Oceanography Committee **ICES CM 2001/C:13**

REPORT OF THE

STEERING GROUP FOR THE ICES/GLOBEC NORTH ATLANTIC PROGRAMME

By Correspondence

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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). It has held two tele-conferences and met briefly in Edinburgh on 10 August 2001, in order to finalise the report. (A list of those present is given in Appendix b).

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) 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. A description of the Cod and Climate Change Programme, as envisaged in the 1999 GLOBEC Implementation Plan, is attached as Appendix d.

2.1 Goals for GLOBEC Programme and the ICES/GLOBEC Office in Relation to the ICES Strategic Plan

The ICES/GLOBEC programme, mainly developed through the Working Group on Cod and Climate Change (WGCCC) and supported by the ICES/GLOBEC Office, is consistent with several of the aims of the new ICES Strategic Plan. The primary goal for the international GLOBEC programme is *"To advance our understanding of the structure and functioning of the global ocean ecosystem, its major subsystems, and its response to physical forcing so that a capability can be developed to forecast the responses of the marine ecosystem to global change"*. This is congruent with Goal 1 of the ICES Strategic Plan - *to understand the physical, chemical and biological functioning of the marine ecosystem* - and the activities, which this encompasses.

Consistent with Goal 4 of the ICES Strategic Plan, the ICES/GLOBEC programme is promoting ways of incorporating environmental information into stock assessments and also contributing to the development of an Ecosystem Approach.

The existing collaboration with GLOBEC is an example of how Goal 5 of the ICES Strategic Plan - *to enhance collaboration with organisations, scientific programmes and stakeholders (including the fishing industry) that are relevant to the ICES goals* - can be achieved.

Under the heading of Added Value, Goal 8 of the ICES Strategic Plan seeks *to broaden the diversity of scientists who participate in ICES' activities.* Evidence of how this is achieved within the Cod and Climate Change programme is presented in Appendix e. Added Value should be regarded as a two-way process and ICES should seek to benefit from its relationship with GLOBEC by encouraging the application of the science being carried out within GLOBEC to fisheries and marine environment management issue. The ICES Strategic Plan states that the reason for ICES' existence is to produce more scientific understanding and more valuable scientific advice than the sum of the individual contributions of its member countries. The ICES/GLOBEC program fits well under the ICES Mission Statement that states "*coordinate interdisciplinary research including partnerships with organizations with similar interest*".

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 Symposium); 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

WGCCC has set out and fulfilled a detailed strategy for its work over the past decade, as part of the Science and Implementation Plan of the International programme. The main achievement has been to stimulate, coordinate and publish a substantial body of inter-disciplinary research on the effects of the physical environment on cod and on the marine ecosystems within which cod live. A brief summary of some of the main results from the workshops, theme sessions, symposia and publications is given in Appendix e.

A recent article on the Baltic ecosystem by Köster, Alheit and Möllmann, published in the IGBP Global Change Newsletter (Issue 46, June 2001, available from www.igbp.kva.se) sets out clearly how contributed research to the Cod and Climate Change programme has substantially improved our understanding of processes affecting cod recruitment in the Baltic. The findings were implemented in environmentally sensitive stock-recruitment models, resulting in improved medium- to long-term projections of fish stock development under different environmental scenarios and fisheries management directives. Papers presented at the ICES Symposium on Hydrobiological Variability in the ICES Area, 1990–1999 by Colbourne, Brander, Buch and Köster also provide evidence of the pervasiveness of environmental effects on cod dynamics and, in some cases, how environmental information can be applied to medium and long-term projections of recruitment.

The current phase of the CCC strategy, which was produced by the WG in 1998 and updated in 2000 (ICES CM 1998/C:10 and 2000/C:11), is primarily aimed at synthesis and application of the results of the scientific work to date to fisheries and marine ecosystem management.

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 seven ICES/GLOBEC Newsletters published to date provides a further source of information on the achievements of the programme.

3.2 Future Direction and Scope of the Programme

The scope of the work of the Regional Office has been principally related to the Cod and Climate Change programme. This has made it less relevant to ICES' members with other interests and has weakened the case for widening the funding base. It has been suggested that the balance between scope, resources and ICES' members interests needs to be reconsidered.

