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Preliminary results of ICES coordinated Monitoring Programme in the North Sea

J.E. Portmann and A. Preston.

Introduction

In 1971 ICES established a Working Group to examine the state of pollution in the North Sea. One of the main tasks undertaken by that Working Group was the conduct of a baseline survey of levels of contaminants/pollutants in fish and shellfish taken from the North Sea. This survey was conducted in 1972 and the results were published by the Council as part of the report of that Working Group (ICES 1974). The Working Group, in its report, considered that the results of the baseline survey showed the North Sea was not seriously polluted, and that the only areas where the results gave any justification for monitoring on a continuous basis were the coastal margins and the Southern Bight, Kattegat and Skaggerak areas. Much of the necessary work in these areas was already being conducted/commissioned by national authorities; therefore, rather than initiate a further special international programme, it was decided that a review of existing monitoring programmes should be undertaken, with a view to deciding which of these would produce data relevant to an ICES coordinated monitoring effort in the North Sea, and whether or not extra work should be commissioned in particular areas.

The North Sea Working Group was disbanded in 1974 at the 62nd Statutory meeting before this review could be completed. However, a new Working Group on Pollution Baseline and Monitoring Studies in the Oslo Commission and ICNAF Areas was formed. This was charged with two main duties: the conduct of a baseline study in that part of the North Atlantic not already surveyed, and the conduct of monitoring in the North Sea area.

* General Secretary
ICES Charlottenlund Slot
2920 Charlottenlund, Denmark

The Working Group held its first meeting in January 1975 and the report of this meeting is submitted to the 63rd Statutory meeting as C.M.1975/E:2. One of the tasks undertaken at that meeting was the selection of national monitoring programmes, the results of which could usefully be used in a coordinated report of North Sea Monitoring Studies in 1974. From an examination of the list of programmes conducted in 1974, the Working Group concluded that there should be an adequate number of results to form a useful report, and the list of selected programmes is included as Annex 7 of the Working Group report (ICES C.M. 1975/E:2). A condition of selection was that the contaminant/pollutant being monitored should have featured in the original baseline study i.e. been subject to an intercalibration exercise.

The Working Group considered that in the light of interest shown by several international organisations, in results of monitoring in the North Sea it was important that a report on the results of studies conducted in 1974 should be prepared and submitted to the 1975 Statutory Meeting. They accordingly agreed to call for results of these programmes, and because of the importance attached to the matter, established a deadline of 30th April 1975 for submission of results on the selected programmes. Owing to the short notice given, several countries experienced difficulties in meeting this deadline and it was extended to 21 June 1975.

Results

For a variety of reasons Sweden, Denmark and Scotland were not able to supply any results in time for this report to be prepared for the 1975 Statutory meeting. However, Norway, Germany, Netherlands, Belgium, France and England all managed to supply results on at least some of their programmes. These have been summarised in Tables 1-4 and the approximate positions of sampling are shown in Figure 1. The results of analyses of some samples taken in 1973 are also included since the original baseline was conducted in 1972.

Metals in Shellfish

Table 1 gives the results submitted for metals in shellfish. No mercury figures were quoted by Norway for mussels and the only available figures which can be compared to those in the baseline survey are those submitted by France and Netherlands. The concentrations found in these mussels are all low, average 0.08 mg/kg and, in common with those reported for oysters, are well below the levels which have been considered harmful to man by some national authorities. The results are of a similar order to those found in the baseline survey.

Similarly, the range of cadmium concentrations reported for mussels and oysters is low and of the same order as that found in the baseline survey. The values reported by Norway for mussels are on a dry weight basis and if it is assumed that the dry weight is approximately one fifth of the wet weight then the results for Norwegian, French and Dutch mussels are quite similar. For zinc the levels in oysters are high compared to those found in mussels (allowing for the dry weight correction) but it is a well known phenomenon that oysters concentrate zinc much more readily than mussels. The values reported for Norwegian mussels corrected to a wet weight base averaged approximately 30 mg/kg a value very similar to that reported for mussels in the baseline report.

The range of concentrations reported in the baseline survey for copper in mussels was between 0.7 and 13 mg/kg, a range of values which is compatible with those reported by France, Netherlands and Norway. The lead values are generally lower than those reported in the baseline survey but at that time it was found that few laboratories were really competent to analyse lead in biological samples. Since then methods have improved considerably and generally have been accompanied by a reduction in the levels reported.

Organochlorine Pesticidecand PCB residues in shellfish

Table 2 gives the results submitted for organochlorine pesticide and PCB residues in mussels and shrimps. All these results were submitted by Germany

and all compare closely with the results obtained in the course of the baseline survey. With only one or two exceptions eg 0.16 mg/kg dieldrin in one sample of mussels and 0.16 mg/kg of δ - BHC in a sample of shrimps the levels of organochlorine pesticide residues were low and typical of present background levels. As expected from the results of the baseline survey the levels of PCB found were somewhat higher than those of the organochlorine pesticide residues. The results do however compare closely with those found in the baseline survey for both species. It will be noted that the concentrations of PCB found in mussels is somewhat higher than that found in shrimps (range 0.062 - 0.22 mg/kg for mussels and 0.036 - 0.10 mg/kg for shrimps) but this can probably be accounted for by the higher lipid content of mussels. If evaluated on a lipid basis the concentrations compare much more closely.

Metals in Fish

Table 3 gives the results of metal analyses of fish. The original baseline survey included only cod, plaice and herring and the results for these are therefore given first in the table and are discussed in more detail. The results for each species have also been separated into two halves according to whether the fish were caught in the Southern Bight or near the coast or well offshore. For all three species the results are similar to those obtained during the baseline survey conducted in 1972. The fish cover a range of year classes but there is no obvious indication of higher mercury residues with increased age of the fish. However, as noted in the baseline survey, there is a slight but distinct tendancy for fish caught in the offshore regions to contain less mercury than those caught in the Southern Bight or near the coast. This does not of course apply to the herring samples of which only one speciment was caught offshore. The highest individual value was found in herring (0.60 mg/kg) although the results for herring are usually lower than those for cod or plaice.

For cadmium and lead the levels are generally reported as having been near to or below the level of detection of the methods used by the laboratories

reporting results. Where particularly sensitive methods were used, the levels reported were generally very low, less than 0.01 mg/kg for cadmium and less than 0.2 mg/kg for lead. Chromium was only analysed by the English Laboratory and almost all the results were below the level of detection of the method used.

As found in the baseline survey herring contain more zinc than either cod or plaice but the levels found in 1974 are not markedly different from those found in the baseline survey. Again as found in that survey, there is little difference between the levels of either copper or zinc in any of the three species which could be attributed to their being caught close to shore as opposed to offshore. However, it may be worth noting that the highest result for zinc, 24 mg/kg in a single plaice and for copper 3.3 mg/kg in herring, both occurred in fish caught in inshore areas.

Table 3 also indicates results for sole (Solea solea L), mackerel (Scomber scombrus L), horse mackerel (Trachurus trachurus), whiting (Merlangius merlangus) witch (Glyptocephalus cynoglossus), gurnards (Triglidae), haddock (Melanogrammus aeglefinus) and 3 specimens of hake (Merluccius merluccius). None of these species were included in the baseline survey of the North Sea although hake is to be included in the survey of the North Atlantic. Most of these 'new' species were only analysed for mercury. All the results are well below 0.5 mg/kg and in no case can the concentrations found be considered to have arisen from pollution.

As with the three baseline species cadmium and lead levels were generally below the level of detection of the methods used for analysis. Results for zinc and copper were only reported for sole, whiting, haddock and a single specimen of witch. The levels found in all four species were very similar to those found in cod, a species closely related to haddock and whiting.

