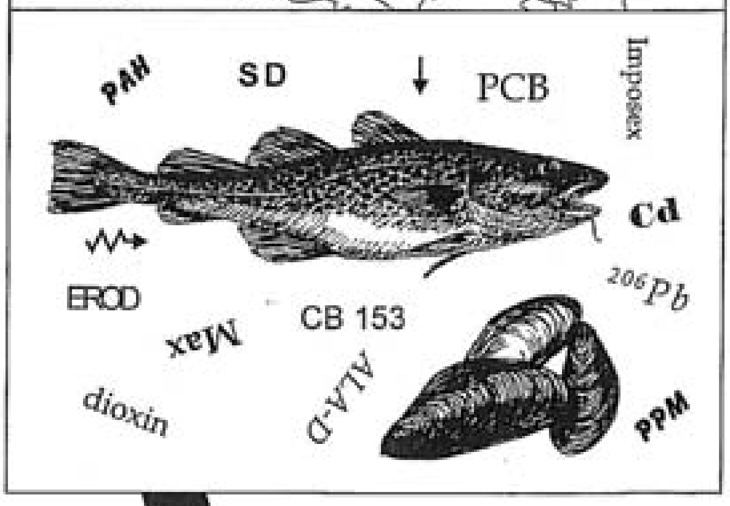
Norwegian State Pollution Monitoring Programme

Report 752/99

Client	Norwegian Pollution Control Authority
Contractor	NIVA

Joint Assessment and Monitoring Programme (JAMP) National Comments regarding the Norwegian Data for 1997



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REPORT

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Abstract

This report is part of the Norwegian contribution to the SIME 1999 meeting administrated by OSPAR. JAMP 1997 included the monitoring of micropollutants in blue mussels (23 stations) and fish (10 stations) along the entire coast of Norway. The results indicated elevated levels of contaminants (i.e. over provisional "high background") in: Oslofjord proper (PCBs, ppDDE and mercury in fish) and Langesundsfjord (HCB in mussels) and Sørfjord and Hardangerfjord (cadmium, lead, mercury and ppDDE in mussels). Significant downward trends were found for cadmium in mussels from the Sørfjord and Hardangerfjord for the period 1987-1997. The results from the remaining stations showed primarily low levels of contamination. Introductory studies using biological effects methods in cod, imposex/intersex in snails, dioxins and dioxin-like compounds in cod liver and lead-isotopes in sediment and mussels were conducted. No change in "pollution" or "reference" index classification was found from 1996 to 1997

4 keywords, Norwegian	4 keywords, English
1. Miljøgifter	1. Micropollutants
2. Organismer	2. Organisms
3. Marin	3. Marine
4. Norge	4. Norway

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JOINT ASSESSMENT AND MONITORING PROGRAMME (JAMP)

NATIONAL COMMENTS REGARDING

THE NORWEGIAN DATA FOR 1997

Oslo, 7. January 1999

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Foreword

This report presents the Norwegian national comments on the 1997 investigations for the Joint Assessment and Monitoring Programme (JAMP). JAMP is administered by the Oslo and Paris Commissions (OSPAR) and their Environmental Assessment and Monitoring Committee (ASMO). JAMP receives guidance from the International Council for the Exploration of the Sea (ICES). ASMO has delegated implementation of part of the programme to the Working Group on Concentrations, Trends and Effects of Substances in the Marine Environment (SIME). The Norwegian 1997 investigations are directed to particular JAMP issues relating to contaminants and implemented by SIME. Some JAMP issues to be addressed lack adequate guidelines, in such cases guidelines used by the Joint Monitoring Programme (JMP) were applied.

The Norwegian JAMP for 1997 was carried out by the Norwegian Institute for Water Research (NIVA) by contract from the Norwegian Pollution Control Authority (SFT), (NIVA contract 80106).

The Norwegian contribution to the JAMP was initiated by SFT in 1981 as part of the national monitoring programme. It now comprises three areas: the Oslofjord and adjacent areas (Hvaler-Singlefjord area and Langesundfjord, 1981-), Sørfjord/Hardangerfjord (1983-84, 1987-) and Orkdalsfjord area (1984-89, 1991-93, 1995-96).

Since the North Sea Task Force Monitoring Master Plan was implemented in 1990 additional areas have also been monitored. These include: Arendal, Lista and Bømlo-Sotra areas. On the initiative of SFT and NIVA "reference" or merely diffusely contaminated areas from Bergen to Lofoten have been monitored since 1992 and from Lofoten to Norwegian-Russian border from 1994.

These comments are considered as preliminary notes on the 1997 results and are not to be viewed as a final assessment.

The comments are presented in accordance with the agreed standardised format (ASMO 1997, Annex 12).

Thanks are due to many colleagues at NIVA, especially: Unni Efraimsen, Frank Kjellberg, Tom Tellefsen for field work, sample preparations, data entry; Einar Brevik and his colleagues for organic analyses; Norunn Følsvik for organotin analyses; Bente Hiort Lauritzen and her colleagues for metal analyses; Gunnar Severinsen for data programme management; and to the authors John Author Berge (organotin), Aud Helland (lead isotopes) Kjetil Hylland (biological effects methods), Jon Knutzen (dioxins) and Mats Walday (organotin). Thanks go also to Risøy Underwater Engineering and their crew aboard 'Risøy' for assisting in the field work and to the numerous fishermen and their boat crews we have had the pleasure working with.

Oslo, 7 January 1999.

Norman W. Green
Project co-ordinator

Contents

1. General Details

1.1 Executive Summary

The Norwegian JAMP 1997 included the monitoring of micropollutants (contaminants) in blue mussels (23 stations) and fish (10 stations) along the entire coast of Norway. The results indicated elevated levels of contaminants (i.e. over provisional "high background") in:

- JAMP area 26: Oslofjord proper (PCBs, and to a lesser degree mercury, lead, zinc and ppDDE) and Langesundsfjord (HCB, less so for cadmium, mercury and CB153). A significant upward trend was found for mercury in cod from the inner Oslofjord 1984-97. A significant downward trend was found for HCB in mussels from Langesund for the period 1990-97.

- JAMP areas 63 and 62: Sørfjord and Hardangerfjord (cadmium, lead and ppDDE and to a lesser degree mercury, zinc and CB153). The ppDDE median concentration in cod from the Hardangerfjord was almost three times higher than any previous year. Significant downward trends were found for cadmium and zinc in mussels from the Sørfjord and cadmium in mussels from the Hardangerfjord for the period 1987-97. A significant upward trend was found for mercury in mussels from one station in the Sørfjord.

- JAMP area 65: Orkdalsfjord. The fjord has not been monitored since 1996.

The remainder of stations are mostly from presumed "reference" areas, where only diffuse contamination is expected. The results indicate primarily low levels of contamination. One possible point of concern is with HCB in cod liver from the Lofoten area where slightly elevated levels have been found for three of the six years this stations has been monitored.

Four biological effect methods were applied to cod from six stations in both diffusely and heavily contaminated areas from the Sørfjord, Hardanger, Lista, and Oslofjord areas. This is the first year in a three-year trial. The results for ALA-D (delta-aminolevulinic acid dehydratase) in blood cells indicated exposure to lead from three of the more contaminated station. High cytochrome P4501A-activity (EROD) in liver was found at the most polluted site. The results for OH-pyrene in bile and metallothionein (MT) in liver were inconclusive.

The effects of organotin were studied for the first time as part of JAMP. Imposex in dog whelks indicated that at all five stations (four from the Haugesund area and one from the outer Oslofjord) were affected by organotin. Intersex in periwinkles indicated only minor effects at the eight stations studied (five from the Haugesund area, two from the south coast and two from the Oslofjord).

Composites of cod livers were analysed for dioxins and dioxin-like compounds. The samples were collected in 1996 from four JAMP stations remote from known point sources of contamination. The results (in part) indicated considerable regional variation in the load of non-ortho PCBs. $TEQ_{PCDD/F}$ and $TEQ_{non\text{-}ortho\ PCB}$ values were in the range expected from Norwegian reference areas.

For the first time in JAMP lead isotopes were used as indicators for lead contamination in the Sørfjord and Hardangerfjord. The study investigated lead derived from Odda at the head of Sørfjord. The results from sediment and mussel soft body indicated that the impacted area extends from Odda to Hardangerfjord. The results for mussel shell did not show an evident gradient.

A new index was tested for the third year to assess the levels of contamination of mussels in "polluted" and "reference" areas. The results for the "pollution" index indicated a "bad" condition and the "reference" index indicated a "fair". There was no change in classification from the 1996 results and no trend is evident.

1.2 Introduction

The Norwegian contribution to the "Joint Assessment and Monitoring Programme (JAMP) was initiated by the Norwegian Pollution Control Authority (SFT) and is integrated with SFT's State Pollution Monitoring Programme. The procedures and practice of JAMP has also provided a basis for other investigations of interest to SFT but not necessarily requested by JAMP (e.g. SFT's Pollution and Reference Indexes, Chapter 1.3.8).

Data are submitted to ICES under three categories: for Purpose A (Health assessment) on a voluntary basis, Purpose C (spatial distribution) on a voluntary basis and Purpose D (temporal trend assessment) on a mandatory basis. Where practical, data collection was in accordance to agreed procedures (OSPAR 1990). Data were screened and submitted to ICES in accordance with procedures outlined by ICES (1996).

This report focuses on issues and situations in Norway concerning contaminants and considered of interest to the implementation of JAMP (Table 1).

Table 1. JAMP issues to which the Norwegian investigations for 1997 can be addressed (cf., ASMO 1997, Annex 30).

Issue	Subject	Description
1.2	Hg, Cd, and Pb	What are the concentrations and fluxes in sediments and biota?
1.3	TBT	To what extent do biological effects occur in the vicinity of major shipping routes offshore installations, marinas and shipyards
1.7	PCBs	Do high concentrations pose a risk to the marine ecosystem?
1.8	PCBs	Do high concentrations of non-ortho and mono-ortho CBs in seafood pose a risk to human health?
1.10	PAHs	What are the concentrations in the maritime area?
1.11	PAHs	Do PAHs affect fish and shellfish?
1.12	Other synthetic compounds	How widespread are synthetic organic compounds within the maritime area?
1.15	Chlorinated dioxins and dibenzofurans	What concentrations occur and have the policy goals (for the relevant parts of the maritime area) been met?
1.17	Biological effects of pollutants	Where do pollutants cause deleterious biological effects?
5.3	Chemical used [mariculture]	In which areas do pesticides and antibiotics affect marine biota?
6.1	Ecosystem health	How can ecosystem health be assessed in order to determine the extent of human impact

This report is structured at the first and second level according to agreed format (ASMO 1997, Annex 12) which *inter alia* presents results before methodology.

1.3 Information on measurements

An overview of JAMP stations in Norway is shown in maps in Figure 1-Figure 4 and Appendix E. The stations and sample counts relevant to the 1997 investigations are noted in Appendix E and F, respectively.

Blue mussels were sampled at 30 stations and fish from 13 stations from the border to Sweden in the south to the border to Russia in the north. Generally, mussels are not in abundance on the exposed coastline from Lista (south Norway) to the North of Norway. A number of samples were collected from dock areas, buoys or anchor lines (see footnotes in Appendix E).

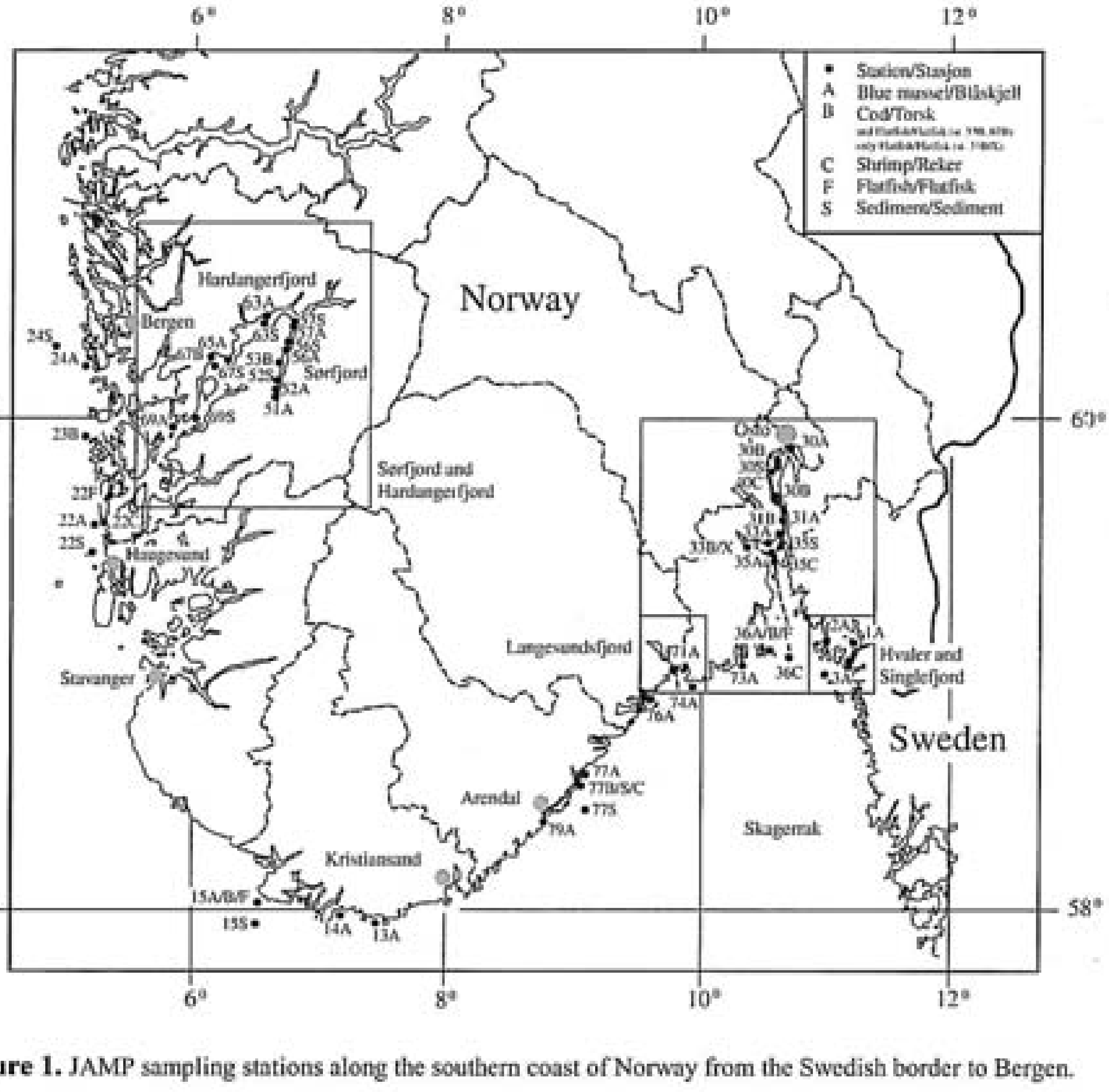


Figure 1. JAMP sampling stations along the southern coast of Norway from the Swedish border to Bergen.

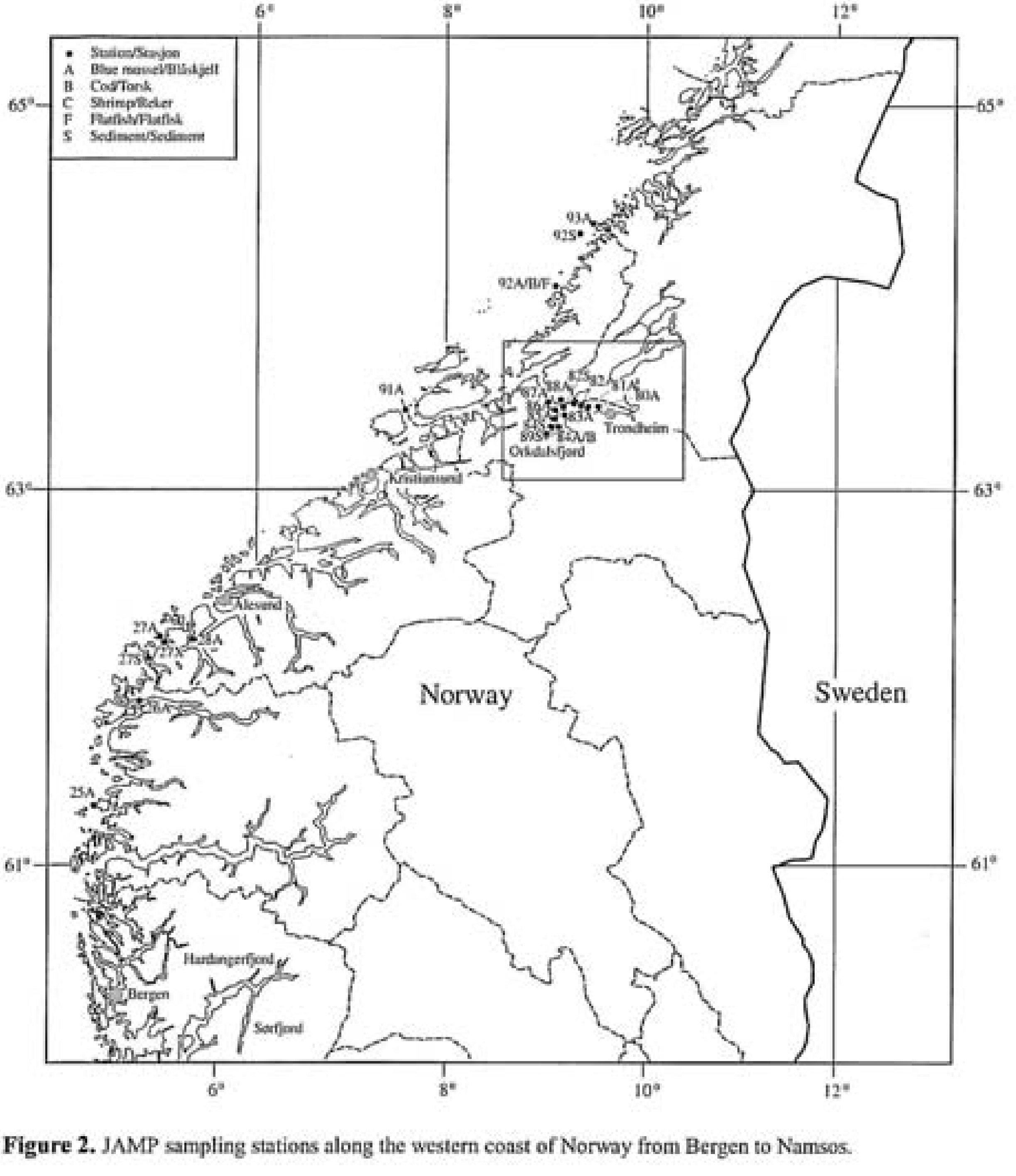


Figure 2. JAMP sampling stations along the western coast of Norway from Bergen to Namsos.

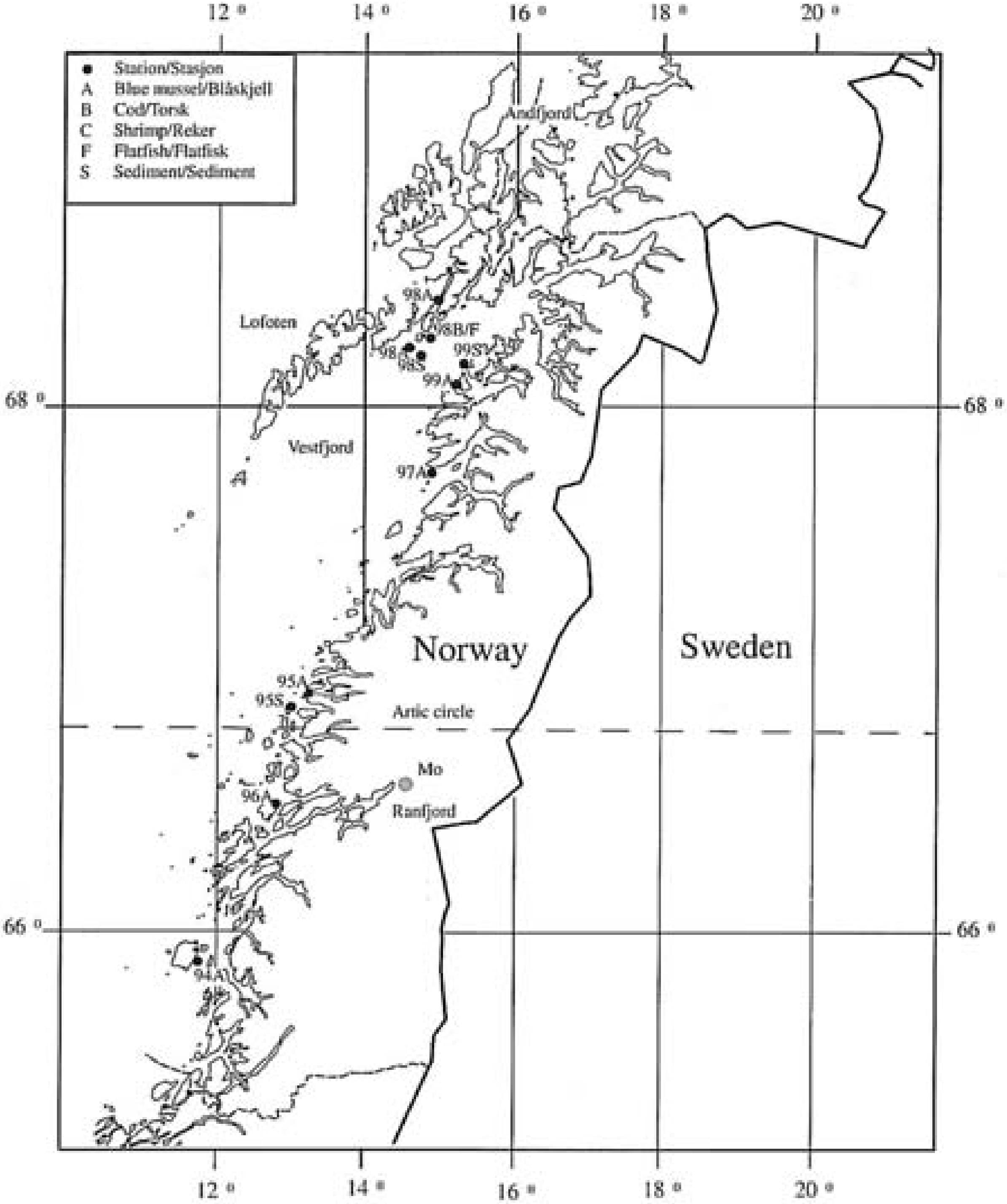


Figure 3. JAMP sampling stations along the Northwest coast of Norway from the region of Ranfjord to Lofoten.

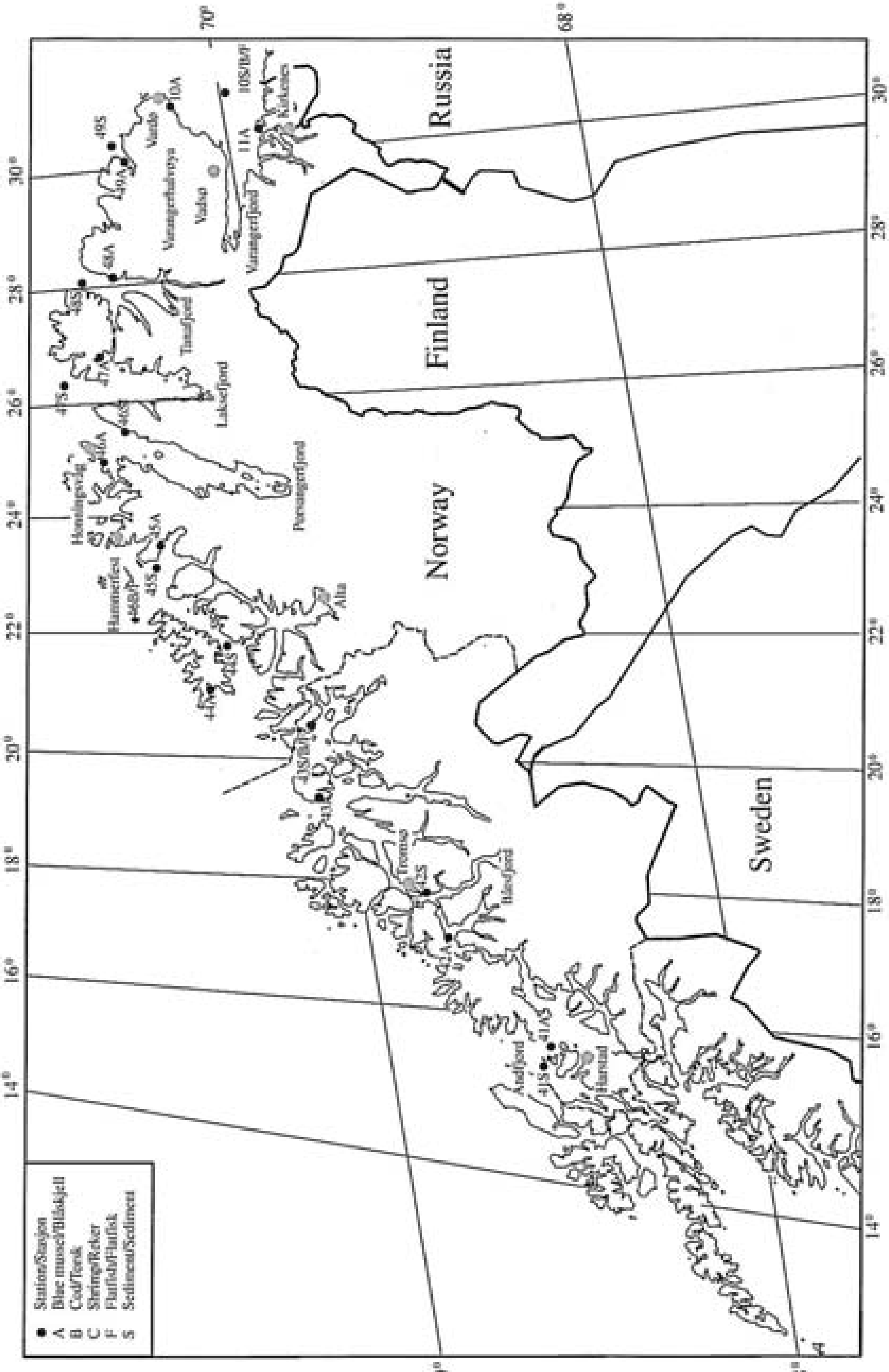


Figure 4. JAMP sampling stations along the north coast of Norway from the region of Lofoten to the Russian border.

1.3.1 Oslofjord area

Moderate overconcentrations of CB153 in mussels were found in the inner Oslofjord (st.30A, up to 5 times provisional "high background" - see Chapter 2.1.2) (Figure 5, Appendix G). Slight overconcentrations were found in flounder caught only at one station (st.31B) midway along the fjord. Overconcentrations were also found in cod liver from the inner Oslofjord (st.30B, up to 6 times "high background"; Figure 6). The median concentration of CB153 in cod liver from the inner Oslofjord was over 1200 ppb w.w. and higher than previous years (1990-1996, Figure 6, Appendix I). Similarly, the median concentration in cod fillet for 1997 was 4.34 ppb and higher than previous years except 1992 (Appendix G).

Overconcentrations were also for sum of 7 PCBs (CB-28, -52, 101, -118, -138, -153 and -180) in mussels and cod liver from inner Oslofjord stations (st.30A and 30B), about 6 times "high background" (Appendix H). Slight overconcentrations (less than 2 times "high background") were found in cod livers from the outer Oslofjord. In 1994 the Norwegian Food Control Authority (SNT) issued recommendations regarding the consumption of fish liver from the inner Oslofjord due to concerns about PCB contamination (Table 5).

No significant linear trend was detected (see Chapter 2.1.3) for CB153 for mussel from four stations (30A, 31A, 35A and 36A) from 1987 to 1997 or for cod (30B and 36B) from 1990 to 1997.

Power analyses (see Chapter 2.1.3) indicated that a hypothetical trend of 10% change per year in CB153 concentration in the blue mussel or cod liver from the inner Oslofjord would take up to 12 years to be detected with 90% significance (Appendix G).

Moderate overconcentrations of mercury (up to twice "high background") were found in the fillet of both "large" and "small" cod (st.30B) from the inner Oslofjord (Figure 7). Trend analyses indicated a significant *upward* trend for the period 1984-1997. The power, indicated as number of years, to detect a change in mercury in cod fillet from the inner Oslofjord was slightly better for "small" fish (9 years) than "large" fish (12 years) (cf., Appendix G). Slight overconcentrations (less than 2 times "high background") were found in "large" cod from outer Oslofjord (st.36B).

In cod liver, slight overconcentrations (less than 3 times "high background") were also found for lead and ppDDE (st. 30B, inner Oslofjord) and zinc (st.36B, outer Oslofjord).

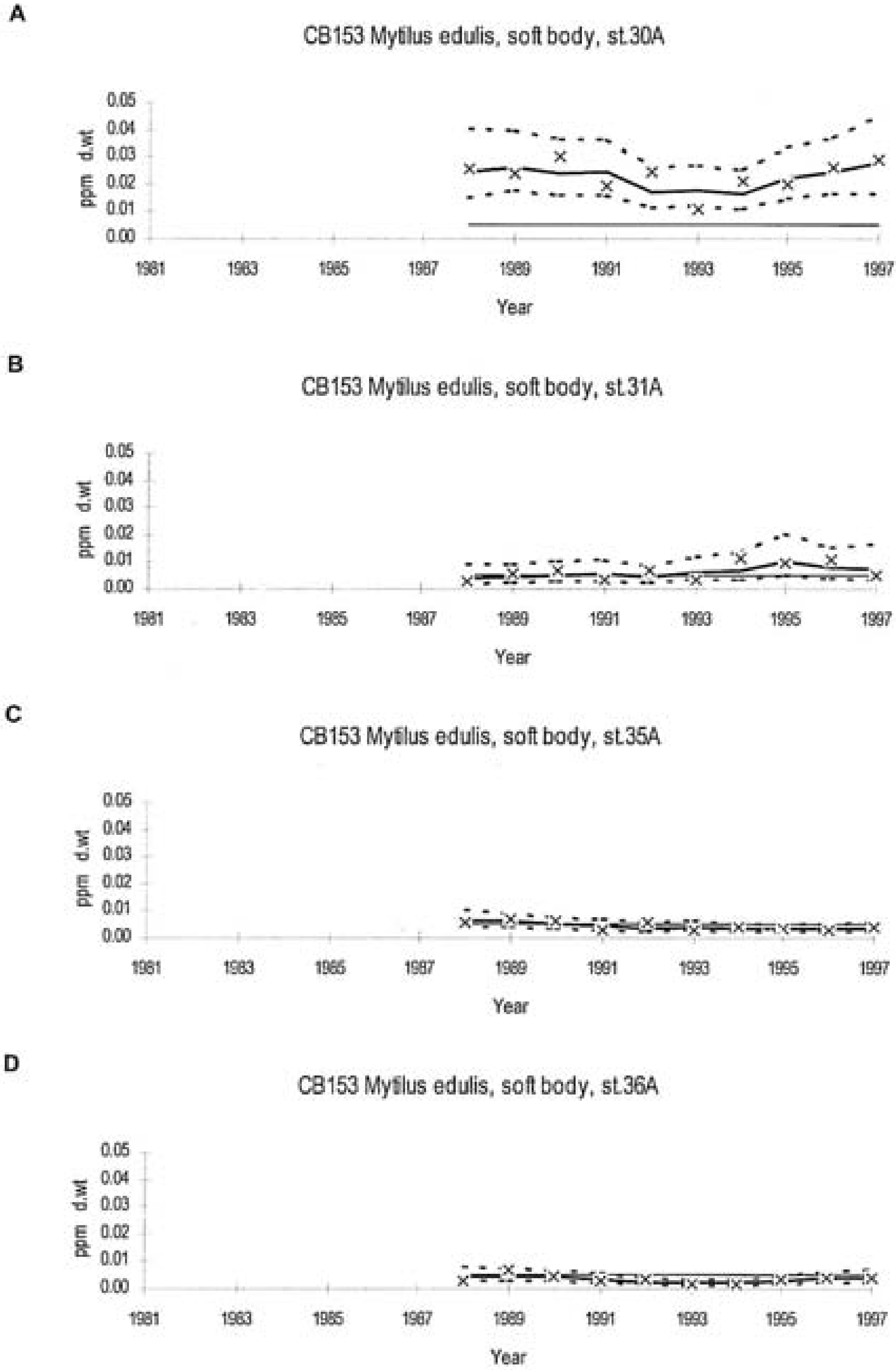
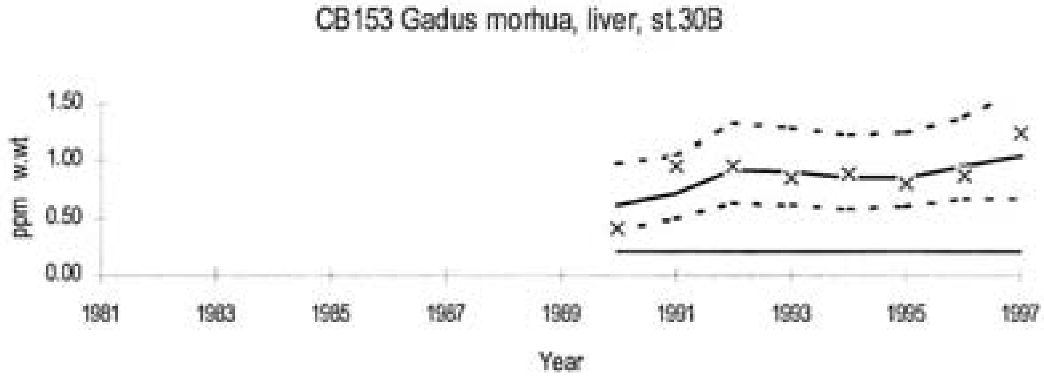


Figure 5. Median CB153 concentration in blue mussel (*Mytilus edulis*) from inner (st.30A) to outer (st.36A) Oslofjord. (cf., Figure 1 and Figure 26).

A



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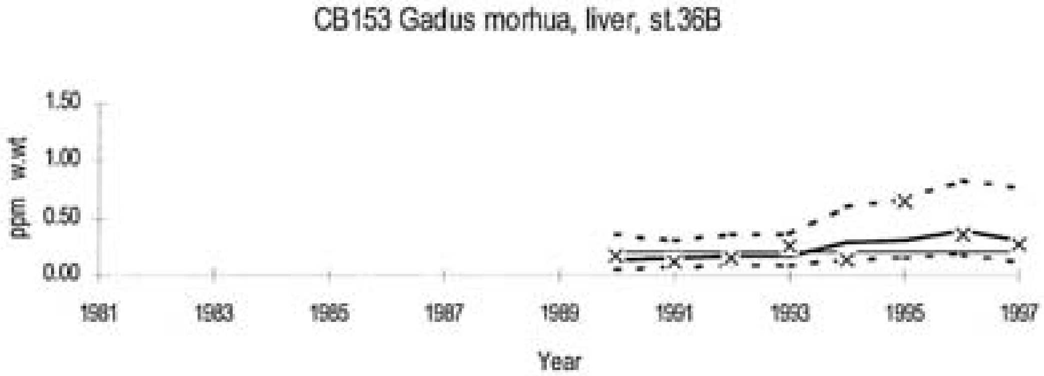

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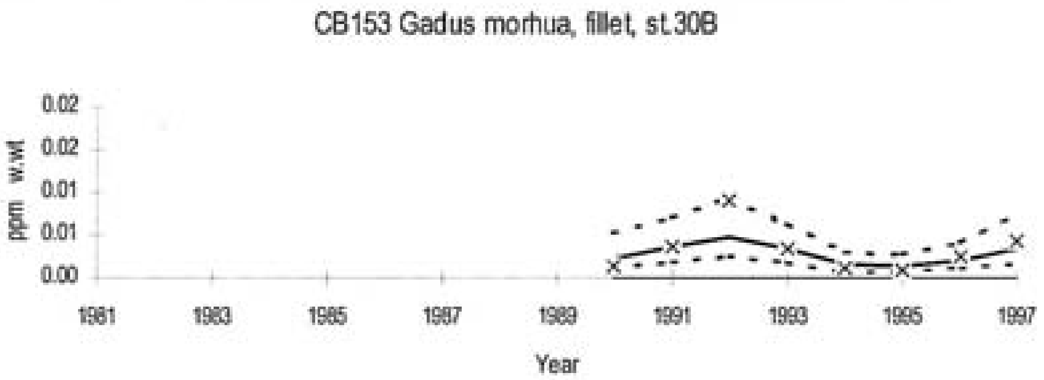

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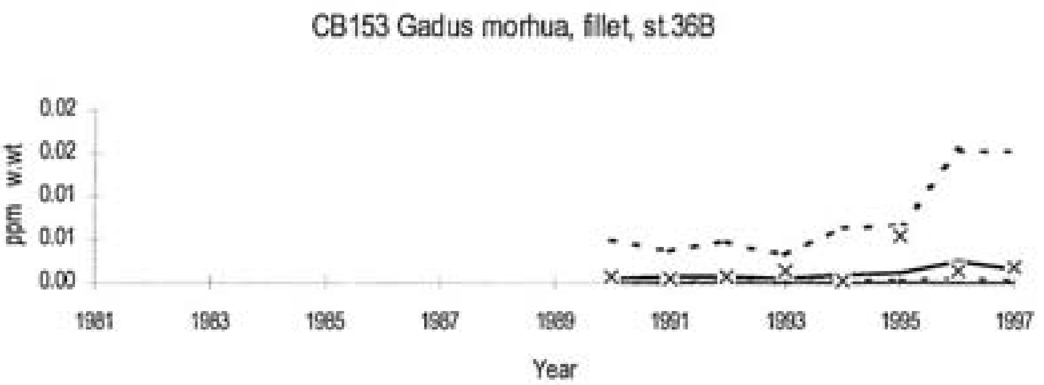


Figure 6. Median CB-153 concentration in liver and fillet of cod (*Gadus morhua*) from the inner (st.30B) to outer (st.36B) Oslofjord. (cf., Figure 1 and Figure 26). **Note: for some years the upper confidence interval line is off-scale in Figure D.**

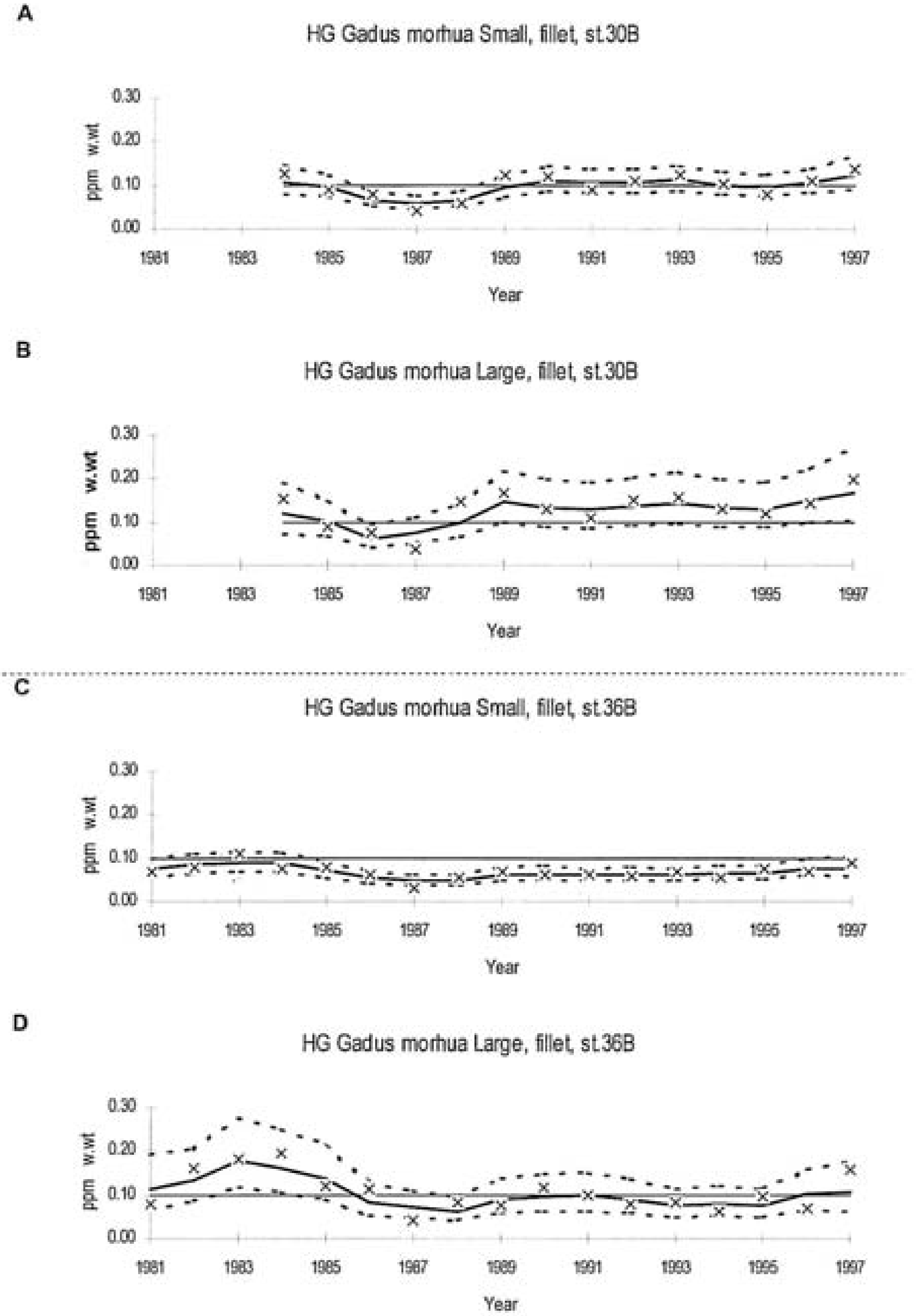


Figure 7. Median mercury (Hg) concentration in fillet of cod (*Gadus morhua*): for the inner Oslofjord (st.30B) "small" (**A**) and "large" (**B**) fish, and for the outer Oslofjord (st.36B) "small" (**C**) and "large" (**D**) fish. (cf., Figure 1 and Figure 26).

Mussels from Langesundsfjord (st.71A) had in 1997 marked overconcentrations of HCB (over 4 times "high background", Appendix G). Concentrations have varied greatly during the investigation period (since 1983) but median value have decreased distinctly since 1989 (Figure 8) due to about a 99% reduction in discharge of HCB and other organochlorines from a magnesium factory (cf., Knutzen *et al.* 1996).

The variability in the data is much less after 1989. The relatively large variability found in this series prior to 1990 accounts for the poor power. The power of the monitoring program for the period 1990-97 is 14 years and better than the power for the entire period which is over 25 years (cf., Appendix G for entire period). The separate analysis for the 1990-97 data also indicated a significant *downward* trend for this period.

Moderate overconcentrations of cadmium, mercury and CB153 (less than twice "high background") were also found.

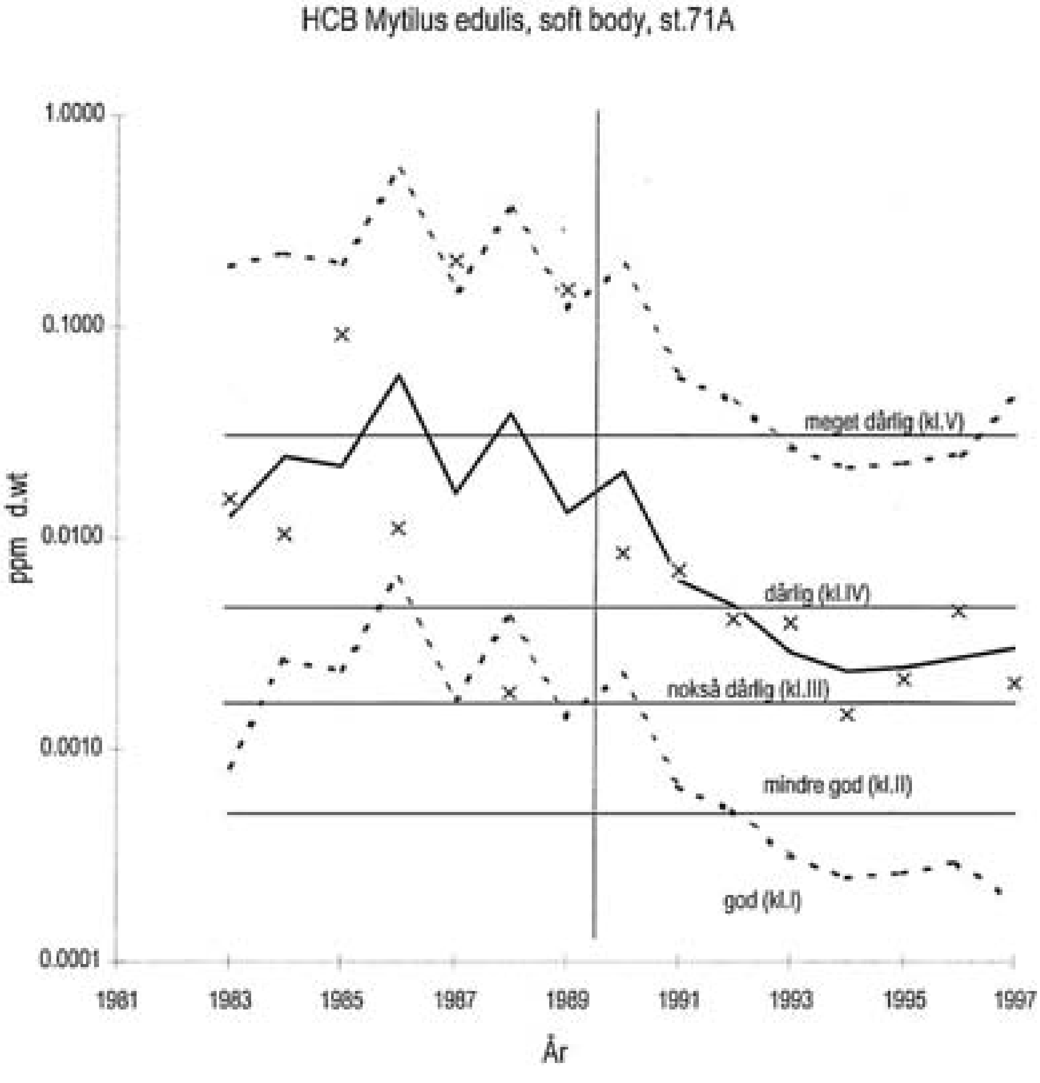


Figure 8. Median HCB concentration in blue mussel (*Mytilus edulis*) from Langesundsfjord (west of Oslofjord). (cf., Figure 1 and Figure 26). Vertical line indicates when a magnesium factory reduced it's discharge by 99%. **NB: log-scale.**

1.3.2 Sørfjord and Hardangerfjord

The development of the contaminant conditions in these connected fjords and the main remedial actions that have been taken, have been outlined in the national comments for 1989 (Green 1991) and recent national report concerning Sørfjord in particular (Skei *et al.* 1998). The results from JAMP 1997 are coupled to other studies in this area (cf., Knutzen *et al.* 1997, 1999) and confirm that the fjords continue to be contaminated especially with cadmium (Figure 9 and Figure 10) and lead and to a lesser degree ppDDE (Figure 11 and Figure 12) and mercury.

Results for mussels collected from the Sørfjord (st. 51A, 52A, 56A and 57A) indicated severe overconcentrations of cadmium (up to 14 times provisional "high background", Appendix G) and lead (up to 12 times "high background"), more moderately for mercury and zinc (up to 2 times). Overconcentrations of cadmium and lead could be traced to Ranaskjær (st.63A) in the Hardangerfjord, about 60km from the head of the Sørfjord. A significant *downward* trend was found for cadmium at st.57A and 63A and for zinc at st.57A from 1987 to 1997 (Appendix G). In addition, significant *upward* trend was found for mercury at st.57A during this period. In 1997 the Norwegian Food Control Authority (SNT) has issued recommendations regarding the consumption of mussels from the inner Sørfjord (Table 5) due to concerns about metal contamination.

Moderate overconcentrations of cadmium, mercury and lead were found in flounder liver from Sørfjord, 2-3 times "high background". Overconcentrations up to 2 times "high background" were found for cadmium and mercury in cod liver from the inner Sørfjord and from Hardangerfjord. Higher concentrations of cadmium in cod liver were found in Hardangerfjord.

The power of the sampling strategies for mussels was relatively poor for samples collected from Odda, at the head of the Sørfjord (st.52A). For example for lead in mussels, it is estimated that it would take 24 years to detect a hypothetical trend of 10% per year with 90% significance (Appendix G). This reflects the large variability found in the data series from this area. The variability is largely due to the irregular/accidental input of contaminated discharges. The power improved with distance from Odda.

Overconcentrations of ppDDE were found in cod liver from Hardangerfjord (st.67B) and Sørfjord (st.53B), up to 10 and 4 times "high background", respectively (Figure 13, Appendix G). The 1997 median concentration in Hardangerfjord was almost three times higher than any previous year. Overconcentrations were found in mussels to about 60km from the head of the Sørfjord (Figure 11 and Figure 12). As in previous years, highest concentrations in mussels (overconcentrations of over 7 times) were found midway along the Sørfjord (st. 56A). Slight overconcentrations (less than 2 times) were found in flounder liver from the inner Sørfjord (st.53B).

The source of ppDDE is uncertain but the Sørfjord and Hardangerfjord area has a considerable number of fruit orchards. Earlier use and persistence of DDT and leaching from contaminated soil is probably the main reason for the elevated levels found. DDT products has been prohibited in Norway since 1970 (excepting the dipping of spruce seedling until 1987). One possible source may be DDT-contaminated material buried in the vicinity of st.56A (Knutzen *et al.*, 1998).

Slight overconcentrations of CB153 were found in cod liver from Sørfjord and Hardangerfjord.

No trends were evident in these organism for ppDDE and CB153 during the period 1990-97.

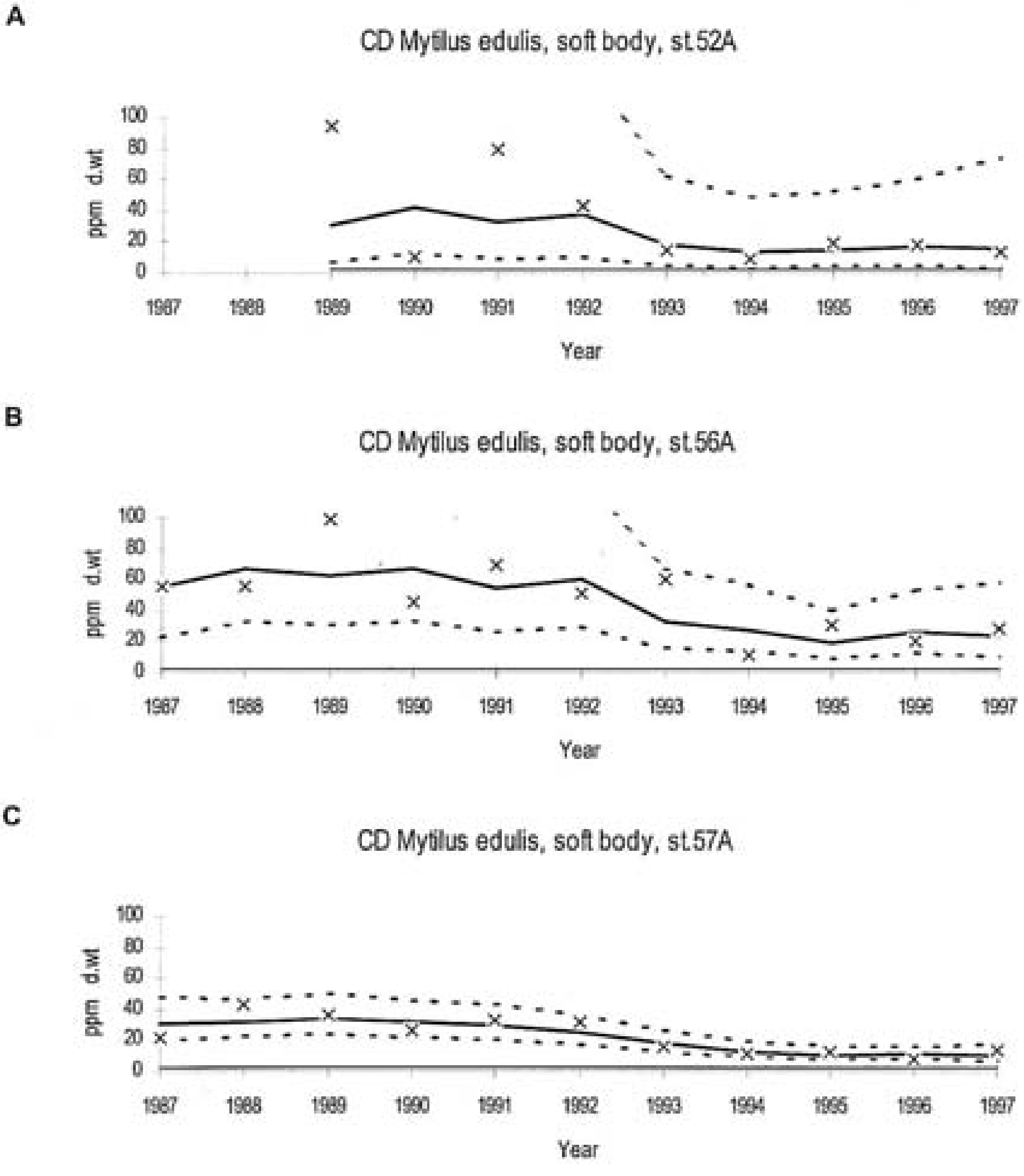


Figure 9. Median cadmium (Cd) concentration in blue mussel (*Mytilus edulis*) from inner (st.52A) to outer (st.57A) Sørfjord. NB: (cf., Figure 1 and Figure 26). **Note: for some years the upper confidence interval line is off-scale in figures A and B.**

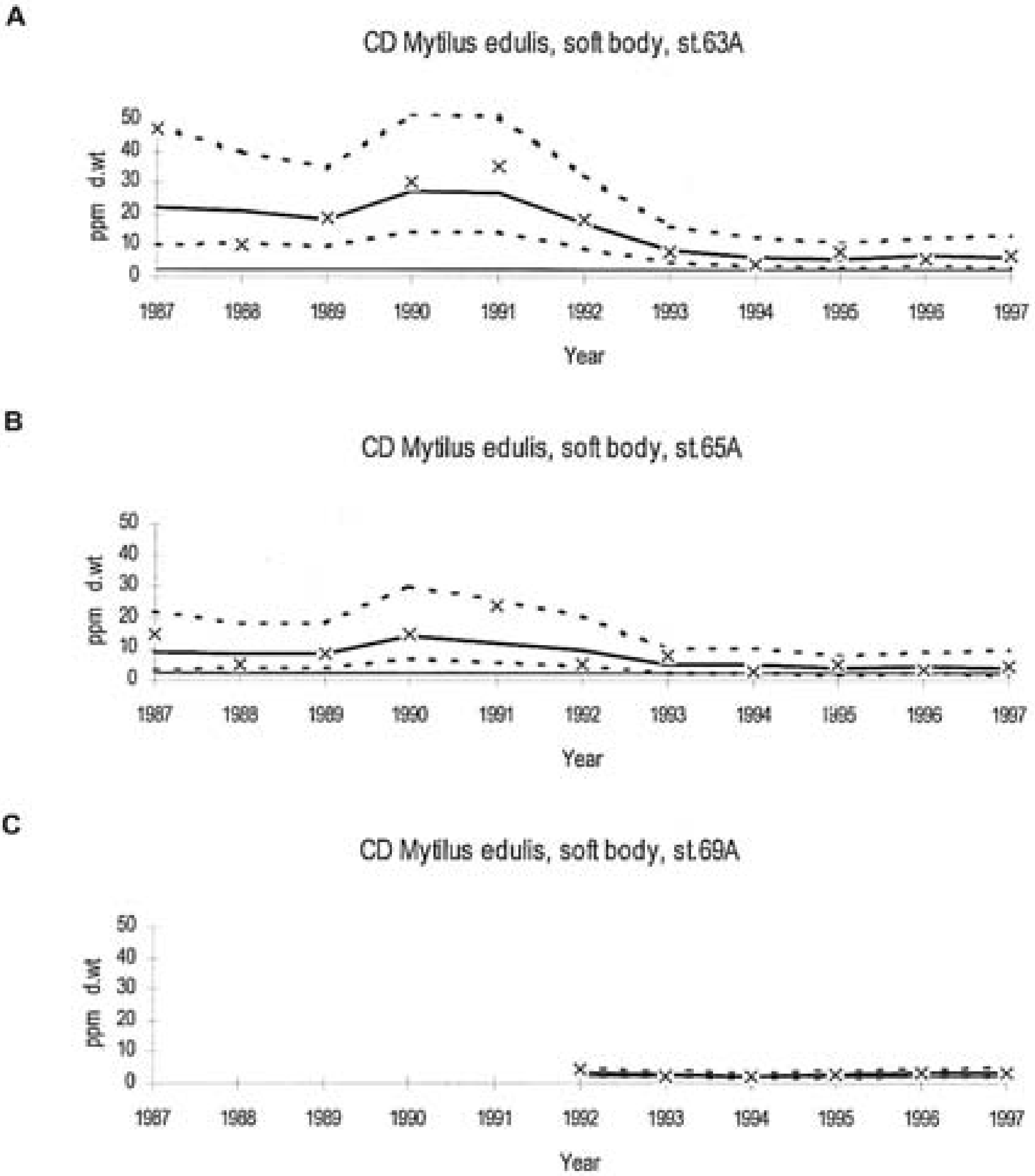
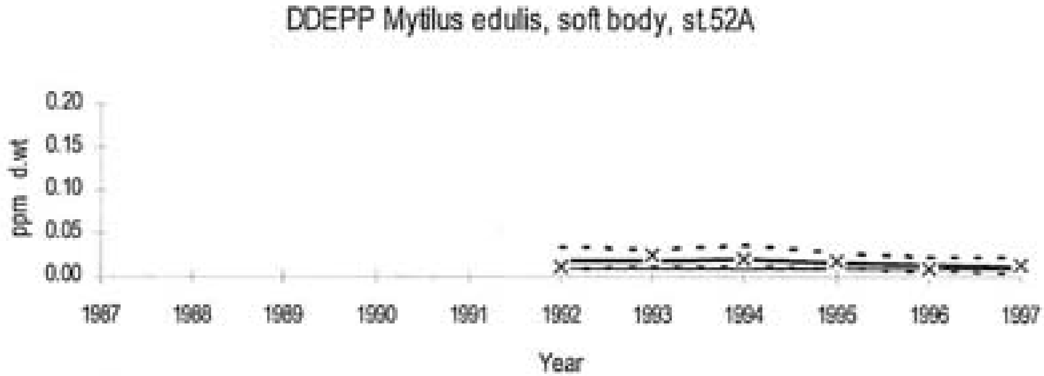


Figure 10. Median cadmium (Cd) concentration in blue mussel (*Mytilus edulis*) from Hardangerfjord (st. 63A, 65A and 69A). (cf., Figure 1 and Figure 26). **Note difference in scale from Figure 9 and that for some years the upper confidence interval line is off-scale in Figure A.**

A



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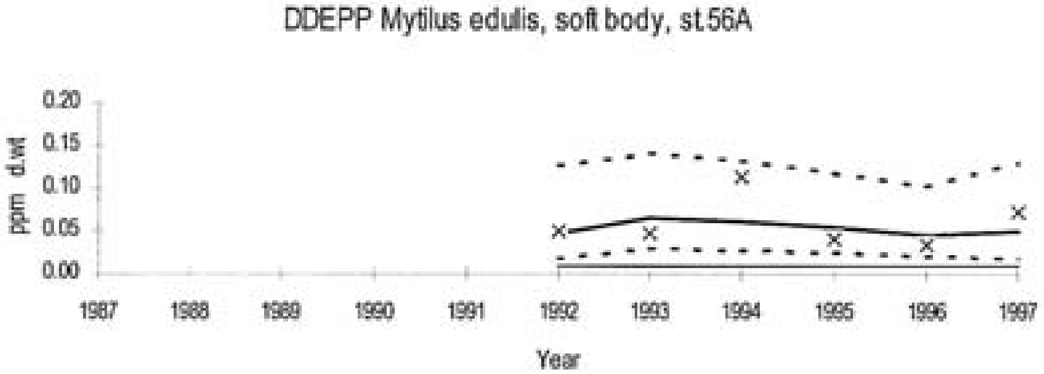

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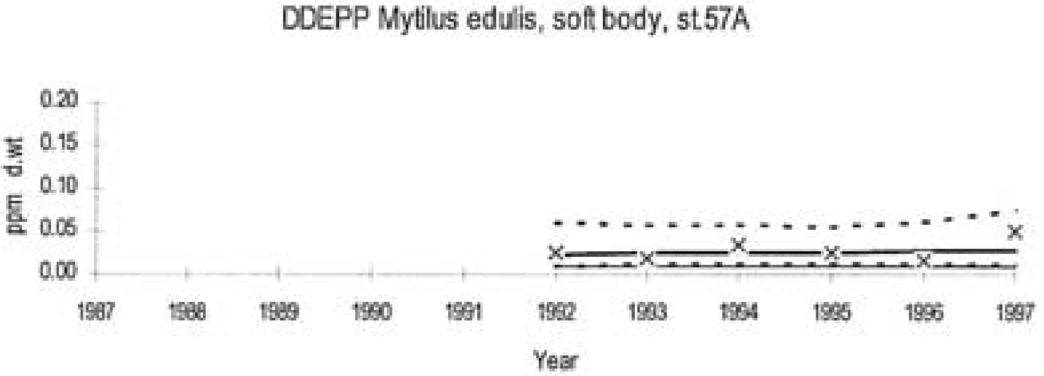

Figure 11. Median ppDDE (DDEPP) concentration in blue mussel (*Mytilus edulis*) from inner (st.52A) to outer (st.57A) Sørfjord. (cf., Figure 1 and Figure 26).

