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REPORT OF THE WORKING GROUP ON ENVIRONMENTAL ASSESSMENTS AND MONITORING STRATEGIES

Brest, France, 24 - 28 April 1989

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T A B L E O F C O N T E N T S

WORKING GROUP ON

ENVIRONMENTAL ASSESSMENTS AND MONITORING STRATEGIES

Brest, France, 24 - 28 April 1989

1 OPENING OF THE MEETING

The Chairman, Mr S. R. Carlberg, opened the meeting at 9.30 hours on 24 April 1989 and welcomed the participants.

M M. Chaussepied, Head of the Departement Environnement Littoral, welcomed the participants to the Institut Français de Recherche pour l'Exploitation de la Mer (IFREMER) Centre de Brest, on behalf of the Centre Director, Mme M. Melguen.

In his opening remarks, he presented information on some recent monitoring activities carried out by IFREMER. He concluded by wishing the participants all possible success with their meeting.

As the membership had changed somewhat since the previous meeting, a tour de table was made and all participants introduced themselves indicating their affiliation and scientific speciality. A list of participants is attached as Annex 2.

2 ADOPTION OF AGENDA

The agenda was adopted as proposed. It is attached as Annex 1. The Chairman pointed out that although item 15, plans for the next meeting, would be discussed late in the week, he invited ideas and suggestions for the future working programme at any time during the meeting.

3 ARRANGEMENTS FOR PREPARATION OF WORKING GROUP REPORT

Upon request from the Chairman, individual members agreed to prepare draft report texts on specific agenda items. M. Joanny had prepared for secretarial assistance so that the draft texts could be distributed when available during the week and then reviewed at the end of the meeting.

4 REPORT FROM STATUTORY MEETING, NORTH SEA TASK FORCE AND JOINT MONITORING GROUP

J. Pawlak, ICES Environment Officer, briefly reported on relevant results of the 1988 Statutory Meeting and provided a list of relevant Council Resolutions. In one of these (C.Res. 1988/3:2), the Council had accepted a joint role with the Oslo and Paris Commissions in implementing the request concerning the "enhancement of scientific knowledge and understanding of the North Sea environment" from the Ministerial Declaration of the Second International Conference on the Protection of the North Sea. A North Sea Task Force has been established to coordinate this work.

A brief written report on the first meeting of the North Sea Task Force, held in December 1988 in the Hague, was presented by J. Pawlak, but the main emphasis was given to an oral report on the outcome of the second Task Force meeting, held in Plymouth on 18-21 April 1989. At this latter meeting, the Task Force had adopted a Five-Year Plan for its work, leading to the production of the next Quality Status Report in 1993. This Five-Year Plan also included items related to the coordination of work on modelling, monitoring and research activities. The Task Force adopted a 'master plan' for monitoring the North Sea and a five-step approach to preparing the next assessment of the North Sea.

The Chairman of ACMP, Dr J. Portmann, had represented ICES at the 14th meeting of the Joint Monitoring Group (JMG) of the Oslo and Paris Commissions, that was held in Vigo, Spain on 24 to 27 January 1989. Dr Portmann had provided a report that was presented to WGEAMS by S. Carlberg. The report highlighted the major items of the JMG meeting and pointed out that ICES had made major contributions to the JMG meeting by reporting the requested results of tasks under most of the agenda items. In general, the advice from ICES, particularly the monitoring strategy, was well received and much appreciated.

However, there were a few points on which JMG had a different view than ICES concerning tasks to be carried out. Although JMG concurred with the ICES view that a repeated baseline study on contaminants in fish and shellfish was not needed, the political pressure was so great that JMG decided to carry out a limited supplementary study "to fill in gaps."

Some of the member countries of JMG insist on wanting to use heavy metals in sea water for trend assessment purposes. ICES will, therefore, be pressed for further work on this topic, even though ICES has previously stated that these efforts are not likely to yield useful results.

In discussing the ICES role as data center for JMP data, the JMP requested that when member countries provide data sets that are flagged for two purposes, they should be output for those two purposes despite the fact that the current guidelines, if followed strictly, preclude the use of data in that way.

Mr G. P. Gabrielides, representing the Food and Agriculture Organization of the United Nations and the Coordinating Unit for the Mediterranean Action Plan as an observer, informed the meeting of the recent MEDPOL activities concerning monitoring. The MEDPOL phase II monitoring data collected so far were evaluated and the whole monitoring component was reviewed at a special meeting held in Athens on 20 to 23 March 1989. The reviewing process will be continued taking into consideration the ICES experience.

5 IMPLEMENTATION OF MONITORING STRATEGIES DOCUMENT

5.1 Review of existing guidelines for monitoring contaminants in marine organisms, sea water and sediments

After looking through the monitoring guidelines from ICES and the JMP, the group felt that there was not sufficient expertise at the meeting to review those guidelines in detail. Nevertheless, the guidelines were closely compared for the specific purpose of the following request from the JMG (see JMG 14/15/1, Annex 7):

> "To provide revised guidelines for the sampling and analysis of biota for purposes (a), (c) and (d) as defined by the Commissions taking account of the desirability of having a sampling strategy for purposes (c) and (d) that would allow use of only one set of samples."

(Comment: In this connection, one set of samples could also be understood as one data set, already available for previous years, e.g., data sets provided by the Netherlands.)

The Working Group did not focus in detail on statistics, number of samples, etc., and only guidelines for monitoring contaminants in biota (not sediments or seawater) were examined, in particular on the requirements of present sampling procedures for monitoring the existing level of marine contamination over a wide geographical area, i.e., a baseline study (JMP purpose c) and temporal trend monitoring (JMP purpose d) (WGEAMS 1989/5a/2, pp. 202-205).

Differences between samples taken for baseline studies (purpose c) and temporal trend monitoring (purpose d) are:

Purpose c	Purpose d
25 fish or 50 mussels, 10 oyesters	25 fish individuals, 25 mussels individuals
Sample: similar sized fish Mussels: 2-6 cm range	Log-length stratified sam pling, 5 length classes with 5 individuals in each class
Fish: representative of location	Cod, plaice; flounder, mussels, oysters. Same stock sampled each year. Additional info. on age, total length, total weight, liver weight, sex, degree of sexual maturat sexual maturation.
Sampling prior to spawning. As many locations as possible	Sampling prior to spawning at same time each year. At specific locations designated for trend monitoring
Samples pooled prior to chemical analysis	Individuals analysed. Mussels may be pooled according to their size group and analyzed in pools

N.B.: Sampling procedures for JMP purpose a (human health risk assessment) are more or less the same as those for JMP purpose c (baseline study), but for purpose a other species may be used if they are significant in the diet of the local population.

In conclusion, the sampling requirements for temporal trend monitoring (purpose d) cover more possible covariates than for monitoring contaminant baselines (purpose c). The group agreed to bring the following questions forward to the attention of the Working Group on the Statistical Aspects of Trend Monitoring (WGSATM):

- For which contaminants is length-stratified sampling required?
- Under what conditions and for which parameter/species can the results obtained for purpose d also be used for purpose c?
- Under what conditions and for which parameter/species can the results obtained for purpose c also be used for purpose d?

In general, the group was in favour of summarising the tactical choices contained in the guidelines in the form of matrix tables for the different monitoring purposes. This work was further considered under agenda item 5c, below. The group also felt that, in addition to the inclusion of such tables, the ICES guidelines would benefit from some purely editorial work that would produce a homogeneous document rather than a collection of annexes from ACMP reports.

5.2 Quality of data required for the different objectives of monitoring

Since no new information was available to WGEAMS to advise on the quality of data required to meet the different objectives of monitoring, a tour de table was made to collect the current thoughts on this item.

It is implicit in the cases of baseline studies and trend monitoring that the methods used for the determination of contaminants in environmental matrices have detection limits adequate for the quantitative measurement of ambient levels. Since detection limits embody a precision component, the detection limit chosen will dictate the levels that can be quantified and the precision with which they can be specified. In this context, it should be noted that, based on experience gained in the monitoring programme, recommended detection limits may be lowered to reflect a more realistic situation. For example, prior to 1985, the JMG recommended a detection limit for cadmium in sea water of "no greater than 50 ng/l". However, data received on concentrations of cadmium in seawater were mainly in the range 15-50 ng/l, although higher levels may be found in nearshore coastal waters and the estuaries of cadmium-contaminated rivers (e.g., Scheldt and Rhine). Thus, the JMG-specified detection limit was amended specifically for assessing cadmium distributions in "uncontaminated" or slightly contaminated sea water to a more appropriate choice of 10 ng/l.

It was emphasized that the use of quality assurance procedures is necessary to ensure the quality of environmental assessments and also for judging/proving environmental damage cases in court. The quality of data should also be viewed in relation to the purposes/objectives of the different monitoring programmes (spatial or temporal trend monitoring *versus* control monitoring). Quality assurance procedures should always be incorporated in monitoring programmes (as they are in research programmes). An essential aspect of quality assurance is the conduct of intercalibration exercises on a regular basis and involving all laboratories participating in the monitoring programme. It is particularly important in the conduct of a baseline study (JMP purpose c, monitoring existing level of marine contamination) to carry out an appropriate intercalibration exercise in association with the study to obtain information on the comparability of analyses among the participating laboratories. For temporal trend monitoring (JMP purpose d), it is important that the laboratory maintains constant control over its analytical performance and retains the necessary records (see Techniques in Marine Environmental Sciences No. 6).

The Working Group recommended the following general actions with regard to this topic:

- Assess in advance the potential magnitude of spatial or temporal trends and relate this to the required detection limit.

- Pre-survey the situation (pilot study) to obtain statistically sound and feasible protocols, and appropriate techniques.

- Assess changes in inputs of contaminants in the most sensitive way (at the most sensitive location, namely, close to the source) and identify factors involved in the dynamics of the area studied.

- Disregard suspect data, as soon as possible.

- Incorporate (routinely) quality assurance procedures and intercalibration exercises in the research/monitoring programmes.

The Working Group provided the following specific advice for the North Sea Task Force:

a) Use experience gained in the past intercalibrations carried out, e.g., by ICES.

b) Make sure that quality assurance procedures and intercalibration exercises are incorporated.

c) Follow the recent guidelines for parameters already tested.

d) Assess the feasibility of measuring new parameters before incorporating them in a programme.

5.3 <u>Matrix tables for monitoring purposes</u>

The Working Group discussed the continuation of its work on monitoring strategies by considering the further development of guidance on matrix selection for contaminant monitoring. One table, dealing with monitoring matrix selection for human health purposes (JMP Purpose a), had been included in ACMP's revision of the text on monitoring strategies prepared by WGEAMS in 1988. Draft tables on baseline study monitoring and temporal trend monitoring (JMP Purposes c and d, respectively) were left to be considered further by WGEAMS at this meeting.

