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THE ICES COORDINATED MONITORING PROGRAMMES, 1975 and 1976

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THE ICES COORDINATED MONITORING PROGRAMME IN THE NORTH SEA, 1975

Introduction

A baseline survey of pollutant levels in fish and shellfish from the North Sea was conducted under ICES auspices in 1972. The results of this survey were published by the Council in Cooperative Research Report, No.39 (1974). The report concluded that although the North Sea was not seriously polluted there was a need for continued monitoring in certain areas, particularly the coastal margins, the Southern Bight, Kattegat and Skagerrak areas. Since most of the countries concerned were already carrying out routine measurements for their own national purposes it was considered likely that information could be pooled from these various programmes and welded into a Coordinated Monitoring Report on the areas indicated to be worthy of continued study on an international basis.

A new Working Group on Pollution Baseline and Monitoring Studies in the Oslo Commission and ICNAF Areas was formed in 1974. This Group was charged, among other duties, with the conduct of on-going monitoring in the North Sea. In order to achieve this, it adopted the suggested use of selected data from national programmes and laid down certain minimum criteria for the acceptance of data. Data were only to be taken from laboratories which had successfully taken part in the ICES intercalibration exercises for analysis of metals and organochlorine pesticides and PCBs. The actual monitoring data were only to refer to those species which had been included in the Baseline Study, i.e., cod, plaice, herring, mussels and brown shrimps, and all the data were to be submitted to the coordinator by April 30 of the following calendar year so as to allow preparation and publication of a report on an annual basis after approval at the ICES Statutory Meeting.

The first report, on 1974 data, was submitted to the 1975 Statutory Meeting and after some delay, while additional late data were incorporated, this report was published in January 1977 as Cooperative Research Report No.58. Prior to publication the report had also been submitted to the Oslo Commission and the Interim Paris Commission, both of which bodies expressed interest in the report and its coverage and indicated a favourable attitude towards further such reports. This confirmed the ICES view that the reports were worthwhile and steps were taken to organise similar reports on monitoring carried out in 1975 and in 1976.

Results

Unfortunately, for a variety of reasons, many countries were slow to submit data from their 1975 programmes. Indeed, the last set was not received until March 1977. Consequently, this report is somewhat later than intended. Results were finally received from Norway, Denmark, Federal Republic of Germany, Netherlands, Belgium, France, England and Scotland. As was the case for the 1974 report, data were submitted by several countries on a variety of species not originally included in the Baseline Survey. Although such data were included in the report on 1974 monitoring, it was not possible to make any comments on them. For this reason, it has been decided to restrict this report to the coverage originally intended by the Working Group, i.e., cod, plaice, herring, mussels and brown shrimps. The results relevant to these species have been summarised in Tables 1-4 (pp. 6-11), and the approximate positions of sampling are shown in Figure 1 (p.12). Some of the data submitted had been produced by laboratories which had not yet participated in the necessary intercalibration programmes and such data have not therefore been included in this report.

Metals in shellfish

Table 1 (p. 6) summarises the results submitted for metals in shellfish. The mercury levels found in mussels were all relatively low, with an average level of 0.07 mg/kg and a range of 0.02 to 0.13 mg/kg. These levels compare very closely with those found during the baseline survey and although the mean value is numerically lower (0.07 compared to 0.08) than that found in 1974, the number and source of the samples was somewhat different and in analytical terms there is no difference between these values. In almost all cases the samples analysed were from commercially exploited stocks and clearly there can be no cause for concern, from a human health standpoint, at the levels found.

The range of cadmium levels (0.09 - 0.44 mg/kg) found in mussels was similar to that found in the baseline survey and in 1974. In contrast, the levels for lead appear to be considerably lower than those found during the baseline survey. This is almost certainly an artefact brought about by improved methods of analysis for lead, since it has been established that the early methods were inaccurate and gave rise to high results. The copper and zinc values reported are generally within the range expected from the baseline data and the copper values in particular fall within a very narrow range, only two values (7.8 and 9.4 mg/kg) falling outside the range 0.8 - 4.2 mg/kg.

Only one set of results for brown shrimps was reported in 1974, but Belgium, Netherlands and England all reported on the metal levels found in this species during 1975. The mercury levels reported ranged from 0.03 to 0.30 mg/kg (0.07 - 0.39 mg/kg in 1974), with the highest concentrations being found off the NE coast of England and northern coast of Germany. Although these are somewhat higher than the levels found in mussels, they are very similar to those found in brown shrimps sampled during the baseline study. Cadmium and lead levels, however, do appear to be somewhat lower than those found during the baseline study, although, as was pointed out in relation to the mussel data, this may well merely be a reflection of improved analytical methodology. With the exception of one low value for zinc (9.0 mg/kg) in a sample of shrimps from the Wash off the English coast (which also had an unusually low copper content), the range of zinc and copper concentrations found in brown shrimps was very similar to that found during the baseline study.

Organochlorine pesticide and PCB residues in shellfish

Results of analyses of both mussels and brown shrimps were reported by the Federal Republic of Germany, Netherlands and England and are shown in Table 2 (p. 7). In many cases the levels of pesticide residues found in both species were below the level of detection of the methods used (either 0.001, 0.005 or 0.01 mg/kg depending on the residue and the laboratory doing this analysis). In no case did the pesticide residue concentration exceed 0.03 mg/kg and in most cases it was below 0.01 mg/kg. These levels all compare very closely with those found during the baseline survey and in 1974.

The levels of PCB were, as was expected from the baseline survey, higher in both species than the pesticide residue values. The levels of PCB found in brown shrimps were almost all in the range 0.1 to 0.2 mg/kg which, although not exceeding the maximum level found during the baseline study, is a higher average value (many of the baseline samples contained less than 0.10 mg/kg PCB). The same general pattern emerged in the 1974 report, although somewhat less markedly. The same general pattern is also apparent for the PCB levels found in mussel samples analysed by Netherlands and the Federal Republic of Germany, although those analysed by England were found to contain relatively lower concentrations which compared closely with those found during the baseline study.

Metals in fish

The results submitted on analyses of fish muscle for metals are summarised in Table 3A (p. 8). A few results of analyses of fish livers for metals were also submitted by the Federal Republic of Germany and Netherlands and are included in Table 3B (p. 9). In general, the levels of most metals analysed were somewhat lower in muscle than in liver tissue, in particular, the concentrations of both copper and zinc were considerably higher in the livers of both plaice and cod when compared to the levels in muscle.

The range of mercury levels found in cod in the baseline survey was from 0.03 to 0.48 mg/kg. The range in 1975 was smaller (mean levels 0.02 - 0.32 mg/kg) and the levels were in general somewhat lower (mean levels generally below 0.15 mg/kg). A similar pattern of slightly lower mercury levels is apparent for plaice and herring, with the mean concentrations reported for mercury in fish from the North Sea falling in the range 0.01 to 0.26 mg/kg. Levels of lead and cadmium in all three species were generally found to be below the level of detection. The highest values of both zinc and copper were found in herring but the differences between the species, although confirming the 1974 and baseline survey findings, are not very marked.

Although concentrations of up to a few tens of mg/kg of zinc and up to 10 mg/kg of copper were found in livers of cod and plaice, the equivalent values in muscle were generally below 10 mg/kg for zinc and 1 mg/kg for copper in all three species. These levels compare very closely with those found in the baseline survey and in 1974.

Organochlorine pesticide and PCB residues in fish

Table 4A (p. 10) summarises the results of analyses of fish muscle for organochlorine and pesticide residues. The levels of pesticide residues found in cod were uniformly low and, as in the baseline survey, in many cases were found to be below the level of detection of the methods used (generally 0.001 mg/kg). Although, as was found in the baseline survey and in 1974, the levels of PCBs were generally detectable, the highest level found in cod was only 0.07 mg/kg. As was noted in the baseline survey and in 1974, although several fish contained several pesticides at residue levels below detection, in general plaice contained detectable concentrations of both dieldrin and DDT and its metabolites. The highest concentration, 0.039 mg/kg ppDDT, was above the highest level found in 1974 though no higher than was found in 1972 (the year of the baseline). Similarly, the concentrations of PCB found in plaice were higher (0.02 to 0.31 mg/kg) than those in cod. These values were very similar to those found in the baseline survey and compare closely with the range found in 1974 (0.01 to 0.19 mg/kg).

Herring has a much higher lipid content in its muscle tissue than either cod or plaice and, consequently, a somewhat higher concentration of organochlorine pesticide and PCB residues is to be expected. Although this is obvious in the results reported for 1975, none of the individual pesticide residue concentrations exceeded 0.10 mg/kg and in general the levels are similar to those found in 1974 and during the baseline survey. A much wider range of PCB residues (0.08 - 0.90) is apparent in the herring muscle than was found in the muscle of either cod or plaice. A similar pattern was noted in 1974, but no apparent explanation was suggested. It does not appear to reflect lipid content, although it may be related to the sex of the fish analysed and/or spawning times. In general, the highest concentrations of PCBs were found in fish which also contained the higher residues of organochlorine pesticides.

The Netherlands, England, Scotland and the Federal Republic of Germany all reported on the levels of organochlorine pesticide and PCB residues found in the livers of cod and plaice. Liver analyses were not

carried out during the baseline study in 1972, but similar analyses were carried out in 1974 and some results were included in the coordinated monitoring report for that year (Coop.Res.Rep., No.58). For this reason, the data collected in 1975 have been included in this report and are summarised in Table 4B (p.11).

Cod livers contain a very high proportion of lipid and the range found in the 1975 samples was both greater and higher than that recorded in 1974 (range 22 - 72% by weight). It is therefore not surprising that the concentrations of virtually all the pesticide residues were well above the detectable level in almost all samples. However, the levels were generally much the same as those found in 1974 and, with the exception of one sample analysed by the Netherlands which contained 1.41 mg/kg total pesticides and one analysed by England which contained 1.42 mg/kg total pesticides, none of the samples had residue concentrations above 0.9 mg/kg. The samples containing the two highest residue levels were both from the Southern Bight area of the North Sea, which had been identified in the baseline survey as having the highest level of contamination. As was found in 1974, the levels of PCBs were generally in the range of 1.0 to 5.0 mg/kg, although one exceptionally high concentration of 20 mg/kg was reported by the Dutch contributors in a cod from the mid-North Sea region.

In all cases, the concentrations of pesticide residues found in plaice livers were above the level of detection. However, as was noted in 1974, the levels were generally somewhat lower than those found in cod. There appears to be little difference between the levels found in 1975 and those found in 1974 and with the single exception of a 0.49 mg/kg level of dieldrin found in a sample from the Southern Bight of the North Sea (over ten times higher than the highest level recorded in 1974), the pesticide residue levels were all below 0.20 mg/kg. Those samples containing up to 0.2 mg/kg all came from the Southern Bight, an area for which there was no comparable samples in 1974 but which, as was pointed out earlier, was found to be more highly contaminated than most other areas. PCB levels in general compare closely with those found in 1974, but the samples from the Southern Bight contained appreciably higher concentrations and accounted for all three levels over 1.0 mg/kg.

It is interesting to note that, whereas in 1974 (both muscle and liver analyses) and in all the baseline muscle samples, there was no clear preponderance of any of the DDT group of compounds, in 1975 in all but four of the nineteen samples of cod livers analysed and just over half of the plaice samples, DDE exceeded the level of both TDE and the parent compound. This may be pure coincidence, but it may reflect the decreasing use of DDT in Europe.

Summary

The results available from the 1975 national monitoring programmes, as summarised in Tables 1-4 and discussed above, indicate a picture rather similar to that recorded in 1974 and during the baseline survey conducted in 1972. The levels of metals are generally much the same as recorded previously and the level of mercury found in both fish and shellfish in 1975 appeared to be slightly lower than that found previously. Pesticide levels in shellfish were also generally very low and comparable to those found in the baseline. However, levels of PCB in both mussels and shrimps appeared to be somewhat higher than those recorded previously.

In fish the metal levels were, with the exception of mercury, generally the same as previously recorded. Pesticide levels were also low, with no residues in fish muscle above 0.1 mg/kg and most of those found in cod being below or only just above the level of detection. Two interesting features were, however, apparent. In the liver analyses, DDE levels

in general were greater than those of the parent DDT, and PCB levels appeared to be slightly higher than in previous surveys. A close examination of the PCB figures and particularly their relationship to DDT shows that the PCB concentration is in almost all cases greater than that of DDT and usually by a factor of at least ten times. In the baseline survey, this factor was usually in the range of two to ten. This suggests that either concentrations of DDT are falling or those of PCB are rising, or perhaps both phenomena are taking place.

At the time this report was being written, data for the 1976 report were being received and it has been possible to publish both reports simultaneously. From the 1976 data it should be possible to gain further evidence on the apparent decreases in several residue levels and the increase in one and perhaps to decide with some degree of certainty whether these trends are real and continuing. Several factors will, however, no doubt complicate the issue, not least the fact that few of the samples will have been collected from the same place or at the same time and little attention will have been paid to physiological conditions. This is a matter which has been given considerable thought during 1976 and it is possible that in 1977 or 1978 certain changes will be made to the way in which the coordinated monitoring programme is conducted, thereby affording greater continuity and coverage.

Note: Areas designated in the Tables correspond to those indicated on the map (p.12). They do not always correspond with the designations for ICES Fishing Areas.

Table 1. Metals in Shellfish.

