

ICES/GLOBEC Newsletter

Number 11, September 2004



Working Group on Cod and Climate Change

Bergen, Norway 9 – 10 May 2004

The group had a short meeting which was co-convened by Geir Ottersen and Ken Drinkwater, the latter in his last session of a long and extremely productive term. The main business was to review various plans and activities, including:

- the new Strategic Plan for CCC, which has been approved by the International GLOBEC SSC
- developments in relation to the ICES/GLOBEC office and the ICES Secretariat
- the Cod and Climate Book
- the Cooperative Research Report on cod life histories
- plans for future workshops
- relations with other parts of GLOBEC

You can download the full report, (ICES CM 2004/C:13) which includes the Strategic Plan through to 2009, from the website:

<http://www.ices.dk/reports/OCC/2004/WGCC04.pdf>

We aim to obtain additional funding for the programme of workshops over the next four years from some of the new research networks, both European and pan-Atlantic, which are just beginning their activities.

The Cooperative Research Report on cod life histories is in the final stages of editing and you can read the latest drafts for eighteen stocks on the website:

<http://www.ices.dk/globec/CRR/life%20history/overview.htm>

The authors have put in a huge amount of work, for which many thanks. We expect it to be completed and printed later this year, once the summary tables have been put together. The bibliographic database for cod, which has been available on the web for several years, will be updated to include about 2000 references. The website will continue to be used for updating the stock summaries as new information is submitted.

Editorial

by Keith Brander

Climate change and its effects on the marine environment have become common news items over the past year. Hardly a week goes by without a story about coral bleaching, the effects of falling ocean pH, the poleward spread of sub-tropical species or shifting regimes in the North Sea and Baltic. Most of these have a pretty solid basis in new science, but editors find it hard to resist sensationalism in their headlines.

“Climate change lets fishermen off the hook” was a pretty wild misrepresentation of a report which Nature published about a UK Marine Productivity meeting. Exaggeration of real events and climate scenarios is the basis for the special effects used in the spectacular disaster movie “Day After Tomorrow”. Hurricanes really are awesome and the Larsen B ice shelf really did crack, perhaps not as suddenly as in the movie, but imaginative recreation is what makes disaster movies exciting – and makes people think after they scream. Simplification and sensationalism are not so helpful in a debate about the causes of fisheries collapse or changes in species distribution.

The work planned for the Cod and Climate Change programme over the next four years aims to provide an evaluation of the causes of decline and recovery in cod stocks and to develop methods, with a thorough grounding in process studies, for improving our forecasts of the future trajectories of cod stocks under different climate scenarios and management regimes. Some of the results from the CCC programme will be applied in the fisheries section of the next report of the IPCC. They are being incorporated into ongoing work on indicators for ecosystem assessment, integrated regional ecosystem assessments and the evaluation of fisheries induced adaptive change.

Progress with the Cod and Climate book is behind schedule and the submission date at the end of 2004 now looks beyond our reach. Authors have been asked when they expect to complete their manuscripts, so that we can revise the publication timetable.

We propose to hold a Theme Session at the 2005 ASC in Aberdeen, where chapter authors will make presentations about the material which they have covered.

ICES Symposium on Influence of Climate Change on North Atlantic Fish Stocks

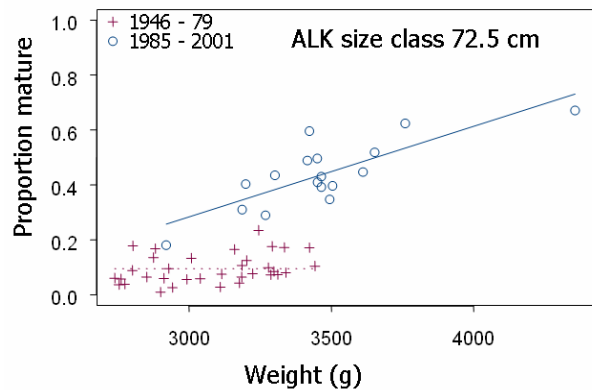
The Symposium, which was initiated by the ICES/GLOBEC Cod and Climate Change Program and co-sponsored by GLOBEC, took place in sunny Bergen on May 11-14 2004. You can read a full account in the International GLOBEC Newsletter and most of the presentations and posters can be viewed on the website (<http://www.imr.no/2004symposium/web/>) so I will just briefly mention a couple of provocative items among the many interesting presentations.