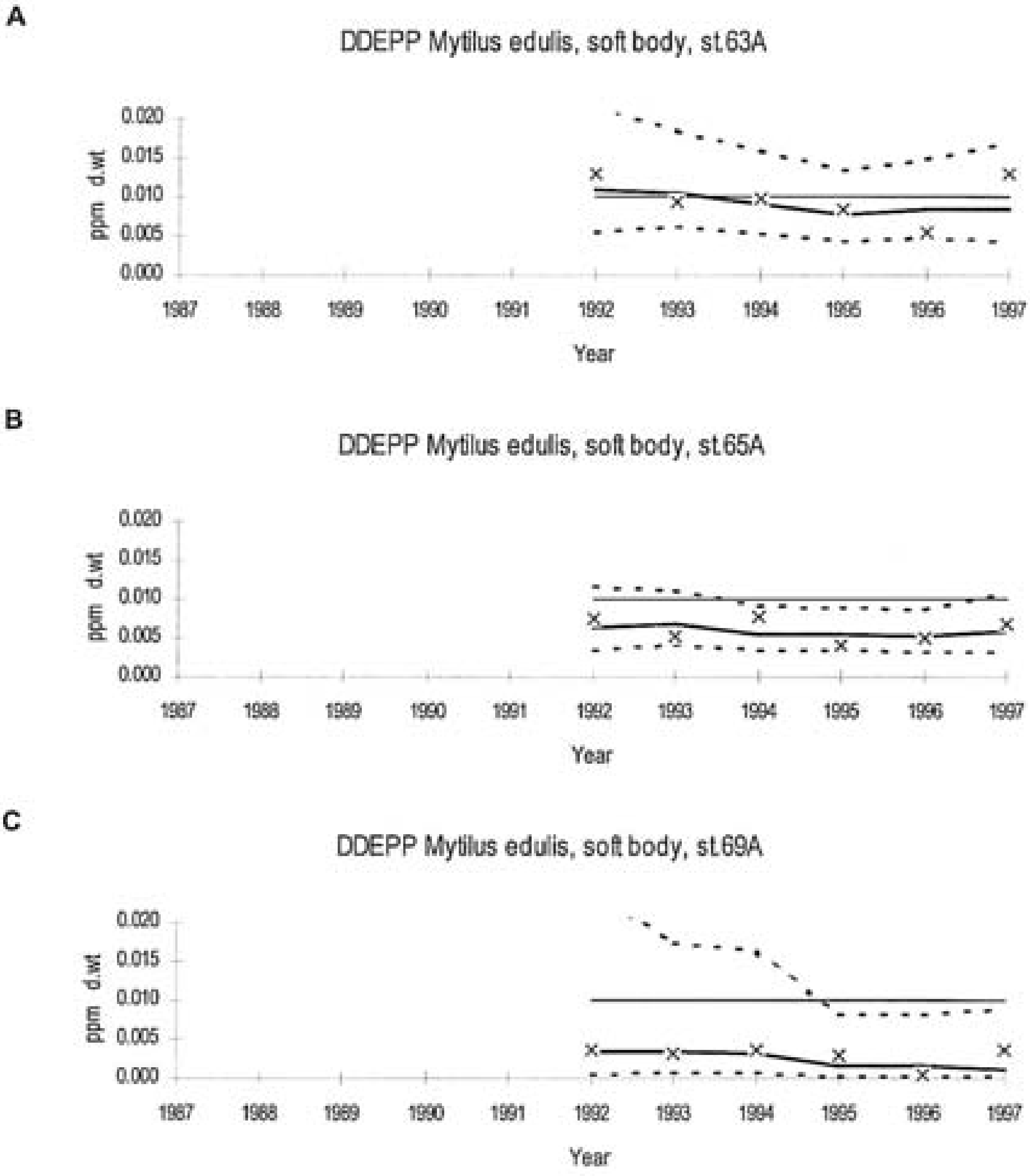

Figure 12. Median ppDDE (DDEPP) concentrations in blue mussel (*Mytilus edulis*) from Hardangerfjord (st. 63A, 65A and 69A). (cf., Figure 1 and Figure 26). **Note difference in scale compared to Figure 11.**

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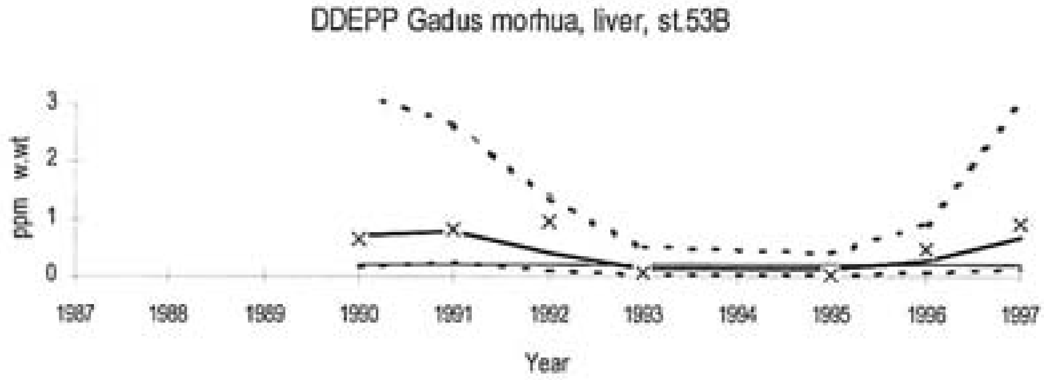

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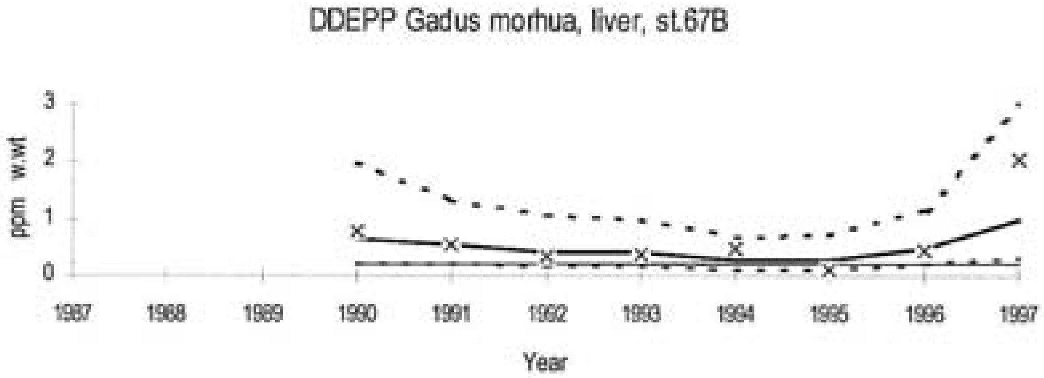

Figure 13. Median ppDDE (DDEPP) concentrations in cod (*Gadus morhua*) from Sørfjord (st.53B) and Hardangerfjord (st.67B) (cf., Figure 1 and Figure 26). **Note that for some years the upper confidence interval line is off-scale in Figures A and B.**

1.3.3 Lista areas

No overconcentrations of metals or chlorinated hydrocarbons were found in mussels, cod, or dab (st.15A/B/F, Figure 1, Appendices G and H).

1.3.4 Bømlo-Sotra area

With one exception there were no overconcentrations of metals or chlorinated hydrocarbons found in mussels, cod, or plaice from this area (st. 22A/F and 23B, Figure 1, Appendices G and H). The exception was for lead in plaice liver where only a slight overconcentration was found (less than 2 times "high background") (Appendix H). Dab was not recovered at this station (22F) as was the case during the period 1990-95.

1.3.5 Orkdalsfjord area

Investigations in the area have been discontinued. Data for mussels is available for the period 1984-1996.

1.3.6 Open coast areas from Bergen to Lofoten

This stretch of coastline covers 7° of latitude to 68°N (Figure 2 and Figure 3). Only two mussel stations (st.92A and 98A) were investigated. Mussels were collected from 98A in 1992-1993. However, during the period 1994-1996 mussels were not found at this station but were collected from nearby Skrova harbour (98X). In 1997 a "new" 98A location was found roughly 18 km north in a small fjord remote from apparent point source of contamination.

Cod was collected in the Froan area (st.92B), but not analysed. Both cod and plaice were collected from the Lofoten area (st.98B/F).

In cod from the Lofoten area, slight to moderate overconcentrations of mercury, lead (on dry weight basis) and HCB (less than 2 times "high background") were found (Appendix G, see also Appendix H). Overconcentrations of HCB (up to 3 times "high background") have been found for three of the six years this station has been monitored (Figure 14).

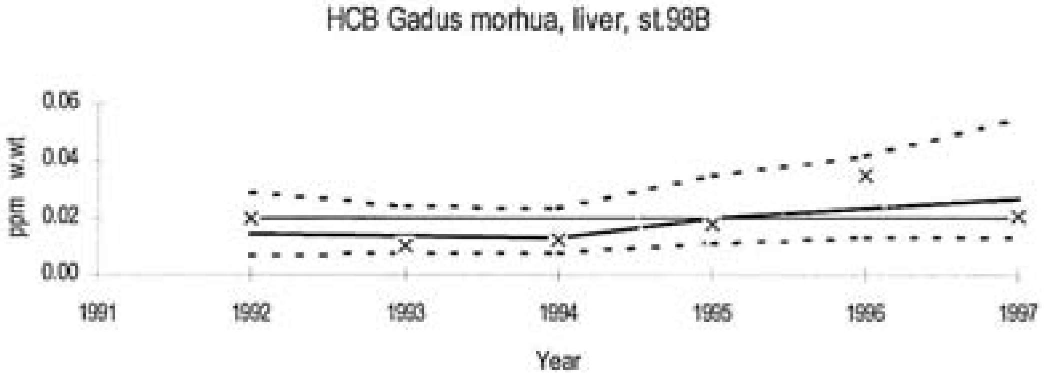

Figure 14. Median HCB concentrations in cod (*Gadus morhua*) from Lofoten (st.98B) (cf., Figure 3 and Figure 26).

1.3.7 Open coast areas from Lofoten to Russian border

Five mussel stations were investigated in the open coast areas from Lofoten to the Russian border, north of 68°N and a longitude from 17 to 29°E (Figure 3 and Figure 4). In addition, cod and plaice were sampled in the Varangerfjord (st.10B). It was the first time a flatfish had been sampled from this station within the JAMP program.

Slight overconcentrations (less than 2 times "high background") of cadmium and CB153 were found at one mussel stations (st. 43A) (Appendix G and H).

1.3.8 Norwegian Pollution and Reference Indexes

The Norwegian Pollution Control Authority (SFT) is interested in obtaining a select and small group of indices to assess the quality of the environment with respect to contaminants. One index is based on the levels and trends of contaminant concentrations in the blue mussel collected annually from a selection of the more contaminated fjords in Norway (Appendix I). SFT has also requested the testing of this index against "reference" stations from selected areas and fjords.

The Index scale varies from 1, in which no overconcentrations were found at any station, to 5, in which at least one sample from each area or fjord could be classified as "very bad" in SFT's system.

Fewer areas and contaminants were sampled in 1997 compared to 1995-96. Hence, the Pollution Index had to be recalculated for 1995-96 on a common basis. Only eight fjord areas were included. The Index for 1997 is 3.3 and lower than previous years. A value between 3 and 4 would be classified by the SFT system as "Bad".

Similarly, the Reference Index values for 1995-96 had to be recalculated in order to compare the results to 1997. Only 6 fjord/areas were included. The Index for 1997 is 1.3 and lower than for previous years. A value between 1 and 2 would be classified as "Fair".

1.3.9 Biological effects methods

The JAMP-programme for 1997 included the first of a three year trial to test the application of 4 methods to determine biological effects of contaminants, i.e. OH-pyrene-metabolites in bile, ALA-D (delta-aminolevulinic acid dehydratase) in blood cells, cytochrome P4501A-activity (EROD) in liver, and metallothionein (MT) in liver. All parameters were measured in Atlantic cod (*Gadus morhua*) from the inner Oslofjord (st.30B), outer Oslofjord (36B), Lista area (15B), Sørfjord (53B) and the connecting Hardangerfjord (67B), and the coastal area near the mouth of the Hardangerfjord (23B) (cf., Figure 1). There were 11-25 fish sampled from each station (cf., Appendix J).

The concentrations of OH-pyrene (a PAH metabolite) in bile were high in cod from site 15B and from sites 53B and 67B (Figure 15). One major reason for those levels was thought to be the conditions for holding the fish before sampling. At these three sites, the cod were held in cages close to or at a jetty with boating activity. At 23B and 36B, the cod were held in areas remote from such possible sources of PAHs.

The activity of ALA-D appeared to be inhibited at the three sites with highest pollutant levels, i.e. 30B, 53B and 67B (Figure 16) indicating that cod from these stations were exposed to lead.

The activity of hepatic cytochrome P4501A (EROD) was clearly elevated at the most polluted site, 53B (Figure 17). No adjustment for season, size or sex has been made here even though these factors might be important (OSPAR 1998).

The hepatic concentrations of the metal-binding protein metallothionein (MT) were lowest at the most polluted station, 53B, whereas levels at the other five sites were similar (Figure 18). This protein is induced by and binds to the metals cadmium, zinc, copper and mercury. Elevated levels of cadmium, mercury and zinc are found in the Sørfjord. Hence, the results from station 53B are unexpected. The results from 1998-1999 will be of particular interest in this respect.

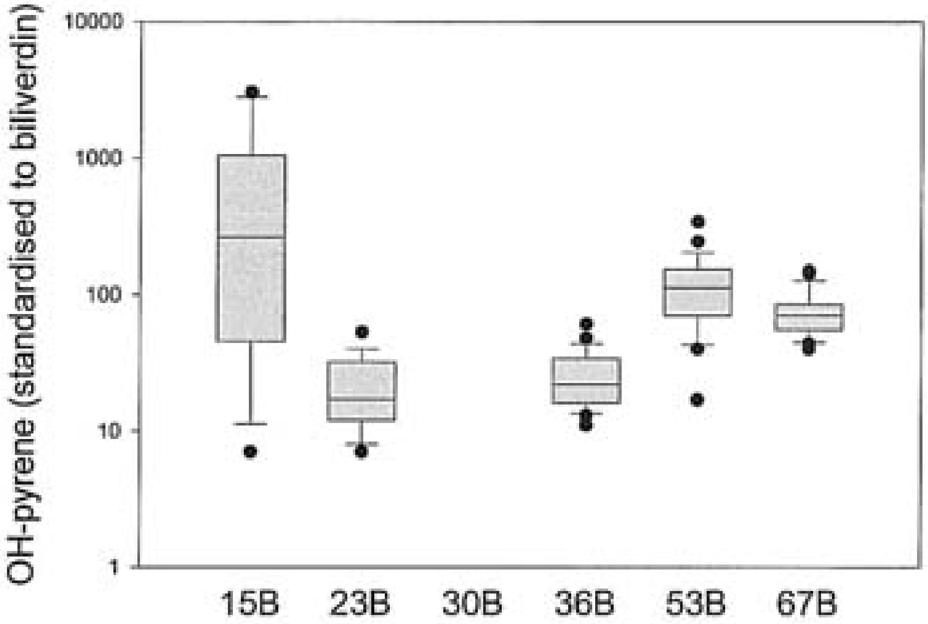

Figure 15. Concentrations of OH-pyrene in bile of cod sampled at the indicated sites. Median, quartiles, 10/90-percentiles and outliers are indicated. (See also Figure 1, Appendix J Table 10.)

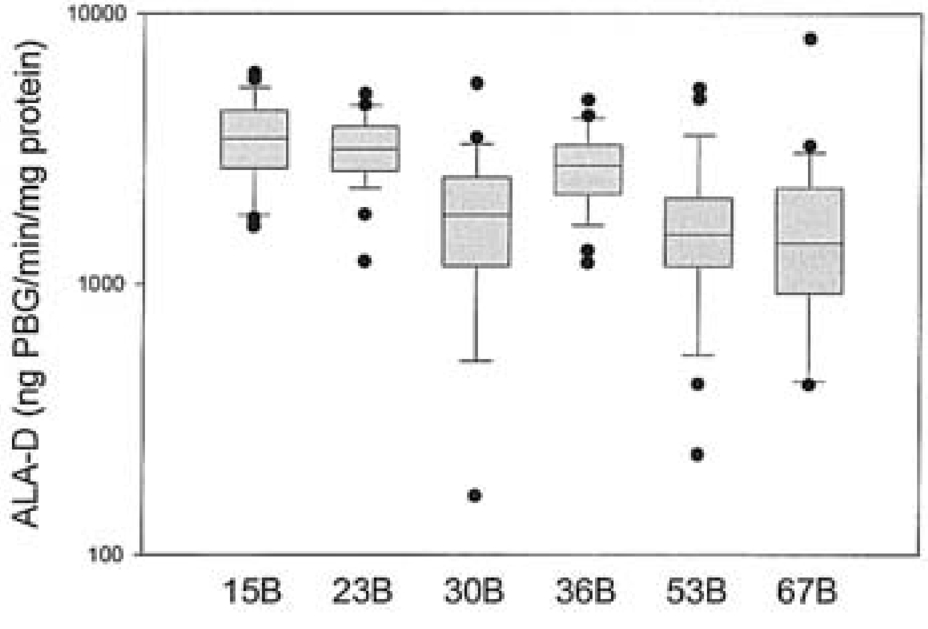

Figure 16. Activity of ALA-D in blood cells of cod sampled at the indicated sites. Median, quartiles, 10/90-percentiles and outliers are indicated. (One low outlier not shown for st.30B, see also Figure 1, Appendix J Table 11.)

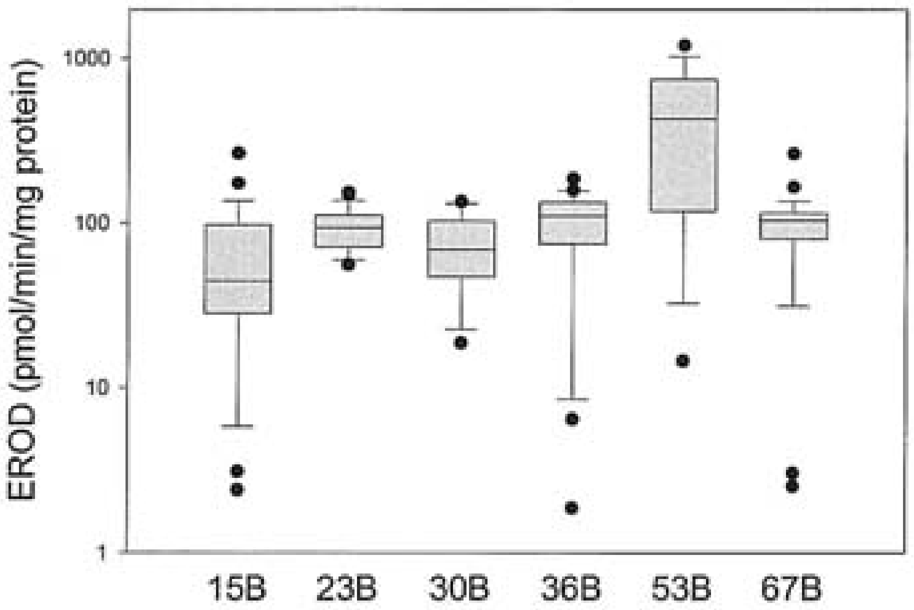

Figure 17. EROD-activity in the microsomal fraction of livers from cod sampled at the indicated sites. Median, quartiles, 10/90-percentiles and outliers are indicated. (See also Figure 1, Appendix J Table 12.)

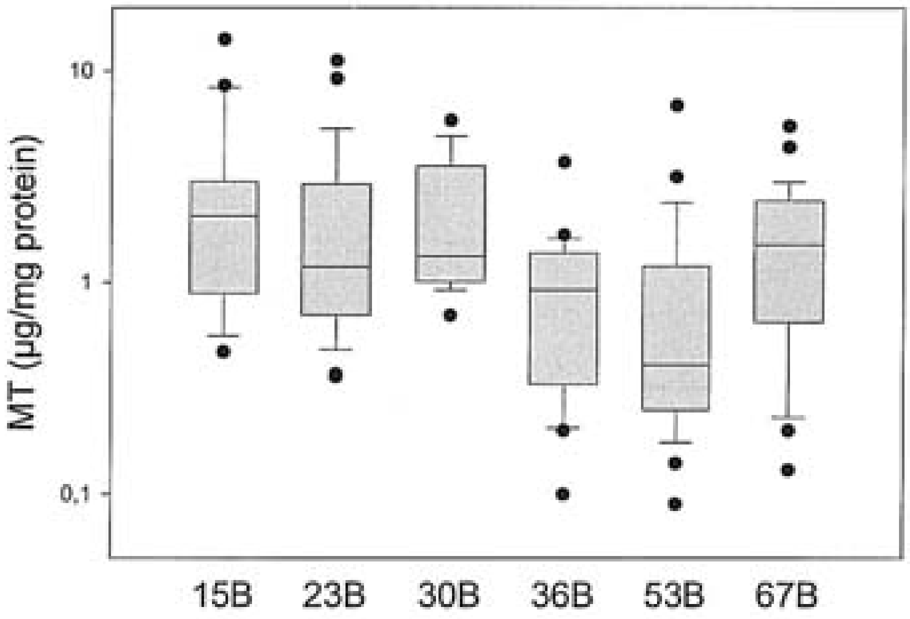

Figure 18. Concentrations of metallothionein (MT) in liver of cod sampled at the indicated sites. Median, quartiles, 10/90-percentiles and outliers are indicated. (See also Figure 1, Appendix J Table 13.)

1.3.10 Investigations of organotin

Effects from-, and concentrations of organotin in *Nucella lapillus* and *Littorina littorea* were investigated along the coast of southern Norway, 1997.

Dogwhelks

Dogwhelks (*Nucella lapillus*) were sampled at five stations in October 1997; four of them in the Haugesund area (Figure 19) and one in outer Oslofjord (st.36A, Figure 1). No snails were found at one station in the Haugesund area (st. 11, Kopervik).

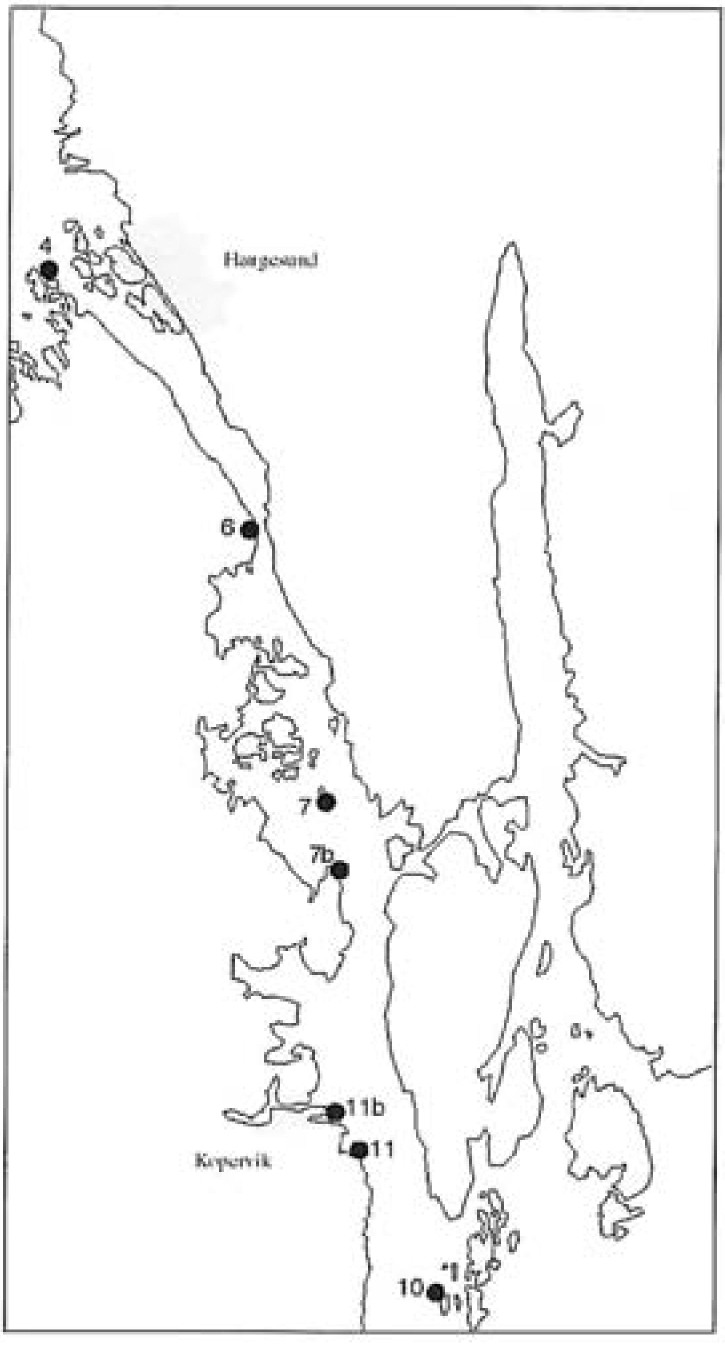

Figure 19. Sampling sites for organotin in dogwhelks (*Nucella lapillus*) in the Haugesund area. "b" stations indicate where mussel were sampled (1998).

TBT-induced development of male sex-characters in females, known as imposex (VDSI and RPSI), was analysed according to OSPAR-JAMP guidelines. Detailed information about the chemical analyses is given in Følsvik *et al.* (1999).

Effects from organotin was observed at all stations; VDSI was around stage 4 (stage 6 indicates the most affected) and sterile females were found on station 4, 6 and 10 in the Haugesund area. Concentrations of organotin were between 31.5 and 111.9µg Sn/kg d.w. (Table 2) indicating that the snails were recently exposed to organotin. Reference samples have concentrations below the detection limit (<7 µg Sn/kg d.w.).

Generally, there was a small improvement in VDSI over the years (Figure 20), and less females were sterile, while the 'relative penis size index' (RPSI) was more inconsistent. There was moderate change in organotin concentrations of dogwhelks from Færder (st. 36A) between 1993 and 1997; in females from 57 to 42,9 µg Sn/kg d.w. and in males from 45 to 66 µg Sn/kg d.w..

Table 2. Imposex (VDSI, RPSI) and levels of organotin (µg Sn/kg d.w.) in *Nucella lapillus* in 1997. ∑BT = TBT+DBT+MBT, SH = avg. shell height in mm, PS = avg. penis length in mm, n.m. = not measured.

Station	Area	Sex	SH	TBT	∑BT	TPh	VDSI	PS	RPSI
4	H.sund	F/M	28.5/28.3	31.5/67.8	49.8/94.7	8.4/9.9	4.1	3.3/4.4	51.6
6	H.sund	F/M	29.5/27.9	111.9/n.m.	155.8/n.m.	18.8/n.m.	4.1	2.9/3.3	63.5
7	H.sund	F/M	25.8/26.1	36.5/ n.m.	60.1/n.m.	9.9/ n.m.	4.0	3.0/3.4	71.5
10	H.sund	F/M	29.9/29.0	33.4/ n.m.	45.2/n.m.	5.4/ n.m.	4.1	2.7/3.6	40.4
36A	Færder	F/M	29.9/28.7	42.9/66.0	62.4/79.3	10.5/18.7	4.0	2.6/5.2	13.6

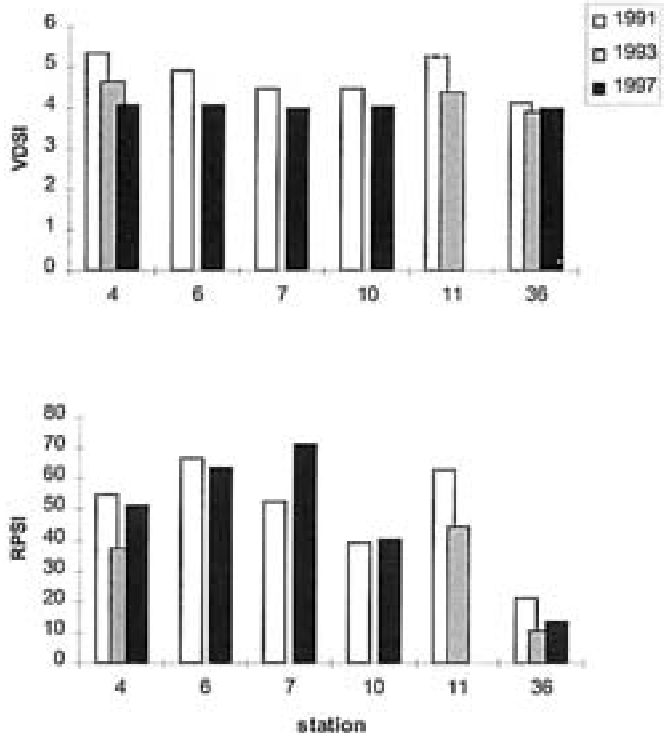

Figure 20. Imposex (VDSI and RPSI) in *Nucella lapillus* at 6 stations in southern Norway in 1991 (Harding *et al.* 1992), 1993 (Walday *et al.* 1997) and 1997. (See maps Figure 1 and Figure 19.)

Periwinkles

Periwinkles (*Littorina littorea*) were sampled at eight stations during October 1997; four stations in the Haugesund area (Figure 19), three near the Oslofjord (st. 71A, 76A, and 36A) and one in the Oslo harbour (st.30A, Figure 1). On one station (st. 11, Kopervik) no snails were found.

TBT-induced anomalies in the reproductive system, known as Intersex (ISI), were analysed according to OSPAR-JAMP guidelines. Detailed information about the chemical analyses is given in Følsvik *et al.* (1999).

Periwinkles were less sensitive to TBT than dogwhelks and effects from organotin on periwinkles were minor (Table 3 and Figure 21). Few of the snails were affected, and no one more than stage 1. No development of prostate was observed in females. Unfortunately, carbon background emission masked some of the results from the chemical analyses. The positive correlation between effects (ISI) and the concentration of TBT found in the periwinkles was almost analogous to the findings of Bauer *et al.* (in press). As for dog whelks, concentraions found here also indicate that periwinkles have been recently exposed to organotin.

Table 3. Intersex (ISI) and levels of organotin (µg Sn/kg d.w.) in *Littorina littorea* in 1997. ∑BT=TBT+DBT+MBT, SH=average. shell height in mm, m=masked values, n.m.=not measured.

Station	Area	Sex	SH	TBT	∑BT	TPh	ISI
4	H.sund	F/M	19.5/18.9	23.1/14.2	82.7/86.1	<1 / <1	0
6	H.sund	F/M	21.3/20.1	135.5/ n.m.	401.0/ n.m.	<1 / n.m.	0.06
7	H.sund	F/M	15.7/16.9	m / n.m.	m / n.m.	m / n.m.	0.05
10	H.sund	F/M	19.9/19.8	m / n.m.	m / n.m.	m / n.m.	0
30A	Oslo	F/M	17.2/17.1	164.3/414.7	340.3/1086.2	26.0/71.1	0.10
36A	Færder.	F/M	16.9/16.6	m / m	m / n.m.	m / m	0
71A	Langesundsfj.	F/M	18.1/17.8	m / n.m.	m / n.m.	m / n.m.	0
76A	Arendal	F/M	23.0/22.2	m / n.m.	m / n.m.	m / n.m.	0.07

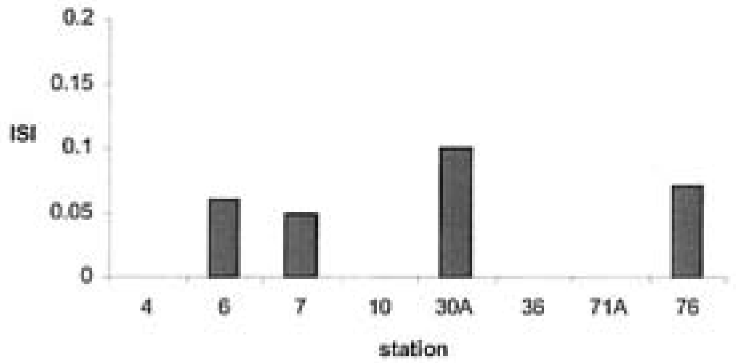

Figure 21. Intersex (ISI) in *Littorina littorea* at eight locations in southern Norway in 1997.

1.3.11 Dioxins and dioxin-like organochlorines in cod liver

Composite 1996-samples (n=25) of cod liver from three assumed reference localities (open coast, far from point sources) and a locality in the outer Oslofjord (JAMP localities 15B Lista, 23B Bømlo, 36B Færder (Oslofjord) and 98B Lofoten) have been analysed for polychlorinated dibenzo-p-dioxins/dibenzofurans (PCDD/PCDF, non-ortho PCBs and polychlorinated naphtalenes (PCN).

The results given in toxicity equivalents (TEQs) are presented in Table 4. $TEQ_{PCDD/F}$ and $TEQ_{non\text{-}ortho\ PCB}$ have been calculated on the basis of toxic equivalency factors (TEFs) in Ahlborg

1989 and Ahlborg *et al.* (1994), respectively. The tentative TEFs for PCN are from Hanberg *et al.* (1990).

Table 4. TEQs in liver of cod (*Gadus morhua*) from open coast localities in Norway 1996, **ng/kg** w.w. (Σ TEQ also on fat weight basis)

Localities	$TEQ_{PCDD/F}$	$TEQ_{n.-o.}$ PCB	TEQ_{PCN}	Σ TEQ w.w. basis	% fat	Σ TEQ fat basis
15B Lista	10.30	37.40	0.52	48.22	40.0	120.6
23B Bømlo	8.24	21.40	0.23	29.87	67.7	44.1
36B Færder	9.30	89.40	1.03	99.73	45.2	220.6
98B Lofoten	7.61	37.40	0.24	47.25	75.2	62.8

The largest contribution to Σ TEQ came from non-ortho PCBs, i.e. 72-90 % of the total. PCDD/PCDF contributed 9-28 % whereas TEQ_{PCN} were negligible (0.5-1 %).

The data indicate considerable regional variation in load of non-ortho PCB along open coast from Skagerrak in the south to Lofoten in northern Norway. On fat weight basis the maximum:minimum ratio was about 6:1 against about 2.5 for dioxins.

$TEQ_{PCDD/F}$ values in the range 5-10 ng/kg w.w. are in accordance with previous recordings in samples from Norwegian reference areas (Knutzen 1995 and more recent data).

Excepting the Færder value, the concentrations of $TEQ_{non-ortho\ PCB}$ in Table 4 are within the interval levels from other (scarce) records from other "uncontaminated" parts of the Norwegian coast.

The relatively high concentrations of non-ortho PCB in outer Oslofjord cod agrees with the frequent observation that routinely monitored Σ PCB_7 often have moderately exceeded the provisional "high background" for this group in Norwegian cod (Green 1997a).

The four samples were also analysed for the organic contaminants normally analysed in fish liver within JAMP. The results compare roughly with the median values. Pending implementation of analytical methods, these samples will also be analysed for Toxaphene and brominated flame retardents.

1.3.12 Introductory studies with lead isotopes

This trial involved the determination of Pb isotope ratios and concentrations in sediments, mussel shells and soft tissues from the Sørfjord and Hardangerfjord south – western Norway.

Both sediment and blue mussels from the Sørfjord in Hardangerfjord, are polluted by zinc and lead due to the industrial discharges from local industry near the town of Odda in the inner part of the Sørfjord (Skei *et al*, 1998).

Analyses of the raw material used for zinc production and the manufactured product (zinc pellets) show a typical low $^{206}Pb/^{204}Pb$ ratio (16.9 – 18.3) compared to a ratio of 19.8 observed at depth in sediment cores from the Sørfjord.. The normal Pb $^{206}Pb/^{204}Pb$ ratio today is about 18.7 (based on literature data). By studying this ratio in sediment samples (two sediment cores and surface samples) and blue mussel (soft tissue and shell) in a gradient towards the open sea, the objective was to investigate changes through time and the influence area of the industrial outlet.

Lead concentrations in sediment were determined by flameless atomic absorption spectrometry (FAAS) after extraction with HNO_3 and HCl. The 206Pb/204Pb ratios were determined by mass spectrometric analyses performed on a Finnigan MAT 261 mass spectrometer with single rhenium filaments.

Analysis of lead in sediment samples from cores collected in the inner part of the fjord (station 2; 10 km from Odda) and the outer part (station 3B; some 30 km from Odda) shows a typical increase in concentration up core from a sediment depth corresponding to about 1930. A rapid increase in lead concentrations in the late 1970ies is observed, corresponding to an increase of zinc production. The Norzinc plant started its production in 1929. The sediment cores available are relatively short, inhibiting analyses of pre-industrial sediments.

Analyses of $^{206}Pb/^{204}Pb$ ratios (naturally occurring lead isotopes) in the same samples show a decrease in the upper part of the sediments, corresponding with high levels of lead of industrial origin. Almost the same $^{206}Pb/^{204}Pb$ ratios detected in the top sediments were found in zinc concentrate and zinc pellets produced by the industry in Odda (Figure 22).

There was a significant difference (95 % confidence level) in both lead concentration and $^{206}Pb/^{204}Pb$ ratio in surface sediments from the Sørfjord (st. 56S Krossanes) to half way out the Hardangerfjord (st. 67S Strandebarm) and the outer coast (st. 22S Espevær). There was no difference between Strandebarm and Espevær (Figure 23). This shows that the industry in Odda has less impact on the sediments in the outer part of the Hardangerfjord and further out to the open coast, regarding lead. However, even at station 22S Espevær at the open coast, the ratio was lower than observed in pre-industrial sediments from the area (Figure 24). This indicates that there must be other sources of lead pollution, which influences the ratio. This could be atmospheric lead from petroleum sources.

The same gradient pattern was evident for the blue mussel tissue (*Mytilus edulis*). There was a significant increase in the $^{206}Pb/^{204}Pb$ ratio ($p= 0.0245$, correlation coefficient = 0.8) with increasing distance from Odda, indicating a reduced influence from industrial discharges (Figure 25). However, the isotope ratio was far below the back ground level found in the sediment core, or the present day "natural" ratio. As for the surface sediments this may reflect influence from other sources such as atmospheric deposition.

The isotope ratio in mussel shell did not show the same significant increase towards the open sea as the soft tissue. It is likely that the shell material reflects impact over the years depending on the age of the shells, while the soft tissue reflects impact over some months.

The use of naturally occurring isotopes, like those for Pb, contributes to the understanding of the discharge history of the industry and is well suited for sediment cores. The sediment cores from the Sørfjord did not penetrate pre-industrial deposits , the "real" background level could therefore not be established. Complimentary sampling of top sediments, mussel shells and soft tissues from the stations between 52 and 22, would allow a better interpretation of changes in the gradients.

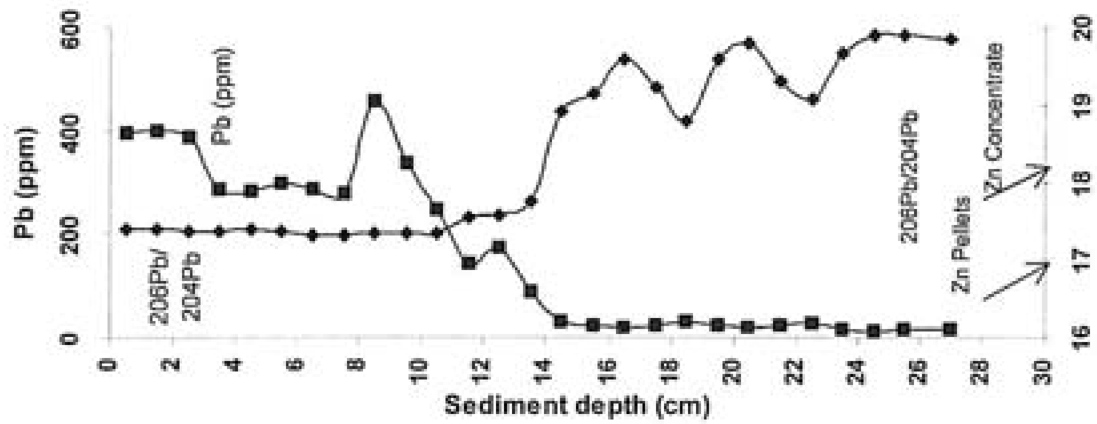

Figure 22. Lead (Pb ppm) and $^{206}Pb/^{204}Pb$ ratio in a sediment core (st. 52S, about 10 km from Odda, Figure 1) from the Sørfjord. The isotope ratio in zinc concentrate and pellets are marked with arrows.

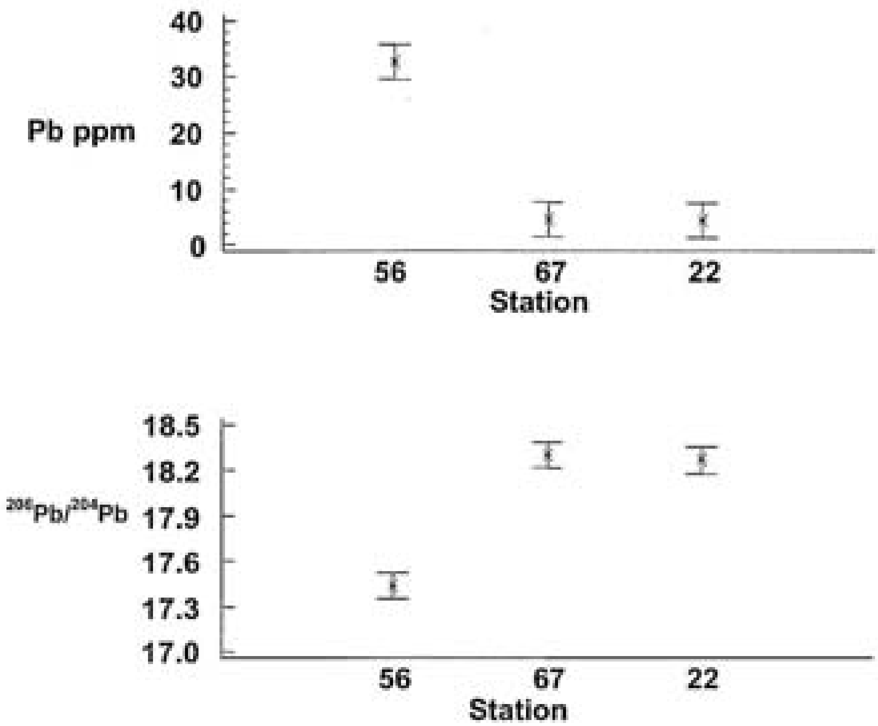

Figure 23. Lead (Pb ppm) and $^{206}Pb/^{204}Pb$ ratio and in surface sediments (0-1cm) from three stations in Sørfjord / Hardangerfjord area (cf., Figure 1).

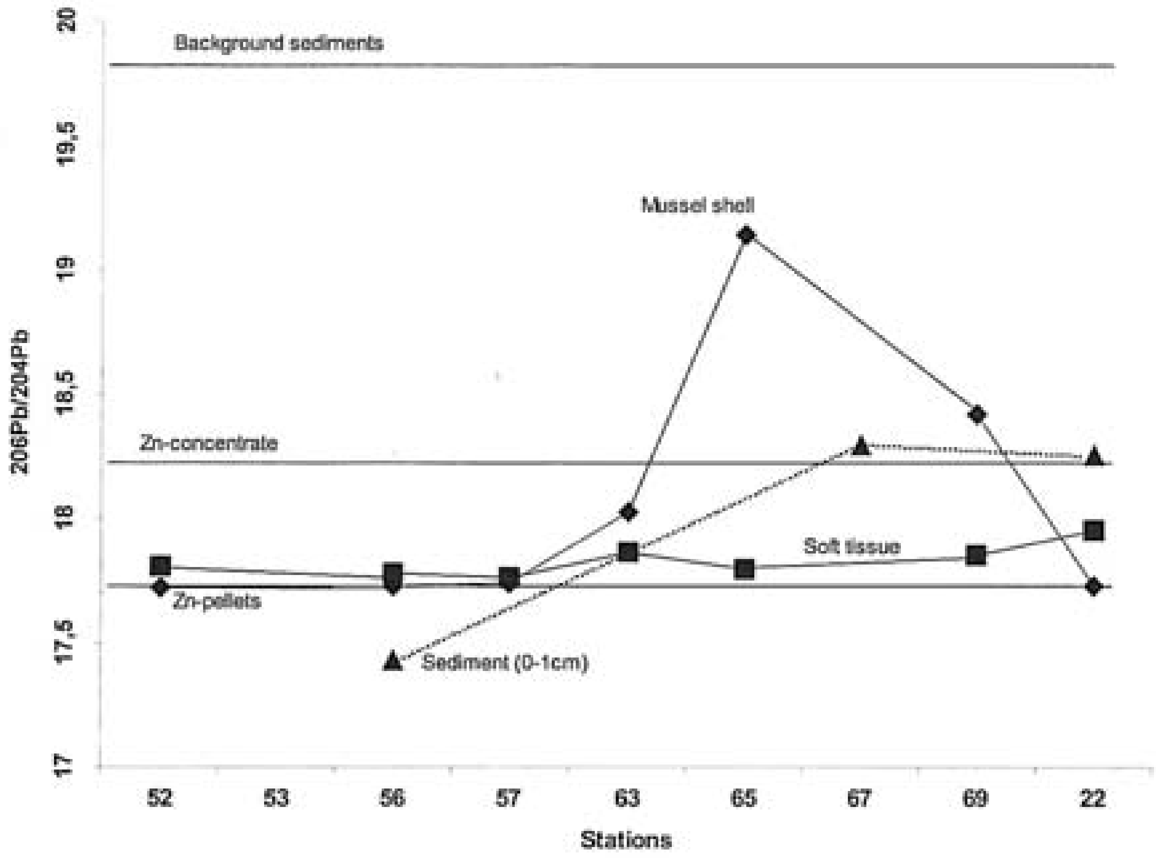

Figure 24. $^{206}Pb/^{204}Pb$ ratios in sediment (0-1cm), Blue Mussel tissue and shell from the Sørfjord and Hardangerfjord (cf., Figure 1). The isotope ratios in industrial products (Zn-concentrate and pellets) and sediment background are indicated by horizontal lines.

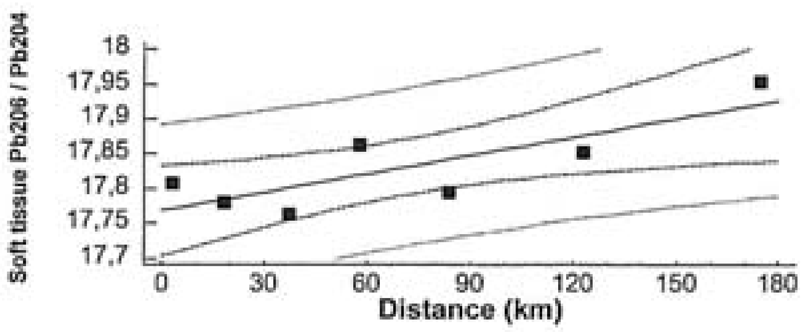

Figure 25. Correlation of the $^{206}Pb/^{204}Pb$ ratios in mussels with distance from Odda(km) (cf., Figure 1) ($p=0,0245$, $r^2=67,0$).

1.4 Overall conclusions

In regards to JMP/JAMP Purpose A (health assessment), attention should be called to the list from Norwegian Food Control Authority (SNT) which names the of restrictions and recommendations concerning the sale and consumption of seafood's in Norway (Table 5).

Table 5. Summary of action taken by the Norwegian Food Control Authority (SNT) concerning the consumption and sale of fish products along the Norwegian Coast (SNT, pers. comm. 1998, SFT, pers. comm. 1999).

Area of concern (km^2)	Last year of issue/ evaluation	Main parameters of concern	Main fish/shellfish product of concerned	Recommendations or restrictions of concern:
Inner Oslofjord (190)	1994	PCB	fish liver	Consumption
Drammensfjorden (45)	1992	Dioxins/PCB	cod liver	Consumption and Sale
Sandefjordfjorden (3)	1993	PCB	round fish liver	Consumption and Sale
Grenlandsfjordene, Langesundsfjord (84)	1997	Dioxins	fish, shellfish	Consumption and Sale
Kristiansandsfjorden (29)	1994	Dioxins/PCB	fish, shellfish	Consumption and Sale
Fedafjorden (13)	1995	PAH	flat fish, shellfish	Consumption
Saudafjorden (21)	1992	PAH	fish liver, mussels	Consumption
Sørfjorden (80)	1997	Cd Pb Hg	mussels	Consumption
Bergen area including Herdlefjorden, Byfjorden, Hjeltefjorden, Grimstadfjorden and Raunefjorden (180)	1996	PCB	fish, shellfish	Consumption and Sale
Årdalsfjorden (8)	1995	PAH	mussels	Consumption
Sunndalsfjorden (15)	1993	PAH	fish liver, mussels	Consumption
Hummelvik (Trondheimsfjorden) (5)	1985	PAH	mussels	Consumption
Ranfjorden (15)	1997	PAH Pb Hg	mussels	Consumption
Vefsnfjorden (50)	1992	PAH	mussels	Consumption

In regards to JMP/JAMP Purpose C (spatial distribution assessment), the concentrations found in 1997 are indicated in the bar graphs shown in Appendix H. Provisional "high background" levels were used to identify elevated concentrations. This initial assessment revealed no new areas of concern that are not currently under surveillance.

In regards to JMP/JAMP Purpose D (temporal trend assessment) there is evidence that the median concentrations of cadmium in mussels from the Sørfjord have decreased since 1987. An analysis of HCB concentrations in mussels from the Langesundsfjord 1990-1997 have shown a decrease.

Study of the power of temporal trend monitoring was useful in assessing existing sampling strategies, however, modifications might be needed to account for local conditions. In order to obtain a better understanding of the source of variation of concentrations as a basis for assessing/improving sampling strategies and remedial action several supplementary investigations were applied to the 1997 material. This report includes discussion of the results of biological effects methods including imposex and intersex, analyses of dioxins and dioxin-like compounds and investigations of lead isotopes. Biological effects methods has also been incorporated in JAMP for 1998 and 1999.

2. Technical Details

2.1 Compliance with guidelines/procedures

2.1.1 JAMP programme

Samples were collected and analysed, where practical, according to OSPAR guidelines (OSPAR 1990) and screened and submitted to ICES by agreed procedures (ICES 1996). The most important point of concern are those stations where insufficient number of fish were collected (cf., Appendix F).

