

ICES/GLOBEC Newsletter

Number 1, August 1997



Editorial

by Keith Brander

Do we need another Newsletter? Good question, which requires some explanation about the ICES/GLOBEC programme and an invitation to contribute in order to make it useful. Like most programmes within ICES, this one is based on agreement to cooperate in order to address scientific problems, which require an international perspective, in this case strategic research on marine productivity.

The problems being addressed are not new, but awareness of the need for better understanding about the functioning of the marine system is growing. As a result, some (generous and far-sighted) ICES members have contributed funds to develop the programme; to set up a Coordinator's office and to produce this Newsletter.

This first issue contains information about the past and present programme and about plans for the future which will be debated at an Open Session on 29 September, during the 1997 ICES Annual Science Conference. Please come and take part.

Cooperative work in ICES takes place in Working Groups and Workshops, which are team rather than spectator events. To be successful they need good preparation and collaborative work before the meetings. The Newsletter is one of the means (along with increasing use of electronic information transfer) to stimulate such collaboration.

The GLOBEC programme has international, regional and national components (see back page on how to find these), which form a network, with many shared aims and methods. The Newsletter aims to nurture these links.

What is the GLOBEC programme about?

The goal is to develop our understanding of the structure and functioning of marine ecosystems and how they respond to changing physical forcing at scales ranging from the very small (e.g. effects of turbulence on predator-prey encounter rates) to the very large (e.g. effects of climate change on long term population fluctuations). The principal applications are to distinguish between natural and anthropogenically induced ecosystem changes and to determine the causes of variability in fisheries production. Scientific approaches being used include (1) retrospective analyses of historic data on biological changes related to climate and (2) process studies and modelling of critical parts of the coupled physical/biological system.

A Science Plan for the International GLOBEC programme was published in 1997 (IGBP Report 40) and an Open Science Meeting will be held in Paris in March 1998 to present and discuss the Implementation Plan.

GLOBEC and ICES - development of the programme.

A full account of the history of GLOBEC within ICES will have to wait for another day, but a few paragraphs may help to introduce some of the underlying ideas, to give a perspective on what has been achieved so far and to stimulate some of those involved to write a proper record.

An influential report entitled "Fisheries Ecology; some constraints that impede advances in our understanding" noted the "*need for increased study of those environmental and ecological factors that relate directly to the present inadequacies in fish-*

stock evaluation". It was produced in 1980 by an ad hoc group of the US National Research Council (not an ICES group), with **John Steele, Colin Clark, Peter Larkin, Rueben Lasker, Robert May, Brian Rothschild, Erik Ursin, John Walsh and Warren Wooster**. Although it looked mainly at fisheries issues it also emphasised "...*the essential connections between the problems of fisheries and of the rest of the marine ecosystem. The need for a unified approach arises both in the practical problems and in the underlying scientific questions.*" The rationale for GLOBEC has been restated and embellished in numerous documents, but it follows in essence from this 1980 report.

Studies of variability in recruitment have always been regarded as a key element in relating environmental factors to fisheries. In GLOBEC the problem of understanding what governs survival during the early life of fish is placed in the context of the ecosystem, within which the early life stages occur; i.e. the (mainly pelagic) ecosystem of zooplankton, their prey and predators. This has stimulated a range of scientific activity on zooplankton (particularly *Calanus* in the ICES area) and on coupled physical and biological processes and models. A complementary line of scientific attack within ICES has taken advantage of the wide geographic and secular data coverage for cod in the North Atlantic to apply comparative methods and to interpret time series in relation to climate variability (the Cod and Climate Change programme).

ICES established the Study Group on Cod Stock Fluctuations in 1989, under the chairmanship of **Prof. Brian Rothschild** and it produced its first report on "Cod and Climate Change, Framework for the Study of Global Ocean Ecosystem Dynamics" in 1990. The international committee for GLOBEC was established by **Prof. Rothschild** and met for the first time in 1991. There may be disputes in years to come over who begat who, but at least there should be none over the identity of the midwife.

