of the science plan as a result.

The Plan is now available via the GLOBEC IPO (GLOBEC Report 19), and downloadable from the GLOBEC Web site. An appendix to the Science Plan (GLOBEC Report 20), with reviews of the climatology, physical oceanography and ecosystem considerations of Sub-Arctic Seas, is also available in hard copy and as a download.

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, from phytoplankton to whales and birds. 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. ESSAS kicked-off its activities with a symposium and planning implementation workshop in Victoria, Canada. A preliminary Scientific Steering Committee for ESSAS has been appointed, and met in Victoria as well for the first time.

2.2. GLOBEC-CLIOTOP



GLOBEC has also approved a new pan-equatorial research activity named CLIOTOP (Climate Impacts on Oceanic Top Predators). The objective of CLIOTOP is to organize a large-scale worldwide comparative effort aimed at identifying the impact of both climate variability (at various scales) and fishing on the structure and function of open ocean pelagic ecosystems and their top predator species by elucidating the key processes involved in open ocean ecosystem functioning. CLIOTOP will focus on populations of tunas, sharks and other large predators, and the ecosystem that sustain them. A science plan has been published (GLOBEC Report 18), following a review process identical to that set up for the approval of the ESSAS Science Plan. CLIOTOP initiated activities with a set of workshop in Hawaii in December 2004 (see above), and plan a kick-off conference for 2006.

2.3. Publications

The GLOBEC publication list can be interactively searched at www.globec.org. Since 2000 the list includes a total of 1,123 publications (943 refereed, 180 non-refereed). This is an underestimate of the total publications of GLOBEC researchers, as they have to be logged in the Web site by the authors themselves 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 are special issues of GLOBEC and IPO publications printed in 2004/2005:

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. **Hofmann, E.E., P.H. Wiebe, D.P. Costa and J.J. Torres (Eds.)**. 2004. Integrated ecosystem studies of western Antarctic peninsula continental shelf waters and related southern ocean regions. *Deep Sea Research* 51(17-19): 1921-2344.
3. **Stenseth, N.C., G. Ottersen, J.W. Hurrell and A. Belgrano (Eds.)** 2004. *Marine ecosystems and climate variation*. Oxford: Oxford University Press.

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4. **Valdes, L., R. Harris, T. Ikeda, S. McKinnell and T. Peterson (Eds.)** 2004. The role of zooplankton in Global Ecosystem Dynamics: comparative studies from the world's oceans. ICES J. Mar. Sci. Symposia 220. ICES J Mar. Sci. 61 (4): 441-737.
5. **Ashby, D.M. (ed.)**. 2004. Update of the Report on the GLOBEC National, Multinational and Regional Programme Activities, 2004. GLOBEC Special Contribution No. 7, 194 pp.
6. *GLOBEC Newsletter 10.1. April 2004*
7. *GLOBEC Newsletter 10.2. October 2004*
8. *GLOBEC Newsletter 11.2. April 2005*

Two GLOBEC Reports are currently in press.

2.4. GLOBEC IPO

We are delighted to inform SCOR that a bid to renew the GLOBEC IPO for a further 5 years (March 2005-March 2010) has been approved by the UK's Natural Environment Research Council and the Plymouth Marine Laboratory. The IPO was established at the Plymouth Marine Laboratory (PML) in 1998, and this support ensures the Office will remain at PML. The renewal will carry the IPO until the completion of GLOBEC, providing for staff salaries, overheads, T&S and other IPO costs. This is a final IPO request, as GLOBEC will formally conclude its science activities in December 2009, after which a 3-month wind-up of the IPO is envisaged.

As part of our involvement in the European network of Excellence EUR-OCEANS, the IPO will grow with an additional project officer to deliver the expected contributions from the IPO. The position is expected be filled during the summer months.

In the short term, however, the IPO will have an important manpower shortage, as Ms. Lotty Ireland will be on maternity leave until January 2006.

2.5. Integration and Synthesis plans

GLOBEC is embarking on an integration and synthesis (I+S) phase that will lead the programme to its conclusion in December 2009. The GLOBEC SSC has developed of a blueprint document to set up the goals, milestones and pathways to this I+S. The document can be downloaded from a section of the GLOBEC Web page devoted to I+S. In this section of the Web page, I+S activities can be proposed online, and the community has the opportunity of requesting information on specific I+S outputs as and when they become available. Much of GLOBEC's I+S will take the form of regional symposia, and the following are already in diverse stages of planning:

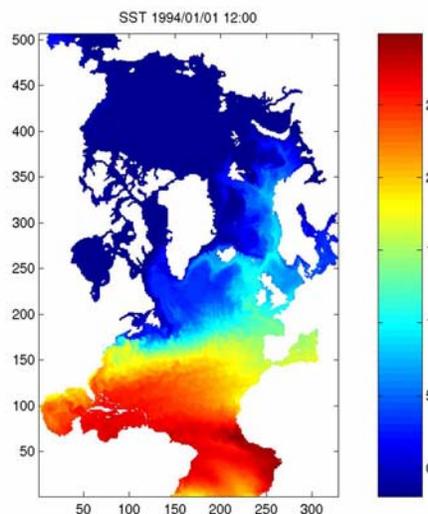
- 1- ICES/GLOBEC The influence of Climate change on North Atlantic fish stocks, Bergen, Norway. May 2004. **COMPLETED**
- 2- GLOBEC Climate variability and sub-arctic marine ecosystems. Victoria, Canada, 16-20 May 2005 **COMPLETED**
- 3- PICES/GLOBEC Climate Change and Ecosystem impacts in the North Pacific, Honolulu, USA, 19-21 April 2006.
- 4- GLOBEC CLIOTOP 1st OSM. La Paz, Mexico. 2006.

- 5- PICES/ICES/GLOBEC 5th Zooplankton Production Symposium. Hiroshima, Japan, June 2007
- 6- GLOBEC Focus 4 Symposium “Natural and Human system implications of large-scale changes in marine systems”. 2007
- 7- Final GLOBEC Open Science Meeting, 2010

For more details, follow the links to Integration and Synthesis plans in www.globec.org.

3. RESEARCH HIGHLIGHTS

The GLOBEC IPO produces an annual research highlights brochure, which is available for download from the GLOBEC Web site. Because this year the SCOR annual meeting is held earlier than it is customary this brochure is not yet available. However, the following are specific highlights extracted from the GLOBEC-Norway programme, which was the subject of a special GLOBEC Newsletter in April 2005.