Organochlorine pesticide and PCB residues in fish

Table 4A summarises the results of analyses of fish muscle for organochlorine pesticide and PCB residues. As with the tables for metals in fish the results for cod, plaice and herring are given first and these are followed by results for miscellaneous other species not included in the baseline survey. In all three species the concentrations of δ - BHC and dieldrin were found to be low, with only 3 exceptions <0.01 mg/kg. There was however, a definite trend for fish caught inshore or in the Southern Bight to contain higher residues of both these pesticides eg. cod where six out of seven of the offshore species contained less than 0.001 mg/kg γ - BHC whereas only 2 out of 23 samples caught inshore contained less than 0.001 mg/kg. A similar trend is apparent for the concentrations of DDT residues in cod and plaice. However, in no case do the residue levels found in 1974 differ significantly from those reported in the baseline survey.

A few results for haddock, sole, mackerel, whiting and witch are also included in Table 4. For haddock, almost all the residue levels were below the limit of detection of the methods used. The highest residue levels were found in mackerel and were similar to those found in herring which is also a pelagic species, and which has a similar lipid content in its muscle tissue. The residue levels found in whiting were similar to those found in cod.

In most samples the concentration of PCB found in the muscle tissue exceeded the concentrations of organochlorine pesticide residues. A similar feature was noted in the baseline survey results which were generally of the same order as those found in 1974.

Table 4B is constructed in the same way as Table 4A but summarises the results obtained from analysis of the livers of fish as opposed to the muscle analysis results given in Table 4A.

As expected from previous reports including the baseline survey, the

residue levels found in the livers of species such as cod and plaice, are much higher than those found in the muscle tissues of these species, although in herring the residue levels found in the livers are similar to those found in the muscle tissue.

Liver tissues were not analysed in the baseline survey, and no comparison with results from 1972 can be made. However, unlike the comparative differences noted between the levels in muscle tissue of fish from coastal and offshore fishing areas, there is no obvious difference between the levels found in livers of cod or plaice from coastal and offshore grounds. As noted in the fish muscle analyses both 1972 and in 1974 there is no clear preponderance of either of the metabolites of DDT over the residue of the parent compound. As with the muscle tissue residues, the PCB levels in cod and plaice are higher than the total residues of organochlorine presticides; and are above 10 mg/kg in a number of the cod liver samples, although in plaice they are an order of magnitude lower, perhaps reflecting the approximately ten fold lower lipid content.

The levels of residues of both organochlorine pesticides and PCB s found in whiting livers are similar to those found in cod but the levels found in the other gadoid species sampled - haddock, are generally lower by a factor of 2 to 3. The lipid levels in all three species are similar but the haddock may well have been younger and probably spent a greater proportion of their life in the open sea. The levels found in both mackerel and witch were of a comparable level to those found in plaice.

Petroleum hydrocarbon levels in water

The results of a number of analyses conducted by the Norwegian Institute for Marine Research at Bergen were also submitted to the authors of this report. They have not been included in full in this report since no formal intercalibration exercise has yet been conducted. The results given

referred to the total concentration of C_{16} to C_{24} n - alkanes found in water
water samples taken at 3 depths at 12 stations on a straight line transect Setlands to Fedje.

Most of the concentrations of C_{16} to C_{24} n - alkanes lay within the single order of magnitude range 0.4 to 4.0 µg/l. Only 17 samples out of 189 lie outside this range ie less than 10%. There was no clear pattern of higher levels of this n-alkane fraction at any of the 3 depths sampled and the levels appear to vary randomly with stations. A number of results were also submitted for the same C_{16} - C_{24} n-alkane fraction for some sea water samples taken around the Ekofisk oil field in the Norwegian sector of the North Sea. This field is now producing oil although it was not in 1974 when these samples were taken. The levels found were similar to those found in the Setland-Fedje. The range was from 0.2 µg/l or less to a maximum of 2.7 µg/l. Samples were taken on two occasions in June and November and at seven depths from 0-65 m; there was no difference between the samples with either depth or date.

Conclusions

The results available from national 1974 monitoring programmes as summarised in Tables 1-4 and discussed above indicate a similar picture to that revealed by the 1972 baseline survey conducted in the North Sea by the Working Group for the International Study of the Pollution of the North Sea and its effects on Living Resources and their Exploitation. On the basis of these results there appears to have been no increase or decrease in the levels of contaminants/pollutants in either fish or shellfish from the North Sea.

From the review of monitoring programmes conducted by countries around the North Sea it is apparent that many more results could be made available to ICES in future years. This report is the result of the first ever attempt by ICES and probably by any other international organisation at coordinating

results of national monitoring programmes and can be regarded as successful within the original aims set down. Several factors contributed to the less than complete response to the request for results to be submitted. Of these the short call-in-time (barely 3 months) was probably the most important. Most laboratory's analytical services are heavily committed and work schedules for monitoring usually lag at least six months behind sampling and it is not always easy to alter work schedules.

At its January 1975 meeting the Working Group on Pollution Baseline and Monitoring Studies agreed to complete reports at annual intervals for submission to each Statutory meeting. It was therefore agreed that a deadline of April 30th 1976 should be set for submission of the results from 1975 monitoring programmes. This should provide ample warning and permit the results of the relevant sections of national programmes to be produced and processed and it is hoped that future reports will be more comprehensive and more suited to the needs of ICES Committees such as the A.C.M.P., and external bodies such as the Oslo Commission and GIPME.

The Working Group on Pollution Baseline and Monitoring Studies noted that the results of a number of national programmes were relevant to the coordinated report but could not be included, as the laboratory responsible had not taken part in intercalibration exercises within the ICES framework. The members of the Working Group each undertook to ensure that this situation was rectified as soon as possible in their own countries. Such moves will clearly also add to the coverage of the future reports.

A report on the second ICES metal intercalibration exercise has also been submitted to the 63rd Statutory meeting by Dr Topping and this outlines the success and shortcomings of the earlier exercise. It also outlines proposals for the third exercise which it is hoped will lead to a further improvement in

the quality of analytical results.

It is hoped that ICES will pass a resolution endorsing the intention to prepare such reports annually and calling for national authorities to submit results of selected programmes before the established deadlines. participation in intercalibration exercises by laboratories which have not already done so or which have not yet achieved satisfactory results is also of great importance and could also usefully be encouraged by an appropriate recommendation.

Note In figure 1 and in the Tables the ICES rectangles are given according to the old system, should it be decided that this report be published amendment to the new system will be necessary.

TABLE 1 - METALS - SHELLFISH (1)

SPECIES	SOURCE		COUNTRY	DATE OF COLLECTION	NUMBER ANALYSED	SIZE RANGE (mm)	Hg	Cd	Pb	Cr	Zn	Cu	
Mussel	IVA	Q18	Norway	Feb, 74	30	40-50	-	3.9	8.3	-	150	8.2	)
"	"	"	"	Mar, 74	30	40-50	-	2.7	6.2	-	150	8.7	)
"	"	"	"	May, 74	30	43-58	-	3.8	8.2	-	190	7.5	)
"	"	"	"	Aug, 74	19	40-50	-	4.0	5.8	-	220	7.9	)
"	"	"	"	Oct, 74	10	40-50	-	1.3	2.6	-	120	6.5	)
"	"	"	"	Oct, 74	5	40-50	-	1.4	2.8	-	130	7.9	) On a Dry Weight
"	"	"	"	Oct, 74	5	40-50	-	1.3	2.8	-	120	6.7	) basis
"	"	"	"	Oct, 74	5	40-50	-	1.3	2.4	-	120	6.2	)
"	"	"	"	Oct, 74	5	40-50	-	5.2	7.4	-	250	6.5	)
"	"	"	"	Oct, 74	5	40-50	-	2.8	6.8	-	140	6.6	)
"	"	"	"	Oct, 74	5	40-50	-	1.6	3.0	-	110	5.6	)
"	IVC	-	Holland I	Feb, 74	-	-	0.11	-	-	0.62	28	1.3	
"	"	-	" R	Feb, 74	-	-	0.11	0.08	0.55	-	24	2.4	
"	"	-	" I	May, 74	-	-	0.06	-	-	-	-	-	
"	"	-	" R	May, 74	-	-	0.12	0.15	-	-	31	2.8	
"	"	-	" R	Aug, 74	-	-	0.09	0.13	0.50	-	14	2.4	
"	"	-	" R	Nov, 74	-	-	0.08	0.29	0.44	-	13	4.3	
"	"	H2	" I	Feb, 74	-	-	0.07	-	-	0.58	22	1.4	
"	"	"	" R	Feb, 74	-	-	0.07	0.11	0.57	-	23	2.6	
"	"	"	" I	May, 74	-	-	0.06	-	-	-	-	-	
"	"	"	" R	May, 74	-	-	0.07	0.30	-	-	30	2.9	
"	"	"	" R	Aug, 74	-	-	0.06	0.37	0.83	-	29	3.3	
"	"	"	" R	Nov, 74	-	-	0.09	0.26	0.68	-	17	5.5	
"	VIII	B58	France	Oct, 74	55	50-70	0.02	0.03	0.55	-	-	2.4	
"	"	"	"	Oct, 74	60	50-70	0.03	0.17	0.63	-	-	2.6	
"	"	"	"	Oct, 74	50	50-70	0.06	0.20	0.47	-	-	3.1	

I = I.T.A.L.
R = R.Z.S.