Much of the ICES/GLOBEC programme comes under the banner of Cod and Climate Change, (CCC) which is recognised as the ICES regional contribution to the international GLOBEC programme. The CCC Working Group generally meets every second year and sets up a number of workshops to report on specific issues in the interim. These workshops have included retrospective studies of climate and fisheries (the Backward Facing workshops), the role of intermediate-scale physical processes in cod early

life and the establishment of a data exchange system. A workshop on Predicting Decadal Scale Ocean Climate Fluctuations of the North Atlantic is scheduled to take place in Copenhagen on 8-10 September 1997 and one on the Application of Environmental Data to Fisheries Assessments in Bergen in late March. The third Backward Facing workshop, looking at coupled changes in the physics and biology of the NW Atlantic during the 1960's and 70's, will probably be during April 1998 and the CCC Working Group will probably meet thereafter.

An office was established in 1996 to help with coordinating the ICES/GLOBEC programme by disseminating data and information (including this Newsletter), helping to organise workshops, theme sessions, symposia etc and giving assistance to chairmen and other scientists involved in the programme. The future of the ICES/GLOBEC office and of the programme in general will be discussed during the Annual Science Conference, on 29 Sept, 0830-1030, Maryland A. This will include dates and details of several of the meetings mentioned above.

The dual role of ICES in coordinating research and providing advice on fisheries and marine environmental management gives it a particular perspective in relation to GLOBEC. ICES has been criticised for losing touch with the wider scientific community of oceanographers (biological, physical, chemical etc.) in many countries and for taking a somewhat narrow scientific perspective in some of its advisory work. The GLOBEC programme addresses these criticisms by attracting wider participation in ICES, while trying to help with the development of improved tools for management of fisheries and of the marine ecosystem generally. This is quite a challenge, but there are some promising signs, such as the number and diversity of contributions to Theme Sessions and Workshops from scientists who have not previously been involved with ICES. On the other hand there is still a great deal of difficult work to be done in developing the tools for applying the scientific progress in the advisory work before the programme can claim success.

GLOBEC related reports, which have been produced by ICES are listed below. In addition to these a number of other Working Groups (e.g. Shelf Seas Hydrography) also address GLOBEC related issues. Numerous papers by individual scientists also relate to the ICES/GLOBEC programme, but it is difficult to catalogue these. ICES does not fund research and is therefore rarely acknowledged in

publications, even when these are intended as a contribution to an ICES programme. The Symposia on Cod and Climate Change and on Zooplankton Production included many papers relevant to GLOBEC and a session during the latter was devoted to GLOBEC. ☺

ICES reports and publications related to GLOBEC

- ICES 1990. Report of the ICES Study Group on Cod Stock Fluctuations. Cod and Climate Change (CCC), Framework for the Study of Global Ocean Ecosystem Dynamics. ICES CM 1990/G:50 Ref C+L. 29 pp.
- ICES 1991. Report of the ICES Study Group on Cod Stock Fluctuations. Towards an implementation plan for the program on Cod and Climate Change (CCC) ICES C.M. 1991/G:78. 35 pp.
- ICES 1992. Report of Steering Group on Cod and Climate Change. CCC. Cod, Copepods and Climate. ICES; CM. 1992/G:17. Ref C+L. 7 pp.
- ICES 1993b. Report of the ICES/GLOBEC Working Group on Cod and Climate Change. ICES C.M. 1993/G:3, 67 pp.
- ICES 1994a. Report of the ICES/GLOBEC Working Group on Cod and Climate Change. ICES C.M. 1994/A:7.
- ICES 1994b. Report of ICES/GLOBEC Cod and Climate AGGREGATION Work shop, Charlottenlund 22-24 August 1994. ICES C.M. 1994/A:10.
- ICES 1994c. Report of the Workshop on the Trans-Latitudinal Study of *Calanus finmarchicus* in the North Atlantic, Oslo 6-8 April 1994. ICES C.M. 1994/L:10, 30 pp.
- Brander, K. (ed) 1994. Spawning and Life History Information for North Atlantic Cod Stocks. ICES Coop. Res. Rep. No. 205, 150 pp.
- Jakobsson, J. (ed) 1994. Proceeding of the ICES Symposium on Cod and Climate Change, Reykjavík, 23 - 27 August 1993. ICES mar. Sci. Symp. 198: 693 pp.
- ICES 1995a. Report of the ICES Working Group on Cod and Climate Change. ICES C.M. 1995/A:8, 25 pp.
- ICES 1995b. Report of the Cod and Climate Backward-Facing Workshop, Bedford Institute of Oceanography, Dartmouth, Canada, 8-10 March 1995. ICES CM 1995/A:7. 23 pp.
- Harris, R. (ed) 1995. Zooplankton Production. Proceedings of a Symposium held in Plymouth, England 15-19 August 1994. ICES Journal of Marine Science Vol. 52 (3&4): 773 pp.