2.1.2 Overconcentrations and classification of environmental quality

This report focuses on the principle cases where *median* concentrations exceeded provisional "high background" ("normal"). The median concentration can be derived from the tables in Appendix G or figures in Appendix H, depending on the year and concentration basis in question. The provisional "high background" limits are summarised in Table 6. The factor by which concentrations exceeded "high background" is termed **overconcentration.** "High background" limits have not been set for all contaminants and species. It should be noted that there is in general a need for periodical review and supplement of this list of limits in the light of results from reference localities and introduction of new analytical methods, and/or units. Because of changes in the limits, assessments of overconcentrations for years prior to 1997 made in this report may not correspond to figures and assessments made in previous national comments.

In addition to the use of "high background", the Norwegian Pollution Control Authority's (SFT's) system for **classification of environmental quality** has been applied (Table 7).

No attempt has been made to compensate for differences in size groups or number of individuals of mussels or fish. The exception was with mercury in fish fillet where seven and seventeen data sets in this study showed significant differences between "small" and "large" fish (Appendix G). In regards to mussels, there is some evidence that concentrations do not vary significantly among the three size groups employed for this study (i.e. 2-3, 3-4 and 4-5 cm) (WGSAEM 1993).

The National Comments since 1994 have included two additional analyses. The first is that the upper 95% confidence interval for the last three sampling years is linearly projected for the next three years. This is in line with a proposal submitted earlier (Nicholson, *et al.* 1994) and is used to assess the likelihood of overconcentrations. This estimate is based on the results for the temporal trend analyses. The estimate was made for series with at least 6 years of data.

The second is an estimate of the power of the temporal trend series expressed as the number of years to detect a 10% change per year with a 90% power (cf., Nicholson, *et al.*, 1997). The fewer the years the harder it is detect a trend. The power is based on the percentage relative standard deviation (RLSD) estimated using the robust method described ASMO (1994) and Nicholson *et al.* (1996). The estimate was made for series with at least 3 years of data and covers the *entire* period monitored. This fixed means of treating all the datasets may give misleading results especially where non-linear temporal changes are known to occur, such as for HCB in blue mussels from Langesund (Figure 8).

With respect to Purpose A (health risk assessment), the Norwegian Food Control Authority (SNT) is responsible for official commentary as to possible health risk due to consumption of seafood. Hence, the results of the JAMP pertaining to this purpose are presented only as a partial basis for evaluation.

Table 6. Provisional "high background levels" of selected contaminants, in **ppm (mg/kg) dry weight** (blue mussel) and **ppm (mg/kg wet weight)** (blue mussel and fish). The respective "high background" limits are from Knutzen & Skei (1990) with mostly minor adjustments (Knutzen & Green 1995; Molvær *et al.* 1997), except for dab where the suggested limit is based on JAMP-data (Knutzen & Green 1995). Especially uncertain values are marked with "?".

Cont.	Blue mussel [1]		Cod [1]		Flounder [1]		Dab [1]	
			liver	fillet	liver	fillet	liver	fillet
	ppm d.w.	ppm w.w.	ppm w.w.	ppm w.w.	ppm w.w.	ppm w.w.	ppm w.w.	ppm w.w.
Lead	3.0 [2]	0.6 [3]	0.1		0.3 ?		0.3 ?	
Cadmium	2.0 [2]	0.4 [3]	0.1		0.3 ?		0.3 ?	
Copper	10 [2]	2 [3]	20		30 ?		10 ?	
Mercury	0.2 [2]	0.04 [3]		0.1 [2]		0.1		0.1 ?
Zinc	200 [2]	40 [3]	30		60 ?		50 ?	
ΣPCB-7 [8]	0.020 [3]	0.004 [2]	0.5 [2]	0.005	0.10 ?	0.005 ? [2]	0.5 ?	0.010 ?
CB-153	0.005 [3]	0.001 [4]	0.2 ? [5]		0.05 ? [7]		0.20 ? [7]	
ppDDE	0.010 [3]	0.002 [6]	0.2 [2]		0.03 ? [6]		0.1 ? [6]	
γ-HCH	0.005 [3]	0.001 [6]	0.05 [2,6]		0.01 ? [6]		0.03 ? [6]	
HCB	0.0005 [3]	0.0001 [2]	0.02 [2]		0.005 ?		0.01 ?	
TCDDN	0.000001 [3]	0.0000002 [2]						

[1]) Respectively: *Mytilus edulis, Gadus morhua, Platichthys flesus* and *Limanda limanda*.
[2]) From the Norwegian Pollution Control Authority Environmental Class I ("good") (Molvær *et al.* 1997).
[3]) Conversion assuming 20% dry weight.
[4]) Approximately 25% of ΣPCB-7 (Knutzen & Green 1995)
[5]) 1.5-2 times 75% quartile (cf., Annex B in Knutzen & Green 1995)
[6]) Assumed equal to limit for ΣDDT or ΣHCH, respectively, from the Norwegian Pollution Control Authority Environmental Class I ("good") (Molvær *et al.* 1997). Hence, limits for ppDDE and γHCH are probably too high (lacking sufficient and reliable reference values)
[7]) Mean plus 2 times standard deviation (cf., Annex B in Knutzen & Green 1995)
[8]) Estimated as sum of 7 individual PCB compounds (CB-28, -52, -101, -118, -138, -153 and -180) and assumed to be ca. 50% and 70 % of total PCB for blue mussel and cod/flatfish, respectively.

Table 7. Extracts of the Norwegian Pollution Control Authority revised environmental classification system of contaminants in blue mussels and fish (from Molvær *et al.* 1997).

Contaminant			Classification (upper limit for classes I-IV)				
			I "good"	II "fair"	III "poor"	IV "bad"	V "very bad"
BLUE MUSSEL							
Lead	ppm	d.w.	3	15	40	100	>100
Cadmium	ppm	d.w.	2	5	20	40	>40
Copper	ppm	d.w.	10	30	100	200	>200
Mercury	ppm	d.w.	0.2	0.5	1.5	4	>4
Zinc	ppm	d.w.	200	400	1000	2500	>2500
ΣPCB-7	ppb	w.w.	4	15	40	100	>100
ΣDDT	ppb	w.w.	2	5	10	30	>30
ΣHCH	ppb	w.w.	1	3	10	30	>30
HCB	ppb	w.w.	0.1	0.3	1	5	>5
$TE_{PCDF/D}$ [1]	ppb	w.w.	0.2	0.5	1.5	3	>3
COD, fillet							
Mercury	ppm	w.w.	0.1	0.3	0.5	1	>1
COD, liver							
ΣPCB-7	ppb	w.w.	500	1500	4000	10000	>10000
ΣDDT	ppb	w.w.	200	500	1500	3000	>3000
ΣHCH	ppb	w.w.	50	200	500	1000	>1000
HCB	ppb	w.w.	20	50	200	400	>400

[1]) TCDDN (cf., Appendix B)

2.1.3 Comparison with previous data

A simple 3-model approach has been developed to study time trends for contaminants in biota based on *median* concentrations (ASMO 1994). A variation of this method was applied to mercury in fish fillet to distinguish trends in "large" and "small" individuals. The method was first used on a large-scale basis by the Ad Hoc Working Group on Monitoring that met in Copenhagen 8-12. November 1993 (MON 1993). At this meeting it was agreed to apply the method on contaminants in fish muscle and liver on a wet weight basis and contaminants in soft tissue of mussels on a dry weight basis. The results for this assessment are presented earlier (cf., ASMO 1994). The method has been applied to Norwegian data and results are shown in Appendix G. The results can be presented as in Figure 26.

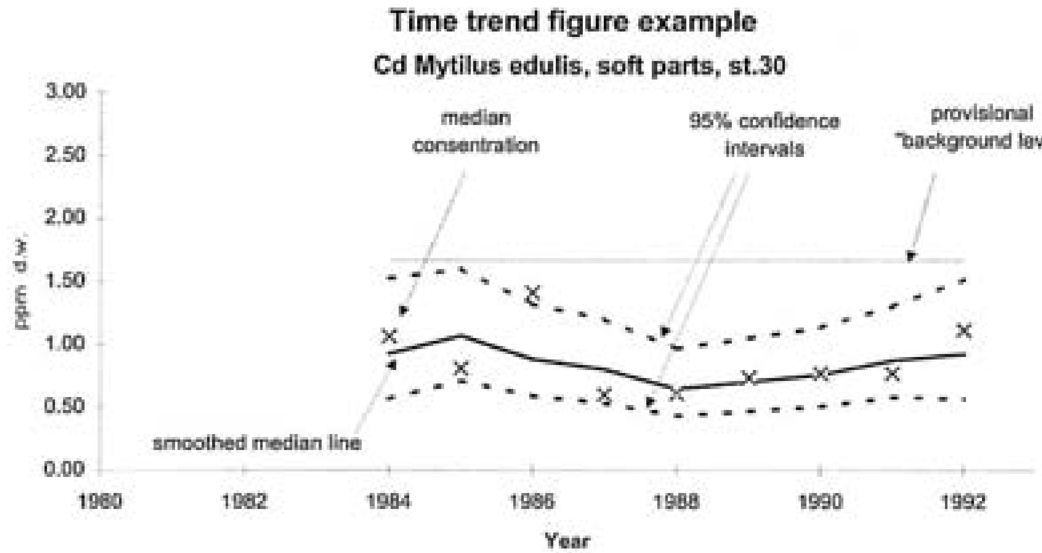

Figure 26. Example presentation of variation in contaminant concentration with time. The figure shows median concentrations, running mean of median values, 95% confidence interval. The provisional "high background level" is marked with a horizontal line and corresponds to values listed in Table 6 (see text).

The statistical analysis was carried out on temporal trend data series for cadmium, copper, mercury, lead, zinc, the PCB congener CB153, ppDDE (ICES code DDEPP), γ-HCH (ICES code HCHG) and HCB. Assessment focused on individual compounds instead of "sum variables". CB153 was chosen because it is persistent and may act as an indicator for other congeners (Atuma *et al.* 1996). Furthermore, there is some evidence that CB153 may correlate with TCDD-equivalents (Boer *et al.* 1993).

2.2 Information on Quality Assurance

NIVA has participated in all the QUASIMEME international intercalibration exercises, including Round 12 (1998). These exercises have included nearly all the contaminants analysed for JAMP. Quality assurance programme for NIVA is similar to the 1996 programme (cf. Green 1997). In addition, NIVA was accredited in 1993 in accordance with the EN45000 standard by the Norwegian Accreditation (reference P009). A summary of the quality assurance programme at NIVA is given in Appendix A. A summary of the intercalibrations exercises that NIVA has participated in is given in Appendix C.

2.3 Description of the Programme

The sampling for 1997 involved sampling of blue mussel at 23 stations and at least one flatfish species and/or cod was sampled at 10 stations. The Norwegian JAMP has been expanded since 1989 to include monitoring in more diffusely polluted areas. Though new stations are initially intended for annual monitoring (temporal trends), there has not always been sufficient funds to do this for every station. Sample/station reduction measures have taken to reduce costs. Furthermore, sufficient samples have not always been practical to obtain. When this applies to mussels a new site in the vicinity is often chosen. As for fish, the quota of 25 individuals (±10%), indicated in Appendix F as either 25 individuals or 5 bulked samples consisting of 5 fish per bulked sample, was met for all stations. Extra sampling may occur where a bi-catch of fish provides 5 or more fish of a priority species or in co-ordination with VIC (SIME 1996, 1997). Initiation of the VIC programme allowed supplementary sampling at st.30B (cod), 33B (flounder), 53B (cod and flounder) and 67B (cod). Appendix E and F gives an overview of the planned and realised sampling.

Concentrations of metals, chlorinated hydrocarbons (including pesticides) and polycyclic aromatic hydrocarbons in mussels and fish were determined at the Norwegian Institute for Water Research (JAMP code NIVA). An overview of the methods applied up to and including 1992 sample material has been presented by Green (1993, also JMG document 19/7 info 3). Only minor modifications have been made since. An overview of analyses applied from 1981 to 1997 (1998) for biological material is given in Appendix D. Parameter abbreviations are given in Appendix B.

A description of the components of variability will be provided with the completion of the Norwegian contribution to the VIC programme.

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Appendix A.
Quality assurance programme

Accreditation

The laboratories at NIVA, both the chemical, microbiological and the ecotoxicological laboratories, were accredited in 1993 for quality assurance system by the National Measurement Service - Norwegian Accreditation and based on European Standard EN45000. NIVA has reference number P009.

Summary of quality control results

A summary of the results for the analyses of the SRM for biota is shown in Table A1.

As standard reference material (SRM) for the control of the determination of metals, dogfish muscle (DORM-2) or dogfish liver (DOLT-2) was used (see Table A1).

For control of PCB's and PAH analyses in biota SRM 350 (mackerel oil) and SRM 1974 was used, respectively. In addition to SRM 1974, an internal standard was used for quality control.

The results are satisfactory.

See also results from intercalibrations exercises listed in Appendix C.

NIVA has also participated in QUASIMEME exercises up to and including Round 14, the latter would apply to the 1997 samples analysed in 1998. The results from Round 14 were acceptable.

Table A1. Summary of the quality control results for the 1997 biota samples analysed 1997-98. The Standard Reference Materials (SRM) were DORM-2* (dogfish muscle) for mussels and fish fillet, DOLT-2* (dogfish liver) for fish liver, 350** (mackerel oil) for mussels and fish liver and NIST SRM 2974*** (mussel tissue) for mussels. SRM was analysed in series with the JAMP-samples for analyses of metals (mg/kg), organic chlorine's or PAH (µg/kg). Tissue types were: mussel softbody (SB), fish liver (LI) and fish fillet (MU).

Code	Contaminant	Tissue type	SRM type	SRM value ± confidence interval	W	N	Mean value	Standard deviation
Cd	cadmium	SB	DORM	0.043 ± 0.008	6	5	0.043	0.002
		LI	DOLT	20.80 ± 0.5	29	17	19.9	0.5
Cu	copper	SB	DORM	2.34 ± 0.16	6	5	2.09	0.04
		SB	DOLT	25.80 ± 1.1	9	8	28.5	0.7
		LI	DOLT	25.80 ± 1.1	29	17	25.9	1.1
Pb	lead	SB	DORM	0.065 ± 0.007	6	5	0.070	0.012
		LI	DOLT	0.22 ± 0.02	29	17	0.22	0.04
Hg	mercury	SB	DORM	4.64 ± 0.26	33	17	4.65	0.19
Zn	zinc	SB	DORM	25.6 ± 2.3	6	5	25.9	1.1
		LI	DOLT	85.8 ± 2.5	29	17	95.5	2.1
CB-28	PCB congener CB-28	(all)	350	22.5 ± 4	31	21	19.0	2.6
CB-52	PCB congener CB-52	(all)	350	62. ± 9	31	21	59	3.6
CB-101	PCB congener CB-101	(all)	350	164 ± 9	31	21	166	7.0
CB-118	PCB congener CB-118	(all)	350	142 ± 20	31	21	144	9.0
CB-153	PCB congener CB-153	(all)	350	317 ± 20	31	21	328	12.9
CB-180	PCB congener CB-180	(all)	350	73. ± 13	31	21	77	5.5

*) National Research Council Canada, Division of Chemistry, Marine Analytical Chemistry Standards
**) BCR, Community Bureau of Reference, Commission of the European Communities
***) National Institute of Standards & Technology (NIST)

Appendix B.
Abbreviations

Abbreviation[1]	English	*Norwegian*
ELEMENTS		
Al	aluminium	*aluminium*
As	arsenic	*arsen*
Cd	cadmium	*kadmium*
Co	cobalt	*kobolt*
Cr	chromium	*krom*
Cu	copper	*kobber*
Fe	iron	*jern*
Hg	mercury	*kvikksølv*
Li	lithium	*litium*
Mn	manganese	*mangan*
Ni	nickel	*nikkel*
Pb	lead	*bly*
Pb210	lead-210	*bly-210*
Se	selenium	*selen*
Ti	titanium	*titan*
Zn	zinc	*sink*
PAHs		
PAH	polycyclic aromatic hydrocarbons	*polysykliske aromatiske hydrokarboner*
ACNE	acenaphthene	*acenaften*
ACNLE	acenaphthylene	*acenaftylen*
ANT	anthracene	*antracen*
BAA [3]	benz[a]anthracene	*benz[a]antracen*
BAP [3]	benzo[a]pyrene	*benzo[a]pyren*
BBF [3]	benzo[b]fluoranthene	*benzo[b]fluoranten*
BBJKF	benzo[b,j,k]fluoranthene	*benzo[b,j,k]fluoranten*
BBKF	benzo[b+k]fluoranthene	*benzo[b+k]fluoranten*
BEP	benzo[e]pyrene	*benzo[e]pyren*
BGHIP	benzo[ghi]perylene	*benzo[ghi]perylen*
BIPN [2]	biphenyl	*bifenyl*
BBJKF [3]	benzo[b+j,k]fluoranthene	*benzo[b+j,k]fluorantren*
BJKF [3]	benzo[j,k]fluoranthene	*benzo[j,k]fluorantren*
CHR	chrysene	*chrysen*
CHRTR	chrysene+triphenyl	*chrysen+trifenylen*
COR	coronene	*coronen*
DBAHA [3]	dibenz[a,h]anthracene	*dibenz[a,h]anthracen*
DBA3A [3]	dibenz[a,c/a,h]anthracene	*dibenz[a,c/a,h]antracen*
DBP [3]	dibenzopyrenes	*dibenzopyren*
DBT	dibenzothiophene	*dibenzothiofen*
DBTC1	C_1-dibenzothiophenes	*C_1-dibenzotiofen*
DBTC2	C_2-dibenzothiophenes	*C_2-dibenzotiofen*
DBTC3	C_3-dibenzothiophenes	*C_3-dibenzotiofen*
FLE	fluorene	*fluoren*
FLU	fluoranthene	*fluoranten*

Abbreviation[1]	English	*Norwegian*
PAHs (cont.)		
ICDP [3]	indeno[1,2,3-*cd*]pyrene	*indeno[1,2,3-cd]pyren*
NAPTM [2]	2,3,5-trimethylnaphthalene	*2,3,5-trimetylnaftalen*
NAP [2]	naphthalene	*naftalen*
NAPC1 [2]	C_1-naphthalenes	*C_1-naftalen*
NAPC2 [2]	C_2-naphthalenes	*C_2-naftalen*
NAPC3 [2]	C_3-naphthalenes	*C_3-naftalen*
NAP1M [2]	1-methylnaphthalene	*1-metylnaftalen*
NAP2M [2]	2-methylnaphthalene	*2-metylnaftalen*
NAPDI [2]	2,6-dimethylnaphthalene	*2,6-dimetylnaftalen*
PA	phenanthrene	*fenantren*
PAC1	C_1-phenanthrenes	*C_1-fenantren*
PAC2	C_2-phenanthrenes	*C_2-fenantren*
PAM1	1-methylphenanthrene	*1-metylfenantren*
PER	perylene	*perylen*
PYR	pyrene	*pyren*
DI-Σn	sum of "n" dicyclic "PAH"s (footnote 2)	*sum "n" disykliske "PAH" (fotnote 2)*
P-Σn	sum "n" PAH	*sum "n" PAH*
PK-Σn	sum carcinogen PAH's (footnote 3)	*sum kreftfremkallende PAH (fotnote 3)*
PAHΣΣ	DI-Σn + P-Σn etc.	*DI-Σn + P-Σn mm..*
SPAH	"total" PAH, specific compounds not quantified (outdated analytical method)	*"total" PAH, spesifikk forbindelser ikke kvantifisert (foreldret metode)*
PCBs		
PCB	polychlorinated biphenyls	*polyklorerte bifenyler*
CB	individual chlorobiphenyls (CB)	*enkelte klorobifenyl*
CB28	CB28 (IUPAC)	*CB28 (IUPAC)*
CB31	CB31 (IUPAC)	*CB31 (IUPAC)*
CB44	CB44 (IUPAC)	*CB44 (IUPAC)*
CB52	CB52 (IUPAC)	*CB52 (IUPAC)*
CB77 [4]	CB77 (IUPAC)	*CB77 (IUPAC)*
CB81 [4]	CB81 (IUPAC)	*CB81 (IUPAC)*
CB95	CB95 (IUPAC)	*CB95 (IUPAC)*
CB101	CB101 (IUPAC)	*CB101 (IUPAC)*
CB105	CB105 (IUPAC)	*CB105 (IUPAC)*
CB110	CB110 (IUPAC)	*CB110 (IUPAC)*
CB118	CB118 (IUPAC)	*CB118 (IUPAC)*
CB126 [4]	CB126 (IUPAC)	*CB126 (IUPAC)*
CB128	CB128 (IUPAC)	*CB128 (IUPAC)*
CB138	CB138 (IUPAC)	*CB138 (IUPAC)*
CB149	CB149 (IUPAC)	*CB149 (IUPAC)*
CB153	CB153 (IUPAC)	*CB153 (IUPAC)*
CB156	CB156 (IUPAC)	*CB156 (IUPAC)*
CB169 [4]	CB169 (IUPAC)	*CB169 (IUPAC)*

Abbreviations (cont'd.)

Abbreviation[1]	English	*Norwegian*
PCBs (cont.)		
CB170	CB170 (IUPAC)	*CB170 (IUPAC)*
CB180	CB180 (IUPAC)	*CB180 (IUPAC)*
CB194	CB194 (IUPAC)	*CB194 (IUPAC)*
CB209	CB209 (IUPAC)	*CB209 (IUPAC)*
CB-Σ7	CB: 28+52+101+118+138+153+180	*CB: 28+52+101+118+138+153+180*
CB-ΣΣ	sum of CBs, includes CB-Σ7	*sum CBer, inkluderer CB-Σ7*
TECBW	Sum of CB-toxicity equivalents after WHO model, see **TEQ**	*Sum CB- toksitets ekvivalenter etter WHO modell, se* ***TEQ***
TECBS	Sum of CB-toxicity equivalents after SAFE model, see **TEQ**	*Sum CB-toksitets ekvivalenter etter SAFE modell, se* ***TEQ***
DIOXINs		
TCDD	2, 3, 7, 8-tetrachloro-dibenzo dioxin	*2, 3, 7, 8-tetrakloro-dibenzo dioksin*
CDDST	Sum of tetrachloro-dibenzo dioxins	*Sum tetrakloro-dibenzo dioksiner*
CDD1N	1, 2, 3, 7, 8-pentachloro-dibenzo dioxin	*1, 2, 3, 7, 8-pentakloro-dibenzo dioksin*
CDDSN	Sum of pentachloro-dibenzo dioxins	*Sum pentakloro-dibenzo dioksiner*
CDD4X	1, 2, 3, 4, 7, 8-hexachloro-dibenzo dioxin	*1, 2, 3, 4, 7, 8-heksakloro-dibenzo dioksin*
CDD6X	1, 2, 3, 6, 7, 8-hexachloro-dibenzo dioxin	*1, 2, 3, 6, 7, 8-heksakloro-dibenzo dioksin*
CDD9X	1, 2, 3, 7, 8, 9-hexachloro-dibenzo dioxin	*1, 2, 3, 7, 8, 9-heksakloro-dibenzo dioksin*
CDDSX	Sum of hexachloro-dibenzo dioxins	*Sum heksakloro-dibenzo dioksiner*
CDD6P	1, 2, 3, 4, 6, 7, 8-heptachloro-dibenzo dioxin	*1, 2, 3, 4, 6, 7, 8-heptakloro-dibenzo dioksin*
CDDSH	Sum of heptachloro-dibenzo dioxins	*Sum heptakloro-dibenzo dioksiner*
CDDO	Octachloro-dibenzo dioxin	*Oktakloro-dibenzo dioksin*
PCDD	Sum of polychlorinated dibenzo-p-dioxins	*Sum polyklorinaterte-dibenzo-p-dioksiner*
CDF2T	2, 3, 7, 8-tetrachloro-dibenzofuran	*2, 3, 7, 8-tetrakloro-dibenzofuran*
CDFST	Sum of tetrachloro-dibenzofurans	*Sum tetrakloro-dibenzofuraner*
CDFDN	1, 2, 3, 7, 8/1, 2, 3, 4, 8-pentachloro-dibenzofuran	*1, 2, 3, 7, 8/1, 2, 3, 4, 8-pentakloro-dibenzofuran*
CDF2N	2, 3, 4, 7, 8-pentachloro-dibenzofurans	*2, 3, 4, 7, 8-pentakloro-dibenzofuran*
CDFSN	Sum of pentachloro-dibenzofurans	*Sum pentakloro-dibenzofuraner*
CDFDX	1, 2, 3, 4, 7, 8/1, 2, 3, 4, 7, 9-hexachloro-dibenzofuran	*1, 2, 3, 4, 7, 8/1, 2, 3, 4, 7, 9-heksakloro-dibenzofuran*
CDF6X	1, 2, 3, 6, 7, 8-hexachloro-dibenzofuran	*1, 2, 3, 6, 7, 8-heksakloro-dibenzofuran*
CDF9X	1, 2, 3, 7, 8, 9-hexachloro-dibenzofuran	*1, 2, 3, 7, 8, 9-heksakloro-dibenzofuran*
CDF4X	2, 3, 4, 6, 7, 8-hexachloro-dibenzofuran	*2, 3, 4, 6, 7, 8-heksakloro-dibenzofuran*
CDFSX	Sum of hexachloro-dibenzofurans	*Sum heksakloro-dibenzofuraner*
CDF6P	1, 2, 3, 4, 6, 7, 8-heptachloro-dibenzofuran	*1, 2, 3, 4, 6, 7, 8-heptakloro-dibenzofuran*
CDF9P	1, 2, 3, 4, 7, 8, 9-heptachloro-dibenzofuran	*1, 2, 3, 4, 7, 8, 9-heptakloro-dibenzofuran*
CDFSP	Sum of heptachloro-dibenzofurans	*Sum heptakloro-dibenzofuraner*
CDFO	Octachloro-dibenzofurans	*Octakloro-dibenzofuran*
PCDF	Sum of polychlorinated dibenzo-furans	*Sum polyklorinated dibenzo-furaner*
CDDFS	Sum of PCDD and PCDF	*Sum PCDD og PCDF*

Abbreviations (cont'd.)

Abbreviation[1]	English	*Norwegian*
DIOXINS (cont.)		
TCDDN	Sum of TCDD-toxicity equivalents after Nordic model, see **TEQ**	*Sum TCDD- toksitets ekvivalenter etter Nordisk modell, se* ***TEQ***
TCDDI	Sum of TCDD-toxicity equivalents after international model, see **TEQ**	*Sum TCDD-toksitets ekvivalenter etter internasjonale modell, se* ***TEQ***
PESTICIDES		
ALD	aldrin	*aldrin*
DIELD	dieldrin	*dieldrin*
ENDA	endrin	*endrin*
CCDAN	cis-chlordane (=α-chlordane)	*cis-chlordan (=α-chlordan)*
TCDAN	trans-chlordane (=γ-chlordane)	*trans-chlordan (=γ-chlordan)*
OCDAN	oxy-chlordane	*oxy-chlordan*
TNONC	trans-nonachlor	*trans-nonaklor*
TCDAN	trans-chlordane	*trans-chlordan*
OCS	octachlorostyrene	*octaklorstyren*
QCB	pentachlorobenzene	*pentaklorbenzen*
DDD	dichlorodiphenyldichloroethane 1,1-dichloro-2,2-bis-(4-chlorophenyl)ethane	*diklordifenyldikloretan 1,1-dikloro-2,2-bis-(4-klorofenyl)etan*
DDE	dichlorodiphenyldichloroethylene (principle metabolite of DDT) 1,1-dichloro-2,2-bis-(4-chlorophenyl)ethylene*	*diklordifenyldikloretylen (hovedmetabolitt av DDT) 1,1-dikloro-2,2-bis-(4-klorofenyl)etylen*
DDT	dichlorodiphenyltrichloroethane 1,1,1-trichloro-2,2-bis-(4-chlorophenyl)ethane	*diklordifenyltrikloretan 1,1,1-trikloro-2,2-bis-(4-klorofenyl)etan*
DDEOP	o,p'-DDE	*o,p'-DDE*
DDEPP	p,p'-DDE	*p,p'-DDE*
DDTOP	o,p'-DDT	*o,p'-DDT*
DDTPP	p,p'-DDT	*p,p'-DDT*
TDEPP	p,p'-DDD	*p,p'-DDD*
DDTEP	p,p'-DDE + p,p'-DDT	*p,p'-DDE + p,p'-DDT*
DD-nΣ	sum of DDT and metabolites, n = number of compounds	*sum DDT og metabolitter, n = antall forbindelser*

Abbreviations (cont'd.)

Abbreviation[1]	English	Norwegian
HCB	hexachlorobenzene	*heksaklorbenzen*
HCHG	lindane γ HCH = gamma hexachlorocyclohexane (γ BHC = gamma benzenehexachloride, outdated synonym)	*lindan* *γ HCH = gamma heksaklorsykloheksan* *(γ BHC = gamma benzenheksaklorid, foreldret betegnelse)*
HCHA	α HCH = alpha HCH	*α HCH = alpha HCH*
HCHB	β HCH = beta HCH	*β HCH = beta HCH*
HC-nΣ	sum of HCHs, n = count	*sum av HCHs, n = antall*
EOCl	extractable organically bound chlorine	*ekstraherbart organisk bundet klor*
EPOCl	extractable persistent organically bound chlorine	*ekstraherbart persistent organisk bundet klor*
NTOT	total organic nitrogen	*total organisk nitrogen*
CTOT	total organic carbon	*total organisk karbon*
CORG	organic carbon	*organisk karbon*
GSAMT	grain size	*kornfordeling*
MOCON	moisture content	*vanninnhold*

Abbreviations (cont'd.)

Abbreviation[1]	English	*Norwegian*
INSTITUTES		
IFEN	Institute for Energy Technology	*Institutt for energiteknikk*
FIER	Institute for Nutrition, Fisheries Directorate	*Fiskeridirektoratets Ernæringsinstitutt*
FORC	FORCE Institutes, Div. for Isotope Technique and Analysis [DK]	*FORCE Institutterne, Div. for Isotopteknik og Analyse [DK]*
IMRN	Institute of Marine Research (IMR)	*Havforskningsinstituttet*
NACE	Nordic Analytical Center	*Nordisk Analyse Center*
NILU	Norwegian Institute for Air Research	*Norsk institutt forluftforskning*
NIVA	Norwegian Institute for Water Research	*Norsk institutt for vannforskning*
SERI	Swedish Environmental Research Institute	*Institutionen för vatten- och luftvårdsforskning*
VETN	Norwegian Veterinary Institute	*Veterinærinstituttet*
SIIF	Fondation for Scientific and Industrial Research at the Norwegian Institute of Technology - SINTEF (a division, previously: Center for Industrial Research SI)	*Stiftelsen for industriell og teknisk forskning ved Norges tekniske høgskole- SINTEF (en avdeling, tidligere: Senter for industriforskning SI)*

1) After: ICES Environmental Data Reporting Formats. International Council for the Exploration of the Sea. July 1996 and supplementary codes related to non-ortho and mono-ortho PCB's and "dioxins" (ICES pers. comm.)

2) Indicates "PAH" compounds that are dicyclic and not truly PAH's typically identified during the analyses of PAH, include naphthalenes and "biphenyls".

3) Indicates PAH compounds potentially cancerogenic for humans according to IARC (1987), i.e., categories 2A+2B (possibly and probably carcinogenic).

4) Indicates non ortho- co-planer PCB compounds ie., those that lack Cl in positions 1, 1', 5, and 5'

*) The Pesticide Index, second edition. The Royal Society of Chemistry, 1991.

Other abbreviations *andre forkortelser*

	English	*Norwegian*
TEQ	"Toxicity equivalency factors" for the most toxic compounds within the following groups: • polychlorinated dibenzo-p-dioxins and dibenzofurans (**PCDD/PCDFs**). Equivalents calculated after Nordic model (Ahlborg *et al.*, 1989) [1] or international model (Int./EPA, cf. Ahlborg *et al.*, 1992) [2] • non-ortho and mono-ortho substituted chlorobiphenyls after WHO model (Ahlborg *et al.*, 1994) [3] or Safe (1994, cf., NILU pers. comm.)	*"Toxisitetsekvivalentfaktorer" for de giftigste forbindelsene innen følgende grupper.* • *polykloverte dibenzo-p-dioksiner og dibenzofuraner (**PCDD/PCDF**). Ekvivalentberegning etter nordisk modell (Ahlborg et al., 1989) [1] eller etter internasjonal modell (Int./EPA, cf. Ahlborg et al., 1992) [2]* • *non-orto og mono-orto substituerte klorobifenyler etter WHO modell (Ahlborg et al., 1994) [3] eller Safe (1994, cf., NILU pers. medd.)*
ppm	parts per million, mg/kg	*deler pr. milliondeler, mg/kg*
ppb	parts per billion, µg/kg	*deler pr. milliarddeler, µg/kg*
ppp	parts per trillion, ng/kg	*deler pr. tusen-milliarddeler, ng/kg*
d.w.	dry weight basis	*tørrvekt basis*
w.w.	wet weight or fresh weight basis	*våtvekt eller friskvekt basis*

[1]) Ahlborg, U.G., 1989. Nordic risk assessment of PCDDs and PCDFs. Chemosphere 19:603-608.

[2]) Ahlborg, U.G., Brouwer, A, Fingerhut, M.A., Jacobson, J.L., Jacobson, S.W:, Kennedy, S.W., Kettrup, A.F., Koeman, J.H., Poiger, H., Rappe, C., Safe, S.H., Schlatter, C., Seegal, R.F., Tuomisto, J., van den Berg, M., 1992. Impact of polychlorinated dibenzo-p-dioxins, dibenzofurans, and biphenyls on human and environmental healrth, with special emphasis on application of the toxic euivalency factor concept *European Journal og Pharmacology . Environmental Toxicology and Pharmacology Section* 228 (1992) 179-199

[3]) Ahlborg, U.G., Becking G.B., Birnbaum, L.S., Brouwer, A, Derks, H.J.G.M., Feely, M., Golor, G., Hanberg, A., Larsen, J.C., J.C., Liem, A.K.G., Safe, S.H., Schlatter, C., Wärn, F., Younes, M., Yrjänheikki, E., 1994. Toxic equivalency factors for dioxin-like PCBs. Report on a WHO-ECEH and IPSC consultation , December 1993. Chemosphere 28:1049-1067.

Appendix C.
Participation in intercalibration exercises

Participation in intercalibration exercises

General: The main contributor to JAMP in 1996 has been NIVA which has participated in all QUASIMEME exercises relevant to the parameter and tissues monitored

Sea water:

4H ICES/JMG Fifth Round Intercalibration on Trace Metals in Sea Water - Section 4, analysis for Hg - 1983 - (5/TM/SW:4).

4I JMG Sixth Intercalibration on Trace Metals in Estuarine Waters - 1986 - (6/TM/SW).

4Z Intercalibration exercise for SIIF/SERI (Cd) and NIVA/IAMK (IAMK=Chalmers Inst., Göteborg) - 1985.

Seabed sediment:

7E ICES, First Intercalibration Exercise on Trace metals in Marine Sediments - 1984 - (1/TM/MS).

8B ICES/OSPAR, First Intercomparison Exercise on Organochlorines (individual chlorobiphenyl congeners) in Marine Sediments - Phase 1, analysis of standard solutions - 1989 - (1/OC/MS:1).

8C ICES/OSPAR, First Intercomparison Exercise on Organochlorines (individual chlorobiphenyl congeners) in Marine Sediments - Phase 2, analysis of standard solutions - 1991 - (1/OC/MS:2).

8B ICES/IOC/OSPAR Intercomparison Programme on the Analysis of Chlorobiphenyls in Marine Media - Step 1 - (analysis of standard solutions) - 1989 - (1/OC/MS-1).

8C ICES/IOC/OSPAR Intercomparison Programme on the Analysis of Chlorobiphenyls in Marine Media - Step 2 - 1990 - (1/OC/MS-2).

8D ICES/IOC/OSPAR Intercomparison Programme on the Analysis of Chlorobiphenyls in Marine Media - Step 3a (1/OC/MS-3a) 1991.

8E ICES/IOC/OSPAR Intercomparison Programme on the Analysis of Chlorobiphenyls in Marine Media - Step 3b - (1/OC/MS-3b) 1992.

8F ICES/IOC/OSPAR Intercomparison Programme on the Analysis of Chlorobiphenyls in Marine Media - Step 4 - (1/OC/MS-4) 1993.

Marine biota:

1E ICES, Fifth Intercalibration Exercise on Trace Metals in Biological Tissues - 1978 - (5/TM/BT).

1F ICES, Sixth Intercalibration Exercise on Trace Metals (Cadmium and Lead only) in Biological Tissues - 1979 - (6/TM/BT).

1G ICES, Seventh Intercalibration Exercise on Trace Metals in Biological Tissues - Part A - 1983 - (7/TM/BT).

1H	ICES, Seventh Intercalibration Exercise on Trace Metals in Biological Tissues - Part B - 1985 - (7/TM/BT) (preliminary report 1987).
1Z VETN	Interlabcalibration exercise with VETN and SIIF 1983, mercury and cadmium in cod filet and liver.
1Z NIVA	Interlabcalibration exercise with VETN, NACE and NIVA 1986 (Hg, Cd, Cu, Pb and Zn in 6 samples).
2D	ICES Fourth Intercalibration Exercise on Organochlorines (mainly PCBs) in Biological Tissues (Sample No.5) - 1979 - (4/OC/BT).
2E	ICES Fifth Intercalibration Exercise on Organochlorines (PCBs only) in Biological Tissues - 1982 - (5/OC/BT).
2G	ICES/IOC/OSPAR Intercomparison Programme on the Analysis of Chlorobiphenyls in Marine Media - Step 1 - (analysis of standard solutions) - 1989 - (7/OC/BT-1).
2H	ICES/IOC/OSPAR Intercomparison Programme on the Analysis of Chlorobiphenyls in Marine Media - Step 2 - 1990 - (7/OC/BT-2).
2I	ICES/IOC/OSPAR Intercomparison Programme on the Analysis of Chlorobiphenyls in Marine Media - Step 3a - (7/OC/BT-3a) 1991.
2J	ICES/IOC/OSPAR Intercomparison Programme on the Analysis of Chlorobiphenyls in Marine Media - Step 3b - (7/OC/BT-3b) 1992.
2K	ICES/IOC/OSPAR Intercomparison Programme on the Analysis of Chlorobiphenyls in Marine Media - Step 4 - (7/OC/BT-4) 1993.
2Z VETN	Interlabcalibration exercise with VETN among others, 1983, PCB and HCB in cod liver.
2Z NACE	Interlabcalibration exercise with NACE, VETNand SIIF 1986 (PCB (all labs), DDE, OCS, HCB and DCB (NACE and VETN).

Appendix D.
Analytical overview

Sorted in three ways:
- **Method, laboratory**
- **Laboratory, method**
- **Contaminant, year, laboratory, intercalibration**

Abbreviations are defined in Appendices B and C

Filename : I:\TBX\JMG\BIO\TAB-4TIS.TB1 Niva 11/12-1998

Analytical overview BIOTA; Sorted by METHOD, LAB. and TISSUE.

Method	Lab.	Tissue	Monitoring Year	Contaminants
110	SIIF	Fish fillet	1981	PCB
		Fish liver	1981	PCB
		Mussel	1981	PCB
111	SIIF	Mussel	1982-1991	PCB
		Mussel	1983-1991	DDTEP, HCB
		Mussel	1986-1987,1989-1991	HCHG
		Mussel	1987-1991	CB101, CB180, CB52
		Mussel	1988-1991	CB138, CB153, CB28
		Mussel	1989-1991	CB118
		Shrimp tail	1982,1984,1986,1988,1990	PCB
		Shrimp tail	1984,1986,1988,1990	DDTEP, HCB
		Shrimp tail	1986,1990	HCHG
		Shrimp tail	1988,1990	CB101, CB138, CB153, CB180, CB28 , CB52
		Shrimp tail	1990	CB118
		~Other	1988	CB101, CB138, CB153, CB180, CB28 , CB52 , DDTEP, HCB , PCB
120	SIIF	Fish fillet	1981	HG
		Fish liver	1981	HG
		Mussel	1981-1985	HG
		Shrimp tail	1982,1984	HG
130	SIIF	Fish fillet	1981	CD
		Fish liver	1981	CD
		Mussel	1981-1985	CD
		Mussel	1983	NI
		Mussel	1983-1984	CU
		Mussel	1983-1985	PB
		Shrimp tail	1982,1984	CD
		Shrimp tail	1984	CU , PB
131	SIIF	Mussel	1983	ZN
132	SIIF	Mussel	1984-1985	MN , ZN
		Shrimp tail	1984	MN , ZN
210	VETN	Fish fillet	1983	DDEPP, HCB
		Fish liver	1982-1985	DDEPP, PCB
		Fish liver	1983-1985	HCB
211	VETN	Fish fillet	1982-1985	PCB
		Fish fillet	1983	DDEPP, HCB
220	VETN	Fish fillet	1982-1985	HG
		Fish liver	1982	HG
230	VETN	Fish liver	1982-1985	CD
240	VETN	Fish fillet	1982	SE
		Fish liver	1982	SE
309	NIVA	Fish fillet	1992	ACNE , ACNLE, ANT , BAA , BAP , BBF , BEP , BGHIP, BIPN , BJKF , CHR , COR , DBA3A, DBP , FLE , FLU , ICDP , NAP , NAP1M, NAP2M, NAPDI, NAPTM, PA , PAM1 , PER , PYR
		Fish liver	1987	PAH
		Fish liver	1992	ACNE , ACNLE, ANT , BAA , BAP , BBF , BEP , BGHIP, BIPN , BJKF , CHR , COR , DBA3A, DBP , FLE , FLU , ICDP , NAP , NAP1M, NAP2M, NAPDI, NAPTM, PA , PAM1 , PER , PYR
		Mussel	1992	COR , DBP
		Mussel	1992,1995-1996	BBF , BJKF , CHR
		Mussel	1992,1995-1997	ACNE , ACNLE, ANT , BAA , BAP , BEP , BGHIP, BIPN , DBA3A, FLE , FLU , ICDP , NAP , PA , PER , PYR
		Mussel	1992,1995,1997	NAP1M, NAP2M, NAPDI, NAPTM, PAM1
		Mussel	1995-1996	DBTC1, DBTC2, DBTC3, NAPC1, NAPC2, NAPC3, PAC1 , PAC2
		Mussel	1995-1997	BBJKF
		Mussel	1995,1997	CHRTR
		Mussel	1997	DBTIO, NAPD2, NAPD3, NAPT2, NAPT3, NAPT4, PAM2 , PAMD1, PAMD2
		Shrimp tail	1992	ACNE , ACNLE, ANT , BAA , BAP , BBF , BEP , BGHIP, BIPN , BJKF , CHR , COR , DBA3A, DBP , FLE , FLU , ICDP , NAP , NAP1M, NAP2M, NAPDI, NAPTM, PA , PAM1 , PER , PYR
310	NIVA	Fish fillet	1986-1997	HG
		Mussel	1986-1997	HG
		Shrimp tail	1986,1988,1990,1992,1995	HG
		~Other	1988	HG
311	NIVA	Fish liver	1986-1997	CU , ZN
		Mussel	1986-1997	CU , ZN
		Shrimp tail	1986,1988,1990,1992,1995	CU , ZN
		~Other	1988	CU , ZN
312	NIVA	Fish liver	1986-1997	CD , PB
		Mussel	1986-1997	CD , PB
		Mussel	1992	CR , NI
		Shrimp tail	1986,1988,1990,1992,1995	CD , PB
		~Other	1988	CD , PB
320	NIVA	Mussel	1997	DBTIN, DPTIN, MBTIN, MPTIN, TBTIN, TPTIN
340	NIVA	Fish liver	1987	PCB
		Fish liver	1990-1997	CB101, CB118, CB138, CB153, CB180, CB209, CB28 , CB52 , DDEPP, HCB , HCHA , HCHG , OCS , QCB , TDEPP
		Fish liver	1991-1997	CB105, CB156
		Fish liver	1996-1997	DDTPP
		Mussel	1995-1997	DDTPP
341	NIVA	Fish fillet	1990-1997	CB101, CB118, CB138, CB153, CB180, CB209, CB28 , CB52 , DDEPP, HCB , HCHA , HCHG , OCS , QCB , TDEPP
		Fish fillet	1991-1997	CB105, CB156
		Mussel	1992-1997	CB101, CB105, CB118, CB138, CB153, CB156, CB180, CB209, CB28 , CB52 , DDEPP, HCB , HCHA , HCHG , OCS , QCB , TDEPP
		Shrimp tail	1992,1995	CB101, CB105, CB118, CB138, CB153, CB156, CB180, CB209, CB28 , CB52 , DDEPP, HCB , HCHA , HCHG , OCS , QCB , TDEPP
401	FIER	Fish fillet	1984,1987	HG
402	FIER	Fish liver	1984,1987	CD
403	FIER	Fish liver	1987	PB
404	FIER	Fish liver	1987	CU

Tab.length cont'd.

Method	Lab.	Tissue	Monitoring Year	Contaminants
405	FIER	Fish liver	1987	ZN
510	NACE	Fish liver	1986-1989	DDEPP, DDTPP, HCB , HCHG , PCB
		Fish liver	1989	CB101, CB118, CB138, CB153, CB180, CB28 , CB52
511	NACE	Fish fillet	1986-1989	PCB
		Fish liver	1986	PCB
605	SIIF	Mussel	1986-1991	EPOCL
		Mussel	1989	EOCL
		Shrimp tail	1986,1988,1990	EPOCL
		~Other	1988	EPOCL
610	NACE	Fish liver	1986-1989	EPOCL
615	NIVA	Fish liver	1990-1991	EPOCL
841	NILU	Mussel	1995-1996	CB126, CB169, CB77 , CB81 , CDD1N, CDD4X, CDD6P, CDD6X, CDD9X, CDDO , CDDSN, CDDSP, CDDST, CDDSX, CDF2N, CDF2T, CDF4X, CDF6P, CDF6X, CDF9P, CDF9X, CDFDN, CDFDX, CDFO , CDFSN, CDFSP, CDFST, CDFSX, PCDD , PCDF , TCDD
842	NILU	Mussel	1996	PCC26, PCC32, PCC50, PCC62
999	NIVA	Fish liver	1997	CU
		Mussel	1996	AG , AS , CD , CR , NI , V

Analytical overview BIOTA; sorted by TISSUE, METHOD and LAB.

Tissue	Method	Lab.	Monitoring Year	Contaminants
Fish fillet	110	SIIF	1981	PCB
	120	SIIF	1981	HG
	130	SIIF	1981	CD
	210	VETN	1983	DDEPP, HCB
	211	VETN	1982-1985	PCB
	211	VETN	1983	DDEPP, HCB
	220	VETN	1982-1985	HG
	240	VETN	1982	SE
	309	NIVA	1992	ACNE , ACNLE, ANT , BAA , BAP , BBF , BEP , BGHIP, BIPN , BJKF , CHR , COR , DBA3A, DBP , FLE , FLU , ICDP , NAP , NAP1M, NAP2M, NAPDI, NAPTM, PA , PAM1 , PER , PYR
	310	NIVA	1986-1997	HG
	341	NIVA	1990-1997	CB101, CB118, CB138, CB153, CB180, CB209, CB28 , CB52 , DDEPP, HCB , HCHA , HCHG , OCS , QCB , TDEPP
	341	NIVA	1991-1997	CB105, CB156
	401	FIER	1984,1987	HG
	511	NACE	1986-1989	PCB
Fish liver	110	SIIF	1981	PCB
	120	.SIIF	1981	HG
	130	SIIF	1981	CD
	210	VETN	1982-1985	DDEPP, PCB
	210	VETN	1983-1985	HCB
	220	VETN	1982	HG
	230	VETN	1982-1985	CD
	240	VETN	1982	SE
	309	NIVA	1987	PAH
	309	NIVA	1992	ACNE , ACNLE, ANT , BAA , BAP , BBF , BEP , BGHIP, BIPN , BJKF , CHR , COR , DBA3A, DBP , FLE , FLU , ICDP , NAP , NAP1M, NAP2M, NAPDI, NAPTM, PA , PAM1 , PER , PYR
	311	NIVA	1986-1997	CU , ZN
	312	NIVA	1986-1997	CD , PB
	340	NIVA	1987	PCB
	340	NIVA	1990-1997	CB101, CB118, CB138, CB153, CB180, CB209, CB28 , CB52 , DDEPP, HCB , HCHA , HCHG , OCS , QCB , TDEPP
	340	NIVA	1991-1997	CB105, CB156
	340	NIVA	1996-1997	DDTPP
	402	FIER	1984,1987	CD
	403	FIER	1987	PB
	404	FIER	1987	CU
	405	FIER	1987	ZN
	510	NACE	1986-1989	DDEPP, DDTPP, HCB , HCHG , PCB
	510	NACE	1989	CB101, CB118, CB138, CB153, CB180, CB28 , CB52
	511	NACE	1986	PCB
	610	NACE	1986-1989	EPOCL
	615	NIVA	1990-1991	EPOCL
	999	NIVA	1997	CU
Mussel	110	SIIF	1981	PCB
	111	SIIF	1982-1991	PCB
	111	SIIF	1983-1991	DDTEP, HCB
	111	SIIF	1986-1987,1989-1991	HCHG
	111	SIIF	1987-1991	CB101, CB180, CB52
	111	SIIF	1988-1991	CB138, CB153, CB28
	111	SIIF	1989-1991	CB118
	120	SIIF	1981-1985	HG
	130	SIIF	1981-1985	CD
	130	SIIF	1983	NI
	130	SIIF	1983-1984	CU
	130	SIIF	1983-1985	PB
	131	SIIF	1983	ZN
	132	SIIF	1984-1985	MN , ZN
	309	NIVA	1992	COR , DBP
	309	NIVA	1992,1995-1996	BBF , BJKF , CHR
	309	NIVA	1992,1995-1997	ACNE , ACNLE, ANT , BAA , BAP , BEP , BGHIP, BIPN , DBA3A, FLE , FLU , ICDP , NAP , PA , PER , PYR
	309	NIVA	1992,1995,1997	NAP1M, NAP2M, NAPDI, NAPTM, PAM1
	309	NIVA	1995-1996	DBTC1, DBTC2, DBTC3, NAPC1, NAPC2, NAPC3, PAC1 , PAC2
	309	NIVA	1995-1997	BBJKF
	309	NIVA	1995,1997	CHRTR
	309	NIVA	1997	DBTIO, NAPD2, NAPD3, NAPT2, NAPT3, NAPT4, PAM2 , PAMD1, PAMD2
	310	NIVA	1986-1997	HG
	311	NIVA	1986-1997	CU , ZN
	312	NIVA	1986-1997	CD , PB
	312	NIVA	1992	CR , NI
	320	NIVA	1997	DBTIN, DPTIN, MBTIN, MPTIN, TBTIN, TPTIN
	340	NIVA	1995-1997	DDTPP
	341	NIVA	1992-1997	CB101, CB105, CB118, CB138, CB153, CB156, CB180, CB209, CB28 , CB52 , DDEPP, HCB , HCHA , HCHG , OCS , QCB , TDEPP
	605	SIIF	1986-1991	EPOCL
	605	SIIF	1989	EOCL
	841	NILU	1995-1996	CB126, CB169, CB77 , CB81 , CDD1N, CDD4X, CDD6P, CDD6X, CDD9X, CDDO , CDDSN, CDDSP, CDDST, CDDSX, CDF2N, CDF2T, CDF4X, CDF6P, CDF6X, CDF9P, CDF9X, CDFDN, CDFDX, CDFO , CDFSN, CDFSP, CDFST, CDFSX, PCDD , PCDF , TCDD
	842	NILU	1996	PCC26, PCC32, PCC50, PCC62
	999	NIVA	1996	AG , AS , CO , CR , NI , V
Shrimp tail	111	SIIF	1982,1984,1986,1988,1990	PCB
	111	SIIF	1984,1986,1988,1990	DDTEP, HCB
	111	SIIF	1986,1990	HCHG
	111	SIIF	1988,1990	CB101, CB138, CB153, CB180, CB28 , CB52
	111	SIIF	1990	CB118
	120	SIIF	1982,1984	HG

Tab.length cont'd.

Tissue	Method	Lab.	Monitoring Year	Contaminants
	130	SIIF	1982,1984	CD
	130	SIIF	1984	CU , PB
	132	SIIF	1984	MN , ZN
	309	NIVA	1992	ACNE , ACNLE, ANT , BAA , BAP , BBF , BEP , BGHIP, BIPN , BJKF , CHR , COR , DBA3A, DBP , FLE , FLU , ICDP , NAP , NAP1M, NAP2M, NAPDI, NAPTM, PA , PAM1 , PER , PYR
	310	NIVA	1986,1988,1990,1992,1995	HG
	311	NIVA	1986,1988,1990,1992,1995	CU , ZN
	312	NIVA	1986,1988,1990,1992,1995	CD , PB
	341	NIVA	1992,1995	CB101, CB105, CB118, CB138, CB153, CB156, CB180, CB209, CB28 , CB52 , DDEPP, HCB , HCHA , HCHG , OCS , QCB , TDEPP
	605	SIIF	1986,1988,1990	EPOCL
"Other	111	SIIF	1988	CB101, CB138, CB153, CB180, CB28 , CB52 , DDTEP, HCB , PCB
	310	NIVA	1988	HG
	311	NIVA	1988	CU , ZN
	312	NIVA	1988	CD , PB
	605	SIIF	1988	EPOCL

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Analytical overview B I O T A ;
Sorted by CONTAMINANT, MonitoringYear & Lab, Intercalibration+Basis and ordered by TISSUE.

Tissue			Fish liver					Fish fillet, Shrimptail, Mussel, Other				
Contam. . .	Mon. Lab. Year	Inter-calibr. +Basis	Analys Method Code	Detect Limit (ppb)	Total Value Count	Count Below D.Lim	N (<) Above D.Lim	Analys Method Code	Detect Limit (ppb)	Total Value Count	Count Below D.Lim	N (<) Above D.Lim
ACNE	1992-NIVA	W	309	0.20	8			309	0.20	46		
	1995-NIVA	W						309	0.20	18		7
	1996-NIVA	W						309	0.20	17		4
	1997-NIVA	W						309	0.50	3		
ACNLE	1992-NIVA	W	309	0.20	8			309	0.20	46		
	1995-NIVA	W						309	0.20	18		17
	1996-NIVA	W						309	0.20	17		14
	1997-NIVA	W						309	0.50	3		
AG	1996-NIVA	W						999	miss	3		
ANT	1992-NIVA	W	309	0.20	8			309	0.20	45		
	1995-NIVA	W						309	0.20	18		9
	1996-NIVA	W						309	0.20	17		8
	1997-NIVA	W						309	0.50	3		
AS	1996-NIVA	W						999	miss	3		
BAA	1992-NIVA	W	309	0.20	8			309	0.20	44		
	1995-NIVA	W						309	0.20	18		9
	1996-NIVA	W						309	0.20	17		8
	1997-NIVA	W						309	0.50	3		
BAP	1992-NIVA	W	309	0.20	8			309	0.20	45		
	1995-NIVA	W						309	0.20	18		10
	1996-NIVA	W						309	0.20	17		11
	1997-NIVA	W						309	0.50	3		
BBF	1992-NIVA	W	309	0.20	8			309	0.20	45		
	1995-NIVA	W						309	0.20	12		7
	1996-NIVA	W						309	0.20	14		4
BBJKF	1995-NIVA	W						309	0.20	6		
	1996-NIVA	W						309	0.20	3		
	1997-NIVA	W						309	0.20	3		
BEP	1992-NIVA	W	309	0.20	8			309	0.20	45		
	1995-NIVA	W						309	0.20	18		5
	1996-NIVA	W						309	0.20	17		6
	1997-NIVA	W						309	0.20	3		
BGHIP	1992-NIVA	W	309	0.20	8			309	0.20	46		
	1995-NIVA	W						309	0.20	18		12
	1996-NIVA	W						309	0.20	17		10
	1997-NIVA	W						309	0.50	3		
BIPN	1992-NIVA	W	309	0.20	8			309	0.20	46		
	1995-NIVA	W						309	0.20	18		12
	1996-NIVA	W						309	0.20	16		2
	1997-NIVA	W						309	0.50	3		
BJKF	1992-NIVA	W	309	0.20	8			309	0.20	45		
	1995-NIVA	W						309	0.20	12		12
	1996-NIVA	W						309	0.20	14		8
CB101	1987-SIIF	W						111	0.20	21	1	
	1988-SIIF	D						111	0.10	3		
	1988-SIIF	W						111	0.10	22		
	1989-NACE	W	510	20.00	93							
	1989-SIIF	W						111	0.10	36		
	1990-NIVA	2G W	340	1.00	169	1		341	0.05	58		
	1990-SIIF	2G W						111	0.40	41	6	
	1991-NIVA	2H W	340	1.00	179		8	341	0.05	62		
	1991-SIIF	2H W						111	0.20	35		1
	1992-NIVA	2J W	340	5.00	192	3		341	0.10	140		
	1993-NIVA	2K W	340	4.00	212	12		341	0.10	133		
	1994-NIVA	2Z W	340	3.00	299	3		341	0.05	164	39	
	1995-NIVA	W	340	3.00	318	10		341	0.05	174	10	
	1996-NIVA	W	340	3.00	332	14		341	0.05	186	9	
	1997-NIVA	W	340	3.00	260	24		341	0.05	173	4	
CB105	1991-NIVA	2H W	340	1.00	87		1	341	0.05	47		
	1992-NIVA	W	340	5.00	192	3		341	0.10	140		
	1993-NIVA	QM W	340	4.00	212	21		341	0.10	133		
	1994-NIVA	2Z W	340	3.00	299	8		341	0.05	164	53	
	1995-NIVA	W	340	3.00	318	13		341	0.05	174	34	
	1996-NIVA	W	340	3.00	332	22		341	0.05	186	23	
	1997-NIVA	W	340	3.00	260	24		341	0.05	173	3	1
CB118	1989-NACE	W	510	20.00	93							
	1989-SIIF	W						111	0.10	36		
	1990-NIVA	2G W	340	1.00	169			341	0.05	58		
	1990-SIIF	2G W						111	0.20	41	1	
	1991-NIVA	2H W	340	1.00	179			341	0.05	62		
	1991-SIIF	2H W						111	0.20	35		1
	1992-NIVA	2J W	340	5.00	192	2		341	0.10	140		
	1993-NIVA	2K W	340	4.00	212	10		341	0.10	133		
	1994-NIVA	2Z W	340	3.00	299	2		341	0.05	164	25	
	1995-NIVA	W	340	3.00	318	2		341	0.05	174	2	
	1996-NIVA	W	340	3.00	332	6		341	0.05	186	4	
	1997-NIVA	W	340	3.00	260	5		341	0.05	173		
CB126	1995-NILU	W						841	.20E-04	4		
	1996-NILU	W						841	.10E-03	14		
CB138	1988-SIIF	D						111	0.10	3		
	1988-SIIF	W						111	0.10	21		
	1989-NACE	W	510	20.00	93							
	1989-SIIF	W						111	0.10	36		
	1990-NIVA	2G W	340	1.00	169			341	0.05	58		
	1990-SIIF	2G W						111	0.30	41		

Tab.length cont'd.