Species	Source	Country	Date of Collection	Number or Weight of Sample Analysed	Size Range (mm)	Concentrations in mg/kg Wet Weight					
						Hg	Cd	Pb	Cr	Zn	Cu
Mussel	V -	Norway	1975	12	30 - 50	0.02	0.09	0.3	-	18	1.1
"	V -	"	1975	12	50 - 90	0.02	0.10	0.3	-	22	1.4
"	VI -	"	1975	40	30 - 50	0.04	0.18	0.5	-	24	1.4
"	VI -	"	1975	20	50 - 70	0.03	0.22	0.5	-	25	1.2
"	IVC F3 32	Netherlands	Feb 1975	20 kg	50 - 80	0.09	0.44	1.1	-	26	3.3
"	IVC F3 32	"	Feb 1975	20 kg	50 - 80	0.03	0.20	-	0.28	29	2.3
"	IVC F4 35	"	Feb 1975	20 kg	50 - 80	0.07	0.15	1.4	-	17	4.0
"	IVC F4 35	"	Feb 1975	20 kg	50 - 80	0.13	0.09	-	0.41	21	2.2
"	IVC F3 32	"	May 1975	20 kg	50 - 80	0.08	0.32	2.1	-	44	9.4
"	IVC F3 32	"	May 1975	20 kg	50 - 80	0.06	0.17	-	0.60	43	3.3
"	IVC F4 35	"	May 1975	20 kg	50 - 80	0.08	0.22	0.6	-	22	3.4
"	IVC F4 35	"	May 1975	20 kg	50 - 80	0.02	0.19	-	0.33	24	3.7
"	IVC F2 32	"	Aug 1975	20 kg	50 - 80	0.05	0.24	-	0.49	13	2.5
"	IVC F4 35	"	Aug 1975	20 kg	50 - 80	0.06	0.15	-	0.50	26	1.6
"	IVC F2 32	"	Oct 1975	20 kg	50 - 80	0.03	0.37	-	-	-	1.5
"	IVC F4 35	"	Oct 1975	20 kg	50 - 80	0.04	0.16	-	-	-	1.3
"	IVC F0 34	England	May 1975	29	-	0.04	0.30	0.8	-	14	0.8
"	IVC F0 34	"	Sep 1975	49	-	0.06	0.20	0.5	-	13	1.3
"	VII Côtes de la Manche	France	Feb 1975	2	-	0.07	0.19	0.28	-	17	7.8
"	VIII Côtes Atlantique	"	Feb & Jun 1975	5	-	0.05	0.27	0.77	-	17	2.0
"	VIII Côtes Atlantique	"	Sep 1975	3	-	0.03	0.28	0.76	-	23	4.2
"	VII Côtes de la Manche	"	Oct 1975	4	-	0.05	0.39	0.94	-	21	2.7
Shrimp	IVC F7 35	Netherlands	Feb 1975	15 kg	60 - 80	0.11	0.16	1.2	-	39	16
"	IVC F7 35	"	Feb 1975	15 kg	60 - 80	0.09	0.06	-	0.30	45	11
"	IVC F4 35	"	Feb 1975	15 kg	60 - 80	0.07	-	-	-	-	-
"	IVC F4 35	"	Feb 1975	15 kg	60 - 80	0.07	0.03	-	-	-	9.7
"	IVC F3 31	"	Feb 1975	15 kg	60 - 80	0.03	0.12	0.42	-	43	15
"	IVC F3 31	"	Feb 1975	15 kg	60 - 80	0.07	0.11	-	0.23	46	11
"	IVC F3 32	"	May 1975	15 kg	60 - 80	0.17	0.05	0.64	-	40	20
"	IVC F8 32	"	May 1975	15 kg	60 - 80	0.16	0.13	-	0.32	47	12
"	IVC F4 35	"	May 1975	15 kg	60 - 80	0.11	0.12	1.1	-	35	21
"	IVC F4 35	"	May 1975	15 kg	60 - 80	0.05	0.05	-	0.17	14	12
"	IVC F3 31	"	May 1975	15 kg	60 - 80	0.12	0.23	1.0	-	42	25
"	IVC F3 31	"	May 1975	15 kg	60 - 80	-	-	-	0.26	49	-
"	IVC F7 35	"	Aug 1975	15 kg	60 - 80	0.11	0.03	-	0.13	34	11
"	IVC F4 35	"	Aug 1975	15 kg	60 - 80	0.10	0.03	-	0.12	31	12
"	IVC F3 31	"	Aug 1975	15 kg	60 - 80	0.07	0.05	-	0.14	-	8.4
"	IVC F3 32	"	Oct 1975	15 kg	60 - 80	0.07	0.03	-	-	-	9.8
"	IVC F4 35	"	Oct 1975	15 kg	60 - 80	0.05	0.09	-	-	-	12
"	IVC F3 31	"	Oct 1975	15 kg	60 - 80	-	0.09	-	-	-	12
"	IVC Belgian coast	Belgium	1975	49	-	0.06	0.04	0.87	-	25	13
"	IVB F8 39	England	Jun 1975	110	-	0.30	<0.2	<0.2	-	28.5	29
"	IVC F0 34	"	Oct 1975	120	-	0.06	<0.2	<0.2	-	9.0	1.5
"	IVC F0 32	"	May 1975	178	-	0.10	<0.2	<0.2	0.7	36	31

Table 2. Organochlorines in Shellfish.

Species	Source	Country	Date of Collection	Number Analysed	Size Range (mm)	Concentrations in mg/kg Wet Weight									$\frac{\Sigma PCB}{\Sigma DDT}$	% Lipid
						α HCH	γ HCH	Dieldrin	HCB	ppDDE	ppTDE	ppDDT	ΣDDT	PCB		
Mussel	IVB F8 37	Germany, Fed.Rep. of	Apr 1975	50	55 - 60	-	0.007	0.003	-	0.003	0.003	0.003	0.009	0.15	16.7	0.68
"	IVB F8 37	"	Sep 1975	200	55 - 60	-	0.007	0.004	-	0.004	0.007	0.005	0.016	0.15	9.4	1.35
"	IVB F7 36	"	Apr 1975	150	55 - 60	-	0.006	0.005	-	0.003	0.004	0.003	0.010	0.17	17.0	0.83
"	IVB F7 36	"	Sep 1975	200	55 - 60	-	0.008	0.008	-	0.005	0.004	0.004	0.013	0.22	16.9	0.90
"	IVC F3 32	Netherlands	Feb 1975	20	50 - 80	<0.005	<0.005	<0.01	<0.005	<0.01	<0.01	<0.01	<0.03	0.28	-	-
"	IVC F4 35	"	Feb 1975	20	50 - 80	0.014	<0.005	<0.01	<0.005	<0.01	<0.01	<0.01	<0.03	0.20	-	-
"	IVC F3 32	"	May 1975	20	50 - 80	<0.005	<0.005	<0.01	<0.005	<0.01	<0.01	<0.01	<0.03	0.26	-	-
"	IVC F4 35	"	May 1975	20	50 - 80	<0.005	<0.005	<0.01	<0.005	<0.01	<0.01	<0.01	<0.03	0.23	-	-
"	IVC F3 32	"	Aug 1975	20	50 - 80	<0.005	<0.005	<0.01	<0.005	<0.01	<0.01	<0.01	<0.03	0.11	-	-
"	IVC F4 35	"	Aug 1975	20	50 - 80	<0.005	<0.005	<0.01	<0.005	<0.01	<0.01	<0.01	<0.03	0.14	-	-
"	IVC F3 32	"	Oct 1975	20	50 - 80	<0.005	<0.005	<0.01	<0.005	<0.01	<0.01	<0.01	<0.03	0.10	-	-
"	IVC F4 35	"	Oct 1975	20	50 - 80	<0.005	<0.005	<0.01	<0.005	<0.01	<0.01	<0.01	<0.03	0.24	-	-
"	IVB E8 39	England	May 1975	34	-	<0.001	0.001	<0.001	-	0.002	0.002	<0.001	<0.005	0.017	-	0.8
"	IVC F0 34	"	May 1975	29	-	<0.001	0.002	0.003	-	<0.001	0.001	0.002	<0.004	<0.01	-	0.2
"	IVC F0 34	"	Sep 1975	49	-	<0.001	<0.001	0.002	-	0.002	0.002	0.006	0.010	0.030	3.0	1.2
Shrimp	IVB F8 36	Germany, Fed.Rep. of	May 1975	200	55	-	0.011	0.002	-	0.012	0.028	0.006	0.046	0.22	4.8	1.2
"	IVB F8 36	"	Jun 1975	100	55	-	0.015	0.002	-	0.024	0.026	0.006	0.056	0.14	2.5	0.75
"	IVB F8 37	"	Jun 1975	300	50 - 55	-	0.007	0.008	-	0.010	0.014	0.006	0.030	0.20	6.6	0.67
"	IVB F8 37	"	Jul 1975	1 000	50 - 55	-	0.006	0.004	-	0.006	0.006	0.007	0.019	0.14	7.4	0.83
"	IVC F7 35	Netherlands	Feb 1975	15	60 - 80	0.005	<0.005	<0.01	0.030	<0.01	<0.01	<0.01	<0.03	0.08	-	-
"	IVC F4 35	"	Feb 1975	15	60 - 80	0.007	<0.005	<0.01	<0.005	<0.01	<0.01	<0.01	<0.03	0.19	-	-
"	IVC F3 31	"	Feb 1975	15	60 - 80	<0.005	<0.005	<0.01	0.006	<0.01	<0.01	<0.01	<0.03	0.20	-	-
"	IVC F7 35	"	May 1975	15	60 - 80	<0.005	<0.005	<0.01	<0.005	<0.01	<0.01	<0.01	<0.03	0.06	-	-
"	IVC F4 35	"	May 1975	15	60 - 80	<0.005	<0.005	<0.01	<0.005	<0.01	<0.01	<0.01	<0.03	0.12	-	-
"	IVC F3 31	"	May 1975	15	60 - 80	<0.005	<0.005	<0.01	<0.005	<0.01	<0.01	<0.01	<0.03	0.07	-	-
"	IVC F7 35	"	Aug 1975	15	60 - 80	<0.005	<0.005	<0.01	<0.005	<0.01	<0.01	<0.01	<0.03	0.05	-	-
"	IVC F4 35	"	Aug 1975	15	60 - 80	<0.005	<0.005	<0.01	<0.005	<0.01	<0.01	<0.01	<0.03	0.09	-	-
"	IVC F3 31	"	Aug 1975	15	60 - 80	<0.005	<0.005	<0.01	<0.005	<0.01	<0.01	<0.01	<0.03	0.12	-	-
"	IVC F7 35	"	Oct 1975	15	60 - 80	<0.005	<0.005	<0.01	<0.005	<0.01	<0.01	<0.01	<0.03	0.08	-	-
"	IVC F4 35	"	Oct 1975	15	60 - 80	<0.005	<0.005	<0.01	<0.005	<0.01	<0.01	<0.01	<0.03	0.11	-	-
"	IVC F3 31	"	Oct 1975	15	60 - 80	<0.005	<0.005	<0.01	<0.005	<0.01	<0.01	<0.01	<0.03	0.10	-	-
"	IVB E8 39	England	Jun 1975	110	-	0.004	0.001	0.009	-	0.013	0.011	0.009	0.033	0.17	5.2	1.4
"	IVC F0 34	"	Oct 1975	120	-	0.003	<0.001	0.013	-	0.009	0.004	<0.001	<0.014	0.080	-	2.6
"	IVC F0 32	"	May 1975	178	-	0.001	0.002	0.004	-	0.008	0.002	0.003	0.013	0.10	7.7	1.4

Table 3A. Metals in Fish Muscle.

