International Council for
the Exploration of the Sea

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Report of the Shelf Seas Hydrography Working Group, 8th Meeting at Dunstaffnage Marine Research Laboratory, Oban, Scotland, UK 24 - 25 May 1984

1. ORGANIZATIONAL MATTERS

1.1 The Working Group met at the Dunstaffnage Marine Research Laboratory, Oban of the SMBA under the chairmanship of K.P.Koltermann (FRG). Those attending were welcomed by the director, Professor R.I.Currie, CBE,FRSE. Present were :

K.P.Koltermann (FRG)
B. Jamart (Belgium)
Y. Camus (France)
G.J. Prangsma (Netherlands)
L. Midttun(Norway)
O. H. Saelen (Norway)
A. Jenkins (Norway)
M. Mork (Norway)
S.H. Fonselius (Sweden)
B. Butman (USA)
D.A. Booth (UK)
R.R. Dickson (UK)
D.J. Ellett (UK)
J.M.Huthnance (UK)
T. McAndrew (UK)
J.H.A. Martin (UK)

1.2 David Ellett provided local information and explained arrangements for the meeting. It was agreed to have a joint dinner, which lateron greatly contributed to the conviviality of the meeting.

1.3 John Huthnance agreed to serve as rapporteur to the meeting.

1.4 The membership was reviewed, and where appropriate, changes were noted. As a new member Brad Butman,USA was welcomed to the Working Group.

1.5 The proposed agenda (see annexe 1) was adopted.

2. REVIEW OF NATIONAL RESEARCH EFFORTS

Institute and national research efforts were taken in round-table order as follows:
M.Mork (Norway) reported on continuing work by the Geophysical Institute, Bergen and institutes in Trondheim on the Norwegian Coastal Current. This work is thought to contribute to potentially forth-coming investigations in SCAPINS area 5. Recently currents have been observed on the shelf break to the north and well away from the coast of up to 4 kts. These observations are well documented. D.A.Booth elaborated on similar observations with satellite- tracked drogues with speeds up to 1.5 m/s. In this Norwegian project moorings, laboratory experiments and numerical models (from UK and USA) are involved. Bursts of fresh and cold outflow from the Skagerrak, as observed in coastal temperature time series and in satellite images - showing possibly developing Norwegian Coastal Current eddies- are being investigated. Also, recirculation of some water flowing southward along the west side of the Norwegian Trench into the NCC "short of" the Skagerrak is suggested by current measurements and drifters at 50, 100, and 150m depth, showing eastward flow across the Trench.

A Barents Sea marine ecology study involving several institutes and their ships begins this summer (1984), followed up in summer 1986. The emphasis is on biological processes near the melting sea-ice edge, where enhanced primary production, maybe related to an increased stability in the water column and vertical velocities, is expected. G.J.Prangsma added, that a Dutch colleague had found deep vertical velocities in an ice-edge model. L. Midttun (IMR,Bergen) described relations between Barents Sea fish recruitment (specifically cod south of the Arctic front and capelin north of it) and temperature and ice coverage there. Apparently, large Atlantic inflow, resulting in warmer conditions, is more favourable and advects more cod eastward, but also advects more capelin northwards from the spawning grounds.

Dickson (MAFF,Lowestoft) presented plans for work on the shelf, indicating that MAFF efforts are reverting back to the continental shelf,with a "rolling" five years review.

The North Channel of the Irish Sea, a critical area for caesium 137, plutonium and sewage sludge dispersion, is to be studied together with SMBA beginning June 1984 in two exploratory phases - for mooring hazards and questions of representativeness - and a two-year phase with six current-meter rigs ending in 1988. Sea-bed drifters, sub-surface samples for caesium, cores for plutonium, fish tests for mercury, metal sampling together with DAFS, and the use of cable data and a near-bed velocity-package are anticipated.

Reporting on toxic blooms, Dickson presented some work on occasional occurrences of Gonyaulux Excavata between the Forth and the Humber (off NE England). A study is planned involving the relation of cyst distribution to mixing,stratification etc. by using the UOR undulator, which now has sensors for chlorophyll, colour, bioluminescence as well.

