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Hydrography Committee

Ref. L

Report of the  
WORKING GROUP ON SHELF SEAS OCEANOGRAPHY

Helsinki, 18 - 19 May 1995

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## 1. Opening of the meeting

The meeting was opened at 10.00 on the 18 May 1995 and hosted by the Finnish Institute of Marine Research, Helsinki. Participants were welcomed by the WG chairman and the representative of the Institute, Mr. Pekka Alenius. At a following joint session with the WG on Harmful Algal Bloom Dynamics both groups were welcomed by the Director of the Institute, Professor Pentti Mälikki.

Ms. Josephine Joordens was appointed as general rapporteur to be supported by other group members on specific agenda items.

Members of the Working Group present were:

Mr P. Alenius, Finland, Dr G. Becker, Germany, Mr H. Dahlin, Sweden, Dr B. Dybern (part of meeting), Sweden, Prof W. Fennel, Germany, Ms J. Joordens, Netherlands, Ms K. Kononen, Finland (part of meeting), Mr H. Loeng, Norway, Prof T. Osborn, USA, Mr J. Rees, UK, participated as a substitute for Mr J. Brown, UK. Mr R. Seatre, Norway, participated as a member of ACME to discuss the ICES attitude to the Global Ocean Observing System, GOOS.

Apologies for absence were received from Dr E. Buch, Denmark, Mr S. Fraga, Spain, Prof J. Olafsson, Iceland, Ms B. Reguera, Spain, Mr B. Sjöberg, Sweden, Mr E. Svendsen, Norway and Mr G. Wegner, Germany.

Only 20 % of the appointed members were present which compared with preceding years was an improvement but still not satisfactory in relation to the tasks of the working group.

## 2. Adoption of agenda

The Working Group on Shelf Seas Oceanography met to

- a) assist the Working Group on Harmful Algal Bloom Dynamics to develop plans for the follow-up workshop on the Modelling of Harmful Algal Bloom Dynamics;
- b) assess the progress being made in model validation procedures, particularly in respect to particle and nutrient fluxes;
- c) evaluate progress in understanding of flux studies drawing on material and information being acquired from various major EU MAST projects in and adjacent to the shelf seas (for example, NOWESP and OMEX);
- d) continue the compilation of estimates of physical/chemical fluxes particularly across the shelf seas/ocean and riverine/coastal interfaces;
- e) examine developments in coastal modelling in terms of quantifying alongshore and cross-shelf transports;
- f) commence a review of quality assurance procedures for oceanographic data.

For item a) the working group devoted half a day to a joint session with the Working Group on Harmful Algal Blooms. The report from the joint session is included in C.M. 1995/L:4, Ref.:C.

To the draft agenda, annex 1, was added g) to give the views of the working group on the ICES attitude to the Global Ocean Observing System (GOOS) and to discuss the feasibility of establishing an annual quality status report for the ICES area.

## 3. Assess development in numerical modelling

### 3.a. Progress in model validation with respect to particle and nutrient fluxes

The opinion of the working group was that proper validation of oceanographic models was a rare phenomenon. Regarded as

main causes were the lack of suitable datasets with spatial and temporal resolution of the same order of magnitude as the models and also lack of interest from many of the modellers.

Operational models for forecasting of the drift of oilspills and for use in marine rescue operations have occasionally been validated in connection to accidents but generally the drift information is not returned to the modeller.

Preliminary information from a recent validation experiment in the Baltic Sea with BSH in Germany as lead agency was presented and discussed. The shortcomings of the presently used operational models appeared distinctly in this experiment. Also difficulties to interpret the results and the importance of a thorough design of the experiment had been experienced. A report on the experiment is under preparation.

The working group stressed the importance of validation of models which should be used for operational and management purposes. ICES ought to promote and arrange experiments to create suitable data sets for model validation.

