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REPORT OF THE

Steering Group on Global Ocean Observing System

By Correspondence

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1 INTRODUCTION

The Global Ocean Observing System(GOOS) is an international programme preparing a permanent global framework of observations, modelling and analyses of ocean variables needed to support operational ocean services. GOOS is promoted by several United Nation agencies such as Intergovernmental Oceanographic Commission(IOC), the World Meteorological Organisation(WMO), United Nations Environmental Programme(UNEP) and the International Council of Scientific Unions(ICSU). The goals of GOOS is

- To serve the marine data and information needs of humanity for the efficient, safe, rational and responsible use and protection of the marine environment, and for the climate prediction and coastal management, especially in matters requiring information beyond that which individual national observing systems can efficiently provide, and which enable smaller and less-developed nations to participate and gain benefit

- To establish an international system to provide the required co-ordination and sharing of data and products that otherwise would not be possible.

More information on the background, status and future plans for GOOS can be found in «Strategic Plan and Principles for the Global Ocean Observing System (GOOS)», Version 1.0 GOOS report No. 41, IOC/INF-1091, January 1998.

Reference is made to C.Res.1997 2:57 where an ICES **Steering Group on the Global Ocean Observing System** (SGGOOS) is established under the chairmanship of Roald Saetre (Norway). Its term of reference is to

i) prepare an action plan for how ICES should take an active and leading role in the further development and implementation of GOOS at a North-Atlantic regional level

ii) with special emphasis on operational fisheries oceanography

iii) advise and support the Secretariat on GOOS-related matters assist the ICES Delegates to promote ICES on GOOS-related national activities

SGGOOS consist of the chairmen of the Working Groups under the Oceanography, Marine Habitat, and Living Resources Committees and has worked by correspondence.

In the international discussion on GOOS a central term is «operational oceanography». In the present report we will use the EuroGOOS definition:

«Operational oceanography is the activity of routinely making, disseminating, and interpreting measurements of the seas and oceans and atmosphere so as to

Provide continuous forecasts of the future condition of the sea for as far ahead as possible*(Forecast)*

Provide the most usefully accurate description of the present state of the sea including living resources*(Nowcast)*

Assemble climatic long term data set which will provide data for description of past states, and time series showing trends and changes*(Hindcast)*»

GOOS was discussed during the first meeting of ICES Advisory Committee on Marine Environment(ACME) in 1993 but without reaching any conclusion. During its 1995 meeting ACME dedicated a whole session to GOOS matters. The discussion concluded that there was a sound case for the evolution of ICES activities into a number of GOOS relevant areas. It was not immediately clear, however, how ICES can put forward a tangible involvement in for GOOS activities. During its 1997 meeting ACME noted that GOOS will ultimately serve as the overall framework for many programmes including environmental monitoring programmes. The ACME 1997 report gave some guidelines for the further ICES involvement in GOOS. Of special interest is the introduction of the term «operational fisheries oceanography.» The meeting concluded that ICES should take an active part and leading role in the further development and implementation of GOOS at the North-Atlantic regional level.

GOOS has also been on the agenda of several of the working groups under the former Hydrography Committee. As a follow-up of a proposal to prepare an annual ICES Environmental Report the Working Group on Oceanic Hydrography has taken the initiative to establish The Annual ICES Ocean Climate Status which is prepared for the first time in 1998. This is based on a series of 50 standard hydrographic sections and stations from the whole North Atlantic maintained by ICES member states. These observations set the regional (North Atlantic ocean) and decadal context for locally observed climate changes in national EEZs.

2 GLOBAL OR REGIONAL APPROACH TO GOOS?

In its initial planning stage the scientific and technical design of GOOS is being based for convenience on four primary «Modules» and a fifth module which is concerned with the development of services and products. These modules are:

- The Climate Module
- Health of the Ocean Module
- Living Marine Resources Module
- Coastal Module
- Services Module

The implementation of the global GOOS programme will have to be based on national and/or regional contributions through bilateral or multilateral agreements. The five GOOS modules were devices which serve their purpose in the planning stage. In the implementation phase, however, the thrust would be thematic rather than modular. The first official GOOS pilot Project is the NEAR-GOOS in Asia involving Japan, China, Korea and Russia. Additionally, an observational array of buoys in the tropical Pacific(TAO) and a planned extension of this into the tropical Atlantic(PIRATA) has been agreed to be contributions to GOOS. EuroGOOS is planning pilot projects for six geographical areas and funding for these are being sought from EC. Only one of these, the Baltic, has at present an operational GOOS-like system.

Most of the ICES countries operate national monitoring and reporting systems for the marine environment where the end products could contain elements of hind-casting, now-casting or forecasting. In selected areas, such as the North Sea, there is some co-ordination of the data collection and assessment reports have been worked out within the framework of the North Sea Conferences. However, no attempt has been made to establish a permanent integrated information system to obtain the synergetic effect of all the national activities.

In the Statement of Conclusion from the Intermediate Ministerial Meeting for the North Sea on the Integration of Fisheries and Environmental Issues in Bergen, March 1997, the ministers adopted several guiding principles. One of these was that «further integration of fisheries and environmental protection, conservation and management measures, shall draw upon the development and application of an ecosystem approach». Different human uses impact directly or indirectly the same component of marine ecosystems. In management of these systems there is a need for continuously updated information. Consequently, the concept of ecosystem approach for the management of an oceanic area call for an integrated information system or a regional GOOS component.

Data used in fish stock assessment usually come from two sources: 1) fish catch statistics and b) research vessel surveys. Environmental data from these surveys constitute a major portion of the data on the spatial and temporal distribution of environmental conditions within the ICES area. The time scale of fish stock assessment is generally the annual cycle. The challenge for the fisheries research and management community is to assemble, assess and use environmental data within the annual fish stock assessment cycle. ICES has already started this work and in the future there will probably be a need for integrated environmental-fish stock assessment working groups with a regional or ecosystem focus.

3 WORKING PROCEDURE

Before an action plan can be formulated on how to achieve that ICES «take an active and leading role in the further development and implementation of GOOS» there is a need to define more precisely the goal, i.e. the degree of ICES involvement in GOOS. The SGGOOS chairman prepared a letter dated 9 January 1998 to all the members of the Steering group. In this he formulate four different potential levels or scenarios, A to D, of ICES involvement. Alternatives B, C, and D presuppose that a regional GOOS system is established within the ICES area.

3.1 Alternative A

ICES is formally represented in all appropriate GOOS fora such as the new GOOS Steering Committee, I-GOOS, the relevant GOOS Module Panels as well as in EuroGOOS. All the operational activities are organised by the member countries themselves and there is no regional GOOS system within the ICES area. This alternative is only slightly above the present involvement level and may be characterised as «Business as usually»

3.2 Alternative B

An official GOOS Pilot Project have been established within the ICES area(e.g. North-east Atlantic, North Sea, the Baltic) by other bodies. In addition to what is mention under Alternative A, ICES have a role as an advisory and service agency for the regional GOOS component. Types of service could be:

- Data bases and data management

- Quality assurance - methods, manuals, guidelines, inter calibration exercises
- To support the Living Marine Resources Module particular concerning phytoplankton, zooplankton and benthos.

3.3 Alternative C

ICES take the responsibility to establish and run a centre for operational fisheries oceanography on non-meteorological time scale(i.e. more than two weeks) or on the time scale of fish stock assessment (some months) for the whole North Atlantic or parts thereof, i.e. the North Sea. The centre should co-ordinate national and international data collection, the rapid transmission of data to computerised data assembly centres for processing through numerical and statistical models to produce regular

Climatic predictions(Time scale season to some years)
Regular environmental status reports
Time series for identifying trends or changes

3.4 Alternative D

In addition to the tasks mentioned under Alternative C we also include processes of meteorological time scales, i.e. ICES establish a Centre for operational fisheries oceanography on time scales from days to years.

In order to be able to proceed the chairman asked the steering group members to respond to the following questions:

1. Which of the four listed alternatives for the degree of ICES involvement in GOOS would you prefer? State the reasons for your choice.
2. If Alternative C or D is your choice - which geographical area should be given priority?
3. List the most significant elements to be included in an action plan for the alternative of your choice.

The chairman proposed a response from the steering group members in two steps:

- The steering group member's personal opinion on the above questions
- The result of the GOOS discussion at the working group meeting

Response reminders were e-mailed to the steering group members in April and in May.

