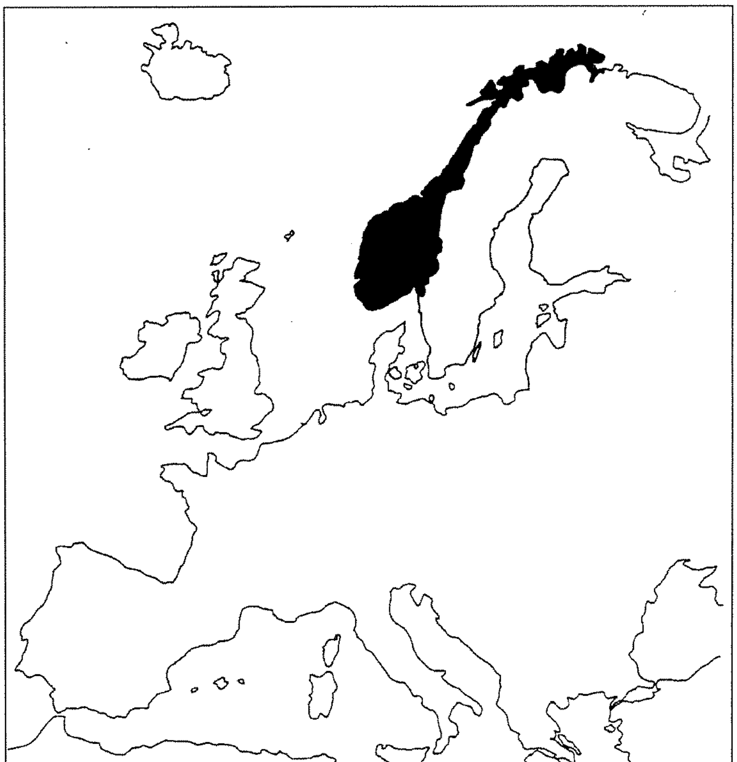
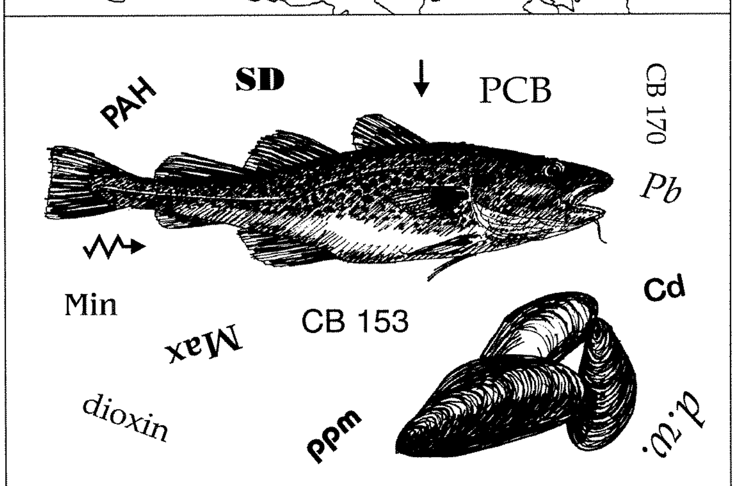
Norwegian State Pollution Monitoring Programme

Client	State Pollution Control Authority
Contractor	NIVA

Report 716/97

Joint Assessment and Monitoring Programme (JAMP) National Comments to the Norwegian Data for 1996





TA 1489/1997

NIVA Norwegian Institute for Water Research

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REPORT

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Abstract

This report is part of the Norwegian contribution to the SIME 1997(2) meeting administrated by OSPARCOM. JAMP 1996 included the monitoring of micropollutants in blue mussels (30 stations) and fish (13 stations) at along the entire coast of Norway. The results indicated elevated levels of contaminants (i.e. over provisional "high background") in: Oslofjord proper (PCBs 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 1987-1996. A mussel station in a harbour at Lofoten had elevated levels of mercury and PCBs. The results from the remainder of stations showed primarily low levels contamination. Introductory studies of PAH and "dioxins" in mussels were conducted. Overconcentrations of PAH were found in the inner Oslofjord and three stations in the North of Norway. No change in "pollution" or "reference" index classification was found from 1995 to 1996.

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 TO THE NORWEGIAN DATA FOR 1996

Oslo, 24. October 1997

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Foreword

This report presents the Norwegian national comments on the 1996 investigations for the Joint Assessment and Monitoring Programme (JAMP). JAMP is administered by the Oslo and Paris Commissions (OSPARCOM) 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 1996 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 1996 was carried out by the Norwegian Institute for Water Research (NIVA) by contract from the Norwegian State 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 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 1996 results and are not to be viewed as a final assessment.

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

Thanks are due to many colleagues at NIVA, especially: Rita Amundsen, Unni Efraimsen, Frank Kjellberg, Tom Tellefsen for field work, sample preparations, data entry; Einar Brevik and his colleagues for organic analyses; Arne Godal, Marit Villø and Bente Hiort Lauritzen and their colleagues for metal analyses; Audun Rønningen and Gunnar Severinsen for data programme management; Jon Knutzen for constructive criticism. 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, 24 October 1997.

Norman W. Green
Project co-ordinator

Contents

1. General Details

1.1 Executive Summary

The Norwegian JAMP 1996 included the monitoring of micropollutants (contaminants) in blue mussels (30 stations) and fish (13 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 mercury) and Langesundsfjord (HCB). Lower concentrations of PCB (CB153) were found in liver and fillet of cod from the outer Oslofjord in 1996 compared to 1995.

- JAMP areas 63 and 62: Sørfjord and Hardangerfjord (especially cadmium and lead and to a lesser degree mercury, zinc, ppDDE and PCBs). Significant downward trends were found for cadmium in mussels from the Sørfjord and Hardangerfjord for the period 1987-1996.

- JAMP area 65: Orkdalsfjord. No overconcentrations were found in blue mussels.

The remainder of stations are mostly from presumed "reference" areas where only diffuse contamination is expected. The results indicate primarily low levels contamination. One exception is a mussel station in a harbour at Lofoten where elevated levels of mercury and PCBs were detected.

PAH and "dioxins" were measured at 6-12 mussels stations. Overconcentrations of PAH were found in the inner Oslofjord and three stations in the north of Norway. Overconcentrations of "dioxin" (TCDNN) were found in the inner Oslofjord and in Langesundsfjord.

A new index was tested for the second 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 1995 results.

1.2 Introduction

The Norwegian contribution to the "Joint Assessment and Monitoring Programme (JAMP) was initiated by the Norwegian State 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 1.3.9).

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 (OSPARCOM 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 1996 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?
1.7	PCBs	Do high concentrations posed 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?
1.15	Chlorinated dioxins and dibenzofurans	What concentrations occur and have the policy goals (for the relevant parts of the maritime area) been met?

This report is structured 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 1996 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).

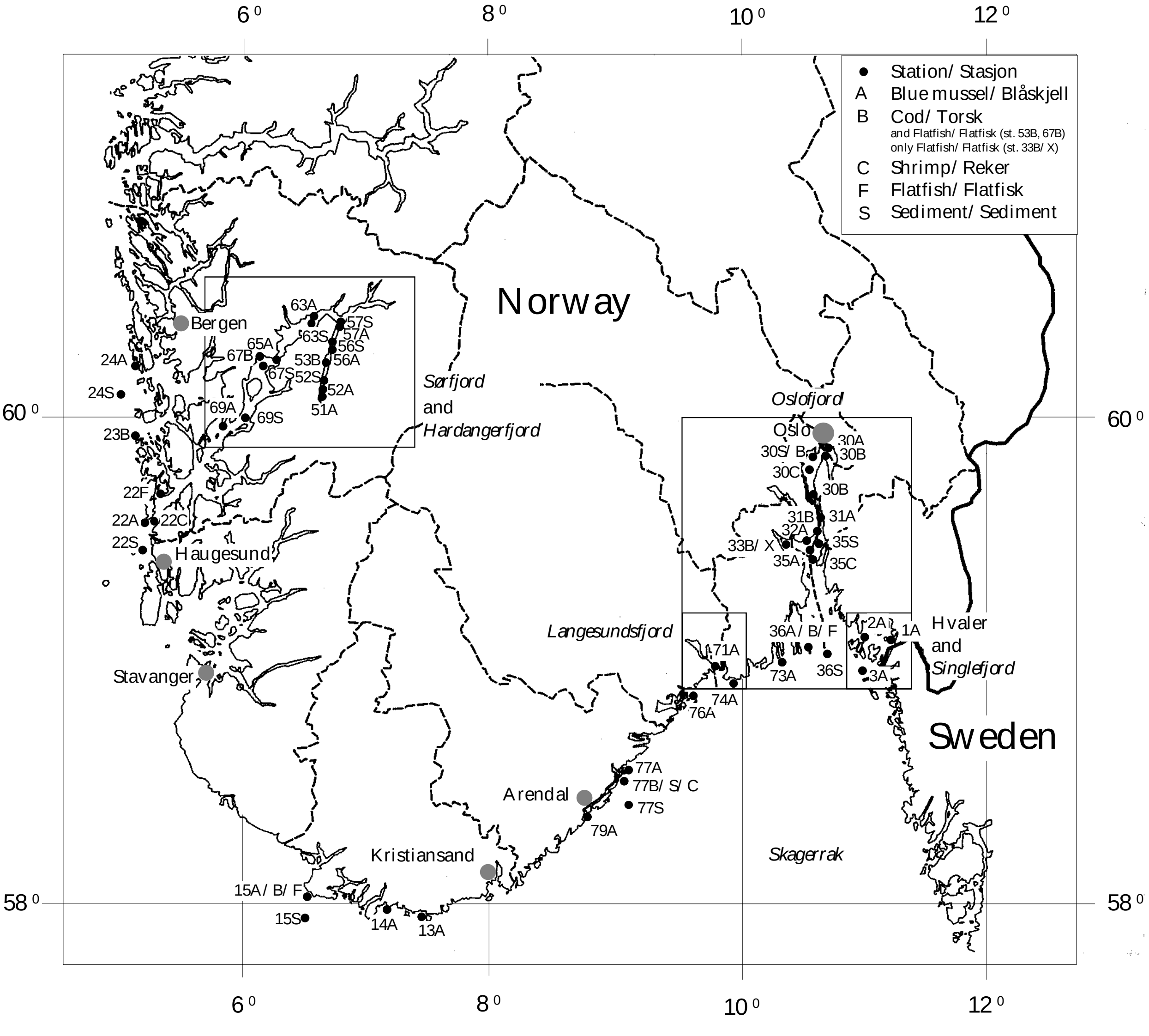


Figure 1. JAMP sampling stations along the southern coast of Norway from the Swedish border to Bergen.

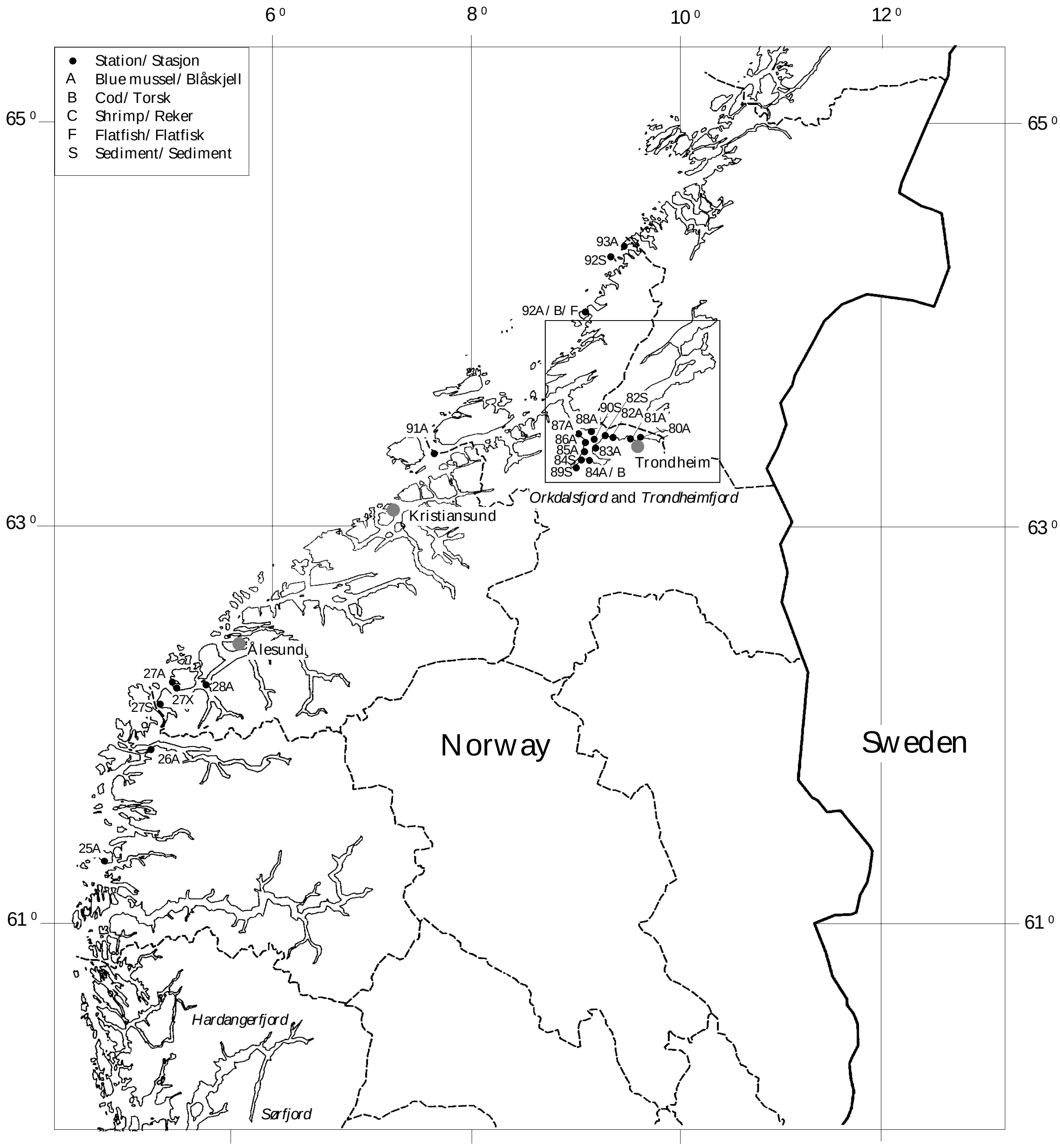


Figure 2. JAMP sampling stations along the western coast of Norway from Bergen to Namsos.

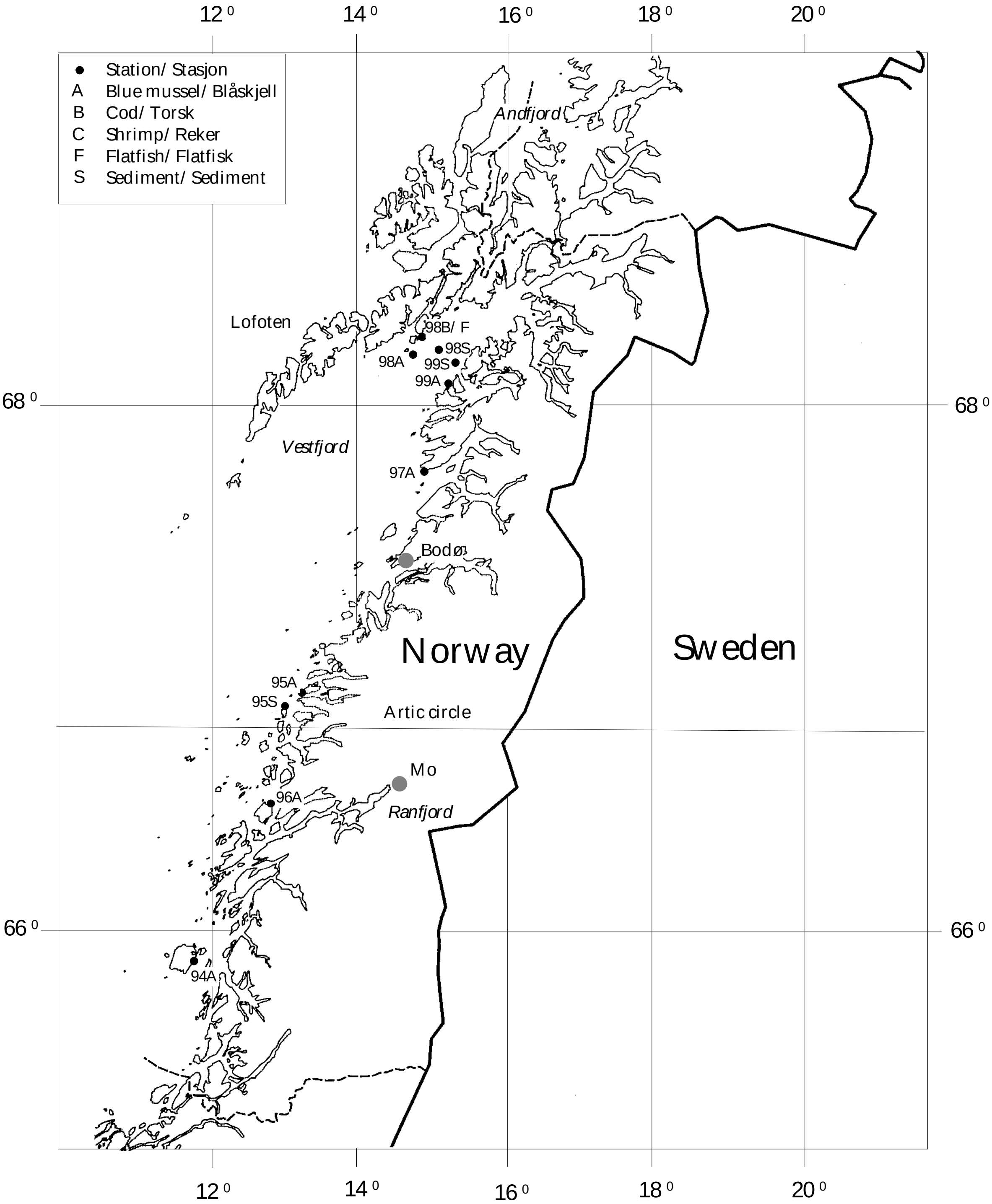


Figure 3. JAMP sampling stations along the Northwest coast of Norway from the region of Ranfjord to Lofoten.

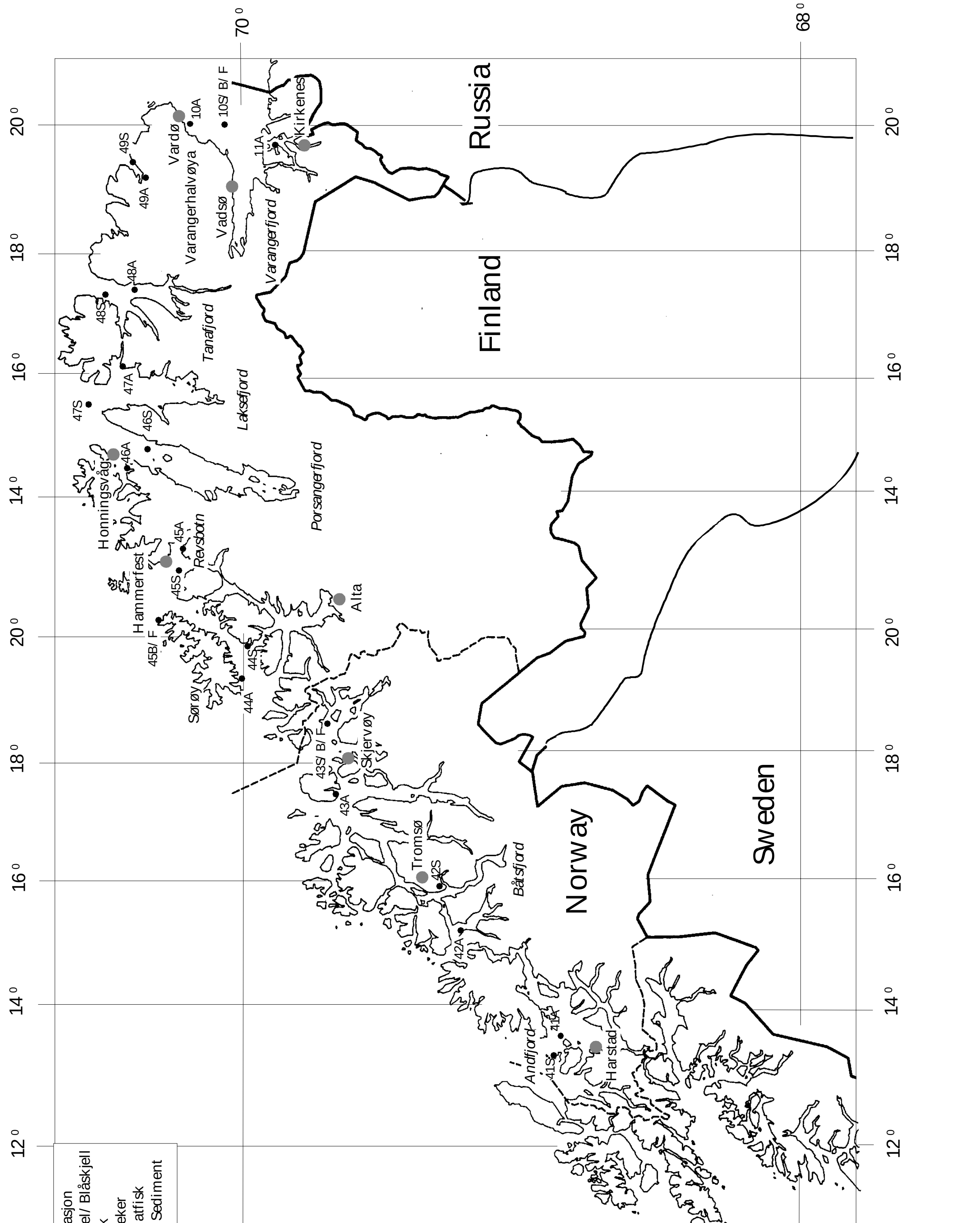


Figure 4. JAMP sampling stations along the north coast of Norway from the region of Lofoten to the Russian border.

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). Overconcentrations (see Chapter 2.1.2) were also found in cod liver from the inner Oslofjord (st.30B, up to 4 times “high background”; Figure 6). Further, overconcentrations were also for sum of 7 PCBs (CB-28, -52, 101, -118, -138, -153 and -180) in mussels and cod liver from these stations (st.30A and 30B), about 5 times “high background” (Appendix H). There has been no consistent change (see Chapter 2.1.3) for CB153 for mussel from four stations (30A, 31A, 35A and 36A) from 1987 to 1996 or for cod (30B and 36B) from 1990 to 1996.

The median concentration of CB153 in cod liver from the outer Oslofjord was roughly half that found in 1995 but higher than previous years (1990-1994, Figure 6, Appendix I). Similarly for cod fillet, the median concentration for 1996 was lower than for 1995 (by about a quarter) but higher than prior years. Flood conditions from Glomma resulted in high concentrations were found in cod 1995 (cf., Green 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 (less than twice “high background”) were found in the fillet of “large” cod (st.30B) from the inner Oslofjord (Figure 7).

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 (10 years) than “large” fish (12 years) (cf., Appendix G).

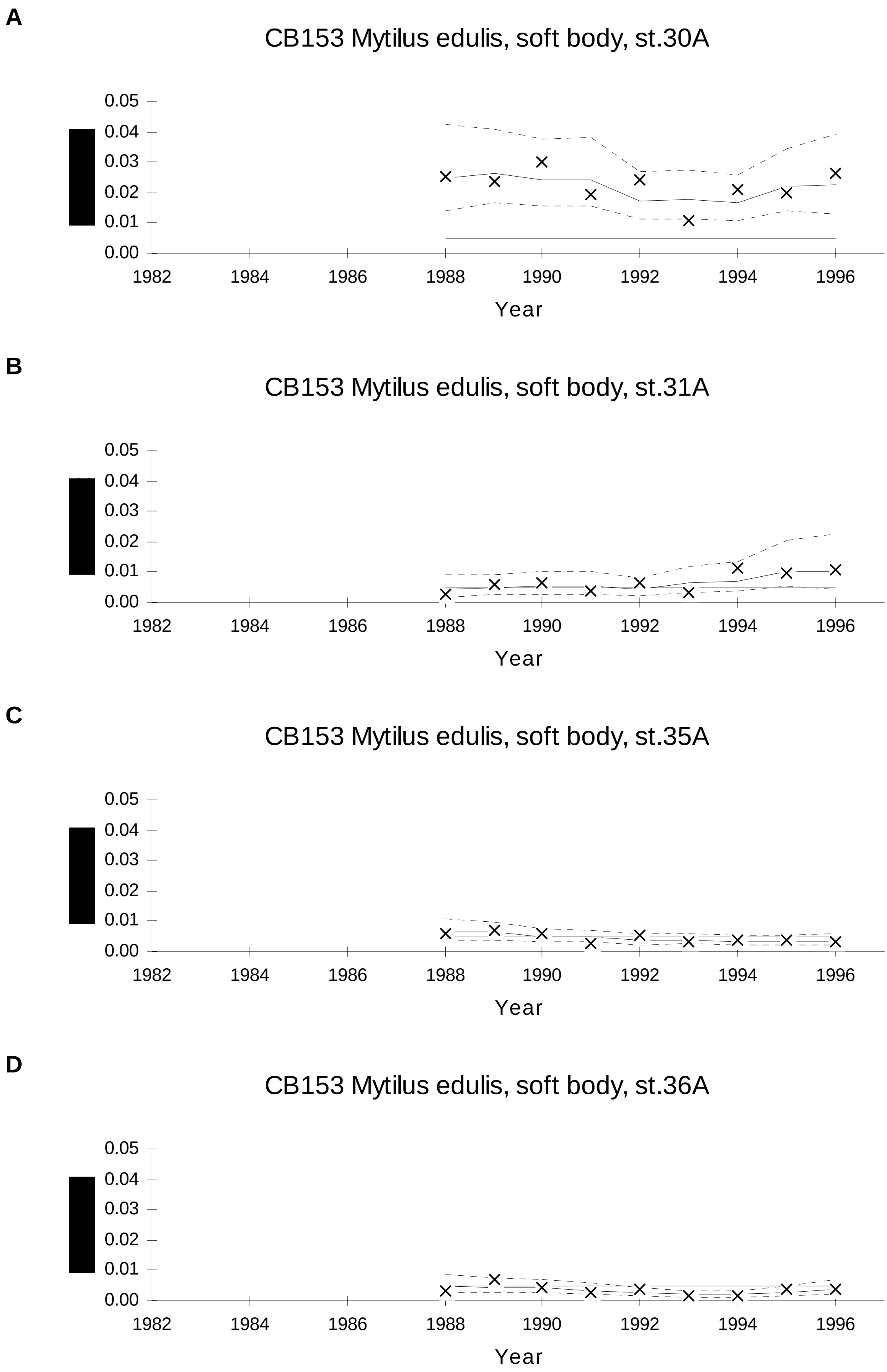
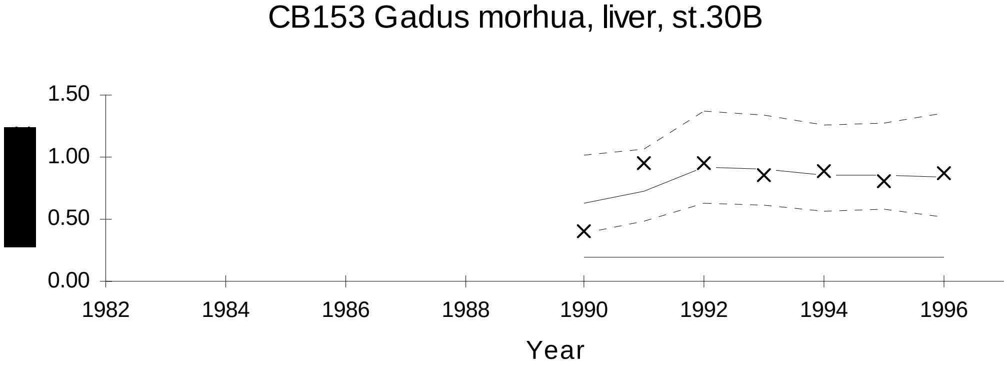


Figure 5. Median CB153 concentration in blue mussel (*Mytilus edulis*) from inner (st.30A) to outer (st.36A) Oslofjord. (cf., Figure 1 and Figure 14).

A



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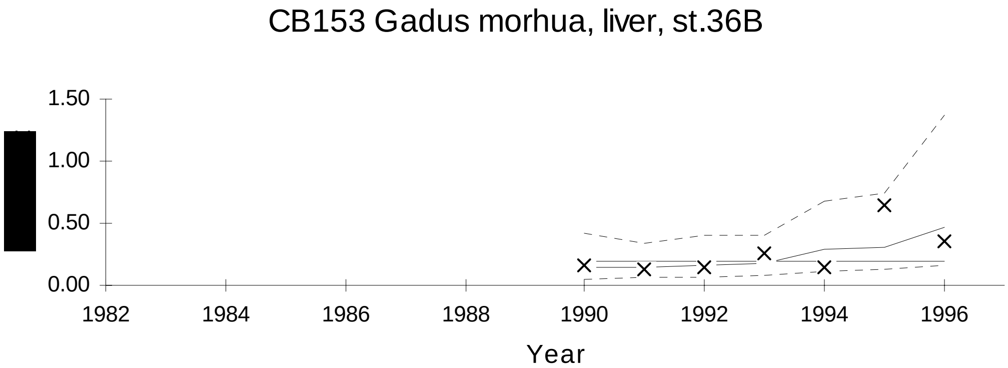

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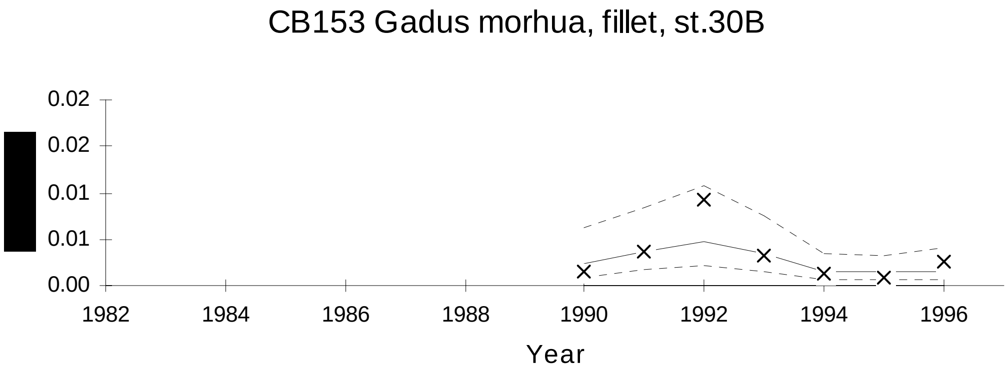

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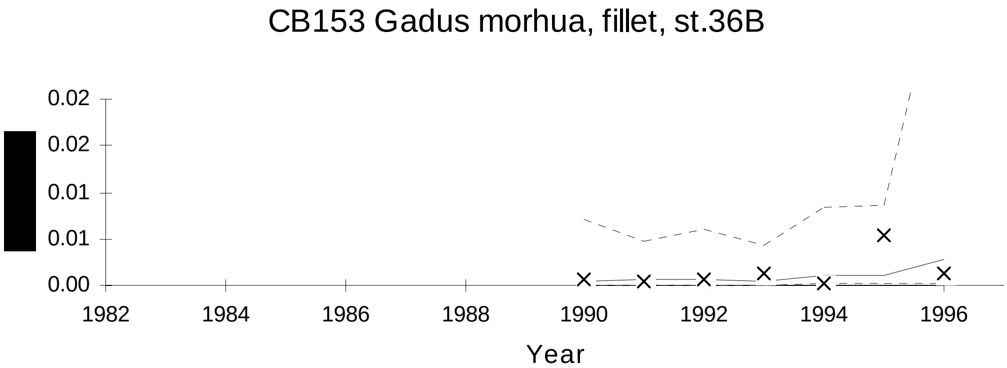
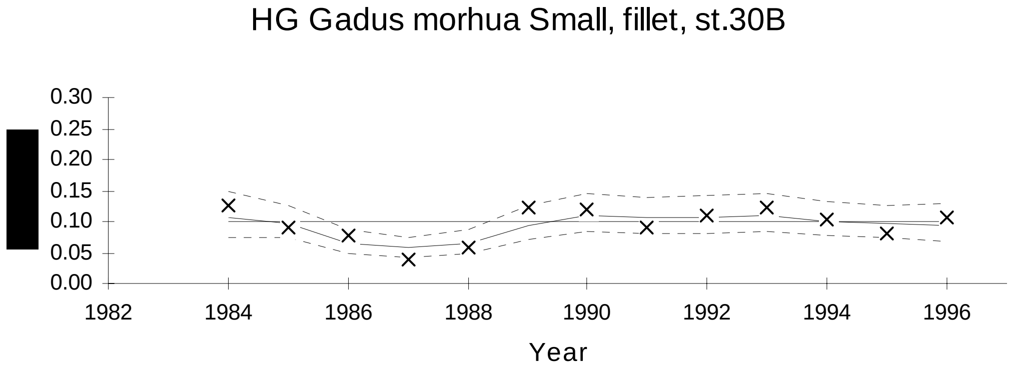


Figure 6. Median CB-153 concentration in liver and fillet of cod (*Gadus morhua*) from the inner (st.30B) to outer (st.36B) Oslofjord. (cf., Figure 1 and Figure 14). **Note: for some years the upper confidence interval line is off-scale in Figure D.**

A



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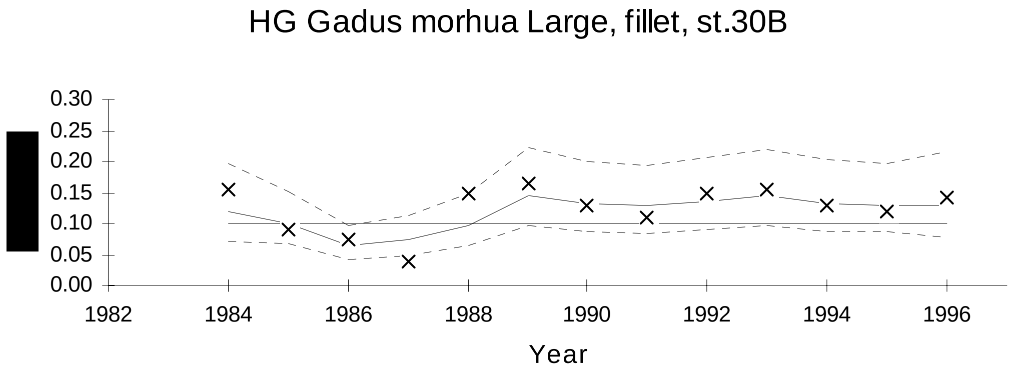

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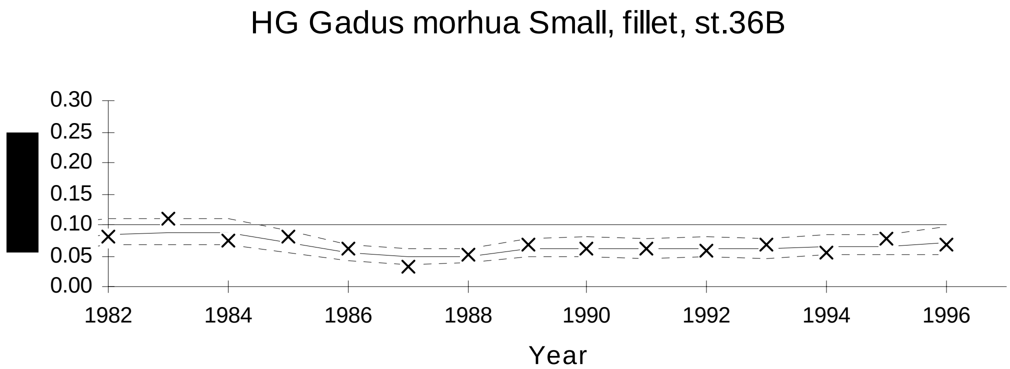

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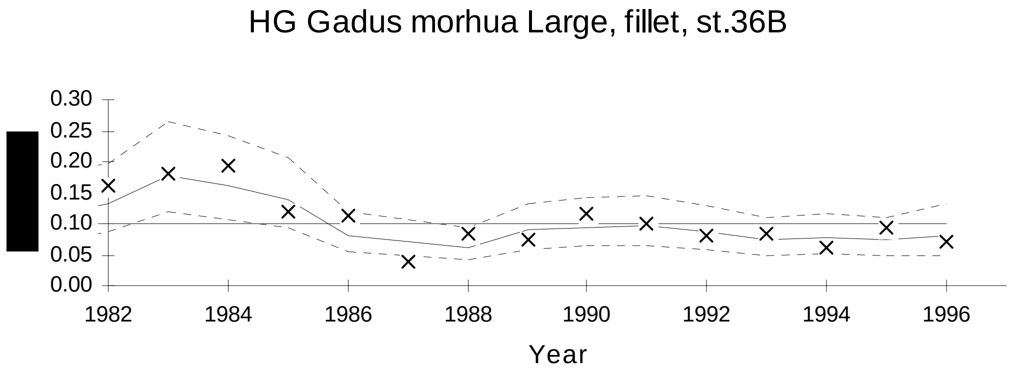


Figure 7. Median mercury (Hg) concentration in fillet of cod (*Gadus morhua*): for the inner Oslofjord (st.30B) "small" (**A**) and "large" (**B**) fish, and for the outer Oslofjord (st.36B) "small" (**C**) and "large" (**D**) fish. (cf., Figure 1 and Figure 14).