### 3. b. Coastal modelling for alongshore and cross-shelf transports

The number of groups using numerical circulation models has increased during the recent years. The variety of the used codes seems to be limited to a certain number of freely available ocean models.

Owing to the modern high speed computers the so called primitive equation models are more and more favoured. Codes once developed for global modelling appear to be very flexible and gain increasing importance for models of the coastal oceans and marginal seas.

The most important models are:

The GFDL-general circulation model due to Bryan/Cox/Semtner and the version with free surface Killworth et al.

B-grid

modular version (MOM I and II) Pacanovski et al (Baltic Sea: Kiel, Warnemünde, Tallinn)

The Princeton Ocean Model (POM) Mellor and Blumberg C-grid, Sigma co-ordinates, (North Sea and Baltic: Copenhagen, Bergen)

Backhaus code and modified versions, C-grid (North Sea and Baltic: Hamburg, Norrköping)

Miami Isopycnic Coordinate Ocean Model (MICOM), layer model (Baltic, White and Kara Seas: Bergen)

Spectral models are not very much in use. There are several models being not freely distributed (System-3, DHI/Copenhagen) or stand alone developments (St Petersburg, Gdansk, Helsinki/Tallinn) which possibly can not compete with the above mentioned due to the fact, that they lack the synergetic effects of the community models.

The modelling of alongshore and cross shore fluxes is addressed in the MAST II-project PROFILE (coordinator J. Huthnance), in the German LOICS-project KUSTOS (Hamburg, J. Sündermann) and in Warnemünde (river plume modelling in the frame of the Baltic sea model).

A summary of current activities was given in the 27th International Liege Colloquium on Ocean Hydrodynamics 'Processes in Regions of Freshwater Influence (ROFI's)' and will be published in the Journal of Marine Systems.

#### 4. Progress in coastal flux measurements

##### 4.a. Major projects

Marine Science and Technology: MAST

###### 1. DYNOCOS (Dynamics of connecting seas)

DYNOCOS aims at a better understanding of the marine environment between connecting seas and its variability in time and space. Emphasis is put on key processes and fluxes characterizing transition areas: jet streams, slope currents, mixing (entrainment) and intrusions, and mesoscale dynamics of transition areas. Both transport processes and ecological aspects associated with transition areas will be studied, using an integrated approach of numerical modelling, field and laboratory experiments. Special attention will be paid to the transition area between the North Sea and the Baltic as this area is characterized by the complex responses of a stratified flow system to changing wind and buoyancy forcing. Envisaged result: improved scientific knowledge and a 3D baroclinic eddy-resolving models of the complete marine system between the North Sea and the Baltic.

Period: 1994-09-01 - 1997-02-20

Danish Hydraulic Institute (MOLLER, J S)

###### 2. OTRANTO (HYDRODYNAMICS AND GEOCHEMICAL FLUXES IN THE STRAIT OF OTRANTO)

Objectives: to improve knowledge about the hydrodynamics of the Strait of Otranto and to evaluate the water and particle fluxes across this Strait at synoptic seasonal and interannual time scales. Long-term monitoring of currents and sediment fluxes in the Strait will be performed. Seasonal surveys in the area of the Strait including one basin-wide survey will complement the observations. Shipboard measurements will include CTD casts, nutrients, dissolved and particulate elements. The results: a data set for validation of the models and assessment of complementary programmes.

Period: 1993-12-01 - 1996-05-31

Osservatorio Geofisico Sperimentale di Trieste (MICHELATO, A)

###### 3. EUROMARGE-AS (TRANSFER PATHWAYS AND FLUXES OF ORGANIC MATTER AND RELATED ELEMENTS IN WATER AND SEDIMENTS OF THE NORTHERN ADRIATIC SEA AND THEIR IMPORTANCE ON THE EASTERN MEDITERRANEAN)

Objective: to quantify on seasonal and interannual bases the material transfer of biogeochemical elements from the Northern shelf to the mid and Southern basins of the Adriatic Sea. A study will be made of the temporal variability of biogeochemical exchanges between river outfalls especially from the river Po the northwestern shelf and the deeper basins to the south. This will necessitate a study of primary production and respiration as they are likely to influence the biogeochemistries of certain metals and radioisotopes transported by particulate matter and sediments. Observations will be used to quantify a biogeochemical budget for this system and to relate this to other areas studied in the Mediterranean Targeted Project.

