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International Council for the
Exploration of the Sea

C.M.1974/E:3
Fisheries Improvement Committee

REPORT OF THE WORKING GROUP ON INTERNATIONAL STUDY OF POLLUTION OF THE NORTH SEA AND ITS EFFECTS ON LIVING RESOURCES AND THEIR EXPLOITATION

Charlottenlund Slot, 8 and 9 January 1974

Contents

-o-o-o-

x) General Secretary,
ICES,
Charlottenlund Slot,
2920 Charlottenlund,
Denmark.

The Meeting was chaired by Mr A.J. Lee who opened the Meeting and formally welcomed all the attendants on behalf of the Council. The Chairman informed the Group that in addition to those present (Annex 2) he had received requests from WHO and Portugal that they be allowed to send observers. Mr R.J. Giroult attended the Meeting on behalf of WHO for part of the second day, but in the event no representative was sent by Portugal.

Following the formal adoption of the Agenda (Annex 1), Dr Portmann was proposed and accepted as Rapporteur for the Meeting.

The Chairman then opened the formal business of the Meeting with Item 4 of the Agenda by reminding the Working Group that the Ad Hoc Meeting of Analysts and Biologists held on 10 - 12 December 1973 had been charged with the task of reviewing national monitoring programmes, with a view to their coordination in terms of coverage and reporting procedures, so as to provide reasonably unified coverage of at least the coastal areas of the North Sea. He then asked Dr Portmann, as Chairman of the Analysts and Biologists Meeting, to outline the progress made towards the posed objectives. Dr Portmann informed the Working Group that the Analysts' discussions had been somewhat inconclusive. They had not found it possible to suggest changes to national programmes because in general, at least for 1974, these had already been finalised. It was, however, established by rapid review of national monitoring programmes in the North Sea area for 1973 and 1974 that a considerable amount of work was in progress and that the resulting information could be made available to ICES. The Ad Hoc Meeting of Analysts and Biologists had, in view of the difficulties encountered in suggesting changes, accordingly agreed that details of national programmes should be presented in a standardised way and that, with the help of Mr Jens Smed, the ICES Secretariat should collate the resultant tables for consideration by the present Working Group. Dr Portmann concluded his remarks by noting that Mr Smed had accomplished his task and referred discussion of the resultant tables to the Group.

After further introductory remarks by Mr Smed and considerable discussion, the Working Group concluded that little could be done in terms of further coordination of national programmes for 1974, but that comprehensive data of the type presented in the tables (see Annex 5 for amended version) provided ICES with valuable information on work in progress. It was agreed that the task of ensuring that the data in the tables were truly comprehensive for each member country could safely be assigned to the Working Group members, but that Delegates should be informed by the Secretariat of the undertaking. It was further agreed that programmes underway in 1974 should be clearly indicated and that a deadline of 1 April should be established for submission of additional data. Mr Smed agreed to continue the task of compilation. It was further agreed that the amended tables be annexed to this Report for submission to the Fisheries Improvement Committee at the 1974 Statutory Meeting of the Council.

The General Secretary informed the Working Group that ICES had assumed the task of reporting regularly pollution data for the North Atlantic area and might be expected to provide information of this nature to the Oslo Commission. With this and other objectives in mind the Council had agreed in principle to establish a post of secretary to the Advisory Committee on Marine Pollution who could, among other tasks, undertake the collation of data gathered by national monitoring programmes and also, in the light of these data, suggest changes in national programmes. The secretary should be in post by mid-1975.

The Working Group therefore agreed that data from national monitoring programmes should be reported to ICES starting with those for 1974. These data should be reported on an annual basis not later than 1 July in the year following that in which they were collected. It was also agreed that data for fish and shellfish should be reported according to the format agreed for the 1972 Base-line Survey, but that the question of reporting data for sea water should be referred to the next Ad Hoc Meeting on Sea Water Analysis. Priority for data submission should be assigned to those data which were of direct relevance to the requirements of the Oslo Commission.

In connection with the work programme agreed at its Meeting on 5 - 7 March 1973 the Working Group noted that for a number of reasons no progress had been made by the two Study Groups on nutrients. However, it was stated that the Southern Bight Group was intending to meet in February 1974. The Kattegat/ Skagerak Group would now be chaired by Dr A. Svansson who had stated that he wished to proceed on lines to be established by the Southern Bight Group and that his Group would meet as soon as possible after he received the report from the first Meeting of the Southern Bight Group.

The Working Group considered progress made on the analysis of oil. Norwegian scientists had continued work on the section Bergen-Shetland, but in cooperation with the United Kingdom team were still working on methods of quantifying the results. Both groups of workers were, however, agreed that it was essential to analyse unfiltered sea water. In response to the request made at the 1973 Working Group Meeting, Norway had received water samples from Scotland and further samples were being collected by England. Although several countries expressed a firm interest and intention to develop analytical facilities for oil, only one country reported real progress in this matter. The Group noted that a small informal Meeting had been proposed by workers in the U.K. at which it was intended to discuss current knowledge and 'state of the art' topics. After some discussion it was agreed that ICES should notify Delegates of the proposed Meeting in an attempt to encourage attendance at the Meeting, and also that a short report on the outcome of the Meeting should be prepared for consideration by the Fisheries Improvement Committee at the 1974 Statutory Meeting of the Council.

At its 1973 Meeting the Working Group had identified a lack of information on the flux of pollutants through estuaries, fjords etc. and had appealed to the Hydrography Committee for further information. The Working Group noted that little progress had been made by the Hydrography Committee which had apparently been unsure how to go about the task. Several members mentioned that their countries had relevant programmes either under-way or planned, and it was agreed that these might well form a basis for action by the Hydrography Committee. After expressing some surprise at the difficulties encountered by the Hydrography Committee, the Working Group agreed to refer the question for further consideration by the Advisory Committee on Marine Pollution which included the Chairman of the Hydrography Committee in its membership.

The Working Group noted that, since its 1973 Meeting and in response to its request for more information on the subject, there was now more information available on the pollutant content of sewage sludges, but that in connection with the disposal of harbour dredgings similar information was required on the pollutant content of dredged spoil. The Group recognised that, even after the average pollutant content of sewage, sewage sludge and dredged spoil was established, there would still be a need for work on the

problem of mobilization of the pollutant content. In order to make progress on the establishment of average pollutant contents of sewage, sewage sludge and dredged spoil, the Working Group agreed that information on the organochlorine pesticide, PCB, and metal levels should be submitted to ICES for compilation with a view to presentation at the 1974 Statutory Meeting of the Council. The Working Group further agreed that the task of compilation should be assigned to Dr Portmann and established a deadline of 31 May for submission of the data.

The Working Group noted that, in response to its request in 1973, a limited amount of work had been done on the variation of pollutant levels in fish and shellfish with age and condition, and that it tended to confirm that variations did occur. The Group expressed the view that further work of this nature was necessary and suggested that the results of such work should be submitted to ICES with the intention of the Secretariat compiling a review on the subject in due course.

The Working Group then considered the draft of their first Report in some detail. A number of corrections, additions and amendments were made to its various sections, and it was agreed that the Report should, in its final version, be prefaced by a summary of the findings and should conclude with a short section on future work. This latter section was drafted by the Chairman and subsequently approved by the Working Group. The Group noted that in the course of its studies there had been some difficulties over the different problems involved in the analysis of sea water as opposed to the analysis of fish and shellfish, and recommended that in the future these two matters should be considered by separate Ad Hoc Meetings.

The Working Group concluded that the proper vehicle for publication of its Report should be the ICES Cooperative Research Report Series and the Chairman indicated that he and the Rapporteur would do their utmost to ensure that ICES receive a typescript and figures for reproduction by Easter 1974. The Group considered that its work, in terms of preparing a Report on the state of pollution in the North Sea, was largely complete. It was agreed, however, that this did not mean its task was over and it was noted that in future it might even be expected to consider work in a larger area. In this connection a proposal to split the Group into two halves was not favourably received, on the grounds that it would involve unnecessary duplication of effort in several countries. The general opinion expressed was that any extension of the area to be considered should be accompanied by an enlarged membership of the Group and extended terms of reference.

The Working Group briefly considered the proposals made within ICES for a punch card system on pollution data and concluded that the proposed series of five cards had been well designed. Some doubts were, however, expressed as to the desirability of such a system (e.g. in relationship to the possible misuse of raw data), and the view was expressed that a more useful approach would be to establish an inventory of the data currently available and its sources. It was also suggested that, because many institutes were supplying pollution data to other data storage systems, there might be some duplication of effort and that such systems, e.g. national data systems, should be consulted concerning the proposals.

There being no other business the Chairman thanked the members for their efforts and formally closed the Meeting during the evening of 9 January.

A.J. Lee
J.E. Portmann

Annex 1

Agenda

1. Opening of the Meeting by the Chairman.
2. Adoption of the Agenda.
3. Appointment of Rapporteur.
4. Future monitoring of toxic substances in fish and shellfish.
5. Progress by Study Groups on phosphate, nitrate and suspended and organic matter: (a) Southern Bight, (b) Skagerak-Kattegat.
6. Studies of oil pollution.
7. Request to Hydrography Committee concerning flux of pollutants from estuaries, fjords etc.
8. Information on organochlorine pesticide, PCB and metal content of sewage.
9. Variations of levels of pollutants in fish with age and season.
10. Consideration of Report of Working Group.
11. Future of the Group.
12. Any other business.