Mussels from Langesundsfjord (st.71A) had in 1996 marked overconcentrations of HCB (over 9 times “high background”, Appendix G), and was four times higher than median for 1995. 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).

Note that 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 (expressed in years) for the period 1990-96 is 13 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 1990-96 data also indicated a significant *downward* trend for this period. Moderate overconcentrations of mercury and CB153 (less than twice “high background”) were also found.

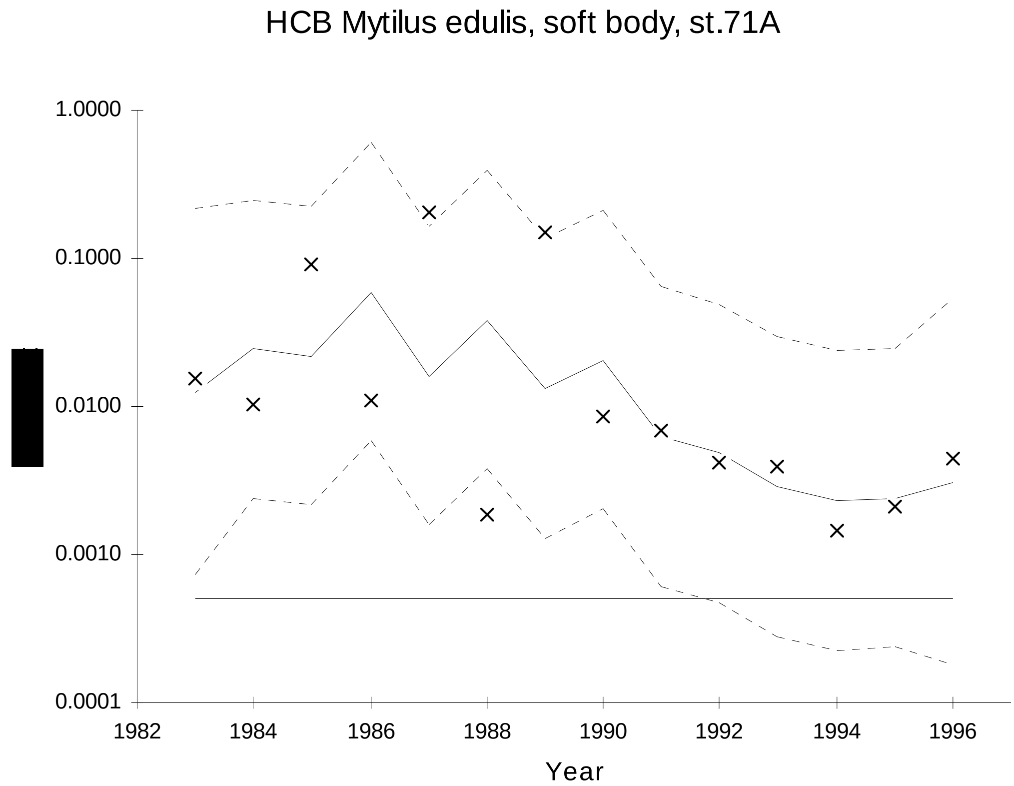


Figure 8. Median HCB concentration in blue mussel (*Mytilus edulis*) from Langesundsfjorden (west of Oslofjord). (cf., Figure 1 and Figure 14). **NB: log-scale.**

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). The results from JAMP 1996 are coupled to other studies in this area (cf., Knutzen *et al.*, in press) 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 Sørfjorden (st. 51A, 52A, 56A and 57A) indicated severe overconcentrations of cadmium (up to 12 times provisional “high background”, Appendix G) and lead (up to 9 times “high background”), more moderately for mercury and zinc (up to 4 times). Overconcentrations of cadmium and lead could be traced to Ranaskjær (st.63A) in the Hardangerfjord. A significant *downward* trend was found for cadmium at st.57A and 63A from 1987 to 1996 (Appendix G).

Overconcentrations of ppDDE (up to 3 times, "high background"; up 6 times for ΣDDT) were also found in mussels from the three stations in the Sørfjorden, the highest at st.56A, midway along the fjord (Figure 11 and Figure 12, Appendix G). Concentrations in cod liver from Sørfjord and Hardangerfjord (st.53B and 67B, respectively) were up to two times “high background” and higher than median values from 1995 (Figure 13). No trend was evident for the period 1990-96.

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.*, in press).

Overconcentrations of cadmium were found in flounder liver from Sørfjord and Hardangerfjord, up to eight times “high background”. The median concentration in flounder liver from Sørfjorden (st.53B) was over 10 times the median concentration found in 1995. Slight overconcentrations (less than two times “high background”) were also found in cod liver from the inner Sørfjord and from Hardangerfjord.

Unexpected and high discharge from industrial areas at the head of the Sørfjord during the period August to December resulted in abnormally high concentrations of cadmium and zinc in sea water in the vicinity (Skei 1997). Preliminary results from the VIC programme (cf., SIME 1996, 1997) indicated no significant local differences for these two metals for flounder (three sites) or cod (two sites). However the concentrations of these metals in cod liver was significantly higher in samples collected in August compared to December.

Moderate overconcentrations (less than two times “high background”) were also found for zinc in mussels, mercury in fish, CB153 in cod-liver and lead in flounder. The variability in concentrations of CB153 in the 25 cod from the inner Sørfjord was large (cf., Appendix H) and indicate that exposure and/or net uptake of this contaminant varies considerably from fish to fish.

The power of the sampling strategies for mussels was relatively poor for samples collected from Odda, the head of the Sørfjord (st.52A). For example for lead in mussels, it is estimated that it would take over 25 years to detect 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.

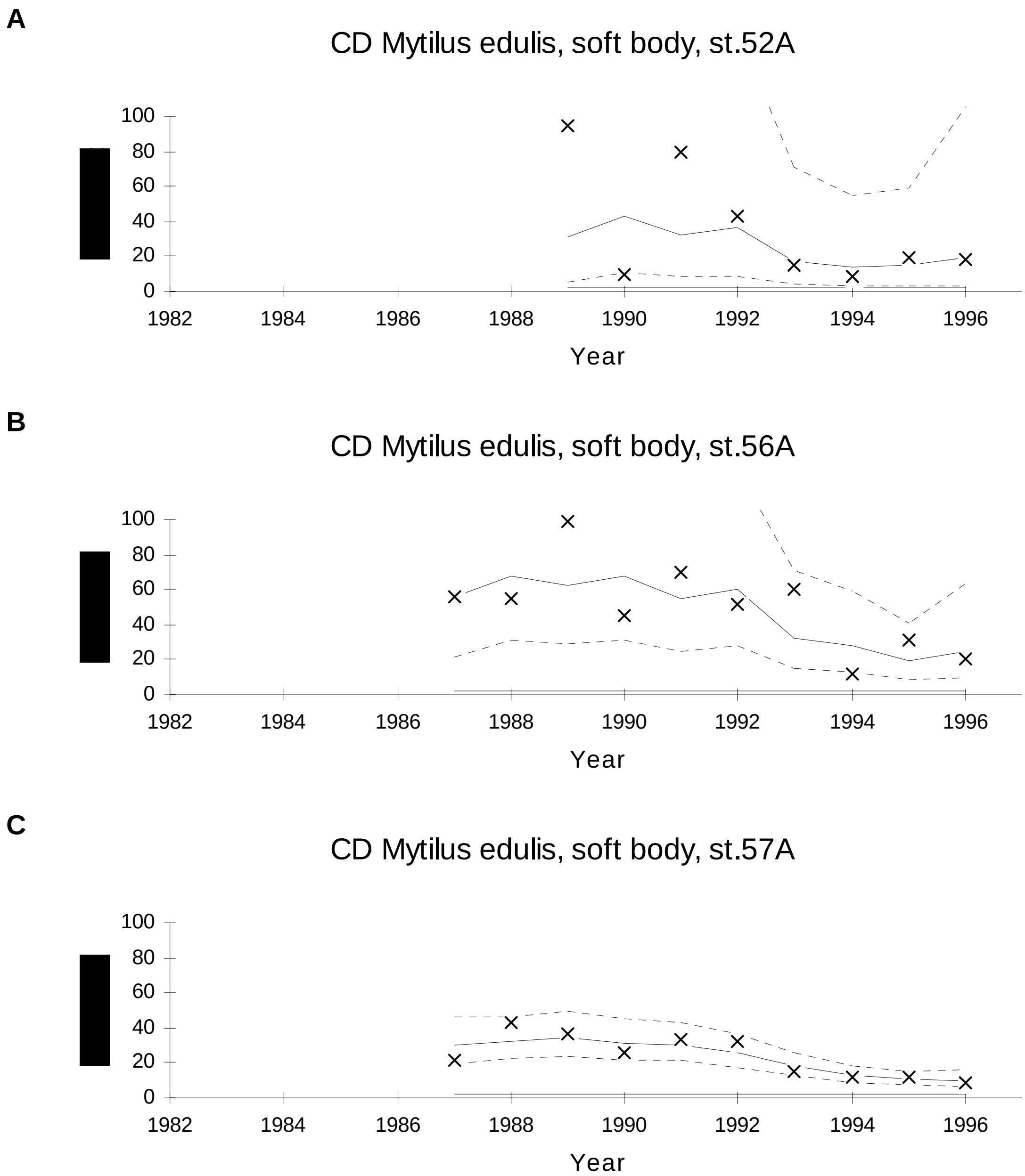
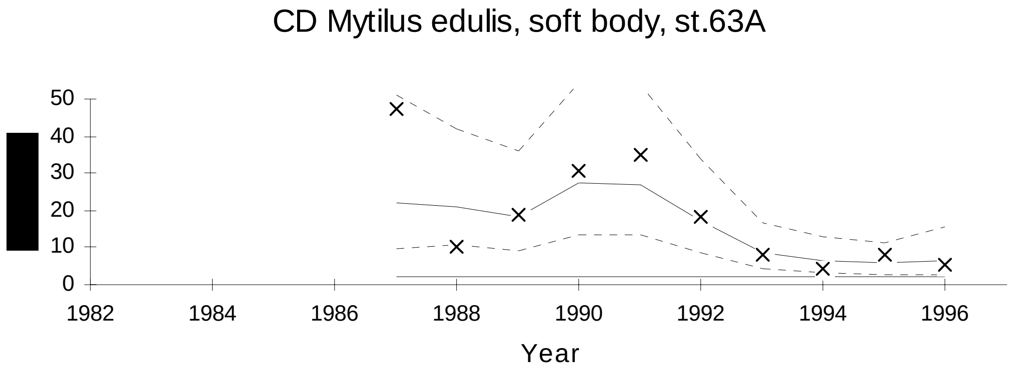


Figure 9. Median cadmium (Cd) concentration in blue mussel (*Mytilus edulis*) from inner (st.52A) to outer (st.57A) Sørfjord. NB: (cf., Figure 1 and Figure 14). **Note: for some years the upper confidence interval line is off-scale in figures A and B.**

A



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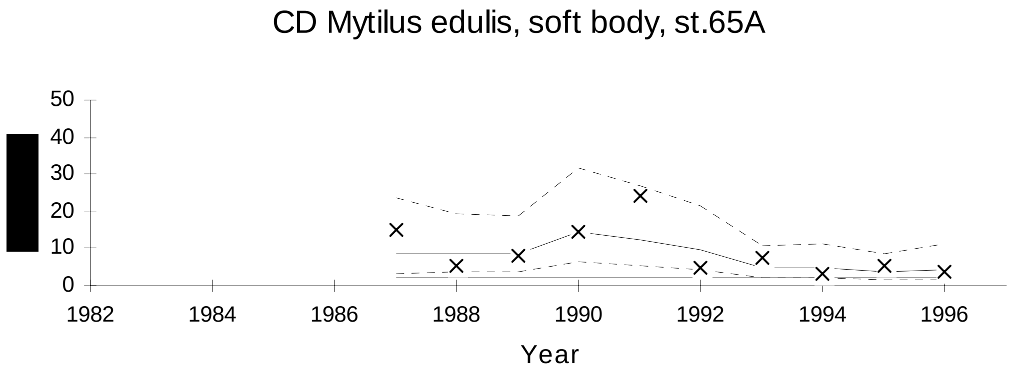

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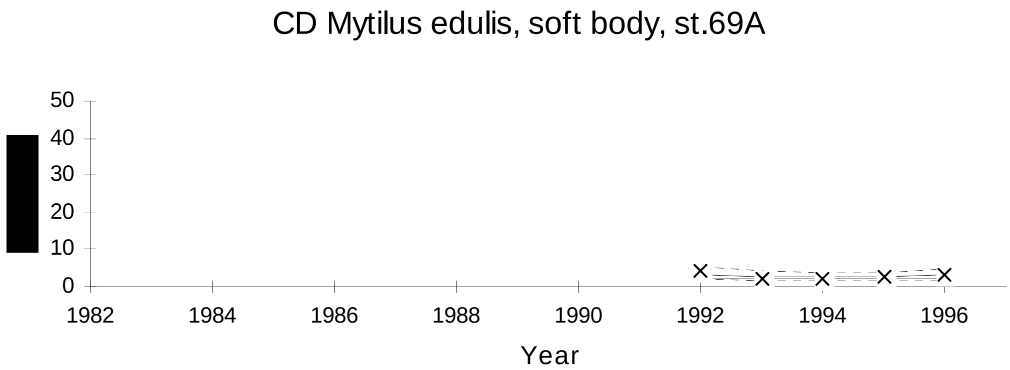


Figure 10. Median cadmium (Cd) concentration in blue mussel (*Mytilus edulis*) from Hardangerfjord (st. 63A, 65A and 69A). (cf., 1 and Figure 14). **Note difference in scale from Figure 9 and that for some years the upper confidence interval line is off-scale in Figure A.**

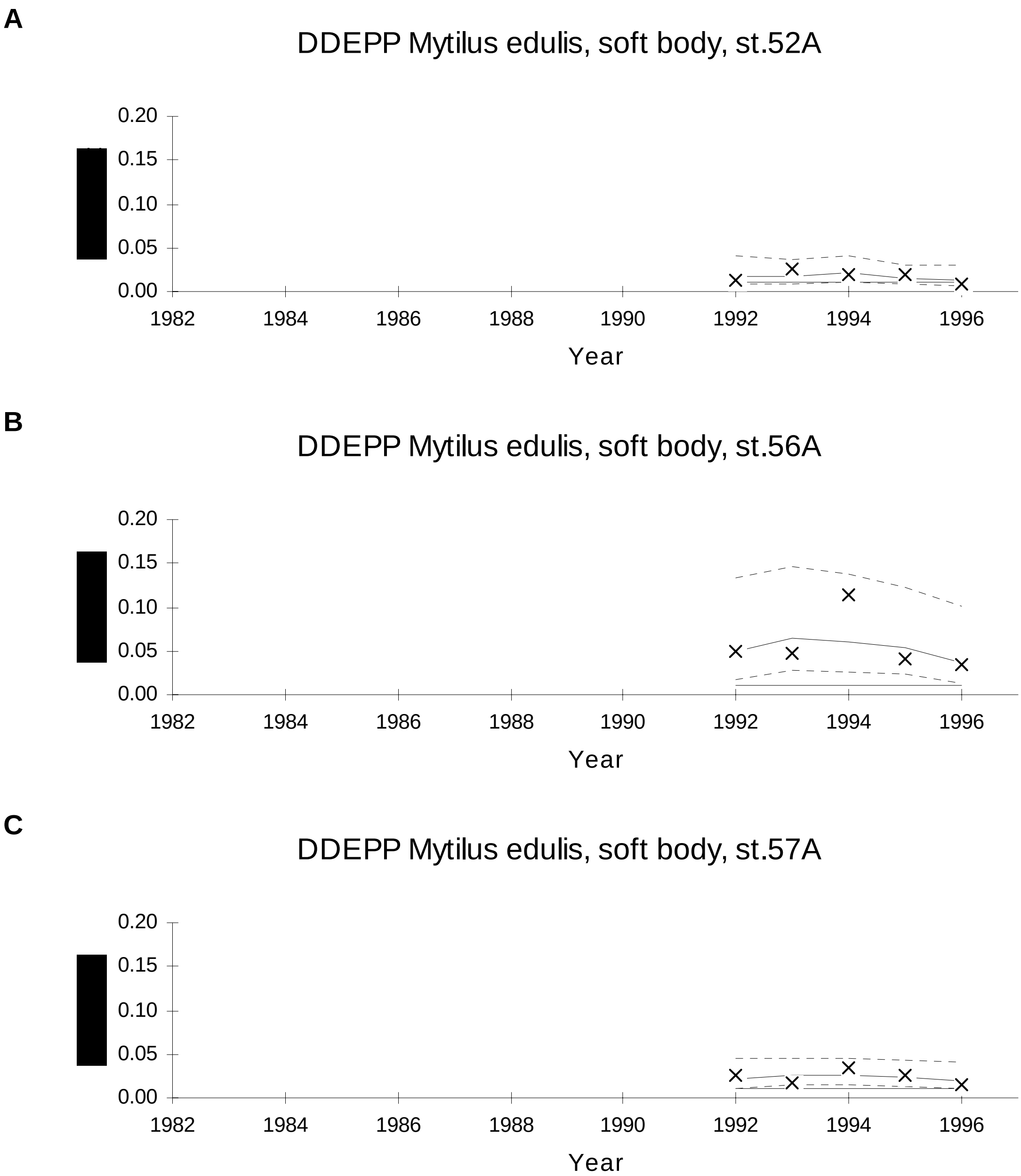


Figure 11. Median ppDDE (DDEPP) concentration in blue mussel (*Mytilus edulis*) from inner (st.52A) to outer (st.57A) Sørfjord. (cf., Figure 1 and Figure 14).

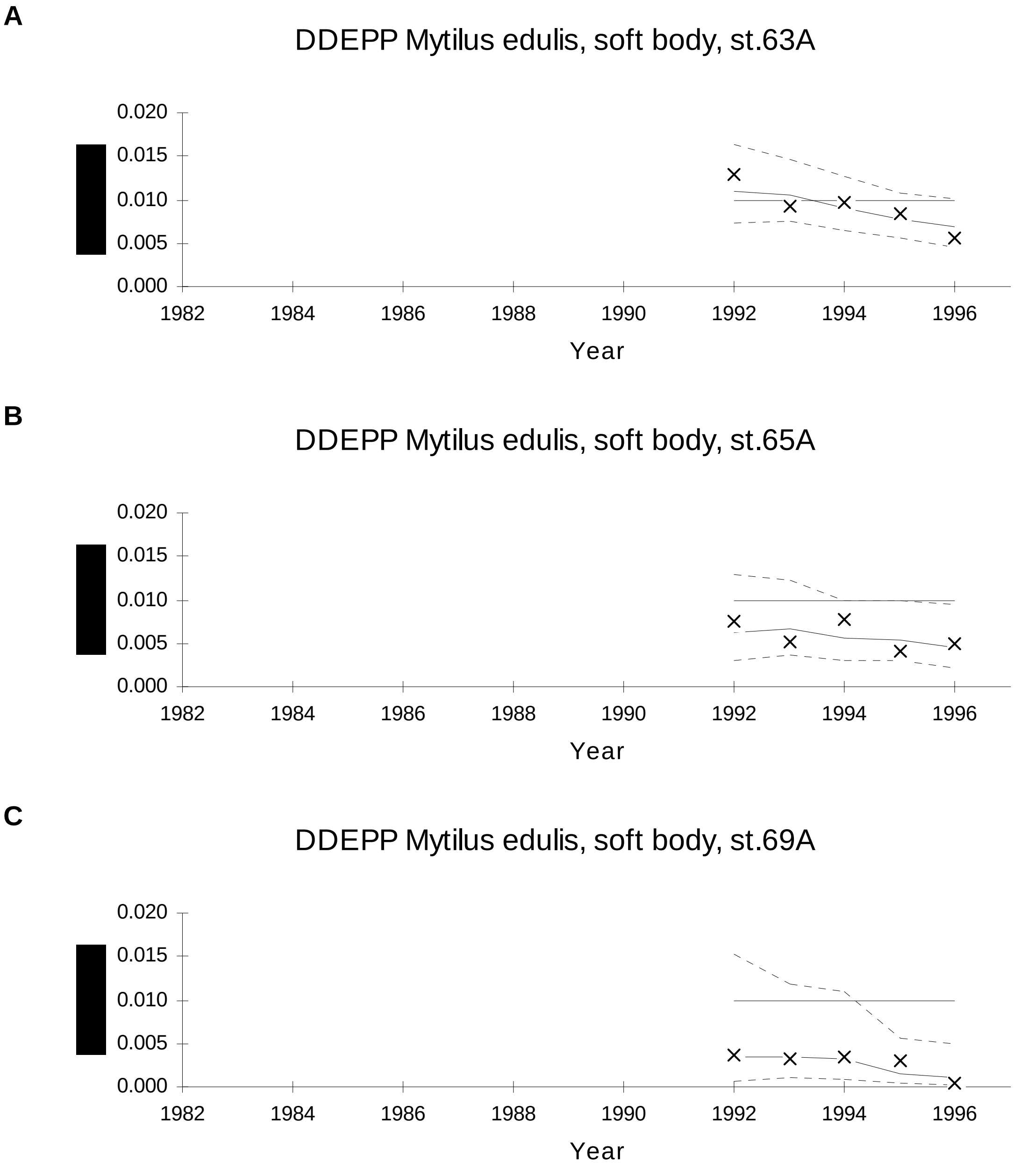
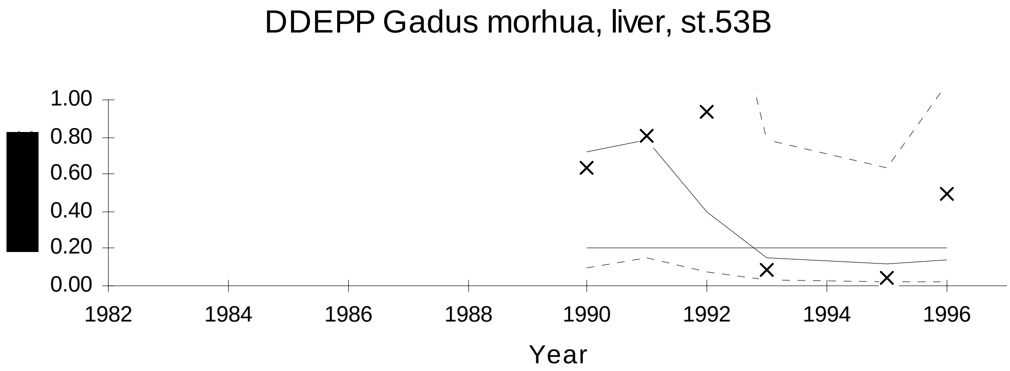


Figure 12. Median ppDDE (DDEPP) concentrations in blue mussel (*Mytilus edulis*) from Hardangerfjord (st. 63A, 65A and 69A). (cf., Figure 1 and Figure 14). **Note difference in scale compared to Figure 11.**

A



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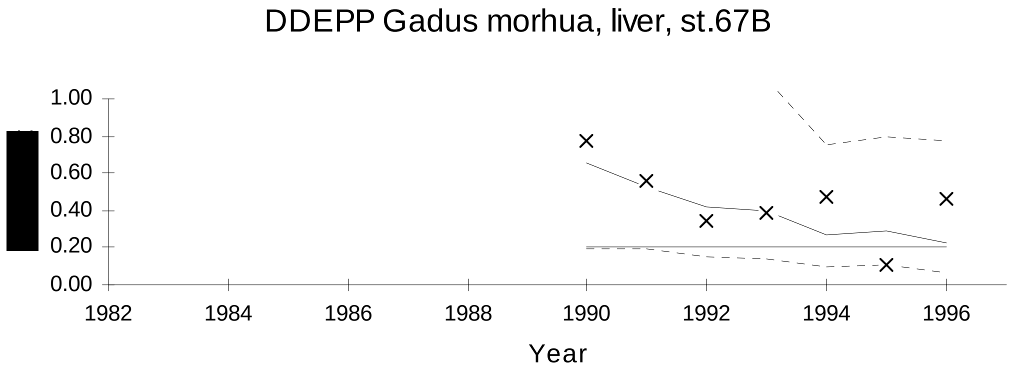

Figure 13. Median ppDDE (DDEPP) concentrations in cod (*Gadus morhua*) from Sørfjord (st.53B) and Hardangerfjord (st.67B) (cf., Figure 1 and Figure 14). **Note that for some years the upper confidence interval line is off-scale in Figures A and B.**

1.3.3 Lista areas

No significant 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

No significant overconcentrations of metals or chlorinated hydrocarbons were found in mussels, cod, or plaice from this area (st. 22A/F and 23B, Figure 1, Appendices G and H). Sufficient samples of dab were not recovered to investigate for elevated levels of mercury (Appendix H, cf., Green 1997).

1.3.5 Orkdalsfjord area

No significant overconcentration of metals or chlorinated hydrocarbons were found in Orkdalsfjord (st. 84A. 82A, and 87A, Figure 2, Appendices G and H).

1.3.6 Open coast areas from Bergen to Lofoten

Only two mussel stations (st.92A and 98X) were investigated in the open coast areas from Bergen to Lofoten, covering 7° of latitude to 68°N (Figure 2 and Figure 3). Unable to obtain mussels from st.98A, as was done in 1993, mussels were collected from nearby Skrova harbour (st.98X). Only cod was collected in the Froan area (st.92B), whereas cod and dab were collected from the Lofoten area (st.98B/F).

Mussels from 98X had moderate overconcentrations (up to 2 times "high background") of CB153 and slight overconcentrations (less than 2 times) of mercury and lead on a dry weight basis (Appendix G, see also Appendix H). Overconcentration of ppDDE was not found, whereas in 1995 the median value was 3 times higher than the 1996 value and slightly over "high background". The enhanced concentrations found at this station may be related to fish and sea mammal processing activity in the harbour where the mussels were collected. Overconcentrations of PCBs and ∑DDT are not uncommon in harbours of northern Norway (Knutzen *et al.* 1995, Konieczny & Juliussen 1995, Konieczny 1996).

Moderate overconcentrations (up to 3 times "high background") of cadmium were found in the livers of cod from st.98B. There were also slight overconcentrations of HCB in cod liver and mercury in dab liver. Slight overconcentration of mercury was found in cod liver from st.92B.

1.3.7 Open coast areas from Lofoten to Russian border

Six 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 was sampled in Kvænangen (st.43B) and Varangerfjorden (st.10B), and lemon sole and dab was sampled in Kvænangen (st.43F).

Slight overconcentrations (less than 2 times "high background") of cadmium were found at two mussel stations (st. 46A and 10A) (Appendix G and H). Moderate overconcentration (over 4 times "high background") of cadmium was also found in the homogenate lemon sole liver (st.43F). There was also moderate overconcentration of lead in mussels from st.44A. The relatively large variability in concentrations PCBs (CB153) found in cod from st.10B 1995 was not confirmed in 1996 (cf., Appendix H).

1.3.8 PAH and "dioxins"

Concentrations of PAH were measured at six blue mussel stations: one in the inner Oslofjord (st.30A) and five in the North of Norway (Appendix H). Moderate overconcentrations (up to 4 times "high background") of ΣPAH, excluding the dicyclic, were found at st.44A and 30A. Highest concentrations were found at st.44A where the median value was slightly higher than the median for 1995. The dicyclics represented 18-86% of ΣPAH, highest at st.10A. This may indicate a significant local influence from small boat traffic. Benzo[*a*]pyrene (BAP) was below "high background" at all six mussel stations.

"Dioxins" (PCDD and PCDF) were investigated in blue mussels at twelve stations spread along the entire coast (cf. Appendix H). The results expressed as sum $TE_{PCDF/D}$ (PCDF/D toxicity equivalents, JAMP code TCDDN) after Nordic standard (Ahlborg 1989) were below "high background" of 0.2 ng/kg (Appendix H) with two exceptions: st.30A and 71A. The TCDDN concentration at st.71A was over 60 times "high background" and is located near the mouth of Frierfjord with a known source of dioxin (cf., Knutzen *et al.* 1996). Moderate overconcentrations (over 2 times "high background" were found at st.30A in the inner Oslofjord. The highest non-ortho and mono-ortho PCBs, expressed as sum TE_{CB} (JAMP code TECBW) after WHO standard (Ahlborg, *et al.* 1994) was at st.30A (Appendix H).

1.3.9 Norwegian Pollution and Reference Indexes

The Norwegian State 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 10-11 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.

The Pollution Index was recalculated for 1995 because of the revisions made in SFT's classification system, which involved lower limits for *inter alia* BAP and HCB. The Index for 1995 is 3.2 compared to 2.8 based on the old system (Appendices I5). The Index for 1996 is 3.1. A value between 3 and 4 would be classified by the SFT system as "Bad".

The recalculated Reference Index for 1995 is 1.6 and unchanged compared to the old system. The Index for 1996 is 1.8 (Appendices I6). The calculation included (low) suspect dioxin values (TCDDN). A value between 1 and 2 would be classified as "Fair".

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 2).

Table 2. 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. 1997). **Contact SNT for more detailed information.**

Area of concern	Last year of issue/ evaluation	Main parameters of concern	Main fish/shellfish product of concerned	Recommendations or restrictions of concern:
Inner Oslofjord	1994	PCB	fish liver	Consumption
Drammensfjorden	1992	Dioxins/PCB	cod liver	Consumption and Sale
Sandefjordfjorden	1993	PCB	round fish liver	Consumption and Sale
Grenlandsfjordene, Langesundsfjord	1997	Dioxins	fish, shellfish	Consumption and Sale
Kristiansandsfjorden	1994	Dioxins/PCB	fish, shellfish	Consumption and Sale
Fedafjorden	1995	PAH	flat fish, shellfish	Consumption
Saudafjorden	1992	PAH	fish liver, mussels	Consumption
Sørfjorden and Hardangerfjorden	1997	Cd Pb Hg,	mussels	Consumption
Bergen area including Herdlefjorden, Byfjorden, Hjeltefjorden, Grimstadfjorden and Raunefjorden	1996	PCB	fish, shellfish	Consumption and Sale
Årdalsfjorden	1995	PAH	mussels	Consumption
Sunndalsfjorden	1993	PAH	fish liver, mussels	Consumption
Hommelvik (Trondheimsfjorden)	1985	PAH	mussels	Consumption
Ranfjorden	1997	PAH Pb Hg	mussels	Consumption
Vefsnfjorden	1992	PAH	mussels	Consumption

In regards to JMP/JAMP Purpose C (spatial distribution assessment), the concentrations found in 1996 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 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 has decreased since 1987. A separate analysis of HCB concentrations in mussels from the Langesundsfjorden 1990-1996 have decreased significantly.

The power of temporal trend monitoring expressed as an estimate of the number of years it would take to detect a hypothetical trend of 10% per year with 90% significance (power analysis) is a useful tool in assessing existing sampling strategies. However, in some cases the results can be misleading (cf., HCB-results for mussels from Langesund, page 11) and indicate the need to develop statistical methods more suited to local conditions. Furthermore, there is a general need to obtain a better understanding of the source of variation of concentrations as a basis for assessing/improving sampling strategies and remedial action.

2. Technical Details

2.1 Compliance with guidelines/procedures

2.1.1 JAMP programme

Samples were collected and analysed where practical, according to OSPARCOM guidelines (OSPARCOM 1990) and screened and submitted to ICES by agreed procedures (ICES 1996).

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 3. 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 1996 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 State Pollution Control Authority’s (SFT’s) system for **classification of environmental quality** has been applied (Table 4).

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 og 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 include 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.*, 1996b in press). The fewer the years the greater the power needed to detect a change. The power is based on the percentage relative standard deviation (RLSD) estimated using the robust method described ASMO (1994) and Nicholson *et al.* (1996a). 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 seafoods. Hence, the results of the JAMP pertaining to this purpose are presented only as a partial basis for evaluation.

Table 3. 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 ?	
∑PCB-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)]	
γHCH	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 State 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 ΣHCH or ΣDDT, respectively, from the Norwegian State 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 PB for blue mussel and cod/flatfish, respectively.