Given the active interest of several ICES members in the GLOBEC regional programme on Small Pelagics and Climate Change (SPACC) it was suggested that the scope of the work of the Regional Office should be widened to support some SPACC-related work, if resources permitted. This could include work on small pelagics in most parts of the ICES area and would link in with national GLOBEC-related research in several countries.

The development of scientific ideas and the exchange of information within the SPACC programme overlaps with the CCC programme to a considerable extent. In the Baltic, ongoing GLOBEC related research includes sprat and herring as well as cod. Climatic indices and data on the physical environment are common to both. The particular role of ICES within GLOBEC is to develop fisheries management applications for the science, which is also common to pelagic species as well as cod.

The ICES/GLOBEC Coordinator will be assisting with the scientific preparations for the ICES Symposium on Climate Variability and Fisheries, which is planned for 2004. The subjects to be covered include pelagic fisheries. He will also be working on the preparations for a follow-up workshop on the application of GLOBEC related research to fisheries management.

There are a number of specific tasks within the overall work-programme, which would benefit from additional resources and it should be possible to widen the scope of the programme if additional funding can be secured from ICES members or elsewhere. These include:

- support for work on small pelagic species
- more active support for work on cod growth studies (this is the topic of an EU funding proposal to be re-submitted in October 2001)
- organisation and costs for the workshop on transport processes during early life (an Accompanying Measure proposal to the EU is in preparation)
- more active support for the Arctic Climate Impact Assessment (national funding will be sought for this)
- enhancement of the database and information exchange to include other data sets and better meta-data for existing data (e.g., on cod size at age)
- support for possible North Sea Ichthyoplankton Surveys (a proposal to the EU may be re-submitted)

4 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 Coordinator has a contract, which runs to the end of March 2002.

4.1 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 2002 and a request for renewal is being prepared. A three-year renewal of Canadian funding will be sought. DEFRA (UK) requested a proposal for a four year renewal of funding, to run from 1 April 2001, and this has been submitted. Norwegian funding currently runs to the end of 2002 and a renewal will be sought by June 2002. Income and expenditure for the ICES/GLOBEC office for the period 1997–2000 and core budget requirements to 2004 are given in Appendix g.

4.2 Future Funding

SGNARO discussed the strategy to be adopted in order to secure funding for the continuation of the Regional Office. Such funding must be related to the time-scale, scope of the work and plans for future activities. While it may be possible to take advantage of some opportunistic funding (e.g., providing assistance with existing programmes, such as the Arctic Climate Impact Assessment), this must be evaluated in relation to the planned activities, rather than dictating what they should be.

The first priority is to secure the continuation of sufficient external funding to cover the basic direct costs of the ICES-GLOBEC office. A canvas of the current donors indicates that this may be possible but firm commitments are not yet in place. Renewed efforts by the Secretariat and the Delegates from those countries are essential to secure this funding for a further three years.

It was noted that the current level of funding covers the basic direct costs of the ICES/GLOBEC office, but not any additional support e.g., for preparation and costs of running workshops or for carrying out additional work. Several bids for EU funding, which include some support for the ICES/GLOBEC programme, will be submitted in October 2001, but the outcome will not be known until early 2002.

The work programme would be strengthened by having some extra funding and this would also provide additional security, since the renewal of existing funding cannot be taken for granted. The General Secretary should therefore continue to present the case for additional contributions from ICES members who do not currently contribute and should pursue targeted funding from other sources for specific parts of the programme.

5 CONCLUSIONS

The ICES/GLOBEC programme has made major progress in implementing the work programme set out by International GLOBEC and by the ICES Cod and Climate Working Group. This has resulted in a steady flow of ICES publications and has also provided the basis for numerous publications by individual scientists and teams associated with the programme. Collectively, these publications demonstrate progress towards the goal of understanding the response of the marine ecosystem and in particular of cod, to physical forcing.

The results are being applied to fisheries assessments and management in a few cases, particularly in developing medium and long-term projections and in evaluating the consequences of scenarios for climate change. The work

programme of the Cod and Climate Change Working Group over the next three years is designed to synthesise the work to date and to develop more applications of the results to assessment and management of fisheries and the marine ecosystem.

The programme has achieved the goals of enhancing collaboration between ICES and other organisations and bodies that can contribute to the ICES' vision, in particular with PICES, IGBP, SCOR, IOC, GOOS, ACIA, SAHFOS and others. It has also attracted a broad range of scientists who would not otherwise attend ICES workshops, working groups and theme sessions to do so and to become a part of the ICES community.