The group re-examined all the tables in the context of comments/ advice offered by MCWG and WGMS at their respective meetings in February 1989. A drafting group then undertook the preparation of revised tables that were thereafter considered by WGEAMS as a whole. Copies were also telefaxed to WGSATM in the Hague for its comments. WGSATM comments, which were received by telefax, were considered and incorporated into the tables, which are attached as Annex 3.

Some initial specification of the criteria used to develop these tables is warranted. Contaminants considered were those on both the mandatory and optional lists of JMG plus tributyl-tin. The matrices for monitoring were selected as the most appropriate for providing the greatest information in relation to each of the three purposes of monitoring. It was fully appreciated that in some cases, especially in respect to purpose c (assessment of the existing level of marine pollution/contamination), comprehensive measurements might be obtained by measuring the contaminant in all matrices. However, priority selections of matrices were made with the aim of providing (1) the most useful scientific information for assessing distributions and (2) focussing attention on those matrices that might enable the most consistent picture of distributions over wide areas to be obtained through the collective efforts of a number of laboratories and countries.

There will be cases in which matrices will be chosen on the basis of pre-existing information and on-going monitoring programmes. Nothing in these tables should preclude attention to useful supporting measurements of these types.

It is axiomatic that the value of the information obtained through monitoring will only be as good as the attention paid to quality assurance at all stages of the measurement programme (sample collection, storage, preparation, preconcentration, analysis, standardization and interpretation).

The group felt that some additional comment is warranted in relation to terminology. The North Sea Task Force has, in general, adhered to existing United Nations (GESAMP) definitions of the terms "pollution" and "contamination" and this greatly enhances the clarity of the objectives of its "Procedure for an assessment of the North Sea". Unfortunately, the Joint Monitoring Group is not precise in the use of these terms, and it would assist considerably if the current international definitions were adopted to make the intentions and objectives of the Joint Monitoring Programme clearer.

In commenting on the draft matrix tables, the WGSATM drew the attention of WGEAMS to an extract from the 1985 WGSATM report, which stated that "more information is needed on biological processes influencing the uptake, metabolism, etc., of contaminants and the transfer of contaminants through the food chain". WGEAMS endorses this view, particularly in relation to temporal trend monitoring (JMP Purpose d). As pointed out by WGSATM, changes in concentrations in organisms cannot be assumed only to reflect changes in concentrations of the contaminant in the environment.

It is quite conceivable that other changes in the environment, for example in the type or availability of prey species, could alter the exposure of the predator to the contaminant in question. Very marked changes in organisms close to strong point sources may more reliably be linked to changes in input.

The WGSATM emphasized the paucity of good quality data sets to consider in the development of trend monitoring procedures. From a simplistic analysis of the "best case" data available to ICES, that for mercury in fish muscle and liver, the WGSATM estimated that, at the 95% probability level, muscle analyses could detect changes of 30% or more over a 10-year period, and liver analyses changes of 50% or more (see C.M. 1989/E:13, Annex 12). These comments illustrate the early stage of development of trend monitoring using biota, and both WGSATM and WGEAMS advocate further research in this area. It might be appropriate for countries to establish long-term, high intensity monitoring stations to examine cyclical and seasonal changes in contaminant levels in animals, and to examine uptake, retention and elimination processes as a background to the analysis of temporal trends of contaminants on an annual basis.

The expansion of these tables to cover matrix selection for additional contaminants, identified by the North Sea Task Force as needing attention, would require input from MCWG. It was, therefore, recommended that MCWG be asked to consider matrix assignments for additional mandatory contaminants (α-HCH and HCB) and optional contaminants (PAHs, polybrominated biphenyls, chlorinated dioxins, dieldrin/aldrin/endrin, triazine, herbicides atrazine and simazine, polychlorinated camphenes and chlordane).

6 CRITERIA TO JUDGE ENVIRONMENTAL DATA

Presentations of papers

Mr F. van der Valk presented an introductory discussion paper on this topic. He stated that measurements of contaminant levels in the environment are not immediately useful, but require interpretation and assessment before they have any benefit. Standards or criteria can be used as a tool in the assessment of these data. However, standards have some drawbacks, for example:

a) Standards are not objectively determinable entities. They are the result of an assessment themselves, and contain in them the evaluation made by the drafters.

b) Standards are very conservative. Once standards have been established, they tend to remain the same forever, despite new scientific insights.

c) Standards are established for a certain purpose, and are generally only applicable for that purpose. However, non-justifiable comparisons in other contexts are commonly made.

d) Standards are often seen as absolute limits between good and bad.

He went on to state that criteria for contaminant levels in the environment can be divided into two broad groups, depending on their applications. The first consists of those which are intended to protect the human consumer and, therefore, concentrations in foodstuffs are considered. Standards on water quality to protect swimmers also fall into this group.

Mr van der Valk stated that much attention has already been paid to the establishment of standards for contaminants in foodstuffs. These refer to the edible parts of organisms and are usually related to the Acceptable Daily Intakes or (Provisional) Tolerable Weekly Intakes for a large number of compounds by WHO. These are based on toxicological research, but contain an arbitrary safety factor, also. In transforming these into standards for contents in food, the mean and extreme consumption, e.g., by critical groups, of the considered foodstuff plays an important role. An overview of national standards for fishery products was attached to Mr van der Valk's paper (see Annex 4).

The purpose of the second group of criteria is to protect the environment, i.e., either the whole ecosystem or individual organisms within it. Mr van der Valk noted that fewer criteria of this type have been developed; they are mainly for freshwater situations, and can be applied in the preparation of an environmental assessment. However, the establishment of these criteria poses some serious difficulties. Firstly, decisions have to be made as to the extent to which the environment and its amenities should be protected. Secondly, naturally occurring differences between areas, e.g., in nutrient and heavy metal levels, have to be taken into account. He suggested that the development of criteria for the following topics might be feasible: levels of nutrients in sea water; levels of selected heavy metals in sediment and biota; levels of PAHs in sediment and biota; and perhaps in future the structure of benthic communities. Background information could be obtained from the WHO Environmental Health Criteria Series and from the Reports and Studies of GESAMP.

Mr Van der Valk concluded that, when a group of experts could reach agreement on them, criteria could play a useful role in the preparation of environmental assessments.

Dr W. Zevenboom introduced a paper on the development of environmental reference values in the Netherlands. Three bases for these reference values were distinguished: the same location in another (undisturbed) period; another (undisturbed) location at the same time; and NOECs (No Effect Concentrations) for the most sensitive species.

It was pointed out that these environmental reference values are by no means proposals for, or to be used as, environmental standards. The environmental reference values are useful tools in the assessment of the present state of the environment. The desired environmental state (environmental quality objectives/standards) should be formulated carefully. It requires a continuous feedback, and the latest results of research monitoring should be taken into account. Some examples were given of environmental reference values for the Dutch Continental Shelf, making reference to an undisturbed reference period and undisturbed reference locations.

For the Dutch part of the North Sea, comparison with the biota situation in a reference period can conveniently be displayed in an amoeba-shaped figure: a circle in which the abundances of selected species are shown relative to the abundances in the reference period (Figure 1).

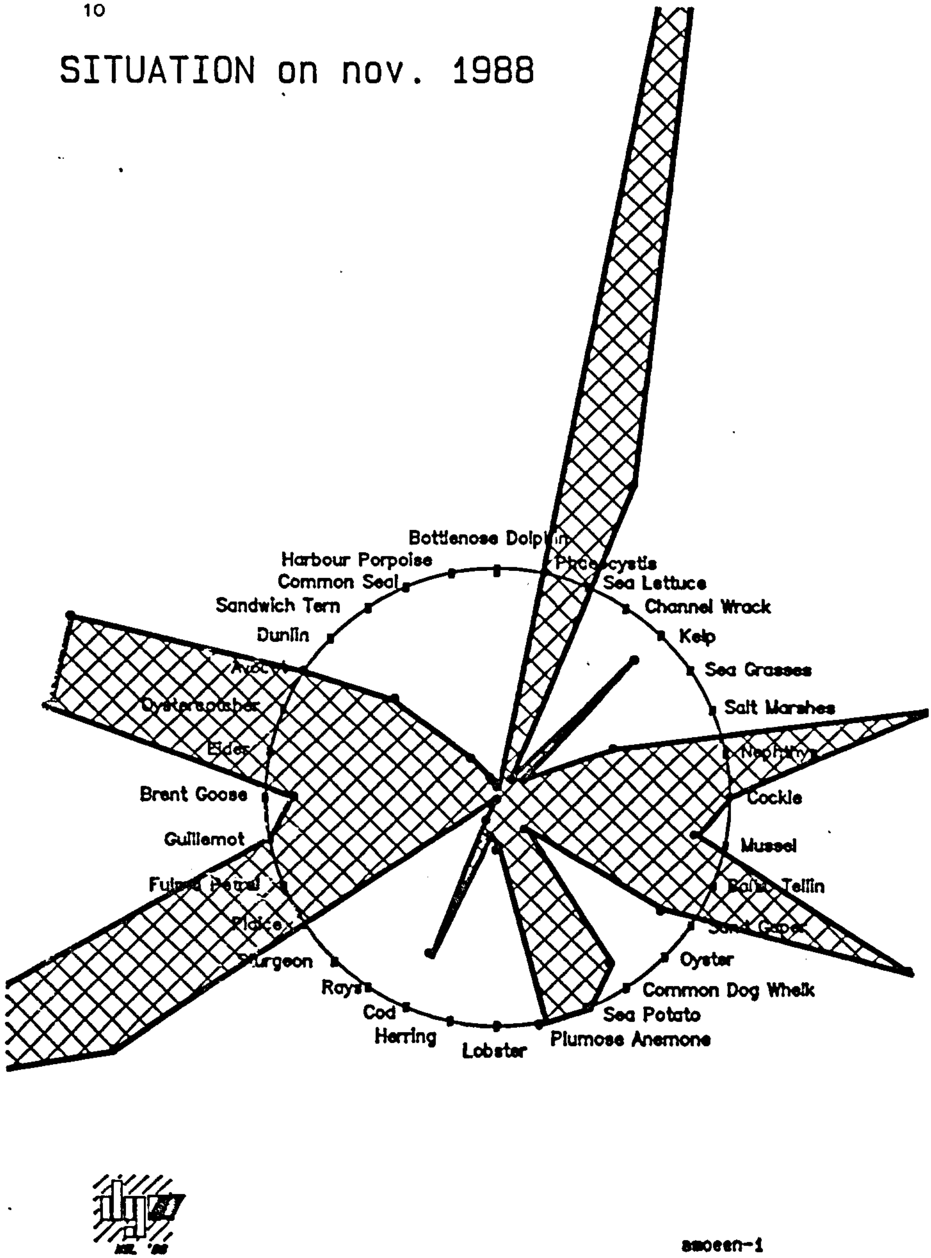

Figure 1. Abundances of selected species in 1988 relative to the reference period.

