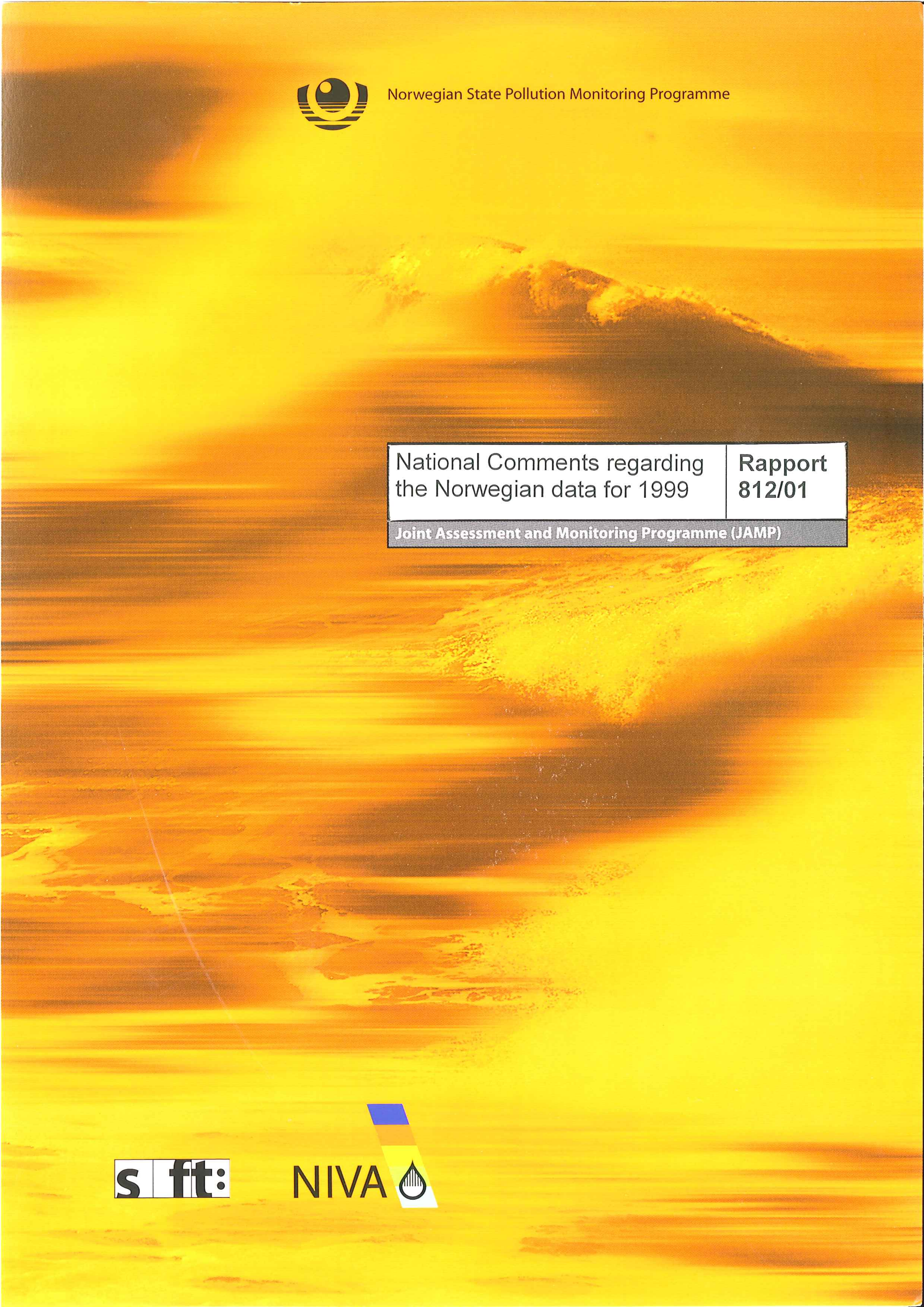

Norwegian State Pollution Monitoring Programme

# National Comments regarding the Norwegian data for 1999

**Rapport 812/01**

Joint Assessment and Monitoring Programme (JAMP)

sft:

NIVA

**Statlig program for forurensningsovervåking**
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# National Comments regarding the Norwegian data for 1999

**Rapport 812/01**

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Norwegian Institute for Water Research

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Abstract

This report is part of the Norwegian contribution to the SIME 2001 meeting administrated by OSPAR. JAMP 1999 included the monitoring of micropollutants in blue mussels (45 stations) and fish (16 stations) along the coast of Norway from Oslo to Bergen, Lofoten and Varangerfjord. The results indicated elevated levels of contaminants (i.e. over provisional "high background") in: Oslofjord proper (PCBs, ppDDE and mercury in fish) and Langesundsfjord (HCB in mussels) and Sørfjord and Hardangerfjord (cadmium, lead, mercury and ppDDE in mussels). A significant upward trend were found for mercury in cod from the inner Oslofjord and downward trends were found for cadmium and lead in mussels from the Sørfjord and Hardangerfjord for the period 1987-1999. The results from the remaining stations showed low or moderately levels of contamination. No change in "pollution" or "reference" index classification was found from 1997 to 1999. Studies were also conducted in two areas on the southern/south-western coast using biological effects methods in cod (6 stations), flatfish (5 stations) and imposex/intersex in dogwhelks (6 stations). Concentrations of organotin in mussels and imposex in dogwhelks were still apparent, especially in the Haugesund area compared to the 1998 investigation.

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

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OSLO AND PARIS CONVENTIONS FOR THE PREVENTION OF MARINE POLLUTION

WORKING GROUP ON CONCENTRATIONS, TRENDS AND EFFECTS OF SUBSTANCES IN THE MARINE ENVIRONMENT (SIME)

NANTES 20-22 FEBRUARY 2001

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**O-80106**

# JOINT ASSESSMENT AND MONITORING PROGRAMME (JAMP)
# NATIONAL COMMENTS REGARDING
# THE NORWEGIAN DATA FOR 1999

Oslo, 21. May 2001[1]

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[1] First edition was published in January 2001. This current edition includes revisions to figures in Chapter 1.4 concerning the results from biological effects analyses.

# *Foreword*

*This report presents the Norwegian national comments on the 1999 investigations for the Joint Assessment and Monitoring Programme (JAMP). JAMP is administered by the Oslo and Paris Commissions (OSPAR) and their Environmental Assessment and Monitoring Committee (ASMO). JAMP receives guidance from the International Council for the Exploration of the Sea (ICES). ASMO has delegated implementation of part of the programme to the Working Group on Concentrations, Trends and Effects of Substances in the Marine Environment (SIME). The Norwegian 1999 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 1999 was carried out by the Norwegian Institute for Water Research (NIVA) by contract from the Norwegian Pollution Control Authority (SFT), (NIVA contract O-80106).*

*The Norwegian contribution to the JMP/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 Langesundsfjord, 1981-), Sørfjord/Hardangerfjord (1983-84, 1987-) and Orkdalsfjord area (1984-89, 1991-93, 1995-96).*

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

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

*Thanks are due to many colleagues at NIVA, especially: Unni Efraimsen, Åse Kristine Rogne, Frank Kjellberg, Sigurd Øxnevad, Tom Tellefsen for field work, sample preparations, data entry; Torgunn Sætre, Alfhild Kringstad, Einar Brevik and colleagues for organic analyses; Norunn Følsvik for organotin analyses; Bente Hiort Lauritzen and her colleagues for metal analyses; Randi Romstad and her collegues for biological effects measurements, Gunnar Severinsen for data programme management and operation; and to the authors Ketil Hylland (biological effects methods), Jon Knutzen (contaminants) and Mats Walday (organotin). Thanks go also to the numerous fishermen and their boat crews we have had the pleasure of working with.*

*This report was first published in January 2001. The current edition includes corrections to figures in Chapter 1.4 concerning biological effects results.*

*Oslo, 21 May 2001.*

*Norman W. Green*
*Project co-ordinator*

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# 1. General Details

## 1.1 Executive Summary

The Norwegian JAMP 1999 included the monitoring of micropollutants (contaminants) in blue mussels (45 stations including supplementary stations for Index, TBT and testing methods) and fish (16 cod/flatfish stations) from the border of Sweden in the south along the coast of Norway to Bergen area, Lofoten and the Varangerfjord bordering Russia. The results indicated elevated levels of contaminants (i.e. over provisional “high background”) in:

- JAMP area 26: Oslofjord proper (PCBs, and to a lesser extent mercury, cadmium, lead, zinc and ppDDE) and Langesundsfjord (HCB, less so for cadmium, mercury and CB153). The median concentrations of CB153 found in cod liver and cod fillet from the inner Oslofjord were the highest since 1992. A significant upward trend was detected for mercury in cod fillet from "large" individuals from the inner Oslofjord 1984-1999.

- JAMP areas 63 and 62: Sørfjord and Hardangerfjord (cadmium, lead, mercury and ppDDE and to a lesser extent PCB). Marked overconcentrations of PCBs were found in cod liver from inner Sørfjord but not in flounder from the same area. Significant downward trends were found for cadmium and lead in mussels at two stations in the Sørfjord and Hardangerfjord 1987-1999.

Two environmental indices were applied for the fifth year to assess the levels of contamination of mussels in “polluted” and “reference” areas. The results indicated a “bad” condition (i.e., in the Norwegian Pollution Control Authority classification system) when applying the “pollution” index and a "fair" condition when applying the “reference” index. There was no change in classification from the 1997 results and no trend is evident.

The biological effects methods OH-pyrene (pyrene metabolite), δ-aminolevulinic acid dehydratase (ALA-D), cytochrome P4501A activity (EROD) and metallothionein (MT) were determined in cod from six stations from the southern and south-western coast from 1997 to 1999. Four of the five flatfish stations observed were in close proximity to the cod stations. Three cod and three flatfish stations were merely diffusely contaminated and the remainder were from two moderately contaminated areas. In all three years for cod and in 1999 for dab there were very high levels of OH-pyrene metabolites at a presumed clean site (Lista). There were also somewhat elevated levels at sites where fish would be expected to be exposed to PAHs (inner Sørfjord, inner Oslofjord). Results for ALA-D and EROD in the moderately polluted stations compared to the diffusely polluted stations were inconsistent for the three years. Results for MT are being reanalysed.

The presence of organotin (e.g. TBT) in Norwegian waters was still a problem in 1999, more severe close to harbours and major ship-routes. The results from the Haugesund area indicated that the area was more contaminated than in 1998. The prohibition against the use of TBT in antifouling on boats <25m of length has not lead to a clear improvement in the investigated areas.

Supplementary investigations of mussels in the Sørfjord and Hardangerfjord area indicated more than one source of DDT (ppDDE, ppDDT and ppTDE) in the mid/outer Sørfjord.

These supplementary investigations of mussels also revealed significant difference between the JAMP-method where mussels are depurated and shucked, and a simpler method where the mussels are merely frozen before being shucked. The JAMP-method yielded higher concentrations for cadmium but lower for lead, zinc, PCBs and DDTs.

## 1.2 Introduction

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

Data are submitted to ICES under three categories: for Purpose A (Health assessment) on a voluntary basis, Purpose C (spatial distribution) on a voluntary basis and Purpose D (temporal trend assessment) on a mandatory basis. Where practical, data collection was in accordance to agreed procedures (OSPAR 1990, 1997). 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 1999 can be addressed (cf. ASMO 1997, Annex 30).

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

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

## 1.3 Information on measurements

An overview of JAMP stations in Norway is shown in the tables in Appendix E. and maps in Appendix F. . The stations and sample counts relevant to the 1999 investigations are noted in the tables in Appendix E. and Appendix G. , respectively.

Blue mussels were sampled at 45 stations (including supplementary stations for Index (22), TBT (3) and method testing (3)) and fish from 16 cod/flatfish stations from the border to Sweden in the south to the border to Russia in the north. Generally, mussels are not abundant 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. ).

### 1.3.1 Oslofjord area

Moderate overconcentrations of CB153 in mussels were found in the inner Oslofjord (st.30A, up to nearly 4 times provisional "high background" - see Chapter 2.1.2) (Figure 1 and temporal trend analyses in Appendix H. ). Overconcentrations were also found in cod liver from the inner Oslofjord (st.30B, up to 6 times “high background”; Figure 2). The median concentration of CB153 in cod liver from the inner Oslofjord was nearly 1300 ppb w.w. and higher than any previous year (1990-1998, Figure 2, Appendix H. and Appendix I. ). Similarly, the median concentration in cod fillet for 1999 was 8.4 ppb and higher than previous years except 1992 (Appendix H. ). Slight overconcentrations were found in cod liver from the outer Oslofjord (st.36B, less than twice "high background").

Overconcentrations were also found for sum of 7 PCBs (CB-28, -52, 101, -118, -138, -153 and -180) in mussels and cod liver from inner Oslofjord stations (st.30A and 30B), about 3 and 6 times “high background”, respectively (Appendix I. ). Slight overconcentrations (less than 2 times "high background") were found in cod livers from the outer Oslofjord (st.36B). In 1994 the Norwegian Food Control Authority (SNT) advised not to consume liver of cod from the inner Oslofjord (north of st.31A) due to concerns about PCB contamination (Table 3, page 28).

The reason for higher concentrations of PCB may be partly due to analytical aspects. Control analyses of certified reference materiale were on the average about 30% higher for CB-153, one of the more persistent PCB congeners (Table 7, Appendix A. ).

No significant linear trend was detected (see method description in Chapter 2.1.3) for CB153 for mussel from four stations (30A, 31A, 35A and 36A) from 1988 to 1999 or for cod (30B and 36B) from 1990 to 1999.

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 15 years to be detected with 90% significance (Appendix H. ).

Overconcentrations of mercury were found in the fillet of both “large” and "small" cod (st.30B) from the inner Oslofjord (Figure 3), over 3 times "high background". A significant *upward trend* was detected for the period 1984-1999 for "large" cod. Slight overconcentration was found for cod from the outer Oslofjord (st.36B). The power, indicated as number of years, to detect a change in mercury in cod fillet from either station was slightly better for “small” fish (10-11 years) than “large” fish (13 years) (cf. Appendix H. ). Concentration of mercury were in general (considering the entire period) significantly higher in "large" cod compared to "small" cod. Slight overconcentrations were also found in fillet of flounder from mid Oslofjord (st.33B).

In cod liver, slight overconcentrations (less than 2 times "high background") were also found for cadmium, ppDDE (st. 30B) and zinc (st.30B and 36B).

Median concentration of lead in cod liver from the inner Oslofjord was 0.85 ppm w.w. and over 3 times "high background" and over 4 times higher than any other year.

Slight overconcentrations of copper in dab liver from the outer Oslofjord were found in 1999. The median value was 14 ppm w.w. and higher than any previous year (i.e. 1990-1998).

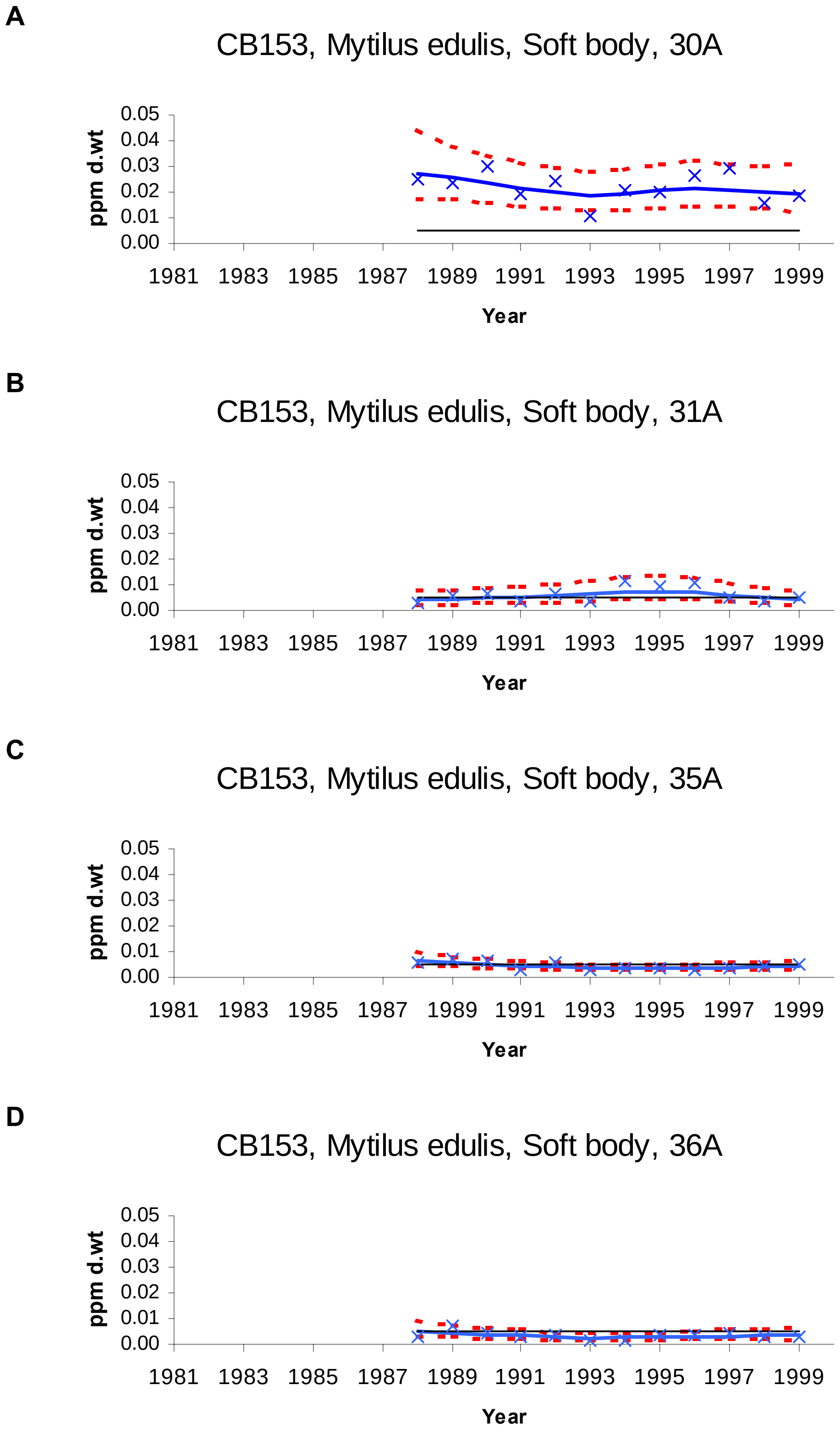

**Figure 1.** Median CB153 concentration in blue mussel (*Mytilus edulis*) from inner (st.30A) to outer (st.36A) Oslofjord. (cf. Appendix F. and key in Figure 21).

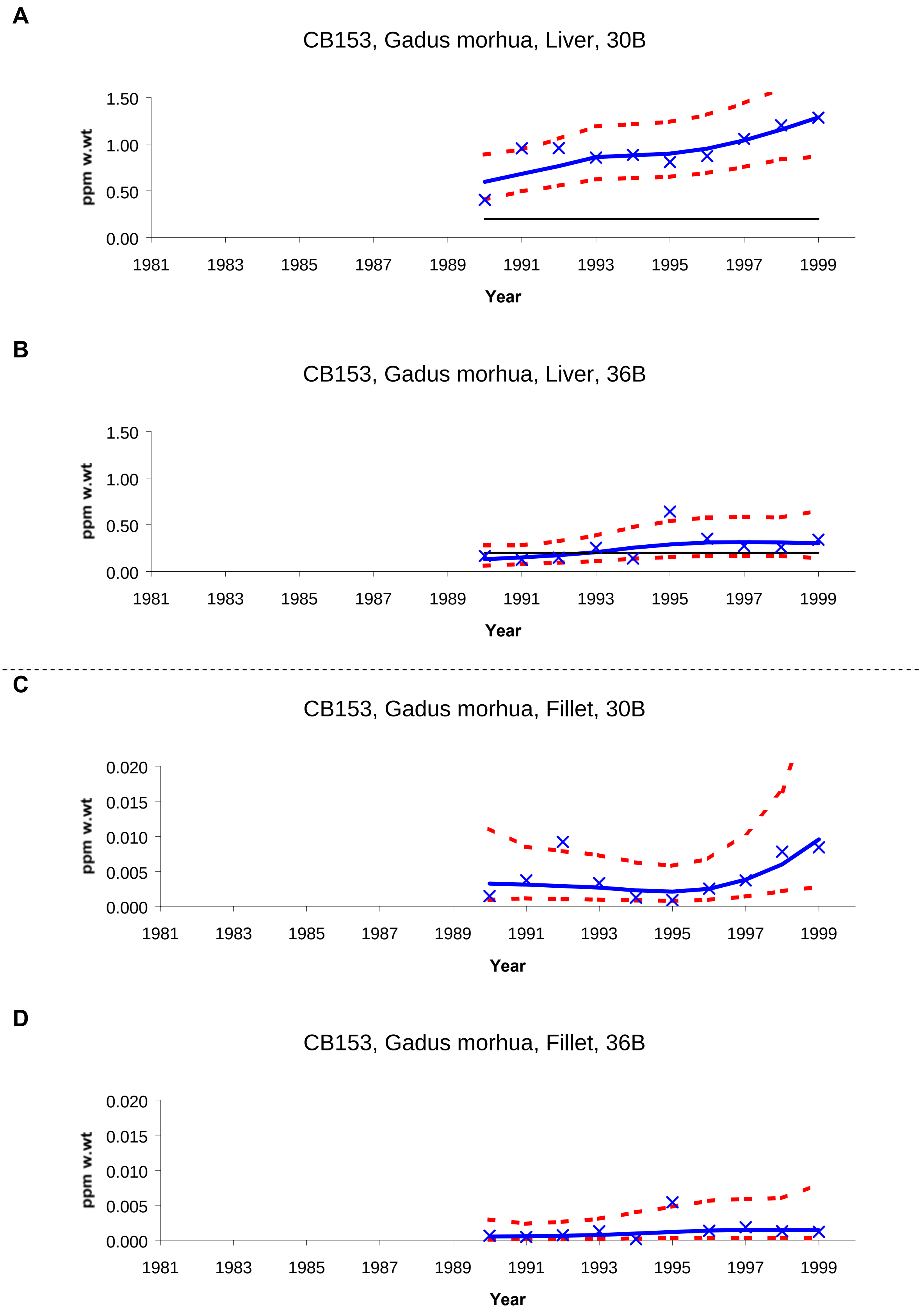

**Figure 2.** Median CB-153 concentration in liver and fillet of cod (*Gadus morhua*) from the inner (st.30B) to outer (st.36B) Oslofjord. (cf. Appendix F. and key in Figure 21). **Note: for some years the upper confidence interval line is off-scale in Figure D. Note: horizontal line for Class I near x-axis.**

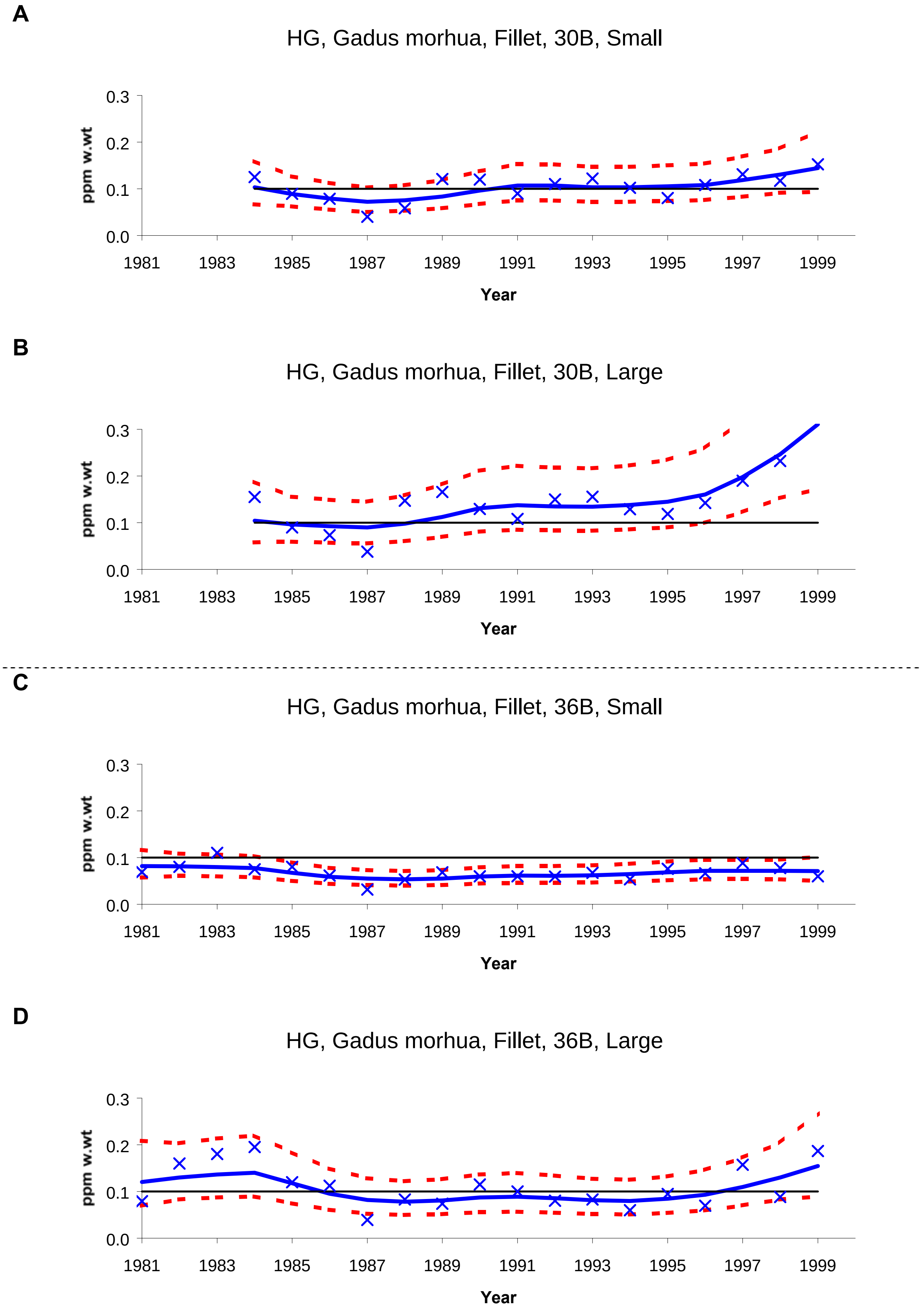

**Figure 3.** Median mercury (Hg) concentration in fillet of cod (*Gadus morhua*): for the inner Oslofjord (st.30B) “small” (**A**) and “large” (**B**) fish, and for the outer Oslofjord (st.36B) “small” (**C**) and “large” (**D**) fish. (cf. Appendix F. and key in Figure 21).

Mussels from Langesundsfjord (st.71A) had in 1999 marked overconcentrations of HCB (over 6 times “high background”, Appendix H. ) and higher than 1998. Concentrations have varied greatly during the investigation period (since 1983) but median value have decreased distinctly since 1989 (Figure 4) due to about a 99% reduction in discharge of HCB and other organochlorines from a magnesium factory after 1990 (cf. Knutzen *et al.* 1999a).

The variability in the data is much less after 1989. The relatively large variability found in this series prior to 1990 accounts for the poor power. The power of the monitoring program for the period 1990-1999 is 14 years and better than the power for the entire period which is over 25 years (cf. Appendix H. for entire period). Separate analysis for the 1990-1999 data also indicated no significant trend. The 1990-1998 period had a significant downward trend but the result for 1999 was higher and the trend was no longer significant.

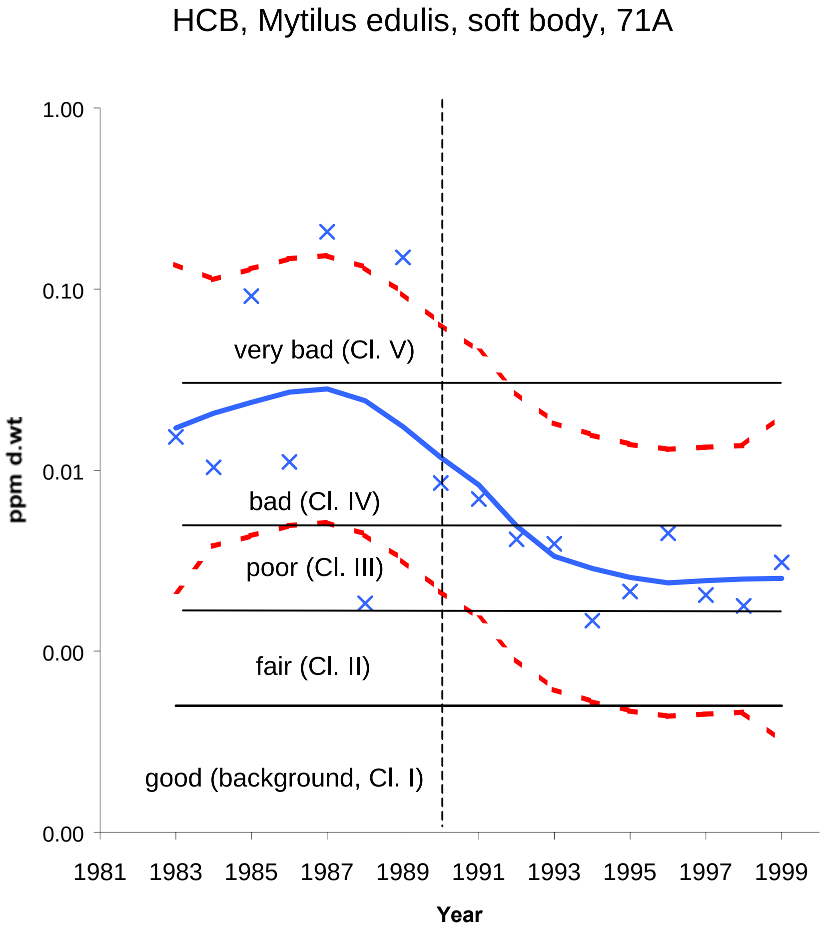

**Figure 4.** Median HCB concentration in blue mussel (*Mytilus edulis*) from Langesundsfjord (west of Oslofjord). (cf. Appendix F. and key in Figure 21). Vertical line indicates when a magnesium factory reduced it's discharge by 99%. Horizontal lines indicate classes as defined in Table 6. **NB: log-scale.**

### 1.3.2 Sørfjord and Hardangerfjord

The development of the contaminant conditions in these connected fjords and the main remedial actions that have been taken, have been outlined in the national comments for 1989 (Green 1991) and in a recent report concerning Sørfjord in particular (Skei 2000). The results from JAMP 1999 are coupled to other studies in this area (cf. Knutzen *et al.* 1997, 1999c; Knutzen & Green 2000) and confirm that the fjords continue to be contaminated especially with cadmium (e.g. Figure 5, Figure 6 and Figure 7), lead, mercury, ppDDE (e.g. Figure 5, Figure 8 and Figure 9) and to a lesser extent PCB.

Results for mussels collected from the Sørfjord (st. 51A, 52A, 56A and 57A) indicated marked overconcentrations of cadmium (7-17 times provisional “high background”, Appendix H. ), lead (3-12 times) and mercury (2-14 times). Overconcentrations of cadmium, lead and mercury could be traced to Ranaskjær (st.63A) in the Hardangerfjord, about 60 km from the head of Sørfjord. A significant *downward* trend was found for cadmium and lead at st. 57A and 63A from 1987 to 1999 (Appendix H. ). In 2000 the Norwegian Food Control Authority (SNT) extended their advice against the consumption mussels to include all seafood in the Sørfjord (Table 3) due to concerns about metal and PCB contamination.

The median concentration of mercury found in mussels from the Sørfjord, September/October 1999 were up to 5 times those of 1998. This may have been due to effluents containing high concentrations of mercury. During the winter/spring of 1999 there were two accidental discharges of effluents: one containing high concentrations of cadmium and zinc and one during the spring that contained high concentrations of mercury (Skei 2000, Skei & Knutzen 2000).

Marked overconcentrations were found for cadmium in cod liver and flounder liver from inner Sørfjord (7 and 9 times "high background", respectively). Slight overconcentrations were found for mercury in fillet and lead in liver for these fish species.

The power of the sampling strategies for mussels was relatively poor for samples collected from Odda; the inner most part of Sørfjord (st.52A). For example for lead in mussels, it is estimated that it would take over 25 years to detect a hypothetical trend of 10% per year with 90% significance (Appendix H. ). This reflects the large variability found in the data series from this area. The variability is mostly due to the irregular/accidental input of contaminated discharges. The power improved with distance from Odda, and at Ranaskjær (st.63A, ca.50km from Odda) it was only 10 years.

Overconcentrations of ppDDE were found in mussels from the head of the Sørfjord to about 60 km seaward (Figure 8 and Figure 9). The highest median concentration in mussels was 35 ppb d.w. (overconcentrations of over 3 times). With the exception of 1998, the highest concentrations since 1992 have been found midway in the Sørfjord (st.56A). However, analyses of supplementary stations (51A, 56A-1, 56A-2 and 57A-1) between 56A and 57A revealed another and higher maximum (at 57A-1, Figure 5, Appendix M. ) indicating that there is more than one source of contamination.

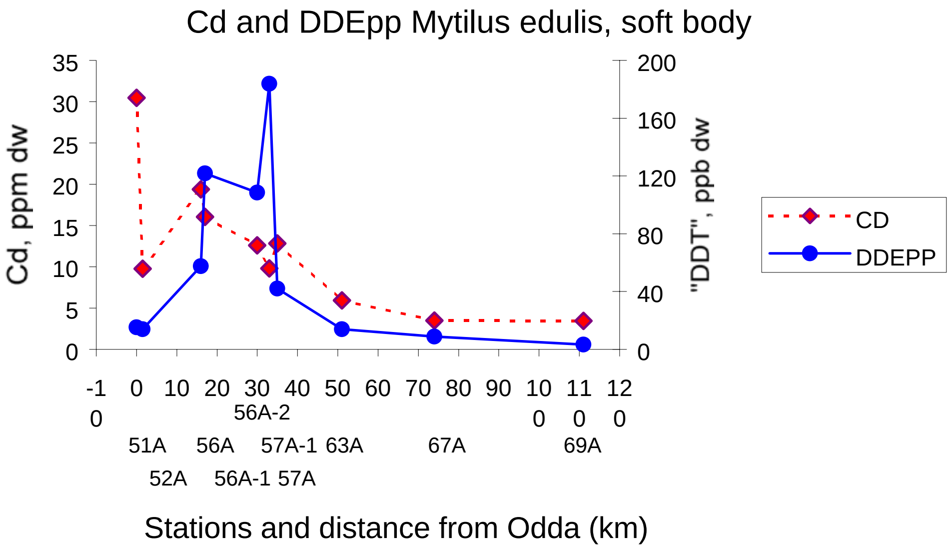

**Figure 5.** Median cadmium (Cd) and ppDDE concentration in blue mussel (*Mytilus edulis*) from the Sørfjord and Hardangerfjord region (cf. Appendix M. ).

Slight overconcentrations (less than 2 times) were found in flounder liver and cod liver from the inner Sørfjord (st.53B), less than 2 times "high background" (Figure 10, Appendix H. ).

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 have been prohibited in Norway since 1970 (excepting the dipping of spruce seedling until 1987).

Concentrations of sum of 7 PCBs (CB-28, -52, 101, -118, -138, -153 and -180) and CB153 (Figure 11, Appendix H. and Appendix I. ) in cod liver from Sørfjord were at or below "high background". The variation was relatively low i.e. standard deviation roughly equal to the median value. These points contrast considerably with the results for 1998 which noted the highest values registered from either Sørfjord or Hardangerfjord since 1990. In 2000 the Norwegian Food Control Authority (SNT) has advised against consumption of cod liver from the inner Sørfjord (Table 3) due to concerns about PCB contamination.

Slight overconcentrations of HCB (less than 2 times "high background") were found in mussels from Sørfjord (st.52A, 56A, 57A) and Hardangerfjord (st.63A, 67A) A significant *downward trend* was found at the three most distant from Odda (st. 56A, 63A, 65A).

No trends were evident in these organisms for ppDDE and CB153 during the period 1990-1999.

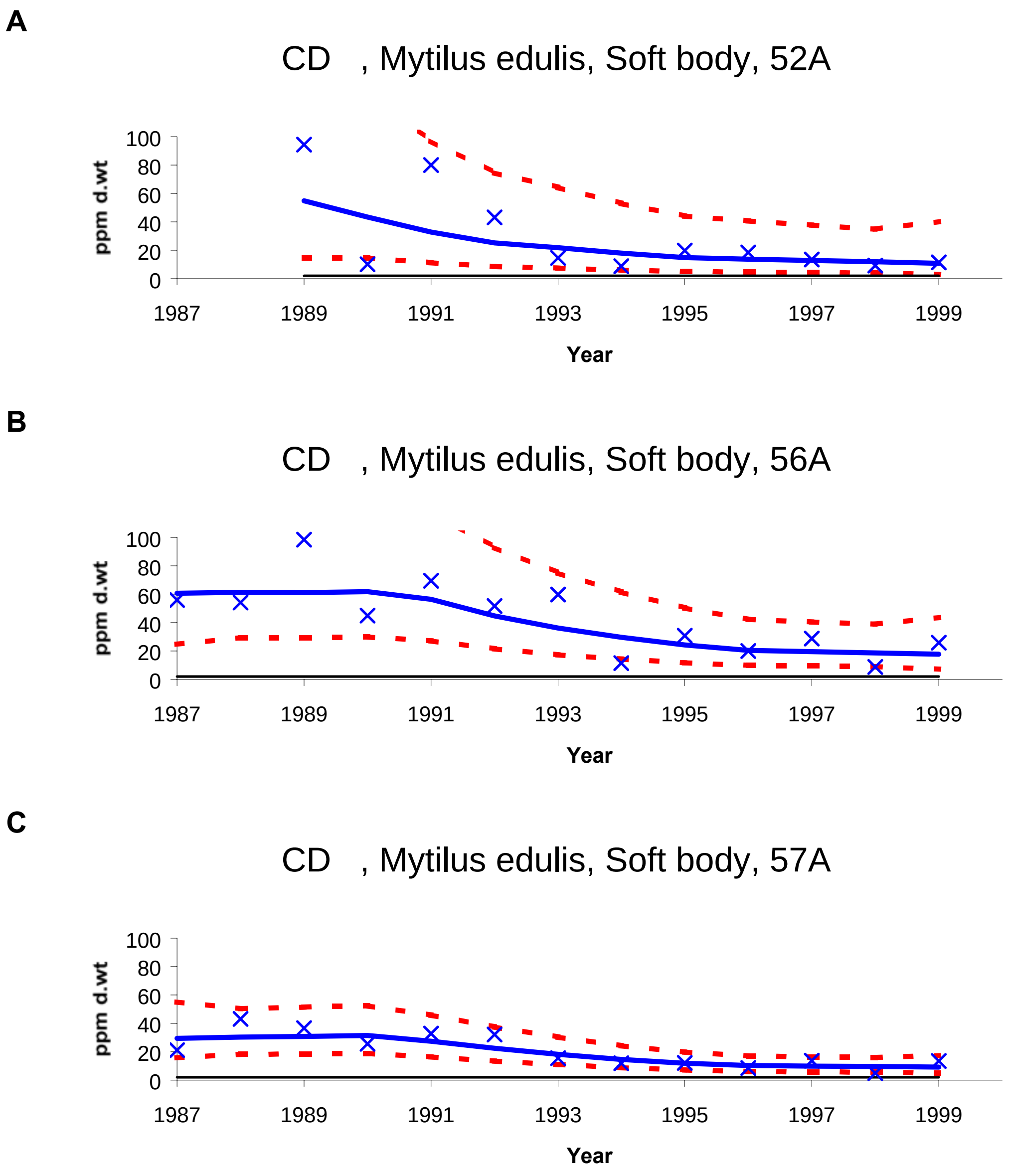

**Figure 6.** Median cadmium (Cd) concentration in blue mussel (*Mytilus edulis*) from inner (st.52A) to outer (st.57A) Sørfjord. NB: (cf. Appendix F. and key in Figure 21). **Note: for some years the upper confidence interval line is off-scale in figures A and B. Note: horizontal line for Class I near x-axis.**

**Figure 7.** Median cadmium (Cd) concentration in blue mussel (*Mytilus edulis*) from Hardangerfjord (st. 63A, 65A and 69A). (cf. Appendix F. and key in Figure 21). **Note difference in scale from Figure 6 and that for some years the upper confidence interval line is off-scale in Figure A. Note: horizontal line for Class I near x-axis.**

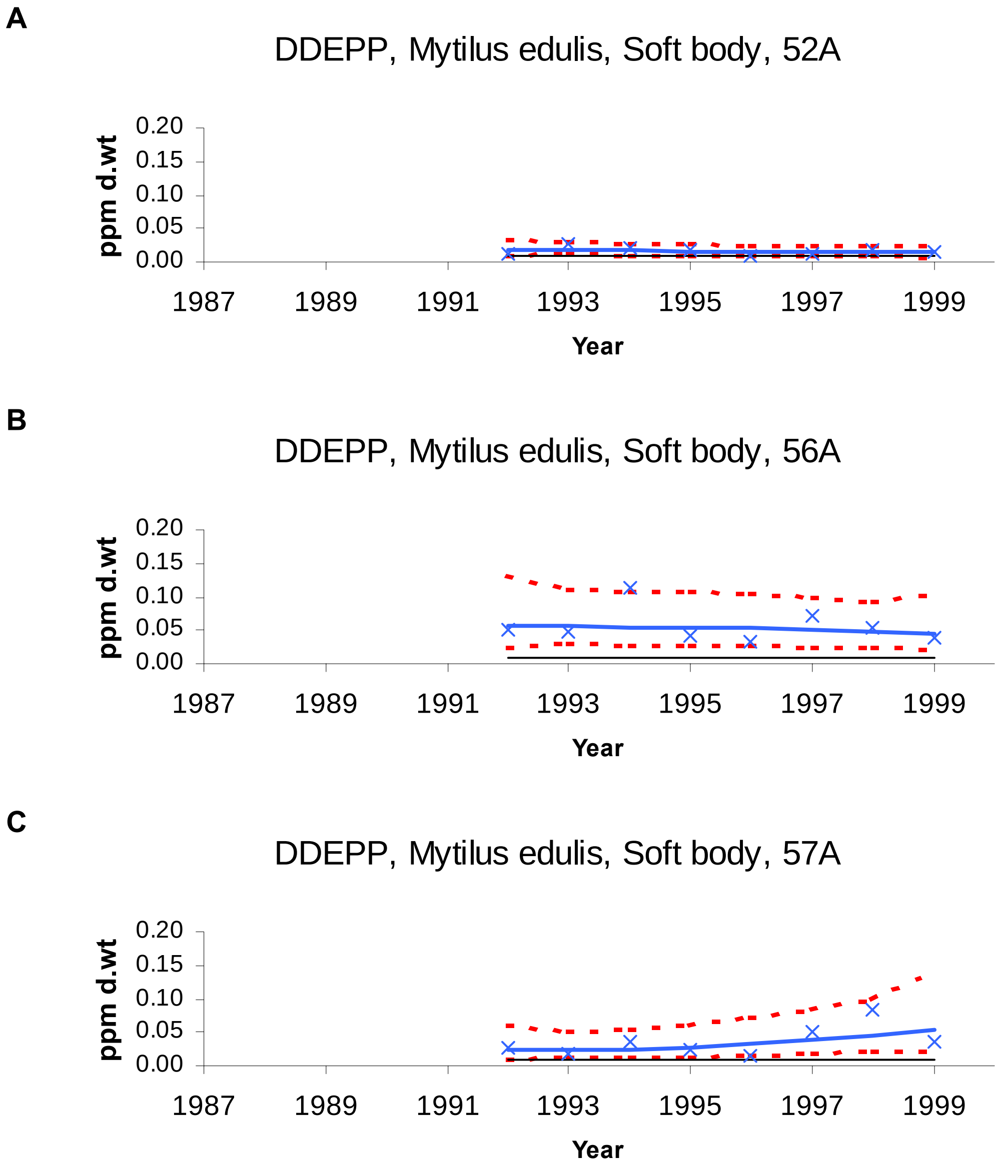

**Figure 8.** Median ppDDE (DDEPP) concentration in blue mussel (*Mytilus edulis*) from inner (st.52A) to outer (st.57A) Sørfjord. (cf. Appendix F. and key in Figure 21).