- ICES 1996a. 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 1996b. 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 1996c. 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 1996d. Report of the ICES/GLOBEC North Atlantic Regional Co-ordination Group. ICES Headquarters, Copenhagen, Denmark 6-7 June 1996 ICES CM 1996/A:12, 11pp.
- ICES 1997a. Second Report of the ICES/GLOBEC North Atlantic Regional Co-ordination Group. Reykjavik, Iceland, 28-29 September 1996 ICES CM 1997/A:7, 18pp
- ICES 1997b. Report of the ICES/GLOBEC North Atlantic Regional Co-ordination Group. ICES Headquarters, 16-17 June 1997 ICES CM 1997/A:8, 13pp
- ICES 1997c. Report of the Working Group on Zooplankton Ecology. Kiel, Germany, 16-18 March 1997 ICES CM 1997/L:4, 29pp
- ICES 1997d. Report of the Working Group on Shelf Seas Oceanography. March 1997 ICES CM 1997/C:1, 29pp

Continuous Plankton Records, Climate and *Calanus*

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The Continuous Plankton Recorder survey

The Continuous Plankton Recorder (CPR) survey has been collecting plankton samples across the North Atlantic Ocean and the North Sea since 1931. For the past five decades, the methods of sampling and analysis have remained almost identical rendering the CPR database the longest and largest set of comparable data on plankton at a multidecadal-basinwide scale. CPRs have been towed for over 3,900,000 miles resulting in the acquisition of over 160,000 samples. Today, CPRs are towed every month along ten routes in the North Atlantic, eight in the North Sea, one in the Irish Sea, one in the Mediterranean Sea and three in the Gulf of Guinea.

1997 - The Year of *Calanus*

The ICES Cod and Climate programme, the TASC (TransAtlantic Studies of *Calanus finmarchicus*), the US Georges Bank and the Canadian GLOBEC activities have all identified the copepod *Calanus* as a target species for its pivotal position in the ecosystems of the North Atlantic and its surrounding seas. The ICES Working Group on Zooplankton Ecology has in consequence named 1997 the 'year of *Calanus*'.

Retrospective analyses relating biological and physical variables play a central role in these programmes as do the studies of long-term records of *Calanus* populations. Large scale sampling records are also of primary interest, especially for the TASC programme which aims to investigate *Calanus finmarchicus* ecology and dynamics in a comparative way for major ecosystems of the North Atlantic and adjacent seas.

Recently, the CPR survey has developed a new methodology for the cartographic representation of species recorded within the survey and for their long-term studies. These methods were first applied to the target species *Calanus finmarchicus* and *C. helgolandicus*. The spatial and temporal distributions of the two species across the North Atlantic and for the past 35 years have been re-examined in relation to large scale climatic changes during the same period.