The role of the ICES/GLOBEC office in maintaining the information flow, pace and coordination of the programme is seen by those involved as being critical to its success. The Steering Group fully supports the continuation of the Regional Office for a further three years (2002–2004). In its view elimination of this office would greatly curtail the activities of the Cod and Climate Change Working Group and in particular the planned work on incorporating environmental information into fisheries management which is the topic of several planned and proposed workshops and is central to future progress on an issue of fundamental importance to ICES and its clients. While these activities would continue in the absence of the ICES/GLOBEC Regional Office, the Steering Group believes that progress would be greatly slowed, because the work load of most scientific members is too great to take over the job undertaken by the ICES/GLOBEC Coordinator.

6 RECOMMENDATIONS

(1) Delegates of current donor countries are requested to seek continuation of the existing levels of funding from their funding authorities.

(2) Delegates of other Member states with an active interest in the ICES-GLOBEC initiative are requested to examine the possibility of contributing financially to the office.

(3) The General Secretary should seek additional external funding to cover the direct costs of maintaining the ICES/GLOBEC office for a further three-year period to the end of 2004. If the direct costs of maintaining the programme in its present form (see Appendix g) 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).

(4) Subject to sufficient external funding being secured to cover the direct costs as projected in Appendix g, the General Secretary should be authorised to extend the position of the ICES/GLOBEC Coordinator accordingly.

7 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 2001, 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 2001 Mid-Term Meeting and to the Bureau and the Oceanography Committee at the 2001 Annual Science Conference.

Appendix b) Participants at the meeting at NASCO headquarters, Edinburgh, 1745–1900h on 10 August 2001

S. Parsons	Canada (chair)
F Köster	Germany
K. Drinkwater	Canada
F Colijn	ICES Oceanography Committee
D. Griffith	ICES
H. Loeng	Norway
S. Jonsson	Iceland
B. Planque	France
K. Brander	ICES

Apologies from M. Reeve USA, L. Valdes Spain, and R. Harris UK

Appendix c) The GLOBEC Goal (from the International GLOBEC Science Plan)

The aim of GLOBEC is to advance our understanding of the structure and functioning of the global ocean ecosystem, its major subsystems, and its response to physical forcing so that a capability can be developed to forecast the responses of the marine ecosystem to global change.

GLOBEC has four primary objectives:

Objective 1	To better understand how multiscale physical environmental processes force large-scale changes in marine ecosystems
Objective 2	To determine the relationships between structure and dynamics in a variety of oceanic systems which typify significant components of the global ocean ecosystem, with emphasis on trophodynamic pathways, their variability and the role of nutrition quality in the food web.
Objective 3	To determine the impacts of global change on stock dynamics using coupled physical, biological and chemical models linked to appropriate observation systems and to develop the capability to predict future impacts.
Objective 4	To determine how changing marine ecosystems will affect the global earth system by identifying and quantifying feedback mechanisms.

Appendix d) ICES-GLOBEC Cod and Climate Change Programme (CCC)
(This extract is taken directly from the International GLOBEC Implementation Plan, which was published in 1999. The plan is therefore partly describing events, which have already taken place. The plan is regularly revised and updated by the ICES Cod and Climate Change Working Group - see Appendix e)

Background

The International Council for the Exploration of the Sea (ICES) and GLOBEC have joined together to develop an innovative programme to advance the understanding and prediction of variability in fish stock recruitment, both in the short term (annual forecasts) and in the long term ("climate effects"). Cod (Gadus morhua) has been chosen to function as the candidate species for this exercise because its biology is well known and supported by ample data bases, it has a pan-Atlantic distribution, and its abundance and distribution have been shown to be sensitive to specific past examples of environmental variability (Figure 33). These considerations provide CCC with the possibility of developing new capabilities in predicting fish recruitment from a better understanding of the interaction of physical processes and population dynamics.