TABLE 1 (cont.) - METALS - SHELLFISH (2)

SPECIES	SOURCE		COUNTRY	DATE OF COLLECTION	NUMBER ANALYSED	SIZE RANGE (mm)	Hg	Cd	Pb	Cr	Zn	Cu
Oyster (Flat)	VIIE	ZZ56	FRANCE	Sept, 74	10	45-60	0.02	-	0.49	-	-	4.6
"	"	"	"	Sept, 74	10	45-60	0.01	-	0.48	-	-	3.2
"	"	"	"	Sept, 74	10	45-60	0.03	-	0.77	-	-	4.0
"	"	"	"	Sept, 74	10	45-60	0.05	-	0.97	-	-	3.0
"	"	"	"	Sept, 74	10	45-60	0.03	-	0.87	-	-	4.1
"	"	"	"	Nov, 74	10	45-60	0.03	0.08	0.74	-	65	-
"	"	"	"	Nov, 74	10	45-60	0.01	0.14	0.77	-	70	4.4
"	"	"	"	Nov, 74	10	45-60	0.03	0.07	1.6	-	65	4.7
"	"	"	"	Nov, 74	10	45-60	0.04	0.05	0.63	-	77	3.4
"	"	"	"	Nov, 74	10	45-60	0.02	0.06	0.34	-	-	-
"	"	"	"	Nov, 74	10	45-60	0.04	0.06	0.93	-	67	6.2

TABLE 1 - METALS - SHELLFISH (3)

SPECIES	SOURCE		COUNTRY		DATE OF COLLECTION	NUMBER ANALYSED	SIZE RANGE (mm)	Hg	Cd	Pb	Cr	Zn	Cu
Shrimp	IVC	M5	Holland	I	Feb, 74	-	-	0.07	-	-	0.16	26	6.4
"	"	"	"	R	Feb, 74	-	-	0.12	0.02	0.67	-	34	12
"	"	"	"	I	May, 74	-	-	0.39	-	-	-	-	-
"	"	"	"	R	May, 74	-	-	0.21	0.04	-	-	40	14
"	"	"	"	R	Aug, 74	-	-	0.14	0.10	0.25	-	49	19
"	"	"	"	R	Nov, 74	-	-	0.39	0.05	0.26	-	26	20
"	"	J5	"	I	Feb, 74	-	-	-	-	-	0.17	25	8.3
"	"	"	"	R	Feb, 74	-	-	-	-	2.1	-	34	13
"	"	"	"	I	May, 74	-	-	0.08	-	-	-	-	-
"	"	"	"	R	May, 74	-	-	0.16	0.10	-	-	43	17
"	"	"	"	R	Nov, 74	-	-	0.11	0.28	0.18	-	25	18
"	"	HI	"	I	Feb, 74	-	-	0.08	-	-	0.18	29	8.4
"	"	"	"	R	Feb, 74	-	-	0.08	0.05	0.21	-	41	15
"	"	"	"	I	May, 74	-	-	0.09	-	-	-	-	-
"	"	"	"	R	May, 74	-	-	0.15	0.12	-	-	41	1.6
"	"	"	"	R	Aug, 74	-	-	0.15	0.16	0.37	-	34	23
"	"	"	"	R	Nov, 74	-	-	0.16	0.23	0.26	-	24	23

TABLE 2 O/Cs - SHELLFISH (1)

SPECIES	SOURCE		COUNTRY		DATE OF COLLECTION	NUMBER ANALYSED	SIZE RANGE (mm)	BHC	BHC	DIELDRIN	DDE	TDE	DDT	PCB	% LIPID
Mussel	IVB	N7/N8	Germany		Dec, 73	100	50-55	-	0.016	0.007	0.007	0.005	0.005	0.14	1.7
"	"	"	"		Oct, 74	100	55-60	-	0.008	0.005	0.004	0.004	0.006	0.13	1.6
"	"	"	"		Oct, 74	100	55-60	-	0.006	0.006	0.003	0.004	0.006	0.14	1.2
"	"	N7	"		Dec, 73	100	50-55	-	0.012	0.16	0.007	0.005	0.007	0.12	1.4
"	"	"	"		May, 74	100	55-60	-	0.004	0.003	0.003	0.004	0.007	0.075	0.08
"	"	"	"		Oct, 74	100	55-60	-	0.004	0.003	0.004	0.006	0.006	0.062	0.85
"	"	M6	"		Dec, 73	100	50-55	-	0.062	0.051	0.007	0.004	0.003	0.16	1.3
"	"	"	"		Dec, 73	100	50-55	-	0.010	0.012	0.006	0.004	0.005	0.10	1.2
"	"	"	"		Dec, 74	100	50-55	-	0.015	0.009	0.006	0.004	0.004	0.13	1.5
"	"	"	"		May, 74	100	55-60	-	0.015	0.005	0.006	0.008	0.010	0.095	1.2
"	"	"	"		May, 74	100	55-60	-	0.010	0.004	0.004	0.006	0.006	0.12	1.5
"	"	"	"		May, 74	100	55-60	-	0.008	0.005	0.014	0.003	0.008	0.081	1.1
"	"	"	"		Oct, 74	100	55-60	-	0.003	0.004	0.004	0.005	0.005	0.12	1.0
"	"	"	"		Oct, 74	100	55-60	-	0.006	0.007	0.004	0.005	0.010	0.094	1.9
"	IVC	-	Holland	R	Feb, 74	-	-	0.006	0.004	0.006	<0.005	0.005	<0.008	0.15	-
"	"	-	"	R	May, 74	-	-	0.004	<0.002	0.006	<0.005	<0.003	<0.010	0.12	-
"	"	-	"	R	Aug, 74	-	-	0.003	<0.002	<0.005	<0.005	<0.005	<0.010	0.07	-
"	"	-	"	R	Nov, 74	-	-	0.004	<0.002	<0.005	<0.005	<0.005	<0.010	0.15	-
		H2		R	Feb, 74	-	-	0.005	0.005	0.016	<0.005	0.008	<0.008	0.20	-
				R	May, 74	-	-	0.002	<0.002	0.008	<0.005	<0.005	<0.010	0.20	-
				R	Aug, 74	-	-	<0.002	<0.002	<0.005	<0.005	<0.005	<0.01	0.15	-
				R	Nov, 74	-	-	0.002	<0.002	<0.007	<0.005	<0.005	<0.010	0.16	-

TABLE 2 (cont.) O/Cs - SHELLFISH (2)