Annex 2

List of Participants

Mr A.J. Lee (Chairman)	Fisheries Laboratory, Lowestoft, Suffolk, England.
Dr J.E. Portmann	Fisheries Laboratory, Remembrance Avenue, Burnham-on-Crouch, Essex CM0 8HA, England.
Dr U. Harms	Bundesforschungsanstalt für Fischerei/ Isotopenlaboratorium, 2 Hamburg 55, Wüstland 2, Federal Republic of Germany.
Dr D. Schmidt	Deutsches Hydrographisches Institut, 2 Hamburg 55, Wüstland 2, Federal Republic of Germany.
Dr Mrs E. Huschenbeth	Institut für Küsten- und Binnenfischerei, 2 Hamburg 50, Palmaille 9, Federal Republic of Germany.
Mr O. Vagn Olsen	Danish Institute for Fisheries and Marine Research, Charlottenlund Slot, 2920 Charlottenlund, Denmark.
Dr P. Hagel	Netherlands Institute for Fishery Investigations, Postbus 68, Haringkade 1, IJmuiden 1620, Netherlands.
Dr A.D. McIntyre	Marine Laboratory, Victoria Road, Aberdeen AB9 8DB, Scotland.
Prof. Dr I. Elskens	Université Libre de Bruxelles, 105 Buyllaan, 1050 Bruxelles, Belgium.
Dr P. Herman	Instituut voor Scheikundige Onderzoekingen, Molenstraat 5, 1980 Tervuren, Belgium.
Mr P. Le Lourd	CNEXO, avenue d'Iéna, 39, Paris 16e, France.
Mr K.H. Palmork	Institute of Marine Research, P.O. Box 2906, 5011 Bergen, Norway.
Mr G. Berge	Institute of Marine Research, P.O. Box 2906, 5011 Bergen, Norway.
Dr B.I. Dybern	Institute of Marine Research, 453 00 Lysekil, Sweden.

Annex 2 (Ctd)

Dr R. Lange	Avd. Marin Zoologi og Marin Kjemi, P.B. 1064, Blindern, Oslo 3, Norway.
Mr J. Smed	ICES, Charlottenlund Slot, 2920 Charlottenlund, Denmark.
Mr H. Tambs-Lyche	ICES, Charlottenlund Slot, 2920 Charlottenlund, Denmark.

Observer

Mr E.R.J. Giroult	WHO, Regional Health Office for Europe, Scherfigsvej 8, DK 2100, Copenhagen Ø, Denmark.

Annex 3

Recommendation

The Working Group noted that in the past certain difficulties had arisen over the different problems posed in the analysis of sea water as opposed to the analysis of fish and shellfish and accordingly recommends that in future these two topics be considered by separate Ad Hoc Meetings.

Annex 4

Responsibility for Agreed Further Action

All Attendants at Meeting 8 and 9 January 1974

1. To supply before 10 March 1974 to the General Secretary complete details of past, present and planned national monitoring programmes or surveys on the lines already provided to ICES. All programmes for 1974 to be clearly indicated; where changes in the table already prepared are required these should be stated.

2. To supply before 31 May to Dr J. Portmann information on the metal, organochlorine, pesticide and PCB content of sewage, sewage sludge, and harbour dredgings.

3. Information on the variation of pollutant concentrations in fish or shellfish with age, condition, season etc. to be supplied to the General Secretary.

For Individual Attention

4. Mr J. Smed to compile data on North Sea monitoring programmes supplied under heading 1. above for inclusion as Annex 5 of this Report.

5. Mr D. Tromp to convene the Meeting on Southern Bight nutrients as soon as possible and to supply a Report on this Meeting to Dr A. Svansson, the General Secretary, and the Chairman of the North Sea Working Group (Mr A.J. Lee).

6. Dr A. Svansson to convene the Meeting on nutrients in the Kattegat/Skagerak area as soon as possible after receiving the Report from the Meeting mentioned under heading 5. above.

Annex 4 (Ctd)

7. Dr P. Jones to consider with his colleagues on the Sea Water Analysis Group how data from national monitoring programmes and surveys of the pollutant content of sea water should be reported to ICES.

8. The General Secretary to notify Delegates of the proposed oil Meeting to be held in Aberdeen 1974.

9. Dr A.D. McIntyre to prepare a short Report on this oil Meeting for consideration by the Fisheries Improvement Committee at the 1974 Statutory Meeting of the Council.

10. Dr J. Portmann to prepare, on the basis of information supplied under heading 2. above, a Report for consideration at the 1974 Statutory Meeting of the Council.

Annex 5

Past, Present and Planned Environmental Monitoring and Surveys

At the ad hoc meeting in Charlottenlund, 10-12 December 1973 of analysts and biologists the national programmes of monitoring were briefly reviewed to consider how these programmes could be modified to give better and more unified coverage of the coastal zones. It soon became evident, however, that these questions could not be solved during the time available for the meeting. They were therefore left to the meeting of the Working Group for the Study of Pollution of the North Sea.

In order to supply the Working Group with the necessary information the representatives on the ad hoc Group completed forms giving details of their monitoring or survey programmes. This information, as later revised, is presented in the appended tables.

The tables would seem to indicate that there is a good coverage, as far as monitoring of the content of heavy metals in fish, shrimps and mussels are concerned, of the North Sea and the Irish Sea, especially the coastal waters, as well as of the waters of the Norwegian and Swedish coasts of Skagerrak and Kattegat; to a minor degree in the English Channel and in the Norwegian Sea. Also some coastal waters of France and Portugal are monitored.

The content of organochlorine pesticides and PCBs in fish and shellfish is also extensively monitored in most of the waters mentioned above.

With regard to petroleum hydrocarbons they are monitored by Norway, Sweden, Portugal and the United Kingdom, but mainly in water. Apparently it is only the United Kingdom that monitors petroleum hydrocarbons in fish, benthos, plankton and sediment.

Heavy metals and/or organochlorines in seawater are monitored in the coastal waters of Belgium, Netherlands, Fed.Rep.of Germany (German Bight and W.Baltic) and United Kingdom, in the North Sea and in the Irish Sea; furthermore, in the Oslofjord, in Skagerrak and Kattegat, and in Portuguese waters.

Heavy metals in sediment are monitored by Belgium (coastal waters), Fed.Rep.of Germany (German Bight), United Kingdom (coastal waters, North Sea and Irish Sea), Norway (Oslofjord), Sweden (Skagerrak and Kattegat), and Portugal (coastal waters); organochlorines in sediment by Belgium (coastal waters), Norway (Oslofjord), and Portugal (coastal waters).

Jens Smed

Belgium

Years	Parameters	Area	Frequency of Measurem.	Type of Sample	Age/ Length	No./ Amount	Institute	Method	Programme valid in
1971 to 1974 etc.	Biological	South. North Sea		Fish (muscle and liver):			SZV		1974
			all year	Cod	1969 to 1971	>10 individ.			
			" "	Sole	1968 to 1971	>10 individ.			
			" "	Plaice	1963 to 1971	>10 individ.			
			September	Herring	1972	>10 individ.			"
"	Metals (see Note)	"	"	"	"	"	IRC		
"	Pesticides and PCBs	"		"	"	"	CRA		"
1971 to 1974 etc.	Biological	South. North Sea and Belgian coast	twice/year	Cod	1969 to 1971	>10 individ.	SZV		"
			"	Plaice	1968 to 1971	>10 individ.			
			"	Whiting	1969 to 1971	>10 individ.			
			"	Sprat	-	>10 lots			
			"	Shrimps	-	>10 lots			
"	Metals (see Note)	"	"	"	"	"	IRC		"
"	Pesticides and PCBs	"	"	"	"	"	CRA		"
1975	Biological	Iceland	all year	Cod (muscle and liver)	1972	>10 individ.	SZV		
"	Metals (see Note)	"	"	"	"	"	IRC		
"	Pesticides and PCBs	"	"	"	"	"	CRA		

Note. Metals: Hg, tot.org. Hg, Me-Hg, Cd, Cu, Pb, Zn, (Se, Sn ...)

Belgium (cont.)

Years	Parameters	Area	Frequency of Measurem.	Type of Sample	Age/ Length	No./ Amount	Insti-tute	Method	Programme valid in
1971 to 1974 etc.	Biological	Irish Sea		Fish (muscle and liver):					1974
			all year	Sole	1963 to 1969	>10 individ.	SZV		
			" "	Plaice	1964 to 1969	>10 individ.			
"	Metals (see Note)	"	" "	"	"	"	IRC		"
"	Pesticides and PCBs	"	" "	"	"	"	CRA		"
1971 to 1974 etc.	Biological	Bristol Channel		Fish (muscle and liver):					
			" "	Sole	1963 to 1969	>10 individ.	SZV		"
				Plaice	1966 to 1969	>10 individ.			
"	Metals (see Note)	"	" "	"	"	"	IRC		"
"	Pesticides and PCBs	"	" "	"	"	"	CRA		"
1971 to 1974 etc.	Biological	English Channel		Fish (muscle and liver):					
			" "	Sole	1969	>10 individ.	SZV		"
			" "	Plaice	1969	>10 individ.			
"	Metals (see Note)	"	" "	"	"	"	IRC		"
"	Pesticides and PCBs	"	" "	"	"	"	CRA		"

Note. Metals: Hg, tot. org. Hg, Me-Hg, Cd,Cu,Pb,Zn, (Se, Sn ...)

Belgium (cont.) National Programme R-D: Mathematical Model Sea (C.I.P.S.)

