Oceanography Committee **ICES CM 2003/C:09**
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Report of the

ICES-IOC Steering Group on GOOS

Nantes, France
9–10 April 2003

International Council for the Exploration of the Sea

Conseil International pour l'Exploration de la Mer

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1 EXECUTIVE SUMMARY

Introduction

SGGOOS met for 2 days at IFREMER, Nantes, France. The meeting commenced with eight presentations covering; the Bay of Biscay pilot project, GoMA-GOOS regional GOOS pilots, GOOS-related activities in the North Pacific, the North Sea Pilot (NORSEPP), recent developments in the International Bottom Trawl Surveys (IBTS), the Nordic Seas AMOEBE initiative, summary of EuroGOOS activities, summary of international GOOS activities.

Development of ICES Implementation Plan For GOOS

The recently updated SGGOOS Implementation Plan was reviewed and a number of changes were suggested. This is available from http://ioc.unesco.org/goos/ices-ioc/sggoos.htm.

ICES GOOS Flyer

It was concluded that, although some details were outdated, it is still generally suitable for its purpose. Revisions were deferred until 2005.

ICES Ocean Annual Climate Status Report

The ICES Ocean Annual Climate Status Report is steadily evolving and SGGOOS noted that it will be an important route by which NORSEPP disseminates product to the ICES community.

Awareness and collaboration between ICES-IOC and EuroGOOS

It was noted that NORSEPP is a major overlap between ICES and EuroGOOS. One area where better contact may be made is in the Bay of Biscay – Canaries region. Portuguese representation at SGGOOS would be particularly welcomed.

The ICES/EuroGOOS North Sea Ecosystem Pilot Project (NORSEPP)

SGGOOS endorsed the conclusion from the PGNSP that a full-time co-ordinator for NORSEPP was needed. A number of alternative funding scenarios were considered. It was concluded that the EuroGOOS representative (H. Dahlin) would investigate the possibility of EU funding for a co-ordinator before other options are pursued.

The role of the North Sea IBTS surveys in the North Sea Ecosystem Pilot Project

Progress in the development of IBTS was recognised but the need for better integration of biological and oceanographic data was emphasised. It was suggested that NORSEPP will address this concern. It was also suggested that IBTS spatial data products be presented beside model output in the NORSEPP status report next year.

GOOS Pilot Projects

It was suggested that a theme session in 2005 comparing and contrasting integrated ecosystem pilot projects should be proposed.

The SGGOOS web site

The Steering Group's web site is now up and running (http://ioc.unesco.org/goos/ices-ioc/sggoos.htm) and is a source of increasing amounts of background information.

2 INTRODUCTION

The Co-Chairs (Dr W G Harrison, Canada, and Dr W R Turrell, UK) welcomed members of the ICES-IOC Steering Group on GOOS (SGGOOS) to the meeting. The participants were welcomed by Dr Benjamin Planque (France). The meeting agenda appears in Annex 1, and the participants to the meeting are listed in Annex 2. Membership of the SGGOOS prior to the 2003 meeting is summarised in Annex 3. Six presentations were scheduled for the first day of the SGGOOS meeting, however, the agenda was modified slightly to accommodate two additional presentations. Morning talks highlighted on-going (Bay of Biscay) or new (GoMA-GOOS) potential regional GOOS pilots. In the afternoon, a summary of GOOS-related activities in the North Pacific, under the PICES umbrella, was provided and an update on the North Sea Pilot (NORSEPP) was given. Recent developments related to the International Bottom Trawl Surveys (IBTS) were summarised and a new 10-year model-based multidisciplinary research and development initiative in Nordic Seas (AMOEBE) was described. The presentations on Day-1 were concluded with a summary of EuroGOOS activities over the last year and recent international GOOS activities (GSC, I-GOOS) were summarised on the morning of the second day. The remainder of day-2 was set aside to address the points of the Terms of Reference for the 2003 SGGOOS meeting not covered in the presentations.

Key points from the presentations and subsequent discussion on Day-1 were:

3 DAY 1 – ICES-IOC/EUROGOOS/GOOS INFORMATION EXCHANGE

3.1 France

A major symposium on the Bay of Biscay project was held in late 2002. Some 60 presentations were made, covering each of the project themes. Some examples of the scientific results from the symposium were described (see Annex 4). A number of technical questions about specific aspects of the project were posed by SGGOOS members but overall, the breadth and significance of the work was considered impressive and the value of this project developing into a regional GOOS pilot was recognised. Integration of the various elements still seems to be one of the greatest challenges. One of the aims of Phase I is to develop operational tools for integrated monitoring and assessment and progress is being made in that area. Questions arose regarding the "policy drivers" behind the Bay of Biscay project concept and why there were not international collaborators (i.e., regional alliance), particular with Spain and Portugal that share jurisdiction and resources in the region. There is apparently no structure within IFREMER to foster such collaboration. Discussion then turned to what role SGGOOS or EuroGOOS could play in broadening participation in the project. One outcome of this discussion was the recognition that there are no regional GOOS activities from the English Channel to the Canary Islands; EuroGOOS is addressing this "gap" through one of two new task teams (Bay of Biscay/Iberian coast). Phase I of the project ends in 2004 and the prospects for a Phase II are not certain yet but are being considered.

3.2 Canada/USA

Significant progress is being made in developing a GOOS regional alliance (GRA) between Canada and the USA through the development of pilot project for the Gulf of Maine area, GoMA-GOOS (See Annex 5). There are a number of attributes that make the Gulf of Maine attractive for a GOOS pilot; important among those is the extensive oceanographic and living marine resource monitoring that has gone on in the region for several decades and the history of research collaboration and shared governance of the Gulf. This pilot will also test specifically the efficacy of the concept of ecosystem-based fisheries management (EBFM) and, along with the NORSEPP project, add an important living marine resource element to the suite of existing and growing number of GOOS regional pilots. A draft project proposal has been completed and task teams are being formed to address technical issues such as data sharing protocols, data product development, etc. It is anticipated that the project will start in 2003/2004, run for 5 years and will be funded primarily from internal resources from the major players – the Canadian Department of Fisheries and Oceans and the US National Marine Fisheries Service. Discussion concentrated on investment (in dollars and human resources) to run the pilot and funding options being considered. It was also noted that the development of this pilot contrasts the Bay of Biscay project, i.e., the conceptual framework for GoMA-GOOS was developed before the project began whereas the Bay of Biscay got underway before the data integration framework was fully developed.

3.3 PICES

Efforts are underway in the Pacific Northwest to inventory and consolidate ecosystem monitoring activities for the long term under the auspices of PICES, and with support from a number of private endowments and research projects (see Annex 6). The Coastal Alaska Observing System (CAOS) is a newly formed consortium trying to pull the various regional agencies together. Various legislative pressures (e.g., the Endangered Species Act in the US and the Species at Risk act in Canada) have made it clear that a better understanding of ecosystem dynamics and an ecosystem approach to resource management is needed. The MONITOR Task Team in PICES will host a session to develop and review its first

Ecosystem Status Report for the North Pacific at the PICES annual meeting in the fall of 2003. Discussion highlighted the numerous parallel developments within PICES and SGGOOS at the moment as they relate to ecosystem monitoring and GOOS. It was concluded that PICES and SGGOOS should continue to exchange information and ideas. It was noted also that ICES and PICES began the process of establishing formal ties at the last (2002) ASC.

3.4 Norway

A new decade-long program called AMOEBE (A Model-based and data-driven Operational Ecological Biomass Indicator) was described (see Annex 7). AMOEBE is a research project for developing a model-based tool to integrate existing and new multi-disciplinary knowledge and data from physics to whales into a new system for assessing the historic, present and future state (and uncertainties) of the marine ecosystem of the Nordic Seas. The main product for fisheries management is to develop an operational system which, through increased understanding of the dynamics of ecosystems, can improve the advice to management with respect to fish and marine mammal stocks of the Barents and Norwegian Seas. Discussion focused on technical aspects of the project, e.g., how will the model(s) accommodate the requirements of the broad user community with diverse needs and what role will the collection, analysis and reporting of observational data and data products play in this model-based project. A range of models will be employed to address the broad range of temporal/spatial scales of information required. In addition, data collection and integration will be an integral part of the project. Education and capacity building will also be an important component of the project and are needed to strengthen national competence in ecosystem-based resource management. The project will involve some 100 researchers and is anticipated to begin in 2005.

3.5 ICES (IBTS)

An historical overview of development and implementation of the International Bottom Trawl Surveys (IBTS) was provided (see Annex 8 and 9). The ITBS has gone through a number of name changes and national representation since its beginnings in the early 1960s. More recent activities, e.g., the inclusion of trawl data from the western and southern divisions since 1997 was described. The DATRAS project, to consolidate and standardise IBTS trawl data is nearing completion and the policy for data access (annex to this SGGOOS report) and the kinds of data products being generated were summarised. Oceanographic data collected during the IBTS cruises are freely available shortly after collection from the ICES web site at http://www.ices.dk/ocean/projects/ibts as are some time series and spatial products of the database. The IBTS oceanographic database extends back to 1970. Since 1992, information on winds, swell and surface currents are also being collected on the surveys. Data on invertebrates are not collected as part of IBTS. The issue of how to better integrate IBTS data into proposed GOOS-related monitoring activities (i.e., NORSEPP) was brought up – and more fully addressed in the presentation on the North Sea pilot that followed.

3.6 ICES/EuroGOOS

A comprehensive overview of the planning steps and current status of the ICES/EuroGOOS North Sea Ecosystem Pilot Project (NORSEPP) was given (see Annex 10). National/international policy drivers behind NORSEPP were reviewed and an illustrated definition of an operational (ocean) observing system (OOS) was provided using NORSEPP as the model. In addition, a framework for an ecosystem approach to resource management was proposed using the NORSEPP example, taking into consideration the current structure and function of ICES and its assessment working groups. It was concluded that in order to accommodate an ecosystem-based management framework within ICES, the current structure and function of the various assessment Working Groups will have to be modified in the least and perhaps be totally revamped. A back-of-the-envelope calculation was made of the projected costs for running NORSEPP compared with the costs for the fisheries surveys and assessments; NORSEPP costs would represent about 2% of the fish assessment costs. The need for action soon on the implementation of NORSEPP was recognised and a plan was proposed. NORSEPP participants were identified and an agreement was made to produce a provisional status report on the North Sea for inclusion in next year's ICES Climate Status Summary. It was also agreed that summary presentations should be made to certain of the ICES assessment Working Groups as well. Much of the discussion that followed focused on the structure of the report (i.e., themes, rationales, data products and interpretation). There was general agreement that the magnitude of the work ahead dictated that a full-time project co-ordinator would be required. A number of potential funding options for a co-ordinator were discussed and will be further explored. For the 2004 report, however, it was agreed that the work would probably have to be done within the resources available at the participating labs/institutes.

3.7 EuroGOOS

EuroGOOS activities since the last SGGOOS meeting were reviewed (see web site for presentation). The goals of EuroGOOS: to promote operational oceanography, coordinate contributions to GOOS and foster and build infrastructure for operational ocean observing through binding national agreements were reiterated. The 2002 EuroGOOS conference on operational oceanography in Athens was apparently a great success. Two new task teams

were formed in 2002: one to address GOOS activity gaps in the Bay of Biscay /Iberian coast region and one to deal more specifically with ocean climate (and interface with OOPC). EuroGOOS's capacity building activities have been enhanced with the introduction of summer schools in 2003.

3.8 IOC

Colin Summerhayes (IOC) summarised a number of major GOOS-related activities over the past year;

1) The major review of GOOS was completed (Headed by Paul Mason) and will be presented at the June 2003 IOC Assembly. The Review Group deemed the overall structure of GOOS satisfactory, although some minor streamlining was suggested. Special scientific advisory panels report to the GOOS Steering Committee (GSC) that addresses scientific and technical issues. The GSC, in turn, reports to the Inter-governmental committee (I-GOOS) that deals with GOOS policy issues. I-GOOS reports to the IOC Assembly. JCOMM is a new body shared by IOC and WMO and tasked with implementing the technical aspects of GOOS.
2) The first I-GOOS Regional Forum met in Athens in 2002. This was the first gathering of representatives of all GOOS Regional Alliances (GRAs) and was held along with the EuroGOOS conference on Operational Oceanography, providing an opportunity for exposure of GRA representatives to "best practice" in implementing operational ocean observing. The EuroGOOS conference was considered a great success, drawing some 300 registered participants.
3) The Coastal Ocean Observations Panel (COOP) completed work on its Design Plan. The near-final draft is available on the GOOS web-site (http://ioc.unesco.org/goos/docs/GOOS_125_COOP_Plan.pdf), and a hardcopy glossy with be available in the summer, 2003. The next step will be development of the COOP Implementation Plan, which has already begun. The issue of panel composition is being discussed, i.e., whether or not new members/expertise will be required. All GOOS activities (pilot programmes) are encouraged to insure that the 18 core variables are included in their observation programmes, in addition to "regionally enhanced" list of variables.
4) The sixth GOOS Steering Committee (GSC) meeting focused on, among other items, COOP development, the Global Ocean Data Assimilation Experiment (GODAE), and the Argo profiling float project. The first major meeting of GODAE scientists was held in June, 2002 and was a very successful meeting (250 participants). Good progress is also being made in ARGO float deployments (720 in water to date). The target 3,000 appears achievable, although the target date has slipped to 2006. Coverage is good (as anticipated) in the Northern Hemisphere and emphasis for future deployments will focus on the under-represented southern hemisphere.
5) An Ocean Information Technology Project has begun. Ocean data analysis systems are considered primitive compared to the massive data exchange systems of banks and airlines, for example. This project will endeavour to open communication with these business entities to access information on their technology (hardware/software) for application to ocean data. The project is headed by Neville Smith and their first meeting is November, 2003. Action/implementation plans are expected in about 2 years.
6) The GSC has asked a small task team (headed by Mike Sinclair) to work intersessionally to develop a suite of "indicators" addressing the observation objectives of COOP-GOOS. A draft report has been produced.
7) The GSC discussed (Action 30) how ICES can link with COOP and OOPC to develop an integrated, comprehensive North Atlantic-wide observing system. SGGOOS was proposed to take the lead in developing this idea.
8) I-GOOS will continue to use the Regional Forum concept as a mechanism to link GRAs. A policy for registering a GOOS Regional Alliance has been developed and will be implemented for future GRAs. GRAs will be required to report to the Regional Forum once every two years. This will provide a better inventory of GOOS activities world-wide than presently exists.

In the discussion that followed, it was noted that these general overviews are helpful for SGGOOS members to better understand the complex structure, linkages and reporting of GOOS. It was noted that the evolution of GOOS will mean that the ToRs of GSC, I-GOOS and JCOMM will change to reflect their linkages, i.e., GSC is advisory, I-GOOS is policy and JCOMM is technical implementation. The 1998 GOOS glossy will be updated soon to reflect the growth of GOOS activities and evolving structure. It was noted that IOC plays an important role in fostering development of new GRA's by providing "seed funds" for secretariat support until regional funding sources are in place. Since GRA's tend to solve their own regional technical problems, the question arose as to the need for JCOMM? It was explained that JCOMM plays a vital role in the integration of the various large-scale climate observing systems, i.e., it is more concerned with the climate component of GOOS (OOPC), whereas the GRAs are more COOP-oriented.