SPECIES	SOURCE		COUNTRY	DATE OF COLLECTION	NUMBER ANALYSED	SIZE RANGE (mm)	BHC	BHC	DIELDRIN	DDE	TDE	DDT	PCB	% LIPID
Oyster	IVC	H2	Holland R	Feb, 74	-	-	0.007	0.005	0.007	<0.005	0.005	<0.008	0.08	-
"	"	"	" R	Aug, 74	-	-	0.002	0.002	<0.005	<0.005	<0.005	<0.010	0.10	-
"	"	"	" R	Nov, 74	-	-	0.002	<0.002	0.005	<0.005	<0.005	<0.010	0.15	-
Shrimp	IVB	N6	Germany	Sept, 73	100	55	-	0.16	0.002	0.005	0.003	0.005	0.071	1.0
"	"	"	"	Sept, 73	100	55	-	0.10	0.003	0.007	0.003	0.004	0.077	0.62
"	"	"	"	Sept, 73	100	55	-	0.078	0.001	0.004	0.002	0.004	0.080	0.65
"	"	M6	"	Oct, 73	100	55	-	0.11	0.003	0.017	0.002	0.005	0.10	0.81
"	"	"	"	Oct, 73	100	55	-	0.026	0.003	0.008	0.002	0.004	0.080	0.88
"	"	"	"	Oct, 73	100	55	-	0.032	0.003	0.008	0.004	0.006	0.078	0.83
"	"	"	"	May, 74	100	55	-	0.019	0.005	0.004	0.004	0.022	0.060	0.22
"	"	"	"	May, 74	100	55	-	0.059	0.004	0.010	0.013	0.009	0.058	0.27
"	"	"	"	May, 74	100	55	-	0.023	0.005	0.020	0.033	0.017	0.050	0.95
"	"	"	"	May, 74	100	55	-	0.11	0.008	0.009	0.011	0.012	0.036	1.0
"	"	"	"	May, 74	100	55	-	0.010	0.008	0.003	0.004	0.006	0.044	0.31
"	"	"	"	May, 74	100	55	-	0.012	0.017	0.004	0.005	0.011	0.038	0.30
"	IVC	M5	Holland	Feb, 74	-	-	0.006	0.003	0.006	<0.005	<0.003	<0.008	0.11	-
"	"	"	"	May, 74	-	-	-	<0.002	0.010	0.010	0.006	<0.010	0.14	-
"	"	"	"	Aug, 74	-	-	0.004	<0.002	0.006	<0.005	<0.005	0.013	0.07	-
"	"	"	"	Nov, 74	-	-	<0.002	<0.002	<0.005	<0.005	<0.005	<0.010	0.05	-
"	"	J5	"	May, 74	-	-	-	<0.002	0.012	0.010	0.006	<0.010	0.29	-
"	"	"	"	Nov, 74	-	-	0.003	<0.002	0.005	<0.005	<0.005	<0.010	0.12	-
"	"	HI	"	Feb, 74	-	-	0.004	0.003	0.009	<0.005	<0.003	<0.008	0.15	-
"	"	"	"	May, 74	-	-	0.003	<0.002	0.006	0.006	<0.005	<0.010	0.18	-
"	"	"	"	Aug, 74	-	-	-	-	<0.010	0.014	-	<0.010	0.17	-
"	"	"	"	Nov, 74	-	-	0.002	<0.002	<0.005	<0.005	<0.005	<0.010	0.12	-

TABLE 3 - METALS - FISH MUSCLE (1)

SPECIES	SOURCE			COUNTRY	DATE OF COLLECTION	NUMBER ANALYSED	YEAR CLASS	Hg MIN	Hg MAX	Hg MEAN	Cd MIN	Cd MAX	Cd MEAN	Pb MIN	Pb MAX	Pb MEAN	Cr MIN	Cr MAX	Cr MEAN	Zn MIN	Zn MAX	Zn MEAN	Cu MIN	Cu MAX	Cu MEAN
COD	COASTAL	IVB	E7	ENGLAND	Feb, 74	4	-	0.07	0.13	0.09	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.4	<0.3	2.8	3.2	3.0	0.4	0.6	0.5
"	"	"	"	"	Mar, 74	10	-	0.04	0.10	0.06	<0.2	<0.2	<0.2	<0.2	0.7	<0.3	<0.2	0.2	<0.2	3.8	5.5	4.6	<0.2	0.4	0.3
"	"	"	M7/M8	GERMANY	July,73	10	1969	0.08	0.13	0.11	0.003	0.01	0.007	0.04	0.10	0.07	-	-	-	2.0	7.3	4.4	0.20	0.63	0.41
"	"	"	"	"	July,74	8	1972	0.06	0.14	0.10	0.003	0.01	0.009	0.06	0.16	0.12	-	-	-	3.8	4.9	4.3	0.27	0.44	0.32
"	"	"	M7	"	July,74	12	1970/1	0.05	0.22	0.12	0.002	0.01	0.004	0.02	0.14	0.04	-	-	-	3.1	4.1	3.9	0.23	0.43	0.28
"	"	IVC	J3	HOLLAND	Feb, 74	-	-	-	-	0.10	-	-	-	-	-	-	-	-	0.10	-	-	2.5	-	-	0.08
"	"	"	GI	BELGIUM	Apr, 73	2	1971	-	-	0.14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
"	"	"	"	"	Apr, 73	8	1972	0.09	0.24	0.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
"	"	"	"	"	Apr, 74	3	1972	-	-	0.22	-	-	<0.01	-	-	0.3	-	-	-	-	-	5.4	-	-	0.9
"	"	"	"	"	Oct, 74	1	1971	-	-	0.23	-	-	<0.01	-	-	0.2	-	-	-	-	-	3.8	-	-	0.6
"	"	"	"	"	Oct, 74	2	1972	-	-	0.29	-	-	-	-	-	-	-	-	-	-	-	0.5	-	-	-
COD	MID	IVB	H7	ENGLAND	Jan, 74	3	-	0.05	0.13	0.09	<0.4	<0.4	<0.4	0.1	0.3	0.2	<0.2	0.5	<0.3	3.8	4.5	4.2	0.4	0.5	0.4
"	N SEA	"	F8	"	Aug, 74	16	-	0.03	0.12	0.07	<0.2	<0.2	<0.2	<0.2	0.3	<0.2	<0.2	1.0	<0.3	2.7	4.5	3.4	0.2	1.3	0.6
"	"	"	G9	"	Aug, 74	10	-	0.06	0.22	0.08	<0.2	<0.2	<0.2	<0.2	0.6	0.4	<0.2	2.4	<0.4	2.5	4.0	3.1	0.3	1.5	0.5
"	"	"	HII	"	Jan, 74	10	-	0.02	0.14	0.08	<0.3	<0.3	<0.3	0.1	0.3	0.3	<0.2	<0.2	<0.2	3.0	3.8	3.4	0.1	0.8	0.3
"	"	"	K9	"	Jan, 74	1	-	-	-	0.20	-	-	<0.4	-	-	.1	-	-	0.3	-	-	3.8	-	-	0.4
"	"	IVC	-	FRANCE	June,74	1	-	-	-	0.18	-	-	0.07	-	-	-	-	-	-	-	-	-	-	-	-
PLAICE	COASTAL	IVB	E7	ENGLAND	Mar, 74	9	-	0.08	0.21	0.12	<0.2	<0.2	<0.2	<0.2	0.3	<0.2	<0.2	<0.2	<0.2	4.5	6.2	5.4	<0.2	0.3	<0.2
"	"	"	D7	"	Feb, 74	10	-	0.05	0.40	0.13	<0.2	<0.2	<0.2	<0.2	0.2	<0.2	<0.2	0.2	<0.2	3.3	4.8	3.7	0.3	1.2	0.5
"	"	"	M7/M8	GERMANY	July,74	10	1970	0.04	0.11	0.08	0.001	0.003	0.002	0.02	0.04	0.02	-	-	-	4.3	7.1	4.9	0.23	0.39	0.28
"	"	"	N6	"	Mar, 73	10	1972	0.10	0.35	0.14	0.008	0.07	0.013	0.08	0.20	0.14	-	-	-	3.9	6.9	4.6	0.21	0.42	0.33
"	"	IVC	GI	BELGIUM	Apr, 73	3	1970	-	-	0.17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
"	"	"	"	"	Apr, 73	13	1971	0.10	0.42	0.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
"	"	"	"	"	Apr, 73	1	1972	-	-	0.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
"	"	"	"	"	Oct, 73	1	1970	-	-	0.14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
"	"	"	"	"	Oct, 73	1	1971	-	-	0.07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
"	"	"	"	"	Oct, 73	4	1972	-	-	0.16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
"	"	"	"	"	Oct, 73	8	1973	0.05	0.15	0.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
"	"	"	"	"	Apr, 74	1	1970	-	-	0.17	-	-	0.08	-	-	0.4	-	-	-	-	-	24	-	-	2.4
"	"	"	"	"	Apr, 74	11	1971	0.11	0.29	0.19	<0.01	0.001	<0.01	0.2	0.4	0.2	-	-	-	5.7	13	8.0	0.3	2.3	0.9
"	"	"	"	"	Apr, 74	13	1972	0.08	0.30	0.16	<0.01	0.02	<0.01	0.2	0.6	0.2	-	-	-	5.8	20	8.3	0.4	2.2	1.0
"	"	"	"	"	Apr, 74	1	1973	-	-	0.10	-	-	<0.01	-	-	0.2	-	-	-	-	-	8.4	-	-	0.9
PLAICE	MID	IVB	H7	ENGLAND	Jan, 74	10	-	0.03	0.08	0.05	<0.2	<0.2	<0.2	0.1	0.4	0.2	<0.3	1.0	<0.4	3.8	5.4	4.8	<0.3	<0.3	<0.3
"	N SEA	"	"	"	Jan, 74	6	-	0.05	0.11	0.07	<0.3	<0.3	<0.3	0.2	0.4	0.3	<0.2	<0.2	<0.2	3.5	6.8	5.0	0.1	0.9	0.3
			G7	BELGIUM	Apr, 74	1	1957	-	-	0.16	-	-	-			0.2	-	-	-			5.5			0.2
				"	Apr, 74	1	1964	-	-	0.12	-	-	-			0.2	-	-	-			5.5			0.1
				"	Apr, 74	1	1965	-	-	0.25	-	-	-			0.3	-	-	-			5.4			0.3
				"	Apr, 74	1	1969	-	-	0.11	-	-	-			0.2	-	-	-			4.3			0.2
				"	Apr, 74	2	1970	-	-	0.10	-	-	-			0.3	-	-	-			5.5			0.4
				"	Apr, 74	1	1971	-	-	0.10	-	-	-			0.2	-	-	-			4.9			0.2
			F8	ENGLAND	Aug, 74	12	-	0.05	0.19	0.08	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	4.0	5.3	4.4	<0.2	1.1	<0.4
			G9	"	Aug, 74	10	-	0.02	0.10	0.07	<0.2	<0.2	<0.2	<0.2	0.5	0.3	<0.2	<0.2	<0.2	2.5	4.0	3.5	<0.2	0.7	0.4
		IVC	-	FRANCE	June,74	1	-	-	-	0.07	-	-	0.10	-	-	<0.4	-	-	-	-	-	-	-	-	-
		"	-		Jun,74	1	-	-	-	0.08	-	-	-	-	-	<0.4	-	-	-	-	-	-	-	-	-