Years	Parameters	Area	Frequency of Measurem.	Type of Sample	Age/ Length	No./ Amount	Insti-tute	Method	Programme valid in
1971 to 1975	Metals and others (1)	Belgian coast (sea and inputs)	3 times a year	water		12 (sea) 12 (inputs)	IHE		1974
"	Microbiol.	"	"	"		"	"		"
"	Pesticides and PCBs	"	"	"		"	"		"
"	Metals and others (2)	"	"	sediment and suspended matter		"	IRC		"
"	Pesticides and PCBs	"	"	"		"	IHE, CRA		"
"	Physic. and Mineralog.	"	"	"		"	IRC		"
1971 to 1975	Metals, Nutri-ents and other chem.	South.North Sea, Math. Model area (25 points)	4 times a year and. addit.	water		25 (3 depths) and addit.	VUB U Lg		"
"	Pesticides and PCBs	"	"	"		"	CRA, IHE, VUB		"
"	Microbiol.	"	"	"		"	IHE, VUB		"

(1) Chem/Water: Ca^{++}, Hg^{++}, Na^{+}, K^{+}, Fe, Mn, ..., resistiv., pH
Hg, Cu, Pb, Zn, Cd, Cr, Ni, Co
$SO_4^{=}$, $CO_3^{=}$, CO_3H^{-}, Cl^{-}, Fl^{-}, CN^{-}, O_2, COD, BOD, $S^{=}$, phenols

(2) Chem/Sediment: Ca^{++}, K^{+}, Fe, Mn, ..., Cl^{-}, S_{tot}, org.mat., loss ign. (450-900)
Hg, Cu, Pb, Zn, Cd, Cr, Ni, Co, Be, Sn, ...
Hydrocarbons

Belgium (cont.) National Programme R-D: Mathematical Model Sea (C.I.P.S.)

Years	Parameters	Area	Frequency of Measurem.	Type of Sample	Age/ Length	No./ Amount	Institute	Method	Programme valid in
1971 to 1975	Metals and other chem.	South. North Sea, Math.Mod. area (25 points)	4 times a year and addit.	sediment and suspended matter		25	ULB, IRSN		1974
"	Pesticides and PCBs	"	"	"		"	CRA IHE		Not in 1974
"	Physic. and Mineralog.	"	"	"		"	KUL ERM		"
"	Biology, Prim.Production	"	"	biol.material (Plankton, Chlorophyll, Benthos ...)		25 (and addit.)	ULB VUB KUL RUG		1974
"	Metals and other chem.	"	"	"		"	VUB U Lg		"
"	Metals and other chem.	South. North Sea Estuaries	all year	water		>10	ULB		"
"	"	"	"	sediment and suspended matter		"	ULB		
"	Phys. and Mineralog., others	"	"	"		"	ULB TP		"

Additional Research

Hydrodynamics, Sediment dynamics	U Lg, UCL	1974	
Interaction air/sea	U Lg, IRM	"	
Hydrography	TP	"	
Meteorology	RVA	"	Gen.Coordinator:
Physiology (effects pollutants/fish and others)	ULB, U Lg, RUG	"	Prof. Nihoul (U Lg)
Fixed stations	M. Com	"	
Information	U Lg	"	

Abbreviations

SZV	Stat. Zeevisserij, Oostende
IRC	Institut de Recherches Chimiques (Min.Agri.), Tervuren
CRA	Centre Rech. Agronomiques (Min.Agri.), Stat. Phycopharmacie, Gembloux
IHE	Institut Hygiène et Epidémiologie (Min. S^{té} Publique et Env^{t}), Bruxelles
VUB	Vrije Universiteit, Brussel
U Lg	Université de Liège
ULB	Université Libre de Bruxelles
IRSN	Institut Royal des Sciences Naturelles (Min. Ed. Nat.), Bruxelles
KUL	Katolicke Universiteit, Leuven
ERM	Ecole Royale Militaire, Bruxelles
RUG	Rijks Universiteit, Gent
TP	Ministère Travaux Publics (Sec. Hydrogr.)
IRM	Institut Royal Météorologie
RVA	Région Voies Aériennes
M.Com	Ministère des Communications (Sec. Pilot)

Denmark

Start of Project	Parameters	Area	Frequency of Measurem.	Type of Sample	Age/ Length	No./ Amount	Institute	Method	Remarks
mid-1974	PO_4, tot.P, Si, O_2, NO_2, NO_3, NH_3, tot.N, tritium, primary production	Kattegat 1)	10/year	water		13 stations	DFH 2)		End of project 1978
	Hg, Cd Pb, (Cu)								At a later date
Jan. 1973	Σ DDT, PCB, dieldrin, lindane	Kattegat and North Sea	monthly	Cod		500 g	NFI	Gas chrom.	
	Hg, Cd, Pb, Cu, Zn			Cod liver		"		At. abs.	
				Flounder		"			
				Herring		"			

Note 1) Part of a Baltic Program
2) In cooperation with one Swedish and five Danish institutions

Abbreviations

DFH Danmarks Fiskeri- og Havundersøgelser, Charlottenlund
NFI National Food Institute, Copenhagen

France

Start of Project	Parameters	Area	Frequency of Measurement	Type of Sample	Age/ Length	No./ Amount	Institute	Method	Remarks
1974	Hg,Cd,Pb, Cu,Zn,etc. et pesticides organochlorés, PCB	Atlantique, côtes françaises 1) Île d'Oléron	août et septembre	merlu	toutes classes	10 ind.	ISTPM	Absorption atomique pour les métaux	Les analyses seront effectuées sur chaque individu;
				plie	d'âges "	10 ind.	"		
				sardine (éventuellement coquillages)	"	10 ind.	"	Chromat. en phase gazeuse avec capture d'électrons pour les pesticides et PCB	muscle et foie homogénéisat. de la totalité dans le cas de la sardine
		2)Concarneau Lorient	août et septembre	merlu	"	10 ind.	ISTPM		Dans le cas des coquillages le dosage portera sur environ 50 g de chair homogénéisée.
				plie (ou sole)	"	10 ind.	"		
				sardine	"	10 ind.	"		
				(éventuellement coquillages)	"		"		

Abbreviation

ISTPM Institut Scientifique et Technique des Pêches Maritimes, Nantes

Belgium

Years	Parameters	Area	Frequency of Measurem.	Type of Sample	Age/ Length	No./ Amount	Institute	Method	Programme valid in
1971 to 1974 etc.	Biological	South. North Sea		Fish (muscle and liver):			SZV		1974
			all year	Cod	1969 to 1971	>10 individ.			
			" "	Sole	1968 to 1971	>10 individ.			
			" "	Plaice	1963 to 1971	>10 individ.			
			September	Herring	1972	>10 individ.			"
"	Metals (see Note)	"	"	"	"	"	IRC		
"	Pesticides and PCBs	"		"	"	"	CRA		"
1971 to 1974 etc.	Biological	South. North Sea and Belgian coast	twice/year	Cod	1969 to 1971	>10 individ.	SZV		"
			"	Plaice	1968 to 1971	>10 individ.			
			"	Whiting	1969 to 1971	>10 individ.			
			"	Sprat	-	>10 lots			
			"	Shrimps	-	>10 lots			
"	Metals (see Note)	"	"	"	"	"	IRC		"
"	Pesticides and PCBs	"	"	"	"	"	CRA		"
1975	Biological	Iceland	all year	Cod (muscle and liver)	1972	>10 individ.	SZV		
"	Metals (see Note)	"	"	"	"	"	IRC		
"	Pesticides and PCBs	"	"	"	"	"	CRA		

Note. Metals: Hg, tot.org. Hg, Me-Hg, Cd, Cu, Pb, Zn, (Se, Sn ...)

Belgium (cont.)

Years	Parameters	Area	Frequency of Measurem.	Type of Sample	Age/ Length	No./ Amount	Insti-tute	Method	Programme valid in
1971 to 1974 etc.	Biological	Irish Sea		Fish (muscle and liver):					1974
			all year	Sole	1963 to 1969	>10 individ.	SZV		
			" "	Plaice	1964 to 1969	>10 individ.			
"	Metals (see Note)	"	" "	"	"	"	IRC		"
"	Pesticides and PCBs	"	" "	"	"	"	CRA		"
1971 to 1974 etc.	Biological	Bristol Channel		Fish (muscle and liver):					
			" "	Sole	1963 to 1969	>10 individ.	SZV		"
				Plaice	1966 to 1969	>10 individ.			
"	Metals (see Note)	"	" "	"	"	"	IRC		"
"	Pesticides and PCBs	"	" "	"	"	"	CRA		"
1971 to 1974 etc.	Biological	English Channel		Fish (muscle and liver):					
			" "	Sole	1969	>10 individ.	SZV		"
			" "	Plaice	1969	>10 individ.			
"	Metals (see Note)	"	" "	"	"	"	IRC		"
"	Pesticides and PCBs	"	" "	"	"	"	CRA		"

Note. Metals: Hg, tot. org. Hg, Me-Hg, Cd,Cu,Pb,Zn, (Se, Sn ...)

Belgium (cont.) National Programme R-D: Mathematical Model Sea (C.I.P.S.)