4 RESULT OF THE POLL

The chairman of the SGGOOS received responses from 9 out of 20 working group chairmen. Two of these stated that they have no opinion on GOOS. Input to this report was received from the following Working Groups:

Phytoplankton Ecology (APPENDIX 1)
Environmental Assessment and Monitoring Strategies (APPENDIX 2)
Recruitment Processes (APPENDIX 3)
Cod and Climate Change (APPENDIX 4)
Oceanic Hydrography (APPENDIX 4/ APPENDIX 5)
Shelf Sea Oceanography (APPENDIX 7)
Marine Data Management (APPENDIX 8/ APPENDIX 9)

Additionally, the chairman received verbal input from several ICES colleagues and written comments from Pekka Alenius/Penti Mälkki ,Finland (APPENDIX 6) and from Bill Turrell, UK (APPENDIX 10)

A brief summary of the responses is given below:

Phytoplankton Ecology(WGPE)

Regarding the structure of ICES-GOOS co-operation no clear views were expressed. The expertise available in WGPE should be used to inform ICES about the possibilities to measure pelagic parameters in an operational way. The importance of GOOS as an instrument for long term observations as well as for development of new techniques was stressed.

Environmental Assessment and Monitoring Strategies(WGEAMS)

WGEAMS pointed to difficulties which could be raised by the ICES's participation in GOOS in the resolution of the relationships between the range of international bodies involved in marine science, such as OSPAR, HELCOM, EEA, EU etc in environmental field. Potential barriers to the progress of ICES within GOOS exist in the reconciliation of current international bodies with the GOOS newcomer, conflicts in the area of commercial exploitation of the products generated within GOOS and the resistance of non-ICES scientists to the arrival of the ICES newcomer.

WGEAMS noted the contrast between the broad base of GOOS and the much narrower project areas that are emerging from it, such as EuroGOOS, the US element of GOOS and the concept of operational fisheries oceanography as expressed in the discussion document circulated by the chairman of SGGOOS. According to WGEAMS this concept does not take account of the very considerably expertise within ICES in subjects falling within the Health of the Ocean module and the Coastal module. The WGEAMS felt that ICES should reflect its wide range of expertise and consider how this breadth might be exploited in relation to GOOS.

In assessing the four alternative strategies for ICES's involvement in GOOS formulated by the chairman of SGGOOS, the WGEAMS considered Alternative A as a non-viable option. ICES cannot afford to be largely a passive observer of GOOS. Alternative D is considered as unrealistic. WGEAMS conclude that a combination of Alternatives B and C would be the most appropriate. Alternative C is a new departure for ICES which would require inter-governmental support and new funding if the current workload is to be maintained in other areas. This will require structures that can operate on a much shorter time scale than the annual one and which can operate with appropriate and necessary levels of delegated authority.

Recruitment Processes(WGRP)

The letter express the personal view of the WGHRP's chairman as the annual meeting of the working group has yet not been held. His favourite option is C or D. Option C is clearly the most useful in relation to fish stock assessment while trying to provide a linkage between the early stages and the environmental conditions, data on a shorter time order is needed. The operational perspective under D may be only needed when specific experiments are underway or to interpret distribution and abundance patterns of plankton and fish eggs and larvae for regular surveys. However, option C appears to be the most appropriate. If any alternative is to be implemented, it should be in an area where there is a sufficient number of stocks, such as the North Sea.

Cod and Climate Change/Oceanic Hydrography

The letter is from the chairman of WG on Oceanic Hydrography with input from two key players in Canada, Allyn Clarks and Ken Drinkwater, chairman of WGCCC. Canada has formed a GOOS Climate Committee in the Department of Fisheries and Ocean and PICES has offered space in Canada for a GOOS Pacific Secretariat. One of the problems in developing ICES's role in GOOS is the different and inconsistent opinions on what GOOS is. One area of international debate is the role GOOS should play in contributing to the scientific management of fisheries and ICES could be a significant participant in this discussion. Up to now, organisations such as EuroGOOS seem to be dominated by a free marked approach to ocean observing systems rather than a management of a common resource in a sustainable way approach.

Alternative C is the preferred option. ICES could establish a centre for ICES area GOOS which will institutionalise and formalise certain monitoring activities in the ICES area and provide interaction with observations and models. The action plan for ICES involvement in GOOS could contain relevant observation programmes in the ICES area, establish mechanism for new GOOS relevant projects, data base and data management systems and development of new products.

Oceanic Hydrography(WGOH)

The working group was strongly of the opinion that the historical strength and present capabilities of ICES lay within option C and recommended that ICES should pursue this role in the North Atlantic in an analogues way to PICES role in the Pacific. It was felt that the cost-recovery aspects of organisations such as EuroGOOS are in conflict with the free and open access to data and information under ICES and GOOS. The capabilities to define climate status of ICES waters is already well-developed in the working groups. The co-ordination and merging of national efforts into an North Atlantic synthesis is an ICES role of central relevance to GOOS.

ICES science is now fully-focused on developing a sufficiently sound knowledge of environmental controls on fish stocks to permit their integration into the procedure of fish stock assessment. The existing ICES capabilities justify an

ICES involvement in GOOS. Actions are needed to document present measurement and co-ordination programmes in the ICES area that are relevant to GOOS and establish how existing efforts might be adjusted to mutual benefit.

Shelf Sea Oceanography(WGSSO)

Alternative C was generally favoured. It was suggested that a pilot area be chosen and the North Sea was proposed by the WG. Choosing the North Sea would require more resources than the Baltic but the Baltic Monitoring Programme(BOOS) was missing fishery data which ICES is ideally placed to provide. Choosing the North Sea would complement BOOS and much could be learned from the Baltic experience. It was suggested that the eventual aim should be to establish operational oceanography throughout the ICES area. A similar collation of North Sea time series as that planned for the Skagerrak would form the basis of a useful operational data set provide it was regularly updated as new data became available.

Marine Data Management(WGMDM)

This input include both some personal thoughts of the chairman as well as the results from the working group discussion as formulated in the WG report. First, the chairman's own ideas:

Option A and B would not have any great impact and D would imply a large amount of extra effort so probably C is the best option. It would be valuable for an organisation such as ICES, with its long history and high quality data banks, to remain involved with new important activities like GOOS. It is important, however, to ensure that there is no duplication of effort between activities like EuroGOOS or other regional projects.

ICES participation in GOOS imply that the ICES secretariat need to be strengthened. The strength of ICES is its North Atlantic perspective which would benefit ICES to build upon for GOOS.

From the WG report:

To the question; should ICES be involved in GOOS, the response was - Can ICES afford to be left out? GOOS is a major project, and an ICES regional project would be very likely to contribute much in terms of knowledge, expertise and data. Alternative C was the favoured option. It was pointed at that extra funding and personnel would be needed. In some countries, such as Sweden and Canada, the work to establish national contributions to GOOS have already started. It was proposed that a pilot project was started first. Some concern was expressed on the possible link between an ICES GOOS regional project and EuroGOOS.

Pekka Alenius/Penti Mälkki - Finland

GOOS is proceeding in several groups that are formed on the basis of operational units such as the ice service and the algae monitoring service at FIMR. It seems that business is already well at hand even without ICES. In the Baltic there is an own Baltic GOOS project ongoing. At this stage ICES should preferably act as an advisor rather then an active initiative maker. If ICES want a more active role than just advisor, it should be especially active in the North Sea and concentrate on longer than «weather forecast» time scale.

Bill Turrell - UK

The preferred alternative is option C. WGOH issued last year for the first time a summary presenting the results of the extensive network of ICES standard sections and stations. These will form the backbone of option C. What has been lacking until now is a co-ordinated way of pooling the results from the originators of the data, and making these rapidly available. Option C sounds like filling this gap. The potential ICES Centre for Operational Fisheries Oceanography must respect and rigorously defend the position of the contributing institutes and convince the national funding sources that the data they are producing are internationally acknowledged as of great importance to fisheries and climate studies.