The central question being investigated by the CCC programme is the effect of climate variability on cod stock fluctuations. It is simply stated, but involves many different scientific disciplines and scales of investigation. These range from the effects of small-scale turbulence on encounter rates between fish larvae and their prey, to large-scale effects of interdecadal changes in wind fields on circulation and transport of heat and young fish. In spite of the complexity of the processes by which variable physical forcing may affect cod stocks, the effects of climatic variability can be detected for several stocks. For example, periods of low temperature are observed to result in stock declines at the northern limits of cod distribution (Barents Sea, Greenland); particular hydrographic and wind conditions result in unusual transport of eggs and larvae (Iceland-Greenland) or flush out deoxygenated basins where cod spawn (Baltic). These examples combine empiricism, a growing understanding of ocean/climate variability and detailed knowledge of processes during the life history of cod (especially the early life history). They give grounds for believing that the question posed is not intractable and that it may be possible to predict at least the broad direction of changes in cod abundance under different physical regimes.

With the establishment of the new ICES framework in November 1997, the ICES Science Committees were requested to develop a scientific strategy and plan of action in order to improve the way in which the Committees function. The CCCWG falls under the Oceanography Committee whose area of responsibility is the physical, chemical and pelagic biological oceanography, especially processes relevant to living marine resources and environmental quality. They include such issues as impacts of climate variability and the physical, chemical and biological fluxes in coastal areas, shelf seas and the open ocean. The ICES Consultative Committee requested the Science Committees to develop a 5-year plan, clearly identifying long-term goals. The Oceanography Committee subsequently asked its associated working groups to develop their own 5-year plan. Specifically to: (i) identify critical knowledge gaps and scientific priorities; (ii) identify priorities to address issues that require the attention of other scientific committees; (iii) take into account the long term needs of the advisory function of ICES; (iv) be sensitive to the emergence of new marine science issues; and (v) develop an interdisciplinary programme of work to address the science of marine ecosystems.

Implementation

The CCCWG identified seven major research components within a five-year plan based upon perceived scientific needs and likelihood of success. The word environment in the following text includes the biological (e.g., plankton, food and predators), as well as the physical and chemical characteristics of the water.

1. Fisheries Management

Objective: To incorporate environmental information in a quantitative manner into fisheries management strategies and planning.

Justification: Traditional stock assessments, which implicitly assume that environmental and ecological conditions are unchanging, are by themselves not sufficient to ensure sustainable fisheries. Incorporation of environmental and ecological variability offers the potential of providing additional explanatory power of changes in fish stocks. Fisheries management was considered by the Working Group to include annual stock assessment, risk analyses and long-term management plans.

Specific Activities: Building upon the discussion and recommendations of the Workshop on Applications of Environmental Data in Stock Assessments held in Bergen, Norway during March 1998, a follow-up workshop that

focuses upon a specific case study is proposed. Using the West Greenland/Iceland Cod example, models of the circulation will be used to develop transport indices for incorporation into fisheries management models. This workshop is planned during the year 2000 or 2001. A workshop on cod growth (see discussion below) will also address some aspects of the inclusion of environmental information into fisheries management.

2. Retrospective Analyses

Objective: To examine past events or periods as a means of better understanding the links between changes in the environment and fisheries.

Justification: Insights into the response of fish stocks to environmental variability have the greatest chance of success when examining periods of minimal fishing pressure, large climate variability and/or large changes in fish stock characteristics such as growth, recruitment, abundance etc. Acknowledging the usefulness of past retrospective workshops (i.e., Backward Facing I, II and III), the CCCWG decided to continue these types of activities.

Specific Activities: A workshop on the Gadoid Outbreak in the North Sea (Backward Facing IV) is proposed for March 1999. This will explore the increase in abundance of gadoid fishes in the North Sea during the 1960s and 1970s and, in particular, the possible role of environmental changes as a causal mechanism. Investigations undertaken as a follow-on to Backward Facing III will also be presented.

3. Zooplankton-Cod Linkages

Objective: To understand the relative importance of zooplankton in determining the variability in cod abundance and production.

Justification: Many regional and national GLOBEC programmes are focussing upon zooplankton dynamics. Efforts are required to establish quantitative links between zooplankton and fish in order to make full use from the fisheries perspective of the information gathered within these GLOBEC programmes. Equally important are establishment of the diet of cod larvae, including the main zooplankton species eaten and the relationship between larval condition and survival with possible physical-induced changes in diet.

Specific Activities: The CCCWG will strongly encourage examination of zooplankton-cod linkages during the Trans-Atlantic Studies of Calanus finmarchicus Symposium scheduled for Tromsø, Norway, in August 1999. In addition a Theme Session at the ICES Annual Science Conference in September 2000 on the linkages between zooplankton and cod will be proposed.