Period: 1993-08-01 - 1996-01-31

University of Edinburgh (PRICE, N.B.)

###### 4. EUROMARGE-NW (TRANSFER PATHWAYS AND FLUXES OF ORGANIC MATTER AND RELATED ELEMENTS IN WATER AND SEDIMENTS OF THE NORTH BALEARIC BASIN AND THEIR IMPORTANCE ON THE WESTERN MEDITERRANEAN SEA)

The project studies the Northwestern Mediterranean continental margin ecosystems, involving the mesoscale Liguro-Catalonian circuit from the East of Marseilles to the

Catalonian coast South of Barcelona and to the North-Balearic margin. Objectives: to determine fluxes of dissolved and particulate matter from terrigenous and biogenic origin; to quantify biogeochemical exchanges at the sediment-water interface with special attention to biological activity; to analyze benthos dynamics; to describe composition and physical properties of sediments in order to track long term changes. Expected results: quantitative simultaneous assessment of water masses suspended particle standing stocks and particulate fluxes over an entire margin system; calculations of mass balances and budgets within the water column of some important elements and compounds; understanding of the fate of particulate matter.

Period: 1993-07-01 - 1995-12-31

Fundacion Bosch i Gimpera de la Universidad de Barcelona (CANALS, M.)

###### 5. PELAGOS (HYDRODYNAMICS) AND BIOGEOCHEMICAL FLUXES IN THE STRAITS OF THE CRETAN ARC (AEGEAN SEA EASTERN MEDITERRANEAN BASIN)

Objectives: to improve knowledge about the hydrodynamics of the South Aegean Sea and to estimate the exchanges of water and dissolved/particulate matter between the Aegean Sea and the adjacent open sea region of the Eastern Mediterranean Basin. Development of models will be combined with measurements of the currents and information derived from the space-time distribution of dissolved and suspended particulate matter. Large-scale water flows around the islands and frontal structures will be studied using a physical (laboratory) model. Biogeochemical fluxes across the Straits of the Cretan Arc will be determined from the hydrodynamic studies and a field measurement programme.

Period: 1993-09-01 - 1996-02-29

National Centre for Marine Research of Greece (BALOPOULOS, E.T.H.)

###### 6. NOWESP (NORTH-WEST EUROPEAN SHELF PROGRAMME)

The North-West European shelf represents an important transit region for dissolved and particulate matter stemming from major European rivers. Combined existing data sets of this area provide a detailed set of observations, but due to the large scale and the strong variability of the phenomena involved present knowledge still has a fragmentary character. The NOWESP objectives are: to quantify the biogeochemical fluxes; to estimate their variabilities and trends; to understand the nature of shelves as a link between land and ocean. NOWESP will integrate and analyze existing European data sets and make an assessment of the fluxes of energy and matter as well as their variability.

Period: 1993-08-01 - 1996-07-31

Rijkswaterstaat, The Netherlands (LEUSSEN, VAN)

###### 7. MORENA (MULTIDISCIPLINARY OCEANOGRAPHIC RESEARCH IN THE EASTERN BOUNDARY OF THE NORTH ATLANTIC)

Objective: to understand and model shelf open ocean exchange in the coastal upwelling region of the eastern boundary layer of the subtropical ocean. This is to be attained by quantitatively understanding the physical, chemical and biological processes involved in the transfer of matter, momentum and energy across and along the shelf, the shelf break and the slope in the Iberian region of the Atlantic. Advection and dispersion processes will be investigated by studying physical dynamics as well as fluxes of nutrients, organic matter, and phytoplankton dynamics.