Table 4. Extracts of the Norwegian State Pollution Control Authority partly 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	**II**	**III**	**IV**	**V**
		"good"	***"fair"***	***"poor"***	***"bad"***	***"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
∑PCB-7	ppb w.w.	4	15	40	100	>100
∑DDT	ppb w.w.	2	5	10	30	>30
∑HCH	ppb w.w.	1	3	10	30	>30
HCB	ppb w.w.	0.1	0.3	1	5	>5
$TE_{PCDF/D}$ [1)]	ppp 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						
∑PCB-7	ppb w.w.	500	1500	4000	10000	>10000
∑DDT	ppb w.w.	200	500	1500	3000	>3000
∑HCH	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 14.

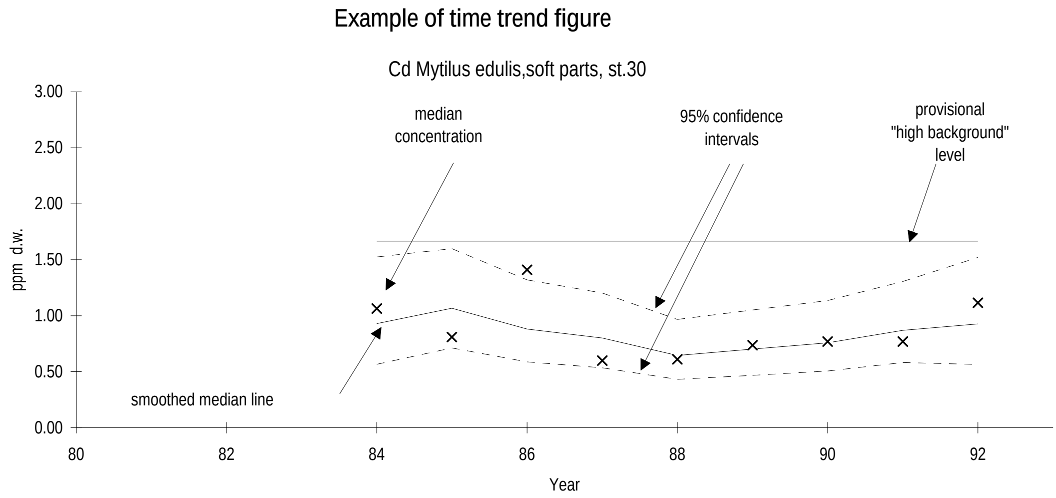

Figure 14. Example presentation of variation in contaminant concentration with time. The figure shows median concentrations, running mean of median values, 95% confidence interval. The provisional "high background level" is marked with a horizontal line and corresponds to values listed in Table 3 (see 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 6 (1996). These exercises have included nearly all the contaminants analysed for JAMP. Quality assurance programme for NIVA is similar to the 1995 programme (cf. Green 1995). 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.

Four JAMP mussel samples were analysed for "dioxins" (PCDDs and PCDFs) and non-ortho chlorobiphenyls by the Norwegian Institute for Air Research (NILU). NILU has participated in seven relevant international intercalibration exercises from 1990 to 1996 (NILU, pers. comm.)

2.3 Description of the Programme

The sampling for 1996 involved sampling of blue mussel at thirty stations and at least one flatfish species and/or cod was sampled at thirteen stations. The Norwegian JAMP has been expanded since 1989 to include monitoring in more diffusely polluted areas. Though new stations are initially intended for temporal trends, there has not always been sufficient funds to do this in following years. Hence, 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 except for flatfish at st.67B (flounder) and 43F (dab and lemon sole). Extra sampling may occur where a bi-catch of fish provides 5 or more fish of a priority species or co-ordination with a another programme such as 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 metal, chlorinated hydrocarbons (including pesticides) and polycyclic aromatic hydrocarbon 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 1996 (‘97) 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 10, the latter would apply to the 1996 samples analyzed in 1997. The results from Round 10 (November 1997) have been submitted to QUASIMEME but at the time of publication for these National Comments P and Z scores, assessment values for comparison with other laboratories, had not been received.

Table A1. Summary of the quality control results for the 1996 biota samples analysed 1996-97. 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 1974*** (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	15	5	0.042	0.004
		LI	DOLT	20.40 ± 1.80	9	14	20.43	1.00
Cu	**copper**	SB	DORM	2.34 ± 0.23	15	5	2.23	0.20
		LI	DOLT	25.10 ± 3.60	9	14	27.44	1.22
Pb	**lead**	SB	DORM	0.066 ± 0.38	15	5	0.07	0.01
		LI	DOLT	0.24 ± 0.11	9	14	0.20	0.02
Hg	**mercury**	SB MU	DORM	4.720 ± 0.520	26	19	4.564	0.272
Zn	**zinc**	SB	DORM	26.4 ± 3.7	15	5	25.86	1.52
		LI	DOLT	95.1 ± 11.3	9	14	94.6	2.87
CB-28	**PCB congener CB-28**	(all)	350	22.5± 4	26	20	18.99	0.91
CB-52	**PCB congener CB-52**	(all)	350	62 ± 9	26	21	57.43	3.60
CB-101	**PCB congener CB-101**	(all)	350	164 ± 9	26	21	169.38	8.07
CB-118	**PCB congener CB-118**	(all)	350	142 ± 20	26	21	151.10	10.90
CB-153	**PCB congener CB-153**	(all)	350	317 ± 20	26	21	346.14	17.69
CB-180	**PCB congener CB-180**	(all)	350	73 ± 13	26	21	82.24	4.30
PA	**phenanthrene**	MU	1974	5.6 ± 1.4	28	4	4.15	0.38
ANT	**anthracene**	MU	1974	0.75 ± 0.21	28	4	0.72	0.07
FLU	**fluoranthene**	MU	1974	33.6 ± 5.8	28	4	30.95	2.00
PYR	**pyrene**	MU	1974	34.1 ± 3.7	28	4	29.58	1.11
BBF	**benzo[*b*]fluoranthene**	MU	1974	6.5 ± 1.2	28	4	7.60	1.56
BAP	**benzo[*a*]pyrene**	MU	1974	2.29 ± 0.47	28	4	2.34	0.43
PER	**perylene**	MU	1974	1.05 ± 0.29	28	4	1.00	0.09
ICDP	**indeno[1,2,3-*cd*]pyrene**	MU	1974	1.80 ± 0.33	28	4	1.85	0.27
BGHIP	**benzo[*ghi*]perylene**	MU	1974	2.47 ± 0.28	28	4	2.74	0.30

*) 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		
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).

*) 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.* • *polyklorerte 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 envirommental 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/OSPARCOM, First Intercomparison Exercise on Organochlorines (individual chlorobiphenyl congeners) in Marine Sediments - Phase 1, analysis of standard solutions - 1989 - (1/OC/MS:1).

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

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

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

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

8F ICES/IOC/OSPARCOM 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/OSPARCOM Intercomparison Programme on the Analysis of Chlorobiphenyls in Marine Media - Step 1 - (analysis of standard solutions) - 1989 - (7/OC/BT-1).
2H	ICES/IOC/OSPARCOM Intercomparison Programme on the Analysis of Chlorobiphenyls in Marine Media - Step 2 - 1990 - (7/OC/BT-2).
2I	ICES/IOC/OSPARCOM Intercomparison Programme on the Analysis of Chlorobiphenyls in Marine Media - Step 3a - (7/OC/BT-3a) 1991.
2J	ICES/IOC/OSPARCOM Intercomparison Programme on the Analysis of Chlorobiphenyls in Marine Media - Step 3b - (7/OC/BT-3b) 1992.
2K	ICES/IOC/OSPARCOM 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 24/10-1997

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	NAP1M, NAP2M, NAPDI, NAPTM, PAM1
		Mussel	1992,1995-1996	ACNE , ACNLE, ANT , BAA , BAP , BBF , BEP , BGHIP, BIPN , BJKF , CHR , DBA3A, FLE , FLU , ICDP , NAP , PA , PER , PYR
		Mussel	1995	CHRTR
		Mussel	1995-1996	BBJKF, DBTC1, DBTC2, DBTC3, NAPC1, NAPC2, NAPC3, PAC1 , PAC2
		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	1986-1996	HG
		Mussel	1986-1996	HG
		Shrimp tail	1986,1988,1990,1992,1995	HG
		˜Other	1988	HG
311	NIVA	Fish liver	1986-1996	CU , ZN
		Mussel	1986-1996	CU , ZN
		Shrimp tail	1986,1988,1990,1992,1995	CU , ZN
		˜Other	1988	CU , ZN
312	NIVA	Fish liver	1986-1996	CD , PB
		Mussel	1986-1996	CD , PB
		Mussel	1992	CR , NI
		Shrimp tail	1986,1988,1990,1992,1995	CD , PB
		˜Other	1988	CD , PB
340	NIVA	Fish liver	1987	PCB
		Fish liver	1990-1996	CB101, CB118, CB138, CB153, CB180, CB209, CB28 , CB52 , DDEPP, HCB , HCHA , HCHG , OCS , QCB , TDEPP
		Fish liver	1991-1996	CB105, CB156
		Fish liver	1996	DDTPP
		Mussel	1995-1996	DDTPP
341	NIVA	Fish fillet	1990-1996	CB101, CB118, CB138, CB153, CB180, CB209, CB28 , CB52 , DDEPP, HCB , HCHA , HCHG , OCS , QCB , TDEPP
		Fish fillet	1991-1996	CB105, CB156
		Mussel	1992-1996	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
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

Tab.length cont'd.

Method	Lab.	Tissue	Monitoring Year	Contaminants
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	Mussel	1996	AG , AS , CO , 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	1986-1996	HG
	341	NIVA	1990-1996	CB101, CB118, CB138, CB153, CB180, CB209, CB28, CB52, DDEPP, HCB, HCHA, HCHG, OCS, QCB, TDEPP
	341	NIVA	1991-1996	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	1986-1996	CU, ZN
	312	NIVA	1986-1996	CD, PB
	340	NIVA	1987	PCB
	340	NIVA	1990-1996	CB101, CB118, CB138, CB153, CB180, CB209, CB28, CB52, DDEPP, HCB, HCHA, HCHG, OCS, QCB, TDEPP
	340	NIVA	1991-1996	CB105, CB156
	340	NIVA	1996	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
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	NAP1M, NAP2M, NAPDI, NAPTM, PAM1
	309	NIVA	1992,1995-1996	ACNE, ACNLE, ANT, BAA, BAP, BBF, BEP, BGHIP, BIPN, BJKF, CHR, DBA3A, FLE, FLU, ICDP, NAP, PA, PER, PYR
	309	NIVA	1995	CHRTR
	309	NIVA	1995-1996	BBJKF, DBTC1, DBTC2, DBTC3, NAPC1, NAPC2, NAPC3, PAC1, PAC2
	310	NIVA	1986-1996	HG
	311	NIVA	1986-1996	CU, ZN
	312	NIVA	1986-1996	CD, PB
	312	NIVA	1992	CR, NI
	340	NIVA	1995-1996	DDTPP
	341	NIVA	1992-1996	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
	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,

Tab.length cont'd.

Tissue	Method	Lab.	Monitoring Year	Contaminants
	309	NIVA		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

Filename : I:\TBX\JMG\BIO\TAB-3TIS.TB1 Niva 24/10-1997

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	72		20
	1996-NIVA	W						309	0.20	65		19
ACNLE	1992-NIVA	W	309	0.20	8			309	0.20	46		
	1995-NIVA	W						309	0.20	72		49
	1996-NIVA	W						309	0.20	65		42
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	72		28
	1996-NIVA	W						309	0.20	65		30
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	72		9
	1996-NIVA	W						309	0.20	65		8
BAP	1992-NIVA	W	309	0.20	8			309	0.20	45		
	1995-NIVA	W						309	0.20	72		21
	1996-NIVA	W						309	0.20	65		26
BBF	1992-NIVA	W	309	0.20	8			309	0.20	45		
	1995-NIVA	W						309	0.20	59		9
	1996-NIVA	W						309	0.20	57		6
BBJKF	1995-NIVA	W						309	0.20	12		
	1996-NIVA	W						309	0.20	8		
BEP	1992-NIVA	W	309	0.20	8			309	0.20	45		
	1995-NIVA	W						309	0.20	72		5
	1996-NIVA	W						309	0.20	65		6
BGHIP	1992-NIVA	W	309	0.20	8			309	0.20	46		
	1995-NIVA	W						309	0.20	72		20
	1996-NIVA	W						309	0.20	65		10
BIPN	1992-NIVA	W	309	0.20	8			309	0.20	46		
	1995-NIVA	W						309	0.20	72		52
	1996-NIVA	W						309	0.20	62		39
BJKF	1992-NIVA	W	309	0.20	8			309	0.20	45		
	1995-NIVA	W						309	0.20	24		21
	1996-NIVA	W						309	0.20	57		16
CB101	1987-SIIF	W						111	0.20	21	1	
	1988-SIIF	D						111	0.10	6		
	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	300	3		341	0.05	165	39	
	1995-NIVA	W	340	3.00	318	10		341	0.05	216	10	
	1996-NIVA	W	340	3.00	332	14		341	0.05	228	9	
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	300	8		341	0.05	165	53	
	1995-NIVA	W	340	3.00	318	13		341	0.05	215	34	
	1996-NIVA	W	340	3.00	332	22		341	0.05	222	23	
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	300	2		341	0.05	165	25	
	1995-NIVA	W	340	3.00	318	2		341	0.05	216	2	
	1996-NIVA	W	340	3.00	332	6		341	0.05	228	4	
CB126	1995-NILU	W						841	.20E-04	6		
	1996-NILU	W						841	.10E-03	18		
CB138	1988-SIIF	D						111	0.10	6		
	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		
	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	2Z W	340	3.00	300			341	0.05	165	12	
	1995-NIVA	W	340	3.00	318	2		341	0.05	216		
	1996-NIVA	W	340	3.00	331	1		341	0.05	226		
CB153	1988-SIIF	D						111	0.10	6		
	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		

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
	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	2Z W	340	3.00	300			341	0.05	165	9	
	1995-NIVA	W	340	3.00	318	1		341	0.05	216		
	1996-NIVA	W	340	3.00	332	1		341	0.05	228		
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	2Z W	340	3.00	300	24	1	341	0.05	162	70	
	1995-NIVA	W	340	3.00	317	27		341	0.05	216	67	
	1996-NIVA	W	340	3.00	332	48		341	0.05	228	62	
CB169	1995-NILU	W						841	.20E-04	6		
	1996-NILU	W						841	.10E-03	18	2	
CB180	1987-SIIF	W						111	0.20	21	6	
	1988-SIIF	D						111	0.10	6		
	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	2Z W	340	3.00	300	3		341	0.05	162	49	
	1995-NIVA	W	340	3.00	318	5		341	0.05	216	22	
	1996-NIVA	W	340	3.00	332	14		341	0.05	228	25	
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	300	29	24	341	0.05	165	91	
	1995-NIVA	W	340	3.00	318	36		341	0.05	216	92	
	1996-NIVA	W	340	3.00	332	255		341	0.05	228	107	
CB28	1988-SIIF	D						111	0.10	6		
	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	2Z W	340	3.00	282	18	4	341	0.05	163	73	
	1995-NIVA	W	340	3.00	313	27		341	0.05	216	75	
	1996-NIVA	W	340	3.00	332	107		341	0.05	227	70	
CB52	1987-SIIF	W						111	0.20	20	1	
	1988-SIIF	D						111	0.10	6		
	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	2Z W	340	3.00	300	9		341	0.05	165	64	
	1995-NIVA	W	340	3.00	312	19		341	0.05	205	28	
	1996-NIVA	W	340	3.00	332	49		341	0.05	226	31	
CB77	1995-NILU	W						841	.20E-04	6		
	1996-NILU	W						841	.10E-03	18		
CB81	1995-NILU	W						841	.20E-04	6		
	1996-NILU	W						841	.10E-03	18		
CD	1981-SIIF	1E W	130	10.00	28			130	5.00	27		
	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	55		
	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		

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
	1993-NIVA	1H W	312	50.00	221	98		312	50.00	79		
	1994-NIVA	1Z W	312	50.00	302	134		312	50.00	81		
	1995-NIVA	W	312	50.00	318	129		312	50.00	139	2	
	1996-NIVA	V1 W						312	50.00	125		
	1996-NIVA	V2 W	312	50.00	368	128						
CDD1N	1995-NILU	W						841	.20E-04	6	1	1
	1996-NILU	W						841	.10E-04	18		2
CDD4X	1995-NILU	W						841	.20E-04	6	3	1
	1996-NILU	W						841	.200E+08	18	18	
CDD6P	1995-NILU	W						841	.20E-04	6		
	1996-NILU	W						841	.40E-04	18		
CDD6X	1995-NILU	W						841	.20E-04	6		1
	1996-NILU	W						841	.20E-04	18		1
CDD9X	1995-NILU	W						841	.20E-04	6	2	1
	1996-NILU	W						841	.20E-04	18		1
CDDO	1995-NILU	W						841	.20E-04	6		
	1996-NILU	W						841	.10E-03	18		
CDDSN	1995-NILU	W						841	.20E-04	5		
	1996-NILU	W						841	.10E-04	18		3
CDDSP	1995-NILU	W						841	.20E-04	6		
	1996-NILU	W						841	.40E-04	18		
CDDST	1995-NILU	W						841	.20E-04	6		
	1996-NILU	W						841	.10E-04	18		
CDDSX	1995-NILU	W						841	.20E-04	5		
	1996-NILU	W						841	.20E-04	18		2
CDF2N	1995-NILU	W						841	.20E-04	6		
	1996-NILU	W						841	.10E-04	18		1
CDF2T	1995-NILU	W						841	.20E-04	6		
	1996-NILU	W						841	.10E-04	18		
CDF4X	1995-NILU	W						841	.20E-04	6		
	1996-NILU	W						841	.20E-04	18		1
CDF6P	1995-NILU	W						841	.20E-04	6		
	1996-NILU	W						841	.40E-04	18	2	1
CDF6X	1995-NILU	W						841	.20E-04	6		
	1996-NILU	W						841	.20E-04	18		1
CDF9P	1995-NILU	W						841	.20E-04	6	2	1
	1996-NILU	W						841	.80E-04	17	3	1
CDF9X	1995-NILU	W						841	.20E-04	6	3	1
	1996-NILU	W						841	.20E-04	18		1
CDFDN	1995-NILU	W						841	.20E-04	6		
	1996-NILU	W						841	.10E-04	18		1
CDFDX	1995-NILU	W						841	.20E-04	6		
	1996-NILU	W						841	.20E-04	18		1
CDFO	1995-NILU	W						841	.20E-04	6		1
	1996-NILU	W						841	.10E-03	18	3	1
CDFSN	1995-NILU	W						841	.20E-04	6		
	1996-NILU	W						841	.10E-04	18		1
CDFSP	1995-NILU	W						841	.20E-04	6		
	1996-NILU	W						841	.80E-04	18	6	1
CDFST	1995-NILU	W						841	.20E-04	6		
	1996-NILU	W						841	.10E-04	18		
CDFSX	1995-NILU	W						841	.20E-04	6		
	1996-NILU	W						841	.20E-04	18		1
CHR	1992-NIVA	W	309	0.20	8			309	0.20	44		
	1995-NIVA	W						309	0.20	56		
	1996-NIVA	W						309	0.20	65		3
CHRTR	1995-NIVA	W						309	0.20	15		2
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	55		
	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	1Z W	311	10.00	302			311	10.00	81		
	1995-NIVA	W	311	10.00	318			311	10.00	124		
	1996-NIVA	V1 W						311	10.00	113		
	1996-NIVA	V2 W	311	10.00	368							
DBA3A	1992-NIVA	W	309	0.20	8			309	0.20	46		
	1995-NIVA	W						309	0.20	71		48
	1996-NIVA	W						309	0.20	65		53
DBP	1992-NIVA	W	309	0.20	8			309	0.20	46		
DBTC1	1995-NIVA	W						309	0.20	57		14
	1996-NIVA	W						309	0.20	65		9
DBTC2	1995-NIVA	W						309	0.20	56		9
	1996-NIVA	W						309	0.20	62		11
DBTC3	1995-NIVA	W						309	0.20	57		4
	1996-NIVA	W						309	0.20	65		5
DDEPP	1982-VETN	W	210	50.00	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
	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	2Z W	510	20.00	56							
	1987-NACE	2Z W	510	40.00	53							
	1988-NACE	2Z W	510	40.00	61							
	1989-NACE	2Z 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	2Z W	340	4.00	300			341	0.10	165	27	
	1995-NIVA	W	340	4.00	318	2		341	0.10	216	30	
	1996-NIVA	W	340	4.00	332	2		341	0.10	228	47	
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	6		
	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		
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	27		
	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	72		22
	1996-NIVA	W						309	0.20	65		6
FLU	1992-NIVA	W	309	0.20	8			309	0.20	44		
	1995-NIVA	W						309	0.20	72		
	1996-NIVA	W						309	0.20	65		
HCB	1983-SIIF	W						111	0.50	12		
	1983-VETN	2Z W	210	10.00	48			211a	10.00	48		
	1984-SIIF	W						111	0.20	24		1
	1984-VETN	2Z W	210	10.00	66							
	1985-SIIF	W						111	0.20	30	6	2
	1985-VETN	2Z W	210	10.00	45		4					
	1986-NACE	2Z W	510	10.00	56							
	1986-SIIF	2Z W						111	0.20	21	3	
	1987-NACE	2Z W	510	40.00	53							
	1987-SIIF	2Z W						111	0.20	21	4	
	1988-NACE	2Z W	510	40.00	61							
	1988-SIIF	2Z D						111	0.20	6		
	1988-SIIF	2Z W						111	0.20	22	2	
	1989-NACE	2Z W	510	20.00	93							
	1989-SIIF	2Z W						111	0.05	36		
	1990-NIVA	W	340	1.00	169	2		341	0.05	58		
	1990-SIIF	2Z W						111	0.05	41	3	
	1991-NIVA	W	340	1.00	179	4	13	341	0.05	62	5	
	1991-SIIF	2Z 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	2Z W	340	3.00	300	24	1	341	0.05	165	33	
	1995-NIVA	W	340	3.00	317	37		341	0.05	216	30	
	1996-NIVA	W	340	3.00	332	52		341	0.05	228	37	
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	2Z W	340	3.00	296	32	3	341	0.05	165	85	
	1995-NIVA	W	340	3.00	318	45		341	0.05	216	98	
	1996-NIVA	W	340	3.00	332	111		341	0.05	222	100	
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		

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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
	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	2Z W	340	3.00	300	24	1	341	0.05	165	46	
	1995-NIVA	W	340	3.00	313	31		341	0.05	204	29	
	1996-NIVA	W	340	3.00	330	68		341	0.05	211	8	
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	116		
	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	381		
	1995-NIVA	W						310	5.00	442	1	
	1996-NIVA	V1 W						310	5.00	481		
ICDP	1992-NIVA	W	309	0.20	8			309	0.20	46		
	1995-NIVA	W						309	0.20	72		29
	1996-NIVA	W						309	0.20	65		23
MN	1984-SIIF	W						132	40.00	27		
	1985-SIIF	D						132	40.00	35		
NAP	1992-NIVA	W	309	0.20	8			309	0.20	46		
	1995-NIVA	W						309	0.20	70		21
	1996-NIVA	W						309	0.20	61		11
NAP1M	1992-NIVA	W	309	0.20	8			309	0.20	46		
	1995-NIVA	W						309	0.20	15		13
NAP2M	1992-NIVA	W	309	0.20	8			309	0.20	46		
	1995-NIVA	W						309	0.20	15		13
NAPC1	1995-NIVA	W						309	0.20	55		6
	1996-NIVA	W						309	0.20	61		
NAPC2	1995-NIVA	W						309	0.20	57		6
	1996-NIVA	W						309	0.20	60		
NAPC3	1995-NIVA	W						309	0.20	57		5
	1996-NIVA	W						309	0.20	60		
NAPDI	1992-NIVA	W	309	0.20	8			309	0.20	46		
	1995-NIVA	W						309	0.20	15		6
NAPTM	1992-NIVA	W	309	0.20	8			309	0.20	46		
	1995-NIVA	W						309	0.20	15		11
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	300	39	22	341	0.05	165	96	
	1995-NIVA	W	340	3.00	318	44		341	0.05	216	102	
	1996-NIVA	W	340	3.00	332	287		341	0.05	228	114	
PA	1992-NIVA	W	309	0.20	8			309	0.20	45		
	1995-NIVA	W						309	0.20	72		
	1996-NIVA	W						309	0.20	65		
PAC1	1995-NIVA	W						309	0.20	57		1
	1996-NIVA	W						309	0.20	65		
PAC2	1995-NIVA	W						309	0.20	56		
	1996-NIVA	W						309	0.20	65		2
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
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	55		
	1989-NIVA	1Z D	312	150.00	135	9	9					
	1989-NIVA	1Z W						312	150.0			

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
	1996-NIVA	V1 W						312	30.00	110		
	1996-NIVA	V2 W	312	30.00	368		109					
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	6		
	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	6		
	1996-NILU	W						841	.10E-03	18		
PCDF	1995-NILU	W						841	.20E-04	6		
	1996-NILU	W						841	.10E-03	18		
PER	1992-NIVA	W	309	0.20	8			309	0.20	46		
	1995-NIVA	W						309	0.20	72		32
	1996-NIVA	W						309	0.20	65		40
PYR	1992-NIVA	W	309	0.20	8			309	0.20	44		
	1995-NIVA	W						309	0.20	72		4
	1996-NIVA	W						309	0.20	65		1
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	299	38	23	341	0.05	165	93	
	1995-NIVA	W	340	3.00	318	45		341	0.05	216	103	
	1996-NIVA	W	340	3.00	332	306		341	0.05	228	109	
SE	1982-VETN	W	240	10.00	46			240	10.00	54		
TCDD	1995-NILU	W						841	.20E-04	6	1	
	1996-NILU	W						841	.10E-04	18		
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	300	17	5	341	0.05	165	47	
	1995-NIVA	W	340	3.00	318	36		341	0.05	213	51	
	1996-NIVA	W	340	3.00	332	23		341	0.05	228	16	
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	55		
	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	302			311	1000.00	81		
	1995-NIVA	W	311	1000.00	318			311	1000.00	142		
	1996-NIVA	V1 W						311	1000.00	131		
	1996-NIVA	V2 W	311	1000.00	368							
Sum of Counts					40365	3611	1007			32068	2896	966

a(6) > 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 1996

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	1996 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°52.5'	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	1996 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 SØRFJORDEN												
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	Kvame 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	1996 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°04.6'	10°00.7'	57G03	+		+				4
	92B	Stokken area	64°09.9'	09°53.0'	57F99						+	
	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	Skrova	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 W	S	B	O	F	R	notes
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						+	
	43F	Kvænangen	70°09.0'	21°22.0'	69H16					+		
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	00°00.0'	00°00.0'						*		
	11A	Sildkroneset, Bøkfjorden	69°47.2'	30°11.1'	68J02	+		+				

notes:

+ - samples collected
* - planned but innsufficient material
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 1996

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)				FISH COD- (C)			
			M0	M1	C4	A1	G1	M3	C2	A1	M3	C2	-L -F	M4 M5	C2 C2	A1 A1	-L -F	M4 M5	C2 C2	A1 A1
26		**OSLOFJORD AREA CENTRAL**, Oslofjord proper																		
26	30A	Gressholmen	1	.	.	.	.	3	3	.	.	.	.	.	.	.	.	.	.	.
26	30S	Steilene	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
26	30B	Oslo city Area / Håøya	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
		VIC: Steilene - 15.1.97	.	.	.	.	.	.	.	.	.	.	.	.	.	.	C-L	10	10	.
			.	.	.	.	.	.	.	.	.	.	.	.	.	.	C-F	10	2B	.
		VIC: Steilene - 22.1.97	.	.	.	.	.	.	.	.	.	.	.	.	.	.	C-L	10	10	.
			.	.	.	.	.	.	.	.	.	.	.	.	.	.	C-F	10	2B	.
		VIC: Steilene - 3.2.97	.	.	.	.	.	.	.	.	.	.	.	.	.	.	C-L	10	10	.
			.	.	.	.	.	.	.	.	.	.	.	.	.	.	C-F	10	2B	.
		VIC: Svestad - 18.1.97	.	.	.	.	.	.	.	.	.	.	.	.	.	.	C-L	10	10	.
			.	.	.	.	.	.	.	.	.	.	.	.	.	.	C-F	10	2B	.
		VIC: Håøya 16.1.97	.	.	.	.	.	.	.	.	.	.	.	.	.	.	C-L	10	10	.
			.	.	.	.	.	.	.	.	.	.	.	.	.	.	C-F	10	2B	.
26	31A	Solbergstrand	1	.	.	.	.	3	3	.	.	.	.	.	.	.	.	.	.	.
26	33B	Sande, east side	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
		VIC: 10.96	.	.	.	.	.	.	.	.	.	.	F-L	5B	5B	.	.	.	.	.
			.	.	.	.	.	.	.	.	.	.	F-F	5B	5B	.	.	.	.	.
		VIC: 11.96	.	.	.	.	.	.	.	.	.	.	F-L	5B	5B	.	.	.	.	.
			.	.	.	.	.	.	.	.	.	.	F-F	5B	5B	.	.	.	.	.
		VIC: 12.96	.	.	.	.	.	.	.	.	.	.	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	SEDIMENT				MUSSEL/			OTHER		FISH FLAT- (P,F,D,M)				FISH COD- (C)			
													-L	M4	C2	A1	-L	M4	C2	A1
			M0	M1	C4	A1	G1	M3	C2	A1			-F	M5	C2	A1	-F	M5	C2	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	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
		VIC: 18.8--	.	.	.	.	.	.	.	.	.	.	FL	3B	3B	.	C-L	25	25	.
			.	.	.	.	.	.	.	.	.	.	FF	3B	3B	.	C-F	25	5B	.
		VIC: 31.10--	.	.	.	.	.	.	.	.	.	.	MF	5B	5B	.	C-L	10	0	.
			.	.	.	.	.	.	.	.	.	.	MF	5B	5B	.	C-F	10	0B	.
62	65A	Vikingneset	1	.	.	.	.	3	3	.	.	.	.	.	.	.	.	.	.	.
62	63A	Ranaskjær	1	.	.	.	.	3	3	.	.	.	.	.	.	.	.	.	.	.
63		**SØRFJORDEN**																		
63	52A	Eitrheimsneset	1	.	.	.	.	3	3	.	.	.	.	.	.	.	.	.	.	.
63	53B	Inner Sørfjord	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
		VIC: Tyssedal - 8.96--	.	.	.	.	.	.	.	.	.	.	F-L	5B	5B	.	C-L	15	15	.
			.	.	.	.	.	.	.	.	.	.	F-F	5B	5B	.	C-F	15	3B	.
		VIC: Tyssedal - 12.96--	.	.	.	.	.	.	.	.	.	.	.	.	.	.	C-L	10	.	.
			.	.	.	.	.	.	.	.	.	.	.	.	.	.	C-F	10	.	.
		VIC: Edna - 8.96--	.	.	.	.	.	.	.	.	.	.	F-L	3B	3B	.	C-L	15	15	.
			.	.	.	.	.	.	.	.	.	.	F-F	3B	3B	.	C-F	15	3B	.
		VIC: Edna - 12.96--	.	.	.	.	.	.	.	.	.	.	.	.	.	.	C-L	10	.	.
			.	.	.	.	.	.	.	.	.	.	.	.	.	.	C-F	10	.	.
		VIC: Odda - 8.96--	.	.	.	.	.	.	.	.	.	.	F-L	3B	3B	.	.	.	.	.
			.	.	.	.	.	.	.	.	.	.	F-F	3B	3B	.	.	.	.	.
63	56A	Kvalnes	1	.	.	.	.	3	3	.	.	.	.	.	.	.	.	.	.	.
63	57A	Krossanes	1	.	.	.	.	3	3	.	.	.	.	.	.	.	.	.	.	.

Appendix F1 (cont.)

JAMP area		STATION	WATER M0	SEDIMENT M1	C4	A1	G1	MUSSEL/ M3	C2	A1	OTHER		FISH FLAT- (P,F,D,M) -L -F	M4 M5	C2 C2	A1 A1	COD- (C) -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	.	.	.	.	.	.	.	.	.	.	.	.	.	.	C-L	25	25	.
			.	.	.	.	.	.	.	.	.	.	.	.	.	.	C-F	25	5B	.
	92F	Stokken	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
		LOFOTEN AREA																		
	98X	Skrova	1	.	.	.	.	3	3	.	.	.	.	.	.	.	.	.	.	.
	98B	Lille Molla	.	.	.	.	.	.	.	.	.	.	.	.	.	.	C-L	25	25	
			.	.	.	.	.	.	.	.	.	.	.	.	.	.	C-F	25	5B	
	98F	Lille Molla	.	.	.	.	.	.	.	.	.	.	D-L	5B	5B	.	.	.	.	.
			.	.	.	.	.	.	.	.	.	.	D-F	5B	5B	.	.	.	.	.
		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	.	.	.	.	.	.	.	.	.	.	.	.	.	.	C-L	25	25	.
			.	.	.	.	.	.	.	.	.	.	.	.	.	.	C-F	25	5B	
	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, DDT, EPOCl (optional), dry weight percent
C2	CB-28,-52,-101,-105,-118,-138,-153,-156,-180, 209, 5-CB, OCS, a+gHCH, HCB, DDT, EPOCl (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 1981-96

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*)

OC Overconcentration expressed as quotient of median of last year and "high background")

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"

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	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	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	no	--	1.2	14
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	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	no	-Y	1.8	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	no	--	1.4	11
76A	MYTI EDU	SB	D.wt										0.638	0.860	0.957	1.098			1.168	no	U?	?	7
15A	MYTI EDU	SB	D.wt										0.505	0.831		1.182	0.794	1.439	1.220	no	--	1.8	12
22A	MYTI EDU	SB	D.wt										0.532	1.139	1.117	0.844	1.020	1.414	1.145	no	--	1.5	11
51A	MYTI EDU	SB	D.wt							42.800	58.200							36.837	25.272	12.6	-?	?	10
52A	MYTI EDU	SB	D.wt									94.400	10.160	80.083	43.089	14.651	8.713	19.759	18.377	9.2	--	128.9	24
56A	MYTI EDU	SB	D.wt							55.900	55.200	98.413	45.034	69.444	51.667	59.681	11.357	30.761	20.000	10.0	--	30.8	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	4.2	DY	5.9	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	2.7	D-	9.4	16
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	1.8	--	5.6	17
69A	MYTI EDU	SB	D.wt												4.261	2.368	2.084	2.910	3.195	1.6	-?	?	10
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	no	-?	?	13
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	no	-?	?	14
44A	MYTI EDU	SB	D.wt														1.691	2.741	1.954	no	-?	?	12
46A	MYTI EDU	SB	D.wt														2.696	2.058	2.718	1.4	-?	?	10
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	no	--	no	16
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	no	D-	1.2	16
15B	GADU MOR	LI	W.wt										0.026	0.009	0.025	0.016	0.014	0.016	0.024	no	--	no	16
23B	GADU MOR	LI	W.wt										0.022	0.024	0.020	0.025	0.015	0.026	0.014	no	--	no	12
53B	GADU MOR	LI	W.wt						0.658		0.058	0.093	0.045	0.149	0.215	0.038		0.007	0.180	1.8	--	4.7	>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	1.1	--	1.5	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	3.3	-?	?	23
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	no	-?	?	12
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	?	--	?	14
36F	LIMA LIM	LI	W.wt										0.106	0.112	0.230	0.295	0.135	0.147	0.139	no	-Y	no	11
15F	LIMA LIM	LI	W.wt													0.099	0.136	0.125	0.153	no	-?	?	8
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	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	8.4	--	19.1	24

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 U (ppm).