4. Comparative Analyses

Objective: To undertake comparative studies of life history strategies and interannual variability in growth, distribution, and abundance between cod stocks around the North Atlantic.

Justification: Research in recent years has expanded our understanding of the dynamics of individual cod stocks and some of the causes of interannual variability. Comparative studies between stocks, such as those on growth and recently on recruitment, have provided knowledge that was unattainable from stock-specific investigations. More such studies offer good potential of providing additional significant insights. Areas where such studies were considered beneficial include further examination of growth and recruitment and investigations into distribution and migration. Application of similar analytical methods for different stocks will be encouraged.

Specific Activities: A Workshop on the Dynamics of Growth in Cod is proposed for autumn 1999 or winter 2000. The aim of the workshop will be to develop a single growth model for cod that will allow interpretation of information from all parts of the geographic range of cod. Incorporation of this information into fisheries management practices will be attempted.

5. Climate and Atmosphere-Ocean Interactions

Objective: To understand and predict climate variability and its associated ecosystem response.

Justification: Fisheries managers are demanding increased knowledge of climate-induced ecosystem changes and asking for predictions of future climate conditions. Although difficult and initially predictive success is unlikely, improvements

in prediction over the long-term are expected and worth the effort. Both short and long-term (decadal) predictions are of interest to fisheries management. Several large international programmes such as CLIVAR are being developed to gain understanding of the climate of the North Atlantic and the role of the NAO. The CCCWG will communicate its needs and establish links to the CLIVAR community and to other such climate programmes.

Specific Activities: A Workshop on Long-term Climate Change and Prediction is planned for the year 2000, the purpose of which is to explore long-term and short-term predictions in ocean climate, the possible existence of "regime shifts" of climate and the relationship between climate change, and associated ecosystem responses. The mechanisms linking the large-scale atmospheric circulation such as the NAO to ecosystem changes will be sought as a follow-on from the Workshop on Decadal-Scale Ocean Climate Fluctuations of the North Atlantic.

6. Data Availability and Management

Objective: To ensure that environmental and fisheries data are easily and widely available.

Justification: Data are critical for research and as such it is important that they be easily accessible to a wide scientific audience. This will encourage and ease activities such as comparative analyses.

Specific Activities: Working relationships with other groups will be established to ensure data accessibility and, where possible, standardize formats. Primary data sources and information required for the proposed workshops will be made available, as much as possible, on the web. The ICES website will be kept up to date.

7. Synthesis

Objective: To provide a synthesis of the research information obtained on cod stocks.

Justification: Much material has been published on many of the cod stocks around the North Atlantic. The CCCWG recognizes the requirement to synthesize this information into a general framework of cod dynamics.

Specific Activities: While an overall synthesis is the long-term aim, the initial work will proceed in a modular manner. Thus, ongoing synthesis of the workshops and theme sessions is identified as a critical aspect.

Potential Joint Work with other Working Groups and Committees

As part of the 5-Year Plan, potential joint work with other ICES Working Groups and Committees and international programmes was identified as follows. This list does not exclude possible links to other groups and committees.

CCCWG Component	**Associated Group**
Fisheries Management	Resource Management Committee
Zooplankton-Cod Interactions	TASC, Zooplankton Ecology WG
Climate and Atmosphere-Ocean Interactions	Oceanic Hydrography WG, Shelf Seas Oceanography WG, CLIVAR
Data Availability and Management	Marine Data Management

Appendix e) The Cod and Climate Change Programme - Progress and Workplan

Working procedure

The CCC Working Group meets every second year for three days to review progress and plan future work, which is carried out by one-off workshops on selected topics. Convenors are encouraged to attract scientists from within and outside the ICES community to contribute to the workshops. Preparation for the workshop may take a year or more and is facilitated and accelerated by the programme office, which assists the convenors in commissioning relevant studies and sets up the exchange of data, information, ideas and working documents using a variety of mainly electronic means. Most of the work takes place before and after the meeting, and there are many contributions by scientists who do not participate in the actual workshop. The progress reviewed below is principally in the form of reports from these workshops, which can obviously be credited to CCC. Many scientific papers arise directly from the workshops, often based on collaboration established during the meetings. The first "Backward-facing" retrospective workshop provides a

good example of successful collaborative publications, involving scientists from several disciplines and outsiders to the ICES community.