Period: 1993-06-01 - 1995-05-31

Universidade de Lisboa (FIUZA, A.)

###### 8. PROFILE (PROCESSES IN REGIONS OF FRESHWATER INFLUENCE)

The overall aim is to develop process understanding and numerical models for Regions of Freshwater Influence (ROFI). It encompasses the study of the role of physical processes controlling water- property distribution and that of suspended

sediments controlling the availability of light and nutrients for phytoplankton growth. The project comprises the construction of a fully coupled 3-D nearshore model. Systematic observations of the contrasted Rhine, Clyde and Thermaikos Bay ROFIs will complement earlier measurements in the ROFI areas of the Rhine German Bight and Po. Behaviour of the contrasting ROFIs will be intercompared and interpreted using models. The outcome will be a defined set of observations, model code and model output on electronic media.

Period: 1993-07-01 - 1996-06-30

Proudman Oceanographic Laboratory, UK (HUTHNANCE, J.)

#### 9. OMEX (OCEAN MARGIN EXCHANGE)

Quantification of fluxes across the ocean margins is a fundamental requirement for the evaluation of the carbon budget and exchange of nutrients and associated trace elements between the continents the coastal zone and the open ocean. OMEX is designed to study the exchanges and processes occurring at the European continentocean margins in the North Atlantic, and consists of 5 subprojects: Physics, Biological Processes, Biogeochemical Cycles, Benthic Processes and Carbon Cycling & Biogases. Key questions in OMEX are: 1) What are the principal processes controlling fluxes of water and particles in geomorphologically contrasting slopes or shelf-edge systems? 2) Which part of the shelf primary production is sustained by oceanic nutrient fluxes versus river and atmospheric inputs? 3) Is shelf production exported to the open ocean and are shelf slopes depo-centres for the missing carbon? 4) What are the consequences of biologic discontinuities and of benthic-pelagic uncoupling at the shelf edge on the carbon fluxes? 5) Is the diversity in the benthic community structure and production controlled by the balance between horizontal and vertical fluxes? 6) How does the ocean margin exchange affect the behaviour of trace elements? How do the scavenging processes in shelf edge systems control the reactivity and residence time of trace metals and radionuclides? 7) What are the characteristics and types of biogases produced on the shelf exchanged with the atmosphere or exported to the open ocean? 8) What is the sensibility of the processes mentioned in the above questions in response to global climatic change and sea-level rise? OMEX sites: Goban Spur area in the Celtic Sea, the Iberian margin.

Period: 1993-06-01 - 1995-05-31

Universite Libre de Bruxelles (WOLLAST)

#### 10. XTRANS-II (DETERMINATION OF THE DISPERSAL OF RHINE WATER IN THE NORTH SEA AND THE N.E. ATLANTIC BY MEASUREMENT OF FLUORESCENT XENOBIOTIC RIVER SUBSTANCES)

Objectives: to determine the dispersal of Rhine water and of other major European rivers discharging in the North Sea and the N.E. Atlantic; to provide accurate data for calibration and verification of mathematical flow and transport models at North Sea and continental shelf scales; to obtain calibrated and verified 3-D dynamic models of flows and transports. A quasi synoptic survey of the Rhine plume between Dover Straits and Skagerrak will be carried out. Dye experiments will be conducted in order to determine dispersion residual flow and photolysis rate. Observed dispersion and residual displacements of the dye patches will be used as a first calibration and for verification of an improved 3-D dynamic flow and transport model of the Eastern part of the North Sea.

Period: 1993-01-01 - 1994-10-31 (Completed)

Rijkswaterstaat, The Netherlands (SUIJLEN, J.M.)

