

Report of the
**Steering Group for the ICES/GLOBEC
North Atlantic Programme and Regional Office**

By correspondence

This report is not to be quoted without prior consultation with the General Secretary. The document is a report of an expert group under the auspices of the International Council for the Exploration of the Sea and does not necessarily represent the views of the Council.

International Council for the Exploration of the Sea

Conseil International pour l'Exploration de la Mer

TABLE OF CONTENTS

Section	Page
1 INTRODUCTION.....	3
2 STRATEGIC GOALS.....	3
3 REVIEW OF PROGRAMME AND WORKPLAN	3
3.1 Cod and Climate Change Programme.....	3
3.2 Progress Report and Workplan for the Regional Office	4
4 FUTURE DIRECTION AND SCOPE OF THE PROGRAMME	4
4.1 Pan-Atlantic research and new vehicles for research cooperation.	4
4.2 Role of the ICES/GLOBEC office in proposed North Sea ecosystem science and monitoring programmes .	4
5 RELATIONSHIP WITH THE INTERNATIONAL GLOBEC PROGRAMME	5
6 STRATEGY FOR FUNDING	5
6.1 Current Funding Situation.....	5
6.2 Future Funding.....	5
7 RECOMMENDATIONS	6
8 APPENDICES.....	6
References.....	11

1 INTRODUCTION

The Steering Group for the ICES-GLOBEC North Atlantic Programme and Regional Office was re-established by the Bureau at its January 2001 meeting, with Dr Scott Parsons as Chair, taking into account the Resolution from the Oceanography Committee tabled at the 2000 Council meeting (Terms of Reference are in Appendix a).

During 2002 the chair and co-chairs held a tele-conference on 30 May and this report is based primarily upon that discussion, which was subsequently circulated to the full membership for their comment. The Group will meet during the Annual Science Conference in Copenhagen in October.

ICES is a regional co-sponsor of GLOBEC, as set out in the MoU with IGBP, SCOR and IOC. ICES had a major role in the development of the International GLOBEC programme and has a substantial part to play in the future development of GLOBEC, in particular because of its long experience as an Application Oriented Organization and its collective expertise in many aspects of marine ecosystem studies.

GLOBEC is the main internationally coordinated programme through which marine ecosystem research is currently being funded in the North Atlantic. ICES benefits from attracting scientists working on nationally and regionally funded GLOBEC programmes to its Working Groups, workshops, Theme Sessions and Symposia. The cooperation adds value to both ICES and GLOBEC and helps to maintain the focus of GLOBEC on application in relation to fisheries and marine environmental management.

2 STRATEGIC GOALS

The Strategic Goals for the International GLOBEC programme (see Appendix c of ICES CM 2001/C:13) are contained in the GLOBEC Science Plan and the Implementation Plan sets out the means of achieving them. The ICES/GLOBEC Cod and Climate Change programme is the North Atlantic regional component of the Plan. The 2001 report of SGNARO includes a description of the Cod and Climate Change Programme, as envisaged in the 1999 GLOBEC Implementation Plan (Appendix c of ICES CM 2001/C:13) and also considers the goals for the GLOBEC Programme and the ICES/GLOBEC Office in Relation to the ICES Strategic Plan.

The ICES Council endorsed the goals of the ICES/GLOBEC programme and the recommendations made by SGNARO last year concerning continued funding for the programme office.

3 REVIEW OF PROGRAMME AND WORKPLAN

ICES' members are involved in many GLOBEC related activities, which are brought within the scope of ICES in various ways (planning groups, working groups, workshops, theme sessions, symposia, publications). The principal scientific activities are the Cod and Climate Change programme; zooplankton related work (Working Group on Zooplankton Ecology, Trans-Atlantic Study of Calanus, GLOBEC/PICES/ICES Zooplankton Symposium in 2003); work on pelagic species (herring, sprat, sardine and anchovies) in the Bay of Biscay, North Sea and under SPACC (Small Pelagic Fishes and Climate Change).

When considering programme achievements and goals it is important to distinguish between the programme as a whole and the role of the Regional Office within it.

3.1 Cod and Climate Change Programme

The Cod and Climate Change Programme developed its strategic plan and list of activities at its 1998 meeting and updated this at its bi-annual meetings in 2000 and 2002. During this past year the principal focus was on a Workshop on Transport of Cod Larvae held in May of 2002. During the upcoming year the emphasis will be on a synthesis of past work of the Cod and Climate Change Programme in the form of a book on cod and an update of the Cooperative Research Report that documents available information on all cod stocks around the North Atlantic. In addition, future activities geared towards application of the work for fisheries management purposes will be developed.

As reported last year, the workshops of the ICES/GLOBEC programme and theme sessions at Annual Science Conferences have been extremely well attended and have attracted many scientists from outside the normal ICES community and from a range of scientific disciplines, thus achieving one of the initial aims of the programme. The series of ICES/GLOBEC Newsletters published to date provides a further source of information on the achievements of the programme.

3.2 Progress Report and Workplan for the Regional Office

The annual Workplan for the ICES/GLOBEC office is included with the Secretariat Workplan which is reviewed by the Bureau early each year (Appendix b). The Coordinator also reports regularly on progress to the ICES Bureau, the funding agencies and to the International GLOBEC programme. A recent report is included in Appendix c.

4 FUTURE DIRECTION AND SCOPE OF THE PROGRAMME

The principal activities of the Coordinator over the past year have been related to the Cod and Climate Programme, in particular the Workshop on Transport of Cod Larvae as set out above. A number of other related activities and issues have arisen, which could occupy a greater proportion of the workplan in future and these need to be considered in relation to priorities and resources.

4.1 Pan-Atlantic research and new vehicles for research cooperation

This has been given new impetus by the signing of an Implementing Arrangement for Cooperative Activities between NSF (National Science Foundation, USA) and EU, which complements existing agreements on research cooperation with Canada, Iceland and other countries. The Coordinator gave a talk at the US-Icelandic Science Day 2002 "North Atlantic Science Connections" in Reykjavik on May 24 th entitled "Understanding the Impact of Climate Change on the Ocean Biosphere – progress, plans and the need for international cooperation."

GLOBEC has a good history of productive pan-Atlantic research and a well-developed international community. It is therefore well placed to take advantage of new opportunities for research cooperation and, at the request of the Cod and Climate Change Working Group and with the support of the International GLOBEC programme director, Dr Brander submitted an Expression of Interest for the forthcoming EU FP6 (see Appendix d).

A number of other Expressions of Interest which are relevant to the North Atlantic GLOBEC programme were also submitted by scientists from several countries (among about 2000 others within the priority area Global Change and Ecosystems). It is not clear at this stage what consequences, if any, there will be for the future funding, direction and scope of the activities within ICES.

4.2 Role of the ICES/GLOBEC office in proposed North Sea ecosystem science and monitoring programmes

The Scientific Expert Conference related to the 5 th International Conference on the Protection of the North Sea (Bergen, February 2002) produced a paper on priority scientific issues, which was endorsed in the Ministerial Declaration (Bergen, March 2002). Details can be found at <http://www.dep.no/md/nsc/> < <http://www.dep.no/md/nsc/>. A relevant part of the Declaration states:

To implement an ecosystem approach in line with this framework the Ministers will: i) develop focused research and information gathering which address the driving forces of North Sea ecosystems variability, including climatic, biological and human factors, which are critical for maintaining ecosystem structure and function and invite ICES, Global Ocean Ecosystem Dynamics (GLOBEC) and other relevant scientific organizations and programmes to consider the priority science issues from the Scientific Expert Conference in Bergen 20–22 February 2002; Norway, as host, will write to ICES and GLOBEC about this.