Years	Parameters	Area	Frequency of Measurem.	Type of Sample	Age/ Length	No./ Amount	Insti-tute	Method	Programme valid in
1971 to 1975	Metals and others (1)	Belgian coast (sea and inputs)	3 times a year	water		12 (sea) 12 (inputs)	IHE		1974
"	Microbiol.	"	"	"		"	"		"
"	Pesticides and PCBs	"	"	"		"	"		"
"	Metals and others (2)	"	"	sediment and suspended matter		"	IRC		"
"	Pesticides and PCBs	"	"	"		"	IHE, CRA		"
"	Physic. and Mineralog.	"	"	"		"	IRC		"
1971 to 1975	Metals, Nutri-ents and other chem.	South.North Sea, Math. Model area (25 points)	4 times a year and. addit.	water		25 (3 depths) and addit.	VUB U Lg		"
"	Pesticides and PCBs	"	"	"		"	CRA, IHE, VUB		"
"	Microbiol.	"	"	"		"	IHE, VUB		"

(1) Chem/Water: Ca^{++}, Hg^{++}, Na^{+}, K^{+}, Fe, Mn, ..., resistiv., pH
Hg, Cu, Pb, Zn, Cd, Cr, Ni, Co
$SO_4^{=}$, $CO_3^{=}$, CO_3H^{-}, Cl^{-}, Fl^{-}, CN^{-}, O_2, COD, BOD, $S^{=}$, phenols

(2) Chem/Sediment: Ca^{++}, K^{+}, Fe, Mn, ..., Cl^{-}, S_{tot}, org.mat., loss ign. (450-900)
Hg, Cu, Pb, Zn, Cd, Cr, Ni, Co, Be, Sn, ...
Hydrocarbons

Belgium (cont.) National Programme R-D: Mathematical Model Sea (C.I.P.S.)

Years	Parameters	Area	Frequency of Measurem.	Type of Sample	Age/ Length	No./ Amount	Institute	Method	Programme valid in
1971 to 1975	Metals and other chem.	South. North Sea, Math.Mod. area (25 points)	4 times a year and addit.	sediment and suspended matter		25	ULB, IRSN		1974
"	Pesticides and PCBs	"	"	"		"	CRA IHE		Not in 1974
"	Physic. and Mineralog.	"	"	"		"	KUL ERM		"
"	Biology, Prim.Production	"	"	biol.material (Plankton, Chlorophyll, Benthos ...)		25 (and addit.)	ULB VUB KUL RUG		1974
"	Metals and other chem.	"	"	"		"	VUB U Lg		"
"	Metals and other chem.	South. North Sea Estuaries	all year	water		>10	ULB		"
"	"	"	"	sediment and suspended matter		"	ULB		
"	Phys. and Mineralog., others	"	"	"		"	ULB TP		"

Additional Research

Hydrodynamics, Sediment dynamics	U Lg, UCL	1974	
Interaction air/sea	U Lg, IRM	"	
Hydrography	TP	"	
Meteorology	RVA	"	Gen.Coordinator:
Physiology (effects pollutants/fish and others)	ULB, U Lg, RUG	"	Prof. Nihoul (U Lg)
Fixed stations	M. Com	"	
Information	U Lg	"	

Abbreviations

SZV	Stat. Zeevisserij, Oostende
IRC	Institut de Recherches Chimiques (Min.Agri.), Tervuren
CRA	Centre Rech. Agronomiques (Min.Agri.), Stat. Phycopharmacie, Gembloux
IHE	Institut Hygiène et Epidémiologie (Min. S^{té} Publique et Env^{t}), Bruxelles
VUB	Vrije Universiteit, Brussel
U Lg	Université de Liège
ULB	Université Libre de Bruxelles
IRSN	Institut Royal des Sciences Naturelles (Min. Ed. Nat.), Bruxelles
KUL	Katolicke Universiteit, Leuven
ERM	Ecole Royale Militaire, Bruxelles
RUG	Rijks Universiteit, Gent
TP	Ministère Travaux Publics (Sec. Hydrogr.)
IRM	Institut Royal Météorologie
RVA	Région Voies Aériennes
M.Com	Ministère des Communications (Sec. Pilot)

Denmark

Start of Project	Parameters	Area	Frequency of Measurem.	Type of Sample	Age/ Length	No./ Amount	Institute	Method	Remarks
mid-1974	PO_4, tot.P, Si, O_2, NO_2, NO_3, NH_3, tot.N, tritium, primary production	Kattegat 1)	10/year	water		13 stations	DFH 2)		End of project 1978
	Hg, Cd Pb, (Cu)								At a later date
Jan. 1973	Σ DDT, PCB, dieldrin, lindane	Kattegat and North Sea	monthly	Cod		500 g	NFI	Gas chrom.	
	Hg, Cd, Pb, Cu, Zn			Cod liver		"		At. abs.	
				Flounder		"			
				Herring		"			

Note 1) Part of a Baltic Program
2) In cooperation with one Swedish and five Danish institutions

Abbreviations

DFH Danmarks Fiskeri- og Havundersøgelser, Charlottenlund
NFI National Food Institute, Copenhagen

France

Start of Project	Parameters	Area	Frequency of Measurement	Type of Sample	Age/ Length	No./ Amount	Institute	Method	Remarks
1974	Hg,Cd,Pb, Cu,Zn,etc. et pesticides organochlorés, PCB	Atlantique, côtes françaises 1) Île d'Oléron	août et septembre	merlu	toutes classes	10 ind.	ISTPM	Absorption atomique pour les métaux	Les analyses seront effectuées sur chaque individu;
				plie	d'âges "	10 ind.	"		
				sardine (éventuellement coquillages)	"	10 ind.	"	Chromat. en phase gazeuse avec capture d'électrons pour les pesticides et PCB	muscle et foie homogénéisat. de la totalité dans le cas de la sardine
		2)Concarneau Lorient	août et septembre	merlu	"	10 ind.	ISTPM		Dans le cas des coquillages le dosage portera sur environ 50 g de chair homogénéisée.
				plie (ou sole)	"	10 ind.	"		
				sardine	"	10 ind.	"		
				(éventuellement coquillages)	"		"		

Abbreviation

ISTPM Institut Scientifique et Technique des Pêches Maritimes, Nantes

Germany, Fed.Rep.of

Start of Project	Parameters	Area	Frequency of Measurem.	Type of Sample	Age/ Length	No./ Amount	Institute	Method	Years	Remarks
1970	Oxides and Hydroxides of Fe	German Bight (TiO_2 waste area)	1/year	Sediments		120 sts. each year 2 or 3 samples per st.	DHI	AAS, Spectro-photometry	1970 1971 1972 1974	Dr. M. Nauke
1972	Heavy metals (Fe,Mn,Zn,Co, Ni,Cr,Cu,Cd) Organic matter	Estuaries of Eider Elbe Jade Weser	once	Suspended matter		13 sts. 33 samples	DHI	AAS	to be con-tin-ued 1974	"
1973	Heavy metals (Fe,Mn,Zn,Co, Ni,Cr,Cu,Cd) Organic matter	Sewage sludge dumping area near Light Vessel Elbe 1	1/year	Sediments		18 sts. 43 samples	DHI	AAS	to be con-tin-ued 1974	"
1970	Heavy metals (Fe,Mn,Zn,Co, Ni,Cr,Cu,Cd, Pb) Organic matter	River Elbe from Hamburg to Cuxhaven	1/year	Suspended matter		4 sts./year 100 samples/ year	DHI	AAS	1970-1973 to be con-tin-ued 1974	"

Germany, Fed.Rep.of

Start of Project	Parameters	Area	Frequency of Measurem.	Type of Sample	Age/ Length	No./ Amount	Institute	Method	Years	Remarks
1970	Oxides and Hydroxides of Fe	German Bight (TiO_2 waste area)	1/year	Sediments		120 sts. each year 2 or 3 samples per st.	DHI	AAS, Spectro-photometry	1970 1971 1972 1974	Dr. M. Nauke
1972	Heavy metals (Fe,Mn,Zn,Co, Ni,Cr,Cu,Cd) Organic matter	Estuaries of Eider Elbe Jade Weser	once	Suspended matter		13 sts. 33 samples	DHI	AAS	to be con-tin-ued 1974	"
1973	Heavy metals (Fe,Mn,Zn,Co, Ni,Cr,Cu,Cd) Organic matter	Sewage sludge dumping area near Light Vessel Elbe 1	1/year	Sediments		18 sts. 43 samples	DHI	AAS	to be con-tin-ued 1974	"
1970	Heavy metals (Fe,Mn,Zn,Co, Ni,Cr,Cu,Cd, Pb) Organic matter	River Elbe from Hamburg to Cuxhaven	1/year	Suspended matter		4 sts./year 100 samples/ year	DHI	AAS	1970-1973 to be con-tin-ued 1974	"

Germany, Fed.Rep.of (cont.)

Start of Project	Parameters	Area	Frequency of Measurement	Type of Sample	Age/ Length	No./ Amount	Institute	Method	Remarks
1973 1974 (1974)	Trace metals Cd,Cu Fe,Ni,Co,Mn,.. Cd,Zn,Pb,Cu	S.E.North Sea (German Bight) and W.Baltic	1/year	Seawater		16..20 sts., 4..6 depths per station 2 l.sample (1973) 0.5 l.sample (1974)	DHI	AAS flameless (graphite furnace) Inverse voltammetry (1974 ..)	Dr.D.Schmidt "
1972	As(V)	Inner German Bight and W.Baltic	once (Survey)	Seawater		North Sea: 16 stations 4..6 depths per station 2 l.samples Baltic: 13 stations 16..20 sts., surface water samples ≃ 10 l.each	DHI	Colorimetric analysis	"
1975	Pesticides PCBs	German Bight and W.Baltic	1/year	Seawater				Gas chrom. (ECD)	Dr.D.Stadler
May 1973	Heavy metals (Mn,Fe,Co,Ni, Cu,Zn,Cd,Hg, Pb)	1)German Bight (S.E. North Sea) 2)Estuary of river Elbe	twice per year	Fish (Cod,plaice) muscle	4-6 years old	5-10 individually	BfF(I)	Standard AAS (acethylene-air flame);flameless AAS (graphite furnace);cold vapour technique for Hg; X-Ray fluorescence analysis (Mn,Fe,Co,Ni,Cu, Zn).	Dr.U.Harms

Germany, Fed.Rep.of (cont.)