St.	Species	Tissue	Base	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	OC	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	no	--	1.2	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	no	UY	1.2	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	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	no	--	2.2	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	no	--	1.1	8
76A	MYTI EDU	SB	D.wt										8.51	10.80	5.65	5.57			6.65	no	-?	?	10
15A	MYTI EDU	SB	D.wt										5.72	7.21		5.50	5.25	5.26	7.32	no	--	1.2	8
22A	MYTI EDU	SB	D.wt										6.35	6.69	5.38	5.76	6.28	6.81	9.29	no	UY	1.5	7
51A	MYTI EDU	SB	D.wt							7.14	6.14							10.20	10.20	1.0	-?	?	9
52A	MYTI EDU	SB	D.wt									8.40	7.49	72.08	9.35	8.45	6.98	7.03	6.28	no	--	3.3	21
56A	MYTI EDU	SB	D.wt							8.07	8.04	8.82	5.37	7.54	7.40	9.15	6.36	7.71	6.59	no	--	no	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	no	D-	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	no	--	1.1	9
65A	MYTI EDU	SB	D.wt							7.98	4.86	5.19	12.23	8.14	5.51	6.00	5.12	5.66	5.82	no	--	1.0	11
69A	MYTI EDU	SB	D.wt												6.19	5.32	5.41	6.26	7.28	no	-?	?	6
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	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	no	-?	?	7
44A	MYTI EDU	SB	D.wt														6.56	9.56	7.78	no	-?	?	10
46A	MYTI EDU	SB	D.wt														6.63	7.43	8.00	no	-?	?	<=5
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	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	no	--	no	12
15B	GADU MOR	LI	W.wt										11.30	1.63	5.83	2.28	1.70	3.64	8.95	no	--	7.6	22
23B	GADU MOR	LI	W.wt										8.15	11.10	5.83	7.06	7.10	10.00	8.75	no	--	1.1	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	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	no	--	no	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	no	-?	?	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	no	-?	?	11
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	?	--	?	9
36F	LIMA LIM	LI	W.wt										13.40	5.29	8.49	8.09	7.30	8.90	7.06	no	--	1.7	13
15F	LIMA LIM	LI	W.wt											2.77		4.11	3.00	5.90	9.12	no	-?	?	12
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	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	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	A N A L Y S E S			
																				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	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	no	--	no	16
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	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	no	--	no	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	1.1	--	2.5	12
76A	MYTI EDU	SB	D.wt										0.071	0.068	0.050	0.020			0.057	no	-?	?	16
15A	MYTI EDU	SB	D.wt										0.056	0.052		0.024	0.050	0.022	0.049	no	--	no	16
22A	MYTI EDU	SB	D.wt										0.053	0.073	0.112	0.048	0.067	0.066	0.072	no	--	no	12
51A	MYTI EDU	SB	D.wt							0.240	0.250							1.510	0.901	4.5	-?	?	19
52A	MYTI EDU	SB	D.wt									2.352	0.321	3.008	0.976	0.372	0.282	0.437	0.178	no	--	8.4	24
56A	MYTI EDU	SB	D.wt							0.530	0.355	1.087	0.710	1.540	0.935	1.223	0.352	0.679	0.365	1.8	--	4.8	17
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	no	UY	no	9
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	no	-Y	2.3	12
65A	MYTI EDU	SB	D.wt							0.100	0.135	0.104	0.313	0.328	0.124	0.119	0.134	0.148	0.118	no	-Y	1.3	12
69A	MYTI EDU	SB	D.wt												0.106	0.026	0.083	0.070	0.104	no	-?	?	20
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	no	-?	?	12
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	no	-?	?	<=5
44A	MYTI EDU	SB	D.wt														0.055	0.050	0.052	no	-?	?	<=5
46A	MYTI EDU	SB	D.wt														0.039	0.062	0.056	no	-?	?	10
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	1.1	UYL	1.3	10
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	1.4	--L	2.3	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	no	DYL	1.2	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	no	D-L	1.6	12
15B	GADU MOR(s)	MU	W.wt										0.065	0.040	0.026	0.018	0.045	0.043	0.058	no	-YL	2.1	12
15B	GADU MOR(l)	MU	W.wt										0.120	0.070	0.063	0.039	0.081	0.045	0.087	no	--L	2.3	14
23B	GADU MOR(s)	MU	W.wt										0.065	0.070	0.060	0.041	0.051	0.069	0.059	no	-YL	1.2	8
23B	GADU MOR(l)	MU	W.wt										0.170	0.110	0.084	0.098	0.073	0.109	0.057	no	--L	1.2	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	2.3	---	3.2	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	2.8	---	3.8	15
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	no	---	no	8
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	no	---	1.6	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	no	-?-	?	10
98B	GADU MOR(l)	MU	W.wt												0.065	0.064	0.069	0.086	0.037	no	-?-	?	12
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	no	-?L	?	7
10B	GADU MOR(l)	MU	W.wt														0.055	0.052	0.039	no	-?L	?	7
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	?	---	?	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	?	---	?	14
36F	LIMA LIM(s)	MU	W.wt										0.045	0.071	0.066	0.070	0.049	0.054	0.049	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	no	--L	1.3	11
15F	LIMA LIM(s)	MU	W.wt											0.090		0.038	0.037	0.024	0.037	no	-?-	?	13
15F	LIMA LIM(l)	MU	W.wt											0.150		0.034	0.036	0.056	0.108	1.1	-?-	?	17
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	no	-Y-	no	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	no	DY-	no	14
53B	PLAT FLE(s)	MU	W.wt								0.111	0.074	0.139	0.154	0.141	0.071		0.035	0.165	1.7	---	2.8	16
53B	PLAT FLE(l)	MU	W.wt								0.111	0.128	0.090	0.124	0.100	0.116		0.036	0.208	2.1	---	4.9	19

(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	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	no	--	1.3	14
31A	MYTI EDU	SB	D.wt										1.383	1.212	1.264	1.027	1.370	1.679	1.789	no	UY	1.1	7
35A	MYTI EDU	SB	D.wt										1.437	1.071	1.676	1.198	1.284	0.507	0.628	no	--	no	12
36A	MYTI EDU	SB	D.wt										1.009	0.847	0.787	1.123	1.394	1.238	2.044	no	U-	1.2	9
71A	MYTI EDU	SB	D.wt										1.161	0.745	1.716	1.421	1.923	1.494	2.209	no	--	1.7	13
76A	MYTI EDU	SB	D.wt										1.773	0.968	1.505	0.913			0.796	no	-?	?	13
15A	MYTI EDU	SB	D.wt										1.457	0.777		0.976	1.053	0.522	0.671	no	--	no	12
22A	MYTI EDU	SB	D.wt										1.371	1.456	2.778	1.867	1.390	1.183	1.506	no	-Y	no	10
52A	MYTI EDU	SB	D.wt										12.073	312.500	189.430	65.504	16.354	17.532	9.843	3.3	--	16.3	25
56A	MYTI EDU	SB	D.wt										20.738	23.413	121.500	109.380	24.691	46.418	27.784	9.3	--	27.2	18
57A	MYTI EDU	SB	D.wt										10.548	12.137	33.258	19.194	15.071	13.195	5.596	1.9	-Y	2.8	13
63A	MYTI EDU	SB	D.wt										12.137	10.093	15.430	10.938	7.215	12.086	7.600	2.5	--	6.0	12
65A	MYTI EDU	SB	D.wt										5.605	3.784	5.190	6.533	3.277	4.725	2.412	no	--	1.5	13
69A	MYTI EDU	SB	D.wt												4.619	3.421	2.800	3.166	4.024	1.3	-?	?	8
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	no	-?	?	12
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	no	-?	?	8
44A	MYTI EDU	SB	D.wt														2.813	2.568	1.657	no	-?	?	9
46A	MYTI EDU	SB	D.wt														1.257	1.570	1.385	no	-?	?	8
30B	GADU MOR	LI	W.wt										0.200	0.115	0.249	0.105	0.120	0.110	0.060	no	--	1.4	15
36B	GADU MOR	LI	W.wt										0.115	0.050	0.030	0.020	0.030	0.020	0.030	no	DY	no	12
15B	GADU MOR	LI	W.wt										0.170	0.060	0.030	0.030	0.030	0.020	0.030	no	DY	no	12
23B	GADU MOR	LI	W.wt										0.060	0.080	0.030	0.030	0.030	0.020	0.030	no	--	no	12
53B	GADU MOR	LI	W.wt										0.190	0.260	0.140	0.030		0.020	0.075	no	DY	1.2	17
67B	GADU MOR	LI	W.wt										0.130	0.180	0.030	0.075	0.090	0.040	0.040	no	--	no	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	no	U?	?	6
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	no	-?	?	14
67B	LEPI WHI	LI	W.wt										0.190	0.070	0.060	0.070	0.040	0.070	0.030	?	--	?	15
36F	LIMA LIM	LI	W.wt										0.600	0.070	0.040	0.070	0.030	0.020	0.030	no	D-	no	19
15F	LIMA LIM	LI	W.wt											0.070		0.041	0.030	0.020	0.030	no	D?	?	11
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	no	DY	no	15
53B	PLAT FLE	LI	W.wt										0.710	0.810	0.410	0.230		0.024	0.460	1.5	--	5.8	>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.

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	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	no	--	no	11
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	no	--	1.4	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	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	no	U-	1.2	9
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	no	--	no	10
76A	MYTI EDU	SB	D.wt										158.16	127.27	124.35	57.65			112.44	no	-?	?	13
15A	MYTI EDU	SB	D.wt										156.56	143.70		71.43	88.95	62.61	231.71	1.2	--	4.6	16
22A	MYTI EDU	SB	D.wt										171.96	162.03	135.00	115.72	98.02	143.94	220.65	1.1	UY	2.3	8
51A	MYTI EDU	SB	D.wt							378.00	253.00							385.71	222.52	1.1	-?	?	13
52A	MYTI EDU	SB	D.wt									824.00	271.74	452.50	408.13	217.83	141.15	196.20	182.81	no	--	2.4	14
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	1.2	--	2.7	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	no	D-	no	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	no	D-	2.1	12
65A	MYTI EDU	SB	D.wt							191.00	147.89	198.70	424.46	307.76	131.06	138.67	117.51	166.27	147.06	no	DY	1.6	11
69A	MYTI EDU	SB	D.wt												134.52	101.58	134.86	162.81	160.57	no	-?	?	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	no	-?	?	10
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	no	-?	?	<=5
44A	MYTI EDU	SB	D.wt														67.19	91.26	81.03	no	-?	?	9
46A	MYTI EDU	SB	D.wt														88.40	112.28	93.33	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	no	--	1.5	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	no	D-	1.7	10
15B	GADU MOR	LI	W.wt										33.80	14.10	20.40	17.00	14.20	21.15	26.40	no	--	2.7	12
23B	GADU MOR	LI	W.wt										29.00	33.80	24.80	21.20	18.70	25.10	21.90	no	--	1.2	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	no	--	1.7	13
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	1.0	--	1.2	11
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	no	-?	?	9
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	no	-?	?	9
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	?	--	?	9
36F	LIMA LIM	LI	W.wt										39.30	26.60	32.20	27.20	28.40	28.00	31.10	no	--	no	8
15F	LIMA LIM	LI	W.wt											25.00		29.73	24.72	34.70	34.80	no	-?	?	8
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	no	--	1.1	10
53B	PLAT FLE	LI	W.wt								54.38	46.27	43.30	51.40	49.20	51.90		35.79	40.50	no	--	no	7

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	ANALYSES OC	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	5.3	--	15.3	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	2.2	--	10.2	15
35A	MYTI EDU	SB	D.wt								5.65	6.90	6.11	2.92	5.52	3.03	3.76	3.69	3.07	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	no	--	3.7	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	1.4	--	3.9	16
76A	MYTI EDU	SB	D.wt										4.62	2.84	2.49	1.18			4.21	no	-?	?	17
15A	MYTI EDU	SB	D.wt										2.84			0.98	2.00	0.90	0.79	no	-?	?	17
22A	MYTI EDU	SB	D.wt										2.96	3.05	2.78	1.31	2.33	2.12	1.94	no	--	no	11
52A	MYTI EDU	SB	D.wt									17.95	3.47		3.77	3.62	5.00	5.32	2.62	no	--	1.9	17
56A	MYTI EDU	SB	D.wt								2.80	14.50	5.57	3.97	2.80	2.08	4.00	3.97	3.09	no	--	2.6	17
57A	MYTI EDU	SB	D.wt									8.46		3.82	1.44	1.59	2.69	2.04	1.81	no	DY	no	12
63A	MYTI EDU	SB	D.wt									8.84		4.85	1.48	1.23	1.77	1.91	1.40	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	no	--	4.6	25
69A	MYTI EDU	SB	D.wt												1.02	1.58	1.66	1.85	0.93	no	-?	?	12
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	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	no	-?	?	6
46A	MYTI EDU	SB	D.wt														1.68	1.28	0.98	no	-?	?	8
30B	GADU MOR	LI	W.wt										405.00	955.00	957.39	856.41	885.00	807.00	871.90	4.4	--	7.6	11
36B	GADU MOR	LI	W.wt										164.86	126.00	147.00	254.00	138.00	642.00	350.00	1.8	--	18.3	17
15B	GADU MOR	LI	W.wt										60.00	104.44	99.00	66.50	97.00	117.73	112.00	no	--	1.4	10
23B	GADU MOR	LI	W.wt										80.00	103.88	86.00	79.00	48.00	75.00	73.00	no	--	no	10
53B	GADU MOR	LI	W.wt										156.00	193.97	560.74	65.00		61.00	262.44	1.3	--	4.5	22
67B	GADU MOR	LI	W.wt										106.00	111.00	105.76	83.50	128.45	85.00	92.00	no	--	no	9
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	no	-?	?	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	no	-?	?	14
30B	GADU MOR	MU	W.wt										1.47	3.70	9.20	3.30	1.23	0.89	2.54	?	-Y	?	16
36B	GADU MOR	MU	W.wt										0.63	0.45	0.70	1.30	0.15	5.42	1.37	?	--	?	>25
15B	GADU MOR	MU	W.wt										0.52	0.39	0.49	0.20	0.13	0.36	0.43	?	-Y	?	13
23B	GADU MOR	MU	W.wt										0.26	0.94	0.20	0.20	0.05	0.27	0.16	?	--	?	23
53B	GADU MOR	MU	W.wt										3.36	0.97	4.79	0.40		0.12	6.43	?	--	?	>25
67B	GADU MOR	MU	W.wt										0.24	0.56	0.40	0.14	0.47	0.19	1.23	?	--	?	22
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	?	-?	?	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	?	-?	?	25
67B	LEPI WHI	LI	W.wt										37.00	42.00	61.00	45.00	87.00	79.00	38.80	?	--	?	12
67B	LEPI WHI	MU	W.wt										0.27	0.33	0.60	0.10	0.17	0.63	0.17	?	--	?	21
36F	LIMA LIM	LI	W.wt										129.48	92.49	138.00	171.00	148.00	161.00	150.80	no	--	1.1	8
15F	LIMA LIM	LI	W.wt											53.00		21.54	28.93	28.00	22.80	no	-?	?	13
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	?	--	?	13
15F	LIMA LIM	MU	W.wt											1.42		0.24	0.12	0.41	0.69	?	-?	?	20
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	no	--	no	13
53B	PLAT FLE	LI	W.wt										123.00	125.94	80.00	10.00		7.94	37.00	no	DY	1.5	19
33B	PLAT FLE	MU	W.wt										0.65	1.24	0.50	0.30	0.12	0.22	0.34	?	DY	?	14
53B	PLAT FLE	MU	W.wt										5.88	8.20	3.40	0.40		0.22	0.93	?	DY	?	19

SB Soft body tissue.
LI Liver 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 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	ANALYSES OC	TRND	U95+3	POWER
30A	MYTI EDU	SB	D.wt												5.24	3.86	7.08	5.70	2.56	no	-?	?	13
31A	MYTI EDU	SB	D.wt												3.30	1.89	3.45	1.84	0.50	no	-?	?	17
35A	MYTI EDU	SB	D.wt												4.91	2.08	3.13	2.84	0.57	no	-?	?	19
36A	MYTI EDU	SB	D.wt												2.76	1.06	1.03	1.76	0.44	no	-?	?	19
71A	MYTI EDU	SB	D.wt												2.61	1.58	3.21	1.29	0.74	no	-?	?	15
76A	MYTI EDU	SB	D.wt												1.40	0.79			0.36	no	-?	?	14
15A	MYTI EDU	SB	D.wt													0.98	1.72	0.73	0.29	no	-?	?	15
22A	MYTI EDU	SB	D.wt												2.22	1.31	1.88	1.45	0.39	no	-?	?	16
52A	MYTI EDU	SB	D.wt												12.26	25.48	19.43	18.48	9.53	no	-?	?	13
56A	MYTI EDU	SB	D.wt												50.00	47.53	114.57	40.84	33.89	3.4	-?	?	15
57A	MYTI EDU	SB	D.wt												25.90	18.25	34.97	25.31	15.80	1.6	-?	?	12
63A	MYTI EDU	SB	D.wt												12.94	9.29	9.68	8.36	5.53	no	-?	?	9
65A	MYTI EDU	SB	D.wt												7.60	5.19	7.79	4.12	5.00	no	-?	?	12
69A	MYTI EDU	SB	D.wt												3.55	3.16	3.54	2.91	0.40	no	-?	?	19
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	no	-?	?	17
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	no	-?	?	10
46A	MYTI EDU	SB	D.wt														1.05	0.76	0.27	no	-?	?	15
30B	GADU MOR	LI	W.wt										163.00	440.00	182.46	158.97	191.00	194.00	312.50	1.6	--	5.6	15
36B	GADU MOR	LI	W.wt										91.90	51.00	50.00	75.00	55.00	105.00	141.00	no	--	2.4	11
15B	GADU MOR	LI	W.wt										50.00	135.99	48.00	56.99	86.00	33.47	75.00	no	--	no	18
23B	GADU MOR	LI	W.wt										68.00	85.38	42.00	41.00	35.00	31.00	49.00	no	--	no	10
53B	GADU MOR	LI	W.wt										637.00	805.84	939.42	85.00		42.00	491.39	2.5	--	7.9	24
67B	GADU MOR	LI	W.wt										776.00	554.00	347.15	391.80	471.14	109.00	460.00	2.3	--	4.1	19
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	no	-?	?	14
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	no	-?	?	16
67B	LEPI WHI	LI	W.wt										294.00	240.00	183.00	163.00	250.00	145.00	142.60	?	--	?	10
36F	LIMA LIM	LI	W.wt										27.98	34.41	28.00	21.00	50.00	40.00	40.00	no	--	no	11
15F	LIMA LIM	LI	W.wt											39.00		13.42	23.49	9.00	20.70	no	-?	?	19
22F	LIMA LIM	LI	W.wt										68.93	47.96	39.95		21.00	9.17		no	D?	?	11
33B	PLAT FLE	LI	W.wt										13.00	9.10	24.00	14.00	13.00	7.00	10.20	no	--	no	14
53B	PLAT FLE	LI	W.wt										94.00	70.14	32.00	41.00		8.00	25.00	no	--	1.4	19

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	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	no	--	no	13
31A	MYTI EDU	SB	D.wt										2.04	3.66	2.20	1.42	1.37	0.78	0.66	no	D-	no	11
35A	MYTI EDU	SB	D.wt										2.65	4.09	2.31	1.52	1.61	1.13	0.84	no	D-	no	10
36A	MYTI EDU	SB	D.wt										3.63	5.46	2.76	1.59	0.77	1.25	0.56	no	D-	no	14
71A	MYTI EDU	SB	D.wt										2.08	4.85	1.96	2.11	0.96	0.79	0.48	no	D-	no	15
76A	MYTI EDU	SB	D.wt										1.59	2.15	1.40	2.35			0.61	no	-?	?	18
15A	MYTI EDU	SB	D.wt										1.68			1.95	1.11	1.06	0.37	no	-?	?	14
22A	MYTI EDU	SB	D.wt										0.80	1.90	1.67	1.33	1.07	1.03	0.58	no	--	no	12
52A	MYTI EDU	SB	D.wt										1.04		0.94	1.15	1.30	1.27	2.57	no	--	1.2	10
56A	MYTI EDU	SB	D.wt										1.75	2.38	0.93	1.04	1.21	1.22	1.74	no	--	no	12
57A	MYTI EDU	SB	D.wt											2.29	1.44	0.79	0.86	1.01	2.46	no	-Y	1.7	12
63A	MYTI EDU	SB	D.wt											2.91	1.48	0.71	0.98	0.86	1.27	no	DY	no	12
65A	MYTI EDU	SB	D.wt										2.16	2.59	1.27	0.74	1.22	0.65	2.88	no	--	2.4	17
69A	MYTI EDU	SB	D.wt												1.60	1.05	0.94	0.65	0.36	no	D?	?	10
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	no	-?	?	10
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	no	-?	?	11
46A	MYTI EDU	SB	D.wt														0.44	0.47	0.33	no	-?	?	9
30B	GADU MOR	LI	W.wt										3.00	15.00	5.00	5.00	10.00	7.00	10.00	no	--	1.1	19
36B	GADU MOR	LI	W.wt										6.48	14.00	9.00	9.00	17.00	3.00	11.00	no	--	no	21
15B	GADU MOR	LI	W.wt										11.00	37.50	7.00	9.00	10.00	6.00	13.00	no	--	1.1	20
23B	GADU MOR	LI	W.wt										13.00	5.92	11.00	5.00	8.00	5.00	13.00	no	--	1.0	17
53B	GADU MOR	LI	W.wt										12.00	8.49	5.00	6.00		6.00	7.00	no	DY	no	9
67B	GADU MOR	LI	W.wt										12.00	7.00	10.00	7.00	6.32	5.00	10.00	no	--	no	12
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	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	no	-?	?	8
67B	LEPI WHI	LI	W.wt										3.00	2.00	5.00	2.00	2.00	1.00	3.70	?	--	?	18
36F	LIMA LIM	LI	W.wt										8.94	3.00	5.00	1.00	4.00	3.00	8.00	no	--	3.9	21
15F	LIMA LIM	LI	W.wt											3.00		4.00	3.46	3.00	5.10	no	-?	?	10
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	no	--	no	23
53B	PLAT FLE	LI	W.wt										3.00	2.00	5.00	2.00		1.41	2.00	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 C B (ppb).

St.	Species	Tissue	Base	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	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	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	no	D-	1.2	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	no	D-	2.0	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	no	D-	2.0	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	9.0	--	320.0	>25
76A	MYTI EDU	SB	D.wt										0.38	0.57	0.50	0.79			0.25	no	-?	?	16
15A	MYTI EDU	SB	D.wt										0.20			0.49	0.25	0.22	0.29	no	-?	?	14
22A	MYTI EDU	SB	D.wt										0.26	0.61	0.56	0.44	0.25	0.25	0.30	no	--	no	11
52A	MYTI EDU	SB	D.wt									0.85	0.38		0.81	0.81	0.28	0.32	0.26	no	--	no	15
56A	MYTI EDU	SB	D.wt								0.20	0.79	0.41	0.79	0.93	1.04	0.31	0.38	0.31	no	--	1.2	16
57A	MYTI EDU	SB	D.wt									0.77		0.76	0.72	0.79	0.36	0.30	0.26	no	DY	no	9
63A	MYTI EDU	SB	D.wt									1.05		0.97	0.74	0.63	0.32	0.33	0.33	no	DY	no	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	no	DY	no	12
69A	MYTI EDU	SB	D.wt												0.53	0.53	0.29	0.25	0.29	no	D?	?	8
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	no	D?	?	9
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	no	-?	?	6
46A	MYTI EDU	SB	D.wt														0.26	0.29	0.27	no	-?	?	<=5
30B	GADU MOR	LI	W.wt										10.00	17.00	7.48	16.00	11.00	11.00	12.00	no	--	1.3	14
36B	GADU MOR	LI	W.wt										7.00	9.00	9.00	10.00	9.00	5.00	9.00	no	--	no	11
15B	GADU MOR	LI	W.wt										5.00	20.49	10.00	14.00	14.00	9.00	11.00	no	--	1.3	17
23B	GADU MOR	LI	W.wt										6.00	9.49	12.00	9.00	8.00	6.00	10.00	no	--	no	10
53B	GADU MOR	LI	W.wt										10.00	10.00	16.49	7.00		5.00	7.00	no	--	no	12
67B	GADU MOR	LI	W.wt										14.00	8.00	7.94	8.00	8.49	10.00	8.00	no	--	no	9
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	1.8	-?	?	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	no	-?	?	10
67B	LEPI WHI	LI	W.wt										9.00	4.00	5.00	4.00	5.00	2.00	4.60	?	--	?	16
36F	LIMA LIM	LI	W.wt										5.48	3.00	5.00	2.00	3.00	2.00	2.30	no	--	no	14
15F	LIMA LIM	LI	W.wt											4.00		4.00	4.00	2.00	3.00	no	-?	?	11
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	no	--	no	20
53B	PLAT FLE	LI	W.wt										6.00	4.47	5.00	2.00		1.00	2.00	no	D-	no	13

(OC, TRND, U95+3 and POWER are under the heading A N A L Y S E S.)

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 1995-96

Sorted by contaminant and species:

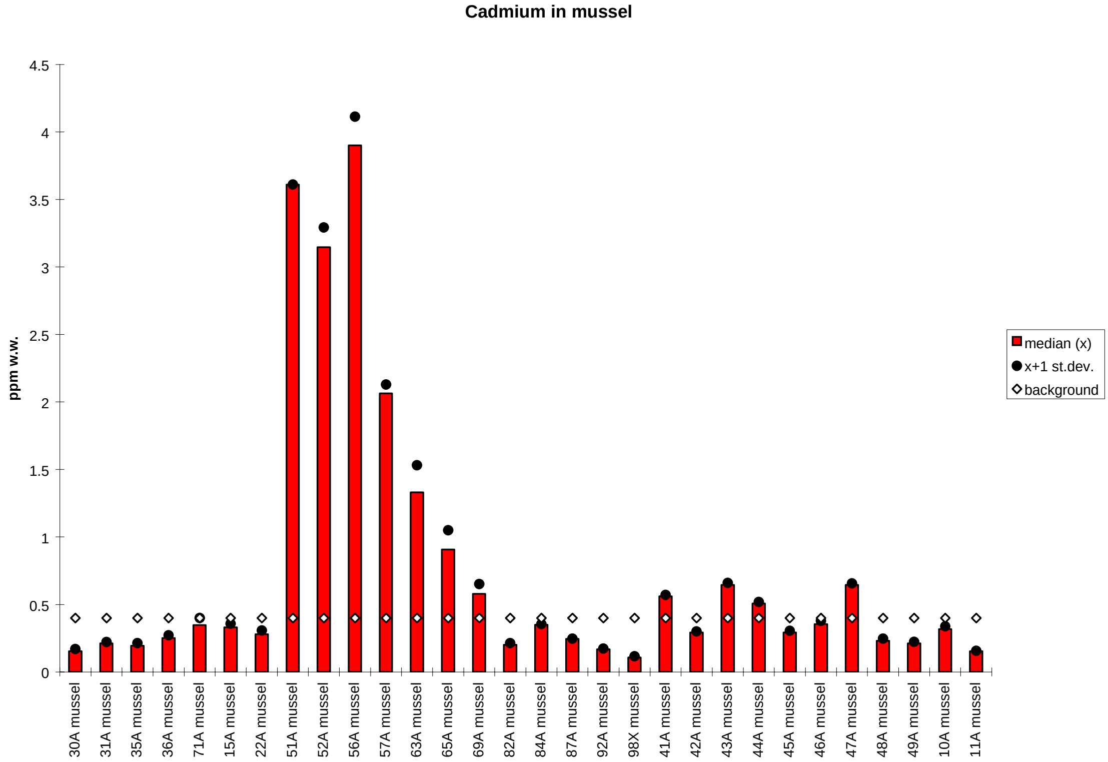
Cadmium (Cd)
Copper (Cu)
Mercury (Hg)
Lead (Pb)
Zinc (Zn)
Sum of 7 CBs (CB-28, -52, 101, -118, -138, -153 and -180)
CB-153
DDEPP (ppDDE)
γ-HCH
HCB
PAH
B[*a*]P
TCDDN
TECBW

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***)**
GLYP CYN - Witch (*Glyptocephalus cynoglossus***)**
BROS BRO - Torsk (*Brosme brosme***)**

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

Appendix H
Geographical distribution of contaminants in biota 1995-96 (cont.)

A



B

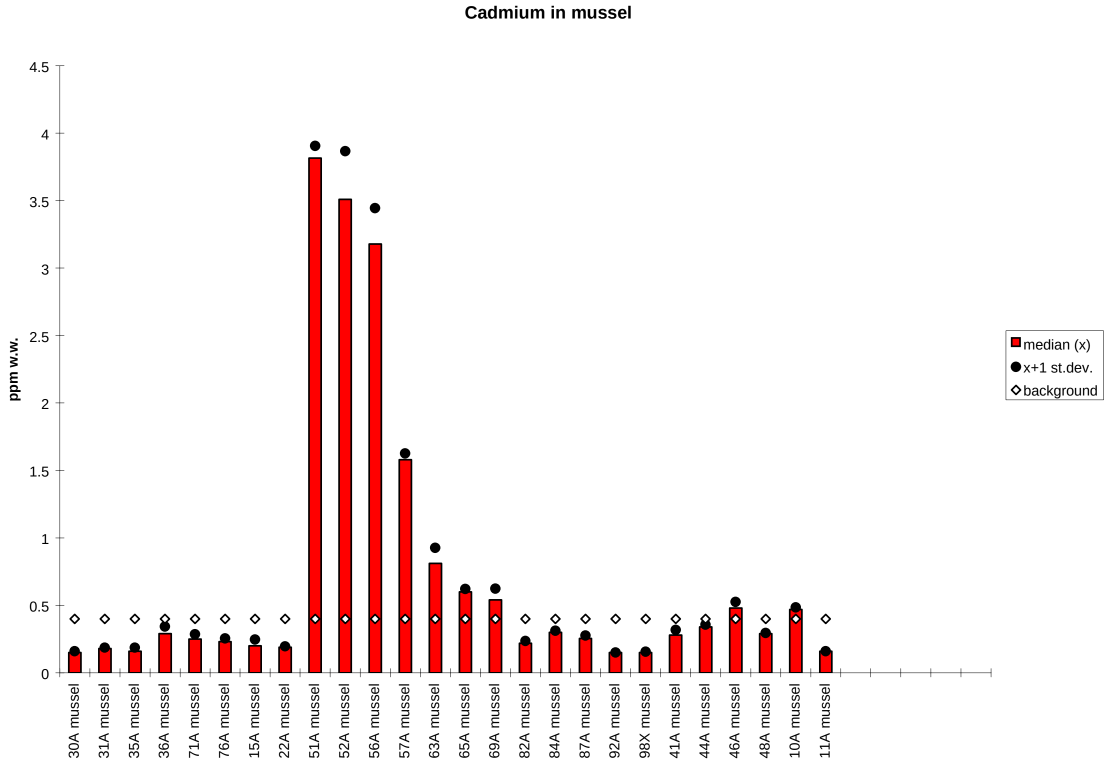
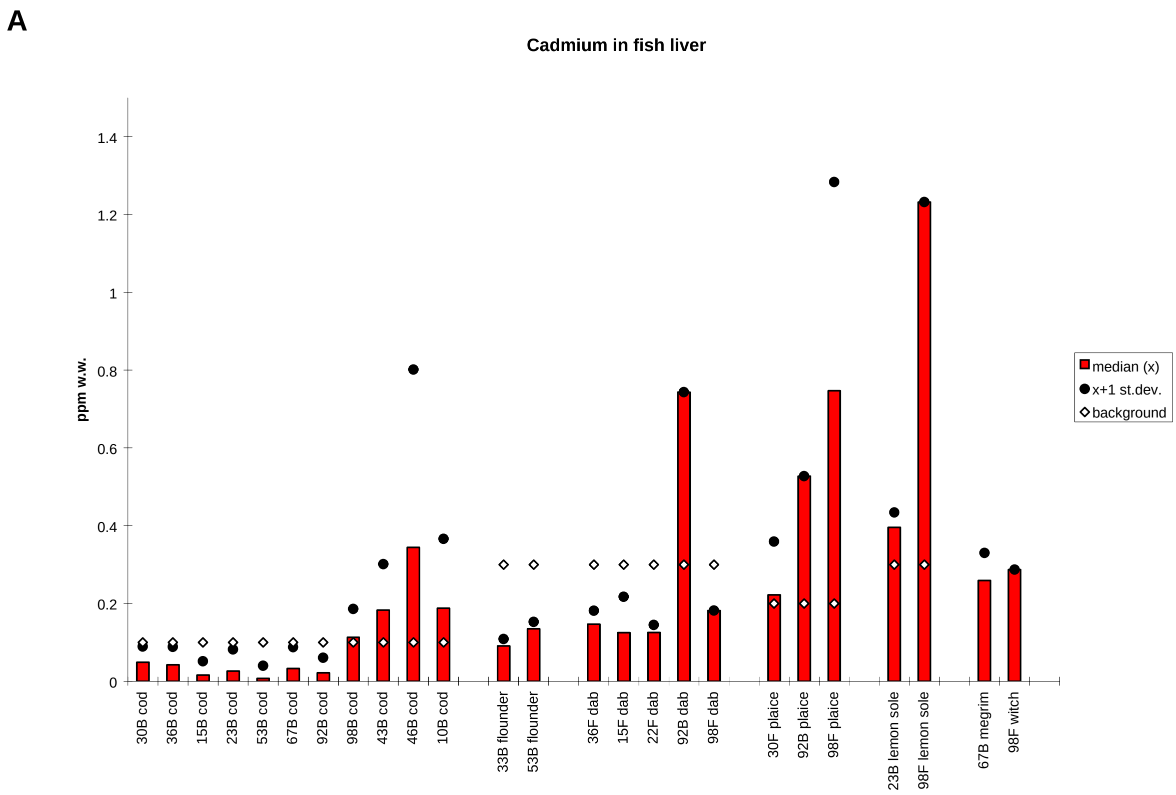


Figure 15. Median, standard deviation and provisional "high background" concentration for cadmium in mussels (*Mytilus edulis*) 1995 (**A**) and 1996 (**B**), ppm wet weight (see maps in Figure 1-Figure 4).