Tissue			Fish liver					Fish fillet, Shrimptail, Mussel, Other				
Contam. . .	Mon. Lab. Year	Inter-calibr. +Basis	Analys Method Code	Detect Limit (ppb)	Total Value Count	Count Below D.Lim	N (<) Above D.Lim	Analys Method Code	Detect Limit (ppb)	Total Value Count	Count Below D.Lim	N (<) Above D.Lim
	1991-NIVA	2H W	340	1.00	179			341	0.05	62		
	1991-SIIF	2H W						111	0.30	35		1
	1992-NIVA	2J W	340	5.00	192			341	0.10	137		
	1993-NIVA	QM W	340	4.00	212	3		341	0.10	133		
	1994-NIVA	22 W	340	3.00	299			341	0.05	164	12	
	1995-NIVA	W	340	3.00	318	2		341	0.05	174		
	1996-NIVA	W	340	3.00	331	1		341	0.05	184		
	1997-NIVA	W	340	3.00	260	1		341	0.05	173		1
CB153	1988-SIIF	D						111	0.10	3		
	1988-SIIF	W						111	0.10	22		
	1989-NACE	W	510	20.00	93							
	1989-SIIF	W						111	0.10	36		
	1990-NIVA	2G W	340	1.00	169			341	0.05	58		
	1990-SIIF	2G W						111	0.30	41		
	1991-NIVA	2H W	340	1,00	179			341	0.05	62		
	1991-SIIF	2H W						111	0.50	35		1
	1992-NIVA	2J W	340	5.00	192			341	0.10	140		
	1993-NIVA	2K W	340	4.00	212	3		341	0.10	133		
	1994-NIVA	22 W	340	3.00	299			341	0.05	164	9	
	1995-NIVA	W	340	3.00	318	1		341	0.05	174		
	1996-NIVA	W	340	3.00	332	1		341	0.05	186		
	1997-NIVA	W	340	3.00	260			341	0.05	173		
CB156	1991-NIVA	2H W	340	1.00	87		15	341	0.05	47		5
	1992-NIVA	W	340	5.00	192	3		341	0.10	140		
	1993-NIVA	QM W	340	4.00	212	31		341	0.10	133		
	1994-NIVA	22 W	340	3.00	299	24	1	341	0.05	161	69	
	1995-NIVA	W	340	3.00	317	27		341	0.05	174	67	
	1996-NIVA	W	340	3.00	332	48		341	0.05	186	62	
	1997-NIVA	W	340	3.00	260	46		341	0.05	173	9	10
CB169	1995-NILU	W						841	.20E-04	4		
	1996-NILU	W						841	.10E-03	14	2	
CB180	1987-SIIF	W						111	0.20	21	6	
	1988-SIIF	D						111	0.10	3		
	1988-SIIF	W						111	0.10	22		
	1989-NACE	W	510	20.00	93	1						
	1989-SIIF	W						111	0.10	36		
	1990-NIVA	2G W	340	1.00	169			341	0.05	58		
	1990-SIIF	2G W						111	0.20	41	8	
	1991-NIVA	2H W	340	1.00	179			341	0.05	62		
	1991-SIIF	2H W						111	0.20	35		
	1992-NIVA	2J W	340	5.00	192	3		341	0.10	140		
	1993-NIVA	2K W	340	4.00	212	15		341	0.10	133		
	1994-NIVA	22 W	340	3.00	299	3		341	0.05	161	48	
	1995-NIVA	W	340	3.00	318	5		341	0.05	174	22	
	1996-NIVA	W	340	3.00	332	14		341	0.05	186	25	
	1997-NIVA	W	340	3.00	260	18		341	0.05	173	1	1
CB209	1990-NIVA	W	340	2.00	169	24	11	341	0.05	58		
	1991-NIVA	W	340	2.00	179	11	88	341	0.05	62	5	7
	1992-NIVA	W	340	5.00	192	3		341	0.10	140		1
	1993-NIVA	W	340	4.00	212	46	14	341	0.10	133		
	1994-NIVA	W	340	3.00	299	29	24	341	0.05	164	90	
	1995-NIVA	W	340	3.00	318	36		341	0.05	174	92	
	1996-NIVA	W	340	3.00	332	255		341	0.05	186	107	
	1997-NIVA	W	340	3.00	260	196		341	0.05	173	30	14
CB28	1988-SIIF	D						111	0.10	3		
	1988-SIIF	W						111	0.10	22		
	1989-NACE	W	510	20.00	93							
	1989-SIIF	W						111	0.10	36		1
	1990-NIVA	2G W	340	1.00	169	2	2	341	0.05	58		
	1990-SIIF	2G W						111	0.20	41	7	
	1991-NIVA	2H W	340	1.00	179	2	52	341	0.05	62	5	1
	1991-SIIF	2H W						111	0.30	35		
	1992-NIVA	2J W	340	5.00	192	3		341	0.10	137		
	1993-NIVA	2K W	340	4.00	212	44	5	341	0.10	133		
	1994-NIVA	22 W	340	3.00	281	18	4	341	0.05	162	72	
	1995-NIVA	W	340	3.00	313	27		341	0.05	174	75	
	1996-NIVA	W	340	3.00	332	107		341	0.05	185	70	
	1997-NIVA	W	340	3.00	260	81		341	0.05	173	22	14
CB52	1987-SIIF	W						111	0.20	20	1	
	1988-SIIF	D						111	0.10	3		
	1988-SIIF	W						111	0.10	22		
	1989-NACE	W	510	20.00	93							
	1989-SIIF	W						111	0.10	36		
	1990-NIVA	2G W	340	1.00	169	2	6	341	0.05	58		
	1990-SIIF	2G W						111	0.40	41	7	
	1991-NIVA	2H W	340	1.00	179	1	37	341	0.05	62	5	1
	1991-SIIF	2H W						111	0.30	35		
	1992-NIVA	2J W	340	5.00	192	3		341	0.10	137		
	1993-NIVA	2K W	340	4.00	212	40		341	0.10	133		
	1994-NIVA	22 W	340	3.00	299	9		341	0.05	164	63	
	1995-NIVA	W	340	3.00	312	19		341	0.05	163	28	
	1996-NIVA	W	340	3.00	332	49		341	0.05	185	31	
	1997-NIVA	W	340	3.00	260	116		341	0.05	173	25	10
CB77	1995-NILU	W						841	.20E-04	4		
	1996-NILU	W						841	.10E-03	14		
CB81	1995-NILU	W						841	.20E-04	4		
	1996-NILU	W						841	.10E-03	14		
CD	1981-SIIF	1E W	130	10.00	28			130	5.00	27		

Tab.length cont'd.

Tissue			Fish liver					Fish fillet, Shrimptail, Mussel, Other				
Contam.	Mon. Year Lab.	Inter-calibr. +Basis	Analys Method Code	Detect Limit (ppb)	Total Value Count	Count Below D.Lim	N (<) Above D.Lim	Analys Method Code	Detect Limit (ppb)	Total Value Count	Count Below D.Lim	N (<) Above D.Lim
	1981-SIIF	1F W						130	10.00	7		
	1982-SIIF	1F W						130	10.00	18		
	1982-VETN	W	230	10.00	54							
	1983-SIIF	1F W						130	10.00	17		
	1983-VETN	1Z W	230	10.00	46							
	1984-FIER	1H W	402	1.00	23							
	1984-SIIF	1G W						130	10.00	27		
	1984-VETN	1Z W	230	10.00	66							
	1985-SIIF	1G D						130	10.00	35		
	1985-VETN	1Z W	230	10.00	45		3					
	1986-NIVA	1H D	312	30.00	56	1		312	30.00	20		
	1987-FIER	1G W	402	1.00	37							
	1987-NIVA	1H D	312	30.00	57		4	312	30.00	37		
	1988-NIVA	1H D	312	30.00	61	11	1	312	30.00	49		
	1989-NIVA	1H D	312	30.00	135	11	8					
	1989-NIVA	1H W						312	30.00	36		
	1990-NIVA	1H W	312	10.00	189	9	2	312	30.00	77	5	
	1991-NIVA	1H W	312	10.00	190	29	2	312	10.00	67		
	1992-NIVA	1H W	312	10.00	191	4		312	10.00	111		
	1993-NIVA	1H W	312	50.00	221	98		312	50.00	79		
	1994-NIVA	1Z W	312	50.00	301	134		312	50.00	81		
	1995-NIVA	W	312	50.00	318	129		312	50.00	88	2	
	1996-NIVA	V1 W						312	50.00	77		
	1996-NIVA	V2 W	312	50.00	368	128						
	1997-NIVA	W	312	50.00	287	90		312	50.00	69		
CDD1N	1995-NILU	W						841	.20E-04	4	1	
	1996-NILU	W						841	.10E-04	14		2
CDD4X	1995-NILU	W						841	.20E-04	4	3	
	1996-NILU	W						841	.200E+08	14	14	
CDD6P	1995-NILU	W						841	.20E-04	4		
	1996-NILU	W						841	.40E-04	14		
CDD6X	1995-NILU	W						841	.20E-04	4		
	1996-NILU	W						841	.20E-04	14		1
CDD9X	1995-NILU	W						841	.20E-04	4	2	
	1996-NILU	W						841	.20E-04	14		1
CDDO	1995-NILU	W						841	.20E-04	4		
	1996-NILU	W						841	.10E-03	14		
CDDSN	1995-NILU	W						841	.20E-04	4		
	1996-NILU	W						841	.10E-04	14		3
CDDSP	1995-NILU	W						841	.20E-04	4		
	1996-NILU	W						841	.40E-04	14		
CDDST	1995-NILU	W						841	.20E-04	4		
	1996-NILU	W						841	.10E-04	14		
CDDSX	1995-NILU	W						841	.20E-04	4		
	1996-NILU	W						841	.20E-04	14		2
CDF2N	1995-NILU	W						841	.20E-04	4		
	1996-NILU	W						841	.10E-04	14		1
CDF2T	1995-NILU	W						841	.20E-04	4		
	1996-NILU	W						841	.10E-04	14		
CDF4X	1995-NILU	W						841	.20E-04	4		
	1996-NILU	W						841	.20E-04	14		1
CDF6P	1995-NILU	W						841	.20E-04	4		
	1996-NILU	W						841	.40E-04	14	2	1
CDF6X	1995-NILU	W						841	.20E-04	4		
	1996-NILU	W						841	.20E-04	14		1
CDF9P	1995-NILU	W						841	.20E-04	4	2	
	1996-NILU	W						841	.80E-04	13	2	1
CDF9X	1995-NILU	W						841	.20E-04	4	3	
	1996-NILU	W						841	.20E-04	14		1
CDFDN	1995-NILU	W						841	.20E-04	4		
	1996-NILU	W						841	.10E-04	14		1
CDFDX	1995-NILU	W						841	.20E-04	4		
	1996-NILU	W						841	.20E-04	14		1
CDFO	1995-NILU	W						841	.20E-04	4		1
	1996-NILU	W						841	.10E-03	14	3	1
CDFSN	1995-NILU	W						841	.20E-04	4		
	1996-NILU	W						841	.10E-04	14		1
CDFSP	1995-NILU	W						841	.20E-04	4		
	1996-NILU	W						841	.80E-04	14	6	1
CDFST	1995-NILU	W						841	.20E-04	4		
	1996-NILU	W						841	.10E-04	14		
CDFSX	1995-NILU	W						841	.20E-04	4		
	1996-NILU	W						841	.20E-04	14		1
CHR	1992-NIVA	W	309	0.20	8			309	0.20	44		
	1995-NIVA	W						309	0.20	3		
	1996-NIVA	W						309	0.20	17		3
CHRTR	1995-NIVA	W						309	0.20	15		2
	1997-NIVA	W						309	0.50	3		
CO	1996-NIVA	W						999	miss	3		
COR	1992-NIVA	W	309	0.20	8			309	0.20	46		
CR	1992-NIVA	W						312	10.00	6		
	1996-NIVA	W						999	miss	3		
CU	1983-SIIF	1G W						130	10.00	12		
	1984-SIIF	1G W						130	10.00	27		
	1986-NIVA	1H D	311	150.00	56			311	150.00	20		
	1987-FIER	1G W	404	50.00	37							
	1987-NIVA	1H D	311	150.00	57			311	150.00	37		
	1988-NIVA	1H D	311	150.00	61			311	150.00	49		

Tab.length cont'd.

Tissue			Fish liver					Fish fillet, Shrimptail, Mussel, Other				
Contam. . .	Mon. Lab. Year	Inter-calibr. +Basis	Analys Method Code	Detect Limit (ppb)	Total Value Count	Count Below D.Lim	N (<) Above D.Lim	Analys Method Code	Detect Limit (ppb)	Total Value Count	Count Below D.Lim	N (<) Above D.Lim
	1989-NIVA	1H D	311	150.00	135							
	1989-NIVA	1H W						311	150.00	36		
	1990-NIVA	1H W	311	150.00	189			311	150.00	77		
	1991-NIVA	1H W	311	50.00	193	2		311	50.00	67		
	1992-NIVA	1H W	311	10.00	191			311	10.00	111		
	1993-NIVA	1H W	311	10.00	221			311	10.00	79		
	1994-NIVA	12 W	311	10.00	301			311	10.00	81		
	1995-NIVA	W	311	10.00	318			311	10.00	88		
	1996-NIVA	V1 W						311	10.00	77		
	1996-NIVA	V2 W	311	10.00	368							
	1997-NIVA	W	999a	5000.00a	287	1		311	10.00	69		
DBA3A	1992-NIVA	W	309	0.20	8			309	0.20	46		
	1995-NIVA	W						309	0.20	17		17
	1996-NIVA	W						309	0.20	17		17
	1997-NIVA	W						309	0.50	3		
DBP	1992-NIVA	W	309	0.20	8			309	0.20	46		
DBTC1	1995-NIVA	W						309	0.20	3		
	1996-NIVA	W						309	0.20	17		2
DBTC2	1995-NIVA	W						309	0.20	3		
	1996-NIVA	W						309	0.20	15		6
DBTC3	1995-NIVA	W						309	0.20	3		
	1996-NIVA	W						309	0.20	17		
DBTIN	1997-NIVA	W						320	5.00	8		
DBTIO	1997-NIVA	W						309	0.50	3		
DDEPP	1982-VETN	W	210	50.00	53							
	1983-VETN	2E W	210	50.00	48			211a	50.00	48		
	1984-VETN	2E W	210	50.00	66							
	1985-VETN	2E W	210	50.00	45							
	1986-NACE	22 W	510	20.00	56							
	1987-NACE	22 W	510	40.00	53							
	1988-NACE	22 W	510	40.00	61							
	1989-NACE	22 W	510	20.00	93							
	1990-NIVA	W	340	1.00	169			341	0.05	58		
	1991-NIVA	W	340	1.00	179			341	0.05	62		
	1992-NIVA	W	340	5.00	192	2		341	0.10	140		
	1993-NIVA	W	340	4.00	212	3		341	0.10	133		
	1994-NIVA	22 W	340	4.00	299			341	0.10	164	27	
	1995-NIVA	W	340	4.00	318	2		341	0.10	174	29	
	1996-NIVA	W	340	4.00	332	2		341	0.10	186	38	
	1997-NIVA	W	340	4.00	260	3		341	0.10	173	1	
DDTEP	1983-SIIF	W						111	0.50	12		
	1984-SIIF	W						111	0.50	24		1
	1985-SIIF	W						111	0.50	27	1	5
	1986-SIIF	W						111	0.50	21		
	1987-SIIF	W						111	0.50	21	1	
	1988-SIIF	D						111	0.50	3		
	1988-SIIF	W						111	0.50	22	1	
	1989-SIIF	W						111	0.50	36	1	
	1990-SIIF	W						111	0.20	41	1	
	1991-SIIF	W						111	0.30	35		
DDTPP	1986-NACE	W	510	40.00	56							
	1987-NACE	W	510	40.00	53							
	1988-NACE	W	510	40.00	61							
	1989-NACE	W	510	20.00	93							
	1995-NIVA	W						340	0.05	60		
	1996-NIVA	W	340	0.05	54		4	340	0.05	36		
	1997-NIVA	W	340	2.00	32			340	0.05	39		
DPTIN	1997-NIVA	W						320	5.00	8		
EOCL	1989-SIIF	W						605	170.00	5		
EPOCL	1986-NACE	W	610	800.00	56							
	1986-SIIF	W						605	5000.00	21	21	
	1987-NACE	W	610	800.00	53							
	1987-SIIF	W						605	40.00	20		
	1988-NACE	W	610	800.00	60							
	1988-SIIF	W						605	40.00	24		
	1989-NACE	W	610	800.00	89	1						
	1989-SIIF	W						605	40.00	35		
	1990-NIVA	W	615	40.00	117		3					
	1990-SIIF	W						605	40.00	41		
	1991-NIVA	W	615	40.00	116		12					
	1991-SIIF	W						605	130.00	35		
FLE	1992-NIVA	W	309	0.20	8			309	0.20	45		
	1995-NIVA	W						309	0.20	18		5
	1996-NIVA	W						309	0.20	17		2
	1997-NIVA	W						309	0.50	3		
FLU	1992-NIVA	W	309	0.20	8			309	0.20	44		
	1995-NIVA	W						309	0.20	18		
	1996-NIVA	W						309	0.20	17		
	1997-NIVA	W						309	0.20	3		
HCB	1983-SIIF	W						111	0.50	12		
	1983-VETN	22 W	210	10.00	48			211a	10.00	48		
	1984-SIIF	W						111	0.20	24		1
	1984-VETN	22 W	210	10.00	66							
	1985-SIIF	W						111	0.20	30	6	2
	1985-VETN	22 W	210	10.00	45		4					
	1986-NACE	22 W	510	10.00	56							
	1986-SIIF	22 W						111	0.20	21	3	
	1987-NACE	22 W	510	40.00	53							

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Tissue			Fish liver					Fish fillet, Shrimptail, Mussel, Other				
Contam. . .	Mon. Lab. Year	Inter-calibr. +Basis	Analys Method Code	Detect Limit (ppb)	Total Value Count	Count Below D.Lim	N (<) Above D.Lim	Analys Method Code	Detect Limit (ppb)	Total Value Count	Count Below D.Lim	N (<) Above D.Lim
	1987-SIIF	22 W						111	0.20	21	4	
	1988-NACE	22 W	510	40.00	61							
	1988-SIIF	22 D						111	0.20	3		
	1988-SIIF	22 W						111	0.20	22	2	
	1989-NACE	22 W	510	20.00	93							
	1989-SIIF	22 W						111	0.05	36		
	1990-NIVA	W	340	1.00	169	2		341	0.05	58		
	1990-SIIF	22 W						111	0.05	41	3	
	1991-NIVA	W	340	1.00	179	4	13	341	0.05	62	5	
	1991-SIIF	22 W						111	0.10	35		
	1992-NIVA	W	340	5.00	189	3		341	0.10	140		
	1993-NIVA	W	340	4.00	212	31		341	0.10	133		
	1994-NIVA	22 W	340	3.00	299	24	1	341	0.05	164	33	
	1995-NIVA	W	340	3.00	317	37		341	0.05	174	30	
	1996-NIVA	W	340	3.00	332	52		341	0.05	186	37	
	1997-NIVA	W	340	2.00	260	39		341	0.05	173	7	
HCHA	1990-NIVA	W	340	1.00	168			341	0.05	58		
	1991-NIVA	W	340	1.00	179	2	111	341	0.05	62	5	10
	1992-NIVA	W	340	5.00	192	3		341	0.10	140		
	1993-NIVA	W	340	4.00	212	45	22	341	0.10	133		
	1994-NIVA	22 W	340	3.00	295	32	3	341	0.05	164	84	
	1995-NIVA	W	340	3.00	318	45		341	0.05	174	98	
	1996-NIVA	W	340	3.00	332	111		341	0.05	186	100	
	1997-NIVA	W	340	0.50	260	2	10	341	0.05	173	20	11
HCHG	1986-NACE	W	510	30.00	56	1						
	1986-SIIF	W						111	3.00	21		
	1987-NACE	W	510	40.00	53							
	1987-SIIF	W						111	5.00	21		1
	1988-NACE	W	510	40.00	61							
	1989-NACE	W	510	20.00	93							
	1989-SIIF	W						111	50.00	36		
	1990-NIVA	W	340	1.00	169	1	9	341	0.05	58		
	1990-SIIF	W						111	0.10	41		
	1991-NIVA	W	340	1.00	179	3	18	341	0.05	62	5	1
	1991-SIIF	W						111	0.30	35		
	1992-NIVA	W	340	5.00	192	3		341	0.10	140		
	1993-NIVA	W	340	4.00	212	42	17	341	0.10	133		
	1994-NIVA	22 W	340	3.00	299	24	1	341	0.05	164	45	
	1995-NIVA	W	340	3.00	313	31		341	0.05	162	29	
	1996-NIVA	W	340	3.00	330	68		341	0.05	169	8	
	1997-NIVA	W	340	2.00	260	47		341	0.05	173	3	9
HG	1981-SIIF	1E W	120	10.00	15		1	120	10.00	35		
	1982-SIIF	1E W						120	10.00	18		
	1982-VETN	W	220	10.00	51			220	10.00	54		
	1983-SIIF	1E W						120	10.00	17		
	1983-VETN	1Z W						220	10.00	48		
	1984-FIER	1G W						401	10.00	39		
	1984-SIIF	1G W						120	10.00	27	6	
	1984-VETN	1Z W						220	10.00	66		
	1985-SIIF	1G D						120	10.00	30		
	1985-VETN	1Z W						220	10.00	90		
	1986-NIVA	1H D						310	10.00	74		
	1987-FIER	1G W						401	10.00	38		
	1987-NIVA	1H D						310	10.00	93		14
	1988-NIVA	1H D						310	10.00	110		
	1989-NIVA	1H D						310	100.00	134		
	1989-NIVA	1H W						310	10.00	36	5	
	1990-NIVA	1H W						310	10.00	266		
	1991-NIVA	1H W						310	100.00a	264	126	
	1992-NIVA	1H W						310	100.00a	303	122	
	1993-NIVA	1H W						310	5.00	300		
	1994-NIVA	1Z W						310	5.00	380		
	1995-NIVA	W						310	5.00	406	1	
	1996-NIVA	V1 W						310	5.00	445		
	1997-NIVA	W						310	5.00	356		
ICDP	1992-NIVA	W	309	0.20	8			309	0.20	46		
	1995-NIVA	W						309	0.20	18		15
	1996-NIVA	W						309	0.20	17		11
	1997-NIVA	W						309	0.50	3		
MBTIN	1997-NIVA	W						320	5.00	8		
MN	1984-SIIF	W						132	40.00	27		
	1985-SIIF	D						132	40.00	35		
MPTIN	1997-NIVA	W						320	5.00	8		
NAP	1992-NIVA	W	309	0.20	8			309	0.20	46		
	1995-NIVA	W						309	0.20	18		15
	1996-NIVA	W						309	0.20	16		
	1997-NIVA	W						309	0.20	3		
NAP1M	1992-NIVA	W	309	0.20	8			309	0.20	46		
	1995-NIVA	W						309	0.20	15		13
	1997-NIVA	W						309	0.50	3		
NAP2M	1992-NIVA	W	309	0.20	8			309	0.20	46		
	1995-NIVA	W						309	0.20	15		13
	1997-NIVA	W						309	0.50	3		
NAPC1	1995-NIVA	W						309	0.20	3		
	1996-NIVA	W						309	0.20	16		
NAPC2	1995-NIVA	W						309	0.20	3		
	1996-NIVA	W						309	0.20	17		
NAPC3	1995-NIVA	W						309	0.20	3		

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Tissue			Fish liver					Fish fillet, Shrimptail, Mussel, Other				
Contam. - -	Mon. Lab. Year	Inter-calibr. +Basis	Analys Method Code	Detect Limit (ppb)	Total Value Count	Count Below D.Lim	N (<) Above D.Lim	Analys Method Code	Detect Limit (ppb)	Total Value Count	Count Below D.Lim	N (<) Above D.Lim
	1996-NIVA	W						309	0.20	17		
NAPD2	1997-NIVA	W						309	0.50	3		
NAPD3	1997-NIVA	W						309	0.50	3		
NAPDI	1992-NIVA	W	309	0.20	8			309	0.20	46		
	1995-NIVA	W						309	0.20	15		6
	1997-NIVA	W						309	0.50	3		
NAPT2	1997-NIVA	W						309	0.50	3		
NAPT3	1997-NIVA	W						309	0.50	3		
NAPT4	1997-NIVA	W						309	0.50	3		
NAPTM	1992-NIVA	W	309	0.20	8			309	0.20	46		
	1995-NIVA	W						309	0.20	15		11
	1997-NIVA	W						309	0.50	3		
NI	1983-SIIF	1G W						130	20.00	12		
	1992-NIVA	W						312	10.00	6		
	1996-NIVA	W						999	miss	3		
OCS	1990-NIVA	W	340	2.00	169	31	24	341	0.05	58		1
	1991-NIVA	W	340	2.00	179	14	81	341	0.05	62	5	8
	1992-NIVA	W	340	5.00	192	3		341	0.10	140		
	1993-NIVA	W	340	4.00	212	51	16	341	0.10	133		
	1994-NIVA	W	340	3.00	299	39	22	341	0.05	164	95	
	1995-NIVA	W	340	3.00	318	44		341	0.05	174	102	
	1996-NIVA	W	340	3.00	332	287		341	0.05	186	114	
	1997-NIVA	W	340	2.00	260	100		341	0.05	173	30	14
PA	1992-NIVA	W	309	0.20	8			309	0.20	45		
	1995-NIVA	W						309	0.20	18		
	1996-NIVA	W						309	0.20	17		
	1997-NIVA	W						309	0.20	3		
PAC1	1995-NIVA	W						309	0.20	3		
	1996-NIVA	W						309	0.20	17		
PAC2	1995-NIVA	W						309	0.20	3		
	1996-NIVA	W						309	0.20	17		
PAH	1987-NIVA	W	309	0.02	1							
PAM1	1992-NIVA	W	309	0.20	8			309	0.20	45		
	1995-NIVA	W						309	0.20	15		2
	1997-NIVA	W						309	0.50	3		
PAM2	1997-NIVA	W						309	0.50	3		
PAMD1	1997-NIVA	W						309	0.50	3		
PAMD2	1997-NIVA	W						309	0.50	3		
PB	1983-SIIF	1G W						130	20.00	12		
	1984-SIIF	1G W						130	20.00	27		2
	1985-SIIF	1G D						130	20.00	35		
	1986-NIVA	1Z D	312	150.00	56	4		312	150.00	20		
	1987-FIER	1G W	403	10.00	37	1						
	1987-NIVA	1Z D	312	150.00	57		12	312	150.00	37		
	1988-NIVA	1Z D	312	150.00	61	17	3	312	150.00	49		
	1989-NIVA	1Z D	312	150.00	135	9	9					
	1989-NIVA	1Z W						312	150.00	36		
	1990-NIVA	1Z W	312	50.00	187	3	1	312	150.00	77	3	
	1991-NIVA	1Z W	312	50.00	193	14		312	50.00	67		
	1992-NIVA	1Z W	312	50.00	191	119		312	50.00	111	2	
	1993-NIVA	1H W	312	30.00	221	40		312	30.00	79		
	1994-NIVA	1Z W	312	30.00	301	3		312	30.00	81		
	1995-NIVA	W	312	30.00	318	162	30	312	30.00	88		
	1996-NIVA	V1 W						312	30.00	77		
	1996-NIVA	V2 W	312	30.00	368		109					
	1997-NIVA	W	312	40.00	287	10	28	312	40.00	69		
PCB	1981-SIIF	2D W	110	10.00	27			110	10.00	35		
	1982-SIIF	2D W						111	5.00	17		
	1982-VETN	W	210	50.00	53			211	50.00	54		
	1983-SIIF	2E W						111	5.00	14		
	1983-VETN	2E W						211	50.00	48		
	1983-VETN	2Z W	210	50.00	48							
	1984-SIIF	2E W						111	5.00	24		
	1984-VETN	2E W						211	50.00	66		
	1984-VETN	2Z W	210	50.00	66							
	1985-SIIF	2E W						111	5.00	32		6
	1985-VETN	2E W						211	50.00	90		1
	1985-VETN	2Z W	210	50.00	45							
	1986-NACE	2Z W	511a	40.00a	56			511	20.00	56		
	1986-SIIF	2E W						111	5.00	21		
	1987-NACE	2Z W	510	40.00	53			511	20.00	54		
	1987-NIVA	W	340	0.10	2							
	1987-SIIF	2E W						111	5.00	21		
	1988-NACE	2Z W	510	40.00	61			511	20.00	13		
	1988-SIIF	2E D						111	5.00	3		
	1988-SIIF	2E W						111	5.00	22	4	
	1989-NACE	2Z W	510	20.00	93			511	20.00	17		
	1989-SIIF	2E W						111	5.00	36	6	
	1990-SIIF	2E W						111	5.00	41		
	1991-SIIF	2E W						111	5.00	35		
PCC26	1996-NILU	W						842	.10E-02	6		
PCC32	1996-NILU	W						842	.30E-02	6		4
PCC50	1996-NILU	W						842	.10E-02	6		
PCC62	1996-NILU	W						842	0.03	6		6
PCDD	1995-NILU	W						841	.20E-04	4		
	1996-NILU	W						841	.10E-03	14		
PCDF	1995-NILU	W						841	.20E-04	4		
	1996-NILU	W						841	.10E-03	14		

Tab.length cont'd.

Tissue			Fish liver					Fish fillet, Shrimptail, Mussel, Other				
Contam.	Mon. Lab. Year	Inter-calibr. +Basis	Analys Method Code	Detect Limit (ppb)	Total Value Count	Count Below D.Lim	N (<) Above D.Lim	Analys Method Code	Detect Limit (ppb)	Total Value Count	Count Below D.Lim	N (<) Above D.Lim
PER	1992-NIVA	W	309	0.20	8			309	0.20	46		
	1995-NIVA	W						309	0.20	18		14
	1996-NIVA	W						309	0.20	17		14
	1997-NIVA	W						309	0.50	3		
PYR	1992-NIVA	W	309	0.20	8			309	0.20	44		
	1995-NIVA	W						309	0.20	18		4
	1996-NIVA	W						309	0.20	17		1
	1997-NIVA	W						309	0.20	3		
QCB	1990-NIVA	W	340	2.00	169	33	39	341	0.05	58		
	1991-NIVA	W	340	2.00	178	13	97	341	0.05	57	5	7
	1992-NIVA	W	340	5.00	192	3		341	0.10	125		
	1993-NIVA	W	340	4.00	212	52	24	341	0.10	133		
	1994-NIVA	W	340	3.00	298	38	23	341	0.05	164	92	
	1995-NIVA	W	340	3.00	318	45		341	0.05	174	103	
	1996-NIVA	W	340	3.00	332	306		341	0.05	186	109	
	1997-NIVA	W	340	2.00	260	79		341	0.05	173	27	10
SE	1982-VETN	W	240	10.00	46			240	10.00	54		
TBTIN	1997-NIVA	W						320	5.00	8		
TCDD	1995-NILU	W						841	.20E-04	4	1	
	1996-NILU	W						841	.10E-04	14		
TDEPP	1991-NIVA	W	340	1.00	138		1	341	0.05	62		
	1992-NIVA	W	340	5.00	191	3		341	0.10	140		
	1993-NIVA	W	340	4.00	212	24	3	341	0.10	133		
	1994-NIVA	2Z W	340	3.00	299	17	5	341	0.05	164	47	
	1995-NIVA	W	340	3.00	318	36		341	0.05	171	51	
	1996-NIVA	W	340	3.00	332	23		341	0.05	186	16	
	1997-NIVA	W	340	3.00	260	23		341	0.05	173	11	
TPTIN	1997-NIVA	W						320	5.00	8		
V	1996-NIVA	W						999	miss	3		
ZN	1983-SIIF	1G W						131	400.00	12		
	1984-SIIF	1G W						132	400.00	27		
	1985-SIIF	1G D						132	400.00	35		
	1986-NIVA	1H D	311	3000.00	56			311	3000.00	20		
	1987-FIER	1G W	405	20.00	37							
	1987-NIVA	1H D	311	3000.00	57			311	3000.00	37		
	1988-NIVA	1H D	311	3000.00	61			311	3000.00	49		
	1989-NIVA	1H D	311	3000.00	135		1					
	1989-NIVA	1H W						311	3000.00	36		
	1990-NIVA	1H W	311	3000.00	189			311	3000.00	77		
	1991-NIVA	1H W	311	1000.00	193			311	1000.00	67		
	1992-NIVA	1H W	311	1000.00	191			311	1000.00	111		
	1993-NIVA	1H W	311	1000.00	221			311	1000.00	79		
	1994-NIVA	1Z W	311	1000.00	301			311	1000.00	81		
	1995-NIVA	W	311	1000.00	318			311	1000.00	88		
	1996-NIVA	V1 W						311	1000.00	77		
	1996-NIVA	V2 W	311	1000.00	368							
	1997-NIVA	W	311	1000.00	287			311	1000.00	69		
Sum of Counts					45944	4516	1045			31048	3065	555

a(8) > Ambiguous value in cell (Maximum value displayed).

Appendix E.
Overview of localities

Station positions are shown on maps (Figure 1 to Figure 4).

JAMP stations and programme 1997

Appendix E1. JMP station positions and sampling overview for 1996. WSBOFR: W=water, S=sediment, B=blue mussel, O=other shellfish, F=flatfish, R=roundfish. second station position indicates previous location. NSTF=North Sea Task Force. Mussels were sampled from rock surfaces unless otherwise noted.

JAMP area	St.	Locality name	North latitude	East longitude	ICES position	1997 W	S	B	O	F	R	notes
26 OSLOFJORD AREA EAST, Hvaler and Singlefjorden												
26	01A	Sponvika	59°05.4'	11°12.5'	47G13							
			59°05.1'	11°13.9'	47G13							
26	02A	Fugleskjær	59°06.6'	10°59.3'	47G09							
			59°06.9'	10°59.0'	47G09							
26	03A	Tisler	58°59.0'	10°57.8'	46G07							C
			58°58.8'	10°57.5'	46G07							
26 OSLOFJORD AREA CENTRAL, Oslofjord proper												
26	30A	Gressholmen	59°52.8'	10°43.0'	48G07	+		+				
26	30A	Gressholmen (- 1996)	59°52.5'	10°43.0'	48G07							
26	30B	Oslo city area / Håøya	59°49'	10°33'	48G04							
			59°44'	10°32'	48G04						+	
26	30B	Oslo city area / Nesodden	59°52'	10°39'	48G04							
26	30F	Oslo city area / Håøya	59°47'	10°34'	48G04							
26	30X	West of Nesodden	59°48.5'	10°36'	48G04							
26	30G	Steilene area (Spro)	59°45.8'	10°34.5'	48G05							
26	30H	Steilene area (Storegrunn)	59°48.5'	10°33.5'	48G05							
26	40C	Steilene	59°49'	10°33'	48G05							
			59°49'	10°39'	48G05							
26	30S	Steilene	59°49.1'	10°33.8'	48G05							
26	31A	Solbergstrand	59°36.9'	10°39.4'	48G06	+		+				
26	31B	Solbergstrand (Filtvet, 1982)	59°37'	10°39'	47G07							
26	32A	Rødtangen	59°31.5'	10°25.6'	48G06							
26	33X	Sande, west side	59°31.7'	10°20.4'	48G06							
26	33B	Sande, east side	59°31.7'	10°21.0'	48G06					+		
26	35A	Mølen	59°29.2'	10°30.1'	47G04	+		+				
26	35C	Holmenstrand-Mølen	59°29'	10°27'	47G04							
26	35S	Mølen	59°30'	10°35'	47G04							
26	36A	Færder	59°01.6'	10°31.7'	47G06	+		+				
26	36B	Færder area	59°02'	10°27'	47G06							
			59°02'	10°32'	47G06						+	
26	36F	Færder area	59°04'	10°23'	47G06					+		
26	36S	Færder area (NSTF-54)	59°00.4'	10°41.6'	47G09							N
26 OSLOFJORD AREA WEST, outer Sandefjord-Langesundsfjord												
26	73A	Lyngholmen	59°02.6'	10°18.1'	47G03							C
26	74A	Oddeneskjær	58°57.3'	09°52.1'	46F97							C
26	71A	Bjørkøya (Risøyodden)	59°01.4'	09°45.4'	47F99	+		+				
ARENDAL AREA												
	76A	Risøy	58°43.6'	09°17.0'	46F92	+		+				C
	77A	Flostafjord	58°31.5'	08°56.9'	46F89							C
	77B	Borøy area	58°33'	09°01'	46F93							
	77F	Borøy area	58°33'	09°01'	46F93							
	77C	Borøy area	58°29'	09°10'	45F91							

Appendix E (cont'd)

JAMP area	St.	Locality name	North latitude	East longitude	ICES position	1997 W	S	B	O	F	R	notes
ARENDAL AREA (cont.)												
	77S	Arendal area (NSTF-57)	58°24.2'	09°01.8'	45F91							N, C
	79A	Gjerdvoldsøyen, east	58°25.0'	08°45.3'	45F87							C
LISTA AREA												
	13A	Langøsund	57°59.8'	07°34.6'	44F74							C
	14A	Aavigen	58°02.2'	07°13.2'	45F73							C
	15A	Gåsøy (Ullerø area)	58°03.1'	06°53.3'	45F69	+		+				
	15B	Ullerø area	58°03'	06°43'	45F69						+	
	15F	Ullerø area	58°03'	06°43'	45F69					+		
	15S	Lista area (NSTF-39)	58°01.0'	06°34.3'	45F66							N, C
BØMLO AREA												
	22A	Espevær, west	59°35.2'	05°00.5'	48F59	+		+				C, 1
	22F	Borøyfjorden	59°43'	05°21'	48F55					+		
	22C	Bømlofjorden	59°34'	05°11'	48F53							
	22S	Bømlo (NSTF-36)	59°25.9'	04°50.2'	47F47							N
	23A	Austvik	59°52.2'	05°06.6'	48F51							
	23B	Karihavet area	59°55'	05°07'	48F51						+	
	24A	Vardøy	60°10.2'	05°00.8'	49F52							C
	24S	Sotra	60°15.1'	04°33.3'	49F45							N
62 HARDANGERFJORDEN												
62	69A	Lille Terøy	59°58.8'	05°45.4'	49F59	+		+				
62	69S	Kvinnheradsfjorden	60°01.3'	05°56.1'	49F59							
62	67B	Strandebarm	60°16'	06°02'	49F62					+	+	
62	67S	Strandebarm	60°13.5'	06°05.1'	49F62							
62	65A	Vikingneset	60°14.5'	06°09.6'	49F62	+		+				
62	63A	Ranaskjær	60°25.1'	06°24.5'	49F64	+		+				
62	63S	Ranaskjær	60°23.6'	06°27.1'	49F64							
63 SØRFJORD												
63	51A	Byrkjenes	60°05.1'	06°33.1'	49F66							
63	52A	Eitrheimsneset	60°05.8'	06°32.2'	49F66	+		+				3
63	52S	Tyssedal	60°06.9'	06°32.9'	49F66							
63	53B	Inner Sørfjord	60°10'	06°34'	49F65					+	+	
63	56A	Kvalnes	60°13.4'	06°36.1'	49F65	+		+				
63	56S	Kvalnes	60°13.7'	06°35.6'	49F65							
63	57A	Krossanes	60°23.2'	06°41.2'	49F67	+		+				
63	57S	Krossanes	60°23.1'	06°40.7'	49F67							
ÅLESUND AREA												
	25A	Hinnøy	61°22.2'	04°52.8'	51F47							5
	26A	Hamnen	61°52.7'	05°13.6'	52F51							5
	27A	Grinden	62°12.2'	05°25.4'	53F55							1
	27X	Kvarne area	62°12.3'	05°22.2'	53F55							
	27S	Stattlandet (east of)	62°09.3'	05°21.3'	53F56							
	28A	Eiksundet	62°14.9'	05°54.5'	53F58							1
		Eiksundet (1992)	62°14.9'	05°54.5'	53F58							1

Appendix E (cont'd)

JAMP area	St.	Locality name	North latitude	East longitude	ICES position	1997 W	S	B	O	F	R	notes
65 ORKDALSFJORDEN												
65	80A	Østmerknes	63°27.5'	10°27.5'	56G04							
65	81A	Biologisk station	63°26.5'	10°21.4'	56G04							
65	82A	Flakk	63°27.1'	10°12.6'	56G01							
65	82S	Flakk	63°27.5'	10°11.8'	56G01							
65	83A	Frøsetskjær	63°25.5'	10°07.8'	56G01							
65	84A	Trossavika	63°20.8'	09°57.8'	55F97							
65	84B	Trossavika	63°20.8'	09°57.8'	55F97							
65	84S	Trossavika	63°21.7'	09°57.4'	55F97							
		(1987)	63°21.2'	09°57.2'	55F97							
65	89S	Thamshavn (indre Orkdal)	63°19.7'	09°52.3'	55F98							
		(1987)	63°19.8'	09°52.5'	55F98							
65	90S	Outer Orkdalsfjord	63°27.4'	10°03.0'	56G01							
		(1987)	63°27.4'	10°04.3'	56G01							
65	85A	Geitastrand	63°21.9'	09°56.3'	55F97							
65	86A	Geitnes	63°26.6'	09°59.2'	55F97							
65	87A	Ingdalsbukt	63°27.8'	09°54.8'	55F97							
65	88A	Rødberg	63°27.2'	10°00.0'	55G01							
FROAN AREA												
	91A	Nerdvika	63°21.2'	08°09.6'	55F81							3
		Fosflua (1992)	63°23.8'	08°17.6'	55F81							4
	92A	Stokken	64°02.2'	10°01.1'	57G03	+		+				5
		(-1996)	64°04.6'	10°00.7'	57G03							4
	92B	Stokken area	64°09.9'	09°53.0'	57F99						x	
	92F	Stokken area	64°09.9'	09°53.0'	57F99							
	93S	Raudøya (northeast of)	64°22.7'	10°27.8'	57G04							
	93A	Låven (Sætervik)	64°23.7'	10°29.0'	57G04							4
		Låven (Sætervik, 1992))	64°23.5'	10°28.0'	57G04							4
HELGELAND AREA												
	94A	Landfast	65°38.4'	12°00.5'	60G23							1
	96A	Breiviken	66°17.6'	12°50.5'	61G28							1
	95S	Rodø (east of)	66°41.8'	13°09.9'	62G32							
	95A	Flatskjær	66°42.6'	13°15.8'	62G32							4
LOFOTEN AREA												
	97A	Klakholmen	67°39.9'	14°44.6'	64G49							4
	99A	Brunvær	68°00.3'	15°05.6'	65G53							4
	98B	Lille Molla	68°12.0'	14°48.0'	65G48						+	
	98F	Lille Molla	68°12.0'	14°48.0'	65G48					+		
	98S	Skrova (south of)	68°07.0'	14°41.0'	65G49							
	98A	Husvågen (1997)	68°15.4'	14°40.6'	65G46	•		•				5
		(1992)	68°09.4'	14°39.3'	65G46	•		•				1
	98X	Skrova	68°10.5'	14°40.2'	65G48	+		+				7
	99S	Lundøy (north of)	68°05.8'	15°10.1'	65G53							

Appendix E (cont'd)

JAMP area	St.	Locality name	North latitude	East longitude	ICES position	1996						notes
						W	S	B	O	F	R	
FINNSNES-SKJERVØY AREA												
	41S	Andfjord	68°56.3'	17°05.2'	66G71							
	41A	Fensneset, Grytøya	68°56.9'	16°38.5'	66G64	+		+				3
	42S	Tromsø area	69°60.4'	18°06.8'	68G83							
	42A	Tennskjær, Malangen	69°28.6'	18°18.0'	67G81							3
	43S	Kvænangen	70°03.3'	21°07.9'	69H13							
	43A	Lyngneset, Langjforden	70°06.2'	20°32.8'	69H06	+		+				2
	43B	Kvænangen	70°09.0'	21°22.0'	69H16						x	
	43F	Kvænangen	70°09.0'	21°22.0'	69H16					x		
HAMMERFEST-HONNINGSVÅG AREA												
	44S	Sørøya, south	70°25.9'	22°31.8'	69H24							
	44A	Elenheimsundet	70°30.8'	22°14.8'	70H23	+		+				1, 6
	45S	Hammerfest area	70°42.9'	24°26.6'	70H45							
	45A	Ytre Sauhamnneset	70°45.8'	24°19.2'	70H42							
	46S	Porsangen area	70°52.9'	26°11.9'	70H61							
	46A	Smineset in Altesula	70°58.4'	25°48.1'	70H57							3, 6
	46B	Hammerfest area	70°50.0'	23°44.0'	70H37							
	46F	Honningsvåg area	00°00.0'	00°00.0'								
	47S	Laksefjord	70°55.0'	26°55.1'	70H67							
	47A	Kifjordeneset	70°52.9'	27°22.2'	70H74							
VARANGER PENINSULA AREA												
	48S	Tanafjord	70°52.5'	28°38.5'	70H84							
	48A	Trollfjorden i Tanafjord	70°41.6'	28°33.3'	70H85							
	49S	Syltefjord	70°33.9'	30°19.9'	70J03							
	49A	Nordfjorden, Syltefjord	70°33.1'	30°05.2'	70J03							
	10S	Varangerfjord	69°56.1'	30°06.7'	68J01							
	10A	Skagoodden	70°04.2'	30°09.8'	69J03							2
	10B	Varangerfjorden	69°54.5'	29°30.0'	68H97						+	
	10F	Varangerfjorden	69°55.0'	29°51.5'	68H97					*		
	11A	Sildkroneset, Bøkfjorden	69°47.2'	30°11.1'	68J02	+		+				
	11X	Brashavn	69°53.9'	29°44.7'	68J02							4

notes:

+ - samples collected
* - planned but innsufficient material
x - collected but not analysed
N - official NSTF station
C - at or near SFT's coastal monitoring programme station
1 - mussels collected from buoy and/or buoy anchor lines
2 - mussels collected from sand/gravel bottom
3 - mussels collected from iron/cement pilings
4 - mussels collected from metal navigation buoys
5 - mussels collected from floating dock
6 - mussels collected from wooden docks
7 - mussels collected from rocks under ferry terminal

Appendix F.
Overview of materials and analyses 1997

Including sampling for VIC (cf., SIME 1996, 1997)

Station positions are shown on maps (Figure 1 to Figure 4)

Appendix F1. Sampling and analyses for 1996, L-liver, F-fillet. (See Appendix F2 for descriptions of codes for analysis (M0, M1, M3, M4, M5, C2, C4, A1, G1), fish (P, F, D, L, M, C) and counts). Analytical overview for liver (-L) or fillet (-F) tissue is distinguished.

JAMP area	STATION	WATER	SEDIMENT				MUSSEL/			OTHER		FISH FLAT- (P,F,D,M)				COD- (C)			
												-L	M4	C2	A1	-L	M4	C2	A1
		M0	M1	C4	A1	G1	M3	C2	A1	M3	C2	-F	M5	C2	A1	-F	M5	C2	A1
26	**OSLOFJORD AREA CENTRAL**, Oslofjord proper																		
26	30A Gressholmen	1	.	.	.	.	3	3	.	.	.	.	.	.	.	.	.	.	.
26	30S Steilene	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
26	30B Oslo city Area / Håøya	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	VIC: Steilene-15.1.98	.	.	.	.	.	.	.	.	.	.	.	.	.	.	C-L	10	10	.
		.	.	.	.	.	.	.	.	.	.	.	.	.	.	C-F	10	2B	.
	VIC: Steilene-21.1.98	.	.	.	.	.	.	.	.	.	.	.	.	.	.	C-L	10	10	.
		.	.	.	.	.	.	.	.	.	.	.	.	.	.	C-F	10	2B	.
	VIC: Steilene-2.2.98	.	.	.	.	.	.	.	.	.	.	.	.	.	.	C-L	10	10	.
		.	.	.	.	.	.	.	.	.	.	.	.	.	.	C-F	10	2B	.
	VIC: Svestad-16.1.98	.	.	.	.	.	.	.	.	.	.	.	.	.	.	C-L	10	10	.
		.	.	.	.	.	.	.	.	.	.	.	.	.	.	C-F	10	2B	.
	VIC: Håøya-16.1.98	.	.	.	.	.	.	.	.	.	.	.	.	.	.	C-L	10	10	.
		.	.	.	.	.	.	.	.	.	.	.	.	.	.	C-F	10	2B	.
26	31A Solbergstrand	1	.	.	.	.	3	3	.	.	.	.	.	.	.	.	.	.	.
26	33B Sande, east side	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	VIC: 10.97	.	.	.	.	.	.	.	.	.	.	F-L	5B	5B	.	.	.	.	.
		.	.	.	.	.	.	.	.	.	.	F-F	5B	5B	.	.	.	.	.
	VIC: 11.97	.	.	.	.	.	.	.	.	.	.	F-L	5B	5B	.	.	.	.	.
		.	.	.	.	.	.	.	.	.	.	F-F	5B	5B	.	.	.	.	.
	VIC: 12.97	.	.	.	.	.	.	.	.	.	.	F-L	5B	5B	.	.	.	.	.
		.	.	.	.	.	.	.	.	.	.	F-F	5B	5B	.	.	.	.	.
26	35S Mølen	.	3	2	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.
26	35A Mølen	1	.	.	.	.	3	3	.	.	.	.	.	.	.	.	.	.	.
26	36S Færder	.	17	4	4	1	.	.	.	.	.	.	.	.	.	.	.	.	.
26	36A Færder	1	.	.	.	.	3	3	.	.	.	.	.	.	.	.	.	.	.
26	36B Færder area	.	.	.	.	.	.	.	.	.	.	.	.	.	.	C-L	25	25	.
		.	.	.	.	.	.	.	.	.	.	.	.	.	.	C-F	25	5B	.
20	36F Færder area	.	.	.	.	.	.	.	.	.	.	D-L	5B	5B	.	.	.	.	.
		.	.	.	.	.	.	.	.	.	.	D-F	5B	5B	.	.	.	.	.
26	**OSLOFJORD AREA WEST**, outer Sandefjord-Langesundsfjord																		
26	71A Bjørkøya	1	.	.	.	.	3	3	.	.	.	.	.	.	.	.	.	.	.
	ARENDAL AREA																		
	76A Risøy	1	.	.	.	.	3	3	.	.	.	.	.	.	.	.	.	.	.

Appendix F1 (cont.)

JAMP area	STATION	WATER M0	SEDIMENT M1	SEDIMENT C4	SEDIMENT A1	SEDIMENT G1	MUSSEL/ M3	MUSSEL/ C2	MUSSEL/ A1	OTHER	OTHER	FISH FLAT- (P,F,D,M) -L/-F	M4/M5	C2/C2	A1/A1	FISH COD- (C) -L/-F	M4/M5	C2/C2	A1/A1
	LISTA AREA																		
	15A Ullerø area	1	.	.	.	.	3	3	.	.	.	.	.	.	.	.	.	.	.
	15B Ullerø area	.	.	.	.	.	.	.	.	.	.	.	.	.	.	C-L	25	25	.
		.	.	.	.	.	.	.	.	.	.	.	.	.	.	C-F	25	5B	.
	15F Ullerø area	.	.	.	.	.	.	.	.	.	.	D-L	5B	5B	.	.	.	.	.
		.	.	.	.	.	.	.	.	.	.	D-F	5B	5B	.	.	.	.	.
	BØMLO-SOTRA AREA																		
	22A Espevær, west	1	.	.	.	.	3	3	.	.	.	.	.	.	.	.	.	.	.
	22F Borøyfjorden	.	.	.	.	.	.	.	.	.	.	P-L	5B	5B	.	.	.	.	.
		.	.	.	.	.	.	.	.	.	.	P-F	5B	5B	.	.	.	.	.
	23B Karihavet	.	.	.	.	.	.	.	.	.	.	.	.	.	.	C-L	25	25	.
		.	.	.	.	.	.	.	.	.	.	.	.	.	.	C-F	25	5B	.
62	**HARDANGERFJORDEN**																		
62	69A Lille Terøy	1	.	.	.	.	3	3	.	.	.	.	.	.	.	.	.	.	.
62	67B Strandebarm	.	.	.	.	.	.	.	.	.	.	MF	5B	5B	.	C-L	25	25	.
		.	.	.	.	.	.	.	.	.	.	MF	5B	5B	.	C-F	25	5B	.
62	65A Vikingneset	1	.	.	.	.	3	3	.	.	.	.	.	.	.	.	.	.	.
62	63A Ranaskjær	1	.	.	.	.	3	3	.	.	.	.	.	.	.	.	.	.	.
63	**SØRFJORD**																		
63	52A Eitrheimsneset	1	.	.	.	.	3	3	.	.	.	.	.	.	.	.	.	.	.
63	53B Inner Sørfjord	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	VIC: Odda - 18.8.97--	.	.	.	.	.	.	.	.	.	.	F-L	5B	5B	.	.	.	.	.
		.	.	.	.	.	.	.	.	.	.	F-F	5B	5B	.	.	.	.	.
	VIC: Tyssedal - 17.8.97	.	.	.	.	.	.	.	.	.	.	F-L	5B	5B	.	.	.	.	.
		.	.	.	.	.	.	.	.	.	.	F-F	5B	5B	.	.	.	.	.
	VIC: Tyssedal - 30.9.97	.	.	.	.	.	.	.	.	.	.	.	.	.	.	C-L	15	15	.
		.	.	.	.	.	.	.	.	.	.	.	.	.	.	C-F	15	3B	.
	VIC: Edna - 4.10-97	.	.	.	.	.	.	.	.	.	.	.	.	.	.	C-L	15	15	.
		.	.	.	.	.	.	.	.	.	.	.	.	.	.	C-F	15	3B	.
	VIC: Edna - 1.10.97	.	.	.	.	.	.	.	.	.	.	F-L	5B	5B	.	.	.	.	.
		.	.	.	.	.	.	.	.	.	.	F-F	5B	5B	.	.	.	.	.
63	56A Kvalnes	1	.	.	.	.	3	3	.	.	.	.	.	.	.	.	.	.	.
63	57A Krossanes	1	.	.	.	.	3	3	.	.	.	.	.	.	.	.	.	.	.