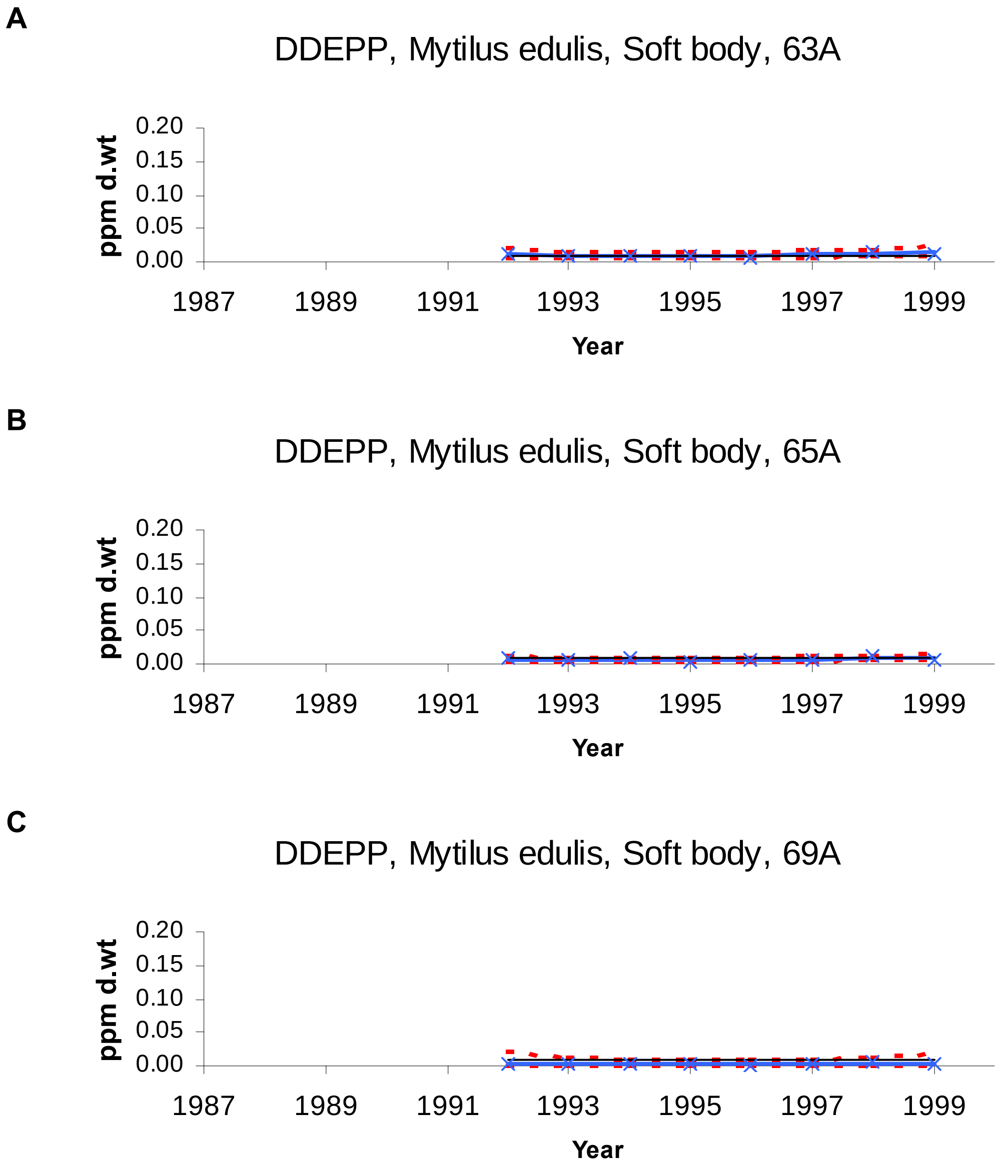

**Figure 9.** Median ppDDE (DDEPP) concentrations in blue mussel (*Mytilus edulis*) from Hardangerfjord (st. 63A, 65A and 69A). (cf. Appendix F. and key in Figure 21).

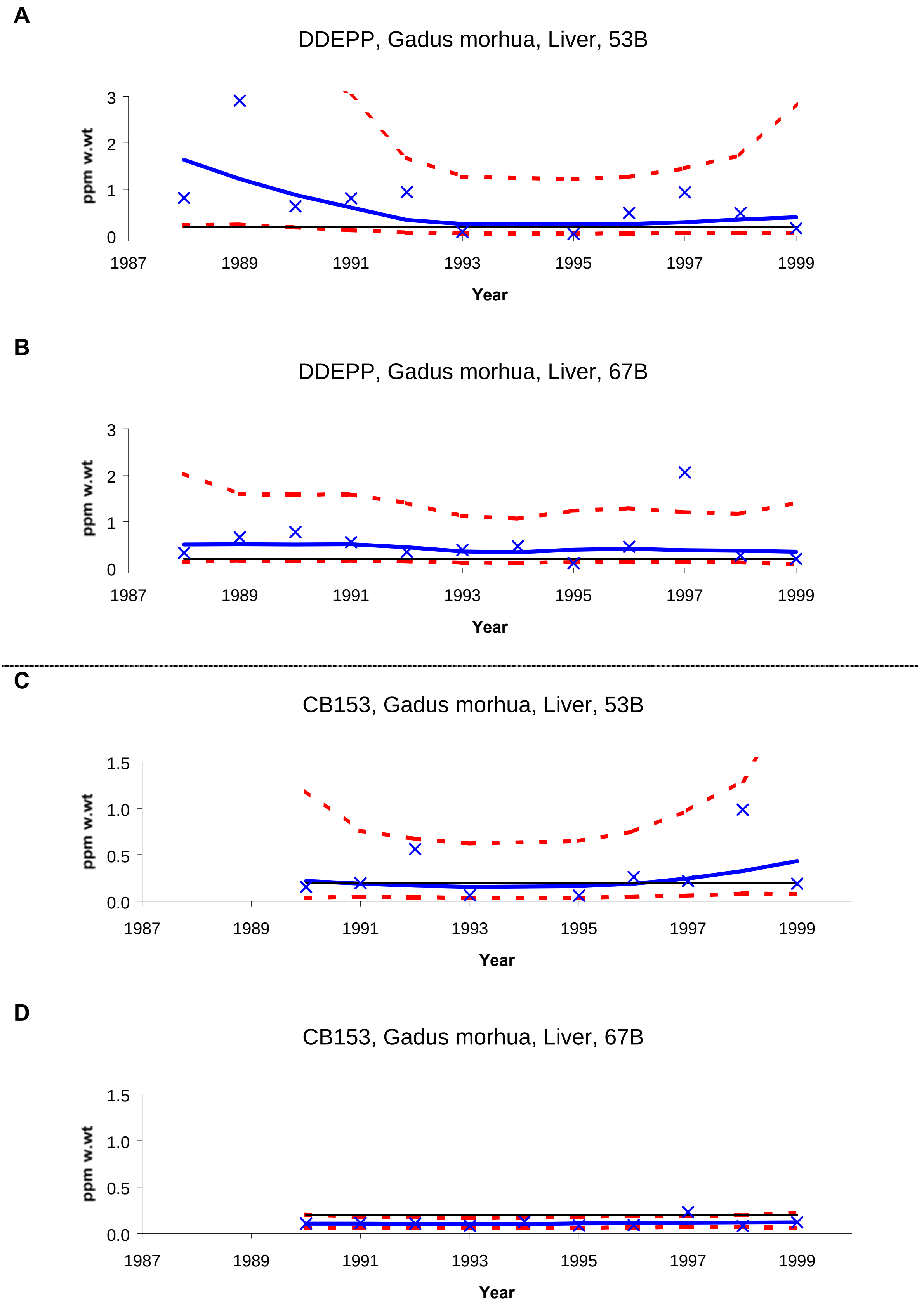

**Figure 10.** Median ppDDE (DDEPP) and CB153 concentrations in cod (*Gadus morhua*) from Sørfjord (st.53B) and Hardangerfjord (st.67B) (cf. Appendix F. and key in Figure 21). **Note that for some years the upper confidence interval line is off-scale in Figures A and B.**

### 1.3.3 Lista area

No overconcentrations of metals or chlorinated hydrocarbons were found in mussels, cod or dab (st.15A/B/F, Appendix H. and Appendix I. ), with the exception of a slight overconcentration for zinc in cod liver (less than 2 times).

### 1.3.4 Bømlo-Sotra area

No overconcentrations of metals or chlorinated hydrocarbons were found in mussels or cod from this area (22A and 23B, Appendix H. and Appendix I. ), exception for mercury in cod fillet and lead in plaice liver where only a slight overconcentration was found (less than 2 times "high background") (Appendix H. ).

It was impractical to continue sampling for flatfish at st.22F Borøyfjorden. Thus, a new station in Åkrafjorden, 21F Kyrping, was initiated. This station is about 82km southeast of 22F, but like 22F, still can be considered in a reference area.

Megrim was sampled at st.21F in 1999. No "high background" has been suggested for contaminants in this species. The median concentrations of mercury and DDE were about 2-3 times higher for megrim caught at st.67B in the more perturbed Hardangerfjord, otherwise the levels were about the same for the other contaminants (Appendix I. ).

### 1.3.5 Orkdalsfjord area

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

### 1.3.6 Open coast areas from Bergen to Lofoten

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

Slight overconcentrations (less than 2 times "high background") of cadmium and mercury were found in mussels but no overconcentrations were found in cod, or plaice (st.98A/B/F, Appendix H. and Appendix I. ).

### 1.3.7 Exposed area of Varangerfjord near the Russian border

The remaining and northern area of JAMP in Norway stretches north of 68°N and a longitude from 17 to 29°E (Appendix F. ). In 1999 only two mussel stations, one cod and one plaice station were investigated in the Varangerfjord (at approximately 70°N) that borders with Russia.

Slight overconcentrations (less than 2 times “high background”) of cadmium and HCB were found in cod liver (st.10B) (Appendix H. and Appendix I. ).

### 1.3.8 Norwegian Pollution and Reference Indices

The Norwegian Pollution Control Authority (SFT) has requested a select and small group of indices to assess the quality of the environment with respect to contaminants. One index is based on the levels and trends of contaminant concentrations in the blue mussel collected annually from a selection of the more contaminated fjords in Norway (Appendix J. ). 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.

Nine fjord areas were used to calculate the Pollution Index. The Index for 1999 is 3.1, and unchanged since 1997. A value between 3 and 4 would be classified as "bad" in the SFT system.

Only four fjord/areas were included in Reference Index for 1998-1999 compared to seven to eight used in previous years. The Index for 1999 is 1.3. A value between 1 and 2 would be classified as “Fair”.

## 1.4 Biological effects methods for cod and flatfish

The JAMP-programme for 1999 included five biological effects methods (BEM): FAC, ALA-D, EROD, MT and TBT (Table 2). The first four are discussed in this chapter (Figure 11 to Figure 18, Appendix K. ) and TBT is discussed separately (cf., Chapter 1.5).

All parameters were measured in Atlantic cod collected at six locations (15B, 23B, 30B, 36B, 53B, 67B). The same parameters were also measured in flounder at three locations (218F, 53F, 67F) and dab at two locations (15F, 36F). The locations can be divided into two groups: one group of stations can be considered to be moderately to markedly polluted (30B, 53B/F, 67B/F), whereas the other locations were from areas with little or no known pollution input.

**Table 2.** Summary of biological methods employed by the JAMP-1999.

| Code | Name | tissue sampled | Specificity |
|---|---|---|---|
| FAC | Pyrene metabolites of PAH | fish bile | PAH |
| ALA-D | δ-amino levulinic acid dehydrase inhibition | fish red blood cells | Pb |
| EROD | Cytochrome P4501A-activity (CYP1A/P4501A1, EROD) | fish liver | planar PCB/PCNs, PAHs, dioxins |
| MT | Metallothionein | fish liver | Cd Cu Zn (Hg) |
| TBT | Imposex/Intersex | snail soft tissue | organotin |

The reason to use biological effects methods within monitoring programmes is to evaluate whether marine organisms are affected by contaminant inputs. Such knowledge can not be derived from tissue levels of contaminants only. In addition to enable conclusions on the health of marine organisms, some biomarkers assist in the interpretation of contaminant bioaccumulation. The biological effects component of the Norwegian JAMP is possibly the most extensive of its type in Europe and includes imposex in gastropods as well as biomarkers in fish. The four chosen methods for fish were selected for specificity, for robustness and because they are among a limited set of methods proposed by international organisations, including OSPAR and ICES.

As in previous years, 25 individual cod were sampled for biological effects measurements at the six locations. Similarly, 25 dab were collected at 15F and 25 flounder at 53F and 67F. A new reference flatfish station was also sampled, but only 11 flounder were collected (218F). At location 36F, 21 individual dab were sampled for biological effects measurements. All fish were collected by local fishermen and kept alive until arrival of NIVA staff within 5 days. Obviously, only live fish is sampled. There is an ongoing process to train and inform the fishermen that collect fish for JAMP to ensure the quality of the material.

### 1.4.1 OH-pyrene metabolites in bile

The concentrations of OH-pyrene metabolites in bile were significantly elevated in cod from station 15B in all three years ($p<0.0001$) (Figure 11). In 1997, there were also significantly increased levels in cod from stations 53B and 67B (but see below), whereas there were increased concentrations of pyrene metabolites in cod from stations 53B and 30B in 1998 and 1999 compared to other locations. There is generally good consistency between years for concentrations of OH-pyrene metabolites in cod bile (exceptions being 15B - 1998 and 67B - 1997). The consistently high levels in cod from station 15B merits further study. This is an area with input from an aluminium-smelter, but there are otherwise no known sources of PAH. The fish are collected on the open coast and the discharge from the smelter is a small bay about 2 km away.

It has been thought that holding conditions prior to sampling could at least partly explain the observed response (the fish were held in a small fishing harbour), but measures were taken in 1998 and 1999 to minimise or remove this exposure. Given the precautions taken, it is highly unlikely that the observed levels have been caused by storage prior to sampling. The increased level of pyrene metabolites in cod from station 67B in 1997 were presumably due to holding conditions as the fish were moved to a more contaminated location before sampling could be effected (see comment under ALA-D). The increased levels of pyrene metabolites at stations 53B and 30B (1998 and 1999) presumably reflect the general contamination of the two areas (inner Sørfjord and inner Oslofjord).

A similarly increased level of OH-pyrene metabolites in bile was found in dab collected in the same area, 15F (Figure 12). Somewhat surprisingly, flatfish (flounder) from the polluted area 53F did not have higher levels of metabolites in bile than flatfish from other locations. An improved method for the analysis of PAH-metabolites has now been implemented (using HPLC separation and synchronous scan fluorimetry detection). In 1999, both the former and the new method were used in parallel. The results indicate good agreement between the two methods.

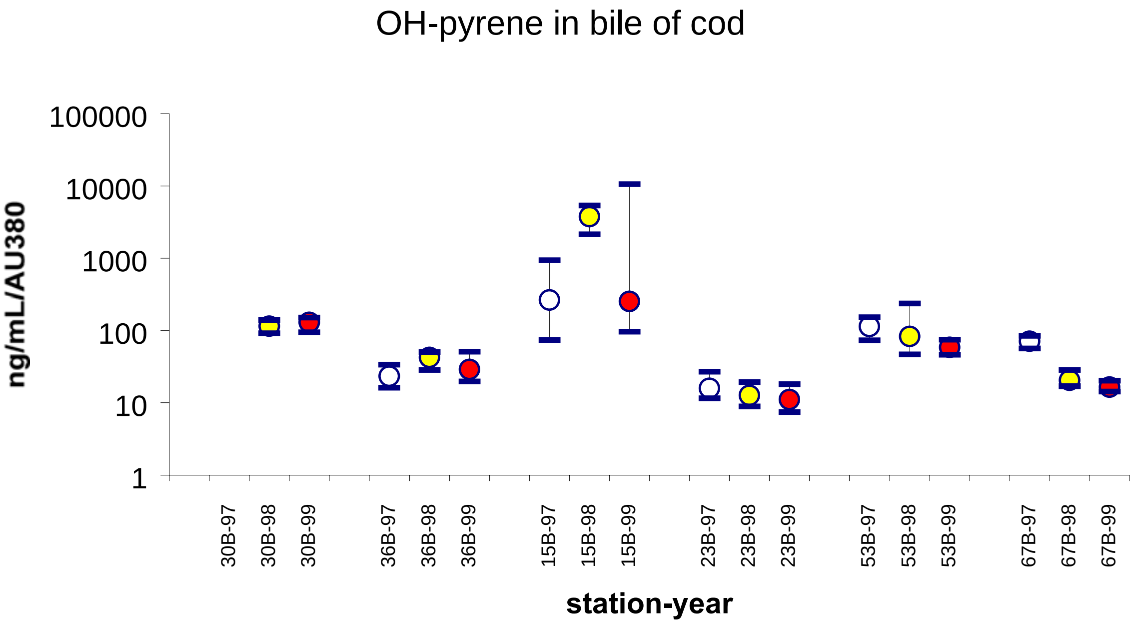

**Figure 11.** Concentration of OH-pyrene (ng/mL/AU$_{380}$) in bile from Atlantic cod collected at the indicated stations from 1997 to and 1999. Medians and quartiles (25%, 75%). Note logarithmic axis and that values were standardised to absorbance at 380 nm. (Biliverdin was used as a standardising faktor in 1997). No values are available for 30B in 1997. Stations 36B, 15B and 23B are considered less perturbed than stations 30B, 67B and 53B.

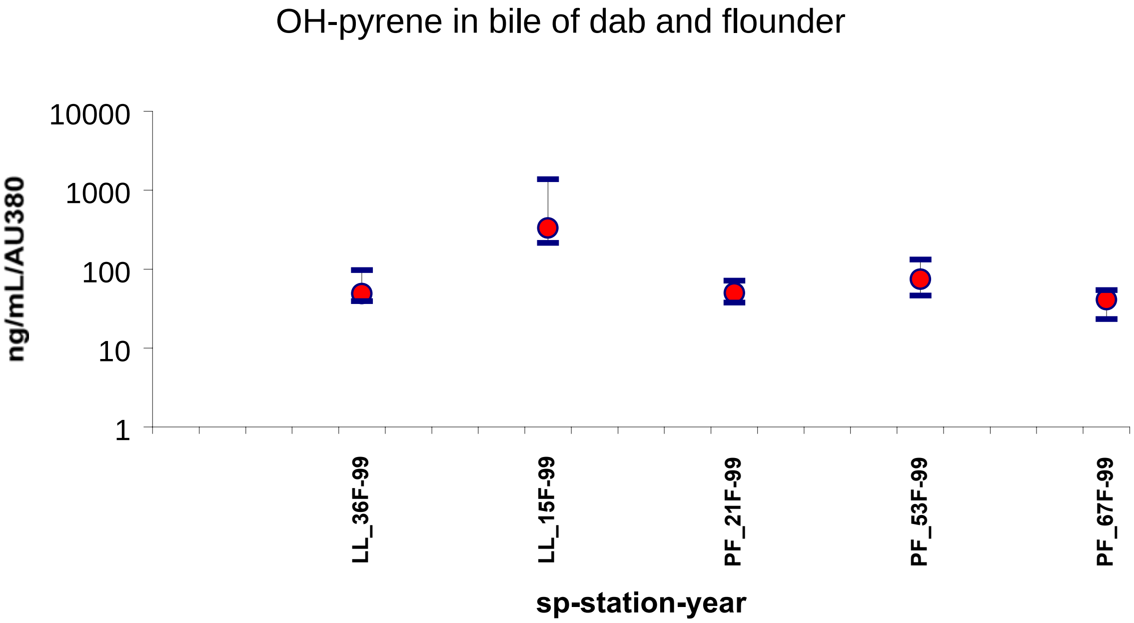

**Figure 12.** Concentration of OH-pyrene in bile from dab (LL, st.15F, 36F) and flounder (PF, st.21F, 53F, 67F) collected at the indicated stations in 1999. Medians and quartiles (25%, 75%). Note logarithmic axis and that values were standardised to absorbance at 380 nm.

### 1.4.2 ALA-D in blood cells

The activity of ALA-D in cod blood was consistent at the different stations between years. In both 1997 and 1998, the activity of ALA-D was significantly inhibited at the two most contaminated stations, i.e. 30B and 53B, compared to cleaner stations (i.e. 23B, 36B) (Figure 13). In 1997, ALA-D was also inhibited in fish at station 67B, presumably due to post-capture exposure (see above). In 1999, cod from all other stations had significantly lower activity of the enzyme than cod collected at 23B and 67B. It is not clear why the enzyme was depressed in cod from 15B and 36B, two “clean” locations.

The pattern seen for cod in 1999 was also found in flounder and dab – the highest activity (i.e. “cleanest” location) was found at 67F and lowest activity at 53F (expected) and 36F (not expected) (Figure 14).

The activity of ALA-D is known to be inhibited by exposure to lead. The results indicate that very low levels of the metal affect fish. Although all results indicate that ALA-D inhibition is lead-specific, it is not possible to rule out interference by other metals or organic contaminants. Note that the absolute activity has been adjusted following the implementation of a new method. This has been corrected for earlier years (no change in relative relationships between 1997 and 1998).

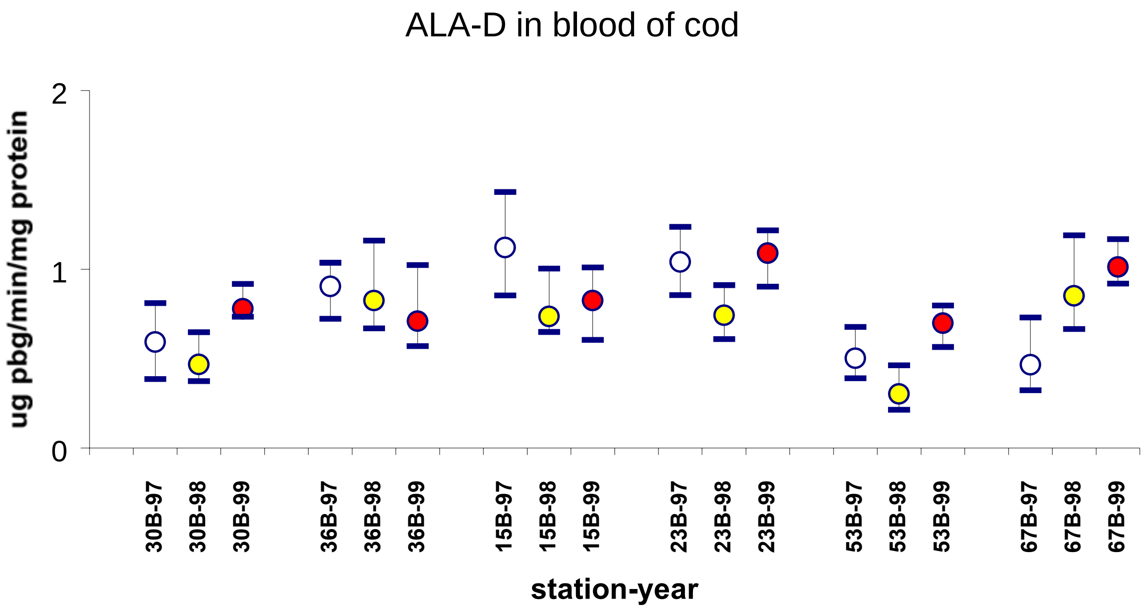

**Figure 13.** Activity of δ-aminolevulinic acid dehydratase (ALA-D, μg pbg/min/mg protein) in red blood cells from Atlantic cod collected at the indicated stations from 1997 to 1999. Median and quartiles (25%, 75%).

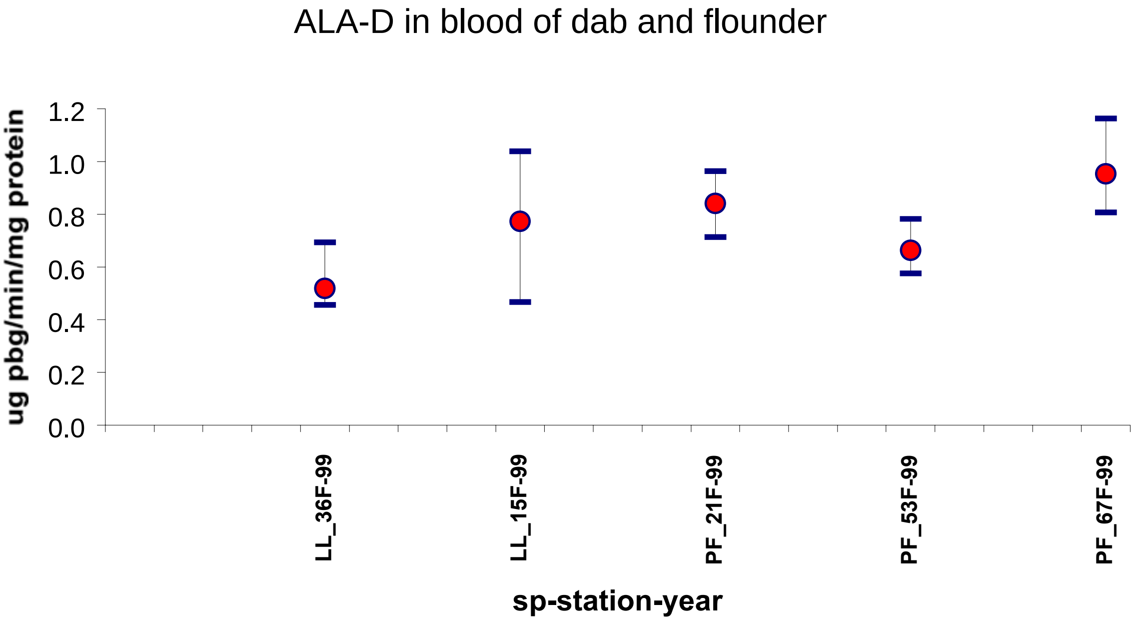

**Figure 14.** Activity of δ-aminolevulinic acid dehydratase (ALA-D, μg pbg/min/mg protein) in red blood cells from dab (LL, st.15F, 36F) and flounder (PF, st.21F, 53F, 67F) collected at the indicated stations in 1999. Median and quartiles (25%, 75%).

### 1.4.3 EROD in liver

In 1997, the activity of hepatic cytochrome P4501A (EROD) in cod was significantly elevated at the most polluted station, 53B, whereas 30B, 53B and 67B were all significantly elevated in 1998 (Figure 15). In 1999, somewhat increased levels were also found at 67B, but significantly higher EROD activity in cod from 15B compared to the other stations.

As mentioned above, an exposure to PAHs is indicated for this cod population (15B), and it is probable that the elevated EROD is a result of that exposure. In 1997 and 1998, EROD in cod was found to be consistently increased in areas with some industrial input, but there were no strong trends.

The 1999 results for dab were similar to each other and significantly higher than flounder (Figure 16). No significant difference was found in flounder from the more polluted Sørfjord (st.53F) as compared to the Hardangerfjord (67F).

No adjustment for water temperature, season, size or sex has been made. Fish is sampled at a time of year (September-November) when differences between the sexes should be at a minimum. EROD is induced by planar organic contaminants, e.g. PAH, dioxins and planar PCBs. Whereas there was higher EROD activity in cod collected at the more contaminated sites in 1998, such response was not apparent in 1997 and 1999. In 1999, there was higher variability in fish collected at the three contaminated sites compared to fish collected in reference areas. This pattern is commonly seen for EROD and indicate that populations with different exposure history is sampled. There is evidence from other fish species that continuous exposure to e.g. PCBs may cause adaptation, i.e. decreased response, in the EROD response following contaminant exposure.

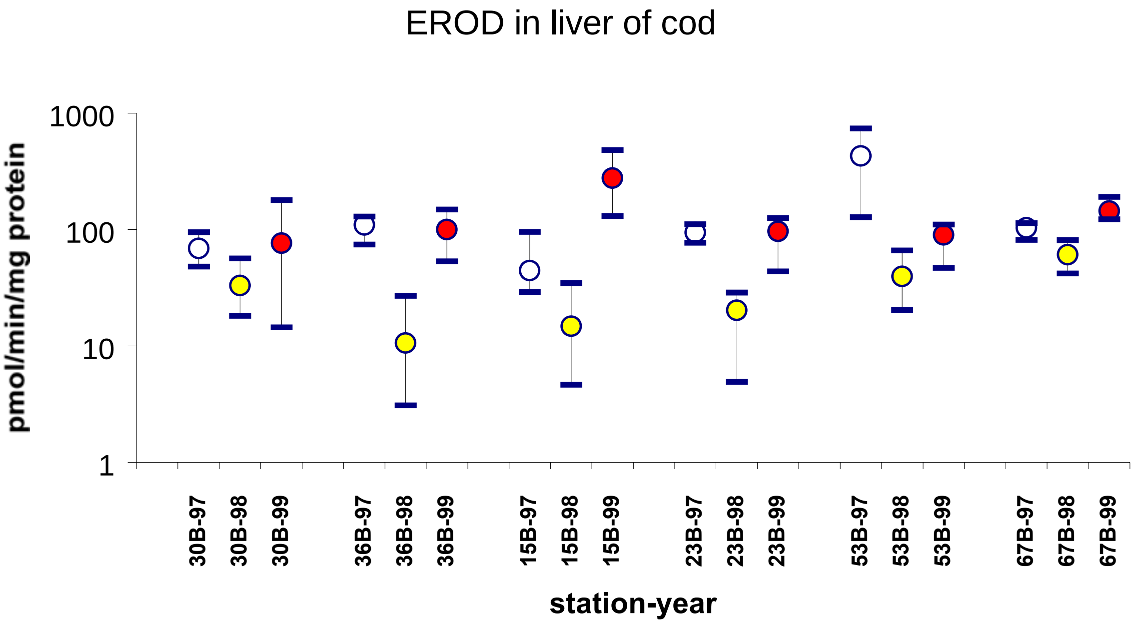

**Figure 15.** Activity of cytochrome P4501A (EROD, pmol/min/mg protein) in liver from Atlantic cod collected at the indicated stations from 1997 to 1999. Median and quartiles (25%, 75%). Note logarithmic axis. Values for individual years were standardised to median value at station 23B (in reality very close to real values expressed in pmol/min/mg protein).

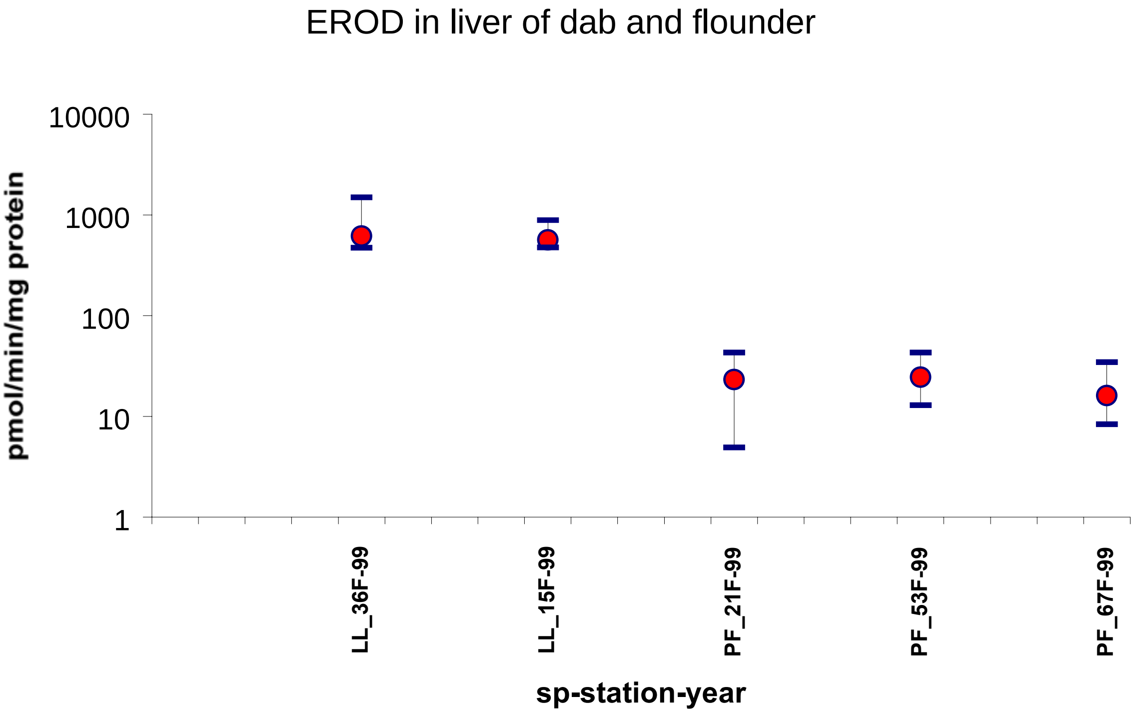

**Figure 16.** Activity of cytochrome P4501A (EROD, pmol/min/mg protein) in liver from dab (LL, st.15F, 36F) and flounder (PF, st.21F, 53F, 67F) collected at the indicated stations in 1999. Median and quartiles (25%, 75%). Note logarithmic axis.

### 1.4.4 Metallothionein in liver

The results for cod for 1999 are being reanalysed. For the sake of consistency the results for 1997-1998 are presented. There were no clear trends in the hepatic concentrations of the metal-binding protein metallothionein (MT) in cod from the six stations in 1997 and 1998 (Figure 17). In 1997, MT concentrations were significantly lower at the most polluted station, 53B, compared to levels at the other five stations, which were similar. In 1998, the concentrations were highest in cod at a clean station, 23B and lowest at the Oslofjord stations, 30B and 36B.

For flatfish, MT-concentrations in 1999 were significantly higher at st.67F, a moderately polluted station, whereas the other stations including the most polluted station (53F) were similar (Figure 18.)

This protein is induced by and binds the metals Cd, Zn, Cu and Hg. As for EROD, no adjustment has been made for sex, size or metal levels in tissues. The lack of relationship with other physiological parameters (e.g. trace metal levels) has prompted a check of the analytical method used. Results from all three years need to be quality controlled before being reported.

### 1.4.5 Concluding remarks

The application of BEM methods within JAMP in previous years (1997 and 1998) has indicated that the location 15B, previously regarded as only diffusely polluted, has an input of PAH which is sufficient to affect fish in the area. Increased levels of PAH-metabolites in bile indicates exposure to PAHs. Chronic exposure to PAHs may lead to liver lesions and reproductive disorders in fish, as shown through National Ocean and Atmospheric Administration's (NOAA (USA)) studies in Puget Sound. The highest levels of PAH metabolites observed in the bile of cod from station 15B are high compared to other studies, but it is not at present possible to infer population effects on cod in the area. It would be relevant to include DNA adduct analyses at some stage to clarify whether the cellular repair system of cod is sufficient to protect against damage from PAH radicals.

Results from 1997 and 1998 also clearly indicated that there are metal effects, indicated by decreased activity of the enzyme ALA-D, in the two most strongly polluted areas (30B and 53B). Results from 1997 and 1998 also gave indications of methods that may not be very useful with the species (cod) and tissue (liver) used. There is a continuous assessment of methods, but it is important to use the selected set of methods over at least a five year period before a final assessment is made.

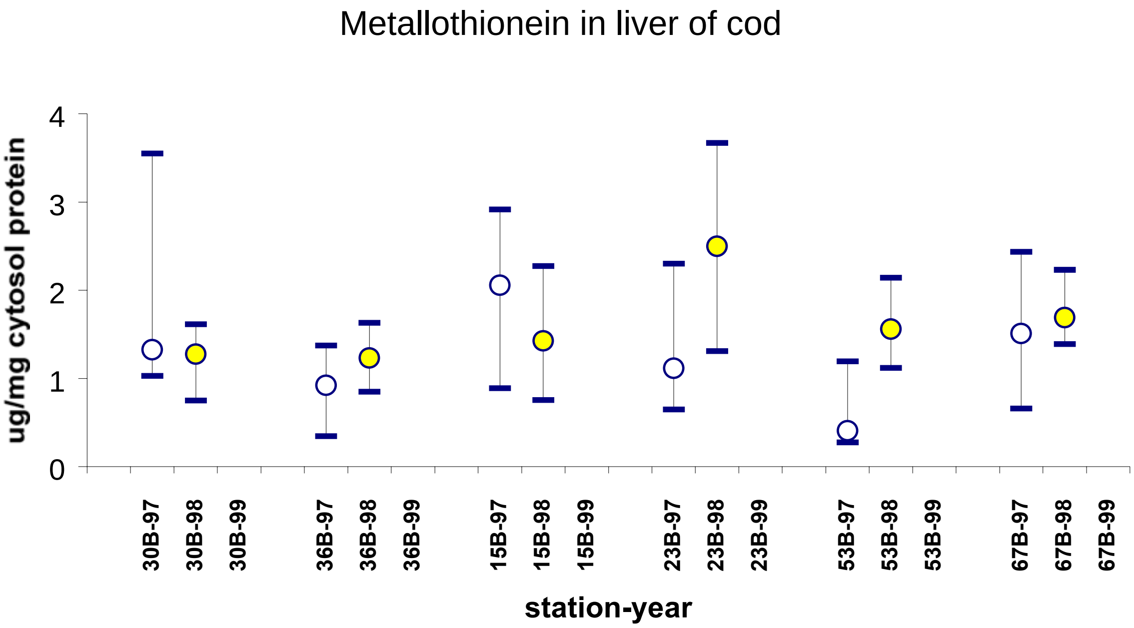

**Figure 17.** Hepatic concentrations of metallothionein (MT, µg/mg cytosol protein) in liver from Atlantic cod collected at the indicated stations from 1997 to 1998. Median and quartiles (25%, 75%). The 1999 materiale was being reanalysed and not available when this publication went to press.

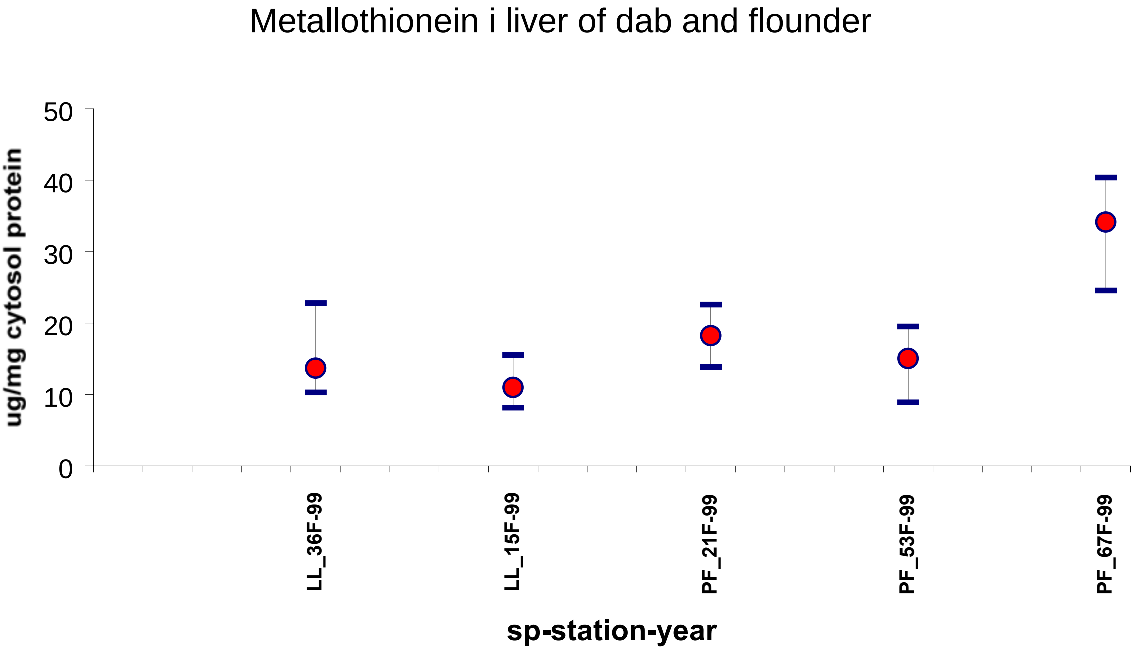

**Figure 18.** Hepatic concentrations of metallothionein (MT, µg/mg cytosol protein) in liver from dab (LL, st.15F, 36F) and flounder (PF, st.21F, 53F, 67F) collected at the indicated stations in 1999. Median and quartiles (25%, 75%).

## 1.5 Effects and concentrations of organotin

Effects from organotin in dogwhelks (*Nucella lapillus*) and concentrations in blue mussels (*Mytilus edulis*) were investigated in two areas on the coast of southern Norway, 1999.

Dogwhelks (*N. lapillus*) were sampled at five stations in the Haugesund area and one in outer Oslofjord (st.36G) in October 1999 (Appendix F. , Map 5). Whelks were present at all stations, but, as for 1998, with low abundance at st. 226G in the Haugesund area. Mussels (*M. edulis*) were sampled from three stations in the Haugesund area, one in outer Oslofjord and one in inner Oslofjord area. TBT-induced development of male sex-characters in females, known as imposex (VDSI and RPSI), was analysed according to OSPAR-JAMP guidelines. Detailed information about the chemical analyses of the animals is given in Følsvik *et al.* (1999). The results are shown in Figure 19 and Figure 20.

### 1.5.1 Dogwhelks

Effects from organotin was in 1999 observed at all stations, least in the open area at Færder (st. 36G), and at the northern- and southernmost stations (220G and 224G) in the Haugesund area (particularly for RPSI, only small differences in VDSI, Figure 19).

Generally, there was an apparent improvement in VDSI from 1991/1993 to 1997, but there has been little change since then (Figure 19). The development of the 'relative penis size index' (RPSI) is not as consistent over the years, and the 1999 investigations indicate a deterioration on four of the Haugesund stations. The Færder area (st. 36G) is clearly least affected area considering the RPSI-index (Figure 19).

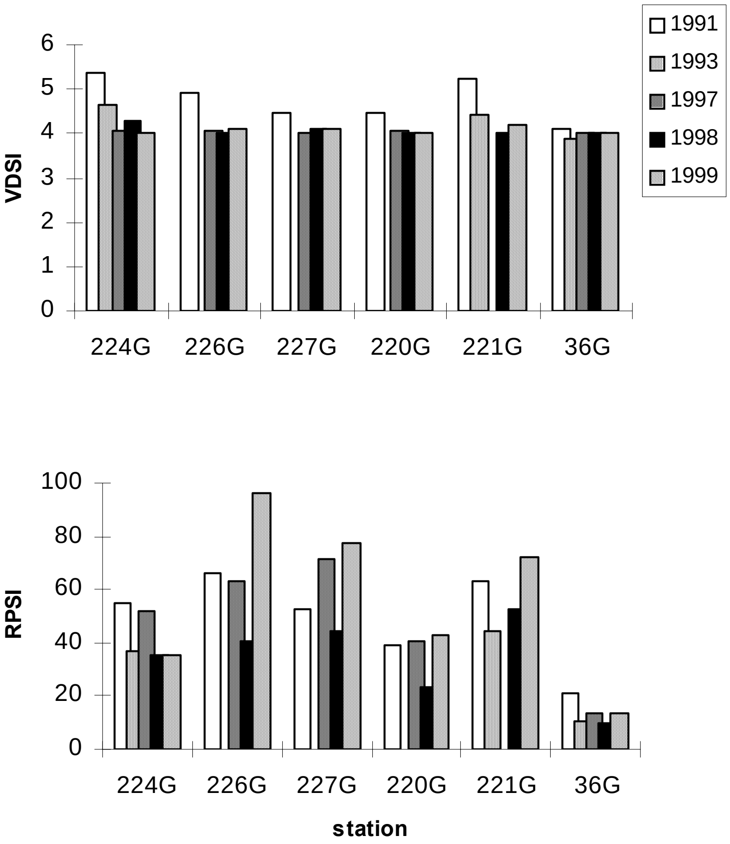

**Figure 19.** Imposex (VDSI and RPSI) in dogwhelks (*Nucella lapillus*) at 6 stations in southern Norway in 1991 (Harding *et al.* 1992), 1993 (Walday *et al.* 1997), 1997, 1998 and 1999. (cf. Appendix F. , Map 2 and 5).

### 1.5.2 Mussels

Three parallels were analysed, except for station 30A and 36A where two parallels were analysed. Concentrations of organotin in mussels were high in most areas, except for the Outer Oslofjord, and extremely high at one station in the Haugesund area (221A). Levels ranged between 79 and 2100 µg Sn/kg d.w. (Figure 20 and Table 13 in Appendix L. ). According to the Norwegian classification of environmental quality (Molvær *et al.* 1997) the inner Oslofjord- and Haugesund area were markedly to extremely polluted with TBT, while outer Oslofjord was moderately polluted.

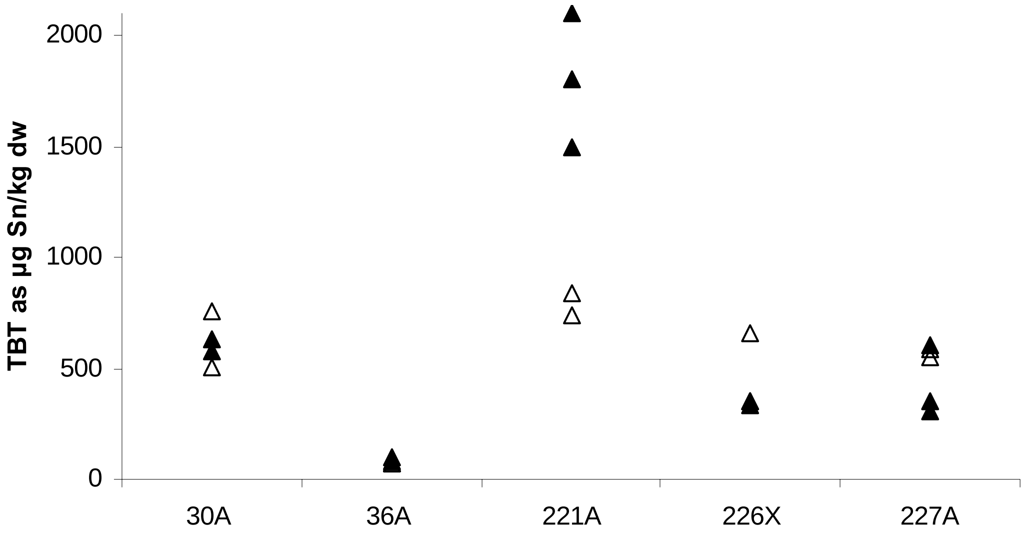

**Figure 20.** Levels of organotin (µg Sn/kg d.w.) in *Mytilus edulis* from parallels at five stations in Southern Norway in 1998 (Δ) and 1999 (▲). (cf. Appendix F. , Map 2 and 5).