In addition to general, routine assistance with developing research on the ecosystem, specific priority issues relevant to ICES and GLOBEC, in which the Regional Office may have a role include (i) mapping and monitoring of spawning areas of commercial fish populations, (ii) further development of ecological objectives and indicators for monitoring changes in the ecosystem and for measuring the effects of management actions (iii) mechanisms influencing transfer efficiencies between phytoplankton and higher trophic levels and the implications on ecosystem dynamics, (iv) food web and life history interactions among fish populations and other ecosystem components and (v) physical and biological transport processes.

The Norwegian authorities are expected to write to the ICES Secretariat about this in early September, in time for these matters to be considered at the ASC/Statutory Meeting.

The ICES/IOC Steering Group on GOOS have developed a plan for a North Sea Ecosystem Pilot Project (NORSEPP), which has also been submitted as an Expression of Interest (see section 4.1. above). A role for the ICES/GLOBEC office in this process has been suggested and SGNARO will need to discuss this as it develops.

5 RELATIONSHIP WITH THE INTERNATIONAL GLOBEC PROGRAMME

The relationship between the International GLOBEC programme and the regional programmes is defined in the MoU (Letter of Agreement between IGBP, SCOR and IOC): "... the Sponsors recognise that there are regional international organisations such as ICES and PICES, that have been, are, or will in future be active in organising GLOBEC at regional level. The Sponsors agree that these organisations are to be considered as regional co-sponsors, and that their interests should be considered in the governance of GLOBEC. The sponsors further agree to inform and consult with these organisations separately or collectively and as deemed necessary by either the regional organisations or the sponsors".

The International Programme Office (IPO) has recently raised some concerns about particular responsibilities and activities. "These mainly regards potential overlapping of efforts, clarifying each other's role in front of the GLOBEC community, as well as explaining each other's role in representing GLOBEC in front of the broader oceanographic community."

Dr Brander sent a report to the IPO (Appendix c) which outlines past and planned activities of the ICES/GLOBEC programme in order to help identify areas of possible overlap, where some agreement is needed on how to clarify the situation and present it to the "broader oceanographic community".

The International GLOBEC Executive held a brief discussion, and concluded that the lines of responsibility should be resolved and that the central GLOBEC structures have all intentions to help resolve it in a manner that would strengthen the operations of the ICES-GLOBEC office as well as the rest of the implementation structures of the programme.

The IPO has requested that a list be drawn up to clarify what the ICES/GLOBEC position will be responsible for and what issues the GLOBEC IPO will handle. The list would be one that both parties would have to agree upon. Roger Harris was asked to follow this issue with Ken Drinkwater, Keith Brander and SGNARO.

6 STRATEGY FOR FUNDING

The Council endorsed, in principle, the establishment of the Project Office for GLOBEC in 1994 (C.Res. 1994/4:7, Appendix f). Following the decision by the Council in 2000 "to continue to support the ICES/GLOBEC office by covering the indirect costs, provided that there are sufficient external funds to cover the direct costs (salary, travel etc.)" the programme has continued and the contract of the Coordinator has been extended to the end of December 2004.

6.1 Current Funding Situation

The direct costs of the Regional Office are currently provided by the US, Canada, UK and Norway as shown in Appendix g. US funding runs to 31 January 2003 and a further extension will be requested. A three-year renewal of Canadian funding was confirmed and runs to the end of 2004. The DEFRA (UK) renewal of funding is at a slightly increased level and runs from 1 April 2001 for five years. Norwegian funding currently runs to the end of 2002 and they have asked for a proposal for renewal by September 2002. Income and expenditure for the ICES/GLOBEC office for the period 2001–2004 and core budget requirements to 2004 are given in Appendix e.

Some additional costs (e.g., attendance at the ICES Annual Science Conference) and recent fluctuations in exchange rates have resulted in a widening of the projected deficit for the period to the end of 2004. Therefore action is needed to either reduce expenditure or secure more income, since, at the present rate of both, the budget will run into deficit in late 2003. Both reduction in expenditure and increased income are possible and will be discussed by SGNARO during the 2002 Annual Science Conference. A clause in the Coordinators contract allows for a reduction in working hours, which would result in a balanced budget. Options for further funding are also being pursued, some of which are dealt with in the Recommendations.

6.2 Future Funding

The current level of funding is slightly below what is required to balance the projected expenditure from 2003 onward (see Appendix e). A plan for balancing the budget, by reducing expenditure or increasing income, is required and will be discussed at the next SGNARO meeting. Additional financial resources would help with the preparation of material for the synthesis phase of the programme.

7 RECOMMENDATIONS

- (1) Delegates of Member states with an active interest in the ICES-GLOBEC initiative are requested to examine the possibility of contributing financially to the office.
- (2) The General Secretary should seek additional external funding to cover the direct costs of maintaining the ICES/GLOBEC office for the period to the end of 2004. If the direct costs of maintaining the programme in its present form (see Appendix e) are adequately covered, additional funding should also be sought in order to support elements of the programme and activities which require extra resources (e.g., particular tasks related to preparation and running of workshops).

8 APPENDICES

Appendix a) Terms of reference for the Steering Group (SGNARO)

The Steering Group for the ICES/GLOBEC North Atlantic Programme and Regional Office (SGNARO) (Chair: Dr Scott Parsons; Co-Chairs: Dr K. Drinkwater and Dr F. Köster) will work by correspondence in 2002, and meet as appropriate at national expense, to:

- a) identify strategic goals for GLOBEC research and a strategic approach for the GLOBEC Office in this context;
- b) identify external funding opportunities and a funding strategy for ICES' GLOBEC activities;
- c) review and advise on the work plan of the ICES/GLOBEC Office to achieve (a) and (b) above.

The Group will include the General Secretary, the GLOBEC Coordinator, and the Chair of the Oceanography Committee, and will be open to participants in the ICES/GLOBEC programme. Member countries not participating directly in the ICES/GLOBEC programme are also entitled to designate representatives to participate in the work of this group, should they so choose.

SGNARO will report to the Bureau at its Mid-Term Meeting and to the Bureau and the Oceanography Committee at the 2002 Annual Science Conference.

Appendix b) Annual Workplan for the ICES/GLOBEC office reviewed by the ICES Bureau in January 2002

ACTIVITY CP2: North Atlantic GLOBEC

Activity leader: Keith Brander

OBJECTIVES AND BACKGROUND

The objective is to coordinate and help to implement the GLOBEC programme within the ICES area. The GLOBEC programme aims to improve forecasts of the responses of the marine ecosystem to physical forcing and global change by developing our understanding of its structure and functioning under varying physical conditions. The research provides the basis for a wider ecosystem approach to issues in fisheries management and environmental protection. Within ICES this will require closer cooperation between physical, chemical and biological oceanographers on the one hand and fisheries and environmental assessment scientists on the other.

GLOBEC is a core project of the IGBP (International Geosphere Biosphere Programme) and is sponsored by the International Oceanographic Commission and the Scientific Committee on Ocean Research. It is the only global change programme in which ICES plays a major part.