One of the longest and most detailed studies of recruitment processes is for walleye pollock in the Gulf of Alaska - they now have more than twenty years of data on abundances of all early life stages, which can be used to model effects of environmental variables and density dependence. Ciannelli et al. (http://www.imr.no/2004symposium/web/Fr_0950_Ciannelli.ppt) showed that when the Pacific Decadal Oscillation shifted from one phase to another, the control of recruitment variability shifted from environmental effects on larvae to predation on juveniles. This could be fitted using a non-additive model with a threshold for environmental state. A paper is in press in Ecology¹. This and other presentations indicate that it is probably wishful thinking to expect much insight from the kind of simple stock-recruit model currently used in fisheries management. Congratulations also to the Symposium organisers, for ignoring the title of the Symposium and accepting this contribution. The lack of geographic relevance is more than compensated by innovative methodology.

Rätz and Lloret updated previous work on growth and recruitment variation of Atlantic cod off Greenland. (http://www.imr.no/2004symposium/web/Th_1505_Lloret.ppt) They explored the effects of temperature and stock size and concluded that conditions had reverted to being favourable for an increase in both recruitment and growth. Growth rates since 1993 have consistently been among the highest recorded there, but recruitment has not improved substantially.

Marshall examined trophodynamic effects on the maturation of Northeast Arctic cod and concluded that growth, condition and maturation of all year classes changed abruptly in 1984, probably due to interrelated

changes in environment and food supply, principally capelin.



Proportion of Arcto-Norwegian cod in the 72.5 cm size class which were mature in two different time periods. (http://www.imr.no/2004symposium/web/Th_1630_Marshall.ppt)

The abundance of capelin affects the stored energy of cod (as measured by the liver index), which in turn governs the maturation schedule. She did not think that genetic change, brought about by selective fishing, is needed to explain the observed long-term decline in maturation reaction norms (see Heino and Dieckmann's article on reaction norms in this Newsletter last year) and she suggested that changes in feeding condition must be taken into account when analysing changes in maturation.

1. Ciannelli, L., Chan, K.S., Bailey, K.M. and Stenseth, N.C. in press Non-additive effects of environmental variables on the density-dependent survival of a large marine fish population. Ecology.

Presentation material

One of the tasks of the ICES/GLOBEC coordinator is to make presentations at scientific and public meetings about different aspects of the programme. Most of the material used in these talks is available on the ICES/GLOBEC website. The subjects covered include:

- The physical and chemical basis of biological production in the sea
- Indicators for marine ecosystem monitoring
- Use of environmental data in fish stock assessment
- Climate change, fisheries and biodiversity
- Consequences of changing climate for North Atlantic cod stocks and their management
- Effect of climate change on fish distribution and dynamics in the North Atlantic
- All change in the ocean – a public lecture
- Results and plans for the CCC programme - poster

You are welcome to download and use this material: www.ices.dk/globec/data/presentations/index.htm but please make sure that you acknowledge sources and ask me if these are not clear. keith@ices.dk

Trophic Interactions between Zooplankton and Fish under the Influence of Physical Processes

The German GLOBEC Programme

(www.globec-germany.de)

Jürgen Alheit (co-ordinator)

The aim of the programme is to improve understanding of the trophodynamic interactions between zooplankton and fish under the influence of physical processes, in order to elucidate the principal mechanisms accounting for the high variability of copepod production and of reproductive success of fishes. The results will form the basis for strategic modelling of the recruitment success of fishes.

Over the last several decades, herring and sprat and numerous copepod populations, in the Baltic and in the North Sea have experienced considerable fluctuations in recruitment and biomass. In the Baltic the weight of individual herring and sprat decreased substantially when their stock biomass was high, but this did not occur in the North Sea. Limited food supply (mainly copepods) is thought to be the cause in the Baltic, however, it is not clear whether this is due to direct effects of trophic interactions (internal dynamics) in the rather simple Baltic food web, or whether the decrease of some copepod populations is a reaction to physical processes (external forcing). An interdisciplinary team of fisheries biologists, planktologists, physiologists, geneticists, physical oceanographers and modellers is investigating these hypotheses.