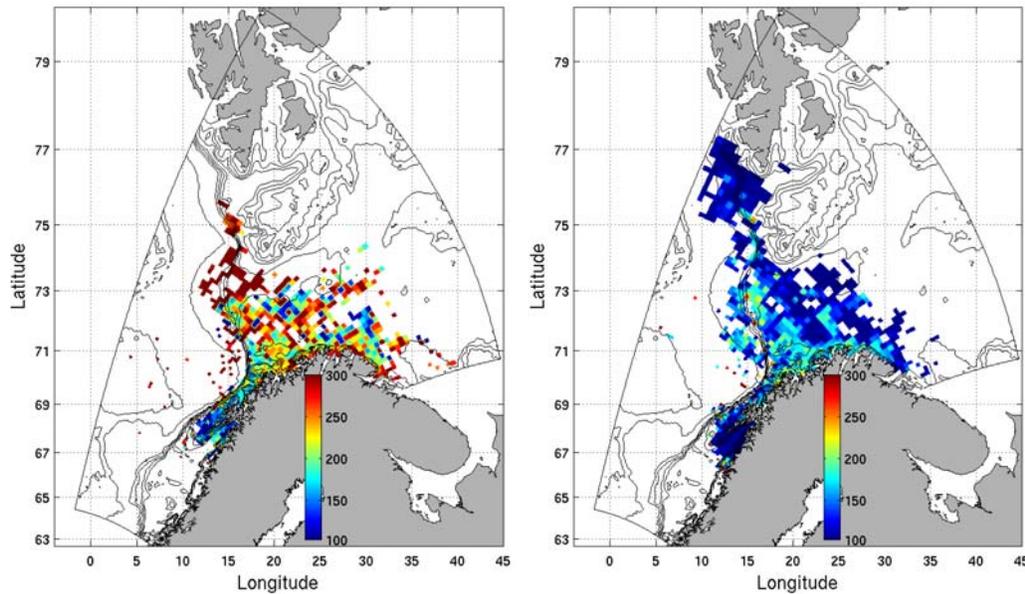
ROMS model for the North Atlantic and Arctic Oceans – W.Paul Budgell.

A Regional Ocean Modelling System coupled to a thermodynamic sea ice model has been developed to simulate the conditions in the North Atlantic and Arctic oceans for the period 1980-2004. The model horizontal resolution is 20km in the study area and 30km in the wider North Atlantic. The forcing fields are daily mean surface heat and momentum fluxes from NCAR/NCEP data sets, and the outputs are used by other GLOBEC-Norway research projects.

What happens with the Arcto-Norwegian cod if the thermohaline circulation slows down? – F. Vikebo, S. Sundby, B. Adlandsvik, O.H. Ottera.

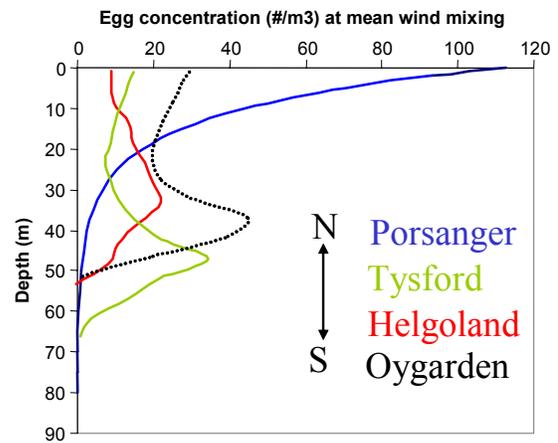
A reduction in the thermohaline circulation might have strong impacts in the Northeast Atlantic ecosystem. A ROMS circulation model forced by a simulated reduction of the thermohaline circulation was coupled to an IBM of cod early life stages to investigate the effects of the reduction. The main results are a reduction of the influx into the Barents Sea, in favour of increased flow west of Spitsbergen Island, a southward and westward shift in the distribution of early stages of cod on the narrow shelves of Norway and away from the Barents Sea (see figure below) and a reduction in growth and therefore poorer year classes.

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Buoyancy of eggs of Norwegian coastal cod from different areas of the coast – E.K. Stenevik, S. Sundby.

It is believed that Arctic and coastal cod form two different stocks genetically differentiated. One of the hypotheses in support of stock differentiation between cod populations is related to the ability to be retained in specific areas. Measuring the buoyancy of cod eggs from different locations along the Norwegian coast (see figure) shows that cod eggs in the northernmost region (Porsanger) were more buoyant and widely distributed in the water column, while the eggs from other areas peaked at depth (30-50m) and were substantially heavier. The implication is that northerly eggs have a higher probability of being advected, while other populations would be retained more successfully. The results have implications for IBM modelling of young stages of cod in Norwegian waters.



More highlights of GLOBEC-Norway are available in the *GLOBEC Newsletter* 11.1, available from the GLOBEC IPO or downloadable from www.globec.org.

4. GLOBEC SSC 2005

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)
Dr Ruben Escribano	M	Chile	SSC	1 st term 2007
Prof John Field	M	South Africa	SSC	1 st 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 James W. Hurrell	M	USA	SSC	1 st term 2007
Dr Patrick Lehodey	M	N. Caledonia	SSC, Focus 4	2 nd term 2005
Prof Rosemary Ommer	F	Canada	SSC, Focus 4 co-Chair	2 nd term 2005
Dr Geir Ottersen	M	Norway	SSC, CCC Co-Chair	2 nd term 2005
Dr Ian Perry	M	Canada	Focus 4 co-Chair	(Ex-Officio)
Dr David Runge	M	USA	SSC	1 st term 2005
Prof Marten Scheffer	M	Netherlands	SSC	1 st term 2007
Prof Qisheng Tang	M	China	SSC	1 st term 2005
Prof Francisco Werner	M	USA	SSC Chair, Focus 3	1 st term as Chair 2005

At the end of 2005 four members complete their second term (Lehodey, Ommer, Ottersen Werner). The latter is eligible for a further term as Chair. The GLOBEC SSC will soon be designing a strategy to fill the vacancies in light of the synthesis phase of GLOBEC.