TASKS AND TARGETS

Task 1 Implementing the Cod and Climate Change work programme, in fulfilment of the contracts and commitments made with funding bodies. (60% of KB's time)

Targets and Milestones:

1. Assist with the work of the Cod and Climate Change Working Group. - 20 days - report due in June 2002;
2. Prepare the report of the Workshop on Dynamics of Cod Growth for publication as a CRR. 10 days - June 2002;
3. Organise and take part in the Workshop on Transport of Cod Larvae, data and information exchange, including establishing web site for preliminary discussion of hypotheses and dissemination of data products 20 days;
4. Compilation of new information on cod life histories, to update Coop. Res. Rep.205. -time required is open ended and assistance is needed - due 2004;
5. Maintain regular ICES/GLOBEC Newsletter and pages on the WWW. - min. 8 days to produce two Newsletters in March and September 2002;
6. Preparations for the Symposium on Fisheries and Climate Change in 2004 - 2 days;
7. Assistance with book synthesising results from the Cod and Climate Change programme. - open ended time requirement.

Task 2 Writing proposals for continued funding, preparing reports and accounts, dealing with ad hoc requests for data and information, evaluating papers and research proposals (40% of KB's time)

Targets and Milestones:

1. Proposals for new or renewed funding from Norway, Iceland, and EU - 15 days;
2. Expert conference on North Sea ecosystem management - Bergen February - 10 days incl. Preparation;
3. Arctic Climate Impacts Assessment - 10 days - meeting in May 2002;
4. Deal with ad hoc requests for data and information - 35 days per year;
5. Steering and review for UK GLOBEC, German GLOBEC, French GLOBEC, Norwegian Research Council. Present talks on North Atlantic GLOBEC programme;
6. Participate in 2 nd GLOBEC Open Science meeting Qingdao, China, October 2002 - 25 days (incl preparation).

Targets and Milestones:

1. Preparing GLOBEC Theme Sessions for ASC. 2 days.

TRAVEL

	Meeting	ICES participation	Purpose	Cost
1.	North Sea prep. Conference, Berger	KB	Speaker and panel discussion	?
2.	Hillerød	KB	WGCCC and WKTCL	6500
3.	ACIA	KB	Drafting group	Nil
4.	Qingdao, China	KB	GLOBEC Science meeting	30000

RESOURCES ALLOCATED

The Council agreed to continue to support the ICES/GLOBEC programme office by covering the indirect costs.

Appendix c) Report on Progress and Workplan for the ICES/GLOBEC office

Summary of results of completed work

The Project Office for the ICES/GLOBEC programme was established in July 1996, when Dr Keith Brander was appointed as Coordinator. Regular reports on progress have been submitted since then for review by a committee, which includes representatives of the funding agencies and scientists representing national GLOBEC interests and the ICES science community. The direction which the programme has taken has been determined by this committee and by the Cod and Climate Change Working Group of ICES.

The activities of the ICES/GLOBEC Project Office can be summarised under the headings a) Cod and Climate Change (CCC), b) Trans Atlantic Study of Calanus (TASC), c) International coordination of GLOBEC programmes d) Other science and science management and e) ICES related activities. The results and reports included in this summary are for the most part the work of many scientists who have contributed to the GLOBEC programme. The Coordinator prepared and organised meetings, produced the reports and contributed to the scientific content.

a) Progress with the Cod and Climate Change Programme.

The scientific programme for CCC was set out in detail in 1993 and updated in 1998 (ICES CM 1998/C:10) and 2000 (ICES CM 2000/C:11). Numerous articles describing the programme and inviting participation have appeared, including one entitled "Where are we in the ICES/GLOBEC Cod and Climate Change Programme?" in the US GLOBEC News No 14 in September 1999, to inform the US GLOBEC community about both progress and planned future activities. Providing such information is an important part of the project. The Coordinator produces a regular six-monthly ICES/GLOBEC Newsletter, seven of which have now been published. The circulation list is about 250 and all issues are currently available on the ICES web site. The Newsletters provide a detailed overview of progress with CCC, TASC and other related programmes, such as the Zooplankton Ecology Working Group of ICES.

ICES has published twenty-five reports related to CCC since 1995 (see reference list). These range from short reports of the project management committee meeting to very substantial workshop reports. Three workshop reports which are particularly relevant to US interests in Climate Change and consequences for fisheries. The first dealt with "Application of Environmental Data in Stock Assessment" (ICES CM 1998/C:1, 97pp). This is an ongoing issue within CCC and is fundamental to the scientific objective "to ensure that the scientific work resulting from the GLOBEC programme is applied effectively in formulating ICES advice". A follow-up workshop is planned. The second workshop was titled "Prediction and Decadal-Scale Ocean Climate Fluctuations of the North Atlantic" (ICES CM 1998/C:14, 53pp). This is a rapidly developing field, which now has its own dedicated international programmes such as CLIVAR. The CCC programme and the ICES/GLOBEC project office help to ensure that scientists with interests in the marine ecosystem and fisheries are kept informed about progress in this field.

The third workshop was on " Ocean Climate of the NW Atlantic during the 1960's and 70's and Consequences for Gadoid Populations" (ICES Cooperative Research Report 234, 81 pp). The extensive fisheries and oceanographic data set assembled for this workshop showed that the 1960s decade was the coldest period on record in most areas from the Laurentian Channel to the Mid Atlantic Bight, but rapid warming at the end of the decade resulted in the 1970s being warmer than average. Cooling of the shelf waters in the 1960s was mainly due to cold, fresher Labrador Slope waters penetrating onto the shelf; the biggest temperature and salinity changes occurred along the shelf edge at 100–300 m. Temperature changes are associated with change in rates of flow, with possibly important consequences for advection of ichthyoplankton. There is an inverse relationship between the strength of southwestward transport of the Labrador Current and the NAO. Cold Labrador Slope water has again been found penetrating the deep basins of the Scotian Shelf and Gulf of Maine in 1997/98, probably linked to the low NAO index of the past two years.

The survival of haddock through to recruitment was low during the 1960s and increased rapidly at the end of the decade. Survival rates on Georges Bank and Browns Bank correlate quite well for both cod and haddock stocks, suggesting that there may be processes affected by common physical forcing. Abundance indices of cod eggs and larvae for the period 1977–87 show that over 50% of the variance in recruitment, as estimated by either VPA or young fish surveys, may be explained by the abundance of 3–5 mm larvae. The inference from this is that most of the processes governing recruitment take place during or before this stage i.e., in the period before or immediately after the eggs hatch.

A workshop in March 1999 on "Gadoid stocks in the North Sea during the 1960's and 1970's" carried out similar work to that reported on for the NW Atlantic (ICES Cooperative Research Report 244, 55pp). A workshop in May 2000 focussed on the dynamics of cod growth, covering the whole of the North Atlantic (ICES CM 2000/C:12 114 pp). Data

for 23 cod stocks were assembled on the ICES web site and an electronic bulletin board was used for a very successful exchange of data, ideas, working documents and references prior to and after the workshop. The workshop was followed up by a Theme Session on "Growth and condition in gadoid stocks and implications for sustainable management" during the ICES Annual Science Conference in Oslo in September 2001, which attracted 27 papers.

b) Trans Atlantic Study of Calanus (TASC)

The Trans Atlantic Study of Calanus was a major programme in biological oceanography, which included participants from all North Atlantic countries. The role of the ICES/GLOBEC project in relation to TASC was to assist with trans-Atlantic coordination, to serve on the EU project Scientific Steering Committee, to produce a TASC Newsletter, to help organise the annual meetings and the final symposium, which took place in August 1999 and the proceedings of which have now appeared as ICES Journal of Marine Science 57(6). All of these tasks have been completed. US participation throughout the programme was extensive, which ensured that strong working links were maintained. The Coordinator produced five issues of the TASC Newsletter, but editorial responsibility was shared between colleagues in Scotland, Denmark and the US. ICES will be the final repository for the database assembled in the EU funded part of the programme.