The influence of physical processes on (i) zooplankton, (ii) spawning products of herring and sprat and (iii) trophodynamic interactions, is being studied in the Baltic and the North Sea, which are ecosystems with very different oceanographic characteristics. In addition to herring and sprat (planktivorous species with different life histories) their main food species, the copepods *Pseudocalanus spec.*, *Acartia spec.* and *Temora longicornis* will be investigated. The study uses a combination of field work, experimental investigations and modelling. The two seas exhibit a gradient from marine to almost fresh-water conditions. Top-down and bottom-up processes are being compared in both ecosystems. Cohorts of eggs and larvae of herring and sprat are produced at different periods over the entire spawning season and their reactions to the continually changing physical and biological environment are being

compared intra-seasonally and regionally. Field research and modelling is closely coupled in order to enhance our understanding of the two ecosystems. Improved understanding of the mechanisms governing population fluctuations at short time scales are expected to give us insights into the causes of major population fluctuations and ecosystem changes at the decadal scale. Early results shown in the Figure illustrate the importance of different life stages of copepod species for recruitment of Baltic Sea sprat and cod.

The programme, which is being carried out by 80 scientists and technicians from seven different research institutions, started in early 2002. Funding of 4 million EURO is provided by the Federal Ministry of Education and Research (BMBF) for three years, with matching funds contributed by the seven participating institutions. The first phase will terminate in February 2005. Following a presentation of very successful preliminary project results in January 2004 and a positive review by the international review committee, the proposal for the second phase has been recently submitted. The intention is to continue the programme for 3 more years. The results of the first phase of GLOBEC-Germany will be presented in 28 mainly oral contributions at several different Theme Sessions at the ICES Annual Science Conference in Vigo in September 2004.

The International GLOBEC Newsletter in the April 2004 carried a number of articles:
<http://www.pml.ac.uk/globec/products/newsletter/News10.1.pdf>

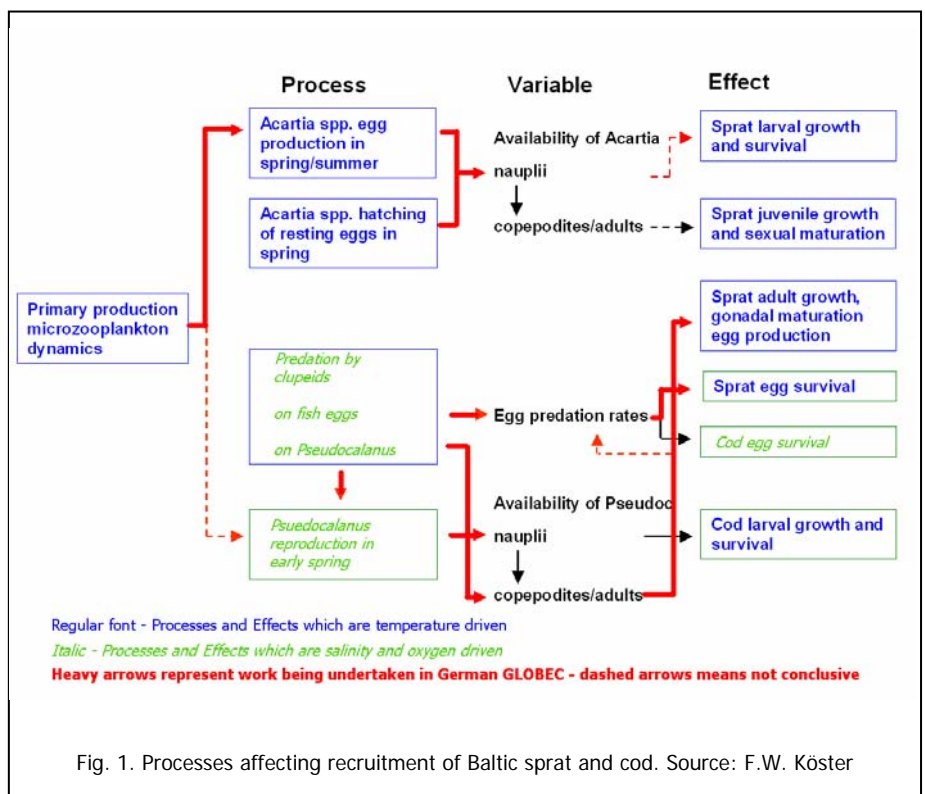


Fig. 1. Processes affecting recruitment of Baltic sprat and cod. Source: F.W. Köster