Recommendation/action: The SGGOOS Co-Chairs were encouraged to consider making presentations on SGGOOS purpose and activities at the next GOOS Regional Forum (Spring 2004. Pacific) and/or I-GOOS meeting (Spring 2005, Pacific).

4 DEVELOPMENT OF THE IMPLEMENTATION PLAN FOR ICES INVOLVEMENT IN GOOS (TOR A)

4.1 Review the revised ICES and GOOS Implementation plan, the ICES GOOS, and the ICES standard sections and stations, (ToR A.i)

ICES GOOS Implementation Plan

The recently updated SGGOOS Implementation Plan was reviewed and a number of minor changes were suggested. Specifically:

1.b. The ICES-IOC contacts list should be updated and gaps filled.

Recommendation/action: ICES (Dooley) will update ICES/IOC contacts list. Contacts list will be included as 2003 SGGOOS report annex (see Annex 15). ICES will seek nomination of a Portuguese member to SGGOOS.

1.i,j. New lines will be added indicating that SGGOOS will invite outside organisations to participate in the steering group as required. As a start, a PICES observer will be invited to future SGGOOS meetings to enhance exchange of information and ideas since parallel planning for Pacific observations systems are underway at this time. The importance of insuring that we have U.S. representation at our SGGOOS meetings was emphasised.

Recommendation/action: SGGOOS Co-Chair (Harrison) will contact PICES (Ian Perry) to determine interest in attending the 2004 SGGOOS meeting, and discuss the prospects of attending future SGGOOS meetings with the US member (W Gabriel).

3.a. NORSEPP will be included

3.b. Wording will be changed to reflect that the SGGOOS will work with the IBTS working group to fully utilise data and data products of the IBTS surveys in general, i.e., not restricted to the North Sea surveys.

4.a. Wording change to indicate the SGGOOS website will be maintained.

4.b. Wording will be changed to reflect that workshops on operational indicators will be developed.

The IOC representative (C. Summerhayes) explained the reasons for changing "ICES-GOOS" in the Implementation Plan to "ICES and GOOS".

Recommendation/action: C. Summerhayes agreed to make revisions to the Implementation Plan after he has seen the draft of this report.

ICES GOOS Flyer

The ICES-GOOS flyer was reviewed. It was concluded that some small details were outdated (e.g., the contact person) but it is still generally suitable for its purpose. Changes will be necessary in future considering new developments such as the implementation of NORSEPP. It was agreed, however, that revisions will be deferred until 2005 at which point it will be reviewed again and updated accordingly.

Recommendation/action: SGGOOS to reconsider the GOOS flyer in 2005.

ICES Standard Sections

The ICES standard sections and stations were reviewed briefly. It was reported that improvements in the ICES Ocean Annual Climate Status Report are steadily evolving and that they will be an important component of NORSEPP.

4.2 Review progress towards enhancing mutual awareness and collaboration between ICES/IOC and EuroGOOS, (ToR A.ii)

This ToR was primarily met by the first day of presentations reviewed above, during which ICES, IOC and EuroGOOS members exchanged information. Discussion specifically on this agenda item focused on the need to make some concrete progress in the implementation NORSEPP. The preceding REGNS and PGNSP meeting were deemed very successful at setting milestones and plans of action to move NORSEPP along in the next year. The significant progress

made in the development of the NW Atlantic pilot was also recognised and discussion continued on how to fill the Bay of Biscay to Canaries gap. It was mentioned that Portugal is a member of ICES but not EuroGOOS. It was suggested that Hans Dahlin (EuroGOOS) should approach the IOC national contact for Portugal, Mario Ruivo.

Recommendation/action: EuroGOOS (Dahlin) to approach Mario Ruivo concerning Portuguese participation in GOOS. ICES (Dooley) to encourage Portuguese ICES Delegate to nominate member to SGGOOS.

4.3 Review progress in the promotion of the ICES Annual Ocean Climate Status Summary, (ToR A.iii)

It was noted that the IAOCSS now appears routinely on the ICES web site, along with the other ICES status reports. The further development of the IAOCSS is an integral part of the NORSEPP proposal.

Recommendation/action: IOC (C. Summerhayes) agreed to approach the JCOMM management committee to seek an invitation for a presentation of the ICES Climate Status Report (and other ICES Status reports) at the next JCOMM meeting in spring 2005.

4.4 Review progress in the development of the ICES/EuroGOOS North Sea Ecosystem Pilot Project (NORSEPP), (ToR A.iv)

Much of the discussion focused on the conclusion from the PGNSP meeting that a full-time co-ordinator for NORSEPP was needed. A number of alternative funding scenarios were considered, as discussed at the PGNSP meeting and reviewed in the NORSEPP presentation on Day-1. The question of whether an FP6 proposal should be reconsidered was discussed but the consensus of opinion was that NORSEPP is not broad enough for consideration for the networks of excellence avenue. It was concluded that the EuroGOOS representative (H. Dahlin) would investigate the possibility of EU funding for a co-ordinator before other options are pursued.

Recommendation/action: EuroGOOS (H. Dahlin) to approach Alan Edwards (DG 12) about the prospects of the EU funding a NORSEPP co-ordinator.

ICES (H. Dooley) was asked if the NORSEPP co-ordinator could reside at the ICES secretariat if funding was found, and the initial response was positive.

4.5 Review progress in enhancing the role of the North Sea IBTS surveys in the North Sea Ecosystem Pilot Project, (ToR A.v)

Progress in the development of IBTS was recognised but the need for better integration of the fish and oceanographic data was emphasised. It was suggested that NORSEPP will address this concern. It was also suggested that IBTS spatial data products be presented beside model output in the NORSEPP status report next year. The IBTS data access document was then discussed further (Annex 9).

4.6 Plan a workshop on variability in North Atlantic basic scale circulation over recent decades and its forcing of (biological) variability in adjoining shelf ecosystems policy, (ToR A.vi)

There was considerable discussion about what approach SGGOOS should take to move the idea of a North Atlantic variability workshop forward. SGGOOS was reminded that the plan to develop a comprehensive and integrated Atlantic-wide ocean observation framework was discussed at the inception of SGGOOS, as an integral part of the SGGOOS Implementation Plan which has been endorsed at all levels in GOOS. IOC (Summerhayes) described a way forward based on the planning and implementation steps followed by the highly successful GODAE and ARGO projects. Members of the SGGOOS felt that, at least in the short term, emphasis within the existing SG has to be placed on getting NORSEPP (and other coastal pilots such as GoMA-GOOS) off the ground. It was suggested that there will likely be a need to capture an entirely new community (new people, resources) to move a North Atlantic initiative along in parallel with the GOOS regional pilots. It was agreed that IOC (C. Summerhayes) and the SGGOOS Co-Chairs would work intersessionally on drafting a strawman discussion paper to get the planning started. Summerhayes suggested that a "champion" was needed and Hein-Rune Skjoldal was suggested as a possible candidate. It was also mentioned that perhaps a discussion group could be organised at the 2004 ASC to recruit interested parties in helping organise a North Atlantic observation system conference. However, it was questioned if the ICES ASC would draw the range of ocean expertise that would be needed.

Recommendation/action: C. Summerhayes, W. Turrell and G. Harrison to work intersessionally to draw up a "strawman" discussion paper on how to move the North Atlantic observation system planning forward. Results to be presented and discussed at the 2004 SGGOOS meeting.

4.7 Review progress in other potential pilot projects, (ToR A.vii)

Much of this agenda item was dealt with under Day 1 above. There was a suggestion that the Bay of Biscay project should be highlighted at an upcoming ICES ASC but it was noted that there are already major meetings planned to report on results of the project in the next year or so. It was suggested that a theme session in 2005 comparing and contrasting integrated ecosystem pilot projects might be useful and this was considered a good idea by the SG members.

Recommendation/action: Turrell to put forward a suggested Theme Session to the Consultative Committee for 2005 entitled "Comparing and contrasting the scientific strategies and output of regional ecosystem pilot projects".

IOS (Summerhayes) subsequently provided SGGOOS with the GOOS-endorsed definition of a "pilot project":

"A GOOS pilot project is defined as an organised, planned set of activities with focused objectives designed to provide an evaluation of technology, methods, or concepts within a defined schedule and having the overall goal of advancing the development of the sustained, integrated ocean observing system."

4.8 Review changes in drivers for GOOS in ICES, (ToR A.viii)

The SGGOOS Co-Chairs have previously discussed this at the ASC meeting in 2002 and have started compiling the information. They requested that members of the SG send any information they had on national drivers.

Recommendation/action: All SGGOOS members to review relevant national and international policy drivers which currently are creating the need for holistic assessments, and ecosystem approach to fisheries management, operational observing systems (OOS) and pilot projects, and send information to SGGOOS Co-Chairs.

Recommendation/action: IOC (C. Summerhayes) to supply a paper on the WSSD 2002 Policy and implementation documents.

Recommendation/action: The Co-Chairs (Turrell and Harrison) will work intersessionally to compile national and international policy drivers for GOOS in ICES. They will produce a working paper for review and discussion at the 2004 SGGOOS meeting.

5 SUPPORTING THE ICES SECRETARIAT IN GOOS RELATED MATTERS (TOR B)

5.1 Review progress with SGGOOS web site, (ToR B.i)

This was discussed briefly. The SG members are satisfied with the website's format and content. Some of the early SGGOOS documents (prior to the 1998 Southampton meeting) are missing and will be provided to IOC by ICES (H. Dooley). It was noted that the Implementation Plan and membership list on the website will require updating. With regard to the latter, it was noted that F. Colijn has been a valuable contributor to the recent SGGOOS meetings but is not an official member of SG. He was strongly encouraged to "nominate" himself since he is a national ICES delegate! A number of the PowerPoint presentations from the 2003 SGGOOS meeting will be added to the website; the NORSEPP presentation was considered to be most important for inclusion on the website.

Recommendation/action: IOC (C. Summerhayes) will update the SGGOOS Implementation Plan, membership list and links on the website after he receives a draft of the meeting report. F. Colijn will put his name forward as a member of SGGOOS. Turrell will supply IOC with PowerPoint presentations from SGGOOS 2003.

6 REVIEW THE ROLE OF ICES IN GOOS AND EUROGOOS TAKING INTO ACCOUNT INPUT FROM THE ICES COMMITTEES (TOR C)

6.1 Review of presentations made to GOOS/EuroGOOS, (ToR C.i)

No further discussion of this ToR element was considered necessary in light of the discussion following the EuroGOOS presentation on Day-1.

7 REVIEW COOPERATION WITH THE COASTAL OCEAN OBSERVATION PANEL (COOP) OF GOOS, (TOR D)

7.1 Report on COOP Chair's cooperation with ICES, (ToR D.i)

Tom Malone gave one of the keynote plenary presentations (on a role for ICES in COOP-GOOS) at the 2002 ICES ASC. His presentation was well received but not that well attended, as reported by H. Dooley. Malone also participated as one of the co-convenors of Theme "W" on operational oceanography and he led some lively discussion during that session. Plans for him to spend some time in Copenhagen to get a better understanding of the Advisory Committees did not materialise but it was recommended he be approached again.

Recommendation/action: Tom Malone's ICES PowerPoint presentation should be included on (or a link provided to) the SGGOOS website – action for IOC.

Recommendation/action: H. Dooley and C. Summerhayes will approach Tom Malone again about spending some time (in 2004) with the ICES Advisory Committees.

7.2 Report on presentations made to COOP, (ToR D.ii)

A NORSEPP presentation was made at the Athens EuroGOOS meeting. One of the SGGOOS Co-Chairs is encouraged to attend the next COOP-GOOS meeting in Mazatlan, Mexico (September 2003) and make a presentation on SGGOOS-related activities. It was suggested that as a number of NORSEPP presentations have already been made describing the planning steps, the SGGOOS might consider waiting until 2005 when NORSEPP is well underway and there are concrete results to report.

8 AOB

This concluded discussion of the ToRs for 2003. No AOB arose.

9 ACTIONS FOR SGGOOS MEMBERS

Annex 13 summarises all actions needed by SGGOOS members intersessionally.

10 NEXT MEETING OF THE SGGOOS

The ICES-IOC Steering Group on GOOS [SGGOOS] (Co-Chairs: W.R. Turrell, UK and ICES and W.G. Harrison, Canada and IOC) will meet in Tenerife (Canary Is.), Spain from 20–21 April 2004 to:

a) Develop global and regional linkages between ICES and GOOS bodies;
   i) review planning (flow-chart/milestones) for SGGOOS Implementation Plan,

   ii) review SGGOOS report on national and international policy drivers behind the ecosystem approach to fisheries management,

   iii) review progress in promoting the development of coordinated North Atlantic wide approach to ocean monitoring.

b) Identify and/or develop components and activities by ICES that may contribute to the Global Ocean Observing System;

i) review, through presentations, local (Spanish) observation, monitoring or modelling programs relevant to ICES and GOOS,

ii) review progress on monitoring terrestrial loading (freshwater and nutrients) in the North Sea,

iii) review ecosystem indicators currently under development (IOC, COOP-GOOS, ICES Status Reports) with a view of selecting a core set for the ICES and GOOS regional pilot projects, especially NORSEPP,

iv) review current methods for ecosystem indicator integration.

c) Develop regional ICES and GOOS pilot projects to demonstrate the benefits of taking a GOOS approach in the ICES context;

i) review, through presentations, progress in developing and implementing the NORSEPP pilot project,

ii) review, through presentations, progress in developing and implementing other regional pilot projects, including GoMA-GOOS, etc.

d) Develop appropriate outreach activities to disseminate information about the programme;

i) review SGGOOS report on options for capacity building.