Appendix 1. GLOBEC National, Multinational and Regional Programmes

National

Country	Duration	Name-code	Funding	Contact
Brazil	1998-2002	DEPROAS	Conselho Nacional de Desenvolvimento Cientifico e Tecnologico	B. M. de Castro
Canada	1996-1999	GLOBEC Canada	Natural Sciences and Engineering Research Council, Fisheries and Oceans Canada	B. de Young
Chile	1997-ongoing	FONDAP-COPAS	Chilean National Commission for Science and Technology	R. Escribano
China	1997-ongoing	China GLOBEC	National Natural Science Foundation of China, Ministry of Science and Technology	Q. Tang
France	1999-ongoing	PNEC	Call for proposals, funded for 1 year. Proposals can be resubmitted each year. Mean duration ~4 years.	F. Carlotti
Germany	2000- ongoing	GLOBEC Germany	Federal Ministry for Education, Science, Research and Technology plus participating institutions	J. Alheit
Italy	2000- ongoing	SINAPSI	Ministero dell'Universita' e della Ricerca Scientifica e Tecnologica	M. Zavatarelli
Japan	1997- ongoing	Japan GLOBEC	One project funded by Japanese Government, others seem to be institute/university funded	Y. Sakurai
		Korea GLOBEC	Korea Science and Engineering Foundation, Ministry of Maritime Affairs and Fisheries, NFR&D Institute	I. Sang Oh
Mexico	1997- ongoing	IMECOCAL	Consejo Nacional de Ciencia y Tecnologia, IAI	T. Baumgartner
Netherlands	1993-2002	Several	Various loosely affiliated projects, various funding agencies	M Baars
Norway	1993-2001 2003-2006	MARE COGNITUM ECOBE, CLIMAR, ADAPT	EU funding, Norwegian Research Council, Norwegian Institutes and Institute of Marine Research	W. Melle/ S Sundby
Portugal	1999- ongoing	GLOBEC Portugal	Portuguese Foundation for Science and Technology, IPIMAR	M. Santos
Peru	2004- ongoing	GLOBEC-IMARPE	Instituto del Mar del Peru (IMARPE)	R. Guevara
Spain	2001- ongoing	GLOBEC Spain	Ministerio de Ciencia, IEO, CSIC, CYCIT, etc.	F. Echevarria
Turkey	1997- ongoing	Black Sea GLOBEC	Turkish scientific and technical research council (TUBITAK)	T. Oguz
Ukraine	1997- 2004	Ukraine GLOBEC	INTAS, UK DETR Darwin Initiative + others	V. Zaika
UK	2000-2005	Marine Productivity (largest)	NERC Thematic money – individual projects by proposal	P. Williamson
USA	1994- ongoing	US GLOBEC	NSF and NOAA – individual projects by submitted proposals	D Haidvogel

Multi-National and Regional

Start Year	Countries	Funding	Contact
1997- 2007	BENEFIT: South Africa, Namibia, Angola, Norway, Germany	Norwegian and German donor agencies, Governments of Angola, Namibia, South Africa	N. Sweijd
2000-2003	LIFECO: Norway, Germany, UK, Denmark	EU FP 5	M. St John
1996-1999	TASC: Norway, UK, Denmark, Iceland, Germany, France, ICES	EU MAST	K. Tande
1999-2001	ENVIFISH: EU countries, Angola, Namibia, South Africa	EU INCO	L. Nykjaer
1997-2000	VIBES: France, South Africa	IRD (ORSTOM)	P. Freon
2001- ongoing	IDYLE1 and 2: France, South Africa, Namibia, Chile, Peru	IRD (ORSTOM)	P. Freon
2002- 2005	NATFISH: Norway, Morocco, Mauritania, Senegal, Italy	EU INCO	L. Nykjaer
2001- ongoing	OFCCP: USA, N.Caledonia, Mexico, Australia, France, N. Zealand, Japan, IATTC	National Funding agencies of participating countries, GEF.	P. Lehodey
Start Year	Countries	Funding	Contact
1993- ongoing	SPACC: Spain, France, Germany, Japan, Chile, Peru, Senegal, Mauritania, Portugal, USA, Mexico, and others	National, GLOBEC	D. Checkley and C. Roy
1993- 2009	CCC: ICES countries	National, ICES	G. Ottersen and K. Drinkwater

Ongoing-2009	CCCC : Japan, China, Korea, Russia, Canada, USA	National, PICES	S. Kim and H. Batchelder
Ongoing	SO GLOBEC : USA, Australia, UK, Germany, IWC, and others.	National	E. Hofmann
2005-ongoing	ESSAS	National, GLOBEC	G. Hunt
2005-ongoing	CLIOTOP	National, GLOBEC	O. Maury and P. Lehodey

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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.

Chair:

Grant Pitcher
Marine and Coastal Management
Private Bag X2, Rogge Bay 8012
Cape Town, SOUTH AFRICA
Tel.: +27 21 402-3345
Fax: +27 21 439-9345
E-mail: gpitcher@sfri2.wacpe.gov.za

Vice Chair:

Marcel Babin
Laboratoire d'Océanographie de Villefranche,
B.P. 8
06238 Villefranche-sur-Mer Cedex
FRANCE
Tel.: +33 (0)4 93 76 37 12
Fax: +33 (0)4 93 76 37 39
Email: marcel@obs-vlfr.fr

Members:

Leonardo Guzman	CHILE	Patricia Glibert	USA
Marcel Babin	FRANCE	Raphael Kudela	USA
Allan Cembella	CANADA	Alicia Lavin	SPAIN
Einar Dahl	NORWAY	Marina Levy	FRANCE
Wolfgang Fennel	GERMANY	Dennis McGillicuddy	USA
Ken Furuya	JAPAN	Robin Raine	IRELAND
Patrick Gentien	FRANCE	Ming-Jiang Zhou	CHINA-Beijing

Ex-officio Member: Beatriz Reguera (IOC IPHAB)

IOC Staff: Henrik Enevoldsen

Executive Committee Reporter: Julie Hall

Global Ecology and Oceanography of Harmful Algal Blooms

ACTIVITIES 2004-2005

1. Implementation of Core Research Projects

The GEOHAB *Implementation Plan*, published in November 2003 (GEOHAB. 2003. *Global Ecology and Oceanography of Harmful Algal Blooms, Implementation Plan*. P. Gentien, G. Pitcher, A. Cembella and P. Glibert (eds.), SCOR and IOC, Baltimore and Paris, 36 pp), specified the formation of Core Research Projects (CRPs) related to four ecosystem types—upwelling systems, fjords and coastal embayments, eutrophic systems, and stratified systems. Initiation of these CRPs through focused Open Science Meetings has been the primary GEOHAB activity during 2004-2005.

A. Core Research Project: HABs in Upwelling Systems

A report of the Open Science Meeting on HABs in Upwelling Systems, hosted at the Instituto Nacional de Investigação Agrária e das Pescas (INIAP-IPIMAR), in Lisbon, Portugal on 17-20 November 2003, has been completed and published (GEOHAB 2005. *Global Ecology and Oceanography of Harmful Algal Blooms, GEOHAB Core Research Project: HABs in Upwelling Systems*. G. Pitcher, T. Moita, V. Trainer, R. Kudela, P. Figueiras, T. Probyn (Eds.) IOC and SCOR, Paris and Baltimore. 82 pp).