Dr. Zevenboom noted that a comparison of present data with data from 1930 showed that nutrient concentrations in the Dutch near-shore waters have increased strongly.

On the NOECs, it was noted that very few data are available for marine organisms.

Working Group discussion

The introductory papers provoked an interesting discussion within the Working Group. It was felt that although guidelines intended to protect the environment were primarily of interest for management and regulatory purposes, they can be valuable in a purely scientific context, also. Here, the development of guidelines can focus attention on gaps in knowledge. Comparison of data with established guidelines or reference values can be used to put those data into perspective, and contribute to a clear presentation of results, even though there may be a degree of scientific uncertainty in the guidelines.

The importance of taking differences in local natural conditions into account was strongly emphasized. Another problem regarding guidelines for individual contaminants was noted, viz., the inability to take account of the combined effects of various substances. Furthermore, guidelines depend strongly on the purpose for which they are established and the definition of the aim would often be primarily the responsibility of policy-makers. Different opinions were expressed as to whether "zero" standards should be set for non-degradable synthetic substances. It was noted that the JMG has used a form of guidelines, in the presentation of data, and also in defining "upper, medium and lower" concentration categories for selected contaminants.

The Working Group recognized the valuable work of the WHO in preparing intake standards to protect human health, and their use in establishing national regulatory standards. The Group decided to attach the prepared overview of national standards, with some additions and corrections, as Annex 4 to this Report.

7 PROGRESS IN DEVELOPING REGIONAL ASSESSMENTS IN AREAS REQUIRING PRIORITY ATTENTION

The Chairman recalled that at the previous year's meeting a number of areas had been identified as being of priority and for which the development of regional environmental assessments should be conducted as soon as practicable. The areas were: Gulf of St Lawrence, New York Bight, Gulf of Maine/Georges Bank, Bay of Biscay, west coast of the Iberian Peninsula and the North Sea.

No assessment documents were presented at the meeting, which was quite understandable in view of fact that the Guidelines document had been worked out by the group only one year ago.

Dr Gordon reported that a joint Canadian - US effort had started in order to undertake an environmental assessment of the Gulf of Maine, the Bay of Fundy, and George's Bank. Funds for assessment and monitoring had been allocated and the ICES guidelines had been provided. The work was to be conducted at the state/province level, with the State of Maine as responsible coordinator. This arrangement would call for a major input to be prepared by consultants. He also pointed out that the US Woods Hole Oceanographic Institute has produced a very good book on George's Bank. Furthermore, Dalhousie University (Halifax) was coordinating the compilation of a computerized data bank covering the Bay of Fundy, the Gulf of Maine and George's Bank.

Dr Franklin reported that in the UK the Marine Pollution Monitoring Management Group was working on an assessment of the NE coast of England (including the Flamborough Front). This assessment is being carried out according to the ICES Guidelines. The next assessments planned by this group would be for the Clyde estuary and a joint UK-French project concerning the Channel. Bilateral meetings regarding the latter had already been held in order to structure the work according to the Guidelines.

The Chairman reported that the conditions in the Skagerrak in the border area between Sweden and Norway had been extensively discussed by the environmental protection agencies of the two countries. It had been agreed that some intensified complementary studies should be conducted over a two-year period, to be followed by an assessment based on the status report that had been prepared by the former ICES Working Group on Pollution-Related Studies in the Skagerrak and Kattegat (Coop.Res.Rep. No. 149) and all the new material brought forward thereafter.

He went on to report on the ongoing assessment work of the Baltic Sea, carried out within the framework of the Helsinki Commission. Following the basic status report on the Baltic, published in 1981, the Baltic Sea environment is re-assessed every five years. The basis for the assessment is data from the Baltic Monitoring Programme, that is also reviewed every five years. Thus, the system is designed for a mutual feed-back between the two elements of monitoring and assessment. It was pointed out that, mainly due to the morphological and hydrographical conditions in the Baltic, the assessment is based on multinational drafting groups dealing with subjects (e.g., hydrography, oxygen conditions, nutrients, etc.) on a subregional basis. From this, a holistic assessment is built up including all parameters for the whole area. One disadvantage of the process is that it is slow and needs a lot of coordination, as it involves a great number of people in seven countries. On the other hand, the process produces a product that is very well received when it is ready.

The group showed considerable interest in the working structure employed by the Baltic countries. Particular interest was devoted to the process of how assessment material from the complete review can be transferred into a small volume that explains in plain language the assessment results for the decision makers and for the general public. The group decided to recommend that ICES invite the Chairman of the Group of Experts on the Second Periodic Assessment of the Baltic (GESPA), Professor S. Gerlach (Kiel), to present how this process is carried out for the benefit of the discussions at the next meeting of WGEAMS.

Dr Skjoldal provided information on the ICES Workshop on the <u>Chrysochromulina polylepis</u> Bloom in Bergen, Norway on 28 February to 2 March 1989. Although the workshop report will not be a regional assessment in itself, and will not follow the ICES Guidelines, the work is of interest to WGEAMS because the workshop addressed the conditions before, during, and after the bloom according to the following objectives: (a) to amalgamate relevant observations of taxonomy, physiology and toxicology of C. polylepis; (b) to describe the environmental background associated with the bloom; (c) to evaluate the effects of the bloom on the aquaculture industry as well as on the marine ecosystem; and (d) to prepare the the papers presented at the meeting for rapid publication in the Cooperative Research Report Series.

He also reported from the Second Meeting of the North Sea Task Force (Plymouth, 18 - 21 April 1989) that although the Task Force had accepted the ICES Regional Assessment Guidelines, it had embarked upon a procedure with a two-pronged attack. Thus, the North Sea assessment will follow a procedure under which assessment of subregions will take place in parallel with a holistic assessment of the entire area. The two assessment approaches have been given the same time schedule. It was also noted that, in contrast to the previous North Sea assessment, the geographical area has been expanded to include the important transition area of the Kattegat.

Dr Zevenboom reported that the Netherlands had started an evaluation of the morphological, geological and chemical characteristics of the Wadden Sea. The study should be expanded to include benthic community material. The study will continue on an annual basis and will, eventually, lead to the preparation of an assessment.

8 REPORT ON MONITORING FOR THE PURPOSE OF ASSESSING RISKS TO HUMAN HEALTH OF CONTAMINANTS IN FISH AND SHELLFISH

This report was yet not finished and, therefore, not available to the meeting. As no other relevant background material was available, this item was closed without further discussion. It was anticipated that Dr J.F. Uthe (Canada) would have a draft of this report ready in advance of the 1990 WGEAMS meeting.

9 DEVELOPMENT OF HABITAT PROTECTION POLICIES AND THE USE OF MODELLING OF ECOSYSTEMS

Policies

Dr Gordon presented a Canadian document entitled "Policy for the Management of Fish Habitat". He provided this document as an example for discussion. Dr Gordon stated that this policy was originally developed by freshwater scientists, as can be seen from most of the illustrative examples. The policy showed itself to be applicable in marine regions as well.

Concern for the quality of fish habitats arose when assessing the construction of culverts or small dams. Because of the increasing number of such small corrective measures that have been taken, a significant amount of fish habitat has gradually been lost.

The overall policy of the programme is: "...to achieve a net gain in productive fish habitat." In more operational terms, the policy attempts to:

- halt further losses (protection);

- restore lost habitats (constructing fish ways, removing dams);

- develop new habitats (e.g., artificial reefs).

The programme includes strategies for:

- Protection and Compliance (enforcement of regulations).

- Integrated Resource Planning.
  A holistic way of looking at fish habitats as whole systems for all sorts of possible uses (recreation/industry). This attempts to resolve conflicts before they arise.

- Scientific Research.
  To provide for information needed to devise policies and to inform the general public.

- Habitat Management.
  To improve the habitats, wherever possible, in cooperation with local fisheries associations and nature conservancy associations.

- Monitoring.
  To evaluate the effectiveness of measures taken, aiming to improve the production of fish.

Evaluating the complete policy programme.

Is there a gain in the number and extent of productive habitats? Is there a gain in quality of fish products (e.g., fewer claims related to coliforms)?

The following comments were offered by WGEAMS participants:

- While implementing this policy, one is confronted with a need to develop criteria and parameters to assess and control habitats (to improve fish production). One may choose to optimize different habitats for different species. The smaller the size of the habitat, the more easily it can be devoted to a single-purpose use.

- One may also decide to allow for "trade-offs": e.g., when developers are asked to compensate for lost habitats. One may allow the destruction of one habitat when other habitats are created. In Sweden, the construction of hydroelectric power plants in rivers destroyed natural habitats of salmon, which was "traded-off" by court decisions that the plant operators should produce young salmon in ponds and hatcheries and return them to the environment. In this way, about 75 per cent of the Baltic salmon fisheries are sustained.

- The programme was regarded as impressive since it created fish habitats, it covers a wide range of fish species and other organisms of interest living both in fresh and salt water, and it also includes activities in land areas where they could have a negative effect on the aquatic environment.

- The Canadian policy seemed to be similar to the Swedish one, although the legal instruments, and thereby also the implementation, may be different.

- While the primary intended result of the policy was growing more fish, by creating more healthy habitats it had some very strong positive spin-offs, both in terms of policy and in terms of identifying needs for further research.

- As this policy approach was developed from freshwater systems, it was not easy to see what the implications are or would be with respect to marine systems. Marine areas should be managed as integrated ecosystems and not as areas to be developed for one purpose only, e.g., for fish production. Current resource utilisation patterns should remain a basis for management of these areas. It was also noted that terrestrial, more or less isolated, habitats could be viewed as separate units, whereas marine habitats could not.

- It was recognised that the Canadian and Western European approaches to policy development for large areas were very similar, but that they depart from different perspectives. In Canada, the main concern (and bottom line for evaluations) was the improvement of production of healthy fish; in countries around the North Sea, the main issue was the guarantee to maintain favourable ecological conditions in marine areas, providing a sound basis for a continuation of multifunctional use of these areas.

- Fisheries itself could in some cases be considered a threat for fish habitats.

- The question was raised as to what could be achieved by carrying out assessments; it was felt that the aim of assessing environmental data was mainly to evaluate progress with respect to pre-set, pre-defined goals for using areas concerned.

- Assessments should be based on legitimate and explicitly stated claims (e.g., human health). Without the objectives being stated as a first step, assessments cannot be made concerning the protection of defined values or goals. Therefore, setting targets must be a first step in making assessments.

- Targets should be set for the North Sea as well, recognizing however that there is no implicit and generic set of acceptability standards. All targets emerge from value judgements with respect to wishes expressed by functional uses or policies.

Models

To set the stage for discussions on this topic, information was provided on the present status of modeling efforts.

Within the context of the work of the North Sea Task Force (NSTF), it was foreseen that an effort will be made to prepare a chapter in the 1993 quality status report (QSR) on the role and results of mathematical modelling efforts for purposes of assessment. The NSTF had chosen to proceed as follows:

1) To make an inventory of existing models by means of a questionnaire with special reference to hydrodynamic, transport/ dispersion and ecological models.