MBA work on coccoliths is being supported; extensive heavy blooms in the North Sea release into the atmosphere dimethyl sulphide which may be oxidised and contribute to acid rain. A 1985 MBA / University of East Anglia cruise is planned. Coccoliths along the continental slope produce calcite which may significantly increase oceanic CO2 absorption.

Dickson then reported of a new current meter report series being started by MAFF.

Martin (DAFS,Aberdeen) showed interesting results from the continued monitoring of the Fair Isle inflow into the North Sea. These data have a great significance for long term observations of climate related changes. In summer 1984, DAFS will work west of Uist to describe changes in fish spawning near the coast and entering the main circulation northwards further offshore. In November 1984 a cruise will run from the Faeroe-Shetland Channel to the Isle of Man for analysis of metals in sea water.

For the 1970's anomaly, Martin showed salinities since 1900. There seems to be a year's lag between the Faeroe-Shetland Channel and North Sea values. During the anomaly, TS-plots did not distinguish waters SW and NE of the Wyville-Thompson Ridge, but silicates (away from the bottom) were different with good agreement. Phosphate values were poor and nitrates did not show any reliable signal. The very different maps of bottom salinities in the North Sea in 1978 (representing 1977-79) and 1983 (repr. 1980-1980) were shown. Anomalous (e.g. 1978) values were perhaps related to weak inflows

into the North Sea, as also observed during JONSDAP 76, and the paucity of herring larvae, which were perhaps not carried through to their normal nursery grounds.

Dickson considered whether the Great Salinity Anomaly represented an eastward shift of the Polar Front, as tentatively suggested by Dooley,Ellett and Martin. Data from cruises in 1905,1910,1913 and 1914, during a previous anomaly, were compared with IGY data, which showed no anomaly. Although particular isotherms or isohalines were displaced, the front was not; this conclusion was supported by species pertaining to one side of the front. Possible explanations of the freshening were (i) increase in moisture input from the atmosphere,(ii) an extra southward influx of polar water E of Greenland, which would not immediately mix into Atlantic Water below.There was some discussion of the subsequent cyclonic progress of the anomaly around the northern North Atlantic (and eventually back into the Arctic), and of the importance of mixing processes off Labrador.

Jamart (Belgium) announced the forth-coming commissioning of a new research vessel, Belgica, with 51 m l.o.a and 1600 t displacement, being launched late in 1984. The studies on coastal waves and sediments for the new Zeebrugge harbour are being continued. Nihoul's group has a new 10' grid 2-d tide and surge model of the whole NW European shelf and slope, the output is being used for dispersion calculations of e.g. radio-nuclides. Furthermore a series of models of increasing resolution of Zeebrugge harbour and the Schelde estuary have been developed. A 3-D model including stratification to study tides in the Adriatic, wind driven circulation and the River Po outflow in conjunction with satellite data is being prepared. Further work is dealing with fronts in the Mediterranean between Corsica and France.

The UGM,Liege, was mainly concerned with monitoring hydrography and chemicals for pollution work in the Belgian coastal zone. Some proposals for the French Satellite SPOT have been prepared. Numerical models for tides, surges, dispersion and oil slick movements and chemical transports have been updated. The movements of two oil slicks, followed mostly by aeroplane in 1983 for a few days in light winds, have been successfully predicted. Field-work and modelling in connection with the dispersal of radioactive waste in the north-east Atlantic are planned. A Bottom Stress Experiment (BOSEX) was being undertaken together with the University of Bergen in connection with the laying of pipelines by oil companies. Measurements off Bergen are planned for 1985 using an acoustic backscatter doppler profiler under development by R&D, California, with a 10cm depth resolution and a sampling frequency of 25 Hz for high resolution in the bottom 10 m. For this, models with simple geometry are being explored, as sediment suspension will influence the dynamics.

There followed a wide open discussion indicating an increasing awareness of problems associated with near-bottom flow, sediment re-suspension etc.