The TASC programme provided us with an enormous amount of new information about the population dynamics of Calanus and its relationship with its physical environment, prey and predators. A major challenge over the next few years is to bring this knowledge to bear on questions about marine ecosystem and fisheries assessment and management. This was the subject of a Theme Session at the ICES Annual Science Conference in 2000. A considerable amount of follow-up activity from TASC is underway, with a major new programme in the UK entering a second, filed phase (Marine Productivity, the ICES/GLOBEC Coordinator is on the Scientific Steering Committee). A recent workshop supported by DFO, Canada brought together many of the active participants in this work on Calanus in order to coordinate ongoing activities and to plan for further cooperative projects and funding (NORWATE workshop, Halifax, 20–22 June 2001).

c) International coordination of GLOBEC programmes

The ICES/GLOBEC Cod and Climate Change Programme is the North Atlantic regional component of the International GLOBEC Implementation Plan, which was published by IGBP in September 1999. One of the major tasks for the Coordinator is to assist with the integration of GLOBEC programmes at international, regional and national levels. The Coordinator is not a member of the International GLOBEC SSC, but has attended their meetings as a guest and has contributed to their reports and Newsletter. He gave talks on the ICES/GLOBEC programme at the Open Science meeting in Paris in March 1998 (see Fisheries Oceanography 7 (3/4)) on the role of GLOBEC during a session on Food Security at the IGBP Congress in Japan in May 1999 and on Models for Ecosystem Comparison to the PICES meeting in Hakodate, Japan in October 2000.

The Coordinator organised the planning workshop which wrote the EuroGLOBEC Science Plan and contributed to its preparation and publication (European Commission Ecosystem Research Report 27, 76pp). He took part in discussions and expert consultations on the structure and content of the EU Fifth Framework Programme and gave a talk on Ecological Considerations in relation to Fisheries at an EU Consensus Conference on Sustainable Production of Seafood (Christiansborg 6 November 1997). He chaired discussion sessions on "Interactions between environment, pollution, fisheries and aquaculture and their impacts on society" at the Third European Marine Science and Technology Conference (Lisbon May 1998) and on "Fisheries and aquaculture research: The contribution of ocean science and marine technology" at the EurOCEAN 2000 Conference (Hamburg, September 2000), where he also acted as Rapporteur for the session on "GLOBEC related studies in the North Atlantic: A perspective for European/North American research cooperation?" (Conference Proceedings p 70–114). He gave a talk on "Do we need to include information about the environment when assessing fish stocks" at a Greenwich Forum Conference on Fisheries Science and the Common Fisheries Policy (Brussels, September 1999) and subsequently addressed the European Parliament Fisheries Committee about the conclusion of the conference.

The Coordinator took part in planning meetings, evaluations and discussions of national GLOBEC programmes in the USA, Canada, France, Germany, Norway and the UK. Providing information about ongoing activity helps to create working links between national programmes and with the regional and international programmes.

A number of climate change programmes for the North Atlantic have been put forward in the last three years and the Coordinator has taken part in meetings to help with planning these, including: An International Workshop on Environment and Climatic Variations and their Impact in the North Atlantic Region, organised by the Icelandic Research Council in cooperation with the National Science Foundation and the European Commission (Reykjavik, September 1998); International Arctic Science Committee workshop on Impacts of Global Climate Change in the Arctic

Regions (Tromso April 1999); Nordic Council of Ministers proposal on Ocean Climate Change and the Nordic Seas (October 1999), several EU research proposals relating to climate change and its effects.

d) Other science and science management

The Coordinator has maintained some personal scientific activity by presenting papers relevant to the development of the CCC programme and publishing them. He chaired a workshop on Coastal and Fisheries Resources at a recent (October '99) conference on Impacts of Climate Change and co-chaired two sessions at the ASLO 2000 Conference, giving two papers. He was a partner in an EU Project on "Sustainable Fisheries: how can the scientific basis for fish stock predictions be improved?" and presented a paper at the final Symposium in Bergen in December 2000 (see reference list). He co-authored the chapter on Fisheries Impacts in an "Assessment of the Potential Effects of Climate Change in Europe", which was presented at the Fifth UN Climate Change Conference in Bonn and forms a contribution to the third IPCC report (see reference list).

During 2001 he presented the following papers:

"Fisheries and Climate Change"	Hanse Workshop on "Marine Science Frontiers for Europe"	Bremen, February
"Life History Parameters from Stock Assessments in the ICES area: Causes of Variability"	IIASA workshop on Fisheries Induced Adaptive Change	Luxembourg, March
"Fish Populations and Climate Change"	Public Lecture	Concarneau, July
"Application of CPR information in marine management"	SAHFOS Symposium	Edinburgh, August
"Changes in fish distribution in the eastern North Atlantic; are we seeing a coherent response to changing temperature?"	ICES Hydrobiological Variability Symposium	Edinburgh, August
"Cod in the NE Atlantic in the 1990's"	ICES Hydrobiological Variability Symposium	Edinburgh, August
"Explaining and predicting variability in growth rates of cod"	ICES ASC	Oslo, September

The Coordinator has given a number of talks and seminars to policy makers and industry representatives in order to explain the relevance of the ICES/GLOBEC programme to their interests. This is important in order to convince them to continue to support it and in order to apply the results in relation to management concerns.

He is a member of the Scientific Steering Committee of the UK GLOBEC programme (Marine Productivity) and President of the Sir Alister Hardy Foundation for Ocean Science, which runs the Continuous Plankton Recorder.

He is a member of the SCOR/IOC Working Group on Ecosystem Indicators for Fisheries Management and of the drafting group for the Marine Systems chapter of the Arctic Climate Impact Assessment

e) ICES related activities

The ways in which ICES can support programmes such as GLOBEC include organising working groups and workshops, such as those described above, maintaining a website and databases and organising special Theme Sessions (usually about three every year) at its Annual Science Conference. The Coordinator assists with preparing and helping to run these, several of which have been of considerable interest to the US GLOBEC community. For example during the 1997 ASC in Baltimore a session on "GLOBEC: Results from interdisciplinary programs in the North Atlantic" attracted over fifty papers and posters. This was the first opportunity for the GLOBEC work being conducted simultaneously on both sides of the North Atlantic to be presented in a coordinated session and proved to be an effective way for investigators from each of the respective regions to present their work to the community at large and each other.

The Coordinator has also undertaken a range of other duties for the ICES Secretariat, including assisting with the management and organising a Young Scientists Conference.

References

ICES/GLOBEC Publications since 1996.

ICES 1996. Report of the ICES/GLOBEC Cod and Climate Database Workshop. 14–16 November 1995, Woods Hole, MA, USA. ICES CM 1996/A:7, 67 pp.

ICES 1996. Report of the Cod and Climate Backward-Facing Workshop, Institute of Marine Research, Bergen, Norway, 21–23 March 1996. ICES CM 1996/A:9. 25 pp.

ICES 1996. Report of the ICES Working Group on Cod and Climate Change. Institute of Marine Research, Bergen, Norway 25–27 March 1996 ICES CM 1996/A:10.