Start of Project	Parameters	Area	Frequency of Measurement	Type of Sample	Age/ Length	No./ Amount	Institute	Method	Remarks
1972 1973 1974	PCBs, Pesticides	North Sea	1/year	Fish Shrimp Mussel	Plaice 4 years Mussels 55-65mm	10 (homogen.)	IfKuBF		Dr. E. Huschenbeth
1971 1972	Σ DDT, PCB "	English Channel, North Sea (2 sts.)	1/year	Benth. and pelagic mollusc. and fish	various	poolgroups	IfMf	Gas.chrom.	

Abbreviations

DHI	Deutsches Hydrographisches Institut
BfF	Bundesforschungsanstalt für Fischerei
BfF(I)	Bundesforschungsanstalt für Fischerei, Isotopenlaboratorium
IfKuBF	Institut für Küsten- und Binnenfischerei der BfF
IfMf	Institut für Meeresforschung Bremerhaven

Ireland

Start of Project	Parameters	Area	Frequency of Measurement	Type of Sample	Age/ Length	No./ Amount	Insti-tute	Method	Remarks
1969 and 1970	Residual pesticides	Wexford to Cork	Monthly	Mytilus edulis	Various	ca.10	FD+FT	Gas chrom.	
1969 to 1973	Hydrocarbons	Various	Irregular			ca.8	FD+IIRS	"	Toxicity tests also
1971 to 1973	Tot.Hg,Zn, Pb,Cd	R. Boyne to R. Shannon	Monthly	Mytilus ed. Cardium ed. Patella vul.	Various	ca.12 to 28	FD+ IIRS+ SL	At.abs. Gas chrom.	

Abbreviations

FD Fisheries Division, Dept. Agriculture and Fisheries
FT Agriculture Institute
IIRS Institute of Industrial Research and Standards
SL State Laboratory

Netherlands

Start of Project	Parameters	Area	Frequency of Measurem.	Type of Sample	Age/ Length	No./ Amount	Institute	Method	Remarks
Oct 1971	Heavy metals (Hg,Cd,Pb,Cu, Zn,As,Cr, and others)	Texel	4/year	Sole	Average market sample	10 kg	RIVO		
		Rhine-mouth				10 kg			
		W.Scheldt estuary				10 kg			
	PCBs and Organo-chlorine pesticides	Ems estuary		Shrimp		15 kg	RZS	AA NA FAA GLC/EC	
	Radioactive fall-out and Nuclear Power Plant corrosion products (as far as they are likely to be accumulated in the edible portion of fish and shellfish)	Western Wadden Sea		Shrimp		15 kg		Radio-activity measure-ment sy-stems	
		W.Scheldt estuary		Shrimp		15 kg	ITAL		
		Western Wadden Sea		Mussel		20 kg	IVP-TNO		
		E.Scheldt estuary		Mussel		20 kg			
		E.Scheldt estuary		Oyster		100			

Netherlands (cont.)

Start of Project	Parameters	Area	Frequency of Measurem.	Type of Sample	Age/ Length	No./ Amount	Institute	Method	Remarks
Jan 1972	Heavy metals (Hg,Cd,Pb,Cu, Zn,Ni,As,Cr, and others) Organo-chlorine compounds A number of "normal" hydrographic parameters (chlorinity,temp., etc.) Nutrients (PO_4,NO_3, NH_3,NO_2, Kjeldahl-N, Total-P) Phytoplankton (diversity)	6 lines (between the Belgium border and Den Helder, 30 km into the North Sea,6 stats. per line)	9/year	Water (filtered and non-filtered)		1 liter bottles (3 at every station)	RIZA RID RIV RIVO	AA FAA GLC/EC Technicon auto-analyser Phyto-plankton counting apparatus	Coordinated by: Directie Noordzee van de Rijkswaterstaat, Sir Winston Churchill Laan 362 Rijswijk (Z.H.)

Abbreviations

ITAL: ITAL, Keyenkagseweg 6, Wageningen
IVP-TNO: IVP-TNO, Dokweg, IJmuiden
RID: RID, Parkweg 13, Den Haag
RIV: RIV, Bilthoven
RIVO: Rijksinstituut voor Visserijonderzoek, IJmuiden
RIZA: RIZA, Westeinde 3A, Voorbing (Z.H.)
RZS: Rijkszuivelstation, Vreewijkstraat 12b, Leiden

Norway

Start of Project	Parameters	Area	Frequency of Measurem.	Type of Sample	Age/ Length	No./ Amount	Institute	Method	Remarks
Sep 1971	Hydrocarbons	Bergen-Shetland	monthly	Seawater	-	36	IMR	GLC	Qualitatively only
Jun 1972	Hydrocarbons	Ekofisk	once a year	Seawater	-	24	IMR	GLC	"
1960	Zooplankton species and biomass	6 fixed stations along the coast	monthly	Zooplankton		72	IMR	Volume displacement + short cut method	
Apr 1968	Prod.indices, fish larvae	Møre-Lofoten	yearly survey	Primary production Chlorophyll Fish larvae and eggs	-	Multiple samples	IMR	C^{14} Chloroph. Clarke-Bumpus	IBP Project
Jun 1973	Heavy metals: Pb,Cd.Cu,Zn, Fe,Hg	Oslofjord	monthly	Flounder (muscle, liver, gonad,heart, skin,stomach content), Seawater and sediment	All age groups	Individuals 50 from 7 diff.loc.	IMBL	AAS ASV	WHO
1970	Heavy metals: Hg (Cd,Cu,Zn, Pb)	Norwegian coastal waters	regularly	Commercial fish, shellfish and fish products	Available groups	200-500	IMR	AAS	Fish quality control

Abbreviations

IMR Institute of Marine Research, Bergen
IMBL Institute of Marine Biology and Limonology, University of Oslo

Portugal

Start of Project	Parameters	Area	Frequency of Measurem.	Type of Sample	Age/ Length	No./ Amount	Institute	Method	Remarks
1971	Metals (Pb, Hg, Cd, Zn, Cu, Cr)	Tagus River, Lisbon	4 times a year: 50 stats.	water		20 litres	CNA	At.abs.	
"	Hg	"	routine	fish			IPCB	At.abs.	
"	Pesticides and PCBs	"		sediments water oysters			LFF	Gas chrom. (ECD)	
"	Chlorophyll a	"	4 times a year: 50 stats.	phyto-plankton		4 litres	IH	Fluorometry, Spectrophotometry	
"	Primary Production	"	see Remark	"		100 ml	IH	Liquid scintillation counting	only in 1974
"	Particulate Org. Carbon	"	4 times a year: 50 stats.	water		1 litre	CNA	Leco Carbon -analyser	
"	Chem. (O_2, PO_4, NO_3, NO_2, pH, salinity)	"	"	water		1 ml (for nutrients) 300 ml (for O_2)	IH	Auto-analysers etc.	
"	Bacteriolog. (total, Coliformes and E.coli)	"		water and sediments		500 ml	IRJ		

Portugal (cont.)

Start of Project	Parameters	Area	Frequency of Measurem.	Type of Sample	Age/ Length	No./ Amount	Institute	Method	Remarks
1973	Hydrocarbons	Tagus River, Lisbon	2 times a year: 50 stats.	water		2 litres	IH	IR Spectrophotometry	
1965	Metals (Cu, Fe)	Sado River and S.coast of Portugal	4 times a year	shellfish (oysters)	8-10 cm	10	IBM	Spectrophotometry	
April 1973	see Remarks	Sines	routine	see Remarks		see Remarks	GAS	see Remarks	Program as described for Tagus River except Hydrocarbons
1972	As in Remarks + food chain studies	Flores Island Azores	at least 2 times a year	see Remarks		see Remarks	CNA	As in Remarks + aquarium system	Program as described for Tagus River Local laboratory completed by August 1974
1973	Hydrocarbons	"	"	water		2 litres	IH	IR Spectrophotometry	

Abbreviations

CNA Comissad Nacional Ambiente
IPCP Instituto Portugués Conservas de Peixe
LFF Laboratorio Fitofarmacologia
IH Instituto Hidrografico
IRJ Instituto Ricardo Jorge
IBM Instituto de Biologia Maritima
GAS Gabinete da Area de Sines

Sweden

Start of Project	Parameters	Area	Freq. of Meas.	Type of Sample	Age/ Length	No./ Amount	Institute	Method	Remarks
1970	Tot.Hg, Zn,Cu,Cr, Pb,Cd DDT + deriv., PCB	Göteborg Archipelago	Irreg.	Cod, Herring, Flounder } muscle; Cod liver	Various	About 10 of each species	FB + EPB	At. abs. Gas chrom.	
1971	Tot.Hg,Zn,Cu,Cr, Pb,Cd DDT + deriv., PCB	Kattegat and Skagerrak,4 localities	Irreg.	Cod, Herring, Plaice } muscle; Cod liver	Various	"	"	"	
1972	Tot.Hg,Zn,Cu,Cr, Pb,Cd DDT+deriv.,PCB	From Norw. border to South of Göteborg	once	Mytilus edulis	45-50 mm 50-55 mm 55-60 mm	25 in each sample (less in somecases)	"	"	
ca. 1966	Hg (tot.and methyl), Zn,Cd,Pb	Øresund, Göteborg Archipelago	Irreg. (As a rule 1-2 times a year)	Salmonid fishes	As a rule 2 year olds	About 10 fishes	EPB	"	Mainly cage experim. Some metals occasion. only. Samples of water and sediment invest. parallel to the fish invest. (same parameters).
ca. 1970	Methyl-Hg	Several places along the Swedish west coast	2-4 times a year	Pike	Fish of about 1 kg	5/locality	FB + EPB and others	Gas chrom.	Part of an invest. carried out in the Baltic and in fresh waters, too.
ca. 1971	Certain metals	Øresund Kattegat	1-2 times a year	Algae	-	Several localities	MBI, Univ. of Lund	At. abs.	Often water samples are invest. parallel to the invest. of algae (same metals).