### 1.5.3 Concluding remark

The presence of organotin (as TBT) in Norwegian waters was still a problem in 1999. Concentrations of organotin in mussels were elevated, and biological effects from TBT were found in all dogwhelks from the investigated areas, higher than last year (RPSI) at most of the stations in the Haugesund area. The prohibition against the use of TBT in antifouling on boats <25 m of length has not lead to a clear improvement in the investigated areas. This is cause for concern.

## 1.6 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 restrictions and recommendations concerning the sale and consumption of seafood in Norway (Table 3).

In regards to JMP/JAMP Purpose C (spatial distribution assessment), the concentrations found in 1999 are indicated in the bar graphs shown in Appendix I. . Provisional “high background" levels were used to identify elevated concentrations. This initial assessment revealed no new areas of concern that are not currently under surveillance.

In regards to JMP/JAMP Purpose D (temporal trend assessment) there is evidence that the median concentrations of cadmium in mussels from the Sørfjord have decreased since 1987. An analysis of HCB concentrations in mussels from the Langesundsfjord 1990-1998 have also shown a decrease.

**Table 3.** Summary of action taken by the Norwegian Food Control Authority (SNT, http://www.snt.no/nytt/tema/kosthold/kyst.html) concerning the consumption and sale of fish products along the Norwegian Coast (SFT, pers. comm. 1999).

| Area of concern ($km^2$) | Last year of issue/ evaluation | Main parameters of concern | Main fish/shellfish product of concerned | Recommendations or restrictions of concern: |
|---|---|---|---|---|
| Inner Oslofjord (190) | 2000 | PCB | fish liver | Consumption |
| Inner Drammensfjord (45) | 1992 | Dioxins/PCB | fish liver | Consumption and Sale |
| Inner Sandefjordfjord (3) | 1993 | PCB | round fish liver | Consumption and Sale |
| Grenlandsfjords, Langesundsfjord (84) | 1997 | Dioxins | fish, shellfish | Consumption and Sale |
| Tvedestrand (2) | 2000 | PCB | fish liver | Consumption |
| Arendal (9) | 2000 | PCB | fish liver | Consumption |
| Inner Kristiansandsfjord (29) | 2000 | Dioxins/PCB | fish, shellfish | Consumption and Sale |
| Farsund (42) | 2000 | PCB PAH | fish, mussels | Consumption |
| Fedafjord (13) | 1995 | PAH | mussels [2)] | Consumption |
| Flekkefjord (3) | 2000 | PCB | fish liver | Consumption |
| Karmsund | 2000 | PAH | shellfish | Consumption |
| Saudafjord (21) | 1992 | PAH | fish liver, mussels | Consumption |
| Sørfjord (80) | 2000 | Cd Pb Hg PCB | fish, shellfish | Consumption |
| Bergen area including Herdlefjord, Byfjord, Hjeltefjord, Grimstadfjord and Raunefjord (180) | 1998 | PCB | fish, shellfish | Consumption and Sale |
| Inner Årdalsfjord (8) | 1995 | PAH | mussels | Consumption |
| Inner Sunndalsfjord (15) | 1993 | PAH | fish liver, mussels | Consumption |
| Hommelvik (Trondheimsfjord) (5) | 1985 | PAH | mussels | Consumption |
| Inner Ranfjord (15) | 1997 | PAH Pb Hg | mussels | Consumption |
| Vefsnfjord (50) | 1992 | PAH | mussels | Consumption |
| Ramsund | 2000 | PCB | fish, shellfish | Consumption |
| Harstad (1) | 2000 | PCB heavy metals | fish liver, mussels | Consumption |
| Tromsø (17) | 2000 | PAH | mussels | Consumption |
| Hammerfest (2) | 2000 | PAH | mussels | Consumption |
| Honningsvåg (2) | 2000 | PAH | mussels | Consumption |

[1)] Up to 1997 included only cod

[2)] Up to 1997 included fish

Study of the power of temporal trend monitoring was useful in assessing existing sampling strategies, however, modifications might be needed to account for local conditions (see Appendix O in Green *et al.* 2000).

The 1999 investigation also includes results on Norwegian Pollution Control Authority Pollution Indices (Appendix J. ), and discussion of the results of biological effects methods including imposex and intersex (Chapter 1.4 and Chapter 1.5).

The JAMP issues to which these investigations are relevant are shown in Table 4.

**Table 4.** JAMP issues relating to the Norwegian JAMP (cf., SIME 1997, Annex 11).

| Subject | JAMP issue | Question | Recent Norwegian contribution |
|---|---|---|---|
| **Hg, Cd and Pb** | JAMP issue 1.2. | What are the concentrations and fluxes in sediments and biota? | 1996-1997: Levels in sediment (cf., Green *et al.* 2000)<br>1999: Levels and trends in biota (annual investigations since 1981, Chapter 1.3)<br>1999: INDEX for blue mussels from selected stations (annual investigations since 1995, cf. Chapter 1.3.8) |
| **TBT** | JAMP issue 1.3. | To what extent do biological effects occur in the vicinity of major shipping routes offshore installations, marinas and shipyards | 1999: Levels and trends in mussels and snails (annual investigations since 1997, cf. Chapter 1.5) |
| **PCBs** | JAMP issue 1.7. | Do high concentrations pose a risk to the marine ecosystem | [as for JAMP issue 1.2] |
| **PCBs** | JAMP issue 1.8. | Do high concentrations of non-ortho and mono-ortho CBs in seafood pose a risk to human health? | 1995: INDEX for blue mussels from selected stations (cf. Green 1997)<br>1996: Levels in cod (cf. Green *et al.* 2000) |
| **PAHs** | JAMP issue 1.10. | What are the concentrations in the maritime 1) area? | 1992: Levels in shellfish (Green *et al.* 1995)<br>1992-1993: Levels in fish for selected stations (Knutzen & Green 1995)<br>1996-1997: Levels in sediment (cf., Green *et al.* 2000)<br>1999: INDEX for blue mussels from selected stations (annual investigations since 1995, Chapter 1.3.8) |
| **PAHs** | JAMP issue 1.11. | Do PAHs affect fish and shellfish? | 1998: Biological effects methods in cod (cf. Chapter 1.4) |
| **Other synthetic organic compounds** | JAMP issue 1.12. | How widespread are synthetic organic compounds within the maritime 1) area? | 1999: Levels and trends in biota (annual investigations since 1983 of selected organochlorines, cf. Chapter 1.3)<br>1996: Introductory investigation of organochlorines in cod livers (cf. Green *et al.* 2000) |
| **Chlorinated dioxins and dibenzofurans** | JAMP issue 1.15. | What concentrations occur and have the policy goals (for the relevant parts of the maritime 1) area) been met? | 1995: INDEX for blue mussels from selected stations (cf. Green 1997)<br>1996: Introductory investigation of organochlorines in cod livers (cf. Green *et al.* 2000) |
| **Biological effects of pollutants** | JAMP issue 1.17. | Where do pollutants cause deleterious biological effects? | 1999: Southern Coast, planar PCBs, metals, PAHs in cod (annual investigations since 1997, cf. Chapter 1.4) |
| **Chemicals used** | JAMP issue 5.3. | In which areas do pesticides and antibiotics affect marine biota? | 1999: Levels and trends in biota (cf. Chapter 1.3) |
| **Ecosystem health** | JAMP issue 6.1. | How can ecosystem health be assessed in order to determine the extent of human impact? | Results for the other issues are also relevant here |

1) Not defined in original text

# 2. Technical Details

## 2.1 Compliance with guidelines/procedures

### 2.1.1 JAMP programme

Samples were collected and analysed, where practical, according to OSPAR guidelines (OSPAR 1990, 1997) and screened and submitted to ICES by agreed procedures (ICES 1996). The most important point of concern are those stations where insufficient number of fish were collected (cf. Appendix G. ).

### 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 H. or figures in Appendix I. , depending on the year and concentration basis in question. The provisional "high background" limits are summarised in Table 5. The factor by which concentrations exceeded “high background” is termed **overconcentration**. “High background” limits have not been set for all contaminants and species. It should be noted that there is in general a need for periodical review and supplement of this list of limits in the light of results from reference localities and introduction of new analytical methods, and/or units. Because of changes in the limits, assessments of overconcentrations for years prior to 1997 made in this report may not correspond to figures and assessments made in previous national comments.

In addition to the use of "high background", the Norwegian Pollution Control Authority’s (SFT’s) system for **classification of environmental quality** has been applied (Table 6).

No attempt has been made to compensate for differences in size groups or number of individuals of mussels or fish. The exception was with mercury in fish fillet where seven and seventeen data sets in this study showed significant differences between “small” and “large” fish (Appendix H. ). 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).

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

**Table 5.** 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 ? | |
| **$\Sigma$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) | |
| **$\gamma$ HCH** | 0.005 3) | 0.001 6) | 0.05 2,6) | | 0.01 ? 6) | | 0.03 ? 6) | |
| **HCB** | 0.0005 3) | 0.0001 2) | 0.02 2) | | 0.005 ? | | 0.01 ? | |
| **TCDDN** | 0.000001 3) | 0.0000002 2) | | | | | | |

[1] ) Respectively: *Mytilus edulis, Gadus morhua, Platichthys flesus* and *Limanda limanda*.

[2] ) From the Norwegian Pollution Control Authority Environmental Class I (“good”) (Molvær *et al.* 1997).

[3] ) Conversion assuming 20% dry weight.

[4] ) Approximately 25% of ΣPCB-7 (Knutzen & Green 1995)

[5] ) 1.5-2 times 75% quartile (cf. Annex B in Knutzen & Green 1995)

[6] ) Assumed equal to limit for ΣDDT or ΣHCH, respectively, from the Norwegian Pollution Control Authority Environmental Class I (“good”) (Molvær *et al.* 1997). Hence, limits for ppDDE and γHCH are probably too high (lacking sufficient and reliable reference values)

[7] ) Mean plus 2 times standard deviation (cf. Annex B in Knutzen & Green 1995)

[8] ) Estimated as sum of 7 individual PCB compounds (CB-28, -52, -101, -118, -138, -153 and -180) and assumed to be ca. 50% and 70 % of total PCB for blue mussel and cod/flatfish, respectively.

**Table 6.** Extracts of the Norwegian Pollution Control Authority revised environmental classification system of contaminants in blue mussels and fish (from Molvær *et al.* 1997).

| **Contaminant** | | | **Classification (upper limit for classes I-IV)** | | | | |
|---|---|---|---|---|---|---|---|
| | | | **I** | **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 |
| **TBT** 1) | ppm | d.w. | 0.1 | 0.5 | 2 | 5 | >5 |
| **∑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 |
| $\mathbf{TE}_{PCDF/D}$ 2) | 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 |
| $\mathbf{TE}_{PCDF/D}$ 2) | ppp | w.w. | 15 | 40 | 100 | 300 | >300 |

1) Tributyltin on a formula basis

2) 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 21.

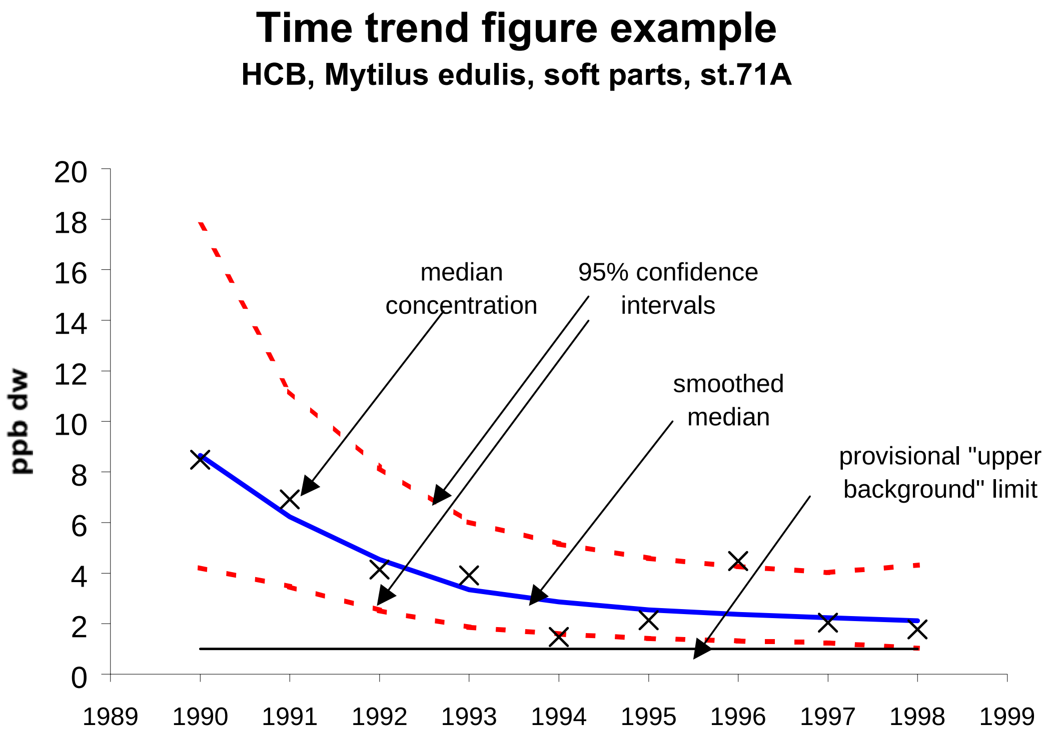

**Figure 21.** Example presentation and variation in contaminant concentration with time, indicating median concentrations, running mean of median values (Loess smoother), 95% confidence intervals. The provisional "high background level" is marked with a horizontal line and corresponds to values listed in Table 5 (see text).

The method of calculating the smoother is in accordance to the methods employed at Ad Hoc Working Group on Monitoring that met in Copenhagen 23-27. February 1998 (MON 1998). A Loess smoother is based on a running seven-year interval, a non-parametric curve fitted to median log-concentrations (Nicholson *et al.*1997). For statistical tests based on a fitted smoother to be valid the contaminants indices should be independent to a constant level of variance and the residuals for the fitted model should be lognormally distributed (cf. Nicholson *et al.* 1998).

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

The second is an estimate of the power of the temporal trend series expressed as the number of years to detect a 10% change per year with a 90% power (cf. Nicholson, *et al.*, 1997). The fewer the years the easier it is to detect a trend. The power is based on the percentage relative standard deviation (RLSD) estimated using the robust method described ASMO (1994) and Nicholson *et al.* (1998). 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 Langesundsfjord (Figure 4).

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 the sum of TCDD-equivalents from PCB (de Boer *et al.* 1993).

### 2.1.4 The effect of depuration and freezing on mussels

This was tested on samples collected in the Sørfjord and Hardangerfjord (cf., Appendix M. ) The JAMP-method of pre-treatment of mussels (i.e., depuration and then cleaning) contrasted significantly to the Index-method (freezing then cleaning). Using the JAMP-method and based on a dryweight basis, cadmium concentrations were significantly higher (24%), whereas significant lower concentrations were found for lead (45%), zinc (14%), PCBs (CB101, -118, -138, -153 27-52%) and DDTs (50-64%). Lower concentrations indicated that these contaminants are associated with the particle load.

The results are not consistent with a previous study from this region that indicated no significant difference between the methods for mercury, cadmium, copper, lead and zinc (Green 1989). A study on mussels from the mouth of the Glomma River in Southern Norway showed the lead and copper were significantly lower in depurated samples (Green *et al.* 1996); however, no differences were found for PCBs or DDTs (on a lipid basis). The PCB concentrations found in the Glomma study were 3-4 times higher than Sørfjord/Hardangerfjord.

Mercury was the only contaminant common to all three studies that had consistent results; that there is no significant difference between the two methods.

The difference in methods has indicated an effect on the concentration of contaminants in mussels. However, with the exception of mercury, the results for Sørfjord/Hardangerfjord 1999 are inconsistent with two other studies in Norway. Revision of JAMP guidelines should take these results into consideration.

## 2.2 Information on Quality Assurance

NIVA has participated in all the QUASIMEME international intercalibration exercises, including Round 20 and 22 (2000). These exercises have included nearly all the contaminants analysed for JAMP. Quality assurance programme for NIVA is similar to the 1999 programme (cf. Green 1999). In addition, NIVA was accredited in 1993 in accordance with the EN45000 standard by the Norwegian Accreditation (reference P009). A summary of the quality assurance programme at NIVA is given in Appendix A. . A summary of the intercalibrations exercises that NIVA has participated in is given in Appendix C. .

## 2.3 Description of the Programme

The sampling for 1999 involved sampling of blue mussel at 45 stations and at least one flatfish species or cod was sampled at 16 stations. The Norwegian JAMP has been expanded since 1989 to include monitoring in more diffusely polluted areas. Though new stations are initially intended for annual monitoring (temporal trends), there has not always been sufficient funds to do this for every station. Sample/station reduction measures have been 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. Flounder was caught for the first time at this station. Appendix E. and Appendix F. gives an overview of the planned and realised sampling.

Concentrations of metals, chlorinated hydrocarbons (including pesticides) and polycyclic aromatic hydrocarbons in mussels and fish were determined at the Norwegian Institute for Water Research (JAMP code NIVA). An overview of the methods applied up to and including 1992 sample material has been presented by Green (1993, also JMG document 19/7 info 3). Only minor modifications have been made since. An overview of analyses applied from 1981 to 1998 (1999) for biological material is given in Appendix D. . Parameter abbreviations are given in Appendix B. .

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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 sediment and biota are shown in Table A1 and A2, respectively.

Marine sediment standard reference material (SRM) MESS-2 and 1941 was used as control for determinations of metals and PCBs/PAHs, respectively.

Dogfish muscle (DORM-2) or dogfish liver (DOLT-2) was used as SRM for the control of the determination of metals (see Table A1). Mackerel oil (350) and mussel tissue (2974) was used as SRM for controls of PCBs and PAHs, respectively. In addition to SRM 2974, an internal standard was used for quality control.

The results were generally satisfactory, the mean was within 2 standard deviations of SRM-mean. Based on these findings, PCBs, DDE and naphthalenes in **sediment** may have been underestimated, whereas benzo(a)pyrene and benzo(ghi)perylene may have been overestimated. It should be noted that SRM values for PCBs, DDE and naphthalenes are listed as not certified. Based on the results for **biota** SRM, lead, benzo(a)pyrene and benzo(e)pyrene may have been underestimated and zinc overestimated. It should be noted that the SRM value for lead is close to the detection limit for this reporting lab.

See also results from intercalibrations exercises listed in Appendix C. .

NIVA has also participated in QUASIMEME exercises up to and including: Round 16 : Matrix QTM045MS for metals, QOR057MS for CBs/OCPs and QPH020MS - PAHs in sediment; and Matrix QTM041BT for metals, QOR057BT for CBs/OCPs and QPH010BT - PAHs in biota. The latest round would apply to the 1998 samples analysed in 1999. The results from this round were generally acceptable (z-scores between -2 and 2).

**Table 7.** Summary of the quality control results for the 1999 biota samples analysed 1999-2000. 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 2974[***] (mussel tissue) for mussels. SRM was analysed in series with the JAMP-samples for analyses of metals (mg/kg w.w.), organic chlorines or PAH (µg/kg w.w.). Tissue types were: mussel softbody (SB), fish liver (LI) and fish fillet (MU). SRMs were measured several times (N) over a number of weeks (W).

| Code | Contaminant | Tissue type | SRM type | SRM value ± confidence interval | N | W | Mean value | Standard deviation |
|---|---|---|---|---|---|---|---|---|
| **Cd** | **cadmium** | SB | DORM | 0.043 ± 0.008 | 7 | 2 | 0.042 | 0.002 |
| | | LI | DOLT | 20.80 ± 0.5 | 7 | 17 | 21.3 | 0.3 |
| **Cu** | **copper** | SB | DORM | 2.34 ± 0.16 | 6 | 2 | 2.20 | 0.18 |
| | | LI | DOLT | 25.80 ± 1.1 | 12 | 17 | 26.8 | 1.6 |
| **Pb** | **lead** | SB | DORM | 0.065 ± 0.007 | 7 | 2 | 0.065 | 0.012 |
| | | LI | DOLT | 0.22 ± 0.02 | 12 | 17 | 0.20 | 0.02 |
| **Hg** | **mercury** | SB | DORM | 4.64 ± 0.26 | 16 | 31 | 4.77 | 0.14 |
| **Zn** | **zinc** | SB | DORM | 25.6 ± 2.3 | 5 | 2 | 24.7 | 0.9 |
| | | LI | DOLT | 85.8 ± 2.5 | 12 | 17 | 98.1 | 2.7 |
| **CB-28** | **PCB congener CB-28** | (all) | 350 | 22.5 ± 4 | 24 | 34 | 17.9 | 1.8 |
| **CB-52** | **PCB congener CB-52** | (all) | 350 | 62. ± 9 | 24 | 34 | 60 | 5.0 |
| **CB-101** | **PCB congener CB-101** | (all) | 350 | 164 ± 9 | 24 | 34 | 187 | 15 |
| **CB-118** | **PCB congener CB-118** | (all) | 350 | 142 ± 20 | 24 | 34 | 150 | 16 |
| **CB-153** | **PCB congener CB-153** | (all) | 350 | 317 ± 20 | 24 | 34 | 415 | 75 |
| **CB-180** | **PCB congener CB-180** | (all) | 350 | 73. ± 13 | 24 | 34 | 84 | 16 |
| **PA** | **phenanthrene** | SB | 2974 | 22.2 ± 2.5 | 6 | 27 | 14.1 | 2.0 |
| **ANT** | **anthracene** | SB | 2974 | 6.1 ± 1.7 | 6 | 27 | 2.9 | 1.0 |
| **FLU** | **fluoranthene** | SB | 2974 | 163.7 ± 10.3 | 6 | 27 | 153 | 13 |
| **PYR** | **pyrene** | SB | 2974 | 151.6 ± 8.0 | 6 | 27 | 144 | 14 |
| **BAA** | **benzo[*a*]anthracene** | SB | 2974 | 32.5 ± 4.8 | 6 | 27 | 28.4 | 8.0 |
| **BAP** | **benzo[*a*]pyrene** | SB | 2974 | 15.63 ± 0.80 | 6 | 27 | 14.4 | 5.5 |
| **BEP** | **benzo[*e*]pyrene** | SB | 2974 | 84.0 ± 3.2 | 6 | 27 | 69.3 | 8.0 |
| **PER** | **perylene** | SB | 2974 | 7.68 ± 2.3 | 6 | 27 | 4.5 | 1.6 |
| **ICDP** | **indeno[1,2,3-*cd*]pyrene** | SB | 2974 | 14.2 ± 2.8 | 6 | 27 | 12.2 | 1.5 |
| **BGHIP** | **benzo[*ghi*]perylene** | SB | 2974 | 22.0 ± 2.3 | 6 | 27 | 20.6 | 2.3 |

[*]) 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] | benzo[*a*]anthracene | *benzo[a]antracen* |
| **BAP** [3] | benzo[*a*]pyrene | *benzo[a]pyren* |
| **BBF** [3] | benzo[*b*]fluoranthene | *benzo[b]fluoranten* |
| **BBJKF** [3] | benzo[*b,j,k*]fluoranthene | *benzo[b,j,k]fluoranten* |
| **BBJKF** [3] | benzo[b+j,k]fluoranthene | *benzo[b+j,k]fluoranten* |
| **BBKF** [3] | 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* |
| **BJKF** [3] | benzo[*j,k*]fluoranthene | *benzo[j,k]fluorantren* |
| **BKF** [3] | benzo[*k*]fluoranthene | *benzo[k]fluorantren* |
| **CHR** | chrysene | *chrysen* |
| **CHRTR** | chrysene+triphenylene | *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* |
| **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* |
| **NAPD2** [2] | 1,6-dimethylnaphthalene | *1,6-dimetylnaftalen* |
| **NAPD3** [2] | 1,5-dimethylnaphthalene | *1,5-dimetylnaftalen* |
| **NAPDI** [2] | 2,6-dimethylnaphthalene | *2,6-dimetylnaftalen* |
| **NAPT2** [2] | 2,3,6-trimethylnaphthalene | *2,3,6-trimetylnaftalen* |
| **NAPT3** [2] | 1,2,4-trimethylnaphthalene | *1,2,4-trimetylnaftalen* |
| **NAPT4** [2] | 1,2,3-trimethylnaphthalene | *1,2,3-trimetylnaftalen* |
| **NAPTM** [2] | 2,3,5-trimethylnaphthalene | *2,3,5-trimetylnaftalen* |
| **NPD** | Collective term for naphthalenes, phenanthrenes and dibenzothiophenes | *Sammebetegnelse for naftalen, fenantren og dibenzotiofens* |
| **PA** | phenanthrene | *fenantren* |
| **PAC1** | $C_1$-phenanthrenes | *$C_1$-fenantren* |
| **PAC2** | $C_2$-phenanthrenes | *$C_2$-fenantren* |
| **PAM1** | 1-methylphenanthrene | *1-metylfenantren* |
| **PAM2** | 2-methylphenanthrene | *2-metylfenantren* |
| **PAMD1** | 3,6-dimethylphenanthrene | *3,6-dimetylfenantren* |
| **PAMD2** | 9,10-dimethylphenanthrene | *9,10-dimetylfenantren* |
| **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)* |

**Abbreviations (cont'd.)**

| **Abbreviation**[1] | English | *Norwegian* |
|---|---|---|
| **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)* |
| **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*** |

**Abbreviations (cont'd.)**

| **Abbreviation**[1] | English | *Norwegian* |
|---|---|---|
| **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* |
| **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*** |

**Abbreviations (cont'd.)**

| **Abbreviation**[1] | English | *Norwegian* |
|---|---|---|
| **PESTICIDES** | | |
| **ALD** | aldrin | *aldrin* |
| **DIELD** | dieldrin | *dieldrin* |
| **ENDA** | endrin | *endrin* |
| **CCDAN** | cis-chlordane (=α-chlordane) | *cis-klordan (=α-klordan)* |
| **TCDAN** | trans-chlordane (=γ-chlordane) | *trans-klordan (=γ-klordan)* |
| **OCDAN** | oxy-chlordane | *oksy-klordan* |
| **TNONC** | trans-nonachlor | *trans-nonaklor* |
| **TCDAN** | trans-chlordane | *trans-klordan* |
| **OCS** | octachlorostyrene | *oktaklorstyren* |
| **QCB** | pentachlorobenzene | *pentaklorbenzen* |
| **DDD** | ɔdiphenyldichloroethane<br>1,1-dichloro-2,2-bis-<br>(4-chlorophenyl)ethane | *diklordifenyldikloretan*<br>*1,1-dikloro-2,2-bis-(4-klorofenyl)etan* |
| **DDE** | dichlorodiphenyldichloroethylene<br>(principle metabolite of DDT)<br>1,1-dichloro-2,2-bis-<br>(4-chlorophenyl)ethylene* | *diklordifenyldikloretylen*<br>*(hovedmetabolitt av DDT)*<br>*1,1-dikloro-2,2-bis-*<br>*(4-klorofenyl)etylen* |
| **DDT** | ɔdiphenyltrichloroethane<br>1,1,1-trichloro-2,2-bis-<br>(4-chlorophenyl)ethane | *diklordifenyltrikloretan*<br>*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,<br>n = number of compounds | *sum DDT og metabolitter,*<br>*n = antall forbindelser* |
| **HCB** | hexachlorobenzene | *heksaklorbenzen* |
| **HCHG** | Lindane<br>γ HCH = gamma hexachlorocyclohexane<br>(γ BHC = gamma benzenehexachloride,<br>outdated synonym) | *Lindan*<br>*γ HCH = gamma heksaklorsykloheksan*<br>*(γ BHC = gamma benzenheksaklorid,*<br>*foreldret betegnelse)* |
| **HCHA** | α HCH = alpha HCH | *α HCH = alpha HCH* |
| **HCHB** | β HCH = beta HCH | *β HCH = beta HCH* |
| **HC-nΣ** | sum of HCHs, n = count | *sum av HCHs, n = antall* |
| **EOCl** | extractable organically bound chlorine | *ekstraherbart organisk bundet klor* |
| **EPOCl** | extractable persistent organically bound chlorine | *ekstraherbart persistent organisk bundet klor* |
| **NTOT** | total organic nitrogen | *total organisk nitrogen* |
| **CTOT** | total organic carbon | *total organisk karbon* |
| **CORG** | organic carbon | *organisk karbon* |
| **GSAMT** | grain size | *kornfordeling* |
| **MOCON** | moisture content | *vanninnhold* |

**Abbreviations (cont'd.)**

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

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

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

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

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

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

**Other abbreviations** *andre forkortelser*

| | English | *Norwegian* |
|---|---|---|
| **TEQ** | "Toxicity equivalency factors" for the most toxic compounds within the following groups:<br>• polychlorinated dibenzo-p-dioxins and dibenzofurans (**PCDD/PCDFs**). Equivalents calculated after Nordic model (Ahlborg *et al.*, 1989) [1] or international model (Int./EPA, cf. Van den Berg *et al.*, 1998) [2]<br>• 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.*<br>• *polyklorerte dibenzo-p-dioksiner og dibenzofuraner (**PCDD/PCDF**). Ekvivalentberegning etter nordisk modell (Ahlborg et al., 1989) [1] eller etter internasjonal modell (Int./EPA, cf. Van den Berg et al. 1998) [2]*<br>• *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) Van den Berg, Birnbaum, L, Bosveld, A. T. C. and co-workers, 1998. Toxic equivalency factors (TEFs) for PCBs, PCDDs, PCDFs for humans and wildlife. Environ Hlth. Perspect. 106:775-792.

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

# Appendix C.
# Participation in intercalibration exercises

# Participation in intercalibration exercises

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

**Sea water:**

| | |
|---|---|
| 4H | ICES/JMG Fifth Round Intercalibration on Trace Metals in Sea Water - Section 4, analysis for Hg - 1983 - (5/TM/SW:4). |
| 4I | JMG Sixth Intercalibration on Trace Metals in Estuarine Waters - 1986 - (6/TM/SW). |
| 4Z | Intercalibration exercise for SIIF/SERI (Cd) and NIVA/IAMK (IAMK=Chalmers Inst., Göteborg) - 1985. |

**Seabed sediment:**

| | |
|---|---|
| 7E | ICES, First Intercalibration Exercise on Trace metals in Marine Sediments - 1984 - (1/TM/MS). |
| 8B | ICES/OSPAR, First Intercomparison Exercise on Organochlorines (individual chlorobiphenyl congeners) in Marine Sediments - Phase 1, analysis of standard solutions - 1989 - (1/OC/MS:1). |
| 8C | ICES/OSPAR, First Intercomparison Exercise on Organochlorines (individual chlorobiphenyl congeners) in Marine Sediments - Phase 2, analysis of standard solutions - 1991 - (1/OC/MS:2). |
| 8B | ICES/IOC/OSPAR Intercomparison Programme on the Analysis of Chlorobiphenyls in Marine Media - Step 1 - (analysis of standard solutions) - 1989 - (1/OC/MS-1). |
| 8C | ICES/IOC/OSPAR Intercomparison Programme on the Analysis of Chlorobiphenyls in Marine Media - Step 2 - 1990 - (1/OC/MS-2). |
| 8D | ICES/IOC/OSPAR Intercomparison Programme on the Analysis of Chlorobiphenyls in Marine Media - Step 3a (1/OC/MS-3a) 1991. |
| 8E | ICES/IOC/OSPAR Intercomparison Programme on the Analysis of Chlorobiphenyls in Marine Media - Step 3b - (1/OC/MS-3b) 1992. |
| 8F | ICES/IOC/OSPAR Intercomparison Programme on the Analysis of Chlorobiphenyls in Marine Media - Step 4 - (1/OC/MS-4) 1993. |

**Marine biota:**

| | |
|---|---|
| 1E | ICES, Fifth Intercalibration Exercise on Trace Metals in Biological Tissues - 1978 - (5/TM/BT). |
| 1F | ICES, Sixth Intercalibration Exercise on Trace Metals (Cadmium and Lead only) in Biological Tissues - 1979 - (6/TM/BT). |
| 1G | ICES, Seventh Intercalibration Exercise on Trace Metals in Biological Tissues - Part A - 1983 - (7/TM/BT). |

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

# Appendix D.
# Analytical overview

**Sorted by:**

- **Contaminant, year, laboratory, intercalibration**

**Abbreviations are defined in Appendix B. and Appendix C.**

| Tissue | | | Fish liver | | | | | Fish fillet, Shrimp tail, Mussel, Other | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Contamin. | 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 |
| ACNE | 1992-NIVA | W | 309 | 0.2 | 8 | | | 309 | 0.2 | 46 | | |
| | 1995-NIVA | W | | | | | | 309 | 0.2 | 72 | | 20 |
| | 1996-NIVA | W | | | | | | 309 | 0.2 | 65 | | 19 |
| | 1997-NIVA | W | | | | | | 309 | 0.5 | 34 | | |
| | 1998-NIVA | W | | | | | | 309 | 0.5 | 39 | | |
| | 1999-NIVA | W | | | | | | 309 | 0.5 | 34 | | |
| ACNLE | 1992-NIVA | W | 309 | 0.2 | 8 | | | 309 | 0.2 | 46 | | |
| | 1995-NIVA | W | | | | | | 309 | 0.2 | 72 | | 49 |
| | 1996-NIVA | W | | | | | | 309 | 0.2 | 65 | | 42 |
| | 1997-NIVA | W | | | | | | 309 | 0.5 | 34 | | |
| | 1998-NIVA | W | | | | | | 309 | 0.5 | 39 | | |
| | 1999-NIVA | W | | | | | | 309 | 0.5 | 34 | | |
| AG | 1996-NIVA | W | | | | | | 999 | miss | 3 | | |
| ANT | 1992-NIVA | W | 309 | 0.2 | 8 | | | 309 | 0.2 | 45 | | |
| | 1995-NIVA | W | | | | | | 309 | 0.2 | 72 | | 28 |
| | 1996-NIVA | W | | | | | | 309 | 0.2 | 65 | | 30 |
| | 1997-NIVA | W | | | | | | 309 | 0.5 | 35 | | |
| | 1998-NIVA | W | | | | | | 309 | 0.5 | 39 | | |
| | 1999-NIVA | EK W | | | | | | 309 | 0.5 | 34 | | |
| AS | 1996-NIVA | W | | | | | | 999 | miss | 3 | | |
| BAA | 1992-NIVA | W | 309 | 0.2 | 8 | | | 309 | 0.2 | 44 | | |
| | 1995-NIVA | W | | | | | | 309 | 0.2 | 72 | | 9 |
| | 1996-NIVA | W | | | | | | 309 | 0.2 | 65 | | 8 |
| | 1997-NIVA | W | | | | | | 309 | 0.5 | 36 | | |
| | 1998-NIVA | W | | | | | | 309 | 0.5 | 39 | | |
| | 1999-NIVA | EK W | | | | | | 309 | 0.5 | 34 | | |
| BAP | 1992-NIVA | W | 309 | 0.2 | 8 | | | 309 | 0.2 | 45 | | |
| | 1995-NIVA | W | | | | | | 309 | 0.2 | 72 | | 21 |
| | 1996-NIVA | W | | | | | | 309 | 0.2 | 65 | | 26 |
| | 1997-NIVA | AL W | | | | | | 309 | 0.5 | 36 | | |
| | 1998-NIVA | W | | | | | | 309 | 0.5 | 39 | | |
| | 1999-NIVA | EK W | | | | | | 309 | 0.5 | 34 | | |
| BBF | 1992-NIVA | W | 309 | 0.2 | 8 | | | 309 | 0.2 | 45 | | |
| | 1995-NIVA | W | | | | | | 309 | 0.2 | 59 | | 9 |
| | 1996-NIVA | W | | | | | | 309 | 0.2 | 57 | | 6 |
| BBJKF | 1995-NIVA | W | | | | | | 309 | 0.2 | 12 | | |
| | 1996-NIVA | W | | | | | | 309 | 0.2 | 8 | | |
| | 1997-NIVA | W | | | | | | 309 | 0.2 | 36 | | 1 |
| | 1998-NIVA | W | | | | | | 309 | 0.2 | 39 | | |
| | 1999-NIVA | W | | | | | | 309 | 0.2 | 34 | | |
| BEP | 1992-NIVA | W | 309 | 0.2 | 8 | | | 309 | 0.2 | 45 | | |
| | 1995-NIVA | W | | | | | | 309 | 0.2 | 72 | | 5 |
| | 1996-NIVA | W | | | | | | 309 | 0.2 | 65 | | 6 |
| | 1997-NIVA | W | | | | | | 309 | 0.2 | 36 | | |
| | 1998-NIVA | W | | | | | | 309 | 0.2 | 38 | | |
| | 1999-NIVA | EK W | | | | | | 309 | 0.2 | 34 | | |
| BGHIP | 1992-NIVA | W | 309 | 0.2 | 8 | | | 309 | 0.2 | 46 | | |
| | 1995-NIVA | W | | | | | | 309 | 0.2 | 72 | | 20 |
| | 1996-NIVA | W | | | | | | 309 | 0.2 | 65 | | 10 |
| | 1997-NIVA | W | | | | | | 309 | 0.5 | 36 | | |
| | 1998-NIVA | W | | | | | | 309 | 0.5 | 35 | | |
| | 1999-NIVA | EK W | | | | | | 309 | 0.5 | 34 | | |
| BIPN | 1992-NIVA | W | 309 | 0.2 | 8 | | | 309 | 0.2 | 46 | | |
| | 1995-NIVA | W | | | | | | 309 | 0.2 | 72 | | 52 |
| | 1996-NIVA | W | | | | | | 309 | 0.2 | 62 | | 39 |
| | 1997-NIVA | W | | | | | | 309 | 0.5 | 34 | | |
| | 1998-NIVA | W | | | | | | 309 | 0.5 | 39 | 1 | |
| | 1999-NIVA | W | | | | | | 309 | 0.5 | 34 | | |

| Tissue | | | | Fish liver | | | | | Fish fillet, Shrimp tail, Mussel, Other | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Contamin. | 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 |
| BJKF | 1992-NIVA | | W | 309 | 0.2 | 8 | | | 309 | 0.2 | 45 | | |
| | 1995-NIVA | | W | | | | | | 309 | 0.2 | 24 | | 21 |
| | 1996-NIVA | | W | | | | | | 309 | 0.2 | 57 | | 16 |
| CB101 | 1987-SIIF | | W | | | | | | 111 | 0.2 | 21 | 1 | |
| | 1988-SIIF | | D | | | | | | 111 | 0.1 | 6 | | |
| | 1988-SIIF | | W | | | | | | 111 | 0.1 | 22 | | |
| | 1989-NACE | | W | 510 | 20 | 93 | | | | | | | |
| | 1989-SIIF | | W | | | | | | 111 | 0.1 | 36 | | |
| | 1990-NIVA | 2G | W | 340 | 1 | 169 | 1 | | 341 | 0.05 | 58 | | |
| | 1990-SIIF | 2G | W | | | | | | 111 | 0.4 | 41 | 6 | |
| | 1991-NIVA | 2H | W | 340 | 1 | 179 | | 8 | 341 | 0.05 | 62 | | |
| | 1991-SIIF | 2H | W | | | | | | 111 | 0.2 | 35 | | 1 |
| | 1992-NIVA | 2J | W | 340 | 5 | 192 | 3 | | 341 | 0.1 | 140 | | |
| | 1993-NIVA | 2K | W | 340 | 4 | 212 | 12 | | 341 | 0.1 | 133 | | |
| | 1994-NIVA | 2Z | W | 340 | 3 | 300 | 3 | | 341 | 0.05 | 165 | 39 | |
| | 1995-NIVA | | W | 340 | 3 | 318 | 10 | | 341 | 0.05 | 225 | 10 | |
| | 1996-NIVA | | W | 340 | 3 | 332 | 14 | | 341 | 0.05 | 237 | 9 | |
| | 1997-NIVA | | W | 340 | 3 | 260 | 24 | | | | | | |
| | 1997-NIVA | AJ | W | | | | | | 341 | 0.05 | 221 | 4 | |
| | 1998-NIVA | | W | 340 | 3 | 284 | 19 | 1 | 341 | 0.05 | 197 | 1 | 3 |
| | 1999-NIVA | | W | 340 | 3 | 245 | 3 | | | | | | |
| | 1999-NIVA | EG | W | | | | | | 341 | 0.05 | 222 | | 12 |
| CB105 | 1991-NIVA | 2H | W | 340 | 1 | 87 | | 1 | 341 | 0.05 | 47 | | |
| | 1992-NIVA | | W | 340 | 5 | 192 | 3 | | 341 | 0.1 | 140 | | |
| | 1993-NIVA | QM | W | 340 | 4 | 212 | 21 | | 341 | 0.1 | 133 | | |
| | 1994-NIVA | 2Z | W | 340 | 3 | 300 | 8 | | 341 | 0.05 | 165 | 53 | |
| | 1995-NIVA | | W | 340 | 3 | 318 | 13 | | 341 | 0.05 | 224 | 34 | |
| | 1996-NIVA | | W | 340 | 3 | 332 | 22 | | 341 | 0.05 | 231 | 23 | |
| | 1997-NIVA | | W | 340 | 3 | 260 | 24 | | 341 | 0.05 | 221 | 3 | 1 |
| | 1998-NIVA | | W | 340 | 3 | 284 | 31 | 19 | 341 | 0.05 | 201 | 11 | 16 |
| | 1999-NIVA | | W | 340 | 3 | 245 | 14 | | | | | | |
| | 1999-NIVA | EG | W | | | | | | 341 | 0.05 | 222 | 4 | 59 |
| CB118 | 1989-NACE | | W | 510 | 20 | 93 | | | | | | | |
| | 1989-SIIF | | W | | | | | | 111 | 0.1 | 36 | | |
| | 1990-NIVA | 2G | W | 340 | 1 | 169 | | | 341 | 0.05 | 58 | | |
| | 1990-SIIF | 2G | W | | | | | | 111 | 0.2 | 41 | 1 | |
| | 1991-NIVA | 2H | W | 340 | 1 | 179 | | | 341 | 0.05 | 62 | | |
| | 1991-SIIF | 2H | W | | | | | | 111 | 0.2 | 35 | | 1 |
| | 1992-NIVA | 2J | W | 340 | 5 | 192 | 2 | | 341 | 0.1 | 140 | | |
| | 1993-NIVA | 2K | W | 340 | 4 | 212 | 10 | | 341 | 0.1 | 133 | | |
| | 1994-NIVA | 2Z | W | 340 | 3 | 300 | 2 | | 341 | 0.05 | 165 | 25 | |
| | 1995-NIVA | | W | 340 | 3 | 318 | 2 | | 341 | 0.05 | 225 | 2 | |
| | 1996-NIVA | | W | 340 | 3 | 332 | 6 | | 341 | 0.05 | 237 | 4 | |
| | 1997-NIVA | | W | 340 | 3 | 260 | 5 | | | | | | |
| | 1997-NIVA | AJ | W | | | | | | 341 | 0.05 | 221 | | |
| | 1998-NIVA | | W | 340 | 3 | 284 | 6 | 1 | 341 | 0.05 | 203 | 3 | 1 |
| | 1999-NIVA | | W | 340 | 3 | 245 | | | | | | | |
| | 1999-NIVA | EG | W | | | | | | 341 | 0.05 | 222 | | 6 |
| CB126 | 1995-NILU | | W | | | | | | 841 | 2E-05 | 6 | | |
| | 1996-NILU | | W | | | | | | 841 | 1E-04 | 18 | | |
| CB138 | 1988-SIIF | | D | | | | | | 111 | 0.1 | 6 | | |
| | 1988-SIIF | | W | | | | | | 111 | 0.1 | 21 | | |
| | 1989-NACE | | W | 510 | 20 | 93 | | | | | | | |
| | 1989-SIIF | | W | | | | | | 111 | 0.1 | 36 | | |
| | 1990-NIVA | 2G | W | 340 | 1 | 169 | | | 341 | 0.05 | 58 | | |
| | 1990-SIIF | 2G | W | | | | | | 111 | 0.3 | 41 | | |
| | 1991-NIVA | 2H | W | 340 | 1 | 179 | | | 341 | 0.05 | 62 | | |
| | 1991-SIIF | 2H | W | | | | | | 111 | 0.3 | 35 | | 1 |