TABLE 3 (cont.) METALS - FISH MUSCLE (2)

SPECIES	SOURCE			COUNTRY	DATE OF COLLECTION	NUMBER ANALYSED	YEAR CLASS	Hg MIN	Hg MAX	Hg MEAN	Cd MIN	Cd MAX	Cd MEAN	Pb MIN	Pb MAX	Pb MEAN	Cr MIN	Cr MAX	Cr MEAN	Zn MIN	Zn MAX	Zn MEAN	Cu MIN	Cu MAX	Cu MEAN
HERRING	COASTAL	IVB	E7	ENGLAND	Feb, 74	10	-	0.04	0.10	0.06	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2	0.5	0.3	3.3	7.0	4.8	1.0	1.7	1.3
"	"	"	"	"	Mar, 74	9	-	0.02	0.22	0.09	<0.2	<0.2	<0.2	<0.2	0.4	<0.2	<0.2	0.3	<0.2	8.2	13	9.2	1.3	3.3	2.1
"	"	IVC	F1	BELGIUM	Dec, 73	25	1970/1	-	-	0.05	-	-	-	-	-	0.3	-	-	-	-	-	8.7	-	-	0.9
"	"	"	G3	"	Oct, 73	1	1969	-	-	0.60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
"	"	"	"	"	Oct, 73	10	1970	0.04	0.07	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
"	"	"	"	"	Oct, 73	13	1971	0.03	0.10	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
"	"	"	"	"	Nov, 74	12	1971	0.03	0.11	0.06	<0.03	0.05	-	0.12	0.22	0.17	-	-	-	5.5	10	7.2	0.6	1.2	0.8
"	"	"	"	"	Nov, 74	13	1972	0.03	0.07	0.04	<0.03	0.04	-	0.14	0.21	0.17	-	-	<0.2	4.6	12	7.2	0.5	1.6	0.9
HERRING	MID N SEA	IVB	F8	ENGLAND	Aug, 74	1	-	-	-	0.07	-	-	<0.2	-	-	<0.2	-	-	<0.2	-	-	4.8	-	-	1.0
GURNARD	MID N SEA	IVC	-	FRANCE	June, 74	1	-	-	-	0.18	-	-	0.12	-	-	-	-	-	-	-	-	-	-	-	-
HADDOCK	MID	IVB	HII	ENGLAND	Jan, 74	1	-	-	-	0.07	-	-	<0.4	-	-	0.2	-	-	<0.2	-	-	3.5	-	-	0.5
"	N SEA	"	"	"	Jan, 74	10	-	0.01	0.07	0.04	<0.2	<0.2	<0.2	0.1	0.5	0.2	<0.3	<0.3	<0.3	2.6	5.5	3.5	<0.3	0.4	< 0.3
"	"	"	K9	"	Jan, 74	10	-	<0.01	0.04	0.02	<0.2	<0.2	<0.2	0.1	0.3	0.2	<0.3	<0.3	<0.3	3.1	4.6	3.8	<0.3	0.3	<0.3
HAKE	MID	IVC	-	FRANCE	June,74	2	-	0.08	0.15	0.12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
"	N SEA	"	-	"	June,74	1	-	-	-	0.24	-	-	-	-	-	<0.4	-	-	-	-	-	-	-	-	-
HORSE MACKEREL	MID N SEA	IVC	-	FRANCE	June,74	1	-	-	-	0.17	-	-	0.09	-	-	<0.4	-	-	-	-	-	-	-	-	-
"	"	"	-	"	June,74	1	-	-	-	0.33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MACKEREL	COASTAL	IVA	MI5	NORWAY	July,74	1	-	-	-	0.06	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
"	"	"	"	"	Oct,74	1	-	-	-	0.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
"	"	"	K16	"	Aug,74	1	-	-	-	0.09	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MACKEREL	MID	IVB	F8	ENGLAND	Aug,74	6	-	0.07	0.15	0.09	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	4.6	6.5	5.5	0.2	1.2	0.7
"	N SEA	"	D20	NORWAY	Aug,74	1	-	-	-	0.07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
"	"	"	G20	"	Oct,74	1	-	-	-	0.07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
"	"	IVC	-	FRANCE	June,74	2	-	0.08	0.15	0.12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
"	"	"	-	"	June,74	1	-	-	-	0.24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SOLE	COASTAL	IVC	J5	HOLLAND	May, 74	-	-	-	-	0.16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
"	"	"	"	"	R May, 74	-	-	-	-	0.16	-	-	0.02	-	-	-	-	-	-	-	-	7.2	-	-	1.1
"	"	"	"	"	R Nov, 74	-	-	-	-	0.12	-	-	0.02	-	-	0.06	-	-	-	-	-	5.1	-	-	0.97
"	"	"	HI	"	I Feb, 74	-	-	-	-	0.07	-	-	-	-	-	-	-	-	-	-	-	4.6	-	-	0.46
"	"	"	"	"	R Feb, 74	-	-	-	-	0.16	-	-	0.01	-	-	0.02	-	-	-	-	-	7.0	-	-	1.3
"	"	"	"	"	I May, 74	-	-	-	-	0.21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
"	"	"	"	"	R May, 74	-	-	-	-	0.19	-	-	0.01	-	-	-	-	-	-	-	-	5.5	-	-	1.1
"	"	"	"	"	R Nov, 74	-	-	-	-	0.14	-	-	0.01	-	-	0.06	-	-	-	-	-	5.0	-	-	1.1
"	"	"	-	"	I Feb, 74	-	-	-	-	0.10	-	-	-	-	-	-	-	-	-	-	-	4.4	-	-	0.33
"	"	"	-	"	R Feb, 74	-	-	-	-	0.10	-	-	0.02	-	-	0.02	-	-	-	-	-	6.5	-	-	1.4
"	"	"	-	"	I May, 74	-	-	-	-	0.11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
"	"	"	-	"	R May, 74	-	-	-	-	0.12	-	-	0.03	-	-	-	-	-	-	-	-	7.3	-	-	1.2
"	"	"	-	"	R Aug, 74	-	-	-	-	0.28	-	-	0.01	-	-	0.05	-	-	-	-	-	5.0	-	-	0.7
"	"	"	-	"	R Nov, 74	-	-	-	-	0.16	-	-	0.01	-	-	0.07	-	-	-	-	-	8.2	-	-	7.2