Sweden (cont.)

Start of Project	Parameters	Area	Frequency of Measurement	Type of Sample	Age/ Length	No./ Amount	Institute	Method	Remarks
1971	PO_4-P Total P NO_3-N NO_2-N NH_4-N	Kattegat	2 times per year	Water		about 200	FB	Spectro-photo-meter	Together with ordinary hydro-graphy, includ-ing oxygen
1971	Mineral oil (non-polar hydrocarbons)	Kattegat	2 times per year	Water		20-25	"	IR Spectro-photo-meter	"
1970	Hg,Cd,Pb, Cu etc.	Kattegat, Skagerrak and Archipelago	Occasio-nally	Sediments		about 200	IMG	At.abs.	
1960	PO_4-P Total P NO_3-N NO_2-N NH_4-N	Skagerrak and Archipelago	4-6 times per year	Water		about 250	FB	Spectro-photo-meter	Together with ordinary hydro-graphy, includ-ing oxygen
1971	Mineral oil (non -polar hydrocarbons)	Skagerrak and Archipelago	"	Water		25-30	"	IR Spectro-photo-meter	"

Abbreviations

FB Fishery Board
EPB Environment Protection Board
MBI Marine Botanical Institute, Univ.of Lund
IMG Institute of Marine Geology, Univ.of Göteborg

United Kingdom

Start of Project	Parameters	Area	Frequency of Measurem.	Type of Sample	Age/ Length	No./ Amount	Insti-tute	Method	Remarks
1972	Petroleum derived hydro-carbons	7 Areas Scotland 6 Areas England	to be re-peated at approx.2 years in-tervals	Surface film, Sub-surface water, Sediment, Plankton, Benthos, Fish	-	Generally of each item per site Benthos/ Fish as available	MAFF/ DAFS	Gas chrom. with FID detection	
1973	"	In vicinity of N.Sea Oil Wells	As neces-sary	As above + more fish	-	-	MAFF/ DAFS	"	Intended as Base-line. Repeat de-pends on results of this, level of oil exploitation and results of research programs
1971	Hg,Cu,Cd, Pb,Zn	Scottish waters	Irregular	Misc.commercial fish and shell-fish (edible tissue), and individual organs	Commercial catch	10 Fish 10-100 Shellfish	DAFS	At.abs.	Number depends on size of animal
1973	Cd	Scottish waters	Irregular	Edible Crab and Crabmeats	Commercial size	5-10	"	At.abs.	
1973 (Mar-Dec)	Hg,Cu,Cd, Zn,Pb	North Sea and Firth of Clyde	Monthly	Saithe Homog.of muscle, liver, kidney	30-40 cms 50-60 cms	10 10	"	At.abs.	

United Kingdom (cont.)

Start of Project	Parameters	Area	Frequency of Measurem.	Type of Sample	Age/ Length	No./ Amount	Institute	Method	Remarks
1973	Nutrients, Susp. solids BOD, DO, Trace metals Chloro-phyll, O/C's, PCBs	Firth of Forth	Yearly	Water, Zooplankton, Sediment organisms	-	-	DAFS	1)	Information from these surveys will be used for budget studies
1974	Trace metals, O/C's, PCBs	Firth of Forth Shetland	Monthly	Rainwater	-	-	DAFS	1)	To be used to estimate inputs to the sea from the atmosphere

1) Trace metals in water by A.S.V.,
in tissue and sediment by At.abs.

United Kingdom (cont.)

Start of Project	Parameters	Area	Frequency of Measurem.	Type of Sample	Age/ Length	No./ Amount	Insti-tute	Method	Remarks
1971	Hg,Cd,Cu, Zn,Pb,Cr	England and Wales Coast	Twice year	Cod,Plaice) Herring)muscle Mackerel)	Specified size each species	10 Fish	MAFF	At. abs.	Fish analysed individually, Larger Shellfish also individually, Samples taken from "Hotspot" Areas
1971	Hg,Cd,Cu, Zn,Pb,Cr	"	Irreg.	Misc.commercial fish and shell-fish: Edible portions		10 Fish	MAFF	"	
1972	Hg,Cd,Cu, Zn,Pb,Cr	Thames/ Wash	Monthly	Shrimp: Whole animal	Commercial catch	100 Animals	MAFF	"	
1971	Hg,Pb,Cd	Thames, Mersey, Bristol Channel	Irreg.	Fish and Shellfish: Edible portions	Commercial catch	10 Fish 50-100 Shellfish	MAFF	"	
1968	O/Cs,PCBs	14 areas England, Wales, Scotland	Twice year	Cod,Whiting, Mackerel,Herring and Plaice: muscle and liver homogenates	Specified size ranges	10 Fish	MAFF/ DAFS	Gas chrom. E/C Detect.	Changed in 1972, see below
1972	O/Cs,PCBs	14 Areas England, Wales, Scotland	Twice year	Cod,Herring, Plaice: muscle and liver homo-genates	"	10 Fish	MAFF/ DAFS	"	Scotland also analyses Haddock, MAFF Mackerel

United Kingdom (cont.)

Start of Project	Parameters	Area	Frequency of Measurem.	Type of Sample	Age/ Length	No./ Amount	Institute	Method	Remarks
1970	O/Cs,PCBs	Thames/ Wash	Monthly	Shrimp homogenate Whole animals	Commercial catch	100 Animals	MAFF	Gas chrom. E/C Detect.	
1971	O/Cs,PCBs	Iceland/ Barents Sea N.Norway/ Greenland	Irreg.	Cod,Plaice and other commercial species: Muscle Homogenate. Liver as available. Individually	"	10 Fish	MAFF	Gas chrom. E/C Detect.	
1971	Hg,Cd,Pb, Cr,Cu,Zn	Iceland/ Barents Sea N.Norway/ Greenland	"	Cod,Plaice and other commercial species: Muscle. Individually	"	10 Fish	MAFF	At.abs.	
1974	Relevant pollutants includes O/Cs,PCBs, Hg,Cd,Pb, Cr,Cu,Zn as appropriate	Coastal dumping areas around England and Wales	Approx. 1-2 times per year according to site	Fish and various benthic animals	Catch from research vessels by grab,dredge and trawl	As available	MAFF	Gas chrom. E/C Detect. At.abs.	Other analytical tools used as appropriate.Nature of sediment as examined
1969	Zn,Fe,Mn, Cu,Ni,Pb, Cd,Ag	Coast sites around England, Wales and Scotland and East coast Inland	As necessary	Sea weed and limpets	Shoreline sampling		MAFF	At.abs.	

United Kingdom (cont.)

Start of Project	Parameters	Area	Frequency of Measurem.	Type of Sample	Age/ Length	No./ Amount	Institute	Method	Remarks
1969	Zn,Fe,Mn, Cu,Ni,Pb, Cd,Co	British coastal waters North Sea and Irish Sea	1/year	Sea water and sediments	Sampling by research vessels		MAFF	At.abs. pulse polarography Mass Spect. for sediments	

Abbreviations

MAFF Ministry of Agriculture, Fisheries and Food
DAFS Department of Agriculture and Fisheries for Scotland

Annex 6

Report on the Ad Hoc Meeting of Analysts and Biologists at Charlottenlund 10-12 December 1973

The meeting was attended by representatives from a number of European Countries and included one representative from Canada (Annex I). The meeting was chaired by Dr J E Portmann who formally welcomed the representatives on behalf of ICES.

Following the formal adoption of the Agenda (Annex II), Dr Topping was then proposed and accepted as Rapporteur for the meeting. The Chairman opened the business proceedings by reviewing the terms of reference of the group (Annex III) and reminded the meeting that a report on the proceedings together with any recommendations would be required by the main Working Party by 8 January 1974.

The Chairman then asked for Comments on item 5 of the agenda. A number of points were raised on this subject which led to suggestions for insertions in the text and a further addition in the form of a discussion paragraph at the end of the report. In order not to spend too much time on minor details and corrections the Chairman suggested that all changes and additions of a minor nature should be sent to him after the meeting. This proposal was accepted and representatives agreed that any points they wished to raise on this Subject would be sent to the Chairman so as to arrive not later than 15 January 1974.

Dr Topping was then asked to make a brief report on the progress of 1973 Intercalibration exercise. He informed the group that all ICES analysts involved in the original intercalibration should now have received both the fish flour reference sample and the standard solution from the trace metal part of this programme. Additional samples had been sent to both Professor Grasshoff for circulation to other analysts involved in the Baltic Study and to a number of people within the UK. So far he had received the results from two laboratories, one in Germany and one in Belgium. He had been advised by Dr Portmann that the fish oil and 'spiked' standards for the organochlorine exercise would not be circulated for some time owing to a delay created by the late shipment of the original fish oil sample from Australia and New Zealand to the DAFS laboratory at Pitlochry, Scotland and subsequently of the discovery of the non-homogenity of the material.

The Chairman then opened the discussion on item 7 by summarising the background to the need for ICES to conduct a Baseline Survey in the NEAFC area. He invited Dr Berge as Chairman of drafting committee of the Oslo Group to comment on the work of this group to date. Dr Berge began by outlining the

terms of reference of this group and after explaining a little of the group's work to date finished by listing the recommendations made by the group on the subject of monitoring in the Oslo Convention area.