Climate variability

In the North Atlantic, the dominant pattern of climate variability is constituted by the year-to-year changes in the winter sea level pressure gradient between the Azores centre of high pressure and the Iceland centre of low pressure. This phenomenon, is known as the North Atlantic Oscillation (NAO). A "high NAO" pattern, indicates strong mid-latitude westerlies and is characterised by an intense pressure gradient between the Iceland Low and the Azores High, while in the "low NAO" case, the westerlies are weaker and the pressure gradient lower than normal. In the northeast Atlantic region, changes in the NAO patterns are associated with fluctuations of winter sea surface temperature, wind field and flows entering the North Sea.

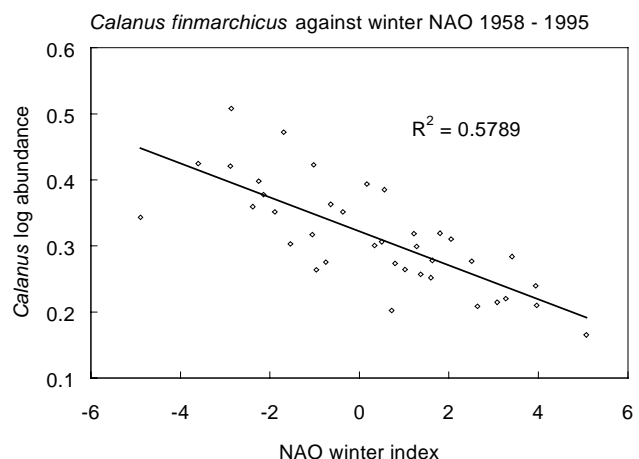
An unexpected result from recent experimental monthly weather forecast studies by the European Centre for Medium Range Weather Forecasting is that European summer type depends rather strongly on late winter/spring anomalies in the North Atlantic.

Linking Climate and *Calanus*

The causes for long-term changes in the populations of *Calanus finmarchicus* are still uncertain but it is likely that, as a result of the overwintering strategy of the species, the winter weather patterns could determine for the abundance of the population in the coming year.

The examination of long-term CPR records is an opportunity to test if the large-scale climatic oscillation constituted by the NAO ultimately alters the distribution and abundance of populations of *C. finmarchicus* in this area.

Indeed, a comparison between the changes in the North Atlantic Oscillation index and the abundance of *C. finmarchicus* in the northeast Atlantic reveals that the two time-series are highly correlated over the period 1958-1995. High NAO winter situations are associated with lower abundance of *C. finmarchicus* than normal and low NAO pattern with higher abundance of the species. The match between the NAO index and *C. finmarchicus* is more than a simple parallelism in their long-term trends as the changes in the two series appear to be synchronised at shorter time scales.



The abundance of *Calanus* was estimated from Continuous Plankton Records. The North Atlantic Oscillation index was calculated as the Winter (December through March) difference of normalised sea level pressures (SLP) between Lisbon, Portugal and Stykkisholmur, Iceland. Data were provided by J.W. Hurrell.

The geographical extent to which the NAO influences *Calanus* abundance is still to be investigated, since another study based on CPR records revealed that long-term changes in the abundance of *C. finmarchicus* at the scale of the North Atlantic basin cannot be extrapolated from northeast Atlantic observations only.

Additional investigation have been carried out within the CPR survey to explore large-scale

variability in the seasonal dynamics of *Calanus* populations and to examine large scale patterns in their diel vertical migration behaviour. ☞

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The CPR survey is operated by the Sir Alister Hardy Foundation for Ocean Science with financial support from a consortium of national and international agencies.

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News about a European GLOBEC initiative