Huthnance (IOS Bidston) presented work by Southampton University using satellite data, especially CZCS images, to study shelf-sea dynamics. They are very interested in a SCAPINS study serving as ground-truth for this work. Bidston is preparing a tidal current atlas for the north-west European Shelf from all records in MIAS exceeding 30 days length. An atlas of "detided" residuals is also probable. Work at Bidston has been continued on vertical profiles of velocity.For tidal currents, especially near-bed, experiments have been conducted together with IOS Taunton since 1982 under

mixed and stratified conditions. For near-surface studies, especially wind-driven, Wormley has been joining. Various instruments for surface, sub-surface and surface-following moorings have been tested in March/April 1984, together with float tracking and HF radar, in the NW Irish Sea in unstratified conditions and weak tidal currents. Further experiments in strong tidal currents, and in stratified conditions are envisaged. The HF radar is being developed by SERC Rutherford - Appleton Laboratory.

Internal waves and tidal currents near the Celtic Shelf break are being studied in relation to sediment transport (IOS Taunton) and internal mixing (IOS/MBA). Cruises continue in 1984 including slope moorings in and out of a canyon. Continental shelf modelling at IOS Bidston was sketched out by Huthnance. Ellett remarked that Prandle's Cs137 distribution modelling had appeared in Phil.Trans.Roy.Soc.

Camus(EPSHOM,Brest) showed very interesting results from a moored array off the French Shelf, which clearly indicated a first-mode internal soliton, phase-locked with the semi-diurnal tide propagating onshore. In autumn 1985 it is planned to study upper-layer evolution under meteorological forcing, and internal waves, especially from non-linear tidal forcing on the shelf, deploying moorings, thermistor chains and running a CTD grid extending to the Ushant front. The latter is also meant to explore any connection with the cool-water band at the shelf edge.

There evolved a discussion of past and planned mesurements of currents on the Porcupine slope, and the effect of the circulation on blue whiting spawning there.

David Ellett (SMBA,Oban) described the continuing seasonal surveys of the Hebridean shelf for T,S and caesium in conjunction with MAFF and University of Glasgow. A Cs-S diagramme proved very valuable for analysing the northward transition from North Channel Water to Atlantic Water, with a 1% freshening by coastal run-off, and enabled transport estimates of 9.0×10^4 m^3/s through the Minch and 2.0×10^4 m^3/s to the west in July 1982.

Near-surface currents between Mull and Jura have been recorded by a sub-surface Aanderaa current-meter and by SERC HF radar: a velocity spike, perhaps from an inter-island jet, had been recorded during the tidal cycle. An acoustic current-meter (Bell,Aldershot) did not perform satisfactorily, this experiment is going to be repeated together with a spherical current-meter (General Oceanics). It is hoped to put such rig north of the Butt of Lewis, and north of Sule Skerry, and try to telemeter the data back via ARGOS.

Prangsma (KNMI,de Bilt) reported that in the Netherlands also the main activity is on the study of chemicals and pollutants along the Dutch coast. A set of long-term current meter moorings is being considered. Tests are also underway to use satellite data quantitatively, e.g. for sea-surface temperatures. A series of monthly bulletins on North Sea conditions including winds, waves, temperatures and humidity had commenced with January 1984. Climatological tables for the North Sea area for the last 30 years are nearly finished and will be published shortly.

He then noted that a Dutch Memorial Expedition for the Snellius Cruise to Indonesia will sail May 28,1984.

Butman (USGS,Woods Hole) tabled the US report to the IUGG for a summary of activities on the continental shelf. He then described in detail work on Georges

Bank. Here a sharp change in tidal currents over the bank and lighter water on it in summer contribute to a clockwise mean circulation around the bank. Sediment transports are very important, and storms on the continental shelf leading to singular sediment plumes off the shelf. Some of these features could also be associated with Gulf Stream rings on at least 250m depth. High frequency internal wave packets could be related to tidal motion. The only significant deposit of silt and clay off the US East coast, the "mud patch" south of Woods Hole, was thought to result from suspended fines falling out in the weak tidal currents there. He also showed pictures of various equipment used especially in work close to the sea floor.

Seasonal sampling over Georges Bank and the Gulf of Maine continued for 3 years, with intensive chemical and biological sampling. Analyses show that discharges from oil rigs stay west of the Bank and have little effect on organisms.

Fonselius(FBS,Göteborg) explained the west coast environmental protection programme, which involves hydrographic observations in the Kattegat 4 or 5 times annually. Oxygen depletion in the southern Kattegat is a problem in summer,the bottom layer below the halocline being only 1-2 m thick and de-oxygenating rapidly. Other studies on sediment chemistry are being continued. SMHI uses models to predict and trace back oil slick movements with some success.