ANNEX 1: AGENDA OF THE 2003 ICES-IOC SGGOOS

Agenda – Day 1 (Wednesday 9 April)

0930 Welcome and Introduction

1000 Initial Presentations

Pilot Projects

1000 – 1030 Update on the Bay of Biscay Pilot Project (Benjamin Planque)
1030 Coffee
1100 – 1130 Planning for a Canada-US GOOS Regional Pilot Project in the Gulf of Maine" (Glen Harrison)
1130 – 1200 Update on the ICES North Sea Pilot Project (Bill Turrell)
1200 – 1230 Efforts toward regional observing systems within the North American areas of PICES (Phil Mundy)
1230 – 1300 Discussion of pilot projects
1300 – 1400 Lunch

International GOOS Activities

1400 – 1430 Update on GOOS Activities (Colin Summerhayes)
1430 – 1500 Update on NOOS / BOOS / EuroGOOS Activities (Hans Dahlin)

1500 ToR a) develop further the Implementation Plan for ICES involvement in GOOS (CM 2001/C:01) including:

i) review the revised ICES and GOOS Implementation plan the ICES GOOS Flyer (its purpose, target readers and content), and the ICES standard sections and stations (their use as a contribution to GOOS),

ii) review progress made towards enhancing mutual awareness and collaboration between ICES/IOC and EuroGOOS,

iii) review progress in the promotion of the ICES Annual Ocean Climate Status summary within the GOOS/GCOS/JCOMM communities and to investigate how this product might be improved to enhance its use in operational aspects of the work of ICES,

1600–1630 Coffee

1630 iv) review progress in the development of the ICES/EuroGOOS North Sea Ecosystem Pilot Project (NORSEPP) and recommend necessary actions,

v) review progress in enhancing the role of the North Sea IBTS surveys in the North Sea Ecosystem Pilot Project,

1800 Close

Agenda – Day 2 (Thursday 10 April)

0930 ToR a) Continued

vi) plan a workshop on variability in North Atlantic basic scale circulation over recent decades and its forcing of (biological) variability in adjoining shelf ecosystems;

vii) review progress in other potential pilot projects (Bay of Biscay, NW Atlantic Pilot, GMES, Gulf of Alaska Pilot - PICES collaboration, FP6 EoIs submitted in 2002)

1030 – 1100 Coffee

1130 viii) review changes in drivers for GOOS in ICES (e.g., OSPAR requirements, EU Directives, EU Marine Strategy).

1200 ToR b) advise and support the ICES Secretariat in GOOS related matters, including;

i) review progress with SGGOOS web site;

1300 – 1400 Lunch

1400 ToR c) review the role of ICES in GOOS and EuroGOOS taking into account input from the ICES Committees, including

i) review of presentations made to GOOS/EuroGOOS;

1500 ToR d) review cooperation with the Coastal Ocean Observation Panel (COOP) of GOOS, including;

i) report on COOP Chair's cooperation with ICES;

ii) report on presentations made to COOP

1630 Close

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SGGOOS "Members" (Not yet nominated by their Delegates) [ATTENDED 2003]

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USA and Canadian GOOS Scientists [ATTENDED 2002]

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Trevor Platt (Canada)
Bob O'Boyle (Canada)
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Savi Narayanan (Canada, JCOMM)
Chris Reid (UK)
Hein Rune Skjoldal (Norway)
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ANNEX 4: THE BAY OF BISCAY PROJECT

The Bay of Biscay Project

(In Press Elsevier proceedings of EuroGOOS III Conference)

Jean Boucher, Philippe Marchand (IFREMER, BP70 - 29280 Plouzané, France)

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Abstract

The Bay of Biscay is important for French fisheries. It is a complex ecosystem scientifically investigated since many years which was chosen by IFREMER to develop a major integrated project for the next decade.

The general objectives are:

(1) To understand interactions between fishing resources, the environment and the human pressure on a regional scale,
(2) To determine how social and economical factors are controlling the behaviour of the various system components,
(3) To analyse, understand and forecast the evolution of the system according to various climatic and economical scenario.

The multidisciplinary project, involving an important IFREMER task team of 80 man/years was launched in 2001.

Keywords: Bay of Biscay, ecosystem modelling, human impact, fishery management

Introduction

The Bay of Biscay is located on the western side of France, between the Brittany and the northern Spanish coast. It is one of the biggest marine ecosystem which was intensively studied during the last two decades, mainly because half of French catches are coming from this complex region and because IFREMER is officially in charge of fish stock assessment. A considerable expertise was accumulated in all disciplines.

What is the *present situation* of the Bay of Biscay?

An evaluation was made by the OSPAR Commission (2000 a and b). All the commercial fish stocks are showing signs of overfishing such as decrease in longevity, decline in abundance, variability. Three quarter of them are beyond their safe biological limit. Despite a decreasing in the power of the fishing fleet, no restoration of stocks abundance occurred during the last twenty years. The explanation is to be found in the adjustment of the fishing capacity and the growth of exploited population within physical and biotic capacity of the ecosystem. Fishing activity impacts on the growth of the population through mortality, selective pressure on stocks and degradation of habitats. In addition during the last two decades, environmental conditions have changed under both climatic variations and the impact of human activities.

Climate variation: the 1990s are characterised by warmer temperature conditions than during the previous century (Planque B. *et al.*, 2002). Especially in south-western part of the Bay of Biscay where the warming reaches values up to 0.6°C/decade. It seems the NAO influence is low because of the location of the Bay of Biscay, between the North Atlantic sub-polar and sub-tropical gyres. As a consequence of the global warming of the region, one can observe the northward migration of tropical fish species (i.e.: *Zenopsis conchifer*) and a change in the main plankton species. *Human impact on the environment*: the increasing fertilisation of the water is a consequence of the development of agriculture and discharge of nutrients into the rivers. Some quiet locations such as the Bay of Vilaine are now subject to anoxia crisis during the summer period. Human activities impacts on the fisheries of the coastal zone where are located spawning and nourricerie areas. The fishing activity itself impacts on the environmental conditions of fish stocks through mortality due to catches, the physical impact of fishing gear on the sea bed, and the low selectivity level of gears.

Because of such crucial changes in the ecosystem of the Bay of Biscay, IFREMER decided in 2001 to launch an ambitious integrated project, after a year of preparation. *The challenge of the Bay of Biscay project* is to understand how the ecosystem respond to the combination of natural changes and human increasing activities and to estimate the socio-economic consequences of those dynamics. The key question is how to preserve in a sustainable way, the environment, the species which live there and their exploitation?

The general objectives of the Bay of Biscay project are:

(1) to understand interactions between fishing resources, environment and human activities on a regional scale,
(2) to determine how social and economical factors are controlling the behaviour of the various system components,
(3) to analyse, understand and forecast the evolution of the system according to various climatic and economical scenario.

The project is mainly fishery oriented. The ultimate goal is to forecast the ecosystem evolution, including catches according with several exploitation scenarios. The complexity of the ecosystem dynamics is very high because it is made of living organisms linked between them, interacting with physical and chemical environment, himself controlled by continental discharge (product of human activity) and climate change. Then the project addresses a large thematic content with *five components* described hereafter:

(1) Physical dynamics of habitat
(2) Population ecology
(3) Communities
(4) Characterisation of the fishing activity, scenario of management
(5) Technological developments

1. Physical dynamics of habitat

The objective is to determine how climate fluctuations are modifying the physical structure of habitat in order to determine the "hydroclimate" of the Bay of Biscay or more simply "the weather which prevails in the ecosystem". The climate variations impact on the biological production through hydrodynamic structures which determine the habitat of species and their migrations during their life and determine the production of food (Fig. N°1). Every specie is able to use in a specific way the physical structures.

The project will then determine typical meteorological situations and associated hydrodynamic disturbances (river inflows, climatic anomalies, wind regimes). It will try to clarify the role of both thermocline and vorticity anomalies as controlling factors of the biological productivity. Hydrodynamic indicators for biology and fishing activity will be constructed.

An other key factor impacting on the dynamic of habitats is the geological nature of the sea bed. In the Bay of Biscay, the "Grande Vasière" is a muddy area of great importance for demersal and benthic fisheries, but this zone is vulnerable because of low thickness. The evolution of such a sedimentary structure is controlled by hydrodynamical process (which determine mud transportation), and the fishing activity which impacts on the sea bed and on the turbidity. One of the question is: did we observed in the past large modifications of the "Grande Vasière" habitat?

First result of the physical dynamics of habitat study: the join analysis of river inflows and abundance of juvenile of soles in the Bay of Vilaine during the last two decades shows a good relation between the juvenile abundance (recruitment) and the climate regime at the beginning of the year. The explanation is that the extension of the river plume determines the area and the production of food (benthic invertebrates) for demersal species.

2. Population ecology

The objective is to understand the effect of the synergies between natural variability and anthropogenic impact on the growth of populations.

The basic principle of fishery management is to adjust, in average, the death rate (through catches) to the birth-rate (recruitment). A consensus exists on the second term, the recruitment, which depends of physical phenomena, production and availability of food. The first term, death rate, results of interactions between the environment and the anthropogenic pressure. Such pressure varies with habitats (i.e.: estuaries, shelf, bays…).

Different populations are considered in the project such as: (1) anchovies which growth depends more of the hydroclimate than exploitation, (2) sole, bass, hake, eel productions are closely dependant of nourriceries located in bays and estuarine areas where anthropogenic impact is great, (3) phytoplankton, first level of the marine food chain, whose abundance is greatly determined by physical disturbances. Cinetics of such populations will be simulated in various biological models taking in account anthropogenic and climatic perturbations.

3. Communities

The nature of the observed changes in production and species structure depends on the relative part of anthropogenic and climatic impacts in the communities' dynamics. These impacts can be synergetic or antagonistic. Concerning human activities, anthropogenic nutrient runoff from land catchment basins changes the primary production and the species structure of the phytoplankton community; exploitation by fishing changes the species structure of the high levels of the food web. Concerning environment, climate change alters the surface of habitat areas, hydrological conditions of transport, time and level of food production available to the various stages of life history. These changes may spread through the food web. An illustration of the evolution of various trophic flows in the Bay of Biscay during the 1973–2000 period is given in fig. N°2.

4. Characterisation of the fishing activity, scenario of management

The first objective is to characterise the present structure of activities related to the exploitation of living resources of the Bay of Biscay and to determine the evolution's factors of these activities. The second one is to simulate the evolution of resources as a response to new management scenarios.

A better knowledge of the behaviour of fishing firms regarding the past regulation measures is essential for two main fisheries: the coastal exploitation along the south Brittany, the demersal exploitation of the Bay of Biscay and in the Celtic sea. The controlling factors to quantify are economical (incomes and costs, market prices…), institutional (access to the resource, general rules), environmental (short term or long term fluctuations), technical (fishing gears, innovations).

Several management scenario will be tested from extreme one's (i.e.: individual quotas) to softer one's (i.e.: modification of rules). New scenario will be envisaged such as limitation of bycatches or multiyear stock management. Forecasts will be performed to estimate the acceptable ecological objective (according with climatic scenarios) and the economical efficiency of the envisaged measures.

5. Technological developments

To understand how the ecosystem is functioning in order to forecast it, especially for fisheries, it is necessary to build and run complex physical and biological models. To perform good forecasts, those numerical models need to be calibrated and fed by at-sea data. Most of data are coming presently from scientific cruises and are transmitted in delayed mode. In order to collect more regular data, and to increase their flux, IFREMER will develop and deploy adapted marine instruments. Among them:

Multibeam echosounder (MBES): it is developed in cooperation between IFREMER and Simrad for specific needs of fishery research and will be installed on the R/V Thalassa by 2005. With a refined angular resolution of 2° in a widened across-track angular sector of 60° to 80°, the MBES is a very innovative system which will perform the job of 30 narrow-beam echosounders! It will allow (1) the detection of demersal species closed to the bottom, (2) a detection of pelagic schools 30° across-track central sector and a 3D both morphological and energetic description, (3) to analyse the fish behaviour (i.e.: fish avoidance of trawl).

Multiparameter fixed station: the idea is to monitor biomass and environmental parameters evolution at a fixed location. It is a new concept which will give an Eulerian description of the water column in fishing areas, complementary of the annual fish survey made by research vessels. A first test of horizontal detection was recently performed with success giving an acoustic detection of schools at more than a 2 Km distance in the 12KHz band.

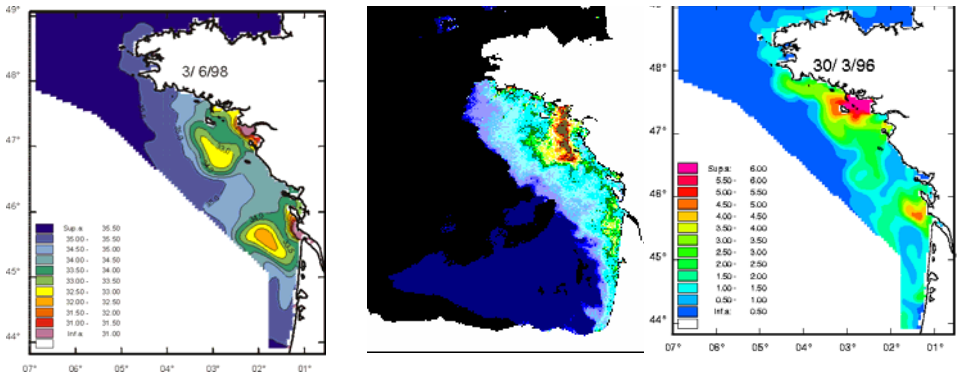
Deployment of *autonomous profilers*, derived from the oceanic profiler Provor, to get systematic temperature and salinity profiles.

The effort in the field of fishing gear technology will be put on tests of *more selective fishing trawls*, evaluation of trawl's impact on the sea bed.

Conclusion

The Bay of Biscay project is very ambitious and everyone is conscious that forecasting the evolution of such a complex ecosystem in all dimensions is not for the next coming years. Nevertheless the integrated approach will obliged various disciplines to interact and specialists to work together. For the next four years, IFREMER is deploying an important task team, with 80 men/year, 1.5 Million Euros/year and about 5 months of dedicated scientific cruises.

Figures



3D hydrodynamic modelling -salinity

Satellite ocean colour (Sea WiFS)

Coupled bio-physical models - Chl a

Figure 1 Habitat dynamics - Physical process

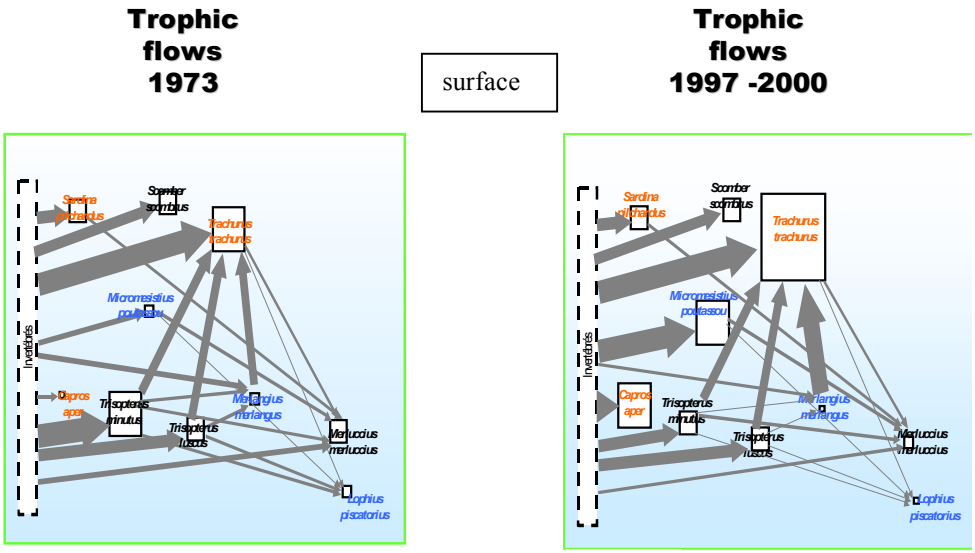


Figure 2. Evolution of trophic flows in the Bay of Biscay (1973 -2000).