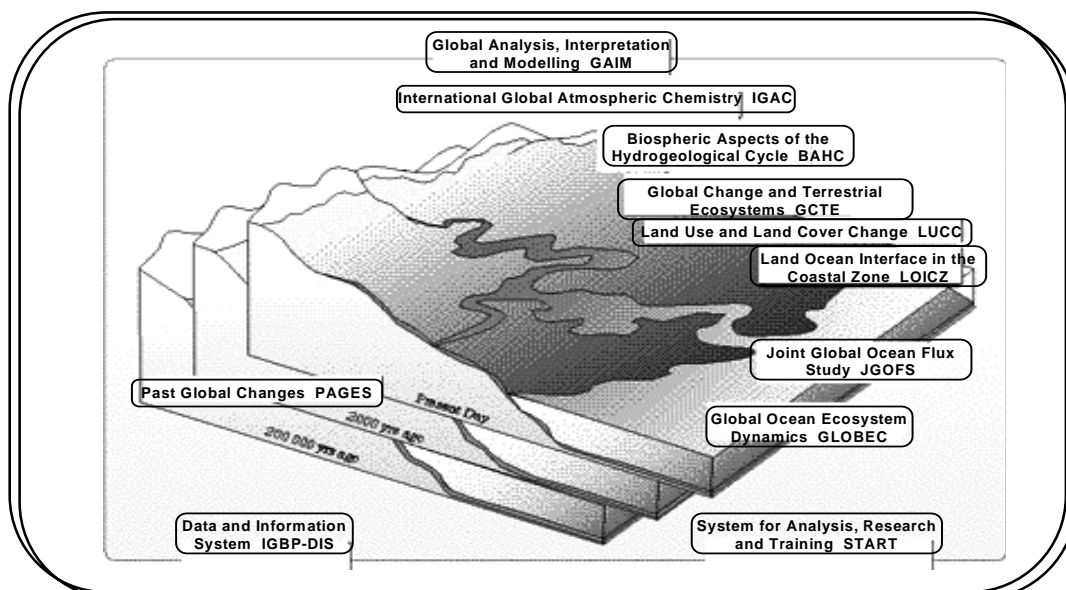
Prospects for a European GLOBEC programme remain uncertain, but an EU funded workshop is planned for this autumn to produce a Science Plan. Whether this plan is implemented by the EU depends on future developments in the fifth research “Framework”, which includes “Unlocking the resources of the living world and the ecosystem” as one of its themes.

Even if the EU does not provide direct funding for GLOBEC, the European Science Plan will help to stimulate community activity and to focus national plans. The TASC programme, which is a major recipient of EU funding at present, demonstrates that such programmes can be pan-Atlantic and can include countries which are not EU members.

The preliminary steering process for the EU GLOBEC workshop was coordinated by the ICES/GLOBEC office, but the workshop itself will be held in Warnemünde, Germany and organised by **Dr J. Alheit**. About 25 scientists from North Atlantic, Mediterranean and Baltic countries will take part, including several from North America.

The principal topics covered by the workshop will be Modelling, Retrospective Analysis, Process Studies, Regional Studies and Technology. The report will be presented to the scientific community and to science policy makers early in 1998, possibly as part of the International GLOBEC Open Science meeting in Paris. ☞

IGBP Global Change Programmes



Where next with Cod and Climate Change?

The Cod and Climate Change (CCC) programme is the ICES regional contribution to the international GLOBEC programme. The aim, to understand how climate variability affects cod stock fluctuations, is simply stated, but the process involved range from effects of small scale turbulence on predator prey encounter, to large scale, interdecadal effects of atmospheric and ocean climate on distribution, growth and recruitment. The underlying philosophy, set out by the CCC Working Group four years ago (ICES CM 1993/G:3, also published as International GLOBEC Report No 4), was to "identify themes and approaches which strengthen and facilitate the scientific programmes being followed at individual or national level and to propose and initiate work which can be carried out more effectively at regional or international level by ICES and GLOBEC." The report then identified a number of unifying themes and set up a programme of workshops which have since met and reported (see the box above, which lists ICES reports and publications).

By next spring another three CCC workshops will have met and it will be timely to take stock of progress made by these and other relevant activities and to set a new course for the further development of CCC. "Other relevant activities" includes the ICES Recruitment Symposium, the GLOBEC Theme Session at the 1997 Annual Science Conference, the TASC programme, the International GLOBEC Open Science meeting (Paris, March 1998), a Workshop on Biophysical Modelling and many individual publications. The "big issues" on the agenda will likely be: (1) how do we apply recently acquired scientific knowledge about the effects of a changing physical and biological environment on cod to improve assessment and management of the stocks? (2) what questions and priorities will most effectively stimulate further progress in understanding the effects of climate variability on cod stock fluctuations? Synthesis, tool building and prioritisation are always difficult, but we need to evaluate the flood of new research and try to make it operational.