#### 11. FLUXMANCHE

Objectives: to improve the knowledge about the hydrodynamics of the Eastern Channel, and to estimate the water and particle fluxes across the Straits of Dover. In the hydrodynamics part, the development of a number of models is to be combined with measurements of the currents in the Straits of Dover and information derived from the space-time distribution of radioactive tracers from their source onward. Coastal processes modulating the fluxes at the interfaces between the water masses are the subject of an experimental

study with a reduced model. Particle fluxes across the Straits of Dover will be estimated from the results of the hydrodynamics studies and several measurement series of the suspended particles concentration and the levels of chemical substances, completed by remote sensing from aircraft.

Period: 1990-06-01 - 1993-08-31 (Completed)

Centre d'Etudes d'Océanographie et de Biologie Marine, ROSCOFF

#### 12. STUDIES ON THE TRANSPORT OF COASTAL WATER FROM THE ENGLISH CHANNEL TO THE BALTIC SEA USING RADIOACTIVE TRACERS

Radionuclides discharged from La Hague were used to trace transport and dispersal of coastal water masses. A time-series of radionuclide measurements in water samples taken in the English Channel at the Dutch coast, in the German North Sea sector and in Danish waters was performed. Rates of water transport, dilution of the coastal currents with other water masses and transit times will be elucidated.

Period: 1990-10-01 - 1993-09-30 (Completed)

Risø National Laboratory, Roskilde Denmark

#### 13. EUROPEAN COASTAL TRANSITION ZONE-ISLAS CANARIAS

The Canary Islands intersect the boundary between eutrophic continental shelf waters affected by upwelling and oligotrophic open ocean waters. Variability in this transition zone arises from both the influence of elongated filaments of cool, nutrient rich water upwelled at the coast extending several hundred kilometres offshore and also the production of eddies and island wakes downstream and downwind of the islands. These processes can result in significant biological enhancement near the archipelago. The programme will study physical characteristics of the flow and hydrography associated with upwelling filaments and island induced eddies and quantify the biological response to physical phenomena in terms of nutrient dynamics, plankton production and distribution and larval survival rates. The short term/seasonal variability of the dominant physical and biological processes near the islands will be studied. A combination of remote sensing, monitoring of sea level, in-situ observations during different seasons and numerical modelling will be used.

Period: 1990-09-01 - 1993-12-31 (Completed)

University of Wales, Bangor

#### National Environmental Research Council: NERC NORTH SEA PROJECT

The project evolved from a NERC review of shelf sea research, which identified the need for a concerted multidisciplinary study of circulation, transport and production in the North Sea. Three objectives were pursued:

- i) production of a 3 dimensional transport model for any conservative passive constituent, incorporating improved representations of the necessary physics - hydrodynamics and dispersion;
- ii) identifying/quantifying non-conservative processes: sources and sinks determining the cycling and fate of individual constituents;
- iii) defining a complete seasonal cycle as a data base for all observational studies needed to formulate, drive and test models.

Observations were made in the North Sea in the period 1988-1990, and consisted of several moorings, 17 survey cruises and 26 process study cruises. Some of the process study cruises concentrated on fronts (nearshore, mixing, circulation) and on plumes, thus yielding additional information to the flux measurements carried out during the survey cruises. Collected data are available on CD-ROM; data analysis and interpretation is given in "Understanding the North Sea System", Charnock et al (eds). The Royal Society/Chapman & Hall, London 1994.

Period: 1987-1992

Proudman Oceanographic Laboratory, Bidston UK

Land-Ocean Interactions in the Coastal Zone: LOICZ

LOICZ is one of 7 Core Projects which comprise the

International Geosphere-Biosphere Programme (IGBP), and focuses on the area of the earth's surface where land, ocean and atmosphere meet and interact. The objective is to determine at regional and global scales: the nature of that dynamic interaction; how changes in various compartments of the Earth system are affecting coastal zones and altering their roles in global cycles; how future changes in these areas will affect their use by people; to provide a sound scientific basis for future integrated management of coastal seas on a sustainable basis.