Species	Source	Country	Date of Collection	Number Analysed	Year Class	Concentrations in mg/kg Wet Weight																
						Hg			Cd			Pb			Cr			Zn			Cu		
						Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
Cod	IVB	Netherlands	1974 late	7	-	0.03	0.13	0.09	-	-	-	-	-	-	0.24	0.41	0.34	3.8	4.4	4.2	0.34	0.68	0.55
"	IVB	"	1975	10	-	0.03	0.10	0.06	-	-	-	-	-	-	0.13	0.36	0.24	3.7	4.8	4.2	0.24	1.3	0.71
"	IVC	"	1974 late	10	-	0.12	0.29	0.19	-	-	-	-	-	-	0.16	0.32	0.22	3.9	4.9	4.3	0.16	1.7	0.49
"	IVC	"	1975	5	-	0.09	0.12	0.10	-	-	-	-	-	-	0.20	0.40	0.26	3.2	4.4	4.1	0.25	1.3	0.81
"	IVB F6 39	Belgium	Jul 1975	15	1972	0.09	0.23	0.14	<0.01	0.05	<0.01	-	-	-	-	-	-	4.3	10	6.0	0.12	0.56	0.34
"	IVC																						
	Belgian coast	"	1975	1	1971	-	-	0.28	-	-	<0.01	-	-	-	-	-	-	-	-	5.9	-	-	0.43
"	" "	"	1975	2	1973	0.11	0.16	0.14	-	-	<0.01	-	-	-	-	-	-	4.8	4.9	4.9	0.38	0.40	0.39
"	" "	"	1975	3	1974	0.12	0.14	0.13	<0.01	0.01	<0.01	-	-	-	-	-	-	4.3	5.8	4.8	0.24	0.60	0.42
"	IVC F1 32	"	Aug 1975	15	1972	0.19	0.60	0.32	<0.01	0.14	0.03	-	-	-	-	-	-	4.1	9.1	5.6	0.19	0.74	0.36
"	IVB E8 39	England	Mar 1975	10		0.06	0.22	0.13	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.3	0.2	2.7	4.4	3.5	0.2	0.4	0.3
"	IVB E8 39	"	Oct 1975	10		0.05	0.21	0.13	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	-	-	2.2	4.0	3.4	<0.2	1.0	<0.2
"	IVB E8 38	"	Mar 1975	10		0.05	0.19	0.10	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.5	<0.2	2.0	3.5	2.7	0.3	1.0	0.6
"	IVB E8 39	"	Mar 1975	10		0.07	0.20	0.13	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.4	<0.2	2.4	5.3	3.4	<0.2	0.8	0.5
"	IVB E8 38	"	Mar 1975	10		0.06	0.09	0.07	<0.2	<0.2	<0.2	<0.2	<0.5	<0.3	<0.2	<0.2	<0.2	2.3	4.6	3.2	0.4	0.9	0.5
"	IVB F2 37	"	Aug 1975	10		0.04	0.14	0.08	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	-	-	3.2	6.3	4.0	0.3	0.5	0.4
"	IVC F2 34	"	Aug 1975	8		0.06	0.19	0.10	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	-	-	2.5	4.0	3.2	<0.2	0.6	0.3
"	IVC F0 35	"	Feb 1975	10		0.06	0.18	0.10	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.4	<0.2	2.7	4.6	3.5	0.2	0.7	0.4
"	IVB E4 39	Scotland	Sep/Oct '75	10	-	0.04	0.18	0.083	-	-	<0.02	-	-	<0.1	-	-	-	3.1	4.2	3.8	0.14	0.31	0.22
"	IVB E9 49	"	Sep/Oct '75	10	-	0.01	0.04	0.024	-	-	<0.02	-	-	<0.1	-	-	-	3.0	4.8	3.9	0.12	0.21	0.17
"	IVB E6 44	"	Sep/Oct '75	10	-	0.02	0.05	0.037	-	-	<0.02	-	-	<0.1	-	-	-	3.8	5.2	4.4	0.14	0.24	0.20
"	IVB F1 49	"	Sep/Oct '75	10	-	0.02	0.06	0.039	-	-	<0.02	-	-	<0.1	-	-	-	3.6	4.2	4.0	0.18	0.29	0.23
"	IVB F2 45	"	Sep/Oct '75	10	-	0.02	0.08	0.048	-	-	<0.02	-	-	<0.1	-	-	-	3.2	5.3	4.4	0.17	0.53	0.29
"	IVB E8 43	"	Sep/Oct '75	10	-	0.07	0.24	0.11	-	-	<0.02	-	-	<0.1	-	-	-	3.4	5.2	4.5	0.16	0.30	0.24
"	IVB E6 41	"	Sep/Oct '75	10	-	0.08	0.24	0.16	-	-	<0.02	-	-	<0.1	-	-	-	3.9	5.0	4.5	0.10	0.35	0.35
Plaice	IIIA G0 41	Denmark	1975	-	14-35cm	0.01	0.04	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
"	IVB F8 36	Germany, Fed.Rep. of	Jul 1975	-	1971/2	-	-	0.04	-	-	0.003	-	-	0.037	-	-	-	-	-	5.0	-	-	0.23
"	IVC	"	Sep 1975	-	1968	-	-	0.12	-	-	0.004	-	-	0.05	-	-	-	-	-	3.6	-	-	0.20
"	IVC	"	Sep 1975	-	1969	-	-	0.07	-	-	0.004	-	-	0.05	-	-	-	-	-	3.6	-	-	0.19
"	IVC	Belgium	Jun/Jul '75	15	1969	0.12	0.37	0.26	-	-	-	-	-	-	-	-	-	4.4	6.9	5.6	0.20	0.86	0.42
"	IVC																						
	Belgian coast	"	1975	1	1969	-	-	0.16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
"	" "	"	1975	3	1971	0.18	0.23	0.21	<0.01	0.01	<0.01	-	-	-	-	-	-	5.4	7.9	6.4	0.46	0.50	0.48
"	" "	"	1975	14	1972	0.05	0.20	0.11	-	-	<0.01	-	-	-	-	-	-	4.9	11	6.7	0.16	0.64	0.44
"	" "	"	1975	7	1973	0.04	0.16	0.10	-	-	<0.01	-	-	-	-	-	-	5.3	7.7	6.2	0.39	1.2	0.71
"	" "	"	1975	7	1974	0.04	0.09	0.07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
"	" "	"	1975	2	1975	0.05	0.06	0.06	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
"	IVD	"	May 1975	15	1969	0.08	1.5	0.50	<0.01	0.03	<0.01	-	-	-	-	-	-	3.9	8.8	6.0	0.13	0.45	0.25
"	IVD	"	Jun 1975	8	1969	0.15	0.32	0.22	<0.01	0.07	<0.01	-	-	-	-	-	-	4.2	7.2	5.4	0.28	0.61	0.42
"	IVB E8 39	England	Mar 1975	10	-	0.05	0.23	0.14	<0.2	<0.2	<0.2	<0.2	0.3	<0.2	<0.2	0.7	<0.3	2.9	5.8	3.9	0.5	1.5	0.8
"	IVB F0 38	"	Mar 1975	10	-	0.05	0.18	0.10	<0.2	0.2	<0.2	<0.2	0.5	<0.2	<0.2	0.4	<0.2	1.9	4.4	3.2	0.2	0.9	0.4
"	IVB E8 39	"	Oct 1975	8	-	0.03	0.08	0.05	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	-	-	3.0	5.0	3.9	0.6	0.9	0.7
"	IVB F2 37	"	Aug 1975	10	-	0.04	0.16	0.09	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	-	-	3.4	8.0	4.6	0.2	0.6	0.3
"	IVB F1 36	"	Jul 1975	10	-	0.02	0.04	0.03	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	-	-	3.5	6.0	4.9	<0.2	0.5	0.3
"	IVC F2 34	"	Aug 1975	10	-	0.04	0.13	0.07	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	-	-	2.5	5.5	4.3	<0.2	0.4	<0.2
"	IVD F0 30	"	Aug 1975	7	-	0.05	0.15	0.10	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	-	-	4.0	6.5	4.7	<0.2	0.4	<0.2
"	IVB E4 39	Scotland	Sep/Oct '75	10	-	0.02	0.15	0.057	-	-	<0.02	-	-	<0.1	-	-	-	4.4	5.4	5.2	0.22	0.48	0.26
"	IVB E9 49	"	Sep/Oct '75	10	-	0.01	0.02	0.016	-	-	<0.02	-	-	<0.1	-	-	-	4.6	5.6	5.2	0.02	0.18	0.12
"	IVB E6 44	"	Sep/Oct '75	10	-	0.01	0.06	0.029	-	-	<0.02	-	-	<0.1	-	-	-	3.7	4.7	4.3	0.14	0.35	0.22
"	IVB F1 49	"	Sep/Oct '75	10	-	0.01	0.11	0.062	-	-	<0.02	-	-	<0.1	-	-	-	3.2	6.0	4.6	0.10	0.53	0.24
"	IVB F2 45	"	Sep/Oct '75	10	-	0.05	0.19	0.084	-	-	<0.02	-	-	<0.1	-	-	-	2.8	5.4	4.4	0.14	0.38	0.20
"	IVB E8 43	"	Sep/Oct '75	10	-	0.03	0.12	0.063	-	-	<0.02	-	-	<0.1	-	-	-	3.0	5.4	4.4	0.15	0.24	0.18
"	IVB E6 41	"	Sep/Oct '75	10	-	0.03	0.09	0.059	-	-	<0.02	-	-	<0.1	-	-	-	4.4	5.4	4.9	0.22	0.48	0.33

/Cont'd.

Table 3A (Continued)

Species	Source	Country	Date of Collection	Number Analysed	Year Class	Concentrations in mg/kg Wet Weight																	
						Hg			Cd			Pb			Cr			Zn			Cu		
						Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
Herring	IV	France	Apr 1975	9	29-35cm	0.03	0.12	0.08	0.01	0.20	0.12	-	-	-	-	-	-	8.2	15	11	-	-	-
"	IVB E8 40	England	Sep 1975	10	-	0.04	0.17	0.09	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	3.2	7.1	5.1	1.0	1.4	1.2
"	IVB F0 37	"	Mar 1975	10	-	0.02	0.10	0.05	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.3	<0.2	5.8	9.0	7.3	1.0	1.5	1.2
"	IVB E8 39	"	Oct 1975	10	-	0.01	0.09	0.03	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	-	-	3.0	6.0	5.1	<0.2	1.1	0.8
"	IVB E8 40	"	Apr 1975	25	2-3	0.02	0.08	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
"	IVB E8 40	"	Aug 1975	25	2	0.01	0.11	0.06	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
"	IVC F0 32	"	Feb 1975	25	4-5	0.21	0.62	0.39	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
"	IVB E4 39	Scotland	Sep/Oct '75	10	-	0.04	0.15	0.088	-	-	<0.02	-	-	<0.1	-	-	-	3.3	4.9	4.4	0.34	0.74	0.54
"	IVB E3 42	"	Sep/Oct '75	10	-	0.03	0.08	0.058	-	-	<0.02	-	-	<0.1	-	-	-	4.1	6.6	4.8	0.13	0.77	0.37
"	IVB E4 45	"	Sep/Oct '75	10	-	0.01	0.06	0.023	-	-	<0.02	-	-	<0.1	-	-	-	4.3	6.1	4.9	0.40	1.7	0.76
"	IVB E9 49	"	Jan 1976	10	-	0.01	0.05	0.04	-	-	<0.02	-	-	<0.1	-	-	-	4.9	9.4	6.5	0.41	1.0	0.66
"	IVB E6 44	"	Jan 1976	10	-	0.01	0.03	0.02	-	-	<0.02	-	-	<0.1	-	-	-	5.1	10.5	7.4	0.41	1.0	0.72
"	IVB E9 49	"	Oct 1975	10	-	0.01	0.08	0.03	-	-	<0.02	-	-	<0.1	-	-	-	5.6	7.3	6.3	0.41	0.90	0.63

Table 3B. Metals in Fish Liver.

Species	Source	Country	Date of Collection	Number Analysed	Year Class	Concentrations in mg/kg Wet Weight																	
						Hg			Cd			Pb			Cr			Zn			Cu		
						Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
Cod	IVB	Germany, Fed.Rep. of	Jul 1975	10	1971-1972	0.03	0.38	0.08	0.022	0.048	0.034	0.09	0.20	0.13	-	-	-	12.9	22.5	18.4	4.3	9.3	7.1
"	IVB	Netherlands	late 1974	1	-	-	-	0.05	-	-	0.07	-	-	0.12	-	-	0.19	-	-	30.3	-	-	12.5
"	IVB	"	1975	1	-	-	-	0.02	-	-	0.04	-	-	0.04	-	-	0.22	-	-	27.3	-	-	8.0
"	IVC	"	late 1974	1	-	-	-	0.04	-	-	0.02	-	-	0.14	-	-	0.03	-	-	22.6	-	-	11.1
"	IVC	"	1975	1	-	-	-	0.08	-	-	0.02	-	-	0.06	-	-	0.07	-	-	24.1	-	-	11.6
Plaice	IVC	Germany, Fed.Rep. of	Jul 1975	10	1971-1972	0.04	0.09	0.06	0.08	0.29	0.17	0.18	0.41	0.25	-	-	-	11.6	61.1	27.9	3.4	8.3	5.5
"	IVC	"	Sep 1975	4	1968	0.06	0.12	0.09	0.24	0.43	0.35	0.16	0.36	0.25	-	-	-	11.0	39.0	25.6	1.2	10.3	4.6
"	IVC	"	Sep 1975	6	1969	0.06	0.12	0.09	0.24	0.33	0.29	0.35	0.73	0.54	-	-	-	29.4	46.0	37.7	5.1	7.1	6.1

Table 4A. Organochlorines in Fish Muscle.

Species	Source	Country	Date of Collection	Number Analysed	Year Class	Concentrations in mg/kg Wet Weight								PCB/ΣDDT	% Lipid
						α HCH	γ HCH	Dieldrin	ppDDE	ppTDE	ppDDT	ΣDDT	PCB		
Cod	IVB E8 39	England	Mar 1975	10	-	0.001	0.002	0.004	0.005	0.002	0.006	0.013	0.05	3.8	1.0
"	IVB E8 39	"	Oct 1975	10	-	<0.001	<0.001	0.001	0.004	<0.001	<0.001	<0.006	0.071	-	0.2
"	IVB E8 38	"	Mar 1975	10	-	<0.001	<0.001	0.002	0.002	<0.001	0.001	<0.004	0.02	-	0.4
"	IVB E8 39	"	Mar 1975	10	-	<0.001	<0.001	0.003	0.002	<0.001	0.003	<0.006	0.02	-	0.2
"	IVB E8 38	"	Mar 1975	10	-	<0.001	<0.001	0.002	0.002	<0.001	0.002	<0.005	0.02	-	0.2
"	IVB F2 37	"	Aug 1975	10	-	<0.001	<0.001	0.002	0.001	0.003	0.006	0.010	0.02	2.0	0.2
"	IVC F2 34	"	Aug 1975	8	-	<0.001	<0.001	0.001	0.001	<0.001	0.001	<0.003	0.02	-	0.2
"	IVC F0 35	"	Feb 1975	10	-	<0.001	0.001	0.004	0.001	<0.001	<0.001	<0.003	0.01	-	0.2
"	IVA E6 44	Scotland	Jan 1975	12	-	-	-	0.001	0.004	0.002	0.001	0.007	0.04	5.7	0.3
"	IVA E6 44	"	Jul 1975	10	-	-	-	0.004	0.001	0.001	0.002	0.004	0.03	7.5	0.3
"	IVA E7 41	"	Jul 1975	13	-	-	-	0.001	0.002	<0.001	<0.001	<0.004	0.02	-	0.2
"	IVA F2 45	"	Sep 1975	10	-	-	-	0.001	0.001	<0.001	0.002	<0.004	0.01	-	0.1
Plaice	IVB G0 34	Germany, Fed.Rep. of	Sep 1975	2	1968	-	0.04	0.010	0.012	0.005	0.004	0.021	0.14	6.7	0.14
"	IVB G0 34	"	Sep 1975	1	1969	-	0.001	0.006	0.011	0.003	0.004	0.018	0.18	10	0.19
"	IVB G0 34	"	Sep 1975	2	1970	-	0.002	0.009	0.007	0.003	0.003	0.013	0.17	13	0.12
"	IVB G0 34	"	Sep 1975	5	1971	-	0.002	0.008	0.008	0.003	0.003	0.014	0.16	11	0.13
"	IVB E8 39	England	Mar 1975	10	-	<0.001	<0.001	0.003	0.004	0.002	0.005	0.011	0.04	3.6	0.6
"	IVB F0 38	"	Mar 1975	10	-	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.003	0.10	-	0.2
"	IVB E8 39	"	Oct 1975	10	-	<0.001	<0.001	0.001	0.001	<0.001	<0.001	<0.003	0.16	-	<0.2
"	IVB F1 36	"	Jul 1975	10	-	<0.001	<0.001	0.002	0.003	<0.001	0.001	<0.005	0.04	-	0.6
"	IVC F0 30	"	Aug 1975	7	-	<0.001	<0.001	0.001	0.003	0.001	0.002	0.006	0.03	5.0	0.2
"	IVC F3 34	"	Aug 1975	8	-	<0.001	<0.001	0.004	0.003	0.001	0.003	0.007	0.11	16	1.0
"	IVC F2 34	"	Aug 1975	9	-	0.001	0.001	0.008	0.014	0.024	0.039	0.077	0.31	4.0	0.6
"	IVA E6 44	Scotland	Jan 1975	5	-	-	-	0.006	0.008	0.005	0.004	0.017	0.07	4.1	0.9
"	IVA E6 44	"	Jul 1975	10	-	-	-	0.001	0.002	<0.002	0.002	<0.006	0.04	-	0.8
"	IVA E7 41	"	Jul 1975	9	-	-	-	0.003	0.007	0.004	0.003	0.014	0.07	5.0	0.9
"	IVA F2 45	"	Sep 1975	10	-	-	-	0.001	0.003	<0.001	0.001	<0.005	0.02	-	0.7
Herring	IV	France	Apr 1975	9	-	-	-	-	0.071	0.031	0.076	0.18	0.33	1.9	-
"	IVB E8 40	England	Sep 1975	10	-	0.004	0.003	0.010	0.033	0.005	0.020	0.058	0.18	3.1	4.8
"	IVB F0 37	"	Mar 1975	10	-	0.005	0.006	0.017	0.015	0.006	0.014	0.035	0.14	4.0	7.6
"	IVB E8 39	"	Oct 1975	10	-	0.003	0.002	0.006	0.007	0.002	0.007	0.016	0.046	2.9	6.8
"	IVB E8 40	"	Apr 1975	25	2 - 5	0.004	0.002	0.013	0.012	0.006	0.012	0.030	0.11	3.7	9.0
"	IVB E8 40	"	Aug 1975	25	2	0.003	0.002	0.011	0.010	0.004	0.008	0.022	0.09	4.1	7.9
"	IVC F0 32	"	Feb 1975	25	4 - 5	0.007	0.019	0.045	0.076	0.043	0.051	0.17	0.90	0.5	7.8
"	IVA E6 44	Scotland	Jan 1975	10	-	-	-	0.005	0.009	0.003	0.005	0.017	0.08	4.7	4.0

Table 4B. Organochlorines in Fish Liver.