TABLE 3 (cont.) - METALS - FISH MUSCLE (3)

SPECIES	SOURCE			COUNTRY	DATE OF COLLECTION	NUMBER ANALYSED	YEAR CLASS	Hg MIN	Hg MAX	Hg MEAN	Cd MIN	Cd MAX	Cd MEAN	Pb MIN	Pb MAX	Pb MEAN	Cr MIN	Cr MAX	Cr MEAN	Zn MIN	Zn MAX	Zn MEAN	Cu MIN	Cu MAX	Cu MEAN
SPRAT	COASTAL	IVA	K19	NORWAY	July, 74	1	-	-	-	0.11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
"	"	"	K16	"	June.74	2	-	0.04	0.05	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
"	"	"	"	"	July, 74	2	-	0.03	0.04	0.04	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
"	"	"	N16	"	May, 74	1	-	-	-	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
"	"	"	P16	"	May, 74	1	-	-	-	0.07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
"	"	"	"	"	July, 74	3	-	0.08	0.25	0.16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
"	"	"	218	"	May, 74	4	-	0.02	0.11	0.06	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
"	"	"	"	"	June,74	9	-	0.07	0.21	0.12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
"	"	"	"	"	July,74	4	-	0.04	0.10	0.07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
"	"	"	Q17	"	Jan, 74	4	-	0.09	0.27	0.18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
"	"	"	"	"	June,74	2	-	0.03	0.05	0.04	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
"	"	"	"	"	July,74	5	-	0.05	0.18	0.08	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPRAT	MID N SEA	IVC	-	FRANCE	June,74	2	-	0.04	0.13	0.09	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WHITING	COASTAL	IVB	E7	ENGLAND	Feb, 74	10	-	0.07	0.20	0.14	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2	<0.2	<0.2	2.5	3.7	3.3	0.5	1.5	0.8
"	"	"	"	"	Mar, 74	10	-	0.07	0.35	0.13	<0.2	<0.2	<0.2	<0.2	0.7	<0.3	<0.2	0.2	<0.2	3.7	6.3	4.9	<0.2	0.4	<0.3
WHITING	MID N SEA	IVB	F8	ENGLAND	Aug, 74	12	-	0.01	0.20	0.11	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2	<0.2	3.0	5.0	3.5	0.3	0.9	0.6
"	"	"	G9	"	Aug, 74	8	-	0.04	0.14	0.08	<0.2	<0.2	<0.2	<0.2	0.4	<0.3	<0.2	0.3	<0.2	2.2	3.2	2.7	<0.2	0.4	0.3
WITCH	MID N SEA	IVB	G11	ENGLAND	Jan, 74	1	-	-	-	0.11	-	-	<0.3	-	-	0.3	-	-	<0.2	-	-	3.3	-	-	0.2

TABLE 4A

O/C's - FISH MUSCLE (1)

SPECIES	SOURCE			COUNTRY	DATE OF COLLECTION	NUMBER ANALYSED	YEAR CLASS	ORGAN	∝BHC	ɣBHC	DIELDRIN	PP DDE	PP TDE	PP DDT	PCB	% LIPID
COD	COASTAL	IVB	E7	ENGLAND	Feb, 74	4	-	MUSCLE	<0.001	<0.001	<0.001	0.003	<0.001	<0.001	0.030	<0.2
"	"	"	"	"	Mar, 74	10	-	"	<0.001	<0.001	0.003	0.002	<0.001	0.006	0.020	0.2
"	"	"	M7/M8	GERMANY	July, 74	1	1972	"	-	0.003	0.005	0.004	0.004	0.015	0.076	0.26
"	"	"	"	"	July 1974	1	"	"	-	0.002	0.004	0.003	0.003	0.008	0.054	0.13
"	"	"	"	"	July, 74	1	"	"	-	0.004	0.004	0.020	0.003	0.008	0.022	0.23
"	"	"	"	"	July, 74	1	1970/1	"	-	0.004	0.004	0.005	0.004	0.011	0.016	0.14
"	"	"	"	"	July, 74	1	"	"	-	0.003	0.004	0.003	0.003	0.006	0.066	0.07
"	"	"	M7/N7	"	April, 73	15	1968	"	-	0.003	0.008	0.005	0.004	0.006	0.025	0.32
"	"	"	"	"	April, 73	4	1964	"	-	0.005	0.007	0.006	0.006	0.005	0.013	0.29
"	"	"	M7	"	July, 74	1	1970/1	"	-	0.004	0.007	0.004	0.004	0.010	0.070	0.08
"	"	"	"	"	July, 74	1	"	"	-	0.002	0.003	0.003	0.004	0.007	0.018	0.06
"	"	"	"	"	July, 74	1	"	"	-	0.002	0.004	0.004	0.004	0.008	0.042	0.32
"	"	"	"	"	July, 74	1	"	"	-	0.003	0.004	0.004	0.004	0.010	0.058	0.16
"	"	"	"	"	July, 74	1	"	"	-	0.007	0.006	0.003	0.004	0.008	0.024	0.17
"	"	"	"	"	July, 74	1	"	"	-	0.004	0.004	0.003	0.004	0.012	0.068	0.22
"	"	"	"	"	July, 74	1	"	"	-	0.004	0.015	0.003	0.003	0.009	0.020	0.17
"	"	"	"	"	July, 74	1	"	"	-	0.004	0.008	0.002	0.003	0.011	0.050	0.17
"	"	"	"	"	July, 74	1	"	"	-	0.003	0.008	0.002	0.003	0.007	0.012	0.15
"	"	"	"	"	July, 74	1	"	"	-	0.003	0.006	0.003	0.003	0.007	0.078	0.14
"	"	"	N6	"	April, 73	10	1968	"	-	0.016	0.007	0.006	0.006	0.006	0.037	0.53
"	"	"	"	"	April, 73	1	1964	"	-	0.004	0.005	0.005	0.006	0.006	0.057	0.21
"	"	"	M6	"	April, 73	10	1968	"	-	0.006	0.007	0.005	0.007	0.010	0.044	0.45
"	"	"	"	"	April, 73	2	1964	"	-	0.016	0.008	0.004	0.005	0.009	0.035	0.53
COD	MID N	IVB	H7	ENGLAND	Jan, 74	1	-	MUSCLE	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.008	1.6
"	SEA	"	"	"	Jan, 74	1	-	"	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	0.021	1.2
"	"	"	"	"	Jan, 74	1	-	"	0.004	0.001	0.001	<0.001	0.006	0.018	0.010	0.8
"	"	"	F8	"	Aug, 74	16	-	"	0.001	<0.001	0.003	0.002	<0.001	0.002	0.020	0.6
"	"	"	G9	"	Aug, 74	10	-	"	<0.001	<0.001	0.003	0.002	0.001	0.002	0.030	<1.0
"	"	"	H11	"	Jan, 74	10	-	"	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.007	0.2
"	"	"	K9	"	Jan, 74	1	-	"	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.010	<0.2
PLAICE	COASTAL	IVB	E7	ENGLAND	Mar, 74	9	-	MUSCLE	0.001	<0.001	0.001	0.001	<0.001	0.001	1.4	0.2
"	"	"	D7	"	Feb, 74	10	-	"	<0.001	<0.001	<0.004	0.003	0.001	0.002	0.040	0.6
"	"	"	M7/M8	GERMANY	April, 73	9	1969	"	-	0.016	0.006	0.005	0.004	0.006	0.10	0.67
"	"	"	"	"	April, 73	4	"	"	-	0.032	0.008	0.006	0.007	0.015	0.13	1.1
"	"	"	"	"	April, 73	5	"	"	-	0.008	0.005	0.003	0.005	0.007	0.10	0.40
"	"	"	"	"	July, 74	1	1970	"	-	0.010	0.006	0.004	0.004	0.007	0.19	1.3
"	"	"	"	"	July, 74	1	"	"	-	0.004	0.008	0.003	0.002	0.006	0.12	0.66
"	"	"	"	"	July, 74	1	"	"	-	0.004	0.007	0.003	0.003	0.008	0.14	0.67
"	"	"	"	"	July, 74	1	"	"	-	0.003	0.005	0.007	0.004	0.010	0.12	0.64
"	"	"	"	"	July, 74	1	"	"	-	0.002	0.003	0.002	0.004	0.008	0.092	0.15
PLAICE	MID N	IVB	H7	ENGLAND	Jan, 74	6	-	MUSCLE	<0.001	<0.001	<0.001	0.002	0.002	0.001	0.028	<0.2
"	SEA	"	"	"	Jan, 74	10	-	"	0.001	<0.001	0.002	0.002	0.001	0.002	0.030	0.4
"	"	"	F8	"	Aug, 74	12	-	"	<0.001	<0.001	0.003	0.002	<0.001	0.003	0.020	0.6
"	"	"	G9	"	Aug, 74	10	-	"	<0.001	<0.001	0.002	0.002	0.001	0.003	0.040	<1.0