Vagn Olsen(Denmark) was not able to attend, his report was read out by the chairman. He gave some remarks on the on-going projects off the Jytland coast and in the Danish Straits.

Koltermann (DHI,Hamburg) reported on German activities. Tide and surge models have now been run for some years and, in general, compare favourably with observations. There are still problems with extrema and their phases, probably due to the meteorological input from another model. Parts of these models have been successfully run on dispersion cases.Most of these models now await routine implementation on an operational basis.

New projects are being drawn up to study river discharges, pollution and metal loads,also with respect to the North Sea. Another group will be concerned with the transport and dispersion of pollutants in the North Sea, doing both field- and model-work.

Further work is dealing with climate-related changes in the air-sea-ice-system on a hemispherical basis. Investigations on the eutrophication, especially in the Baltic are continuing. In cooperation with the Geophysical Institute in Bergen, further experiments and field projects are dealing with the recirculation of the Norwegian Coastal Current. A group of Hamburg University has been successfully running HF radar current measurements and are presently modifiying the equipment to be used from a ship.As lightships are rapidly being phased out, automatic instrumentation is taking over. These stations now use for transmission a METEOSAT link quite successfully. Tests have also being run by the University of Oldenburg with an airplane-mounted laser, to measure rhodamine dye, blue algae concentrations and potentially monitor larger salinity fronts. In discussion it was mentioned, that in Australia a laser has been used to measure water depths up to 40 m from an airplane.

The routine surveys in the North Sea for caesium are being continued. Additionally this year's Young Fish Survey was used to map nutrients. This proposal seems to have been succesfully followed by other participants in the YFS. It is planned to rerun the survey in 1985, to gain a better and reli-

able base for questions of long-term changes. Becker has been using his 16 years of gridded sea-surface temperatures (weekly DHI charts) to derive heat transport and other arguments, including higher statistics.

Jenkins (IKU,Trondheim) described tracks of surface drifters monitored by the ARGOS system in comparison with moored current meter records. The drifter tracks showed much stronger inertial or semi-diurnal oscillations than the current meter, and some correlation with Stokes' drift.They roughly followed the wind on longer time scales. Drifters monitored with DECCA have shown extreme a high speeds, agreeing with an oil slick tracetory.

A subsequent summing up led to a discussion on the use of models in multidisciplinary work. Here particularly the co-operation with biologists, the quality of biological data and their potential usefulness to physical oceanographers were questioned. The Belgian UGM plans to resume biological modelling with new transfer rates.

3. ROUTINE MONITORING of physical and chemical parameters in European shelf seas

The topic had been raised at times during previous parts of the agenda. In view of the decline in number of manned permanent stations, the need for continuous information on the "health" of the sea on a broad span of time scales and still unknown associated space scales other means of obtaining relevant data have to be investigated. One way is to make use of routine shipping lines, appropriately equipped, which cover most of the European shelf. Here more sophisticated sensors, i.e. for salinity or chemical parameters, are needed. To assess the present state of use of these means and possibly to enhance future sampling schemes the chairman proposed to send out a questionnaire in that respect to pull together information on existing schemes and on potentially available fixed stations,e.g. oil rigs.

Comments available were as follows :
UK: MAFF is maintaining their present routes and plans to run Humber-Newcastle or Humber-Leith. Great interest in mid-North sea route. UK Navy is maintaining Rona - Cape Farewell (Greenland) XBT run, might extend to cover northern North Sea. Data are dispersed through IGOSS.

Shortly discussing the use of satellite data in this respect, it was not thought valuable to generate time or space series. Here certain long-range developments with micro-wave sensors could be more promising. There followed some more optimistic discussion about sea level data at tide gauge sites, and their real-time interrogation.

4. JOINT PROGRAMMES

A general consent brought along the ideas of looking at the summer circulation and productivity in some specific areas of the North sea, as proposed by Dooley (SCAPINS). The six areas envisaged could allow individual groups to pursue their own interests within SCAPINS, thereby greatly contributing to the gross picture of changes in the North Sea.