The Open Science Meeting served to identify interested participants and research regions and to bring together the international community to design core research. The meeting report provides a general overview of HABs in the designated upwelling systems (California Current System, Iberian Upwelling System and Benguela Upwelling System) and details 8 high-priority research activities to be addressed in understanding the ecology and oceanography of HABs in upwelling systems. Our understanding of and ability to predict HABs in upwelling systems over the next 5-10 years may reflect the extent to which the above questions are answered. Much of the content of the Open Science Meeting report was included in paper published in *Oceanography* (Kudela, R, G Pitcher, T Probyn, F Figueiras, M Moita and V Trainer. 2005. Harmful algal blooms in coastal upwelling systems. *Oceanography* 18(2):184-197).

A GEOHAB Core Research Project Committee [Grant Pitcher – South Africa, Teresa Moita – Portugal, Francisco Figueiras – Spain, Raphael Kudela – USA, Trevor Probyn – South Africa, Vera Trainer – USA] is responsible for implementation. In accordance with the GEOHAB strategy this committee is required to encourage comparative research projects, to address the key questions identified in the CRP report. Committee members are therefore required to play a leading role within their region in establishing comparative projects. Involvement may include generating interest within the research community, disseminating information, submitting proposals and securing funding, coordinating and actively participating in projects and possibly data sharing. Two members of the CRP Committee are members of the international GEOHAB SSC, to ensure a strong linkage between the Committee and the SSC. It is intended that much of the work of the CRP Committee will be conducted by means of the GEOHAB Web site and through the establishment of a CRP mailing list. Periodic meetings of the Committee may be organized and combined with GEOHAB SSC meetings, for example, in conjunction with the next GEOHAB SSC meeting (see below).

An invitation to participate in the Core Research Project: HABs in Upwelling Systems has recently been sent to all participants of the Open Science Meeting.

B. Core Research Project: 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 from 26-29 April 2004 under the co-direction of Allan Cembella (Alfred Wegener Institute, Germany) and Leonardo Guzmán (IFOP, Chile). The objectives of this meeting were fourfold: (1) to introduce the GEOHAB Core Research approach 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 coastal embayments, and (4) to initiate the development of an action plan for implementation of the Core Research on coastal embayments. An international panel of experts participated as the Core Research Project Co-ordinating Committee to plan the research agenda, in conjunction with several key members of the GEOHAB SSC.

The invitation to the OSM was issued to all prospective participants in the emerging international Core Research programme; however, strong participation from Latin America was particularly noteworthy. More than 60 participants attended at least part of the meeting, which featured 11 key lectures, more than 25 posters presented by participants and an 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 Secretariat and 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 importance of physical constraints in determining hydrodynamics and species outcomes in coastal embayments and the significance of benthic-pelagic coupling. The critical importance of water residence time was also noted.

On the day following the completion of the open meeting, the co-convenors met with the GEOHAB Chairman, the international Core 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 processes and mechanisms that must be studied in such ecosystems to define HAB dynamics; (2) determination of the most important questions and working hypotheses; (3) consideration of opportunities, differences and commonalities to be addressed in studies of coastal embayments; (4) discussion of potential 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 were also invited to prepare a manuscript based upon their presentations, subject to peer review and publication in a special GEOHAB edition of the Elsevier journal *Harmful Algae*. The practical implementation of Core Research activities in coastal embayments is in the advanced planning stage and actual field work is anticipated in 2005.

C. Core Research Project: HABs and Eutrophication

The Open Science Meeting on HABs and Eutrophication was held on 7-10 March 2005 in Baltimore, Maryland, USA, under the leadership of Patricia Glibert assisted by a Steering Committee of D. Anderson [USA], E. Graneli [Sweden], M. Zhou [China], J.I. Allen [UK] and M. Burford [Australia]. As with the previous Open Science Meetings, this meeting served to obtain community input for the development of a detailed research plan for the Core Research Project – Harmful Algal Blooms in Eutrophied Systems. The plan is presently being drafted by the Steering Committee based on the input of the approximately 120 participants at the meeting. The programme incorporated sessions on trends in eutrophication and HABs; physiology and ecology of HABs with respect to nutrients; the GEOHAB programme and other initiatives; comparative studies and international programmes on HABs in eutrophic areas; macronutrient interactions with other factors controlling HABs; new challenges and methodologies; modelling of nutrients and HABs; and GEOHAB implementation.

D. Core Research Project: HABs and Stratification

The fourth Open Science Meeting on HABs and Stratification, is scheduled on 5-8 December 2005, at the UNESCO Headquarters in Paris, France, under the leadership of Patrick Gentien (see announcement following). This meeting, the fourth in a series of Open Science Meetings convened by GEOHAB, is designed to bring experts together to review the state of knowledge of the physical and chemical processes related to stratification, and their interaction with microscopic algae. As profiling techniques have improved, persistent and spatially coherent plankton patches have been described at scales smaller than those of standard sampling. These patches are recurrent in coastal systems and their study is essential to understanding the development of HABs. The meeting will address topics relating to the physical processes relevant to stratification, the maintenance of HAB populations in thin layers, the selection of assemblages by different turbulent regimes, the influence of phytoplankton communities on small-scale physical properties, the implications for sampling, monitoring and operational oceanography, and the required detection systems.

2. Targeted Research

The Scientific Steering Committee has approved establishment of two task teams to develop Targeted Research relating to Modelling Studies and Observation Systems and Instrumentation. Membership will be developed in close cooperation with the chairs of the CRP committees and should eventually include members from each CRP committee.

A. Modelling Studies

A Task Team chaired by Wolfgang Fennel, and including SSC members Marcel Babin and Dennis McGillicuddy will be formed during the course of 2005. Their Terms of Reference are as follows:

- Advise on the development, application, and dissemination of models within GEOHAB CRPs.
- Organize a GEOHAB Modelling Workshop, focusing on model inter-comparisons, by the end of 2006, after the completion of all Open Science Meeting reports. Modellers involved in the CRPs will be encouraged to participate and to demonstrate the use of their models.
- Conduct an annual assessment of the success of GEOHAB in modelling and prediction and report to the SSC.

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- Specify targeted modelling research.

B. Observation Systems and Instrumentation

A Task Team chaired by Marcel Babin, and including SSC member Patrick Gentien will be formed during the course of 2005. Their Terms of Reference are as follows:

- Assist and advise on the use of sensors and systems in CRPs.
- Identify the needs for new developments and promote inter-comparison of instruments.
- Conduct periodic evaluation of recent technological and methodological developments.