TABLE 4A (cont.)

C/C's - FISH MUSCLE (2)

SPECIES	SOURCE			COUNTRY	DATE OF COLLECTION	NUMBER ANALYSED	YEAR CLASS	ORGAN	∝ BHC	∂ BHC	DIELDRIN	PP DDE	PP TDE	PP DDT	PCB	% LIPID
HERRING	COASTAL	IVB	E7	ENGLAND	Feb, 74	10	-	MUSCLE	0.009	0.003	0.011	0.013	<0.001	0.020	0.10	5.6
"	"	"	"	"	Mar, 74	9	-	"	0.008	0.003	0.015	0.019	0.014	0.074	0.25	8.4
"	"	IVC	F1	BELGIUM	Dec, 73	15	1970	"	-	0.004	0.008	0.007	0.006	0.016	0.11	3.7
"	"	"	"	"	Dec, 73	10	1971	"	-	0.004	0.008	0.007	0.006	0.013	0.10	5.3
"	"	"	G3	"	Oct, 73	1	1969	"	-	0.004	0.016	0.011	0.011	0.030	0.19	9.2
"	"	"	"	"	Oct, 73	10	1970	"	-	0.006	0.011	0.012	0.009	0.023	0.14	7.5
"	"	"	"	"	Oct, 73	13	1971	"	-	0.005	0.010	0.014	0.008	0.021	0.19	10.1
"	"	"	"	"	Nov, 74	12	1971	"	-	0.006	0.012	0.010	0.011	0.031	0.15	7.4
"	"	"	"	"	Nov, 74	13	1972	"	-	0.006	0.014	0.009	0.013	0.030	0.24	8.3
HADDOCK	MID N SEA	IVB	H11	ENGLAND	Jan, 74	1	-	MUSCLE	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.008	<0.2
"	"	"	"	"	Jan, 74	10	-	"	0.001	0.001	0.002	<0.001	<0.001	<0.001	<0.010	0.6
"	"	"	"	"	Jan, 74	10	-	"	0.001	0.001	0.001	<0.001	<0.001	<0.001	<0.010	<0.2
MACKEREL	MID N SEA	IVB	F8	ENGLAND	Aug, 74	6	-	MUSCLE	0.002	0.005	0.008	0.010	0.005	0.021	0.21	4.6
SOLE	COASTAL	IVB	J5	HOLLAND	May, 74	-	-	MUSCLE	<0.002	<0.002	0.020	0.009	0.013	<0.010	0.28	-
"	"	"	"	"	Nov, 74	-	-	"	0.003	<0.002	0.014	<0.005	<0.005	<0.010	0.29	-
"	"	"	H1	"	Feb, 74	-	-	"	0.002	<0.001	0.005	<0.005	0.005	<0.008	0.12	-
"	"	"	"	"	May, 74	-	-	"	-	<0.002	0.012	0.008	0.010	<0.010	0.29	-
"	"	"	"	"	Nov, 74	-	-	"	<0.002	<0.005	<0.005	<0.005	<0.005	<0.010	0.12	-
"	"	"	-	"	Feb, 74	-	-	"	0.002	0.001	0.007	<0.005	<0.003	<0.008	0.12	-
"	"	"	-	"	May, 74	-	-	"	<0.002	<0.002	0.013	0.010	0.011	0.012	0.25	-
"	"	"	-	"	Aug, 74	-	-	"	0.002	-	0.030	0.005	0.006	0.019	0.80	-
"	"	"	-	"	Nov, 74	-	-	"	0.003	<0.002	0.021	<0.005	<0.005	<0.010	0.63	-
WHITING	COASTAL	IVB	E7	ENGLAND	Feb, 74	10	-	MUSCLE	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.030	0.4
"	"	"	"	"	Mar, 74	10	-	"	<0.001	<0.001	0.002	0.002	0.001	0.002	0.020	0.4
WHITING	MID N SEA	IVB	F8	ENGLAND	Aug, 74	12	-	MUSCLE	<0.001	<0.001	0.003	0.003	0.002	0.004	0.030	0.4
"	"	"	G8	"	Aug, 74	8	-	"	<0.001	<0.001	0.002	0.001	<0.001	0.002	0.010	<1.0
WITCH	MID N SEA	IVB	G11	ENGLAND	Jan, 74	1	-	MUSCLE	0.002	<0.001	0.004	0.002	0.001	0.007	0.078	3.8

TABLE 4B

O/C's - FISH LIVER (1)