Option C should focus on the North Atlantic and the Nordic Seas. An action plan could contain the following elements:

* Strengthening of the resources to ICES staff
* Improve the existing ocean monitoring.
* Establish data exchange protocols, status report format and web page.
* Start the internal discussion on planning and implementation
* Initiate EU funded projects to establish the new enhanced network

Working Group on Zooplankton Ecology(WGZE)

No response was received from the chairman of this group. However, GOOS is briefly mentioned in the working group report under the discussion on future work programme/ICES 5 year plan. The proposed priority issues on the work plan for WGZE consist of Monitoring, Assessment and Research and under the two first points several GOOS relevant activities are mentioned, such as contribution to the annual environmental status report for the ICES area. The WG report state further that « Monitoring of zooplankton and routine use and assessment of data from the monitoring could constitute an element in a regional North Atlantic GOOS component». As a part of the Terms of reference for the 1999 meeting the WGZE propose to «consider plan for a co-ordinated zooplankton monitoring programme for the ICES area, based on national programmes, as a contribution to the North Atlantic regional GOOS»

Conclusion

The result of the poll is quite clear among the respondents with a preference of Option C. This means that ICES should take an active and leading role in the development and implementation of a regional component of GOOS by taking the responsibility to establish and run a centre or centres for operational fisheries oceanography on a non-meteorological time-scale.

However, only 7 out of 20 working group chairmen contributed. There is clearly a need for some action to involve especially the working groups under the Living Resources and Marine Habitats Committees in the process. This was also acknowledged by ACME during its meeting in June 1998 who stated:

"It was felt that the GOOS issue is relevant to broad areas of ICES and ACME has a role in stimulating work within ICES concerning GOOS. It could be useful if the Chairman of ACME writes a letter to the Chairman of SGGOOS, expressing the great interest and support from ACME and urging him to continue to press on the groups that have not yet contributed to the development of the ICES action plan for GOOS"

5 ACTION PLAN

Introduction

ICES's active participation in GOOS presuppose both support for the GOOS concept internally and the resolution of the relationships between ICES and other relevant international bodies involved in marine science in the ICES area, such as OSPAR, HELCOM, EEA and EU. Some feel that the concept of operational fisheries oceanography is a narrowing of the broad base of GOOS and that it does not take account of the very considerable ICES expertise in subjects falling within the Health of the Ocean and the Coastal modules. It is therefore important to define «Fisheries oceanography» in a wide manner to include the breadth of ICES's competence and to be of relevance for all the five GOOS modules. Concerning the geographical area for ICES-GOOS involvement both the North Sea and the North Atlantic have been proposed.

One area of international debate is the role GOOS should play in contributing to the scientific management of fisheries and ICES could be a significant participant in this discussion. For unknown reasons FAO is not one of the sponsoring agencies for GOOS. In the ICES area the most important data originators is still predominantly fisheries research institutes. Additionally, fisheries management probably represent one of the most important customers for GOOS. An active ICES participation in GOOS may contribute to put more emphasis on fisheries and fisheries management into the GOOS concept. Up to now, organisations such as EuroGOOS seem to be dominated by a free marked approach to ocean observing system rather then management of a common resource in a sustainable way approach.

To guide the design and the implementation of GOOS two sets of Principles have been developed(GOOS Report No 41, IOC/INF-1091) These are included in the present report as APPENDIX 11. The first set, the Design Principles, define the overall principles that determine the design of the system and provide a guide for what GOOS should include and what it should exclude. The second set, the Involvement Principles, is a guide to the conditions that should determine the participation in the system and the elements that determine those conditions. Consequently, ICES' involvement in GOOS need to be based on these principles.

A suitable mile stone for planning and implementation of ICES' involvement in GOOS might be the First GOOS Agreement Meeting. This meeting has been postponed several times but is now planned in conjunction with the IOC Assembly in mid-1999. The objective of the Agreement Meeting is to

- obtain agreement from governments to the concepts and principles of GOOS.
- obtain commitments from governments and national agencies to contribute to the implementation of GOOS.

ICES participation in GOOS imply that the ICES secretariat needs to be strengthened by extra funding and personnel. However, it is probably not realistic to build up a central unit at the ICES secretariat to run a Centre for Operational Fisheries Oceanography. The development of such a regional GOOS system could be based on the principle of shared tasks and responsibility between nations and/or agencies with ICES as key co-ordinator both in planning and implementation of the system. Centre or centres should be established in co-operation with the environmental commissions in the area(e.g. OSPAR, HELCOM) and should also cover their needs. Such centres may be virtual centres consisting of a network of participating institutions with one institution acting as co-ordinator or «Lead institution». The co-operation within the Baltic Monitoring Programme could be one of several models for ICES-GOOS.

New working procedures, such as applying the OSPAR's principles of «Lead country» and «Regional Task Team» should also be considered. The development of a regional GOOS system should be a stepwise expansion from a core area, both geographically and in the amount and quality of services. Establishment of a regional GOOS component under the ICES umbrella will probably also contribute in defending the position of the contributing institutes and in convincing the national funding sources that the data they are producing are internationally acknowledged as of great importance to fisheries and climate studies.

In relation to the preparation of the ICES Environmental Status Report some of the working groups have already started up the work to report annually on items such as Ocean climate status, Harmful algae blooms and Zooplankton monitoring. These activities could actually form the core of ICES-GOOS.

According to GOOS Report No. 41 GOOS will be implemented in five overlapping phases:

- Planning, including design and technical definition
- Operational demonstration and pilot experiments
- Immediate implementation using existing systems
- Gradual operational implementation of the permanent system
- Continued assessment and improvement of the system

The implementation of ICES-GOOS could follow the same phases.

The Action Plan

Task 1

In conjunction with the 1998 Annual Science Conference the SGGOOS report will be discussed in the Oceanography, the Living Resources and the Marine Habitat Committees in order to get support for an ICES-GOOS. It is suggested that the appropriate ICES fora should approve the following recommendation:

> "ICES should take the initiative to develop and implement a regional component of GOOS by establishing centres or institutional networks for operational fisheries oceanography on a non-meteorological time-scale for the ICES area or parts thereof. The ICES Steering Group on GOOS(SGGOOS) (or a minor ad-hoc group from this) is asked to explore the feasibility for such establishment in co-operation with the Secretariat"

Task 2

During October 1998 to January 1999 SGGOOS together with the Secretariat explore the views on a ICES-GOOS from other relevant international bodies such as OSPAR, HELCOM, EEA; EU and IOC as well as from the member states of ICES via the delegates.

Task 3

In March 1999 an ICES-GOOS workshop is organised with the following Terms of Reference:

- Identify existing ocean observing activities within the ICES area that are relevant to GOOS.
- Investigate how these observations already being made routinely, could be combined and enhanced and incorporated within a common plan.
- Propose a possible design for an ICES regional GOOS component
- Develop a draft implementation plan for ICES-GOOS

It is further recommended that the Workshop should be held in Bergen, Norway from 8-10 March 1999 with R. Sætre as convener and supported by two co-conveners to be identified.

Task 4

The draft implementation plan is presented for ACFM and ACME during their meetings in May-June 1999. The plan is then revised incorporating the comments and proposals from the two advisory committees.

Task 5

The plans for ICES-GOOS is presented at the First GOOS Agreement Meeting in Paris in July 1999.

Task 6

In conjunction with the 1999 Annual Science Conference the appropriate ICES fora should approve the implementation plan for ICES-GOOS and establish a group responsible for the accomplishment of the plan and for the co-ordination of the routine operation of ICES-GOOS.

Task 7

An annual ICES-GOOS Progress Report is prepared, first time at the ASC in 2000.

APPENDIX 1

FROM THE REPORT OF THE WG ON PHYTOPLANKTON ECOLOGY

a) i) (new/added) discuss the role of ICES in (EURO)GOOS and report suggestions to the chairman of SGGOOS, R. Saetre.

The chairman gave information to the members on the meaning of (EURO)GOOS. Of particular interest for the WGPE are the modules Health of the Ocean and Living Resources. The role of a ferry box in surface mapping was pointed out with specific operational interests. Examples of using these techniques are available and discussed several times in the WGPE.

Some general concern was expressed at the over interest in technology at the expense of science. However there should not be a conflict between these two viewpoints, because data acquisition is of great help in e.g. modelling studies, and interaction between long term climatic changes and biological parameters. Simply the possibilities now appearing should be used as much as possible. A short description of SEANET and its role in dealing with fixed point monitoring network was given.

In general it was concluded that the expertise available in the WGPE should be used to inform ICES about the possibilities to measure in an operational way pelagic parameters. Moreover the development of new techniques should be stressed, a topic long dealt with in the WG. These include new methods to measure primary production based on PAM fluorescence, species composition/groups by flowcytometry and the cooperation in developing blue-box like machines, including updated versions of CPR's with newly added instrumentation to measure abiotic parameters.

Regarding the structure of the ICES-GOOS cooperation no clear views were expressed. The importance of GOOS as an instrument for long term observations of pelagic parameters however is swell taken and strongly supported. Quality of data however must be secured, and comparability needs to be guaranteed.