Two Targeted Research proposals with international participation were endorsed by the GEOHAB SSC during the course of 2005:

- ALEXARRAY – Genetic Regulation of Bloom Formation in the Toxic Marine Dinoflagellate *Alexandrium tamarense*.
- SEED: Life cycle transformations among HAB species, and the environmental and physiological factors that regulate them.

3. SCOR Meeting on Coordination of International Marine Projects

Supported by the Sloan Foundation, this meeting took place from 23-24 September 2004 in Mestre, Italy. It served to bring together representatives of the major international ocean research and observation projects and programs to discuss common opportunities, issues and problems. Meeting participants included representatives from virtually all international marine research projects and programmes (CLIVAR, CoML, DIVERSITAS, GEOHAB, GLOBEC, iAnZone, IMAGES, InterRidge, IMBER, LOICZ, and SOLAS). Profs. John Field and Laurent Labeyrie convened the meeting on behalf of the SCOR Executive Committee. The meeting agenda included several specific topics determined in advance to be important inter-project issues, including data management, interactions of projects with the Global Ocean Observing System (GOOS), project coordination in the area of Southern Ocean research and participation in the International Polar Year, project needs for time-series stations, and future project contributions to global environmental assessments. GEOHAB was represented at the meeting by Grant Pitcher and Henrik Enevoldsen. Discussions on the interactions with GOOS were of particular importance to GEOHAB. Mechanisms to improve the way in which GEOHAB and other programmes integrate with GOOS were addressed. Measurements required from GOOS by GEOHAB and the potential for data from GEOHAB to enter GOOS data streams were considered. Information and recommendations relating to the meeting are available on the activity Web page (see www.jhu.edu/scor/ProjCoord.htm).

4. XI International Conference on Harmful Algae

A GEOHAB display was constructed at the XI International Conference on Harmful Algae held in Cape Town, South Africa, from 14-19 November 2004, to promote the strategy, mission and achievements of GEOHAB. The stand served primarily to distribute the *GEOHAB Implementation Plan*.

5. SSC Meeting: Cape Town, South Africa, 2004

A Scientific Steering Committee meeting was held from 21-23 November 2004 following the XI International Conference on Harmful Algae in Cape Town, South Africa. The focus of this meeting was 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], data management, the development of standard measurement protocols within GEOHAB, and the establishment of an International Programme Office.

6. Special Issue of *Oceanography*

A special issue of *Oceanography* (Vol. 18, No. 2, June 2005) devoted to the ecology and oceanography of Harmful Algal Blooms was edited by Scientific Steering Committee members P. Glibert and G. Pitcher. The issue gave extensive coverage to GEOHAB and the Core Research Projects, and other international programmes on harmful algae. Several of the papers were written by present and past members of the Scientific Steering Committee, such as

- Glibert, PM, DM Anderson, P Gentien, E Graneli and K Sellner. The global, complex phenomena of harmful algal blooms.
- Anderson, DM, GC Pitcher and M Estrada. The comparative “systems” approach to HAB research.
- Cembella, AD, DA Ibarra, J Diogene and E Dahl. Harmful Algal Blooms and their Assessment in Fjords and Coastal Embayments.
- Gentien, P, P Donoghay, H Yamazaki, R Raine, B Reguera and T Osborne. Harmful algal blooms in stratified environments.
- Kudela, R, G Pitcher, T Probyn, F Figueiras, M Moita and V Trainer. Harmful algal blooms in coastal upwelling systems.
- Glibert, PM, S Seitzinger, CA Heil, JM Burkholder, MW Parrow, LA Codispoti and V Kelly. The role of eutrophication in the global proliferation of harmful algal blooms: New perspectives and new approaches.
- Babin, M, JJ Cullen, CS Roesler, PL Donoghay, GJ Doucette, M Kahru, MR Lewis, CA Scholin, ME Sieracki and HM Sosik. New approaches and technologies for observing harmful algal blooms.

7. ASLO meeting 2005

Two Special Sessions were organized by the GEOHAB Scientific Steering Committee to promote GEOHAB at the next ASLO meeting in Santiago de Compostela, Spain, from the 19-24 June 2005. Both sessions will be chaired by members of the Scientific Steering Committee.

- Session SS 43: Eutrophication and Harmful Algal Blooms
Co-chaired by P. Glibert and E. Graneli.
- Session SS52: Comparative Ecosystem Studies of Harmful Algal Blooms
Co-chaired by G. Pitcher, P. Gentien and A. Cembella.

The GEOHAB approach of international co-operative research on HABs in ecosystem types sharing common features will be emphasized in these sessions with presentations relating to all four Core Research Projects.

8. International Programme Office [IPO]

GEOHAB, SCOR and IOC continue to seek the establishment of an International Programme Office to help implement, co-ordinate and manage GEOHAB resources in accordance with the approved international *GEOHAB Science Plan* and *Implementation Plan*. IOC and SCOR seek a commitment to host the IPO for GEOHAB with basic operational funds of US\$200,000 per year. For support of the Executive Officer and Administrative Assistant, IOC and SCOR seek international funds from national funding agencies for a period of no less than 3 years and preferably at least 5 years. IPOs are established by the parent bodies for large international

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research programmes to relieve the Scientific Steering Committees of the day-to-day responsibility of handling the administrative and logistical aspects of the programmes. The IPO serves as the programme secretariat and works with the SSC and co-sponsors in implementing the programme and raising funds for its international coordination, planning and framework activities. The transition from the programme planning phase to programme implementation and establishment of an IPO is an important step that makes it possible for programmes to be implemented more quickly and comprehensively. Until the GEOHAB IPO is established, the co-sponsors of GEOHAB are responsible for overseeing programme progress, as one of their many tasks. Despite recent consideration of the location of the IPO in Norway, China, United Kingdom and Germany, none of these options have materialized. This situation is unsatisfactory for the long-term success of the programme.

9. SSC Meeting: Villefranche, France 2006

The next SSC meeting is tentatively scheduled for January/February 2006 in Villefranche, France. The focus of this meeting will be on the implementation of Core Research Projects.