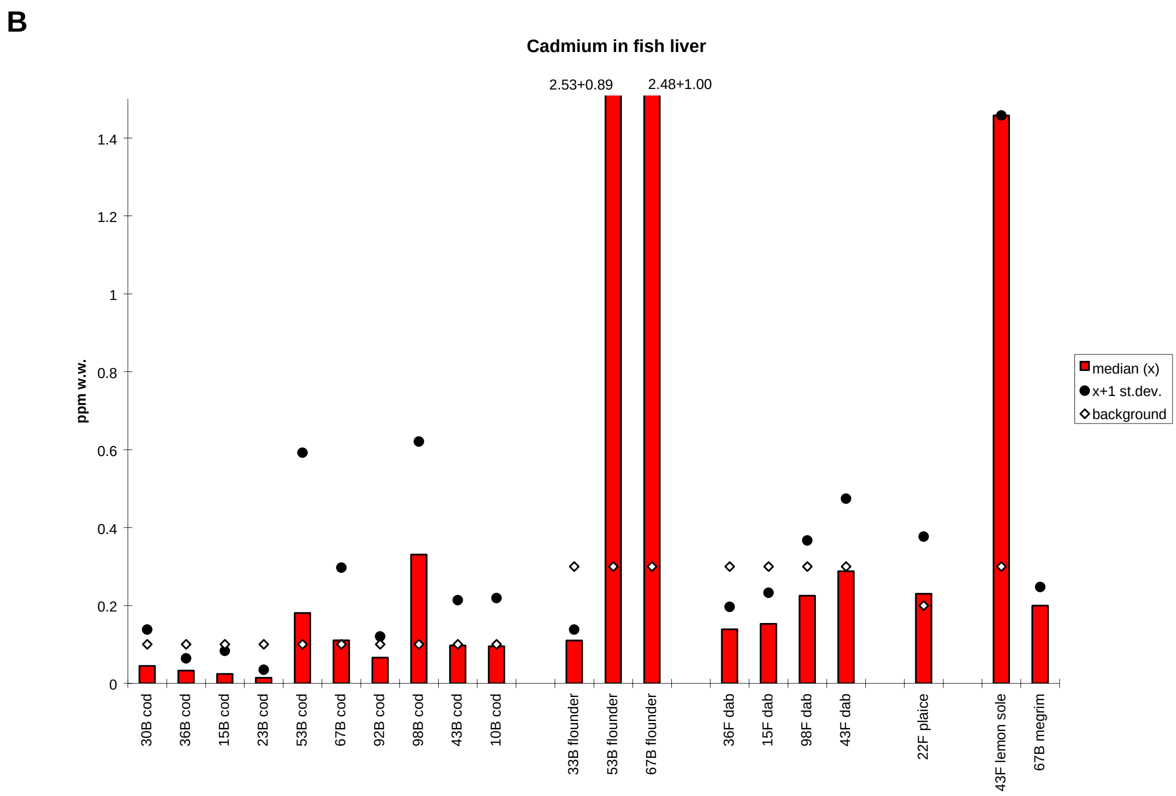
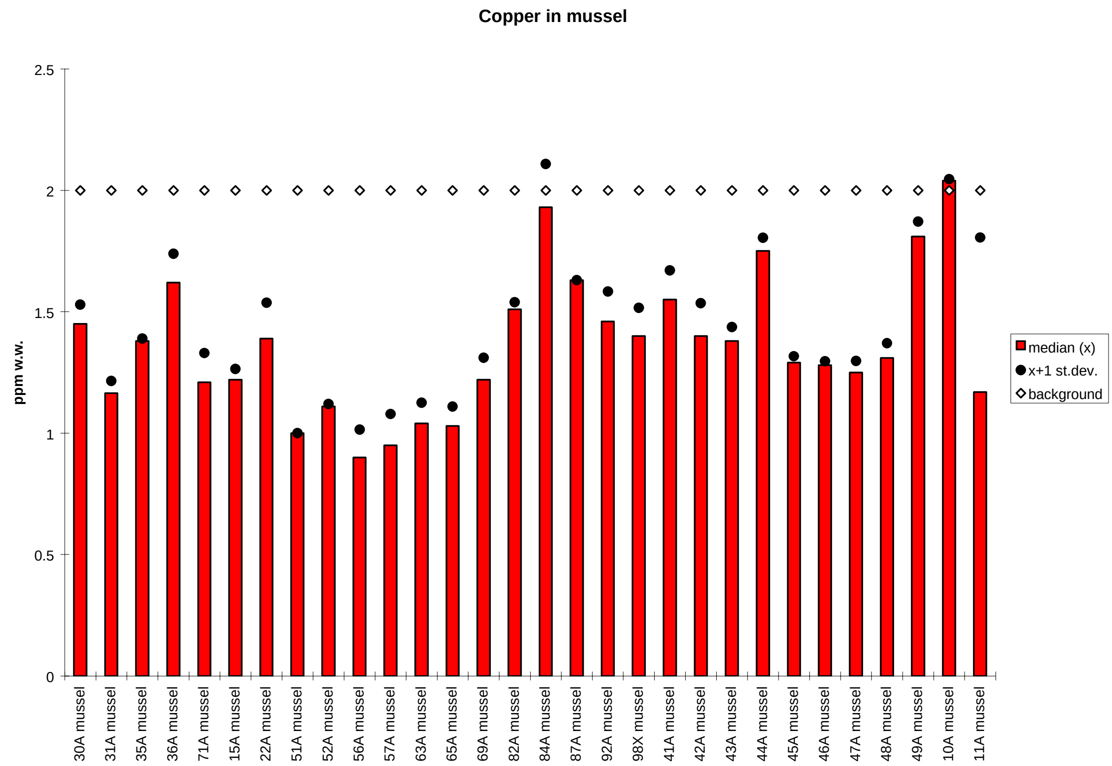


Figure 16. Median, standard deviation and provisional "high background" concentration for cadmium in fish liver 1995 (**A**) and 1996 (**B**), ppm wet weight (see maps in Figure 1-Figure 4).

A



B

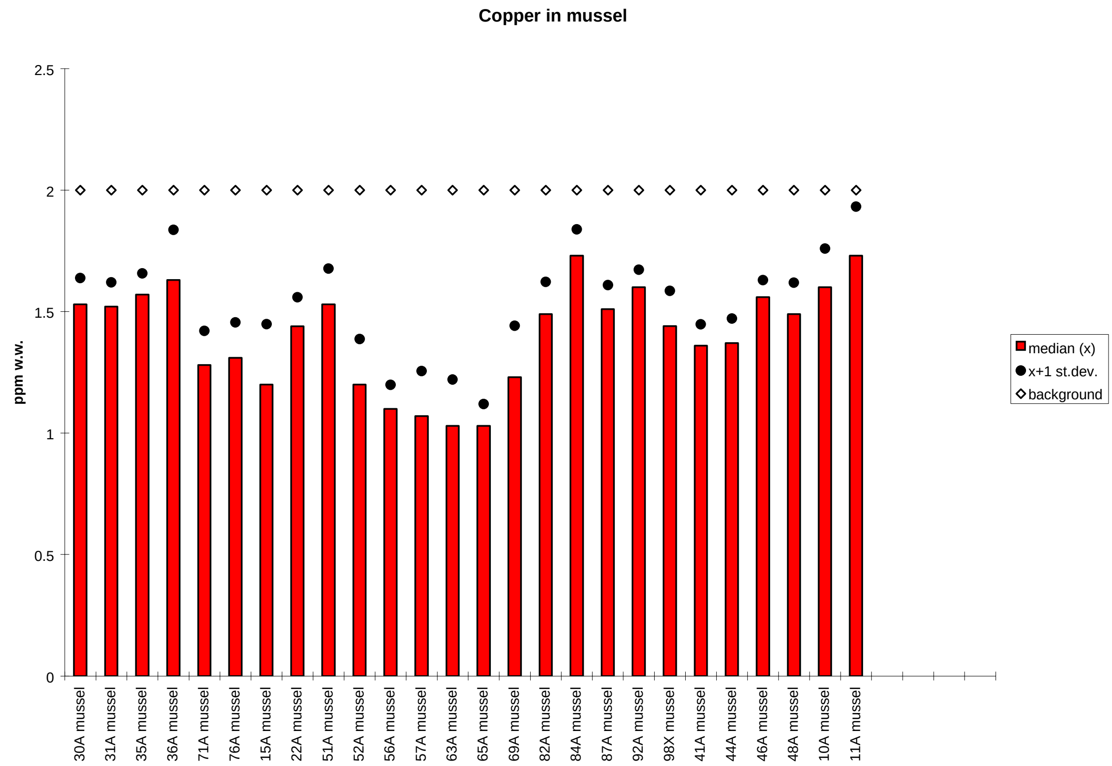
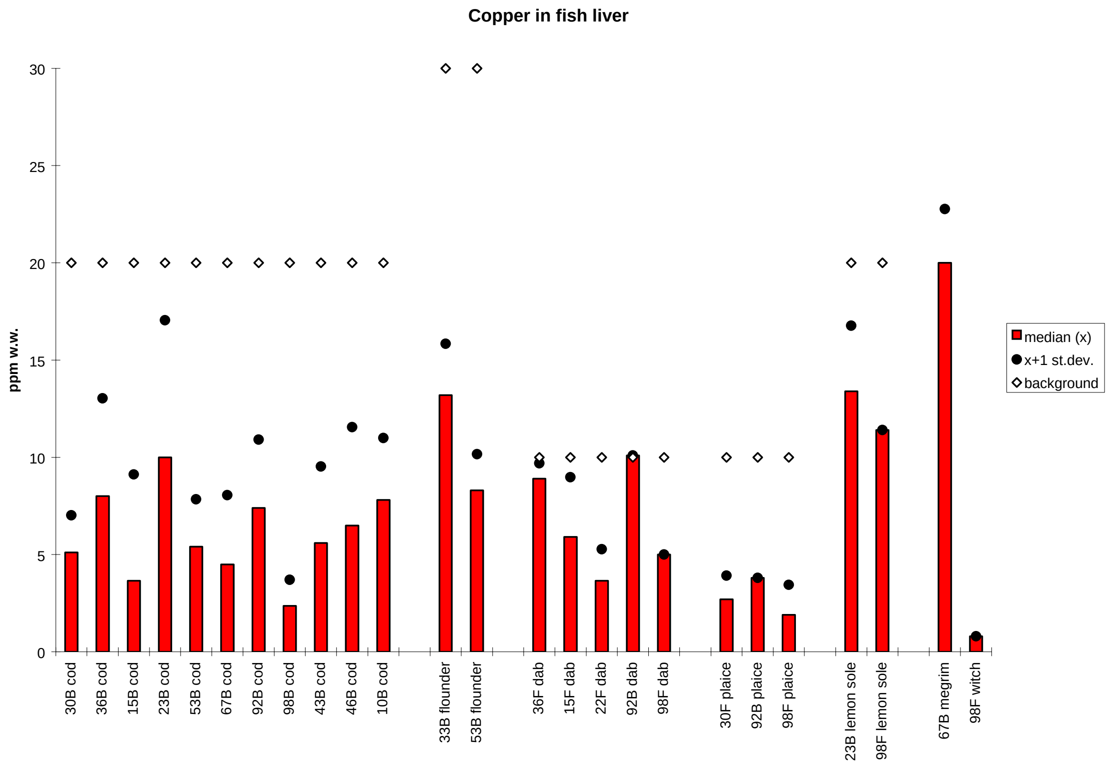


Figure 17. Median standard deviation and provisional "high background" concentration for copper in mussels (*Mytilus edulis*) 1995 (**A**) and 1996 (**B**), ppm wet weight (see maps in Figure 1-Figure 4).

A



B

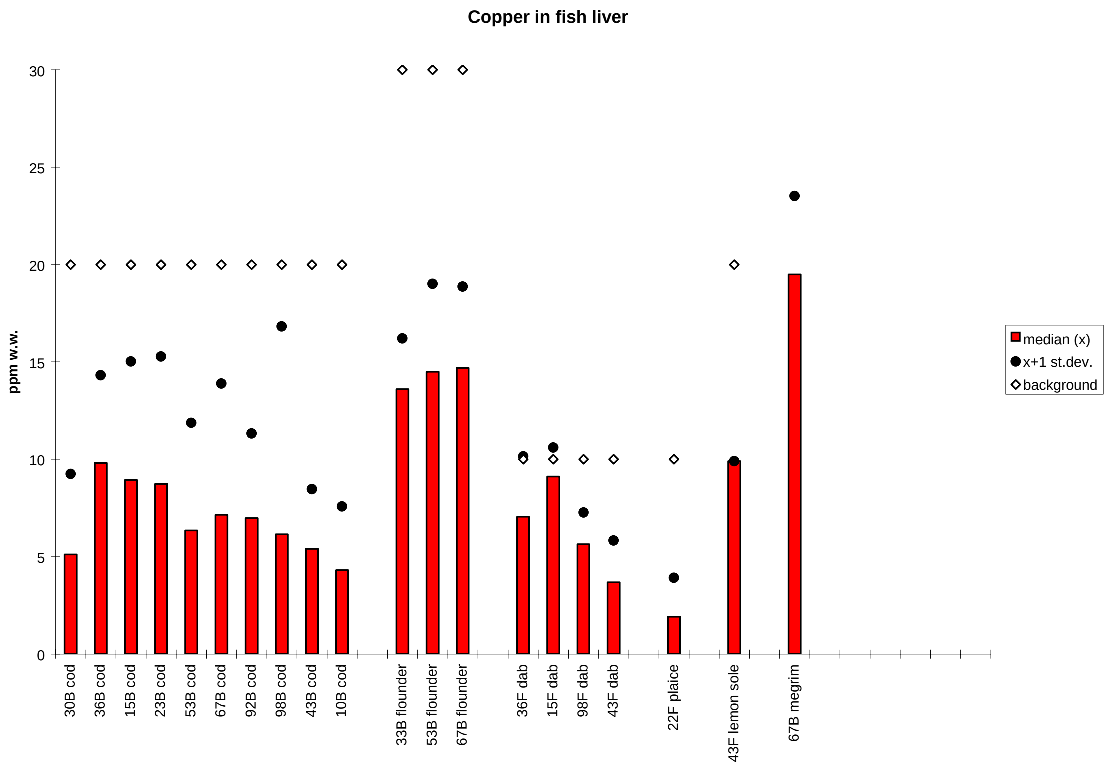
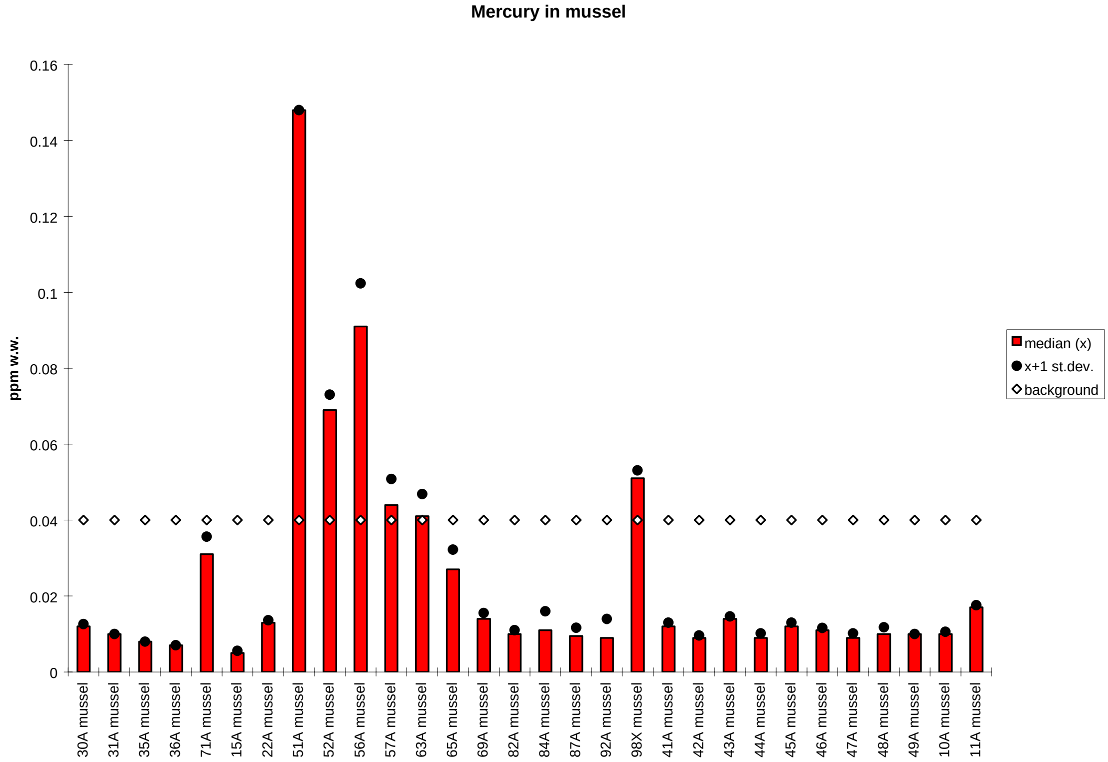


Figure 18. Median, standard deviation and provisional "high background" concentration for copper in fish liver 1995 (**A**) and 1996 (**B**), ppm wet weight (see maps in Figure 1-Figure 4).

A



B

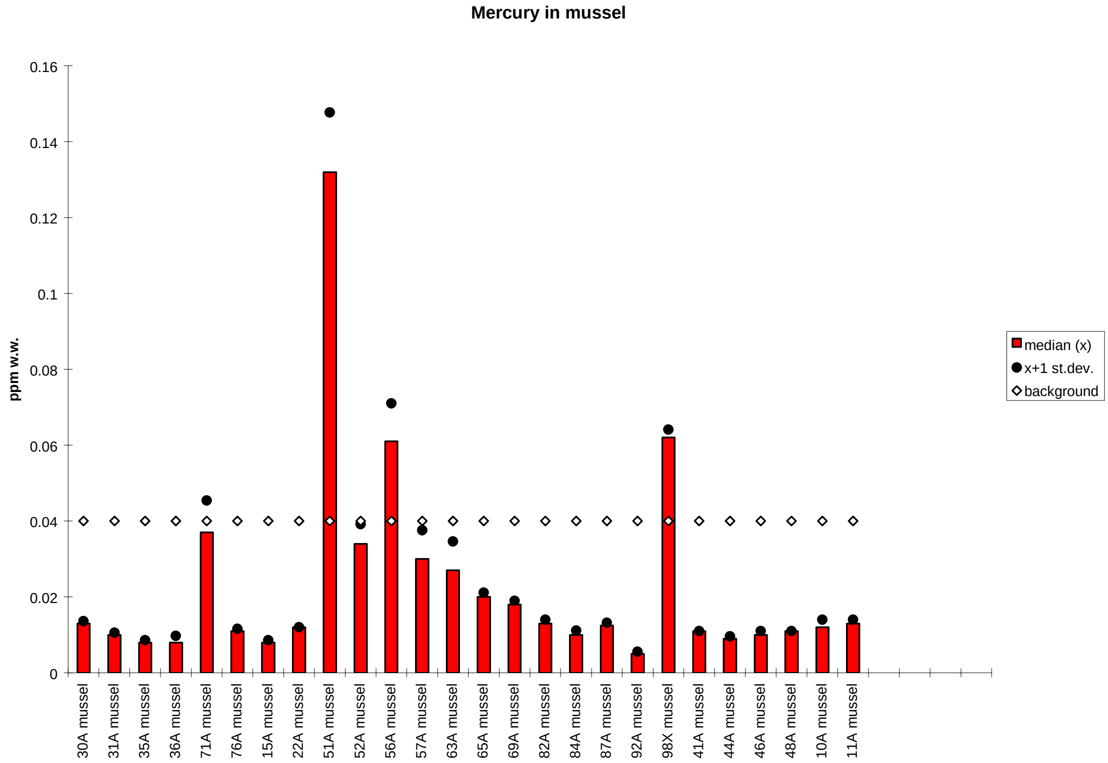
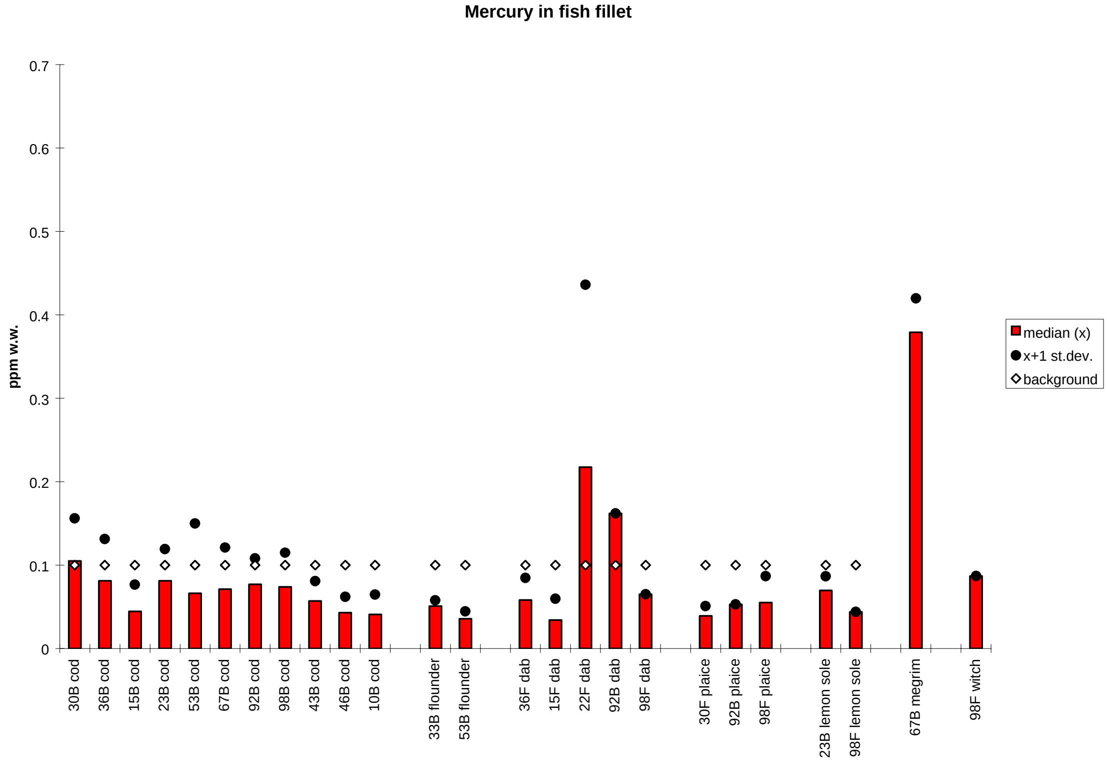


Figure 19. Median, standard deviation and provisional "high background" concentration for mercury in mussels (*Mytilus edulis*) 1995 (**A**) and 1996 (**B**), ppm wet weight (see maps in Figure 1-Figure 4).

A



B

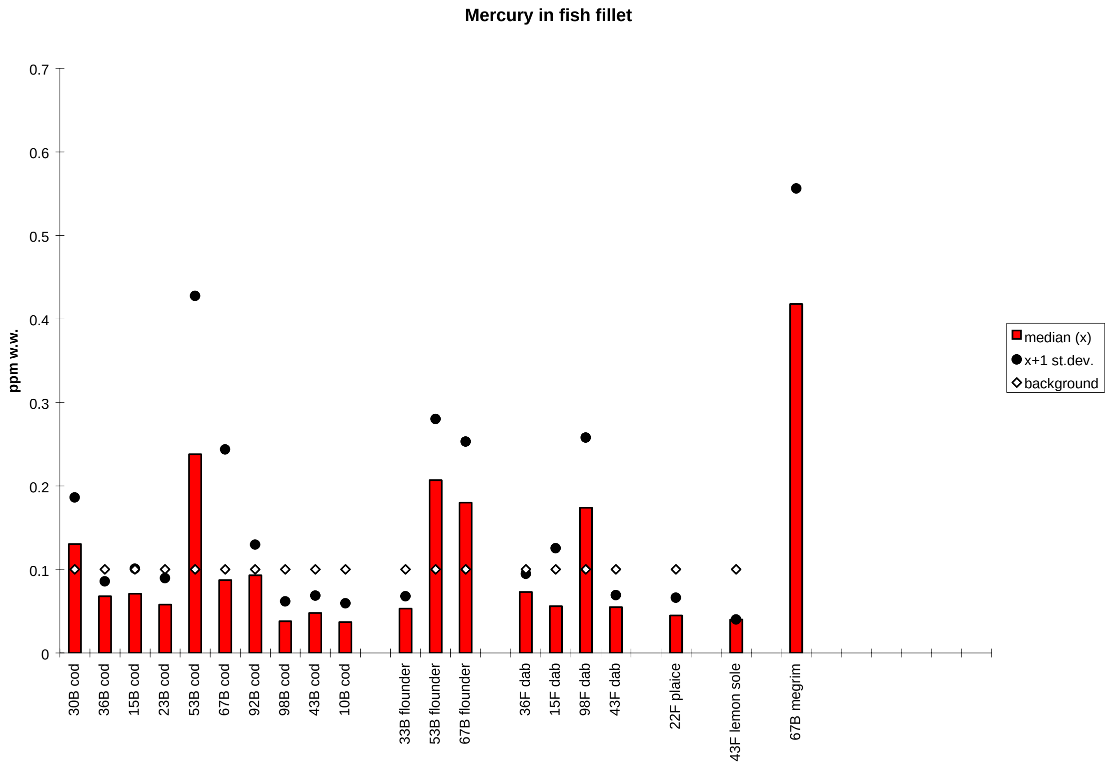
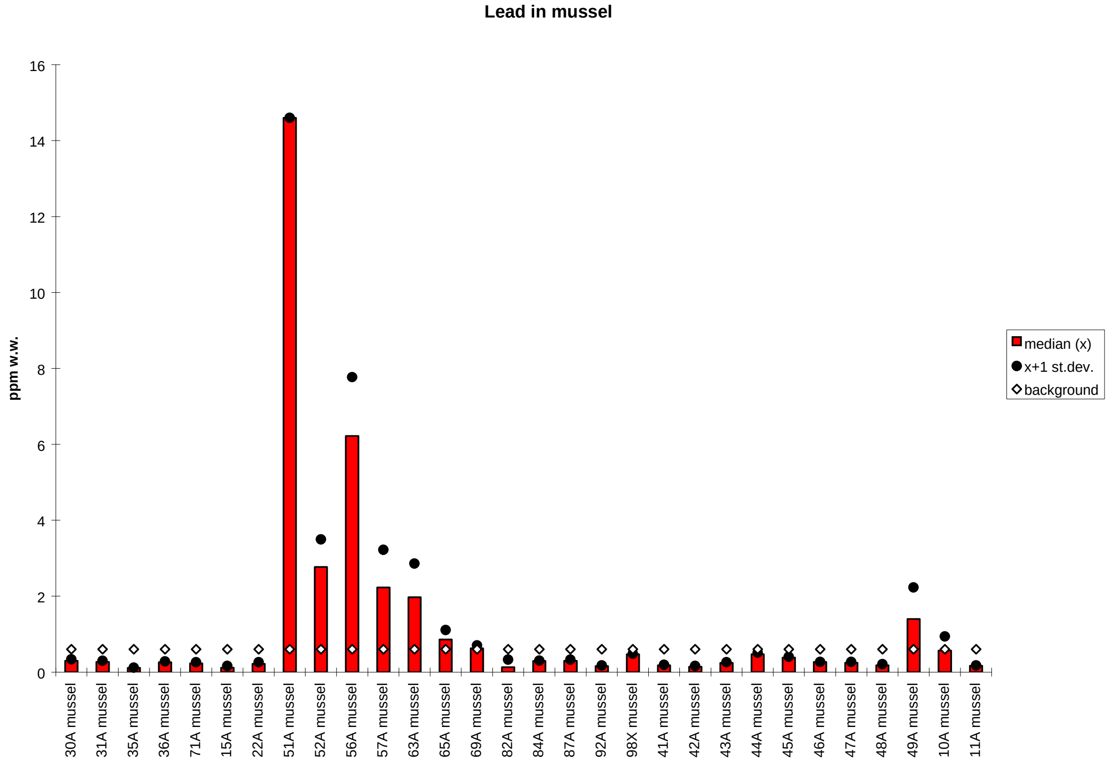


Figure 20. Median, standard deviation and provisional "high background" concentration for mercury in fish fillet 1995 (**A**) and 1996 (**B**), ppm wet weight (see maps in Figure 1-Figure 4).

A



B

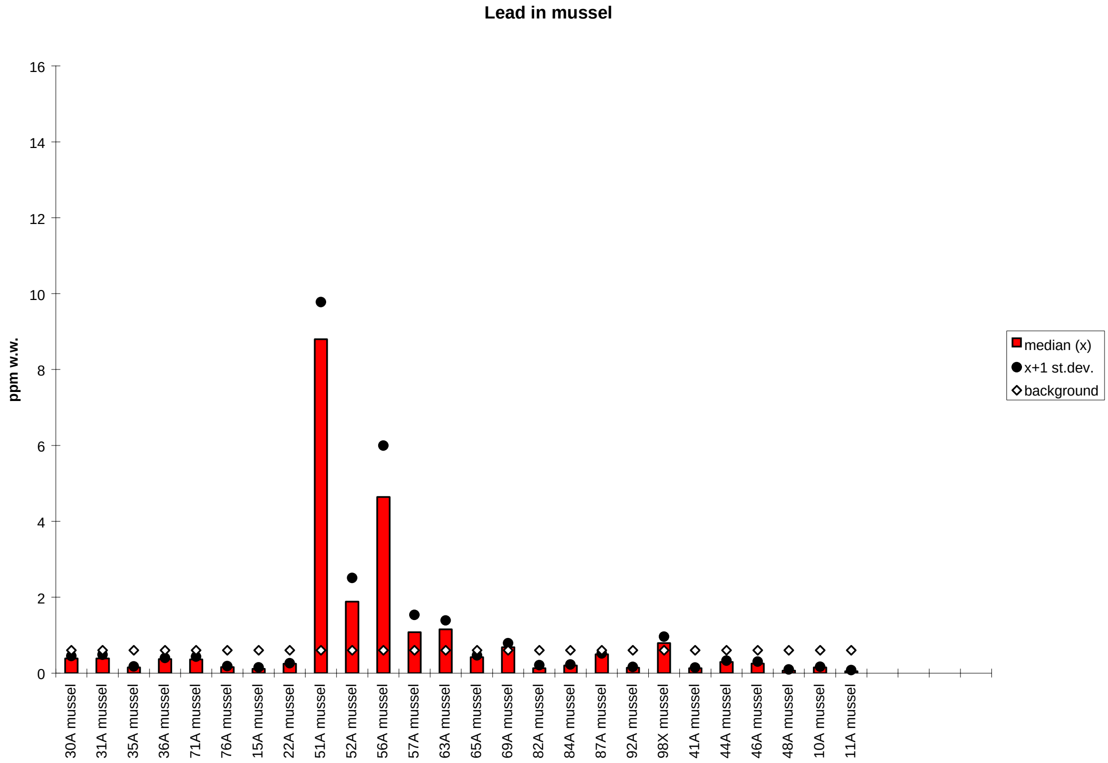
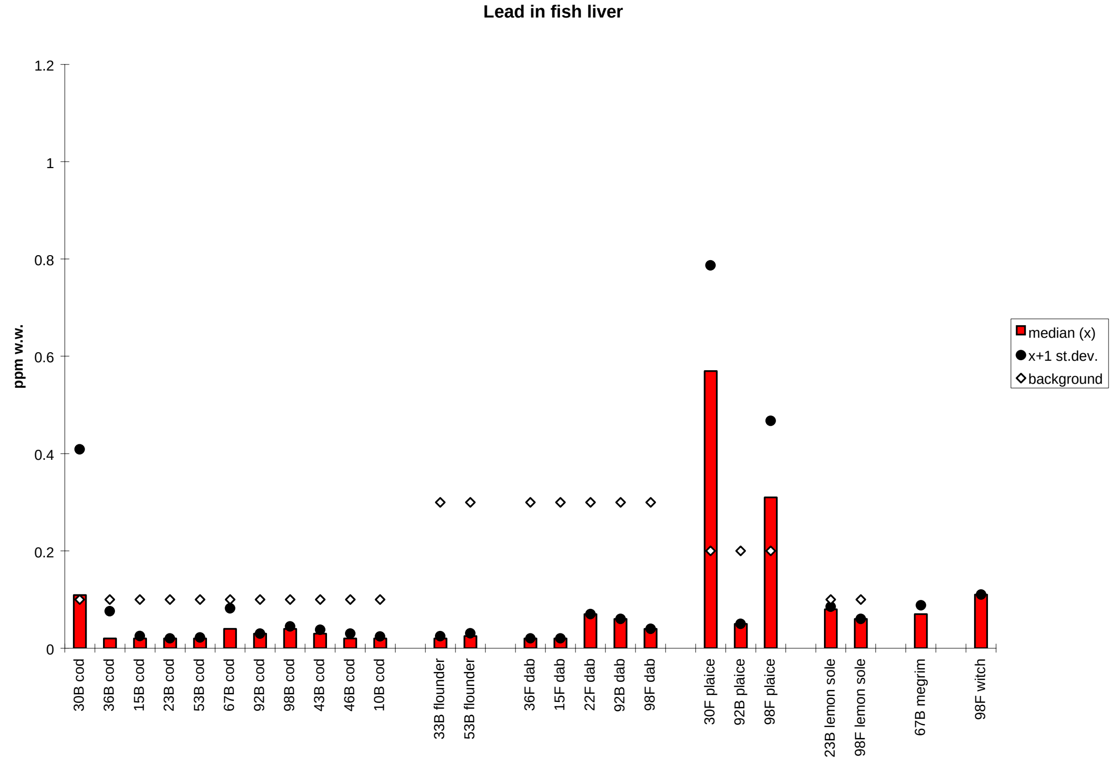


Figure 21. Median, standard deviation and provisional "high background" concentration for lead in mussels (*Mytilus edulis*) 1995 (**A**) and 1996 (**B**), ppm wet weight (see maps in Figure 1-Figure 4).