Between 1973 and nowadays a shift of the main trophic flows is observed for the benefit of the prey species and the pelagic ones and to the detriment of demersal predator species of most important commercial value. The positive effect of climate warming on the Sardine (*Sardina pilchardus*) biomass is not observed probably because Sardine is depleted by fishing in the Iberian Peninsula. The Horse mackerel (*Trachurus trachurus*) and Boarfish (*Capros aper*) biomass increase probably because of a stronger effect of warming than the fishing effect. Blue whiting (*Micromesistius poutassou*) biomass increases despite warming is unfair probably because its main predators decrease. Whiting (*Merlangius merlangus*) biomass decreases because of fishing and the negative effect of warming. Hake (*Merluccius merluccius*) and Anglerfish (*Lophius piscatorius*) decrease: they are overexploited and climate warming may be unfair to the Anglerfish.

Climate and exploitation can interact negatively so as no temporal trend may be observed (Sardine) or positively so as trends may be observed (Anglerfish, Whiting).

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ANNEX 5: PLANNING FOR A CANADA-US GOOS REGIONAL PILOT PROJECT IN THE GULF OF MAINE

Planning for a Canada-US GOOS Regional Pilot Project in the Gulf of Maine, "GOMA-GOOS"

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Two meetings were held in 2002 among scientists from the Canadian Department of Fisheries & Oceans (DFO-BIO and SABS) and the National Marine Fisheries Service (NMFS-Woods Hole) to discuss common interests in and feasibility of developing a pilot project for COOP-GOOS in the Gulf of Maine area.

The Gulf of Maine area has several attributes that make it an attractive location for a GOOS regional alliance (GRA) pilot COOP-GOOS. There has been extensive research on the oceanography and marine ecology of this highly productive shelf sea over several decades, due in part to the concentration of research institutes in close proximity (at for example Woods Hole, Boothbay, St. Andrews and Halifax). The USA and Canadian governments have conducted extensive monitoring activities since the 1960s, with additional more spotty information on some parameters from earlier decades. In recent years, there has been extensive research on the role of climate change on biological productivity and on population dynamics of selected species as part of JGOFS, GEOHAB and GLOBEC. These multi-disciplinary programs have enhanced our understanding of oceanographic and ecological processes that are of importance to ecosystem structure and function. Also, oceanographic monitoring activities have been recently enhanced under the Gulf of Maine Ocean Observing System (GoMOOS).

There are conflicting multiple uses of the Gulf ecosystem; including fisheries, oil and gas, aquaculture, waste disposal, eco-tourism, marine transportation and recreation. Given the transboundary character of many of the issues, and the shared jurisdiction, there is a growing need for scientific and technical advice.

Changes in international and national legal instruments have created a regime shift in the management of ocean activities; from ad hoc consideration of sectoral issues within relatively narrow conservation constraints, to integrated management of multiple ocean uses within the context of broad ecosystem objectives. These changes in ocean use management have been driven by such international instruments as the Convention on Biological Diversity (CBB), the FAO Code of Conduct for Responsible Fisheries, and the 2002 Reykjavik Declaration on Responsible Fisheries and the Marine Ecosystem.

The scientific community is responding to this "regime shift" in oceans management at all levels. Within the 2002 Strategic Plan of the International Council for the Exploration of the Seas (ICES) there is a strong emphasis on research, monitoring and advice in support of ecosystem-based management. The Census of Marine Life (CoML) is addressing the urgent need to address understanding of changes in marine biodiversity at the seascope, species and genetic levels - a regional pilot is under development in the Gulf of Maine area (GoMAP). At the national levels both United States and Canada are grappling with the technical challenges of implementing ecosystem-based fisheries management (EBFM) in a practical manner. The United States and Canada have a trans-boundary advisory committee for fisheries issues in the Gulf of Maine area (TRAC). This committee is beginning to include ecosystem considerations within their advice on fisheries management activities. Canada has initiated a pilot on integrated management of ocean uses on the Eastern Scotian Shelf (ESSIM), an area contiguous and upstream to the Gulf of Maine ecosystem.

These new challenges of the implementation of integrated management require the enhancement of monitoring systems that will provide the indicators necessary for decision making. The combination of history of marine observations, expanding multiple uses of this marine ecosystem, and the shift in management philosophy make the Gulf of Maine area particularly relevant to the goals of COOP-GOOS. The pilot has ambitious objectives. It is expected that the Gulf of Maine Area GRA will identify generic issues of interest to governance of COOP-GOOS at the global scale. The second objective, linking the products of the basin scale observations and models of the North Atlantic to shelf circulation and mixing models, should accelerate the utility of observational activities associated with the climate module (OOPC) of GOOS. The work should address questions on the accuracy of the global coupled ocean/atmosphere climate models. The third objective addresses the efficacy of present monitoring activities in the Gulf of Maine area - are they sufficient for the needs of EBFM? The last two objectives deal with making the data products and indicators available in a timely manner to a broad range of clients. Without an information support system, and ongoing interpretation and synthesis of the observations the monitoring activities of COOP-GOOS will not be sustained.

A draft proposal has been written and planning is proceeding with the designation of task teams to better develop: (1) national roles and responsibilities and project management structure, (2) data exchange protocols and (3) data integration and product development. Initially, funding and human resource requirements will be covered internally

(from DFO and NMFS). It is anticipated that the pilot will start sometime in late 2003/early 2004 and last five years. Contacts are Mike Sinclair (Canada) and Mike Sissenwine (USA).

ANNEX 6: PICES EFFORTS TOWARD LONG-TERM MARINE OBSERVING SYSTEMS WITHIN NORTH AMERICA

PICES Efforts Toward Long-term Marine Observing Systems within North America

Phillip R. Mundy

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PICES efforts toward long-term marine observing systems within North America and the North Pacific are currently focused on the efforts of three organisations; 1) Gulf of Alaska Ecosystem Research and Monitoring (GEM, Exoon Valdez Oil Spill Trustee Council), North Pacific Research Board (NPRB, U.S. federal), and the (Southeast) Sustainable Salmon Fund (SSSF, International Pacific Salmon Treaty, U.S.-Canada). All three are relatively new, created circa 1999 – 2000, and are financed by earnings on funds of approximately U.S. $ 380 million now in hand. Alaskan efforts are coordinated by a newly formed Coastal Alaska Observation System (CAOS; federal, state, nongovernmental), U.S. national efforts are coordinated by the Integrated and Sustained Ocean Observing System (IOOS), and international efforts are coordinated by the PICES MONITOR Task Team. Existing elements of the observing system conducted under the auspices of PICES with support from GEM and NPRB deploy a continuous plankton recorder from volunteer observing tanker vessels on a trans-Pacific route (Vancouver, Canada to Hokkaido, Japan) and eastern Pacific route (Valdez, Alaska to Long Beach, California, USA), and a thermosalinograph and fluorometer on the eastern route. In addition, GEM is supporting an observation mooring at the site of the longest continuously observed oceanographic station in Alaskan waters, GAK1. Future prospects are to develop operational fisheries oceanography projects in the northern Gulf of Alaska, and to place long-term funding under existing ocean observing stations and projects that lack dependable funding. The end point is a system of coupled biophysical models that can advise natural resource managers, however this appears to be in the distant future. Opportunities for ICES-PICES cooperation are in the development of ferry box systems for the Alaska Marine Highway System, and advice on development of biophysical models. An opportunity for ICES- PICES cooperation is the MONITOR Task Team meeting on the North Pacific Ecosystem Status Report, at the October 2003 PICES meeting in Seoul, Korea.

ANNEX 7: AMOEBE: A MODEL BASED AND DATA-DRIVEN OPERATIONAL ECOSYSTEM BIOMASS ESTIMATOR

AMOEBE: A Model Based and Data-Driven Operational Ecosystem Biomass Estimator

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A 10-year multidisciplinary research and development project plan to improve the understanding of the dynamics of the marine ecosystems, and to produce a tool to meet the future increasing demands for an ecological approach to marine management based on precautionary principles.

SUMMARY AND MOTIVATION

Fisheries and fish farming represent Norway's largest export value based on renewable resources (second largest in total), and Norway is the world's second largest export nation of fish and fish products. The national goal is to increase the export value from 30 to 150 billion NOK in the period 2000 to 2020. The value of the fisheries for the national economy is assumed to be manifold of the export value.

To reach this goal investments are needed in many fields, not the least on creating new knowledge related to the fisheries and the marine environment. Therefore the broad Norwegian research communities within oceanography, meteorology, fishery and marine biology, ecology, mathematics, system theory and fisheries management have decided to cooperate in the development of AMOEBE. AMOEBE is a 10-year research project for developing a model based tool to integrate existing and new multi-disciplinary knowledge and data from physics to whales into a new system for assessing the historic, present and future states of the marine ecosystems of the high north, as a function of the main driving forces on the systems; variable climate/weather and harvesting/fisheries. Effective observations of the ecosystems include complementary observations from ships, satellites, buoys and maybe aircraft and autonomous underwater vehicles (AUV). This includes the development and implementation of modern technology within the fields of marine instrumentation, information and communication.

Since there will be a shortage of marine scientists, the involvement and training of PhD students will be a significant activity within AMOEBE. This may amount to 30–50 candidates, most of which will continue as post docs on the project.

The development of AMOEBE will yield significant impacts upon a number of important sectors of the Norwegian society, being an investment not only for increased knowledge, but also to prepare for the future international demands to proper management of the oceans. Demands for documentation of sustainable fisheries management within healthy oceans may be a significant "driving force" on the export market and the fisheries, (as already seen in the US Pollock fisheries where lack of ecosystem knowledge and documentation leads to quotas far below precautionary principles). In this respect AMOEBE will also have to deal with large-scale transport and distribution of pollution (nuclear waste, organic pollutants, production water from offshore industry, harmful algae, etc.). Not just because the pollution may have an effect on the ecosystem, but also because it may have a major effect on the export market.

In addition to improved qualitative and quantitative multi-disciplinary knowledge of the marine ecosystems supporting the new demands to ecosystem management, we foresee:

- Significant contributions to a sustainable management of the marine biological resources with a potential gain of 20 % in an economic sector with at present an annual export value of 30 billion NOK, (expected to increase to 100–200 billion within 2020).
- Participation of a number of small to large Norwegian companies within engineering an information/communication technology being potential suppliers of subsystems and services in the development and operation of the AMOEBE system (Telenor, ABB, Oceanor, Kongsberg Maritime, Simrad, Scanmar, Aanderaa Instruments, Predictor, Triad, etc.)
- The knowledge and operationality of AMOEBE offers a global market for Norwegian products and services, with unforeseen spin-off effects as seen e.g., in relation to the US space programme.
- Information of significant interest to a number of offices within the Norwegian state administration.

It is a great organisational, communicational and management challenge to have the "whole" marine research and technology sector working together towards a common goal. Therefore the work is organised in 11 modules (see list of content), with short descriptions below and detailed descriptions and plans in Part 2 of The AMOEBE Plan. When funding is made available, detailed action plans and milestones will be made where the work and funding is distributed among participating institutes (including purchase of foreign competence) according to who is best suited for solving the individual challenges. The action plans will be updated annually. Parts of the work and funding will be made open for competition and held back for solving unforeseen but necessary challenges.

OBJECTIVES AND EXPECTED ACHIEVEMENTS

The overall objective of AMOEBE is to improve our understanding of the ecosystem dynamics and to apply this in an ecological approach towards the future demands to management advice based on precautionary principles. The specific goals are through national and international cooperation to develop an operational model-based system for describing and quantifying the various levels and interactions of the ecosystem related to the commercially exploited (or exploitable) stocks of fish, plankton and marine mammals in the Norwegian Sea and the Barents Sea. This includes further development of the methodology and technology to measure the state variables in the ecosystem and to estimate the standing and future stock sizes and distributions. It also includes the establishment and evaluation of "optimal" harvesting control rules.

This formulation of objectives is to a large extent overlapping with the four first strategic goals for ICES:

1) Understand the physical, chemical and biological processes in marine ecosystems.
2) Understand and quantify human impact on marine ecosystems, including the living marine resources.
3) Evaluate options for sustainable marine industry, specially fisheries and fish farming.
4) Develop protocols for sustainable use of living marine resources and protection of the marine environment.

The main planned and expected achievements will be:

- Advanced integrated knowledge of the northern marine ecosystems.
- Advanced methodology related to quantitative marine ecologic understanding and assessment of marine resources, including uncertainty estimates.
- Advanced operational information on the present and future state of the marine ecosystems.
- Advanced methodology to quantify the development of the stocks for the following years under varying climate and harvesting strategies.
- Advanced competence, knowledge and methodology for producing management advice and strategies for sustainable harvesting of the marine resources.
- Increased recruitment of scientists to the marine sector.

Additional achievements will be:

- Evaluation of future feed sources (also plankton) for fish farming and the possible effect on the ecosystems.
- Improved methodology for estimating the threats from pollution against the marine ecosystems and the fish farming industry.
- A major step to fulfil our international obligations and the future demands for a documented ecological approach to fisheries management based on precautionary principles.
- Position Norway internationally on top within marine ecology and resource management, with a potential gain of 20 % in an economic sector with at present an annual export value of 30 billion NOK, (expected to increase to 100–200 billion within 2020).
- Creation and implementation of new technology, products and services with unforeseen spin-off effects for Norwegian industry.
- Evaluation of cost/benefit improvements within the total management advice system.
- A unique national (and international) cooperation within marine ecology, which will continue long after the project termination and secure more focused connections between fisheries and science.

INNOVATION

Two main key words of AMOEBE are multidisciplinary integration and cooperation. Today a lot of good knowledge on parts of the ecosystem, data and observational systems, modelling tools and management advisory experience are spread all over Norway and internationally. Internationally we have the 100-year old ICES organisation a good job in integrating the fishery data is maintained. For the North Atlantic, ICES is the main organisation for developing annual advices to the governments on the harvesting policy purely based on the biological status.

However, in present-day management, species interactions and relations between living resources and the environment are considered only fragmentarily and in rare cases. The management of fish in the Northeast Atlantic is mainly focused on keeping spawning stocks next year high enough for the recruitment not to be severely hampered, with no or little consideration of what is good management on the long run. These are basic national and international challenges and the innovation of AMOEBE.

In Norway, the Institute of Marine Research (IMR) in many ways acts as a miniature ICES. However, much of the marine ecosystem and technological knowledge are located outside IMR, and still the research funding policy is based on national competition rather than cooperation. Within EU they have also seen the problems with lack of cooperation and integrated and useful knowledge. Therefore they are planning on having Large Integrated Projects within the 6th Framework Programme. It will be highly desirable to have the "whole" Norwegian marine research community (in cooperation with industry and international research and management bodies) cooperating towards a multidisciplinary and integrated system (AMOEBE) for understanding and quantifying the dynamics of the northern ecosystems, with the aim of serving the goals for sustainable long term management based on ecological and precautionary principles. We anticipate this will lead to a new curriculum and exiting future perspectives for marine science and ecosystem management.