The chairman will give the suggestions to the Chairman of WGGOOS, R. Saetre.

APPENDIX 2

FROM THE REPORT OF THE WG ON ENVIRONMENTAL ASSESSMENT AND MONITORING STRATEGIES

GOOS

At the 1997 Annual Science Conference, ICES established a Steering Group on the Global Ocean Observing System (SGGOOS) to 'prepare an action plan for how ICES should take an active and leading role in the further development

and implementation of GOOS at a North-Atlantic regional level with special emphasis on operational fisheries oceanography'. The Chairman of SGGOOS, Roald Saetre (IMR Bergen), had circulated a discussion paper in January 1998 to Chairmen of all Working Groups under the Oceanography, Marine Habitat and Living Resources Committees asking for their views and requesting that the documents also be discussed at WG meetings.

The ICES Oceanographer, Dr Harry Dooley, kindly agreed to make a short presentation on ICES and GOOS and to lead the subsequent discussion. He described the processes which have led to the formation of SGGOOS and recent discussions regarding the founding of a national NORGOOS for Norway.

WGEAMS noted that GOOS is an extremely broad concept which encompasses almost all activities in the marine and coastal environment. The original five modules (Climate, Health of the Oceans, Living Marine Resources, the Coastal Module, and the Services module) cover all aspects of marine science currently within ICES' expertise and others as well. The concept of linking all such projects into a single unit was attractive and offered considerable benefits over the normal more piecemeal approach. The possible involvement of ICES in GOOS will be greatly influenced by the outcome of an intergovernmental meeting later in 1998. It is anticipated that this meeting will result in the recognition of GOOS by national governments and some degree of commitment of resources to the programme. Should this occur, the status of GOOS will change dramatically.

Whereas there is already considerable pressure for ICES to become involved in GOOS as an ocean science programme, if it becomes an intergovernmental venture it is likely that ICES will be required by Member Countries to participate. This should be seen as a positive move which will give ICES a more genuine and potentially significant position within the GOOS community. However, it could raise considerable difficulties for the resolution of the relationships between the range of international bodies involved in marine science, for example, ICES, OSPAR, HELCOM, EEA, EU, etc., in environmental fields.

At the moment, the Commissions are customers for ICES advice, data storage, and data presentation. It would be logical for ICES to act in the same role towards GOOS. However, WGEAMS suspects that many of the scientific initiatives in GOOS have been, and will be, started by scientists outside the ICES community. These scientists may not immediately welcome ICES in this role, particularly if these scientists see the data products as having commercial value. Potential barriers to the progress of ICES within GOOS therefore exist in the reconciliation of current international bodies with the GOOS newcomer, conflicts in the area of commercial exploitation of the products generated within GOOS, and the resistance of non-ICES scientists to the arrival (and possible imposition) of the ICES newcomer.

WGEAMS noted the contrast between the broad base of GOOS and the much narrower project areas that are emerging from it. For example, EUROGOOS is heavily directed towards engineering support for coastal activities, shipping, meteorology, etc., and the current US element of GOOS seeks to unify aspects of US coastal zone management. There is considerable interest in the UK in using GOOS as a vehicle and justification for large oceanic monitoring programmes using automatic submarines (AUTOSUB) or smaller scale (but still primarily hydrographic) studies. This narrowing was also apparent in discussion documents circulated by Roald Saetre. The concept of operational fisheries oceanography was based on the combination of ICES expertise in the areas of fisheries science (mainly the analysis of data from fish stock surveys) and associated hydrography and nutrient measurements. This concept did not take account of the very considerable expertise within ICES in subjects falling within the Health of the Oceans module (pollution chemistry, biological effects, etc.) and developing within the Coastal Module (e.g., coastal zone management issues within WGEIM). WGEAMS felt that ICES should reflect on its unique position in having access to a wide range of expertise available in the ICES community and consider how this breadth might be exploited in relation to GOOS.

WGEAMS then considered the four alternative strategies outlined by Roald Saetre, Chairman of the ICES Steering Group on the Global Ocean Observing System, and listed below.

Alternative A

ICES is formally represented in all appropriate GOOS fora such as the new GOOS Steering Committee, I-GOOS, the relevant GOOS Modules Panels as well as in EuroGOOS. All operational activities are organised by the Member Countries themselves and there is no regional GOOS system within the ICES area. This alternative is only slightly above the present involvement level and may be characterised as 'business as usual'.

Alternative B

An official GOOS Pilot Project is established within the ICES area (e.g., Northeast Atlantic Ocean, North Sea, Baltic Sea) by other bodies. In addition to what is mentioned under Alternative A, ICES has a role as an advisory and service agency for the regional GOOS component.

Types of service could include:

- *data bases and data management;*
- *quality assurance—methods, manual, guidelines, intercalibration exercises;*

- *support for the Living Marine Resources Module—in particular concerning phytoplankton, zooplankton, and benthos.*

Alternative C

ICES takes responsibility to establish and run a centre for operational fisheries oceanography on non-meteorological time scales (i.e., more than two weeks) or on the time scale of fish stock assessment (some months) for the whole North Atlantic or parts thereof, i.e., the North Sea. The centre co-ordinate national and international data collections, the rapid transmission of data to computerised data assembly centres for processing through numerical and statistical models to produce regular

- *climatic predictions (time scale: season to some years);*
- *regular environmental status reports;*
- *time series for identifying trends or changes.*

Alternative D

In addition to the tasks mentioned under Alternative C, we also include processes of meteorological time scales, i.e., ICES establish a Centre for operational fisheries oceanography on times scales from days to years.

WGEAMS considered that *Alternative A* (the status quo, business as usual) is not a viable option. On the assumption that GOOS develops into a significant series of linked international programmes, the potential for GOOS projects to take ground from under ICES is large. ICES cannot afford to be a largely passive observer of GOOS, and as a member of GOOS Panels without direction of component programmes or providing significant support in cash or kind, it would have little claim on the attention of active participants.

Alternative D is unrealistic. The provision of Data Products on a daily time scale would, in the first instance, be seen as a direct trespass on the property of the meteorologists and related scientists. Secondly, WGEAMS feels that the provision of Products without any significant time for assessment would not fit well with the traditional role of ICES as provider of high quality, reliable, considered advice to national governments and international bodies. The strengths of ICES in these areas could be compromised by new tasks which by their nature could tend to dominate the day-to-day activity at ICES HQ.

WGEAMS believes that the role for ICES lies within *Alternatives B* and *C. Alternative B* remains rather narrow and represents ICES remaining firmly within its traditional roles. Database management and QA are routine activities for the Commissions. It is not clear what support in the fields of benthos and plankton might be offered. Is it intended to charter or co-ordinate research vessels, plan sampling programmes, supervise analysis of samples or data?

Alternative C is a new departure for ICES which would require intergovernmental support and new funding if the current workload is to be maintained in other areas. Time scales in the order of weeks would allow data to undergo appropriate QA screening within the originating organisations and perhaps also at ICES before they are used to prepare Data Products. In this way, the reputation of ICES would be protected and ICES traditional role enhanced. In times of emergency, such as shipping accidents or catastrophic toxic bloom incidents it could be envisaged that the data turn-round time could be shortened to meet the public demand for data and need for data on which to base (almost) real time environmental management.

WGEAMS therefore concluded that a combination of *Alternatives B* and *C* would be the most appropriate. This is contingent on GOOS receiving the necessary intergovernmental support and the GOOS management allocating the relevant tasks to ICES. ICES can enhance the likelihood of the necessary allocation of tasks by:

a) taking an active role in establishing a local GOOS project;
b) using ICES community expertise to offer a breadth of expertise not available elsewhere;
c) ensuring that the local GOOS project reflects the breadth of the GOOS concept;
d) ensuring that the project does not have dominant commercial aims;
e) ensuring that the dominant aims of the project lie within ICES expertise;
f) encouraging the recognition of GOOS by ICES Member Countries;
g) facilitating and working for the resolution of the new relationships that will be required between the many relevant international bodies once GOOS is recognised by national governments;
h) demonstrating that the ICES system can respond on the time scales necessary to design large programmes, seek funding for such programmes, manage programmes, provide technical advice during programme development and execution. This will require structures that can operate on a much shorter time scale than the annual ICES/Commissions cycle of meetings, and which can operate with appropriate and necessary levels of delegated authority.

APPENDIX 3

FROM THE CHAIRMAN OF THE WG ON RECRUITMENT PROCESSES

I wish I could present your letter to the members of the working. However, that will not be possible until later this year so you shall get my personal opinion from a "recruitment" perspective as well as an oceanographic one.