Dr Tambs-Lyche (General Secretary) also informed the members that IOC as well as the Oslo Group, had recognised that ICES should be the group to co-ordinate monitoring programmes in NEAFC area. The Chairman thanked both for their comments, which had served to endorse the view that a further Baseline study would be required which would extend the 1972 North Sea Baseline Survey to the NEAFC area. He called upon the meeting for suggestions on the type of programme they felt should be carried out during 1974 in this area *.

It was evident from the discussion on this subject that people had mixed views on the type of programme to be operated and these were influenced by the following factors :-

(a) Their committments to existing and planned National monitoring programmes

(b) A desire by some representatives to obtain information leading to maximum understanding of both possible public health problems and effects on marine life

(c) A desire to anticipate future monitoring requirements by selecting a species which they hoped would reflect changes in the marine environment

(d) A desire to include marine animals from several trophic levels and finally, and most important

(e) Analytical capacity of each country which effectively created a limit to the number of samples to be analysed and therefore overall average of species and areas.

Eventually an agreement was reached based on the following proposal :-

that COD (or HAKE where Cod was not available, ie in the south) should be sampled from a number of positions in the NEAFC area and that sampling should be divided up between all countries present in an attempt to get full coverage of one species in all areas and that additional species (hake, sole, plaice, flounder, pilchard, capelin) would be sampled in a few of these areas by some of the laboratories to provide overlap coverage and to assess levels in the

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* Footnote - Following discussion of the proposals for a NEAFC area Baseline Survey at the second meeting of the Advisory Committee on Marine Pollution it was agreed that only the Council could authorise a survey such as that proposed since it would pose some strain on national resources. This means the survey will not now take place until 1975 and the details in Annex VI will have to be modified.

pelagic and bottom feeding fish. It was recognised that this was a compromise which was by no means ideal but that the analytical capability and other circumstances required this survey to be conducted in a limited manner. It was agreed that, as for the North Sea Baseline, the first priority should be given to human health considerations. It was noted that certain fish livers are eaten by man and that fish liver may show signs of damage due to the metals they concentrate as detoxifying organs. For these two reasons it was agreed that fish livers should be analysed as well as fish muscle. Following the acceptance of these proposals the meeting then proceeded to draw up details of the sampling areas, size of samples, year class, etc. These details are given in Annex IV, V, VI of this report. The meeting noted that there was a weakness in the coverage afforded to areas south of 49° 30' and welcomed the contribution of Portugal in this matter and expressed the hope that France and Spain could be encouraged to fill the gaps in the programme in this area. Although it was agreed that priority should be afforded to coastal areas the list of samples given in Annexes IV and V are a minimum requirement and each country is free to add additional samples. During the discussion on measurements of individual parameters Dr Jensen had informed the group that the O/C programme could benefit by the inclusion of poly-chlorinated terphenyls. He also informed the group that standards synthesised by his laboratory for individual PCB component analysis were freely available for use by others in the group. It was agreed that those members who wished to take advantage of this offer should get in touch with Dr Jensen personally to obtain these standards and for details of any other points raised by Dr Jensen on the subject of analytical techniques.

Under item 8 of the agenda the Chairman then asked Dr Levy, Canadian representative, to give a brief account of the proposed Canadian work in the N Atlantic Ocean and how this might be linked with the NEAFC programme. Details of these proposals are given in Annex VII of this report. At the end of his interesting summary Dr Levy entered a plea for assistance from the Scientists present, especially the biologists, for support for his programme which he felt sure could benefit from the expertise of other scientists outside Canada. Dr Tambs-Lyche advised him that maximum publcity for this programme would best be obtained by circulating details of these proposals among ICES members.

Under items 9 and 10 the Chairman then asked each country to give a brief summary of their National monitoring programmes for heavy metals, organochlorine pesticides and PCBs, oil and other pollutants so that the meeting

could discuss ways in which they could be modified to give better and more unified coverage of coastal areas. It rapidly became apparent from the resulting discussion that this task would pose too many problems for the meeting to be able to reach firm conclusions in the time available and that in most cases changes in National Programmes for 1974 were unlikely to be made. It was therefore felt that the task of suggesting any future amendments could best be left to the Main Working Group provided that they had the necessary information before them in reasonably comparable tabular form. After further discussion the Rapporteur drew up a list of headings for columns of tables which the meeting felt adequately reflected all necessary information required by the Main Group. It was proposed that all representatives complete forms giving details of their monitoring or Survey programmes for fish and shellfish for collection by the ICES Hydrographer so that it would be available for the meeting of the Main Group.

Following a brief summary of the proposed punch card data storage system by J Smed, the last item in the agenda was then put before the group for discussion. Although considerable interest was expressed by the Group they felt that they would like time to ponder on the report before going into a detailed discussion. It was therefore agreed that those present should send comments to J Smed after consideration of the proposals and discussions with colleagues. There being no other business under item 12 of the agenda the Chairman thanked everybody for attending and formally closed the Meeting on the evening of 12 December.

G Topping
J E Portmann

Annex I

List of Participants

Dr J Portmann (Chemist) Chairman	Fisheries Laboratory, Remembrance Avenue, Burnham-on-Crouch, Essex,England
Dr T Andersen (Biologist)	Institutt for Marinbiologi og Limnologi, Avd. Marin Zoologi eg Marin Kjemi, Postbox 1064, Blindern, Osle 3, Norway
Mr G Berge (Biologist)	Institute of Marine Research, P O Box 2906, 5011 Bergen, Norway
Dr L Canelas (Chemist)	Instituto Hidrografico, Rua das Trinas 49, Lisboa 2, Port gal
Dr R De Clerck (Biologist)	Station de Peche maritime, Hotel de Ville 8300 Ostende, Belgium
Dr B I Dybern (Biologist)	Institute of Marine Research, 453 00 Lysekil, Sweden
Dr Maria J Figueiredo (Biologist)	Instituto de Biologia Maritima, Cais do Sodre, Lisboa 2, Portugal
Dr S H Fonselius (Chemist)	Institute of Marine Research, Hydrographic Department, Box 4031, 400 40 Goteborg 4 Sweden
Mr S J de Groot (Biologist)	Netherlands Institute for Fishery Investigations, Postbus 68, Haringkade 1, Ijmuiden 1620, Netherlands
Dr P Hagel (Chemist)	Netherlands Institute for Fishery Investigations, Postbus 68, Haringkade 1, Ijmuiden 1620, Netherlands
Dr U Harms (Chemist)	Bundesforschungsanstalt fur Fischerei, Isotopenlaboratorium, Wustland 2, 2 Hamburg 55, Fed. Rep. of Germany
Mr J Henriet (Chemist)	Station de Phytopharmacie, Ministere de l'Agriculture, 11 Rue du Bordia, 5800 Gembloux, Belgium
Dr P Herman (Chemist)	Institut de Recherches Chimiques, Ministere de l'Agriculture, 5 Molenstr, 1980 Tervuren, Belgium

Dr (Mrs)E Huschenbeth (Chemist)	Institut for Kusten-und Binnen-fischerei, Palmaille 9, 2 Hamburg 50, Fed. Rep. of Germany
Dr S Jensen (Chemist)	Naturvardsverkets Sepcialanalytiska Laboratorium, Wallenbergslaboratoriety, Frescati, 104 05 Stockholm, Sweden
Dr E Levy (Chemist)	Atlantic Oceanographic Laboratory Bedford Institute of Oceanography, P.O. Box 1006, Dartmouth, Nova Scotia, Canada
Mr O Lindgren (Chemist)	Naturvardsverkets Undersoknings laboratoriu, 170 11 Drottningholm, Sweden
Dr A D McIntyre (Biologist)	Marine Laboratory, P O Box 101, Victoria Road, Aberdeen AB9 8DB, Scotland
Mr K H Palmork (Chemist)	Institute of Marine Research, P O Box 2906, 5011 Bergen, Norway
Dr J L Pissarra (Chemist)	Instituto Hidrografico, Rua das Trinas 49, Lisboa 2, Portugal
Dr D Schmidt (Chemist)	Deutsches Hydrographisches, Institut Wustland 2, 2 Hamburg 55, Fed. Rep. of Germany
Dr G Topping (Chemist)	Marine Laboratory, DAFS, P O Box 101, Victoria Road, Aberdeen AB9 8DB, Scotland
Mr O Vagn Olsen (Chemist)	Danmarks Fiskeri-og Havundersøgelser, Charlottenlund, Denmark
Mr T Williams (Biologist)	Fisheries Laboratory, Lowestoft, Suffolk England
Mr H Tambs-Lyche	General Secretary International Council for the Exploration of the Sea, Charlottenlund Slot, 2920 Charlottenlund, Denmark
Mr J Smed	Hydrographer International Council for the Exploration of the Sea, Charlottenlund Slot, 2920 Charlottenlund, Denmark

Annex II

Agenda

1. Adoption of Agenda
2. Appointment of Rapporteur
3. Composite of Membership
4. Terms of Reference of the Meeting
5. Consideration of the Draft Report on 1972 Base-Line Survey
6. Progress report on intercalibration exercise
7. Consideration of the Extention of the North Sea Base-Line to cover the NEAFC Area.
   - 7.1. Report on N. Sea monitoring Group
   - 7.2. General discussion
   - 7.3. Pollutants to be analysed
   - 7.4. Selection of Species
   - 7.5. Division of responsibility for sampling and analysis
8. Consideration of Possible Extension of Southern Bight North Sea Water Survey to cover the NEAFC Area (Link with Canada/USA)
9. Review of National Programmes of Monitoring in the North Sea
   - 9.1. Metals
   - 9.2. Organochlorine pesticides and PCBs
   - 9.3. Oil
   - 9.4. Others
10. Consideration of how National Programmes could be modified to give unified coverage of Coastal Zones in the North Sea
11. Punch card systems
12. Any other Business

Annex III

Terms of Reference

An ad hoc group of analysts with strong support by biologists should be convened in Charlottenlund at national expense as soon as possible after the 1973 Council Meeting with the following terms of reference:-

a) to coordinate and suggest possible extension to National Programmes of monitoring in the North Sea, using the Base-Line Survey data as a basis for its recommendations, also taking into account any available information on variations in residue concentrations with age, season etc.

b) to consider the technical problems involved in a possible extension of the North Sea Base-Line Study to cover the whole of the NEAFC (Oslo Commission) area.