To design, implement and operate such a multidisciplinary system (never built before) is very demanding and will require an innovative approach to reach optimum solutions. First of all it will be a technological and scientific challenge of System Integration, to have the 11 different modules of AMOEBE to work together and exchange necessary information to ensure that the final deliverables are given with sufficient quality and reliability. A major challenge will also be the proper handling and assimilation into the model system of the many different kinds of observations in the form of remote sensing data, catch data, buoy data, tagging data etc. This also includes the validation of the usefulness of data and the need for new critical data to improve the system behaviour. It also includes improvements of mathematical process formulations/parameter estimations and uncertainty estimates of individual state variables. Furthermore, it is a general challenge for the development and dissemination of new products (described below) to be operational useful for management and of interest to other scientists, industry and the general public.

Obviously the AMOEBE concept has to obtain an international scientific acceptance and usage first of all within the ICES system. Except for minke whale (assessed by the International Whaling Commission), the assessment of all the key stocks in AMOEBE is carried out in different ICES working groups with quality control and final advice through the ICES Advisory Committee in Fisheries Management. The annual management decisions (quotas and other regulations) are for several of the northern stocks made by the mixed Norwegian-Russian Fisheries Commission. Herring is handled by a 5-part group (Norway, Russia, the Faeroes, Iceland, EU). Regulations for saithe and minke whale are made by Norwegian authorities.

One of the main problems with fisheries management today is that the managers do not sufficiently follow the scientific advice. Innovative thinking is therefore also required on how to communicate the developed harvesting control rules and the medium to long-term effects of different harvesting strategies.

At last we anticipate that the development of new technology or new composition or use of existing modern technology may give benefits to industry, and that the know-how built in AMOEBE may in itself be exportable and have unknown spin-off effects.

MAIN DELIVERABLES

The main product for the fisheries management is to develop an operational system which through increased understanding of the dynamics of the ecosystems can improve the advice to the management with respect to fish and marine mammal stocks of the Barents Sea and the Norwegian Sea, where Norway along with Russia dominate the fisheries. The most important stocks are: Northeast Arctic cod, Norwegian spring-spawning herring and Barents Sea capelin. Other important stocks to be considered are: Shrimp in the Barents Sea, polar cod, Northeast Arctic haddock, Greenland halibut, Northeast Arctic saithe, blue whiting, mackerel, redfish, harp seal and minke whale. (The Institute of

Marine Research (IMR) in Bergen and Tromsø has the responsibility for providing management advice for all these stocks). In addition zooplankton may become an important food-source for the fish farming.

The specific products (in addition to the achievements mentioned earlier) the system shall deliver can be arranged according to forecast, nowcast and hindcast, and shall include:

- Estimates of the historic to present stock sizes (numbers at age and length, biomass) and their spatial distribution.
- Prediction (time scale: season-some years) of the above quantities (based on recruitment success, mortality, growth rate, maturation and condition factor) for given fishing scenarios and predicted climate or climate scenarios.
- Long-term (decades) prognoses.
- Quantification of uncertainties of the above estimates.
- Synthesis of optimum harvesting strategy in relation to ecological objectives, precautionary principles, and/or single species long-term biological objectives, combined with simple economical or political management objectives.

To be able to deliver these products, a set of "continuous" (bottom-up) sub-products will be delivered:

- Ocean circulation and marine climate status and short time prediction (years-season-days) that may affect the stocks.
- Concentration and distribution of marine primary production (food for zooplankton) and underwater light intensity (affecting vertical migration and visual predation).
- Concentration, distribution, stage composition and stock size of zooplankton (especially C. *finmarchicus*), and prediction of next year stock size.
- Overlap in time and space ("exposure time") between prey and predators (drift and migration) for estimation of mortality and growth (affecting recruitment, maturation and conditioning factor).

One product will also be a set of recommendations regarding what type of measurements that should be acquired, and where and when monitoring activities should be carried out in order to obtain optimal AMOEBE-system performance.

In addition the system will form a basis for a similar approach necessary for estimating the threats to fisheries and ocean farming due to pollution and harmful algal blooms. The potential products of such a pollution module would be to estimate and predict the:

- Distribution and concentration of contaminants and harmful algae.
- Pollution exposure time (dose) on plankton, fish, shellfish, macro algae and ocean farms.
- Possible long and short term biological effects.

A potential development of a pollution module will require additional chemical experts and data and computer resources, but the additional investment cost will be much less since the framework will be laid in the AMOEBE project.

ANNEX 8: INTERNATIONAL BOTTOM TRAWL SURVEYS

International Bottom Trawl Surveys

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INTRODUCTION

In the North Sea pre-recruit surveys are made chiefly for the four gadoid species: cod, haddock, whiting and Norway pout and for herring. There are differences in both the times of spawning and the main spawning areas of these species.

Cod and saithe spawn relatively early in the year, from January to April, haddock from January to May and whiting from February to July. However, there is considerable geographic variation in

spawning time within the overall spawning area of each species; spawning begins three to four weeks earlier in the southern than in the northern North Sea. The North Sea gadoids do not have well defined spawning grounds. However, in general terms one can state that spawning by haddock, saithe and Norway pout takes place mainly in Division IVa (northern North Sea), whereas for cod and whiting Divisions IVb (central North Sea) and IVc (southern North Sea) are of greater importance as spawning areas.

Herring are quite different from the gadoid species in that the majority spawn in the North Sea in the autumn-winter period and have well defined spawning areas. There is a progression in the time of spawning as one goes from north to south with spawning taking place in August/September around Orkney and off the Aberdeenshire coast, in September/October off the north-east coast of England and over the Dogger Bank, and in November in the Channel and Sandettie area. Less than 10% of the North Sea stock are spring spawners and they are mainly found in the German Bight.

National surveys in the North Sea aimed at measuring the abundance of the young stages of fish species of commercial importance have a fairly long history. Coordinated international young fish surveys in the North Sea started in the 1960s. In recent years, however, there has been an increase in participation in young fish surveys, largely because of the need for earlier and more accurate forecasts in relation to management of stocks. As the size of many of the important fish stocks are now dependant on the strength of one or two young year classes it is important to have an early indication of the strength of the incoming year class. The young fish surveys offer an opportunity to sample these year classes prior to the time that they enter the commercial fishery and they also offer a fisheries independent perspective of the state of the stocks.

HISTORY

The International Young Fish Survey (IYFS) started off as a joint programme by Germany, Denmark, the Netherlands, England and Scotland to investigate herring recruitment. Four extensive surveys were made in the spring and autumn of 1960 and 1961. The objectives of these surveys were:

(1) to identify the main centres of abundance of pre-recruit herring
(2) to determine their racial characters in relation to those of the adult stocks.

The first objective was readily achieved. Main centres of abundance were located to the east and west of the Dogger Bank, with subsidiary ones in the Skagerrak, Moray Firth and the Southern Bight.

The second objective, however, turned out to be far more difficult to achieve. Immatures of the three main adult stocks (Bank, Buchan and Downs) occurred, mixed together, in all nurseries and the separation of immatures into sub-populations on the basis of meristic characters required a complicated analysis of the material.

After the last survey in 1961, the programme was temporarily halted pending the analysis of the material. In 1965, however, the ICES Herring Committee recommended the revival of the joint surveys. The main emphasis of the surveys would now be on abundance estimates of immature herring, as a means of forecasting recruitment to the adult fisheries. The surveys were re-started in 1966 when two ships participated in the survey. Their objectives were to find out whether:

(1) catch rate could be used to estimate the abundance of young herring

(2) echosounders could be used for the same purpose.

They found that the variance on a single haul is lower in spring than in autumn. Echo traces normally did not coincide with concentrations of juvenile herring. Because the results for spring surveys looked promising, it was decided to repeat the Young Herring Survey in 1967 and the years afterwards. Since 1967 there has been a steady increase in participation in the survey. In 1970 the number of nations increased to five and this further increased to eight in 1974. In 1976 France joined the survey and the number of nations remained at nine until the USSR withdrew in 1983.

One of the reasons for greater participation was the realisation that data obtained on gadoids could be used in a similar fashion to the herring data for estimating year class strengths. There are undoubtedly problems in using one survey to obtain data on both demersal and pelagic fish as they differ in geographical distribution and behaviour. However, the large number of ships participating means that a large geographical area can be surveyed and by restricting the hauls within the herring standard area to daylight hours an effort has been made to accommodate the diel vertical movement of herring.

GEAR

Prior to 1977 there was no standardisation of gear although all ships used bottom trawls with a small mesh cover. In 1977 ICES recommended that all ships should use a GOV trawl as specified by the Institut des Peches Maritimes, Boulogne. A detailed description of the net is to be found in the ICES IYFS manual. The GOV trawl has been gradually been phased in, e.g., in 1979 only 3 vessels were equipped with this particular net but by 1983 all 8 nations were using this gear. It should be noted that although the gear is now standard, variations in the rigging exist between the various countries.

In 1977 ICES also recommended that the duration of a tow should be reduced from an hour to half an hour with the catch data to be expressed in numbers per hour. All nations have now accepted this recommendation.

DATA

Over the years the quantity and quality of the data from the surveys has increased.

Trawl catch – for the early years the gadoid data are very patchy e.g., in 1965 only whiting were measured as a routine, cod were split into size groups and counted, haddock were merely counted. Numbers at age were only calculated for I and II groups; the calculation was done by either using an Age Length Key (ALK) or by the Petersen method. By 1969 most nations were measuring cod, haddock and whiting but up to, and including, 1971 the numbers at age for I, II and older fish were calculated from Scottish ALKs. 1972 saw the start of other nations (Netherlands, England and Norway) taking otoliths and by 1975 all nations were providing length frequencies for the 3 main gadoid species. 1977 saw the beginning of routine production of ALKs by all countries (Sweden, Germany and the USSR being the last to produce these data). The ALKs continued to be based on 3 groupings (I, II and older) until 1980. In 1981 the ALKs were expanded to include the age groups I to VI. At the same time sex and maturity data were recorded for each otolith taken. The resulting keys (known as SMALKs) exist for 1981 and each subsequent year. Until 1982 the data gathered by the individual nations were submitted to RIVO, IJmuiden. The latter provided a provisional index of I group abundance, based on the catches of each major species below a species-specific size limit, for use by the Assessment Working Groups. Later they ran the entire material through a set of programs to produce the definitive Standard Indices, together with other data such as mean length at age etc. In 1983 ICES assumed the role previously played by the Dutch in producing the final indices although RIVO have continued to produce the provisional indices..

Hydrography – for a number of years the surface and bottom temperature and salinity have been recorded. These data are sent separately to the ICES Hydrographer although the bottom temperature and salinity are also recorded with the trawl data. In 1984 ICES asked for the collection of additional data, i.e., nitrates, phosphates and silicates, on a routine basis. These data are used to establish a base line of nutrients available for the annual spring bloom.

Other Environmental Data – starting in 1992 participating institutes were asked to provide additional information on surface and bottom currents, swell height and direction and wind speed and direction.

OTHER SURVEYS

North Sea

In 1990 it was agreed that ICES should coordinate a 5 year series of quarterly surveys in the North Sea. This series commenced in 1991 and actually lasted until 1997 although for the last two years only a limited number of institutes participated in the co-ordination. The quarterly surveys were based on existing independent national surveys and only a minimum number of extra surveys were required to fulfilled the stated objective. However, as always, there were resource pressures on these surveys and by the end of 1996 it became obvious that institutes were only willing to support two surveys on a long term basis:

1 The existing quarter 1 survey

2 A quarter 3 survey

The quarter 3 surveys are based on existing national surveys (in Scotland's case started in 1984) and provide almost exactly the same coverage as the quarter 1 survey although at a lower level (301 hauls against 401). Support for this survey was forthcoming due to the fact that the survey data are used to tune the North Sea assessments calculated in September/October of each year.

Western Division

France, Ireland and Scotland have been running a number of independent surveys in ICES sub-areas VIa and VII for a number of years but in recent years there has been a level of cooperation concerning a quarter 4 survey which originally was started to assess mackerel stocks. This cooperation has increased since 1998 as, again, there was the realisation that other indices could be calculated from the data gathered. Currently these surveys are coordinated within the ICES framework by Ireland.

Southern Division

From the end of the 1970s France, Spain and Portugal have been conducting national surveys from the south of Ireland to the Strait of Gibraltar. In 1997 the surveys that occurred in October/November were coordinated within an EU project (SESITS – DGXIX 96/029) for a period of two years. This contract built a strong foundation for continuing cooperation and these particular surveys were originally coordinated within the ICES framework by Spain but have now been incorporated into the western division and renamed the eastern Atlantic survey.

DATRAS

ICES have held the data from the international quarter 1 North Sea surveys since 1967 but accessing this data for all but standard outputs has proved more and more difficult as time has progressed. At the same time the previous section has demonstrated the increase in surveys. This situation lead to the birth of a EU funded project called DATRAS. The project is coordinated by RIVO with ICES making a significant contribution. The DATRAS database will contain data from the following surveys:

- The Baltic International Trawl Survey (BITS), Baltic Sea
- The International Bottom Trawl Survey (IBTS), North Sea, Skagerrak, Kattegat
- The International Bottom Trawl Survey (IBTS), western and southern divisions
- The Beam Trawl Survey (BTS), North Sea, Channel and Irish Sea

The database will be held in Microsoft SQL-server and access will be at task levels. One level, which only will be accessible in ICES (database manager) where import, updates and maintenance are done, and one level for data extraction which is for all users and can be entered through the Internet.

The project started in December 2001 and is due to end December 2003. The work was divided into 3 separate components:

(1) Data checking – all the historical data held in ICES is to be checked. Data held at individual institutes is to be checked via a new web-based checking program. A beta version of the latter is currently being tested.

(2) Database – data from all the surveys described above will be entered in the new database. Currently the last four years of IBTS and BITS have been loaded with only minor problems.

(3) Outputs – (i) Code for calculating the indices for herring and sprat in the North Sea first quarter 2003 have been generated. Although this code was generated for a specific case (i.e., herring and sprat), the index calculation of most other species relies on the same algorithm where depending on the case the choice of index area, choice of strata and weighting of strata differs. This should allow the code to be easily transformed in order to calculate indices for other species.

ii) Production of standard maps and graphs per survey/area combination for all relevant ages of species for which assessments are conducted will be undertaken. Maps will show bubble plots indicating abundance per ICES rectangle or per haul.

iii) Time series of the indices and a graph showing the proportion of the age groups will be generated.

iv) Of most interest to SGGOOS is the long term relative abundance indices for the main commercial species and the construction of standard maps etc. (see point (ii)) for all other species. The latter will depend on the acquisition of extra funding for further programming.

