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Report of the
WORKING GROUP ON SHELF SEAS OCEANOGRAPHY

Vigo, 11-12 May 1994

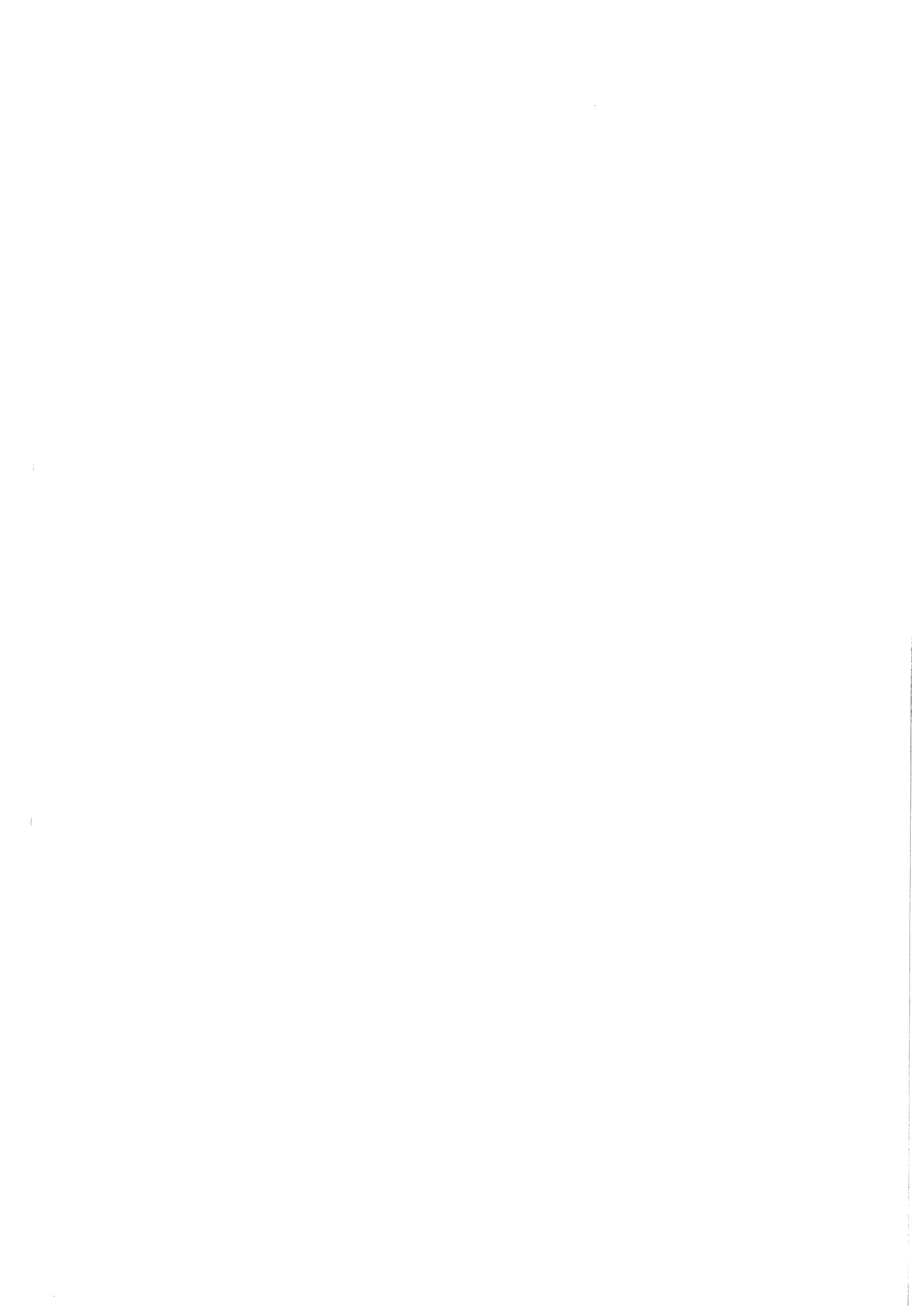
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1. Opening of the Meeting

The ICES Working Group on Shelf Seas Oceanography met in the Centro Oceanografico de Vigo of the Instituto Espanol de Oceanografia, Vigo, Spain, from 11-12 May 1994, preceded by two days of joint session with the ICES/IOC Working Group on Harmful Algal Bloom Dynamics (Reported in C.M. 1994/L:11). Twelve scientists from six countries and the ICES secretariat participated in the meeting. A list of participants is given in Annex 1. The meeting was chaired by Hans Dahlin (Sweden). J. Joordens (The Netherlands) acted as rapporteur. The meeting was opened at 10.00

2. Terms of Reference

At the 81st Statutory meeting in Dublin the Council resolved (C.Res. 1993/2:16) that:

The Working Group on Shelf Seas Oceanography (Chairman: Dr H. Dahlin, Sweden) will meet in Vigo, Spain from 11-12 May 1994 to:

- a) begin a compilation of estimates on physical/chemical fluxes particularly across the shelf seas/ocean and riverine/coastal interfaces;
- b) assist the Working Group on Harmful Algal Bloom Dynamics;
- c) assess the value of oxygen consumption rate measurements in stagnant Norwegian fjords as a tool for monitoring eutrophication trends in the North Sea;
- d) review the role of coastal currents in transporting and distributing biological organisms (e.g. fish eggs/larvae, algae)

A joint session with the ICES/IOC Working Group on Harmful Algal Bloom Dynamics will be held from 9-10 May to consider item b).

3. Adoption of Agenda

After some changes in the proposed agenda, due to members participating just one of the days, the meeting accepted to follow the agenda in Annex 2.

4. Review of the Results of the Joint Session with the WG on HABD

The Chairman reviewed the topics that had been discussed at the joint session with the WG on HABD's for the benefit of those participants that had not been present. The session had created a great deal of interest with more than 40 participants attending.

It was clear that the dialogue between physicists and biologists on the question of bloom dynamics was developing well, and that there was now a lot of physics in the discussion. The presentations of case studies on the first day were seen to be particularly valuable and established a valuable basis for the joint session. Presentations drew particular attention to the importance of interactions at small scales of the physical and biological processes (Gentien and Donagheye). A description of the processes relevant to bloom dynamics, including the role of variable climate forcing, in the Benguelan upwelling system was graphically presented by Pitcher. The National Reports of Algal Blooms were also presented in the joint session, and these showed the value of observations and the fact that there was still little understanding of the mechanisms underlying the observed phenomenon. Furthermore, it was clear that the modelling of these phenomenon was still at a fairly rudimentary level.

The Working Group noted, with regret, the distinct lack of progress in two of the Pilot Projects on HAB's, and this may lead to a slowing down of the interaction between these groups, as well as the growth of understanding. However it was hoped that the proposed studies of these processes in the

Baltic Sea that was announced at the Joint session would be supported sufficiently to help maintain the current momentum.

5. Review of the Modelling Workshop on HABs

The conduct of the Modelling Workshop which had taken place during the preceding week was reviewed by the Chairman. Most participants had considered that the workshop was generally successful, although it fell short of addressing the question of how harmful algal blooms could be modelled. This is because the case studies used as a basis of the workshop discussion tended to concentrate on the modelling of phytoplankton biomass production with the more relevant toxic/harmful aspects being largely ignored. Part of the reason for this was that the workshop was designed primarily to familiarize biologists with the benefits of using modelling techniques. It was concluded that consideration of the harmful aspects could most appropriately be addressed at follow-up workshop, possibly in two years time.

Since a sound knowledge of the main biological and physical processes at the relevant space and time scales is required to achieve the development of predictive HAB models, ongoing discussion between biologists, physicists and modellers must be maintained.

6. Development of HAB Database

The question was posed if collation of (inter)national reports on HABs to form a data base was desired: Will this information be used? Who should create and maintain the data base? What kind of information should be in it? The Mommaerts' data base is presented as an example. It was concluded that it is worthwhile to have a synthesis of existing data in a consistent, comparable format available via computer. This should be regarded as a "one-person job" to assure

quality control and selection of the data that are provided. Mommaerts could be asked to continue the work he has started.

Suggestions for extension of the format are:

Latitude-longitude position of sampling station, sampling depth (surface, pycnocline, near bottom), weather information, range of cell numbers per litre (not just maximum number).

It is felt that such an international database on HABs could provide insight regarding qualitative patterns important for understanding and modelling harmful algal bloom dynamics.

In conclusion however the working group considered that it did not have sufficient interest and expertise to be able to make a value judgement on this need. It was therefore unable to endorse the development of such a facility.

7. Assess the value of oxygen consumption rates in stagnant Norwegian fjords as a tool for monitoring eutrophication trends in the North Sea

Oxygen measurements in selected Norwegian fjords as a medium for monitoring regional eutrophication are proposed in a paper by Jan Aure and Roald Sætre "Stagnant Basin water of fjords - A medium for monitoring regional eutrophication", Institute for Marine Research, Bergen, Norway. This document was presented at the Scientific Symposium on the 1993 North Sea Quality Status Report, April 18-21, 1994, Ebelhoft, Denmark. They state that the carbon flux (determining oxygen consumption rate) in Norwegian fjords is dominated by organic material coming in over the sill from the coastal water outside the fjords. The conditions in the coastal water is supposed to be representative for the degree of eutrophication in a larger region. They also show that an increase of the oxygen demand

has been observed since the first part of the 1980s.