Appendix F1 (cont.)

JAMP area	STATION	WATER	SEDIMENT				MUSSEL/			OTHER		FISH FLAT- (P,F,D,M)				COD- (C)			
		M0	M1	C4	A1	G1	M3	C2	A1			-L -F	M4 M5	C2 C2	A1 A1	-L -F	M4 M5	C2 C2	A1 A1
65	**ORKDALSFJORD AREA**																		
65	82A Flakk	1	.	.	.	.	3	.	.	.	.	.	.	.	.	.	.	.	.
65	84A Trossavika	1	.	.	.	.	3	3	.	.	.	.	.	.	.	.	.	.	.
65	87A Ingdalsbukta	1	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.
	FROAN AREA																		
	92A Stokken	1	.	.	.	.	3	3	.	.	.	.	.	.	.	.	.	.	.
	92B Stokken	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	92F Stokken	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	LOFOTEN AREA																		
	98X Skrova	1	.	.	.	.	3	3	.	.	.	.	.	.	.	.	.	.	.
	98B Lille Molla	.	.	.	.	.	.	.	.	.	.	.	.	.	.	C-L	25	25	
		.	.	.	.	.	.	.	.	.	.	.	.	.	.	C-F	25	5B	
	98F Lille Molla	.	.	.	.	.	.	.	.	.	.	P-L	4B	4B	.	.	.	.	.
		.	.	.	.	.	.	.	.	.	.	P-F	4B	4B	.	.	.	.	.
	FINNSNES-SKJERVØY AREA																		
	41A Fensneset, Grytøya	1	.	.	.	.	3	3	.	.	.	.	.	.	.	.	.	.	.
	42A Tennskjær, Malangen	1	.	.	.	.	3		.	.	.	.	.	.	.	.	.	.	.
	43A Lyngneset, Langjforden	1	.	.	.	.	3	3	.	.	.	.	.	.	.	.	.	.	.
	43B Kvænangen	.	.	.	.	.	.	.	.	.	.	.	.	.	.	C-L	25	25	.
		.	.	.	.	.	.	.	.	.	.	.	.	.	.	C-F	25	5B	
	43F Kvænangen	.	.	.	.	.	.	.	.	.	.	D-L	3B	3B	.	.	.	.	.
		.	.	.	.	.	.	.	.	.	.	D-F	3B	3B	.	.	.	.	.
												L-L	1B	1B	.	.	.	.	.
												L-F	1B	1B	.	.	.	.	.
	HAMMERFEST-HONNINGSVÅG AREA																		
	44A Elenheimsundet	1	.	.	.	.	3	.	.	.	.	.	.	.	.	.	.	.	.
	45A Ytre Sauhamnneset	1	.	.	.	.	3	3	.	.	.	.	.	.	.	.	.	.	.
	45B Hammerfest area	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	45F Honningsvåg area	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	46A Smineset in Altesula	1	.	.	.	.	3	3	3	.	.	.	.	.	.	.	.	.	.
	47A Kifjordeneset	1	.	.	.	.	3	.	.	.	.	.	.	.	.	.	.	.	.
	VARANGER PENINSULA AREA																		
	48A Trollfjorden i Tanafjord	1	.	.	.	.	3	3	.	.	.	.	.	.	.	.	.	.	.
	49A Nordfjorden, Syltefjord	1	.	.	.	.	3	.	.	.	.	.	.	.	.	.	.	.	.
	10A Skagoodden	1	.	.	.	.	3	3	.	.	.	.	.	.	.	.	.	.	.
	10B Varangerfjorden	.	.	.	.	.	.	.	.	.	.	P-L	5B	5B	.	C-L	23	25	.
		.	.	.	.	.	.	.	.	.	.	P-F	5B	5B	.	C-F	23	4B	
	10F Varangerfjorden	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	11A Sildkroneset, Bøkfjorden	1	.	.	.	.	3	3	.	.	.	.	.	.	.	.	.	.	.

Appendix F2: Key to analysis codes and sample counts used in Appendix F1.

ANALYSIS CODES:

Code	Analyses
M0	suspended matter
M1	Hg, Cd, Cu, Pb, Zn, Li (normalising element) total organic carbon (TOC)
M3	Hg, Cd, Cu, Pb, Zn
M4	Cd Cu Pb Zn (for fish liver)
M5	Hg (for fish fillet)
C1	CB-28,-52,-101,-105,-118,-138,-153,-156,-180, 209, 5-CB, OCS, a+gHCH, HCB, DDE, DDD, EPOCI (optional), dry weight percent
C2	CB-28,-52,-101,-105,-118,-138,-153,-156,-180, 209, 5-CB, OCS, a+gHCH, HCB, DDE, DDD, EPOCI (optional), fat and dry weight percent
A1	PAH
G1	Sediment core geological dating

SAMPLE COUNT CODES:

Medium	Count	Explanation
SEAWATER	1	sample for suspended matter determination
SEDIMENT	17	17 samples for metal analyses; two cores each with samples from 0-1, 1-2, 2-4, 4-6, 6-10, 10-15, 15-20cm and deepest 5cm slice plus one core with sample from 0-1cm.
	4	4 samples for PCB or PAH analyses; two each cores with samples from 0-1cm and deepest 5cm slice.
	3	3 samples for metal analyses; three cores each with samples from 0-1cm.
MUSSEL	3/6	3 size groups (2-3, 3-4, 4-5cm) each a bulk of ca.50 individuals and/or 1 size group (3-4 or 4-5cm), 3 parallel samples each a bulk of 20 individuals.
	1/2	1 size group (2-3 or 3-4cm), 2 parallel samples each a bulk of 50 individuals.
SHRIMP	2	2 samples of 100 individuals (edible size)
FISH		The number of individual fish or bulk samples of fish (-B) for analyses is shown. Bulk samples of fish consist of 5 fish. The five longest fish make up one bulk sample, the next five longest fish make up the another bulk sample and so on. The letter following the number indicates the fish type: D=dab, F=flounder, L=lemon sole, M=megrim, P=plaice, W=witch and C=cod.

Appendix G.
Temporal trend analyses of contaminants in biota 1981-97

Sorted by contaminant, species and area/station:

Cadmium (Cd)
Copper (Cu)
Mercury (Hg)
Lead (Pb)
Zinc (Zn)
CB-153
DDEPP (ppDDE)
γHCH
HCB

MYTI EDU - Blue Mussel (*Mytilus edulis*)
GADU MOR - Atlantic cod (*Gadus morhua*)
LEPI WHI - Megrim (*Lepidorhombus whiff-iagonis*)
LIMA LIM - Dab (*Limanda limanda*)
PLAT FLE - Flounder (*Platichthys flesus*)

SB - Soft body tissue
LI - Liver tissue
MU - Muscle tissue

OC	**Overconcentration expressed as quotient of median of last year and "high background" ("?" missing background value)**	
TRND	**trend**	
	D-	**Significant linear trend, downward**
	U-	**Significant linear trend, upward**
	--	**No significant trend**
	-?	**No significant linear trend, systematic non-linear trend can not be tested because of insufficient data (<6 years)**
	-Y	**No significant linear trend, but a systematic non-linear trend**
	DY or UY	**Significant linear trend (downward or upward) and a significant non-linear trend. This is considered the same as "-Y"**
	SIZE length effect mercury in fillet)	
	L	**Significant difference in concentration levels but pattern of variation same**
	D	**As "L" but pattern of variation significantly different**
	-	**No significant difference between "small" and "large" fish**
U95+3	**Projected upper 95% confidence interval in three years expressed as quotient of value and "high background" ("?" if missing background or if number of years is less than seven)**	
POWER	**Estimated number of years to detect a hypothetical situation of 10% trend a year with a 90% power**	

Annual Median Concentrations of C D (ppm).

St.	Species	Tissue	Base	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	ANALYSES OC	TRND	U95+3	POWER
30A	MYTI EDU	SB	D.wt				1.065	0.810	1.410	0.600	0.610	0.736	0.769	0.769	1.117	1.257	1.174	0.776	0.800	0.857	no	--	no	10
31A	MYTI EDU	SB	D.wt			1.386	1.314	0.890	1.930	0.400	0.430	0.412	0.719	0.727	0.914	0.933	0.781	1.324	0.789	0.854	no	--	no	13
35A	MYTI EDU	SB	D.wt			1.347	0.952	1.170	1.300	0.520	0.660	0.647	0.926	1.053	1.350	1.111	0.958	0.894	0.766	0.965	no	DY	no	10
36A	MYTI EDU	SB	D.wt			0.845	1.191	0.840	1.380	0.590	0.560	0.502	0.407	1.217	1.063	0.899	1.215	1.172	1.602	1.839	no	UY	2.3	12
71A	MYTI EDU	SB	D.wt			2.520	1.975	1.419	2.004	0.980	2.110	2.021	0.968	1.088	1.657	1.895	1.974	2.253	1.497	2.440	1.2	--	1.8	12
76A	MYTI EDU	SB	D.wt										0.638	0.860	0.957	1.098			1.168	1.190	no	UY	no	6
15A	MYTI EDU	SB	D.wt										0.505	0.831		1.182	0.794	1.439	1.220	1.066	no	--	1.1	11
22A	MYTI EDU	SB	D.wt										0.532	1.139	1.117	0.844	1.020	1.414	1.145	1.012	no	--	no	10
51A	MYTI EDU	SB	D.wt							42.800	58.200							36.837	25.272	5.448	2.7	-?	?	16
52A	MYTI EDU	SB	D.wt									94.400	10.160	80.083	43.089	14.651	8.713	19.759	18.377	13.400	6.7	--	62.1	23
56A	MYTI EDU	SB	D.wt							55.900	55.547	98.413	45.034	69.444	51.667	59.681	11.357	30.761	20.000	28.793	14.4	--	54.2	17
57A	MYTI EDU	SB	D.wt							21.100	43.200	36.692	25.685	32.803	32.121	15.397	11.800	12.207	8.482	13.607	6.8	D-	9.6	11
63A	MYTI EDU	SB	D.wt							47.200	10.300	19.006	30.394	35.140	18.212	7.811	4.228	8.160	5.400	6.621	3.3	D-	8.9	15
65A	MYTI EDU	SB	D.wt							15.000	5.219	8.291	14.604	23.964	5.088	7.733	3.006	5.367.	3.529	4.280	2.1	--	6.3	17
69A	MYTI EDU	SB	D.wt												4.261	2.368	2.084	2.910	3.195	3.525	1.8	-Y	3.9	9
82A	MYTI EDU	SB	D.wt				1.412	1.155	2.315	0.990	0.400	1.257		1.200	1.213	1.147		0.981	1.223		no	--	1.2	14
84A	MYTI EDU	SB	D.wt				1.389	1.860	2.380	2.100	0.960	1.191		1.818	2.105	1.596		1.639	1.288		no	DY	no	9
87A	MYTI EDU	SB	D.wt				0.968	1.020	1.930	0.770	0.690	0.756		0.872	0.978	0.927		1.150	1.270		no	--	1.3	10
91A	MYTI EDU	SB	D.wt												1.677	1.275	1.818				no	-?	?	10
92A	MYTI EDU	SB	D.wt												1.078	0.544	0.939	0.743	0.691	0.716	no	--	no	12
98A	MYTI EDU	SB	D.wt												1.084	1.087				0.854	no	-?	?	7
98X	MYTI EDU	SB	D.wt														0.712	0.688	0.781		no	-?	?	6
41A	MYTI EDU	SB	D.wt														1.891	2.947	1.628	1.884	no	-?	?	12
43A	MYTI EDU	SB	D.wt														3.469	4.320		3.855	1.9	-?	?	7
44A	MYTI EDU	SB	D.wt														1.691	2.741	1.954	1.506	no	-?	?	11
46A	MYTI EDU	SB	D.wt														2.696	2.058	2.718		1.4	-?	?	10
48A	MYTI EDU	SB	D.wt														1.352	1.305	1.381		no	-?	?	<=5
10A	MYTI EDU	SB	D.wt														1.737	1.710	2.342	1.058	no	-?	?	13
11A	MYTI EDU	SB	D.wt														1.308	1.281	1.074	1.587	no	-?	?	9
30B	GADU MOR	LI	W.wt				0.010	0.050	0.062	0.071	0.022	0.027	0.035	0.027	0.100	0.064	0.063	0.049	0.045	0.046	no	--	no	15
36B	GADU MOR	LI	W.wt	0.078	0.060	0.220	0.070	0.050	0.137	0.061	0.031	0.028	0.023	0.010	0.021	0.034	0.021	0.042	0.033	0.082	no	DY	3.2	16
15B	GADU MOR	LI	W.wt										0.026	0.009	0.025	0.016	0.014	0.016	0.024	0.031	no	--	1.5	15
23B	GADU MOR	LI	W.wt										0.022	0.024	0.020	0.025	0.015	0.026	0.014	0.029	no	--	no	13
53B	GADU MOR	LI	W.wt						0.658		0.058	0.093	0.045	0.149	0.215	0.038		0.007	0.180	0.143	1.4	--	139.9	>25
67B	GADU MOR	LI	W.wt							0.145	0.052	0.047	0.069	0.077	0.051	0.115	0.099	0.033	0.111	0.277	2.8	--	17.6	16
84B	GADU MOR	LI	W.wt				0.130	0.095	0.069		0.029										no	-?	?	12
92B	GADU MOR	LI	W.wt													0.036	0.029	0.022	0.066		no	-?	?	16
98B	GADU MOR	LI	W.wt												0.069	0.150	0.025	0.113	0.330	0.064	no	--	33.1	24
43B	GADU MOR	LI	W.wt														0.168	0.183	0.097		no	-?	?	12
10B	GADU MOR	LI	W.wt														0.230	0.188	0.095	0.128	1.3	-?	?	11
67B	LEPI WHI	LI	W.wt			0.181				0.180	0.109	0.066	0.197	0.085	0.100	0.120	0.304	0.259	0.200	0.097	?	--	?	14
36F	LIMA LIM	LI	W.wt										0.106	0.112	0.230	0.295	0.135	0.147	0.139	0.123	no	-Y	no	10
15F	LIMA LIM	LI	W.wt													0.099	0.136	0.125	0.153	0.076	no	-?	?	12
22F	LIMA LIM	LI	W.wt										0.095	0.091	0.128		0.169	0.125			no	-?	?	8
98F	LIMA LIM	LI	W.wt														0.980	0.182	0.225		no	-?	?	21
33B	PLAT FLE	LI	W.wt			0.190		0.195	0.176	0.251	0.061	0.106	0.234	0.196	0.160	0.184	0.087	0.091	0.110	0.107	no	--	no	13
53B	PLAT FLE	LI	W.wt								2.236	1.527	1.537	1.724	1.790	0.789		0.135	2.530	0.892	3.0	--	113.7	23

SB Soft body tissue.
LI Liver tissue.
OC Overconcentration; Median(LastYear)/Background (="?" if missing Background)
U95+3 Upper 95% ConfidenceInterval(Last+3years)/Background (="?" if missing Background or N(years)<=5)
POWER Number of years to detect a 10% trend/year with 90% power.

98

Annual Median Concentrations of C U (ppm).

St.	Species	Tissue	Base	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	ANALYSES QC	TRND	U95+3	POWER
30A	MYTI EDU	SB	D.wt				4.57		7.45	4.96	5.48	5.97	10.26	10.47	5.84	6.67	8.56	6.94	7.69	9.47	no	--	1.5	10
31A	MYTI EDU	SB	D.wt			7.03	6.57			4.44	4.52	4.51	9.04	11.00	5.49	5.67	6.21	7.26	6.61	6.08	no	UY	no	9
35A	MYTI EDU	SB	D.wt			6.32	3.62		8.06	4.89	4.58	5.26	8.02	10.06	6.56	6.34	6.61	6.41	6.94	6.81	no	--	1.2	11
36A	MYTI EDU	SB	D.wt			6.29	3.57		6.08	4.47	4.87	4.30	5.50	9.23	5.16	5.51	5.63	7.67	9.06	6.86	no	--	1.5	11
71A	MYTI EDU	SB	D.wt			8.47	5.24			6.08	8.43	6.99	8.33	10.26	7.40	7.88	7.18	8.11	7.66	9.44	no	--	1.4	9
76A	MYTI EDU	SB	D.wt										8.51	10.80	5.65	5.57			6.65	7.80	no	-Y	1.6	10
15A	MYTI EDU	SB	D.wt										5.72	7.21		5.50	5.25	5.26	7.32	6.14	no	--	1.2	8
22A	MYTI EDU	SB	D.wt										6.35	6.69	5.38	5.76	6.28	6.81	9.29	4.16	no	--	no	11
51A	MYTI EDU	SB	D.wt							7.14	6.14							10.20	10.20	7.44	no	-?	?	9
52A	MYTI EDU	SB	D.wt									8.40	7.49	72.08	9.35	8.45	6.98	7.03	6.28	7.73	no	--	3.7	20
56A	MYTI EDU	SB	D.wt							8.07	7.28	8.82	5.37	7.54	7.40	9.15	6.36	7.71	6.59	7.79	no	--	1.2	9
57A	MYTI EDU	SB	D.wt							8.21	6.33	6.01	6.16	7.27	6.59	6.77	6.43	5.62	5.54	6.98	no	--	no	6
63A	MYTI EDU	SB	D.wt							9.84	6.16	5.11	6.84	11.07	6.32	6.11	6.71	6.84	6.56	6.12	no	--	no	9
65A	MYTI EDU	SB	D.wt							7.98	4.84	5.19	12.23	8.14	5.51	6.00	5.12	5.66	5.82	5.59	no	--	no	10
69A	MYTI EDU	SB	D.wt												6.19	5.32	5.41	6.26	7.28	5.56	no	--	no	7
82A	MYTI EDU	SB	D.wt				6.38			4.69	5.77	7.49		11.77	6.87	9.61		7.44	7.93		no	--	1.2	10
84A	MYTI EDU	SB	D.wt				10.27		96.80	56.80	39.30	26.76		17.07	22.24	23.99		9.51	7.21		no	--	1.0	18
87A	MYTI EDU	SB	D.wt				4.57			20.10	8.35	5.88		7.28	6.30	6.88		7.63	7.52		no	--	2.4	15
91A	MYTI EDU	SB	D.wt												6.59	6.36	8.36				no	-?	?	8
92A	MYTI EDU	SB	D.wt												6.65	6.03	7.56	6.26	7.48	6.40	no	--	no	8
98A	MYTI EDU	SB	D.wt												8.86	6.57				5.50	no	-?	?	8
98X	MYTI EDU	SB	D.wt														8.99	8.91	7.74		no	-?	?	6
41A	MYTI EDU	SB	D.wt														6.83	8.16	7.64	4.76	no	-?	?	9
43A	MYTI EDU	SB	D.wt														7.79	9.32		6.32	no	-?	?	10
44A	MYTI EDU	SB	D.wt														6.56	9.56	7.78	6.86	no	-?	?	9
46A	MYTI EDU	SB	D.wt														6.63	7.43	8.00		no	-?	?	<=5
48A	MYTI EDU	SB	D.wt														6.57	7.74	7.10		no	-?	?	7
10A	MYTI EDU	SB	D.wt														7.25	10.85	7.84	5.71	no	-?	?	10
11A	MYTI EDU	SB	D.wt														9.93	9.74	11.61	8.35	no	-?	?	8
30B	GADU MOR	LI	W.wt						7.00	28.00	5.12	4.21	4.52	3.74	8.54	6.80	8.10	5.10	5.11	7.01	no	--	no	17
36B	GADU MOR	LI	W.wt						14.20	20.00	6.98	12.18	10.70	8.74	9.65	7.43	10.70	8.00	9.82	13.50	no	--	1.5	12
15B	GADU MOR	LI	W.wt										11.30	1.63	5.83	2.28	1.70	3.64	8.95	5.93	no	--	5.8	21
23B	GADU MOR	LI	W.wt										8.15	11.10	5.83	7.06	7.10	10.00	8.75	9.09	no	--	no	10
53B	GADU MOR	LI	W.wt						12.27		7.11	5.86	2.40	3.29	4.68	6.01		5.40	6.34	8.15	no	DY	no	10
67B	GADU MOR	LI	W.wt							8.00	6.91	13.90	8.94	8.76	5.15	7.98	9.66	4.50	7.17	18.90	no	--	2.7	13
92B	GADU MOR	LI	W.wt													7.78	6.08	7.40	6.98		no	-?	?	8
98B	GADU MOR	LI	W.wt												5.87	8.20	3.80	2.35	6.17	3.94	no	--	1.0	15
43B	GADU MOR	LI	W.wt														6.00	5.60	5.41		no	-?	?	<=5
10B	GADU MOR	LI	W.wt														9.90	7.80	4.31	5.30	no	-?	?	10
67B	LEPI WHI	LI	W.wt							15.30	14.19	18.63	10.70	13.80	13.00	12.40	14.20	20.00	19.50	13.40	?	--	?	9
36F	LIMA LIM	LI	W.wt										13.40	5.29	8.49	8.09	7.30	8.90	7.06	9.56	no	--	2.0	12
15F	LIMA LIM	LI	W.wt											2.77		4.11	3.00	5.90	9.12	1.91	no	--	1.2	18
22F	LIMA LIM	LI	W.wt										9.83	6.66	3.38		2.20	3.46			no	D?	?	11
98F	LIMA LIM	LI	W.wt														3.51	5.00	5.65		no	-?	?	8
33B	PLAT FLE	LI	W.wt						21.74	34.98	16.26	34.32	20.30	18.80	15.70	18.10	18.40	13.20	13.60	15.40	no	--	no	12
53B	PLAT FLE	LI	W.wt								13.99	9.02	8.19	18.90	10.50	17.20		8.28	14.50	8.40	no	--	no	15

SB Soft body tissue.
LI Liver tissue.
OC Overconcentration; Median(LastYear)/Background ("?" if missing Background)
U95+3 Upper 95% ConfidenceInterval(Last+3years)/Background ("?" if missing Background or N(years)<=5)
POWER Number of years to detect a 10% trend/year with 90% power.

Annual Median Concentrations of H G (ppm).

St.	Species	Tissue	Base	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	ANALYSES OC	TRND	U95+3	POWER
30A	MYTI EDU	SB	D.wt				0.118	0.073	0.147	0.050	0.130	0.044	0.064	0.053	0.051	0.070	0.086	0.057	0.070	0.060	no	--	no	15
31A	MYTI EDU	SB	D.wt			0.076	0.164	0.086	0.120	0.050	0.090	0.022	0.060	0.048	0.051	0.045	0.050	0.062	0.043	0.052	no	--	no	15
35A	MYTI EDU	SB	D.wt			0.093	0.074	0.084	0.170	0.050	0.180	0.050	0.062	0.058	0.058	0.054	0.061	0.037	0.038	0.035	no	--	no	16
36A	MYTI EDU	SB	D.wt			0.052	0.043	0.084	0.140	0.050	0.140	0.034	0.045	0.048	0.039	0.032	0.048	0.033	0.044	0.074	no	--	1.1	15
71A	MYTI EDU	SB	D.wt			0.393	0.242	0.218	0.247	0.120	0.340	0.249	0.182	0.145	0.178	0.140	0.212	0.201	0.222	0.312	1.6	--	3.3	12
76A	MYTI EDU	SB	D.wt										0.071	0.068	0.050	0.020			0.057	0.082	no	-Y	2.0	14
15A	MYTI EDU	SB	D.wt										0.056	0.052		0.024	0.050	0.022	0.049	0.056	no	--	1.2	15
22A	MYTI EDU	SB	D.wt										0.053	0.073	0.112	0.048	0.067	0.066	0.072	0.068	no	--	no	11
51A	MYTI EDU	SB	D.wt							0.240	0.250							1.510	0.901	0.175	no	-?	?	21
52A	MYTI EDU	SB	D.wt									2.352	0.321	3.008	0.976	0.372	0.282	0.437	0.178	0.260	1.3	--	5.5	23
56A	MYTI EDU	SB	D.wt							0.530	0.375	1.087	0.710	1.540	0.935	1.223	0.352	0.679	0.365	0.526	2.6	--	6.6	16
57A	MYTI EDU	SB	D.wt							0.170	0.210	0.269	0.411	0.758	0.576	0.349	0.350	0.260	0.155	0.319	1.6	UY	1.7	11
63A	MYTI EDU	SB	D.wt							0.310	0.140	0.177	0.394	0.468	0.294	0.143	0.190	0.252	0.172	0.203	1.0	-Y	1.6	12
65A	MYTI EDU	SB	D.wt							0.100	0.150	0.104	0.313	0.328	0.124	0.119	0.134	0.148	0.118	0.136	no	--	1.2	12
69A	MYTI EDU	SB	D.wt												0.106	0.026	0.083	0.070	0.104	0.111	no	--	3.7	18
82A	MYTI EDU	SB	D.wt				0.051	0.110	0.170	0.080	0.120	0.067		0.074	0.052	0.079		0.049	0.069		no	--	no	13
84A	MYTI EDU	SB	D.wt				0.077	0.112	0.150	0.080	0.240	0.057		0.066	0.090	0.057		0.054	0.043		no	--	no	15
87A	MYTI EDU	SB	D.wt				0.178		0.150	0.050	0.260	0.046		0.056	0.054	0.049		0.044	0.062		no	--	1.2	19
91A	MYTI EDU	SB	D.wt												0.054	0.076	0.094				no	-?	?	8
92A	MYTI EDU	SB	D.wt												0.055	0.033	0.052	0.041	0.023	0.067	no	--	no	15
98A	MYTI EDU	SB	D.wt												0.086	0.086				0.104	no	-?	?	6
98X	MYTI EDU	SB	D.wt														0.335	0.340	0.328		1.6	-?	?	<=5
41A	MYTI EDU	SB	D.wt														0.069	0.063	0.064	0.085	no	-?	?	7
43A	MYTI EDU	SB	D.wt														0.084	0.095		0.104	no	-?	?	<=5
44A	MYTI EDU	SB	D.wt														0.055	0.050	0.052	0.059	no	-?	?	6
46A	MYTI EDU	SB	D.wt														0.039	0.062	0.056		no	-?	?	10
48A	MYTI EDU	SB	D.wt														0.073	0.060	0.052		no	-?	?	6
10A	MYTI EDU	SB	D.wt														0.053	0.049	0.059	0.062	no	-?	?	6
11A	MYTI EDU	SB	D.wt														0.182	0.145	0.086	0.146	no	-?	?	12
30B	GADU MOR(s)	MU	W.wt				0.125	0.089	0.079	0.040	0.059	0.121	0.120	0.090	0.110	0.122	0.102	0.080	0.108	0.137	1.4	UYL	2.6	9
30B	GADU MOR(l)	MU	W.wt				0.155	0.090	0.073	0.038	0.147	0.166	0.130	0.108	0.150	0.155	0.129	0.119	0.142	0.197	2.0	U-L	4.5	12
36B	GADU MOR(s)	MU	W.wt	0.069	0.080	0.110	0.075	0.080	0.061	0.032	0.053	0.068	0.060	0.060	0.059	0.067	0.053	0.076	0.066	0.088	no	DYL	1.5	9
36B	GADU MOR(l)	MU	W.wt	0.079	0.160	0.180	0.195	0.120	0.112	0.039	0.083	0.074	0.115	0.100	0.080	0.083	0.060	0.095	0.069	0.157	1.6	--L	3.6	13
15B	GADU MOR(s)	MU	W.wt										0.065	0.040	0.026	0.018	0.045	0.043	0.058	0.076	no	UYL	2.0	11
15B	GADU MOR(l)	MU	W.wt										0.120	0.070	0.063	0.039	0.081	0.045	0.087	0.108	1.1	--L	3.6	13
23B	GADU MOR(s)	MU	W.wt										0.065	0.070	0.060	0.041	0.051	0.069	0.059	0.073	no	-YL	1.1	8
23B	GADU MOR(l)	MU	W.wt										0.170	0.110	0.084	0.098	0.073	0.109	0.057	0.105	1.0	--L	1.7	12
53B	GADU MOR(s)	MU	W.wt						0.223		0.105	0.160	0.184	0.204	0.360	0.090		0.053	0.229	0.128	1.3	---	11.0	17
53B	GADU MOR(l)	MU	W.wt						0.196		0.105	0.203	0.170	0.269	0.396	0.141		0.090	0.277	0.243	2.4	---	13.8	14
67B	GADU MOR(s)	MU	W.wt							0.100	0.085	0.090	0.079	0.100	0.085	0.092	0.120	0.071	0.073	0.117	1.2	---	1.5	9
67B	GADU MOR(l)	MU	W.wt							0.170	0.085	0.102	0.255	0.130	0.141	0.083	0.106	0.072	0.089	0.160	1.6	---	4.0	13
84B	GADU MOR(s)	MU	W.wt				0.035	0.040	0.025		0.044										no	-?-	?	13
84B	GADU MOR(l)	MU	W.wt				0.060	0.040	0.025		0.044										no	-?-	?	12
92B	GADU MOR(s)	MU	W.wt													0.046	0.078	0.079	0.077		no	-?-	?	10
92B	GADU MOR(l)	MU	W.wt													0.058	0.091	0.074	0.117		1.2	-?-	?	12
98B	GADU MOR(s)	MU	W.wt												0.066	0.054	0.069	0.068	0.039	0.095	no	---	1.7	13
98B	GADU MOR(l)	MU	W.wt												0.065	0.064	0.069	0.086	0.037	0.128	1.3	---	3.3	16
43B	GADU MOR(s)	MU	W.wt														0.065	0.054	0.047		no	-?D	?	6
43B	GADU MOR(l)	MU	W.wt														0.050	0.059	0.057		no	-?D	?	6
10B	GADU MOR(s)	MU	W.wt														0.044	0.034	0.028	0.011	no	-?-	?	13
10B	GADU MOR(l)	MU	W.wt														0.055	0.052	0.039	0.020	no	-?-	?	11
67B	LEPI WHI(s)	MU	W.wt			0.235				0.350	0.329	0.210	0.343	0.075	0.174	0.187	0.305	0.364	0.398	0.172	?	--L	?	15
67B	LEPI WHI(l)	MU	W.wt			0.499				0.350	0.329	0.320	0.589	0.147	0.327	0.336	0.422	0.341	0.372	0.331	?	--L	?	14
36F	LIMA LIM(s)	MU	W.wt										0.045	0.071	0.066	0.070	0.049	0.054	0.049	0.031	no	--L	no	9
36F	LIMA LIM(l)	MU	W.wt										0.098	0.074	0.133	0.101	0.076	0.100	0.066	0.091	no	--L	1.4	11
15F	LIMA LIM(s)	MU	W.wt											0.090		0.038	0.037	0.024	0.037	0.047	no	---	1.4	12
15F	LIMA LIM(l)	MU	W.wt											0.150		0.034	0.036	0.056	0.108	0.073	no	---	5.9	16
22F	LIMA LIM(s)	MU	W.wt										0.084	0.040	0.207		0.045	0.063			no	-?L	?	23
22F	LIMA LIM(l)	MU	W.wt										0.174	0.152	0.282		0.223	0.372			3.7	-?L	?	12

33B PLAT FLE(s) MU W.wt	0.110		0.090	0.077	0.021	0.069		0.175	0.088	0.116	0.092	0.069	0.053	0.048	0.076	no	---	1.5	14
33B PLAT FLE(l) MU W.wt	0.139		0.100	0.077	0.021	0.069		0.195	0.135	0.196	0.103	0.088	0.049	0.060	0.087	no	DY-	1.9	14
53B PLAT FLE(s) MU W.wt						0.111	0.074	0.139	0.154	0.141	0.071		0.035	0.165	0.130	1.3	---	10.3	15
53B PLAT FLE(l) MU W.wt						0.111	0.128	0.090	0.124	0.100	0.116		0.036	0.208	0.221	2.2	---	21.7	17

(s) Small fish
(l) Large fish
SB Soft body tissue.
MU Muscle tissue.
OC Overconcentration; Median(LastYear)/Background (="?" if missing Background)
U95+3 Upper 95% ConfidenceInterval(Last+3years)/Background (="?" if missing Background or N(years)<=5)
POWER Number of years to detect a 10% trend/year with 90% power.

Annual Median Concentrations of P B (ppm).

St.	Species	Tissue	Base	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	ANALYSES OC	TRND	U95+3	POWER
30A	MYTI EDU	SB	D.wt										1.859	1.361	3.952	2.270	2.543	1.579	2.120	2.692	no	--	2.3	13
31A	MYTI EDU	SB	D.wt										1.383	1.212	1.264	1.027	1.370	1.679	1.789	0.732	no	--	no	11
35A	MYTI EDU	SB	D.wt										1.437	1.071	1.676	1.198	1.284	0.507	0.628	0.664	no	--	no	12
36A	MYTI EDU	SB	D.wt										1.009	0.847	0.787	1.123	1.394	1.238	2.044	2.174	no	U-	1.6	8
71A	MYTI EDU	SB	D.wt										1.161	0.745	1.716	1.421	1.923	1.494	2.209	2.830	no	--	2.6	12
76A	MYTI EDU	SB	D.wt										1.773	0.968	1.505	0.913			0.796	1.839	no	--	1.4	14
15A	MYTI EDU	SB	D.wt										1.457	0.777		0.976	1.053	0.522	0.671	1.117	no	--	no	12
22A	MYTI EDU	SB	D.wt										1.371	1.456	2.778	1.867	1.390	1.183	1.506	1.367	no	--	no	9
51A	MYTI EDU	SB	D.wt															148.980	40.274	17.178	5.7	-?	?	18
52A	MYTI EDU	SB	D.wt										12.073	312.500	189.430	65.504	16.354	17.532	9.843	20.600	6.9	--	45.9	24
56A	MYTI EDU	SB	D.wt										20.738	23.413	121.500	109.380	24.691	46.418	27.784	37.500	12.5	--	40.8	17
57A	MYTI EDU	SB	D.wt										10.548	12.137	33.258	19.194	15.071	13.195	5.596	13.707	4.6	--	6.3	15
63A	MYTI EDU	SB	D.wt										12.137	10.093	15.430	10.938	7.215	12.086	7.600	6.098	2.0	--	2.9	11
65A	MYTI EDU	SB	D.wt										5.605	3.784	5.190	6.533	3.277	4.725	2.412	3.000	no	--	1.4	12
69A	MYTI EDU	SB	D.wt												4.619	3.421	2.800	3.166	4.024	3.660	1.2	-Y	2.2	7
82A	MYTI EDU	SB	D.wt											1.278	0.933	0.916		0.622	0.674		no	D?	?	8
84A	MYTI EDU	SB	D.wt											1.010	1.152	1.383		1.378	0.833		no	-?	?	9
87A	MYTI EDU	SB	D.wt											0.974	0.870	0.634		1.402	2.468		no	U?	?	11
91A	MYTI EDU	SB	D.wt												0.898	1.465	2.013				no	-?	?	10
92A	MYTI EDU	SB	D.wt												0.933	0.628	1.094	0.664	0.654	2.183	no	--	2.5	15
98A	MYTI EDU	SB	D.wt												1.868	1.848				1.544	no	-?	?	6
98X	MYTI EDU	SB	D.wt														4.341	3.121	4.115		1.4	-?	?	10
41A	MYTI EDU	SB	D.wt														1.287	0.900	0.793	0.651	no	-?	?	8
43A	MYTI EDU	SB	D.wt														1.563	1.509		0.855	no	-?	?	11
44A	MYTI EDU	SB	D.wt														2.813	2.568	1.657	1.154	no	D?	?	8
46A	MYTI EDU	SB	D.wt														1.257	1.570	1.385		no	-?	?	8
48A	MYTI EDU	SB	D.wt														0.682	1.078	0.333		no	-?	?	19
10A	MYTI EDU	SB	D.wt														1.939	2.781	0.735	0.807	no	-?	?	16
11A	MYTI EDU	SB	D.wt														1.539	1.475	0.336	0.367	no	-?	?	15
30B	GADU MOR	LI	W.wt										0.200	0.115	0.249	0.105	0.120	0.110	0.060	0.105	1.0	--	1.7	15
36B	GADU MOR	LI	W.wt										0.115	0.050	0.030	0.020	0.030	0.020	0.030	0.040	no	DY	1.0	12
15B	GADU MOR	LI	W.wt										0.170	0.060	0.030	0.030	0.030	0.020	0.030	0.040	no	DY	1.0	12
23B	GADU MOR	LI	W.wt										0.060	0.080	0.030	0.030	0.030	0.020	0.030	0.040	no	--	no	12
53B	GADU MOR	LI	W.wt										0.190	0.260	0.140	0.030		0.020	0.075	0.070	no	DY	6.1	15
67B	GADU MOR	LI	W.wt										0.130	0.180	0.030	0.075	0.090	0.040	0.040	0.090	no	--	2.8	18
92B	GADU MOR	LI	W.wt													0.020	0.030	0.030	0.040		no	-?	?	9
98B	GADU MOR	LI	W.wt												0.030	0.030	0.030	0.040	0.040	0.050	no	U-	no	7
43B	GADU MOR	LI	W.wt														0.030	0.030	0.030		no	-?	?	<=5
10B	GADU MOR	LI	W.wt														0.030	0.020	0.040	0.040	no	-?	?	12
67B	LEPI WHI	LI	W.wt										0.190	0.070	0.060	0.070	0.040	0.070	0.030	0.040	?	--	?	15
36F	LIMA LIM	LI	W.wt										0.600	0.070	0.040	0.070	0.030	0.020	0.030	0.050	no	D-	no	18
15F	LIMA LIM	LI	W.wt											0.070		0.041	0.030	0.020	0.030	0.050	no	DY	no	10
22F	LIMA LIM	LI	W.wt										0.250	0.160	0.042		0.060	0.070			no	D?	?	14
98F	LIMA LIM	LI	W.wt														0.020	0.040	0.030		no	-?	?	14
33B	PLAT FLE	LI	W.wt										0.240	0.350	0.060	0.030	0.030	0.020	0.030	0.040	no	DY	no	14
53B	PLAT FLE	LI	W.wt										0.710	0.810	0.410	0.230		0.024	0.460	0.350	1.2	--	67.0	25

SB Soft body tissue.
LI Liver tissue.
OC Overconcentration; Median(LastYear)/Background (="?" if missing Background)
U95+3 Upper 95% ConfidenceInterval(Last+3years)/Background (="?" if missing Background or N(years)<=5)
POWER Number of years to detect a 10% trend/year with 90% power.

90

Annual Median Concentrations of Z N (ppm).

St.	Species	Tissue	Base	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	ANALYSES OC	TRND	U95+3	POWER
30A	MYTI EDU	SB	D.wt				137.80	90.50	140.30	120.00	93.10	76.19	160.90	115.98	147.14	104.32	117.30	108.77	114.00	126.20	no	--	1.0	10
31A	MYTI EDU	SB	D.wt			88.14	132.41	76.90	106.00	66.30	67.70	58.05	180.84	127.88	124.87	96.43	96.80	151.20	103.21	127.64	no	--	1.1	12
35A	MYTI EDU	SB	D.wt			91.89	79.63	75.90	89.80	68.40	81.50	83.19	166.05	139.18	131.29	118.54	97.56	82.88	94.26	103.48	no	UY	no	8
36A	MYTI EDU	SB	D.wt			66.50	85.78	66.10	57.70	61.50	73.60	65.27	125.69	126.98	104.33	83.96	121.15	115.35	137.02	144.63	no	U-	1.2	8
71A	MYTI EDU	SB	D.wt			123.61	125.00	77.04	114.93	101.00	169.00	128.18	161.81	143.03	165.68	120.22	157.05	150.00	122.16	192.45	no	--	1.3	10
76A	MYTI EDU	SB	D.wt										158.16	127.27	124.35	57.65			112.44	134.71	no	-Y	1.9	12
15A	MYTI EDU	SB	D.wt										156.56	143.70		71.43	88.95	62.61	231.71	106.94	no	--	4.4	16
22A	MYTI EDU	SB	D.wt										171.96	162.03	135.00	115.72	98.02	143.94	220.65	109.94	no	--	1.5	10
51A	MYTI EDU	SB	D.wt							378.00	253.00							385.71	222.52	119.63	no	-?	?	12
52A	MYTI EDU	SB	D.wt									824.00	271.74	452.50	408.13	217.83	141.15	196.20	182.81	247.33	1.2	--	3.4	13
56A	MYTI EDU	SB	D.wt							869.00	410.31	1174.60	571.61	478.57	417.59	388.12	210.91	289.55	246.11	376.79	1.9	--	4.9	14
57A	MYTI EDU	SB	D.wt							378.00	263.00	440.56	519.86	291.60	256.06	146.83	172.86	181.66	114.62	223.42	1.1	D-	1.6	11
63A	MYTI EDU	SB	D.wt							579.00	216.00	241.44	508.66	391.59	207.28	121.86	122.15	188.73	146.67	169.53	no	D-	1.7	12
65A	MYTI EDU	SB	D.wt							191.00	155.89	198.70	424.46	307.76	131.06	138.67	117.51	166.27	147.06	184.00	no	DY	1.7	10
69A	MYTI EDU	SB	D.wt												134.52	101.58	134.86	162.81	160.57	217.65	1.1	--	1.9	8
82A	MYTI EDU	SB	D.wt				126.55	106.09	131.99	109.00	76.10	129.15		145.24	122.63	111.75		109.09	87.57		no	--	no	8
84A	MYTI EDU	SB	D.wt				118.47	160.00	163.00	133.00	132.00	141.67		184.85	180.45	113.30		121.18	85.84		no	DY	no	8
87A	MYTI EDU	SB	D.wt				100.05	92.80	97.70	102.00	105.00	96.64		116.92	114.13	90.24		108.88	97.22		no	--	no	6
91A	MYTI EDU	SB	D.wt												96.15	102.45	116.35				no	-?	?	<=5
92A	MYTI EDU	SB	D.wt												88.72	61.09	90.24	77.48	59.17	97.85	no	--	no	11
98A	MYTI EDU	SB	D.wt												117.47	105.14				89.93	no	-?	?	6
98X	MYTI EDU	SB	D.wt														187.15	181.53	146.24		no	-?	?	7
41A	MYTI EDU	SB	D.wt														85.09	89.00	94.77	90.91	no	-?	?	<=5
43A	MYTI EDU	SB	D.wt														98.66	96.60		89.15	no	-?	?	<=5
44A	MYTI EDU	SB	D.wt														67.19	91.26	81.03	78.85	no	-?	?	8
46A	MYTI EDU	SB	D.wt														88.40	112.28	93.33		no	-?	?	8
48A	MYTI EDU	SB	D.wt														74.86	87.01	68.75		no	-?	?	8
10A	MYTI EDU	SB	D.wt														127.27	120.49	94.63	113.58	no	-?	?	7
11A	MYTI EDU	SB	D.wt														86.71	98.29	76.51	88.26	no	-?	?	8
30B	GADU MOR	LI	W.wt						13.77	67.03	30.26	12.85	16.60	22.60	31.70	23.50	24.80	19.70	20.60	25.25	no	--	2.0	15
36B	GADU MOR	LI	W.wt						46.35	64.45	35.40	36.35	31.80	19.70	25.85	22.60	24.30	31.10	25.70	47.30	1.6	DY	2.9	10
15B	GADU MOR	LI	W.wt										33.80	14.10	20.40	17.00	14.20	21.15	26.40	22.90	no	--	2.3	12
23B	GADU MOR	LI	W.wt										29.00	33.80	24.80	21.20	18.70	25.10	21.90	27.40	no	--	1.4	8
53B	GADU MOR	LI	W.wt						28.98		26.83	27.87	10.90	24.40	30.05	20.40		17.50	29.60	27.20	no	--	2.7	12
67B	GADU MOR	LI	W.wt							26.40	22.26	26.37	27.00	25.70	19.42	29.19	27.44	15.80	30.70	47.30	1.6	--	4.0	10
92B	GADU MOR	LI	W.wt													20.60	17.89	21.60	25.00		no	-?	?	7
98B	GADU MOR	LI	W.wt												19.90	24.00	14.60	13.55	16.20	20.00	no	-Y	1.2	8
43B	GADU MOR	LI	W.wt														17.10	15.10	15.70		no	-?	?	6
10B	GADU MOR	LI	W.wt														29.30	23.40	15.90	23.40	no	-?	?	10
67B	LEPI WHI	LI	W.wt							80.50	106.39	68.29	85.70	94.10	73.20	78.80	58.70	80.80	83.50	61.00	?	--	?	9
36F	LIMA LIM	LI	W.wt										39.30	26.60	32.20	27.20	28.40	28.00	31.10	34.70	no	--	1.1	8
15F	LIMA LIM	LI	W.wt											25.00		29.73	24.72	34.70	34.80	22.10	no	--	no	9
22F	LIMA LIM	LI	W.wt										41.30	29.00	34.32		27.50	37.02			no	-?	?	10
98F	LIMA LIM	LI	W.wt														23.50	34.80	31.70		no	-?	?	9
33B	PLAT FLE	LI	W.wt						52.71	91.08	54.61	48.31	56.90	47.30	45.10	50.00	49.40	38.00	51.20	43.60	no	--	1.2	9
53B	PLAT FLE	LI	W.wt								54.38	46.27	43.30	51.40	49.20	51.90		35.79	40.50	27.10	no	--	no	8

SB Soft body tissue.
LI Liver tissue.
OC Overconcentration; Median(LastYear)/Background (="?" if missing Background)
U95+3 Upper 95% ConfidenceInterval(Last+3years)/Background (="?" if missing Background or N(years)<=5)
POWER Number of years to detect a 10% trend/year with 90% power.

Annual Median Concentrations of C B 1 5 3 (ppb).

St.	Species	Tissue	Base	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	ANALYSES DC	TRND	U95+3	POWER
30A	MYTI EDU	SB	D.wt								25.29	23.81	30.13	19.53	24.37	10.86	20.87	19.65	26.36	29.01	5.8	--	14.4	12
31A	MYTI EDU	SB	D.wt								2.86	5.78	6.59	3.66	6.59	3.30	11.23	9.41	10.88	5.03	1.0	--	2.3	16
35A	MYTI EDU	SB	D.wt								5.65	6.90	6.11	2.92	5.52	3.03	3.76	3.69	3.07	3.76	no	--	1.2	12
36A	MYTI EDU	SB	D.wt								3.09	6.81	4.36	2.73	3.54	1.59	1.59	3.62	3.72	4.10	no	--	2.8	13
71A	MYTI EDU	SB	D.wt								5.13	12.71	5.87	3.03	4.59	3.35	5.45	3.02	7.24	2.78	no	--	2.2	16
76A	MYTI EDU	SB	D.wt										4.62	2.84	2.49	1.18			4.21	4.00	no	--	5.9	15
15A	MYTI EDU	SB	D.wt										2.84			0.98	2.00	0.90	0.79	1.27	no	--	no	17
22A	MYTI EDU	SB	D.wt										2.96	3.05	2.78	1.31	2.33	2.12	1.94	1.61	no	--	no	11
51A	MYTI EDU	SB	D.wt															10.20	3.49	4.17	no	-?	?	16
52A	MYTI EDU	SB	D.wt									17.95	3.47		3.77	3.62	5.00	5.32	2.62	4.89	no	--	2.0	16
56A	MYTI EDU	SB	D.wt									14.50	5.57	3.97	2.80	2.08	4.00	3.97	3.09	4.34	no	DY	1.4	12
57A	MYTI EDU	SB	D.wt									8.46		3.82	1.44	1.59	2.69	2.04	1.81	2.76	no	DY	no	12
63A	MYTI EDU	SB	D.wt									8.84		4.85	1.48	1.23	1.77	1.91	1.40	1.54	no	DY	no	11
65A	MYTI EDU	SB	D.wt								0.10	4.70	4.45	4.31	1.17	0.74	1.69	1.30	1.83	1.24	no	--	2.2	24
69A	MYTI EDU	SB	D.wt												1.02	1.58	1.66	1.85.	0.93	2.19	no	--	no	14
84A	MYTI EDU	SB	D.wt								0.69	9.36		2.53	3.13	1.70		1.43	2.40		no	--	3.2	24
92A	MYTI EDU	SB	D.wt												1.27	0.45	1.82	1.17	0.89	2.39	no	--	2.0	19
98A	MYTI EDU	SB	D.wt												7.96	2.29				3.36	no	-?	?	19
98X	MYTI EDU	SB	D.wt														27.42	25.29	14.64		2.9	-?	?	10
41A	MYTI EDU	SB	D.wt														0.99	0.84	0.73	0.73	no	D?	?	<=5
43A	MYTI EDU	SB	D.wt														0.97	0.88		0.85	no	-?	?	<=5
44A	MYTI EDU	SB	D.wt															2.83	3.62	9.08	1.8	-?	?	14
46A	MYTI EDU	SB	D.wt														1.68	1.28	0.98		no	-?	?	8
48A	MYTI EDU	SB	D.wt														2.38	1.47	1.10		no	-?	?	10
10A	MYTI EDU	SB	D.wt														1.88	1.46	1.85	2.55	no	-?	?	9
11A	MYTI EDU	SB	D.wt														2.44	2.22	1.43	1.84	no	-?	?	9
30B	GADU MOR	LI	W.wt										405.00	955.00	957.39	856.41	885.00	807.00	871.90	1236.82	6.2	--	12.3	11
36B	GADU MOR	LI	W.wt										164.86	126.00	147.00	254.00	138.00	642.00	350.00	272.00	1.4	--	5.0	16
15B	GADU MOR	LI	W.wt										60.00	104.44	99.00	66.50	97.00	117.73	112.00	140.00	no	--	1.3	10
23B	GADU MOR	LI	W.wt										80.00	103.88	86.00	79.00	48.00	75.00	73.00	52.00	no	--	no	10
53B	GADU MOR	LI	W.wt										156.00	193.97	560.74	65.00		61.00	262.44	219.00	1.1	--	24.5	20
67B	GADU MOR	LI	W.wt										106.00	111.00	105.76	83.50	128.45	85.00	92.00	230.84	1.2	--	2.5	12
92B	GADU MOR	LI	W.wt													51.00	50.99	102.00	129.00		no	U?	?	9
98B	GADU MOR	LI	W.wt												65.00	72.97	33.00	55.00	80.00	129.45	no	-Y	3.1	12
43B	GADU MOR	LI	W.wt														110.00	113.00	50.00		no	-?	?	14
10B	GADU MOR	LI	W.wt														201.00	171.00	66.00	55.00	no	D?	?	11
30B	GADU MOR	MU	W.wt										1.47	3.70	9.20	3.30	1.23	0.89	2.54	4.34	?	DY	?	15
36B	GADU MOR	MU	W.wt										0.63	0.45	0.70	1.30	0.15	5.42	1.37	1.87	?	--	?	>25
15B	GADU MOR	MU	W.wt										0.52	0.39	0.49	0.20	0.13	0.36	0.43	0.50	?	-Y	?	12
23B	GADU MOR	MU	W.wt										0.26	0.94	0.20	0.20	0.05	0.27	0.16	0.31	?	--	?	22
53B	GADU MOR	MU	W.wt										3.36	0.97	4.79	0.40		0.12	6.43	1.34	?	--	?	>25
67B	GADU MOR	MU	W.wt										0.24	0.56	0.40	0.14	0.47	0.19	1.23	2.65	?	--	?	20
92B	GADU MOR	MU	W.wt													0.10	0.06	0.10	0.26		?	-?	?	15
98B	GADU MOR	MU	W.wt												0.20	0.30	0.03	0.08	0.12	0.50	?	-Y	?	22
43B	GADU MOR	MU	W.wt														0.14	0.21	0.13		?	-?	?	12
10B	GADU MOR	MU	W.wt														0.55	0.85	0.11	0.20	?	-?	?	22
67B	LEPI WHI	LI	W.wt										37.00	42.00	61.00	45.00	87.00	79.00	38.80	35.00	?	-Y	?	11
67B	LEPI WHI	MU	W.wt										0.27	0.33	0.60	0.10	0.17	0.63	0.17	0.24	?	--	?	20
36F	LIMA LIM	LI	W.wt										129.48	92.49	138.00	171.00	148.00	161.00	150.80	155.00	no	--	1.1	8
15F	LIMA LIM	LI	W.wt											53.00		21.54	28.93	28.00	22.80	25.00	no	--	no	12
22F	LIMA LIM	LI	W.wt										65.41	48.96	52.44		24.00	29.60			no	-?	?	11
36F	LIMA LIM	MU	W.wt										1.13	2.70	2.30	3.20	2.06	3.22	3.33	1.63	?	--	?	13
15F	LIMA LIM	MU	W.wt											1.42		0.24	0.12	0.41	0.69	0.48	?	-Y	?	18
22F	LIMA LIM	MU	W.wt										0.70	2.00	1.28		0.50	1.66			?	-?	?	19
98F	LIMA LIM	MU	W.wt														0.27	0.44	1.16		?	-?	?	15
33B	PLAT FLE	LI	W.wt										11.00	10.00	30.00	22.00	17.00	17.00	9.40	11.10	no	-Y	no	12
53B	PLAT FLE	LI	W.wt										123.00	125.94	80.00	10.00		7.94	37.00	39.00	no	DY	12.0	17
33B	PLAT FLE	MU	W.wt										0.65	1.24	0.50	0.30	0.12	0.22	0.34	0.22	?	DY	?	14
53B	PLAT FLE	MU	W.wt										5.88	8.20	3.40	0.40		0.22	0.93	0.92	?	DY	?	17

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Annual Median Concentrations of D D E P P (ppb).