These areas and key issues would be :
area 1 : processes at Flamborough front, area extended northwards
along NE England. Of interest to MAFF
area 2 : off Rhine Delta to German bight. processes on salinity
fronts.
Of interest to Belgian,Dutch and German groups.

area 3 : Skagerrak, extended to west and south.
Of interest to Swedish and Norwegian groups.
area 4 : west of Shetlands, frontal studies and larvae dispersal.
Fair Isle Current dynamics and front.
Of interest to MAFF and DAFS.
area 5 : Norwegian Trench, eddy dynamics and mixing,
presently being worked by Norwegian and other groups.
area 6 : central northern North Sea. Recirculation and thermocline development.
some German interest.
(see annexe 2 for map)

It was agreed that this backbone needed some fleshing out, but through active co-ordination of existing efforts and concentration on 1987 or 1988, the goal of a general synoptic picture could be achieved. Direct contacts should be sought to biological and chemical groups, it was also felt that the backing of the Hydrography Committee should strongly be sought.

Fonselius (Sweden) reported on the topic of "patchiness", the main question being the representativeness of chosen monitoring stations in view of non-uniform distributions of properties. 1985 was to be a pilot study in the Baltic with a convincing Soviet proposal on how to proceed.

MAFF mentioned that it had failed to raise international co-operation for a study of herring larvae distributions and inhomogeneous dispersal. Their own results have been inconclusive.

This led to a broad discussion indicating wide spread interest in dispersion of e.g larvae, sediments rhodamine, heavy metals in shelf seas at different kind of fronts.

5. ICES MATTERS

The chairman read the list of over 30 papers submitted to the Hydrography Committee for the 1984 Statutory Meeting, and hoped that in the future more papers would indicate collaboration. Discussing main-themes and mini-symposia, the 1985 topics suggested were " Fronts In Shelf Seas" and "Procedures for Collecting and Processing Hydrographic Data". There was some discussion about the relationship between scientific and technical aspects of the second topic, which made clear that in view of wide-spread automatic dissemination as well as new technologies available the ultimate goal should still be to produce not only adequate but first class data, also for the benefit of the secondary user.

The chairman proposed to ask members, near the end of 1984, if they were going to submit special topic papers for 1985. Here the group felt that the new dead-lines for paper submission were counterproductive as they exclude any papers dealing with results from cruises in the year of the Statutory Meeting.

One 1986 special topic is to be " Deep Water Project - Results". The chairman asked for ideas for shelf seas special topics for 1986 and 1987.

The group then shortly discussed the list and some excerpts of papers from the Nantes Symposium on "Contaminant Fluxes through the Coastal Zone", the aim of which was to see if budgets were feasible. The number of papers using chemistry to study hydrography budgets was impressive. However, no one of the Working Group was present at the symposium.

The chairman then outlined some matters relating to the Service Hydrographique. Harry Dooley has replaced Jens Smed as ICES Hydrographer; the present transition period should soon finish. The chairman had visited Copenhagen on Jens Smed's last day and presented a letter of thanks on behalf of the Working Group. The Working Group here unanimously expressed their best wishes for a productive and long-lasting co-operation with the new ICES Hydrographer.

Regarding the collection of nutrient data during the Young Fish Survey, a long-standing dilemma, there had been a good response after the chairman wrote to the chief scientists involved. Efforts would be made to maintain the nutrient data collection next year. The data should go to the Service Hydrographique, although here problems came up as some groups feel to first publish their data prior to submitting them to the S.H.

CTD data management had been discussed by the WG on Oceanic Hydrography. The group was informed of those discussions. It pressed for storage in 1 or 2 dbar increments with calibration data explicitly given in the header to help users gauge the accuracy of the data, and for separate submission as bottle data, possibly with temperature stemming from the CTD, to avoid the usual time lag with CTD data submission, and to include nutrients and oxygen data, if collected. The group was not worried by possible duplication. As the WG on Oceanic Hydrography, the WG had not been happy with the proposition by the WG on Marine Data Management for required accurcay and means of data compression. Members were urged to consider this matter in detail.