My favourite options are C or D. The line defining the two is thin and somewhat arbitrary but it has serious implications for what can be done. Options C is clearly the most useful from the perspective of the traditional assessment(and fisheries issues) because most adult stock dynamics integrate over the period of a year. However, if one is trying to provide linkage between early life stages and environmental conditions, data on the order of a week (or possibly less) becomes very important. Whether the ICES structure has the capability of dealing with that type of data (or what data types are available within the ICES area) may be questionable. If data are collected regularly, then forecasting and prediction are not needed and archiving is the only need (therefore use existing data sources to build the required archives). The operational perspective needed under D may only be needed when specific "experiments" are underway or they may be important to interpret distribution and abundance patterns of zooplankton and ichthyoplankton for regular surveys (e.g. larval herring) which are used in environmental or fisheries assessments. However, once again that can probably be accommodated by archive existing data collections rather than trying to predict or forecast. So in the end, option C appears to be most appropriate but there is a need to maintain appropriate data sets which reflect meteorological processes on time scales shorter than monthly averages.

If any alternative is to be implemented, it should be in an area where there are a sufficient number of species and/or stocks to provide a thorough assessment of the value of the project. Therefore the North Sea would likely be a more suitable area than the Norwegian coast simply because of the greater diversity of situations against which the data and forecasts can be applied. Species diversity is simply too limited in the more northern areas.

With respect to data products (i.e., elements), bi-weekly data on sea surface temperature (and if possible salinity), depth of mixed layer (for all those working on the dynamics of animals smaller than adult fish), and some information on wind patterns at selected sites. These would form the key elements. When it comes to living resources, there will be a need for dialogue within the WG before I can make any suggestions.

APPENDIX 4

FROM THE CHAIRMEN OF WG ON OCEANIC HYDROGRAPHY AND WG ON COD AND CLIMATE CHANGE

Instead of replying to you right away, I decided to get input from two key players in Canada, Allyn Clarks and Ken Drinkwater. What I am sending you is a synthesis of what I received from them and my own thoughts.

There is also certain developments in Canada. First of all, we have now formed a GOOS Climate Committee in the Department of Fisheries and Oceans, and I have been given the task of chairing it. Other members will yet to be finalised, but will consist of representatives in Physics, biological and chemical oceanography. This Committee will provide liaison with GOOS and other IOC climate activities in addition to those within Canada.

Second, PICES has offered space in Canada for a GOOS Pacific Secretariat. It is my understanding that the salaries and O&M for such a GOOS Pacific coordination have to be found elsewhere. I have been told that I will liaise with this secretariat as well.

One of the problems in developing ICES's role in GOOS, is that each of us has our own idea what GOOS is, and that these are not consistent. The international GOOS committees are having difficulty making those definitions and organisations such as EuroGOOS are putting their own spin on the process.

One area of debate within international GOOS is the role GOOS should play in contributing to the scientific management of fisheries both in international waters and in national waters. ICES, as an international fisheries assessment and management organisation with a long history of linking science with management, could play significant roles in this debate. Up to now, organisations such as EuroGOOS seem to be dominated by a free market approach to ocean observing systems and have been considering the marketing of data and services to assist the fishing companies rather than a management of a common resource in a sustainable way approach.

You have given in your letter four options.

Option A: You mentioned that this option will have no consequence to ICES. Though I agree that this option is not sufficient, in my opinion, even this minimal option is not done well. Overworked Harry tries to attend these meetings, perhaps others as well, but to have influence ICES also need to be at the table at the working level.

Option B: An official GOOS project will not provide the necessary interaction between ICES and GOOS. ICES has lot more to offer to GOOS than that.

Option C: This is the option of choice for me. Just as in the PICES Secretariat, a GOOS Pacific may be established, ICES could establish a centre for ICES area GOOS. This will institutionalise and formalize certain monitoring activities in the ICES area and provide interaction with observationalists and modellers. It is premature to limit the level of activity for this centre to time scales (whether climate or weather-band, so I am grouping C&D here).

As to the most significant elements to be included in an action Plan:

- Document present measurement and coordination programs in the ICES area that are of relevance to GOOS;
- Establish mechanism whereby new projects that are of relevance to GOOS are brought under the joint sponsorship of ICES and GOOS (IOC)
- Set up database and data management system including QC; this will require (in my opinion) significant enhancement to ICES data centre capabilities, and more active participation in the J-DIMP activities. Also require new approaches to data management (multidisciplinary, single-window access, etc)
- Develop products

I hope these comments are useful. I will include this as an agenda item in the OHWG and get back to you with the WG's comments.

APPENDIX 5

FROM THE REPORT OF THE WG ON OCEANIC HYDROGRAPHY

(Agenda 7, Assess developments in GOOS and Agenda 12, Comment on the 1997 ACME statement (Agenda item 21.3) concerning the development of GOOS initiatives in ICES)

The WG debated the options for a possible ICES role in GOOS. C.Res 1997 2:57 had established an ICES steering Group on GOOS under Dr. Roald Sætre, IMR, Bergen, and with the chair of the WGs under the Oceanography, Marine Habitat and Living Resources Committees as members. The WG was asked to comment on four alternative options:

a) that ICES attends and advises all appropriate GOOS for a but has no active role in the project,

b) that ICES supplements these advisory role by providing certain services for a regional GOOS effort, e.g. Databases, data management, quality control, and aspects of support for the Living Marine Services module,

c) that ICES takes responsibility for establishing and running a centre for operational fisheries oceanography dealing with climatic scale variability (months to years),

d) that ICES adds to option C a capacity in operational oceanography on meteorological time scales of days to months.

The WG was strongly of the opinion that the historical strengths and present capabilities of ICES lay with Option C and recommended that ICES should pursue this role in the north Atlantic in an analogous way to the PICES role in the Pacific.

The structure and science base of EUROGOOS was presented, but it was felt that the cost-recovery aspects of EUROGOOS are in conflict with the free and open access to data and information under ICES and GOOS. A wide ranging discussion subsequently began the task of defining the ICES role and the changes necessary to meet it in the key modules for Climate, Coastal Zone, Living Marine resources and health of the Ocean.

Climate Status. The capability to define the climate status of ICES waters (the maintenance of key representative sections and stations, data cross-checking and quality control, and the interpretation of change) is a capability already well-developed in Oceanography Committee and its Oceanic and Shelf seas WGs. The coordination and merging of national efforts into an Atlantic synthesis is an ICES role of central relevance to GOOS which would not simply or automatically emerge from national programs.

The role of ICES as a regional data centre and the activities of ICES MDM to ensure the full, open and timely archiving/exchange of well-kept ocean data and meta-data are established elements of importance to GOOS. However, these capabilities may need to be enhanced and easier tools provided for the handling, checking and synthesis of the broader parameter-mix associated with Living Resources module.

The Oceanography (and the previous Hydrograhy) Committee of ICES has long fixed a focus for regional studies of the impact of environmental change on the survival, growth and recruitment of fish stocks. Through the continuation of these studies, through the restructuring of ICES Committees into multi-disciplinary groups better able to pursue these studies, and by a range of external initiatives, ICES science is now fully-focused on developing a sufficiently sound knowledge of environmental controls on fish stocks to permit their integration into the procedures of fish-stock assessment.

These remarks on the existing ICES capabilities in climatic status, data management and environmental effects, certainly justify an ICES involvement with GOOS but would continue anyway. What is needed are actions to document present measurement and coordination programs in the ICES area that are relevant to GOOS, and establish how existing efforts, such as the above, might be adjusted to mutual benefit.

The next step will be to establish mechanisms to ensure that projects of interest to ICES and GOOS are brought under their joint sponsorship.

The hope is that such joint sponsorship might strengthen the science and its funding-base. It might also provide funding stability for ICES ocean monitoring and the development and upgrade of instrumentation such as the CPR, Moving Vessel CTDs, and others.

APPENDIX 6

FROM PEKKA ALENIUS/PENTI MÄLKKI - FINLAND

Because of many confusions here, we have forgotten to inform you directly on our opinion on the possible ICES activities in GOOS. Pentti Mälkki has several times reminded me on the need to reply to your questions. We actually have discussed here among several persons on our joint opinion and the confusion was that we formulated our opinion to our representative in WG on Marine Data Management and forgot to send it to you also.

Unfortunately I do not have the text at present, but I noticed that I am going to some meeting and may forgot it again, therefore I want to give you some idea of our opinion in somewhat informal way.