One (of the project's four) focus point is especially relevant to coastal flux measurements: The Effects of Changes in External Forcing or Boundary Conditions on Coastal Fluxes. This focus consist of 4 activities:

- i) Catchment basin dynamics and delivery;
- ii) Atmospheric inputs to the coastal zone;
- iii) Exchanges of energy and matter at the shelf edge;
- iv) Development of coupled models for coastal systems.

The LOICZ Implementation Plan lays out the scientific goals and charts a course towards their achievement based on the coordination of nationally funded research.

Period: 1993-2003

LOICZ Core Project Office based at NIOZ, Texel (The Netherlands)

#### 6. b. Compile estimates of physical/chemical fluxes

A need has been identified to study fluxes of physical and chemical constituents instead of concentrations. To gain better understanding, it is proposed to draw up (or calculate with models) a contour map of time constants. In order to do this, information on water mass types, volumes and fluxes is required for each specific area. Tom Osborn will do this for the US East coast, Hans Dahlin for the Baltic, Gert Becker for the North Sea, Antonio Sa Silva for the Iberian Seas and Roald Saetre for the Nordic Seas. Results in the form of calculated fluxes (min-max) and observed fluxes can be presented in the format of a graph/map for each region.

The work will be performed intersessionally by correspondence and the working group recommends that the first compilation is reviewed by the group at a meeting during 1996.

#### 7. Quality assurance in oceanographic data collection procedures

H. Loeng presented shortly the background for this item which also has been on the agenda for the other working groups under the Hydrography Committee.

The problem is not necessarily linked to the quality of the data values from different observations. Most scientist carefully check that the values are correct. The main problem is the metadata. What kind of information is necessary to store together with the data? It was suggested that a minimum of standard information should follow the data. This will in the future give scientists a possibility to have the necessary background to judge the quality of data collected in the past. The metadata should include information about instruments, position and time, control procedures and so on. Under the discussion it was pointed out that there already exist a lot of guidelines for data collection and handling. However, most of this guideline are very detailed and in addition, they are often linked to a special project.

It was thought that it was useful if there were a set of notes describing the minimum amount of information that was needed for different data sets. This pamphlet (two, maximum four A4 pages), could then give some references to some of the most important guideline.

In conclusion, the WG supported the idea of having a study or discussion group within the Hydrography Committee to consider this more in detail before the 1996 working groups meetings within the committee. The WG would be glad to participate in the future work of such a study group.

#### 8. ICES attitude to GOOS

Based on a request from the chairman of the Hydrography Committee the following two issues were discussed during the meeting in Helsinki:

1. ICES attitude to Global Oceans Observing System (GOOS)
2. The feasibility of establish an annual quality status report for the ICES area

In 1987 the Intergovernmental Oceanographic Commission (IOC) took the first step to establish a global observing system for the ocean and coastal areas. Other UN agencies such as WMO and UNEP were invited to support the development of a GOOS system after the model of WMO World Weather Watch. Five interrelated modules have been defined for GOOS representing users interests and application.

These are:

- Climate monitoring, assessment and prediction
- Monitoring of the coastal environment
- Monitoring and assessment of marine living resources
- Assessment and prediction of the health of the ocean
- Marine meteorological and oceanographic operational service

Most of the ICES activities are included in the GOOS concept. It is believed that a fully operational GOOS is established by about the year 2010.

The GOOS discussion on the meeting may be characterized by a positive scepticism. GOOS is probably the most ambitious programme even initiated by IOC and some working group members expressed some doubt on whether GOOS will ever leave the ground. ICES may provide significant input to GOOS in such areas as data management, methods and intercalibration as well as to the majority of the defined modules. The cooperation within the ICES area may even be further developed towards ICES as a regional GOOS component.

It was recommended that ICES take an active part in the planning and implementation of GOOS. The biological monitoring activities should be strengthened (CPR) and the development of new cost effective monitoring technology should be encouraged.