| Tissue | | | | Fish liver | | | | | Fish fillet, Shrimp tail, Mussel, Other | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Contamin. | 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 |
| | 1992-NIVA | 2J | W | 340 | 5 | 192 | | | 341 | 0.1 | 137 | | |
| | 1993-NIVA | QM | W | 340 | 4 | 212 | 3 | | 341 | 0.1 | 133 | | |
| | 1994-NIVA | 2Z | W | 340 | 3 | 300 | | | 341 | 0.05 | 165 | 12 | |
| | 1995-NIVA | | W | 340 | 3 | 318 | 2 | | 341 | 0.05 | 225 | | |
| | 1996-NIVA | | W | 340 | 3 | 331 | 1 | | 341 | 0.05 | 235 | | |
| | 1997-NIVA | | W | 340 | 3 | 260 | 1 | | | | | | |
| | 1997-NIVA | AJ | W | | | | | | 341 | 0.05 | 221 | | 1 |
| | 1998-NIVA | | W | 340 | 3 | 284 | 3 | | 341 | 0.05 | 203 | | |
| | 1999-NIVA | | W | 340 | 3 | 245 | | | | | | | |
| | 1999-NIVA | EG | W | | | | | | 341 | 0.05 | 222 | | |
| CB153 | 1988-SIIF | | D | | | | | | 111 | 0.1 | 6 | | |
| | 1988-SIIF | | W | | | | | | 111 | 0.1 | 22 | | |
| | 1989-NACE | | W | 510 | 20 | 93 | | | | | | | |
| | 1989-SIIF | | W | | | | | | 111 | 0.1 | 36 | | |
| | 1990-NIVA | 2G | W | 340 | 1 | 169 | | | 341 | 0.05 | 58 | | |
| | 1990-SIIF | 2G | W | | | | | | 111 | 0.3 | 41 | | |
| | 1991-NIVA | 2H | W | 340 | 1 | 179 | | | 341 | 0.05 | 62 | | |
| | 1991-SIIF | 2H | W | | | | | | 111 | 0.5 | 35 | | 1 |
| | 1992-NIVA | 2J | W | 340 | 5 | 192 | | | 341 | 0.1 | 140 | | |
| | 1993-NIVA | 2K | W | 340 | 4 | 212 | 3 | | 341 | 0.1 | 133 | | |
| | 1994-NIVA | 2Z | W | 340 | 3 | 300 | | | 341 | 0.05 | 165 | 9 | |
| | 1995-NIVA | | W | 340 | 3 | 318 | 1 | | 341 | 0.05 | 225 | | |
| | 1996-NIVA | | W | 340 | 3 | 332 | 1 | | 341 | 0.05 | 237 | | |
| | 1997-NIVA | | W | 340 | 3 | 260 | | | | | | | |
| | 1997-NIVA | AJ | W | | | | | | 341 | 0.05 | 221 | | |
| | 1998-NIVA | | W | 340 | 3 | 284 | 1 | | 341 | 0.05 | 203 | 1 | 1 |
| | 1999-NIVA | | W | 340 | 3 | 245 | | | | | | | |
| | 1999-NIVA | EG | W | | | | | | 341 | 0.05 | 222 | | |
| CB156 | 1991-NIVA | 2H | W | 340 | 1 | 87 | | 15 | 341 | 0.05 | 47 | | 5 |
| | 1992-NIVA | | W | 340 | 5 | 192 | 3 | | 341 | 0.1 | 140 | | |
| | 1993-NIVA | QM | W | 340 | 4 | 212 | 31 | | 341 | 0.1 | 133 | | |
| | 1994-NIVA | 2Z | W | 340 | 3 | 300 | 24 | 1 | 341 | 0.05 | 162 | 70 | |
| | 1995-NIVA | | W | 340 | 3 | 317 | 27 | | 341 | 0.05 | 225 | 67 | |
| | 1996-NIVA | | W | 340 | 3 | 332 | 48 | | 341 | 0.05 | 237 | 62 | |
| | 1997-NIVA | | W | 340 | 3 | 260 | 46 | | | | | | |
| | 1997-NIVA | AJ | W | | | | | | 341 | 0.05 | 221 | 9 | 10 |
| | 1998-NIVA | | W | 340 | 3 | 284 | 52 | 70 | 341 | 0.05 | 203 | 37 | 47 |
| | 1999-NIVA | | W | 340 | 3 | 245 | 35 | 2 | | | | | |
| | 1999-NIVA | EG | W | | | | | | 341 | 0.05 | 222 | 12 | 132 |
| CB169 | 1995-NILU | | W | | | | | | 841 | 2E-05 | 6 | | |
| | 1996-NILU | | W | | | | | | 841 | 1E-04 | 18 | 2 | |
| CB180 | 1987-SIIF | | W | | | | | | 111 | 0.2 | 21 | 6 | |
| | 1988-SIIF | | D | | | | | | 111 | 0.1 | 6 | | |
| | 1988-SIIF | | W | | | | | | 111 | 0.1 | 22 | | |
| | 1989-NACE | | W | 510 | 20 | 93 | 1 | | | | | | |
| | 1989-SIIF | | W | | | | | | 111 | 0.1 | 36 | | |
| | 1990-NIVA | 2G | W | 340 | 1 | 169 | | | 341 | 0.05 | 58 | | |
| | 1990-SIIF | 2G | W | | | | | | 111 | 0.2 | 41 | 8 | |
| | 1991-NIVA | 2H | W | 340 | 1 | 179 | | | 341 | 0.05 | 62 | | |
| | 1991-SIIF | 2H | W | | | | | | 111 | 0.2 | 35 | | |
| | 1992-NIVA | 2J | W | 340 | 5 | 192 | 3 | | 341 | 0.1 | 140 | | |
| | 1993-NIVA | 2K | W | 340 | 4 | 212 | 15 | | 341 | 0.1 | 133 | | |
| | 1994-NIVA | 2Z | W | 340 | 3 | 300 | 3 | | 341 | 0.05 | 162 | 49 | |
| | 1995-NIVA | | W | 340 | 3 | 318 | 5 | | 341 | 0.05 | 225 | 22 | |
| | 1996-NIVA | | W | 340 | 3 | 332 | 14 | | 341 | 0.05 | 237 | 25 | |
| | 1997-NIVA | | W | 340 | 3 | 260 | 18 | | | | | | |
| | 1997-NIVA | AJ | W | | | | | | 341 | 0.05 | 221 | 1 | 1 |
| | 1998-NIVA | | W | 340 | 3 | 284 | 20 | 14 | 341 | 0.05 | 203 | 18 | 44 |

| Tissue | | | | Fish liver | | | | | Fish fillet, Shrimp tail, Mussel, Other | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Contamin. | 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 |
| | 1999-NIVA | | W | 340 | 3 | 245 | 4 | 1 | | | | | |
| | 1999-NIVA | EG | W | | | | | | 341 | 0.05 | 222 | 2 | 76 |
| CB209 | 1990-NIVA | | W | 340 | 2 | 169 | 24 | 11 | 341 | 0.05 | 58 | | |
| | 1991-NIVA | | W | 340 | 2 | 179 | 11 | 88 | 341 | 0.05 | 62 | 5 | 7 |
| | 1992-NIVA | | W | 340 | 5 | 192 | 3 | | 341 | 0.1 | 140 | | 1 |
| | 1993-NIVA | | W | 340 | 4 | 212 | 46 | 14 | 341 | 0.1 | 133 | | |
| | 1994-NIVA | | W | 340 | 3 | 300 | 29 | 24 | 341 | 0.05 | 165 | 91 | |
| | 1995-NIVA | | W | 340 | 3 | 318 | 36 | | 341 | 0.05 | 225 | 92 | 5 |
| | 1996-NIVA | | W | 340 | 3 | 332 | 255 | | 341 | 0.05 | 237 | 107 | 9 |
| | 1997-NIVA | | W | 340 | 3 | 260 | 196 | | 341 | 0.05 | 221 | 30 | 14 |
| | 1998-NIVA | | W | 340 | 3 | 283 | 120 | 121 | 341 | 0.05 | 203 | 50 | 69 |
| | 1999-NIVA | | W | 340 | 3 | 242 | 162 | 17 | 341 | 0.05 | 222 | 19 | 171 |
| CB28 | 1988-SIIF | | D | | | | | | 111 | 0.1 | 6 | | |
| | 1988-SIIF | | W | | | | | | 111 | 0.1 | 22 | | |
| | 1989-NACE | | W | 510 | 20 | 93 | | | | | | | |
| | 1989-SIIF | | W | | | | | | 111 | 0.1 | 36 | | 1 |
| | 1990-NIVA | 2G | W | 340 | 1 | 169 | 2 | 2 | 341 | 0.05 | 58 | | |
| | 1990-SIIF | 2G | W | | | | | | 111 | 0.2 | 41 | 7 | |
| | 1991-NIVA | 2H | W | 340 | 1 | 179 | 2 | 52 | 341 | 0.05 | 62 | 5 | 1 |
| | 1991-SIIF | 2H | W | | | | | | 111 | 0.3 | 35 | | |
| | 1992-NIVA | 2J | W | 340 | 5 | 192 | 3 | | 341 | 0.1 | 137 | | |
| | 1993-NIVA | 2K | W | 340 | 4 | 212 | 44 | 5 | 341 | 0.1 | 133 | | |
| | 1994-NIVA | 2Z | W | 340 | 3 | 282 | 18 | 4 | 341 | 0.05 | 163 | 73 | |
| | 1995-NIVA | | W | 340 | 3 | 313 | 27 | | 341 | 0.05 | 225 | 75 | |
| | 1996-NIVA | | W | 340 | 3 | 332 | 107 | | 341 | 0.05 | 236 | 70 | |
| | 1997-NIVA | | W | 340 | 3 | 260 | 81 | | | | | | |
| | 1997-NIVA | AJ | W | | | | | | 341 | 0.05 | 221 | 22 | 14 |
| | 1998-NIVA | | W | 340 | 3 | 284 | 96 | 99 | 341 | 0.05 | 201 | 33 | 46 |
| | 1999-NIVA | | W | 340 | 3 | 245 | 92 | 18 | | | | | |
| | 1999-NIVA | EG | W | | | | | | 341 | 0.05 | 222 | 14 | 140 |
| CB52 | 1987-SIIF | | W | | | | | | 111 | 0.2 | 20 | 1 | |
| | 1988-SIIF | | D | | | | | | 111 | 0.1 | 6 | | |
| | 1988-SIIF | | W | | | | | | 111 | 0.1 | 22 | | |
| | 1989-NACE | | W | 510 | 20 | 93 | | | | | | | |
| | 1989-SIIF | | W | | | | | | 111 | 0.1 | 36 | | |
| | 1990-NIVA | 2G | W | 340 | 1 | 169 | 2 | 6 | 341 | 0.05 | 58 | | |
| | 1990-SIIF | 2G | W | | | | | | 111 | 0.4 | 41 | 7 | |
| | 1991-NIVA | 2H | W | 340 | 1 | 179 | 1 | 37 | 341 | 0.05 | 62 | 5 | 1 |
| | 1991-SIIF | 2H | W | | | | | | 111 | 0.3 | 35 | | |
| | 1992-NIVA | 2J | W | 340 | 5 | 192 | 3 | | 341 | 0.1 | 137 | | |
| | 1993-NIVA | 2K | W | 340 | 4 | 212 | 40 | | 341 | 0.1 | 133 | | |
| | 1994-NIVA | 2Z | W | 340 | 3 | 300 | 9 | | 341 | 0.05 | 165 | 64 | |
| | 1995-NIVA | | W | 340 | 3 | 312 | 19 | | 341 | 0.05 | 214 | 28 | |
| | 1996-NIVA | | W | 340 | 3 | 332 | 49 | | 341 | 0.05 | 235 | 31 | |
| | 1997-NIVA | | W | 340 | 3 | 260 | 116 | | | | | | |
| | 1997-NIVA | AJ | W | | | | | | 341 | 0.05 | 221 | 25 | 10 |
| | 1998-NIVA | | W | 340 | 3 | 281 | 47 | 44 | 341 | 0.05 | 168 | 12 | 17 |
| | 1999-NIVA | | W | 340 | 3 | 245 | 49 | 11 | | | | | |
| | 1999-NIVA | EG | W | | | | | | 341 | 0.05 | 212 | 7 | 70 |
| CB77 | 1995-NILU | | W | | | | | | 841 | 2E-05 | 6 | | |
| | 1996-NILU | | W | | | | | | 841 | 1E-04 | 18 | | |
| CB81 | 1995-NILU | | W | | | | | | 841 | 2E-05 | 6 | | |
| | 1996-NILU | | W | | | | | | 841 | 1E-04 | 18 | | |
| CD | 1981-SIIF | 1E | W | 130 | 10 | 28 | | | 130 | 5 | 27 | | |
| | 1981-SIIF | 1F | W | | | | | | 130 | 10 | 7 | | |
| | 1982-SIIF | 1F | W | | | | | | 130 | 10 | 18 | | |
| | 1982-VETN | | W | 230 | 10 | 54 | | | | | | | |
| | 1983-SIIF | 1F | W | | | | | | 130 | 10 | 17 | | |

| Tissue | | | | Fish liver | | | | | Fish fillet, Shrimp tail, Mussel, Other | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Contamin. | 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 |
| | 1983-VETN | 1Z | W | 230 | 10 | 46 | | | | | | | |
| | 1984-FIER | 1H | W | 402 | 1 | 23 | | | | | | | |
| | 1984-SIIF | 1G | W | | | | | | 130 | 10 | 27 | | |
| | 1984-VETN | 1Z | W | 230 | 10 | 66 | | | | | | | |
| | 1985-SIIF | 1G | D | | | | | | 130 | 10 | 35 | | |
| | 1985-VETN | 1Z | W | 230 | 10 | 45 | | 3 | | | | | |
| | 1986-NIVA | 1H | D | 312 | 30 | 56 | 1 | | 312 | 30 | 20 | | |
| | 1987-FIER | 1G | W | 402 | 1 | 37 | | | | | | | |
| | 1987-NIVA | 1H | D | 312 | 30 | 57 | | 4 | 312 | 30 | 37 | | |
| | 1988-NIVA | 1H | D | 312 | 30 | 61 | 11 | 1 | 312 | 30 | 55 | | |
| | 1989-NIVA | 1H | D | 312 | 30 | 135 | 11 | 8 | | | | | |
| | 1989-NIVA | 1H | W | | | | | | 312 | 30 | 36 | | |
| | 1990-NIVA | 1H | W | 312 | 10 | 189 | 9 | 2 | 312 | 30 | 77 | 5 | |
| | 1991-NIVA | 1H | W | 312 | 10 | 190 | 29 | 2 | 312 | 10 | 67 | | |
| | 1992-NIVA | 1H | W | 312 | 10 | 191 | 4 | | 312 | 10 | 111 | | |
| | 1993-NIVA | 1H | W | 312 | 50 | 221 | 98 | | 312 | 50 | 79 | | |
| | 1994-NIVA | 1Z | W | 312 | 50 | 302 | 134 | | 312 | 50 | 81 | | |
| | 1995-NIVA | | W | 312 | 50 | 318 | 129 | | 312 | 50 | 139 | 2 | |
| | 1996-NIVA | V1 | W | | | | | | 312 | 50 | 125 | | |
| | 1996-NIVA | V2 | W | 312 | 50 | 368 | 128 | | | | | | |
| | 1997-NIVA | | W | 312 | 50 | 287 | 90 | | | | | | |
| | 1997-NIVA | AH | W | | | | | | 312 | 50 | 107 | | |
| | 1998-NIVA | | W | 312 | 50 | 285 | 101 | | 312 | 50 | 93 | | |
| | 1999-NIVA | | W | 312 | 50 | 233 | 79 | | | | | | |
| | 1999-NIVA | EF | W | | | | | | 312 | 50 | 132 | 15 | |
| CDD1N | 1995-NILU | | W | | | | | | 841 | 2E-05 | 6 | 1 | 1 |
| | 1996-NILU | | W | | | | | | 841 | 1E-05 | 18 | | 2 |
| CDD4X | 1995-NILU | | W | | | | | | 841 | 2E-05 | 6 | 3 | 1 |
| | 1996-NILU | | W | | | | | | 841 | 2E-05 | 18 | | 1 |
| CDD6P | 1995-NILU | | W | | | | | | 841 | 2E-05 | 6 | | |
| | 1996-NILU | | W | | | | | | 841 | 4E-05 | 18 | | |
| CDD6X | 1995-NILU | | W | | | | | | 841 | 2E-05 | 6 | | 1 |
| | 1996-NILU | | W | | | | | | 841 | 2E-05 | 18 | | 1 |
| CDD9X | 1995-NILU | | W | | | | | | 841 | 2E-05 | 6 | 2 | 1 |
| | 1996-NILU | | W | | | | | | 841 | 2E-05 | 18 | | 1 |
| CDDO | 1995-NILU | | W | | | | | | 841 | 2E-05 | 6 | | |
| | 1996-NILU | | W | | | | | | 841 | 1E-04 | 18 | | |
| CDDSN | 1995-NILU | | W | | | | | | 841 | 2E-05 | 5 | | |
| | 1996-NILU | | W | | | | | | 841 | 1E-05 | 18 | | 3 |
| CDDSP | 1995-NILU | | W | | | | | | 841 | 2E-05 | 6 | | |
| | 1996-NILU | | W | | | | | | 841 | 4E-05 | 18 | | |
| CDDST | 1995-NILU | | W | | | | | | 841 | 2E-05 | 6 | | |
| | 1996-NILU | | W | | | | | | 841 | 1E-05 | 18 | | |
| CDDSX | 1995-NILU | | W | | | | | | 841 | 2E-05 | 5 | | |
| | 1996-NILU | | W | | | | | | 841 | 2E-05 | 18 | | 2 |
| CDF2N | 1995-NILU | | W | | | | | | 841 | 2E-05 | 6 | | |
| | 1996-NILU | | W | | | | | | 841 | 1E-05 | 18 | | 1 |
| CDF2T | 1995-NILU | | W | | | | | | 841 | 2E-05 | 6 | | |
| | 1996-NILU | | W | | | | | | 841 | 1E-05 | 18 | | |
| CDF4X | 1995-NILU | | W | | | | | | 841 | 2E-05 | 6 | | |
| | 1996-NILU | | W | | | | | | 841 | 2E-05 | 18 | | 1 |
| CDF6P | 1995-NILU | | W | | | | | | 841 | 2E-05 | 6 | | |
| | 1996-NILU | | W | | | | | | 841 | 4E-05 | 18 | 2 | 1 |
| CDF6X | 1995-NILU | | W | | | | | | 841 | 2E-05 | 6 | | |
| | 1996-NILU | | W | | | | | | 841 | 2E-05 | 18 | | 1 |
| CDF9P | 1995-NILU | | W | | | | | | 841 | 2E-05 | 6 | 2 | 1 |
| | 1996-NILU | | W | | | | | | 841 | 8E-05 | 17 | 3 | 1 |

| Tissue | | | | Fish liver | | | | | Fish fillet, Shrimp tail, Mussel, Other | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Contamin. | 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 |
| CDF9X | 1995-NILU | | W | | | | | | 841 | 2E-05 | 6 | 3 | 1 |
| | 1996-NILU | | W | | | | | | 841 | 2E-05 | 18 | | 1 |
| CDFDN | 1995-NILU | | W | | | | | | 841 | 2E-05 | 6 | | |
| | 1996-NILU | | W | | | | | | 841 | 1E-05 | 18 | | 1 |
| CDFDX | 1995-NILU | | W | | | | | | 841 | 2E-05 | 6 | | |
| | 1996-NILU | | W | | | | | | 841 | 2E-05 | 18 | | 1 |
| CDFO | 1995-NILU | | W | | | | | | 841 | 2E-05 | 6 | | 1 |
| | 1996-NILU | | W | | | | | | 841 | 1E-04 | 18 | 3 | 1 |
| CDFSN | 1995-NILU | | W | | | | | | 841 | 2E-05 | 6 | | |
| | 1996-NILU | | W | | | | | | 841 | 1E-05 | 18 | | 1 |
| CDFSP | 1995-NILU | | W | | | | | | 841 | 2E-05 | 6 | | |
| | 1996-NILU | | W | | | | | | 841 | 8E-05 | 18 | 6 | 1 |
| CDFST | 1995-NILU | | W | | | | | | 841 | 2E-05 | 6 | | |
| | 1996-NILU | | W | | | | | | 841 | 1E-05 | 18 | | |
| CDFSX | 1995-NILU | | W | | | | | | 841 | 2E-05 | 6 | | |
| | 1996-NILU | | W | | | | | | 841 | 2E-05 | 18 | | 1 |
| CHR | 1992-NIVA | | W | 309 | 0.2 | 8 | | | 309 | 0.2 | 44 | | |
| | 1995-NIVA | | W | | | | | | 309 | 0.2 | 56 | | |
| | 1996-NIVA | | W | | | | | | 309 | 0.2 | 65 | | 3 |
| CHRTR | 1995-NIVA | | W | | | | | | 309 | 0.2 | 15 | | 2 |
| | 1997-NIVA | | W | | | | | | 309 | 0.5 | 36 | | |
| | 1998-NIVA | | W | | | | | | 309 | 0.5 | 39 | | |
| | 1999-NIVA | | W | | | | | | 309 | 0.5 | 34 | | |
| CO | 1996-NIVA | | W | | | | | | 999 | miss | 3 | | |
| COR | 1992-NIVA | | W | 309 | 0.2 | 8 | | | 309 | 0.2 | 46 | | |
| CR | 1992-NIVA | | W | | | | | | 312 | 10 | 6 | | |
| | 1996-NIVA | | W | | | | | | 999 | miss | 3 | | |
| CU | 1983-SIIF | 1G | W | | | | | | 130 | 10 | 12 | | |
| | 1984-SIIF | 1G | W | | | | | | 130 | 10 | 27 | | |
| | 1986-NIVA | 1H | D | 311 | 150 | 56 | | | 311 | 150 | 20 | | |
| | 1987-FIER | 1G | W | 404 | 50 | 37 | | | | | | | |
| | 1987-NIVA | 1H | D | 311 | 150 | 57 | | | 311 | 150 | 37 | | |
| | 1988-NIVA | 1H | D | 311 | 150 | 61 | | | 311 | 150 | 55 | | |
| | 1989-NIVA | 1H | D | 311 | 150 | 135 | | | | | | | |
| | 1989-NIVA | 1H | W | | | | | | 311 | 150 | 36 | | |
| | 1990-NIVA | 1H | W | 311 | 150 | 189 | | | 311 | 150 | 77 | | |
| | 1991-NIVA | 1H | W | 311 | 50 | 193 | 2 | | 311 | 50 | 67 | | |
| | 1992-NIVA | 1H | W | 311 | 10 | 191 | | | 311 | 10 | 111 | | |
| | 1993-NIVA | 1H | W | 311 | 10 | 221 | | | 311 | 10 | 79 | | |
| | 1994-NIVA | 1Z | W | 311 | 10 | 302 | | | 311 | 10 | 81 | | |
| | 1995-NIVA | | W | 311 | 10 | 318 | | | 311 | 10 | 124 | | |
| | 1996-NIVA | V1 | W | | | | | | 311 | 10 | 113 | | |
| | 1996-NIVA | V2 | W | 311 | 10 | 368 | | | | | | | |
| | 1997-NIVA | | W | 311 | 5000a | 287 | 1 | | | | | | |
| | 1997-NIVA | AH | W | | | | | | 311 | 10 | 96 | | |
| | 1998-NIVA | | W | 311 | 10 | 285 | | | 311 | 10 | 51 | | |
| | 1999-NIVA | | W | 311 | 10 | 233 | | | | | | | |
| | 1999-NIVA | EF | W | | | | | | 311 | 10 | 99 | | |
| DBA3A | 1992-NIVA | | W | 309 | 0.2 | 8 | | | 309 | 0.2 | 46 | | |
| | 1995-NIVA | | W | | | | | | 309 | 0.2 | 71 | | 48 |
| | 1996-NIVA | | W | | | | | | 309 | 0.2 | 65 | | 53 |
| | 1997-NIVA | | W | | | | | | 309 | 0.5 | 36 | | |
| | 1998-NIVA | | W | | | | | | 309 | 0.5 | 39 | | |
| | 1999-NIVA | | W | | | | | | 309 | 0.5 | 34 | | |
| DBP | 1992-NIVA | | W | 309 | 0.2 | 8 | | | 309 | 0.2 | 46 | | |
| DBT | 1998-NIVA | | W | | | | | | 309 | 0.5 | 39 | | |
| | 1999-NIVA | | W | | | | | | 309 | 0.5 | 34 | | |

| Tissue | | | Fish liver | | | | | Fish fillet, Shrimp tail, Mussel, Other | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Contamin. | 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 |
| DBTC1 | 1995-NIVA | W | | | | | | 309 | 0.2 | 57 | | 14 |
| | 1996-NIVA | W | | | | | | 309 | 0.2 | 65 | | 9 |
| DBTC2 | 1995-NIVA | W | | | | | | 309 | 0.2 | 56 | | 9 |
| | 1996-NIVA | W | | | | | | 309 | 0.2 | 62 | | 11 |
| DBTC3 | 1995-NIVA | W | | | | | | 309 | 0.2 | 57 | | 4 |
| | 1996-NIVA | W | | | | | | 309 | 0.2 | 65 | | 5 |
| DBTIN | 1997-NIVA | D | | | | | | 320 | 5 | 8 | | |
| | 1998-NIVA | D | | | | | | 320 | 5 | 15 | | |
| | 1999-NIVA | D | | | | | | 320 | 5 | 13 | | |
| DBTIO | 1997-NIVA | W | | | | | | 309 | 0.5 | 34 | | |
| DDEPP | 1982-VETN | W | 210 | 50 | 53 | | | | | | | |
| | 1983-VETN | 2E W | 210 | 50 | 48 | | | 211a | 50 | 48 | | |
| | 1984-VETN | 2E W | 210 | 50 | 66 | | | | | | | |
| | 1985-VETN | 2E W | 210 | 50 | 45 | | | | | | | |
| | 1986-NACE | 2Z W | 510 | 20 | 56 | | | | | | | |
| | 1987-NACE | 2Z W | 510 | 40 | 53 | | | | | | | |
| | 1988-NACE | 2Z W | 510 | 40 | 61 | | | | | | | |
| | 1989-NACE | 2Z W | 510 | 20 | 93 | | | | | | | |
| | 1990-NIVA | W | 340 | 1 | 169 | | | 341 | 0.05 | 58 | | |
| | 1991-NIVA | W | 340 | 1 | 179 | | | 341 | 0.05 | 62 | | |
| | 1992-NIVA | W | 340 | 5 | 192 | 2 | | 341 | 0.1 | 140 | | |
| | 1993-NIVA | W | 340 | 4 | 212 | 3 | | 341 | 0.1 | 133 | | |
| | 1994-NIVA | 2Z W | 340 | 4 | 300 | | | 341 | 0.1 | 165 | 27 | |
| | 1995-NIVA | W | 340 | 4 | 318 | 2 | | 341 | 0.1 | 225 | 30 | |
| | 1996-NIVA | W | 340 | 4 | 332 | 2 | | 341 | 0.1 | 237 | 47 | |
| | 1997-NIVA | W | 340 | 4 | 260 | 3 | | 341 | 0.1 | 221 | 1 | |
| | 1998-NIVA | W | 340 | 4 | 284 | 6 | | 341 | 0.1 | 203 | 4 | |
| | 1999-NIVA | W | 340 | 4 | 245 | | | | | | | |
| | 1999-NIVA | EG W | | | | | | 341 | 0.1 | 222 | 2 | |
| DDTEP | 1983-SIIF | W | | | | | | 111 | 0.5 | 12 | | |
| | 1984-SIIF | W | | | | | | 111 | 0.5 | 24 | | 1 |
| | 1985-SIIF | W | | | | | | 111 | 0.5 | 27 | 1 | 5 |
| | 1986-SIIF | W | | | | | | 111 | 0.5 | 21 | | |
| | 1987-SIIF | W | | | | | | 111 | 0.5 | 21 | 1 | |
| | 1988-SIIF | D | | | | | | 111 | 0.5 | 6 | | |
| | 1988-SIIF | W | | | | | | 111 | 0.5 | 22 | 1 | |
| | 1989-SIIF | W | | | | | | 111 | 0.5 | 36 | 1 | |
| | 1990-SIIF | W | | | | | | 111 | 0.2 | 41 | 1 | |
| | 1991-SIIF | W | | | | | | 111 | 0.3 | 35 | | |
| DDTPP | 1986-NACE | W | 510 | 40 | 56 | | | | | | | |
| | 1987-NACE | W | 510 | 40 | 53 | | | | | | | |
| | 1988-NACE | W | 510 | 40 | 61 | | | | | | | |
| | 1989-NACE | W | 510 | 20 | 93 | | | | | | | |
| | 1995-NIVA | W | | | | | | 340 | 0.05 | 72 | | |
| | 1996-NIVA | W | 340 | 0.05 | 54 | | 4 | 340 | 0.05 | 45 | | |
| | 1997-NIVA | W | 340 | 2 | 32 | | | | | | | |
| | 1997-NIVA | AJ W | | | | | | 340 | 0.05 | 48 | | |
| | 1998-NIVA | W | 340 | 2 | 37 | 1 | 8 | 340 | 0.05 | 68 | | 24 |
| | 1999-NIVA | W | 340 | 2 | 29 | | 4 | 340 | 0.05 | 93 | | 7 |
| DPTIN | 1997-NIVA | D | | | | | | 320 | 5 | 8 | | |
| | 1998-NIVA | D | | | | | | 320 | 5 | 15 | 9 | |
| | 1999-NIVA | D | | | | | | 320 | 5 | 13 | 12 | |
| EOCL | 1989-SIIF | W | | | | | | 605 | 170 | 5 | | |
| EPOCL | 1986-NACE | W | 610 | 800 | 56 | | | | | | | |
| | 1986-SIIF | W | | | | | | 605 | 5000 | 21 | 21 | |
| | 1987-NACE | W | 610 | 800 | 53 | | | | | | | |
| | 1987-SIIF | W | | | | | | 605 | 40 | 20 | | |
| | 1988-NACE | W | 610 | 800 | 60 | | | | | | | |

| Tissue | | | Fish liver | | | | | Fish fillet, Shrimp tail, Mussel, Other | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Contamin. | 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 |
| | 1988-SIIF | W | | | | | | 605 | 40 | 27 | | |
| | 1989-NACE | W | 610 | 800 | 89 | 1 | | | | | | |
| | 1989-SIIF | W | | | | | | 605 | 40 | 35 | | |
| | 1990-NIVA | W | 615 | 40 | 117 | | 3 | | | | | |
| | 1990-SIIF | W | | | | | | 605 | 40 | 41 | | |
| | 1991-NIVA | W | 615 | 40 | 116 | | 12 | | | | | |
| | 1991-SIIF | W | | | | | | 605 | 130 | 35 | | |
| | 1997-IFEN | W | | | | | | 607 | 50 | 6 | | |
| | 1998-IFEN | W | | | | | | 607 | 1 | 6 | | |
| FLE | 1992-NIVA | W | 309 | 0.2 | 8 | | | 309 | 0.2 | 45 | | |
| | 1995-NIVA | W | | | | | | 309 | 0.2 | 72 | | 22 |
| | 1996-NIVA | W | | | | | | 309 | 0.2 | 65 | | 6 |
| | 1997-NIVA | AL W | | | | | | 309 | 0.5 | 34 | | |
| | 1998-NIVA | W | | | | | | 309 | 0.5 | 39 | | |
| | 1999-NIVA | W | | | | | | 309 | 0.5 | 34 | | |
| FLU | 1992-NIVA | W | 309 | 0.2 | 8 | | | 309 | 0.2 | 44 | | |
| | 1995-NIVA | W | | | | | | 309 | 0.2 | 72 | | |
| | 1996-NIVA | W | | | | | | 309 | 0.2 | 65 | | |
| | 1997-NIVA | AL W | | | | | | 309 | 0.2 | 36 | | |
| | 1998-NIVA | W | | | | | | 309 | 0.2 | 39 | | |
| | 1999-NIVA | EK W | | | | | | 309 | 0.2 | 34 | | |
| HCB | 1983-SIIF | W | | | | | | 111 | 0.5 | 12 | | |
| | 1983-VETN | 2Z W | 210 | 10 | 48 | | | 211a | 10 | 48 | | |
| | 1984-SIIF | W | | | | | | 111 | 0.2 | 24 | | 1 |
| | 1984-VETN | 2Z W | 210 | 10 | 66 | | | | | | | |
| | 1985-SIIF | W | | | | | | 111 | 0.2 | 30 | 6 | 2 |
| | 1985-VETN | 2Z W | 210 | 10 | 45 | | 4 | | | | | |
| | 1986-NACE | 2Z W | 510 | 10 | 56 | | | | | | | |
| | 1986-SIIF | 2Z W | | | | | | 111 | 0.2 | 21 | 3 | |
| | 1987-NACE | 2Z W | 510 | 40 | 53 | | | | | | | |
| | 1987-SIIF | 2Z W | | | | | | 111 | 0.2 | 21 | 4 | |
| | 1988-NACE | 2Z W | 510 | 40 | 61 | | | | | | | |
| | 1988-SIIF | 2Z D | | | | | | 111 | 0.2 | 6 | | |
| | 1988-SIIF | 2Z W | | | | | | 111 | 0.2 | 22 | 2 | |
| | 1989-NACE | 2Z W | 510 | 20 | 93 | | | | | | | |
| | 1989-SIIF | 2Z W | | | | | | 111 | 0.05 | 36 | | |
| | 1990-NIVA | W | 340 | 1 | 169 | 2 | | 341 | 0.05 | 58 | | |
| | 1990-SIIF | 2Z W | | | | | | 111 | 0.05 | 41 | 3 | |
| | 1991-NIVA | W | 340 | 1 | 179 | 4 | 13 | 341 | 0.05 | 62 | 5 | |
| | 1991-SIIF | 2Z W | | | | | | 111 | 0.1 | 35 | | |
| | 1992-NIVA | W | 340 | 5 | 189 | 3 | | 341 | 0.1 | 140 | | |
| | 1993-NIVA | W | 340 | 4 | 212 | 31 | | 341 | 0.1 | 133 | | |
| | 1994-NIVA | 2Z W | 340 | 3 | 300 | 24 | 1 | 341 | 0.05 | 165 | 33 | |
| | 1995-NIVA | W | 340 | 3 | 317 | 37 | | 341 | 0.05 | 225 | 30 | |
| | 1996-NIVA | W | 340 | 3 | 332 | 52 | | 341 | 0.05 | 237 | 37 | |
| | 1997-NIVA | W | 340 | 2 | 260 | 39 | | | | | | |
| | 1997-NIVA | AJ W | | | | | | 341 | 0.05 | 221 | 7 | |
| | 1998-NIVA | W | 340 | 2 | 284 | 48 | 13 | 341 | 0.05 | 203 | 67 | 2 |
| | 1999-NIVA | W | 340 | 2 | 245 | 18 | | | | | | |
| | 1999-NIVA | EG W | | | | | | 341 | 0.05 | 222 | 18 | 8 |
| HCHA | 1990-NIVA | W | 340 | 1 | 168 | | | 341 | 0.05 | 58 | | |
| | 1991-NIVA | W | 340 | 1 | 179 | 2 | 111 | 341 | 0.05 | 62 | 5 | 10 |
| | 1992-NIVA | W | 340 | 5 | 192 | 3 | | 341 | 0.1 | 140 | | |
| | 1993-NIVA | W | 340 | 4 | 212 | 45 | 22 | 341 | 0.1 | 133 | | |
| | 1994-NIVA | 2Z W | 340 | 3 | 296 | 32 | 3 | 341 | 0.05 | 165 | 85 | |
| | 1995-NIVA | W | 340 | 3 | 318 | 45 | | 341 | 0.05 | 225 | 98 | |
| | 1996-NIVA | W | 340 | 3 | 332 | 111 | | 341 | 0.05 | 231 | 100 | |
| | 1997-NIVA | W | 340 | 0.5 | 260 | 2 | 10 | 341 | 0.05 | 221 | 20 | 11 |

| Tissue | | | | Fish liver | | | | | Fish fillet, Shrimp tail, Mussel, Other | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Contamin. | 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 |
| | 1998-NIVA | | W | 340 | 0.5 | 284 | 8 | 208 | 341 | 0.05 | 202 | 25 | 121 |
| | 1999-NIVA | | W | 340 | 0.5 | 245 | 17 | 75 | 341 | 0.05 | 222 | 23 | 147 |
| HCHG | 1986-NACE | | W | 510 | 30 | 56 | 1 | | | | | | |
| | 1986-SIIF | | W | | | | | | 111 | 3 | 21 | | |
| | 1987-NACE | | W | 510 | 40 | 53 | | | | | | | |
| | 1987-SIIF | | W | | | | | | 111 | 5 | 21 | | 1 |
| | 1988-NACE | | W | 510 | 40 | 61 | | | | | | | |
| | 1989-NACE | | W | 510 | 20 | 93 | | | | | | | |
| | 1989-SIIF | | W | | | | | | 111 | 50 | 36 | | |
| | 1990-NIVA | | W | 340 | 1 | 169 | 1 | 9 | 341 | 0.05 | 58 | | |
| | 1990-SIIF | | W | | | | | | 111 | 0.1 | 41 | | |
| | 1991-NIVA | | W | 340 | 1 | 179 | 3 | 18 | 341 | 0.05 | 62 | 5 | 1 |
| | 1991-SIIF | | W | | | | | | 111 | 0.3 | 35 | | |
| | 1992-NIVA | | W | 340 | 5 | 192 | 3 | | 341 | 0.1 | 140 | | |
| | 1993-NIVA | | W | 340 | 4 | 212 | 42 | 17 | 341 | 0.1 | 133 | | |
| | 1994-NIVA | 2Z | W | 340 | 3 | 300 | 24 | 1 | 341 | 0.05 | 165 | 46 | |
| | 1995-NIVA | | W | 340 | 3 | 313 | 31 | | 341 | 0.05 | 213 | 29 | |
| | 1996-NIVA | | W | 340 | 3 | 330 | 68 | | 341 | 0.05 | 220 | 8 | |
| | 1997-NIVA | | W | 340 | 2 | 260 | 47 | | | | | | |
| | 1997-NIVA | AJ | W | | | | | | 341 | 0.05 | 221 | 3 | 9 |
| | 1998-NIVA | | W | 340 | 2 | 284 | 25 | 63 | | | | | |
| | 1998-NIVA | AJ | W | | | | | | 341 | 0.05 | 203 | 10 | 23 |
| | 1999-NIVA | | W | 340 | 2 | 245 | 51 | 3 | 341 | 0.05 | 222 | 19 | 61 |
| HG | 1981-SIIF | 1E | W | 120 | 10 | 15 | | 1 | 120 | 10 | 35 | | |
| | 1982-SIIF | 1E | W | | | | | | 120 | 10 | 18 | | |
| | 1982-VETN | | W | 220 | 10 | 51 | | | 220 | 10 | 54 | | |
| | 1983-SIIF | 1E | W | | | | | | 120 | 10 | 17 | | |
| | 1983-VETN | 1Z | W | | | | | | 220 | 10 | 48 | | |
| | 1984-FIER | 1G | W | | | | | | 401 | 10 | 39 | | |
| | 1984-SIIF | 1G | W | | | | | | 120 | 10 | 27 | 6 | |
| | 1984-VETN | 1Z | W | | | | | | 220 | 10 | 66 | | |
| | 1985-SIIF | 1G | D | | | | | | 120 | 10 | 30 | | |
| | 1985-VETN | 1Z | W | | | | | | 220 | 10 | 90 | | |
| | 1986-NIVA | 1H | D | | | | | | 310 | 10 | 74 | | |
| | 1987-FIER | 1G | W | | | | | | 401 | 10 | 38 | | |
| | 1987-NIVA | 1H | D | | | | | | 310 | 10 | 93 | | 14 |
| | 1988-NIVA | 1H | D | | | | | | 310 | 10 | 116 | | |
| | 1989-NIVA | 1H | D | | | | | | 310 | 100 | 134 | | |
| | 1989-NIVA | 1H | W | | | | | | 310 | 10 | 36 | 5 | |
| | 1990-NIVA | 1H | W | | | | | | 310 | 10 | 266 | | |
| | 1991-NIVA | 1H | W | | | | | | 310 | 100a | 264 | 126 | |
| | 1992-NIVA | 1H | W | | | | | | 310 | 100a | 303 | 122 | |
| | 1993-NIVA | 1H | W | | | | | | 310 | 5 | 300 | | |
| | 1994-NIVA | 1Z | W | | | | | | 310 | 5 | 381 | | |
| | 1995-NIVA | | W | | | | | | 310 | 5 | 442 | 1 | |
| | 1996-NIVA | V1 | W | | | | | | 310 | 5 | 481 | | |
| | 1997-NIVA | AH | W | | | | | | 310 | 5 | 383 | | |
| | 1998-NIVA | | W | | | | | | 310 | 5 | 381 | 6 | |
| | 1999-NIVA | | W | 310 | 5 | 3 | | | | | | | |
| | 1999-NIVA | EF | W | | | | | | 310 | 5 | 382 | | |
| ICDP | 1992-NIVA | | W | 309 | 0.2 | 8 | | | 309 | 0.2 | 46 | | |
| | 1995-NIVA | | W | | | | | | 309 | 0.2 | 72 | | 29 |
| | 1996-NIVA | | W | | | | | | 309 | 0.2 | 65 | | 23 |
| | 1997-NIVA | | W | | | | | | 309 | 0.5 | 36 | | |
| | 1998-NIVA | | W | | | | | | 309 | 0.5 | 37 | 2 | |
| | 1999-NIVA | EK | W | | | | | | 309 | 0.5 | 34 | | |
| MBTIN | 1997-NIVA | | D | | | | | | 320 | 5 | 8 | | |
| | 1998-NIVA | | D | | | | | | 320 | 5 | 15 | | |

| Tissue | | | Fish liver | | | | | Fish fillet, Shrimp tail, Mussel, Other | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Contamin. | 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 |
| | 1999-NIVA | D | | | | | | 320 | 5 | 13 | | |
| MN | 1984-SIIF | W | | | | | | 132 | 40 | 27 | | |
| | 1985-SIIF | D | | | | | | 132 | 40 | 35 | | |
| MPTIN | 1997-NIVA | D | | | | | | 320 | 5 | 8 | | |
| | 1998-NIVA | D | | | | | | 320 | 5 | 15 | 9 | |
| | 1999-NIVA | D | | | | | | 320 | 5 | 13 | 13 | |
| NAP | 1992-NIVA | W | 309 | 0.2 | 8 | | | 309 | 0.2 | 46 | | |
| | 1995-NIVA | W | | | | | | 309 | 0.2 | 70 | | 21 |
| | 1996-NIVA | W | | | | | | 309 | 0.2 | 61 | | 11 |
| | 1997-NIVA | W | | | | | | 309 | 0.2 | 34 | | 1 |
| | 1998-NIVA | W | | | | | | 309 | 0.2 | 37 | | |
| | 1999-NIVA | W | | | | | | 309 | 0.2 | 34 | | 1 |
| NAP1M | 1992-NIVA | W | 309 | 0.2 | 8 | | | 309 | 0.2 | 46 | | |
| | 1995-NIVA | W | | | | | | 309 | 0.2 | 15 | | 13 |
| | 1997-NIVA | W | | | | | | 309 | 0.5 | 34 | | |
| | 1998-NIVA | W | | | | | | 309 | 0.5 | 37 | | |
| | 1999-NIVA | W | | | | | | 309 | 0.5 | 34 | | |
| NAP2M | 1992-NIVA | W | 309 | 0.2 | 8 | | | 309 | 0.2 | 46 | | |
| | 1995-NIVA | W | | | | | | 309 | 0.2 | 15 | | 13 |
| | 1997-NIVA | W | | | | | | 309 | 0.5 | 34 | | |
| | 1998-NIVA | W | | | | | | 309 | 0.5 | 37 | | |
| | 1999-NIVA | W | | | | | | 309 | 0.5 | 34 | | |
| NAPC1 | 1995-NIVA | W | | | | | | 309 | 0.2 | 55 | | 6 |
| | 1996-NIVA | W | | | | | | 309 | 0.2 | 61 | | |
| NAPC2 | 1995-NIVA | W | | | | | | 309 | 0.2 | 57 | | 6 |
| | 1996-NIVA | W | | | | | | 309 | 0.2 | 60 | | |
| NAPC3 | 1995-NIVA | W | | | | | | 309 | 0.2 | 57 | | 5 |
| | 1996-NIVA | W | | | | | | 309 | 0.2 | 60 | | |
| NAPD2 | 1997-NIVA | W | | | | | | 309 | 0.5 | 34 | | |
| | 1998-NIVA | W | | | | | | 309 | 0.5 | 39 | | |
| | 1999-NIVA | W | | | | | | 309 | 0.5 | 34 | | |
| NAPD3 | 1997-NIVA | W | | | | | | 309 | 0.5 | 34 | | |
| | 1998-NIVA | W | | | | | | 309 | 0.5 | 39 | | |
| | 1999-NIVA | W | | | | | | 309 | 0.5 | 34 | | |
| NAPDI | 1992-NIVA | W | 309 | 0.2 | 8 | | | 309 | 0.2 | 46 | | |
| | 1995-NIVA | W | | | | | | 309 | 0.2 | 15 | | 6 |
| | 1997-NIVA | W | | | | | | 309 | 0.5 | 34 | | |
| | 1998-NIVA | W | | | | | | 309 | 0.5 | 39 | | |
| | 1999-NIVA | W | | | | | | 309 | 0.5 | 34 | | |
| NAPT2 | 1997-NIVA | W | | | | | | 309 | 0.5 | 34 | | |
| | 1998-NIVA | W | | | | | | 309 | 0.5 | 39 | | |
| | 1999-NIVA | W | | | | | | 309 | 0.5 | 34 | | |
| NAPT3 | 1997-NIVA | W | | | | | | 309 | 0.5 | 34 | | |
| | 1998-NIVA | W | | | | | | 309 | 0.5 | 39 | | |
| | 1999-NIVA | W | | | | | | 309 | 0.5 | 34 | | |
| NAPT4 | 1997-NIVA | W | | | | | | 309 | 0.5 | 34 | | |
| | 1998-NIVA | W | | | | | | 309 | 0.5 | 39 | | |
| | 1999-NIVA | W | | | | | | 309 | 0.5 | 34 | | |
| NAPTM | 1992-NIVA | W | 309 | 0.2 | 8 | | | 309 | 0.2 | 46 | | |
| | 1995-NIVA | W | | | | | | 309 | 0.2 | 15 | | 11 |
| | 1997-NIVA | W | | | | | | 309 | 0.5 | 34 | | |
| | 1998-NIVA | W | | | | | | 309 | 0.5 | 39 | | |
| | 1999-NIVA | W | | | | | | 309 | 0.5 | 34 | | |
| NI | 1983-SIIF | 1G W | | | | | | 130 | 20 | 12 | | |
| | 1992-NIVA | W | | | | | | 312 | 10 | 6 | | |
| | 1996-NIVA | W | | | | | | 999 | miss | 3 | | |
| OCS | 1990-NIVA | W | 340 | 2 | 169 | 31 | 24 | 341 | 0.05 | 58 | | 1 |