We looked through your alternatives and discussed on the potential implications of each. The GOOS is proceeding in several working groups that are formed on the basis of operational units (like the ice service and algaline service in our institute). So it seems that the business is already well at hand even without ICES. In the Baltic Sea area there is an own Baltic GOOS project ongoing.

Our conclusion was that that your own favourite suggestions were acceptable for us, too. We think that at this stage ICES should preferably act as an advisor rather than an active initiative maker. So our first alternative is even slightly more modest than your final suggestion. However, we think that if ICES in any case wants to have more active role than just advisor, then your suggestion that it should be active especially in the North Sea area and concentrate on longer than "weather forecast" time scale, is very good.

APPENDIX 7

FROM THE REPORT OF THE WG ON SHELF SEA OCEANOGRAPHY

14. Comment on the 1997 ACME statement concerning the development of GOOS initiatives in ICES

This topic was introduced by Roald Saetre who had formulated four possible alternatives for ICES involvement in GOOS. In brief, the four options were as follows:

i. "Business as usual" i.e. involvement of ICES on all GOOS fora, but no specific ICES activity.
ii. Establish an official GOOS pilot project within the ICES area, with ICES taken an advisory and service role for the regional GOOS component e.g. data management, quality assurance.
iii. ICES take responsibility to establish and run a centre for operational fisheries oceanography on a time scale of fish stock assessments (i.e. months) for the whole North Atlantic or a part thereof.
iv. ICES establish a centre for operational fisheries oceanography on time scales of days to years.

After some discussion, Saetre's personal choice of (iii) was generally favoured. It was suggested in the document that a pilot project area be chosen and the North Sea was duly selected by the group. There was some discussion between the relative merits of the North Sea and the Baltic, but the North Sea has more surrounding active participants and

much suitable data are already available. Bjorn Sjoberg suggested that choosing the North Sea would require more resources than the Baltic and also noted that BOOS was missing fishery data which ICES is ideally placed to provide. However, the general feeling was that choosing the North Sea would complement BOOS, and that much could be learned from the Baltic experience.

It was suggested that the eventual aim should be to establish operational oceanography throughout the ICES area (including Canada). A similar collation of North Sea time series as that planned for the Skagerrak (Agenda Item 6) would form the basis of a useful operational data set provided it was regularly updated as new data became available.

Hans Dahlin presented details of an operational model of the Baltic Sea which predicts (in real time) sea level, currents, ice cover and other parameters. The model is used to forecast given parameters based on predicted atmospheric forcing, and is run daily for the subsequent 24-hour period. Results from the model have been used in search-and-rescue operations.

APPENDIX 8

FROM THE CHAIRMAN OF THE WG ON MARINE DATA MANAGEMENT

My preference would be for some active involvement of ICES within GOOS. Options A and B would not really have any great impact, and D would imply a large amount of extra effort. So, probably C is the best option. I would think that it would be valuable for an organisation like ICES, with its long history and high quality data banks, to remain involved with new and important activities like GOOS. One concern I have is that every effort should be made to ensure that there is no duplication of effort between other enterprises like EuroGOOS or other regional projects.

My experience of operational oceanography is not great, but there are two activities that I am have had a little involvement with. Firstly, the University of Hawaii Sea Level Centre, acquires data within a month of collection, initially monthly values, to produce sea level anomaly maps of the Pacific - useful for El Nino. This is a collaborative project with many countries. Originally maps were distributed by post, but now the information is available via the Web.

The other example which springs to mind is the Global Temperature and Salinity Profile Project (GTSPP), which relies largely on commercial ships taking part in a voluntary programme using XBTs - supplemented by fishing and research vessels. Data from these XBTs (and more recently XCTDs) are transmitted via the Global Telecommunications System to MEDS (Canada), where they are made freely available. In addition, delayed mode data gradually replace the real-time data in a Continuously Managed Database (CMD).

A second concern that I have is the resources needed for ICES participation in GOOS. To have an impact and to be able to produce useful products, I think that the ICES Secretariat would need to be strengthened - at a time when funding appears to be tight and resources stretched. Perhaps member countries would agree to an increase in their funding to ICES, or to second staff to work there for periods of 1, 2 or 3 years. I certainly feel that it would need some centralised effort as has taken place with GLOBEC.

To my mind, one of the strengths of ICES is that its member countries are all around the North Atlantic and this moves away from a European perspective that seems common at present, particularly within EU countries. This is something which it would benefit ICES to build upon for GOOS.

The ICES Oceanographic Databank has temperature, salinity and nutrient data going back to the beginning of the century, and includes time series from sections and fixed points. These would be very valuable for providing descriptions of past states and showing trends and changes with time, and thus could provide an important contribution to hindcasting.

The choice of area is, I think, quite difficult. In many ways the North Sea would seem a good choice as it has quite a lot of measurements currently taking place there (as, indeed, has the Baltic) but both of these would mean the pilot project would have a European flavour. I am in favour of a pilot project which takes into account the interests of the USA and Canada, as well as European countries. But I think that the choice of area is best decided by scientists and not data management people. Perhaps looking at two geographic areas rather than just one would be a possibility.

Following on from this, I would not wish to try to define what is done (i.e. what sort of data to collect, sampling strategy, etc.). However, I would emphasise the need for management of the data collected, both in the short term (hours to weeks after data collection), when the data may be used to produce maps or statistics of the current situation or fed into models, and in the longer term (years after), so that the data are still readily available to the scientific community. In addition, quality assurance guidelines, data exchange mechanisms, and data dissemination would all be part of the marine data management contribution. There is considerable expertise within the ICES community in this field.

APPENDIX 9

FROM THE REPORT OF THE WG ON MARINE DATA MANAGEMENT

12.Comment on the 1997 ACME statement (Agenda Item 21.3) concerning the development of GOOS initiatives in ICES H. Loeng introduced this item and provided some background information. At the last ICES Annual Science Conference, an ICES Steering Group on the Global Ocean Observing System (GOOS) was established. Its term of reference is to: 'Prepare an action plan for how ICES should take an active and leading role in the further development of GOOS at a North Atlantic regional level with special emphasis on fisheries oceanography.' The chairmen of the Working Groups under the Oceanography, Marine Habitat and Living Resources Committees make up the steering group. Prior to developing with an action plan, it was necessary to define more precisely the degree of ICES involvement in GOOS. The WG is asked to comment on the following four alternatives:

Alternative A: ICES is formally represented in all appropriate GOOS fora, such as the new GOOS Steering Committee, I-GOOS, the relevant GOOS Module Panels as well as in EuroGOOS. All the operational activities are organised by the member countries themselves and there is no regional GOOS system within the ICES area. This alternative is only slightly above the present involvement and may be characterised as 'Business as usual'.

Alternative B: An official GOOS Pilot Project has been established within the ICES area (e.g. North-east Atlantic, North Sea, the Baltic) by other bodies. In addition to what is mentioned under Alternative A, ICES have a role as an advisory and service agency for the regional GOOS component. Types of services could be:

* Databases and data management;
* Quality assurance - methods, manuals, guidelines, inter-calibration exercises;
* To support the Living Marine Resources Module, in particular concerning phytoplankton, zooplankton and benthos.

Alternative C: ICES take the responsibility to run a centre for operational fisheries oceanography on non-meteorological time scales (i.e. more than two weeks) or on the time scale of fish stock assessment (some months) for the whole North Atlantic or parts thereof, i.e. the North Sea. The centre co-ordinate national and international data collection, the rapid transmission of data to computerised data assembly centres for processing through numerical and statistical models to produce regular:

* Climatic prediction (time scale season to some years)
* Regular environmental status reports
* Time series for identifying trends or changes

Alternative D: In addition to the tasks mentioned under Alternative C, we could also include processes of meteorological time scales, i.e. ICES establish a Centre for operational fisheries oceanography on time scales from days to years.

H. Loeng requested the views of the MDM WG on their involvement and suggested they could have a role in real time data exchange, quality assurance, common data formats and products. The MDM WG noted that there were many national committee for GOOS, and also that R. Keeley (MEDS) and B. Searle (AODC) had written a paper showing how GOOS could use the existing IOC/IODE system for managing GOOS data (in particular the scheme used for the Global Temperature and Salinity Profile Project (GTSPP)).