Summary of progress

ICES has published eighteen reports related to CCC since 1995 (reference list available). These range from short reports of the project management committee meeting to substantial workshop reports. For example a workshop 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. A workshop of particular relevance to climate variability and its effects 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 and that their interests are represented within programmes like CLIVAR.

A workshop in March 1999 dealt with “Ocean Climate of the NW Atlantic during the 1960s and 1970s 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 1997/1998, 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 1977–1987 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 3–5mm 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 on “Gadoid stocks in the North Sea during the 1960s and 1970s” (ICES Cooperative Research Report 244, 55 pp) carried out similar work to that reported on for the NW Atlantic. The physical ocean climate was unusual during period of the 1960s and 1970s and all four major gadoid species produced exceptionally high levels of recruitment. The relationship between cod and the atmospheric patterns expressed by the NAO is particularly striking, but the nature of the processes is not yet established.

A workshop in May 2000 dealt with the dynamics of cod growth, covering the whole of the North Atlantic (ICES C.M.2000/C: 12). Data for 23 cod stocks were assembled on the ICES web site and an electronic bulletin board was used for exchange of data, ideas, reports and references. The work on growth continues, with a Theme Session at the 2001 ASC, a number of cooperative research proposals (some already funded) and a Cooperative Research Report to be produced after the Theme Session. The overall aim is to produce consistent empirical and bioenergetic models, which can be used to explain and predict changes in cod growth and maturity as a consequence of population and environmental variability.

The above brief summary indicates the progress has been made on all seven of the major research components set out in the International GLOBEC Implementation over the past five years. In some cases application of the results to fisheries assessment and management has begun (see Section 3.1), but this area will be the main focus of activity over the next three years

The current Workplan

The Cod and Climate Change Working Group, met in May 2000, reviewed its five year plan and put forward a number of new proposals, which include:

- Theme Session on cod growth in 2001
- Workshop on Trans-boundary movement during early life in April 2002
- Collaborative research project on individual growth using back calculation (2002 onward)
- Workshop on application of environmental data in fisheries assessments (2003)
- Synthesis of stock information, and databases of relevant environmental and fisheries information (2001 onward)
- Symposium on Fisheries and Climate Change in 2004
- Book synthesising results from the Cod and Climate Change programme. (2004)

Appendix f) ICES C. Res. 1994/4:7

The General Secretary will seek funding from ICES Member Countries and inter-governmental bodies for the establishment as soon as possible of a Project Office for the North Atlantic Regional Programme of GLOBEC, in particular the Cod and Climate Change Programme. The Project Office, which will be located in the ICES Secretariat, will be manned by a Project Coordinator who will:

a) coordinate regional programmes relevant to GLOBEC (e.g., planned ichthyoplankton surveys of the North Sea), by means planning the field work, undertaking data analysis, and overseeing archiving of datasets;

b) facilitate the coordination of national GLOBEC programmes of ICES Member Countries;

c) provide a link between ICES Assessment Working Groups on areas of common interest;

d) produce a regular (quarterly) newsletter on GLOBEC news;

e) assist in the establishment and maintenance of environmental and fisheries databases as are considered essential by GLOBEC groups;

f) coordinate the GLOBEC-related activities of the various ICES Groups/Meetings whose terms of reference overlap with those of GLOBEC.

Appendix g) Budget for ICES/GLOBEC Project Office

All in DKK:	1997/98 1/8 to 30/10	1998/99	1999/00 14 months	2001	2002	2003	2004
INCOME:							
From USA		327970	389715	433406			
From Canada	415,570	423450		215575			
From Iceland	75,000	75,000					
From UK		96499	214156	170000			
From Norway			136345	88600	*88600*		
Total Income	490570	922919	740216	907581			
EXPENDITURE							
Salary	191493	801111	963724	*783343*	*800000*	*800000*	*800000*
T&S	0	27846	27815	*16000*	*25000*	*25000*	*25000*
Other expenses	7655	27046	1138	*214*	*25000*	*25000*	*110000*
Total Expenses	199148	856003	992677	*799557*	*850000*	*850000*	*935000*
BALANCE	291422	358338	105877	*213901*			

NOTES

1. Figures in italics are projected
2. A blank entry for a particular country in a particular year may be due to payment being made out with the accounting period and not due to non-contribution
3. The slight drop in salary costs from 2001 on is due to reduced dependent allowance
4. "Other expenses" in 2004 include repatriation costs