Supply-Side Ecology and the Response of Zooplankton to Climate-Driven Changes in North Atlantic Circulation

The Mercina Working Group

C.H. Greene, J. Pershing, B.C. Monger, M.C. Benfield, E.G. Durbin and M.C. Casas

Recent findings from oceanographic field studies conducted on both sides of the North Atlantic have dramatically altered our view of how zooplankton populations respond to climate-driven changes in ocean circulation. Shelf populations of the copepod species *Calanus finmarchicus* dominate springtime secondary production in many shelf ecosystems throughout the North Atlantic. Despite their seasonal dominance, these shelf populations must be supplied by advection from oceanic sources or else they would be driven to local extinction. It now appears that the supply of external recruits is not only important to the long-term persistence of these shelf populations, but also central to their dynamics on seasonal to interdecadal time scales. A synthesis of findings from the U.S. GLOBEC Northwest Atlantic Field Study, which has just been published in *Oceanography* (September, 2004), reveals that climate-driven changes in the circulation of the Northwest Atlantic can account for a large amount of the variability in *C. finmarchicus* abundance observed in the Gulf of Maine/Georges Bank region during recent years and over the past half century.

Calanus finmarchicus dominates the springtime zooplankton biomass and secondary production in many shelf ecosystems throughout the North Atlantic Ocean. Despite its seasonal dominance, *C. finmarchicus* is an expatriate species in these shelf ecosystems whose populations must be replenished every year or every few years by advection from external oceanic sources. This dependence on advective supply makes *C. finmarchicus* a good indicator of climate-driven changes in ocean circulation patterns and therefore a suitable target species for climate change research.

The U.S. GLOBEC Northwest Atlantic Field Study was conducted in the Gulf of Maine/Georges Bank region from 1995 through 1999. *C. finmarchicus* was chosen as one of the principal target species for investigation during this field study. While it has long been recognized that populations of *C. finmarchicus* in the Gulf of Maine and on Georges Bank are tightly coupled, recent findings suggest that there is considerable variability in the physical-biological coupling between these two ecosystems. The paper reviews hypotheses suggesting how these physical and biological processes interact seasonally in the two ecosystems. Initially, we focus on the typical or climatological seasonal cycles in the Gulf of Maine and on Georges Bank. Then, we describe anomalies from these seasonal cycles observed from 1995 to

1999. After providing this background information, we develop a synthesis that integrates findings from recent U.S. GLOBEC field studies with retrospective time-series analyses of hydrographic and continuous plankton recorder data. Our goals are (1) to identify key processes regulating the population dynamics of *C. finmarchicus* in the region from 1995 to 1999, (2) to understand how climate-driven changes in the circulation patterns of the Northwest Atlantic affect these processes on interannual to interdecadal time scales, and (3) to present a conceptual framework for studying the trans-Atlantic population responses of *C. finmarchicus* to climate variability and change.



Climate, plankton and cod – making the connections

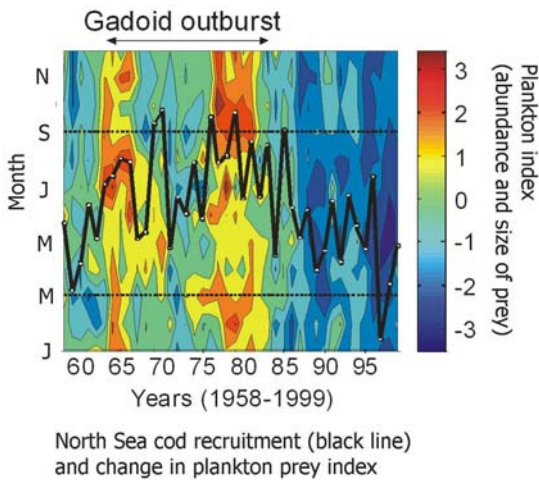
Large scale plankton changes

During the past year, scientists from the Sir Alister Hardy Foundation for Ocean Science (SAHFOS) have published a series of papers¹⁻³ in *Nature* and *Science* describing changes since 1958 in abundance, seasonal timing and composition of plankton in the northeast Atlantic from sampling with the Continuous Plankton Recorder. Climate is identified as the principal cause of the changes, with consequences for productivity, trophic mismatch and specifically cod recruitment in the North Sea.