St.	Species	Tissue	Base	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	OC	TRND	U95+3	POWER
30A	MYTI EDU	SB	D.wt												5.24	3.86	7.08	5.70	2.56	5.88	no	--	no	15
31A	MYTI EDU	SB	D.wt												3.30	1.89	3.45	1.84	0.50	3.37	no	--	no	22
35A	MYTI EDU	SB	D.wt												4.91	2.08	3.13	2.84	0.57	3.91	no	--	1.2	23
36A	MYTI EDU	SB	D.wt												2.76	1.06	1.03	1.76	0.44	2.11	no	--	no	21
71A	MYTI EDU	SB	D.wt												2.61	1.58	3.21	1.29	0.74	1.02	no	--	no	14
76A	MYTI EDU	SB	D.wt												1.40	0.79			0.36	1.21	no	-?	?	18
15A	MYTI EDU	SB	D.wt													0.98	1.72	0.73	0.29	1.02	no	-?	?	18
22A	MYTI EDU	SB	D.wt												2.22	1.31	1.88	1.45	0.39	1.37	no	--	no	18
51A	MYTI EDU	SB	D.wt															33.88	6.67	14.68	1.5	-?	?	23
52A	MYTI EDU	SB	D.wt												12.26	25.48	19.43	18.48	9.53	13.13	1.3	--	1.7	13
56A	MYTI EDU	SB	D.wt												50.00	47.53	114.57	40.84	33.89	72.32	7.2	--	13.8	15
57A	MYTI EDU	SB	D.wt												25.90	18.25	34.97	25.31	15.80	50.00	5.0	--	12.2	16
63A	MYTI EDU	SB	D.wt												12.94	9.29	9.68	8.36	5.53	13.01	1.3	--	2.4	13
65A	MYTI EDU	SB	D.wt												7.60	5.19	7.79	4.12	5.00	6.90	no	--	1.4	12
69A	MYTI EDU	SB	D.wt												3.55	3.16	3.54	2.91	0.40	3.69	no	--	no	24
84A	MYTI EDU	SB	D.wt												3.13	2.23		0.99	0.74		no	D?	?	10
92A	MYTI EDU	SB	D.wt												0.68	2.09	1.41	0.77	0.28	1.93	no	--	no	22
98A	MYTI EDU	SB	D.wt												5.81	2.29				1.59	no	-?	?	14
98X	MYTI EDU	SB	D.wt														31.65	22.87	5.16		no	-?	?	19
41A	MYTI EDU	SB	D.wt														0.62	0.42	0.29	0.61	no	-?	?	13
44A	MYTI EDU	SB	D.wt															0.49	0.34	1.41	no	-?	?	20
46A	MYTI EDU	SB	D.wt														1.05	0.76	0.27		no	-?	?	15
48A	MYTI EDU	SB	D.wt														1.71	1.13	0.29		no	-?	?	18
10A	MYTI EDU	SB	D.wt														0.85	0.78	0.44	1.49	no	-?	?	17
11A	MYTI EDU	SB	D.wt														1.30	1.88	0.41	1.23	no	-?	?	21
30B	GADU MOR	LI	W.wt										163.00	440.00	182.46	158.97	191.00	194.00	312.50	413.17	2.1	--	8.8	14
36B	GADU MOR	LI	W.wt										91.90	51.00	50.00	75.00	55.00	105.00	141.00	129.00	no	U-	2.2	11
15B	GADU MOR	LI	W.wt										50.00	135.99	48.00	56.99	86.00	33.47	75.00	140.00	no	--	3.9	17
23B	GADU MOR	LI	W.wt										68.00	85.38	42.00	41.00	35.00	31.00	49.00	33.00	no	--	no	11
53B	GADU MOR	LI	W.wt										637.00	805.84	939.42	85.00		42.00	491.39	936.00	4.7	-Y	285.6	21
67B	GADU MOR	LI	W.wt										776.00	554.00	347.15	391.80	471.14	109.00	460.00	2057.93	10.3	-Y	116.4	18
92B	GADU MOR	LI	W.wt													53.00	50.50	50.00	196.00		no	-?	?	17
98B	GADU MOR	LI	W.wt												73.00	83.40	43.00	48.96	138.00	197.96	no	U?	7.0	12
43B	GADU MOR	LI	W.wt														126.00	69.00	60.00		no	-?	?	11
10B	GADU MOR	LI	W.wt														211.00	71.00	75.00	99.00	no	-?	?	15
67B	LEPI WHI	LI	W.wt										294.00	240.00	183.00	163.00	250.00	145.00	142.60	167.00	?	--	?	9
36F	LIMA LIM	LI	W.wt										27.98	34.41	20.00	21.00	50.00	40.00	40.00	22.00	no	--	no	12
15F	LIMA LIM	LI	W.wt											39.00		13.42	23.49	9.00	20.70	20.00	no	--	1.2	18
22F	LIMA LIM	LI	W.wt										68.93	47.96	39.95		21.00	9.17			no	U?	?	11
33B	PLAI FLE	LI	W.wt										13.00	9.10	24.00	14.00	13.00	7.00	10.70	9.70	no	--	no	13
53B	PLAI FLE	LI	W.wt										94.00	70.14	37.00	41.00		8.00	24.00	45.00	1.5		9.2	18

SB Soft body tissue.
LI Liver tissue.
OC Overconcentration; Median(LastYear)/Background (="?" if missing Background)
U95+3 Upper 95% ConfidenceInterval(Last+3years)/Background (="?" if missing Background or N(years)<=5)
POWER Number of years to detect a 10% trend/year with 90% power.

Annual Median Concentrations of H C H G (ppb).

St. Species	Tissue Base	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	ANALYSES OC	TRND	U95+3	POWER
30A MYTI EDU	SB D.wt										2.05	3.55	1.52	1.62	1.73	1.48	0.65	1.60	no	--	no	15
31A MYTI EDU	SB D.wt										2.04	3.66	2.20	1.42	1.37	0.78	0.66	2.73	no	--	1.4	15
35A MYTI EDU	SB D.wt										2.65	4.09	2.31	1.52	1.61	1.13	0.84	4.51	no	--	2.8	16
36A MYTI EDU	SB D.wt										3.63	5.46	2.76	1.59	0.77	1.25	0.56	2.88	no	--	2.1	18
71A MYTI EDU	SB D.wt										2.08	4.85	1.96	2.11	0.96	0.79	0.48	1.02	no	D-	no	15
76A MYTI EDU	SB D.wt										1.59	2.15	1.40	2.35			0.61	1.68	no	--	no	18
15A MYTI EDU	SB D.wt										1.68			1.95	1.11	1.06	0.37	1.99	no	--	1.2	19
22A MYTI EDU	SB D.wt										0.80	1.90	1.67	1.33	1.07	1.03	0.58	1.20	no	--	no	13
51A MYTI EDU	SB D.wt															1.73	1.13	1.22	no	-?	?	10
52A MYTI EDU	SB D.wt										1.04		0.94	1.15	1.30	1.27	2.57	1.22	no	--	no	12
56A MYTI EDU	SB D.wt										1.75	2.38	0.93	1.04	1.21	1.22	1.74	1.25	no	--	no	11
57A MYTI EDU	SB D.wt											2.29	1.44	0.79	0.86	1.01	2.46	1.03	no	--	1.1	14
63A MYTI EDU	SB D.wt											2.91	1.48	0.71	0.98	0.86	1.27	0.78	no	--	no	12
65A MYTI EDU	SB D.wt										2.16	2.59	1.27	0.74	1.22	0.65	2.88	1.00	no	--	1.8	18
69A MYTI EDU	SB D.wt												1.60	1.05	0.94	0.65	0.36	1.31	no	--	no	16
84A MYTI EDU	SB D.wt											1.52	0.63	1.06		0.79	0.52		no	-?	?	14
92A MYTI EDU	SB D.wt												0.68	0.84	0.99	0.77	0.41	0.86	no	--	no	12
98A MYTI EDU	SB D.wt												0.62	0.57				0.60	no	-?	?	<=5
98X MYTI EDU	SB D.wt														1.45	0.64	0.42		no	-?	?	13
41A MYTI EDU	SB D.wt														0.68	0.53	0.29	0.43	no	-?	?	11
43A MYTI EDU	SB D.wt														0.52	0.41		0.45	no	-?	?	8
44A MYTI EDU	SB D.wt															0.54	0.29	0.64	no	-?	?	17
46A MYTI EDU	SB D.wt														0.44	0.47	0.33		no	-?	?	9
48A MYTI EDU	SB D.wt														0.34	0.48	0.33		no	-?	?	11
10A MYTI EDU	SB D.wt														0.52	0.54	0.44	0.40	no	D?	?	6
11A MYTI EDU	SB D.wt														0.44	0.51	0.34	0.46	no	-?	?	10
30B GADU MOR	LI W.wt										3.00	15.00	5.00	5.00	10.00	7.00	10.00	9.95	no	--	no	18
36B GADU MOR	LI W.wt										6.48	14.00	9.00	9.00	17.00	3.00	11.00	6.00	no	--	no	20
15B GADU MOR	LI W.wt										11.00	37.50	7.00	9.00	10.00	6.00	13.00	10.00	no	--	1.3	19
23B GADU MOR	LI W.wt										13.00	5.92	11.00	5.00	8.00	5.00	13.00	8.00	no	--	no	16
53B GADU MOR	LI W.wt										12.00	8.49	5.00	6.00		6.00	7.00	8.00	no	DY	no	8
67B GADU MOR	LI W.wt										12.00	7.00	10.00	7.00	6.32	5.00	10.00	11.00	no	--	no	11
92B GADU MOR	LI W.wt													6.00	6.00	4.00	6.00		no	-?	?	10
98B GADU MOR	LI W.wt												5.00		8.00	3.00	6.00	3.00	no	-?	?	17
43B GADU MOR	LI W.wt														3.00	3.00	4.00		no	-?	?	8
10B GADU MOR	LI W.wt														3.00	3.00	4.00	3.00	no	-?	?	9
67B LEPI WHI	LI W.wt										3.00	2.00	5.00	2.00	2.00	1.00	3.70	3.00	?	--	?	17
36F LIMA LIM	LI W.wt										8.94	3.00	5.00	1.00	4.00	3.00	8.00	5.00	no	--	1.8	21
15F LIMA LIM	LI W.wt											3.00		4.00	3.46	3.00	5.10	5.60	no	--	no	9
22F LIMA LIM	LI W.wt										6.93	3.00	5.00		1.00	1.00			no	-?	?	18
33B PLAT FLE	LI W.wt										2.00	0.50	5.00	2.00	2.00	1.00	1.90	1.80	no	--	1.5	22
53B PLAT FLE	LI W.wt										3.00	2.00	5.00	2.00		1.41	2.00	3.00	no	--	1.1	14

SB Soft body tissue.
LI Liver tissue.
OC Overconcentration; Median(LastYear)/Background (="?" if missing Background)
U95+3 Upper 95% ConfidenceInterval(Last+3years)/Background (="?" if missing Background or N(years)<=5)
POWER Number of years to detect a 10% trend/year with 90% power.

Annual Median Concentrations of H C B (ppb).

St.	Species	Tissue	Base	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	ANALYSES OC	TRND	U95+3	POWER
30A	MYTI EDU	SB	D.wt				1.18	0.88	2.06	0.92	1.15	0.87	0.35	0.59	0.95	0.54	0.27	0.24	0.25	0.27	no	D-	no	13
31A	MYTI EDU	SB	D.wt			13.37	1.38	3.83	1.89	0.93	0.89	0.36	0.32	0.61	0.55	0.45	0.24	0.31	0.22	0.26	no	D-	1.4	18
35A	MYTI EDU	SB	D.wt			12.83	0.95	3.33	0.79	0.98	1.12	0.47	0.42	0.58	0.58	0.51	0.23	0.28	0.22	0.52	1.0	D-	4.8	20
36A	MYTI EDU	SB	D.wt			15.02	0.95	3.83	2.90	2.37	0.96	0.43	0.33	0.55	0.39	0.53	0.24	0.33	0.28	0.31	no	D-	2.6	20
71A	MYTI EDU	SB	D.wt			15.25	10.37	91.37	11.11	206.90	1.84	149.17	8.48	6.92	4.14	3.91	1.47	2.13	4.48	2.04	4.1	--	250.0	>25
76A	MYTI EDU	SB	D.wt										0.38	0.57	0.50	0.79			0.25	0.29	no	--	no	14
15A	MYTI EDU	SB	D.wt										0.20			0.49	0.25	0.22	0.29	0.25	no	--	2.0	14
22A	MYTI EDU	SB	D.wt										0.26	0.61	0.56	0.44	0.25	0.25	0.30	0.31	no	--	1.4	11
51A	MYTI EDU	SB	D.wt															0.61	0.33	0.31	no	-?	?	11
52A	MYTI EDU	SB	D.wt									0.85	0.38		0.81	0.81	0.28	0.32	0.26	0.33	no	--	1.6	14
56A	MYTI EDU	SB	D.wt									0.79	0.41	0.79	0.93	1.04	0.31	0.38	0.31	0.44	no	--	2.0	14
57A	MYTI EDU	SB	D.wt									0.77		0.76	0.72	0.79	0.36	0.30	0.26	0.43	no	DY	1.2	10
63A	MYTI EDU	SB	D.wt									1.05		0.97	0.74	0.63	0.32	0.33	0.33	0.41	no	DY	1.2	8
65A	MYTI EDU	SB	D.wt								0.20	0.43	0.52	0.86	0.62	0.67	0.28	0.30	0.29	0.34	no	DY	1.4	11
69A	MYTI EDU	SB	D.wt												0.53	0.53	0.29	0.25	0.29	0.50	no	-Y	2.2	10
82A	MYTI EDU	SB	D.wt				2.26	10.73	0.66	0.62	0.80	0.53									1.1	--	14.0	24
84A	MYTI EDU	SB	D.wt				3.41	8.79	3.33	2.04	1.23	0.48		0.51	0.63	0.53		0.25	0.21		no	D-	no	13
92A	MYTI EDU	SB	D.wt												0.68	0.42	0.24	0.23	0.23	0.25	no	DY	no	8
98A	MYTI EDU	SB	D.wt												0.62	0.57				0.34	no	-?	?	10
98X	MYTI EDU	SB	D.wt														0.56	0.32	0.26		no	-?	?	11
41A	MYTI EDU	SB	D.wt														0.29	0.26	0.29	0.30	no	-?	?	<=5
43A	MYTI EDU	SB	D.wt														0.32	0.34		0.45	no	-?	?	7
44A	MYTI EDU	SB	D.wt															0.27	0.29	0.33	no	-?	?	<=5
46A	MYTI EDU	SB	D.wt														0.26	0.29	0.27		no	-?	?	<=5
48A	MYTI EDU	SB	D.wt														0.28	0.29	0.24		no	-?	?	7
10A	MYTI EDU	SB	D.wt														0.29	0.27	0.25	0.31	no	-?	?	7
11A	MYTI EDU	SB	D.wt														0.35	0.43	0.34	0.46	no	-?	?	9
30B	GADU MOR	LI	W.wt										10.00	17.00	7.48	16.00	11.00	11.00	12.00	7.48	no	--	no	14
36B	GADU MOR	LI	W.wt										7.00	9.00	9.00	10.00	9.00	5.00	9.00	6.00	no	--	no	11
15B	GADU MOR	LI	W.wt										5.00	20.49	10.00	14.00	14.00	9.00	11.00	13.00	no	--	2.0	16
23B	GADU MOR	LI	W.wt										6.00	9.49	12.00	9.00	8.00	6.00	10.00	6.00	no	--	no	11
53B	GADU MOR	LI	W.wt										10.00	10.00	16.49	7.00		5.00	7.00	7.00	no	--	no	11
67B	GADU MOR	LI	W.wt										14.00	8.00	7.94	8.00	8.49	10.00	8.00	15.49	no	--	1.5	11
92B	GADU MOR	LI	W.wt													17.00	11.00	14.00	13.00		no	-?	?	10
98B	GADU MOR	LI	W.wt												20.00	9.95	12.00	18.00	35.00	20.49	1.0	--	5.2	13
43B	GADU MOR	LI	W.wt														15.00	16.49	13.00		no	-?	?	8
10B	GADU MOR	LI	W.wt														13.00	11.00	16.00	17.00	no	-?	?	8
67B	LEPI WHI	LI	W.wt										9.00	4.00	5.00	4.00	5.00	2.00	4.60	4.00	?	--	?	15
36F	LIMA LIM	LI	W.wt										5.48	3.00	5.00	2.00	3.00	2.00	2.30	3.00	no	--	no	14
15F	LIMA LIM	LI	W.wt											4.00		4.00	4.00	2.00	3.00	3.20	no	--	no	10
22F	LIMA LIM	LI	W.wt										6.00	3.00	5.00		1.00	1.41			no	-?	?	19
33B	PLAT FLE	LI	W.wt										1.00	0.50	5.00	2.00	1.00	1.00	0.60	0.80	no	--	no	20
53B	PLAT FLE	LI	W.wt										6.00	4.47	5.00	2.00		1.00	2.00	3.00	no	DY	1.9	12

SB Soft body tissue.
LI Liver tissue.
OC Overconcentration; Median(LastYear)/Background (="?" if missing Background)
U95+3 Upper 95% ConfidenceInterval(Last+3years)/Background (="?" if missing Background or N(years)<=5)
POWER Number of years to detect a 10% trend/year with 90% power.

Appendix H.
Geographical distribution of contaminants in biota 1996-97

Sorted by contaminant and species:

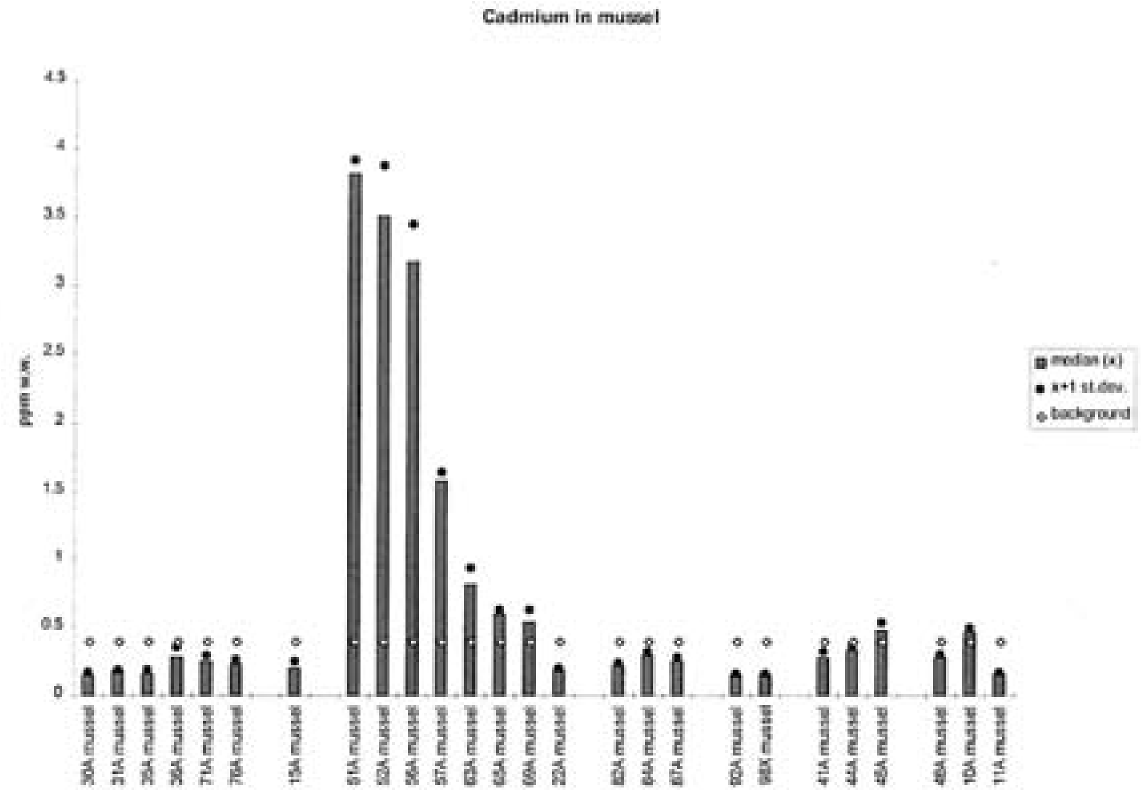
Cadmium (Cd)
Copper (Cu)
Mercury (Hg)
Lead (Pb)
Zinc (Zn)
Sum of 7 CBs (CB-28, -52, 101, -118, -138, -153 and -180)
CB-153
DDEPP (ppDDE)
γ-HCH
HCB

MYTI EDU - Blue Mussel (*Mytilus edulis*)
GADU MOR - Atlantic cod (*Gadus morhua*)
PLAT FLE - Flounder (*Platichthys flesus*)
LIMA LIM - Dab (*Limanda limanda*)
PLEU PLA - Plaice (*Pleuronectes platessa*)
MICR KIT - Lemon sole (*Microstomus kitt*)
LEPI WHI - Megrim (*Lepidorhombus whiff-iagonis*)

Station positions are shown on maps (Figure 1 to Figure 4)

Appendix H
Geographical distribution of contaminants in biota 1996-97 (cont.)

A



B

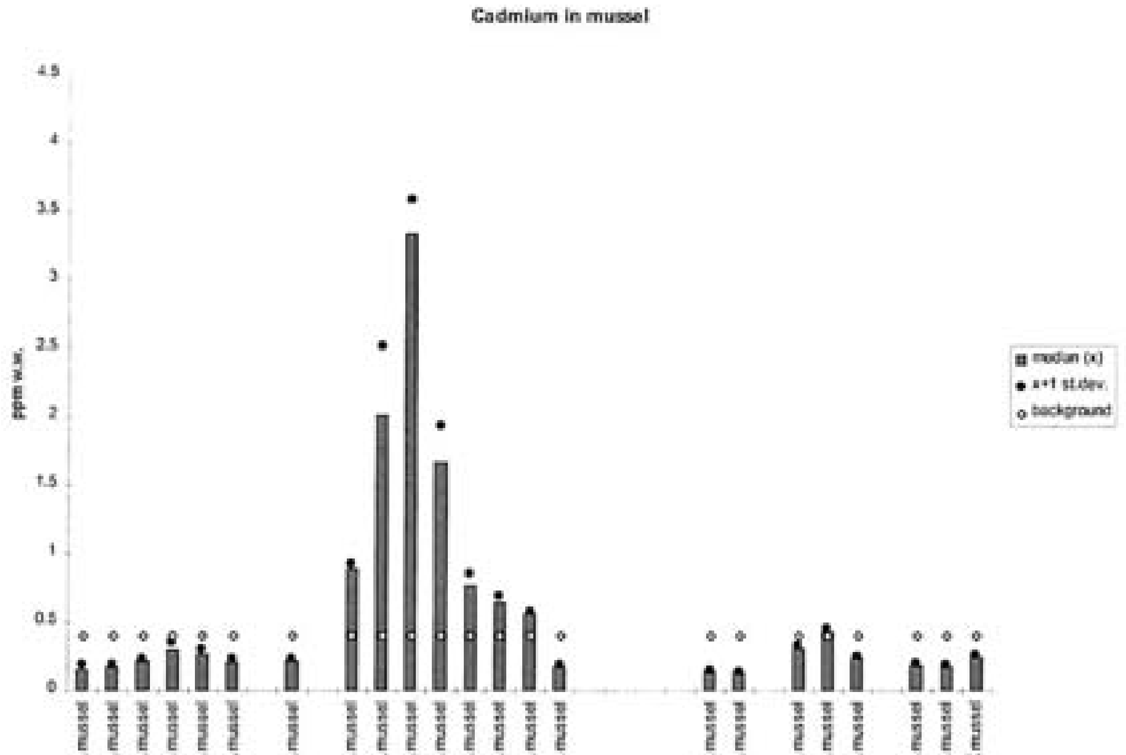
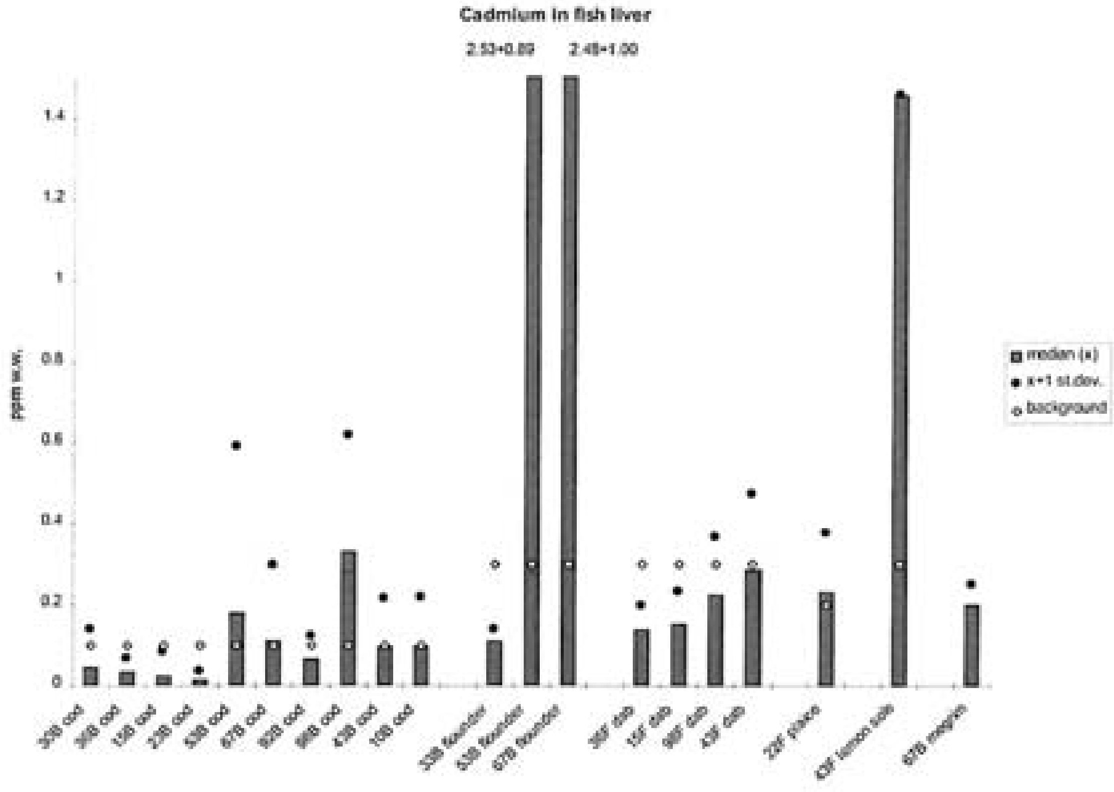


Figure 27. Median, standard deviation and provisional "high background" concentration for cadmium in mussels (*Mytilus edulis*) 1996 (**A**) and 1997 (**B**), ppm wet weight (see maps in Figure 1-Figure 4).

A



B

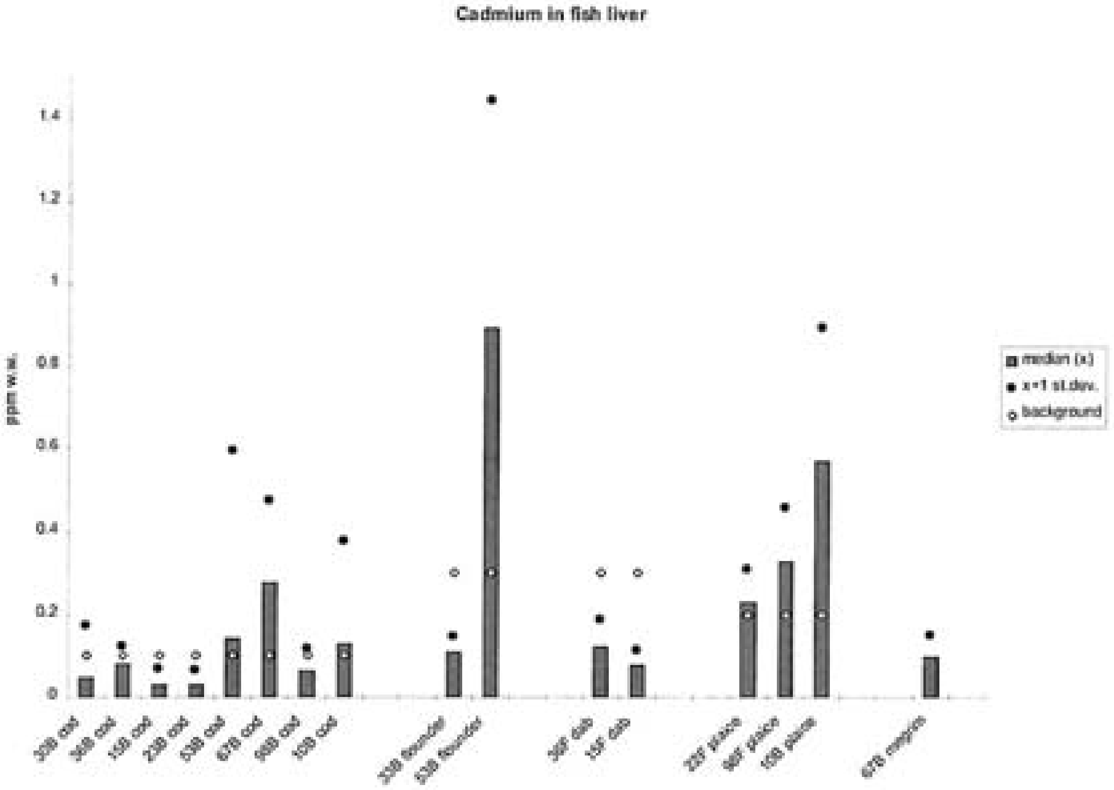
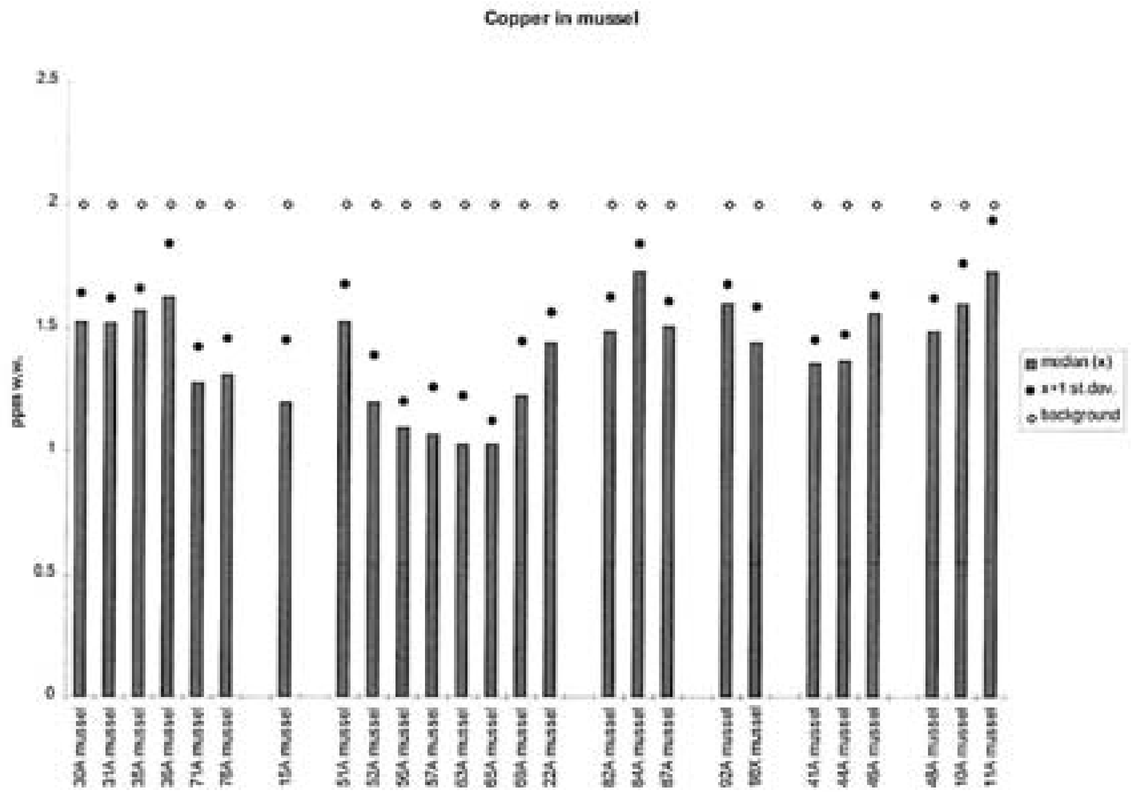


Figure 28. Median, standard deviation and provisional "high background" concentration for cadmium in fish liver 1996 (**A**) and 1997 (**B**), ppm wet weight (see maps in Figure 1-Figure 4).

A



B

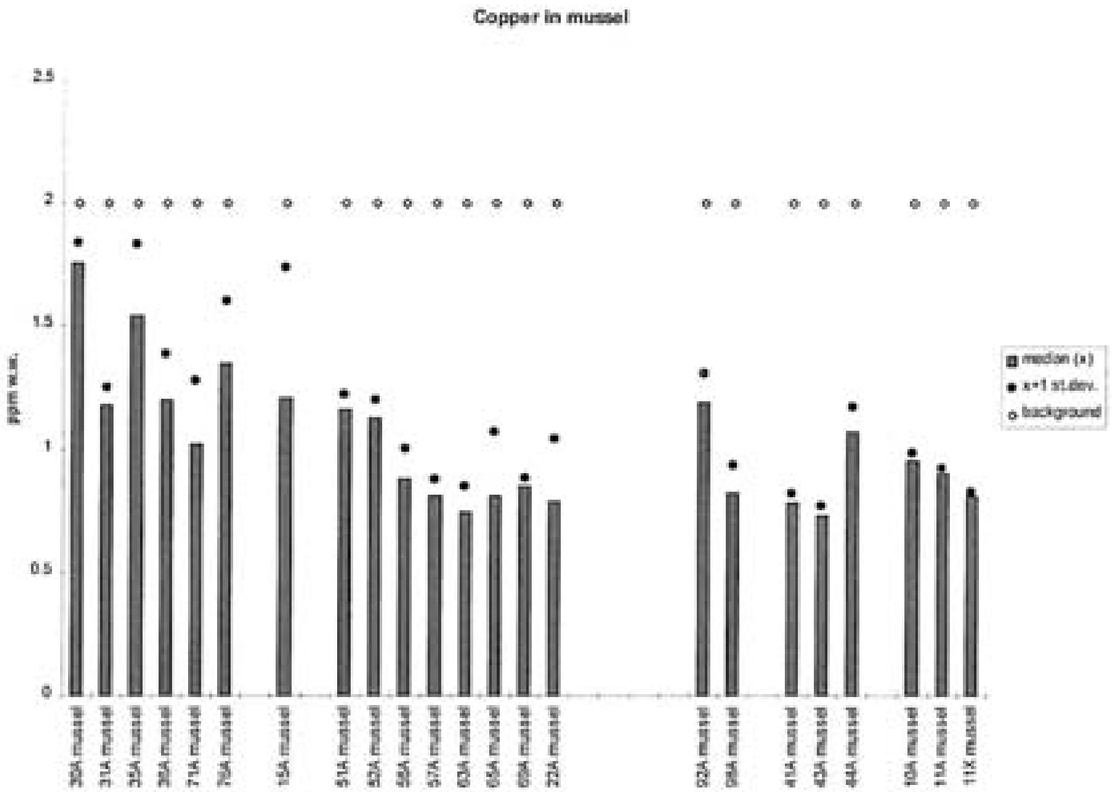
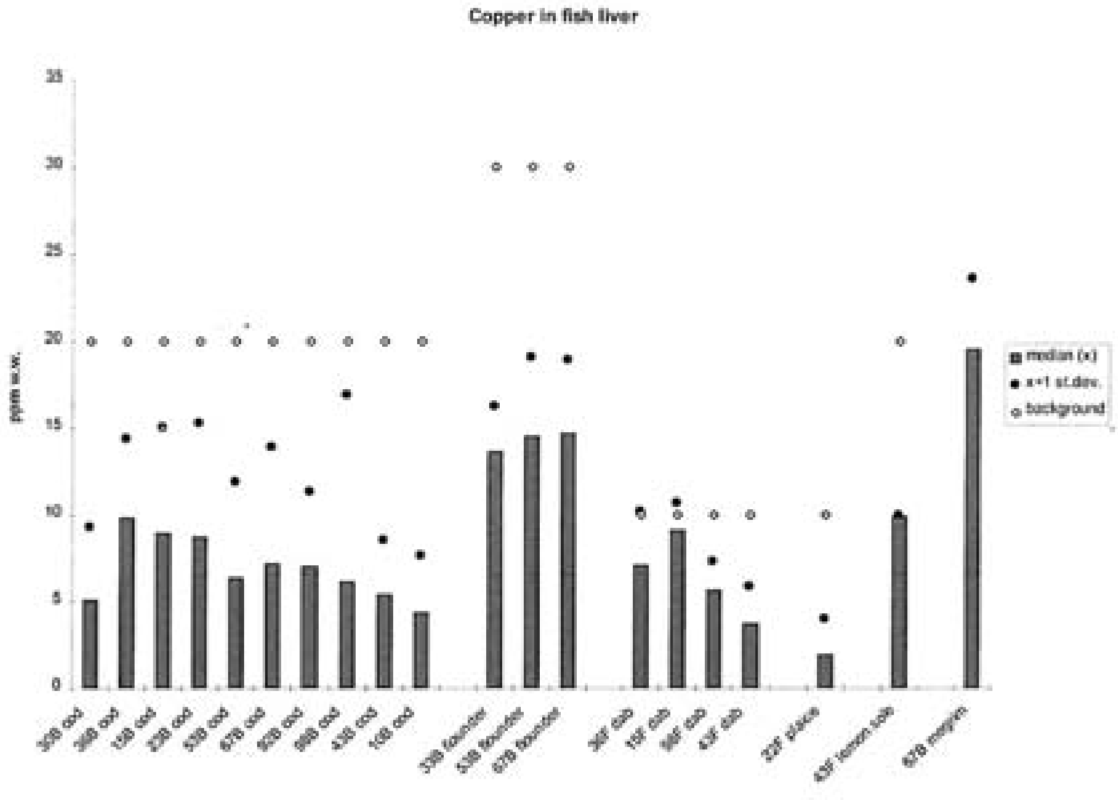


Figure 29. Median standard deviation and provisional "high background" concentration for copper in mussels (*Mytilus edulis*) 1996 (**A**) and 1997 (**B**), ppm wet weight (see maps in Figure 1-Figure 4).

A



B

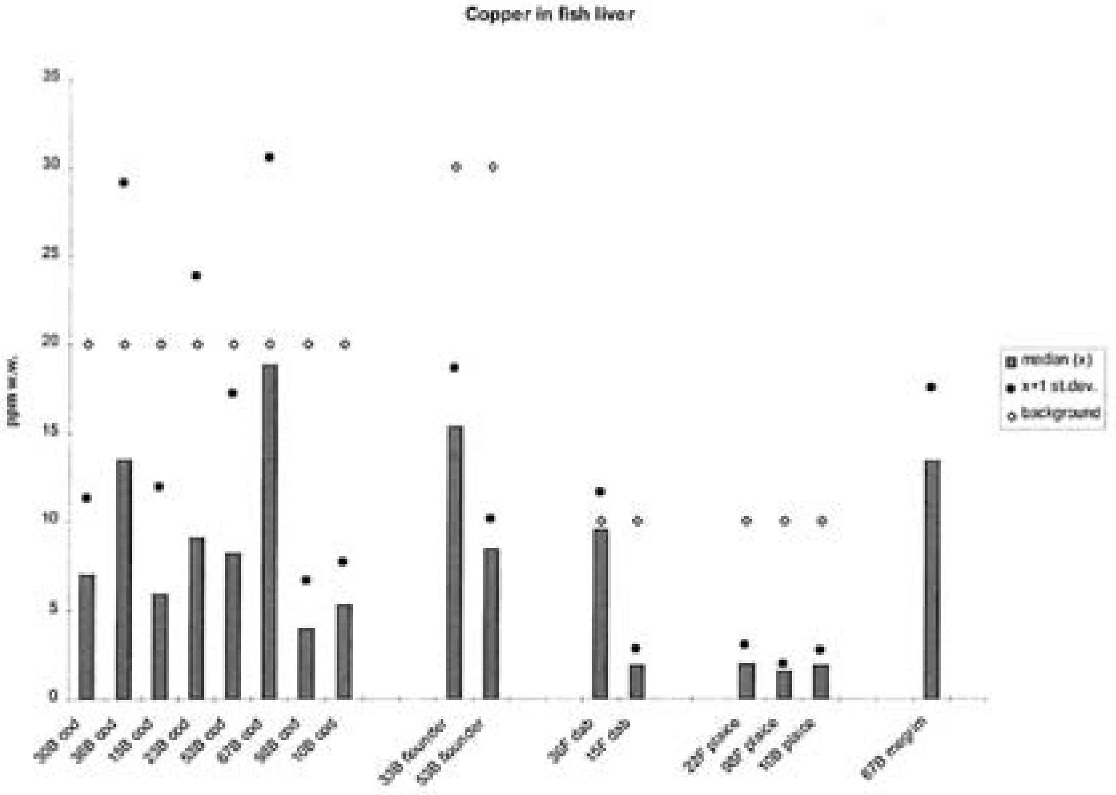
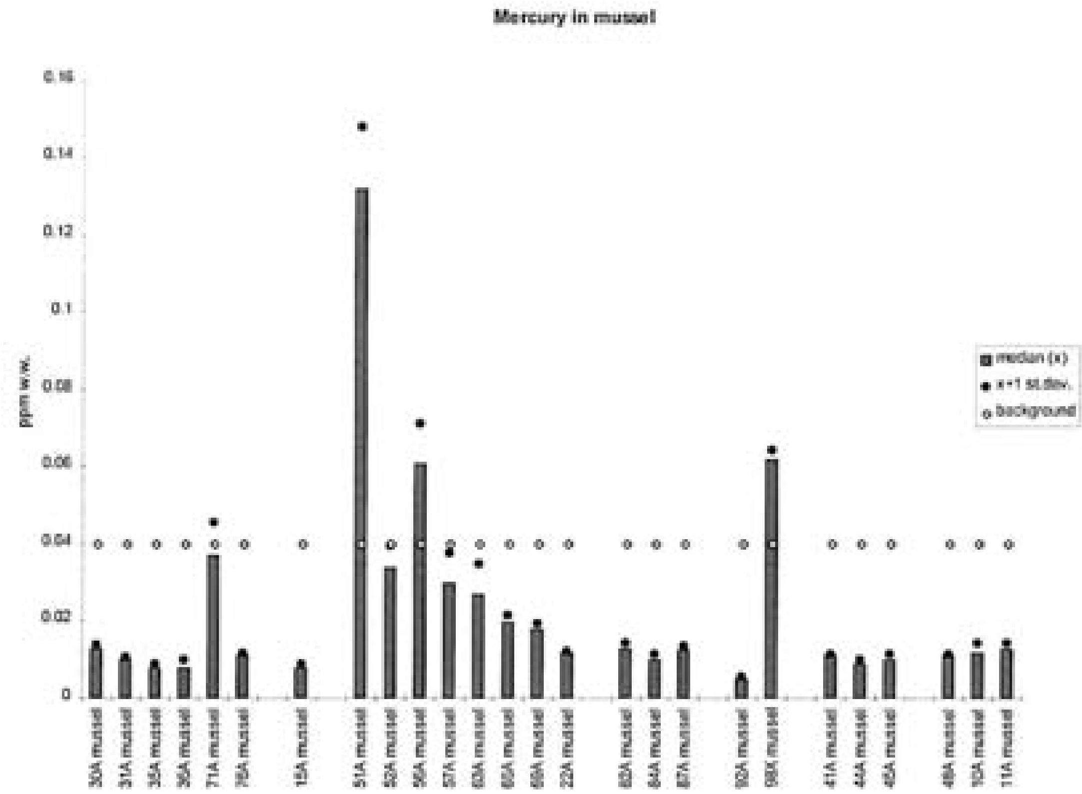


Figure 30. Median, standard deviation and provisional "high background" concentration for copper in fish liver 1996 (**A**) and 1997 (**B**), ppm wet weight (see maps in Figure 1-Figure 4).

A



B

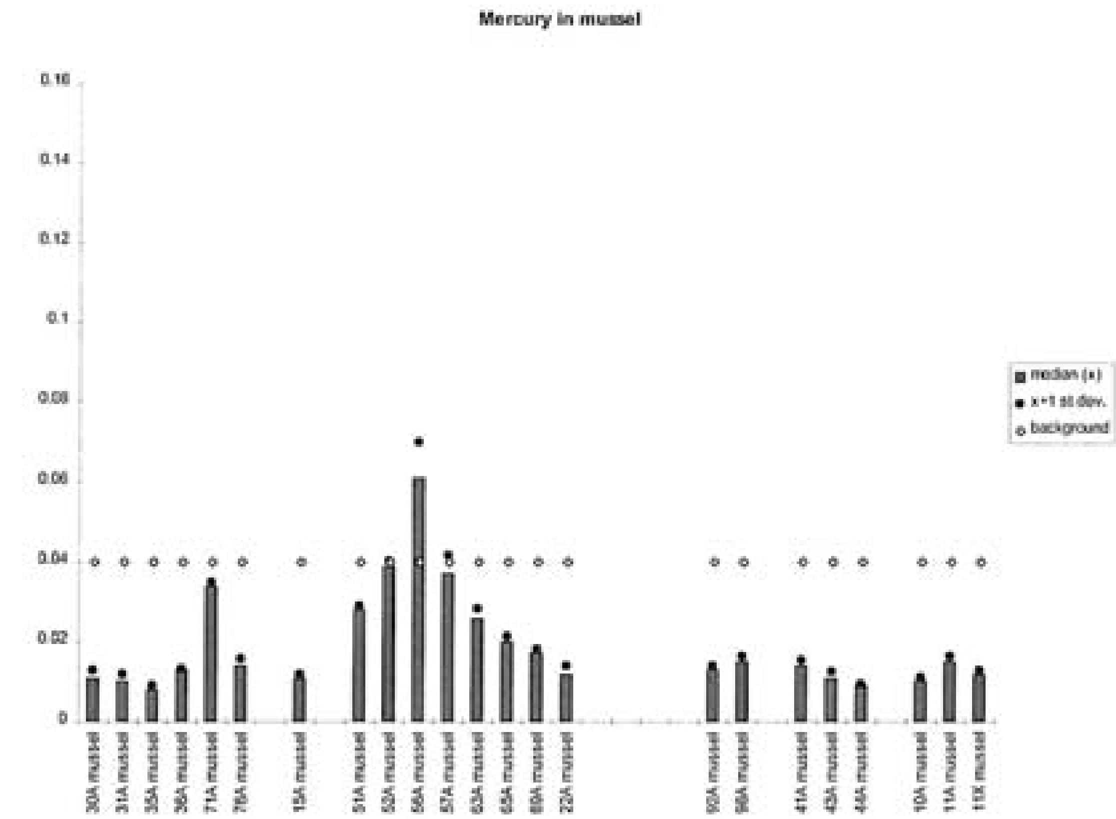
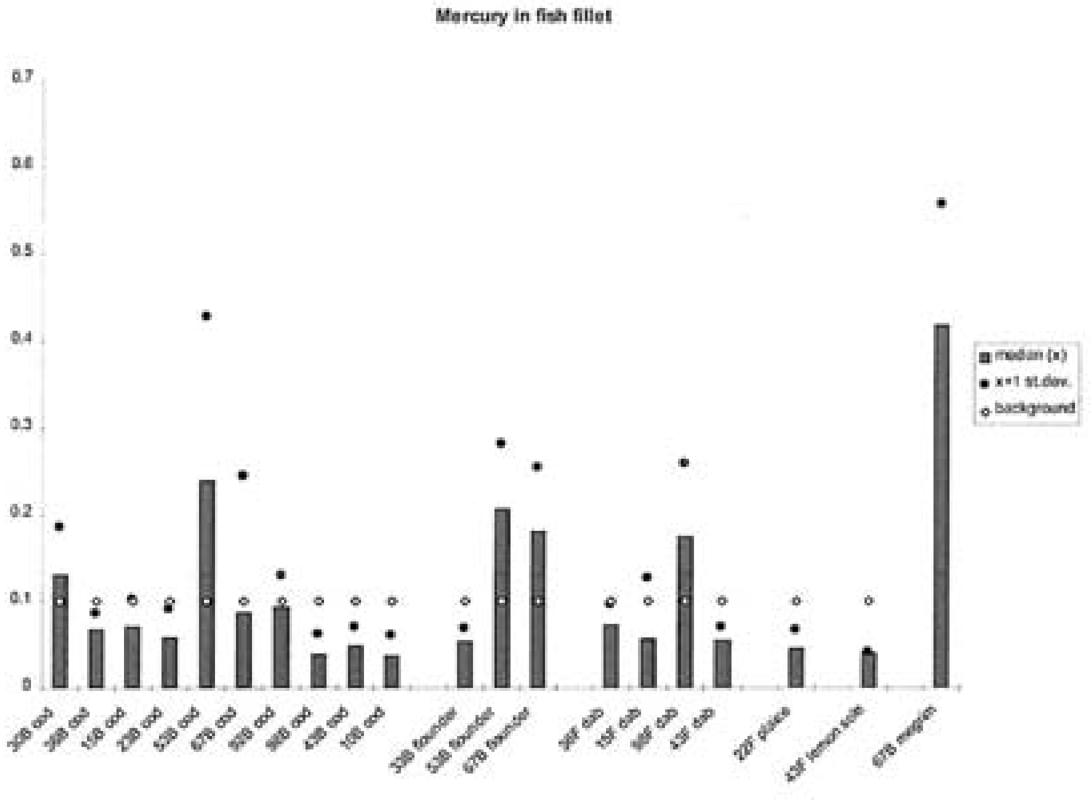


Figure 31. Median, standard deviation and provisional "high background" concentration for mercury in mussels (*Mytilus edulis*) 1996 (**A**) and 1997 (**B**), ppm wet weight (see maps in Figure 1-Figure 4).

A



B

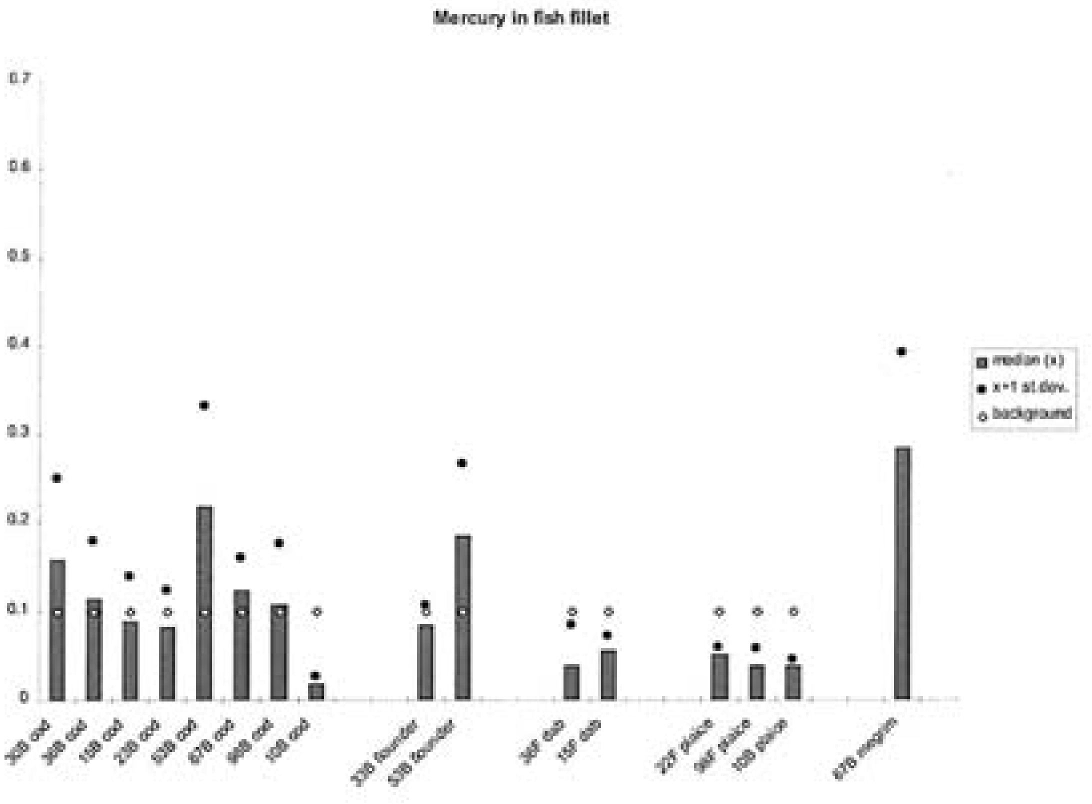
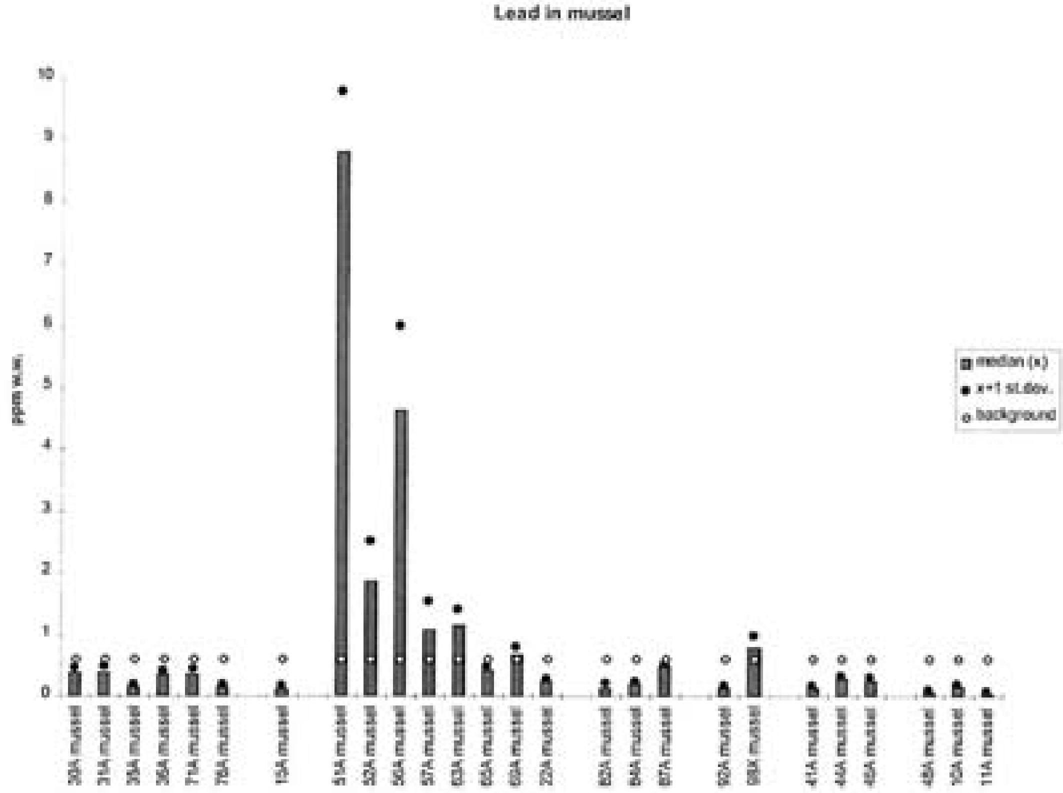


Figure 32. Median, standard deviation and provisional "high background" concentration for mercury in fish fillet 1996 (**A**) and 1997 (**B**), ppm wet weight (see maps in Figure 1-Figure 4).

A



B

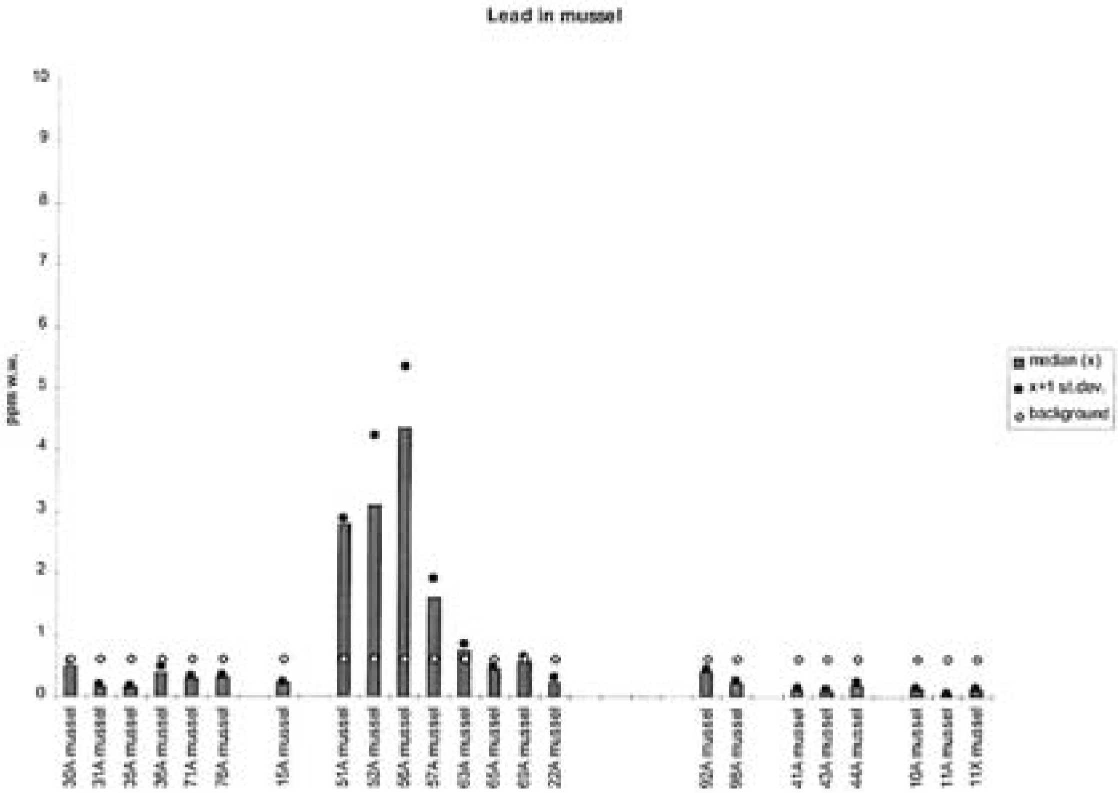
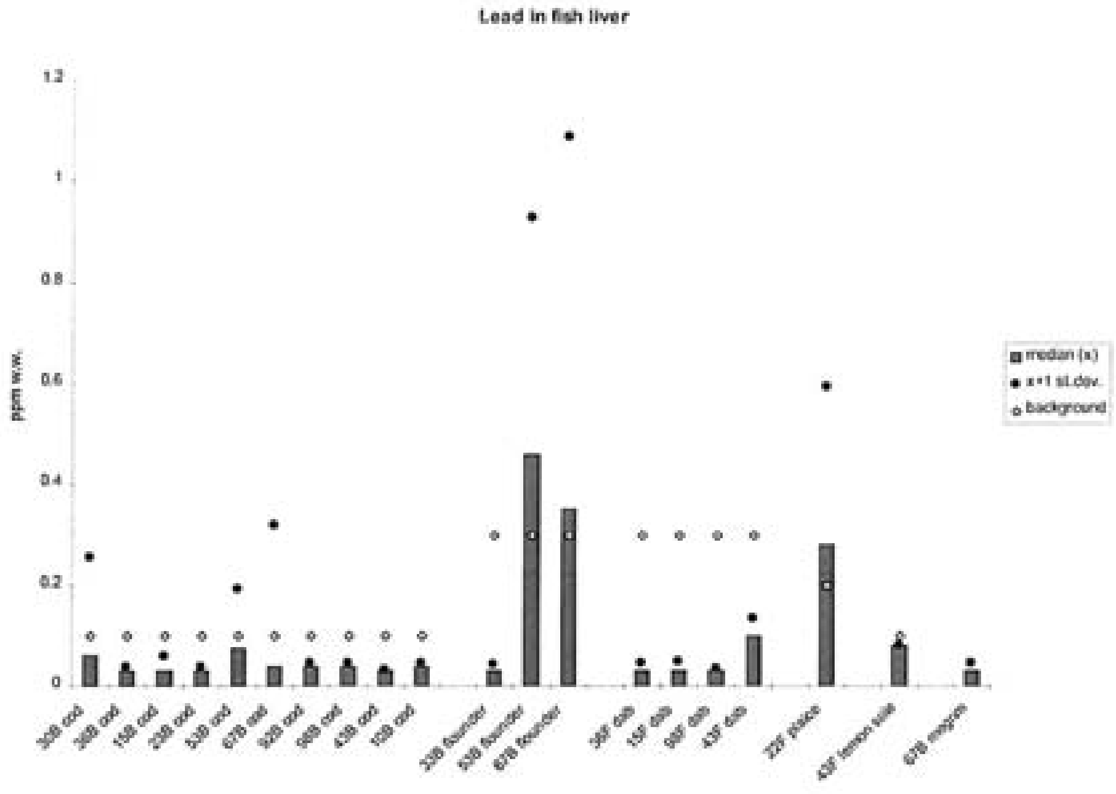


Figure 33. Median, standard deviation and provisional "high background" concentration for lead in mussels (*Mytilus edulis*) 1996 (**A**) and 1997 (**B**), ppm wet weight (see maps in Figure 1-Figure 4).