Species	Source	Country	Date of Collection	Number Analysed	Year Class	Concentrations in mg/kg Wet Weight								PCB/ΣDDT	% Lipid
						α HCH	γ HCH	Dieldrin	ppDDE	ppTDE	ppDDT	ΣDDT	PCB		
Cod	IVB F6 37	Germany, Fed.Rep. of	Sep 1975	8	-	-	0.038	0.096	0.22	0.33	0.19	0.74	5.6	7.6	55.2
"	IVA	Netherlands	1974-5	10	-	0.03	<0.001	0.05	0.16	0.14	0.12	0.42	1.8	4.3	40.4
"	IVB	"	1974-5	6	-	0.072	0.016	0.19	0.5	0.23	0.07	0.80	8.5	11	40.5
"	IVC	"	1974-5	10	-	0.05	0.02	0.40	0.42	0.25	0.27	0.94	20	21	52.7
"	IVB E8 39	England	Mar 1975	10	-	0.056	0.012	0.25	0.26	0.16	0.29	0.71	3.1	4.4	65.6
"	IVB E8 39	"	Oct 1975	10	-	0.040	0.014	0.10	0.30	0.090	0.21	0.60	3.7	6.2	52.8
"	IVB E8 38	"	Mar 1975	10	-	0.035	0.018	0.22	0.26	0.084	0.29	0.63	3.4	5.4	22.4
"	IVB E8 39	"	Mar 1975	10	-	0.018	0.016	0.13	0.32	0.040	0.046	0.41	3.1	7.6	56.8
"	IVB E8 38	"	Mar 1975	10	-	0.014	0.004	0.016	0.87	0.14	0.38	1.4	5.7	4.1	31.2
"	IVB F2 37	"	Aug 1975	10	-	0.008	0.012	0.12	0.18	0.084	0.15	0.41	4.7	11	27.2
"	IVC F2 34	"	Aug 1975	8	-	0.030	0.016	0.16	0.33	0.11	0.17	0.61	8.4	14	41.6
"	IVC F0 35	"	Feb 1975	10	-	0.042	0.024	0.18	0.30	0.084	0.075	0.46	3.4	7.4	72.4
"	IVA E6 44	Scotland	Jan 1975	12	-	-	-	0.05	0.15	0.07	0.11	0.33	1.6	4.8	38.4
"	IVA E6 44	"	Jul 1975	10	-	-	-	0.09	0.17	0.18	0.27	0.62	4.9	7.9	49.1
"	IVA E7 41	"	Jul 1975	13	-	-	-	0.21	0.25	0.11	0.08	0.44	4.2	9.5	35.3
"	IVA F2 45	"	Sep 1975	10	-	-	-	0.06	0.16	0.17	0.21	0.54	1.8	3.3	59.0
Plaice	IVB	Germany, Fed.Rep. of	Sep 1975	10	1971	-	0.009	0.014	0.043	0.018	0.096	0.16	0.41	2.6	2.9
"	IVB E8 39	England	Mar 1975	10	-	0.001	0.002	0.011	0.014	0.054	0.013	0.084	0.11	1.3	6.4
"	IVB F0 38	"	Mar 1975	10	-	<0.001	<0.001	0.007	0.006	0.004	0.005	0.015	0.09	6.0	0.8
"	IVB E8 39	"	Oct 1975	8	-	0.002	0.002	0.010	0.014	0.007	0.008	0.029	0.18	6.2	6.0
"	IVB F1 36	"	Jul 1975	10	-	0.006	0.003	0.016	0.049	0.012	0.016	0.077	0.80	10	3.6
"	IVC F0 30	"	Aug 1975	7	-	0.014	0.012	0.038	0.19	0.038	0.17	0.40	2.2	5.5	30.0
"	IVC F3 34	"	Aug 1975	9	-	0.012	0.011	0.088	0.16	0.052	0.13	0.34	5.5	16	16.4
"	IVC F2 34	"	Aug 1975	10	-	0.009	0.013	0.49	0.054	0.11	0.15	0.31	1.9	6.1	17.6
"	IVA E6 44	Scotland	Jan 1975	5	-	-	-	0.036	0.013	0.013	0.014	0.040	0.50	13	5.8
"	IVA E6 44	"	Jul 1975	10	-	-	-	0.011	0.014	0.023	0.037	0.074	0.16	2.2	23.9
"	IVA E7 41	"	Jul 1975	9	-	-	-	0.035	0.043	0.073	0.047	0.16	0.79	4.8	15.4
"	IVA F2 45	"	Sep 1975	10	-	-	-	0.007	0.038	0.012	0.004	0.054	0.31	5.7	11.6
Herring	IVB E8 40	England	Sep 1975	10	-	0.072	0.044	0.68	0.019	0.59	0.35	0.96	0.15	0.2	1.2
"	IVB F0 37	"	Mar 1975	10	-	0.002	0.002	0.013	0.011	0.002	0.011	0.024	0.08	3.3	3.2
"	IVB E8 39	"	Oct 1975	10	-	0.008	0.003	0.013	0.082	<0.004	0.018	<0.10	1.5	15	8.0

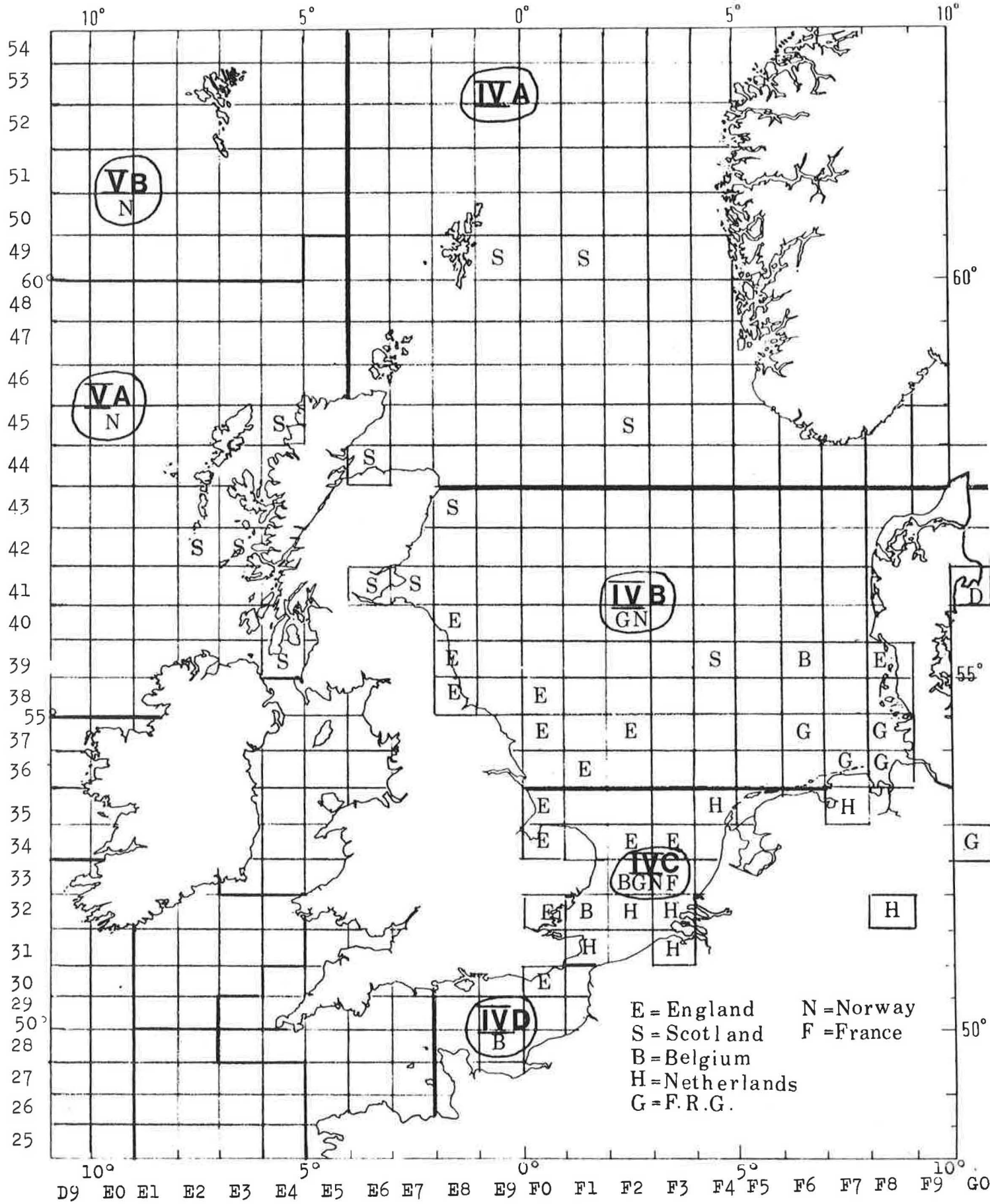

Figure 1. Localities sampled by named countries, 1975.

THE ICES COORDINATED MONITORING PROGRAMME 1976

Introduction

The results of the baseline survey of pollutant levels in fish and shellfish from the North Sea carried out in 1972 (Coop.Res.Rep., No.39 (1974)) revealed that, although the majority of the area studied was only lightly contaminated, certain areas, in particular the coastal margins and the Southern Bight, merited further study. It was accordingly agreed that a coordinated monitoring programme should be conducted, under the general auspices of ICES, and that annual Coordinated Monitoring Reports should be produced.

To this end elements of national programmes already planned or underway were identified and the relevant countries agreed to submit results, from these sections of their programmes, to a coordinator not later than 30 April of the following calendar year. The elements selected were restricted to those species sampled in the baseline survey, in an attempt to maintain comparability of data, and data were only to be accepted from those laboratories which had successfully taken part in the ICES inter-calibration exercises for metals, organochlorine pesticides and PCBs. Two reports have since been prepared based on data from programmes conducted in 1974 (Coop.Res.Rep., No.58 (1977)) and in 1975 (this volume).

A baseline study of pollutant levels in the North Atlantic was carried out in 1975. This study extended the coverage of the earlier North Sea baseline westwards and southwards to cover the entire Oslo Commission area and parts of the area of the International Commission for the Northwest Atlantic Fisheries. At the same time, samples were again taken from the North Sea. As in the previous survey, the emphasis was placed on fish, since these are of interest from a human health standpoint and act as integrators of many pollutants. They are therefore suitable for providing "broad-based" pictures of the state of pollution. Inevitably some different species had to be used, but continuity with the earlier study was maintained via the use of cod.

Upon completion of this North Atlantic study, it was concluded that the majority of the area was not seriously contaminated and that the only areas definitely worthy of continued study were the Irish Sea and the eastern seaboard of Canada and the United States, in particular the Gulf of St. Lawrence. It was recognised that certain other areas which had been inadequately surveyed may need to be added to these identified key areas at a later date and that, as more information became available from the USA and Canada, their effort might be concentrated on specific areas rather than the entire seaboard of North America. It was agreed that data should be called for from the identified areas and should be combined with those already being collected by ICES for the North Sea to produce a single Coordinated Monitoring Report. The same type of restrictions were placed on the type of data to be submitted and all data were to be submitted to a coordinator before 30 April of the following calendar year, starting with data collected in 1976.

This report is based upon data received from Norway, Federal Republic of Germany, Netherlands, Belgium, France, England, Scotland and Ireland.

Results

In most cases, the data received only related to species covered in the baseline studies and, following the policy adopted for the 1975 report, only such data have been included in this summary, i.e., the report is based on data on cod, plaice, herring and sole, brown shrimps and mussels. The results relevant to these species are summarised in Tables 1-4 (pp.19-25). and the approximate positions of sampling are shown in Figure 1 (p. 26).

Additionally, following the practice adopted for previous such reports, only data submitted by laboratories which have successfully intercalibrated their methodologies have been included.

Metals in shellfish

Table 1 (p.19) summarises the results submitted for metals in shellfish. The majority of the results received related to mussels; only the Netherlands submitted data on shrimps. The mercury levels reported were all relatively low, ranging from < 0.02 to 0.09 mg/kg for mussels and from 0.04 to 0.18 mg/kg for shrimps. For the few samples of mussels from the North Sea, the mean value was 0.06 mg/kg whereas the mean value in 1974 was 0.08 and in 1975 0.07 mg/kg. It is, however, doubtful, on the basis of the few samples analysed, whether there is any real difference from year to year. In all cases, the samples analysed were taken from commercially-exploited stocks and there can be no cause for concern, from a human health standpoint, at the levels found.

With the exception of one high concentration (1.1 mg/kg), the level of cadmium found in mussels was similar to that found during the baseline surveys. The apparent decrease in levels of lead, noted in 1974, has been maintained but it should be recognised that this is probably largely a result of improved analytical techniques and not a genuine decrease in residue concentrations. The results obtained in 1976 agree closely with those reported in 1975. The copper and zinc values for mussels are unremarkable and, with the exception of one unusually high concentration of zinc (64 mg/kg), they fall within a narrow range for both metals (0.6 - 6.6 mg/kg for copper and 10 - 32 mg/kg for zinc).