| Tissue | | | | Fish liver | | | | | Fish fillet, Shrimp tail, Mussel, Other | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Contamin. | 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 |
| | 1991-NIVA | | W | 340 | 2 | 179 | 14 | 81 | 341 | 0.05 | 62 | 5 | 8 |
| | 1992-NIVA | | W | 340 | 5 | 192 | 3 | | 341 | 0.1 | 140 | | |
| | 1993-NIVA | | W | 340 | 4 | 212 | 51 | 16 | 341 | 0.1 | 133 | | |
| | 1994-NIVA | | W | 340 | 3 | 300 | 39 | 22 | 341 | 0.05 | 165 | 96 | |
| | 1995-NIVA | | W | 340 | 3 | 318 | 44 | | 341 | 0.05 | 225 | 102 | |
| | 1996-NIVA | | W | 340 | 3 | 332 | 287 | | 341 | 0.05 | 237 | 114 | |
| | 1997-NIVA | | W | 340 | 2 | 260 | 100 | | 341 | 0.05 | 221 | 30 | 14 |
| | 1998-NIVA | | W | 340 | 2 | 277 | 132 | 101 | 341 | 0.05 | 203 | 182 | 1 |
| | 1999-NIVA | | W | 340 | 2 | 245 | 144 | 2 | 341 | 0.05 | 222 | 80 | 23 |
| PA | 1992-NIVA | | W | 309 | 0.2 | 8 | | | 309 | 0.2 | 45 | | |
| | 1995-NIVA | | W | | | | | | 309 | 0.2 | 72 | | |
| | 1996-NIVA | | W | | | | | | 309 | 0.2 | 65 | | |
| | 1997-NIVA | AL | W | | | | | | 309 | 0.2 | 36 | | |
| | 1998-NIVA | | W | | | | | | 309 | 0.2 | 39 | | |
| | 1999-NIVA | EK | W | | | | | | 309 | 0.2 | 34 | | |
| PAC1 | 1995-NIVA | | W | | | | | | 309 | 0.2 | 57 | | 1 |
| | 1996-NIVA | | W | | | | | | 309 | 0.2 | 65 | | |
| PAC2 | 1995-NIVA | | W | | | | | | 309 | 0.2 | 56 | | |
| | 1996-NIVA | | W | | | | | | 309 | 0.2 | 65 | | 2 |
| PAD10 | 1999-NIVA | | W | | | | | | 309 | 0.2 | 34 | | 21 |
| PAD36 | 1999-NIVA | | W | | | | | | 309 | 0.2 | 34 | | 3 |
| PAH | 1987-NIVA | | W | 309 | 0.02 | 1 | | | | | | | |
| PAM1 | 1992-NIVA | | W | 309 | 0.2 | 8 | | | 309 | 0.2 | 45 | | |
| | 1995-NIVA | | W | | | | | | 309 | 0.2 | 15 | | 2 |
| | 1997-NIVA | | W | | | | | | 309 | 0.5 | 36 | | |
| | 1998-NIVA | | W | | | | | | 309 | 0.5 | 39 | | |
| | 1999-NIVA | | W | | | | | | 309 | 0.5 | 34 | | |
| PAM2 | 1997-NIVA | | W | | | | | | 309 | 0.5 | 36 | | |
| | 1998-NIVA | | W | | | | | | 309 | 0.5 | 39 | | |
| | 1999-NIVA | | W | | | | | | 309 | 0.5 | 34 | | |
| PAMD1 | 1997-NIVA | | W | | | | | | 309 | 0.5 | 36 | | |
| | 1998-NIVA | | W | | | | | | 309 | 0.5 | 39 | | |
| PAMD2 | 1997-NIVA | | W | | | | | | 309 | 0.5 | 36 | | |
| | 1998-NIVA | | W | | | | | | 309 | 0.5 | 39 | | |
| PB | 1983-SIIF | 1G | W | | | | | | 130 | 20 | 12 | | |
| | 1984-SIIF | 1G | W | | | | | | 130 | 20 | 27 | | 2 |
| | 1985-SIIF | 1G | D | | | | | | 130 | 20 | 35 | | |
| | 1986-NIVA | 1Z | D | 312 | 150 | 56 | 4 | | 312 | 150 | 20 | | |
| | 1987-FIER | 1G | W | 403 | 10 | 37 | 1 | | | | | | |
| | 1987-NIVA | 1Z | D | 312 | 150 | 57 | | 12 | 312 | 150 | 37 | | |
| | 1988-NIVA | 1Z | D | 312 | 150 | 61 | 17 | 3 | 312 | 150 | 55 | | |
| | 1989-NIVA | 1Z | D | 312 | 150 | 135 | 9 | 9 | | | | | |
| | 1989-NIVA | 1Z | W | | | | | | 312 | 150 | 36 | | |
| | 1990-NIVA | 1Z | W | 312 | 50 | 187 | 3 | 1 | 312 | 150 | 77 | 3 | |
| | 1991-NIVA | 1Z | W | 312 | 50 | 193 | 14 | | 312 | 50 | 67 | | |
| | 1992-NIVA | 1Z | W | 312 | 50 | 191 | 119 | | 312 | 50 | 111 | 2 | |
| | 1993-NIVA | 1H | W | 312 | 30 | 221 | 40 | | 312 | 30 | 79 | | |
| | 1994-NIVA | 1Z | W | 312 | 30 | 302 | 3 | | 312 | 30 | 81 | | |
| | 1995-NIVA | | W | 312 | 30 | 318 | 162 | 30 | 312 | 30 | 124 | | |
| | 1996-NIVA | V1 | W | | | | | | 312 | 30 | 110 | | |
| | 1996-NIVA | V2 | W | 312 | 30 | 368 | | 109 | | | | | |
| | 1997-NIVA | | W | 312 | 40 | 287 | 10 | 28 | 312 | 40 | 92 | | |
| | 1998-NIVA | | W | 312 | 40 | 285 | 126 | 2 | 312 | 40 | 90 | | |
| | 1999-NIVA | | W | 312 | 40 | 233 | 118 | 11 | | | | | |
| | 1999-NIVA | EF | W | | | | | | 312 | 40 | 129 | 10 | |
| PCB | 1981-SIIF | 2D | W | 110 | 10 | 27 | | | 110 | 10 | 35 | | |
| | 1982-SIIF | 2D | W | | | | | | 111 | 5 | 17 | | |
| | 1982-VETN | | W | 210 | 50 | 53 | | | 211 | 50 | 54 | | |

| Tissue | | | | Fish liver | | | | | Fish fillet, Shrimp tail, Mussel, Other | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Contamin. | 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-SIIF | 2E | W | | | | | | 111 | 5 | 14 | | |
| | 1983-VETN | 2E | W | | | | | | 211 | 50 | 48 | | |
| | 1983-VETN | 2Z | W | 210 | 50 | 48 | | | | | | | |
| | 1984-SIIF | 2E | W | | | | | | 111 | 5 | 24 | | |
| | 1984-VETN | 2E | W | | | | | | 211 | 50 | 66 | | |
| | 1984-VETN | 2Z | W | 210 | 50 | 66 | | | | | | | |
| | 1985-SIIF | 2E | W | | | | | | 111 | 5 | 32 | | 6 |
| | 1985-VETN | 2E | W | | | | | | 211 | 50 | 90 | | 1 |
| | 1985-VETN | 2Z | W | 210 | 50 | 45 | | | | | | | |
| | 1986-NACE | 2Z | W | 511a | 40a | 56 | | | 511 | 20 | 56 | | |
| | 1986-SIIF | 2E | W | | | | | | 111 | 5 | 21 | | |
| | 1987-NACE | 2Z | W | 510 | 40 | 53 | | | 511 | 20 | 54 | | |
| | 1987-NIVA | | W | 340 | 0.1 | 2 | | | | | | | |
| | 1987-SIIF | 2E | W | | | | | | 111 | 5 | 21 | | |
| | 1988-NACE | 2Z | W | 510 | 40 | 61 | | | 511 | 20 | 13 | | |
| | 1988-SIIF | 2E | D | | | | | | 111 | 5 | 6 | | |
| | 1988-SIIF | 2E | W | | | | | | 111 | 5 | 22 | 4 | |
| | 1989-NACE | 2Z | W | 510 | 20 | 93 | | | 511 | 20 | 17 | | |
| | 1989-SIIF | 2E | W | | | | | | 111 | 5 | 36 | 6 | |
| | 1990-SIIF | 2E | W | | | | | | 111 | 5 | 41 | | |
| | 1991-SIIF | 2E | W | | | | | | 111 | 5 | 35 | | |
| PCC26 | 1996-NILU | | W | | | | | | 842 | 0.001 | 6 | | |
| PCC32 | 1996-NILU | | W | | | | | | 842 | 0.003 | 6 | | 4 |
| PCC50 | 1996-NILU | | W | | | | | | 842 | 0.001 | 6 | | |
| PCC62 | 1996-NILU | | W | | | | | | 842 | 0.025 | 6 | | 6 |
| PCDD | 1995-NILU | | W | | | | | | 841 | 2E-05 | 6 | | |
| | 1996-NILU | | W | | | | | | 841 | 1E-04 | 18 | | |
| PCDF | 1995-NILU | | W | | | | | | 841 | 2E-05 | 6 | | |
| | 1996-NILU | | W | | | | | | 841 | 1E-04 | 18 | | |
| PER | 1992-NIVA | | W | 309 | 0.2 | 8 | | | 309 | 0.2 | 46 | | |
| | 1995-NIVA | | W | | | | | | 309 | 0.2 | 72 | | 32 |
| | 1996-NIVA | | W | | | | | | 309 | 0.2 | 65 | | 40 |
| | 1997-NIVA | | W | | | | | | 309 | 0.5 | 36 | | |
| | 1998-NIVA | | W | | | | | | 309 | 0.5 | 39 | | |
| | 1999-NIVA | EK | W | | | | | | 309 | 0.5 | 34 | | |
| PYR | 1992-NIVA | | W | 309 | 0.2 | 8 | | | 309 | 0.2 | 44 | | |
| | 1995-NIVA | | W | | | | | | 309 | 0.2 | 72 | | 4 |
| | 1996-NIVA | | W | | | | | | 309 | 0.2 | 65 | | 1 |
| | 1997-NIVA | AL | W | | | | | | 309 | 0.2 | 36 | | |
| | 1998-NIVA | | W | | | | | | 309 | 0.2 | 39 | | |
| | 1999-NIVA | EK | W | | | | | | 309 | 0.2 | 34 | | |
| QCB | 1990-NIVA | | W | 340 | 2 | 169 | 33 | 39 | 341 | 0.05 | 58 | | |
| | 1991-NIVA | | W | 340 | 2 | 178 | 13 | 97 | 341 | 0.05 | 57 | 5 | 7 |
| | 1992-NIVA | | W | 340 | 5 | 192 | 3 | | 341 | 0.1 | 125 | | |
| | 1993-NIVA | | W | 340 | 4 | 212 | 52 | 24 | 341 | 0.1 | 133 | | |
| | 1994-NIVA | | W | 340 | 3 | 299 | 38 | 23 | 341 | 0.05 | 165 | 93 | |
| | 1995-NIVA | | W | 340 | 3 | 318 | 45 | | 341 | 0.05 | 225 | 103 | |
| | 1996-NIVA | | W | 340 | 3 | 332 | 306 | | 341 | 0.05 | 237 | 109 | |
| | 1997-NIVA | | W | 340 | 2 | 260 | 79 | | 341 | 0.05 | 221 | 27 | 10 |
| | 1998-NIVA | | W | 340 | 2 | 284 | 121 | 101 | 341 | 0.05 | 203 | 171 | 1 |
| | 1999-NIVA | | W | 340 | 2 | 238 | 181 | 2 | 341 | 0.05 | 222 | 81 | 14 |
| SE | 1982-VETN | | W | 240 | 10 | 46 | | | 240 | 10 | 54 | | |
| TBTIN | 1997-NIVA | | D | | | | | | 320 | 5 | 8 | | |
| | 1998-NIVA | | D | | | | | | 320 | 5 | 15 | | |
| | 1999-NIVA | | D | | | | | | 320 | 5 | 13 | | |
| TCDD | 1995-NILU | | W | | | | | | 841 | 2E-05 | 6 | 1 | |
| | 1996-NILU | | W | | | | | | 841 | 1E-05 | 18 | | |

| Tissue | | | | Fish liver | | | | | Fish fillet, Shrimp tail, Mussel, Other | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Contamin. | 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 |
| TDEPP | 1991-NIVA | | W | 340 | 1 | 138 | | 1 | 341 | 0.05 | 62 | | |
| | 1992-NIVA | | W | 340 | 5 | 191 | 3 | | 341 | 0.1 | 140 | | |
| | 1993-NIVA | | W | 340 | 4 | 212 | 24 | 3 | 341 | 0.1 | 133 | | |
| | 1994-NIVA | 2Z | W | 340 | 3 | 300 | 17 | 5 | 341 | 0.05 | 165 | 47 | |
| | 1995-NIVA | | W | 340 | 3 | 318 | 36 | | 341 | 0.05 | 222 | 51 | |
| | 1996-NIVA | | W | 340 | 3 | 332 | 23 | | 341 | 0.05 | 237 | 16 | |
| | 1997-NIVA | | W | 340 | 3 | 260 | 23 | | | | | | |
| | 1997-NIVA | AJ | W | | | | | | 341 | 0.05 | 221 | 11 | |
| | 1998-NIVA | | W | 340 | 3 | 278 | 19 | 26 | 341 | 0.05 | 203 | 1 | 44 |
| | 1999-NIVA | | W | 340 | 3 | 245 | 5 | 1 | | | | | |
| | 1999-NIVA | EG | W | | | | | | 341 | 0.05 | 222 | 2 | 69 |
| TPTIN | 1997-NIVA | | D | | | | | | 320 | 5 | 8 | | |
| | 1998-NIVA | | D | | | | | | 320 | 5 | 15 | | 5 |
| | 1999-NIVA | | D | | | | | | 320 | 5 | 13 | | |
| V | 1996-NIVA | | W | | | | | | 999 | miss | 3 | | |
| ZN | 1983-SIIF | 1G | W | | | | | | 131 | 400 | 12 | | |
| | 1984-SIIF | 1G | W | | | | | | 132 | 400 | 27 | | |
| | 1985-SIIF | 1G | D | | | | | | 132 | 400 | 35 | | |
| | 1986-NIVA | 1H | D | 311 | 3000 | 56 | | | 311 | 3000 | 20 | | |
| | 1987-FIER | 1G | W | 405 | 20 | 37 | | | | | | | |
| | 1987-NIVA | 1H | D | 311 | 3000 | 57 | | | 311 | 3000 | 37 | | |
| | 1988-NIVA | 1H | D | 311 | 3000 | 61 | | | 311 | 3000 | 55 | | |
| | 1989-NIVA | 1H | D | 311 | 3000 | 135 | | 1 | | | | | |
| | 1989-NIVA | 1H | W | | | | | | 311 | 3000 | 36 | | |
| | 1990-NIVA | 1H | W | 311 | 3000 | 189 | | | 311 | 3000 | 77 | | |
| | 1991-NIVA | 1H | W | 311 | 1000 | 193 | | | 311 | 1000 | 67 | | |
| | 1992-NIVA | 1H | W | 311 | 1000 | 191 | | | 311 | 1000 | 111 | | |
| | 1993-NIVA | 1H | W | 311 | 1000 | 221 | | | 311 | 1000 | 79 | | |
| | 1994-NIVA | 1Z | W | 311 | 1000 | 302 | | | 311 | 1000 | 81 | | |
| | 1995-NIVA | | W | 311 | 1000 | 318 | | | 311 | 1000 | 142 | | |
| | 1996-NIVA | V1 | W | | | | | | 311 | 1000 | 131 | | |
| | 1996-NIVA | V2 | W | 311 | 1000 | 368 | | | | | | | |
| | 1997-NIVA | | W | 311 | 1000 | 287 | | | | | | | |
| | 1997-NIVA | AH | W | | | | | | 311 | 1000 | 110 | | |
| | 1998-NIVA | | W | 311 | 1000 | 285 | | | 311 | 1000 | 51 | | |
| | 1999-NIVA | | W | 311 | 1000 | 233 | | | | | | | |
| | 1999-NIVA | EF | W | | | | | | 311 | 1000 | 99 | | |
| Sum of counts | | | | | | 57072 | 6470 | 2083 | | | 49497 | 4057 | 2563 |

a(7) > ambigous value (Maximum value displayed)

# Appendix E.
# Overview of localities

**Station positions are shown on maps in Appendix F. .**

# JAMP stations and programme 1999

**Appendix E. 1.** JAMP station positions and sampling overview for 1999. 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 | 1999 | | | | | | notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | W | S | B | O | F | R | |
| **26 OSLOFJORD AREA EAST, Hvaler and Singlefjorden** | | | | | | | | | | | | |
| 26 | 01A | Sponvika | 59°05.4' | 11°12.5' | 47G13 | | | | | | | |
| | | | 59°05.1' | 11°13.9' | 47G13 | | | | | | | |
| 26 | 02A | Fugleskjær | 59°06.6' | 10°59.3' | 47G09 | | | | | | | |
| | | | 59°06.9' | 10°59.0' | 47G09 | | | | | | | |
| 26 | 03A | Tisler | 58°59.0' | 10°57.8' | 46G07 | | | | | | | C |
| | | | 58°58.8' | 10°57.5' | 46G07 | | | | | | | |
| **26 OSLOFJORD AREA CENTRAL, Oslofjord proper** | | | | | | | | | | | | |
| 26 | 30A | Gressholmen | 59°52.8' | 10°43.0' | 48G07 | + | | + | | | | |
| 26 | 30A | Gressholmen (- 1996) | 59°52.5' | 10°43.0' | 48G07 | | | | | | | |
| 26 | 30B | Oslo city area / Håøya | 59°49' | 10°33' | 48G04 | | | | | | | |
| | | | 59°44' | 10°32' | 48G04 | | | | | | + | |
| 26 | 30B | Oslo city area / Nesodden | 59°52' | 10°39' | 48G04 | | | | | | | |
| 26 | 30F | Oslo city area / Håøya | 59°47' | 10°34' | 48G04 | | | | | | | |
| 26 | 30X | West of Nesodden | 59°48.5' | 10°36' | 48G04 | | | | | | | |
| 26 | 30G | Steilene area (Spro) | 59°45.8' | 10°34.5' | 48G05 | | | | | | | |
| 26 | 30H | Steilene area (Storegrunn) | 59°48.5' | 10°33.5' | 48G05 | | | | | | | |
| 26 | 40C | Steilene | 59°49' | 10°33' | 48G05 | | | | | | | |
| | | | 59°49' | 10°39' | 48G05 | | | | | | | |
| 26 | 30S | Steilene | 59°49.1' | 10°33.8' | 48G05 | | | | | | | |
| 26 | 31A | Solbergstrand | 59°36.9' | 10°39.4' | 48G06 | + | | + | | | | |
| 26 | 31B | Solbergstrand (Filtvet, 1982) | 59°37' | 10°39' | 47G07 | | | | | | | |
| 26 | 32A | Rødtangen | 59°31.5' | 10°25.6' | 48G06 | | | | | | | |
| 26 | 33X | Sande, west side | 59°31.7' | 10°20.4' | 48G06 | | | | | | | |
| 26 | 33B | Sande, east side | 59°31.7' | 10°21.0' | 48G06 | | | | | + | | |
| 26 | 35A | Mølen | 59°29.2' | 10°30.1' | 47G04 | + | | + | | | | |
| 26 | 35C | Holmenstrand-Mølen | 59°29' | 10°27' | 47G04 | | | | | | | |
| 26 | 35S | Mølen | 59°30' | 10°35' | 47G04 | | | | | | | |
| 26 | 36A | Færder | 59°01.6' | 10°31.7' | 47G06 | + | | + | | | | |
| 26 | 36B | Færder area | 59°02' | 10°27' | 47G06 | | | | | | | |
| | | | 59°02' | 10°32' | 47G06 | | | | | | + | |
| 26 | 36F | Færder area | 59°04' | 10°23' | 47G06 | | | | | + | | |
| 26 | 36S | Færder area (NSTF-54) | 59°00.4' | 10°41.6' | 47G09 | | | | | | | N |
| **26 OSLOFJORD AREA WEST, outer Sandefjord-Langesundsfjord** | | | | | | | | | | | | |
| 26 | 73A | Lyngholmen | 59°02.6' | 10°18.1' | 47G03 | | | | | | | C |
| 26 | 74A | Oddeneskjær | 58°57.3' | 09°52.1' | 46F97 | | | | | | | C |
| 26 | 71A | Bjørkøya (Risøyodden) | 59°01.4' | 09°45.4' | 47F99 | + | | + | | | | |
| **ARENDAL AREA** | | | | | | | | | | | | |
| | 76A | Risøy | 58°43.6' | 09°17.0' | 46F92 | + | | + | | | | C |
| | 77A | Flostafjord | 58°31.5' | 08°56.9' | 46F89 | | | | | | | C |
| | 77B | Borøy area | 58°33' | 09°01' | 46F93 | | | | | | | |
| | 77F | Borøy area | 58°33' | 09°01' | 46F93 | | | | | | | |
| | 77C | Borøy area | 58°29' | 09°10' | 45F91 | | | | | | | |

**Appendix E. (cont'd)**

| JAMP area | St. | Locality name | North latitude | East longitude | ICES position | 1999 | | | | | | notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | W | S | B | O | F | R | |
| **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** | | | | | | | | | | | | |
| | 224G | Heggjelen | 59°25.2' | 05°13.90' | 47F51 | | | | + | | | |
| | 226A | Karmsund bridge (east) | 59°22.6' | 05°17.91' | 47F51 | | | + | | | | |
| | 226G | Karmsund bridge (east) | 59°22.6' | 05°17.91' | 47F51 | | | | + | | | |
| | 227A | Melandholmen | 59°20.0' | 05°18.90' | 47F51 | | | + | | | | |
| | 227G | Melandholmen | 59°20.0' | 05°18.90' | 47F51 | | | | + | | | |
| | 220G | Smørstakk | 59°15.2' | 05°21.14' | 47F55 | | | | + | | | |
| | 221A | Stangeland | 59°16.6' | 05°19.70' | 47F52 | | | + | | | | |
| | 221G | Stangeland | 59°16.6' | 05°19.70' | 47F52 | | | | + | | | |
| | 22A | Espevær, west | 59°35.2' | 05°00.5' | 48F59 | + | | + | | | | C, 1 |
| | 22F | Borøyfjorden | 59°43' | 05°21' | 48F55 | | | | | + | | |
| | 22C | Bømlofjorden | 59°34' | 05°11' | 48F53 | | | | | | | |
| | 22S | Bømlo (NSTF-36) | 59°25.9' | 04°50.2' | 47F47 | | | | | | | N |
| | 23A | Austvik | 59°52.2' | 05°06.6' | 48F51 | | | | | | | |
| | 23B | Karihavet area | 59°55' | 05°07' | 48F51 | | | | | | + | |
| | 24A | Vardøy | 60°10.2' | 05°00.8' | 49F52 | | | | | | | C |
| | 24S | Sotra | 60°15.1' | 04°33.3' | 49F45 | | | | | | | N |
| **62 HARDANGERFJORDEN** | | | | | | | | | | | | |
| 62 | 69A | Lille Terøy | 59°58.8' | 05°45.4' | 49F59 | + | | + | | | | |
| 62 | 69S | Kvinnheradsfjorden | 60°01.3' | 05°56.1' | 49F59 | | | | | | | |
| 62 | 67B | Strandebarm | 60°16' | 06°02' | 49F62 | | | | | + | + | |
| 62 | 67S | Strandebarm | 60°13.5' | 06°05.1' | 49F62 | | | | | | | |
| 62 | 65A | Vikingneset | 60°14.5' | 06°09.6' | 49F62 | + | | + | | | | |
| 62 | 63A | Ranaskjær | 60°25.1' | 06°24.5' | 49F64 | + | | + | | | | |
| 62 | 63S | Ranaskjær | 60°23.6' | 06°27.1' | 49F64 | | | | | | | |
| **63 SØRFJORD** | | | | | | | | | | | | |
| 63 | 51A | Byrkjenes | 60°05.1' | 06°33.1' | 49F66 | | | | | | | |
| 63 | 52A | Eitrheimsneset | 60°05.8' | 06°32.2' | 49F66 | + | | + | | | | 3 |
| 63 | 52S | Tyssedal | 60°06.9' | 06°32.9' | 49F66 | | | | | | | |
| 63 | 53B | Inner Sørfjord | 60°10' | 06°34' | 49F65 | | | | | + | + | |
| 63 | 56A | Kvalnes | 60°13.4' | 06°36.1' | 49F65 | + | | + | | | | |
| 63 | 56S | Kvalnes | 60°13.7' | 06°35.6' | 49F65 | | | | | | | |
| 63 | 57A | Krossanes | 60°23.2' | 06°41.2' | 49F67 | + | | + | | | | |
| 63 | 57S | Krossanes | 60°23.1' | 06°40.7' | 49F67 | | | | | | | |
| | 56A-1 | Kvalnes, north | 60°13.6' | 06°36.45' | 49F66 | | | + | | | | 8 |
| | 56A-2 | Kjeken at Helland | 60°20.58' | 06°39.50' | 49F66 | | | + | | | | 8 |
| | 57A-1 | Urdhem | 60°22.17' | 06°40.65' | 49F66 | | | + | | | | 8 |
| **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 | 1999 W | S | B | O | F | R | notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **65 ORKDALSFJORDEN** | | | | | | | | | | | | |
| 65 | 80A | Østmerknes | 63°27.5' | 10°27.5' | 56G04 | | | | | | | |
| 65 | 81A | Biologisk station | 63°26.5' | 10°21.4' | 56G04 | | | | | | | |
| 65 | 82A | Flakk | 63°27.1' | 10°12.6' | 56G01 | | | | | | | |
| 65 | 82S | Flakk | 63°27.5' | 10°11.8' | 56G01 | | | | | | | |
| 65 | 83A | Frøsetskjær | 63°25.5' | 10°07.8' | 56G01 | | | | | | | |
| 65 | 84A | Trossavika | 63°20.8' | 09°57.8' | 55F97 | | | | | | | |
| 65 | 84B | Trossavika | 63°20.8' | 09°57.8' | 55F97 | | | | | | | |
| 65 | 84S | Trossavika | 63°21.7' | 09°57.4' | 55F97 | | | | | | | |
| | | (1987) | 63°21.2' | 09°57.2' | 55F97 | | | | | | | |
| 65 | 89S | Thamshavn (indre Orkdal) | 63°19.7' | 09°52.3' | 55F98 | | | | | | | |
| | | (1987) | 63°19.8' | 09°52.5' | 55F98 | | | | | | | |
| 65 | 90S | Outer Orkdalsfjord | 63°27.4' | 10°03.0' | 56G01 | | | | | | | |
| | | (1987) | 63°27.4' | 10°04.3' | 56G01 | | | | | | | |
| 65 | 85A | Geitastrand | 63°21.9' | 09°56.3' | 55F97 | | | | | | | |
| 65 | 86A | Geitnes | 63°26.6' | 09°59.2' | 55F97 | | | | | | | |
| 65 | 87A | Ingdalsbukt | 63°27.8' | 09°54.8' | 55F97 | | | | | | | |
| 65 | 88A | Rødberg | 63°27.2' | 10°00.0' | 55G01 | | | | | | | |
| **FROAN AREA** | | | | | | | | | | | | |
| | 91A | Nerdvika | 63°21.2' | 08°09.6' | 55F81 | | | | | | | 3 |
| | | Fosflua (1992) | 63°23.8' | 08°17.6' | 55F81 | | | | | | | 4 |
| | 92A | Stokken | 64°02.2' | 10°01.1' | 57G03 | | | | | | | 5 |
| | | (-1996) | 64°04.6' | 10°00.7' | 57G03 | | | | | | | 4 |
| | 92B | Stokken area | 64°09.9' | 09°53.0' | 57F99 | | | | | | | |
| | 92F | Stokken area | 64°09.9' | 09°53.0' | 57F99 | | | | | | | |
| | 93S | Raudøya (northeast of) | 64°22.7' | 10°27.8' | 57G04 | | | | | | | |
| | 93A | Låven (Sætervik) | 64°23.7' | 10°29.0' | 57G04 | | | | | | | 4 |
| | | Låven (Sætervik, 1992)) | 64°23.5' | 10°28.0' | 57G04 | | | | | | | 4 |
| **HELGELAND AREA** | | | | | | | | | | | | |
| | 94A | Landfast | 65°38.4' | 12°00.5' | 60G23 | | | | | | | 1 |
| | 96A | Breiviken | 66°17.6' | 12°50.5' | 61G28 | | | | | | | 1 |
| | 95S | Rodø (east of) | 66°41.8' | 13°09.9' | 62G32 | | | | | | | |
| | 95A | Flatskjær | 66°42.6' | 13°15.8' | 62G32 | | | | | | | 4 |
| **LOFOTEN AREA** | | | | | | | | | | | | |
| | 97A | Klakholmen | 67°39.9' | 14°44.6' | 64G49 | | | | | | | 4 |
| | 99A | Brunvær | 68°00.3' | 15°05.6' | 65G53 | | | | | | | 4 |
| | 98B | Lille Molla | 68°12.0' | 14°48.0' | 65G48 | | | | | | + | |
| | 98F | Lille Molla | 68°12.0' | 14°48.0' | 65G48 | | | | | + | | |
| | 98S | Skrova (south of) | 68°07.0' | 14°41.0' | 65G49 | | | | | | | |
| | 98A | Husvågen (1997) | 68°15.4' | 14°40.6' | 65G46 | + | | + | | | | 5 |
| | | (1992) | 68°09.4' | 14°39.3' | 65G46 | | | | | | | 1 |
| | 98X | Skrova | 68°10.5' | 14°40.2' | 65G48 | | | | | | | 7 |
| | 99S | Lundøy (north of) | 68°05.8' | 15°10.1' | 65G53 | | | | | | | |

**Appendix E. (cont'd)**

| JAMP | St. | Locality name | North | East | ICES | 1999 | | | | | | notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| area | | | latitude | longitude | position | W | S | B | O | F | R | |
| **FINNSNES-SKJERVØY AREA** | | | | | | | | | | | | |
| | 41S | Andfjord | 68°56.3' | 17°05.2' | 66G71 | | | | | | | |
| | 41A | Fensneset, Grytøya | 68°56.9' | 16°38.5' | 66G64 | | | | | | | 3 |
| | 42S | Tromsø area | 69°60.4' | 18°06.8' | 68G83 | | | | | | | |
| | 42A | Tennskjær, Malangen | 69°28.6' | 18°18.0' | 67G81 | | | | | | | 3 |
| | 43S | Kvænangen | 70°03.3' | 21°07.9' | 69H13 | | | | | | | |
| | 43A | Lyngneset, Langjforden | 70°06.2' | 20°32.8' | 69H06 | | | | | | | 2 |
| | 43B | Kvænangen | 70°09.0' | 21°22.0' | 69H16 | | | | | | | |
| | 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 | Skagodden | 70°04.2' | 30°09.8' | 69J03 | + | | + | | | | 2 |
| | 10B | Varangerfjorden | 69°54.5' | 29°30.0' | 68H97 | | | | | | + | |
| | 10F | Varangerfjorden | 69°55.0' | 29°51.5' | 68H97 | | | | | * | | |
| | 11A | Sildkroneset, Bøkfjorden | 69°47.2' | 30°11.1' | 68J02 | | | | | | | |
| | 11X | Brashavn | 69°53.9' | 29°44.7' | 68J02 | + | | + | | | | 4 |

notes:

+ - samples collected
* - planned but innsufficient material
**x** - collected but not analysed
N - official NSTF station
C - at or near SFT's coastal monitoring programme station
1 - mussels collected from buoy and/or buoy anchor lines
2 - mussels collected from sand/gravel bottom
3 - mussels collected from iron/cement pilings
4 - mussels collected from metal navigation buoys
5 - mussels collected from floating dock
6 - mussels collected from wooden docks
7 - mussels collected from rocks under ferry terminal
8- extra sample frozen directly without depuration prior to cleaning (se section 2.1.4)

# Appendix F.
# Map of stations

**Station positions 1981-1999**
**(cf. Appendix G. and Appendix J. )**

# Appendix F. (cont.) Map of stations

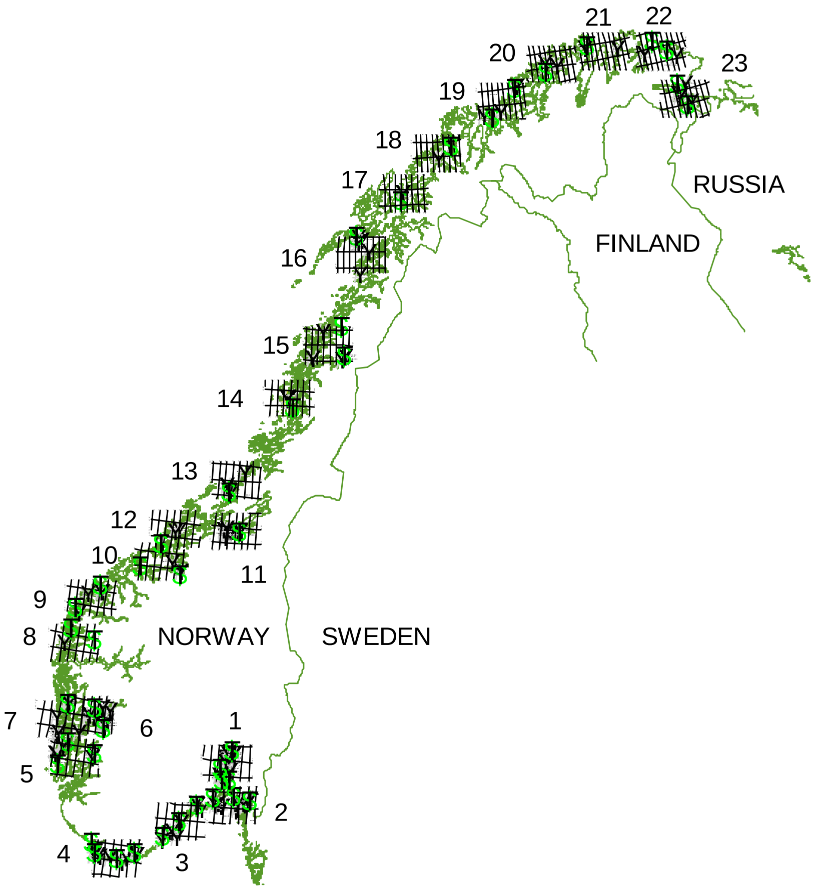
## NOTES

For a few station the positions of sampling has varied in order to collect sufficient material (e.g., st. 36B and 98A) or investigate local geographical variations (e.g., in the inner Oslofjord and Sørfjord). Hence, the same station name may appear more than once on a map.

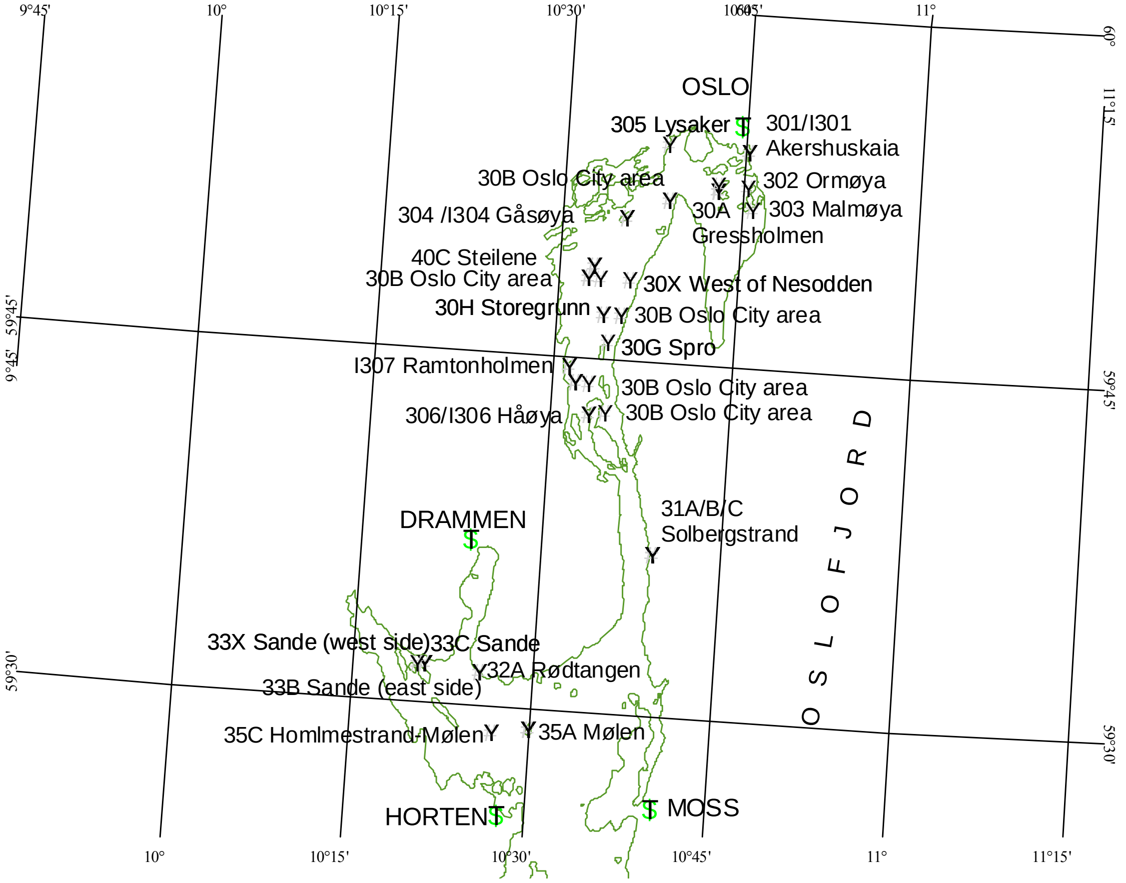
The letter A following the station identification number indicates that blue mussels were sampled. The letter B indicates sampling for cod and the letter F indicates sampling for flatfish. This system for fish is not consistent for some older stations (30, 33, 52 and 67) where only the letter B is used indicating that either cod or flatfish or both were sampled.

The letter "I" preceding the station identification number indicates an INDEX station for evaluating a "pollution" index. The letter R indicates a station for evaluating a "reference" index. Only blue mussels are used for these indices. The indices are based on a selection of JAMP and INDEX stations (cf. Green *et al.* 2000).

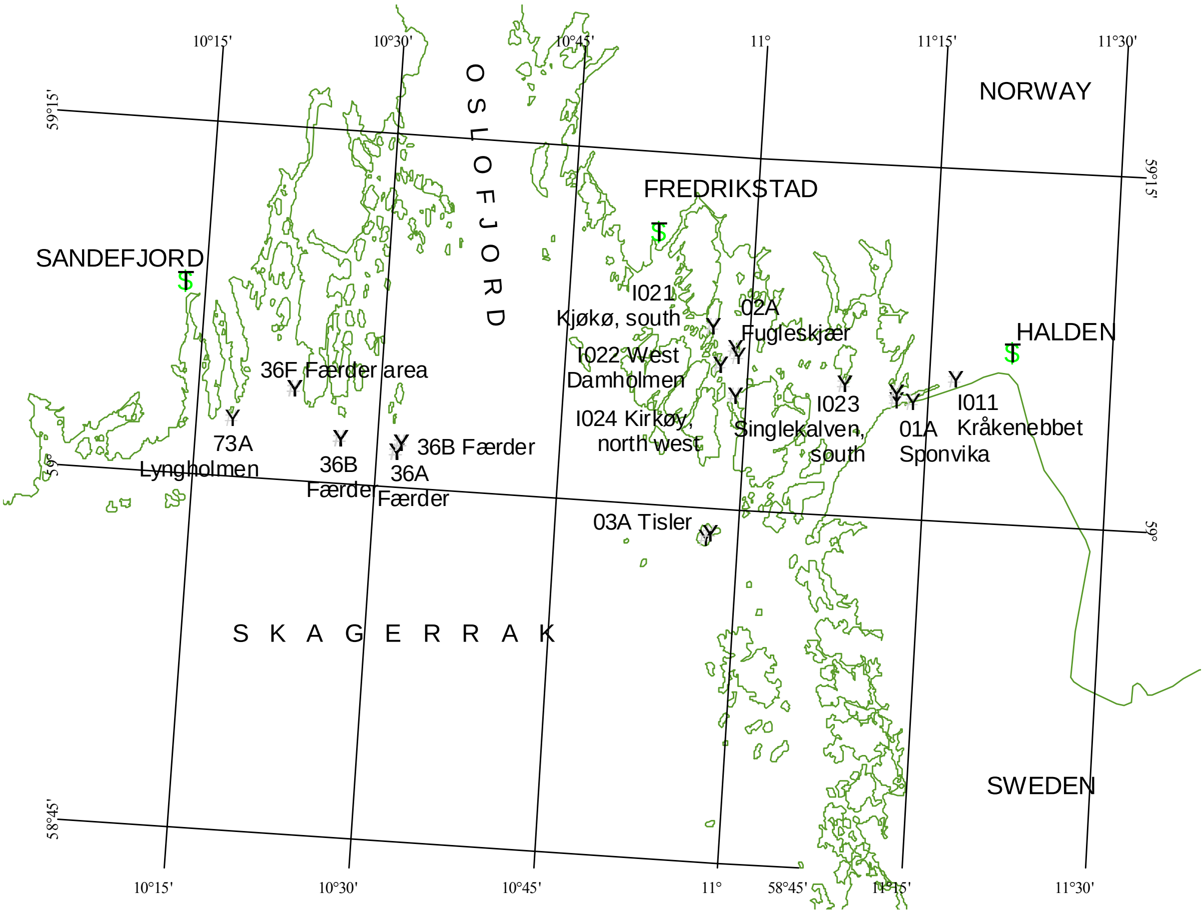
The maps are generated using ArcView GIS version 3.1.



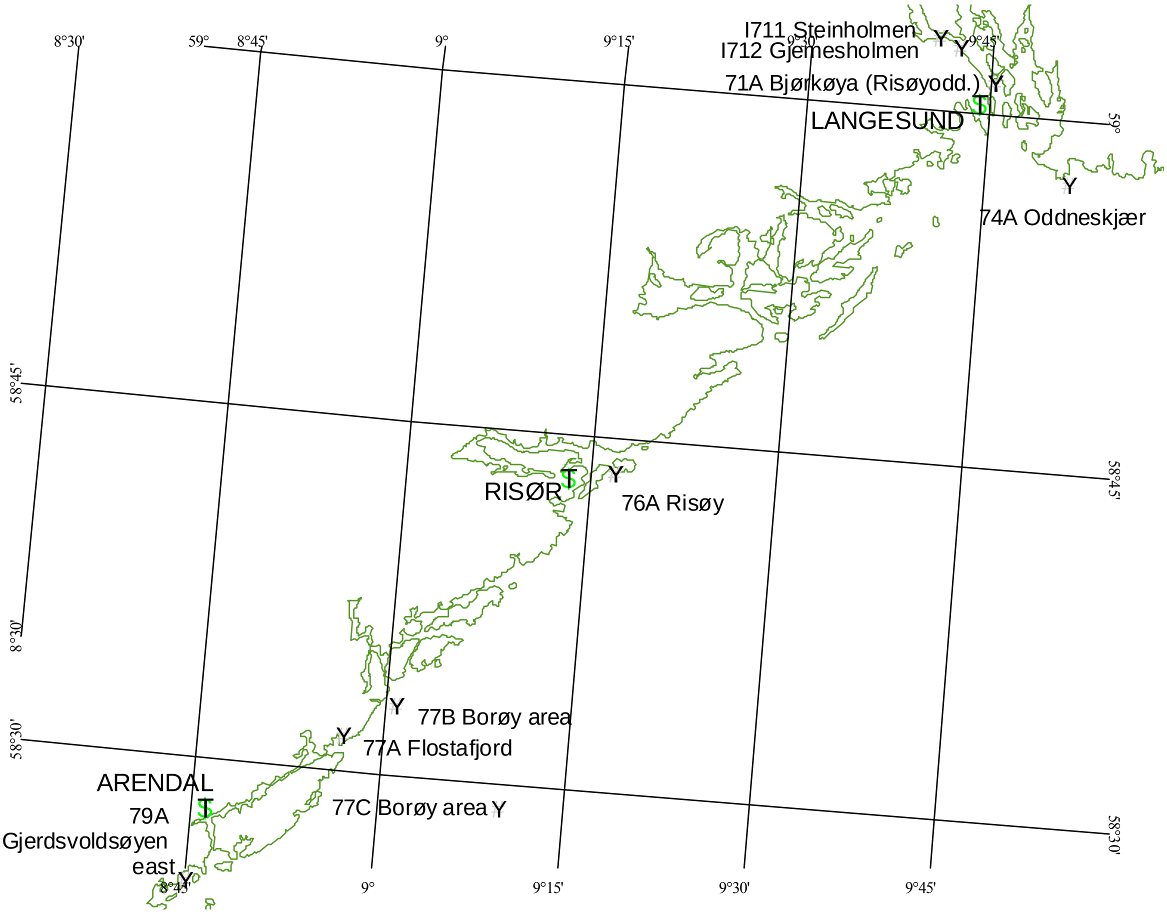
JAMP stations in Norway. Numbers refer to detail maps below.