2) To identify the questions that member countries regard as being of relevance for making assessments.

3) To organise a workshop by February or March 1990 to provide advice for the NSTF on the limitations of current models (e.g., reliability, usefulness) and questions which might be answered by the appropriate development of models.

Regarding efforts in EUROMAR, it was concluded that the pressure to initiate activities had eased the conditions for approval of proposals by EUROMAR to such a degree that the programme should be seen more as a compilation of proposals, rather than being comprehensive in the sense that proposals contribute to pre-set aims.

Within the Netherlands there is a long tradition in the field of the physical modelling of currents, tides, forces on structures and the like (the 1930 closure of the Zuiderzee was accompanied by physical models). There are very different types of modelling exercises made in different institutes and universities, ranging from physical, via chemical through biological and ecosystem modelling. For two areas, ecosystem modelling was part of an integrated multidisciplinary study: the Eastern Scheldt and the Ems-Dollard Estuary (where about 20 scientists were involved in field studies per basin). Also, less complicated models were designed to describe, e.g., oxygen depletion in stratified water bodies, and primary production related to turbidity. Within the fisheries research institute a multispecies interaction model is being designed. From experience, Dutch modellers provide advice based on models and other scientific knowledge, rather than providing the models themselves for uncontrolled external use. Also, it is the experience that the more precise one is able to ask questions in advance, the more likely one is to be served with a specific and relevant answer. In other words, one should not expect to produce specific answers by building general (ecosystem-)models, however relevant and valuable they are as research tools.

In Norway, several research groups are involved in making models, e.g., those focussed on the Barents Sea (circulation models, interconnected with primary production/copepod development models). IBM has founded the Bergen Scientific Centre, where special attention is given to modelling atmospheric processes and developments, and coastal processes. In Norway, work is presently being conducted on the interconnection of circulation, nutrient distribution and related biology models. Special attention is given to modelling efforts in the framework of prior assessments of the impact of oil production developments and spills.

In Canada, much experience has been gained in hydrodynamic modelling, especially during the studies focussed on harnessing tidal power (Bay of Fundy/Cumberland Basin). These models are very advanced, as are the models used by sedimentologists to assess sedimentation patterns in influenced areas.

Applied Science Associates (a contract research institute) are specialists in designing models to assess the environmental impact of hydrocarbon development (Georges Bank). There is also much experience with the development of ecosystem/ecological models, where Canadians have cooperated fruitfully with the Dutch (BOEDE group, Ems-Dollard studies) and the English (Severn Estuary Gembase Model). The present state is that overall carbon fluxes in ecosystems are described fairly well. A great deal can be learned on both sides by exchanging views and ideas in cooperative programmes. A new approach (not modelling by ecologically functional groups, but by size-structured groupings) was mentioned as an interesting experience, worth noting.

Dalhousie University is in the final stage of reporting how successful general ecosystem models can be in impact assessments (a report to be forwarded to all members of WGEAMS). The main merits of such modelling efforts are:

- the facilitate communication between all involved parties;
- the exchange of ideas can be specific and based on quantitative information;
- the best return is gained when model efforts are made from the very beginning of projects and include all interested parties.

It was felt that the more generic type of ecosystem models will in future provide building blocks for modelling to answer specific questions. Dr Gordon offered to provide, on request, all interested members with a simulation package with which one can enter into the world of modelling ecological systems (BSIM, devised by Bill Silvert). The Canadians welcome international participation in their modelling efforts and expressed interest in being involved in the North Sea modelling exercises.

In France (IFREMER), two groups of modelling specialists are working on physical and biological models. Their experience has shown the importance of modelling efforts being accompanied by field research in order to verify the results. After a two-year modelling effort on N and P cycles in the coastal zone, a "Green Tide" (strong development of Ulva lactuca) forced modellers to become involved in field research programmes where they discovered the crucial importance of N-compounds. As freshwater management enforces P-limiting measures, many scientists argue a different approach (N-limiting measures). The physical modelling effort showed itself to be of value in particular while designing a special monitoring programme in the area where lindane barrels were spilled in the Channel.

In the UK, there is considerable experience in the use of models for the management of waste and effluent disposal. These models are necessary when controlling waste disposal by a system of environmental quality objectives/standards (EQO/EQS). DAFS in Aberdeen is working on a variety of types of models, including:

- the description of solid and liquid waste dispersed in coastal waters;

- the environmental effects of mariculture, including organic enrichment of sediments, nutrient enrichment, chemical and pathogen dispersion and effects, with a view to assessing holding and carrying capacities of sea lochs.

Large-scale ecological modelling efforts include growth/survival models for herring larvae (primary production/zooplankton production/larvae development) in sea areas around the north of Scotland. General energy flow models and interactive multispecies fish models to describe and, in future, assist in managing the North Sea and N.E. Atlantic. The UK institutes (Proudman Institute and Plymouth Marine Labs) presently are involved in the large NERC project on the North Sea and studies are made of the Flamborough Front System off the northeast coast of the UK.

It was noted that GESAMP is producing a report containing guidelines and recommendations regarding modelling coastal zone circulation and transport/dispersion of discharges in these areas.

In the Federal Republic of Germany, many different groups are involved, of which special reference can be made to the DHI (Deutsches Hydrographisches Institut) and the Universities of Hamburg and Kiel. Their main involvement is with hydrodynamic models (wind forces, tides, currents, wind drift/oil pollution). It was felt that modelling the distribution of well-dissolved substances is done well presently, but that contaminant transport associated with particle transport is still difficult; only in a few cases do they produce reasonable results.

After these overview presentations, the use of models for assessment purposes was discussed.

Most models of a generic nature were considered to be research tools, providing information on processes, testing the proper understanding of mechanisms, facilitating discussions of a quantitatively supported nature, integrating different types of information. The main concern is reliability, as field verification programmes are very expensive and more of a "research" than of a "monitoring" nature.

When models (as is the case for monitoring efforts) are to be designed for assessment purposes, it should be made clear what one hopes to gain by carrying out the assessment (e.g., what resource or value is at stake?). Attention must also be given to the influence of human activities aside from pollution, e.g., the harvesting efforts of fisheries. In this respect ICES, being involved in scientific efforts in both fisheries and marine contamination, might become an excellent coordinator of efforts, trying to bring together both fields and integrating both research fields in designing policies for each separate field (and others, e.g., quota or input regulations).

Much accompanying research is necessary to gain confidence in model results, as was well illustrated by Norwegian research and modelling activities necessary to assess the potential impact of the development of new oilfields. As an example, modelling the impact in a certain marine area implied a loss of 2.5% of a cod year-class, if an oil spill should take place at the critical period of the year; an influence of no ecological significance judging the natural variability. The problem here is how to convince laymen that the modelling result is realistic.

Modelling efforts may be of great value in designing field research programmes. In this respect, JMG and ICES monitoring efforts are expected to produce not much more than background information.

Quick and crude modelling efforts have proven themselves worthwhile when accidental spills in the marine area are in progress. Such modelling has supported both the design of countermeasures and information given to the public. Any attempt to focus the many modelling efforts, such as those by the NSTF for purposes of assessments, are considered worthwhile. ICES might initiate more work in this area.

10 PROGRESS IN THE DEVELOPMENT OF BIOLOGICAL EFFECTS TECHNIQUES AND STATISTICAL METHODS FOR THE ASSESSMENT OF TEMPORAL TRENDS IN DATA ON CONTAMINANT LEVELS

Dr M. Bewers introduced paper WGEAMS 1989/10/1, "An introduction to the study of temporal and spatial trends in contaminant levels in marine biota", by J.F. Uthe and co-workers. This paper was initially drafted for WGSATM, which has proposed that the paper should be published as a leaflet in the ICES Techniques in Marine Environmental Sciences (TIMES) series. The paper specifies guidelines and procedures which should be followed in the conduct of monitoring programmes.

In discussing the paper, several members of the WG emphasized the practical aspects of selecting species to be monitored. It was pointed out that guidance from people involved in fisheries research was essential in this process. The usefulness of length stratified sampling was discussed. Dr J. Pawlak pointed to the experience gained in the ICES monitoring programme on temporal trends in contaminants, where length stratified sampling has been found to have statistical advantages in comparison with, e.g., the Swedish national programme, where only a narrow range of lengths have been sampled for cod and herring.

The emphasis in the paper on the need to follow the procedures rigorously when a programme is established received strong support from the Group. Analytical improvements may be introduced as a parallel activity to running programmes. This may form a basis for judgement, after an appropriate time of overlap (e.g., 4-5 years), on whether or not to end the old programme and replace it with the new activity.

The Group concluded that the paper represented a valuable document and recommended that it should be forwarded to ACMP for eventual publication in the ICES TIMES series.

Dr Bewers then introduced paper WGEAMS 1989/10/2, "Sampling strategies for trend monitoring using biota, sediments or seawater" by J.F. Uthe et al. This paper was prepared for consideration by the meeting of WGSATM. In his introduction, Dr Bewers emphasized that trend monitoring programmes should not be started before information on variance was available. He also pointed out that contributions on the sections on sediments and seawater were awaited from WGMS and MCWG, respectively.

In the discussion of the paper, it was noted that the present experience is mainly based on the work carried out on metals and that there is a need to consider also other classes of contaminants, such as organic compounds and nutrients. This situation is not likely to change, however, before the analyses of these compounds have been carried through the necessary procedures for data quality assurance.

The statement in the paper that nutrient analyses at high concentrations could be carried out with a precision and accuracy of ± 1% was considered not to be correct. The true figure is probably closer to 5%. Several members of the WG expressed concern about the quality of nutrient data and emphasized the need for the intercalibration exercise that is now being carried out.

The WG considered this paper a useful contribution and endorsed the continuation of work on it.

With regard to development of biological effects techniques, the Group considered the draft plan for the joint ICES/IOC sea-going workshop on biological effects techniques (WGEAMS 1989/10/3). The document was introduced by Don Gordon, who informed that the Benthos Ecology Working Group (BEWG) had endorsed the inclusion of benthos studies in the workshop, with the recommendation that priority should be given to the proposed oil platform gradient.

The Group considered the workshop in general to be a useful exercise. It was pointed out that the plan contains a sizable pathology component, which hopefully will lead to progress in the field of determining links between disease and contamination. During the discussion of the plan, some points of concern were raised. In finalizing the plan, due consideration has to be paid to selecting contaminant gradients that could be expected to yield signals in the techniques applied. The surface microlayer was in this regard considered an uncertain part of the plan. It was also emphasized that the chemical component of the plan needs careful consideration prior to the exercise.