HEALTH WARNING

The advent of a large fisheries database with the potential of easy access to aggregated data offers up the prospect of a powerful research tool for linking biological data to similar data sets which exist for environmental and climatic data. However, some of the fisheries data must be treated with care. For example, the section on Data (Trawl Catch) highlighted the gradual increase in sampling of selected species until all species were included in the early 1980s. Likewise some concerns are currently being raised by fishery biologist's over the efficiency of the GOV trawl for certain bottom living species. It is strongly recommended that advice is sought from fishery scientists involved in the IBTS data base when examining the stored data.

ANNEX 9: ICES POLICY ON TRAWL SURVEY DATA

Introduction

Over recent decades it has become apparent that much of the scientific and advisory work relies heavily on the availability of, and easy access to, high-quality data sources. Although there is a feeling among individual scientists that access to these data should be as unrestricted as possible, it is understood that these data were collected at considerable cost and therefore represent a substantial value. As such it should be possible to protect them from being accessed by unauthorised parties. ICES has a long tradition of maintaining databases of oceanographic, environmental or fisheries data at their Headquarters and providing potential users with extractions from these databases. Access to these data was regulated by rules and procedures as stated in "Status, and rules and procedures governing oceanographic, environmental and fisheries data bases maintained at the ICES Secretariat" (C.M. 1994/Del:10). The development of an extensive database of trawl survey data at ICES Headquarters that can be accessed through the web necessitates a further formalization of these rules and procedures. The aim of this revision is to enhance transparency and ensure easy access to the data by authorised parties, while restricting access by other parties.

Database Trawl Surveys (DATRAS)

As part of the assessment of the status of the fish stocks in the North Sea, Baltic Sea and western European waters (i.e., Celtic Sea, Bay of Biscay and Eastern Atlantic from the Shetlands to Gibraltar), fisheries institutes of the bordering countries have for many years carried out research vessel surveys. As part of the EU funded project DATRAS)database Trawl Surveys) in which the ICES Secretariat is a partner, the data from these surveys will be combined into one central database at ICES HQ. Therefore this database will hold data from the following survey/area combinations:

- IBTS North Sea, Skagerrak, Kattegat (IV, IIIa)
- IBTS western and southern divisions (VI, VII, VIII, IX)
- BTS North Sea, Channel and Irish Sea
- BITS Baltic Sea

ICES Policy on Access to Bottom Trawl Survey Data

The ICES policy on access to the trawl database distinguishes four user categories and three different types of data.

User categories:

1. Public
2. ICES working groups.
3. Institutes that have supplied data to the database.
4. Individuals that request data, typically for research purposes.

Data types:

Standard maps and graphs per survey/area combination for all relevant ages of species for which assessments are conducted. Maps will show bubble plots indicating abundance per ICES rectangle or per haul. Time series of the indices and a graph showing the proportion of the age-groups will be generated.

1. Aggregated data. A query of the database using pivot tables. Based on these tables, plots and graphs can be made on an interactive basis. The minimum level of aggregation differs between survey/area combinations.
    - ICES rectangle: IBTS in the North Sea, Skagerrak, Kattegat and the BTS in the North Sea, Channel and Irish Sea

- Stratum: IBTS western and southern divisions
- Sub-division and stratum: BITS Baltic Sea

2. 2. Un-aggregated (raw) data. These are catch (numbers at length and/or numbers at age) data on a haul-by-haul basis and SMALK (Sex, Maturity, Age-Length-Keys) data per individual.

Data access per "User category" and per "Data type" can be organised according to the following matrix. F is the abbreviation for "free access", P for "password protected access" and R for "access after granted request".

Data type	User categories			
	Public	ICES WG[1]	Data supplier[2]	Individuals
Standard maps and graphs	F	F	F	F
Aggregated data		P	P	P/R[3]
Non-aggregated (raw) data		P	P	R[4]

Notes:

[1] ICES Working Groups will have access to data from only those survey/area combinations that are relevant for their recommendations and as such should be specified in those recommendations.

[2] Data suppliers will only have access to data of those survey/area combinations to which the institute has provided data.

[3] Per survey/area combination the members can decide whether individuals will have free access to aggregated data or only after request. In case of a request, access can be requested and allowed per survey/area combination

[4] Access can be requested and allowed per survey/area combination

The maps and graphs can be downloaded from the ICES website. All data (aggregated or non-aggregated) are protected by passwords. Different passwords will be applied for each survey/area combination. For ICES Working Groups the required passwords for those survey/area combinations that may be accessed will be issued to the Chair of the WG. These passwords will only be valid for the duration of the WG. Institutes that have supplied data to the database will receive a password for access to that survey/ area combination to which they supplied the data. For access to other survey/ area combinations the same rules apply as for individuals.

Request for access to the database must be made through the ICES website. A standard form must be filled in to inform the institutes involved in the survey(s) on:

- Who is requesting data, including partners in the research project
- The purpose of the data request
- Which data are requested
- Confirmation that the ICES rules for acknowledging the data source will be observed

Completing the form will automatically send a request to the relevant survey contact person of each institute involved with that survey/ area combination and this person will be requested to reply to ICES within 14 days. If a contact person does not reply within this time limit, it will be taken as acceptance of the request for data access. When after 14 days no relevant data supplier has objected, ICES will provide a password to the requesting scientist. Using this password the data requester will be able to download the requested data. This password will only be valid for 7 days.

The policy described in this paper may have to be reviewed in the light of pending EC decisions (under the EU Data Collection Regulation) regarding access to aggregated survey data.

February 2003

ANNEX 10: UPDATE ON NORSEPP

Update on North Sea Ecosystem Pilot Project

(NORSEPP)

Steps leading to NORSEPP

There have been a series of steps leading to the present status of NORSEPP. In summary these have been:

1997 Intermediate Ministerial Meeting for the North Sea- Integration of Fisheries and Environmental Issues highlighted as key step.

1998 SGGOOS North Sea Pilot Project – SGGOOS decided to "establish a coordinated and harmonised observation network and design a system for operational oceanography on appropriate time scale for the North Sea".

2000 ICES GOOS Implementation Plan - Restated ICES intention to create a regional ICES GOOS Programme component for the North Sea.

2001 Bergen Strategic Workshop- ICES organised this WK "Towards a North Sea ecosystem component of GOOS for assessment and management".

2002 5th North Sea Ministerial Conference – The BERGEN DECLARATION emphasised the policy need for NORSEPP.

2002 ICES/EuroGOOS Planning Group North Sea Pilot Project re-established to progress NORSEPP.

2003 The Nantes Meetings – This year's meetings of REGNS and PGNSP.

The Bergen Declaration in particular highlighted the need for NORSEPP in several statements, e.g.:

> The Ministers therefore agree to implement an ecosystem approach by identifying and taking action on influences which are critical to the health of the North Sea ecosystem:
>
> 1) Development of general and operational environmental goals
>
> 2) Best use of available scientific and technical knowledge about the structure and function of the ecosystem
>
> 3) Integrated expert assessment
>
> 4) Coordinated and integrated monitoring

In addition the revised Common Fisheries Policy contains a 10th objective:

> to improve the quality and amount of relevant data to support decision-making and to promote multidisciplinary scientific research which will allow the supply of timely and qualitative scientific information and advice on fisheries, associated ecosystems and relevant environmental factors

ICES itself calls for the development of NORSEPP at several locations in its Strategic Plan:

> Goal 1. Understand the physical, chemical, and biological functioning of marine ecosystems
>
> > Describe understand, and quantify the state and variability of the marine environment in terms of its physical, chemical, and biological processes;

Understand and quantify the role of climate variability and its implications for marine ecosystems;

Characterise biological diversity, and its importance in the functioning of marine ecosystems;

Goal 2. Understand and quantify human impacts on marine ecosystems, including living marine resources

Evaluate the ecosystem consequences of contaminants and eutrophication;

Evaluate the consequences of physical habitat change on the marine ecosystem;

Goal 4. Advise on the sustainable use of living marine resources and protection of the marine environment

Further develop practical ways of applying the ecosystem approach, including the possible use of indicators of sustainability for fisheries;

Improve the assessment of fish stocks, and design new stock-assessment methods that incorporate environmental information;

Improve the basis for assessment of environmental conditions, and the status and outlook of marine ecosystems;

Thus the North Sea Ecosystem Pilot Project was established with the overall objective:

To initiate operational fisheries oceanography by integrating existing physical, geochemical, and biological monitoring programmes and models to improve advice to fisheries managers.

This overall objective could be translated, to match the reality we face within ICES presently, to:

Capture National initiatives, effort and resources in order to deliver operational data and model products to ICES to support ecosystem-based assessments and advice.

What is an Operational Ocean Observing System?

An OOS might be defined by the following diagram:

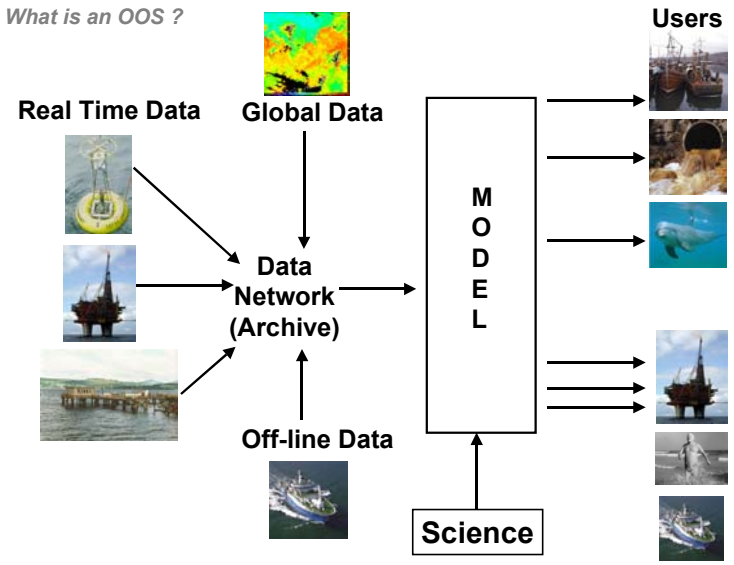

Figure 1.

Where real time and off-line data are integrated in an active data network, synthesised by a model which then develops operational products for users. Investment in scientific knowledge then aids the customer through improvement in the model system.

In a fisheries context, a key question is, what are the relevant data products needed by the community?

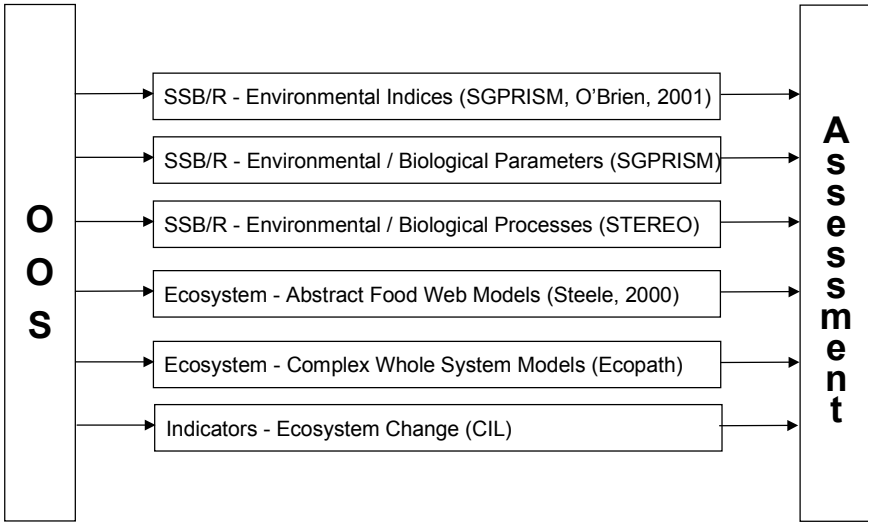

Figure 2.

In fact within ICES a number of initiatives have already taken place creating methods of including environmental parameters into the assessment process. The assessment process itself is under review, and the classical single-species, single year, large area type assessment may well be replaced in the future with a range of assessment processes, including Regional Advisory Committees, new structures of ICES Working Groups and Advisory Committees, new methods such as a traffic-light approach using multiple input streams, as well as perhaps most importantly, integrated ecosystem based assessments.

The Cost of Integrated Assessments

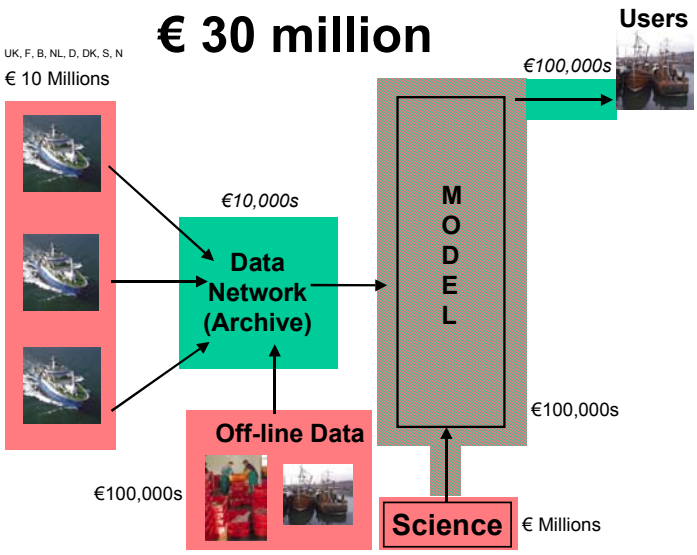

Figure 3.

Figure 3 shows the structure of the operational process used to assess fish stocks each year in the North Sea. Using very rough calculations, the total amount invested per year is approximately 30–40 million Euro. If we consider the present day infrastructure NORSEPP can call upon in the North Sea, to attempt to supply commensurate environmental assessments alongside the fisheries assessments, we come to a figure of just 2% of that spent on fisheries assessments, i.e., 800,000 Euro (Figure 4).

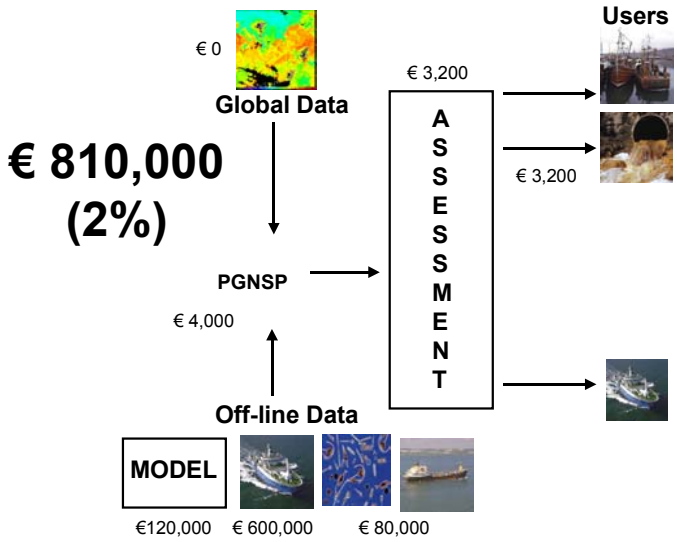

Figure 4.