ICES 1997. Report of the Working Group on Cod and Climate Change (by correspondence) ICES CM 1997/A:9, 4 pp

ICES 1997 Preliminary Report of the ICES/GLOBEC Workshop on Prediction and Decadal-Scale Ocean Climate Fluctuations of the North Atlantic. ICES CM 1997/A:13, 2 pp.

ICES 1997 Second Report of the ICES/GLOBEC North Atlantic Regional Co-ordination Group. Reykjavik, Iceland, 28–29 September 1996 ICES CM 1997/A:7, 18 pp.

ICES 1997. Report of the ICES/GLOBEC North Atlantic Regional Co-ordination Group. ICES Headquarters, 16–17 June 1997 ICES CM 1997/A:8, 13 pp.

ICES 1997. Report of the Working Group on Zooplankton Ecology. Kiel, Germany, 16–18 March 1997 ICES CM 1997/L:4, 29 pp.

ICES 1998. Report of the ICES/GLOBEC North Atlantic Regional Co-ordination Group. Baltimore, USA 26 and 29 September 1997 ICES CM 1998/C:11, 10 pp.

ICES 1998. Ocean Climate of the NW Atlantic during the 1960s and 70s and Consequences for Gadoid Populations. Third Backward-Facing Workshop. ICES CM 1998/C:9, 89 pp.

ICES 1998. Report of the Working Group on Cod and Climate Change ICES CM 1998/C:10, 19 pp.

ICES 1998. Report of the ICES/GLOBEC North Atlantic Regional Co-ordination Group. Baltimore, USA 26 and 29 September 1997 ICES CM 1998/C:11, 10 pp.

ICES 1998. Report of the ICES/GLOBEC North Atlantic Regional Co-ordination Group. Woods Hole, USA 9 May ICES CM 1998/C:13, 4 pp.

ICES 1998. Report of the Workshop on Prediction and Decadal-Scale Ocean Climate Fluctuations of the North Atlantic. ICES CM 1998/C:14, 53 pp.

ICES 1998. Report of the Working Group on Zooplankton Ecology. ICES CM 1998/C:6, 48 pp.

ICES 1999. Report of the ICES/GLOBEC North Atlantic Regional Co-ordination Group. ICES CM 199/C:1, 10 pp.

ICES 1999. Report of the Working Group on Cod and Climate Change ICES CM 1999/C:10, 19 pp.

ICES 1999. Report of the Steering Group for the ICES/GLOBEC North Atlantic Regional Office ICES CM 1999/C:12, 19 pp.

ICES 1999. Workshop on Gadoid Stocks of the North Sea during the 1960's and 1970's. The Fourth Backward-Facing Workshop. ICES CM 1999/C:15, 89 pp.

ICES 1999. Report of the Workshop on Ocean Climate of the NW Atlantic during the 1960s and 70s and Consequences for Gadoid Populations. ICES Cooperative Research Report 234, 81 pp.

ICES 2000. Report of the Working Group on Cod and Climate Change. ICES CM 2000/C:11, 16 pp.

ICES 2000. Report of the ICES/GLOBEC Workshop on the Dynamics of Growth in Cod. ICES CM 2000/C:12, 114 pp.

ICES 2001. Workshop on Gadoid Stocks in the North Sea during the 1960's and 1970's. ICES Cooperative Research Report 244, 55 pp.

ICES 2001. Report of the Working Group on Cod and Climate Change. ICES CM 2001/C:12, 10 pp.

ICES 2001. Report of the Steering Group for the ICES/GLOBEC North Atlantic Regional Office ICES CM 2001/C:13, 13 pp.

ICES 2002 ICES/GLOBEC Sea-going Workshop for Intercalibration of Plankton Samplers. ICES Cooperative Research Report 250, 25 pp. plus 4 CDs.

ICES 2002 Report of the ICES/GLOBEC Workshop on the Dynamics of Growth in Cod. ICES Cooperative Research Report 252, 97 pp. plus CD.

The ICE/GLOBEC office made a substantial contribution to the timeliness, content and quality of these reports and relieved some of the workload, which would otherwise have fallen on the chairpersons and convenors. The Coordinator also contributed to the production of a number of individual papers, not listed here, by assisting with the provision of data and the exchange of ideas via meetings, Newsletters, the web site and direct requests.

Background information on ICES and GLOBEC

GLOBEC (Global Ocean Ecosystem Dynamics) is a major international component of the International Geophysics and Biophysics Programme (IGBP) and is co-sponsored by SCOR and IOC. It aims to develop and apply coupled physical and biological models in order to interpret and predict the effects of physical factors on the marine ecosystem, particularly zooplankton. GLOBEC links with other IGBP programmes including WOCE (World Ocean Circulation Experiment), JGOFS (Joint Global Ocean Flux Study) and LOICZ (Land-Ocean Interactions in the Coastal Zone) and will help with the design and interpretation of the Living Marine Resources component of GOOS (Global Ocean Observing System). GLOBEC is a major NSF Global Change program. The current annual expenditure on GLOBEC-related research in the North Atlantic is well in excess of USD 20M p.a.

ICES has been charged in the International GLOBEC Implementation Plan with the coordination and implementation of the North Atlantic Regional Programme of GLOBEC. A programme office was established at ICES Headquarters in Copenhagen (Denmark) and Dr Keith Brander has run it since 1 August 1996. Funding has been provided by the USA, Canada, Norway, UK, Iceland and the EU. The ICES/GLOBEC North Atlantic Regional Programme Office is intended to continue for at least two more years and further funding is required for this purpose.

The GLOBEC programme has clearly defined scientific objectives and also applications for the science. ICES is particularly well established to provide coordination on both the scientific and advisory aspects. The aims for the North Atlantic programme are to:

- add value to national research through cooperation;
- develop coupled physical/biological models for improved advice on i) exploitation and management of marine resources ii) causes of observed changes in the plankton ecosystem iii) consequences of climate change on fisheries and other marine life (e.g., Cod and Climate Change programme);
- draw a wider community of scientists (atmospheric science, climatology, modelling, biological oceanography) into the study of long term changes in the ocean ecosystem.

ICES is the world's oldest intergovernmental marine science organisation, having been established in 1902. Iceland is a Contracting Party (dues paying Member Country) to the Convention of ICES. Iceland participates through its nationally appointed Delegates to ICES, and through support of Icelandic scientists to participate in numerous Study/Working Groups, Workshops, Science Committees, Advisory Committees and the ICES Annual Science Conference (Statutory Meeting).

The environment of the North Atlantic and adjacent seas has been a prime concern of the Council since its inception in 1902. As the oldest intergovernmental marine science organisation in the world, ICES has long recognised the mutual interdependence of the living marine resources and their physical and chemical environment. The Council's principal functions are to:

- promote and encourage marine research;
- develop and co-ordinate research programmes;
- publish and disseminate the results of such research;
- provide scientific information and advice, for management and regulatory purposes, to Member Country Governments and regulatory commissions.

The Member Countries of ICES are:

Belgium Netherlands Canada Norway Denmark Poland Estonia Portugal Finland Russia France Spain Germany Sweden Iceland United Kingdom Ireland United States of America Latvia Lithuania.

The work of the Council is focused on the broad areas of fisheries, oceanography, and marine pollution, and is organised and carried out by scientists from the 20 ICES Member Countries. Seven Science Committees (Baltic, Fisheries Technology, Living Resources, Mariculture, Marine Habitat, Oceanography, Resource Management), each with two appointed members from each Member Country, are responsible for keeping under review and coordinating the research of interest to the Council in their respective disciplines.