GEOHAB Finances

Income	2004	2005
Carry-over from previous year (NSF grant)		\$15,485.04
NOAA (through SCOR)		\$24,000.00
NSF (through SCOR)	\$40,574.00	\$30,000.00
IOC	\$18,000.00	\$20,000.00
IFREMER*		\$5,000.00
SCOR Support for LDC Travel	\$1,674.78	\$5,000.00
Other sources (YSI, DNR, CRC)		\$2,500.00
Registration Fees	\$2,525	\$17,500.00
Total	\$62,773.78	\$119,485.04
Expenses		
Publications (formatting, printing, mailing)	\$5,626.67	special issue
Advertising	\$545.00	
SCOR Administrative Expenses	\$189.42	
Subcommittees		
IOC Expenses (airfares)	\$18,000.00	
Other Meetings (including Bergen)		
SSC Meeting 1		
SSC Meeting 1	\$11,739.20	\$25,000.00
SSC Meeting 2		
SSC support and HABWATCH meeting		
LDC Travel		
Editorial/Executive Committee		
HABs in Upwelling Systems	\$363.13	
HABs in Fjords and Coastal Embayments	\$13,793.15	editorial meeting
HABs in Stratified Systems		\$35,000.00
HABs in Eutrophified Systems		\$56,365.22
Total	\$50,256.57	\$116,365.22
Remaining	\$12,517.21	\$3,119.82

3.3 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.

Chair:

Julie Hall
NIWA
Box 11-115
Hamilton, NZ
Tel: +64-7-856 1709
Fax +64-7-856 0151
E-mail: j.hall@niwa.co.nz

Vice-Chair:

Patrick Monfray
24 rue de Limayrac
31500 Toulouse
FRANCE
Phone: +33 6 76 74 87 71
E-mail: monfray@cnes.fr

Vice-Chair:

Dennis A. Hansell
Rosenstiel School of Marine and
Atmos. Sci.
University of Miami
4600 Rickenbacker Causeway
Miami, FL 33149, USA
Tel: +1-305-361-4078
Fax +1-305-361-4689
E-mail:
dhansell@rsmas.miami.edu

Members:

Ann Bucklin	USA	Jack Middelburg	NETHERLANDS
Wilco Hazeleger	NETHERLANDS	Syed Wajih Ahmad Naqvi	INDIA
David Hutchins	USA	Raymond Pollard	UK
Arne Körtzinger	GERMANY	Hiroaki Saito	JAPAN
Carina Lange	CHILE	Carol Turkey	UK
Coleen Maloney	SOUTH AFRICA	Jing Zhang	CHINA-Beijing

Executive Committee Reporter: Bob Duce

IGBP Liaison: Wendy Broadgate

Executive Officer: Sylvie Roy

IMBER: Integrated Marine Biogeochemistry and Ecosystem Research

Report 2004/2005

Submitted by Julie Hall, IMBER Chair

On behalf of the IMBER Scientific Steering Committee

Contents

IMBER Science Plan and Implementation Strategy

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Funding

Development of the IMBER Science Plan and Implementation Strategy (SP/IS)

The IMBER *Science Plan and Implementation Strategy* was approved by both SCOR and IGBP earlier this year. The plan is being printed and will be distributed to over fifteen hundred scientists and funding agency staff and has been made available electronically on the IMBER Web site (www.imber.info).

SSC Meetings

An IMBER SSC Executive meeting was held in December 2004, hosted by Denise Hansell at the Rosenstiel School of Marine and Atmospheric Sciences, University of Miami. This meeting focused on editing the IMBER *Science Plan and Implementation Strategy* to address the reviewers' comments and the immediate needs for the implementation of the IMBER project.

The second IMBER SSC meeting was hosted by Jing Zhang at the East China Normal University in Shanghai, China in April. This meeting focused on developing more detailed plans for the implementation of IMBER and developing a promotional strategy for the project.

International Project Office

The IMBER IPO will be funded for the next three years by a consortium of French agencies (Centre National de la Recherche Scientifique [CNRS], Institut de Recherche pour le Développement [IRD], the Université de Bretagne Occidentale and the Brittany Region.) and will be based at Institut Universitaire Européen de la Mer (IUEM) in Brest, France. The office will open in late August 2005 and will be staffed by the Executive Officer, a Deputy Executive Officer and an Administrative Assistant.

The Executive Officer position was advertised in early January 2005, and we received more than 30 applicants for the position. Eight candidates were short listed for the position and four were interviewed. In April, Dr. Sylvie Roy was appointed and will take up the position in late August. Sylvie is currently based in the Canadian SOLAS office. We are looking forward to welcoming Sylvie to the IMBER project.

Development of IMBER Research

There are a significant number of countries currently developing IMBER activities. Several countries, including India and China, have funding proposals submitted, others such as Japan and the Netherlands have formed committees to take IMBER initiatives forward and others such as Germany and Canada are working towards developing funding proposal for future research. In other countries (i.e., France, England, New Zealand, Chile, South Africa) there are already

significant research activities being undertaken that are closely aligned with the IMBER project goals and we are working with these researchers to ensure close links to the IMBER project. In the USA a town meeting was held at the American Society of Limnology and Oceanography meeting in February to introduce the IMBER project to the marine science community.

There are a number of regional activities developing. The ICCED (Integrated analyses of Circumpolar Climate interactions and Ecosystem Dynamics in the Southern Ocean) had a planning meeting in May to develop a Science Plan for a joint IMBER/GLOBEC activity in the Southern Ocean. There are also two European initiatives that are closely aligned with IMBER. These are EUR-OCEANS, which is a European Union funded network of excellence and CARBOCEANS, which is an EU-funded integrated project focused on the marine carbon cycle. A close association between IMBER and EUR-OCEANS is developing which will be facilitated by the co-location of their IPOs at IUEM in Brest.

Implementation of IMBER

At the recent SSC meeting a more detailed plan was developed for the implementation of the IMBER project. This will involve setting up a number of working groups to take forward sections of research. A joint IMBER/SOLAS working group has already been formed to develop a joint implementation plan for the two projects on marine carbon research. This plan will be published electronically later this year. Another important working group will be an End-to-End Food Webs Working Group that will be jointly developed between IMBER and GLOBEC. This group will be developing plans for taking forward both experimental and modeling approaches of end-to-end food web studies. A small data management working group will be formed once the Deputy Executive Officer has been appointed and will be responsible for developing IMBER's data management policy and plans. These will be implemented in close collaboration with several other marine research projects. A small capacity-building working group has also been formed and has been charged with developing a capacity-building policy for IMBER that can be used by all the working groups in their planning.

Acknowledgements

I would like to thank Ed Urban, Wendy Broadgate and Claire Hamilton for their excellent support of the IMBER project and Bill Young and John Bellamy for their work in preparing the IMBER *Science Plan and Implementation Strategy* for publication. Special thanks must also go to Plymouth Marine Laboratory for supporting the Interim IMBER International Project Office in 2004/05.