A



B

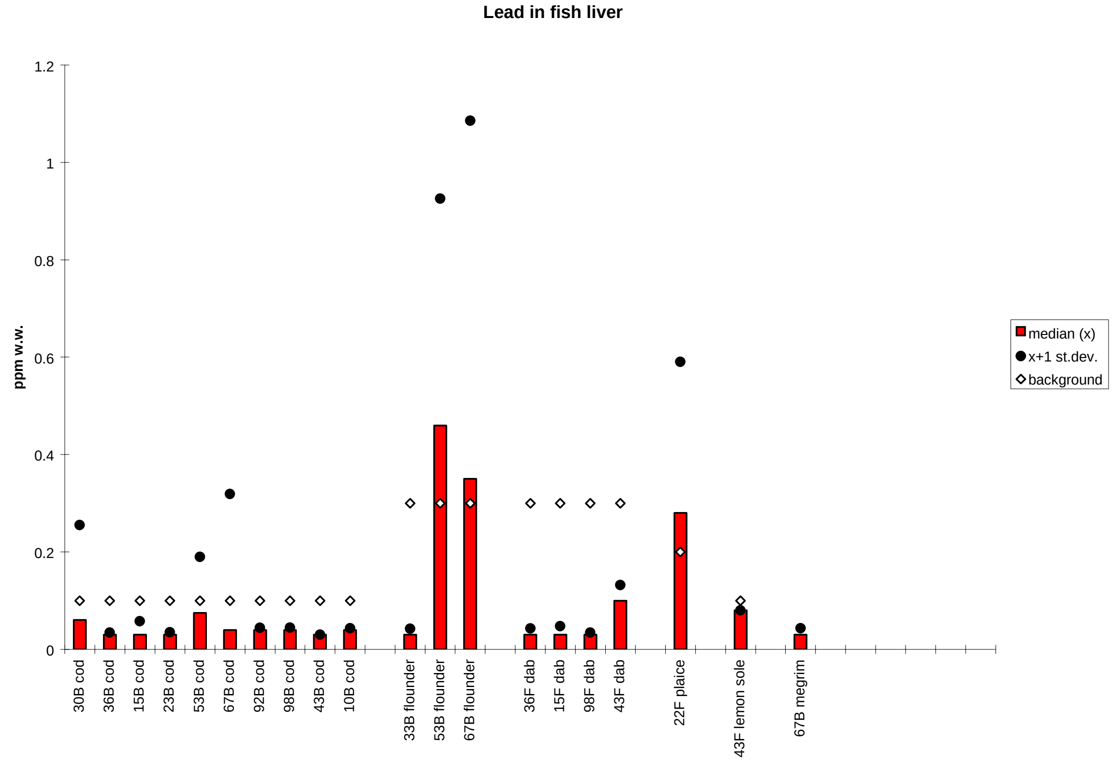
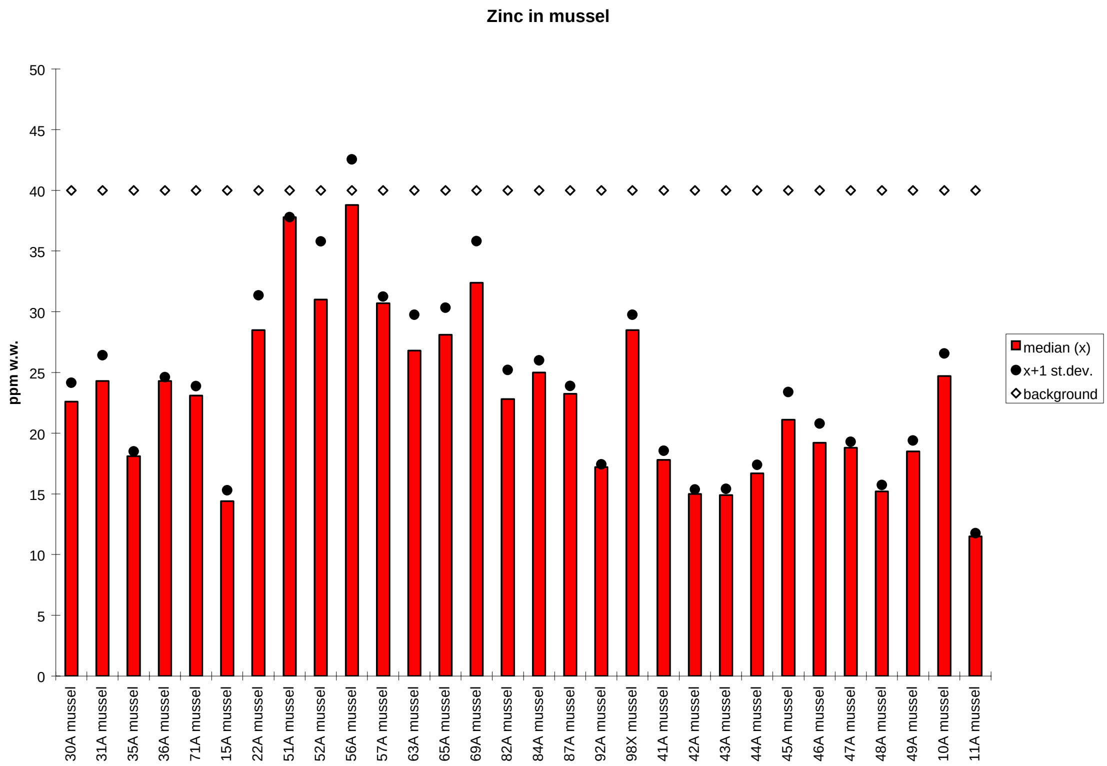


Figure 22. Median, standard deviation and provisional "high background" concentration for lead in fish liver 1995 (**A**) and 1996 (**B**), ppm wet weight (see maps in Figure 1-Figure 4).

A



B

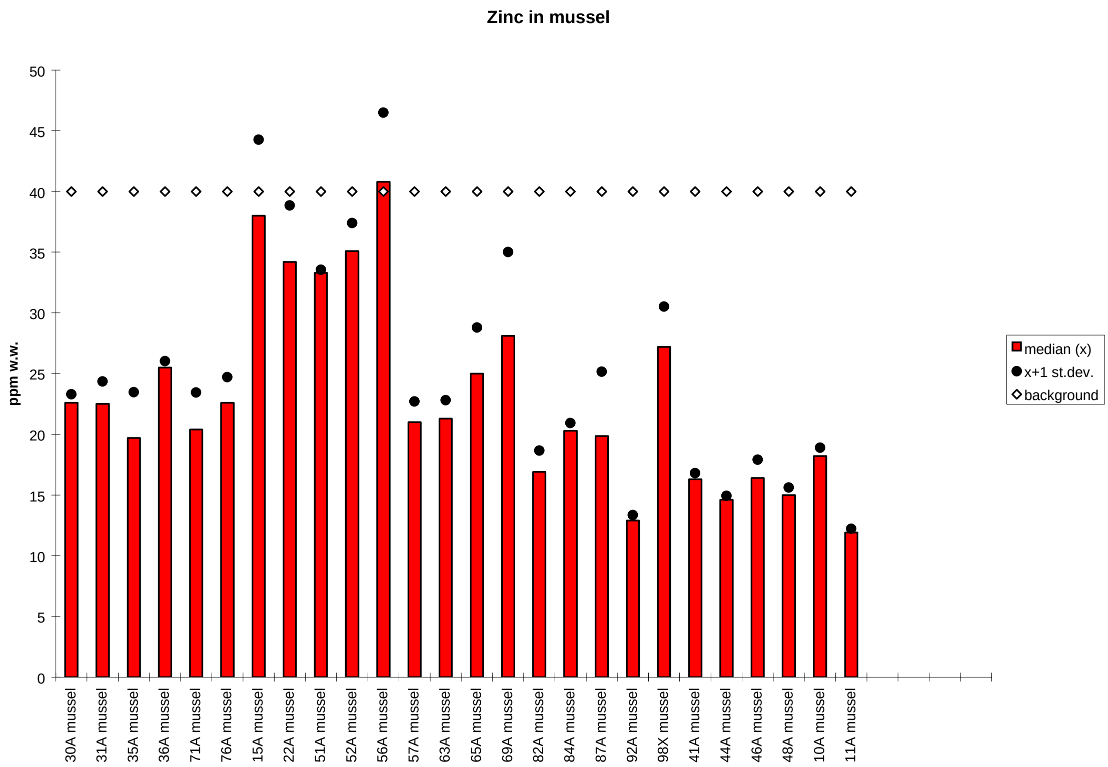
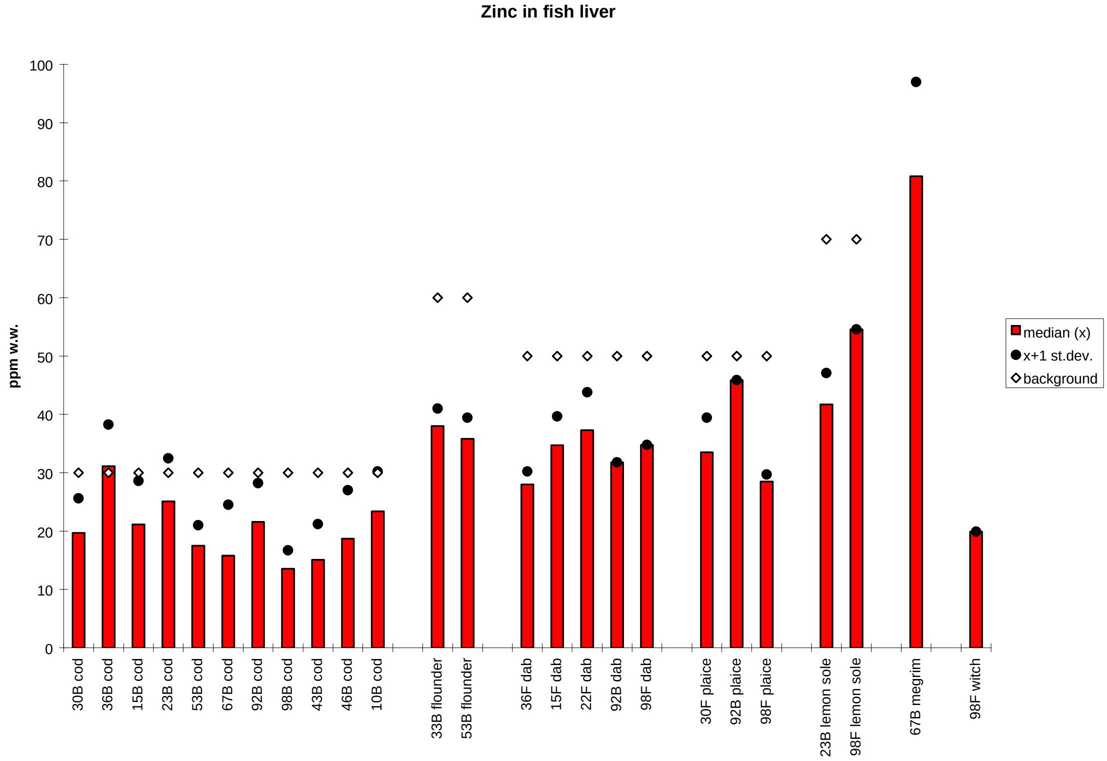


Figure 23. Median, standard deviation and provisional "high background" concentration for zinc in mussels (*Mytilus edulis*) 1995 (**A**) and 1996 (**B**), ppm wet weight (see maps in Figure 1-Figure 4).

A



B

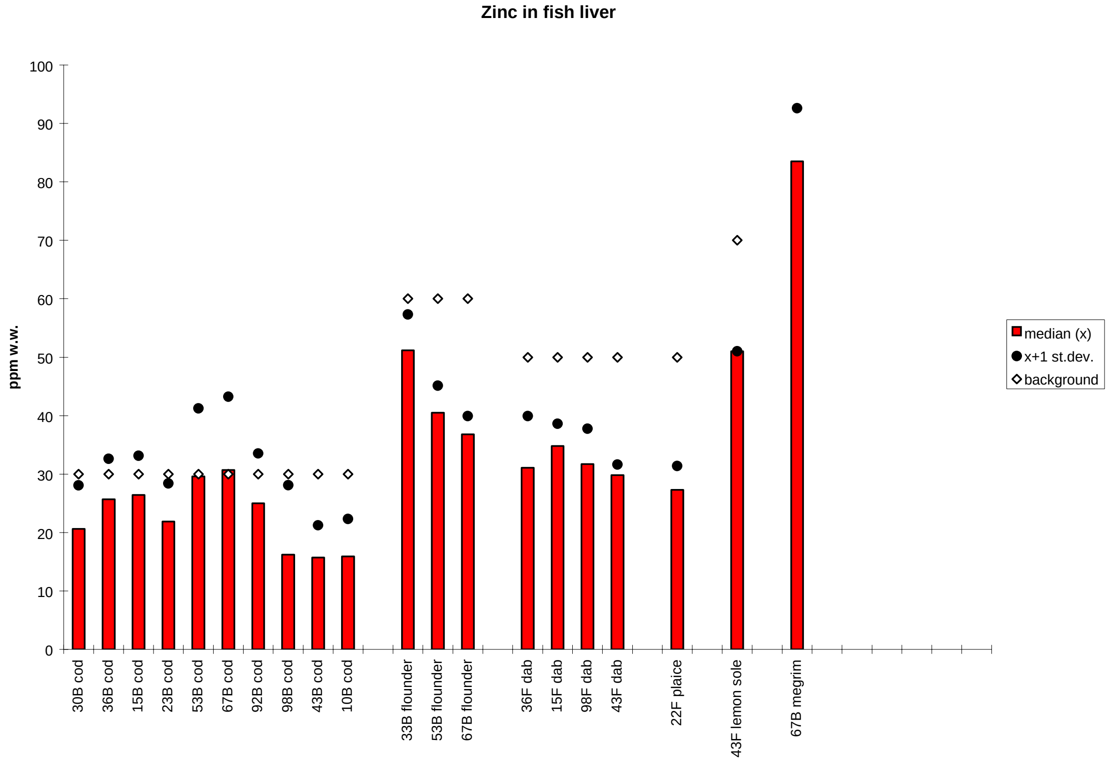
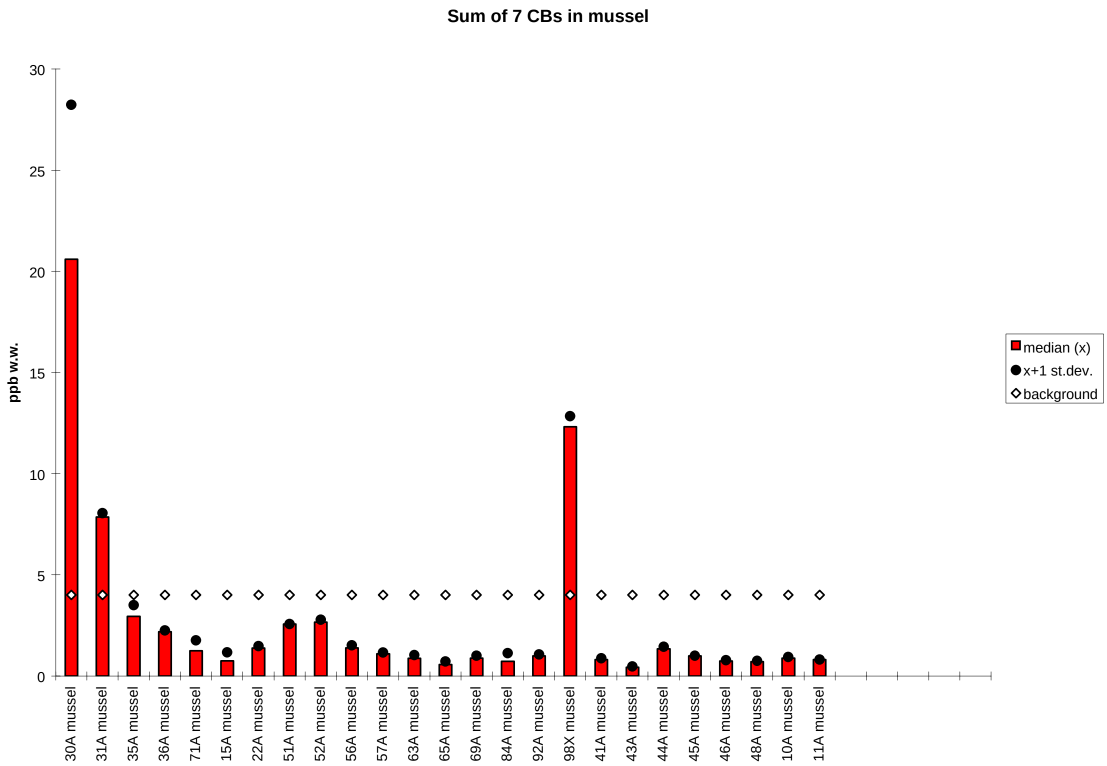


Figure 24. Median, standard deviation and provisional "high background" concentration for zinc in fish liver 1995 (**A**) and 1996 (**B**), ppm wet weight (see maps in Figure 1-Figure 4).

A



B

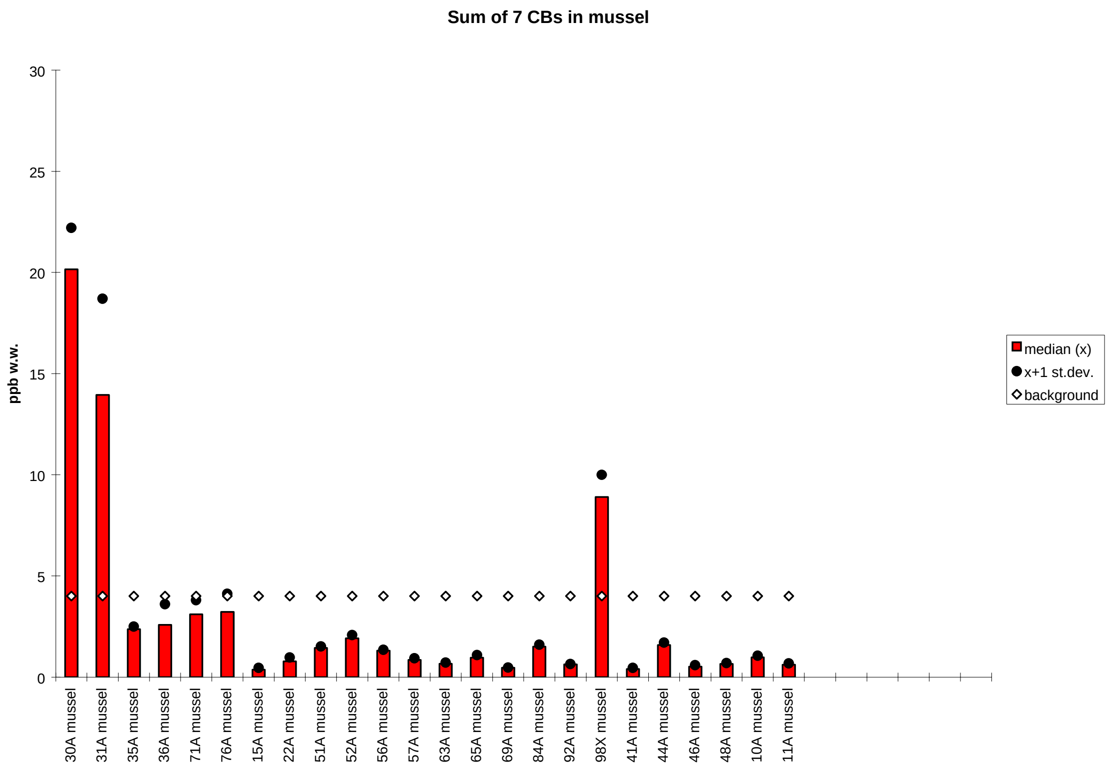
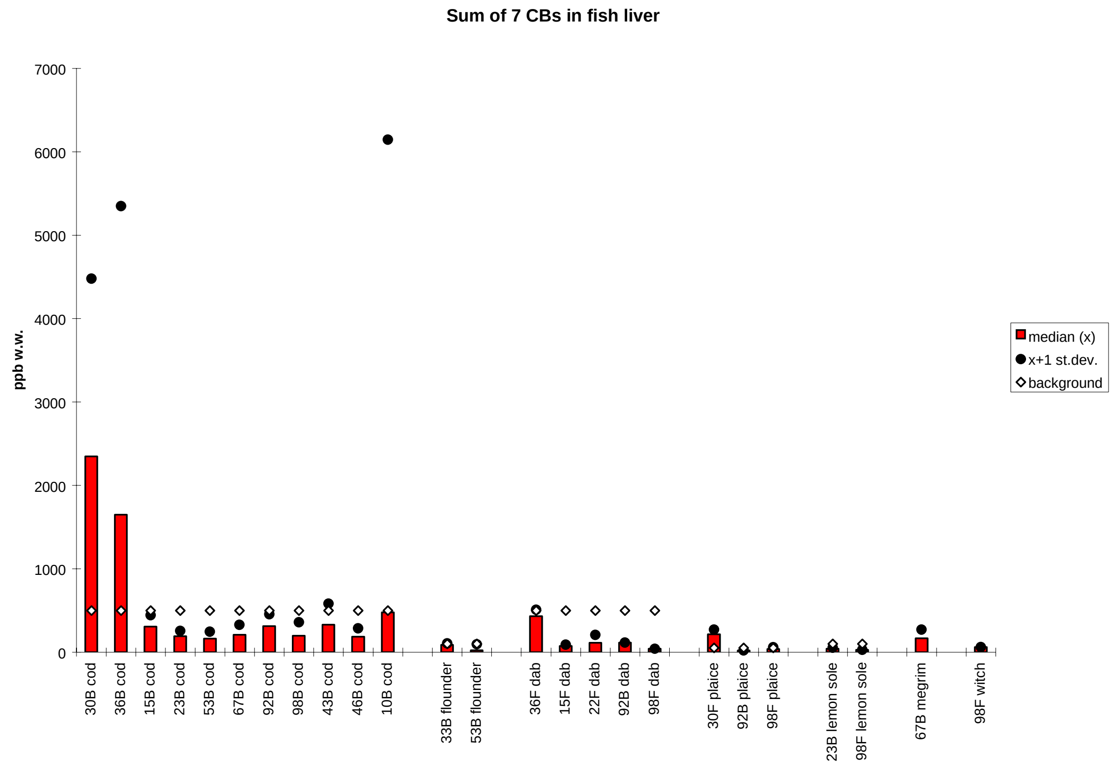


Figure 25. Median, standard deviation and provisional "high background" concentration for sum of 7 PCBs (CB-28, -52, 101, -118, -138, -153 and -180) in mussels (*Mytilus edulis*) 1995 (**A**) and 1996 (**B**), ppb wet weight (see maps in Figure 1-Figure 4).

A



B

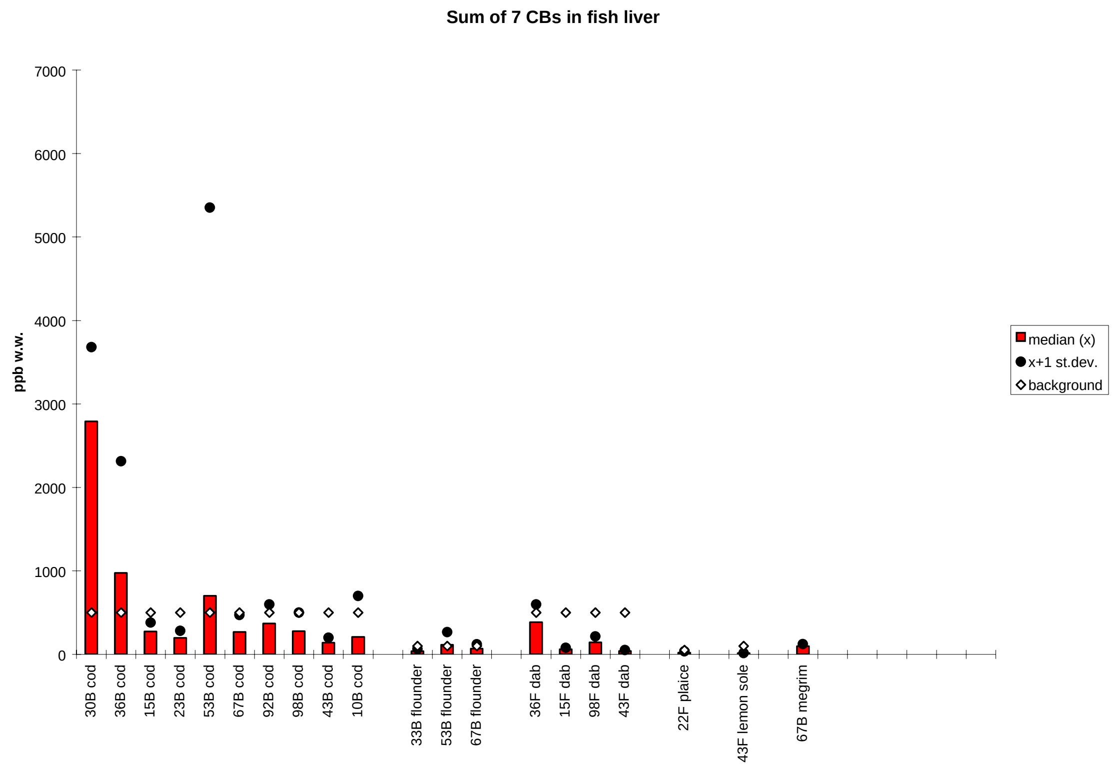
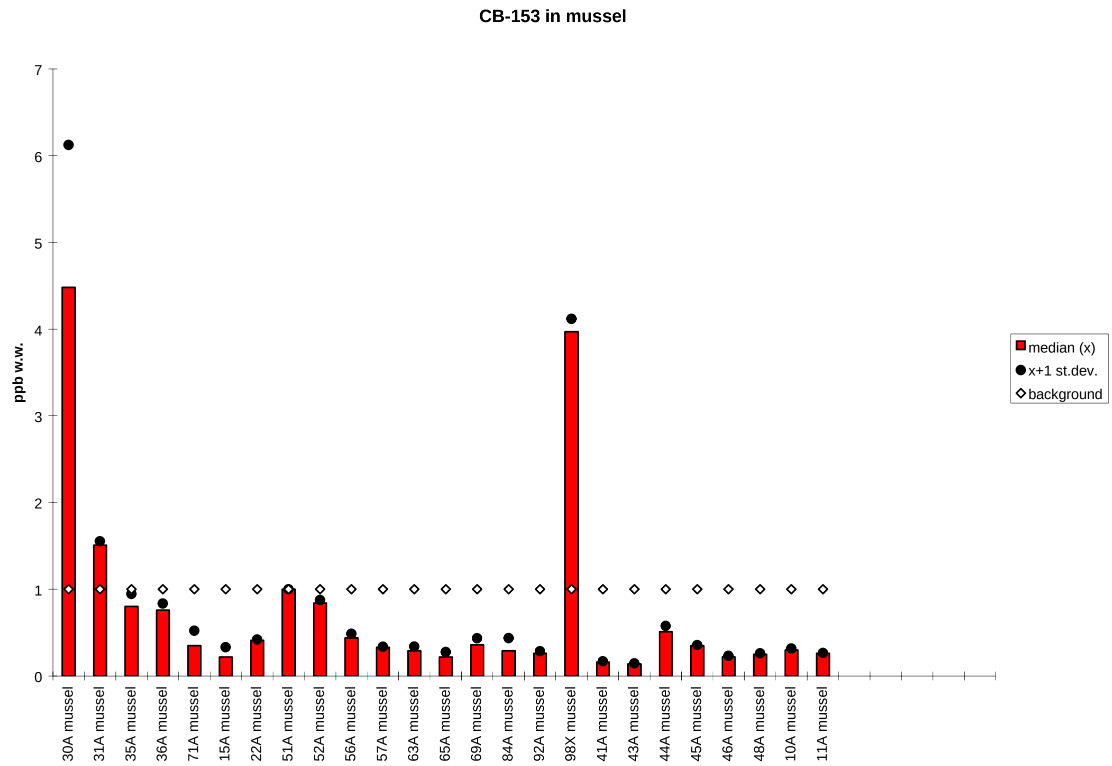


Figure 26. Median, standard deviation and provisional "high background" concentration for sum of 7 PCBs (CB-28, -52, 101, -118, -138, -153 and -180) in fish liver 1995 (**A**) and 1996 (**B**), ppb wet weight (see maps in Figure 1-Figure 4).

A



B

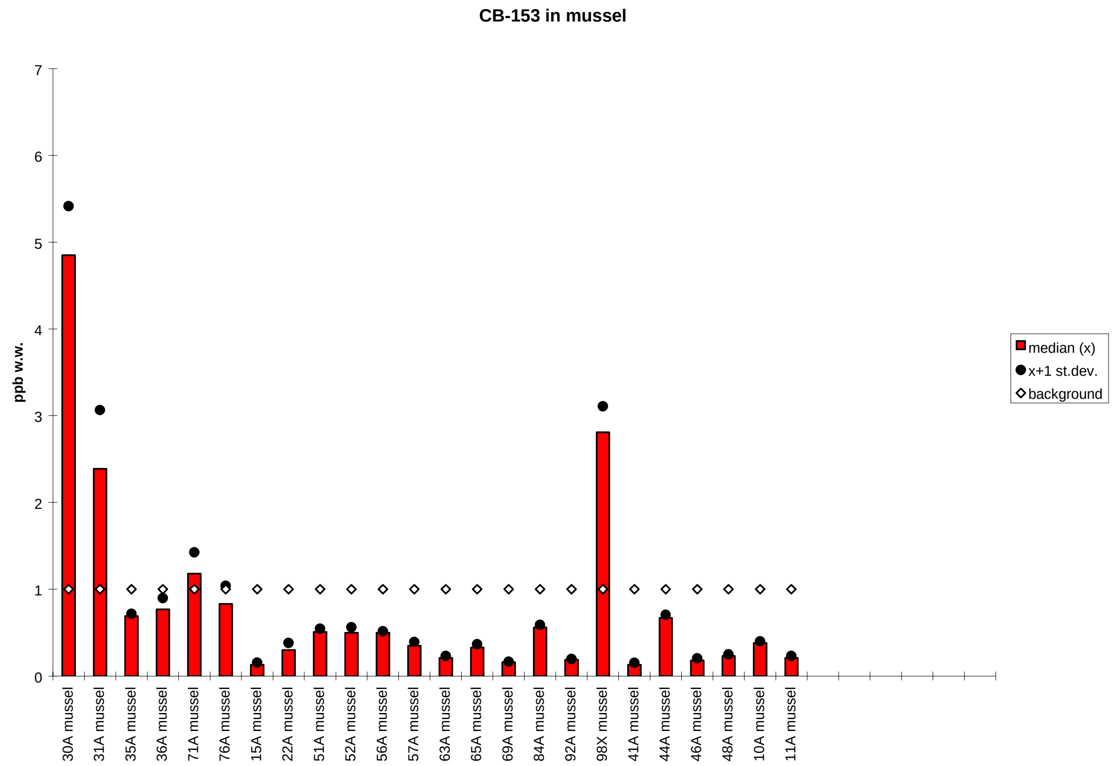
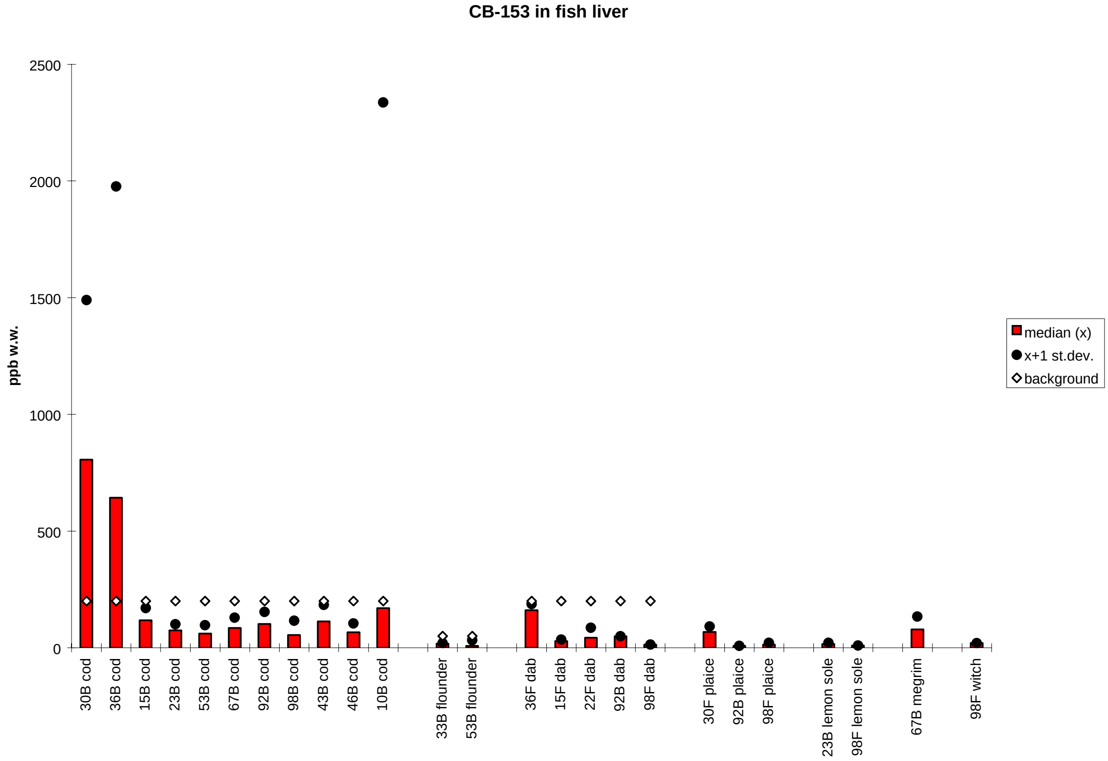


Figure 27. Median, standard deviation and provisional "high background" concentration for CB-153 in mussels (*Mytilus edulis*) 1995 (**A**) and 1996 (**B**), ppb wet weight (see maps in Figure 1-Figure 4).