There was some discussion on salinity accuracy over the years and in relation to handling techniques. Different stoppers, procedures for bottle wiping and the use of standards and sub-standards etc. could introduce discrepancies of a noticable size. Generally it was felt that, coming back to bottle hydrography parallel to CTD use, the standards set by hydrographers in the first decades of the century should at least be met, especially as modern interpretations revealed complicate processes strongly depending on very accurate data. Regarding the ICES Current Meter Inventory, the WG on MDM had met the previous week and should have renewed MIAS-ICES interchange for a complete inventory. There again followed a lively discussion on current-meter data accuracy and calibration.

The International Hydrographic Bureau had asked Meirion Jones, chairman of WG on MDM, to investigate the availability of digital depth data. Depth as a function of position, as used by modellers, was more common than digitized depth contours, as used for display and comparison. Some sets of depths and land contours are available at several institutions, as i.e. DHI, the Belgian UGM. It was mentioned that from the US CIA an open file with land contours of the whole world on a 5 km resolution was available. There followed some discussion on Matthews tables, corrections and depth accuracy.

The Marine Chemistry WG had asked for advice on suitable monitoring sites for "baseline studies".This was considered especially in view of the patchiness aspects. It was considered not possible in a rigorous sense, the only advice possible was as to, in general, most representative sites, away from fronts etc. Dickson will inform the chairman of the outcome of MAFF discussions which were taking place on similar questions.

6.ANY OTHER BUSINESS

The chairman reported on a Council of Europe hearing on marine science in June 1983. The Council Administration probably is setting up a European Association of Marine Science Laboratories with a Strasbourg office, organising educational courses in marine sciences and awarding the title of "centre of excellence" to laboratories.

He than shortly commented on the forthcoming Conference on the Protection of the North Sea in Bremen, FRG in October 1984, which seemes to see heavy political and laboratory involvement.

The SMBA and the Royal Society of Edinburgh are organising a joint conference on Rockall Channel on 27 -29 March 1985 in Edinburgh.

With respect to the venue of the next meeting of the WG, it was agreed to continue meeting separately from the ICES Statutory Meetings; some discussion evolved on meeting together with other ICES WGs, i.e. the WG on Oceanic Hydrography. Hamburg or the Netherlands were put forward as venue. In the mean time, the WG has been invited to meet in Hamburg.

In closing, the chairman thanked all those attending and, in particular, Professor Currie and David Ellett for the great hospitality and support shown to the Working Group.

Recommendations

The WG recommends to the Hydrography Committee

1- in order to concentrate several regional investigations, ongoing or planned, with respect to transport, circulation and productivity studies in the North Sea, to yield a much needed overall picture of these processes also on longer time scales,
- to ask the Study Group on SCAPINS to draw up a joint programme plan for 1986 and 1987
- to enlarge the Study Group and appoint a new chairman after Dooley's withdrawal.

2- that the WG on Shelf Seas Hydrography meet for two days in May 1985 in Hamburg, the Hydrographer being present,
- to review the progress of SCAPINS and possibly consider results of on-going work in that frame-work
- to assess the results of the WG questionnaire on data collection on shipping routes on the European shelf and possibly suggest future action also in view of contributing to WCRP and
- to review and identify contributions for the 1985 special theme session on "Fronts in Shelf Seas".