SPECIES	SOURCE			COUNTRY	DATE OF COLLECTION	NUMBER ANALYSED	YEAR CLASS	ORGAN	∝ BHC	♂ BHC	DIELDRIN	PP DDE	PP TDE	PP DDT	PCB	% LIPID
COD	COASTAL	IVB	E7	ENGLAND	Feb, 74	4	-	LIVER	0.003	0.020	0.15	0.17	0.15	0.18	0.45	19.6
"	"	"	"	"	Mar, 74	10	-	"	0.040	0.008	0.21	0.40	0.30	0.41	4.8	24.0
"	"	"	M7/M8	GERMANY	July, 74	1	1972	"	-	0.16	0.11	0.16	0.16	0.36	4.6	55.8
"	"	"	"	"	July, 74	1	"	"	-	0.062	0.088	0.14	0.22	0.73	3.5	65.8
"	"	"	"	"	July, 74	1	"	"	-	0.11	0.070	0.10	0.22	0.20	4.6	43.2
"	"	"	"	"	July, 74	1	1970/1	"	-	0.11	0.070	0.20	0.18	0.28	4.8	47.3
"	"	"	"	"	July, 74	1	"	"	-	0.070	0.26	0.23	0.20	0.16	5.1	46.3
"	"	"	M7	"	July, 74	1	"	"	-	0.097	0.053	0.31	0.24	0.44	6.4	-
"	"	"	"	"	July, 74	1	"	"	-	0.048	0.084	0.28	0.13	0.30	7.1	46.2
"	"	"	"	"	July, 74	1	"	"	-	0.048	0.11	0.32	0.16	0.25	8.5	28.8
"	"	"	"	"	July, 74	1	"	"	-	0.048	0.22	0.40	0.24	0.35	7.5	41.9
"	"	"	"	"	July, 74	1	"	"	-	0.036	0.12	0.26	0.16	0.30	3.9	20.8
"	"	"	"	"	July, 74	1	"	"	-	0.036	0.084	0.25	0.13	0.096	5.7	14.6
"	"	"	"	"	July, 74	1	"	"	-	0.036	0.14	0.42	0.24	0.20	8.4	26.1
"	"	"	"	"	July, 74	1	"	"	-	0.048	0.14	0.24	0.20	0.25	6.9	3.71
COD	MID N SEA	IVB	H7	ENGLAND	Jan, 74	1	-	LIVER	0.056	0.019	0.017	0.27	0.097	0.22	2.4	52.0
"	"	"	"	"	Jan, 74	1	-	"	0.054	0.015	0.082	0.62	0.27	0.74	12.	49.6
"	"	"	F8	"	Jan, 74	1	-	"	0.082	0.035	0.019	0.33	0.30	0.46	3.8	55.2
"	"	"	G9	"	Aug, 74	16	-	"	0.043	0.030	0.12	0.20	0.15	0.19	3.0	16.8
"	"	"	H11	"	Aug, 74	10	-	"	0.036	0.013	0.040	0.25	0.18	0.30	3.8	28.0
"	"	"	K9	"	Jan, 74	10	-	"	0.027	0.009	0.068	0.47	0.23	0.52	5.0	51.6
					Jan, 74	1	-	"	0.007	0.008	<0.005	0.20	<0.012	<0.015	2.3	42.8
PLAICE	COASTAL	IVB	E7	ENGLAND	Mar, 74	9	-	LIVER	0.003	0.002	0.012	0.019	0.014	0.027	0.24	2.8
"	"	"	D7	"	Feb, 74	10	-	"	0.004	0.002	0.012	0.054	0.028	0.011	0.68	3.2
PLAICE	MID N SEA	IVB	H7	ENGLAND	Jan, 74	6	-	LIVER	0.006	0.003	0.013	0.022	0.008	0.017	0.28	5.6
"	"	"	"	"	Jan, 74	10	-	"	0.005	0.003	0.012	0.030	0.021	0.017	0.31	8.4
"	"	"	F8	"	Aug, 74	12	-	"	0.003	0.002	0.010	0.013	0.006	0.005	0.15	2.4
"	"	"	G9	"	Aug, 74	10	-	"	0.009	0.004	0.018	0.023	0.025	0.048	0.50	9.0
HERRING	COASTAL	IVB	E7	ENGLAND	Feb, 74	10	-	LIVER	0.007	0.005	0.010	0.019	0.009	0.016	0.20	2.0
HADDOCK	MID N SEA	IVB	H11	ENGLAND	Jan, 74	1	-	LIVER	0.048	0.023	0.008	0.11	0.11	0.11	1.3	48.0
"	"	"	"	"	Jan, 74	10	-	"	0.054	0.019	0.099	0.11	0.071	0.25	1.6	21.0
"	"	"	K9	"	Jan, 74	10	-	"	0.065	0.024	0.10	0.098	0.055	0.14	1.5	25.2
MACKEREL	MID N SEA	IVB	F8	ENGLAND	Aug, 74	6	-	LIVER	0.005	0.005	0.018	0.022	0.016	0.047	0.33	6.8
WHITING	COASTAL	IVB	E7	ENGLAND	Feb, 74	10	-	LIVER	0.038	0.014	0.079	0.19	0.26	0.42	2.4	46.0
"	"	"	"	"	Mar, 74	10	-	"	0.014	0.012	0.17	0.32	0.22	0.41	6.1	61.6
WHITING	MID N SEA	IVB	F8	ENGLAND	Aug, 74	12	-	LIVER	0.052	0.012	0.11	0.46	0.30	0.54	5.0	23.2
"	"	"	G9	"	Aug, 74	8	-	"	0.022	0.024	0.13	0.13	0.13	0.46	3.2	69.0
WITCH	MID N SEA	IVB	G11	ENGLAND	Jan, 74	1	-	LIVER	0.005	0.002	0.008	0.020	0.003	0.011	0.17	8.0

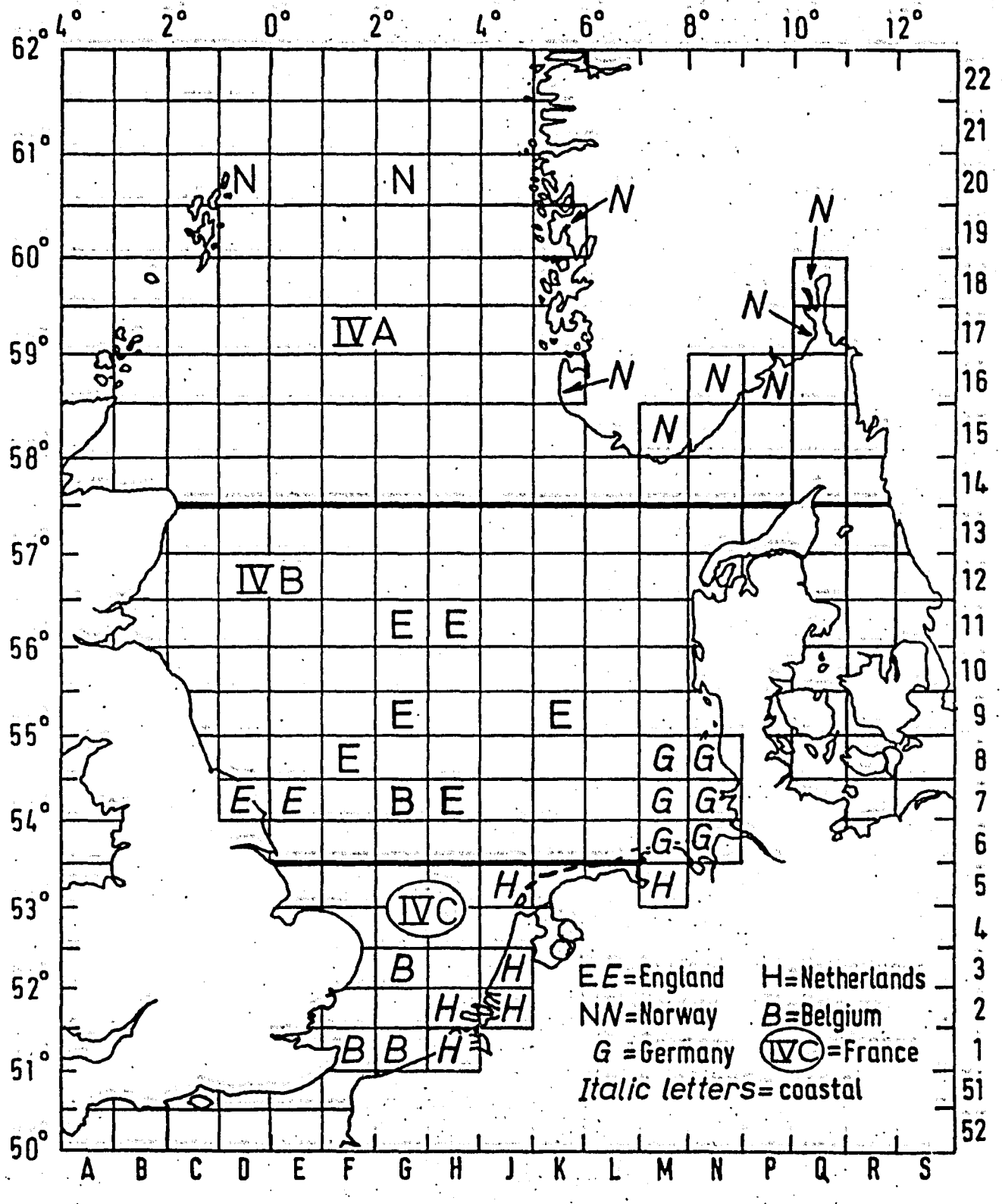

Figure 1. Localities sampled by named countries