#### 9. Quality Status Report (QSR) for the ICES area

Up to 1994 ICES published annually *Annales Biologiques* which was a kind of status report for both the environment and the fish stocks in the ICES area. The issuing stopped due to high printing costs, long delay and a lack of demand from potential customers. A proposal have been presented to reopen this issue and that ICES establish an annual report on the environment conditions in the ICES area such as the Baltic, the North Sea, NE Atlantic etc. The element to be included in the report could be such as

- Characterizing the ocean climate and production for the previous year in relation to a long-term mean
- General trend in environmental problems like pollution, eutrophication, fish deceases etc
- Description of special environmental events for the previous year like acute pollution accidents or harmful algal blooms

The participants in the discussion was positive to such an idea and recommended Advisory Committee on Marine Environment (ACME) to carry it further. There is a need to map potential customers for such a report and to study the feasibility of its implementation. Most of ICES countries report annually from their monitoring activities. Probably most of the job to establish a QSR is already carried out at national level. Making an ICES QSR will then be a coordination and summarizing task.

It was recommended that as a first step ICES could make a survey of the national annual reporting procedure from the monitoring activities in order to see how these may be incorporated into a QSR for the whole ICES area.

#### **10. New chairman**

Since the 3 year term for the present chairman, Mr Hans Dahlin, Sweden, is running out during 1995 the working group discussed the nomination of a successor. The group proposed unanimously Mr. Einar Svendsen, Norway, as new chairman if the group is given continued mandate.

#### **11. Recommendations**

The working group concluded by making seven recommendation which are summarized in annex 3.

#### **12. The closing of the meeting**

The chairman closed the meeting on Friday 19 May at 1600.

## AGENDA

Working Group  
Shelf Seas Oceanography  
Helsinki, Finland 18-19 may 1995

1. Welcome and opening of the meeting
2. Appointment of rapporteurs
3. Approval of the agenda
4. Reports on national activities of specific interest to Working Group participants
5. Asses developments in numerical modelling for:
  - a) progress in model validation with respect to particle and vertical fluxes, and
  - b) coastal modelling for alongshore and cross-shelf transport
6. Progress in coastal flux measurements
  - a) major projects, e.g. EUMAST projects
  - b) compile estimates of physical/chemical fluxes
    - i) the shelf seas to open ocean interface
    - ii) the river to coastal ocean interface
    - iii) should we put something about fluxes within the coastal ocean
7. Quality assurance in oceanographic data collection procedures. Following the spirit of the joint theme session on Quality Assurance (St John's, 1994), are we using adequate procedures for data collection and handling to maintain achieve the necessary quality in the final products? Similar terms of reference were set for the Oceanic Hydrography and Marine Data Management Working Groups.
8. Development of plans for studying population dynamics and modelling on harmful algal blooms. To be done in conjunction with the Working Group on the Dynamics of Harmful Algal Blooms meeting in Helsinki 17-19 May).
9. Review report of the Working Group on Phytoplankton Ecology with respect to the interaction of physical and biological processes on nutrient fluxes and concentrations in the coastal ocean.
10. Other business

**Annex 2**

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## Recommendations

The Working Group on Shelf Seas Oceanography makes the following recommendations:

The Hydrography Committee is recommended to continue the work on

- quality assurance in oceanographic data collection procedures (paragraph 7);
- assessing the need for and possibilities to produce an annual QSR for the ICES area (paragraph 9).

The Working Group on Shelf Seas Oceanography is recommended to meet for three days during 1996 (time and place to be decided later) under the chairmanship of Mr. Einar Svendsen, Norway, to

- review and finalize a first compilation of physical/chemical fluxes in the ICES area (paragraph 6b);
- plan an ICES experiment to create a suitable data set for model validation;
- continue the work on harmful algal bloom dynamics by planning a project on the physics of population dynamics;
- provide further advice on the ICES attitude to GOOS (paragraph 8).