A



B

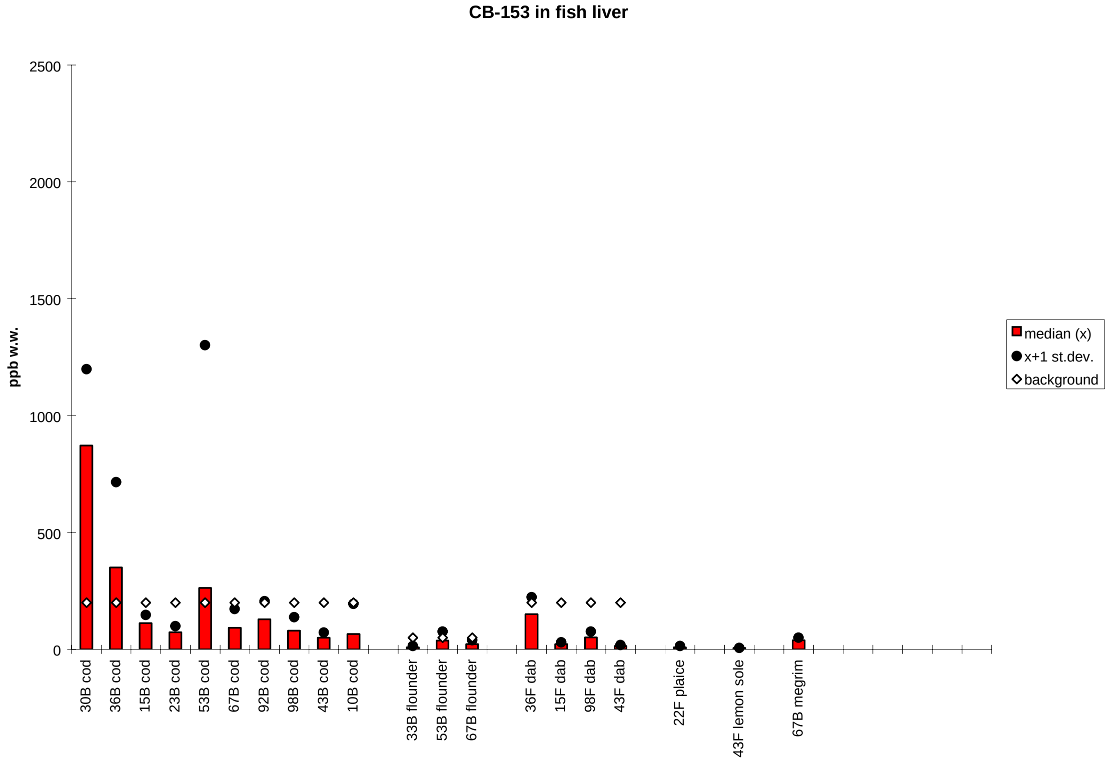
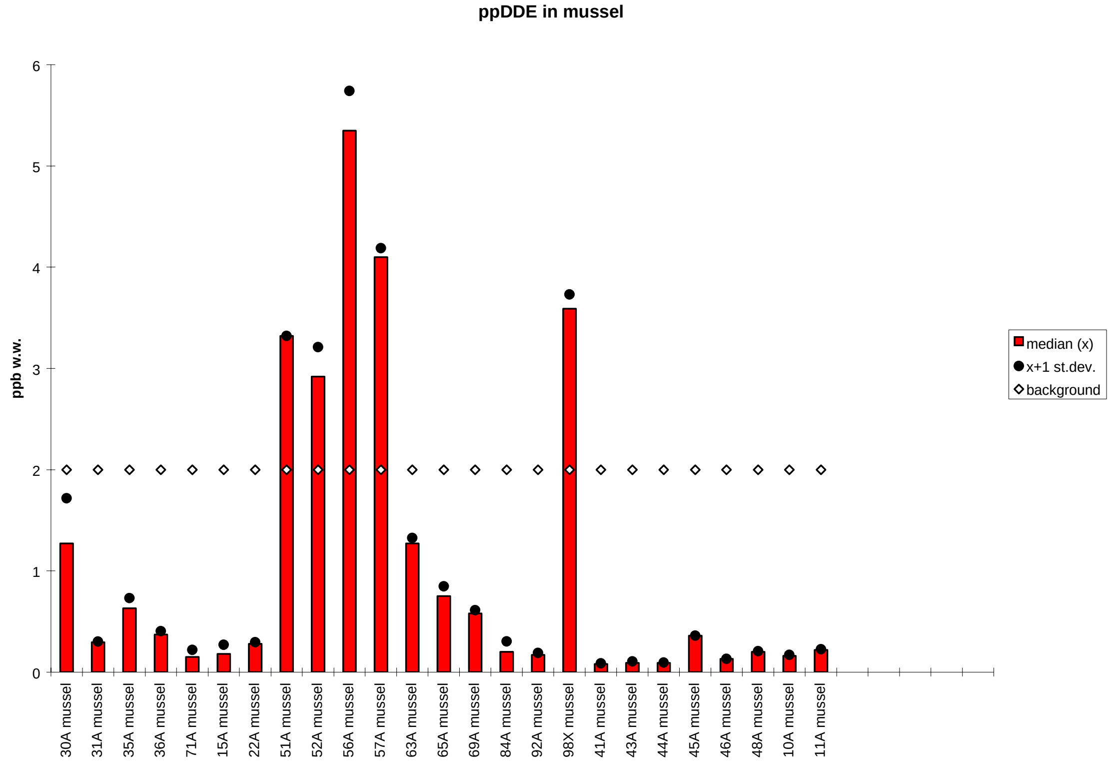


Figure 28. Median, standard deviation and provisional "high background" concentration for CB-153 in fish liver 1995 (**A**) and 1996 (**B**), ppb wet weight (see maps in Figure 1-Figure 4).

A



B

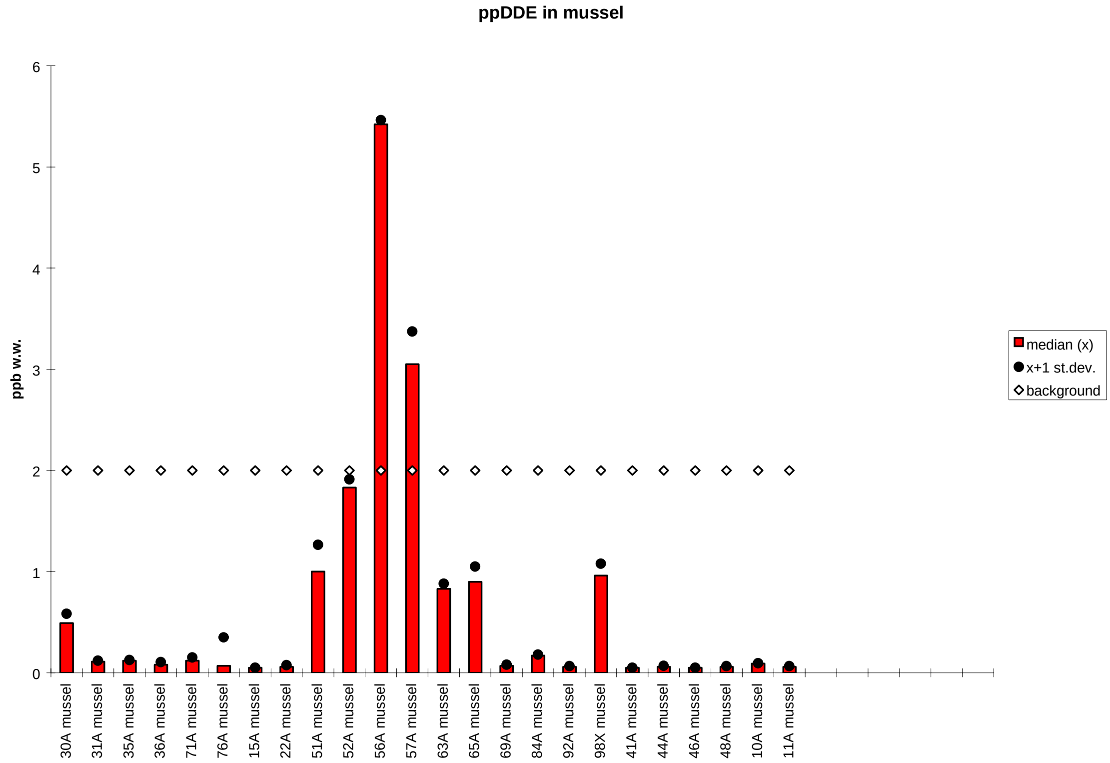
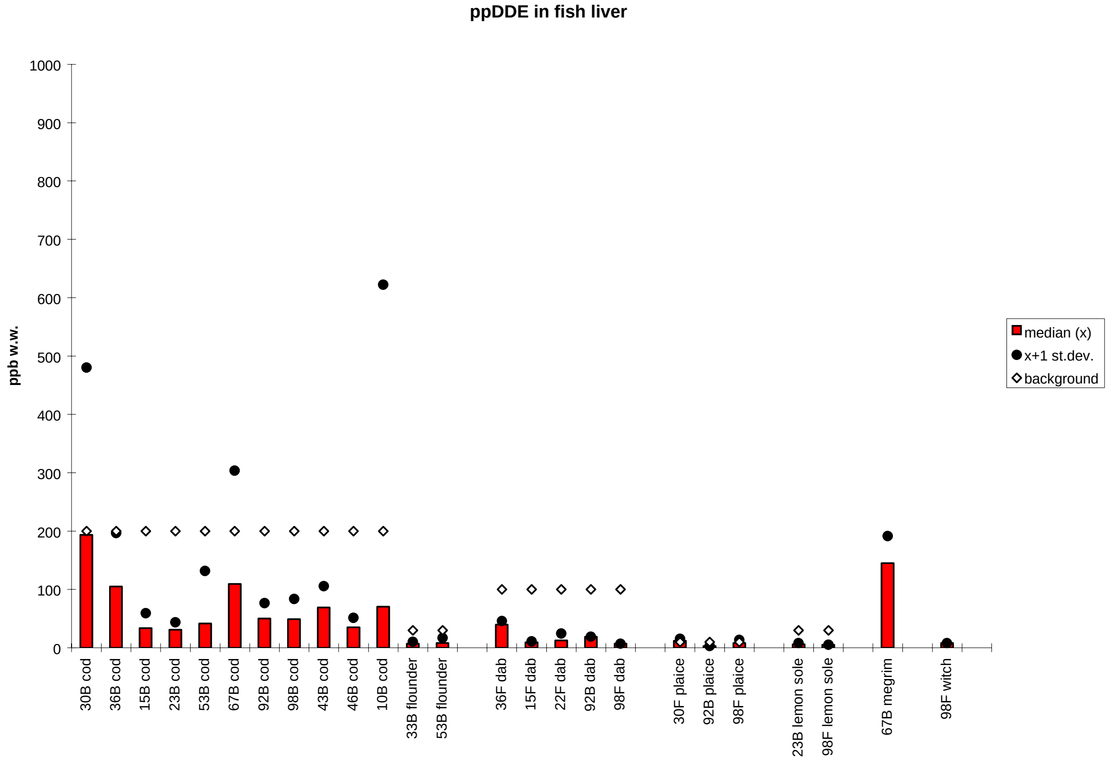


Figure 29. Median, standard deviation and provisional "high background" concentration for ppDDE (DDEPP) in mussels (*Mytilus edulis*) 1995 (**A**) and 1996 (**B**), ppb wet weight (see maps in Figure 1-Figure 4). (See also footnote in Table 3.)

A



B

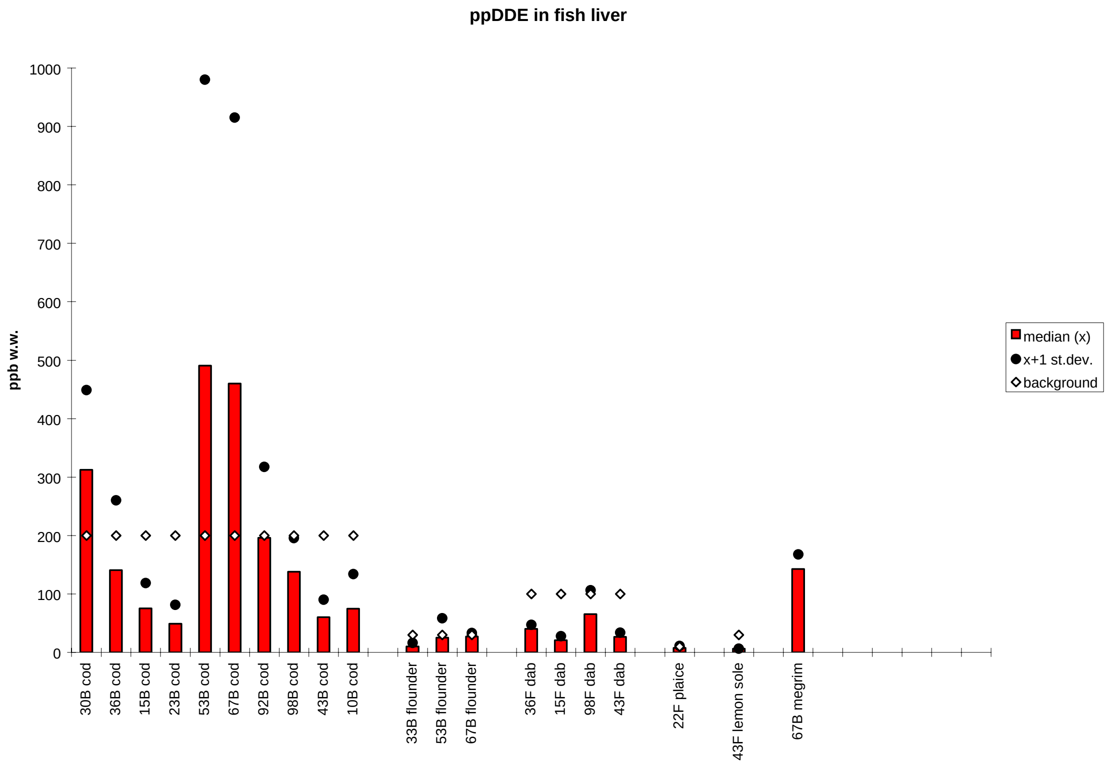


Figure 30. Median, standard deviation and provisional "high background" concentration for ppDDE (DDEPP) in fish liver 1995 (**A**) and 1996 (**B**), ppb wet weight (see maps in Figure 1-Figure 4). (See also footnote in Table 3.)

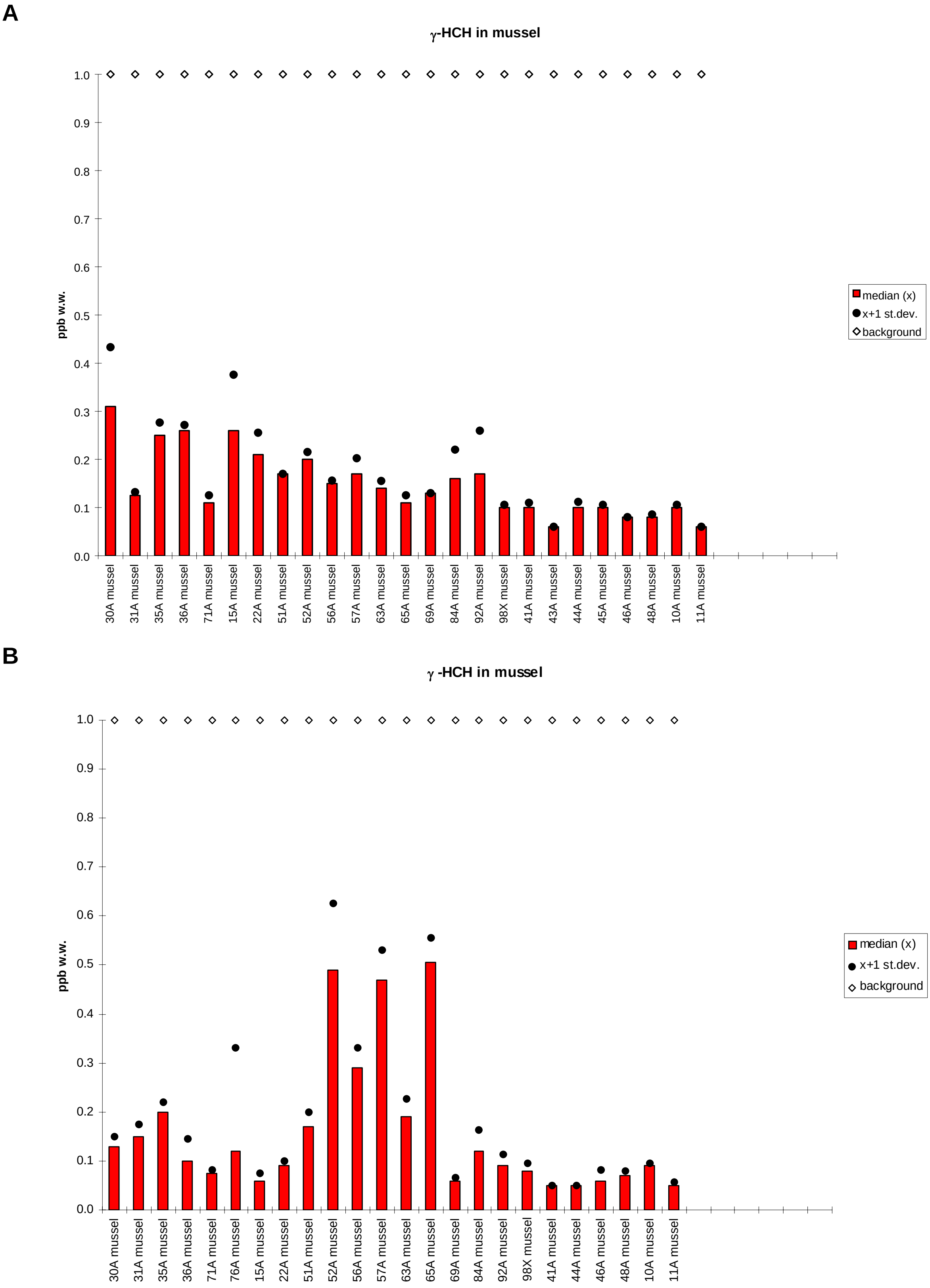


Figure 31. Median, standard deviation and provisional "high background" concentration for γ-HCH (Lindan) in mussels (*Mytilus edulis*) 1995 (**A**) and 1996 (**B**), ppb wet weight (see maps in Figure 1-Figure 4). (See also footnote in Table 3.)

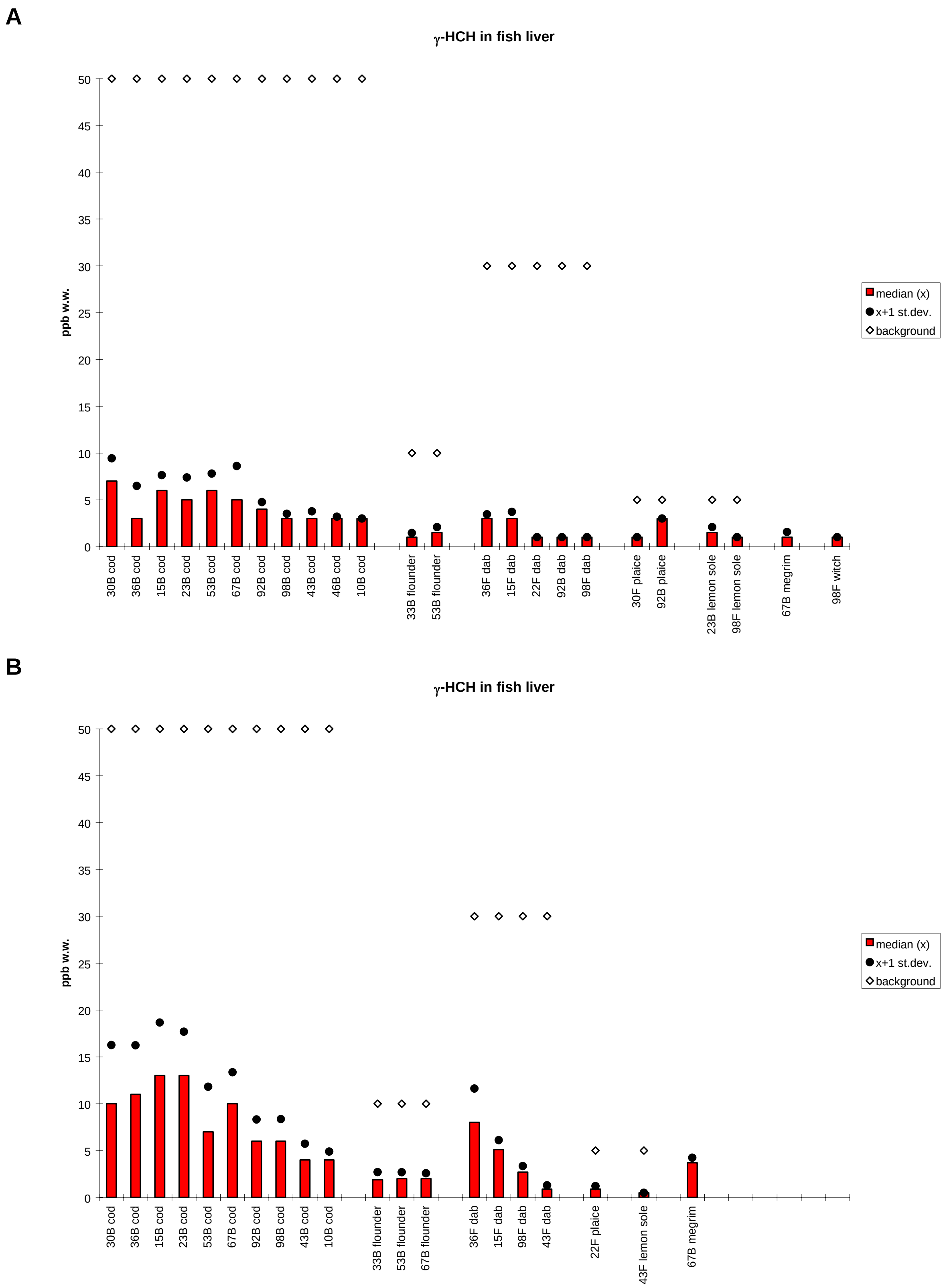
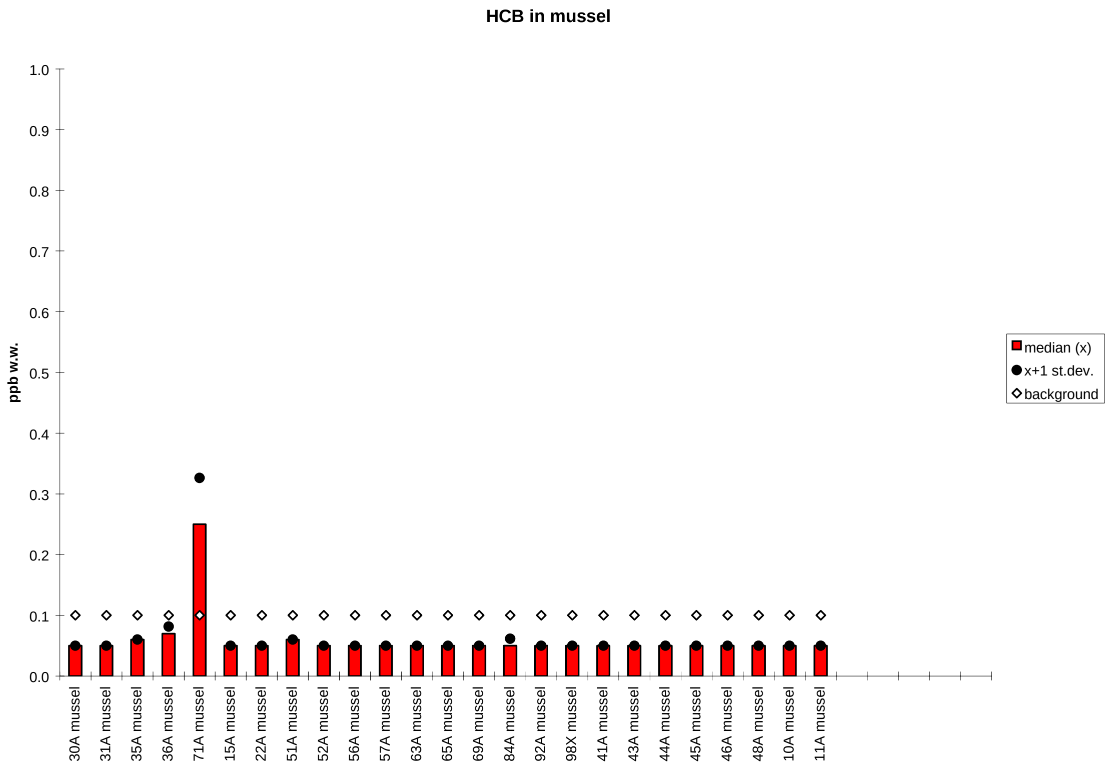


Figure 32. Median, standard deviation and provisional "high background" concentration for γ-HCH (Lindan) in fish liver 1995 (**A**) and 1996 (**B**), ppb wet weight (see maps in Figure 1-Figure 4). (See also footnote in Table 3.)

A



B

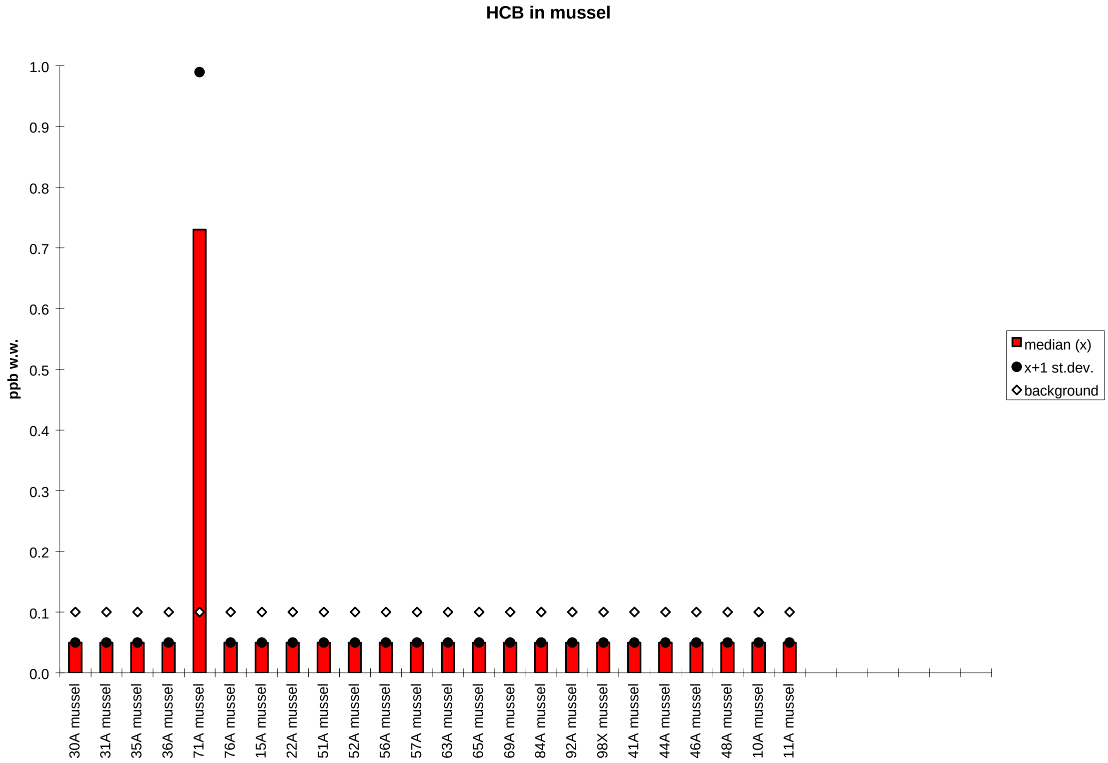
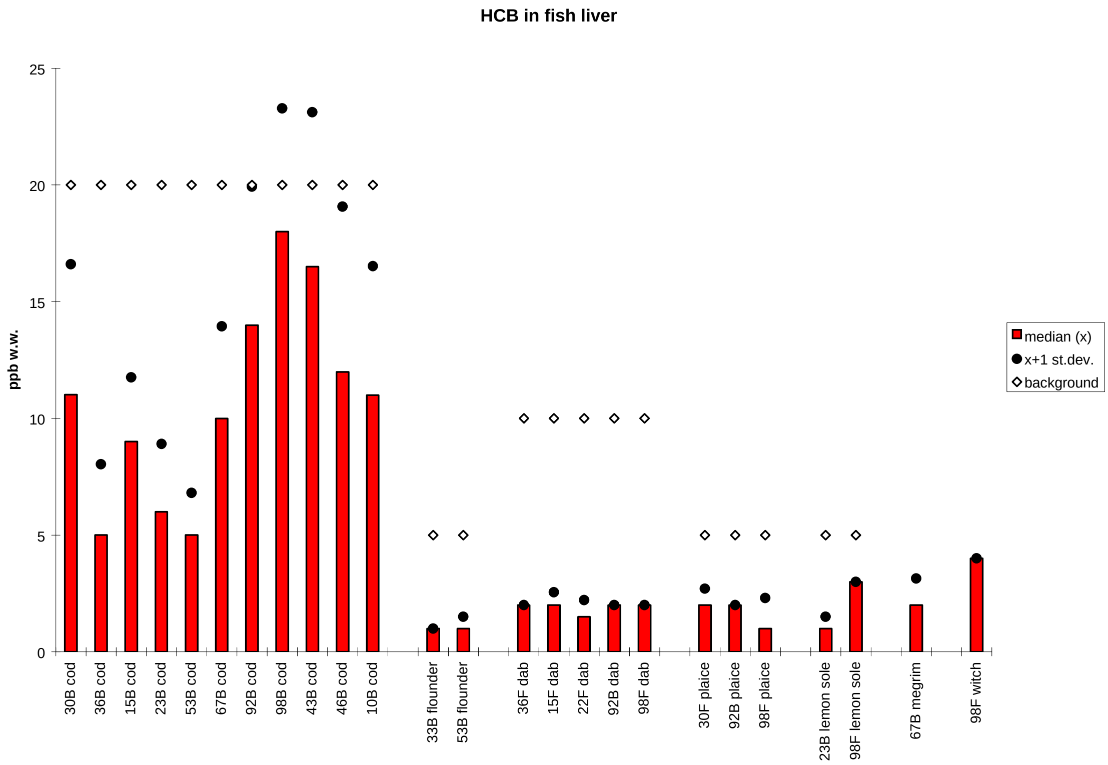


Figure 33. Median, standard deviation and provisional "high background" concentration for HCB in mussels (*Mytilus edulis*) 1995 (**A**) and 1996 (**B**), ppb wet weight (see maps in Figure 1-Figure 4).

A



B

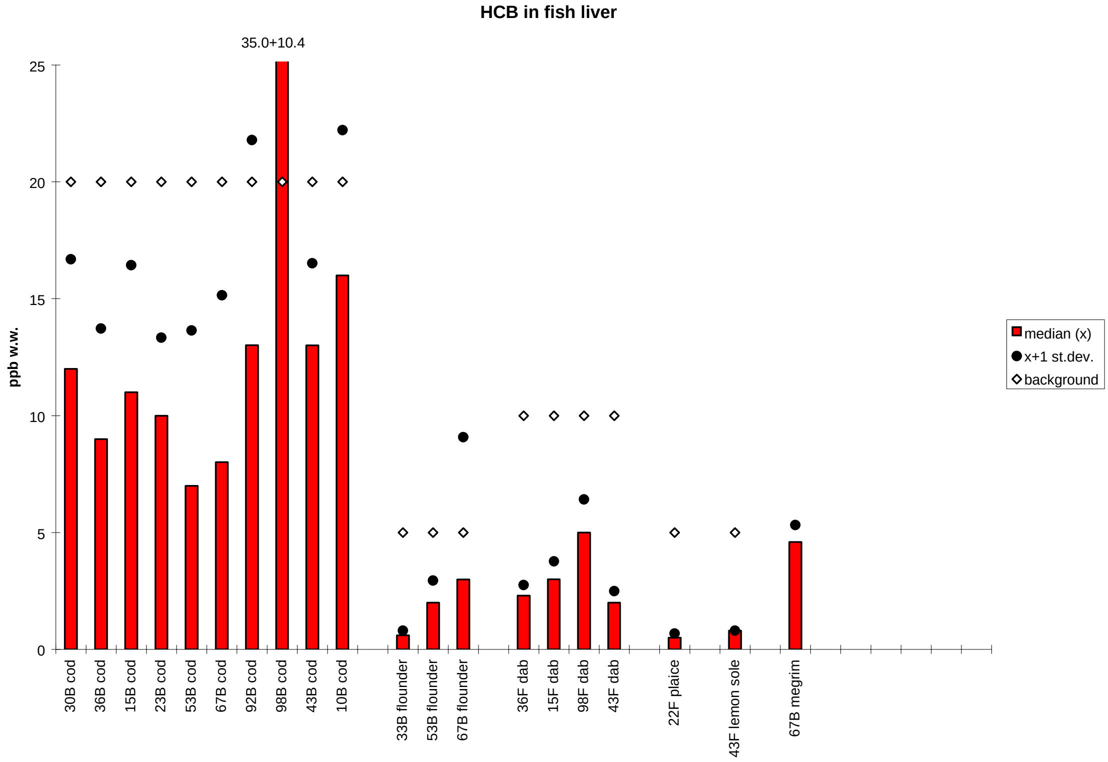
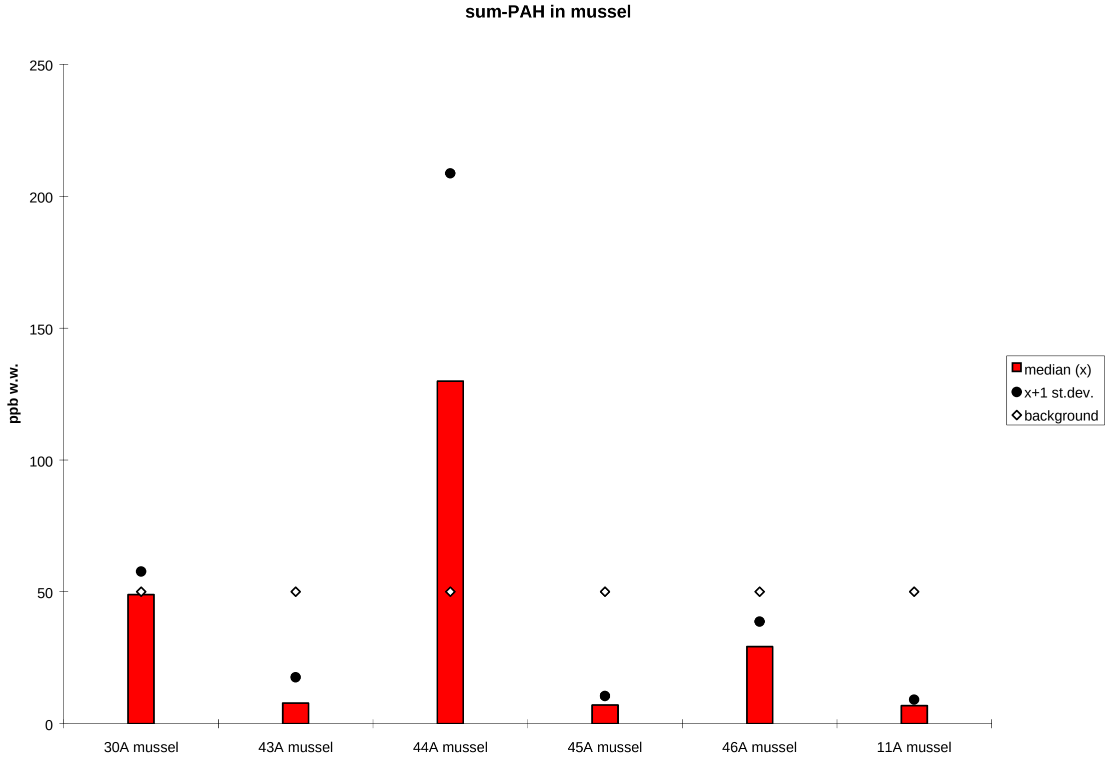


Figure 34. Median, standard deviation and provisional "high background" concentration for HCB in fish liver 1995 (**A**) and 1996 (**B**), ppb wet weight (see maps in Figure 1-Figure 4).