The WG recommends that an effort be spent in compiling and analysing available information on the proposed gradients prior to the workshop. In addition to data on contaminant levels, the compilation should also include available information on biological effects and ecological impacts in the chosen areas. In finalizing the plans, decisions on priorities should be guided by the need to evaluate and compare biological effects techniques for the purposes of monitoring.

The Group considered briefly some general aspects of biological effects monitoring. It was noted that the ICES study group on biological effects monitoring in 1986 had spent some effort in developing general guidelines for the choice of biological effects techniques. These guidelines were based on interrelationships between suites of techniques, the properties and attributes of the techniques, the stages in pollution monitoring strategy, and the different purposes of monitoring. It was also noted that, for the purpose of ecological assessment, the reproduction stage of organisms represents a bridge which connects a suite of techniques ranging from the biochemical to the population levels.

The Group considered this issue of importance for further strategic analysis. It was recommended that this should be a topic for the next meeting of the Group.

11 IDENTIFICATION OF TOXIC COMPOUNDS BEFORE THEY CAUSE POLLUTION, INCLUDING THE EFFECTS OF MIXTURES OF CHEMICALS IN FIELD SITUATIONS

The Chairman opened the discussion by presenting the major ideas in three reports. Two were OECD reports that dealt with ecological effects assessment. One general point made was that such assessments are huge tasks requiring a lot of work. They also tend to use simple systems or studies of single species, which limits their extrapolation to real environmental situations.

The third article presented a Swedish study called ESTHER, which uses a two-stage process for the assessment of potentially hazardous chemicals. If the initial screening process does not yield enough information for assessment, the chemical advances to the second stage. The study used multispecies, complex aquatic and marine systems, which makes the studies more relevant for environmental assessment.

Dr Bewers stimulated a lively discussion on approaches to hazard assessment. The two principal components of such assessments are estimates of exposure (or potential exposure) and the properties of substances (especially toxicological properties). Both components must be considered, but it appears that greater attention is being paid to exposure at the expense of the attention to the evaluation of the properties of chemicals that will determine the severity of threats imposed by exposure. It was argued that this imbalance needs correcting to allow for larger resource allocations to physico-chemical property evaluations of existing chemicals and reduced emphasis on exposure monitoring for a relatively few chemicals, some of which may be of a relatively low hazard potential.

In the first instance, chemical property assessments should serve to differentiate between chemicals having predominantly non-stochastic effects (i.e., chemicals having effects in proportion to exposure above some threshold) and those having stochastic effects (i.e., chemicals where the risk of effect is proportional to exposure, often without threshold) on human health. Such classification would considerably influence the extent of concerns for exposure, and the nature and importance of exposure studies, including monitoring. Thus, it might facilitate a more balanced and reasoned approach to be adopted to exposure studies to make the most cost-effective use of limited resources.

Dr Bewers went on to argue that there can be pitfalls in applying production volume as a criterion for selecting chemicals for hazard assessments, as has been done in the OECD mechanism. The reason for this is that it may result in neglecting the hazards posed by low-volume chemicals to restricted exposure groups (both human and animal). He further questioned whether the continued monitoring of natural substances having principally non-stochastic effects (such as Zn and Cu) is warranted at the expense of attention to assessments of the relative threats posed by the wide range of chemicals having potentially stochastic effects.

Recent advances in Qualitative and Quantitative Structure Activity Relationships (QSARs) suggest that these techniques could have greater application in hazard assessments to simplify the assignments of priorities to existing chemicals in the environment.

He concluded that the evaluation of new chemicals would probably be best achieved through the application of the justification principle, as discussed by ACMP. There are already schemes that consider the benefits offered by new substances and the risks imposed by their release to the environment that have been applied, for example, to the licensing of new pesticides in Canada. Such schemes would seem to offer a logical approach to hazard assessments of a wide variety of new chemicals.

One possibility is to use similar principles for screening as are used in licensing drugs. For instance, determining toxicity, persistence, biodegradability, etc., to assess the risk to the environment if used; risk/benefit ratings could also be used, weighing the risks and benefits against each other.

Another possibility proposed was a flow chart scheme using physico-chemical properties, such as octanol:water partition coefficient, toxicity, persistence, bioconcentration, etc., as different points in the flow chart. This type of scheme could be used to pre-screen chemicals before they are used, so as to identify potential problems.

It was suggested that the order in which factors were considered in such a sequential assessment scheme may be important. In the UK, a similar scheme had been used to determine a "Red List" of priority contaminants in the context of the reduction in inputs called for by the North Sea Ministerial Conference. The scheme had used toxicity as the first parameter, and this may have emphasized a particular type of chemical. Although the UK scheme had assessed the various factors on a three-point scale (high, medium and low) rather than a simple binary (yes, no) scale, it was still felt that the order in which factors were considered influenced which compounds were finally identified as being of high priority.

It was pointed out that such a flow chart system was developed more than 15 years ago by a working group set up to deal with Annex II compounds in the preparation of the Convention on Prevention of Pollution by Ships. This scheme also included how and in what quantities the chemicals were likely to enter into the sea. A suggestion was made that this scheme could be considered a good approach also in a more general context. The UK scheme for the Red List also has usage (exposure) as its last box.

In conclusion, WGEAMS thought that greater priority in risk assessment should be given to effects studies focussed on the physico-chemical properties of chemical substances to identify chemicals that may cause pollution. Production and usage amounts should be taken into account, but should not be the first priority in determining their potential environmental impact. A question was raised as to what animals to use in toxicity testing, as most of the species used are not particularly sensitive, and the sensitive species are generally protected (such as seals).

It may also be possible to identify future potential problems by reading the patent literature. This gives some idea where industry is going and what products it is developing before they come onto the market and into the environment.

In Sweden, a study was made on the ecological impact of chlorinated substances released in effluents from pulp and paper industries into the marine environment. Of the total amount of chlorinated organic matter, PCBs and DDTs constituted only about 1% and the remainder contained a great number of other compounds that could not be identified. It was proposed that an English summary of this study be presented at next year's meeting.

Biological test methods may be one way of assessing the toxicity of mixtures of chemicals. When combined with chemical analyses, they may help indicate where chemical analyses are not adequate to indicate contamination levels.

Another coming development is the use of Quantitative Structure Activity Relationships (QSAR), which focusses on molecular characteristics of chemicals to predict their biological activity. Such work is already being done with pesticides. The Swedish Institute for Air and Water Research has published two reports on QSAR approaches to ecological toxicity. It was proposed that these two reports should be presented next year.

In addition, next year the Working Group should consider the various decision chart schemes on toxic, persistent substances and their use in identifying potential marine environmental contaminants of priority concern.

12 REVIEW OF NATIONAL MONITORING PROGRAMMES, FOCUSSING ON NUTRIENTS IN THE MARINE ENVIRONMENT

The Group considered the question of for what purpose a review of national monitoring programmes was needed. It was felt that this item would only be a piece of mutual information. On the other hand, the North Sea Task Force had asked the North Sea countries for their national programmes for monitoring nutrients. Such a compilation was prepared by the Secretary of the Task Force. An evaluation of the answers will be presented to WGEAMS at its next meeting by B. Bannink. However, the Group will not restrict itself to summarizing the different national monitoring programmes. It was decided to present at the next meeting results of some monitoring programmes or studies in order to establish a feedback mechanism in the system "strategy - monitoring - assessment", and then possibly revision of the strategy for the benefit of the design of future monitoring programmes.

Dr Gordon agreed to prepare, with the assistance of Dr Bewers, a presentation evaluating the design of a Canadian phytotoxin monitoring programme in view of the strategy prepared by WGEAMS. This recently established programme, conducted at numerous aquaculture sites along the coast of eastern Canada, includes the measurement of phytoplankton species abundance, nutrients, domoic acid and selected physical variables.

Dr Zevenboom indicated that she would be willing to prepare a paper on the design of a monitoring programme around offshore oil drilling locations in the Dutch part of the North Sea.

Dr. Berthomé promised to review a French monitoring programme that includes the use of phytoplankton as a key parameter.

13 DEVELOPMENT OF DEFINITIONS OF RELEVANT KEY TERMS, ACRONYMS AND SYMBOLS WITH A VIEW TO THEIR GENERAL ADOPTION BY ICES

The Chairman led a brief discussion on definitions. He presented a triangle model (Figure 2) which contained three compartments: a) strategy, b) tactics, and c) operational details. He compared the use of these terms in modern management by applying this model to operating a business and to conducting an environmental assessment/monitoring programme.

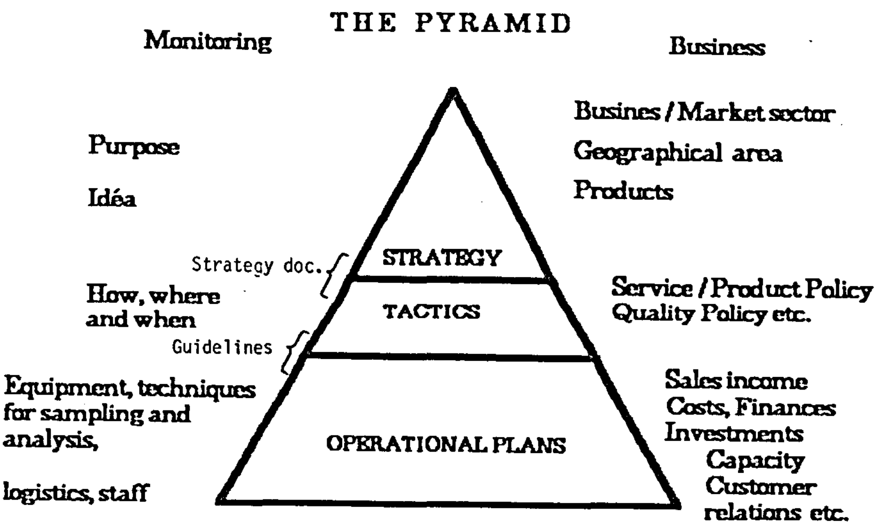

Figure 2.

Strategy covers the purpose of the programme, while tactics refer to how, where, and when the purpose is achieved. Operational details cover specific aspects, such as equipment, techniques and personnel. He concluded that the monitoring strategy document, as worked out by the Group last year, actually bridged the division between strategy and tactics and that the JMG and ICES monitoring guidelines bridged between tactics and operational plans.

Most activities of WGEAMS to date have dealt with strategies and tactics and all members agreed that this focus should continue. WGEAMS should be a "think tank" which advises ICES on the more philosophical aspects of environmental assessment and monitoring. Operational details of specific programmes should be decided only by those expert groups responsible for conducting them.

14 ANY OTHER BUSINESS

No matter was raised by the Chairman or the Group under this agenda item.

15 PLANS FOR THE NEXT MEETING

The Group offered a number of suggestions and ideas for the future working programme of WGEAMS. The concrete proposals are contained in Recommendation 1 from the meeting (see Annex 5).