International Council for the
Exploration of the Sea

Working Group on Shelf Seas Hydrography

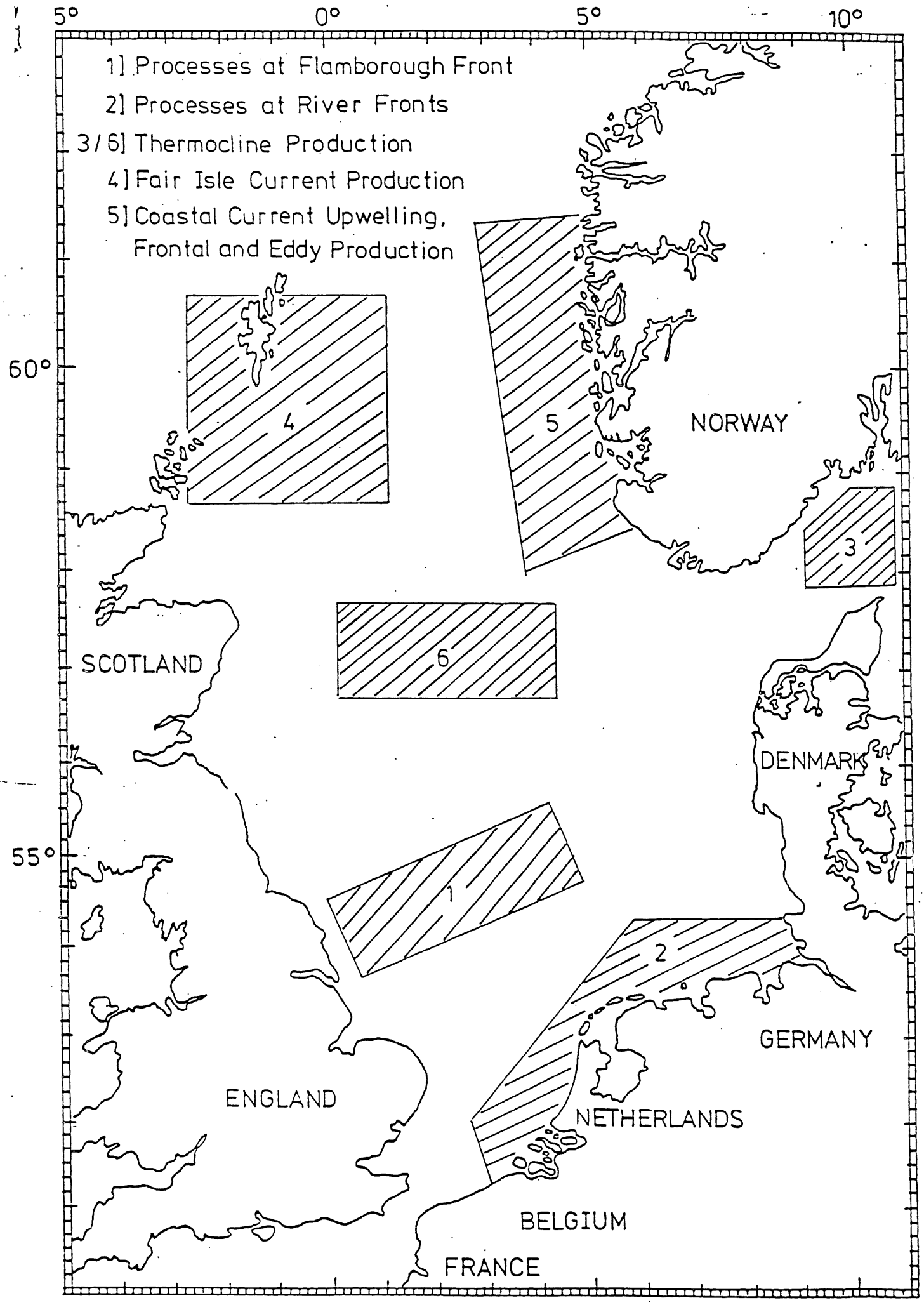
8th meeting at Dunstaffnage Marine Laboratory, SMBA,
Oban, Scotland from May 24-25, 1984
starting at 9.30 a.m.

Draft agenda

1	organizational matters	
1.1	opening of the meeting	
1.2	local information	DJE
1.3	appointment of a rapporteur	
1.4	review of membership	
1.5	approval of and, if any, amendments to the agenda	
2	Review of National Research Efforts	
2.1	institute plans, proposals, results	all
2.2	national and international efforts (SCAPINS, CONSLEX, Danish projects in the Straits and at Jysk Kyst)	all
2.3	Discussion of future lines of research work	all
3	Review of plans for a routine monitoring programme of physical and chemical parameters in European Shelf Seas	
3.1	national efforts	
3.2	co-ordinated national efforts	
3.3	prospect of joint programmes	
4	Drafting session on joint programmes	
4.1	SCAPINS	
4.2	"Joint study of inhomogeneous distributions (patchiness)" as a successor to the Baltic Patchiness Study	
4.3	frontal studies	
5	ICES matters	
5.1	national review of papers submitted for ICES Stat. Meeting 1984	
5.2	proposal for main-theme sessions and mini-symposia	
5.3	review of Nantes symposium, relevant action to be taken up by WG	
5.4	matters related to Service Hydrographique	
5.5	matters referred to the WG by other WGs	
6	any other business	
6.1	date and venue for next WG meeting	

Annexe 1

SCAPINS - Possible Scenario



Annexe 2