The initial reaction of the WG was that for options other than Alternative A, funding and personnel would be needed, which could be a problem. However, leaving that consideration aside, Alternative C was favoured by most members of the WG. J. Szaron noted that in Sweden, some of this type of work was already being carried out. Similarly, in Canada, work was just starting in this area, and J. Gagnon felt this was opportune. He recommended a pilot project first. He also noted that area of most interest to Canada was the western Atlantic. M. Garcia was aware of sea level data being available in near real time in Spain, but not of any other data types at present.

O. Ni Cheileachair noted that EuroGOOS was accelerating, and setting up a data management scheme, and asked how an ICES GOOS regional project would link with EuroGOOS? She also felt that there were definite advantages of regional data sets, where data have been pulled together over a large area. These can be used for modelling and to produce statistics.

As a data management group, we did not feel that it was for us to suggest the scientific elements of the scheme, but data management should form a part of any project. The MDM WG can certainly provide input on databases, data exchange (both mechanisms and formats), quality assurance, assembling regional data sets, data dissemination, presentation of data (via the Web, for example) and production of products.

To summarise:

1. To the question should ICES be involved, one response was - Can ICES afford to be left out? GOOS is a major project, and an ICES regional project would be very likely to contribute much in terms of knowledge, expertise and data.
2. Alternative C was the favoured option.
3. The WG could contribute a wide range of expertise in data management.

APPENDIX 10

FROM BILL TURRELL – UK

1. My preferred option is also Option C. In some respects ICES is already half way there. Within the ICES Oceanic Hydrography WG we issued last year for the first time a summary presenting all results from the extensive network of ICES standard sections and stations. It is these which will form the backbone of option C, but with (hopefully) additions which may include automated foxed buoys or platforms located in key areas chosen from existing knowledge and modelling results. The EU proposal TRANPOSE is aimed at selecting such key sites for the future. But I must stress these new developments should build on the existing network, and not be instead of it. What we have lacked until now is a co-ordinated way of pooling the results from the originators of the data, and making these data rapidly available. Option C sounds like it is filling this gap. The www and associated methods of data transfer (Email and ftp) now allow such rapid data transfer, display and publication. HOWEVER, option C should be used to strengthen the position of the data originators. In the ICES area this is still predominantly fishery labs, with central Government core funding. These labs must defend the high costs in data collection to 'customers' who do not always appreciate why we repeatedly monitor the sea and what benefit it gives them. The Centre for Operational Fisheries Oceanography must respect and rigorously defend the position of contributing institutes, and give a high profile to their work, so that individual workers can report to their own customers who are actually paying the bills that the data they are producing are internationally acknowledges as of great importance to fisheries and climate studies.
2. Option C should focus on the North Atlantic and Nordic Seas. This is where:
3. Most ICES activity already occurs
4. Most ICES fisheries take place
5. Most weather patterns form, which impinge on Europe (hence broadening the appeal to a more climate related network which will meet GOOS concepts more closely.
6. Elements in an Action Plan:
7. Earmark some money and employ a full time person to help the ICES staff.
8. Establish the background network of ocean monitoring based on the existing ICES standard sections and stations. This MUST closely involve all contributing parties, who are already part of the ICES OHWG.
9. Establish data exchange protocols within this group. Establish a status report format. Establish a web page.
10. Start a debate (symposium/workshops ? At ICES annual science meeting ?/ involve ICES WG's) about what should be added to the 'background network'.
11. Initiate EU funded projects (5th Framework) to establish the new 'enhanced' network. Emphasis should be on building on existing results and monitoring networks, and establish systems which can survive for one century. I do not think this is unreasonable. Our counterparts at the turn of the century established standard sections which are still going. We certainly need to sustain a GOOS network for decades. This is made clear in GOOS literature, and is sensible. From existing data sets a decade is probably the minimum time scale over which trends or patterns can be seen. This sort of sustainability must be built in, and involves consideration of which technologies are involved and the costs of the infrastructure needed to run monitoring networks (i.e. we do not want and Autosub cruising the NA if it takes 20 technicians, a cray computer and western Europe's battery supply !) Perhaps this initiative comes at a good time, at the start of the 21st century. We should be able to learn from the experiences of the 20th century and set up a system for the coming 100 years, with all the uncertain but significant changes which are predicted to occur.

APPENDIX 11

THE GOOS PRINCIPLES

The GOOS Principles

(source: http://ioc.unesco.org/goos/princip.htm)

Introduction

It has been recognized for some time that a set of GOOS principles concerning the design and implementation of GOOS could provide coherence to the program, a set of basic rules for the design of the system itself and a clear statement to engage the interest and commitment of agencies and governments while spelling out the expected 'terms' of their involvement in this ambitious undertaking.

The Principles are designed as a set of relatively concise statements that could be understood without great elaboration. The SSC of I-GOOS requested that explanations of the principles be prepared in time for distribution to J-GOOS in April 1997 and I-GOOS in June 1997. Explanations of the intent of the principles are given below, incorporating modifications by J-GOOS.

Two sets of Principles are defined. The first (Design Principles) define the overall principles that determine the design of the system and provide a guide for what the design should include and exclude. The second is a guide to the conditions that should determine participation in the system, and the elements that determine those conditions.

These Principles have been adopted to guide the design and implementation of GOOS. Nothing within them should be interpreted as contravening or conflicting with the rules and regulations of the sponsoring organizations or the individual rights of Member States.

I. DESIGN PRINCIPLES

- **D1. GOOS** is based on a plan designed to meet defined objectives on the basis of user needs.
- **D2.** The design assumes that contributions to GOOS are long term.
- **D3.** The design will be reviewed regularly.
- **D4.** The design allows for flexibility of technique.
- **D5. GOOS** is directed towards global problems and/or those ubiquitous problems benefiting from global observing systems.
- **D6.** The design covers the range from data capture to end products and services.
- **D7.** The management, processing and distribution of data will follow a specified data policy.
- **D8.** The design takes into account the existence of systems outside GOOS that can contribute to and/or benefit from GOOS.
- **D9.** The design takes into account quality assurance procedures.

II. PRINCIPLES OF INVOLVEMENT

- **P1.** Contributions to GOOS will be compliant with plans developed and agreed on the basis of the above design principles.
- **P2.** Contributions will be compliant with a defined GOOS data policy.
- **P3.** Contributions should reflect an intent for sustained observations.
- **P4.** Standards of quality will apply to GOOS contributions.
- **P5.** Implementation will be effected using existing national and international systems and organisations where appropriate.

- **P6.** Implementation will be incremental and progressive, whilst bearing in mind the long term goals.
- **P7.** Participation in GOOS implies an undertaking to help less-developed countries to participate and benefit.
- **P8.** Participants will have full autonomy in the management of their contributions to GOOS.
- **P9.** Contributing nations and organisations will reserve the right to determine and limit their contributions to GOOS.
- **P10.** Use of the GOOS 'label' implies conformity with the relevant principles of GOOS.

EXPLANATIONS OF THE GOOS DESIGN PRINCIPLES

•Principle D1. GOOS is based on a plan designed to meet defined objectives on the basis of user needs. This principle states foremost that GOOS from its conception, is a planned system for the acquisition and value-added application of a specific subset of observations gathered according to a designed strategy. It is not an opportunistic assembly of whatever ocean observations are offered for contribution by participating countries. The plan will therefore state (or at least outline) the observations that are required for each particular objective, and should where possible define how they would be applied to the needs of users. Applications should include the 'public good' where there is a defined socio-economic basis. Observations that qualify for inclusion as contributions to GOOS will, by definition, be of a kind and quality applicable to the defined objectives and end-use.

•Principle D2. The design assumes that contributions to GOOS are long term.

GOOS is founded on the concept of an observing system that is ongoing or of an indefinite lifetime, in the same sense as the system of global meteorological observations. Although it will inevitably include observations gathered and sponsored for a limited duration and for differing purposes, the design will assume that such observations will be selected and contributed as part of a continuum that assembles to create a long-term, systematically structured and quality-controlled dataset.

•Principle D3. The design will be reviewed regularly.

GOOS will evolve as plans consolidate, alliances form, commitments are made, needs become better defined and prioritised and technology improves. In addition, an essential element of the observing system must be the continual evaluation of the system design through the analysis of its products. Thus, to ensure that implementation proceeds continuously and effectively, the system design will require frequent review and adaptation.

•Principle D4. The design allows for flexibility of technique.

GOOS is aimed at the assembly of a data set of specific oceanic variables. Depending on the capability of the participating observing agencies and the advance of technology, the method of observation of these variables will differ. The design should not unnecessarily restrict the technique used for observation provided its standard is adequate for the purpose.