Satellite imagery also reveals widespread global changes in surface chlorophyll pigments, which have been ascribed to changes in marine production resulting from trends in warming, stratification, nutrient supply and pH. Predicting the consequences of such trends for fisheries production in different parts of the world is not straightforward, but will be given careful attention in the fourth IPCC report, which is in the initial drafting stage and will be published in 2007. Unfortunately the Theme Session at the ICES ASC on this extremely important topic has been cancelled due to lack of papers.

The paper on plankton effects on cod recruitment in the North Sea¹ measured the changes in the feeding environment for cod larvae since 1958 in a number of ways, including the size composition of copepods and their seasonal abundance. The resulting indices matched the increases in recruitment which took place in the mid 1960s (and led to the "gadoid outburst") as well as the decline from the mid 1980s on. The paper generated substantial publicity, particularly when representatives of the fishing industry used it to claim that the decline in the North Sea cod was due to climate, not overfishing. The journal *Nature*, in which the paper appeared, even lent some weight to this claim, with a news item⁴ misleadingly headed "Climate change lets fishermen off the hook". Such an either/or view of the decline in cod biomass is a bit like blaming ones overweight on either too much food or lack of

exercise. Unlike food and exercise, which we can control fairly easily, fishing is hard to regulate and climate virtually impossible.

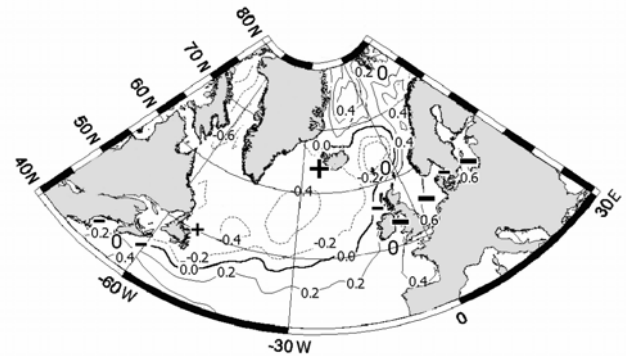


These publications are very relevant to the Cod and Climate Change programme and there has been a regular interchange of ideas and data with colleagues at SAHFOS. Many of the issues which they raise will be addressed by CCC workshops over the next couple of years. The workshop on Impact of Zooplankton on Cod Abundance and Production in 2005 will be looking more closely at processes by which variability in plankton dynamics may govern cod recruitment. The way in which climate indicators may affect cod dynamics will be dealt with by workshops in 2006 and 2007.

Using climate indicators

Numerous papers have related interannual variability in cod recruitment to temperature, with positive effects at the cold end of the range and negative effects at the warm end. Since there are many ways in which temperature may affect growth and survival of early life stages and since the distribution of the early stages is often not well known (e.g. in the North Sea), it is not easy to specify the appropriate measure of interannual variability in temperature when trying to evaluate past effects and predict future climate effects. Taking a different approach, Bob Mohn and I⁵ analysed data from 13 cod stocks to investigate whether variability in cod recruitment could be linked directly to a climate indicator, the North Atlantic Oscillation (NAO). This approach does not resolve the processes which govern recruitment directly, but it has a number of advantages: the winter NAO index is expressed by a single annual figure, which does not have local values and is available in April each year; the index is widely used in studies of long term ecological change (including plankton changes in the North Sea) and is the subject of considerable research effort into the behaviour of the global climate system. We showed, by fitting a stock-recruit model for cod with the NAO index as a variable, that there was a consistent effect of the NAO on cod recruitment. The geographic

pattern of the NAO effect among stocks was identical to the influence of the NAO on sea surface temperature (SST) and other climate variables. Thus, for example, all six European cod stocks south of 62°N respond to the NAO in the same (negative) way. The NAO may be acting via its effect on temperature, but the process may also involve the kinds of plankton changes which Beaugrand et al.¹ found to affect recruitment.



Symbols (+ 0 -) show sign and strength of NAO effect on cod recruitment. Contours show correlation between NAO and SST.

These results provide new insight into interpreting major historic changes in cod recruitment and also into expectations for the future. They strengthen the view (expressed in the BF4 report⁶) that the "gadoid outburst" in the North Sea was due to changes in the NAO and in SST. Since then the underlying climate state has shifted in a direction less favourable to cod recruitment. The expectation from climate models is that the trend towards positive NAO states will continue⁷.