Organochlorine pesticide and PCB residues in shellfish

Results for analyses of mussels were reported by France, the Federal Republic of Germany, Netherlands and England, but for brown shrimps only the Federal Republic of Germany and Netherlands reported any data. A summary of those received is given in Table 2 (p.20). As in the baseline surveys and in 1974 and 1975, many of the levels were reported to be below the level of detection of the methods used (0.001 or 0.01 mg/kg depending on the residue in question). In no case did the level of any one pesticide in mussels exceed 0.015 mg/kg and in all but five cases it was below 0.01 mg/kg. The levels of dieldrin reported in mussels were entirely consistent with those found in 1975, although the general pattern of DDT group values was lower than in previous surveys. PCB concentrations in mussels including those found by the Netherlands, which in 1975 reported the highest levels, were also generally lower than those reported previously.

The Federal Republic of Germany and Netherlands were the only countries to submit data on the levels of organochlorine pesticides and PCBs in brown shrimps. The samples taken in 1976 by the Federal Republic of Germany were from the same sites as those sampled in 1975, but were taken slightly later in the year than in 1975 (August instead of May-July). Levels of all residues found, except DDT, appear to have been slightly lower than in 1975 although interestingly, as it is against the trend, DDT concentrations were higher than those of either DDE or TDE residues for almost all cases. Netherlands samples were below the level of detection of the method used. As was noted in previous years for both mussels and shrimps, PCB residue levels were higher than those found for pesticides, usually by a factor of about ten. However, although the levels appear to be slightly higher than those reported found during the North Sea baseline, they are lower than those found in 1975 and 1976. (The highest value in 1975 from the same area was 0.22 mg/kg with a mean of 0.18 mg/kg, whereas in 1976 the highest level was 0.48 mg/kg with a mean of 0.12 mg/kg.)

Metals in fish

The results submitted on analysis of fish muscle for metals are summarised in Table 3A (p.21) and a very few results of analyses of metals in fish liver are presented in Table 3B (p.22).

The data on livers can be compared with similar figures presented in the 1975 data report and, as noted in that report, the concentrations of mercury, lead and cadmium were all somewhat higher than those found in muscle tissue.

The range of mean mercury levels found in cod in the North Sea baseline study was from 0.03 to 0.48 mg/kg, in 1975 the range found was somewhat smaller (0.02 - 0.32 mg/kg), and in 1976 the range (0.04 - 0.30 mg/kg) was very similar. The few results reported for cod from the Irish Sea compare closely with those found in the 1975 baseline study. Levels of mercury in both sole and herring from the North Sea were generally low; the highest mean concentration was only 0.27 mg/kg, with this concentration reported in a sample taken from the Southern Bight of the North Sea, an area identified as being more polluted than most others in the 1972 baseline of that area. The highest concentrations of mercury found in sole were in a small sample taken from the North Irish Sea (mean 0.6 mg/kg).

An even higher level was reported to have been found in one sample of plaice from this same area and, although similar samples of plaice analysed by England from the same area were found to contain lower concentrations of mercury, this high value is not dissimilar to levels reported in the 1975 baseline survey report and elsewhere.

In all four species, most countries reported the levels of cadmium found to be generally below the level of detection of the method used. Only the Federal Republic of Germany and Ireland had used a method sufficiently sensitive to detect cadmium (levels 0.00X mg/kg) and it should be recognised that such levels as <0.1 or <0.2 mg/kg probably mean levels of the same order as those reported by the Federal Republic of Germany. A similar point applies to the results for lead. Recent work suggests that the true level of lead in fish tissue is similar to that reported by the Federal Republic of Germany, e.g., 0.02 mg/kg in plaice, and this tends to be confirmed by the <0.2 mg/kg reported by England for most of their samples.

As was noted for the shellfish data above and in the 1975 report on fish data, the levels of copper and zinc in fish muscle tissue, almost regardless of species, fell within a narrow range. This was also noted in the baseline study and, as recent work suggests that fish, at least, can regulate the copper and zinc muscle burdens, it is perhaps doubtful whether such studies are worth continuing.

Organochlorine pesticide and PCB residues in fish

Table 4A (p.23) summarises the results of analyses of fish muscle for organochlorine and pesticide residues. The levels of pesticide residues found in cod, plaice and sole were uniformly low and, as in the baseline survey, were often below the level of detection of the methods used (generally 0.001 mg/kg). In contrast, the levels of PCB present were generally above the level of detection, although the highest level found in cod from areas sampled in 1976 was only 0.18 mg/kg (in 1975, 0.07 mg/kg). The highest residue levels of PCB found in cod were in a sample from the German Bight. Plaice, as was noted in 1975, especially those from the North Sea contained higher concentrations of PCB than cod from the same area. The levels of dieldrin were all low in cod, plaice and sole - the highest was only 0.008 mg/kg. In the DDT group, DDE appeared to be the predominant residue in that almost all samples contained DDE at detectable levels, whereas in many cases DDT and TDE were not detectable.

In only a very few instances did the level of any of the DDT group exceed 0.01 mg/kg in samples of cod, plaice or sole taken in the North Sea and the highest levels were below those reported in 1974 and 1975.

Herring, as was noted in the baseline surveys, typically contain higher residue levels of both pesticides and PCBs in their muscle tissue. It is, therefore, not surprising that the highest levels of both types of organochlorine compounds were found in herring. The levels found in herring from the North Sea were, however, noticeably lower than those reported in 1974 and 1975; the highest pesticide residue level was less than 0.02 mg/kg, whereas in 1975 it was 0.076 mg/kg. Concentrations in excess of 0.1 mg/kg were found in herring from the Clyde area of the North Irish Sea. This area was not sampled during the 1975 baseline survey of the North Atlantic, but has previously been reported to be heavily contaminated with both pesticide and PCB residues. The highest concentrations of PCB were also found in herring from this area and, at 1.23 mg/kg, were almost one order of magnitude higher than the PCB concentrations found in herring taken from any other area. Elsewhere, the highest PCB level was 0.13 mg/kg and in the North Sea it was 0.13 mg/kg compared to 0.90 mg/kg in 1975.

In plaice, sole and cod from the Irish Sea, and to a lesser extent from the English Channel, there is some indication that levels of both PCB and pesticides are higher than in similar samples taken from the North Sea. This is in line with the findings of the baseline surveys in these two areas.

Table 4B (p.25) gives a summary of the levels of pesticides and PCBs found in the livers of the same fish from which the muscle tissues were analysed. Cod livers contain a very high proportion of lipid (range 11-55%) and, as reported in 1975 and 1974, much higher concentrations of pesticide and PCBs are found in the liver than in muscle tissue. In 1975 one sample was found to contain an exceptionally high concentration of total pesticides (1.42 mg/kg) and again in 1976 there were two high samples taken from the North Sea (highest reported 2.06 mg/kg). Norway reported finding an even higher concentration (3.25 mg/kg) in a cod caught off their North Coast. Apart from this one high value, samples from the North Sea did not contain more than 1.62 mg/kg and, as was found in the baseline survey and in 1975 for samples from the North Sea, the highest residues were generally found in cod taken from the Southern Bight. Similar high values were also reported in the few samples of cod taken from the Irish Sea, an area identified in the course of the North Atlantic baseline survey as having a level of contamination similar to or higher than that in the Southern Bight.

PCB levels in cod liver were, as found previously, always substantially higher than those of the pesticides. The highest residue concentrations were found in cod from the Southern Bight (32 mg/kg) and the Irish Sea (15 mg/kg). The levels reported were all above 1 mg/kg and even discounting the highest level were, from the North Sea samples, all in the range 1.2 - 9.8 mg/kg. The range in 1974 and 1975 was only 0.4 to 8.9 mg/kg and this apparent increase will need to be watched in future years. Dieldrin levels were all detectable but showed quite a wide range, with the highest concentrations occurring in cod from the Southern Bight (0.68 mg/kg) and Irish Sea (0.43 mg/kg).

In most cases the concentrations of pesticide residues found in plaice livers were above the level of detection. However, as was noted in previous years, the levels found were in general below those found in cod livers, even though the lipid content of many of the plaice liver samples was similar to that found in cod. For the North Sea samples, there appears to be little difference between the levels found in 1976 and those reported in 1975. All the concentrations found were well below 0.1 mg/kg for the pesticides. Somewhat higher concentrations were found

in samples taken from the English Channel and Irish Sea, where the typical levels were, as found in the baseline, above 0.1 mg/kg. As was noted with cod, quite high concentrations of dieldrin appear to be typical in fish taken from the North Irish Sea around the Clyde (0.32 and 0.20 mg/kg). PCB residues in plaice from the North Sea were all below 1 mg/kg in 1976, in contrast to 1975 when several samples were found to contain in excess of that concentration. However, in the samples from the Clyde area the concentrations were higher, reaching 6.5 mg/kg in one sample. In all cases PCB residues were at a higher concentration than those of the pesticides.

In herring, the concentrations of both pesticides and PCBs in liver were much lower than those found in either cod or plaice and in general were similar to the levels found in herring muscle. Both England and Scotland reported the highest concentrations in samples caught in the Irish Sea. Sole were also found not to have particularly high pesticide residue burdens in their livers, generally well below 0.05 mg/kg of any one residue, although as with the other white fish, the residues were substantially higher than those found in the muscle tissue.

Summary

The results available from the 1976 national monitoring programmes, as summarised in Tables 1-4 and discussed above, indicate a picture not dissimilar to that found in previous years. The highest levels of all pollutants were found in samples taken from the Southern Bight of the North Sea and from the Irish Sea. In the latter area, the highest residue levels of pesticides and PCB were found around the Clyde, an area not covered in the North Atlantic baseline, and for mercury in the area off the northwest coast of England.

Very few data were available on shellfish, but the data available indicate that the levels of both metals and pesticides were low. In 1975 it was reported that the levels of PCB appeared to be slightly higher than those found in 1974, but in 1976 that apparent trend appears to have been reversed.

In fish the metal levels, including those of mercury, were generally the same as those recorded previously. Pesticide levels, at least in fish muscle, were also low with very few residues above 0.1 mg/kg. It was noted in 1975 that the levels of DDT were generally below those of DDE and this feature is again obvious in most of the fish liver samples analysed in 1976, whether from the Irish Sea or from the North Sea. The tendency for PCB to be higher than the total DDT residue level, usually by a factor of at least ten, remains obvious and from the generally slightly lower values of DDT this may well be a reflection of reduced DDT usage rather than continued or increased input of PCB.

It was pointed out in the report on the 1975 data that there are considerable problems in making comparisons of the data obtained from one year to another, especially as few of the samples are strictly comparable. At a Working Group meeting held at ICES headquarters in May 1977, this problem was discussed and it was agreed that steps must be taken to remedy this.

The major effort will be directed toward a research programme, in which it is hoped each member country will participate, and which is designed to try to establish which factors affect the residue levels of particular pollutants. For example, is age a critical factor for all pollutants; does condition affect the residue concentrations of lipid-soluble pollutants such as organochlorine pesticides? In the meantime, it has been

agreed that all sampling should be done in as reproducible a way as practicable and that samples should only be taken if there is a reasonable chance of obtaining similar samples the next year. A stricter method of reporting the data has been drafted and full details of the sample, its history of preservation, and method of treatment and analysis must be supplied along with the full analytical results. Dry weight and fat weight analysis are in the future to be included wherever possible. Finally, in the future all samples are to consist of at least 10 individuals and data will only be taken from laboratories which have recently successfully completed an ICES intercalibration exercise.

Note: Areas designated in the Tables correspond to those indicated on the map (p. 26). They do not always correspond with the designations for ICES Fishing Areas.

Table 1. Metals in Shellfish.

Species	Source		Country	Date of Collection	Weight/ Number Analysed	Mean Weight/ Size Range mm	Concentrations in mg/kg Wet Weight				
							Hg	Cd	Pb	Zn	Cu
				1976							
Mussel	IVC	F4 35	Netherlands	Feb	20 kg	50 - 80 mm	0.09	0.30	1.6	32	4.0
"	IVC	F4 35	"	May	20 kg	50 - 80 mm	0.07	0.20	1.0	24	2.3
"	IVC	F4 35	"	Aug	20 kg	50 - 80 mm	0.05	0.18	0.66	15	3.8
"	IVC	F4 35	"	Nov	20 kg	50 - 80 mm	0.05	0.16	0.84	17	5.2
"	IVC	F3 32	"	Feb	20 kg	50 - 80 mm	0.08	0.30	1.4	23	2.7
"	IVC	F3 32	"	May	20 kg	50 - 80 mm	0.06	0.26	1.6	30	3.4
"	IVC	F3 32	"	Aug	20 kg	50 - 80 mm	0.03	0.21	1.0	22	6.6
"	IVC	F3 32	"	Nov	20 kg	50 - 80 mm	0.08	0.21	0.83	18	2.2
"	VII	French coast	France	Mar/Apr	1½ kg	12.6 g	0.067	-	-	-	-
"	VIII	"	"	Mar/Apr	1½ kg	14.2 g	0.010	-	-	-	-
"	IVC	F0 34	England	Mar	30	30 - 40 mm	0.05	1.1	0.5	15	1.1
"	IVC	F0 34	"	Jun	25	30 - 40 mm	0.05	0.3	<0.2	18	1.2
"	IVC	F0 34	"	Jun	50	-	0.03	0.2	<0.2	10	1.0
"	IVC	F1 34	"	Jun	20	-	0.06	0.3	<0.2	11	1.1
"	VIIG	E4 29	"	Jul	20	-	0.04	0.3	2.0	64	2.9
"	VIIF	E5 32	"	Aug	15	-	<0.02	0.6	0.9	15	1.3
"	VIIA	E5 35	"	Apr	49	-	0.07	0.4	1.5	18	0.8
"	VIIA	E6 35	"	Apr	55	-	0.05	<0.2	0.7	10	0.6
"	VIIA	E6 35	"	Apr	53	-	0.06	<0.2	1.2	17	1.2
"	VIIA	E5 35	"	Dec	67	-	0.05	0.2	1.2	15	2.0
"	VIIA	E6 36	"	Dec	52	-	0.05	0.3	1.2	15	1.9
Shrimp	IVC	F6 35	Netherlands	Feb	15 kg	60 - 80 mm	0.14	0.04	0.30	23	3.8
"	IVC	F6 35	"	May	15 kg	60 - 80 mm	0.13	0.04	0.47	35	14
"	IVC	F6 35	"	Aug	15 kg	60 - 80 mm	0.14	0.02	0.30	36	17
"	IVC	F6 35	"	Nov	15 kg	60 - 80 mm	0.18	0.07	0.33	31	25
"	IVC	F4 35	"	Feb	15 kg	60 - 80 mm	0.15	0.04	0.35	23	14
"	IVC	F4 35	"	May	15 kg	60 - 80 mm	0.11	0.09	0.50	36	15
"	IVC	F4 35	"	Aug	15 kg	60 - 80 mm	0.10	0.04	0.29	33	18
"	IVC	F4 35	"	Nov	15 kg	60 - 80 mm	0.05	0.03	0.30	24	12
"	IVC	F3 31/32	"	Feb	15 kg	60 - 80 mm	0.11	0.08	0.26	30	9.6
"	IVC	F3 31/32	"	May	15 kg	60 - 80 mm	0.11	0.12	0.38	38	13
"	IVC	F3 31/32	"	Aug	15 kg	60 - 80 mm	0.07	0.21	0.30	28	19
"	IVC	F3 31/32	"	Nov	15 kg	60 - 80 mm	0.04	0.11	0.40	23	19

Table 2. Organochlorines in Shellfish.