•Principle D5. GOOS is directed towards global problems and/or those ubiquitous problems benefiting from global observing systems.

Among the range of needs for systematic observation of the marine environment on all scales, there is a subset of needs that can be most effectively addressed through cooperation within GOOS. Some depend on a scheme of related observations; such as are required for the changing climate of the large-scale ocean or for a pollutant stressing the capacity of large parts of the ocean. Others are generic, common or dependent and can be facilitated and in some cases only made possible by a globally coordinated or globally designed and facilitated system of observations. Even needs that are dependent only on local observations, is the case for many coastal applications, may benefit greatly from data products that are generated as part of a globally coordinated system. The thrust of the GOOS design should be to service this subset of needs without prejudice to existing systems operating outside of the GOOS framework.

•Principle D6. The design covers the range from data capture to end products and services.

The end-to-end concept implies a known or definable pathway of connections between a basic observational element and the end use or purpose to which the observation (or information derived from it) is applied. Typically, each type of

ocean observation has a range of potential applications, and most applications have the need for more than one observation type. In designing a system to serve a given range of end-uses, it is important to know how the observation would be used, processed and combined with other observations to deliver an observational 'product' of value to the end user. The GOOS design must therefore be concerned not only with how observations should be made but the steps and operational and scientific products (e.g. technology and models) required for their end use.

•Principle D7. The management, processing and distribution of data will follow a specified data policy.

In concert with the policies of IODE, IGOSS and GCOS, and following the data management plan for the World Weather Watch of the WMO, commitment is required by GOOS participants to establishing, maintaining, validating, making accessible, and distributing high quality, long term data meeting internationally agreed standards. Preservation of GOOS data is required in suitable archives following appropriate procedures and criteria for data acquisition and retention, and should include information about data holdings. Data should be processed to a level which is generally suitable for the generation of operational products and for research, and described in internationally accessible on-line computerised directories that can also be made available by other means. GOOS contributors are responsible for full, open and timely sharing and exchange of GOOS-relevant data and products for non-commercial activities. Exchange implies that donation by individual nations gains access to data from others as well as to products derived using all available data, such that the benefit of cooperation exceeds the cost.

•Principle D8. The design takes into account the existence of systems outside GOOS that can contribute to and/or benefit from GOOS.

A cornerstone of GOOS development is that it will be built to the greatest extent upon existing systems of observation and data management, national, regional and global This requirement is vitally important for the most effective use of global resources. By the same token, these systems have their own defined purposes and goals outside GOOS and these goals cannot necessarily be deflected to the delivery of GOOS. GOOS must therefore be designed to 'co-exist' and interact cooperatively and to mutual benefit with the other systems. As a particular example, to the present time, most interior ocean physical observations have been made through individual research projects or in connection with global research programs like TOGA and WOCE. These provide valuable data sets to GOOS and could in turn benefit from GOOS observations, although in many respects they are inappropriate for incorporation into a GOOS implementation framework. Systems like IGOSS, GLOSS and IODE are presently structured as central points for the management of specific data types collected by national agencies for reasons that will often be outside the scope of GOOS. Their operations could be adapted and/or expanded to the management of a subset of data that contributes to GOOS.

•Principle D9. The design takes into account quality assurance procedures.

The incorporation of quality assurance (qa) procedures as an integral part of the GOOS plan represents a departure from the practice of existing observing systems, which in some cases apply qa processes but not as part of the observation design and acceptance strategy. Without quality assurance procedures, the great promise of global data sets to address specified problems will certainly not be met. Several of the principles stated above, for example D2, D3 and D4, address the need for strong oversight of the observing system and its continued review with an eye to assessing and improving its effectiveness. Quality assurance is a fundamental part of that effort.

EXPLANATIONS OF THE GOOS PRINCIPLES OF INVOLVEMENT

In order to assist nations and national agencies to decide whether they are willing and able to participate in the implementation of GOOS, there needs to be a set of principles that define the nature of participation, in terms of the 'requirements' of GOOS as conceived and consistent with the foregoing Design Principles.

•Principle P1. Contributions to GOOS will be compliant with plans developed and agreed on the basis of the above design principles. Consistent with Principle D1, GOOS is designed and implemented according to a plan or series of plans. There will be a great deal of latitude in the way nations participate in GOOS. However, it is very important for the coherence and orderly development of GOOS as well as the optimisation of cooperation between countries and the delivery of benefits, that all contributions are made with the clear intent to comply as closely as possible with these plans.

•Principle P2. Contributions will be compliant with a defined GOOS data policy.

Principle D7 indicates that data policies will be defined for GOOS. The success of GOOS depends critically upon the implementation of these policies. It is therefore necessary that compliance with these policies is a prerequisite to

effective participation, recognising that the benefits of GOOS will flow primarily from the reciprocal exchange of data and products between countries.

•Principle P3. Contributions should reflect an intent for sustained observations.

Nations contributing to GOOS will be understandably reluctant to make an open-ended commitment to GOOS. However, it needs to be recognised that the benefits of GOOS, and indeed the whole concept, depend upon the collation of data sets that are continuous and sustained. Thus, this principle requires affirmation of an intention that, subject to changing circumstances, observations submitted as part of GOOS will be sustained.

•Principle P4. Standards of quality will apply to GOOS contributions.

Participants should be aware that GOOS will not be a repository of any data that might be contributed to it. GOOS data will be subject to quality testing to ensure its capacity to meet GOOS requirements. Contributors will be encouraged to apply the agreed quality assurance procedures.

•Principle P5. Implementation will be effected using existing national and international systems and organisations where appropriate.

There are a number of international organizations and agencies responsible for the coordination of ocean data collection and its storage. It has been accepted from the start of GOOS that for reasons of efficiency, such bodies, which include IGOSS, DBCP, GLOSS and the IODE, will be used whenever possible to implement GOOS. At the same time it is recognised that these bodies exist to serve purposes outside of GOOS. Therefore GOOS will not substitute for them or subsume their function. The principle implies the effective use of existing systems, and that the proliferation of new systems and organisations to serve GOOS alone will not be encouraged. At national level observation systems exist primarily to serve defined national objectives. In many cases these systems could be expanded or adapted to meet GOOS requirements. The principle therefore encourages nations and agencies to facilitate their participation in GOOS through these systems, rather than requiring the creation of new systems.

•Principle P6. Implementation will be incremental and progressive, whilst bearing in mind the long term goals.

The implementation of GOOS will occur gradually as nations and agencies decide to submit part of their existing ocean observing effort and put in place new systems as contributions to GOOS networks. It will take time for regional alliances to take shape and new resources to be committed for GOOS as the benefits become apparent. Also, GOOS will evolve as techniques and technologies change and its scope extends, and it is realistic to expect that full implementation will take many years. This principle makes it clear that participation should not be inhibited by the lack of implementation of the complete observing system, and that incremental contributions are effective additions to the whole.

•Principle P7. Participation in GOOS implies an undertaking to help less-developed countries to participate and benefit.

Consistent with the global nature of GOOS and its purpose to serve all humankind there is an obligation to enable all nations to participate in and benefit from GOOS. Without external assistance and cooperation, few countries are well-equipped to establish observing systems to meet the requirements of GOOS or to derive full benefit from the enhanced knowledge and the management tools that GOOS will create. Therefore the undertaking to assist these countries where possible to become capable and effective partners in GOOS is incorporated as a core principle of GOOS participation.

•Principle P8. Participants will have full autonomy in the management of their contributions to GOOS.

GOOS will be implemented by nations and their agencies. While GOOS is planned and coordinated internationally, it is recognised that the way in which observations are gathered, resourced and managed differs widely between nations and agencies. This principle is an assurance that GOOS has no role in these internal processes, and its influence will be confined to the encouragement of adherence to the quality assurances protocols, data exchange policy, etc. according to the other GOOS

•Principle P9. Contributing nations and organisations will reserve the right to determine and limit their contributions to GOOS.

As a corollary to Principles P6 and P8, this principle affirms that, although the success of GOOS will depend on long-term and indefinitely sustained observations, nations must always retain full control of the resources and contributions they make to GOOS.

•Principle P10. Use of the GOOS 'label' implies conformity with the relevant principles of GOOS.

The GOOS acronym is already in widespread use and, in the absence of overarching GOOS plans and principles, has become associated with a variety of national and international activities. Some of these lack any effective association with the intended global system. This principle indicates the intention to ensure the quality and dependability of GOOS programs and the consistency and coherence of GOOS development by requiring all activities using the GOOS 'label' to comply with the fore-stated GOOS Principles.