A



B

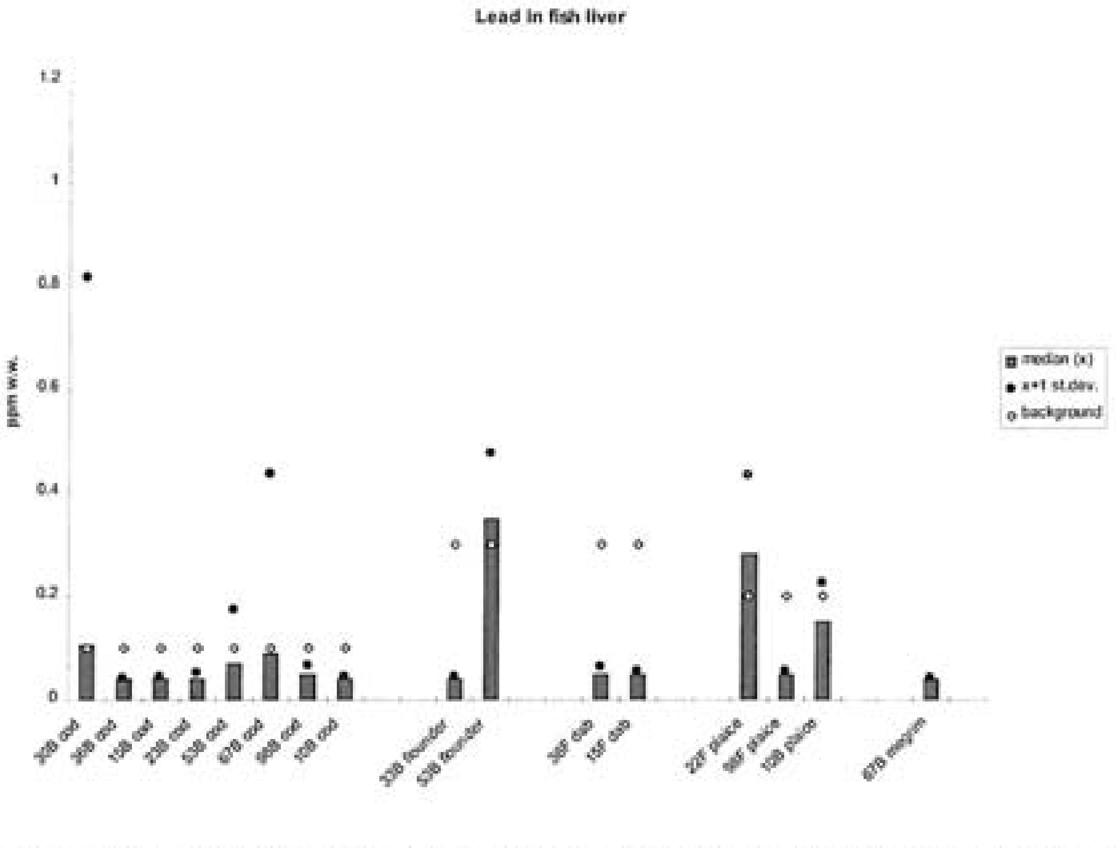
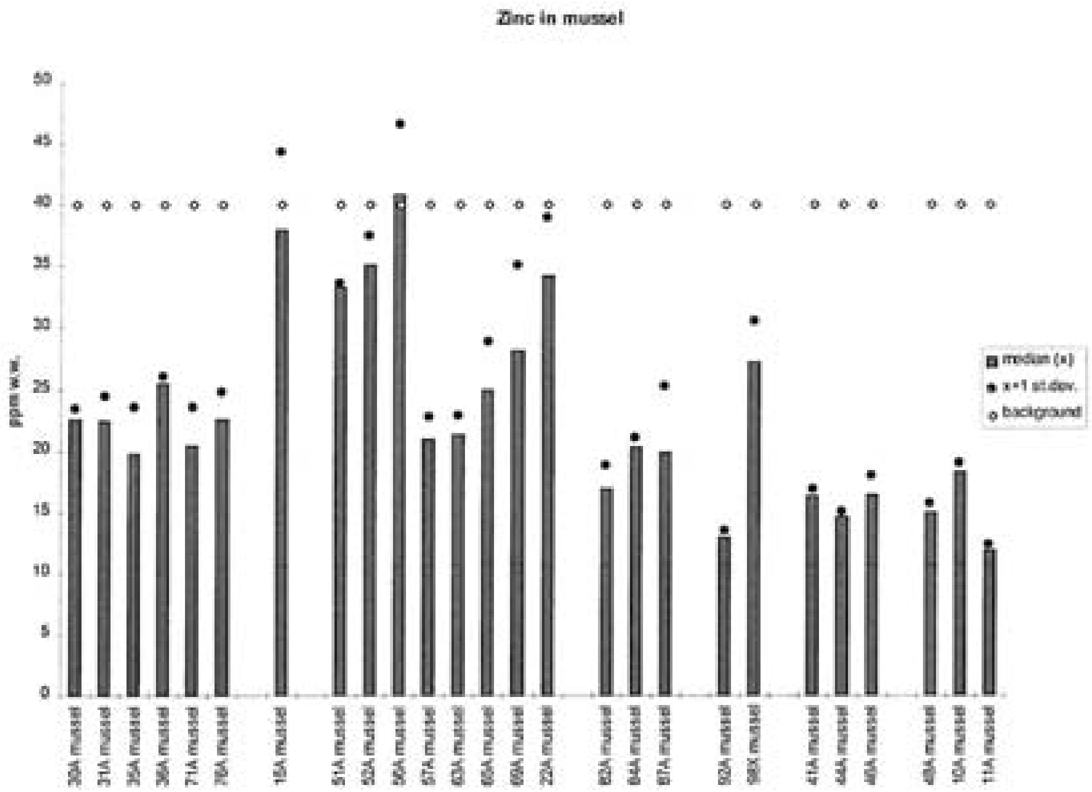


Figure 34. Median, standard deviation and provisional "high background" concentration for lead in fish liver 1996 (**A**) and 1997 (**B**), ppm wet weight (see maps in Figure 1-Figure 4).

A



B

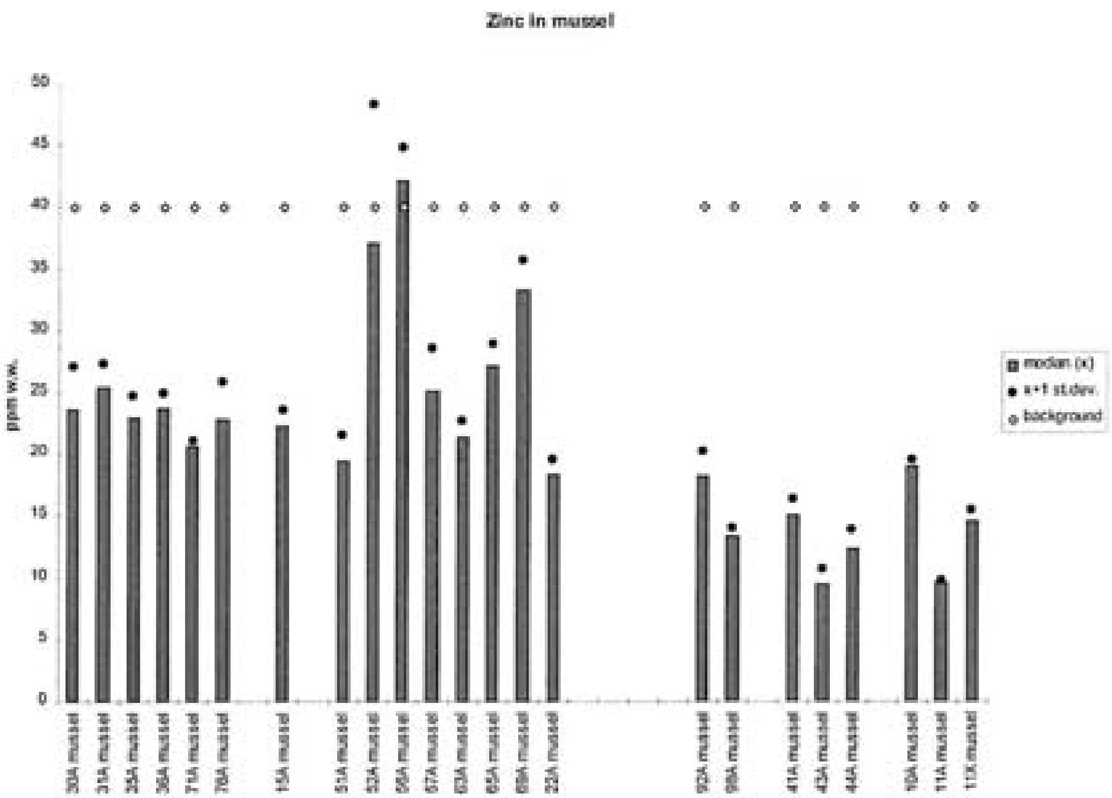
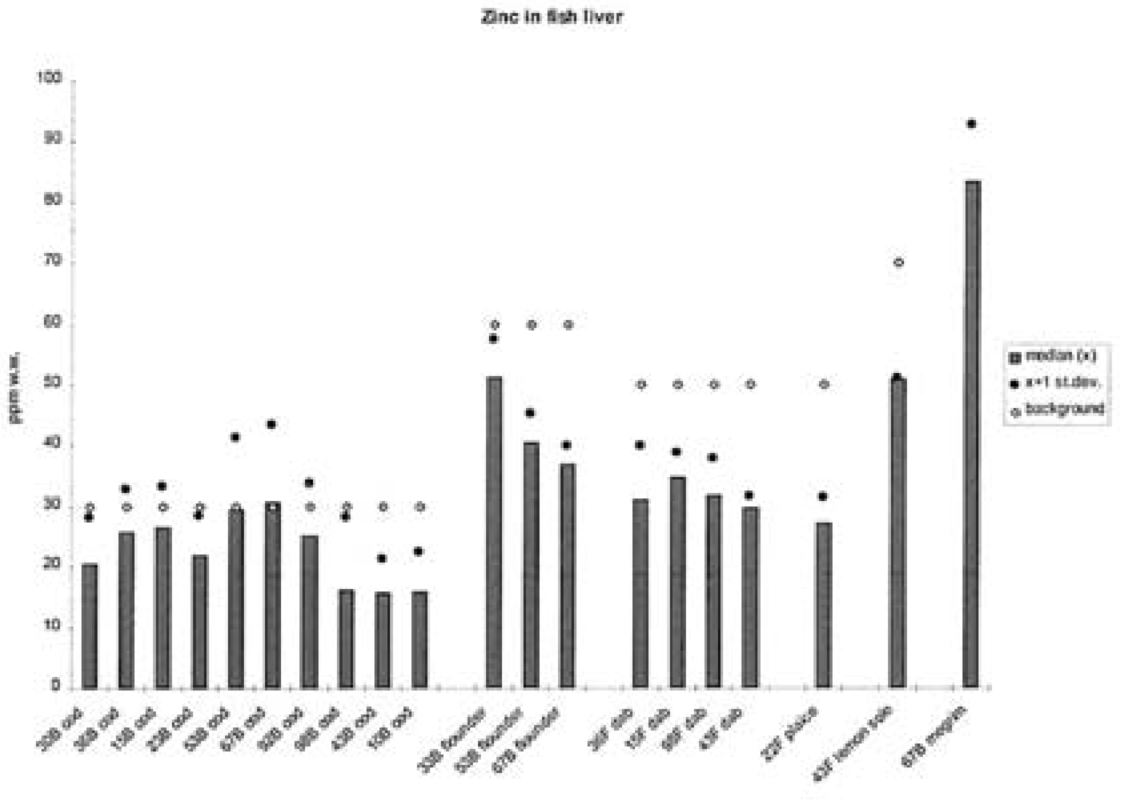


Figure 35. Median, standard deviation and provisional "high background" concentration for zinc in mussels (*Mytilus edulis*) 1996 (**A**) and 1997 (**B**), ppm wet weight (see maps in Figure 1-Figure 4).

A



B

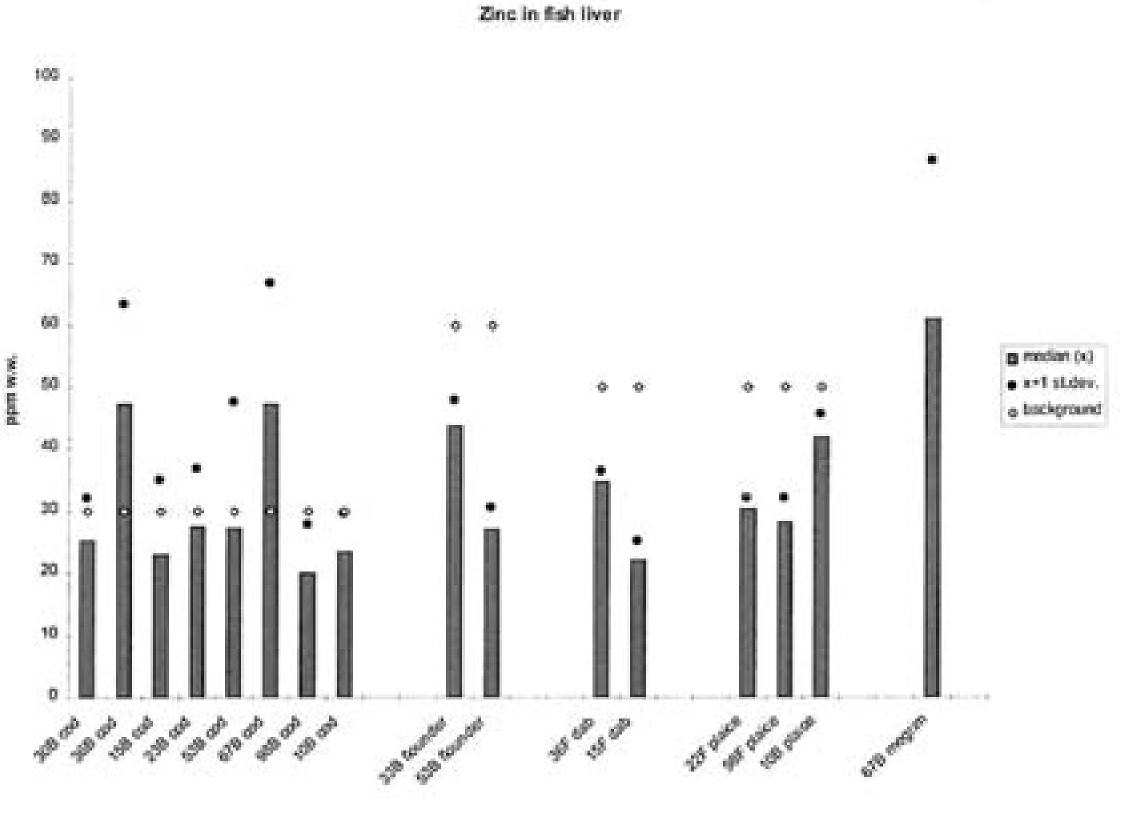


Figure 36. Median, standard deviation and provisional "high background" concentration for zinc in fish liver 1996 (**A**) and 1997 (**B**), ppm wet weight (see maps in Figure 1-Figure 4).

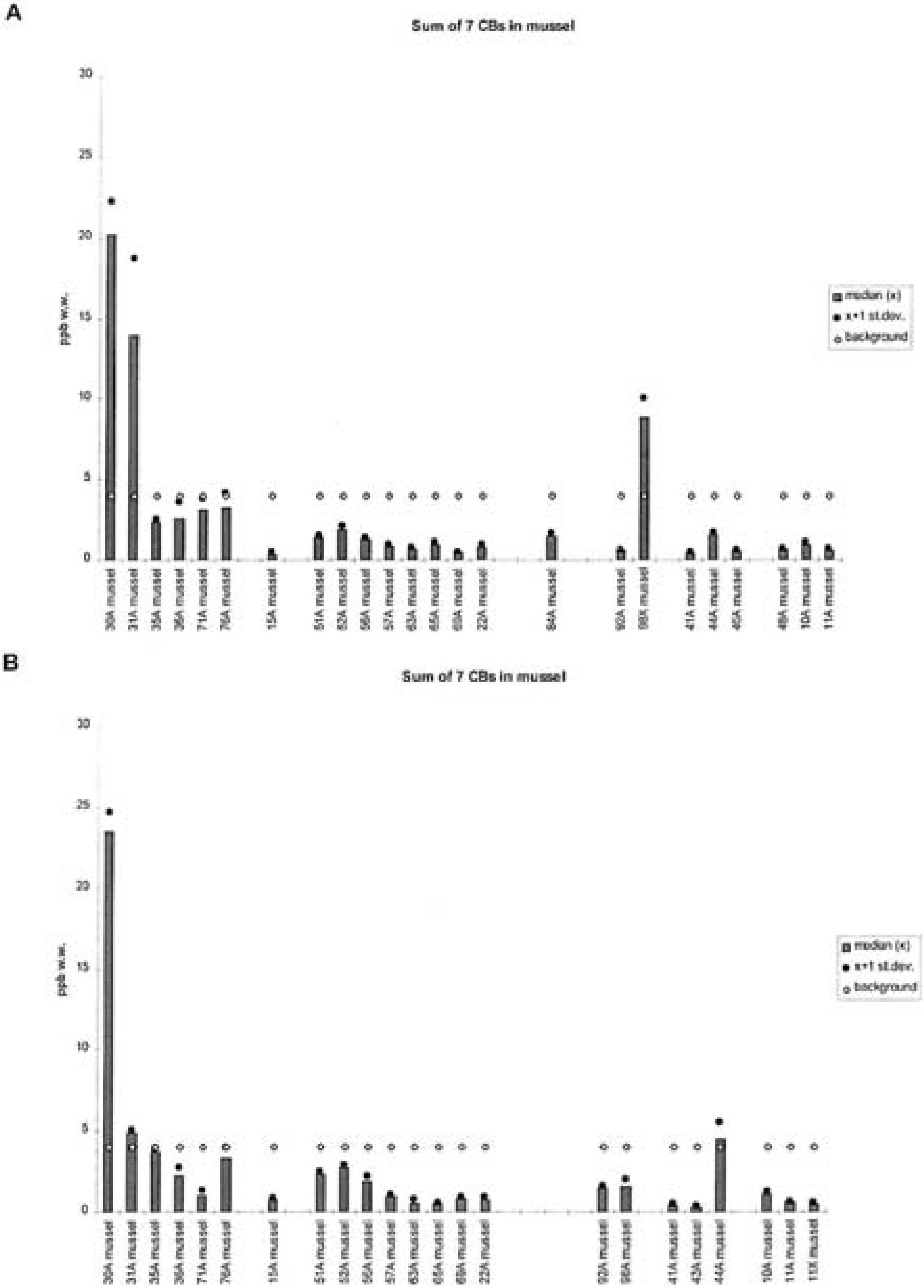
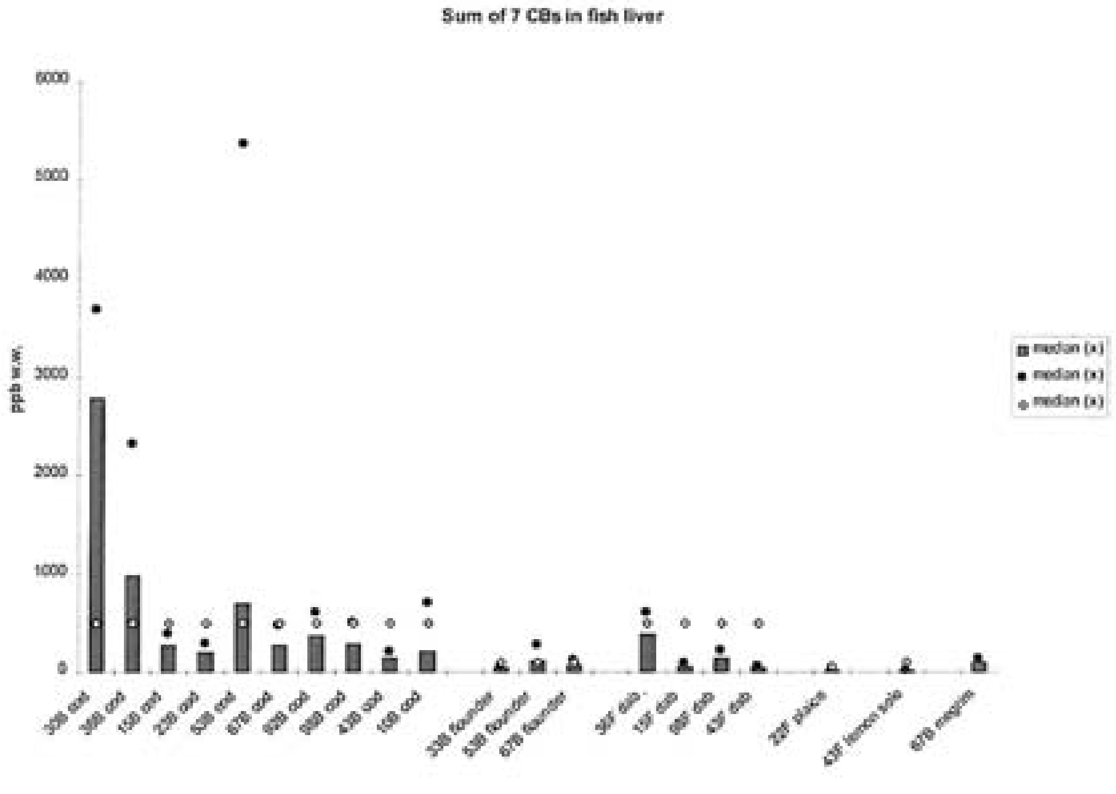


Figure 37. Median, standard deviation and provisional "high background" concentration for sum of 7 PCBs (CB-28, -52, 101, -118, -138, -153 and -180) in mussels (*Mytilus edulis*) 1996 (**A**) and 1997 (**B**), ppb wet weight (see maps in Figure 1-Figure 4).

A



B

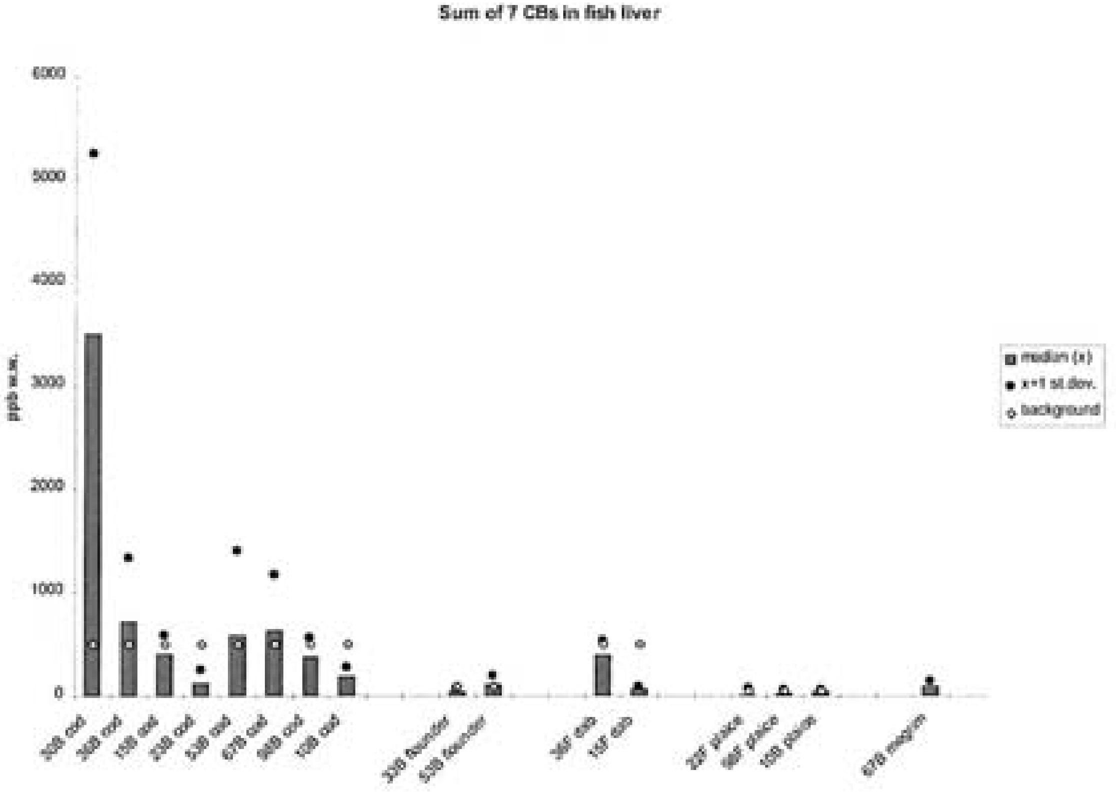
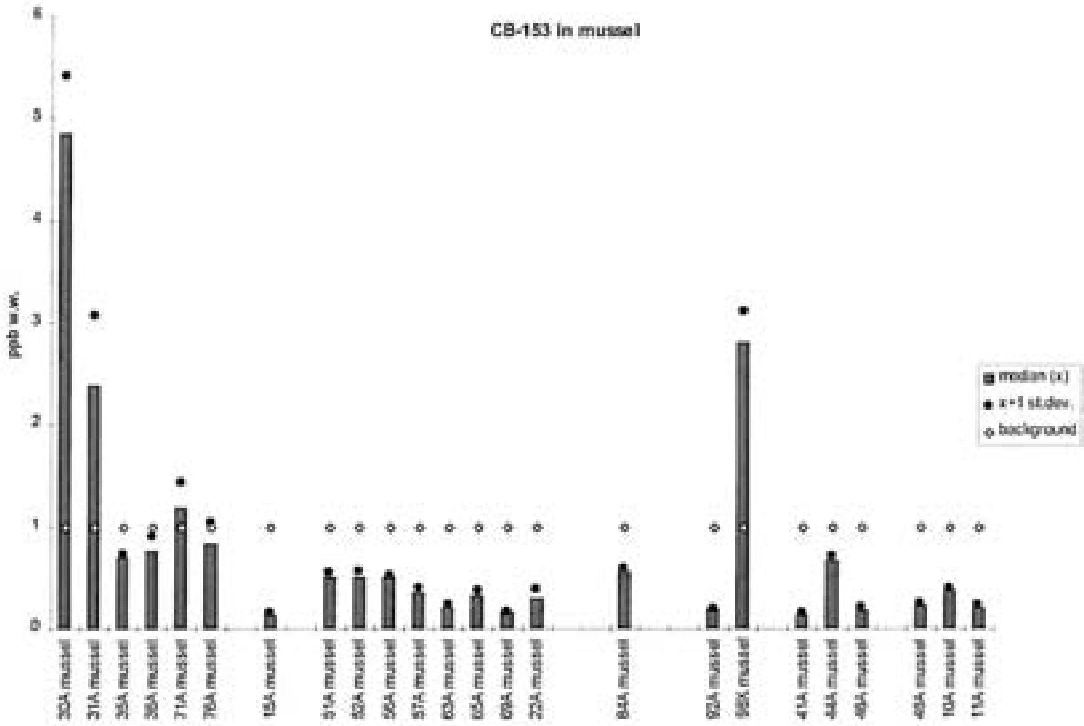


Figure 38. Median, standard deviation and provisional "high background" concentration for sum of 7 PCBs (CB-28, -52, 101, -118, -138, -153 and -180) in fish liver 1996 (**A**) and 1997 (**B**), ppb wet weight (see maps in Figure 1-Figure 4).

A



B

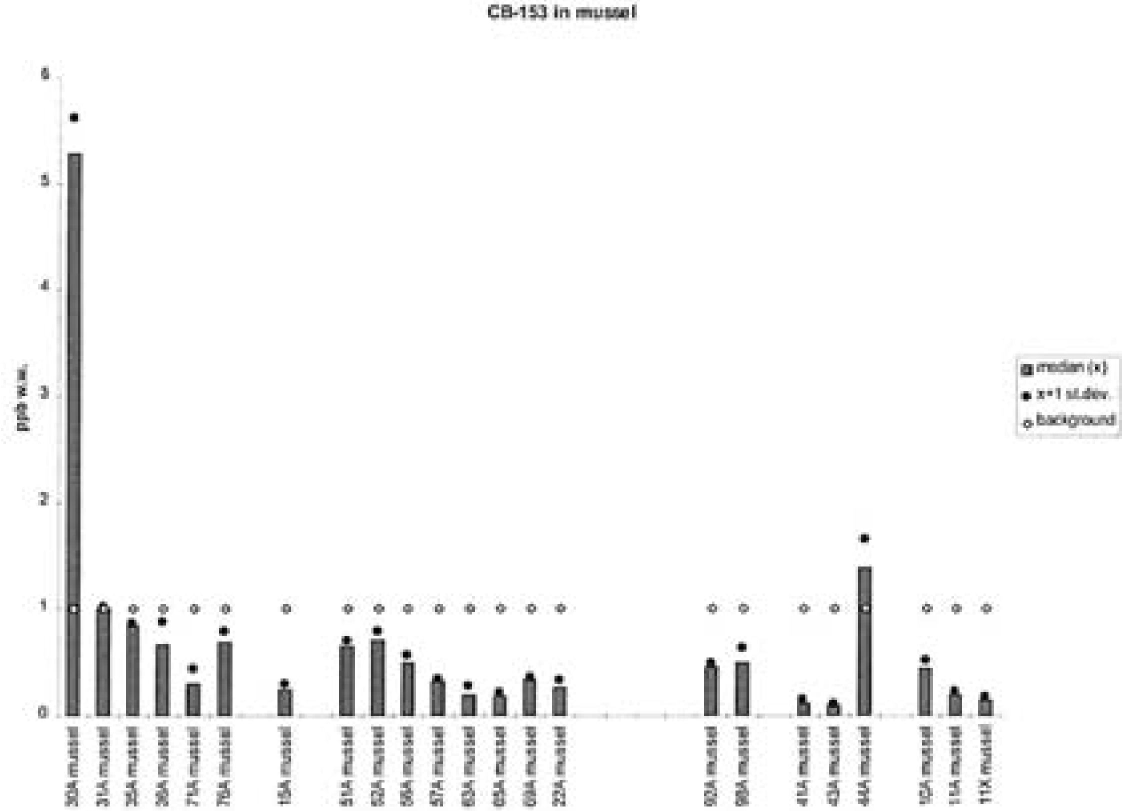
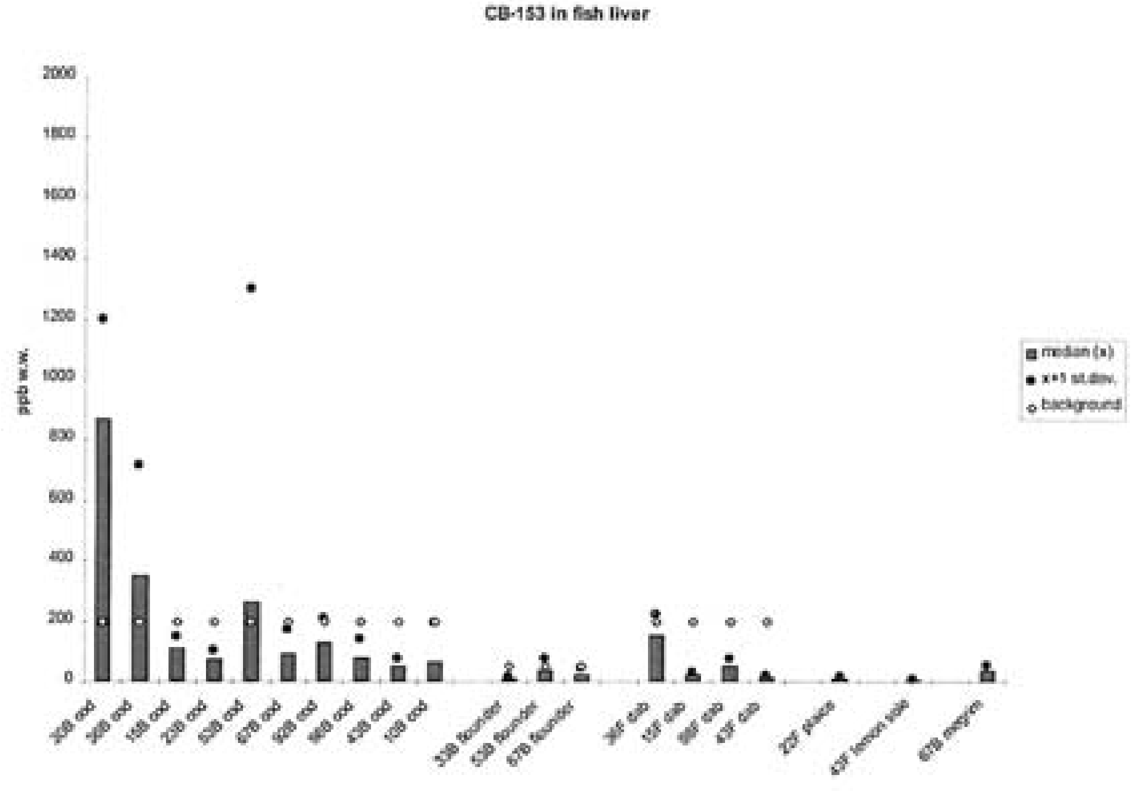


Figure 39. Median, standard deviation and provisional "high background" concentration for CB-153 in mussels (*Mytilus edulis*) 1996 (**A**) and 1997 (**B**), ppb wet weight (see maps in Figure 1-Figure 4).

A



B

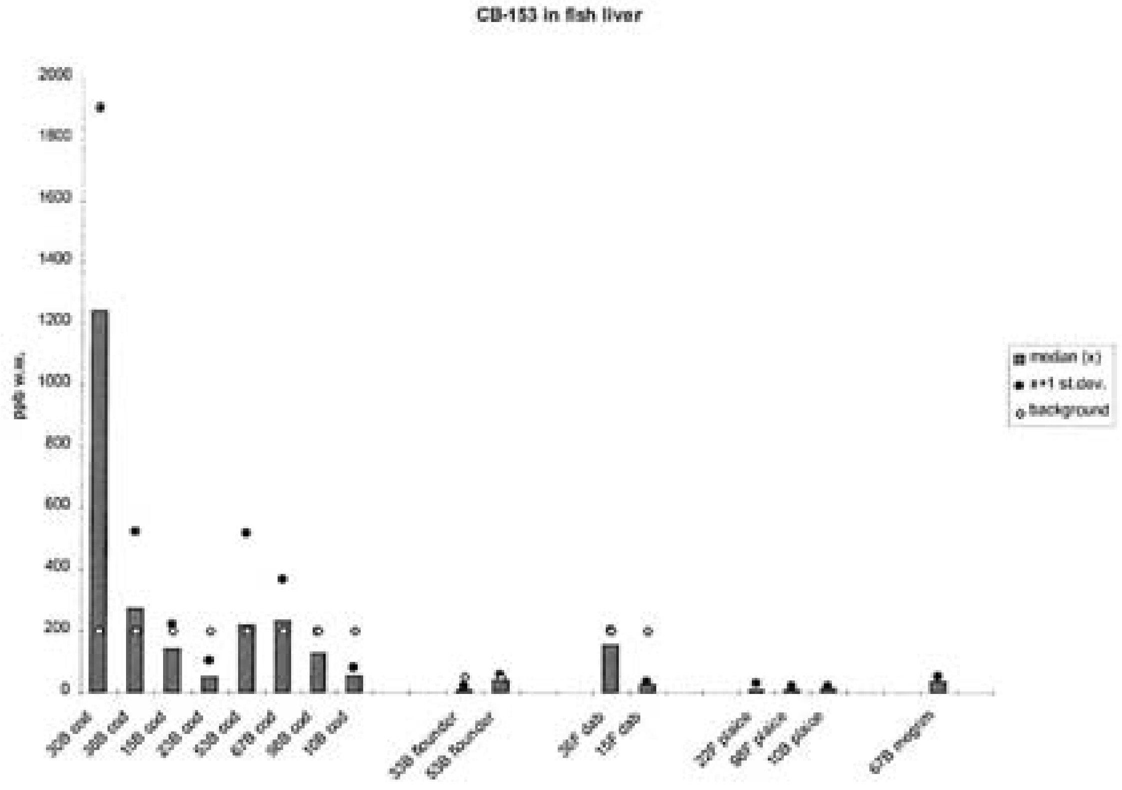
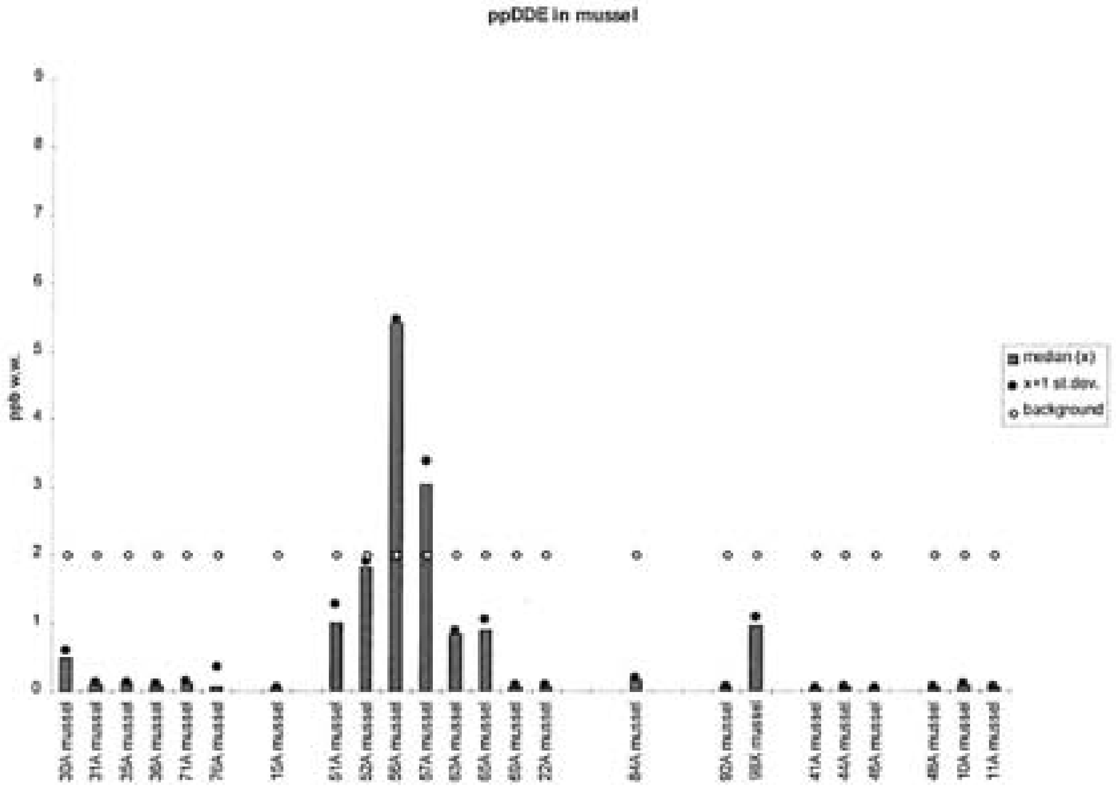


Figure 40. Median, standard deviation and provisional "high background" concentration for CB-153 in fish liver 1996 (**A**) and 1997 (**B**), ppb wet weight (see maps in Figure 1-Figure 4).

A



B

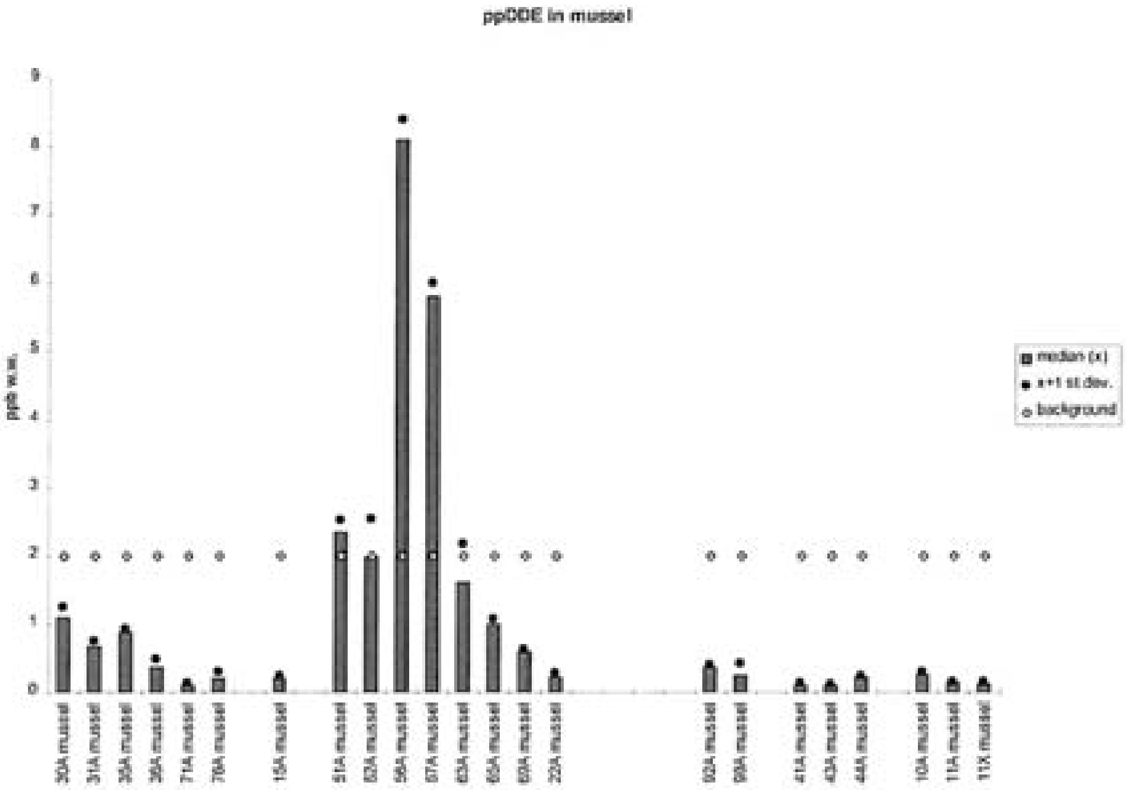


Figure 41. Median, standard deviation and provisional "high background" concentration for ppDDE (DDEPP) in mussels (*Mytilus edulis*) 1996 (**A**) and 1997 (**B**), ppb wet weight (see maps in Figure 1-Figure 4). (See also footnote in Table 6.)

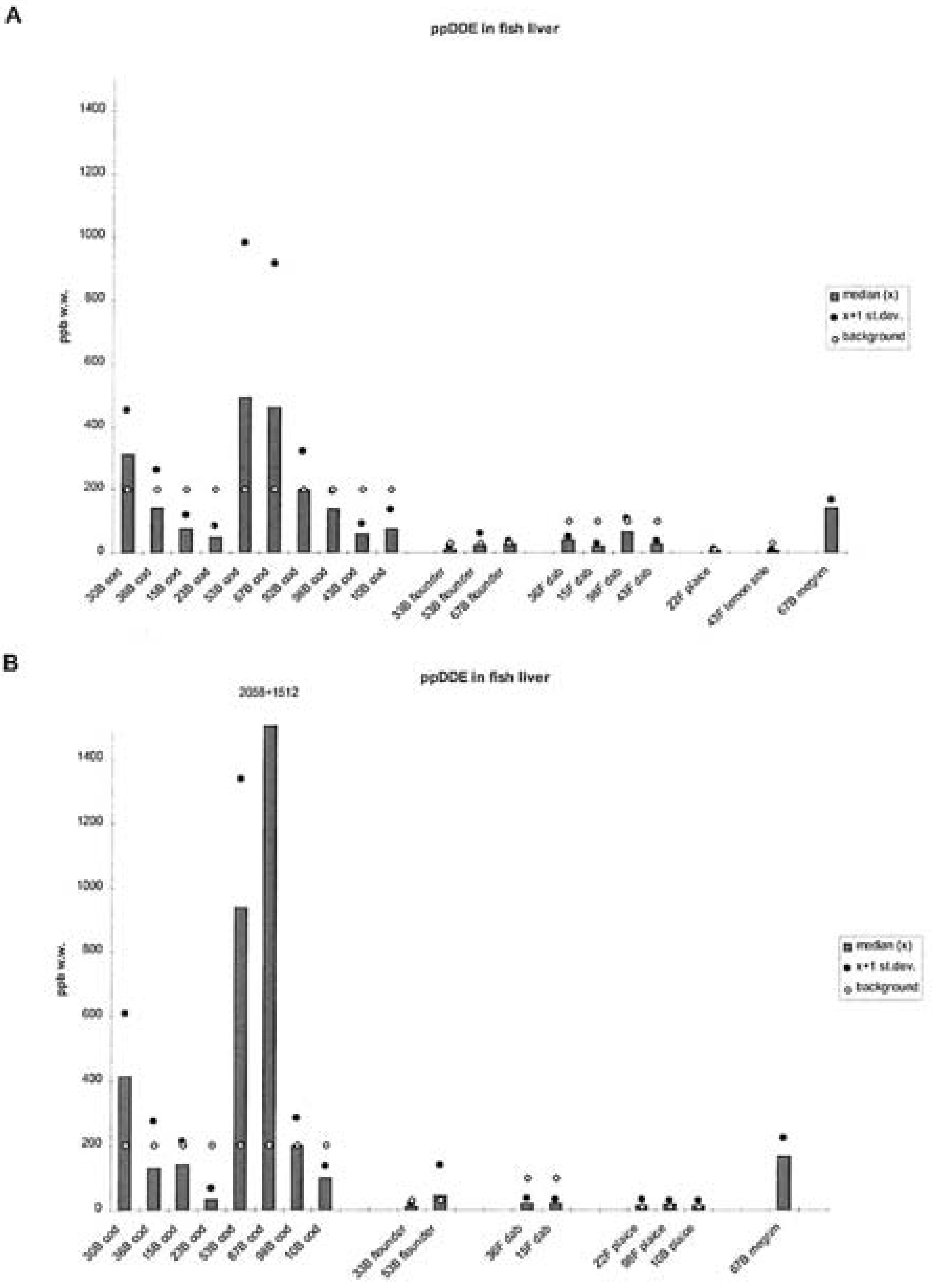
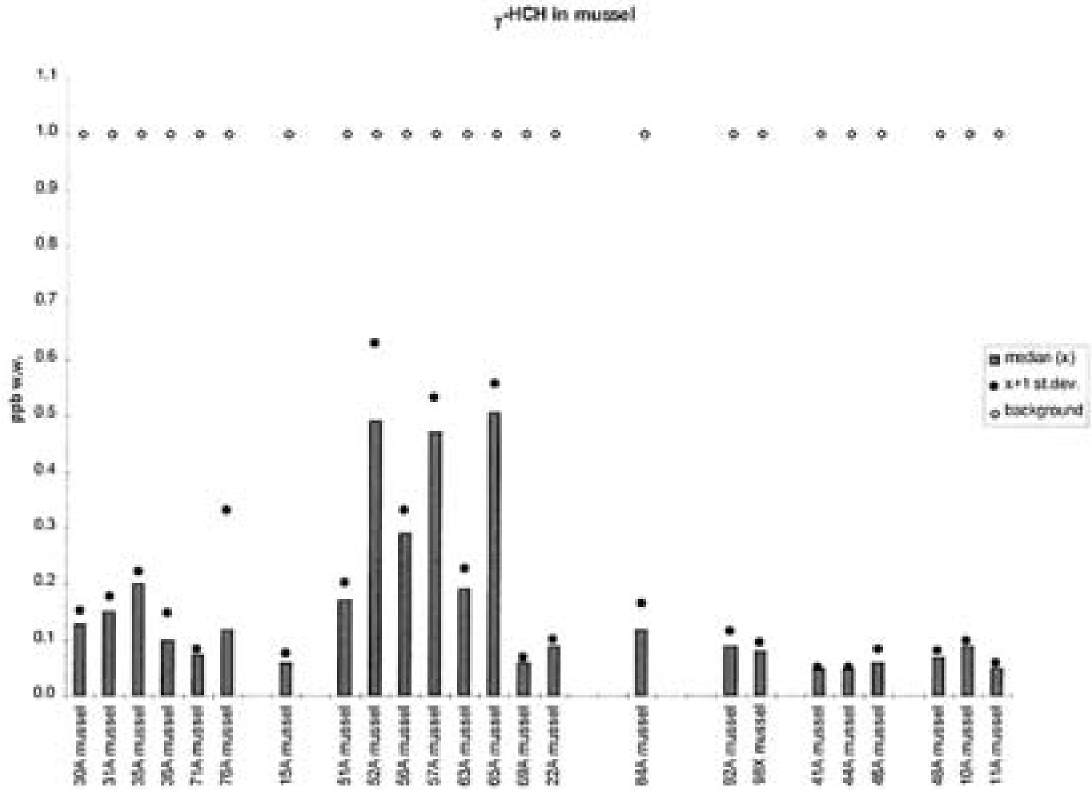


Figure 42. Median, standard deviation and provisional "high background" concentration for ppDDE (DDEPP) in fish liver 1996 (**A**) and 1997 (**B**), ppb wet weight (see maps in Figure 1-Figure 4). (See also footnote in Table 6.)

A



B

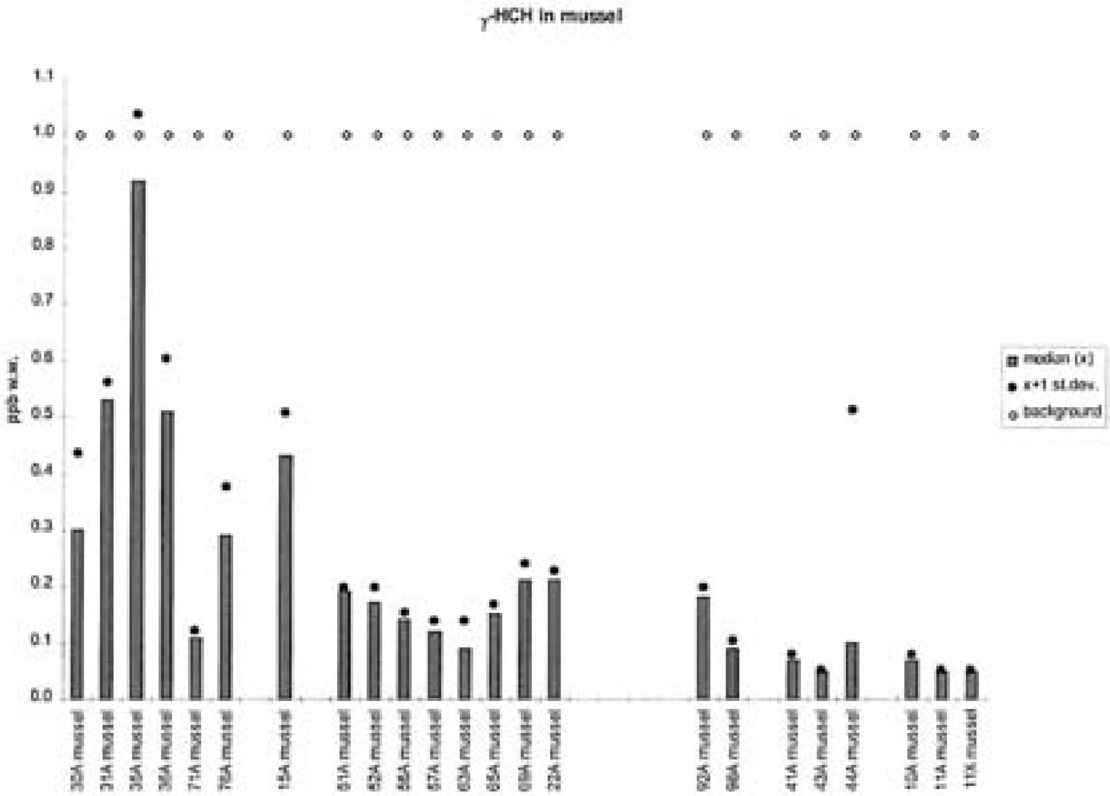
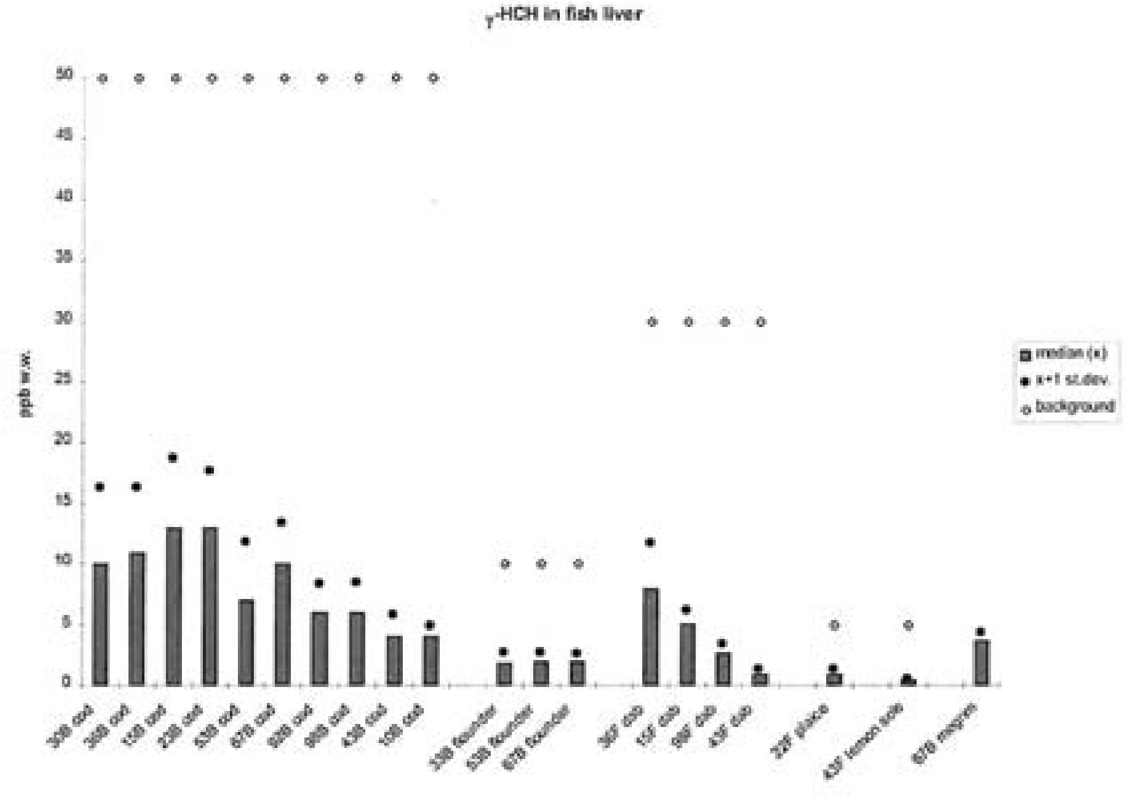


Figure 43. Median, standard deviation and provisional "high background" concentration for γ-HCH (Lindan) in mussels (*Mytilus edulis*) 1996 (**A**) and 1997 (**B**), ppb wet weight (see maps in Figure 1-Figure 4). (See also footnote in Table 6.)