The question to be considered was if this method could be used for monitoring trends of eutrophication in the North Sea, and if development of this method should be continued.

The oxygen consumption trends in the fjord reflects the degree of eutrophication of the water outside the fjord. If this could be a method for regional (North Sea) monitoring of eutrophication leads to the question of how well we can describe the composition of the coastal water. The Norwegian coastal water is a mixture of Atlantic, Continental, Baltic and local origin.

The Working Group has in previous reports stated that monitoring nutrient concentrations in the North Sea as a measure for eutrophication is not sufficient, since the nutrients will disappear into phytoplankton biomass. The method presented is an example of an integrated approach to monitor eutrophication and further development should be encouraged.

To be able to extrapolate the results to the whole North Sea it has to be shown that the North Sea is the main source of organic material for the southern Norwegian coastal waters.

It was also noted that most of the Norwegian fjord data were not digitized and therefore not available in the ICES data bank.

8. Review the role of coastal currents in transporting and distributing organisms (fish eggs/larvae, algae)

Cross-shore currents, buoyant plumes, trapped shelf waves, Kelvin waves etc. are important hydrographical features in coastal areas, and they can influence the distribution of organisms like fish eggs and larvae. Here lies a political and economical interest. Coastal transport exists in the form of net

transport driven by several mechanisms (buoyant plumes, wind, tide). Coastal circulation in cross-shore and vertical direction is important as well since this determines particle distribution and structures associated with fronts (e.g. patchiness). We are unsure of the variability in net transport, and the exact causes and timescales of variability. For instance: How does the inflow of Atlantic water (and its possible relaxation) influence the coastal transport in the North Sea? Physical instabilities (eddies, freshwater blobs) can cause a delay in transporting particles or they can act as a pump.

Also, particle behaviour has to be taken into account. Fish eggs and larvae are fairly passive tracers (no swimming) but they are not conservative as they may be preyed upon. In the same way, algae have limited moving capacity, but they can sink, ascent, grow and be grazed at short timescales. Eulerian residual currents do not necessarily reflect actual transport of biological particles!

The review concluded that the interaction between residual currents, coastal circulation, physical instabilities, residence time in bays, particle distribution and particle behaviour determine the actual transport of particles like fish eggs, larvae and algae.

The Working Group proposes this subject for a theme session or symposium. As a first step, a paper should be written to be discussed at next year's meeting and a short presentation should be given at the Hydrography Committee meeting.

9. Compilation of estimates on physical/chemical fluxes across shelf seas/oceans and riverine/coastal interfaces

During the 1992 meeting of the Working Group, fluxes in the ICES area was considered as an important area for further

studies. The work should be concentrated on the shelf seas/ocean exchange and the riverine/coastal exchange. One proposed method of organising such a study was an atlas of fluxes in the ICES area, which could supersede and replace Report 123 which formed the basis of many studies of the North Sea (including the NSTF MMP and QSR). A compilation of all the known quantification of fluxes, and their variability both on seasonal and interannual timescales, within and into the shelf seas of the ICES area could also reveal significant gaps in our knowledge and hence stimulate further research programmes. The Council Meeting 1993 gave the working group the task to start such a compilation.

During the meeting the subject was introduced by Tom Osborn by showing a picture of the ratio between phosphate concentrations in 1989 and phosphate concentrations in 1935/1936, showing enrichment along the Dutch and German coast. Several questions related to the fluxes of material along a coast was discussed. What is the amount of mixing across interfaces that takes place, and which mechanisms are responsible: wind-driven off-shore transport, instabilities in the coastal current associated with buoyant plumes? Why do coastal waters mix so little in lateral sense? Bathymetry can influence the stability of a coastal jet, and entrainment at the edge of a jet may be important. Nutrient fluxes should include the N, P and Si that is incorporated in phytoplankton and detritus. Transport models (advective, diffusive) are helpful in estimating nutrient fluxes, although response times of phytoplankton and zooplankton growth have to be taken into account.

Models were regarded as the main tool to produce flux information but the importance of good model validation and comparison with observations were stressed. Drifter and dye experiments as well as extensive datasets as for example the SKAGEX data were proposed as methods to test wind-forced models. An assessment of the progress being

made in model validation procedures, particularly in respect to particle and nutrient fluxes were proposed as a main topic for the next meeting of the working group. It was also proposed to 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, OMEX and DYNOCES).

To be able to produce a first draft compilation of fluxes each member of the Shelf Seas working group was asked to compile estimates of fluxes, in for them relevant areas, to be sent to Hans Dahlin well in time before the next meeting of the working group.

10 Evaluate final work of SKAGEX

The SKAGEX project has resulted in a report to the Council of Nordic Ministers, scientific papers for ICES, a computerized data atlas and development of a model of the area. Future plans are to work up material from the database (e.g. transport of water masses, distribution of nutrients and phytoplankton, meteorology, upwelling, planktonic indicator species for different water masses).