First Demonstration Product

The PGNSP at its 2003 meeting decided to meet back-to-back with WGOH in 2004 in order to produce a chapter to ICES Ocean Climate Status Report 2003. It is hoped that special versions of the IAOCSS may also be produced for specific Fish Working Groups. This will allow ICES to learn from the process and identify key gaps, which we are sure there will be many !. The tables below lists the first products we hope members will bring to the table in 2004:

Theme - Status

Model			Observations					
IMR	UKMO	MUMM	RV (2)	IBTS	CPR	Sat		
●	●	●		●			Bottom T, S and NO3 in Feb (IBTS)	February
●	●	●	●			●	T, S surface	Monthly
●	●	●	●				T, S bottom	Monthly
●	●	●					Transport / residual current anomaly	Monthly

Theme – Primary / Secondary Productivity

Model			Observations					
IMR	UKMO	MUMM	RV (2)	IBTS	CPR	Sat		
●	●	●					Timing of the onset of stratification	Annual
●	●	●	●		●	●	Timing Spring bloom	Annual
●	●	●	●		●	●	Timing of Peak Diatom Abundance	Annual
●	●	●	●		●	●	Timing of Max Dinoflagellate abundance	Annual

Theme – Eutrophication

Model			Observations					
IMR	UKMO	MUMM	RV (2)	IBTS	CPR	Sat		
●	●	●			●	●	Annual primary production – integral of year	Annual
●	●	●					Annual min bottom oxygen	Annual
●	●	●	●				Chla in August	August
●	●	●	●				September oxygen minimum	September

Whether these products can become operational, and are delivered each year to ICES depends on member states, and funding. EuroGOOS members input is vital for NORSEPP to succeed. In the medium term, the REGNS has proposed a first ICES Ecosystem Integrated Assessment should be performed in 2005. If we are to meet this challenge, ICES must start to build the relevant infrastructure. A first step is the establishment of a full time NORSEPP Co-ordinator. This proposal also awaits a decision and funding. Member states must also fulfil their obligations, and provide the correct national experts and data products.

ANNEX 11: REPORT ON NATIONAL GOOS ACTIVITIES - GERMANY

The following is a survey of the German contribution to the initial Global Ocean Observing System (GOOS) and of some GOOS supporting services in the years 2001 and 2002.

Ship-of-Opportunity Programme (SOOP)

The ship-of-opportunity programme (SOOP) managed by the Bundesamt für Seeschifffahrt und Hydro-gra-phie (BSH) focuses on the North Atlantic Ocean as well as on the North and Baltic Seas. Its main contribution is the Atlantic XBT programme along TOGA-WOCE-IGOSS (TWI) lines AX-3 and AX-11. Line AX-3 from the English Channel to the Grand Banks is being operated as a high density line since 1988, with almost no severe problems. The Europe–Brazil line (AX-11) was established in 1981. Almost 15,000 temperature profiles from expendable bathythermographs (XBT) have been obtained so far covering the Atlantic Ocean from the North Pole to the Equator. Within the framework of the BSH ship-of-opportunity programme research and merchant vessels equipped with thermo-salinographs or contact thermometers participate in near-surface temperature and salinity measurements, primarily in the North Sea and in the Baltic Sea.

Plans have been implemented by BSH in 1998 to improve its commercial vessel-based upper ocean thermal programme into an enlarged upper ocean climate programme (in particular TWI line AX-3) by means of more sophisticated measurements. As a contribution to GOOS and CLIVAR (Climate Variability and Predictability) BSH has combined the AX-3 XBT programme with occasional XCTD measurements and with reiterations of research vessel-based full depth hydrographic sections in order to operate a well designed and cost-effective climate related monitoring programme in the GOOS A2-corridor of the North Atlantic, a key region for both ocean climate and European climate change investigation.

As BSH acts as the German input and output GTS hub for real-time oceanographic data, in close cooperation with the German Weather Service (DWD), all SOOP data are inserted as BATHY, TESAC or TRACKOB coded bulletins onto GTS (Global Telecommunication System of WMO) with a delay of about 1 day to 1 week. Real-time data from various Atlantic Ocean areas have been contributed by the German Navy which accounted for some 20 % of the total of 15,000 German BATHY data. However, since 2001 the Navy data contribution decreased almost down to zero due to changes in its declassification policy. Further BATHY data are contributed in real-time from the BSH stationary “Marine Environmental Monitoring Network in the North and Baltic Seas” (MARNET).

The Institut für Meereskunde, Kiel (Institute of Marine Research, IfM-Kiel) started recently the European Union (EU) funded pCO2-SSS programme CAVASSOO (Carbon Variability Studies by Ships Of Opportunity) at the southern fringe of the GOOS A2 corridor. The equipment is installed on the Swedish car-carrier “Falstaff” operated by Wallenius Wilhelmsen Line. The first transatlantic run has been carried out successfully in February 2002. For further information click: www.ifm.uni-kiel.de.

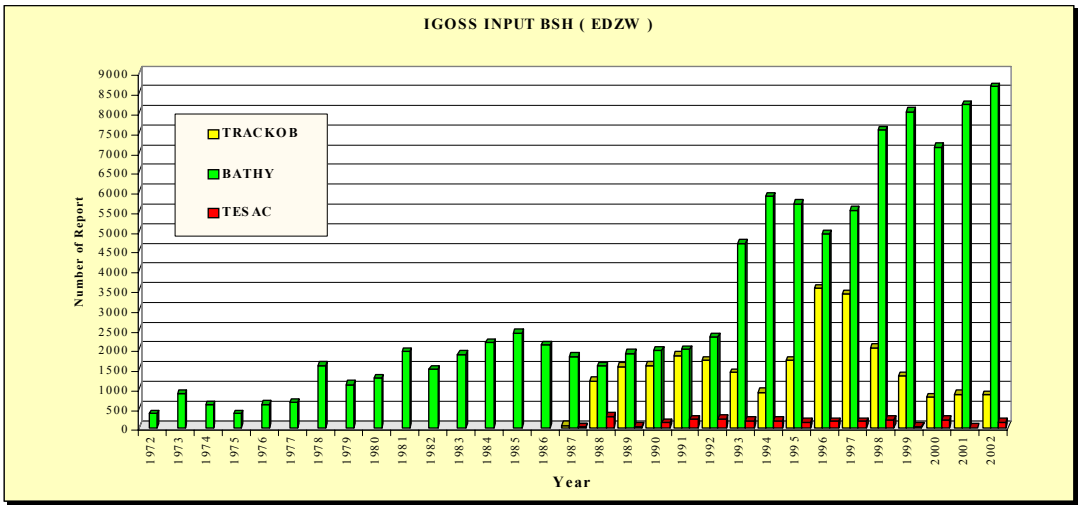

Fig. 1: Time series of total real-time data input by BSH since 1972.

Ferry Box Project

Ships-of-opportunity like Ferries offer cheap and reliable measuring platforms to make automatic observations of coastal waters. In November 2002 an EU-funded FerryBox project started, in which different FerryBox systems and different types of seas (enclosed, coastal, shelf, oceanic, oligotrophic, eutrophic,) will be compared.

Ferries with automatic equipment are used by the project partners in different sea areas, e.g., the Baltic Sea, the North Sea, the Dutch Wadden Sea, the English Channel, the Skagerrak, the Irish Sea, the Mediterranean and between Portsmouth and Bilbao.

Temporal and spatial resolution on a scale normally not available will enable the application of the data in operational models both as a means of calibration and validation. Cost effective monitoring is the main application, thus the project will deliver background data for the European Water Framework Directive.

One of the systems used in the project is the "German FerryBox" operating on a ferry Cuxhaven (DE) to Harwich (UK). The innovative system consists of a fully automated flow-through system with different sensors and automatic analysers. It provides the possibility of automatic cleaning cycles and position-controlled sampling (GPS). Data can be transferred to shore and the system can be remotely operated by GSM (mobile phone), if the ferry is near the shore. Data acquisition, -storage and telemetry is coordinated by an industrial PC. Online presentation of data on board is planned.

To avoid bio-fouling automatic acid cleaning and rinsing of critical sensors is used. Other key features are automatic and remote controlled operation from the shore, safety precautions to remove water blockage by automatic back-flushing and automatic hut-down in case of severe errors.

The "German FerryBox" automatically measures the following parameters: temperature, salinity, turbidity, oxygen, pH, chlorophyll fluorescence, ammonium, nitrate/nitrite, phosphate, silicate and main algal classes (by specific fluorescence).

The system is under operation since November 2001. Results so far show that the system works well almost without discontinuities and that the data have a high quality, if calibration takes place regularly.

MARNET (Marine Environmental Monitoring Network in the North and Baltic Seas)

The Bundesamt für Seeschifffahrt und Hydrographie (BSH – Federal Maritime and Hydro-graphic Agency) is operating a network of fixed automatically recording oceanographic stations in the North ea and Baltic Sea (MARNET - Marine Environmental Monitoring Network in the North Sea and Baltic Sea). [http://www.bsh.de/Marine_Environment/MARNET/index.htm]

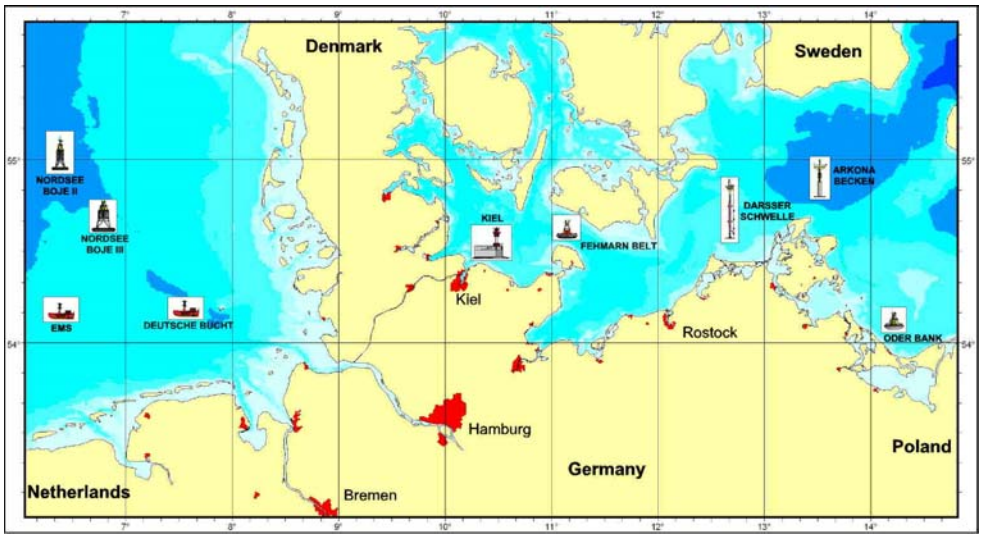

Fig. 2: Locations of stations of Marine Monitoring Network in the North Sea and Baltic Sea.

A new station - ARKONA-BECKEN – has been moored in October 2002 in the Baltic Sea, another additional station – NORTHSEA BUOY III - will be deployed in early 2003 in the German Bight. In its final stage, MARNET will consist of 9 stations; 4 in the German Bight and 5 in the western Baltic Sea. Seawater variables, presently measured at 2 - 5 depth levels, are temperature, salinity, oxygen, radioactivity and nutrients. A complete overview of all MAR-NET stations is listed below and shown in Fig. 2.

MARNET Station	**WMO-ID**	**Position**		**Remarks**
"Ems"	10004	54° 10.0' N	6° 20.8' E	unmanned light vessel
"Nordseeboje II"	62086	55° 00.0' N	6° 20.0' E	buoy, semi-diver
"Nordseeboje III"	62087	54° 41.0' N	6° 45.0' E	buoy, semi-diver (deployment in 2003)
"Deutsche Bucht"	10007	54° 10.0' N	7° 26.0' E	unmanned light vessel
"Kiel"	10044	54° 30.0' N	10° 16.0' E	lighthouse
"Fehmarn Belt"	62088	54° 36.0' N,	11° 09.0' E	discus buoy
"Darsser Schwelle"	62089	54° 41.8' N,	12° 42.4' E	mast
"Arkona Becken"	66021	54° 55.5' N,	13° 30.0' E	buoy, semi-diver (deployed in 2002)
"Oder Bank"	66022	54° 04.6' N,	14° 09.6' E	discus buoy

Since 1992 temperature data from the MARNET stations have been inserted increasingly onto GTS as BATHY coded messages.

ARGO

There are plans in Germany to participate in the ARGO programme. The Alfred-Wegener- Institute of Polar and Marine Research (AWI), the BSH, and the IfM-Kiel have submitted a joint proposal for financial support. A decision about the approval of the project is expected within the next few months.

The following 3 institutions have contributed floats to the ARGO programme:

- AWI: 9 floats in the year 2001
- BSH: 5 floats in the year 2001 and 7 floats in 2002
- IfM-Kiel: 7 floats in the year 2001

German Marine Monitoring Programme (BLMP)

Germany's contribution to the coastal module of GOOS is the German Marine Monitoring Programme (BLMP) which is constituted as a pool of different Federal and regional coastal authorities responsible for monitoring and assessment of the German marine environment. The BLMP represents Germany in different international forums dealing with monitoring and assessment in the sea, i.e., OSPAR, HELCOM and the EU. Collection of environmental data and information is carried out for all relevant problems in the sea, such as eutrophication, hazardous chemicals and radioactivity. http://www.bsh.de/Meeresumweltschutz/BLMP/index.htm

The following variables are sampled in German territorial waters:

- Hydrographic measurements [temperature, salinity]
- Harmful substances
- Trace metals
    - sea water
    - sediment
    - organisms

- Organic trace substances
    - sea water
    - sediment
    - organisms
- Biological effects
- Nutrients, oxygen, hydrogen sulphide
- North Sea
- Baltic Sea
- Marine communities
- submarine communities
- sea birds

Agencies and institutions which presently co-operate in the BLMP are the following:

- Bundesforschungsanstalt für Fischerei (BFA-Fi)
  http://www.bfa-fish.de/ifo/research/research.html
- Bundesamt für Seeschifffahrt und Hydrographie (BSH)
  http://www.bsh.de/Meeresumweltschutz/BLMP/index.htm
- Bundesanstalt für Gewässerkunde (BfG)
  http://www.bafg.de
- Umweltbundesamt (UBA)
  http://www.umweltbundesamt.de/uba-info-daten/daten/umweltprobenbank-des-bundes.htm
- Biologische Anstalt Helgoland (BAH) im Alfred-Wegener Institut
  http://www.awi-bremerhaven.de/BAH/index-d.html
- Landesamt für Umwelt, Naturschutz und Geologie, Mecklenburg-Vorpommern (LUNG)
  http://www.lung.mv-regierung.de
- Staatliches Amt für Umwelt und Natur, Mecklenburg-Vorpommern (StAUN)
  http://www.mv-regierung.de/staeun/stralsund
- Landesforschungsanstalt für Landwirtschaft und Fischerei, Mecklenburg-Vorpommern (LFA)
  http://landwirtschaft-mv.de
- Niedersächsisches Landesamt für Ökologie (NLÖ)
  http://jupiter.nloe.de/scripts/db4web_c.exe/projekt6/crome/wasser/index.htm
- Landesamt für Natur und Umwelt des Landes Schleswig-Holstein (LANU)
  http://landesregierung.schleswig-holstein.de/coremedia/generator/Kategorien/Landesregierung/Ministerien/MUNF/_C3_84mter_2C_20Beh_C3_B6rden/MUNF___C3_84mter_2C_20Beh_C3_B6rden__Treffer.html
- Institut für Ostseeforschung Warnemünde an der Universität Rostock (IOW)
  http://www.io-warnemuende.de

Tide gauges

The German Water and Shipping Administration is operating a network of tide gauges along the German coast. The tide gauge data is used in real-time for water-level prediction and storm surge warnings. The station CUXHAVEN is part of the Global Sea-Level Observing System (GLOSS). Sea-level data is delivered to the Permanent Service for Mean Sea-Level (PSMSL) in Bidston (U.K.) in delayed mode.