There is a further twist in the tale. A pooled frequency analysis of all six European cod stocks south of 62°N⁸ shows that the NAO effect on recruitment is only significant when the spawning stock is low. This reinforces the message that environmental and fisheries effects interact and must be dealt with together when developing strategies for fisheries management.

1. Beaugrand, G., Brander, K.M., Lindley, J.A., Souissi, S., and Reid, P.C. 2003. Plankton have effect on cod recruitment in North Sea. *Nature*, 426: 661-664.
2. Edwards M. and Richardson A.J. 2004 Impact of climate change on marine pelagic phenology and trophic mismatch. *Nature* 430: 881-884
3. Richardson A.J. and Schoeman D.S. 2004. Climate Impact on Plankton Ecosystems in the Northeast Atlantic. *Science* 305: 1609-1612
4. Schiermeier, Q. 2004. Climate findings let fishermen off the hook. *Nature*, 428: 4.
5. Brander, K.M., and Mohn, R. 2004. Effect of North Atlantic Oscillation (NAO) on recruitment of Atlantic cod (*Gadus morhua*). *Canadian Journal of Fisheries and Aquatic Sciences* 61: xxx-xxx.
6. Heath M.R and Brander K.M. (eds) 2001 Report of the Workshop on Gadoid Stocks in the North Sea during the 1960s and 1970s. ICES Cooperative Research Report 244 55pp.
7. Gillett, N.P., Graf, H.F. and Osborn, T. 2003 Climate Change and the North Atlantic Oscillation. in Hurrell, J.W. et al. (eds.) *The North Atlantic Oscillation: climatic significance and environmental impact*. American Geophysical Union, Washington DC.
8. Brander K.M. 2005 Cod recruitment is strongly affected by climate when stock biomass is low. *ICES Journal of Marine Science* (in press). ☺

Workshop on the Impact of Zooplankton on Cod Abundance and Production

June 2005, ICES HQ, Copenhagen

Co-convenors - Ø. Fiksen and J. Runge

Early stages of zooplankton are important prey for larval and early juvenile stages of cod. For most cod stocks *Calanus* sp. are the main prey, while in some areas, e.g. the Baltic, other species dominate. Survival and growth through these early stages have been shown to be critical for establishing a strong cod year class in some cod stocks. A better understanding of zooplankton-cod linkages is therefore an important step towards better early estimates of year-class strength and thus recruitment to the cod stocks. The workshop will examine relations between temporal and spatial dynamics of zooplankton and early stages of cod. Issues to be addressed will include how timing of zooplankton production and spatial dynamics of nauplii relates to the spawning and distribution patterns of early stages of cod and ultimately cod recruitment. Links between later stages of cod and zooplankton will also be addressed. A combination of statistical data analyses, process studies and a variety of modelling approaches will be applied. The workshop will build on the results of the 2002 workshop and the 2003 theme session on transport of cod eggs and larvae as well as output from the ICES 2003 Zooplankton Symposium.

The terms of reference have yet to be finalised by the co-convenors. The draft to date is:

- to determine the zooplankton species in the diets of cod, their temporal and spatial changes;
- to determine the variability in zooplankton populations and their relationships to cod;
- to examine the vital rates (growth, reproduction, mortality, recruitment) of zooplankton which are relevant to cod life histories ("stock assessment" of zooplankton);
- to determine how the timing of zooplankton production and spatial dynamics (including patchiness) of nauplii relates to the spawning, distribution and survival of early stages of cod; to establish the links between zooplankton and later stages of cod.

Regional Ecosystem Group for the North Sea

REGNS is a Study Group of the ICES Advisory Committee on Ecosystems. Its task is to develop a "proof of concept" regional integrated ecosystem assessment of the North Sea.

The ministers at the 5th North Sea Conference in Bergen in 2002 agreed to implement an ecosystem approach to the management of the North Sea. They invited ICES and GLOBEC to consider the priority science issues and contribute to their development. The ICES/GLOBEC Coordinator took part in the 2004 REGNS meeting and acted as a liaison with the International GLOBEC programme. The report of this meeting is at www.ices.dk/reports/ACE/2003/REGNS03.pdf.