A



B

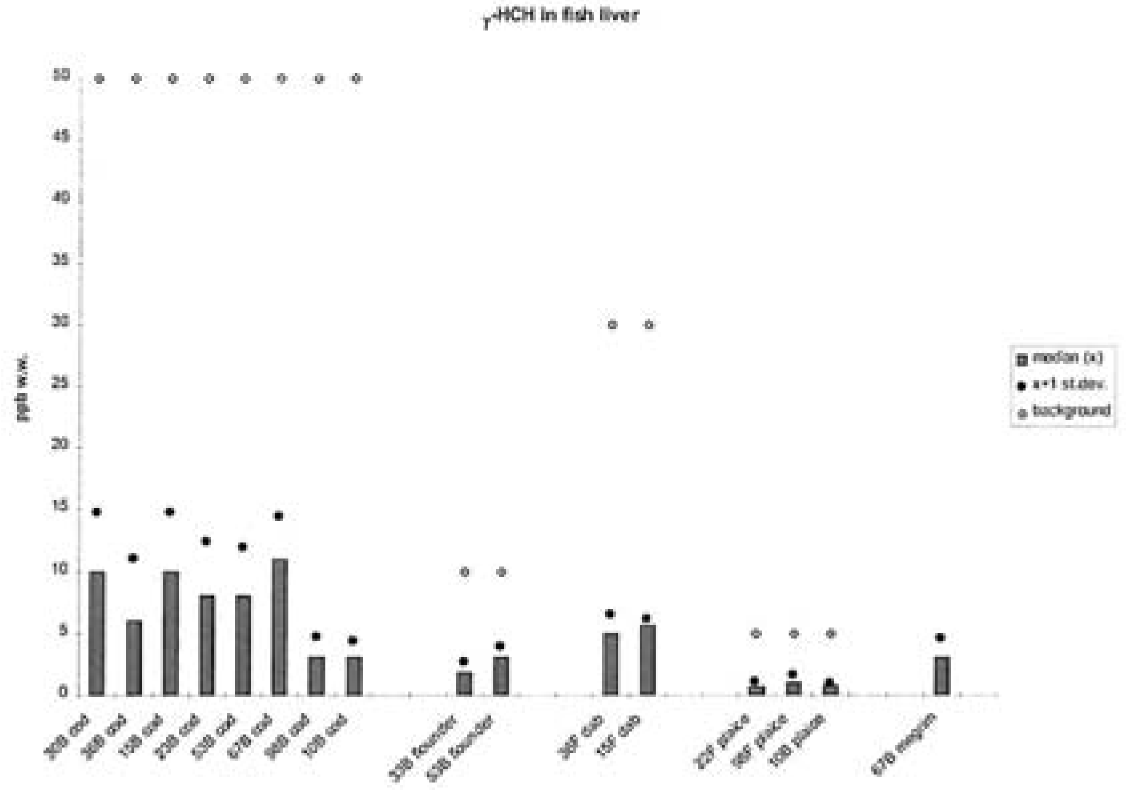
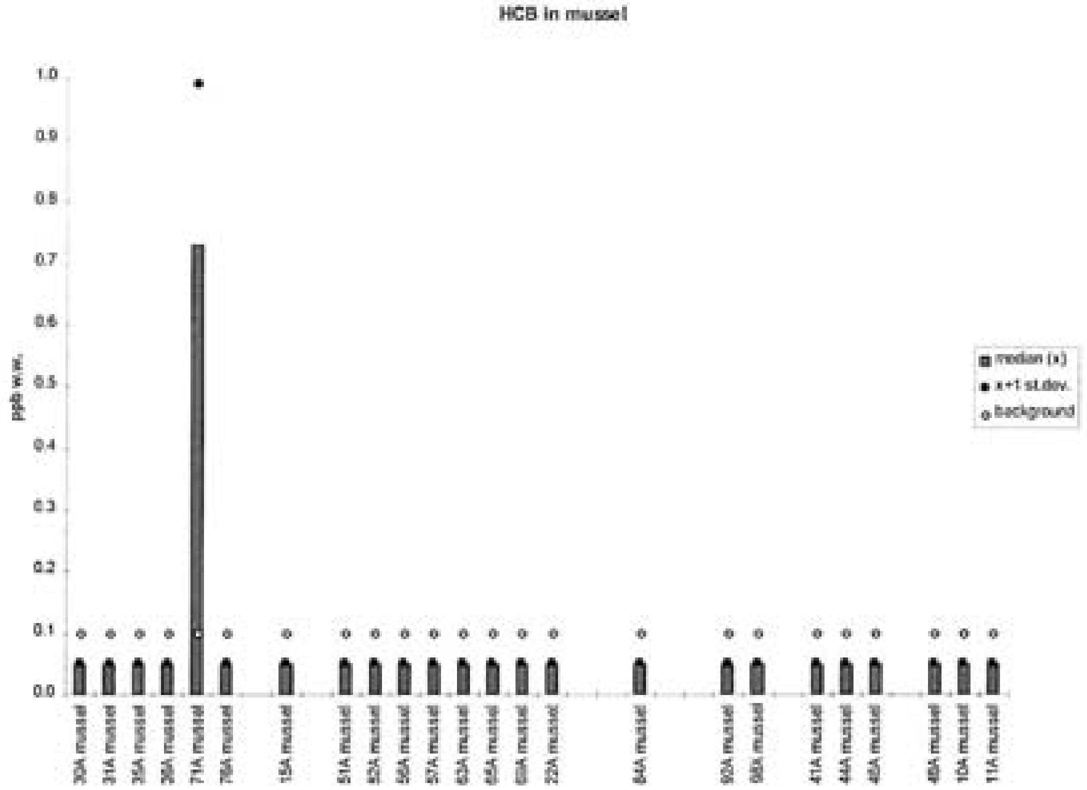


Figure 44. Median, standard deviation and provisional "high background" concentration for γ-HCH (Lindan) in fish liver 1996 (**A**) and 1997 (**B**), ppb wet weight (see maps in Figure 1-Figure 4). (See also footnote in Table 6.)

A



B

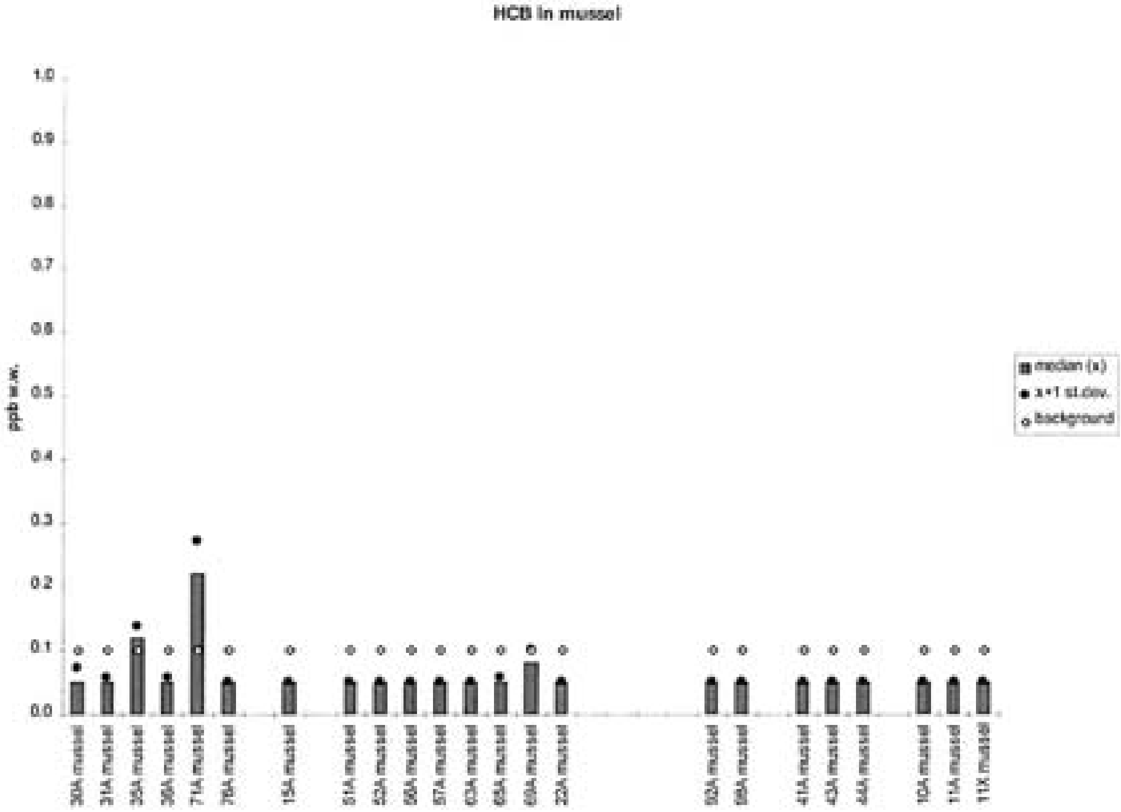


Figure 45. Median, standard deviation and provisional "high background" concentration for HCB in mussels (*Mytilus edulis*) 1996 (**A**) and 1997 (**B**), ppb wet weight (see maps in Figure 1-Figure 4).

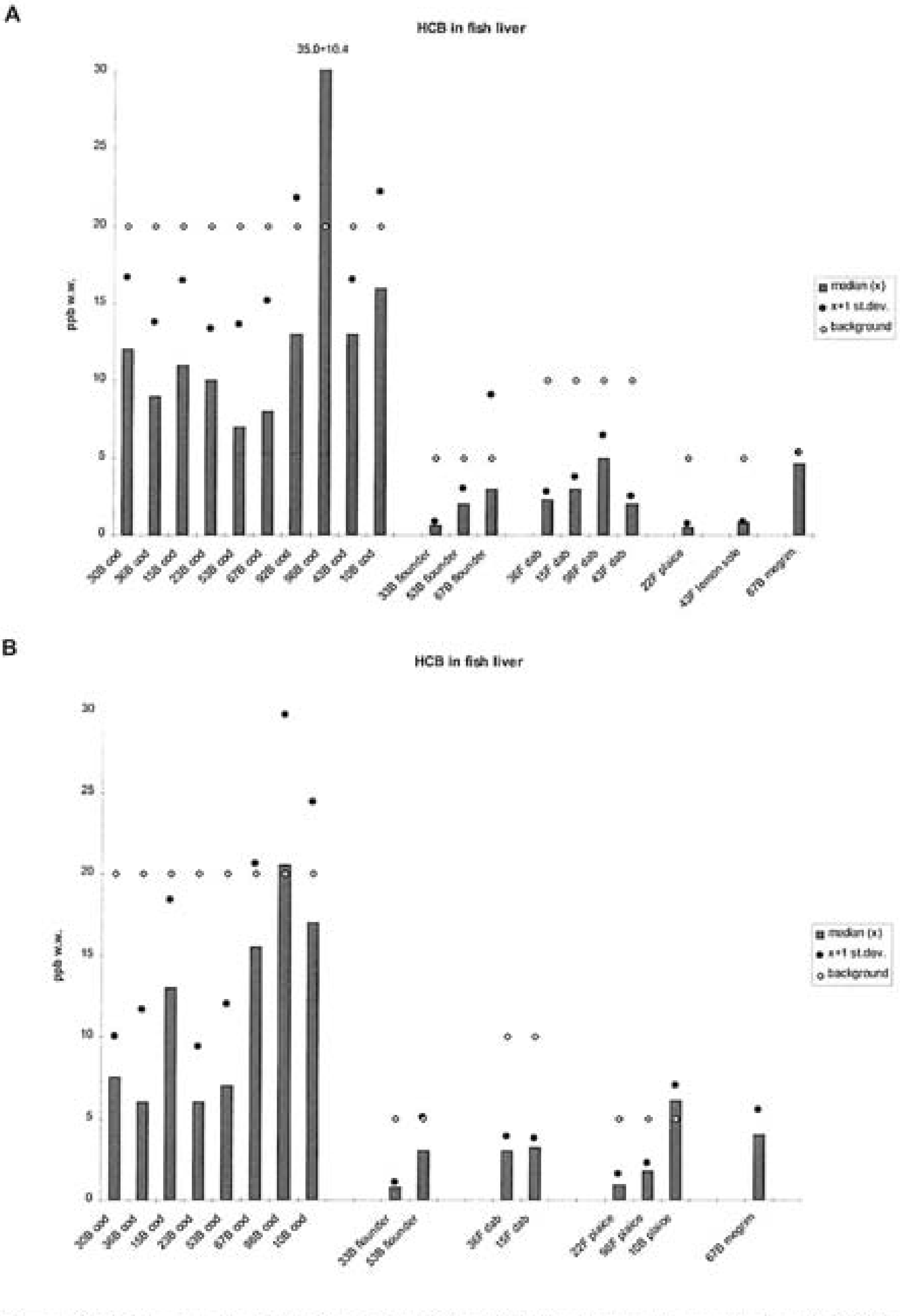


Figure 46. Median, standard deviation and provisional "high background" concentration for HCB in fish liver 1996 (**A**) and 1997 (**B**), ppb wet weight (see maps in Figure 1-Figure 4).

Appendix I.
Results from INDEX determinations 1995-96

Introduction

The Norwegian Pollution Control Authority (SFT) is interested in obtaining a small group of indices to assess the quality of the environment with respect to contaminants. The target medium for both indices may vary depending on the purpose, however sediment, cod and mussels are considered to be the most likely choices. Blue mussels were selected for this investigation (Appendix II).

Two indexes are calculated. One index is based on the contaminant concentrations in the blue mussel collected annually from 9 of the more contaminated fjords in Norway (Walday *et al.* 1995), herein designated "Pollution Index". This index was initiated in 1995. Initially there were 11 fjords but sampling from Orkdalsfjord and Iddefjord was discontinued in 1997. It was practical to organise sampling within JAMP. Some JAMP results could be used to calculate the index value.

In addition, a "Reference Index" was initiated in 1995 based on annual contaminant concentrations in the blue mussel. The mussels were collect at JAMP stations along the entire coast where there is presumably low levels of contamination. The importance of "reference" stations for monitoring of contaminants has been discussed earlier (cf., Green 1987). One of the main reasons for this work is to establish points of reference for contaminated fjords. In the OSPAR context this might be useful criteria for assessing Areas of Special Concern (JMG 1992).

Calculation of the index

A detailed discussion of calculation of the Pollution Index has been given earlier (cf. Walday *et al.* 1995) and only a brief summary will be given here. The relevant contaminants for each of the Pollution Index fjords are summarised in Appendices I2 and I3. Their selection is based on earlier investigations. Two to five stations were sampled from each area. Three parallels of 20 individuals from 3-5cm are collected from each station. Each sample was analysed for the contaminants according to the scheme in Appendix I3. "Dioxins" were only investigated in 1995-96.

One to three stations were sampled from selected areas for the determination of the Reference Index. Each station included three parallels which were analysed for the usual JAMP contaminants (cf., analysis code A, Appendix I3). Some samples were also analysed for PAHs and dioxins.

Mussel sampling differed in that: a) stations that were exclusively to be used for index calculations and b) those included in the JAMP for 1995-97 in that the former allowed a greater size range and that the mussels were not depurated.

The maximum median for each contaminant for all the stations in an area was determined. These concentrations were classified according to SFT's classification system for contaminants in the marine environment (Appendix I4). The highest class found for any contaminant measured in an area determined the index value for that area.

The SFT Classes are roughly based on the provisional "high background" levels. This system has been recently revised (Molvær *et al.* 1997); where among other changes the sum of CB-28, -52, -101, -118, -138, -153, and -180 (CBΣΣe) is now a distinct parameter for classification. The sum of all PAHs (including the dicyclic) (PAHΣΣ) was compared to the system's "sum-PAH". "Dioxins" were assessed based on toxicity equivalency factors (TEQ) according to a Nordic model (Ahlborg 1989). Note that EPOCl is considered a relevant contaminant for one area but is not included in the part of the classification system based on levels in mussels. Likewise, there are contaminants which are included in the classification system but have not been measured in any area.

The maximum class found for any contaminant determined the Class (I-V) of the area. The average Class for all the contaminated sub areas and all the reference localities determined the Pollution or Reference Index, respectively. The lowest Index value is 1 and means that all median values were in Class I ("Good"). The highest Index value is 5 and means that all median values were in Class V ("Very bad").

Conclusion from application of the indices

To compare the 1997 results with previous years the calculations were be done on a common basis with respect to areas and contaminants. Only 8 fjord areas are now used to calculate the Pollution Index compared to 11 for 1995-96. Byfjord in Bergen can be included for future calculations pending reanalyses of stored material from 1995-96. No special considerations were made when stations were not sampled. This occured twice for the Pollution Index (st.I205 Bølsnes from Saudafjord 1996 and st.I911 Horvika in the Sunndalsfjord). The Pollution Index for 1997 is 3.3 (Table 8, Appendix I5). A value between 3 and 4 would be classified by the SFT system as "Bad".

Only 6 fjords/areas were used for the Reference Index for 1997 compared to 8 for 1995-96 (Table 9, Appendix I6). The value for 1997 is 1.3 and lower than the results for 1995-96. A value between 1 and 2 would classified as "Fair".

Table 8. Maximum environmental classification for fjords selected for Pollution INDEX. (See text and Appendix I5).

Index Area 1)	1995	1996	1997 2)
Hvaler/Singlefjord	2	2	2
Iddefjord			
Inner Oslofjord	3	3	4
Frierfjord	3	4	3
Inner Kristiansandsfjord	5	5	5
Saudafjord	4	5	5
Sørfjorden	5	4	3
Byfjorden, Bergen 3)			(3)
Sunndalsfjord	3	3	2
Orkdalsfjord			
Inner Ranfjord	5	3	2
AVERAGE (Pollution INDEX)	**3.8**	**3.6**	**3.3**

1) Iddefjord and Orkdalsfjord was not sampled in 1997, hence the index 1995-96 excludes these fjords

2) Copper, zinc and TCDDN excluded in 1997, hence index for 1995-96 excludes these contaminants

3) PAH (PAHΣΣ and BAP) excluded in 1997, hence index for 1995-96 excludes these contaminants. NOTE: PCB (DDTΣ, HCB, HCHΣΣ and CBΣΣ) analysed in 1997 but not included in calculation of index. There are plans to analyse PCB on stored samples from 1995 and 1996 so that the index can be recalculated for the period 1995-97

Table 9. Maximum environmental classification for fjords selected for Reference INDEX. (See text and Appendix I6).

Index Area	1995	1996	1997
Mid and outer Oslofjord 1)	2	2	2
Lista	1	1	1
Bømlo-Sotra	1	1	1
Outer Ranfjord, Helgeland 2)	(1)	(1)	-
Lofoten 3)	(2)	(2)	(1)
Finnsnes-Skjervøy	2	1	1
Hammerfest-Honningsvåg	2	2	2
Varanger Peninsula	1	2	1
AVERAGE (Reference INDEX)	**2.0**	**1.5**	**1.3**

1) Inclusion of results for arenic, nikkel and silver in 1996 (see Appendix I6) did not effect the classification

2) Outer Ranfjord was not sampled in 1997, hence the index for 1995-96 did not take these results into account

3) Inconsistancy in sampling site, st.98X in 1995-96 and st.98A in 1997, hence, results from Lofoten excluded

Appendix I1.
INDEX - Stations and programme 1995-97

Appendix I1. INDEX station positions and sampling overview for blue mussels 1995-97, where P = "Pollution Index" and R = "Reference Index" (contaminated and assumed "background" stations, respectively). Mussels were sampled from rock surfaces unless otherwise noted. See Walday *et al.* (1995) for discussion of station selection and analyses.

Station		Locality name	North latitude	East longitude	ICES position	INDEX type P/R	notes
HVALER/SINGLEFJORDEN, east of outer OSLOFJORD							
	I021	Kjøkø, south	59°07.8'	10°57.1'	47G13	P	
	I024	Kirkø, north west	59°04.9'	10°59.2'	47G09	P	
	I022	West Damholmen	59°06.2'	10°57.9'	47G09	P	
	I023	Kirkø, north west	59°05.7'	11°08.2'	47G09	P	
IDDEFJORD, east of outer OSLOFJORD							
	I001	Sponvikskansen	59°05.4'	11°12.5'	47G09	P	
	I011	Kråkenebbet	59°06.1'	11°17.3'	47G09	P	
INNER OSLOFJORD							
JAMP	30A	Gressholmen	59°52.5'	10°43.0'	48G07	P	
	I301	Akershuskaia	59°54.2'	10°45.5'	48G07	P	
	I304	Gåsøya	59°51.0'	10°35.5'	48G04	P	
	I307	Ramtonholmen	59°44.7'	10°31.4'	48G05	P	
	I306	Håøya	59°24.7'	10°33.4'	48G04	P	
MID and OUTER OSLOFJORD							
JAMP	31A	Solbergstrand	59°36.9'	10°39.4'	48G06	R	
JAMP	35A	Mølen	59°29.2'	10°30.1'	47G04	R	
JAMP	36A	Færder	59°01.6'	10°31.7'	47G06	R	
FRIERFJORD AREA, west of outer Oslofjord							
	I711	Steinholmen	59°31.7'	09°40.7'	48F99	P	
	I712	Gjermundsholmen	59°21.7'	09°42.6'	47F99	P	
JAMP	71A	Bjørkøya (Risøyodden)	59°01.4'	09°45.4'	47F99	P	
INNER KRISTIANSANDSFJORD							
	I132	Fiskåtangen	57°07.7'	07°59.2'	43F79	P	
	I133	Odderø, west	57°07.9'	08°00.3'	43F83	P	
LISTA AREA							
JAMP	15A	Gåsøy (Ullerø area)	58°03.1'	06°53.3'	45F69	R	
	I131	Lastad	58°03.3'	07°42.4'	45F79	R	
SAUDAFJORD							
	I201	Ekkjegrunn (G1)	59°38.7'	06°21.4'	48F66	P	
**	I205	Bølsnes (G5)	59°35.5'	06°18.3'	48F63	P	
BØMLO AREA							
JAMP	22A	Espevær, west	59°35.2'	05°58.5'	48F59	R	C, 1
SØRFJORD							
*	51A	Byrkjenes	60°05.1'	06°33.1'	49F66	P	
JAMP	52A	Eitrheimsneset	60°05.8'	06°32.2'	49F66	P	3

Appendix I1 (cont'd)

Station		Locality name	North latitude	East longitude	ICES position	INDEX type P/R	notes
BYFJORDEN, Bergen							
	I242	Valheimneset	60°23.7'	05°16.1'	49F51	P	
	I241	Nordnes	60°24.1'	05°18.2'	49F51	P	
	I243	Hagreneset	60°24.9'	05°18.3'	49F51	P	
SUNNDALSFJORDen							
	I912	Honnhammer	62°51.2'	08°09.7'	54F81	P	
	I911	Horvika	62°44.1'	08°31.4'	54F85	P	
[TRONDHEIM AREA - not related to INDEX investigation]							
*	80A	Østmerknes	63°27.5'	10°27.5'	56G04	P	
ORKDALSFJORD AREA, supplementary area (cf. Walday *et al.* 1995)							
JAMP	82A	Flakk	63°27.1'	10°12.6'	56G01	P	
JAMP	84A	Trossavika	63°20.8'	09°57.8'	55F97	P	
JAMP	87A	Ingdalsbukt	63°27.8'	09°54.8'	55F97	P	
INNER RANFJORD							
	I969	Bjørnbærviken (B9)	66°16.8'	14°02.1'	61G42	P	
	I962	Koksverkkaien (B2)	66°19.4'	14°08.0'	61G42	P	3
OUTER RANFJORD, Helgeland area							
*	96A	Breiviken	66°17.6'	12°50.5'	61G28	R	1
LOFOTEN AREA							
JAMP	98A	Husvågen (1997)	68°15.4'	14°40.6'	65G46	R	5
FINNSNES-SKJERVØY AREA							
JAMP	41A	Fensneset, Grytøya	68°56.9'	16°38.5'	66G64	R	3
HAMMERFEST-HONNINGSVÅG AREA							
JAMP	44A	Elenheimsundet	70°30.8'	22°14.8'	70H23	R	1, 6
JAMP	46A	Smineset in Altesula	70°58.4'	25°48.1'	70H57	R	3, 6
VARANGER PENINSULA AREA							
JAMP	48A	Trollfjorden i Tanafjord	70°41.6'	28°33.3'	70H85	R	
JAMP	10A	Skagoodden	70°04.2'	30°09.8'	69J03	R	2
JAMP	11A	Sildkroneset, Bøkfjorden	69°47.0'	30°11.1'	68J02	R	

notes:

* - JAMP station but not sampled in accordance to JAMP guidelines, see appendix text.
** - Sufficient mussel-sample not found in 1996.
1 - mussels collected from buoy and/or buoy anchor lines
2 - mussels collected from sand/gravel bottom
3 - mussels collected from iron/cement pilings
4 - mussels collected from metal navigation buoys
5 - mussels collected from floating dock
6 - mussels collected from wooden docks

Appendix I2.
INDEX - Sampling and analyses for 1995-97

Appendix I2. Blue mussel samples used in INDEX 1995-97, where P = "Pollution Index" and R = "Reference Index" (contaminated and assumed "background" stations, respectively). + indicates JAMP sampling and analyses (i.e. equivalent to analysis code A). The number indicates the number samples analyzed. Codes for analysis (A, B etc.) are defined in Appendix I3. See Walday *et al.* (1995) for discussion of selection of stations and analyses.

JAMP st.	STATION	INDEX	ANALYSIS CODE +	A	B	C	D	E	F	G	H	I	J
	HVALER/SINGLEFJORD AREA												
021	Kjøkø, south	P		3									
024	Kirøy, north west	P		3									
022	West Damholmen	P		3									
023	Singlekalven, south	P		3									
	IDDEFJORD												
01A	Sponvikskansen	P			3								
011	Kråkenebbet	P			3								
	OSLOFJORD, inner												
30A	Gressholmen	P	+								3		1
301	Akershuskaia	P				3							
304	Gåsøya	P				3							
307	Ramtonholmen	P				3							
306	Håøya	P				3							
	OSLOFJORD, mid and outer												
31A	Solbergstrand	R	+										1
35A	Mølen	R	+										
36A	Færder	R	+										2*
	FRIERFJORD AREA, west of outer Oslofjord												
711	Steinholmen	P					3						1
712	Gjermundsholmen	P					3						1
71A	Bjørkøya	P	+										1
	INNER KRISTRIANSANDSFJORD												
132	Fiskåtangen	P						3					1
133	Odderø, west	P						3					1
	LISTA AREA												
15A	Gåsøya	R	+										1
131	Lastad	R				3.							
	SAUDAFJORD												
201	Ekkjegrunn (G1)	P							3				
205	Bølsnes (G5)	P							3				
	BØMLO-SOTRA AREA												
22A	Espevær, west	R	+										2*
	SØRFJORD												
51A	Byrkjeneset	P		3									
52A	Eirtrheimsneset	P	+										

*) indicates Toxaphene included

Appendix I2 (cont'd)

JAMP st.	STATION	INDEX	+	A	B	C	D	E	F	G	H	I	J
	BYFJORDEN, BERGEN												
242	Valheimsneset	P	.	.	.	.	.	.	.	3	.	.	.
241	Nordnes	P	.	.	.	.	.	.	.	3	.	.	.
243	Hagreneset	P	.	.	.	.	.	.	.	3	.	.	.
	SUNNDALSFJORD												
912	Honnhammer	P	.	.	.	.	.	.	.	.	3	.	.
911	Horvika	P	.	.	.	.	.	.	.	.	3	.	.
	[TRONDHEIM AREA - not related to index investigation]												
80A	Østmarknes	-	.	.	.	.	.	.	.	.	.	3	.
	ORKDALSFJORD AREA (not suggested in Walday *et al.* 1993)												
82A	Flakk	P	+	.	.	.	.	.	.	.	.	.	.
84A	Trossavika	P	+	.	.	.	.	.	.	.	.	.	.
87A	Ingdalsbukta	P	+	.	.	.	.	.	.	.	.	.	.
	INNER RANFJORD												
962	Koksverkkaien (B2)	P	.	.	.	.	.	.	.	.	.	3	.
969	Bjørnbærvikenn (B9)	P	.	.	.	.	.	.	.	.	.	3	.
	OUTER RANFJORD, HELGELAND AREA												
96A	Breivika, Tomma	R	.	3	.	.	.	.	.	.	.	.	.
	LOFOTEN AREA												
98A	Husvågen	R	+	.	.	.	.	.	.	.	.	.	1
	FINNSNES-SKJERVØY AREA												
41A	Fensneset, Grytøya	R	+	.	.	.	.	.	.	.	3	.	1
	HAMMERFEST-HONNINGSVÅG AREA												
44A	Elenheimsundet	R	+	.	.	.	.	.	.	.	3	.	2*
46A	Smineset in Altesula	R	+	.	.	.	.	.	.	.	3	.	1*
	VARANGER PENINSULA AREA												
48A	Trollfjorden i Tanafjord	R	+	.	.	.	.	.	.	.	3	.	.
10A	Skagoodden	R	+	.	.	.	.	.	.	.	3	.	1
11A	Sildkroneset	R	+	.	.	.	.	.	.	.	.	.	1

*) indicates Toxaphene included

Appendix I3.
INDEX - Key to analysis codes and sample counts

(Used in Appendix I2.)

ANALYSIS CODES[1] See Walday *et al.* (1995) for discussion of selection of analyses.

Contaminant	Analysis code									
	A	B	C	D	E	F	G	H	I	J
Lead	x	x	.	.	.	x	.	.	x	.
Cadmium	x	x	x	.	.	x	.	.	x	.
Copper [2])	x	x	x	.	.	.	.	.	.	.
Mercury	x	x	x	.	.	.	.	.	.	.
Zinc [2])	x	x	x	.	.	.	x	.	x	.
EPOCl	.	.	.	.	x	.	.	.	.	.
PAHs	.	.	x	.	x	x	x	x	x	.
PCBs	x	.	x	x	x	.	.	.	.	.
"Dioxin" [3])	.	.	.	.	.	.	.	.	.	x

[1]) Concerns MUSSEL 1 size group (3-5cm), 3 parallel samples each a bulk of 20 individuals (see text)
[2]) Concerns MUSSEL discontinued since 1996
[3]) Concerns MUSSEL discontinued since 1995

Appendix I4.
INDEX - SFT Environmental quality classes

(Molvær *et al.* 1997)

As	arsenic
Pb	lead
F	fluoride
Cd	cadmium
Cu	copper
Cr	chromium
Hg	mercury
Ni	nickel
Zn	zinc
Ag	silver
PAHΣΣ	total PAH including dicyclic *
BAP	benzo[*a*]pyrene
DDTΣΣ	DDTPP+DDEPP+TDEPP *
HCB	hexachlorobenzene
HCHΣΣ	HCHG+HCHA+HCHB *
CBΣΣe	sum of CB: 28+52+101+118+138+153+180 *
TCDDN	Sum of TCDD-toxicity equivalents *

*) See also Appendix B for definitions.

LIMIT-CHECK-file; **I:\TPX\JMG\LIM\NI970923.ISH** 15/10-97

CLASS-limits for **M Y T I E D U** (Mytilus edulis, GB: Blue mussel, N: Blåskjell).
Tissue : **WHOLE SOFT BODY.**

Limit Level=>		Class I		Class II		Class III		Class IV		Class V	
Basis =======> Param.	Unit	Wet weight	Dry weight	Wet weight	Dry weight	Wet weight	Dry weight	Wet weight	Dry weight	Wet weight	Dry weight
As	ppm	.	<10.0	.	<30.0	.	<100.0	.	<200.0	.	>=200.0
Pb	ppm	.	<3.0	.	<15.0	.	<40.0	.	<100.0	.	>=100.0
F	ppm	.	<15.0	.	<50.0	.	<150.0	.	<300.0	.	>=300.0
Cd	ppm	.	<2.0	.	<5.0	.	<20.0	.	<40.0	.	>=40.0
Cu	ppm	.	<10.0	.	<30.0	.	<100.0	.	<200.0	.	>=200.0
Cr	ppm	.	<3.0	.	<10.0	.	<30.0	.	<60.0	.	>=60.0
Hg	ppm	.	<0.2	.	<0.5	.	<1.5	.	<4.0	.	>=4.0
Ni	ppm	.	<5.0	.	<20.0	.	<50.0	.	<100.0	.	>=100.0
Zn	ppm	.	<200.0	.	<400.0	.	<1000.0	.	<2500.0	.	>=2500.0
Ag	ppm	.	<0.3	.	<1.0	.	<2.0	.	<5.0	.	>=5.0
PAHΣΣ	ppb	<50.0	.	<200.0	.	<2000.0	.	<5000.0	.	>=5000.0	.
BAP	ppb	<1.0	.	<3.0	.	<10.0	.	<30.0	.	>=30.0	.
DDTΣΣ	ppb	<2.0	.	<5.0	.	<10.0	.	<30.0	.	>=30.0	.
HCB	ppb	<0.1	.	<0.3	.	<1.0	.	<5.0	.	>=5.0	.
HCHΣΣ	ppb	<1.0	.	<3.0	.	<10.0	.	<30.0	.	>=30.0	.
CBΣΣe	ppb	<4.0	.	<15.0	.	<40.0	.	<100.0	.	>=100.0	.
TCDDN	ppp	<0.2	.	<0.5	.	<1.5	.	<3.0	.	>=3.0	.

Appendix I5.
INDEX - Summary table "Pollution index" 1995-1997

Max(Median). Statistics om ALL AREAs: (n = INDEX-Stations measured, N = Station programmed for INDEX)

INDEX.AreaNames (PollutionAreas) 1995	n	N	AS ppm d.wt	Pb ppm w.wt	F ppm d.wt	CD ppm w.wt	CU ppm d.wt	CR ppm d.wt	HG ppm w.wt	NI ppm d.wt	ZN ppm d.wt	AG ppm d.wt	PAHΣΣ ppb w.wt	BAP ppb w.wt	DDTΣΣ ppb w.wt	HCB ppb w.wt	HCHΣΣ ppb w.wt	CBΣΣe ppb w.wt	TCDDN ppp w.wt	Max E.C I:V
Hvaler/Singlefjord	4	4	i	0.20A	i	0.27A	i	i	0.03B	i	i	i	i	i	0.93a	0.13b	0.53a	6.73b	i	II
Iddefjord	2	2	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	Miss
Inner Oslofjord	5	5	i	i	i	0.20A	i	i	0.01A	i	i	i	<97.90b	0.80a	1.95a	<0.05a	0.41a	20.60c	i	III
Frierfjord	3	3	i	i	i	i	i	i	i	i	i	i	i	i	0.85a	0.60c	0.27a	4.74b	i	III
Inner Kristiansandsfjord	2	2	i	i	i	i	i	i	i	i	i	i	<444.80c	15.00d	0.65a	9.55e	≤1.01b	5.08b	i	V
Saudafjord	2	2	i	0.92B	i	0.16A	i	i	i	i	i	i	<387.80c	15.00d	i	i	i	i	i	IV
Sørfjorden	2	2	i	14.60E	i	3.61D	i	i	0.15D	i	i	i	i	i	6.01c	0.06a	0.28a	2.67a	i	V
Byfjorden, Bergen	3	3	i	i	i	i	i	i	i	i	i	i	i	i	w	w	w	w	i	Miss
Sunndalsfjord	2	2	i	i	i	i	i	i	i	i	i	i	<704.90c	8.00c	i	i	i	i	i	III
Orkdalsfjord	3	3	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	Miss
Inner Ranfjord	2	2	i	0.56B	i	0.11A	i	i	i	i	i	i	487.90c	31.00e	i	i	i	i	i	V
Count			0	4	0	5	0	0	3	0	0	0	5	5	5	5	5	5	0	8
Min			.	0.20A	.	0.11A	.	.	0.01A	.	.	.	<97.90b	0.80a	0.65a	<0.05a	0.27a	2.67a	.	II
Max			.	14.60E	.	3.61D	.	.	0.15D	.	.	.	<704.90c	31.00e	6.01c	9.55e	≤1.01b	20.60c	.	V
Mean			.	4.07C	.	0.87C	.	.	0.06C	.	.	.	<424.66c	13.96d	2.08b	<2.08d	≤0.50a	7.96b	.	3.8

i (141) ! Value ignored when calculating Environment Class.
w (4) ! Missing value. Should be included when calculating Environment Class E.C
a/A(27) > Below Class-I limit.
b/B(13) > Below Class-II limit.
c/C(15) > Below Class-III limit.
d/D(8) > Below Class-IV limit.
e/E(6) > Below Class-V limit.

Max(Median). Statistics om ALL AREAs: (n = INDEX-Stations measured, N = Station programmed for INDEX)

INDEX.AreaNames (PollutionAreas) 1996	n	N	AS ppm d.wt	PB ppm w.wt	F ppm d.wt	CD ppm w.wt	CU ppm d.wt	CR ppm d.wt	HG ppm w.wt	NI ppm d.wt	ZN ppm d.wt	AG ppm d.wt	PAHΣΣ ppb w.wt	BAP ppb w.wt	DDTΣΣ ppb w.wt	HCB ppb w.wt	HCHΣΣ ppb w.wt	CBΣ7e ppb w.wt	TCDDN ppp w.wt	Max E.C I:V
Hvaler/Singlefjord	4	4	i	0.30A	i	0.28B	i	i	0.05B	i	i	i	i	i	<0.56a	0.12b	0.27a	4.83b	i	II
Iddefjord	2	2	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	Miss
Inner Oslofjord	5	5	i	i	i	0.15A	i	i	0.01A	i	i	i	<345.70c	3.30c	1.08a	<0.05a	0.30a	20.86c	i	III
Frierfjord	3	3	i	i	i	i	i	i	i	i	i	i	i	i	0.26a	2.20d	0.19a	4.18b	i	IV
Inner Kristiansandsfjord	2	2	i	i	i	i	i	i	i	i	i	i	<418.40c	17.00d	0.61a	17.55e	1.32b	6.64b	i	V
Saudafjord	1	2	i	0.75B	i	0.15A	i	i	i	i	i	i	<850.30e	35.00e	i	i	i	i	i	V
Sørfjorden	2	2	i	8.80D	i	3.82D	i	i	0.13C	i	i	i	i	i	4.08b	<0.05a	0.60a	1.92a	i	IV
Byfjorden, Bergen	3	3	i	i	i	i	i	i	i	i	i	i	i	i	w	w	w	w	i	Miss
Sunndalsfjord	2	2	i	i	i	i	i	i	i	i	i	i	<265.00c	3.80c	i	i	i	i	i	III
Orkdalsfjord	3	3	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	Miss
Inner Ranfjord	2	2	i	1.03B	i	0.12A	i	i	i	i	i	i	181.60b	6.20c	i	i	i	i	i	III
Count			0	4	0	5	0	0	3	0	0	0	5	5	5	5	5	5	0	8
Min			.	0.30A	.	0.12A	.	.	0.01A	.	.	.	181.60b	3.30c	0.26a	<0.05a	0.19a	1.92a	.	II
Max			.	8.80D	.	3.82D	.	.	0.13C	.	.	.	<850.30c	35.00e	4.08b	17.55e	1.32b	20.86c	.	V
Mean			.	2.72C	.	0.90C	.	.	0.07B	.	.	.	<412.20c	13.06d	<1.32a	<3.99d	0.54a	7.69b	.	3.6

i (141) ! Value ignored when calculating Environment Class.
w (4) ! Missing value. Should be included when calculating Environment Class E.C
a/A(25) > Below Class-I limit.
b/B(16) > Below Class-II limit.
c/C(16) > Below Class-III limit.
d/D(8) > Below Class-IV limit.
e/E(4) > Below Class-V limit.

Max(Median). Statistics om ALL AREAs: (n = INDEX-Stations measured, N = Station programed for INDEX)

INDEX.AreaNames (PollutionAreas) 1997	n	N	AS ppm d.wt	Pb ppm w.wt	F ppm d.wt	CD ppm w.wt	CU ppm d.wt	CR ppm d.wt	HG ppm w.wt	NI ppm d.wt	ZN ppm d.wt	AG ppm d.wt	PAHΣΣ ppb w.wt	BAP ppb w.wt	DDTΣΣ ppb w.wt	HCB ppb w.wt	HCHΣΣ ppb w.wt	CBΣ7e ppb w.wt	TCDDN ppp w.wt	Max E.C I:V
Hvaler/Singlefjord	4	4	i	0.20A	i	0.31B	i	i	0.06B	i	i	i	i	i	1.14a	0.13b	0.42a	5.61b	i	II
Iddefjord	0	2	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	Miss
Inner Oslofjord	5	5	i	i	i	0.16A	i	i	0.01A	i	i	i	<341.90c	3.50c	12.08d	0.13b	0.79a	33.81c	i	IV
Frierfjord	3	3	i	i	i	i	i	i	i	i	i	i	i	i	0.65a	0.83c	0.26a	<2.68a	i	III
Inner Kristiansandsfjord	2	2	i	i	i	i	i	i	i	i	i	i	<262.70c	9.10c	1.22a	7.59e	0.81a	<6.00b	i	V
Saudafjord	2	2	i	1.28B	i	0.24A	i	i	i	i	i	i	<1901.70c	108.00e	i	i	i	i	i	V
Sørfjorden	2	2	i	3.09C	i	2.01C	i	i	0.04B	i	i	i	i	i	5.07c	<0.05a	0.29a	<2.71a	i	III
Byfjorden, Bergen	3	3	i	i	i	i	i	i	i	i	i	i	i	i	2.94b	0.12b	0.40a	24.54c	i	III
Sunndalsfjord	1	2	i	i	i	i	i	i	i	i	i	i	<165.40b	1.40b	i	i	i	i	i	II
Orkdalsfjord	0	3	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	Miss
Inner Ranfjord	2	2	i	0.52B	i	0.09A	i	i	i	i	i	i	<73.90b	3.10c	i	i	i	i	i	III
Count			0	4	0	5	0	0	3	0	0	0	5	5	6	6	6	6	0	9
Min			.	0.20A	.	0.09A	.	.	0.01A	.	.	.	<73.90b	1.40b	0.65a	<0.05a	0.26a	<2.68a	.	II
Max			.	3.09C	.	2.01C	.	.	0.06B	.	.	.	<1901.70c	108.00e	12.08d	7.59e	0.81a	33.81c	.	V
Mean			.	1.27B	.	0.56B	.	.	0.04B	.	.	.	<549.12c	25.02d	3.85b	<1.48d	0.50a	<12.56b	.	3.3

i (141) ! Value ignored when calculating Environment Class.
a/A(26) > Below Class-I limit.
b/B(22) > Below Class-II limit.
c/C(17) > Below Class-III limit.
d/D(4) > Below Class-IV limit.
e/E(4) > Below Class-V limit.

Missing INDEX Areas and their programed stations:

Iddefjord................: 1001,1011
Orkdalsfjord............: 82A,84A,87A

Appendix I6.
INDEX - Summary table "Reference index" 1995-1997

Max(Median). Statistics om ALL AREAs: (n = INDEX-Stations measured, N = Station programmed for INDEX)

INDEX.AreaNames (ReferenceAreas) 1995	n	N	AS ppm d.wt	Pb ppm w.wt	F ppm d.wt	CD ppm w.wt	CU ppm d.wt	CR ppm d.wt	HG ppm w.wt	NI ppm d.wt	ZN ppm d.wt	AG ppm d.wt	PAHΣΣ ppb w.wt	BAP ppb w.wt	DDTΣΣ ppb w.wt	HCB ppb w.wt	HCHΣΣ ppb w.wt	CBΣΣe ppb w.wt	TCDDN ppp w.wt	Max E.C I:V
Mid and outer Oslofjord	3	3	w	0.27A	w	0.25A	i	w	0.01A	w	i	w	w	w	<0.95a	0.07a	0.40a	7.86b	i	II
Lista	2	2	w	0.12A	w	0.33A	i	w	0.02A	w	i	w	<17.60a	0.50a	<0.34a	0.05a	0.38a	<1.28a	i	I
Bømlo-Sotra	1	1	w	0.22A	w	0.28A	i	w	0.01A	w	i	w	w	w	<0.46a	<0.05a	0.31a	<1.38a	i	I
Outer Ranfjord, Helgeland	1	1	w	0.18A	w	0.15A	i	w	0.01A	w	i	w	<28.20a	<0.50a	0.21a	<0.05a	0.38a	<0.90a	i	I
Lofoten	1	2	w	0.47B	w	0.11A	i	w	0.05B	w	i	w	w	w	4.20b	<0.05a	0.15a	12.31b	i	II
Finnsnes-Skjervøy	1	1	w	0.18A	w	0.56B	i	w	0.01A	w	i	w	w	w	<0.18a	<0.05a	0.16a	<0.81a	i	II
Hammerfest-Honningsvåg	2	2	w	0.47A	w	0.51B	i	w	0.01A	w	i	w	<131.60b	0.70a	<0.23a	<0.05a	<0.15a	<1.34a	i	II
Varanger Peninsula	3	3	w	0.57A	w	0.32A	i	w	0.02A	w	i	w	<6.90a	<0.50a	<0.36a	<0.05a	0.16a	<0.88a	i	I
Count			0	8	0	8	0	0	8	0	0	0	4	4	8	8	8	8	0	8
Min			.	0.12A	.	0.11A	.	.	0.01A	.	.	.	<6.90a	<0.50a	<0.18a	<0.05a	<0.15a	<0.81a	.	I
Max			.	0.57B	.	0.56B	.	.	0.05B	.	.	.	<131.60b	0.70a	4.20b	0.07a	0.40a	12.31b	.	II
Mean			.	0.31A	.	0.31A	.	.	0.02A	.	.	.	<46.08a	<0.55a	<0.87a	<0.05a	<0.26a	<3.34a	.	1.5

i (24) ! Value ignored when calculating Environment Class.
w (48) ! Missing value. Should be included when calculating Environment Class E.C
a/A(77) > Below Class-I limit.
b/B(14) > Below Class-II limit.

Max(Median). Statistics om ALL AREAs: (n = INDEX-Stations measured, N = Station programed for INDEX)

INDEX.AreaNames (ReferenceAreas) 1996	n	N	AS ppm w.wt	Pb ppm w.wt	F ppm d.wt	CD ppm w.wt	CU ppm d.wt	CR ppm w.wt	HG ppm w.wt	NI ppm w.wt	ZN ppm d.wt	AG ppm w.wt	PAHΣΣ ppb w.wt	BAP ppb w.wt	DDTΣΣ ppb w.wt	HCB ppb w.wt	HCHΣΣ ppb w.wt	CB22e ppb w.wt	TCDDN ppp w.wt	Max E.C I:V
Mid and outer Oslofjord	3	3	1.66A	0.39A	w	0.29A	i	0.11A	0.01A	0.20A	i	0.03A	w	w	<0.25a	<0.05a	0.25a	13.95b	i	II
Lista	2	2	w	0.11A	w	0.20A	i	w	0.01A	w	i	w	<19.20a	<0.50a	<0.20a	0.05a	0.29a	<2.14a	i	I
Bømlo-Sotra	1	1	w	0.25A	w	0.19A	i	w	0.01A	w	i	w	w	w	<0.11a	<0.05a	<0.14a	<0.78a	i	I
Outer Ranfjord, Helgeland	1	1	w	0.17A	w	0.16A	i	w	0.01A	w	i	w	w	w	<0.12a	<0.05a	0.21a	<0.62a	i	I
Lofoten	1	2	w	0.79B	w	0.15A	i	w	0.06B	w	i	w	w	w	<1.15a	<0.05a	<0.13a	8.90b	i	II
Finnsnes-Skjervøy	1	1	w	0.13A	w	0.28A	i	w	0.01A	w	i	w	<10.05a	<0.50a	<0.05a	<0.05a	<0.05a	<0.40a	i	I
Hammerfest-Honningsvåg	2	2	w	0.29A	w	0.48B	i	w	0.01A	w	i	w	<111.30b	0.80a	<0.11a	<0.05a	<0.11a	<1.59a	i	II
Varanger Peninsula	3	3	w	0.15A	w	0.47B	i	w	0.01A	w	i	w	<36.20a	<0.50a	<0.14a	<0.05a	0.14a	<0.98a	i	II
Count			1	8	0	8	0	1	8	1	0	1	4	4	8	8	8	8	0	8
Min			1.66A	0.11A	.	0.15A	.	0.11A	0.01A	0.20A	.	0.03A	<10.05a	<0.50a	<0.05a	<0.05a	<0.05a	<0.40a	.	I
Max			1.66A	0.79B	.	0.48B	.	0.11A	0.06B	0.20A	.	0.03A	<111.30b	0.80a	<1.15a	0.05a	0.29a	13.95b	.	II
Mean			1.66A	0.29A	.	0.28A	.	0.11A	0.02A	0.20A	.	0.03A	<44.19a	<0.58a	<0.27a	<0.05a	<0.17a	<3.67a	.	1.5

i (24) ! Value ignored when calculating Environment Class.
w (44) ! Missing value. Should be included when calculating Environment Class E.C
a/A(95) > Below Class-I limit.
b/B(12) > Below Class-II limit.

Max(Median). Statistics om ALL AREAs: (n = INDEX-Stations measured, N = Station programmed for INDEX)

INDEX.AreaNames (ReferenceAreas) 1997	n	N	AS ppm d.wt	Pb ppm w.wt	F ppm d.wt	CD ppm w.wt	CU ppm d.wt	CR ppm d.wt	HG ppm w.wt	NI ppm d.wt	ZN ppm d.wt	AG ppm d.wt	PAHΣΣ ppb w.wt	BAP ppb w.wt	DDTΣΣ ppb w.wt	HCB ppb w.wt	HCHΣΣ ppb w.wt	CBΣΣ7 ppb w.wt	TCDDN ppp w.wt	Max E.C I:V
Mid and outer Oslofjord	3	3	w	0.38A	w	0.30A	i	w	0.01A	w	i	w	w	w	2.75b	0.12b	1.16b	4.90b	i	II
Lista	2	2	w	0.22A	w	0.22A	i	w	0.01A	w	i	w	<26.30a	<0.50a	0.58a	<0.05a	0.53a	2.43a	i	I
Bømlo-Sotra	1	1	w	0.23A	w	0.17A	i	w	0.01A	w	i	w	w	w	<0.39a	<0.05a	0.26a	<0.73a	i	I
Outer Ranfjord, Helgeland	0	1	w	w	w	w	i	w	w	w	i	w	w	w	w	w	w	w	i	Miss
Lofoten	1	2	w	0.23A	w	0.13A	i	w	0.02A	w	i	w	w	w	0.61a	<0.05a	0.14a	<1.57a	i	I
Finnenes-Skjervøy	1	1	w	0.11A	w	0.31A	i	w	0.01A	w	i	w	w	w	<0.15a	<0.05a	0.12a	<0.40a	i	I
Hammerfest-Honningsvåg	1	2	w	0.18A	w	0.24A	i	w	0.01A	w	i	w	w	w	0.27a	0.05a	0.18a	<4.49b	i	II
Varanger Peninsula	2	3	w	0.14A	w	0.18A	i	w	0.02A	w	i	w	w	w	0.33a	0.05a	0.13a	<1.07a	i	I
Count			0	7	0	7	0	0	7	0	0	0	1	1	7	7	7	7	0	7
Min			.	0.11A	.	0.13A	.	.	0.01A	.	.	.	<26.30a	<0.50a	<0.15a	<0.05a	0.12a	<0.40a	.	I
Max			.	0.38A	.	0.31A	.	.	0.02A	.	.	.	<26.30a	<0.50a	2.75b	0.12b	1.16b	4.90b	.	II
Mean			.	0.21A	.	0.22A	.	.	0.01A	.	.	.	<26.30a	<0.50a	<0.73a	<0.06a	0.36a	<2.23a	.	1.3

i (24) ! Value ignored when calculating Environment Class.
w (61) ! Missing value. Should be included when calculating Environment Class E.C
a/A(69) > Below Class-I limit.
b/B(9) > Below Class-II limit.

Missing INDEX Areas and their programmed stations:

Outer Ranfjord, Helgeland: R096

Appendix J.
Biological Effects Methods - Results 1997

Table 10. Estimates for OH-pyrene (fluorescence 341/383, standardised to biliverdin) in bile of cod sampled at the indicated sites. (See also support parameters in Table 14.)

	OH-pyren (FU/biliverdin)			
JAMP station	**n**	**median**	**min**	**max**
15B	11	265.1	6.9	3023.9
23B	22	15.8	6.8	53.0
30B	0	-	-	-
36B	21	22.5	11.4	61.0
53B	25	113.3	17.5	344.1
67B	25	71.1	40.0	148.8

Table 11. Activity of ALA-D (δ-aminolevulinic acid dehydratase) in red blood cells of cod sampled at the indicated sites. Values given as ng porphobilinogen/min/mg protein. (See also support parameters in Table 14.)

	ALA-D (ng PBG/min/mg protein)			
JAMP station	**n**	**median**	**min**	**max**
15B	24	3448	1633	6054
23B	25	3154	1211	5059
30B	20	1796	25	5529
36B	21	2739	1195	4790
53B	25	1520	234	5296
67B	24	1433	423	8072

Table 12. EROD (ethoxyresorufin *O*-deethylase) activity in liver of cod sampled at the indicated sites. Values are given as pmol/min/mg microsomal protein. (See also support parameters in Table 14.)

	EROD (pmol/min/mg protein)			
JAMP station	**n**	**median**	**min**	**max**
15B	24	44	2	265
23B	21	94	56	153
30B	11	69	19	134
36B	18	110	2	186
53B	15	430	15	1201
67B	25	103	3	264

Table 13. Concentration of metallothionein (MT) in liver of cod sampled at the indicated sites. Values are given as µg/mg cytosolic protein. (See also support parameters in Table 14.)

	MT (µg/mg protein)			
JAMP station	**n**	**median**	**min**	**max**
15B	25	2.06	0.47	14.11
23B	22	1.11	0.27	11.18
30B	15	1.33	0.70	5.86
36B	20	0.92	0.10	3.73
	24	0.41	0.09	6.88
53B				
67B	25	1.51	0.13	5.50

Table 14. Support parameters for the determination of biomarker responses. Sample weight is the liver sample (homogenised in 5 mL buffer), biliverdin was measured in bile, microsomal and cytosolic protein were determined in liver samples.

	sample weight (g)				biliverdin (mg/mL)				cytosol protein (mg/mL)				microsomal protein (mg/mL)			
JAMP station	n	median	min	max	n	median	min	max	n	median	min	max	n	median	min	max
15B	25	1.41	0.63	2.21	11	628	385	1017	25	13.25	5.10	30.85	25	5.25	1.84	13.11
23B	22	1.27	0.86	2.22	22	674	127	1550	22	14.41	9.96	30.57	21	6.06	3.75	10.76
30B	16	0.82	0.50	1.49	0	-	-	-	17	8.46	2.89	17.89	16	3.89	1.18	9.50
36B	21	1.05	0.81	1.99	21	967	370	3562	20	16.76	11.76	31.95	20	8.54	3.73	13.09
53B	25	1.19	0.85	2.23	25	410	168	1926	25	17.87	7.05	27.30	25	6.61	4.13	9.78
67B	25	1.05	0.82	2.40	25	663	243	1364	25	17.43	13.72	33.06	25	6.44	4.49	10.26