The aim of the CCC Workshop on Applications of Environmental Data in Stock Assessment is to design operational tools. The same issues have also been addressed by other recent groups, such as the Canadian Fisheries Oceanography Committee and the Comprehensive Fisheries Evaluation WG. The

latter listed a number of activities which it considered useful for GLOBEC to undertake:

1. find numerical relationships between temperature and growth/recruitment, including error structure;
2. make time series of temperature available for stock assessment modellers;
3. improve short term and long term prediction of environmental parameters;
4. consider design of existing environmental data collection for evaluating effects on fisheries;
5. quantify relationships between environmental variability and catchability.

These have already been addressed to a greater or lesser extent by existing WGs (notably Zooplankton Ecology and Shelf Seas Oceanography) or are included in the terms of reference for planned WGs and workshops. However they require refinement, development and demonstration in order to make a useful and accepted contribution to fisheries evaluation.

The relationship between temperature and growth can serve as an example of some of the difficulties of applying environmental data. There is a considerable amount of recent work on the subject, (e.g Shackell et al 1997 ICES Journal 54: 383-398) which shows that temperature has a very large effect on the growth rate of cod ($Q_{10} = 2.5$). Temperature could be used as an additional explanatory variable in assessments of current and future stock biomass. Obtaining temperature data (and predictions of future temperature fields) is a necessary first step, but it is not sufficient, because we also need to know the (horizontal and vertical) location of the cod in relation to those fields in order to estimate their ambient temperature. Cod do not remain in one location, nor do they spend all (or in some periods any) of their lives on the sea bed. In addition to "normal" seasonal migratory patterns cod may move to maintain a preferred temperature and they have shown vertical migratory behaviour which apparently optimises their metabolism in relation to food availability (behavioural thermoregulation). There are two lessons: (1) we need appropriate environmental data, which, in this case, may be obtained from data storage tags, otolith microchemistry or sophisticated distributional studies; (2) in addition to detailed data on environmental factors we need to understand the (biological) processes by which they act.

The terms of reference for the CCC Working Group and Workshops, which are due to meet in the spring of 1998 will be finalised during the 1997 Annual Science Conference in Baltimore. They will be

critical in ensuring the future shape and relevance of the programme. A new chairman for the CCC Working Group is also required as **Dr Svein Sundby** has announced his resignation.

The CCC programme is a major component of GLOBEC work within ICES, but there is a large amount of other work going on at regional and national level which is not part of the CCC programme. There is also a large amount of work within ICES on environmental effects which is not part of GLOBEC, either because it falls outwith the scope of GLOBEC or because the scientists involved see no benefit in making the association. ☺

Data and Information Exchange for ICES/GLOBEC

One of the principal functions of the ICES/GLOBEC Coordination office is to facilitate data and information exchange between the scientists involved in the programme (e.g this Newsletter).

The CCC Database Workshop (CM 1996/A:7) provided an excellent technical basis for setting up the necessary data systems and their recommendations are being implemented, although perhaps inevitably more slowly than one would wish. An overarching principle which they set out was that the system should be designed to meet actual user needs. They identified four tasks requiring a structured approach to data access, management and coordination:

1. retrospective data analysis by the Backward Facing Workshops
2. assembly of data for between-stock comparisons
3. data and information on global and basin scales to assist with analysis of remote causal links and for embedding regional scale models
4. assistance with acquisition, validation, storage and use of data

Since the Coordinators office is located at ICES headquarters it makes use of the computer facilities there and relies on support from expert staff and the existing data and information systems within the ICES Secretariat. This is a considerable advantage, because of shared data interests in a number of fields and because ICES is actively developing its information systems, particularly by electronic access (via the Web). Reorganisation

within the Secretariat has put all databases within a single "Regional Data Centre" Project and access to the oceanographic, fisheries and environmental databases is being improved.