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IMBER Budget

Income	2004	2005	2006
SCOR - NSF (IMBER)	\$48,951	\$60,061	\$50,000
SCOR - NSF (Carbon Coordination)		\$4,000	\$2,000
SCOR - NSF (Travel Grants)		?	?
SCOR Carry-over from Previous Year	\$0	\$0	\$9,547
IGBP to SCOR	\$18,480	\$20,000	\$20,000
IGBP directly for Gorick figure	\$1,520		
PML	£13900	£11100	
IPO (France)			150000 euros
Proposals for Specific Activities			
National Contributions to international SSC Activities?			
National Hosting of Meetings?			
Total Income	\$68,951	\$84,061	\$81,547
Expenses			
Representation at other meetings	\$3,603	\$12,000	\$12,000
Interviews for EO Position		\$5,275	
Website costs		\$216	
Gorick Figure		\$1,250	
Other SCOR Admin	\$351		
NIWA Expenses		\$1,011	
PML Expenses	£13900	£11100	
IPO (France)			150000 euros
SP/IS Editorial Meeting	\$5,219		
SSC Meeting	\$29,344	19,162.37	\$25,000
SSC Executive Committee Meeting	\$15,741	\$12,000	\$12,000
SP/IS		\$4,600	
Brochures		\$1,000	
Joint SOLAS-IMBER-LOICZ Ocean Carbon Group	\$13,101	\$10,000	\$10,000
Data Management Subcommittee		\$0	
End-to-end Food Webs Working Group		\$8,000	\$8,000
Send people to EUR-OCEANS meeting			seek funding
Planning Meeting for T2 (I1)			
Planning Meeting for T2 (I3)			\$10,000
Continental Margins Open Science Meeting		seek funding	seek funding
Human Dimensions Working Group		seek funding	seek funding
Total Expenses	\$67,359	\$74,514	\$77,000
Remaining Balance	\$1,592	\$9,547	\$4,547

3.4 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).

Co-Chairs:

Robert Anderson
Lamont-Doherty Earth Observatory
P.O. Box 1000
Palisades, NY 10964, USA
Tel: +1-845-365-8508
Fax: +1-845-365-8155
E-mail: boba@ldeo.columbia.edu

Gideon M. Henderson
Department of Earth Sciences
Parks Road
Oxford OX1 3PR UK
Tel: +44 (0)1865 282123
Fax: +44 (0)1865 272072
E-mail: Gideon.Henderson@earth.ox.ac.uk

Full Members

Martin Frank	SWITZERLAND
Toshitaka Gamo	JAPAN
Catherine Jeandel	FRANCE
Bill Jenkins	USA
Tim Jickells	UK
S. Krishnaswami	INDIA
Denis Mackey	AUSTRALIA
Keith Moore	USA
Raymond Pollard	UK
Reiner Schlitzer	GERMANY

Associate Members

Jess Adkins	USA
Per Andersson	SWEDEN
Ed Boyle	USA
Greg Cutter	USA
Hein de Baar	NETHERLANDS
Anton Eisenhauer	GERMANY
Roger Francois	CANADA
Chris German	UK
Chris Measures	USA
Jim Moffett	USA
Kristin Orians	CANADA
Mukul Sharma	USA
Karen von Damm	USA
Michiel Rutgers van der Loeff	GERMANY
Jing Zhang	JAPAN

Executive Committee Reporter: Robert Duce

GEOTRACES PLANNING GROUP
ANNUAL REPORT TO SCOR 2004/2005
May 2005

Development of science plan for GEOTRACES

The primary goal of GEOTRACES SCOR planning group activity over the last year has been to set the priorities for the programme and to incorporate these into a cogent and comprehensive Science Plan. A draft of the Science Plan was completed in February 2005 and posted for public comment on the Web (at <http://www.ldeo.columbia.edu/res/pi/geotraces/index.html>). Comments were received from more than 40 people. These were uniformly positive, and suggested a number of areas where the plan could be further strengthened. Suggestions have now been discussed and incorporated (see below) and a complete version of the Science Plan is now ready for review.

Meetings

- Oxford, UK (June 2004): This first full SCOR Planning Group meeting outlined the structure of the science plan and commenced the work of writing it. Individual members of the Planning Group were tasked with writing subsections of the plan following this meeting.
- Boston, USA (December 2004): A subgroup of the SCOR Planning Group (10 people) met to discuss the first complete draft of the Science Plan and comments on this plan from members of the Planning Group. Changes to structure and content were initiated at Boston and completed following this meeting.
- Vienna, Austria (May 2005): The second full SCOR Planning Group meeting responded to comments from the wider ocean geochemical community with a thorough revision of the Science Plan. This meeting also set up Standardisation and Data Management Sub-Committees, discussed other enabling activities, and planned overall implementation of the programme.

Establishment of Sub-committees

In the first instance, two subcommittees are considered essential to the realisation of GEOTRACES goals:

- i) *Standardisation and Intercalibration*: Just as WOCE and JGOFS found that standards were essential to measurement of carbon system parameters, well-constrained standards are essential to accurate measurement of trace elements and isotopes. This will ensure that data can be compared readily among different laboratories, and among different oceanographic regions.
- ii) *Data Management*: Robust storage of all GEOTRACES data and its rapid retrieval will clearly be important to achieve full use of new data, and to maximize rewards from the programme.

The reasons for establishment of these sub-committees are discussed fully in the GEOTRACES Science Plan. Both issues are of major importance and require significant work, so that a subcommittee is required for each task.

Future Issues

The GEOTRACES Planning Group is looking forward to the SCOR review of the Science Plan and to addressing the comments received from reviewers. We are aware that we will need to move to an SSC and establish an IPO in the near future. These issues are of higher priority now that the Science Plan is ready for review.

Links with Other Programmes

Throughout the planning of GEOTRACES we have maintained close linkages to other programmes in order to maintain synergies and to avoid replication. Major links have been established with

- *SOLAS*, is represented on the GEOTRACES planning group by Tim Jickells. SOLAS has also been asked for and provided input on a draft of the Science Plan.
- *IMBER*. Raymond Pollard is a member of both the GEOTRACES Planning Group and the IMBER SSC. Gideon Henderson is co-chair of the GEOTRACES Planning Group and attended the 2004 IMBER Meeting (Plymouth, August 2004). IMBER has also been asked for and provided input on a draft of the Science Plan.
- *Two SCOR working groups* (PACE, #123; LINKS, #124) are represented on the GEOTRACES Planning Group (by Jess Adkins and Roger Francois, respectively).

All members of the Planning Group named above attended the Vienna meeting and contributed to revision of the Science Plan.

We also have established less formal links with other programmes including IMAGES, CLIVAR, and InterRidge.