16 DATE AND PLACE FOR THE NEXT MEETING

The Group considered that at the present meeting tasks had been discussed that needed input from groups that were meeting in parallel with, or later than, WGEAMS. It was therefore considered to be an advantage to carefully coordinate the various meetings, particularly those of MCWG, WGMS, WGSATM and WGBEC, with the meeting of WGEAMS.

Having been invited twice to various institutes the Group decided that the next meeting should be held at ICES in Copenhagen.

The content of this discussion is also reflected in Recommendation 1 in Annex 5.

17 CONSIDERATION AND APPROVAL OF RECOMMENDATIONS AND REPORT

The draft texts of the report concerning agenda item 4 (partly) through item 13 were available at the meeting, and all draft texts except those for items 12 and 13 were discussed in plenary on the morning of the last day of the meeting and amendments were made according to the comments made by participants. Due to shortage of time, it was decided that the draft texts for items 12 and 13 could be commented upon by facsimile to the Chairman within one week.

The draft recommendations were discussed and several additional proposals for the future work programme were suggested in writing by the Group members. It was decided that the Chairman, in cooperation with the ICES Environment Officer, should be entrusted with the task of working out the various proposals into a coherent work programme that could be used as a draft agenda for the next meeting.

In view of the review of the draft text for the report at the meeting and the short time before the ACMP meeting, it was agreed that it was not necessary to circulate the draft report for comment by participants after the meeting.

As all business was complete, the Chairman thanked M. Joanny and his support staff for the excellent facilities and assistance during the meeting. He also thanked the participants for their contributions to the meeting. He then closed the meeting at 12.30 hrs on 28 April 1989.

ANNEX 1

WORKING GROUP ON
ENVIRONMENTAL ASSESSMENTS AND MONITORING STRATEGIES

Brest, 24-28 April 1989

DRAFT AGENDA

1. Opening of the Meeting

2. Adoption of the Agenda

3. Arrangements for preparation of working group report

4. Report from Statutory Meeting, the North Sea Task Force (first and second meeting) and the Joint Monitoring Group

5a. Review the existing guidelines and, if necessary, revise and develop new ones for the monitoring of contaminants in marine organisms, sea water and sediments 5b. Advise on the quality of data required to meet the different objectives of monitoring

5c. Develop matrix tables for monitoring purposes other than human health

6. Consider the development of standards/criteria against which to judge environmental data, taking due account of the activities of FAO/WHO in this field and national standards

7. Review progress in regional assessments in the areas suggested as requiring priority attention

8. Review a report on monitoring for the purpose of assessing risks to human health of contaminants in fish and shellfish

9. Consider, as a progression from the conduct of regional environmental assessments, the development of habitat protection policies and the use of modelling of ecosystems

10. Review progress in the development of biological effects techniques and statistical methods for the assessment of temporal trends in data on contaminant levels

11. Consider further the possibilities of identifying toxic compounds before they cause pollution, including the effects of mixtures of chemicals in field situations

12. Commence a review of national monitoring programmes, focussing in 1989 on nutrients in the marine environment

13. Consider developing definitions of relevant key terms, acronyms and symbols with a view to their general adoption by ICES

14. Any other business

15. Plans for next meeting

16. Date and place of next meeting

17. Consideration and approval of Recommendations and Report.

ANNEX 2

WORKING GROUP ON
ENVIRONMENTAL ASSESSMENTS AND MONITORING STRATEGIES

Brest, 24-28 April 1989

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ANNEX 3

IMPLEMENTATION OF MONITORING STRATEGIES DOCUMENT

1 INTRODUCTION

In 1988, the Advisory Committee on Marine Pollution adopted a document entitled "Philosophy, Principles and Strategy of Monitoring", on the basis of a draft prepared by WGEAMS at its 1988 meeting. In continuation of this work, the ACMP thereafter requested WGEAMS to provide information on the implementation of this monitoring strategy, particularly with respect to the identification of the most appropriate marine compartment(s) in which to measure each of the contaminants commonly included in present monitoring programmes. The identification of "new" contaminants is being covered in other work by WGEAMS and is not included here.

This document is intended for general use in the implementation of the monitoring strategies document. However, the Joint Monitoring Group of the Oslo and Paris Commissions has made a specific request to ICES concerning which matrices would be most useful for the measurement of the contaminants of priority concern in the Joint Monitoring Programme (JMP) in relation to the purposes of monitoring agreed for the JMP. Accordingly, the JMP will be used as a specific example in this description of the implementation of the monitoring strategies document.

2 PURPOSES OF THE JOINT MONITORING PROGRAMME

The purposes of the JMP, and their relationship to objectives of the Cooperative ICES Monitoring Studies Programme, are listed below as a background to the proposed implementation.

JMP Purpose (a): the assessment of possible hazards to human health.

This corresponds to ICES Objective 1: the provision of a continuing assurance of the quality of marine foodstuffs with respect to human health.

Sampling is conducted every second year (even-numbered years) of marine organisms consumed by man.

For their interpretation, the JMG has identified three classes of concentrations of the contaminants in their programme: lower, medium and upper. These are not statistically derived and the classes have no relation to human health criteria. JMG has agreed that monitoring for purpose (a) has to be continued only in areas with values in the upper class.

JMP Purpose (b): the assessment of harm to living resources and marine life (ecosystems).

This is interpreted as biological effects monitoring and is not considered further here.

JMP Purpose (c): the earliest possible assessment of the existing level of marine pollution.

This corresponds to ICES Objective 2: the provision over a wide geographical area of an indication of the health of the marine environment in the entire ICES North Atlantic area (baseline study).

Originally, the sampling frequency was proposed to be every fifth year.

In the 1985 Baseline Study of Contaminants in Fish and Shellfish, the ICES/OSPARCOM/HELCOM group to evaluate the results arrayed the data for each contaminant in each species/tissue according to quartiles, with an area being identified as a "hot spot" area if values of a contaminant have been reported above the upper quartile for at least two species. In addition, some of the same classes were used as for purpose (a). As the Baseline Study of 1985 had not identified unexpected hot spot areas, JMG expressed doubt about the need for a similar programme in the future, and asked ICES for advice (see below).

JMP Purpose (d): the assessment of the effectiveness of measures taken for the reduction of marine pollution within the framework of the Conventions.

This is similar to ICES Objective 3: to provide an analysis of trends over time in pollutant concentrations in selected areas, especially in relation to the assessment of the efficacy of control measures.

These trend monitoring studies only began in 1982-1983, so JMG has decided to continue monitoring for this purpose. Sea water is not recommended for the assessment of trends in trace element concentrations, though the Commissions acknowledged that more frequent monitoring than once every 5 years (for Purpose (c)) could be justified in areas with enhanced levels of contamination and in areas where changes could be expected as a result, for example, of known reductions in inputs.

At the 14th Meeting of JMG (in 1989), recommendations were made for a supplementary baseline study for purpose (c) for biota (JMG 14/15/1, Annex 6). The programme includes areas that were not included in the 1985 baseline study. Special emphasis will be given to offshore stations in the following areas: North Sea, English Channel, Irish Sea, Celtic Sea and Bay of Biscay, and also in the following regions: west coast of Portugal and Spain, west coast of Ireland, coastal areas of Iceland and Norwegian coastline. A list of biota and contaminants was also given.

3 OPTIMISATION OF THE MONITORING PROGRAMME

ICES has been requested by the JMG to advise further on the optimisation of its Joint Monitoring Programme (JMP). Specifically, the JMG requested (Annex 7, JMG 14/15/1) that ICES:

A) Give further advice and clarification to the proposed matrix table for contaminants in relation to JMP Purpose (a), (JMG 14/5/3, table was included).

B) Provide advice by means of matrix tables on how most effectively to monitor each contaminant of interest for Purposes (c) and (d) as defined by the Commissions.

WGEAMS addressed these questions, taking note of the relevant information about the JMG programme and the JMG recommendations for a 1990 supplementary baseline study for Purpose (c) for biota.

In preparing its advice, the Working Group restricted itself to the priority contaminants of the JMP, together with a number of contaminants (e.g., nickel, chromium, tributyl-tin) which are not mandatory in the current JMP. The matrices considered included sea water, sediments, and biota, as are included in the current JMP. The Working Group did not review the purposes of the JMP, as advice had been sought on matrix selection in relation to the defined monitoring Purposes (a), (c) and (d).

The matrices were selected as those most appropriate for the provision of the greatest information in relation to each monitoring purpose. They were selected on scientific grounds, and did not take any account of relative costs or convenience of the alternative choices.

In some cases, no matrix has been recommended, either because the monitoring of a particular contaminant was not appropriate to the monitoring purpose, or because advice could not be given for technical reasons. More complete explanations of individual cases are given below.

In many cases, primary and secondary choices of matrix are given, and, in somes cases, tertiary choices. These choices should be viewed as alternatives, or complementary choices, but the Working Group considered that, if circumstances permitted, a primary matrix should be preferentially selected for analysis, as this would provide the greatest amount of information relevant to the particular monitoring purpose. The Working Group recognised that suitable primary matrices may not be available in all monitoring locations and, in such cases, secondary or tertiary matrices should be used. It was fully appreciated that, in some cases (particularly in relation to Purpose (c), the assessment of the existing level of marine pollution), a more comprehensive assessment might be obtained by the analysis of the contaminant in all matrices. However, the priority selections of matrices were made with the aim of providing the most useful scientific information for assessing distributions of contaminants, and focussing attention on those matrices that might enable the most consistent picture of distributions over wide areas to be obtained through the collective efforts of a number of laboratories and countries.

It was also recognised that in some cases matrices will be chosen on the basis of pre-existing local information and on-going monitoring programmes. The advice in the following sections should not be taken as denegrating the continuation of existing monitoring programmes designed in the context of local conditions that are yielding useful information, even if they do not wholly match the selections advocated here.

The Working Group wished to remind the JMG that, in all circumstances, the reliability of the information from a monitoring programme, and its consequent value, is dependent upon the attention paid to quality assurance at all stages of the measurement programme (sample collection, storage, preparation, pre-concentration, analysis, standardisation and interpretation). Participating laboratories should be required to adopt appropriate procedures in this area.

Purpose A. The assessment of possible hazards to human health (Table 1)

The Working Group recognised that, in the generality of the area covered by JMG, none of the contaminants considered presented a widespread serious hazard to human health through the consumption of marine foodstuffs. In some cases (e.g., copper, zinc, arsenic, chromium, and nickel), the contaminants were not normally of concern with respect to fisheries products. Equally, the monitoring of contaminants in sea water or sediment would not have any direct applicability to human health risk, and these considerations are reflected in the matrix Table 1. This table, therefore, provides advice on the contaminants and matrices that should be included in a regional or wider scale survey to assess the possible hazards to human health presented by the presence of selected contaminants in marine foodstuffs. In several cases, primary and secondary choices of matrix are given.