Species	Source		Country	Date of Collection	Weight/ Number Analysed	Mean Weight Size Range	Concentrations in mg/kg Wet Weight								PCB/Σ DDT	% Lipid
							α HCH	γ HCH	Dieldrin	DDE	TDE	DDT	Σ DDT	PCB		
				1976												
Mussel	VII	French Coast	France	Mar/Apr	1½ kg	12.6 g	-	-	-	0.008	0.010	<0.006	<0.024	0.30	-	2.3
"	VIII	"	"	Mar/Apr	1½ kg	14.2 g	-	-	-	0.006	0.008	0.004	0.018	0.21	12	1.6
"	IVB	F7 36	Germany, Fed.Rep. of	May	100	55 - 60 mm	-	0.008	0.005	0.002	0.008	0.008	0.018	0.075	4.2	0.97
"	IVB	F7 36	"	May	100	55 - 60 mm	-	0.009	0.009	0.004	0.007	0.012	0.023	0.12	5.2	2.0
"	IVB	F7 36	"	May	100	55 - 60 mm	-	0.012	0.013	0.003	0.008	0.012	0.023	0.16	7.0	2.4
"	IVC	F4 35	Netherlands	Feb	15 kg	50 - 80 mm	0.005	<0.005	<0.01	<0.01	<0.01	<0.02	<0.04	0.14	-	-
"	IVC	F4 35	"	May	15 kg	50 - 80 mm	<0.005	<0.005	<0.01	<0.01	<0.01	<0.02	<0.04	0.14	-	-
"	IVC	F4 35	"	Aug	15 kg	50 - 80 mm	<0.005	<0.005	<0.01	<0.01	<0.01	<0.02	<0.04	0.14	-	-
"	IVC	F4 35	"	Nov	15 kg	50 - 80 mm	<0.005	<0.005	<0.01	<0.01	<0.01	<0.02	<0.04	0.21	-	-
"	IVC	F3 32	"	Feb	15 kg	50 - 80 mm	0.005	0.005	<0.01	<0.01	<0.01	<0.02	<0.04	0.31	-	-
"	IVC	F3 32	"	May	15 kg	50 - 80 mm	<0.005	<0.005	<0.01	<0.01	<0.01	<0.02	<0.04	0.12	-	-
"	IVC	F3 32	"	Aug	15 kg	50 - 80 mm	<0.005	<0.005	<0.01	<0.01	<0.01	<0.02	<0.04	0.10	-	-
"	IVC	F3 32	"	Nov	15 kg	50 - 80 mm	<0.005	<0.005	<0.01	<0.01	<0.01	<0.02	<0.04	0.14	-	-
"	IVB	E8 40	England	Sep	15	30 - 40 mm	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.01	-	0.6
"	IVC	F0 34	"	Mar	30	30 - 40 mm	<0.001	<0.001	0.004	0.002	0.002	0.003	0.007	0.04	5.7	0.6
"	IVC	F0 34	"	Jun	25	-	<0.001	<0.001	0.004	0.002	0.003	0.006	0.011	0.02	1.8	0.6
"	IVC	F0 34	"	Jun	50	-	<0.001	<0.001	0.002	<0.001	0.002	0.002	<0.005	<0.01	-	0.6
"	IVC	F1 34	"	Jun	20	-	<0.001	<0.001	0.002	<0.001	0.001	0.001	<0.003	<0.01	-	0.2
"	VIIG	E4 29	"	Jul	20	-	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.003	0.03	-	0.2
"	VIIA	E5 35	"	Apr	49	-	<0.001	<0.001	0.001	<0.001	0.001	0.001	<0.003	0.02	-	0.2
"	VIIA	E6 35	"	Apr	55	-	<0.001	<0.001	0.002	0.001	0.003	0.002	0.006	0.03	5.0	0.4
"	VIIA	E6 35	"	Apr	53	-	<0.001	<0.001	0.002	0.001	0.004	0.002	0.007	0.03	4.3	0.2
"	VIIA	E5 35	"	Dec	67	-	0.001	0.001	0.004	0.002	0.004	0.003	0.009	0.04	4.4	0.4
"	VIIA	E6 36	"	Dec	52	-	<0.001	<0.001	0.008	0.005	0.010	0.009	0.024	0.10	4.2	0.8
Shrimp (Brown)	IVB	F8 37	Germany, Fed.Rep. of	Aug	100	55 mm	-	0.006	0.003	0.002	0.004	0.014	0.020	0.11	5.5	0.31
"	IVB	F8 37	"	Aug	100	55 mm	-	0.005	0.002	0.002	0.002	0.010	0.014	0.091	6.5	0.22
"	IVB	F8 37	"	Aug	100	55 mm	-	0.003	0.003	0.002	0.003	0.012	0.017	0.098	5.8	0.71
"	IVB	F8 37	"	Aug	100	55 mm	-	0.002	0.003	0.002	0.003	0.010	0.015	0.14	9.3	0.82
"	IVB	F8 37	"	Aug	100	55 mm	-	0.002	0.003	0.003	0.004	0.014	0.021	0.080	3.8	0.33
"	IVB	F8 37	"	Aug	100	55 mm	-	0.002	0.002	0.003	0.003	0.010	0.016	0.085	5.3	0.34
"	IVC		Netherlands	Feb	10 kg	60 - 80 mm	<0.005	<0.005	<0.01	<0.01	<0.01	<0.02	<0.04	0.08	-	-
"	IVC		"	May	10 kg	60 - 80 mm	<0.005	<0.005	<0.01	<0.01	<0.01	<0.02	<0.04	0.10	-	-
"	IVC		"	Aug	10 kg	60 - 80 mm	<0.005	<0.005	<0.01	<0.01	<0.01	<0.02	<0.04	0.48	-	-
"	IVC		"	Nov	10 kg	60 - 80 mm	<0.005	<0.005	<0.01	<0.01	<0.01	<0.02	<0.04	0.05	-	-
"	IVC		"	Feb	10 kg	60 - 80 mm	<0.005	<0.005	<0.01	<0.01	<0.01	<0.02	<0.04	0.16	-	-
"	IVC		"	May	10 kg	60 - 80 mm	<0.005	<0.005	<0.01	<0.01	<0.01	<0.02	<0.04	0.16	-	-
"	IVC		"	Aug	10 kg	60 - 80 mm	<0.005	<0.005	<0.01	<0.01	<0.01	<0.02	<0.04	0.06	-	-
"	IVC		"	Nov	10 kg	60 - 80 mm	<0.005	<0.005	<0.01	<0.01	<0.01	<0.02	<0.04	0.06	-	-
"	IVC		"	Feb	10 kg	60 - 80 mm	<0.005	<0.005	<0.01	<0.01	<0.01	<0.02	<0.04	0.13	-	-
"	IVC		"	May	10 kg	60 - 80 mm	<0.005	<0.005	<0.01	<0.01	<0.01	<0.02	<0.04	0.04	-	-
"	IVC		"	Aug	10 kg	60 - 80 mm	<0.005	<0.005	<0.01	<0.01	<0.01	<0.02	<0.04	0.12	-	-
"	IVC		"	Nov	10 kg	60 - 80 mm	<0.005	<0.005	<0.01	<0.01	<0.01	<0.02	<0.04	0.05	-	-

Table 3A. Metals in Fish Muscle.

Species	Source	Country	Date of Collection	Number Analysed	Size/ Year Class	Concentrations in mg/kg Wet Weight													
						Hg			Cd			Pb			Cu			Zn		
						Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
			1976																
Cod	-	Norway	Jun	15	125 - 1500 g	0.03	0.08	0.05	0.004	0.029	0.012	-	-	-	0.06	0.90	0.40	2.7	4.8	3.9
"	IVB F7 37	Germany, Fed.Rep. of	Sep	10	1973/74	0.04	0.11	0.06	0.001	0.004	0.003	0.01	0.07	0.03	0.16	0.22	0.19	3.0	4.0	3.5
"	IVC F4 35	Netherlands	Dec	10	-	0.15	0.37	0.22	-	-	<0.01	0.04	0.14	0.06	0.38	1.0	0.93	4.3	6.2	5.2
"	IVC F4 33	"	Dec	10	-	0.15	0.49	0.22	-	-	<0.01	0.04	0.16	0.10	0.42	2.5	1.3	3.8	5.5	5.0
"	IVB F6 41	Belgium	Oct/Nov	15	1973	0.06	0.23	0.10	-	-	<0.01	-	-	-	0.14	0.30	0.24	3.3	8.7	5.5
"	VII -	"	-	3	1970	0.10	0.21	0.14	-	-	<0.01	-	-	-	0.20	0.26	0.24	3.6	4.0	3.8
"	IVB F6 37	France	Feb	3	58 - 90 cm	0.11	0.37	0.23	<0.008	0.009	<0.008	0.06	0.25	0.10	0.6	1.9	0.8	1.4	2.5	2.2
"	IVC F3 35	"	Feb	4	84 - 95 cm	0.11	0.40	0.30	-	-	<0.008	<0.02	0.40	0.15	0.3	2.5	1.1	2.3	3.8	2.8
"	IVB E9 37	England	Aug	10	37 - 75 cm	0.03	0.13	0.08	-	-	<0.2	<0.2	0.2	<0.2	-	-	<0.2	2.8	3.6	3.1
"	IVB E8 39	"	Apr	10	31 - 42 cm	0.04	0.07	0.06	-	-	<0.2	-	-	<0.2	-	-	<0.2	3.2	4.6	3.9
"	IVB F0 35	"	May	5	44 - 48 cm	0.06	0.10	0.07	-	-	<0.2	-	-	<0.2	-	-	<0.2	1.8	4.1	3.3
"	IVB F1 37	"	May	5	47 - 95 cm	0.05	0.13	0.08	-	-	<0.2	-	-	<0.2	-	-	<0.2	2.9	4.9	3.5
"	IVB F1 37	"	Jul	5	41 - 75 cm	0.06	0.30	0.15	-	-	<0.2	-	-	<0.2	-	-	<0.2	3.4	4.8	4.0
"	IVB F1 36	"	Apr	10	36 - 45 cm	0.03	0.06	0.04	-	-	<0.2	-	-	<0.2	0.2	0.3	0.2	3.3	4.3	3.5
"	VIIA E5 35	"	Mar	20	26 - 52 cm	0.08	0.44	0.26	-	-	<0.2	<0.2	1.0	<0.3	<0.2	0.3	<0.2	2.8	5.1	3.9
"	VIIA E3 33	"	May	10	46 - 52 cm	0.03	0.20	0.10	-	-	-	-	-	<0.2	<0.2	0.3	<0.2	2.8	4.0	3.6
"	VIIA E6 36	"	Apr	10	40 - 55 cm	0.08	0.37	0.27	-	-	<0.2	<0.2	0.4	<0.2	<0.2	0.2	<0.2	2.9	3.6	3.3
"	VIIG Irish Coast	Ireland	1976	14	2	0.03	0.15	0.07	0.02	0.09	0.04	-	-	-	0.09	1.8	0.89	3.4	8.9	5.9
"	VIIG "	"	1976	5	3	0.10	0.22	0.14	0.03	0.04	0.03	-	0.07	0.03	-	-	-	3.5	4.0	3.7
"	VIIG "	"	1976	3	4	-	-	0.12	0.01	0.07	0.04	-	-	-	0.43	0.57	0.5	3.4	3.5	3.4
Plaice	-	Norway	Jun	3	115 - 250 g	0.02	0.08	0.05	<0.006	0.028	0.016	-	-	-	0.06	0.42	0.19	4.5	5.2	4.9
"	IVB F8 36	Germany, Fed.Rep. of	Sep	10	1972/73	0.02	0.10	0.06	0.001	0.005	0.002	0.01	0.04	0.02	0.14	0.20	0.18	3.4	5.0	4.0
"	IVC F2 33	Belgium	Nov	5	1970	0.27	0.47	0.34	-	-	<0.01	-	-	-	0.14	0.34	0.28	3.9	4.9	4.3
"	VIIG -	"	Nov	6	1970	0.08	0.54	0.33	-	-	<0.01	-	-	-	0.16	0.26	0.21	4.1	4.7	4.5
"	VIIA -	"	Nov	6	1970	0.29	1.18	0.76	-	-	<0.01	-	-	-	0.18	0.29	0.22	3.3	4.7	4.2
"	IVB E8 38	England	Apr	10	20 - 25 cm	0.02	0.14	0.05	-	-	<0.2	-	-	<0.2	-	-	<0.2	3.1	7.3	4.6
"	IVB E9 37	"	Aug	10	28 - 50 cm	0.02	0.35	0.09	-	-	<0.2	<0.2	0.2	<0.2	-	-	<0.2	2.4	4.6	3.3
"	IVB F1 37	"	Jul	5	32 - 40 cm	0.03	0.14	0.06	-	-	<0.2	-	-	<0.2	-	-	<0.2	4.2	5.7	5.1
"	IVB F1 36	"	Apr	9	38 - 61 cm	0.10	0.39	0.24	-	-	<0.2	-	-	<0.2	<0.2	0.2	<0.2	3.4	4.6	4.0
"	IVC F1 31	"	Jul	10	26 - 36 cm	0.06	0.23	0.15	-	-	<0.2	<0.2	0.3	<0.2	<0.2	0.5	0.4	3.6	5.2	4.3
"	VIIF E5 31	"	Oct	10	30 - 41 cm	0.02	0.17	0.04	-	-	<0.2	-	-	<0.2	-	-	<0.2	4.2	6.1	4.9
"	VIIF E6 35	"	Mar	20	27 - 32 cm	0.17	1.1	0.40	-	-	<0.2	-	-	<0.2	<0.2	0.5	<0.2	3.5	8.9	4.9
"	VIIA E3 33	"	May	10	31 - 41 cm	0.01	0.14	0.07	-	-	<0.2	-	-	<0.2	<0.2	0.3	<0.2	3.6	5.3	4.4
"	VIIA E6 36	"	Apr	10	23 - 31 cm	0.10	0.53	0.27	-	-	<0.2	<0.2	0.4	<0.2	<0.2	0.3	<0.2	2.6	7.6	4.6
"	VIIG Irish Coast	Ireland	1976	1	2	-	-	0.06	-	-	0.07	-	-	-	-	-	0.74	-	-	11.2
"	VIIG "	"	1976	11	3	-	0.03	0.03	-	-	0.04	-	-	-	0.33	0.87	0.59	5.1	13.7	10.2
"	VIIG "	"	1976	3	4	-	-	-	-	0.08	0.07	-	-	-	-	-	-	10.8	11.6	11.2
Herring	IVA F0 46	France	Feb	9	21 - 25 cm	-	-	0.06	-	-	0.07	-	-	0.08	-	-	0.7	-	-	3.4
"	IVA F0 46	"	Feb	11	20 - 22 cm	-	-	0.04	-	-	<0.01	-	-	0.05	-	-	0.5	-	-	2.4
"	IVB F1 40	"	Feb	9	20 - 23 cm	-	-	0.06	-	-	0.02	-	-	0.05	-	-	0.8	-	-	2.4
"	IVB F1 40	"	Feb	9	20 - 21 cm	-	-	0.05	-	-	0.03	-	-	0.09	-	-	0.6	-	-	2.2
"	IVB E8 39	England	Apr	10	21 - 23 cm	0.02	0.07	0.04	-	-	<0.2	<0.2	0.4	<0.2	0.6	1.4	1.0	6.3	17	9.0
"	IVB E8 38	"	Apr	10	21 - 25 cm	<0.02	0.09	0.04	-	-	<0.2	-	-	<0.2	0.4	1.1	0.7	5.0	13	8.6
"	VIIA E6 38	"	Jan	10	26 - 29 cm	0.08	0.37	0.16	-	-	<0.2	<0.2	0.2	<0.2	0.6	1.3	0.8	2.4	7.7	4.8