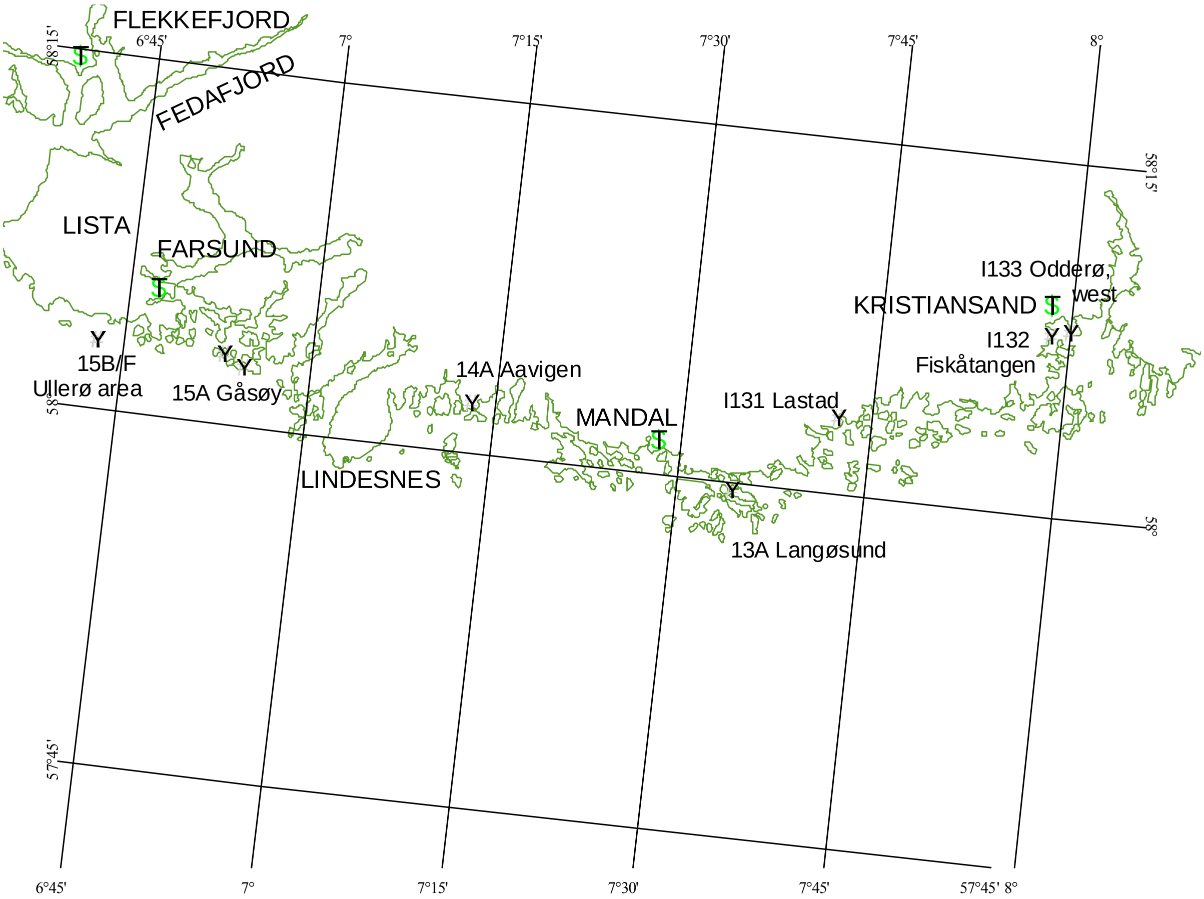
MAP 1


10°15'
10°30'
10°45'
11°
11°15'
11°30'
59°15'
59°
58°45'
NORWAY
OSLOFJORD
FREDRIKSTAD
SANDEFJORD
I021
Kjøkø, south
02A
Fugleskjær
HALDEN
I022 West
Damholmen
36F Færder area
I023
Singlekalven,
south
I011
Kråkenebbet
01A
Sponvika
I024 Kirkøy,
north west
73A
Lyngholmen
36B
Færder
36B Færder
36A
Færder
03A Tisler
SKAGERRAK
SWEDEN

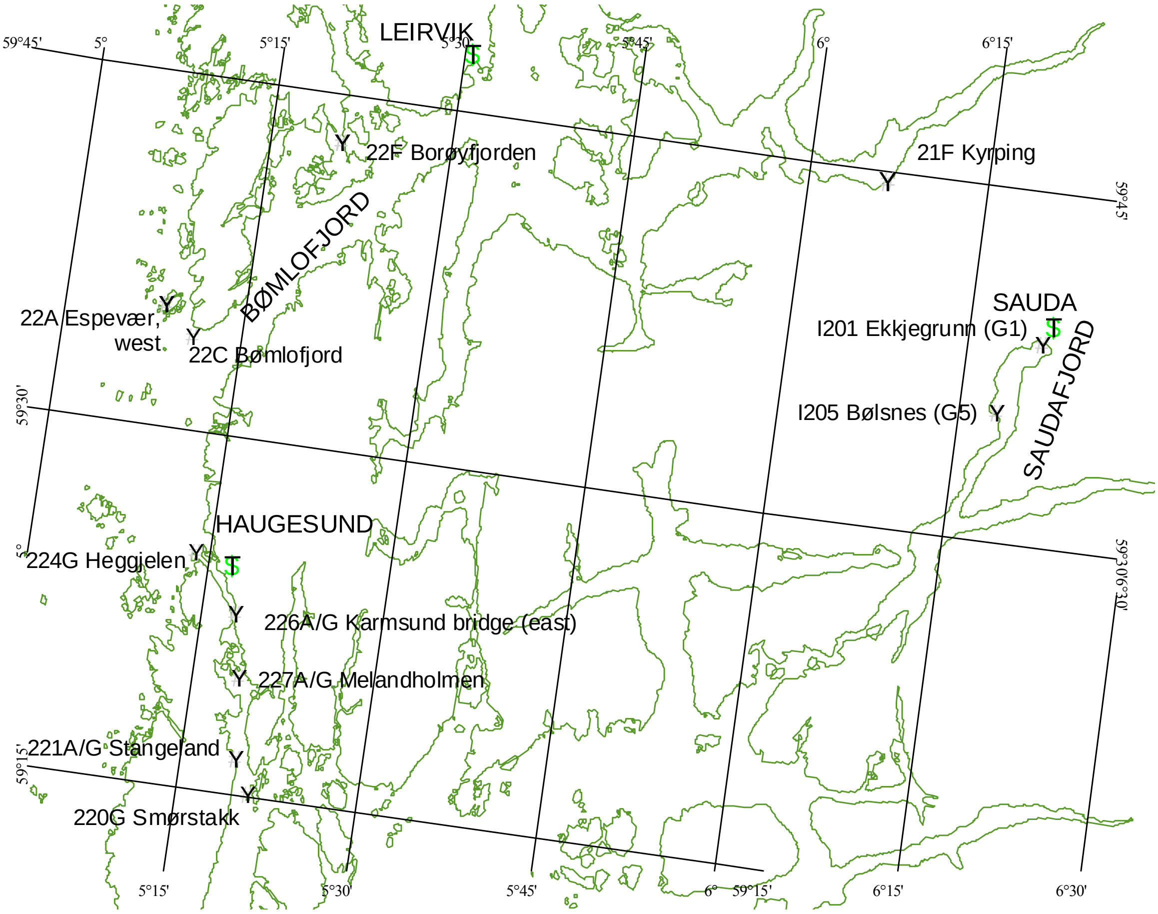
MAP 2


8°30'
59°
8°45'
9°
9°15'
9°30'
9°45'
I711 Steinholmen
I712 Gjemesholmen
71A Bjørkøya (Risøyodd.)
LANGESUND
74A Oddneskjær
58°45'
RISØR
76A Risøy
8°30'
58°30'
77B Borøy area
77A Flostafjord
ARENDAL
79A
Gjerdsvoldsøyen
east
77C Borøy area

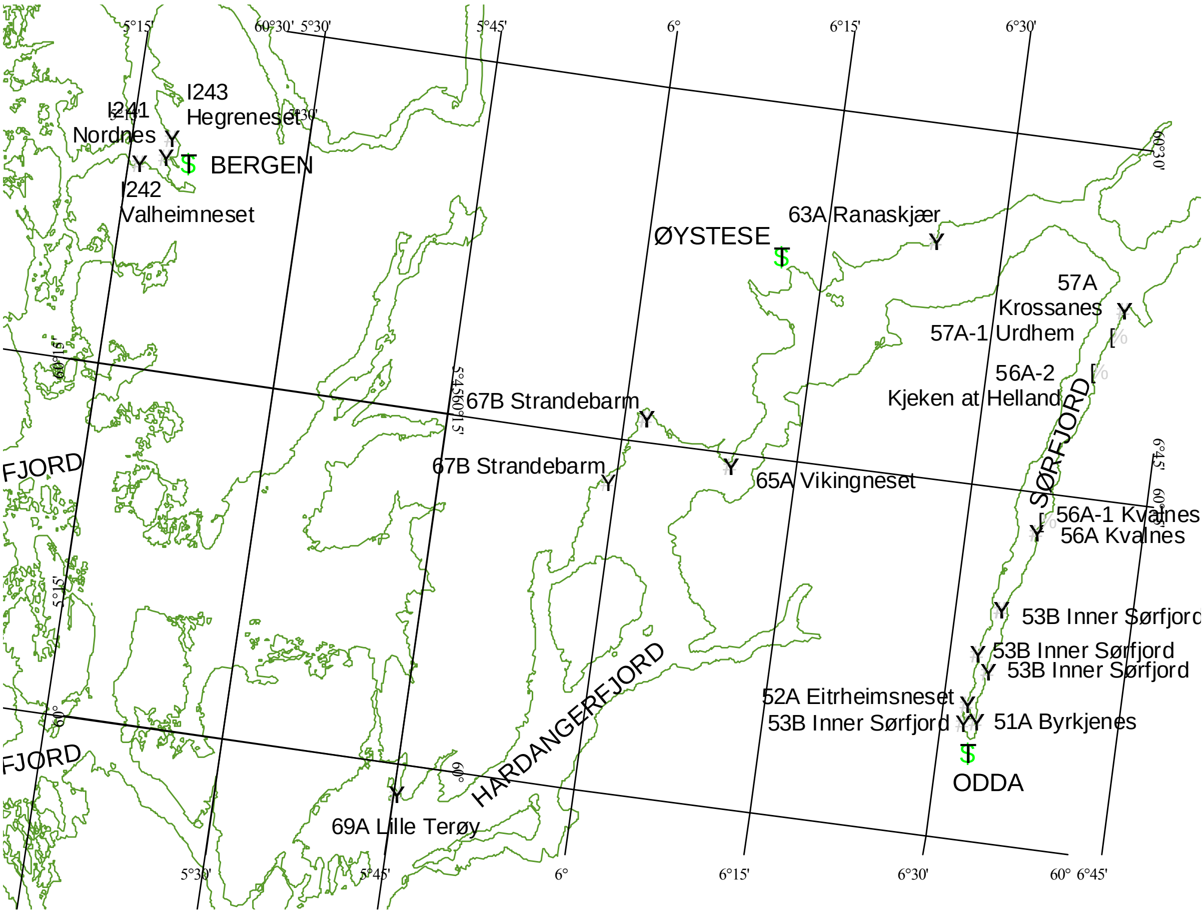
MAP 3


FLEKKEFJORD
FEDAFJORD
LISTA
FARSUND
15B/F
Ullerø area
15A Gåsøy
LINDESNES
14A Aavigen
MANDAL
I131 Lastad
13A Langøsund
KRISTIANSAND
I133 Odderø,
west
I132
Fiskåtangen
58°15'
6°45'
7°
7°15'
7°30'
7°45'
8°
58°
57°45'

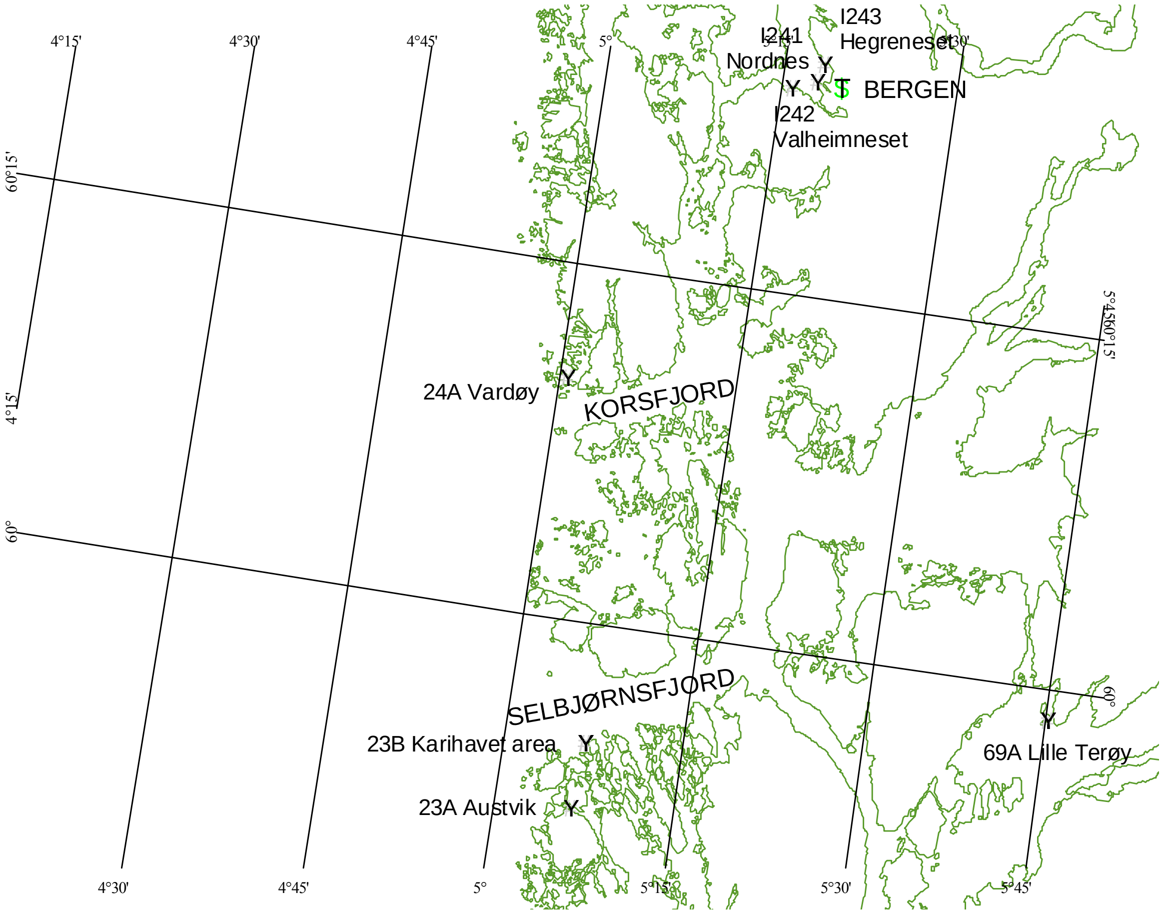
MAP 4


LEIRVIK
22F Borøyfjorden
21F Kyrping
BØMLOFJORD
22A Espevær,
west.
22C Bømlofjord
SAUDA
I201 Ekkjegrunn (G1)
I205 Bølsnes (G5)
SAUDAFJORD
HAUGESUND
224G Heggjelen
226A/G Karmsund bridge (east)
227A/G Melandholmen
221A/G Stangeland
220G Smørstakk
59°45'
5°
5°15'
5°30'
5°45'
6°
6°15'
6°30'
59°30'
59°15'

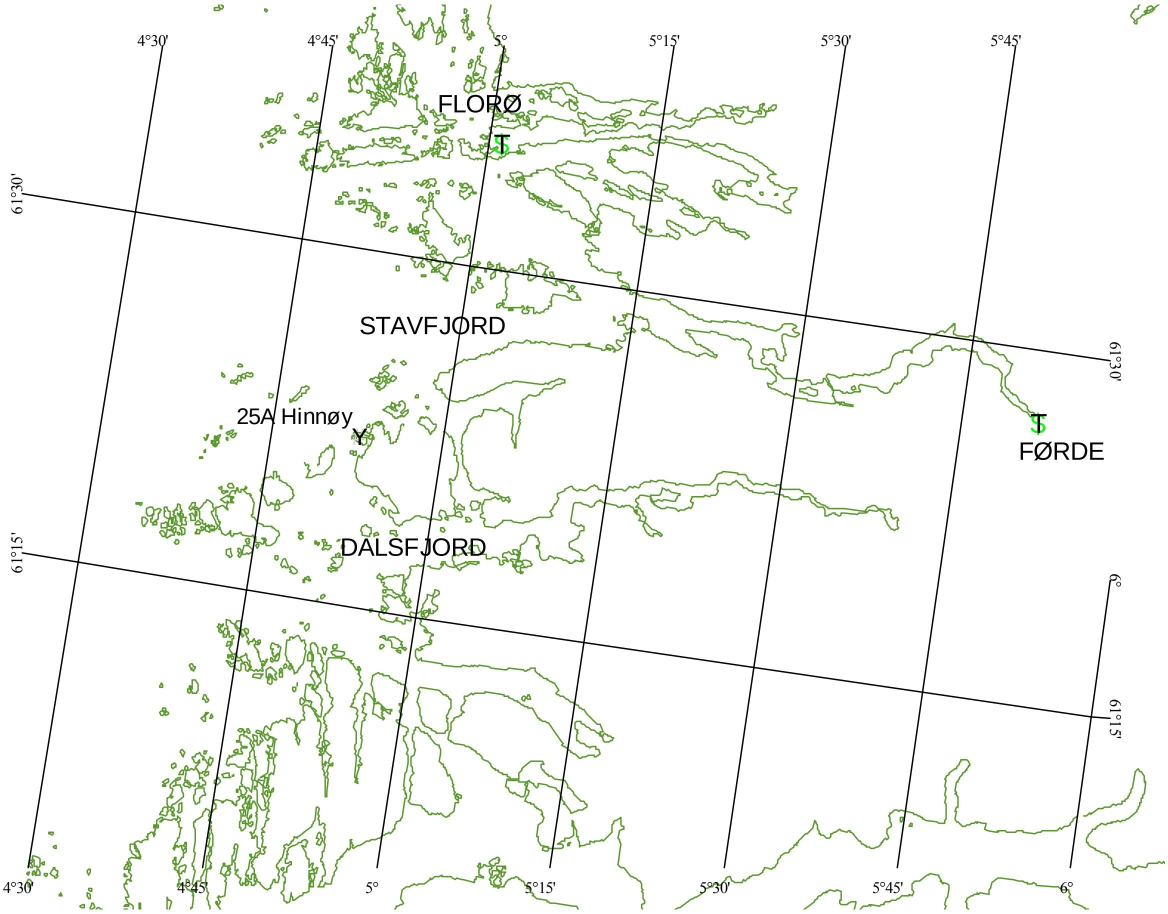
MAP 5


5°15'
60°30' 5°30'
5°45'
6°
6°15'
6°30'
60°30'
I243
Hegreneset
I241
Nordnes
BERGEN
I242
Valheimneset
63A Ranaskjær
ØYSTESE
57A
Krossanes
57A-1 Urdhem
56A-2
Kjeken at Helland
60°15'
5°45' 60°15'
67B Strandebarm
67B Strandebarm
65A Vikingneset
SØRFJORD
6°45'
60°15'
FJORD
56A-1 Kvalnes
56A Kvalnes
5°15'
53B Inner Sørfjord
53B Inner Sørfjord
53B Inner Sørfjord
HARDANGERFJORD
52A Eitrheimsneset
53B Inner Sørfjord
51A Byrkjenes
60°
FJORD
ODDA
60°
69A Lille Terøy
5°30'
5°45'
6°
6°15'
6°30'
60° 6°45'

MAP 6


4°15'
4°30'
4°45'
5°
I243
Hegreneset
5°30'
I241
Nordnes
BERGEN
I242
Valheimneset
60°15'
5°45' 60°15'
4°15'
24A Vardøy
KORSFJORD
60°
SELBJØRNSFJORD
60°
69A Lille Terøy
23B Karihavet area
23A Austvik
4°30'
4°45'
5°
5°15'
5°30'
5°45'

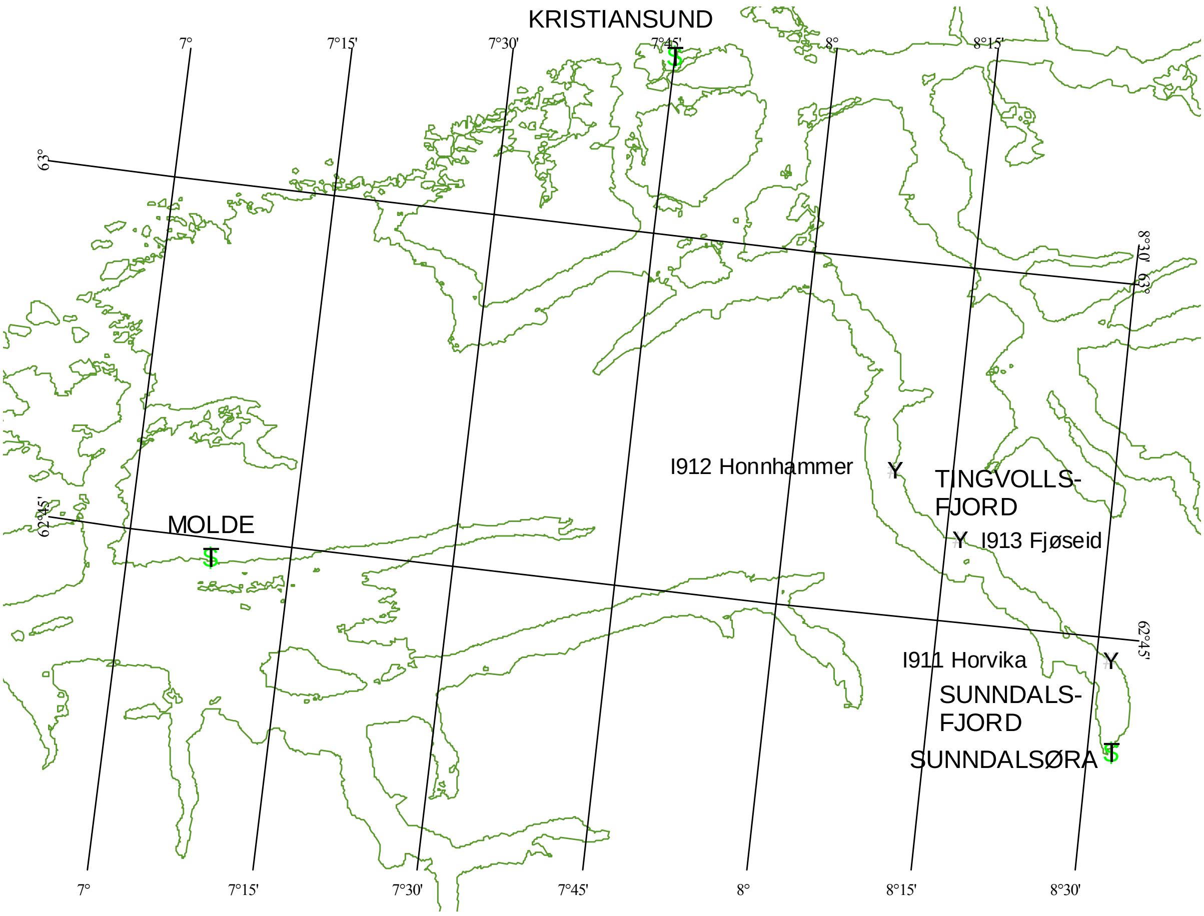
MAP 7


4°30'
4°45'
5°
5°15'
5°30'
5°45'
6°
61°30'
61°15'
FLORØ
STAVFJORD
25A Hinnøy
DALSFJORD
FØRDE

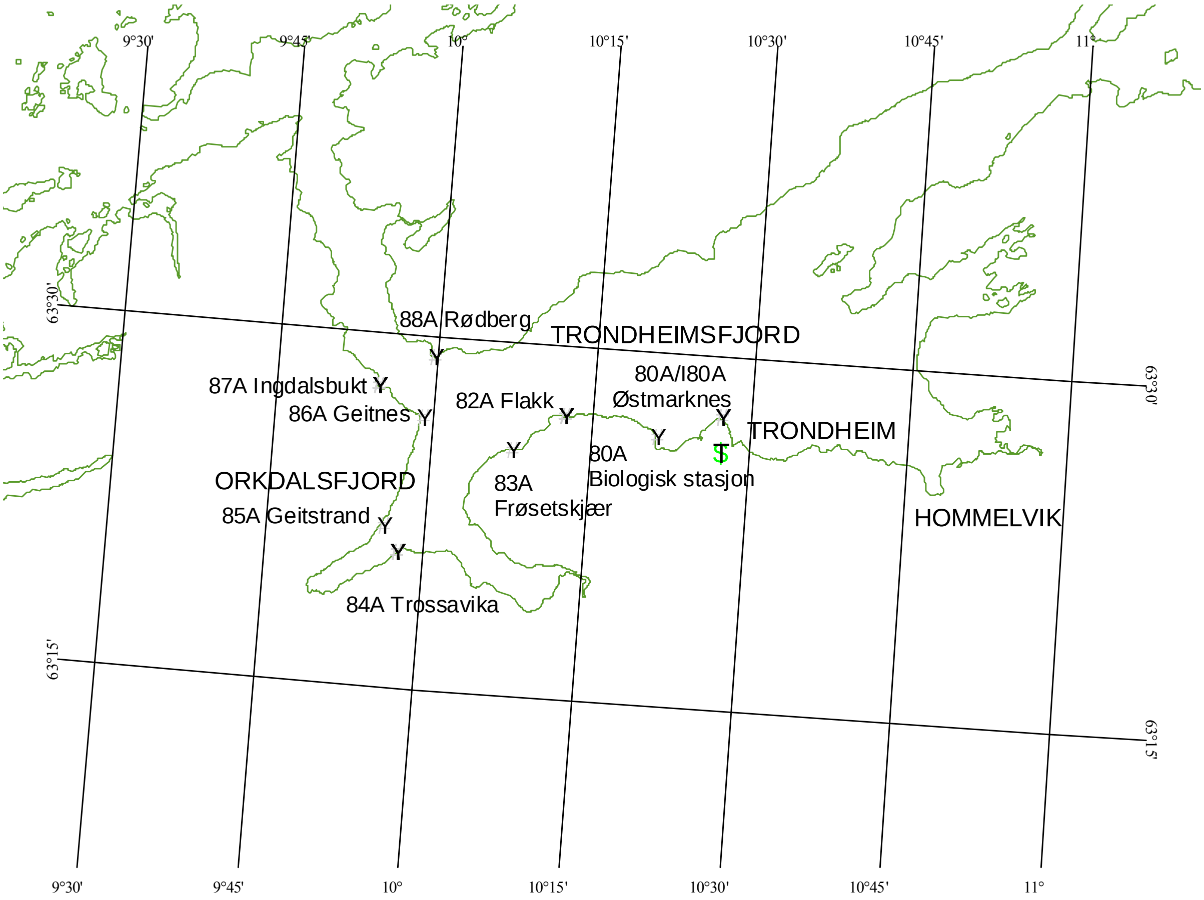
MAP 8


4°45'
5°
5°15'
5°30'
5°45'
6°
6°15'
62°15'
62°
ULTSTEINVIK
VARTDALSFJORD
28A Eiksundet
27A Grinden
STADLANDET
VANYLVS-
FJORD
MÅLØY
26A Hamnen

MAP 9


KRISTIANSUND
7°
7°15'
7°30'
7°45'
8°
8°15'
8°30'
63°
62°45'
I912 Honnhammer
TINGVOLLS-
FJORD
I913 Fjøseid
MOLDE
I911 Horvika
SUNNDALS-
FJORD
SUNNDALSØRA

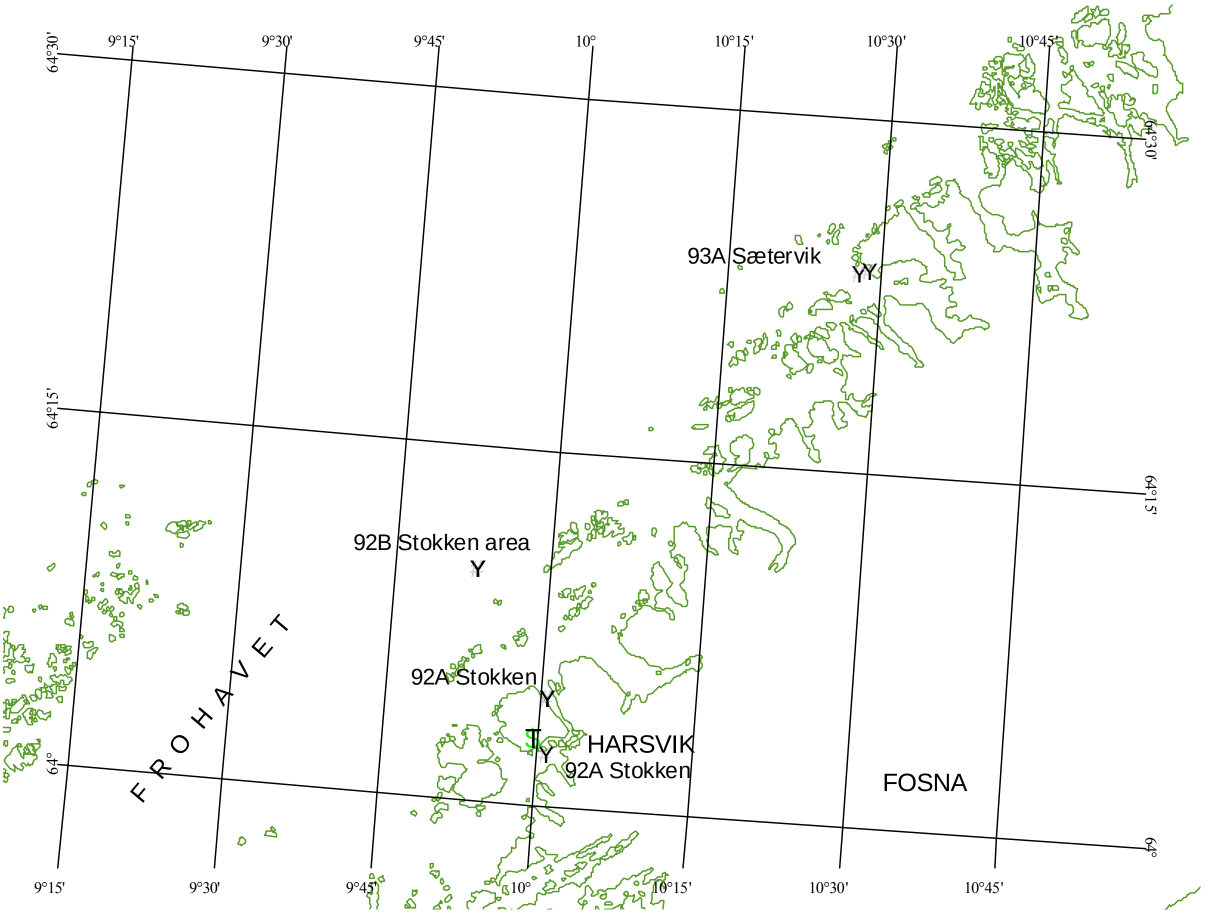
MAP 10


9°30'
9°45'
10°
10°15'
10°30'
10°45'
11°
63°30'
63°15'
88A Rødberg
TRONDHEIMSFJORD
87A Ingdalsbukt
86A Geitnes
82A Flakk
80A/I80A
Østmarknes
TRONDHEIM
80A
Biologisk stasjon
83A
Frøsetskjær
ORKDALSFJORD
85A Geitstrand
84A Trossavika
HOMMELVIK

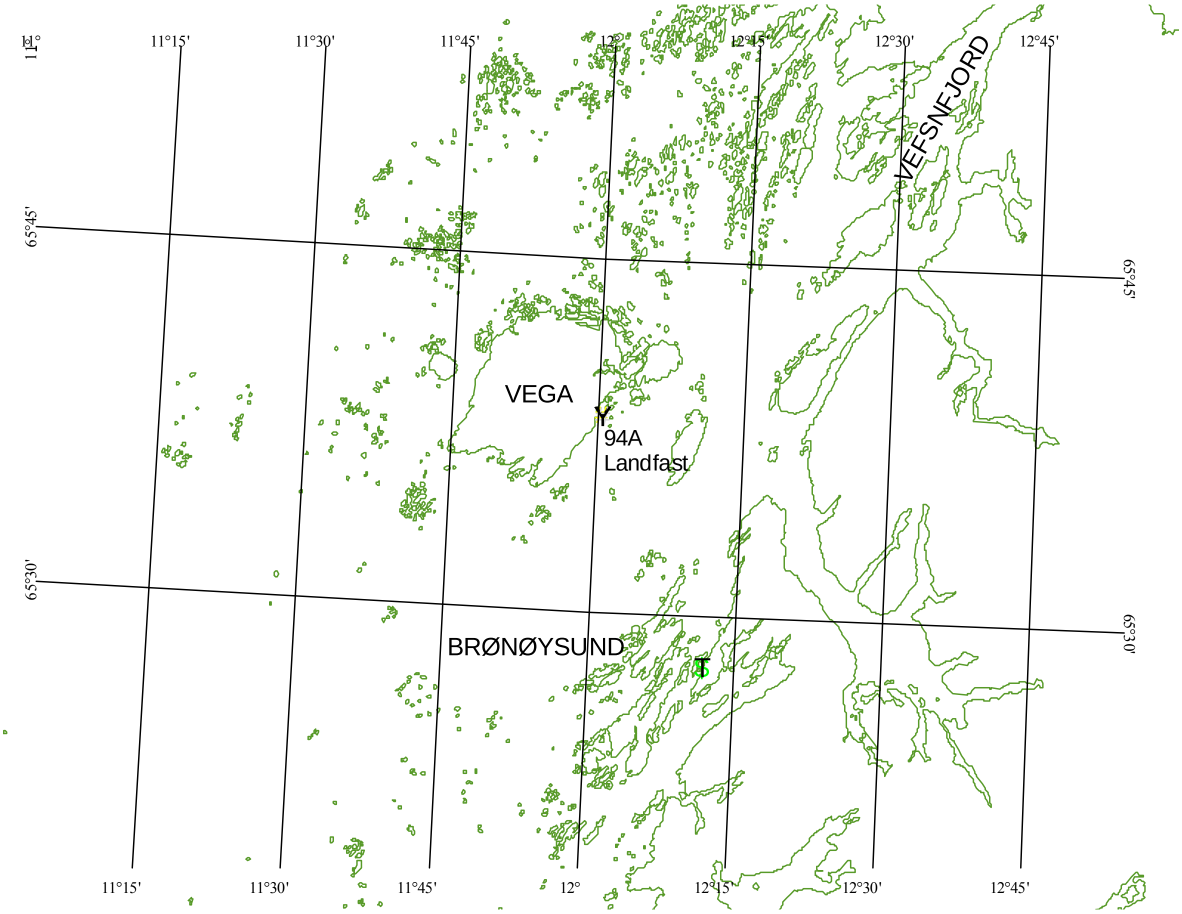
MAP 11


7°15'
7°30'
7°45'
8°
8°15'
8°30'
8°45'
63°30'
7°15'
63°15'
HITRA
SMØLA
91A Nerdvika
Y
Y
91A Nerdvika
TRONDHEIMSLEIA
KRISTIANSUND
7°30'
7°45'
8°
8°15'
8°30'
8°45'
9°
63°30'
63°15'

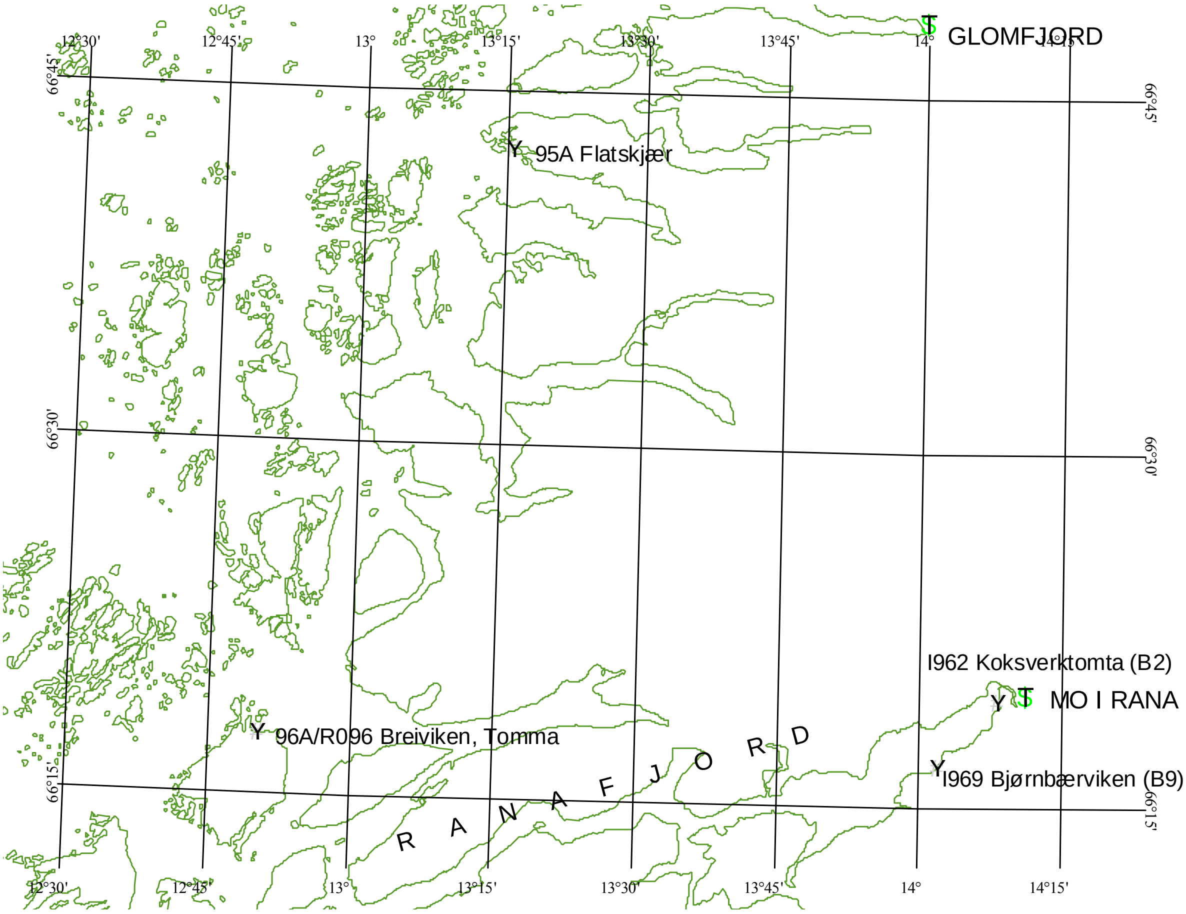
MAP 12


9°15'
9°30'
9°45'
10°
10°15'
10°30'
10°45'
64°30'
64°15'
64°
93A Sætervik
YY
92B Stokken area
Y
FROHAVET
92A Stokken
Y
Y
HARSVIK
92A Stokken
FOSNA
9°15'
9°30'
9°45'
10°
10°15'
10°30'
10°45'
64°30'
64°15'
64°

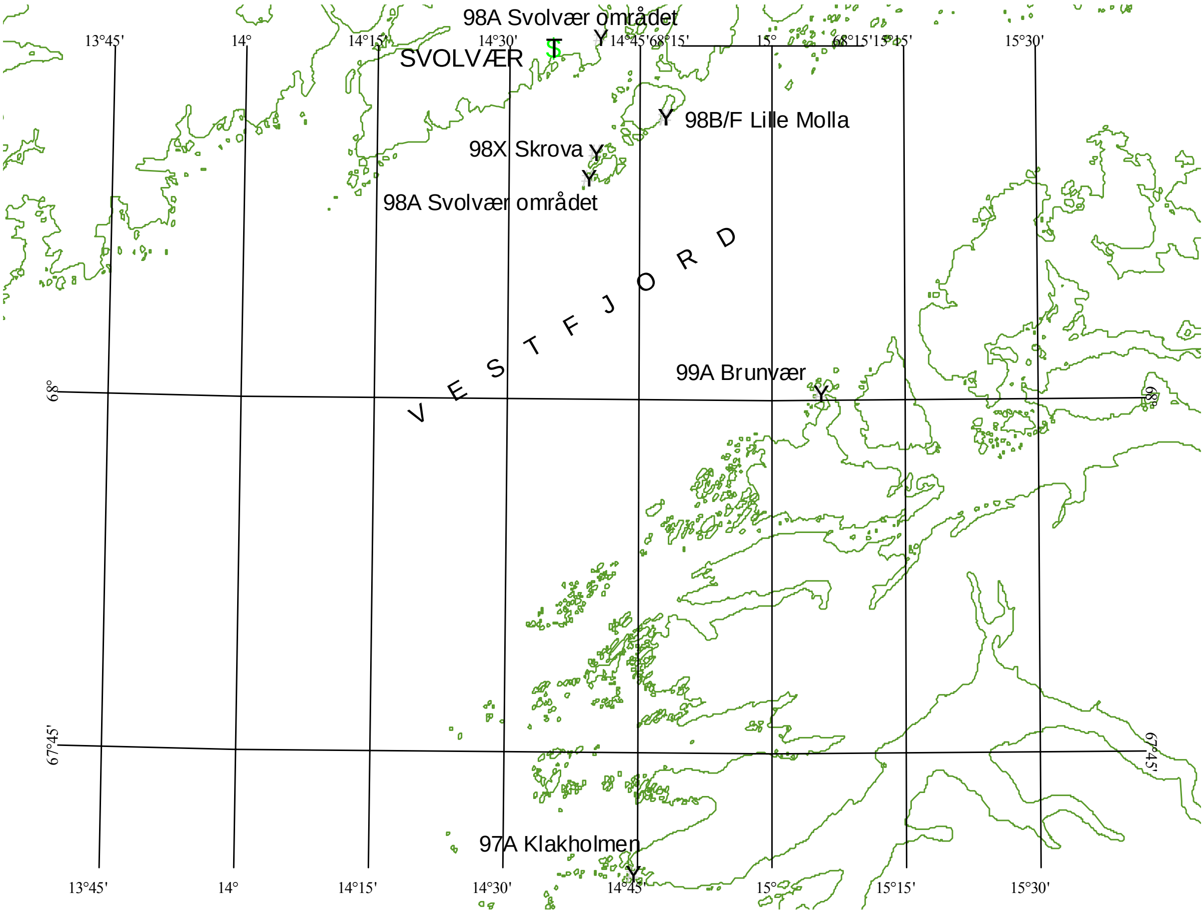
MAP 13


11°
11°15'
11°30'
11°45'
12°
12°15'
12°30'
12°45'
VEFSNFJORD
65°45'
VEGA
94A
Landfast
65°30'
BRØNØYSUND
11°15'
11°30'
11°45'
12°
12°15'
12°30'
12°45'

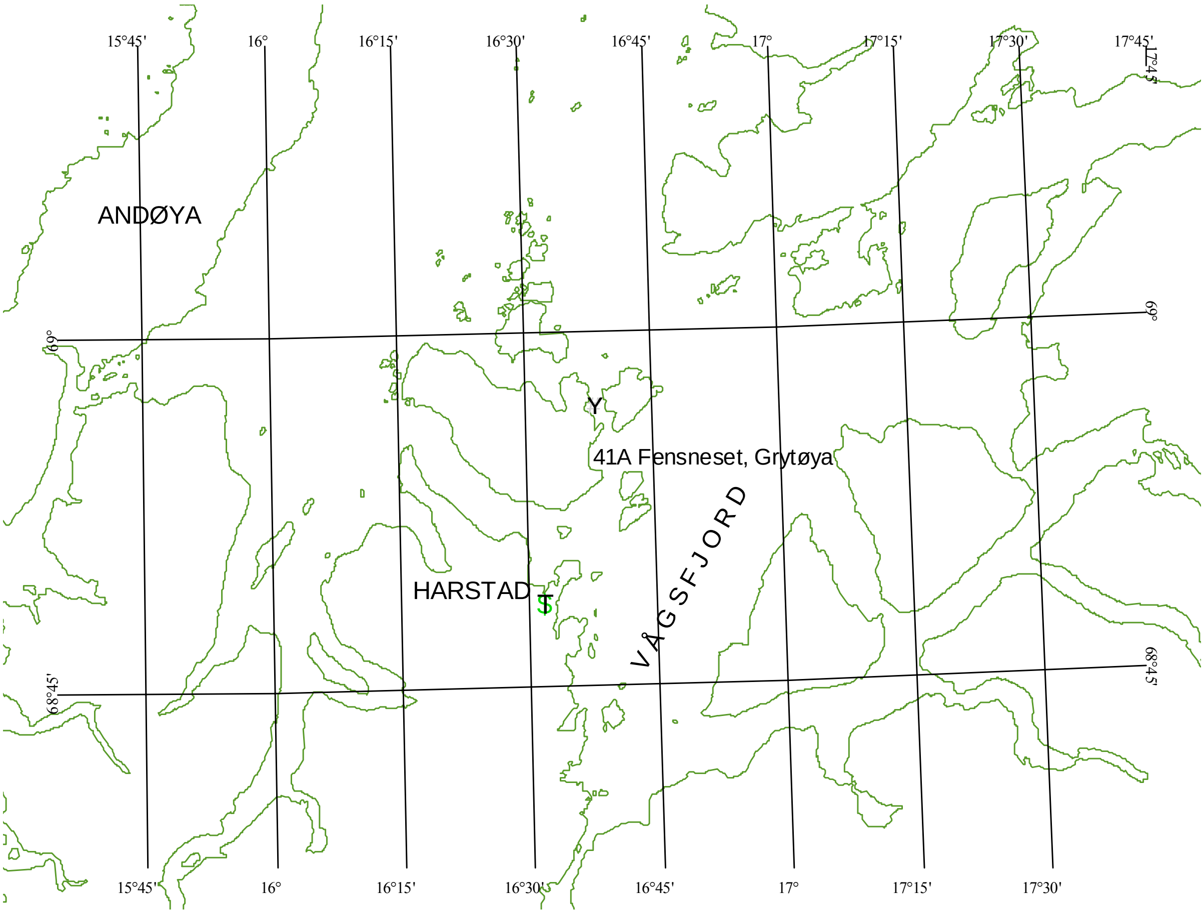
MAP 14


12°30'
12°45'
13°
13°15'
13°30'
13°45'
14°
14°15'
GLOMFJORD
66°45'
95A Flatskjær
66°30'
I962 Koksverktomta (B2)
MO I RANA
96A/R096 Breiviken, Tomma
RANAFJORD
I969 Bjørnbærviken (B9)
66°15'
12°30'
12°45'
13°
13°15'
13°30'
13°45'
14°
14°15'