The Working Group also recognised that areas of contamination could exist which could give rise to localised increases of concentration in foodstuffs. Such situations were unlikely to be detected or adequately described by large-scale surveys, and were better approached through specially designed and targeted monitoring exercises by national or local authorities. In such circumstances, the relevant authorities should assess the most important exposure pathway by which the contaminant reached the public through marine foodstuffs. The monitoring programme should be directed at that pathway, and not be constrained by the advice given in Table 1 in relation to broader scale surveys. For example, in some areas there may be concern over the concentrations of CBs in the muscle of lipid-rich fish species, such as herring or mackerel, and in such circumstances it would be appropriate to analyse herring or mackerel muscle.

Purpose C. The assessment of the existing level of marine pollution (Table 2)

Water

In designing Table 2 (and Table 3), the Working Group took note of the JMG recommendation (JMG 14/15/1, Annex 8) that "seawater analysis should not, as a rule, be used for purpose (d) - trend monitoring (OSPAR 10/11/1, § 2.12). Although the Commissions agreed that seawater analyses were not the most appropriate compartment for detecting true statistical trends in time (purpose (d)), the Commissions nevertheless acknowledged that the monitoring of seawater at a more regular frequency than once every five years could be justified:

1) in areas with enhanced levels of contaminants; and

2) in areas where changes could be expected as a result, for example, of known reduction in inputs (OSPAR 10/11/1, § 2.13)".

In discussing sea water analysis, the Working Group drew a distinction between near-shore waters, in which marked salinity gradients may be found, and which are more likely to be influenced by riverine or land-based inputs of contaminants, and off-shore waters where gradients are normally substantially less marked, and which are more remote from the above-mentioned inputs of contaminants.

The use of water analysis to reflect current levels of marine contamination is attractive in that it concerns the important aqueous phase, the environment in which both biota and sediment exist. However, the Working Group recognised the considerable efforts being made by the Marine Chemistry Working Group to improve the comparability of analytical performance among laboratories engaged in sea water analysis in member states. The requirements for precision and accuracy of analysis at low concentrations limit the number of determinands that could be considered in off-shore waters to mercury, cadmium, copper, zinc, lead, and lindane, all at secondary matrix level. Even in these cases, it would be essential for each laboratory to establish in-house quality control procedures, and for rigorous assessments to be made to establish comparability between laboratories, with particular attention to lead.

In near-shore waters, concentrations may be somewhat more variable and subject to anthropogenic influences, and chromium and nickel analyses might also be considered. The same quality assurance precautions would be needed. In near-shore waters, it is necessary to take account of any correlation between contaminant concentrations and salinity, and of the influence of the concentration and composition of suspended matter on the dissolved contaminants.

Sea water is not a matrix of choice for CBs, as the octanol:water partition coefficients indicate that the compounds would be predominantly associated with sediment or biota.

The concentrations of arsenic naturally present in sea water make the discrimination of anthropogenic influences from natural processes difficult and, therefore, sea water is not indicated as an appropriate matrix.

The Working Group recognised that some sea areas (usually small and isolated) existed in which the inputs of contaminants are sufficiently large to cause marked elevations of contaminant concentrations in sea water, or in which changes in concentrations could be expected. As agreed by the Commissions, in such areas it might be appropriate for national authorities to give more prominence to water analysis in monitoring programmes.

Sediments

There is very considerable emphasis laid on the use of surficial sediments as a primary matrix for most of the contaminants. Participating laboratories should take full account of the most recent advice on the selection of sampling locations and methods (see, e.g., Section 15, Coop.Res.Rep. No. 142 (1987); Annex 2, Coop.Res.Rep. No. 124 (1983); Annex 2, Coop.Res.Rep. No. 132 (1984)). Areas of high sedimentation and low bioturbation rates are particularly favourable. It is also necessary to subject the samples or data to appropriate normalisation procedures to allow, particularly, for grain size variations.

Biota

Both sediment and shellfish are indicated as primary monitoring matrices for TBT. Whilst the main area of concern over TBT is its effects on shellfish, particularly molluscs (oyster, dogwhelk, etc.), these organisms are by nature of limited geographical distribution. TBT, and its derivatives DBT and MBT, can be found in sediments, especially near shipyards, harbours and areas of extensive shipping and mariculture, and the monitoring of sediments should allow the use of a single matrix in a wider range of environments (e.g., into low salinity areas of estuaries) than would be possible using one mollusc species.

In preparing advice in relation to this monitoring purpose, the Working Group interpreted the purpose as referring to marine contamination, rather than marine pollution (as stated in the purpose). It must be emphasised that this advice has no relation to effects of contaminants on biota. Biological effects monitoring is, in the view of the Working Group, covered by JMP Purpose (b). The Working Group envisaged that once biological effects monitoring was established, it would be accompanied by appropriate chemical measurements of the active contaminant or contaminants. It may be possible subsequently to make inferences of the likely extent and intensity of biological effects from the results of Purpose (c) monitoring, by application of correlations between effects and contaminant concentrations derived from Purpose (b) monitoring.

Purpose D. Assessment of the effectiveness of measures taken for the reduction of marine pollution within the framework of the Conventions (Table 3)

Measures taken within the framework of the Conventions to reduce the level of marine pollution are primarily directed at the control and reduction of inputs of contaminants. The main inputs are from riverine sources, land-based discharges, the atmosphere, and by direct dumping. The most efficient way to assess the effectiveness of the measures taken to reduce inputs is therefore to monitor the inputs, and JMG should take note of efforts already being made within the Commissions to assess the levels and trends of inputs. JMG may wish to take note of the comments in the 1988 ACMP report on the estimation of gross and net riverine inputs, and on atmospheric inputs. The monitoring of inputs can give detailed information on the effects of control measures on individual or localised groups of contaminant sources, and can therefore be particularly useful in regulatory procedures. It is likely that more and larger responses will be obtained when monitoring is conducted closer to the sources being regulated. Thus, for example, for land discharges, rivers and streams will generally yield higher signal-to-noise ratios than the marine environment.

It is also necessary to assess the effectiveness of the control measures in improving the quality of the marine environment. It is this aspect of trend monitoring that is covered by the Working Group advice in Table 3.

The Working Group noted that monitoring for the assessment of temporal trends of contaminants in the marine environment is very much less developed than monitoring for Purposes (a) and (c). There is an ICES Working Group on Statistical Aspects of Trend Monitoring (WGSATM) which is primarily addressing questions in this area. The advice in Table 3 represents the combinations of matrices and contaminants which WGEAMS feels have so far demonstrated the potential to display temporal trends, or which (e.g., shellfish) are likely to be usable in the near future. The table, therefore, represents a statement of the current "state of the art", and JMG should be aware that, as the subject is developed, additional combinations may become appropriate. With these considerations in mind, most of the recommendations are indicated as primary matrices, to reflect that they are very much alternatives.

When considering monitoring for temporal trends, it is necessary to consider the likely length of time which may elapse before any change in input may be reflected in the monitoring matrix. This length of time will be a complex function of environmental factors and processes, the magnitude and rate of changes in inputs, analytical factors, and data analysis procedures, with particular emphasis on the variance of each of the contributory media and processes. This may have particular importance in relation to the frequency with which JMG may wish to assess the effectiveness of measures taken by the Commissions, or the frequency of regional assessment exercises (e.g., in the North Sea area).

The WGSATM has conducted a simplistic assessment of trend monitoring data on the mercury content of fish muscle and liver made available to ICES, and estimated from these data that fish muscle analyses could detect (with at least 0.95 probability) changes of at least 30 % over a period of 10 years, whilst fish liver analyses could only detect changes of 50 % or more. Such observations should be taken into account by JMG when assessing the potential usefulness of temporal trend monitoring, bearing in mind that the data set analysed, whilst selected as representing the "best available case" in terms of data quality and quantity, was limited in respect to both of these.

Biota

In relation to the use of biota in trend monitoring, the WGSATM has pointed out that the detection of trends in contaminant concentrations in biota may not necessarily imply that environmental levels or inputs have changed. Circumstances are quite conceivable in which other environmental factors, for example leading to a change in type or availability of prey species, could give rise to changes in the degree of exposure of the predator species to the contaminants concerned.

Sediments

Table 3 particularly emphasises the potential of down-core analysis of sediments in trend monitoring for a wide range of contaminants. As noted with respect to Purpose (c), and in footnote 5 to Table 3, it is particularly important to pay attention to the site selection and data normalisation procedures discussed in other ICES documents. Arsenic and chromium analyses are not recommended as it is as yet unclear how the distribution of these elements may be affected by changes in redox potential in anoxic sediments.

The JMG should take note of comments in the 1989 report of the Working Group on Marine Sediments in Relation to Pollution on the influence of sedimentation rate and bioturbation intensity on the ability of sediment core samples to reflect changes in input to the sediment. It is also likely that sediment core analyses will reflect general basin conditions, rather than changes in single sources or types of input.

Water

Water analysis is not recommended for trend monitoring (except for lindane). However, in circumstances of marked contamination and where changes are expected, as discussed for Purpose (c), contaminant monitoring in sea water may be appropriate, provided that statistical considerations indicate that such analyses could reliably reflect the effects of control measures.

The comments above on the relationship between contaminant monitoring and biological effects monitoring apply equally to monitoring for Purpose (d).

It should be noted that the CBs referred to on the matrix tables are the chlorobiphenyls that ICES has recommended for determination in general monitoring situations, namely, primarily, IUPAC Nos. 28, 52, 101, 118, 153, 138, and 180, and, secondarily, IUPAC Nos. 18, 31, 44, 66/95, 110, 149, 187, and 170.

Matrix Table 1

In relation to the assessment of possible hazards to human health (JMP Purpose a)

Matrix	Contaminant									
	CBs	γ-HCH	Hg[5]	Cd	Cu[3]	Zn[3]	As[4]	Cr[3]	Ni[3]	Pb
Shellfish	P	P	P	P						P
Fish muscle			P							
Fish liver	S[2]	S[2]		S[1]						

P: primary matrix
S: secondary matrix

Notes and Qualifications:

1. If fish liver is not a consumed fisheries product, no analysis is needed.

2. If fish liver is not a consumed fisheries product and there remain human health concerns, transfer attention to fish muscle.

3. These contaminants are not normally of concern in respect to the consumption of fisheries products.

4. Arsenic is present in seafood in measurable concentrations, but its chemical form makes it of little concern with respect to human health.

5. Hg should be understood to include methyl-mercury compounds. In countries where public health regulations refer to methyl-mercury rather than total mercury, samples may be analysed for methyl-mercury.

CBs: Chlorobiphenyls on an individual basis, congener nos. 28, 52, 101, 118, 153, 138, and 180.