ICES has recently developed a Strategic Plan, several of the scientific objectives of which are particularly relevant to the ICES/GLOBEC programme:

- Understanding the physical, chemical and biological functioning of marine ecosystems;
- Developing the scientific basis for sustainable use and protection of the marine environment, including living resources;
- Coordinating and supporting interdisciplinary and international marine science programmes.

An important responsibility of ICES is the coordination of fisheries-related scientific research. This comprises monitoring the abundance and composition of fish stocks in the North Atlantic and adjacent seas, including developing appropriate methods to estimate fish stock abundance, collecting statistics on fish catches, fishing effort, relevant biological data on the various life stages of fish, recruitment to fish stocks, and multispecies interactions and their effects on individual fish stocks.

ICES is the officially-recognised advisory body to the following fisheries regulatory commissions:

- North-East Atlantic Fisheries Commission (NEAFC);
- International Baltic Sea Fishery Commission (IBSFC);
- North Atlantic Salmon Conservation Organization (NASCO);
- Commission of the European Union (CEU).

These commissions and governments of ICES Member Countries formulate requests to ICES for information and advice relative to the management of specific stocks of fish. The Advisory Committee on Fishery Management (ACFM) is responsible for answering these requests and providing scientific advice on behalf of the Council. In formulating its advice on the management of 90–100 stocks of fish and shellfish. ACFM utilises information prepared by numerous stock assessment Working Groups. ACFM meets twice per year to prepare its advice, which is published annually in the ICES Cooperative Research Report series.

ICES also provides scientific information and advice on marine pollution and its effects on living resources through its Advisory Committee on the Marine Environment (ACME) to Member Country governments and the following regulatory commissions:

- Convention for the Prevention of Marine Pollution by Dumping from Ships and Aircraft (Oslo Commission);
- Convention for the Prevention of Marine Pollution from Land-Based Sources (Paris Commission);
- Convention for the Protection of the Marine Environment of the Baltic Sea Area (Helsinki Commission).

As a basis for this advice, ACME reviews the reports of approximately 20 Working Groups that co-ordinate work on various topics related to the marine environment and marine contamination. ACME meets annually and publishes its report in the ICES Cooperative Research Report series.

Oceanographic investigations form integral parts of the ICES programme of multi-disciplinary work aimed at understanding the features and dynamics of water masses and their ecological processes. Special reference is on the influence of changes in the environment on the distribution, abundance, and population dynamics of exploited fish resources. These investigations are also directly relevant to marine pollution studies because physical oceanographic conditions have an influence on the distribution and transport of contaminants in the marine environment. ICES promotes the development and calibration of oceanographic equipment and the maintenance of appropriate standards of quality and inter-comparability of oceanographic data

ICES has played a very active role in co-ordinating Cooperative Research Programmes in the North Sea and elsewhere in the ICES area (North Atlantic including the Baltic Sea).

The Council's Secretariat, at ICES Headquarters here in Copenhagen, maintains some of the world's largest fisheries, pollution, and oceanographic databases. In the area of fisheries, ICES maintains a computerised data bank containing detailed information relevant to fish stock assessment, data from the annual International Bottom Trawl Surveys in the North Sea, and catch statistics for the Northeast Atlantic. ICES is the oldest international data centre on marine contaminants, including data from its Cooperative Monitoring Studies Programme and from the Oslo and Paris Commissions' Joint Monitoring Programme covering contaminants in biota, sea water, and sediments. ICES also serves as the centre for environmental and biological data used in the work of the North Sea Task Force, and has a formal agreement with the Arctic Monitoring and Assessment Programme (AMAP) to act as its thematic data centre for marine contaminants. ICES maintains a bank of oceanographic data supplied by Member Countries, dating back to the early 1900's. Submission to the data bank is subject to intense quality control, thus providing some measure of validation. This data bank is supplemented by an inventory of cruise information, based on Reports of Oceanographic Cruises and Data Stations (ROSCOP), which summarises all cruise activities in Member Countries related to physical oceanographic, marine biological, pollution, fisheries, and geophysical research.

Over 40 international organisations have observer status and co-operative relations with ICES. Of the United Nations Agencies, ICES works actively with the Fisheries Department of the Food and Agricultural Organization (FAO), the Intergovernmental Oceanographic Commission of UNESCO, the International Maritime Organization (IMO), the World Meteorological Organization (WMO), and the United Nations Environment Programme.

Proposal for future work

a. Purpose

The objective of the ICES/GLOBEC Project Office is to coordinate and help to implement the GLOBEC programme within the ICES area. The GLOBEC programme aims to improve forecasts of the responses of the marine ecosystem to physical forcing and global change by developing our understanding of its structure and functioning under varying physical conditions. The research provides the basis for a wider ecosystem approach to issues in fisheries management and environment protection. Within ICES this will require closer cooperation between physical, chemical and biological oceanographers on the one hand and fisheries and environmental assessment scientists on the other.

b. Scientific context

The overall scientific context of the programme includes ongoing work on zooplankton dynamics and on the effects of climate on fish stocks. ICES Symposia on Cod and Climate Change in 1993, on Zooplankton Dynamics in 1994 and 1999 on Recruitment Dynamics in 1997 and on Ecosystem Effects of Fishing in 1999 set the scene. Two main areas of work are currently underway in the ICES area: the Cod and Climate Change programme and follow-up activities from Trans Atlantic Study of Calanus. The ICES/GLOBEC Coordinator contributes to both of these.

c. Scientific Objectives

1. The principal scientific objectives are defined by the Cod and Climate Change Working Group. This is a major ongoing research programme of ICES and is also the North Atlantic regional component of the International GLOBEC programme of IGBP. The main task of the Coordinator is to facilitate the implementation of the 5 Year Plan, as set out in the ICES/GLOBEC Cod and Climate Change Working Group report (CM 2000/C:11) and the International GLOBEC Implementation Plan (as set out in IGBP Report 47 pp 145–150). The Coordinator will

provide scientific and organisational support, including establishing a database and information network to assist workshop convenors and participants.

2. Assist with the follow-on from the Trans Atlantic Study of Calanus. The final TASC Symposium took place in August 1999, and a follow-up Theme Session at the ICES ASC in 2000. The Coordinator is responsible for developing links between all components of the North Atlantic programme and for production of a Newsletter. A DFO, Canada, workshop in Halifax, NS in June 2001 (NORWATE) coordinated ongoing (national) activities and laid plans for further pan-Atlantic cooperative work.
3. Help to ensure that the scientific work resulting from the GLOBEC programme is applied effectively in formulating ICES advice.

d. Approaches and Research Plan

A Steering Group, which includes representatives of all funding bodies, provides oversight and direction for the work of the ICES/GLOBEC Office. The Coordinator is the secretary for this group, and is responsible for preparing material on the budget and programme planning. The science and business plan for the office are regularly updated and reviewed.