Information about the ICES/GLOBEC programme is available via the ICES website, so that the timetable of Workshops, Working Groups, Theme Sessions and Symposia is integrated with the overall ICES timetable. Additional information on forthcoming CCC Workshops and other GLOBEC related events, such as the Working Group on Zooplankton Ecology is updated regularly. As plans for the CCC workshops develop over the coming year the GLOBEC website will be expanded to include data sets and documents which participants wish to work on together.

Metadata sets on zooplankton monitoring data and on oceanographic time series have been prepared by the Working Groups on Zooplankton Ecology and Shelf Seas Oceanography respectively and will be accessible shortly. Since cod is the main target species for much of the ICES/GLOBEC programme a major effort has gone into updating stock and early life history information (following the format of Cooperative Research Report 205) and these data, together with the very large reference list (800+ papers on cod) will also be made available.

Further developments will be carried out in discussion with the chairmen and members of Workshops, to meet their needs. In some cases this may require in-house preparation of particular data products and in others it may involve locating and gaining access to data already held in ICES or elsewhere. The extent to which this development will use existing distributed database software, such as the system used by JGOFS and US GLOBEC will depend on user needs and on the capacity of the ICES servers and support.

Access to data is not always easy, because of the increasing practice of charging and because some data are politically sensitive (e.g recent stock levels). Many countries operate an open data access policy for global change research, but this is by no means universal. Even within the ICES data holdings not all the data may be accessed. A declaration on data policy for ICES is being prepared. International scientific cooperation in analysing and interpreting data is essential for programmes such as GLOBEC and we must learn to make full use of our rapidly increasing ability to process and transfer data and information. ☺

Further information on ICES events

Available on the ICES Web Pages (<http://www.ices.dk>). Here is the latest news on meetings and workshops:

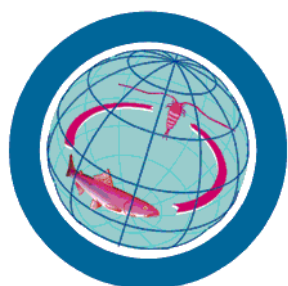
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| Sept 8-10 | Workshop on Prediction and Decadal-scale Ocean Climate Fluctuations of the North Atlantic. Convenor - Dr Svein Sundby. Copenhagen. |
| Sept 26 - 27 | Theme Session on GLOBEC: Results from interdisciplinary programs in the North Atlantic. To be held at the ICES ASC, Baltimore USA |
| September 29 | ICES/GLOBEC Open Discussion Session ICES ASC, Baltimore USA |
| Spring 1998 | Workshop on Applications of Environmental Data in Stock Assessment. To be held in Bergen, Norway |

Dates of other meetings in 1997/98 will be discussed and finalised during the ASC.

In addition you should be aware of the ICES Symposium on Recruitment, 22-24 September 1997, Baltimore. Plans for the TASC Symposium in 1999 are also moving ahead and a preliminary draft of the flyer has been prepared.

If you are interested in contributing to or taking part in one or more of the above Working Groups and Workshops, please get in touch with the ICES/GLOBEC Co-ordinator, Dr K. Brander (keith@ices.dk) for further details. You should note that attendance is restricted and that participants pay their own expenses.

More information about other parts of GLOBEC



GLOBEC
G L O B A L
O C E A N
E C O S Y S T E M
D Y N A M I C S

The best starting point to find information about international, regional and national GLOBEC programmes is the the International GLOBEC website

<http://www1.npm.ac.uk/globec/index.htm>

It maintains links with all other sites as well as carrying a comprehensive calendar of forthcoming events, list of past reports, Newsletter etc. The address is:

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About the ICES/GLOBEC Newsletter

We aim to print a new issue every 6 months or so and it will also be available from the ICES web site. Write if you would like to receive future issues. You are also very welcome to send news items, short articles etc.to:

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