Matrix Table 2

In relation to the assessment of the existing level of marine pollution (i.e., contamination)
(JMP Purpose c)

Matrix	Contaminant										
	CBs	γ-HCH	Hg	Cd	Cu	Zn	As	Cr	Ni	Pb	TBT
Nearshore water		P	P[1]	P[1]	P[1]	P[1]		P[1]	P[1]	P[1]	S[1]
Offshore water		S	S[1]	S[1]	S[1]	S[1]				S[1]	
Surficial sediments[2]	P		P	P	P	P	P[5]	P	P	P	P
Shellfish	S[3]	S[3]	S[1]	S[1]		S[1]				S[1]	P
Fish muscle			T[1,4]				S[1,4]				
Fish liver	S[4]		T[1,4]							T[1,4]	

P: primary matrix
S: secondary matrix
T: tertiary matrix

Notes and Qualifications:

1. Potential addition/alternative to sediment measurements in areas where sediment conditions are not appropriate for monitoring purposes (see 1988 ACMP Report, Section 15).

2. Should be accompanied by measurements that facilitate normalization.

3. Could be carried out on an opportunistic basis, as may provide additional information on distribution.

4. Sedentary species only (e.g., flatfish).

5. The signal-to-noise ratio for discriminating between anthropogenic and natural influences is extremely low.

CBs: Chlorobiphenyls on an individual basis, congener nos. 28, 52, 101, 118, 153, 138, and 180.

Matrix Table 3

In relation to the assessment of the effectiveness of measures taken for the reduction of marine pollution (i.e., contamination) in the framework of the Conventions
(JMP Purpose d)

Matrix	Contaminant										
	CBs	γ-HCH	Hg	Cd	Cu[4]	Zn	As[6]	Cr[6]	Ni[4]	Pb	TBT
Water		P[2]									
Sediment profiles[5]	P		P	P	P	P			P	P	P
Shellfish			P	P	P	P				P	P
Fish muscle			P[1,3]								
Fish liver	S[1,3]										

P: primary matrix
S: secondary matrix

Notes and Qualifications:

1. Considerable care has to be taken with species selection and availability, sampling protocol, and statistical aspects of data analysis.

2. Considerably greater effort is required, in respect to sampling and analytical frequency, if measurements are made in water, but the potential signal-to-noise ratio for trends is greater than that in sediments.

3. Sedentary species should be selected.

4. Highly unlikely that any trend signal related to anthropogenic influences will be detected.

5. Care should be taken in selecting favourable areas of high sedimentation rate, and limited bioturbation, following the latest ICES Guidelines for monitoring contaminants in sediments, including organic carbon measurements and appropriate normalization procedures.

6. No recommendation can yet be made, except that As should not be measured in sediment profiles.

CBs: Chlorobiphenyls on an individual basis, congener nos. 28, 52, 101, 118, 153, 138, and 180.

ANNEX 4

OVERVIEW OF STANDARDS FOR CONTAMINANTS IN FISHERY PRODUCTS

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General remarks :
- the standards is this overview apply to fishery products as human food, *i.e.* they are intended to protect the human consumer;
- unit is mg/kg wet weight unless indicated otherwise;
- no analytical details are given;
- in general standards apply to all fishery products (fish, shellfish, crustacea) unless indicated otherwise;
- the overview is restricted to ICES countries.

COMPOUND	COUNTRY	STANDARD	REMARKS
ALDRIN and DIELDRIN	FRGermany	1.0*	for the sum of the two in eel, salmon, sturgeon; * on lipid basis
	"	0.5*	for the sum of the two; * on lipid basis
	Netherlands	0.05	for the sum of the two; proposed
	Sweden	0.1	for the sum of the two
ARSENIC	Canada	3.5	in protein
	Finland	5.0	
	Poland	4.0	
CADMIUM	Canada	0.35	
	Finland	0.3	proposed
	FRGermany	0.5	for freshwater fish
	Netherlands	0.3	for crustacea
	"	1.0	for molluscan shellfish
	"	0.05	for others
CAMPHECHLOR (TOXAPHENE)	FRGermany	0.4*	* on lipid basis
	USA	5.0	

COMPOUND	COUNTRY	STANDARD	REMARKS
CESIUM (radio-)	Netherlands	1250 Bq/kg	$^{134}Cs + ^{137}Cs$
	Sweden	300 Bq/kg	^{137}Cs
CHLORDANES	FRGermany	0.01	total chlordanes
	Netherlands	0.02	total chlordanes; proposed
	USA	0.3	total chlordanes
DDT and related compounds	Canada	5.0	Σ DDT, DDE, DDD
	Denmark	2.0	"DDT", 5.0 for liver
	FRGermany	3.5*	Σ DDT, DDE, DDD; for eel, salmon,sturgeon; * on lipid basis
	"	5.0*	Σ DDT, DDE, DDD; for liver and roe; * on lipid basis
	"	2.0*	Σ DDT, DDE, DDD; for others; *on lipid basis
	Netherlands	0.5	Σ DDT, DDE, DDD; proposed
	Sweden	5.0	Σ DDT, DDE, DDD
	USA	5.0	Σ DDT, DDE, DDD
DIOXINS	Canada	20 ng/kg	TCDD-equivalents
DIARRHETIC SHELLFISH POISON (DSP)	Netherlands	absent	according to rat bioassay
	Sweden	0.6	for mussels; as okadaic acid equivalents
DOMOIC ACID	Canada	20	for molluscan shellfish; preliminary
ENDRIN	FRGermany	0.01	
	Netherlands	0.02	proposed
FLUORIDE	Canada	150	
HEPTACHLOR (EPOXIDE)	Netherlands	0.02	for the sum of the two; proposed
	USA	0.3	for the sum of the two

COMPOUND	COUNTRY	STANDARD	REMARKS
HEXACHLORO-	FRGermany	0.5*	* on lipid basis
BENZENE (HCB)	Netherlands	0.05	proposed
	Sweden	0.2	
	USA	0.2	
HEXACHLORO-	FRGermany	2.0*	γ-HCH; * on lipid basis
CYCLOHEXANES	"	0.5*	Σ other isomers; * on lipid basis
	Netherlands	0.05	per isomer; proposed
	Sweden	0.2	$\Sigma\ \alpha + \beta + \gamma$
LEAD	Canada	0.5	in protein
	Finland	2.0	for mussels, cuttlefish, crayfish
	FRGermany	0.5	for freshwater fish
	Netherlands	0.5	2.0 for molluscan shellfish
	Sweden	1.0	2.0 for liver
	UK	2.0	10.0 for shellfish
MERCURY	Canada	0.5	except swordfish
	Finland	1.0	
	France	0.5	0.7 for tuna, swordfish
	FRGermany	0.5/1.0	depending on species
	Netherlands	1.0	
	Spain	0.5	
	Sweden	1.0	
	USA	1.0	
	USSR	0.5	0.7 for tuna
MIREX	FRGermany	0.01	
	Netherlands	0.01	proposed
PARALYTIC	Canada	0.8	for molluscan shellfish
SHELLFISH	Netherlands	0.4	for molluscan shellfish
POISON (PSP)	Sweden	0.8	for mussels; as saxitoxin equivalents

COMPOUND	COUNTRY	STANDARD	REMARKS
PCBs	Canada	2.0	total PCBs
	Sweden	2.0	total PCBs, 5.0 for salmon, liver
	USA	5.0	total PCBs

PCBno. :		28	52	101	118	138	153	180	
	FRGermany	0.2	0.2	0.2		0.3	0.3	0.2	freshwater fish
	"	0.4	0.4	0.4		0.6	0.6	0.4	codliver
	"	0.08	0.08	0.08		0.1	0.1	0.08	others
	Netherlands	0.5	0.2	0.4	0.4	0.5	0.5	0.6	eel
	"	0.3	0.12	0.24	0.24	0.30	0.30	0.36	herring, mackerel
	"	1.5	0.6	1.2	1.2	1.5	1.5	2.0	liver
	"	0.1	0.04	0.08	0.08	0.1	0.1	0.12	others

In Canada the limit for other agricultural chemicals is 0.1 mg/kg each.

In Belgium no standards for contaminants in fishery products are in force.

LITERATURE

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April 1989

ANNEX 5

RECOMMENDATIONS

Recommendation 1

The WGEAMS recommends that it meet for 5 days in spring 1990 at ICES Headquarters in Copenhagen, coordinated in such a way that input from the MCWG, WGMS, WGSATM and WGBEC meetings can be made available in advance. The work programme for the meeting will include:

1) consider progress in the conduct of regional assessments;

2) consider issues relevant to the modelling of ecosystems and how such models can assist in assessment work;

3) consider (i.a., in the context of ACMP's position on environmental protection principles) QSAR techniques as well as systematic procedures to assess the hazards to the marine environment of existing and new toxic, stable substances and their use in identifying potential contaminants of priority concern;

4) consider the bearing that ACMP's position on environmental protection principles might have on the design of marine monitoring programmes and review the effectiveness of monitoring activities in relation to other potential uses of available resources;

5) consider progress in the development of the concept of preparing assessments concerning: 1) conveying condensed information to policymakers and the general public, using the Baltic Sea assessment as an example, and 2) conclusions that can be drawn from an analysis of these information items for designing research, monitoring and modelling efforts;

6) review the practical experiences of implementation of earlier WGEAMS recommendations for the design of monitoring programmes and regional assessments (from proposed Canadian monitoring programme, from French monitoring programme containing phytoplankton and microbiological parameters, assessment by the North Sea Task Force);

7) consider further the role of biological effects techniques in pollution/contamination monitoring. The WGEAMS will review the basic concept of the guidelines for selection of such techniques as developed by the Study Group on Biological Effects Techniques at its meeting in Hirtshals in 1985 (see ICES, Doc.C.M.1985/ E:48).

Recommendation 2

The WGEAMS recommends that the coordinator of the Second Periodic Assessment of the Baltic Sea environment, Professor S. Gerlach, be invited to attend, at national expense, the 1990 WGEAMS meeting to describe the process of assessment used in the Baltic, particularly how the results are condensed to a suitable form for presentation to decision makers and the general public.

Recommendation 3

The WGEAMS recommends that the document "An Introduction to the Study of Temporal and Spatial Trends in Contaminant Levels in Marine Biota", prepared by Dr J.F Uthe et al., be reviewed by an expert nominated by ACMP with a view of having it published as a TIMES document.

Recommendation 4

The WGEAMS wish to request MCWG to provide information for the inclusion of new substances, to be covered by the North Sea Task Force, in the matrix tables. These substances should include α-HCH, HCB, PAHs, polybrominated biphenyls, dioxins, dieldrin/aldrin/endrin, triazine herbicides (atrazine and simazine), toxaphene, and chlordane.

Recommendation 5

In order to respond to the request from the Joint Monitoring Group on possibly combining sampling for monitoring purposes c) and d), the WGEAMS wish to request the WGSATM to address the following questions:

- For which contaminants is length-stratified sampling required?
- Under what conditions and for which parameter/species can the results obtained for purpose d) also be used for purpose c)?
- Under what conditions and for which parameter/species can the results obtained for purpose c) also be used for purpose d)?