Developments at national and international levels

National Planning activities/workshops:

	Date	activity	Info:
Canada:	7-9 June 2005	just after SOLAS workshop, forum to discuss: <ul style="list-style-type: none"> - Canadian contribution to GEOTRACES - mesh with Canadian-SOLAS/IMBER - GEOTRACES-related Canadian contributions to IPY - setting up a "C-GEOTRACES Network" in 2006 	Roger Francois UBC
China-Beijing	28-30 June 2005	Regional workshop on GEOTRACES Xiamen	Minhan Dai Xiamen University
Western Pacific		Proposal to the U.S. NSF requesting funds to expand the national GEOTRACES planning workshop in China to become a western Pacific regional planning workshop. Contacts in Korea, Hong Kong, Taiwan, Japan and Australia who have expressed interest in participating.	Yan Zheng and Bob Anderson, LDEO
India		discussions about developing an institute or a national plan for GEOTRACES-related research	S. Krishnaswami, PRL
Germany	Jan., May, Oct. 2004	submission of a priority program to the German Funding agency DFG	Michiel Rutgers van der Loeff, AWI
Japan	May 2005	GEOTRACES Subcommittee set up under the National Committee for SCOR Members: Y. Sano, H. Ogawa, H. Amakawa, H. Obata, S. Takeda, Y. Kumamoto, Y. Sohrin, M. Yamada, M. Minagawa, Y. Yamanaka, H. Kawahata, Y. Kato, J. Zhang, T. Gamo	Toshi Gamo ORI - Tokyo
Spain		Proposal for pilot project in Atlantic / Drake Passage	Pere Masqué UAB
France		Informal workshops to discuss on the "margin" topic. proposed (pre-) GEOTRACES cruises: BONUS (IPY, G Sarthou) and PRIMO (Peru Chile Margin and OMZ, Y. Dupenhoat)	Catherine Jeandel LEGOS

The International Polar Year (IPY):

IPY 2007-2008 provides an opportunity for a major joint effort in polar research. Out of 901 Expressions of Intent (EOI) submitted to the IPY Planning committee (www.ipy.org), seven were related to GEOTRACES. These tracer studies will be performed in coordination with a wide range of interdisciplinary studies. Related oceanographic programs are iAOOS for the Arctic and CASO for the Antarctic. The coordination structure is presently under discussion.

Acronym	title	PI	Country
	<i>Bipolar</i>		
GEOTRACES Umbrella	GEOTRACES: An international study of the biogeochemical cycles of trace elements in the Arctic and Southern Oceans	Anderson	USA
	<i>Antarctic</i>		
U.S. GEOTRACES	U.S. GEOTRACES: Biogeochemical cycles of trace elements in the SW Pacific Sector of the Southern Ocean	Anderson	USA
MACS 07-08	Micronutrients in Antarctic coastal seawaters — determinants of primary production	Butler	Australia
BONUS	Biogeochemistry of the southern Ocean: interactions between NUTrients, dynamics, and ecosystem Structure	Sarthou	France
ZERO&DRAKE	ZERO&DRAKE: Synoptic transects of trace elements and their isotopes in the AntArctic Ocean. A contribution to the international GEOTRACES program	De Baar	The Netherlands
	<i>Arctic</i>		
Arctic GEOTRACES	Synoptic transects of trace elements and their isotopes in the Arctic Ocean. A contribution to the international GEOTRACES program	Rutgers van der Loeff	Germany
Canadian GEOTRACES	Canadian GEOTRACES in the Arctic	François	Canada

GEOTRACES: Spreading the word

We have strived to engage the wider research community through special sessions at a number of conferences, and by publication of two articles in relevant newsletters.

Conferences:

- Special session at European Geosciences Union, Vienna (April 2005), “*Cycling of trace elements and their isotopes in the oceans*”. Convened by M. Rutgers van der Loeff, C. Jeandel, G. Henderson, M. Frank.
- Special plenary session at the International Ocean Research Conference, sponsored by The Oceanography Society and UNESCO's Intergovernmental Oceanographic Commission, Paris (June 6-10, 2005), “*Biogeochemical Cycles of Trace Elements and Implications for Marine Ecosystems*”. Convened by R.F. Anderson (GEOTRACES) and T.D. Jickells (SOLAS).

Publications:

- “GEOTRACES gathers speed”, R.F. Anderson, G.M. Henderson, Global Change Newsletter IGBP, No. 60 December 2004
- “New International Study to Focus on Trace Elements and Isotopes in The Ocean”, R.F. Anderson, G.M. Henderson, U.S. JGOFS Newsletter, November 2004.

Acknowledgements

We offer our thanks to Ed Urban, Tim Jickells, particularly for serving as a liaison with SOLAS; Julie Hall (together with Dave Hutchins & Jay Cullen) for comments on the relationship of planned GEOTRACES research with that of IMBER.

Budget for GEOTRACES

	2004	2005	2006
Carry-over		\$28,508	-\$1,130
<u>Income</u>			
SCOR	\$11,989		
NSF	\$6,492	\$29,167	\$50,000
LDEO (Boston Meeting)	airfare/meals		
Total Income	\$18,481	\$57,675	\$48,870
<u>Expenses</u>			
Publications		\$10,000	
Representation at meetings			??
Oxford Meeting	\$16,391		
Boston-LDEO	airfare/meals		
Boston-SCOR	\$2,091		
Vienna Meeting		\$26,805	
2006 SSC Meeting			\$25,000
Exec. Comm. Meeting?		??	??
DM Comm. Meeting		\$10,000	\$10,000
Stds/Protocol Meeting		\$12,000	\$12,000
Cruise Planning Meeting?			??
Other?			??
Total Expenses	\$18,482	\$58,805	\$47,000
Balance	-\$1	-\$1,130	\$1,870

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3.5 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.

Chair:

Peter Liss
School of Environmental Sciences
University of East Anglia
Norwich, NR4 7TJ
United Kingdom
Tel: +44-1603-592563
Fax: +44-1603-507714
p.liss@uea.ac.uk

Vice-Chair:

Patricia A. Matrai
Bigelow Laboratory for Ocean Sciences
180 McKown Point Rd.
W. Boothbay Harbor, ME 04575
USA
Tel.: +1-207-633-9614
Fax: +1-207-633-9641
PMatrai@bigelow.org

Members:

Elsa Cortijo	FRANCE	Wade McGillis	USA
Gerrit de Leeuw	THE NETHERLANDS	William Miller	USA
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	Oswaldo Ulloa	CHILE
Christiane Lancelot	BELGIUM	Doug Wallace	GERMANY

Executive Committee Reporter: Laurent Labeyrie

IGBP Liaison: Wendy Broadgate

Executive Officer: Jeffrey Hare

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