There will be a meeting of REGNS on 21 September at 1800h, during the ICES ASC in Vigo to meet with representatives from contributing Working Groups and to present and discuss the objectives for the proposed workshop meeting in 2005. This will:

1. outline REGNS objectives, process and timetable
2. present examples of integrated assessments and of summary data and indicators
3. discuss the role of ICES data centre and Secretariat. ☺

Ecosystem Studies of Sub-Arctic Seas (ESSAS)

A new regional GLOBEC program is being developed entitled Ecosystem Studies of Sub-Arctic Seas (ESSAS). The goal of ESSAS will be to compare, quantify and predict the impact of climate variability on the productivity and sustainability of Sub-Arctic marine ecosystems. The area included is the northern North Atlantic (Barents Sea, Nordic Seas, Iceland region, Greenland shelves, Newfoundland/Labrador shelves, Gulf of St. Lawrence and Hudson Bay) and North Pacific (Bering Sea, Sea of Okhotsk and the Oyashio Shelf Region). In the works for the past 3 years, the ESSAS science and implementation received tentative approval from the GLOBEC Scientific Steering Committee in April of 2004, pending favourable external reviews. These were forthcoming, but with suggestions for some changes. Their recommendations were incorporated and a revised Science and Implementation Plan was delivered to the GLOBEC IPO in mid-September. It is expected to obtain official GLOBEC status as a regional program soon.

Several factors make these Sub-Arctic seas unique: exchange with the Arctic Ocean, seasonal ice cover, freshwater from ice-melt and runoff, dramatic seasonality, reduced sunlight and low biodiversity. They also support stocks of commercial fish that not only generate a major portion of the fish landings of the nations bordering them, but also support subsistence fishers along their coasts, as well as vast numbers of marine birds and mammals. Recently, changes in species abundance or distribution have been observed within several Sub-Arctic marine ecosystems, which appear to correlate with fluctuations in the physical environment. These areas

are also expected to undergo the largest anthropogenic-induced climate change, which would have major economic and societal impact. ESSAS therefore will address the need to understand how climate change will affect the marine ecosystems of the Sub-Arctic Seas and their sustainability.

ESSAS will investigate, within the Sub-Arctic Seas, the connections between external forcing mechanisms and the hydrographic structure and physical processes as well as between climate-forced changes in physical aspects of the marine environment and the responses of the biota of the Sub-Arctic Seas. It also aims at providing forecasts of how Sub-Arctic marine ecosystems might respond under future climate scenarios.

ESSAS will leverage knowledge and resources from: 1) recently completed studies of the Sub-Arctic Seas, 2)

ongoing national and international programs, and 3) international programs addressing global change. The results of prior research in the Sub-Arctic Seas provide a strong foundation on which to build. Important within ESSAS will be the comparative approach, through which insights can be gained that would not be possible by examining a single Sub-Arctic region alone.

Several members of the ICES/GLOBEC WGCCC have been involved in the development and planning of ESSAS and the syntheses and future work from the CCC program will provide valuable information to ESSAS.

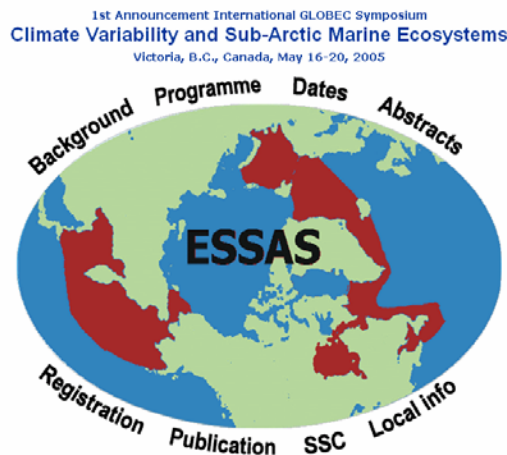
As a start to the ESSAS program, an international Symposium on the Effects of Climate Variability on the Ecosystems of Sub-Arctic Seas is planned for May of 2005 (see below).