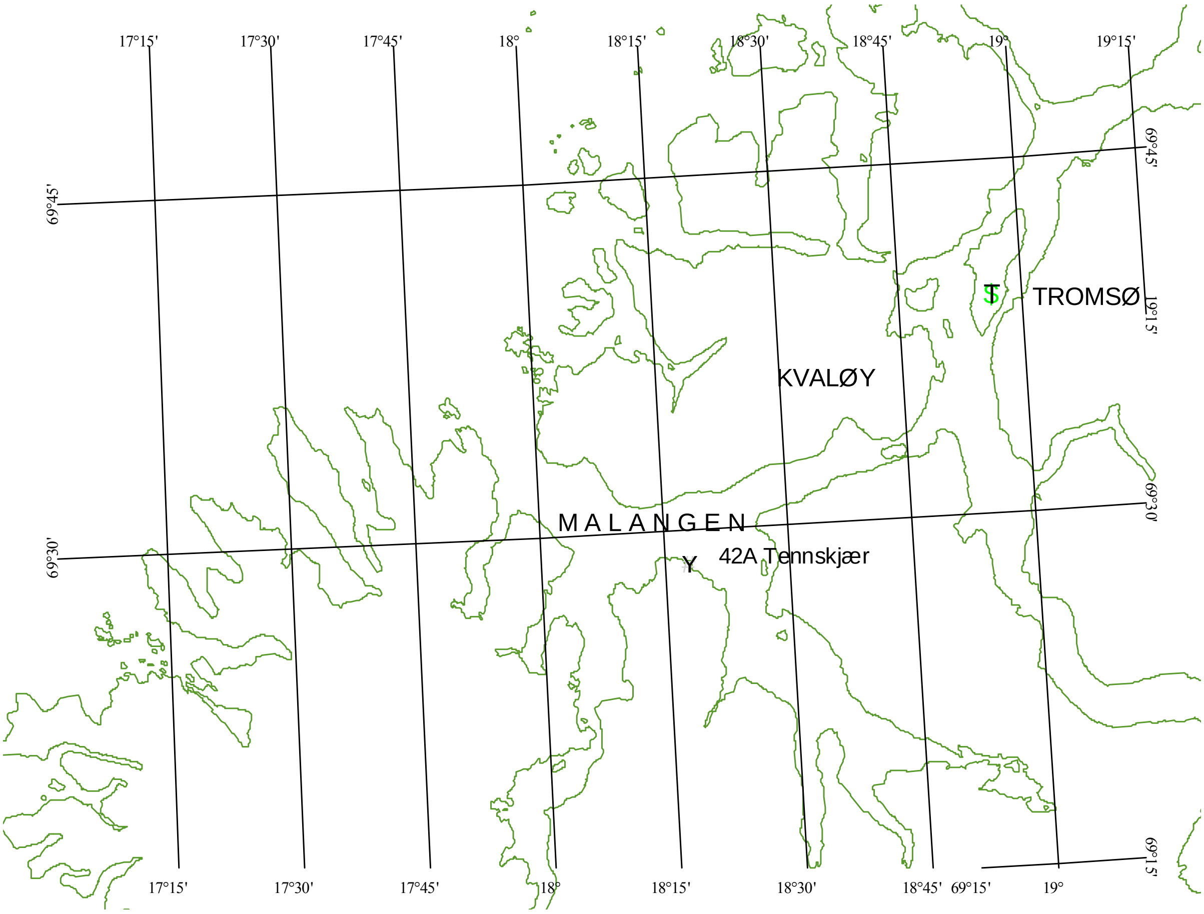
MAP 15


98A Svolvær området
SVOLVÆR
98B/F Lille Molla
98X Skrova
98A Svolvær området
VESTFJORD
99A Brunvær
97A Klakholmen
13°45'
14°
14°15'
14°30'
14°45'
15°
15°15'
15°30'
68°
67°45'

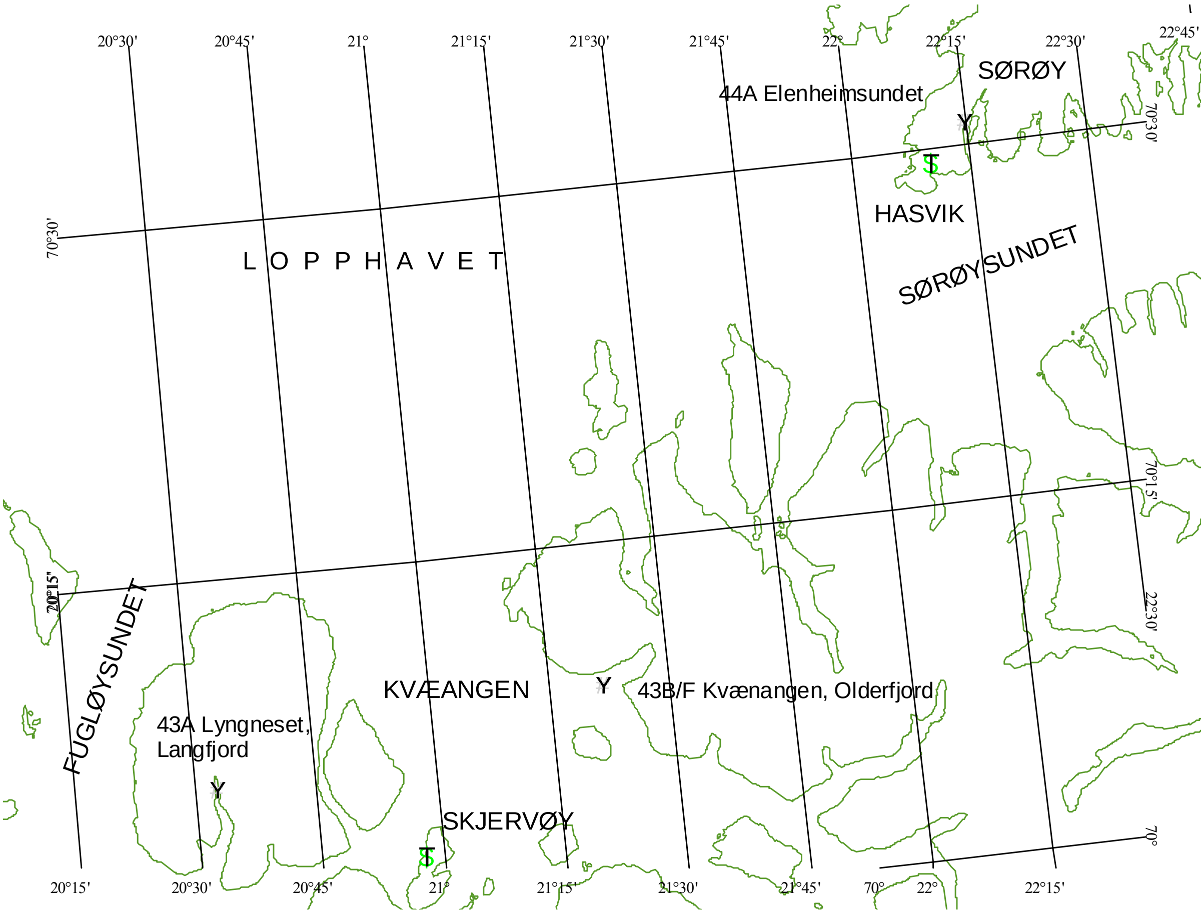
MAP 16


ANDØYA
41A Fensneset, Grytøya
HARSTAD
VÅGSFJORD
15°45'
16°
16°15'
16°30'
16°45'
17°
17°15'
17°30'
17°45'
69°
68°45'

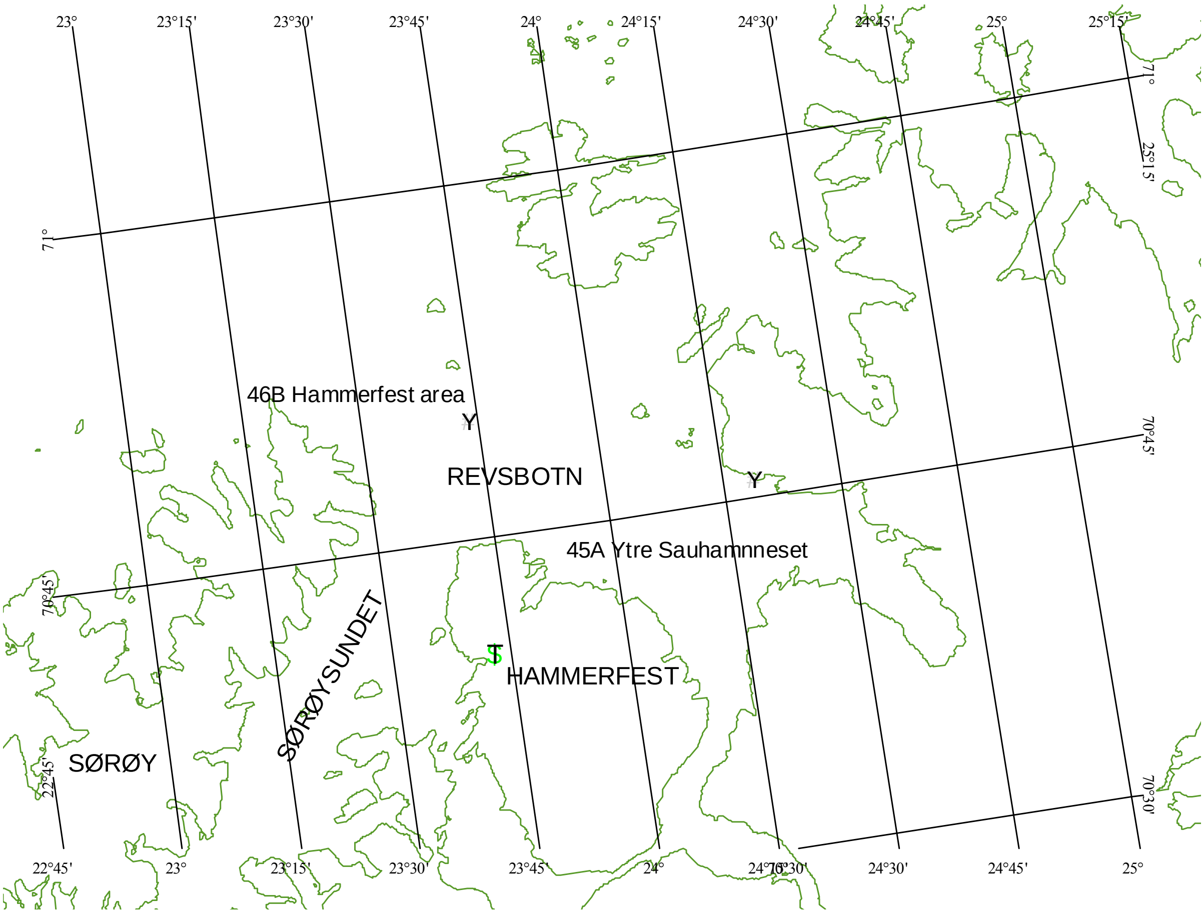
MAP 17


17°15'
17°30'
17°45'
18°
18°15'
18°30'
18°45'
19°
19°15'
69°45'
69°30'
69°15'
TROMSØ
KVALØY
MALANGEN
42A Tennskjær
Y

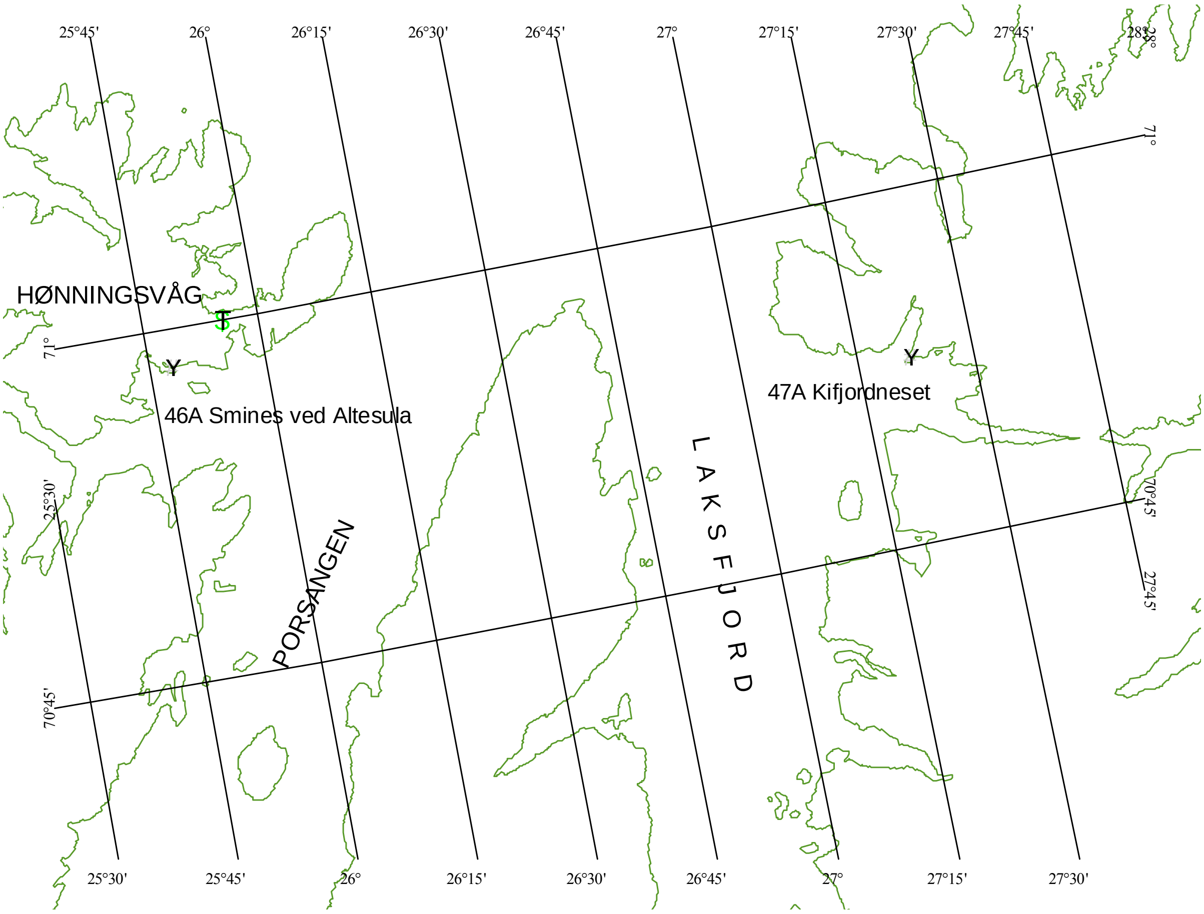
MAP 18


20°30'
20°45'
21°
21°15'
21°30'
21°45'
22°
22°15'
22°30'
22°45'
70°30'
70°15'
70°
20°15'
SØRØY
44A Elenheimsundet
HASVIK
LOPPHAVET
SØRØYSUNDET
FUGLØYSUNDET
KVÆANGEN
43B/F Kvænangen, Olderfjord
43A Lyngneset, Langfjord
SKJERVØY
Y

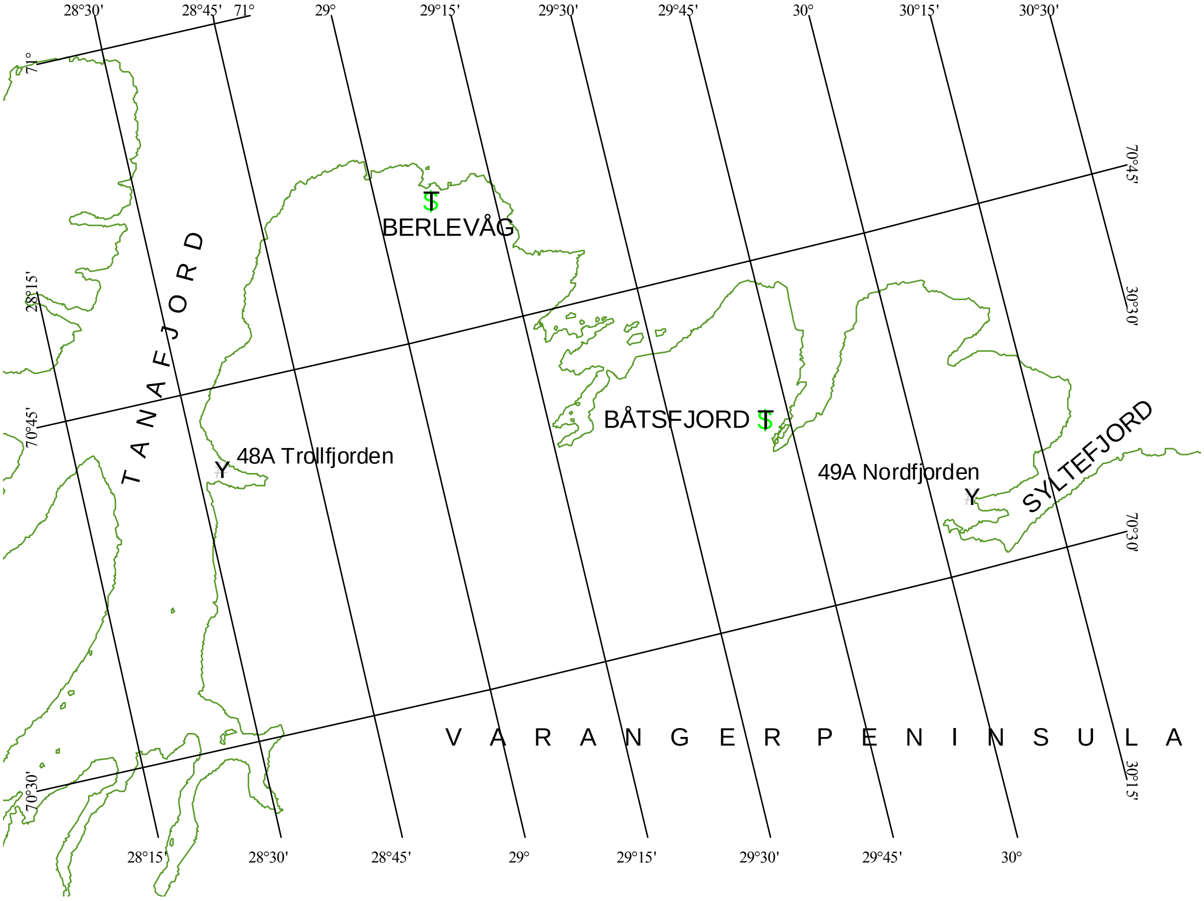
MAP 19


23°
23°15'
23°30'
23°45'
24°
24°15'
24°30'
24°45'
25°
25°15'
71°
70°45'
70°30'
46B Hammerfest area
REVSBOTN
45A Ytre Sauhamnneset
HAMMERFEST
SØRØYSUNDET
SØRØY
22°45'
23°
23°15'
23°30'
23°45'
24°
24°30'
24°45'
25°

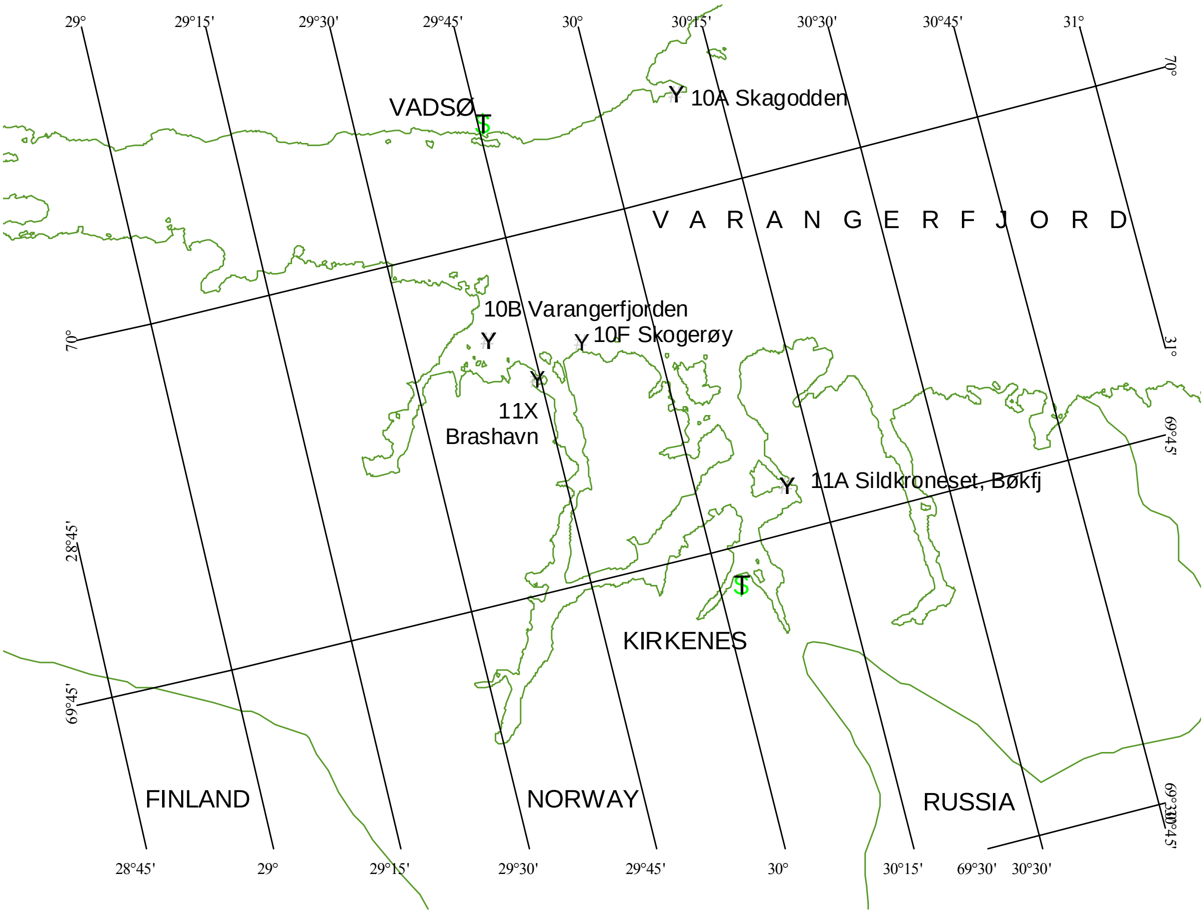
MAP 20


25°45'
26°
26°15'
26°30'
26°45'
27°
27°15'
27°30'
27°45'
28°
71°
70°45'
HØNNINGSVÅG
46A Smines ved Altesula
47A Kifjordneset
PORSANGEN
L A K S F J O R D
25°30'
27°45'
25°30'
25°45'
26°
26°15'
26°30'
26°45'
27°
27°15'
27°30'

MAP 21


28°30'
28°45'
71°
29°
29°15'
29°30'
29°45'
30°
30°15'
30°30'
70°45'
30°30'
70°30'
30°15'
28°15'
70°45'
70°30'
28°15'
28°30'
28°45'
29°
29°15'
29°30'
29°45'
30°
TANAFJORD
BERLEVÅG
BÅTSFJORD
48A Trollfjorden
49A Nordfjorden
SYLTEFJORD
VARANGERPENINSULA

MAP 22


29°
29°15'
29°30'
29°45'
30°
30°15'
30°30'
30°45'
31°
70°
31°
69°45'
70°
28°45'
69°45'
VADSØ
10A Skagodden
VARANGERFJORD
10B Varangerfjorden
10F Skogerøy
11X Brashavn
11A Sildkroneset, Bøkfj
KIRKENES
FINLAND
NORWAY
RUSSIA
28°45'
29°
29°15'
29°30'
29°45'
30°
30°15'
69°30'
30°30'

MAP 23

# Appendix G.
# Overview of materials and analyses 1999

**Station positions are shown on maps in Appendix F. .**

**Appendix G. 1.** Sampling and analyses for 1999, L-liver, F-fillet. (See Appendix G. 2 for descriptions of codes for analysis (M0, M1, M3, M4, M5, C2, C4, A1, G1), fish (P, F, D, L, M, C) and counts). Analytical overview for liver (-L) or fillet (-F) tissue is distinguished.

| JAMP area | | STATION | WATER | SEDIMENT | | | | MUSSEL/ | | | OTHER | | FISH FLAT- (P,F,D,M) | | | | COD- (C) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | M0 | M1 | C4 | A1 | G1 | M3 | C2 | A1 | M3 | C2 | -L<br>-F | M4<br>M5 | C2<br>C2 | A1<br>A1 | -L<br>-F | M4<br>M5 | C2<br>C2 | A1<br>A1 |
| 26 | | **OSLOFJORD AREA CENTRAL**, Oslofjord proper | | | | | | | | | | | | | | | | | | |
| 26 | 30A | Gressholmen | 1 | . | . | . | . | 3 | 3 | . | . | . | . | . | . | . | . | . | . | . |
| 26 | 30B | Oslo city Area / Håøya | . | . | . | . | . | . | . | . | . | . | . | . | . | . | C-L | 25 | 25 | . |
| | | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | C-F | 25 | 5B | . |
| 26 | 31A | Solbergstrand | 1 | . | . | . | . | 3 | 3 | . | . | . | . | . | . | . | . | . | . | . |
| 26 | 33B | Sande, east side | . | . | . | . | . | . | . | . | . | . | F-L | 5B | 5B | . | . | . | . | . |
| | | | . | . | . | . | . | . | . | . | . | . | F-F | 5B | 5B | . | . | . | . | . |
| 26 | 35A | Mølen | 1 | . | . | . | . | 3 | 3 | . | . | . | . | . | . | . | . | . | . | . |
| 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 | . | . | . | . | . | . | . | . | . | . | . |
| | | **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** | | | | | | | | | | | | | | | | | | |
| | 21F | Kyrping (Åkrafjord 1999) | . | . | . | . | . | . | . | . | . | . | P-L | 5B | 5B | . | . | . | . | . |
| | | | . | . | . | . | . | . | . | . | . | . | P-F | 5B | 5B | . | . | . | . | . |
| | 22A | Espevær, west | 1 | . | . | . | . | 3 | 3 | . | . | . | . | . | . | . | . | . | . | . |
| | 23B | Karihavet | . | . | . | . | . | . | . | . | . | . | . | . | . | . | C-L | 25 | 25 | . |
| | | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | C-F | 25 | 5B | . |
| 62 | | **HARDANGERFJORDEN** | | | | | | | | | | | | | | | | | | |
| 62 | 69A | Lille Terøy | 1 | . | . | . | . | 3[1] | 3[1] | . | . | . | . | . | . | . | . | . | . | . |
| 62 | 67B | Strandebarm | | | | | | | | | | | ML | 5B | 5B | . | C-L | 25 | 25 | . |
| | | | . | . | . | . | . | . | . | . | . | . | MF | 5B | 5B | . | C-F | 25 | 5B | . |
| 62 | 65A | Vikingneset | 1 | . | . | . | . | 3[1] | 3[1] | . | . | . | . | . | . | . | . | . | . | . |
| 62 | 63A | Ranaskjær | 1 | . | . | . | . | 3[1] | 3[1] | . | . | . | . | . | . | . | . | . | . | . |
| 63 | | **SØRFJORDEN** | | | | | | | | | | | | | | | | | | |
| 63 | 52A | Eitrheimsneset | 1 | . | . | . | . | 3[1] | 3[1] | . | . | . | . | . | . | . | . | . | . | . |
| 63 | 53B | Inner Sørfjord | . | . | . | . | . | . | . | . | . | . | P-L | 5B | 5B | . | C-L | 25 | 25 | . |
| | | | . | . | . | . | . | . | . | . | . | . | P-F | 5B | 5B | . | C-F | 25 | 5B | . |
| 63 | 56A | Kvalnes | 1 | . | . | . | . | 3[1] | 3[1] | . | . | . | . | . | . | . | . | . | . | . |
| 63 | 57A | Krossanes | 1 | . | . | . | . | 3[1] | 3[1] | . | . | . | . | . | . | . | . | . | . | . |

**Appendix G. 1 (cont.)**

| **JAMP area** | **STATION** | WATER | SEDIMENT | | | | MUSSEL/ | | | OTHER | | FISH | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | FLAT- (P,F,D,M) | | | | COD- (C) | | | |
| | | | | | | | | | | | | -L | M4 | C2 | A1 | -L | M4 | C2 | A1 |
| | | M0 | M1 | C4 | A1 | G1 | M3 | C2 | A1 | | | -F | M5 | C2 | A1 | -F | M5 | C2 | A1 |
| | **LOFOTEN AREA** | | | | | | | | | | | | | | | | | | |
| 98A | Husvågen (1997) | 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 | . | . | . | . | . |
| | **VARANGER PENINSULA AREA** | | | | | | | | | | | | | | | | | | |
| 10A | Skagodden | 1 | . | . | . | . | 3 | 3 | . | . | . | . | . | . | . | . | . | . | . |
| 10B | Varangerfjorden | . | . | . | . | . | . | . | . | . | . | . | . | . | . | C-L | 25 | 25 | . |
| | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | C-F | 25 | 5B | . |
| 10F | Varangerfjorden | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| 11X | Brashavn (1997) | 1 | . | . | . | . | 3 | 3 | . | . | . | . | . | . | . | . | . | . | . |

NOTES:

[1]) Parallel samples collected for analysis that were frozen directly and not depurated prior to cleaning

## **Appendix G. 2:** Key to analysis codes and sample counts used in Appendix G. 1.

**ANALYSIS CODES:**

| Code | Analyses |
|---|---|
| M0 | suspended matter |
| M1 | Hg, Cd, Cu, Pb, Zn, Li (normalising element) total organic carbon (TOC) |
| M3 | Hg, Cd, Cu, Pb, Zn |
| M4 | Cd Cu Pb Zn (for fish liver) |
| M5 | Hg (for fish fillet) |
| C1 | CB-28,-52,-101,-105,-118,-138,-153,-156,-180, 209, 5-CB, OCS, a+gHCH, HCB, DDE, DDD, EPOCl (optional), dry weight percent |
| C2 | CB-28,-52,-101,-105,-118,-138,-153,-156,-180, 209, 5-CB, OCS, a+gHCH, HCB, DDE, DDD, 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, 15-20 cm and deepest 5 cm slice plus one core with sample from 0-1 cm. |
|  | 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, 4-5 cm) each a bulk of ca.50 individuals and/or 1 size group (3-4 or 4-5 cm), 3 parallel samples each a bulk of 20 individuals. |
|  | 1/2 | 1 size group (2-3 or 3-4 cm), 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 H.

# Temporal trend analyses of contaminants in biota 1981-1999

**Sorted by contaminant, species and area/station:**

**Cadmium (Cd)**
**Copper (Cu)**
**Mercury (Hg)**
**Lead (Pb)**
**Zinc (Zn)**
**CB-153**
**DDEPP (ppDDE)**
**$\gamma$HCH (HCHG)**
**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***)**
**(s) - Small fish**
**(l) - Large fish**
**SB - Soft body tissue**
**LI - Liver tissue**
**MU - Muscle tissue**

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

Annual median concentration of Cd (ppm)

| | | | | | | | | | | | | | | | | | | | | | | | ANALYSIS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | OC | TRND | UP95+3 | POWER |
| 30A | MYTI EDU | SB | d.wt | | | | 1.1 | 0.81 | 1.4 | 0.6 | 0.61 | 0.74 | 0.77 | 0.77 | 1.1 | 1.3 | 1.2 | 0.78 | 0.8 | 0.86 | 1.3 | 1.2 | no | -- | 1.2 | 11 |
| 31A | MYTI EDU | SB | d.wt | | | 1.4 | 1.3 | 0.89 | 1.9 | 0.4 | 0.43 | 0.41 | 0.72 | 0.73 | 0.91 | 0.93 | 0.78 | 1.3 | 0.79 | 0.85 | 1.1 | 1.2 | no | -- | 1.3 | 13 |
| 35A | MYTI EDU | SB | d.wt | | | 1.3 | 0.95 | 1.2 | 1.3 | 0.52 | 0.66 | 0.65 | 0.93 | 1.1 | 1.3 | 1.1 | 0.96 | 0.89 | 0.77 | 0.97 | 1.1 | 1.5 | no | -- | 1.5 | 10 |
| 36A | MYTI EDU | SB | d.wt | | | 0.85 | 1.2 | 0.84 | 1.4 | 0.59 | 0.56 | 0.5 | 0.41 | 1.2 | 1.1 | 0.9 | 1.2 | 1.2 | 1.6 | 1.8 | 0.97 | 1 | no | -- | no | 12 |
| 71A | MYTI EDU | SB | d.wt | | | 2.5 | 2 | 1.4 | 2 | 0.98 | 2.1 | 2 | 0.97 | 1.1 | 1.7 | 1.9 | 2 | 2.3 | 1.5 | 2.4 | 1.5 | 1.8 | no | -- | 1.4 | 12 |
| 76A | MYTI EDU | SB | d.wt | | | | | | | | | | 0.64 | 0.86 | 0.96 | 1.1 | | | 1.2 | 1.2 | 1.2 | 1.3 | no | UY | no | 6 |
| 15A | MYTI EDU | SB | d.wt | | | | | | | | | | 0.5 | 0.83 | | 1.2 | 0.79 | 1.4 | 1.2 | 1.1 | 1 | 0.84 | no | -- | no | 10 |
| 51A | MYTI EDU | SB | d.wt | | | | | | | 43 | 58 | | | | | | | 37 | 25 | 5.4 | 10 | 35 | 17.3 | -- | 32.5 | 21 |
| 52A | MYTI EDU | SB | d.wt | | | | | | | | | 94 | 10 | 80 | 43 | 15 | 8.7 | 20 | 18 | 13 | 9.1 | 11 | 5.7 | -- | 21.2 | 21 |
| 56A | MYTI EDU | SB | d.wt | | | | | | | 56 | 54 | 98 | 45 | 69 | 52 | 60 | 11 | 31 | 20 | 29 | 8.7 | 26 | 12.9 | -- | 23.7 | 17 |
| 57A | MYTI EDU | SB | d.wt | | | | | | | 21 | 43 | 37 | 26 | 33 | 32 | 15 | 12 | 12 | 8.5 | 14 | 5 | 14 | 6.8 | D- | 9.3 | 14 |
| 63A | MYTI EDU | SB | d.wt | | | | | | | 47 | 10 | 19 | 30 | 35 | 18 | 7.8 | 4.2 | 8.2 | 5.4 | 6.6 | 4.4 | 6.9 | 3.4 | D- | 8.5 | 17 |
| 65A | MYTI EDU | SB | d.wt | | | | | | | 15 | 6 | 8.3 | 15 | 24 | 5.1 | 7.7 | 3 | 5.4 | 3.5 | 4.3 | 1.7 | 3.8 | 1.9 | -- | 3.2 | 17 |
| 69A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 4.3 | 2.4 | 2.1 | 2.9 | 3.2 | 3.5 | 1.6 | 3.8 | 1.9 | -- | 3.6 | 14 |
| 22A | MYTI EDU | SB | d.wt | | | | | | | | | | 0.53 | 1.1 | 1.1 | 0.84 | 1 | 1.4 | 1.1 | 1 | 0.85 | 1.3 | no | -- | no | 11 |
| 82A | MYTI EDU | SB | d.wt | | | | 1.4 | 1.2 | 2.3 | 0.99 | 0.4 | 1.3 | | 1.2 | 1.2 | 1.1 | | 0.98 | 1.2 | | | | no | -- | 1.5 | 15 |
| 84A | MYTI EDU | SB | d.wt | | | | 1.4 | 1.9 | 2.4 | 2.1 | 0.96 | 1.2 | | 1.8 | 2.1 | 1.6 | | 1.6 | 1.3 | | | | no | -- | 1.3 | 12 |
| 87A | MYTI EDU | SB | d.wt | | | | 0.97 | 1 | 1.9 | 0.77 | 0.69 | 0.76 | | 0.87 | 0.98 | 0.93 | | 1.1 | 1.3 | | | | no | -- | 1.5 | 12 |
| 91A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 1.7 | 1.3 | 1.8 | | | | | | no | -? | ? | 11 |
| 92A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 1.1 | 0.54 | 0.94 | 0.74 | 0.69 | 0.72 | | | no | -- | no | 11 |
| 98A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 1.1 | 1.1 | | | | 0.85 | 1.6 | 2.2 | 1.1 | -? | ? | 13 |
| 98X | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.71 | 0.69 | 0.78 | | | | no | -? | ? | 6 |
| 41A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 1.9 | 2.9 | 1.6 | 1.9 | | | no | -? | ? | 12 |
| 43A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 3.5 | 4.3 | | 3.9 | | | 1.9 | -? | ? | 8 |
| 44A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 1.7 | 2.7 | 2 | 1.5 | | | no | -? | ? | 12 |
| 46A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 2.7 | 2.1 | 2.7 | | | | 1.4 | -? | ? | 10 |
| 48A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 1.4 | 1.3 | 1.4 | | | | no | -? | ? | <=5 |
| 10A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 1.7 | 1.7 | 2.3 | 1.1 | 2.3 | 1.6 | no | -- | 4.1 | 12 |
| 11A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 1.3 | 1.3 | 1.1 | 1.6 | | | no | -? | ? | 9 |
| 30B | GADU MOR | LI | w.wt | | | | 0.01 | 0.05 | 0.062 | 0.071 | 0.022 | 0.027 | 0.035 | 0.027 | 0.1 | 0.064 | 0.063 | 0.049 | 0.045 | 0.045 | 0.11 | 0.17 | 1.7 | -- | 8.3 | 17 |
| 36B | GADU MOR | LI | w.wt | 0.078 | 0.06 | 0.22 | 0.07 | 0.05 | 0.14 | 0.061 | 0.031 | 0.028 | 0.023 | 0.01 | 0.021 | 0.034 | 0.021 | 0.042 | 0.033 | 0.074 | 0.036 | 0.065 | no | DY | 2.4 | 16 |
| 15B | GADU MOR | LI | w.wt | | | | | | | | | | 0.026 | 0.009 | 0.025 | 0.016 | 0.014 | 0.016 | 0.024 | 0.031 | 0.03 | 0.026 | no | -- | 1 | 14 |
| 53B | GADU MOR | LI | w.wt | | | | | | 0.66 | | 0.058 | 0.093 | 0.045 | 0.15 | 0.21 | 0.038 | | 0.007 | 0.18 | 0.14 | 0.23 | 0.73 | 7.3 | -- | 551.8 | >25 |
| 67B | GADU MOR | LI | w.wt | | | | | | | 0.14 | 0.052 | 0.047 | 0.069 | 0.077 | 0.051 | 0.11 | 0.099 | 0.033 | 0.11 | 0.28 | 0.018 | 0.071 | no | -- | 2.2 | 22 |
| 23B | GADU MOR | LI | w.wt | | | | | | | | | | 0.022 | 0.024 | 0.02 | 0.025 | 0.015 | 0.026 | 0.014 | 0.029 | 0.025 | 0.033 | no | -- | no | 11 |
| 84B | GADU MOR | LI | w.wt | | | | 0.13 | 0.095 | 0.069 | | 0.029 | | | | | | | | | | | | no | D? | ? | 6 |
| 92B | GADU MOR | LI | w.wt | | | | | | | | | | | | | 0.036 | 0.029 | 0.022 | 0.066 | | | | no | -? | ? | 16 |
| 98B | GADU MOR | LI | w.wt | | | | | | | | | | | | 0.069 | 0.15 | 0.025 | 0.11 | 0.33 | 0.064 | 0.047 | 0.039 | no | -- | 1.6 | 23 |
| 43B | GADU MOR | LI | w.wt | | | | | | | | | | | | | | 0.17 | 0.18 | 0.097 | | | | no | -? | ? | 12 |
| 10B | GADU MOR | LI | w.wt | | | | | | | | | | | | | | 0.23 | 0.19 | 0.095 | 0.13 | 0.12 | 0.14 | 1.4 | -- | 2.9 | 11 |
| 33B | PLAT FLE | LI | w.wt | | | 0.19 | | 0.19 | 0.18 | 0.25 | 0.061 | 0.11 | 0.23 | 0.2 | 0.16 | 0.18 | 0.087 | 0.091 | 0.11 | 0.11 | 0.11 | 0.13 | no | -- | no | 14 |
| 53B | PLAT FLE | LI | w.wt | | | | | | | | 2.2 | 1.5 | 1.5 | 1.7 | 1.8 | 0.79 | | 0.13 | 2.5 | 0.89 | 1.5 | 2.6 | 8.5 | -- | 124.8 | 22 |
| 36F | LIMA LIM | LI | w.wt | | | | | | | | | | 0.11 | 0.11 | 0.23 | 0.29 | 0.14 | 0.15 | 0.14 | 0.12 | 0.2 | 0.23 | no | -- | 1.8 | 12 |
| 15F | LIMA LIM | LI | w.wt | | | | | | | | | | | | | 0.099 | 0.14 | 0.13 | 0.15 | 0.076 | 0.18 | 0.19 | no | -- | 1.7 | 13 |
| 22F | LIMA LIM | LI | w.wt | | | | | | | | | | 0.095 | 0.091 | 0.13 | | 0.17 | 0.12 | | | | | no | -? | ? | 9 |
| 98F | LIMA LIM | LI | w.wt | | | | | | | | | | | | | | 0.98 | 0.18 | 0.23 | | | | no | -? | ? | 21 |
| 67B | LEPI WHI | LI | w.wt | | | 0.18 | | | | 0.18 | 0.11 | 0.066 | 0.2 | 0.085 | 0.1 | 0.12 | 0.3 | 0.26 | 0.2 | 0.097 | 0.033 | 0.051 | m | -- | m | 15 |