The Group should report the results of its discussions to the Working Group on the Study of Pollution of the North Sea and to the Advisory Committee on Marine Pollution.

Annex IV

ARRANGEMENTS FOR SAMPLING OF COD+

Area	Country
E Greenland	Germany
Iceland	Iceland/Denmark, Belgium
Spitzbergen	Norway
N Norway (x2)	Norway
W Barents Sea	Norway*/Sweden, Netherlands
E Barents Sea	Norway*/Sweden, Netherlands
Faroes	Scotland, Denmark
Faroes Bank	Scotland
W Scotland	Scotland
Irish Sea	England
W Ireland	Ireland
S W Ireland	Ireland
Kattegat	Sweden, Denmark
Biscay	France, Spain
Portugal	Portugal
English Channel	England
Bristol Channel	England
Azores	Portugal
S North Sea	Belgium, Germany
E North Sea	Netherlands

All samples to consist of 10 fish.

For metals each fish to be analysed individually for muscle tissue and in duplicate on an homogenate of the livers.

For organochlorines and PCBs each fish to be analysed individually for liver tissue and in duplicate on an homogenate of the muscle tissues.

* To be assisted by Sweden with Analysis if necessary.

\+ Where Cod are not available use Hake.

Annex V

SPECIES OF FISH IN ADDITION TO COD TO BE ANALYSED DURING THE BASE-LINE SURVEY

Country	Area	Species
Norway	Barents Sea	Capelin, Plaice or Flounder
	Norwegian Coast	Herring and Flounder or Plaice
Sweden	Skagerak	Flounder or Plaice, Herring
	Iceland*	" " " "
	E Barents Sea	" " " "
Denmark	Faroe	Herring
	E Greenland	Capelin
	Kattegat	Herring, Plaice, Sole
Germany	S North Sea	Plaice
Netherlands	S Ireland	Hake
	Irish Sea	Sole
	North Sea	Sole
Belgium	Irish Sea	Sole, Plaice
	English Channel	Sole, Plaice
	Bristol Channel	Sole, Plaice
	S North Sea	Sole, Plaice
	S North Sea	Herring
Portugal	Portugal	Hake, Pilchard, Sole
	Azores	as above, if possible.
England	W Scotland	Hake
	N Irish Sea	Hake
	S North Sea	Sole
	English Channel	Pilchard
Scotland	Faroe	Plaice
	Faroe Bank	Plaice
	W Scotland	Plaice, Herring

* if required by Iceland

Each sample to consist of 10 fish liver and muscle tissues to be analysed either separately or in duplicate on homogenates of muscle samples from the 10 fish and of the livers from the 10 fish.

Annex VI

DETAILS OF YEAR CLASS AND TIME OF SAMPLING*

and substances to be analysed

Species	Year Class	Remarks
Cod	1972 1969	1969 Year Class in Norther Waters
Sole	1963 (N. Sea)	1967 - Irish Sea
		1969 - Bristol Channel
		1969 or 1963 - English Channel
		1969 - S. North Sea/English Coast
Hake	Age difficulty - length to be selected 40 -50 cm.	
Plaice	1968	1969 (Irish Sea, Bristol Channel English Channel)
Herring	1972	Norway will do the best they can to get 1972 year class
Capelin	1971	
Pilchard	1971	

Note: 1) the above samples should be collected within the period July-September and each sample should consist of 10 fish.

2) Year Class and Remarks columns may need revision following referral of proposals to the Council for approval.

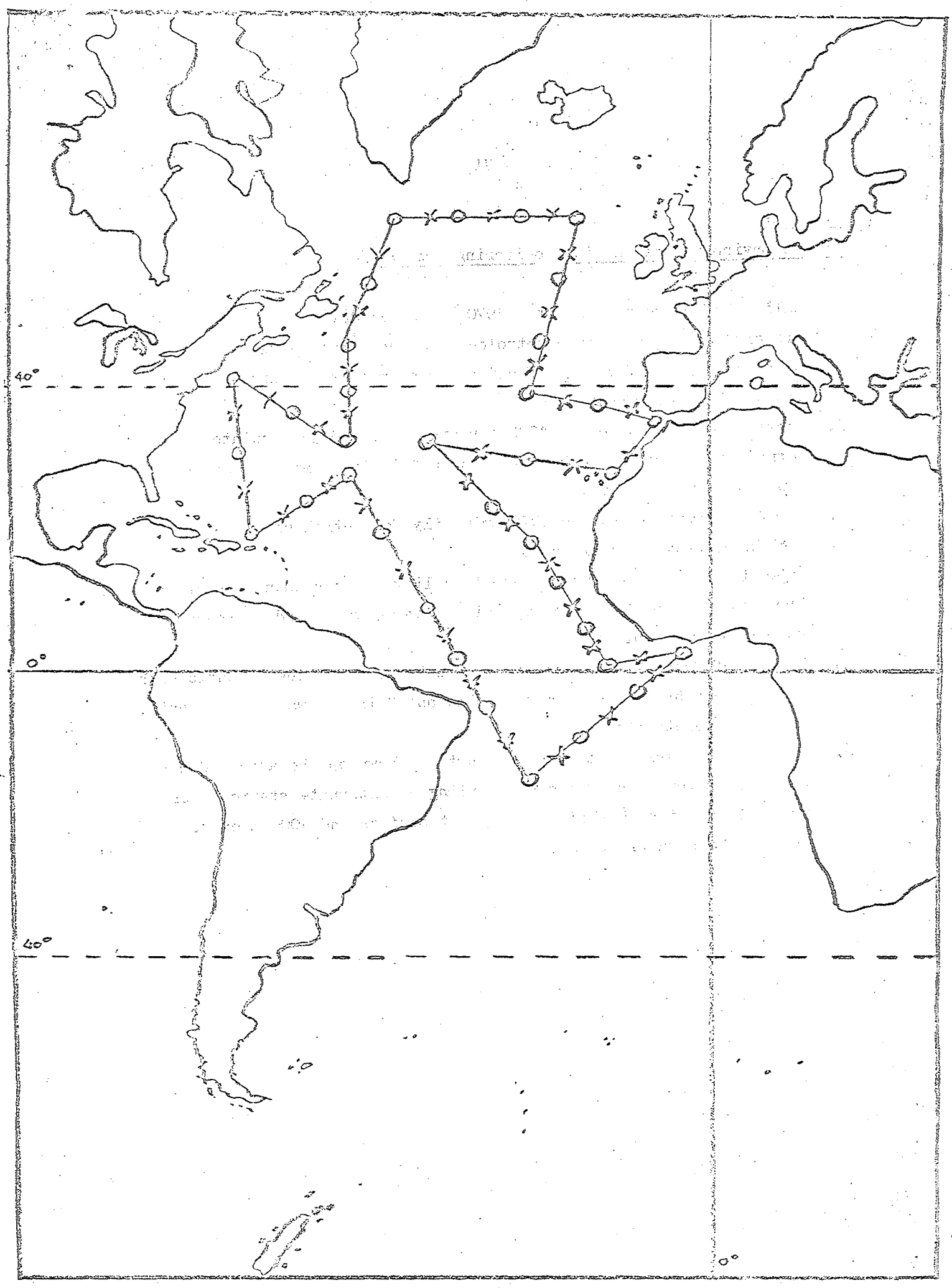
All samples (muscle and liver) to be analysed for the following organic substances, organochlorine pesticide residues, PCBs, and wherever possible polychlorinated terphyeryls; all samples will also be analysed for mercury, cadmium, lead, copper and zinc, and wherever possible for organic mercury. Other metals and organics may be included at the discretion of the analyst concerened. Wherever possible, but certainly for all liver samples results for pesticides and PCBs to be expressed on both fat and fresh weight basis.

All results should be reported as stipulated for the intercalabration exercise.

Annex VII

Canadian
Marine Environmental Quality Monitoring Programme

1. Gulf of St Lawrence - started 1970. T S Dissolved O_2, dissolved and particulate petroleum residues, nutrients, dissolved and particulate organics, trace metals, lignin, stable isotopes (annual).
2. Scotia Shelf - started in 1970 for dissolved and particulate petroleum residues. To be expanded in 1974 to parameters as in 1 on a quarterly basis.
3. Halifax-Bermuda - started 1971 primarily for petroleum
4. Various inshore coastal areas
   Objective is "Marine Environmental Quality" rather than "Fisheries Improvement" and therefore emphasis is on seawater and suspended and bottom sediments
5. "Health of Oceans" - evaluation of the "health" of the Atlantic with respect to a broad spectrum of "pollutants" in the water, sediments, atmosphere biota etc.
6. Sampling on a grid pattern based on that shown on the attached map. Analyses as for 1 and 2 above, sampling at alternate stations for sediment and at number of depths or at surface and 1000 m only. Some plankton samples.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