The long-term scientific strategy is mapped out by the Cod and Climate Change Working Group and reviewed by the Oceanography Committee of ICES. Specific workplans and targets are updated on an annual basis and approved by the Steering Group. The principal ongoing components are:

- ICES Symposia and Working Groups. These are the principal ways in which ICES brings scientists together and publishes the results. The Coordinator provides assistance with many of the practical and scientific elements in the process, including following through on the preparation and publication of their reports.
- Data and information exchange via the Web and other media. This is being developed in close collaboration with existing ICES activities and data systems in order to serve the needs of participating scientists and to stimulate cooperative research. Web based exchange of ideas, data, information and references is being developed as a way of preparing and expanding the collaborative activities of workshops beyond the immediate attendance at the meeting. Current examples of this activity can be viewed at <http://www.ices.dk/globec/globec.htm>
- Development of links between the scientific elements of GLOBEC and the ICES advisory mechanisms for fishery and environmental management. The Coordinator attends assessment Working Groups meeting at ICES and also the Advisory Committees in order to inform them about the GLOBEC programme and to identify and encourage the development of applications.
- Relations with International and other GLOBEC activities. The coordinating function extends to the International GLOBEC programme, to other regional programmes (e.g., PICES) and also to the national programmes of ICES member countries. The North Atlantic Regional GLOBEC programme now includes research on a number of different systems and areas. The scope for involvement in all of these is limited, with the existing staffing, but help will be provided where it is requested and can be given within such resource limits.

Appendix d) Expression of Interest for the EU FP6 programme

Update 2 May 2002



EXPRESSIONS OF INTEREST TO IDENTIFY
RESEARCH ACTIONS READY FOR SPECIFIC
PROGRAMME TOPICS AS A BASIS FOR THE
PREPARATION OF WORK PROGRAMMES FOR THE
6TH FRAMEWORK PROGRAMME FOR RESEARCH

EoI n°:

ADMINISTRATIVE INFORMATION					
Name of organisation submitting the EoI	International Council for the Exploration of the Sea				
Contact person details	Title (Dr, Prof ...)	Dr		Gender	F <input type="checkbox"/> M <input checked="" type="checkbox"/>
	Family Name	Brander		First Name	Keith
Address	ICES, Palaegade2-4, DK-1261 Copenhagen K, Denmark				
Telephone No.	4533154225		Fax No.	4533934215	
E-mail	keith@ices.dk				
Title of the expression of interest (up to 10 words)	Pan-Atlantic Synthesis of Marine Ecosystem Research				
Acronym (up to 20 Characters)	PATSY				
This EoI refers to an Integrated Project	<input type="checkbox"/>		This EoI refers to a Network of Excellence	<input checked="" type="checkbox"/>	
Sub-Thematic Priority ¹ most relevant to your topic	1.1.6.3				
Other relevant Sub-Thematic Priorities ²					
Abstract (max. 10 lines)	National and regional research into the structure and functioning of N. Atlantic marine ecosystems has been undertaken by all riparian states around the N. Atlantic over the past decade. Cooperation is organised within several international projects and the research community has well-developed plans for a Pan Atlantic Synthesis, aiming to apply the resultant knowledge to global change issues, including climate impacts on ecosystem functioning and the implications for biodiversity and sustainable use of natural resources. International cooperation adds value to relevant science carried out in many countries by encouraging integration, comparison and meta-analysis and is needed (i) because Atlantic scale climatic and biological forcing acts on local processes; (ii) to carry out sufficient observations over large geographic scales and (iii) to standardise methods and to exchange and integrate data sets. The Network will include all North Atlantic and European countries. It will be a Cooperative Activity with the US National Science Foundation.				
I request that the information given in this form is not published ³				YES <input type="checkbox"/>	
This form must be accompanied by the short document (maximum 5 pages) referred to in Section 3 of the Guide for Submitters.					

¹ Indicate only one sub-thematic priority number given in Annex 1, eg. 1.1.6.1.i or 1.1.1.ii.b or 2.3

² If appropriate, indicate one or more sub-thematic priority numbers given in Annex 1.

³ Unless you tick the YES box the information included in the Annex 3 form will be published by the Commission Services. The 5 Pages EoI short document will not be published.

Pan Atlantic Synthesis of Marine Ecosystem Research (PATSY)

An Expression of Interest to identify research actions in the priority area Global Change and ecosystems

Proposer: Dr Keith Brander, International Council for the Exploration of the Sea, Copenhagen

Implementing Arrangements for Cooperative Research Activities

The recent signing of an Implementing Arrangement between the EC and the US National Science Foundation for Cooperative Activities in research areas including climate research, marine science and technology, and environmental biology provides an opportunity to develop the network of cooperative international research on marine ecosystems and to implement some of the plans for integration, pan-Atlantic comparison and synthesis, which have been discussed and formulated by the scientific community in a series of major international workshops (see footnote)³.

Rationale

The North Atlantic influences the climate and biological environment of Europe with major consequences for human settlement, culture, trade and food supply. The shelf seas surrounding Europe are affected by large-scale climatic, oceanographic and biological processes in the North Atlantic. We have become more aware of our reliance on the ecosystem services which the North Atlantic and the European shelf seas provide, but have also recognised our limited understanding of the functioning of the marine system and of the alterations, which human activities are bringing about. Consequences of global change, including climate impacts, on marine ecosystem functioning, and the implications for biodiversity and sustainable use of natural resources confront all nations, but the scientific community, which is addressing these questions around the North Atlantic, is particularly strong and well organised. It has a relatively long history of marine science and observation, which is essential for the study of long-term change.

Understanding and managing marine ecosystems is a global issue, with particular regional and local features. The influence and state of the North Atlantic is a shared concern among riparian states and there is much to be gained by sharing and synthesising our knowledge; the dynamics of the shelf sea ecosystems are strongly influenced by the ocean basins between them. Given the complexity of marine ecosystems and their remoteness from our everyday experience it will take some time before we become confident that particular management actions will achieve desired effects. The development of institutions and activities that will strengthen our capacity in this direction is an immediate prerequisite and this proposal includes support for activities and institutions which synthesise and apply the results of that research. An expression of need for and relevance of these activities and institutions is contained in the Ministerial Declaration of the Fifth International Conference on the Protection of the North Sea (March 2002) which states that they *will develop focused research and information gathering which addresses the driving forces of North Sea ecosystem variability, including climatic, biological and human factors, which are critical for maintaining ecosystem structure and function and invite ICES, GLOBEC and other relevant scientific organizations and programmes to consider the priority science issues from the Scientific Expert Conference in Bergen 20–22 February 2002.*

National and regional research into the structure and functioning of North Atlantic marine ecosystems has been undertaken by all riparian states and has intensified over the past decade. Cooperation is organised within several national and international projects, in particular the core projects of the International Geosphere-Biosphere Programme (IGBP), which include GLOBEC (Global Ocean Ecosystem Dynamics), JGOFS (Joint Global Ocean Flux Study) and LOICZ (Land-Ocean Interactions in the Coastal Zone).

³ Workshop reports:

1. EuroGLOBEC Science Plan 1997 Report of an international workshop organised jointly by the MAST Programme of the European Commission, DG XII/D-3 and the Baltic Sea Research Institute Warnemünde. 76pp
2. GLOBEC Implementation Plan 1999 IGBP Report 47 207pp
3. GLOBEC related studies in the North Atlantic: A perspective for European/North American research cooperation? 2001 Proceedings of the EuroOCEAN 2000 conference p 69-114
4. Proceedings of the workshop on "The Northwest Atlantic ecosystem - a basin scale approach. 2001 Canadian Science Advisory Secretariat Proceedings Series 2001/23 113pp

The Specific Activities set out below are based on an Announcement of Opportunity for jointly funded research on the impact of climate-related processes on the dynamics of plankton and fish populations drafted by the North Atlantic GLOBEC community. This community has a substantial record of publications, including several major symposia and special issues of journals. It has carried out many cooperative field and experimental studies, which included international exchange of scientists at all career levels from doctoral to senior researchers. The means of information exchange within the community include regular Newsletters for the Trans-Atlantic Study of Calanus and the Cod and Climate Change programme.