/Continued

Table 3A (Continued)

Species	Source		Country	Date of Collection	Number Analysed	Size/ Year Class	Concentrations in mg/kg Wet Weight													
							Hg			Cd			Pb			Cu			Zn		
							Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
Herring	VIIA	Irish Coast	Ireland	1976	3	2	-	-	-	-	0.09	0.04	-	-	-	0.08	0.59	0.28	10.9	23.6	18.4
"	VIIA	"	"	1976	17	3	-	0.09	0.03	-	0.04	0.03	-	0.07	0.01	0.57	2.4	1.5	6.7	15.7	9.6
"	VIIA	"	"	1976	11	4	<0.01	0.12	0.05	-	0.07	0.03	-	-	-	0.38	1.8	0.87	6.1	14.7	10.8
"	VIIA	"	"	1976	9	5	-	0.03	0.02	-	0.04	0.02	-	-	-	0.72	2.0	1.5	5.4	9.6	7.9
"	VIIA	"	"	1976	1	6	-	-	0.10	-	-	-	-	-	-	-	-	1.9	-	-	7.2
"	VIIA	"	"	1976	4	7	0.02	0.12	0.06	-	0.04	0.02	-	0.06	0.03	1.1	2.0	1.7	6.8	9.4	7.9
"	VIIA	"	"	1976	1	8	-	-	-	-	-	-	-	-	-	-	-	1.8	-	-	10.7
"	VIIA	"	"	1976	3	9	0.11	0.31	0.18	-	0.02	0.02	0.04	0.09	0.06	1.7	1.9	1.8	7.6	12.0	10.2
"	VIIA	"	"	1976	1	10+	-	-	-	-	-	-	-	-	0.04	-	-	1.3	-	-	7.4
"	VIIG	"	"	1976	7	2	-	-	0.01	-	0.04	0.02	-	-	-	0.88	2.5	1.3	8.1	11.4	9.9
"	VIIG	"	"	1976	20	3	0.01	0.06	0.02	-	0.09	0.02	-	-	-	0.17	1.7	0.76	6.1	13.6	9.7
"	VIIG	"	"	1976	9	4	0.04	0.26	0.12	-	0.09	0.05	-	-	-	0.47	1.7	1.1	7.4	12.9	9.9
"	VIIG	"	"	1976	3	5	-	-	0.23	-	-	0.04	-	0.06	0.03	1.3	1.5	1.4	6.3	12.9	9.5
"	VIIG	"	"	1976	1	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14.2
				1976																	
Sole	VIIG	-	Belgium	Dec	14	1970	0.07	0.27	0.11	-	-	<0.01	-	-	-	0.18	0.37	0.26	4.7	6.8	5.4
"	VIIA	-	"	Nov	3	1970	0.34	0.89	0.61	-	-	<0.01	-	-	-	0.18	0.24	0.20	4.2	5.3	4.9
"	IVB	E8 39	England	Apr	10	27 - 39 cm	0.03	0.07	0.04	-	-	<0.2	-	-	<0.2	-	-	<0.2	3.4	4.7	3.9
"	IVB	E9 37	"	Aug	10	24 - 31 cm	0.02	0.06	0.04	-	-	<0.2	<0.2	0.2	<0.2	-	-	<0.2	2.0	3.3	2.9
"	IVB	F1 37	"	Jul	5	25 - 32 cm	0.03	0.07	0.05	-	-	<0.2	<0.2	0.2	<0.2	-	-	<0.2	3.3	4.8	4.0
"	IVB	F1 36	"	Apr	10	31 - 42 cm	0.04	0.30	0.19	-	-	<0.2	-	-	<0.2	<0.2	0.6	<0.3	3.1	4.6	3.7
"	IVB	F1 36	"	Apr	6	24 - 30 cm	<0.01	0.03	0.02	-	-	<0.2	-	-	<0.2	-	-	<0.2	3.3	4.1	3.7
"	IVC	F1 31	"	Jul	10	27 - 37 cm	0.11	0.66	0.27	-	-	<0.2	-	-	<0.2	<0.2	0.5	0.3	2.8	3.9	3.3
"	VIIA	E3 33	"	Jun	10	28 - 35 cm	0.03	0.10	0.05	-	-	<0.2	-	-	<0.2	<0.2	0.3	0.2	2.6	5.0	3.6

Table 3B. Metals in Fish Liver.

Species	Source		Country	Date Collected	Number Analysed	Size/ Year Class	Concentrations in mg/kg Wet Weight													
							Hg			Cd			Pb			Cu			Zn		
							Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
				1976																	
Cod	VIB	F7 37	Germany, Fed.Rep. of	Sep	10	1973/74	0.02	0.07	0.04	0.013	0.040	0.030	0.04	0.13	0.09	3.2	10	6.7	12	21	18
Plaice	VIB	F8 36	"	Sep	10	1972/73	0.02	0.07	0.05	0.010	0.085	0.035	0.08	0.23	0.16	3.7	8.5	3.8	21	63	34
Herring	IVA	F0 45	France	Feb	20	-	-	-	0.25	-	-	0.12	-	-	0.35	-	-	2.4	-	-	23
"	IVB	F1 40	"	Feb	18	-	-	-	0.27	-	-	0.10	-	-	0.15	-	-	2.2	-	-	26

Table 4A. Organochlorines in Fish Muscle.

Species	Source	Country	Date of Collection	Number Analysed	Size/ Year Class	Concentrations in mg/kg Wet Weight								PCB/ΣDDT	% Lipid
						α HCH	ϑ HCH	Dieldrin	DDE	TDE	DDT	ΣDDT	PCB		
			1976												
Cod	IIA	Norway	Dec	1	39 cm/4	-	-	-	0.004	<0.001	0.003	<0.008	-	-	0.13
"	IIA	"	Dec	1	3	-	-	-	<0.001	-	<0.001	<0.002	-	-	0.18
"	German Bight	Germany, Fed.Rep. of	Oct	5	1974	-	0.007	0.004	0.005	0.006	0.014	0.025	0.18	7.2	0.09
"	"	"	Oct	5	1973	-	0.007	0.005	0.003	0.005	0.008	0.016	0.16	10	0.18
"	IVB F6 37	France	Feb	3	58 - 90 cm	-	-	-	0.003	<0.001	<0.001	<0.005	0.026	-	0.10
"	IVC F3 34	"	Feb	4	84 - 95 cm	-	-	-	0.001	0.001	<0.001	<0.003	0.082	-	0.08
"	IVB E9 37	England	Aug	10	37 - 75 cm	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.003	<0.01	-	0.2
"	IVB E8 39	"	Apr	10	31 - 42 cm	<0.001	<0.001	0.001	0.001	<0.001	<0.001	<0.003	<0.01	-	0.2
"	IVB F0 35	"	May	5	44 - 48 cm	<0.001	<0.001	0.002	0.002	<0.001	0.001	<0.004	0.02	-	0.4
"	IVB F1 37	"	May	5	47 - 95 cm	<0.001	<0.001	0.002	0.002	<0.001	0.002	<0.005	0.05	-	0.2
"	IVB F1 37	"	Jul	5	41 - 75 cm	<0.001	<0.001	0.001	0.002	<0.001	<0.001	<0.004	0.04	-	0.2
"	IVB F1 36	"	Apr	10	36 - 45 cm	<0.001	<0.001	0.001	0.001	<0.001	<0.001	<0.003	0.01	-	0.8
"	VIIA E5 35	"	Mar	20	26 - 52 cm	<0.001	<0.001	0.002	0.002	<0.001	<0.001	<0.004	0.03	-	0.2
"	VIIA E3 33	"	May	10	46 - 52 cm	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.004	0.02	-	0.2
"	VIIA E6 36	"	Apr	10	40 - 55 cm	<0.001	<0.001	0.002	0.001	0.001	<0.001	<0.003	0.03	-	0.2
"	IVA E6 44	Scotland	Jan	10	-	-	-	0.001	0.002	<0.001	<0.001	<0.004	0.04	-	0.4
"	IVA E6 44	"	Jun	10	-	-	-	0.001	0.002	<0.001	<0.001	<0.004	0.02	-	0.3
"	IVA E7 41	"	Feb	8	-	-	-	0.003	0.003	<0.001	<0.001	<0.005	0.06	-	0.3
"	IVA E7 41	"	Aug	5	-	-	-	0.001	0.002	<0.001	<0.001	<0.004	0.03	-	0.2
"	IVA F2 45	"	Feb	10	-	-	-	0.001	0.002	0.001	0.001	0.004	0.03	7.5	0.3
"	IVA F2 45	"	Jul	10	-	-	-	0.001	0.001	<0.001	<0.001	<0.003	0.01	-	0.3
"	VIIA E4 39	"	Feb	6	-	-	-	0.004	0.006	0.001	0.002	0.009	0.11	12	0.2
"	VIIA E4 39	"	Aug	4	-	-	-	0.004	0.004	0.002	0.002	0.008	0.11	14	0.2
Plaice	IVB F8 36	Germany, Fed.Rep. of	Oct	10	1972/74	-	0.007	0.008	0.002	0.004	0.004	0.010	0.16	16	1.0
"	IVB E8 38	England	Apr	10	20 - 25 cm	<0.001	<0.001	0.002	0.001	<0.001	0.001	<0.003	0.01	-	<0.2
"	IVB E9 37	"	Aug	10	28 - 50 cm	<0.001	<0.001	0.001	0.001	<0.001	<0.001	<0.003	<0.01	-	0.2
"	IVB F1 37	"	Jul	5	32 - 40 cm	<0.001	<0.001	0.004	0.003	<0.001	0.003	<0.007	0.04	-	0.8
"	IVB F1 36	"	Apr	9	38 - 61 cm	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.01	-	<0.2
"	IVC F1 31	"	Jul	10	30 - 41 cm	<0.001	<0.001	0.002	0.002	0.001	<0.001	<0.004	0.02	-	0.2
"	VIIF E5 35	"	Mar	20	27 - 32 cm	<0.001	<0.001	0.003	0.004	0.008	0.001	0.013	0.08	6.2	0.2
"	VIIA E3 33	"	May	10	31 - 41 cm	<0.001	<0.001	0.002	0.001	<0.001	<0.001	<0.003	0.01	-	0.6
"	VIIA E6 36	"	Apr	10	27 - 31 cm	<0.001	<0.001	0.003	0.005	0.006	0.002	0.013	0.11	8.5	<0.2
"	IVA E6 44	Scotland	Jan	10	-	-	-	0.001	0.002	<0.001	<0.001	<0.004	0.02	-	0.4
"	IVA E6 44	"	Jun	10	-	-	-	<0.001	0.001	<0.001	<0.001	<0.003	0.01	-	0.6
"	IVA F2 45	"	Jul	4	-	-	-	0.001	0.004	<0.001	0.002	0.007	0.07	10	0.5
"	IVB E7 41	"	Feb	9	-	-	-	0.002	0.001	<0.001	<0.001	<0.003	0.02	-	0.3
"	IVB E7 41	"	Aug	9	-	-	-	<0.001	0.001	<0.001	<0.001	<0.003	0.01	-	0.3
"	VIIA E4 39	"	Feb	7	-	-	-	0.007	0.003	0.001	0.001	0.005	0.09	18	0.6
"	VIIA E4 39	"	Aug	10	-	-	-	0.007	0.006	0.004	0.002	0.012	0.11	9.2	0.8
Herring	IVA F0 46	France	Feb	9	21 - 25 cm	-	-	-	0.008	0.008	0.005	0.021	0.07	3.3	3.8
"	IVA F0 46	"	Feb	11	20 - 22 cm	-	-	-	0.005	0.006	0.004	0.015	0.05	3.3	3.6
"	IVB F1 40	"	Feb	9	20 - 23 cm	-	-	-	0.006	0.007	0.005	0.018	0.05	2.8	2.6
"	IVB F1 40	"	Feb	9	20 - 21 cm	-	-	-	0.004	0.001	0.001	0.006	0.04	6.7	1.5
"	IVB E8 39	England	Apr	10	21 - 23 cm	<0.001	<0.001	0.006	0.003	0.002	0.005	0.010	0.05	5.0	1.4
"	IVB E8 38	"	Apr	10	21 - 25 cm	<0.001	<0.001	0.005	0.005	0.002	0.004	0.011	0.07	6.4	1.6
"	VIIA E6 36	"	Jan	10	26 - 29 cm	0.003	0.002	0.007	0.010	0.014	0.012	0.036	0.13	3.6	2.0
"	IVA E7 41	Scotland	Jan	10	-	-	-	0.007	0.009	0.001	0.006	0.016	0.07	4.4	3.0
"	IVA E7 41	"	Aug	10	-	-	-	0.007	0.017	0.001	0.012	0.030	0.13	4.3	10.7
"	VIIA E4 39	"	Apr	10	-	-	-	0.08	0.14	0.10	0.08	0.32	1.23	3.8	3.0