Operational Modelling

At the Federal Maritime and Hydrographic Agency (BSH) an operational model system has been in use for nearly two decades now. In daily routine runs, predictions for up to 84 hours are computed on the basis of meteorological and wave forecasts supplied by the German Weather Service (Deutscher Wetterdienst, DWD). The main constituents of the model

sys-tem are a hydrodynamic numerical model for the North Sea and the Baltic Sea (circulation model), programmes to compute the drift and dispersion of substances (dispersion models), a surge model for the North Sea and local models for German estuaries.

The circulation model predicts currents, water levels, water temperatures, salinity, and ice cover in the North Sea and Baltic Sea in nightly routine runs on two nested and interactively coupled grids. Grid spacing in the German Bight and western Baltic Sea is 1 nautical mile (nm) and 6 nm in the other North and Baltic Sea areas. The model is three-dimensional and takes into account meteorological conditions in the North Sea and Baltic Sea area, tides and external surges entering the North Sea from the Atlantic as well as river runoff from the major rivers.

The models are validated on a regular basis. As model forecasts are important tools in the BSH's water level prediction service their accuracy is checked daily by comparing measured and computed water levels. Another validation on a routine basis is carried out using data of the BSH Marine Environmental Monitoring Network (MARNET).

The BSH operates two types of dispersion models serving different purposes. Studies of the dispersion of water soluble substances and of the quality of North and Baltic Sea water are mostly performed using an Eulerian dispersion model while a Lagrangian Model is used primarily to support search and rescue operations and to assist the coast guard in cases of marine environmental pollution. Among its applications are drift forecasts for shipwrecked per-sons and floating objects (boats, lost cargo etc), as well as drift and dispersion computations for oil and water-soluble chemicals. The model is also used to trace back harmful substances and is thus a valuable tool in identifying environmental polluters.

EuroGOOS / EDIOS

The German Member of EuroGOOS is the Bundesamt für Seeschifffahrt und Hydrographie (BSH). Presently, BSH is compiling a full set of metadata information about the German ocean observing system in European waters. This is part of an international project (EDIOS – European Directory of the Initial Ocean Observing System) which is financed by the European Union. The EDIOS metadata information will be put in a publicly accessible and regularly updated data base.

Data Exchange

Real-time: SOOP and ARGO data as well as parts of the MARNET data is exchanged in real-time through the GTS of WMO. Sea-level data is available to the BSH in real-time for their public services, but is not exchanged internationally in real-time.

Delayed mode:

The German Oceanographic Data Centre (DOD – BSH/Deutsches Ozeanographisches Datentrum) function as the national data archive for physical, chemical and biological ocean data. As for the tide gauge data, it is kept by the German Water and Shipping Administration.

Miscellaneous

The BSH function as national secretariat for the

- Global Ocean Observing System (GOOS)
- German IOC Commission
- German Marine Monitoring Programme (BLMP)

ANNEX 12: REVIEW OF INNOVATIVE TECHNOLOGIES SUITABLE FOR OPERATIONAL FISHERIES OCEANOGRAPHY

Franciscus Colijn

FerryBox:

Ships-of-opportunity like Ferries offer cheap and reliable measuring platforms to make automatic observations in coastal waters. In November 2002 an EU-Funded (FP5) project 'FerryBox' started, in which different FerryBox systems and different types of seas (enclosed, coastal, shelf, oceanic, oligotrophic, eutrophic) will be compared.

Ferries with automatic equipment are used by the project partners (Germany, Finland, Estonia, Norway, UK, Spain, Greece, the Netherlands) in different sea areas, e.g., the North Sea, Baltic Sea, Skagerrak, the English Channel, and Irish Sea, the Bay of Biscay, the Mediterranean (Athens-Crete) and the Dutch Wadden Sea.

Temporal and spatial resolution on a scale normally not available will enable the application of the data in operational models both as a means of calibration and validation. Cost effective monitoring is the main application, thus the project will deliver background data for the European Water Framework Directive.

One of the systems used in the EU funded project is the German 'FerryBox' operating on a ferry between Cuxhaven (Ger) to Harwich (UK), with a transect length of about 600 km. The innovative system consists of a fully automated flow-through system with different sensors and automatic analysers. It provides the possibility of automatic cleaning and wash-cycles and position-controlled sampling (GPS). Data can be transferred to shore and the system can be remotely operated by GSM (mobile phone), if the ferry is near shore. Data acquisition, -storage and telemetry are coordinated by an industrial PC. Online presentation of data on board is planned as one of the dissemination mechanism.

To avoid bio-fouling automatic cleaning and rinsing of critical sensors is used. Other key features are automatic and remote controlled operation from the shore, safety precautions to remove water blockage by automatic back-flushing and automatic shut-down in case of leakage or malfunction.

The German FerryBox automatically measures the following parameters: temperature, salinity, turbidity, oxygen, pH, chlorophyll fluorescence, ammonium, nitrate/nitrite, phosphate, silicate and main algal groups (by wave length dependent fluorescence). Further options within the EU funded project are to test other, new sensors like a flowcytometer (algal 'species') and equipment to measure primary production (PAM Fluorescence, FRR fluorescence).

The system is under operation since November 2001. Results so far show that the system works well almost without discontinuities and that the data have a high quality, if calibration takes place regularly.

More information is available from the FerryBox website (www.ferrybox.com or from the GKSS website: www.gkss.de). Data of the different FerryBox routes will be made available through this website as well.

ANNEX 13: ACTION POINTS FOR SGGOOS MEMBERS

All Members	All SGGOOS members to review relevant national and international policy drivers which currently are creating the need for holistic assessments, and ecosystem approach to fisheries management, operational observing systems (OOS) and pilot projects, and send information to SGGOOS Co-Chairs.
Colijn	F. Colijn will put his name forward as a member of SGGOOS. Turrell will supply IOC with PowerPoint presentations from SGGOOS 2003
Dahlin	EuroGOOS (Dahlin) to approach Mario Ruivo concerning Portuguese participation in GOOS.
Dahlin	EuroGOOS (H. Dahlin) to approach Alan Edwards (DG 12) about the prospects of the EU funding a NORSEPP co-ordinator.
Dooley	ICES (Dooley) will update ICES-IOC contacts list. Contacts list will be included as 2003 SGGOOS report annex.
Dooley	ICES (Dooley) to encourage Portuguese ICES Delegate to nominate member to SGGOOS.
Dooley	H. Dooley and C. Summerhayes will approach Tom Malone again about spending some time (in 2004) with the ICES Advisory Committees.
Dooley	To supply missing early SGGOOS documents (prior to the 1998 Southampton meeting) IOC
Harrison	The SGGOOS Co-Chairs were encouraged to consider making presentations on SGGOOS purpose and activities at the next GOOS Regional Forum (Spring 2004. Pacific) and/or I-GOOS meeting (Spring 2005, Pacific).
Harrison	SGGOOS Co-Chair (Harrison) will contact PICES (Ian Perry) to determine interest in attending the 2004 SGGOOS meeting.
Harrison	SGGOOS Co-Chair will discuss the prospects of attending future SGGOOS meetings with the US member (W Gabriel).
Harrison	C. Summerhayes, W. Turrell and G. Harrison to work intersessionally to draw up a “strawman” discussion paper on how to move the North Atlantic observation system planning forward. Results to be presented and discussed at the 2004 SGGOOS meeting.
Harrison	The Co-Chairs (Turrell and Harrison) will work intersessionally to compile national and international policy drivers for GOOS in ICES. They will produce a working paper for review and discussion at the 2004 SGGOOS meeting.
SGGOOS	SGGOOS to reconsider the GOOS flyer in 2005.
Summerhayes	C. Summerhayes agreed to make revisions to the Implementation Plan after he has seen the draft of this report.
Summerhayes	IOC (C. Summerhayes) agreed to approach the JCOMM management committee to seek an invitation for a presentation of the ICES Climate Status Report (and other ICES Status reports) at the JCOMM meeting in spring 2005.

Summerhayes	C. Summerhayes, W. Turrell and G. Harrison to work intersessionally to draw up a "strawman" discussion paper on how to move the North Atlantic observation system planning forward. Results to be presented and discussed at the 2004 SGGOOS meeting.
Summerhayes	IOC (C. Summerhayes) to supply a paper on the WSSD 2002 Policy and implementation documents.
Summerhayes	IOC (C. Summerhayes) will update the SGGOOS Implementation Plan, membership list and links on the website after he receives a draft of the meeting report.
Summerhayes	Tom Malone's ICES PowerPoint presentation should be included on (or a link provided to) the SGGOOS website – action for IOC.
Summerhayes	H. Dooley and C. Summerhayes will approach Tom Malone again about spending some time (in 2004) with the ICES Advisory Committees.
Turrell	The SGGOOS Co-Chairs were encouraged to consider making presentations on SGGOOS purpose and activities at the next GOOS Regional Forum (Spring 2004. Pacific) and/or I-GOOS meeting (Spring 2005, Pacific).
Turrell	C. Summerhayes, W. Turrell and G. Harrison to work inter-sessionally to draw up a "strawman" discussion paper on how to move the North Atlantic observation system planning forward. Results to be presented and discussed at the 2004 SGGOOS meeting.
Turrell	Turrell to put forward a suggested Theme Session to the Consultative Committee for 2005 entitled "Comparing and contrasting the scientific strategies and output of regional ecosystem pilot projects".
Turrell	The Co-Chairs (Turrell and Harrison) will work inter-sessionally to compile national and international policy drivers for GOOS in ICES. They will produce a working paper for review and discussion at the 2004 SGGOOS meeting.
Turrell	Turrell will supply IOC with PowerPoint presentations from SGGOOS 2003.

ANNEX 14: ICES INTEGRATED ACTION PLAN; ITEMS RELEVANT TO SGGOOS 2004

1.5 Develop and apply bio-physical modelling, and improve capacity in such modelling to cover biological-physical interactions in the sea. [LRC/OCC/BLC/MHC/DFC]*

1.7 Play an active role in the design, implementation, and execution of global and regional research and monitoring programmes, in collaborations between the ICES and other international oceanographic research or monitoring programmes such as GOOS and GLOBEC. [OCC/LRC/MHC/BLC/DFC]

1.8 Implement a North Sea-oriented monitoring programme which incorporates oceanographic and fisheries data. [OCC/LRC/RMC/MHC/DFC]*

1.10 Develop better tools and training opportunities for monitoring and observation of physical, chemical and biological properties of marine ecosystems. [FTC]* [Other Science Committees]

2.2 Develop a process for conducting holistic assessments of the impact of human activities, and identify a suite of indicators or variables that will facilitate the monitoring of ecosystem status and evaluating whether ecosystem quality objectives (EcoQOs) are being met. This will be achieved by:

2.2.1 contributing to the scientific advice for the development of EcoQOs that will ensure the environmental health of marine ecosystems [MHC/LRC/OCC/BLC/DFC/ACFM/-ACME/ACE]

2.2.2 assisting in the development of spatial and temporal assessments of the indicators for those EcoQOs [MHC/LRC/OCC/BLC/RMC/DFC]*

4.11 Develop the scientific basis for an ecosystem approach to management, including assessments and the provision of scientific advice. Specifically there is a need to:

4.11.1 Continue and expand the development of tools, possibly ecosystem models, that facilitate the assessment of monitoring and scientific knowledge of ecosystem functions in a holistic manner; [MHC/OCC/RMC/BLC]*

4.11.4 Work towards the use of indicators of sustainability for a wider range of ecological properties in the provision of scientific advice to clients. [Advisory Committees/MHC/RMC/LRC/BLC]

5.10 Further develop joint activities with PICES in support of the ICES/PICES Memorandum of Understanding including co-sponsorship of symposia, joint working groups, and collaboration on projects with marine ecology and environmental processes, and on advancing our capacity to understand marine ecosystem, climate variability and marine ecosystem impacts. [OCC/MHC/LRC/DFC]

5.13 Develop and maintain joint activities with IOC in support of the ICES/IOC Memorandum of Understanding including: [OCC/MHC]

5.13.1 Assisting and participating in the implementation of GOOS and regional GOOS components (in particular EuroGOOS)

5.13.6 Develop a specific plan of action for enhanced collaboration, taking into account the development and implementation of GOOS

Related Action Plan Points

1.6 Assess and predict impacts of climate variability and climate change, on scales from populations to marine ecosystems, including impacts on commercially important fish stocks. [OCC/LRC/BLC/DFC]

2.9 Determine the biological response to eutrophication taking into account oceanographic conditions. [OCC/MHC/LRC]*

3.2 Further develop, and evaluate performance of, indicators of the status of stocks and ecosystems, relative to effects of fishing and other human activities by new analyses and modelling. [ACFM/ACME/ACE/LRC/RMC/MHC/OCC/BLC/DFC]

3.3 Develop a framework for an integrated evaluation of the impacts of human activities in the coastal zone, (e.g., mariculture, dredging/extraction, building structures), as an aid to coastal zone management. [MHC/MARC/RMC/-OCC/DFC/ACE/ACME]*

3.4 Evaluate alternative fisheries management regimes and strategies with regard to robustness, cost effectiveness, and sustainability through analysis of new types of data and simulation modelling. [MHC/MARC/RMC/BLC/DFC]*

3.5 Develop and improve fisheries assessment tools that use environmental information, consider biological and socio-economic interactions, and address issues of uncertainty, risk, and sustainability [RMC/BLC/DFC]

4.11.2 Incorporate scientific information on ecosystem components and processes into the advice that is provided to clients; [MHC/RMC/BLC/Advisory Committees]*

4.11.3 Consider more fully impacts of human activities on the marine ecosystem, through provision of more integrated ecosystem advice. [MHC/RMC/OCC/BLC/Advisory Committees]

ANNEX 15: IOC & ICES NATIONAL CONTACTS FOR GOOS (AS OF JUNE 2003)

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