A



B

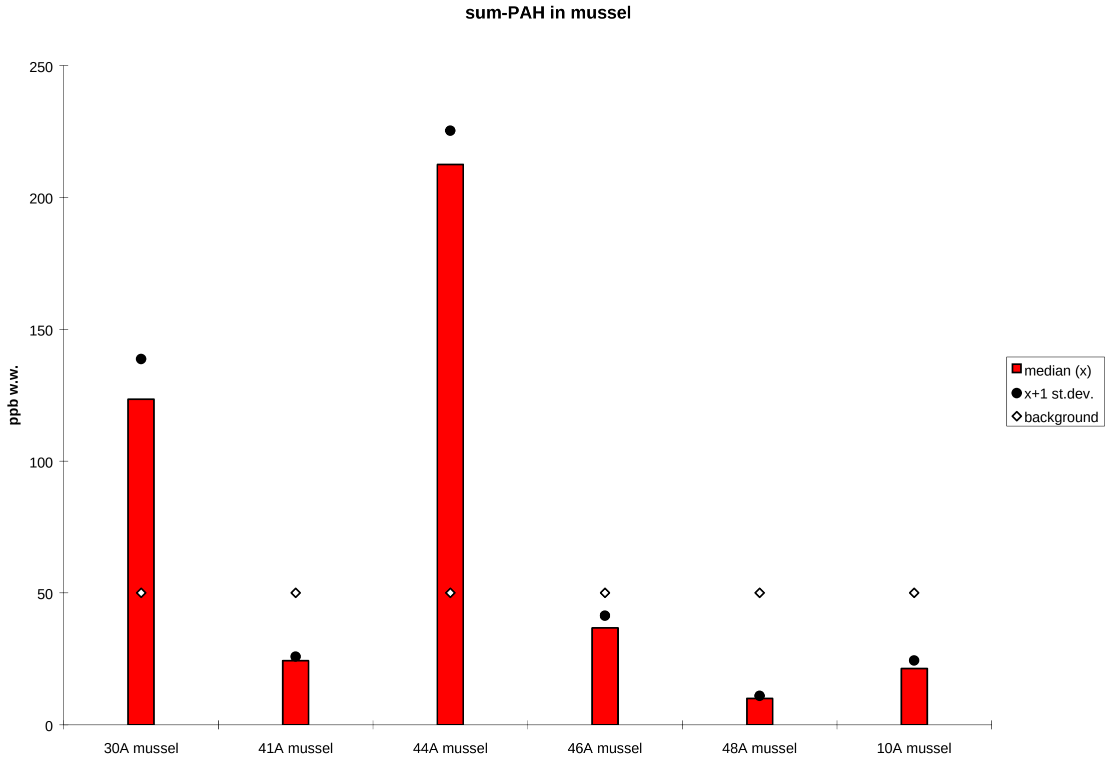
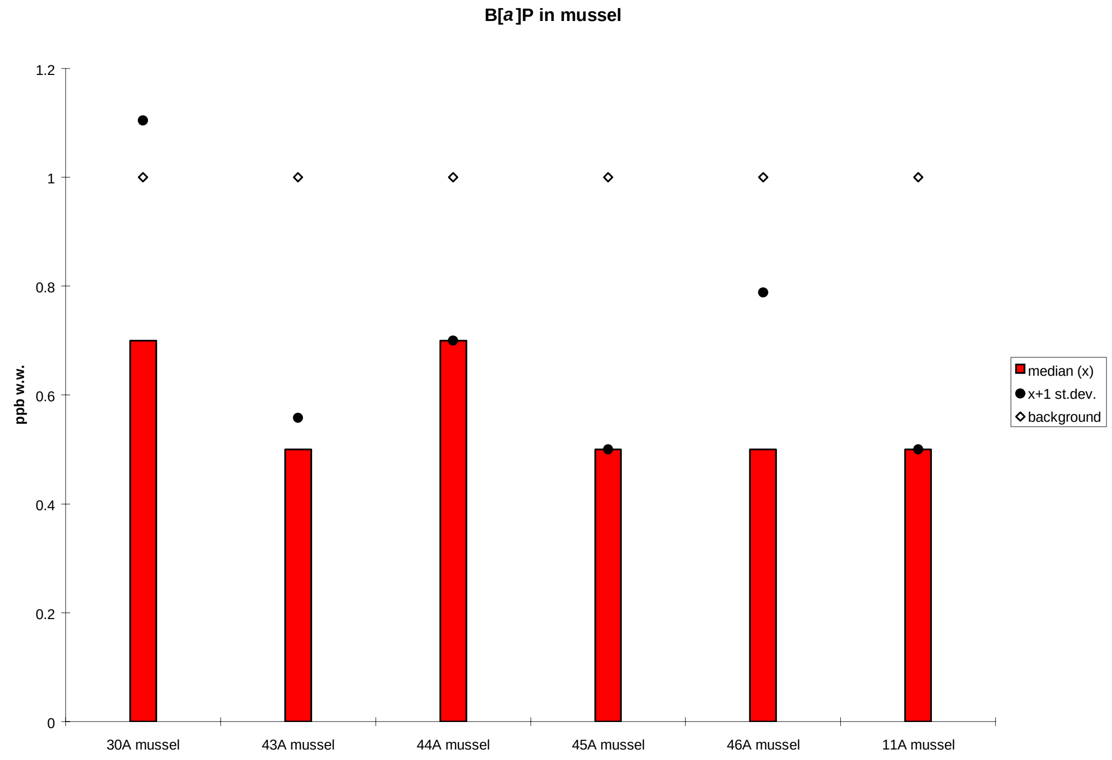


Figure 35. Median, standard deviation and provisional "high background" concentration for PAH (excluding dicyclics) in mussels 1995 (**A**) and 1996 (**B**) ppb wet weight (see maps in Figure 1 and Figure 4).

A



B

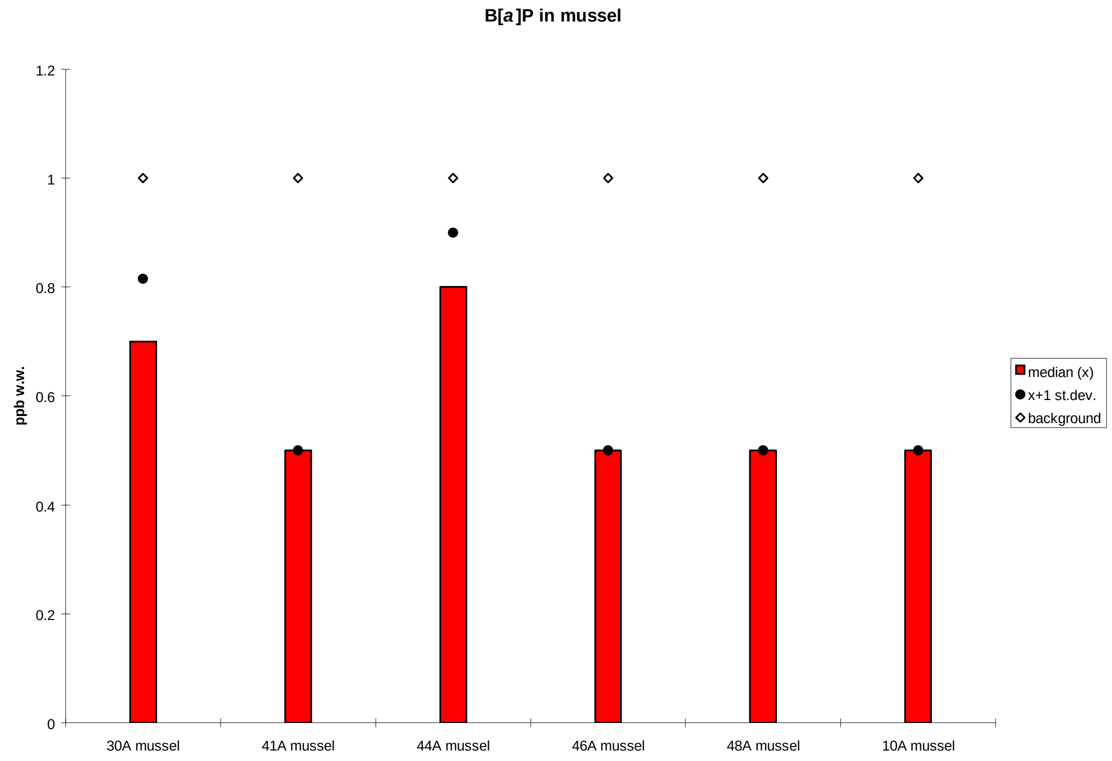
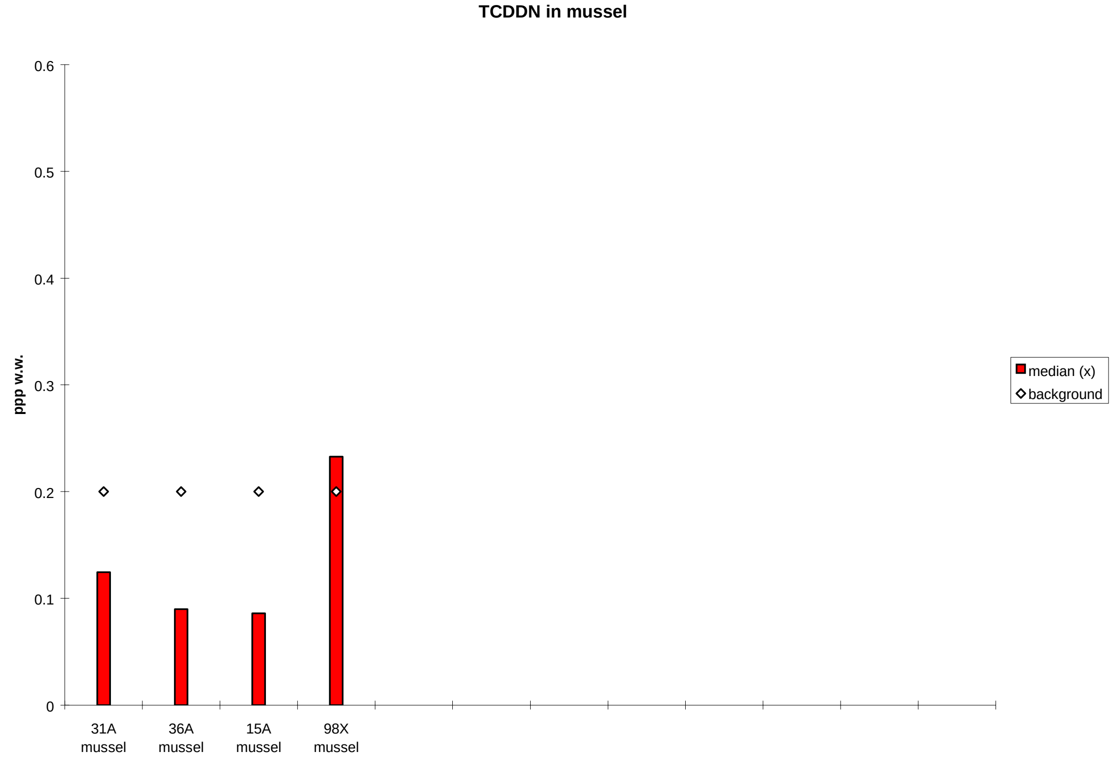


Figure 36. Median, standard deviation and provisional "high background" concentration for B[*a*]P (BAP) in mussels 1995 (**A**) and 1996 (**B**) ppb wet weight (see maps in Figure 1 and Figure 4).

A



B

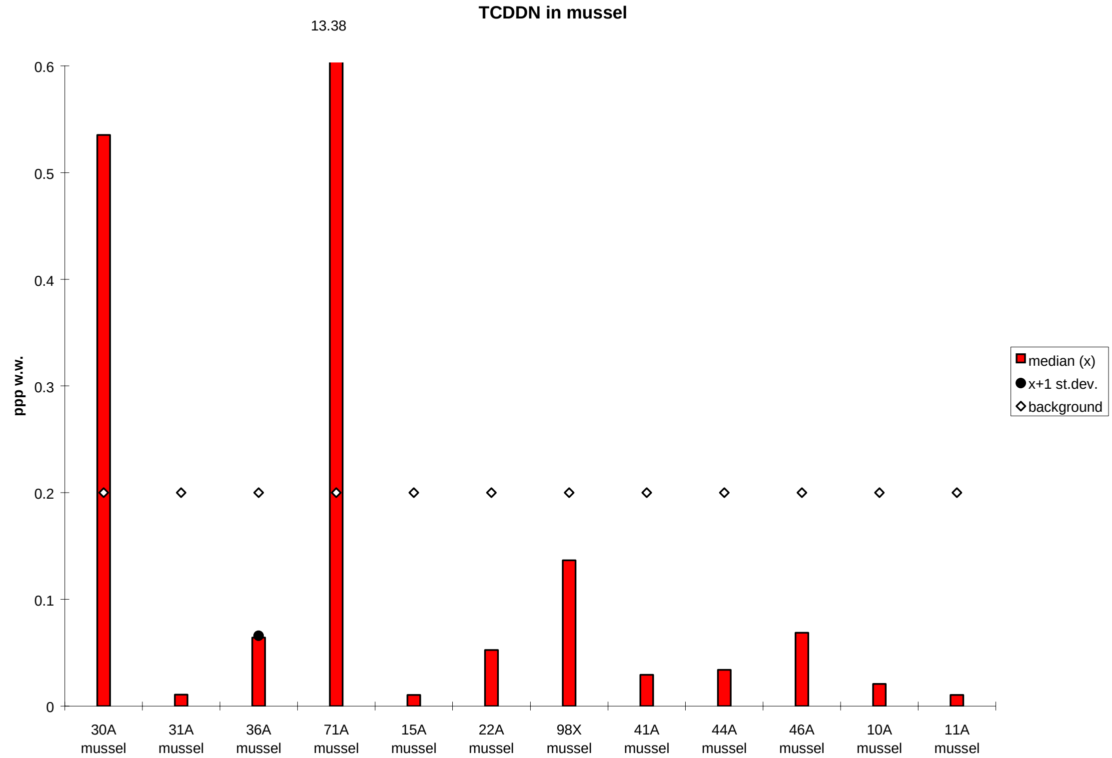
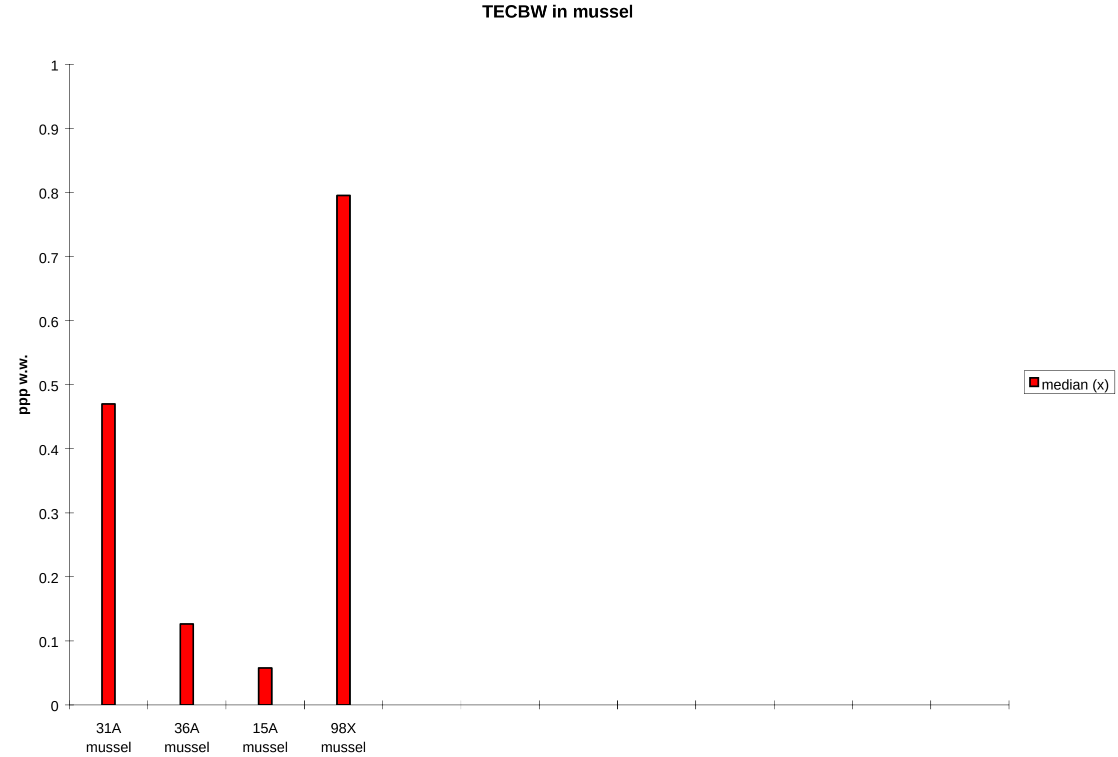


Figure 37. Measured and provisional "high background" concentration for sum of TCDD-toxicity equivalents after Nordic model (TCDDN) in mussel 1995 (**A**) and 1996 (**B**), **NB! ppp (nanogram/kg)** wet weight (see maps in Figure 1 and Figure 4).

A



B

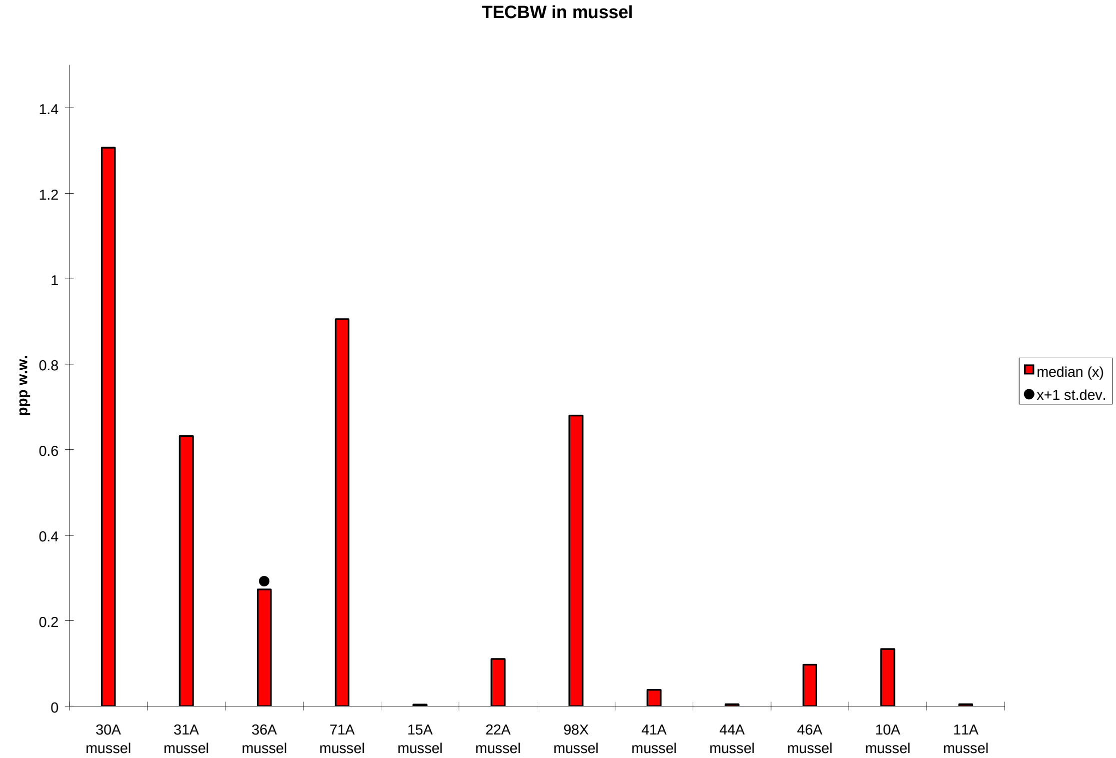


Figure 38. Measured and provisional "high background" concentration for sum of TECB-toxicity equivalents after WHO model (TECBW) in mussel 1995 (**A**) and 1996 (**B**), **NB! ppp (nanogram/kg)** wet weight (see maps in Figure 1 and Figure 4).

Appendix I.
Results from INDEX determinations 1995-96

Introduction

The Norwegian State Pollution Control Authority (SFT) is interested in obtaining a 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 10 of the more contaminated fjords in Norway (Walday *et al*. 1995), herein designated “Pollution Index”. JAMP results from Orkdalsfjorden were also included in the calculation of this index (SFT, pers. comm.). This index was to be tested in 1995-96. It was practical to organise sampling within JAMP, which included monitoring of mussels from in or near the 11 fjords. Some JAMP results could be used to calculate the index value. Also, mussels from one station in Trondheim harbour were collected and analysed but were not included in this initial evaluation of the index.

In addition, a “Reference Index” was tested in 1995-96 based on contaminant concentrations in the blue mussel found along the entire coast in areas with presumably low levels of contamination. JAMP stations sampled in 1996 were used for the most part. 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 that may fall under the criteria for Areas of Special Concern (JMG 1992). This is also of national and international interest.

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 the 1995-96 investigation (Appendix I1).

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 (including Orksalsfjord) 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. Due to expense only one or two samples per fjord were analysed for dioxins where this contaminant group was relevant.

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 from (A) stations that were exclusively to be used for index calculations and (B) those included in the JAMP for 1995-96 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 classes are roughly and not systematically 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 first application of the indices

The Pollution Index was recalculated for 1995 because of the revisions made in SFTs classification system, which involved lower limits for *inter alia* BAP and HCB. The Index for 1995 is 3.2 compared to 2.8 based on the old system (Appendices I5). The Index for 1996 is 3.1. A value between 3 and 4 would be classified by the SFT system as "Bad".

The Reference Index for 1995 is 1.6 and unchanged compared to the old system. The Index for 1996 is 1.8 (Appendices I6). The calculation included (low) suspect dioxin values (TCDDN). A value between 1 and 2 would classified as "Fair".

There may be need to review the selection of areas/stations and contaminants for the Pollution Index (cf. Walday *et al.* 1995) as well as for the Reference Index. The anticipated remedial actions should eventually cause the index to decrease, hence, the initial "Pollution Index" could be closer to the upper end of the scale (5) than where it now (close to and below the middle). With the given analytical scheme, two of the eleven "polluted" areas were classified as "good" (Iddefjord and Orkdalsfjord), and this was the situation for both years 1995-96. Removing these fjords from the calculation would increase the index. Another means of raising the index is by changing the classification system, which was recently done (cf., Molvær *et al.* 1997).

Only two of the eight "reference" areas are classified as "good". The remaining stations are classified as "fair" and show that the majority are more polluted. One reason could be that the stations were selected from the JAMP program and are not necessarily representative of "diffusely" polluted areas along the entire coast of Norway.

Appendix I1.
INDEX - Stations and programme 1995-96

Appendix I1. INDEX station positions and sampling overview for blue mussels 1995-96, 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	Gjemesholmen	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
SØRFJORDEN							
*	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	98X	Skrova	68°10.5'	14°40.2'	65G48	R	
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 1995-96

Appendix I2. Blue mussel samples used in INDEX 1995-96, 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	Gjemesholmen	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*
	SØRFJORDEN												
51A	Byrkjeneset	P	.	3	.	.	.	.	.	.	.	.	.
52A	Eirtrheimsneset	P	+	.	.	.	.	.	.	.	.	.	.

*) indicates Toxaphene included

Appendix I2 (cont'd)

JAMP st.	STATION	INDEX	ANALYSIS CODE +	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												
98X	Skrova	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.

	Analysis code									
Contaminant	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**
Lead	x	x	.	.	.	x	.	.	x	.
Cadmium	x	x	x	.	.	x	.	.	x	.
Copper	x	x	x	.	.	.	.	.	.	.
Mercury	x	x	x	.	.	.	.	.	.	.
Zinc	x	x	x	.	.	.	x	.	x	.
EPOCl	.	.	.	.	x	.	.	.	.	.
PAHs	.	.	x	.	x	x	x	x	x	.
PCBs	x	.	x	x	x	.	.	.	.	.
“Dioxin”	.	.	.	.	.	.	.	.	.	x

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

Appendix I4.
INDEX - SFT Environment classes

(Molvær *et al.* 1997)

As	arsenic
Åb	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

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

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 w.wt	CR ppm d.wt	HG ppm w.wt	NI ppm d.wt	ZN ppm w.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	1.71A	i	0.03B	i	17.40A	i	i	i	0.93a	0.13b	0.53a	6.73b	i	II
Iddefjord	2	2	i	0.12A	i	0.17A	1.30A	i	0.01A	i	14.70A	i	i	i	i	i	i	i	i	I
Inner Oslofjord	5	5	i	i	i	0.20A	1.45A	i	0.01A	i	27.90A	i	<97.90b	0.80a	1.95a	<0.05a	0.41a	20.60c	w	III
Frierfjord	3	3	i	i	i	i	i	i	i	i	i	i	i	i	0.85a	0.60c	0.27a	4.74b	w	III
Inner Kristiansandsfjord	2	2	i	i	i	i	i	i	i	i	i	i	<444.80c	15.00d	0.65a	9.55e	s1.01b	5.08b	<1.68d	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	1.11B	i	0.15D	i	37.80B	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	31.30A	i	162.90b	4.80c	i	i	i	i	i	III
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	0.30A	i	0.35A	1.93A	i	0.01A	i	25.00A	i	i	i	<0.38a	0.05a	0.28a	<0.73a	i	I
Inner Ranfjord	2	2	i	0.56B	i	0.11A	i	i	i	i	23.50A	i	487.90c	31.00e	i	i	i	i	i	V
Count			0	6	0	7	5	0	5	0	7	0	6	6	6	6	6	6	1	11
Min			.	0.12A	.	0.11A	1.11A	.	0.01A	.	14.70A	.	<97.90b	0.80a	<0.38a	<0.05a	0.27a	<0.73a	<1.68d	I
Max			.	14.60E	.	3.61D	1.93B	.	0.15D	.	37.80B	.	<704.90c	31.00e	6.01c	9.55e	s1.01b	20.60c	<1.68d	V
Mean			.	2.78C	.	0.70C	1.50A	.	0.04B	.	25.37A	.	<381.03c	12.43d	<1.80a	<1.74d	s0.46a	<6.76b	<1.68d	3.2

i (118) ! Value ignored when calculating Environment Class.
w (2) ! Missing value. Should be included when calculating Environment Class E.C
a/A(52) > Below Class-I limit.
b/B(18) > Below Class-II limit.
c/C(15) > Below Class-III limit.
d/D(12) > Below Class-IV limit.
e/E(6) > Below Class-V limit.

1996

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 w.wt	CR ppm d.wt	HG ppm w.wt	NI ppm d.wt	ZN ppm w.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	0.30A	i	0.28B	1.64B	i	0.05B	i	20.80A	i	i	i	<0.56a	0.12b	0.27a	4.83b	i	II
Iddefjord	2	2	i	0.15A	i	0.11A	1.47A	i	0.02A	i	15.90A	i	i	i	i	i	i	i	i	I
Inner Oslofjord	5	5	i	i	i	0.15A	1.86B	i	0.01A	i	23.60A	i	<345.70c	3.30c	1.08a	<0.05a	0.30a	20.86c	s<0.56c	III
Frierfjord	3	3	i	i	i	i	i	i	i	i	i	i	i	i	0.26a	2.20d	0.19a	4.18b	14.30e	V
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	s<2.25d	V
Saudafjord	1	2	i	0.75B	i	0.15A	i	i	i	i	i	i	<850.30c	35.00e	i	i	i	i	i	V
Sørfjorden	2	2	i	8.80D	i	3.82D	1.53B	i	0.13C	i	35.10B	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	39.70B	i	<38.20a	0.80a	i	i	i	i	i	II
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	0.50A	i	0.30A	1.73A	i	0.01A	i	20.30A	i	i	i	<0.22a	<0.05a	0.19a	<1.51a	i	I
Inner Ranfjord	2	2	i	1.03B	i	0.12A	i	i	i	i	44.20B	i	181.60b	6.20c	i	i	i	i	i	III
Count			0	6	0	7	5	0	5	0	7	0	6	6	6	6	6	6	3	11
Min			.	0.15A	.	0.11A	1.47A	.	0.01A	.	15.90A	.	<38.20a	0.80a	<0.22a	<0.05a	0.19a	<1.51a	s<0.56c	I
Max			.	8.80D	.	3.82D	1.86B	.	0.13C	.	44.20B	.	<850.30c	35.00e	4.08b	17.55e	1.32b	20.86c	14.30e	V
Mean			.	1.92B	.	0.70B	1.65A	.	0.05B	.	28.51A	.	<349.87c	11.02d	<1.14a	<3.34d	0.48a	<6.66b	s<5.70e	s3.1

i (118) ! Value ignored when calculating Environment Class.
a/A(49) > Below Class-I limit.
b/B(25) > Below Class-II limit.
c/C(15) > Below Class-III limit.
d/D(9) > Below Class-IV limit.
e/E(7) > Below Class-V limit.

Appendix I6.
INDEX - Summary table “Reference index”

1995

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

INDEX.AreaNames	n	N	AS	Pb	F	CD	CU	CR	HG	NI	ZN	AG	PAHΣΣ	BAP	DDTΣΣ	HCB	HCHΣΣ	CBΣΣe	TCDDN	Max
(ReferenceAreas)			ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppb	ppb	ppb	ppb	ppb	ppb	ppp	E.C
. 1995			d.wt	w.wt	d.wt	w.wt	w.wt	d.wt	w.wt	d.wt	w.wt	d.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	I:V
Mid and outer Oslofjord	3	3	w	0.27A	w	0.25A	1.62A	w	0.01A	w	24.30A	w	w	w	<0.95a	0.07a	0.40a	7.86b	<0.12a	II
Lista	2	2	w	0.12A	w	0.33A	1.22A	w	0.02A	w	17.50A	w	<17.60a	0.50a	<0.34a	0.05a	0.38a	<1.28a	<0.09a	I
Bømlo-Sotra	1	1	w	0.22A	w	0.28A	1.39A	w	0.01A	w	28.50A	w	w	w	<0.46a	<0.05a	0.31a	<1.38a	w	I
Outer Ranfjord, Helgeland	1	1	w	0.18A	w	0.15A	0.96A	w	0.01A	w	15.90A	w	<28.20a	<0.50a	0.21a	<0.05a	0.38a	<0.90a	w	I
Lofoten	1	1	w	0.47B	w	0.11A	1.40A	w	0.05B	w	28.50A	w	w	w	4.20b	<0.05a	0.15a	12.31b	<0.23b	II
Finnsnes-Skjervøy	1	1	w	0.18A	w	0.56B	1.55A	w	0.01A	w	17.80A	w	w	w	<0.18a	<0.05a	0.16a	<0.81a	w	II
Hammerfest-Honningsvåg	2	2	w	0.47A	w	0.51B	1.75A	w	0.01A	w	19.20A	w	<131.60b	0.70a	<0.23a	<0.05a	<0.15a	<1.34a	w	II
Varanger Peninsula	3	3	w	0.57A	w	0.32A	2.04B	w	0.02A	w	24.70A	w	<6.90a	<0.50a	<0.36a	<0.05a	0.16a	<0.88a	w	II
Count			0	8	0	8	8	0	8	0	8	0	4	4	8	8	8	8	3	8
Min			.	0.12A	.	0.11A	0.96A	.	0.01A	.	15.90A	.	<6.90a	<0.50a	<0.18a	<0.05a	<0.15a	<0.81a	<0.09a	I
Max			.	0.57B	.	0.56B	2.04B	.	0.05B	.	28.50A	.	<131.60b	0.70a	4.20b	0.07a	0.40a	12.31b	<0.23b	II
Mean			.	0.31A	.	0.31A	1.49A	.	0.02A	.	22.05A	.	<46.08a	<0.55a	<0.87a	<0.05a	<0.26a	<3.34a	<0.15a	1.6

w (53) ! Missing value. Should be included when calculating Environment Class E.C
a/A(101) > Below Class-I limit.
b/B(18) > Below Class-II limit.

1996

Max(Median). Statistics om ALL AREAs: (n = INDEX-Stations measured, N = Station programmed 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 w.wt	CR ppm w.wt	HG ppm w.wt	NI ppm w.wt	ZN ppm w.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	CBΣΣe 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	1.63A	0.11A	0.01A	0.20A	25.50A	0.03A	w	w	<0.25a	<0.05a	0.25a	13.95b	s<0.17a	II
Lista	2	2	w	0.11A	w	0.20A	1.21A	w	0.01A	w	38.00B	w	<19.20a	<0.50a	<0.20a	0.05a	0.29a	<2.14a	s<0.04a	II
Bømlo-Sotra	1	1	w	0.25A	w	0.19A	1.44A	w	0.01A	w	34.20B	w	w	w	<0.11a	<0.05a	<0.14a	<0.78a	s<0.07a	II
Outer Ranfjord, Helgeland	1	1	w	0.17A	w	0.16A	1.50A	w	0.01A	w	13.80A	w	w	w	<0.12a	<0.05a	0.21a	<0.62a	w	I
Lofoten	1	1	w	0.79B	w	0.15A	1.44A	w	0.06B	w	27.20A	w	w	w	<1.15a	<0.05a	<0.13a	8.90b	s<0.25b	II
Finnsnes-Skjervøy	1	1	w	0.13A	w	0.28A	1.36A	w	0.01A	w	16.30A	w	<10.05a	<0.50a	<0.05a	<0.05a	<0.05a	<0.40a	s<0.03a	I
Hammerfest-Honningsvåg	2	2	w	0.29A	w	0.48B	1.56A	w	0.01A	w	16.40A	w	<111.30b	0.80a	<0.11a	<0.05a	<0.11a	<1.59a	s<0.14a	II
Varanger Peninsula	3	3	w	0.15A	w	0.47B	1.73B	w	0.01A	w	18.20A	w	<36.20a	<0.50a	<0.14a	<0.05a	0.14a	<0.98a	s<0.12a	II
Count			1	8	0	8	8	1	8	1	8	1	4	4	8	8	8	8	7	8
Min			1.66A	0.11A	.	0.15A	1.21A	0.11A	0.01A	0.20A	13.80A	0.03A	<10.05a	<0.50a	<0.05a	<0.05a	<0.05a	<0.40a	s<0.03a	I
Max			1.66A	0.79B	.	0.48B	1.73B	0.11A	0.06B	0.20A	38.00B	0.03A	<111.30b	0.80a	<1.15a	0.05a	0.29a	13.95b	s<0.25b	II
Mean			1.66A	0.29A	.	0.28A	1.48A	0.11A	0.02A	0.20A	23.70A	0.03A	<44.19a	<0.58a	<0.27a	<0.05a	<0.17a	<3.67a	s<0.12a	s1.8

w (45) ! Missing value. Should be included when calculating Environment Class E.C
a/A(120) > Below Class-I limit.
b/B(19) > Below Class-II limit.