/Continued

Table 4A (Continued)

Species	Source		Country	Date of Collection	Number Analysed	Size/ Year Class	Concentrations in mg/kg Wet Weight								PCB/ΣDDT	% Lipid
							α HCH	ϑ HCH	Dieldrin	DDE	TDE	DDT	ΣDDT	PCB		
				1976												
Sole	IVB	E8 39	England	Apr	10	27 - 39 cm	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.003	0.01	-	<0.2
"	IVB	E9 37	"	Aug	10	24 - 31 cm	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.003	<0.01	-	0.4
"	IVB	F1 37	"	Jul	5	25 - 32 cm	<0.001	<0.001	0.001	0.001	<0.001	<0.001	<0.003	0.01	-	<0.2
"	IVB	F1 36	"	Apr	10	31 - 42 cm	<0.001	<0.001	0.001	<0.001	<0.001	0.001	<0.003	0.02	-	0.4
"	IVB	F1 36	"	Apr	6	24 - 30 cm	<0.001	<0.001	0.004	<0.001	<0.001	0.001	<0.003	<0.01	-	0.8
"	IVC	F1 31	"	Jul	10	27 - 37 cm	<0.001	<0.001	0.002	0.001	0.001	0.001	0.003	0.02	6.7	0.2
"	VIIA	E3 33	"	Jun	10	28 - 35 cm	<0.001	<0.001	0.001	0.002	<0.001	<0.001	<0.004	0.01	-	0.2
Pilchard	VIII	Penmarch	France	Mar	10	21 - 23 cm	-	-	-	0.020	0.004	0.003	0.027	0.12	4.4	2.2
"	VIII	St Guénolé	"	Mar	10	14 - 16 cm	-	-	-	0.009	0.002	0.002	0.013	0.12	9.2	1.2

Table 4B. Organochlorines in Fish Liver.

Species	Source	Country	Date of Collection	Number Analysed	Size/ Year Class	Concentrations in mg/kg Wet Weight								PCB/ΣDDT	% Lipid
						α HCH	γ HCH	Dieldrin	DDE	TDE	DDT	ΣDDT	PCB		
			1976												
Cod	IIA	Norway	Nov	1	38 cm/3	-	-	-	0.28	0.21	0.19	0.68	-	-	39
"	IIA	"	Nov	1	61 cm/5	-	-	-	0.81	0.22	1.00	2.0	-	-	37
"	IIA	"	Nov	1	60 cm/3	-	-	-	0.56	0.24	0.65	1.5	-	-	46
"	IIA	"	Nov	1	90 cm/4	-	-	-	1.34	0.38	1.53	3.3	-	-	41
"	IVB E9 37	England	Aug	10	37 - 75 cm	0.046	0.050	0.054	0.18	0.11	0.22	0.51	2.4	4.7	52
"	IVB E8 39	"	Apr	10	31 - 42 cm	0.034	0.008	0.25	0.33	0.18	0.42	0.93	1.2	1.3	43
"	IVB F0 35	"	May	5	44 - 48 cm	0.020	0.036	0.68	0.40	0.34	0.20	0.94	3.2	3.4	41
"	IVB F1 37	"	May	5	47 - 95 cm	0.018	0.008	0.16	1.29	0.15	0.42	1.9	32	17	41
"	IVB F1 37	"	Jul	5	41 - 75 cm	0.032	0.012	0.10	0.40	0.17	0.52	1.09	9.8	9.0	22
"	IVB F1 36	"	Aug	10	36 - 45 cm	0.023	0.006	0.09	0.27	0.072	0.20	0.54	3.0	5.5	27
"	VIIA E5 35	"	Mar	20	26 - 52 cm	0.026	0.012	0.21	0.41	0.35	0.046	0.81	6.1	7.6	28
"	VIIA E3 33	"	May	10	46 - 52 cm	0.014	0.002	0.082	0.26	0.17	0.05	0.48	3.4	7.1	19
"	VIIA E6 36	"	Apr	10	40 - 55 cm	0.028	0.016	0.17	0.43	0.42	0.12	0.97	9.5	9.8	46
"	IVA E6 44	Scotland	Jan	10	-	-	-	0.10	0.21	0.08	0.16	0.45	2.2	4.9	55
"	IVA E6 44	"	Jun	10	-	-	-	0.04	0.12	0.07	0.04	0.23	1.4	6.1	41
"	IVA F2 45	"	Feb	6	-	-	-	0.05	0.11	0.06	0.14	0.31	1.3	4.2	43
"	IVA F2 45	"	Jul	4	-	-	-	0.07	0.12	0.06	0.04	0.22	1.5	6.8	50
"	IVB E7 41	"	Feb	8	-	-	-	0.42	0.44	0.22	0.22	0.88	6.4	7.3	46
"	IVB E7 41	"	Aug	5	-	-	-	0.12	0.20	0.16	0.06	0.42	3.0	7.1	40
"	VIIA E4 39	"	Feb	10	-	-	-	0.43	0.84	0.65	0.29	1.8	15	8.4	42
"	VIIA E4 39	"	Aug	10	-	-	-	0.29	0.24	0.39	0.02	0.65	6.2	9.5	11
Plaice	IVB E8 38	England	Apr	10	20 - 25 cm	<0.001	<0.001	0.015	0.008	0.008	0.006	0.022	0.10	4.5	0.8
"	IVB E9 37	"	Aug	10	26 - 50 cm	0.002	0.001	0.006	0.012	<0.001	0.007	<0.020	0.07	-	3.2
"	IVB F1 37	"	Jul	5	32 - 40 cm	0.009	0.010	0.016	0.020	0.006	0.023	0.049	0.25	5.1	13
"	IVB F1 36	"	Apr	9	38 - 61 cm	<0.001	<0.001	0.002	0.004	0.001	0.002	0.007	0.04	5.7	4.0
"	IVC F1 31	"	Jul	10	26 - 36 cm	0.009	0.011	0.045	0.025	0.053	0.033	0.11	0.27	2.4	19
"	VIIF E5 35	"	Mar	20	30 - 41 cm	<0.002	<0.002	0.094	0.067	0.160	<0.020	<0.25	0.96	-	6.0
"	VIIA E3 33	"	May	10	31 - 41 cm	0.007	0.002	0.013	0.007	0.009	0.021	0.037	0.09	2.4	7.2
"	VIIA E6 36	"	Apr	10	27 - 31 cm	0.002	<0.001	0.019	0.020	0.042	0.009	0.071	0.66	9.3	3.2
"	IVA E6 44	Scotland	Jan	10	-	-	-	0.027	0.019	0.016	0.010	0.045	0.81	18	7.9
"	IVA E6 44	"	Jun	10	-	-	-	0.020	0.021	0.009	0.026	0.056	0.38	6.8	9.7
"	IVA F2 45	"	Jul	4	-	-	-	0.014	0.054	0.007	0.040	0.10	0.45	4.5	10
"	IVB E7 41	"	Feb	9	-	-	-	0.015	0.015	0.009	0.008	0.032	0.21	6.6	1.5
"	IVB E7 41	"	Aug	9	-	-	-	0.018	0.043	0.007	0.034	0.084	0.43	5.1	14
"	VIIA E4 39	"	Feb	7	-	-	-	0.32	0.21	0.17	0.16	0.54	6.5	12	34
"	VIIA E4 39	"	Aug	10	-	-	-	0.20	0.14	0.06	0.06	0.26	1.8	6.9	24
Herring	IVA F2 46	France	Feb	20	20 - 23 cm	-	-	-	0.27	0.002	0.001	0.27	0.30	1.1	4.2
"	IVB F1 40	"	Feb	18	20 - 25 cm	-	-	-	0.012	0.003	0.001	0.016	0.14	8.8	4.1
"	IVB E8 39	England	Apr	10	21 - 23 cm	<0.001	<0.001	0.010	0.005	0.002	0.005	0.012	0.06	5.0	2.0
"	IVB E8 38	"	Apr	10	21 - 25 cm	<0.001	<0.001	0.008	0.008	0.003	0.004	0.011	0.09	8.2	1.2
"	VIIA E6 38	"	Jan	10	25 - 29 cm	0.002	0.001	0.010	0.013	0.020	0.010	0.043	0.16	3.7	1.6
"	IVA E6 44	Scotland	Jan	10	-	-	-	0.011	0.006	0.004	0.008	0.018	0.06	3.3	4.0
"	IVB E7 41	"	Jan	10	-	-	-	0.034	0.010	0.018	0.040	0.068	0.012	0.2	5.0
"	VIIA E4 39	"	Apr	10	-	-	-	0.12	0.22	0.14	0.11	0.47	1.9	4.0	4.0
Sole	IVB E8 39	England	Apr	10	27 - 39 cm	0.001	<0.001	0.003	0.013	0.006	0.016	0.035	0.13	3.7	6.4
"	IVB E9 37	"	Aug	10	24 - 31 cm	0.002	0.002	0.003	0.012	0.003	0.010	0.025	0.09	3.6	6.8
"	IVB F1 37	"	Jul	5	25 - 32 cm	0.004	0.003	0.005	0.012	0.003	0.007	0.022	0.14	6.4	4.0
"	IVB F1 36	"	Apr	10	31 - 42 cm	0.008	0.003	0.008	0.016	0.012	0.017	0.045	0.29	6.4	7.2
"	IVB F1 36	"	Apr	6	24 - 30 cm	0.002	0.002	0.055	0.020	0.010	0.030	0.060	0.20	3.3	9.2
"	IVC F1 31	"	Jul	10	27 - 37 cm	0.002	0.002	0.002	0.023	0.029	0.007	0.059	0.51	8.6	6.4
"	VIIA E3 33	"	Jun	10	28 - 35 cm	0.006	0.003	0.006	0.015	0.002	<0.005	<0.022	0.24	-	7.6

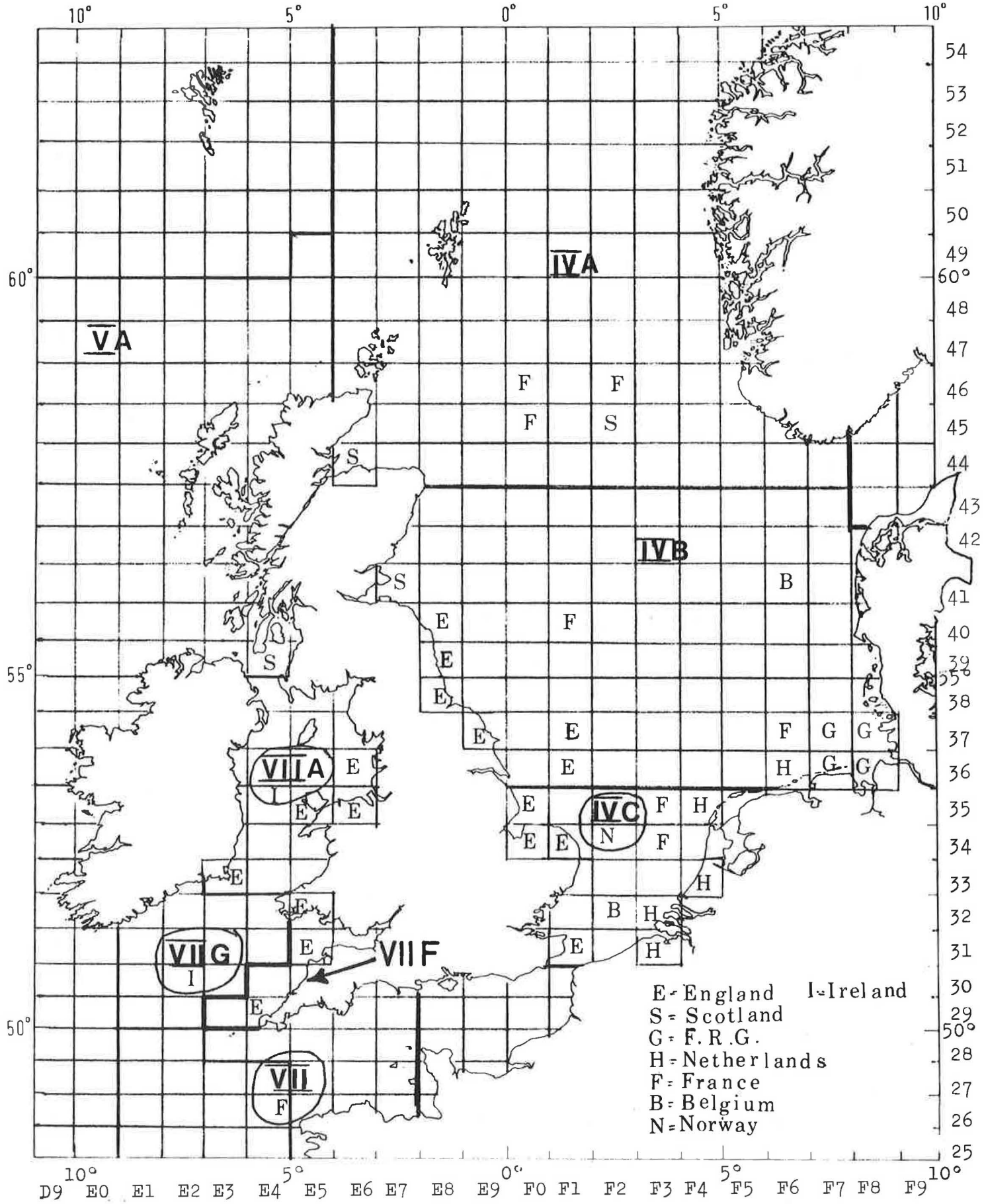

Figure 1. Localities sampled by named countries, 1976.

Indication of spine colours

Liaison Committee Reports	Red
Reports of Advisory Committee on Marine Pollution	Yellow
Fish Assessment Reports	Grey
Pollution Studies	Green
Others	Black

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