It was concluded that the project should be reviewed by members of the Working Group (Osborn, Fennel, Da Silva, Dooley), in order to recommend if the work should continue within the SKAGEX Study Group. It could be considered to continue SKAGEX as a MAST project, and also to propose a theme session on SKAGEX at the Statutory Meeting in Copenhagen 1995.

11 Reports on activities relevant for the Working Group

compilation and evaluation, field measurements and modelling.

11.1 Reports on activities within ICES

The ICES Oceanography Secretary reports on compilation of data sets ("comments" of Oceanography Secretary). Data quality control is very important, since untrained personnel can endanger data quality. Recommendations are to encourage contribution of data, especially on the Baltic Inflow. Also, an overview is desired of who does and who does not, how fast and how much, contribute data to the data base.

It is acknowledged that the position and importance of ICES should be made clear to (scientists in) the member countries, so that they will keep funding travel expenses to ICES meetings. ICES acts as an international inter-disciplinary free consulting company, that looks at different regions and their problems at a higher level of integration, and that provides a chance to transfer political ideas to a higher level of management.

11.2 Reports on activities outside ICES

Portugal: In OMEX the emphasis is on ocean/margin exchange and modelling. A relation between OMEX and SEAFOS will be established, e.g in the form of presentations at OMEX meetings.

Netherlands: MAST projects PROFILE and NOWESP are carried out in close cooperation with different European countries. PROFILE is concerned with field measurements, process understanding and modelling in regions of freshwater inflow. NOWESP concentrates on the North West European Shelf: data

Spain:

Studies are centred on the topics upwelling, hydrography-fisheries, and hydrography-red tides, and consist of transects across inner shelf, cruises in Cantabric Sea, MORENA cruises and weekly monitoring in Rias.

Germany:

Involvement in projects like PROFILE, NOWESP, DYNOCS (exchange Baltic-North Sea), TRUMP (Oder river outflow), ECOPS, OMEX and BALTEX. MAST III projects will focus on the Baltic Sea.

USA:

A review is presented in EOS.

Sweden:

In the Baltic Area several bilateral or multilateral projects are studying fluxes and accumulation of water and substances in different basins of the Baltic Sea. Monitoring, models and campaign measurement are used. New result on fresh water discharges and measured numbers on horizontal scales and exchange rates were presented.

12. Next Meeting

It was decided that it was important for the Working Group to maintain its current momentum in collaborating with the Working Group on Harmful Algal Blooms. However no formal joint sessions are considered necessary, but the Working Group should meet at the same place and time so as to allow the collaborative

discussion to develop as opportunity permits. A number of pressing themes not concerned with Algal Blooms, but in relation to progress being made in connection with EU Mast projects in particular demanded that the Working Group develop other central themes. This would require that working group members should establish direct contact with relevant sessions and come well prepared to address these issues at the next meeting. Furthermore it was noted with some concern that the recent narrow focusing of the Working Group to address Algal Blooms had meant that only a small hardcore of active members had participated in recent meetings. The Chairman noted that similar concerns had been expressed by various members of the Hydrography Committee. Thus it was essential to stimulate discussion of a wider diversity of topics, by taking heed of the current great advances in knowledge in Shelf Seas oceanographic research. Consequently the Working Group agreed to the following recommendation:

13. Recommendation

The Working Group on Shelf Seas Oceanography (Chairman Dr H. Dahlin, Sweden) will meet in Helsinki, Finland for three days in March 1995 to

- a) assist the Working Group on Harmful Algal Bloom Dynamics to develop plans for a 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.

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Annex 2 Agenda

Working Group of Shelf Seas Oceanography
Meeting in Vigo, Spain, 11 - 12 May 1994

Agenda

1. Opening
2. Appointment of Rapporteur
3. Adoption of Agenda
4. Review the results of the joint session with the WG on Harmful Algal Bloom Dynamics
5. Review the Modelling Workshop on Harmful Algal Bloom Dynamics
6. Discuss development of HAB Database
7. Assess the value of oxygen consumption rate measurements in stagnant Norwegian fjords as a tool for monitoring eutrophication trends in the North Sea.
8. Review the role of coastal currents in transporting and distributing biological organisms (e.g. fish egg/larvae, alga)
9. Compilation of estimates on physical/chemical fluxes particularly across the shelf seas/ocean and riverine/coastal interfaces
10. Evaluate final work of The Study Group on Skagex
11. Reports on activities relevant for the WGSSO
 - 11.1 Activities within ICES
 - 11.2 Activities in other organisations
 - 11.3 National activities
12. Scientific presentations
13. Any other business
14. Recommendations
15. Closing