Working Groups, Workshops and Study Groups

Meeting title	Convenors	Location	Dates (2005)
Working Group on Modelling of Physical/Biological Interactions WGPBI	C. Hannah, Canada	Hamburg, Germany	March/April
WG on Zooplankton Ecology WGZE	S.Hay, UK	Lisbon, Portugal	4-7 April
ICES-EuroGOOS Planning Group on the North Sea Pilot Project NORSEPP	M Holt UK	Brussels, Belgium	11-13 April
WG on Oceanic Hydrography	A. Lavin, Spain	Rhode Island, USA	11-14 April
ICES-IOC Steering Group on GOOS SGGOOS	W.G.Harrison, Canada and IOC	Brest, France	10-11 June
Workshop on Impact of Zooplankton on Cod Abundance and Production	Ø. Fiksen, Norway and J. Runge, Canada	ICES HQ	June
Working Group on Cod and Climate Change WGCCC	G. Ottersen, Norway	by correspondence	

Symposia in 2004/2005

The CCC program is supporting the new GLOBEC regional program, Ecosystems of Sub-Arctic Seas (ESSAS). ICES has been invited to co-sponsor a Symposium as a kick-off to the program and to aid in development of its implementation plan. The symposium provides the opportunity to highlight what is known about each of the sub-Arctic regions and to begin to compare and contrast how the ecosystems function. It will provide a forum for presentation of recent results from national programs focusing on Sub-Arctic Seas



and the opportunity for exchange of ideas between researchers from different Sub-Arctic Seas. The plans are to publish the proceedings of the meeting in a primary scientific journal. A 1-day workshop will follow the Symposium to further develop and refine the implementation plan for ESSAS, and to develop the ways and means to begin to carry it forward. It will also provide a gauge by which to measure progress within ESSAS, much as the Cod and Climate Change Symposium held in 1993 has done within the CCC program.

Further information from:
www.pml.ac.uk/globec/structure/regional/essas/symposium/announcement.htm

2nd GODAE Symposium

1-3 November 2004
St Petersburg, Florida

Background

The Global Ocean Data Assimilation Experiment (GODAE) is a pilot project of GOOS (the Global Ocean Observing System). GODAE is taking advantage of the advances in ocean observations from satellites (e.g., Jason) and autonomous instruments (e.g., Argo) to develop advanced analyses and model assimilation estimates for the ocean. Beginning with an initial concept for GODAE and after consulting widely with the community, a new generation of products and forecasts is emerging from GODAE prototype systems, ranging from regional and global short-range ocean forecasts to high-fidelity estimates of ocean climate. These products are expected to benefit a wide range of users. While some are positioned to derive immediate benefit, intermediate service providers will be needed to tailor the products to enable many of the users to extract full value from the products. GODAE is implemented through innovative new partnerships in pilot projects and the development of global and regional systems, with a common commitment to sharing core facilities and functions.

Purpose and Objectives

The Second GODAE Symposium will bring the scientific community developing GODAE capacity and products together with the existing and potential users and exploiters of those products. Based on the developers' knowledge of the capability and potential, and the users' views of what is useful and valuable, its aim is to develop specific actions that will better attune GODAE to the needs of the user community, enabling that community to assess the extent to which GODAE is relevant to them.

Specific objectives are:

- To hear from, and learn to understand, the requirements for ocean information.
- To understand the role GODAE can, or might, play in satisfying the requirements.
- To develop an understanding of the modalities for working between these communities and forming mutually beneficial partnerships.
- To develop guidance concerning measures of effect, both objective in terms of GODAE system skill scores, and subjective in the form of evaluation and feedback.
- To identify high priority projects that should form the focus of GODAE during 2004-2007, and beyond.
- To identify issues that should be addressed by GODAE or its partners in the research community.

Keith Brander and Brad de Young will be co-convening Break-out group 3 at the Symposium on Marine Ecosystems management: fisheries and biogeochemistry. GODAE aims to develop models and estimates of the ocean state that are useful for such applications, both within research and in practice. This Session will test the degree to which global and regional ocean model data assimilation systems are meeting this challenge, for shorter high-resolution time scales and for the larger scales of climate. What aspects are giving realistic information, and where do the communities need to adapt/change in order to facilitate greater integration and collaboration? Are GODAE products useful for fisheries management and operations? What new products are required?

See the Symposium website for more information:

<http://www.bom.gov.au/bmrc/ocean/GODAE/Symposium%2011/index.html>

This Newsletter is produced by the ICES/GLOBEC programme coordinator: keith@ices.dk

News items, articles and announcements are always welcome.

Remember, backnumbers of all Newsletters are on the website: www.ices.dk

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