Objectives

- 1 To strengthen the capacity to understand, detect and predict changes in marine ecosystems of the North Atlantic and their consequences for ecosystem functions, biodiversity and sustainable use.
- 2 To provide scientific support for improvement of management strategies for prevention, mitigation and adaption by producing and applying timely, relevant knowledge of marine ecosystems to the highest possible international standards.

General approach

Cooperative research will be directed at compiling and standardising field and experimental data, describing and understanding system structures and processes, developing coupled physical-biological models of the dynamics of key species, using observational and experimental data for testing models, and applying results to support improvements in management. The activities set out below are a part of more comprehensive research plans, which deal with a number of marine ecosystems and species, and which are described in the workshop documents listed above.

Specific activities may be carried out by individuals, research groups or by cooperative international groups. The latter may take the form of workshops, theme sessions, symposia and other forms of international information exchange and cooperation. Exchange of personnel, will be encouraged in order to benefit from experience and interaction across the whole North Atlantic research community and to develop scientific capacity in this area.

The North Atlantic GLOBEC community has concentrated over the past decade on *Calanus finmarchicus*, the principal copepod (zooplankton) species of the North Atlantic ecosystem (the EU funded Trans-Atlantic Study of Calanus and many other regional and national programmes), and Atlantic cod (*Gadus morhua*) the principal demersal fish species and a predator on *Calanus* (the ICES/GLOBEC Cod and Climate programme).

Specific Activities

1. Compiling and standardising data sets, including, but not limited to:

Distribution, abundance and life history characteristics of target species. Data may come from research surveys, ships-of-opportunity, moorings, satellites and sampling of catches. The emphasis is on distribution and abundance of target organisms in relation to their physical environment. Integrated, standardised data sets will be made widely available for time series analysis, regional comparisons, modelling of population processes and coupling to structure and variability of the environment.

Data from process and vital-rate studies, including integration of field and laboratory data designed to investigate specific biological and physical processes associated with vertical mixing and stratification, with regional exchange of water and organisms, and with the mechanisms and dynamics of cross-frontal exchange. Examples include: factors shaping variation in cohort formation and recruitment; experimental measurements of vital rates of target species to determine if vertical distribution and vital rates are affected by mixing processes; transport of organisms between regions and across oceanographic boundaries to determine how this influences population distribution and dynamics; how transport of biota is affected by vertical migration; influence of turbulence (all scales) on plankton patchiness, predator-prey interactions, and vital rates.

2. Comparing ecosystems and processes between areas and meta-analysis

Regional comparisons across the North Atlantic may include vital rates of target species - recruitment, mortality, fecundity, growth (as a function of food, temperature and stock characteristics), behaviour, predation, trophic interactions, and source populations. The extent and timing of planktonic transport within and between regions and the role of banks and basins as spawning/nursery areas for gadids and their prey need to be examined.

Time series of biological data from both the northeastern and northwestern Atlantic correlate with the North Atlantic Oscillation (NAO), which is an index of climate variability. Studies which clarify the nature of the processes by which environmental variability affects biological populations within ocean and shelf areas around the North Atlantic will be supported, as will comparisons between regions, using the compiled data sets to identify or eliminate some of the candidate processes and to provide structural background for the modelling activities.

3. Coupled physical-biological modelling

Conceptual and quantitative models are required, to investigate physical and coupled physical/biological processes in the North Atlantic basin and the associated shelf seas, and to synthesise new knowledge of the functioning and variability of the marine ecosystems. Three-dimensional circulation models using both idealized and realistic basin and shelf seas bathymetry and forcing are needed. The role of advection, turbulent mixing, nutrient supply, insolation, predation, and other factors on the early population development of the target species should be examined using both continuous and individual-based models. Studies may involve both diagnostic and predictive models, and include data assimilation to improve model accuracy and understanding of key processes. These and other model approaches will be encouraged, with the following aims: a) to improve understanding of the key physical and biological processes affecting the target species in the North Atlantic; b) to help integrate and synthesize the various physical and biological data collected during the field programs; c) to begin coupling the lower and upper trophic level models for the North Atlantic basin and shelf seas.

Studies that investigate basin scale effects of climate variability are encouraged. For example how is secondary productivity of North Atlantic shelf seas linked to basin-scale, long-term properties of the ocean circulation and climate system?

Ongoing modelling based research programs such as the Climate Variability and Prediction (CLIVAR), and the Global Ocean Data Assimilation Experiment (GODAE) may provide additional opportunities for collaboration in the synthesis.

4. Integrating knowledge and application

Applications within this priority area can be expressed in terms of structure (preserving ecosystems, protecting biodiversity and genetic resources), functions (productivity, bio-geochemical cycles) and goods and services (sustainable harvest, ecosystem services). Bringing new scientific knowledge to bear on management applications requires close interaction between scientists, managers and stakeholders. The International Council for the Exploration of the Sea (ICES) is an application-oriented scientific body, established a hundred years ago to provide a forum for cooperative studies of marine ecosystems and their management, particularly the fisheries. It therefore has a role to play and will serve as the principal forum for the integration and application of results.

Results include development of indices to characterize environmental and ecosystem status and change; indices for the physical and lower trophic level system components that characterize the status of the ecosystem, particularly in relation to potential higher trophic level production; indices for environmental variability which influence fish recruitment, growth, distribution and mortality for incorporation into short and long term assessment of fish stocks. Indices may be derived from parameters measured directly, or from output of specific configurations of biological-physical models

Design of better - more efficient and more informative - monitoring programs.

5. Training, capacity building and stakeholder involvement

Developing effective management of marine ecosystems will take many years; therefore training and capacity building is essential. In addition to the usual forms of training, post-doctoral fellowships etc. a regular series of conferences for young scientists, managers and stakeholder representatives will be instigated, in order to foster the exchange of experience between disciplines and the development of close professional contacts early in their careers. ICES ran a conference on Marine Ecosystems for 100 young scientists from 25 countries in 1999.

Management and Partnership

This Expression of Interest is based on plans prepared at the Workshops listed above, which included participants from Canada, Denmark, Finland, France, Germany, Greece, Iceland, Italy, Norway, Poland, Portugal, Romania, Spain, Sweden, UK and USA. A formal partnership for the Network has not been set up at this stage. International and regional Steering Committees for the scientific programmes which provide the background to the proposed synthesis exist, but the form of a new Steering Group for the Network and the Management Structure associated with it will depend on the modalities which are agreed as part of the Implementing Arrangements for Cooperative Research.

Appendix e) Budget for ICES/GLOBEC Project Office

All in DKK:	2001	2002	2003	2004	2005	2006
INCOME:						
Carried forward	105,877	163,268	32,953	-100,762		
From USA	433,406	371,000	371,000	371,000		
From Canada	215,575	106,507	106,507	106,000		
From UK	161,476	140,102	140,102	140,102	140,102	36,375
From Norway	91,583	98,464	98,464	98,464		
Total Income	902,040	879,341	749,026	614,804	140,102	36,375
EXPENDITURE						
Salary	610,386	629,196	629,196	629,196		
Pension	208,322	190,592	190,592	190,592		
T&S ¹	25,400	21,600	25,000	25,000		
Other expenses	541	5,000	5,000	5,000		
Total Expenses	844,649	846,388	849,788	849,788		
BALANCE	163,268	32,953	-100,762	-234,984		

Notes

1 ICES ceased paying the Coordinators costs for attending the ASC in 2001