Annual median concentration of CU (ppm)

| | | | | | | | | | | | | | | | | | | | | | | ANALYSIS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | OC | TRND | UP95+3 | POWER |
| 30A | MYTI EDU | SB | d.wt | | | | 4.6 | | 7.5 | 5 | 5.5 | 6 | 10 | 10 | 5.8 | 6.7 | 8.6 | 6.9 | 7.7 | 9.5 | 7.7 | 8 | no | -- | 1.4 | 10 |
| 31A | MYTI EDU | SB | d.wt | | | 7 | 6.6 | | | 4.4 | 4.5 | 4.5 | 9 | 11 | 5.5 | 5.7 | 6.2 | 7.3 | 6.6 | 6.1 | 8.1 | 7.5 | no | -- | 1.4 | 11 |
| 35A | MYTI EDU | SB | d.wt | | | 6.3 | 3.6 | | 8.1 | 4.9 | 4.6 | 5.3 | 8 | 10 | 6.6 | 6.3 | 6.6 | 6.4 | 6.9 | 6.8 | 7.2 | 7.1 | no | -- | 1.2 | 11 |
| 36A | MYTI EDU | SB | d.wt | | | 6.3 | 3.6 | | 6.1 | 4.5 | 4.9 | 4.3 | 5.5 | 9.2 | 5.2 | 5.5 | 5.6 | 7.7 | 9.1 | 6.9 | 6.8 | 6.2 | no | -- | no | 10 |
| 71A | MYTI EDU | SB | d.wt | | | 8.5 | 5.2 | | | 6.1 | 8.4 | 7 | 8.3 | 10 | 7.4 | 7.9 | 7.2 | 8.1 | 7.7 | 9.4 | 7.5 | 7.6 | no | -- | 1.1 | 9 |
| 76A | MYTI EDU | SB | d.wt | | | | | | | | | | 8.5 | 11 | 5.6 | 5.6 | | | 6.6 | 7.8 | 9.1 | 10 | 1 | -- | 2.3 | 10 |
| 15A | MYTI EDU | SB | d.wt | | | | | | | | | | 5.7 | 7.2 | | 5.5 | 5.3 | 5.3 | 7.3 | 6.1 | 7.6 | 7.3 | no | -- | 1.3 | 8 |
| 51A | MYTI EDU | SB | d.wt | | | | | | | 7.1 | 6.1 | | | | | | | 10 | 10 | 7.4 | | 8.2 | no | -- | no | 9 |
| 52A | MYTI EDU | SB | d.wt | | | | | | | | | 8.4 | 7.5 | 72 | 9.3 | 8.4 | 7 | 7 | 6.3 | 7.7 | 6.5 | 5.5 | no | -- | 2.4 | 20 |
| 56A | MYTI EDU | SB | d.wt | | | | | | | 8.1 | 7.9 | 8.8 | 5.4 | 7.5 | 7.4 | 9.1 | 6.4 | 7.7 | 6.6 | 7.8 | 7.2 | 8.2 | no | -- | 1.2 | 8 |
| 57A | MYTI EDU | SB | d.wt | | | | | | | 8.2 | 6.3 | 6 | 6.2 | 7.3 | 6.6 | 6.8 | 6.4 | 5.6 | 5.5 | 7 | 6.9 | 6.4 | no | -- | no | 7 |
| 63A | MYTI EDU | SB | d.wt | | | | | | | 9.8 | 6.2 | 5.1 | 6.8 | 11 | 6.3 | 6.1 | 6.7 | 6.8 | 6.6 | 6.1 | 5.6 | 5.1 | no | -- | no | 10 |
| 65A | MYTI EDU | SB | d.wt | | | | | | | 8 | 4.9 | 5.2 | 12 | 8.1 | 5.5 | 6 | 5.1 | 5.7 | 5.8 | 5.6 | 5.1 | 5 | no | -- | no | 11 |
| 69A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 6.2 | 5.3 | 5.4 | 6.3 | 7.3 | 5.6 | 5.2 | 7.2 | no | -- | no | 8 |
| 22A | MYTI EDU | SB | d.wt | | | | | | | | | | 6.3 | 6.7 | 5.4 | 5.8 | 6.3 | 6.8 | 9.3 | 4.2 | 8.6 | 7.5 | no | -- | 1.4 | 11 |
| 82A | MYTI EDU | SB | d.wt | | | | 6.4 | | | 4.7 | 5.8 | 7.5 | | 12 | 6.9 | 9.6 | | 7.4 | 7.9 | | | | no | -- | 1.2 | 10 |
| 84A | MYTI EDU | SB | d.wt | | | | 10 | | 97 | 57 | 39 | 27 | | 17 | 22 | 24 | | 9.5 | 7.2 | | | | no | -- | 1.7 | 20 |
| 87A | MYTI EDU | SB | d.wt | | | | 4.6 | | | 20 | 8.3 | 5.9 | | 7.3 | 6.3 | 6.9 | | 7.6 | 7.5 | | | | no | -- | 2.3 | 15 |
| 91A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 6.6 | 6.4 | 8.4 | | | | | | no | -? | ? | 7 |
| 92A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 6.7 | 6 | 7.6 | 6.3 | 7.5 | 6.4 | | | no | -- | no | 7 |
| 98A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 8.9 | 6.6 | | | | 5.5 | 5.3 | 5.9 | no | -? | ? | 8 |
| 98X | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 9 | 8.9 | 7.7 | | | | no | -? | ? | <=5 |
| 41A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 6.8 | 8.2 | 7.6 | 4.8 | | | no | -? | ? | 10 |
| 43A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 7.8 | 9.3 | | 6.3 | | | no | -? | ? | 9 |
| 44A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 6.6 | 9.6 | 7.8 | 6.9 | | | no | -? | ? | 10 |
| 46A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 6.6 | 7.4 | 8 | | | | no | -? | ? | <=5 |
| 48A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 6.6 | 7.7 | 7.1 | | | | no | -? | ? | 7 |
| 10A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 7.3 | 11 | 7.8 | 5.7 | 7.9 | 6.9 | no | -- | 1.7 | 10 |
| 11A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 9.9 | 9.7 | 12 | 8.3 | | | no | -? | ? | 8 |
| 30B | GADU MOR | LI | w.wt | | | | | | 7 | 28 | 5.1 | 4.2 | 4.5 | 3.7 | 8.5 | 6.8 | 8.1 | 5.1 | 5.1 | 7 | 9.3 | 12 | no | -- | 2.5 | 16 |
| 36B | GADU MOR | LI | w.wt | | | | | | 14 | 20 | 7 | 12 | 11 | 8.7 | 9.6 | 7.4 | 11 | 8 | 9.8 | 14 | 10 | 14 | no | -- | 1.5 | 11 |
| 15B | GADU MOR | LI | w.wt | | | | | | | | | | 11 | 1.6 | 5.8 | 2.3 | 1.7 | 3.6 | 9 | 5.9 | 5.5 | 3.8 | no | -- | 1.3 | 19 |
| 53B | GADU MOR | LI | w.wt | | | | | | 12 | | 7.1 | 5.9 | 2.4 | 3.3 | 4.7 | 6 | | 5.4 | 6.3 | 8.2 | 15 | 9.6 | no | UY | 1.9 | 12 |
| 67B | GADU MOR | LI | w.wt | | | | | | | 8 | 6.9 | 14 | 8.9 | 8.8 | 5.2 | 8 | 9.7 | 4.5 | 7.2 | 19 | 10 | 9.6 | no | -- | 1.9 | 14 |
| 23B | GADU MOR | LI | w.wt | | | | | | | | | | 8.2 | 11 | 5.8 | 7.1 | 7.1 | 10 | 8.8 | 9.1 | 7.4 | 13 | no | -- | 1.1 | 11 |
| 92B | GADU MOR | LI | w.wt | | | | | | | | | | | | | 7.8 | 6.1 | 7.4 | 7 | | | | no | -? | ? | 7 |
| 98B | GADU MOR | LI | w.wt | | | | | | | | | | | | 5.9 | 8.2 | 3.8 | 2.3 | 6.2 | 3.9 | 5.9 | 6.8 | no | -- | 1.2 | 14 |
| 43B | GADU MOR | LI | w.wt | | | | | | | | | | | | | | 6 | 5.6 | 5.4 | | | | no | -? | ? | <=5 |
| 10B | GADU MOR | LI | w.wt | | | | | | | | | | | | | | 9.9 | 7.8 | 4.3 | 5.3 | 4.3 | 3.5 | no | D- | no | 9 |
| 33B | PLAT FLE | LI | w.wt | | | | | | 22 | 35 | 16 | 34 | 20 | 19 | 16 | 18 | 18 | 13 | 14 | 15 | 15 | 17 | no | -- | no | 11 |
| 53B | PLAT FLE | LI | w.wt | | | | | | | | 14 | 9 | 8.2 | 19 | 11 | 17 | | 8.3 | 15 | 8.4 | 19 | 14 | no | -- | 1.3 | 14 |
| 36F | LIMA LIM | LI | w.wt | | | | | | | | | | 13 | 5.3 | 8.5 | 8.1 | 7.3 | 8.9 | 7.1 | 9.6 | 7.6 | 14 | 1.4 | -- | 2.9 | 12 |
| 15F | LIMA LIM | LI | w.wt | | | | | | | | | | | 2.8 | | 4.1 | 3 | 5.9 | 9.1 | 1.9 | 9 | 10 | 1 | -- | 5.5 | 18 |
| 22F | LIMA LIM | LI | w.wt | | | | | | | | | | 9.8 | 6.7 | 3.4 | | 2.2 | 3.5 | | | | | no | -? | ? | 14 |
| 98F | LIMA LIM | LI | w.wt | | | | | | | | | | | | | | 3.5 | 5 | 5.7 | | | | no | -? | ? | 6 |
| 67B | LEPI WHI | LI | w.wt | | | | | | | 15 | 14 | 19 | 11 | 14 | 13 | 12 | 14 | 20 | 20 | 13 | 9.4 | 11 | m | -- | m | 10 |

Annual median concentration of HG (ppm)

| | | | | | | | | | | | | | | | | | | | | | | | | ANALYSIS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | OC | TRND | UP95+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 | 0.087 | 0.057 | 0.070 | 0.060 | 0.078 | 0.114 | no | -- | 1.3 | 13 |
| 31A | MYTI EDU | SB | d.wt | | | 0.076 | 0.164 | 0.086 | 0.120 | 0.050 | 0.090 | 0.023 | 0.060 | 0.049 | 0.051 | 0.045 | 0.050 | 0.062 | 0.044 | 0.052 | 0.070 | 0.088 | no | -- | 1.2 | 14 |
| 35A | MYTI EDU | SB | d.wt | | | 0.093 | 0.074 | 0.084 | 0.170 | 0.050 | 0.180 | 0.050 | 0.062 | 0.059 | 0.058 | 0.054 | 0.061 | 0.037 | 0.038 | 0.035 | 0.067 | 0.101 | no | -- | 1.5 | 14 |
| 36A | MYTI EDU | SB | d.wt | | | 0.052 | 0.043 | 0.084 | 0.140 | 0.050 | 0.140 | 0.034 | 0.045 | 0.048 | 0.039 | 0.032 | 0.048 | 0.033 | 0.044 | 0.074 | 0.030 | 0.046 | 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 | 0.312 | 0.110 | 0.155 | no | -- | 1.1 | 13 |
| 76A | MYTI EDU | SB | d.wt | | | | | | | | | | 0.071 | 0.068 | 0.050 | 0.021 | | | 0.057 | 0.082 | 0.063 | 0.101 | no | -- | 2.4 | 15 |
| 15A | MYTI EDU | SB | d.wt | | | | | | | | | | 0.056 | 0.052 | | 0.024 | 0.050 | 0.022 | 0.049 | 0.056 | 0.053 | 0.044 | no | -- | no | 14 |
| 51A | MYTI EDU | SB | d.wt | | | | | | | 0.240 | 0.250 | | | | | | | 1.510 | 0.901 | 0.175 | 0.577 | 2.890 | 14.5 | -- | 156.4 | >25 |
| 52A | MYTI EDU | SB | d.wt | | | | | | | | | 2.350 | 0.321 | 3.010 | 0.976 | 0.372 | 0.282 | 0.437 | 0.178 | 0.260 | 0.258 | 0.580 | 2.9 | -- | 13.6 | 21 |
| 56A | MYTI EDU | SB | d.wt | | | | | | | 0.530 | 0.370 | 1.090 | 0.710 | 1.540 | 0.935 | 1.220 | 0.352 | 0.679 | 0.365 | 0.526 | 0.282 | 0.917 | 4.6 | -- | 9 | 16 |
| 57A | MYTI EDU | SB | d.wt | | | | | | | 0.170 | 0.210 | 0.269 | 0.411 | 0.758 | 0.576 | 0.349 | 0.350 | 0.260 | 0.155 | 0.319 | 0.166 | 0.467 | 2.3 | -- | 4 | 13 |
| 63A | MYTI EDU | SB | d.wt | | | | | | | 0.310 | 0.140 | 0.177 | 0.394 | 0.468 | 0.294 | 0.143 | 0.190 | 0.252 | 0.172 | 0.203 | 0.226 | 0.268 | 1.3 | -- | 3.3 | 14 |
| 65A | MYTI EDU | SB | d.wt | | | | | | | 0.100 | 0.150 | 0.104 | 0.312 | 0.328 | 0.124 | 0.119 | 0.134 | 0.148 | 0.118 | 0.136 | 0.079 | 0.142 | no | -- | 1.1 | 14 |
| 69A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 0.106 | 0.026 | 0.083 | 0.070 | 0.104 | 0.111 | 0.077 | 0.161 | no | -- | 3.3 | 17 |
| 22A | MYTI EDU | SB | d.wt | | | | | | | | | | 0.053 | 0.073 | 0.112 | 0.048 | 0.067 | 0.066 | 0.072 | 0.068 | 0.046 | 0.074 | no | -- | no | 12 |
| 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 | -- | no | 17 |
| 91A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 0.054 | 0.076 | 0.094 | | | | | | no | -? | ? | <=5 |
| 92A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 0.055 | 0.034 | 0.052 | 0.041 | 0.023 | 0.067 | | | no | -- | 1.5 | 14 |
| 98A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 0.087 | 0.086 | | | | 0.104 | 0.155 | 0.246 | 1.2 | -? | ? | 11 |
| 98X | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.335 | 0.340 | 0.328 | | | | 1.6 | -? | ? | <=5 |
| 41A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.069 | 0.064 | 0.064 | 0.085 | | | no | -? | ? | 8 |
| 43A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.084 | 0.095 | | 0.104 | | | no | -? | ? | <=5 |
| 44A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.055 | 0.050 | 0.052 | 0.059 | | | no | -? | ? | 6 |
| 46A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.039 | 0.062 | 0.056 | | | | no | -? | ? | 10 |
| 48A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.073 | 0.060 | 0.052 | | | | no | -? | ? | <=5 |
| 10A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.053 | 0.049 | 0.059 | 0.062 | 0.058 | 0.063 | no | -- | no | 6 |
| 11A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.182 | 0.145 | 0.086 | 0.146 | | | no | -? | ? | 13 |

Annual median concentration of HG (ppm)

| | | | | | | | | | | | | | | | | | | | | | | | | ANALYSIS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | OC | TRND | UP95+3 | POWER |
| 30B | GADU MOR (s) | MU | w.wt | | | | 0.125 | 0.089 | 0.079 | 0.04 | 0.059 | 0.121 | 0.12 | 0.09 | 0.11 | 0.122 | 0.102 | 0.08 | 0.108 | 0.131 | 0.117 | 0.153 | 1.5 | --L | 3.3 | 11 |
| 30B | GADU MOR (l) | MU | w.wt | | | | 0.155 | 0.09 | 0.074 | 0.038 | 0.147 | 0.166 | 0.13 | 0.108 | 0.15 | 0.155 | 0.129 | 0.119 | 0.142 | 0.19 | 0.232 | 0.351 | 3.5 | U-L | 12.7 | 13 |
| 36B | GADU MOR (s) | MU | w.wt | 0.069 | 0.08 | 0.11 | 0.075 | 0.08 | 0.061 | 0.032 | 0.053 | 0.069 | 0.06 | 0.06 | 0.059 | 0.067 | 0.054 | 0.076 | 0.067 | 0.089 | 0.078 | 0.06 | no | --L | 1.1 | 10 |
| 36B | GADU MOR (l) | MU | w.wt | 0.079 | 0.16 | 0.18 | 0.195 | 0.12 | 0.112 | 0.039 | 0.083 | 0.074 | 0.115 | 0.1 | 0.08 | 0.083 | 0.06 | 0.095 | 0.07 | 0.157 | 0.088 | 0.186 | 1.9 | --L | 5.1 | 13 |
| 15B | GADU MOR (s) | MU | w.wt | | | | | | | | | | 0.065 | 0.04 | 0.026 | 0.018 | 0.045 | 0.044 | 0.059 | 0.076 | 0.044 | 0.023 | no | --L | no | 14 |
| 15B | GADU MOR (l) | MU | w.wt | | | | | | | | | | 0.12 | 0.07 | 0.063 | 0.039 | 0.081 | 0.046 | 0.087 | 0.108 | 0.09 | 0.027 | no | --L | no | 15 |
| 53B | GADU MOR (s) | MU | w.wt | | | | | | 0.223 | | 0.105 | 0.16 | 0.184 | 0.204 | 0.36 | 0.09 | | 0.054 | 0.229 | 0.128 | 0.151 | 0.175 | 1.8 | --- | 8.1 | 17 |
| 53B | GADU MOR (l) | MU | w.wt | | | | | | 0.196 | | 0.105 | 0.203 | 0.17 | 0.269 | 0.396 | 0.141 | | 0.09 | 0.277 | 0.243 | 0.298 | 0.285 | 2.9 | --- | 13.7 | 15 |
| 67B | GADU MOR (s) | MU | w.wt | | | | | | | 0.1 | 0.085 | 0.09 | 0.079 | 0.1 | 0.085 | 0.093 | 0.12 | 0.071 | 0.073 | 0.117 | 0.051 | 0.058 | no | --- | no | 10 |
| 67B | GADU MOR (l) | MU | w.wt | | | | | | | 0.17 | 0.085 | 0.102 | 0.255 | 0.13 | 0.141 | 0.083 | 0.106 | 0.072 | 0.089 | 0.16 | 0.068 | 0.06 | no | --- | 1.3 | 14 |
| 23B | GADU MOR (s) | MU | w.wt | | | | | | | | | | 0.065 | 0.07 | 0.06 | 0.042 | 0.052 | 0.069 | 0.06 | 0.073 | 0.075 | 0.061 | no | --L | 1.1 | 9 |
| 23B | GADU MOR (l) | MU | w.wt | | | | | | | | | | 0.17 | 0.11 | 0.084 | 0.098 | 0.074 | 0.109 | 0.057 | 0.105 | 0.116 | 0.113 | 1.1 | --L | 2.6 | 11 |
| 84B | GADU MOR (s) | MU | w.wt | | | | 0.035 | 0.04 | 0.025 | | 0.044 | | | | | | | | | | | | no | -?- | ? | 12 |
| 84B | GADU MOR (l) | MU | w.wt | | | | 0.06 | 0.04 | 0.025 | | 0.044 | | | | | | | | | | | | no | -?- | ? | 14 |
| 92B | GADU MOR (s) | MU | w.wt | | | | | | | | | | | | | 0.046 | 0.079 | 0.08 | 0.077 | | | | no | -?- | ? | 10 |
| 92B | GADU MOR (l) | MU | w.wt | | | | | | | | | | | | | 0.058 | 0.091 | 0.074 | 0.117 | | | | 1.2 | -?- | ? | 10 |
| 98B | GADU MOR (s) | MU | w.wt | | | | | | | | | | | | 0.067 | 0.054 | 0.069 | 0.069 | 0.04 | 0.095 | 0.066 | 0.047 | no | --- | 1.1 | 12 |
| 98B | GADU MOR (l) | MU | w.wt | | | | | | | | | | | | 0.065 | 0.064 | 0.069 | 0.086 | 0.037 | 0.128 | 0.09 | 0.043 | no | --- | 1.6 | 15 |
| 43B | GADU MOR (s) | MU | w.wt | | | | | | | | | | | | | | 0.065 | 0.054 | 0.047 | | | | no | -?- | ? | <=5 |
| 43B | GADU MOR (l) | MU | w.wt | | | | | | | | | | | | | | 0.05 | 0.059 | 0.057 | | | | no | -?- | ? | 6 |
| 10B | GADU MOR (s) | MU | w.wt | | | | | | | | | | | | | | 0.044 | 0.034 | 0.029 | 0.011 | 0.014 | 0.017 | no | D-- | no | 13 |
| 10B | GADU MOR (l) | MU | w.wt | | | | | | | | | | | | | | 0.056 | 0.053 | 0.04 | 0.02 | 0.019 | 0.032 | no | --- | 1.4 | 13 |
| 33B | PLAT FLE (s) | MU | w.wt | | | 0.11 | | 0.09 | 0.077 | 0.019 | 0.069 | | 0.175 | 0.088 | 0.116 | 0.092 | 0.069 | 0.053 | 0.048 | 0.076 | 0.038 | 0.046 | no | --- | no | 16 |
| 33B | PLAT FLE (l) | MU | w.wt | | | 0.139 | | 0.1 | 0.077 | 0.024 | 0.069 | | 0.195 | 0.135 | 0.196 | 0.103 | 0.088 | 0.049 | 0.06 | 0.087 | 0.07 | 0.119 | 1.2 | --- | 3.6 | 16 |
| 53B | PLAT FLE (s) | MU | w.wt | | | | | | | | 0.111 | 0.074 | 0.139 | 0.154 | 0.141 | 0.071 | | 0.035 | 0.165 | 0.13 | 0.165 | 0.249 | 2.5 | --- | 16.1 | 16 |
| 53B | PLAT FLE (l) | MU | w.wt | | | | | | | | 0.111 | 0.128 | 0.09 | 0.124 | 0.1 | 0.116 | | 0.036 | 0.208 | 0.221 | 0.257 | 0.157 | 1.6 | --- | 13.1 | 17 |
| 36F | LIMA LIM (s) | MU | w.wt | | | | | | | | | | 0.045 | 0.071 | 0.066 | 0.07 | 0.05 | 0.054 | 0.049 | 0.031 | 0.062 | 0.038 | no | --L | no | 11 |
| 36F | LIMA LIM (l) | MU | w.wt | | | | | | | | | | 0.098 | 0.074 | 0.133 | 0.101 | 0.076 | 0.1 | 0.066 | 0.091 | 0.092 | 0.068 | no | --L | 1.2 | 10 |
| 15F | LIMA LIM (s) | MU | w.wt | | | | | | | | | | | 0.09 | | 0.038 | 0.037 | 0.025 | 0.037 | 0.048 | 0.042 | 0.029 | no | --L | no | 13 |
| 15F | LIMA LIM (l) | MU | w.wt | | | | | | | | | | | 0.15 | | 0.034 | 0.036 | 0.056 | 0.108 | 0.073 | 0.088 | 0.068 | no | --L | 3.7 | 17 |
| 22F | LIMA LIM (s) | MU | w.wt | | | | | | | | | | 0.084 | 0.04 | 0.207 | | 0.045 | 0.063 | | | | | no | -?- | ? | 20 |
| 22F | LIMA LIM (l) | MU | w.wt | | | | | | | | | | 0.174 | 0.152 | 0.282 | | 0.223 | 0.372 | | | | | 3.7 | -?- | ? | 11 |
| 67B | LEPI WHI (s) | MU | w.wt | | | 0.235 | | | | 0.35 | 0.329 | 0.21 | 0.343 | 0.075 | 0.174 | 0.187 | 0.305 | 0.364 | 0.398 | 0.172 | 0.066 | 0.11 | m | --L | m | 16 |
| 67B | LEPI WHI (l) | MU | w.wt | | | 0.499 | | | | 0.35 | 0.329 | 0.32 | 0.589 | 0.147 | 0.327 | 0.336 | 0.422 | 0.341 | 0.372 | 0.331 | 0.275 | 0.392 | m | --L | m | 13 |

Annual median concentration of PB (ppm)

| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | OC | ANALYSIS<br>TRND | UP95+3 | POWER |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30A | MYTI EDU | SB | d.wt | | | | | | | | | | 1.9 | 1.4 | 4 | 2.3 | 2.5 | 1.6 | 2.1 | 2.7 | 37 | 2.1 | no | -- | 40.2 | 24 |
| 31A | MYTI EDU | SB | d.wt | | | | | | | | | | 1.4 | 1.2 | 1.3 | 1 | 1.4 | 1.7 | 1.8 | 0.73 | 1.5 | 0.63 | no | -- | no | 13 |
| 35A | MYTI EDU | SB | d.wt | | | | | | | | | | 1.4 | 1.1 | 1.7 | 1.2 | 1.3 | 0.51 | 0.63 | 0.66 | 0.76 | 0.71 | no | -- | no | 11 |
| 36A | MYTI EDU | SB | d.wt | | | | | | | | | | 1 | 0.85 | 0.79 | 1.1 | 1.4 | 1.2 | 2 | 2.2 | 1.6 | 1 | no | -- | no | 11 |
| 71A | MYTI EDU | SB | d.wt | | | | | | | | | | 1.2 | 0.74 | 1.7 | 1.4 | 1.9 | 1.5 | 2.2 | 2.8 | 0.87 | 0.9 | no | -- | no | 14 |
| 76A | MYTI EDU | SB | d.wt | | | | | | | | | | 1.8 | 0.97 | 1.5 | 0.91 | | | 0.8 | 1.8 | 1.2 | 2 | no | -- | 1.9 | 13 |
| 15A | MYTI EDU | SB | d.wt | | | | | | | | | | 1.5 | 0.78 | | 0.98 | 1.1 | 0.52 | 0.67 | 1.1 | 1.3 | 1.7 | no | -- | 1.8 | 12 |
| 51A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 150 | 60 | 17 | 30 | 37 | 12.4 | -? | ? | 19 |
| 52A | MYTI EDU | SB | d.wt | | | | | | | | | | 12 | 310 | 190 | 66 | 16 | 18 | 9.8 | 21 | 15 | 12 | 3.9 | -- | 37.1 | >25 |
| 56A | MYTI EDU | SB | d.wt | | | | | | | | | | 21 | 23 | 120 | 110 | 25 | 46 | 28 | 37 | 16 | 30 | 10.1 | -- | 24.4 | 19 |
| 57A | MYTI EDU | SB | d.wt | | | | | | | | | | 11 | 12 | 33 | 19 | 15 | 13 | 5.6 | 14 | 6.1 | 10 | 3.5 | -- | 6.2 | 15 |
| 63A | MYTI EDU | SB | d.wt | | | | | | | | | | 12 | 10 | 15 | 11 | 7.2 | 12 | 7.6 | 6.1 | 6.4 | 4.8 | 1.6 | D- | 1.8 | 10 |
| 65A | MYTI EDU | SB | d.wt | | | | | | | | | | 5.6 | 3.8 | 5.2 | 6.5 | 3.3 | 4.7 | 2.4 | 3 | 1.8 | 1.6 | no | D- | no | 11 |
| 69A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 4.6 | 3.4 | 2.8 | 3.2 | 4 | 3.7 | 2 | 3.4 | 1.1 | -- | 1.6 | 11 |
| 22A | MYTI EDU | SB | d.wt | | | | | | | | | | 1.4 | 1.5 | 2.8 | 1.9 | 1.4 | 1.2 | 1.5 | 1.4 | 1.2 | 1.7 | no | -- | no | 11 |
| 82A | MYTI EDU | SB | d.wt | | | | | | | | | | | 1.3 | 0.93 | 0.92 | | 0.62 | 0.67 | | | | no | D? | ? | 7 |
| 84A | MYTI EDU | SB | d.wt | | | | | | | | | | | 1 | 1.2 | 1.4 | | 1.4 | 0.83 | | | | no | -? | ? | 11 |
| 87A | MYTI EDU | SB | d.wt | | | | | | | | | | | 0.97 | 0.87 | 0.63 | | 1.4 | 2.5 | | | | no | -? | ? | 14 |
| 91A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 0.9 | 1.5 | 2 | | | | | | no | -? | ? | 6 |
| 92A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 0.93 | 0.63 | 1.1 | 0.66 | 0.65 | 2.2 | | | no | -- | 11.5 | 16 |
| 98A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 1.9 | 1.8 | | | | 1.5 | 2.4 | 1.6 | no | -? | ? | 9 |
| 98X | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 4.3 | 3.1 | 4.1 | | | | 1.4 | -? | ? | 11 |
| 41A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 1.3 | 0.9 | 0.79 | 0.65 | | | no | D? | ? | 6 |
| 43A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 1.6 | 1.5 | | 0.85 | | | no | -? | ? | 8 |
| 44A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 2.8 | 2.6 | 1.7 | 1.2 | | | no | D? | ? | 7 |
| 46A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 1.3 | 1.6 | 1.4 | | | | no | -? | ? | 8 |
| 48A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.68 | 1.1 | 0.33 | | | | no | -? | ? | 19 |
| 10A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 1.9 | 2.8 | 0.74 | 0.81 | 2.3 | 1.6 | no | -- | 8.1 | 18 |
| 11A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 1.5 | 1.5 | 0.34 | 0.37 | | | no | -? | ? | 16 |
| 30B | GADU MOR | LI | w.wt | | | | | | | | | | 0.2 | 0.11 | 0.25 | 0.1 | 0.12 | 0.11 | 0.06 | 0.1 | 0.16 | 0.85 | 8.5 | -- | 46.3 | 17 |
| 36B | GADU MOR | LI | w.wt | | | | | | | | | | 0.11 | 0.05 | 0.03 | 0.02 | 0.03 | 0.02 | 0.03 | 0.04 | 0.03 | 0.04 | no | DY | no | 12 |
| 15B | GADU MOR | LI | w.wt | | | | | | | | | | 0.17 | 0.06 | 0.03 | 0.03 | 0.03 | 0.02 | 0.03 | 0.04 | 0.03 | 0.03 | no | DY | no | 13 |
| 53B | GADU MOR | LI | w.wt | | | | | | | | | | 0.19 | 0.26 | 0.14 | 0.03 | | 0.02 | 0.075 | 0.07 | 0.1 | 0.11 | 1.1 | -- | 11.6 | 18 |
| 67B | GADU MOR | LI | w.wt | | | | | | | | | | 0.13 | 0.18 | 0.03 | 0.075 | 0.09 | 0.04 | 0.04 | 0.09 | 0.03 | 0.04 | no | -- | 1.1 | 18 |
| 23B | GADU MOR | LI | w.wt | | | | | | | | | | 0.06 | 0.08 | 0.03 | 0.03 | 0.03 | 0.02 | 0.03 | 0.04 | 0.03 | 0.04 | no | -- | no | 11 |
| 92B | GADU MOR | LI | w.wt | | | | | | | | | | | | | 0.02 | 0.03 | 0.03 | 0.04 | | | | no | -? | ? | 7 |
| 98B | GADU MOR | LI | w.wt | | | | | | | | | | | | 0.03 | 0.03 | 0.03 | 0.04 | 0.04 | 0.05 | 0.03 | 0.03 | no | -- | no | 9 |
| 43B | GADU MOR | LI | w.wt | | | | | | | | | | | | | | 0.03 | 0.03 | 0.03 | | | | no | -? | ? | <=5 |
| 10B | GADU MOR | LI | w.wt | | | | | | | | | | | | | | 0.03 | 0.02 | 0.04 | 0.04 | 0.04 | 0.03 | no | -- | no | 11 |
| 33B | PLAT FLE | LI | w.wt | | | | | | | | | | 0.24 | 0.35 | 0.06 | 0.03 | 0.03 | 0.02 | 0.03 | 0.04 | 0.04 | 0.04 | no | DY | no | 15 |
| 53B | PLAT FLE | LI | w.wt | | | | | | | | | | 0.71 | 0.81 | 0.41 | 0.23 | | 0.024 | 0.46 | 0.35 | 0.52 | 0.46 | 1.5 | -- | 49.6 | 24 |
| 36F | LIMA LIM | LI | w.wt | | | | | | | | | | 0.6 | 0.07 | 0.04 | 0.07 | 0.03 | 0.02 | 0.03 | 0.05 | 0.05 | 0.05 | no | D- | 1.1 | 18 |
| 15F | LIMA LIM | LI | w.wt | | | | | | | | | | | 0.07 | | 0.041 | 0.03 | 0.02 | 0.03 | 0.05 | 0.04 | 0.03 | no | -- | no | 13 |
| 22F | LIMA LIM | LI | w.wt | | | | | | | | | | 0.25 | 0.16 | 0.042 | | 0.06 | 0.07 | | | | | no | -? | ? | 18 |
| 98F | LIMA LIM | LI | w.wt | | | | | | | | | | | | | | 0.02 | 0.04 | 0.03 | | | | no | -? | ? | 14 |
| 67B | LEPI WHI | LI | w.wt | | | | | | | | | | 0.19 | 0.07 | 0.06 | 0.07 | 0.04 | 0.07 | 0.03 | 0.04 | 0.04 | 0.03 | m | D- | m | 13 |

Annual median concentration of ZN (ppm)

| | | | | | | | | | | | | | | | | | | | | | | | ANALYSIS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | OC | TRND | UP95+3 | POWER |
| 30A | MYTI EDU | SB | d.wt | | | | 138 | 90.5 | 140 | 120 | 93.1 | 76.2 | 161 | 116 | 147 | 104 | 117 | 109 | 114 | 126 | 173 | 106 | no | -- | 1.2 | 11 |
| 31A | MYTI EDU | SB | d.wt | | | 88.1 | 132 | 76.9 | 106 | 66.3 | 67.7 | 58.1 | 181 | 128 | 125 | 96.4 | 96.8 | 151 | 103 | 128 | 120 | 112 | no | -- | 1 | 12 |
| 35A | MYTI EDU | SB | d.wt | | | 91.9 | 79.6 | 75.9 | 89.8 | 68.4 | 81.5 | 83.2 | 166 | 139 | 131 | 119 | 97.6 | 82.9 | 94.3 | 103 | 112 | 111 | no | UY | no | 9 |
| 36A | MYTI EDU | SB | d.wt | | | 66.5 | 85.8 | 66.1 | 57.7 | 61.5 | 73.6 | 65.3 | 126 | 127 | 104 | 84 | 121 | 115 | 137 | 145 | 105 | 95.5 | no | U- | no | 9 |
| 71A | MYTI EDU | SB | d.wt | | | 124 | 125 | 77 | 115 | 101 | 169 | 128 | 162 | 143 | 166 | 120 | 157 | 150 | 122 | 192 | 114 | 114 | no | -- | no | 10 |
| 76A | MYTI EDU | SB | d.wt | | | | | | | | | | 158 | 127 | 124 | 57.6 | | | 112 | 135 | 137 | 132 | no | -- | 1.9 | 12 |
| 15A | MYTI EDU | SB | d.wt | | | | | | | | | | 157 | 144 | | 71.4 | 88.9 | 62.6 | 232 | 107 | 127 | 105 | no | -- | 1.8 | 15 |
| 51A | MYTI EDU | SB | d.wt | | | | | | | 378 | 253 | | | | | | | 386 | 223 | 120 | | 170 | no | -- | 1.3 | 14 |
| 52A | MYTI EDU | SB | d.wt | | | | | | | | | 824 | 272 | 453 | 408 | 218 | 141 | 196 | 183 | 247 | 160 | 143 | no | D- | 1.5 | 13 |
| 56A | MYTI EDU | SB | d.wt | | | | | | | 869 | 410 | 1170 | 572 | 479 | 418 | 388 | 211 | 290 | 246 | 377 | 143 | 271 | 1.4 | D- | 2.3 | 14 |
| 57A | MYTI EDU | SB | d.wt | | | | | | | 378 | 263 | 441 | 520 | 292 | 256 | 147 | 173 | 182 | 115 | 223 | 121 | 207 | 1 | D- | 1.8 | 12 |
| 63A | MYTI EDU | SB | d.wt | | | | | | | 579 | 216 | 241 | 509 | 392 | 207 | 122 | 122 | 189 | 147 | 170 | 129 | 115 | no | D- | 1.2 | 14 |
| 65A | MYTI EDU | SB | d.wt | | | | | | | 191 | 156 | 199 | 424 | 308 | 131 | 139 | 118 | 166 | 147 | 184 | 121 | 152 | no | -- | 1.4 | 12 |
| 69A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 135 | 102 | 135 | 163 | 161 | 218 | 144 | 201 | 1 | -- | 1.7 | 9 |
| 22A | MYTI EDU | SB | d.wt | | | | | | | | | | 172 | 162 | 135 | 116 | 98 | 144 | 221 | 110 | 128 | 122 | no | -- | no | 11 |
| 82A | MYTI EDU | SB | d.wt | | | | 127 | 106 | 132 | 109 | 76.1 | 129 | | 145 | 123 | 112 | | 109 | 87.6 | | | | no | -- | no | 9 |
| 84A | MYTI EDU | SB | d.wt | | | | 118 | 160 | 163 | 133 | 132 | 142 | | 185 | 180 | 113 | | 121 | 85.8 | | | | no | -- | no | 9 |
| 87A | MYTI EDU | SB | d.wt | | | | 100 | 92.8 | 97.7 | 102 | 105 | 96.6 | | 117 | 114 | 90.2 | | 109 | 97.2 | | | | no | -- | no | 6 |
| 91A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 96.2 | 102 | 116 | | | | | | no | -? | ? | <=5 |
| 92A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 88.7 | 61.1 | 90.2 | 77.5 | 59.2 | 97.8 | | | no | -- | 1.1 | 10 |
| 98A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 117 | 105 | | | | 89.9 | 81.6 | 82.1 | no | D? | ? | <=5 |
| 98X | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 187 | 182 | 146 | | | | no | -? | ? | 6 |
| 41A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 85.1 | 89 | 94.8 | 90.9 | | | no | -? | ? | <=5 |
| 43A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 98.7 | 96.6 | | 89.2 | | | no | -? | ? | <=5 |
| 44A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 67.2 | 91.3 | 81 | 78.8 | | | no | -? | ? | 8 |
| 46A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 88.4 | 112 | 93.3 | | | | no | -? | ? | 9 |
| 48A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 74.9 | 87 | 68.8 | | | | no | -? | ? | 8 |
| 10A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 127 | 120 | 94.6 | 114 | 102 | 103 | no | -- | no | 6 |
| 11A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 86.7 | 98.3 | 76.5 | 88.3 | | | no | -? | ? | 7 |
| 30B | GADU MOR | LI | w.wt | | | | | | 13.8 | 67 | 30.3 | 12.8 | 16.6 | 22.6 | 31.7 | 23.5 | 24.8 | 19.7 | 20.6 | 24.9 | 29.1 | 38.2 | 1.3 | -- | 4.3 | 16 |
| 36B | GADU MOR | LI | w.wt | | | | | | 46.4 | 64.4 | 35.4 | 36.4 | 31.8 | 19.7 | 25.8 | 22.6 | 24.3 | 31.1 | 25.7 | 47.3 | 29.9 | 32.3 | 1.1 | DY | 2.1 | 10 |
| 15B | GADU MOR | LI | w.wt | | | | | | | | | | 33.8 | 14.1 | 20.4 | 17 | 14.2 | 21.1 | 26.4 | 22.9 | 33.3 | 29.5 | no | -- | 2.7 | 11 |
| 53B | GADU MOR | LI | w.wt | | | | | | 29 | | 26.8 | 27.9 | 10.9 | 24.4 | 30 | 20.4 | | 17.5 | 29.6 | 27.2 | 32.4 | 28.2 | no | -- | 2.6 | 12 |
| 67B | GADU MOR | LI | w.wt | | | | | | | 26.4 | 22.3 | 26.4 | 27 | 25.7 | 19.4 | 29.2 | 27.4 | 15.8 | 30.7 | 47.3 | 25.5 | 30.2 | 1 | -- | 2.4 | 12 |
| 23B | GADU MOR | LI | w.wt | | | | | | | | | | 29 | 33.8 | 24.8 | 21.2 | 18.7 | 25.1 | 21.9 | 27.4 | 27.5 | 30.8 | 1 | -- | 1.7 | 8 |
| 92B | GADU MOR | LI | w.wt | | | | | | | | | | | | | 20.6 | 17.9 | 21.6 | 25 | | | | no | -? | ? | 7 |
| 98B | GADU MOR | LI | w.wt | | | | | | | | | | | | 19.9 | 24 | 14.6 | 13.5 | 16.2 | 20 | 14.1 | 17.6 | no | -- | no | 10 |
| 43B | GADU MOR | LI | w.wt | | | | | | | | | | | | | | 17.1 | 15.1 | 15.7 | | | | no | -? | ? | 6 |
| 10B | GADU MOR | LI | w.wt | | | | | | | | | | | | | | 29.3 | 23.4 | 15.9 | 23.4 | 18.8 | 16.9 | no | -- | no | 9 |
| 33B | PLAT FLE | LI | w.wt | | | | | | 52.7 | 91.1 | 54.6 | 48.3 | 56.9 | 47.3 | 45.1 | 50 | 49.4 | 38 | 51.2 | 43.6 | 44.7 | 41.6 | no | -- | no | 9 |
| 53B | PLAT FLE | LI | w.wt | | | | | | | | 54.4 | 46.3 | 43.3 | 51.4 | 49.2 | 51.9 | | 35.8 | 40.5 | 27.1 | 56.7 | 40.6 | no | -- | 1.2 | 10 |
| 36F | LIMA LIM | LI | w.wt | | | | | | | | | | 39.3 | 26.6 | 32.2 | 27.2 | 28.4 | 28 | 31.1 | 34.7 | 35.6 | 38.7 | no | -- | 1.2 | 7 |
| 15F | LIMA LIM | LI | w.wt | | | | | | | | | | | 25 | | 29.7 | 24.7 | 34.7 | 34.8 | 22.1 | 32.6 | 37.1 | no | -- | 1.2 | 9 |
| 22F | LIMA LIM | LI | w.wt | | | | | | | | | | 41.3 | 29 | 34.3 | | 27.5 | 37 | | | | | no | -? | ? | 9 |
| 98F | LIMA LIM | LI | w.wt | | | | | | | | | | | | | | 23.5 | 34.8 | 31.7 | | | | no | -? | ? | 9 |
| 67B | LEPI WHI | LI | w.wt | | | | | | | 80.5 | 106 | 68.3 | 85.7 | 94.1 | 73.2 | 78.8 | 58.7 | 80.8 | 83.5 | 61 | 98.6 | 70 | m | -- | m | 9 |

Annual median concentration of CB153 (ppb)

| | | | | | | | | | | | | | | | | | | | | | | | | ANALYSIS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | OC | TRND | UP95+3 | POWER |
| 30A | MYTI EDU | SB | d.wt | | | | | | | | 25.3 | 23.8 | 30.1 | 19.5 | 24.4 | 10.9 | 20.9 | 19.6 | 26.4 | 29 | 15.5 | 18.7 | 3.7 | -- | 6.2 | 12 |
| 31A | MYTI EDU | SB | d.wt | | | | | | | | 2.86 | 5.78 | 6.59 | 3.66 | 6.59 | 3.3 | 11.2 | 9.41 | 10.9 | 5.03 | 3.72 | 4.75 | no | -- | 1.1 | 15 |
| 35A | MYTI EDU | SB | d.wt | | | | | | | | 5.65 | 6.9 | 6.11 | 2.92 | 5.52 | 3.03 | 3.76 | 3.69 | 3.07 | 3.76 | 4.13 | 4.79 | no | -- | 1.8 | 11 |
| 36A | MYTI EDU | SB | d.wt | | | | | | | | 3.09 | 6.81 | 4.36 | 2.73 | 3.54 | 1.59 | 1.59 | 3.62 | 3.72 | 4.1 | 2.9 | 2.93 | no | -- | 1.5 | 14 |
| 71A | MYTI EDU | SB | d.wt | | | | | | | | 5.13 | 12.7 | 5.87 | 3.03 | 4.59 | 3.35 | 5.45 | 3.02 | 7.24 | 2.78 | 3.82 | 4.38 | no | -- | 1.8 | 15 |
| 76A | MYTI EDU | SB | d.wt | | | | | | | | | | 4.62 | 2.84 | 2.49 | 1.18 | | | 4.21 | 4 | 3.77 | 3.63 | no | -- | 3.6 | 15 |
| 15A | MYTI EDU | SB | d.wt | | | | | | | | | | 2.84 | | | 0.976 | 2 | 0.898 | 0.793 | 1.27 | 1.19 | 1.4 | no | -- | no | 14 |
| 51A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 10.2 | 3.49 | 4.17 | 3.03 | 3.87 | no | -? | ? | 14 |
| 52A | MYTI EDU | SB | d.wt | | | | | | | | | 17.9 | 3.47 | | 3.77 | 3.62 | 5 | 5.32 | 2.62 | 4.89 | 2.73 | 3.31 | no | -- | 1.4 | 16 |
| 56A | MYTI EDU | SB | d.wt | | | | | | | | 2.8 | 14.5 | 5.57 | 3.97 | 2.8 | 2.08 | 4 | 3.97 | 3.09 | 4.34 | 1.76 | 3.33 | no | -- | 1.3 | 17 |
| 57A | MYTI EDU | SB | d.wt | | | | | | | | | 8.46 | | 3.82 | 1.44 | 1.59 | 2.69 | 2.04 | 1.81 | 2.76 | 2.88 | 2.48 | no | -- | 1.5 | 14 |
| 63A | MYTI EDU | SB | d.wt | | | | | | | | | 8.84 | | 4.85 | 1.48 | 1.23 | 1.77 | 1.91 | 1.4 | 1.54 | 2.45 | 2.26 | no | DY | 1.3 | 14 |
| 65A | MYTI EDU | SB | d.wt | | | | | | | | 0.1 | 4.7 | 4.45 | 4.31 | 1.17 | 0.741 | 1.69 | 1.3 | 1.83 | 1.24 | 2.48 | 1.89 | no | -- | 4.6 | 25 |
| 69A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 1.02 | 1.58 | 1.66 | 1.85 | 0.929 | 2.19 | 3.78 | 1.8 | no | -- | 1.9 | 15 |
| 22A | MYTI EDU | SB | d.wt | | | | | | | | | | 2.96 | 3.05 | 2.78 | 1.31 | 2.33 | 2.12 | 1.94 | 1.61 | 3.81 | 1.78 | no | -- | 1 | 13 |
| 84A | MYTI EDU | SB | d.wt | | | | | | | | 0.694 | 9.36 | | 2.53 | 3.12 | 1.7 | | 1.43 | 2.4 | | | | no | -- | 2 | 23 |
| 92A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 1.27 | 0.452 | 1.82 | 1.17 | 0.888 | 2.39 | | | no | -- | 4.7 | 18 |
| 98A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 7.96 | 2.29 | | | | 3.36 | 2.73 | 1.38 | no | -? | ? | 17 |
| 98X | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 27.4 | 25.3 | 14.6 | | | | 2.9 | -? | ? | 9 |
| 41A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.994 | 0.842 | 0.73 | 0.727 | | | no | -? | ? | <=5 |
| 43A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.974 | 0.884 | | 0.855 | | | no | -? | ? | <=5 |
| 44A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 2.83 | 3.62 | 9.08 | | | 1.8 | -? | ? | 11 |
| 46A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 1.68 | 1.28 | 0.984 | | | | no | D? | ? | <=5 |
| 48A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 2.38 | 1.47 | 1.1 | | | | no | -? | ? | 6 |
| 10A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 1.88 | 1.46 | 1.85 | 2.55 | | 1.56 | no | -? | ? | 11 |
| 11A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 2.44 | 2.22 | 1.43 | 1.84 | | | no | -? | ? | 10 |

Annual median concentration of CB153 (ppb) cont.

| | | | | | | | | | | | | | | | | | | | | | | | ANALYSIS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | OC | TRND | UP95+3 | POWER |
| 30B | GADU MOR | LI | w.wt | | | | | | | | | | 405 | 955 | 957 | 856 | 885 | 807 | 872 | 1060 | 1200 | 1280 | 6.4 | -- | 14.4 | 10 |
| 36B | GADU MOR | LI | w.wt | | | | | | | | | | 165 | 126 | 147 | 254 | 138 | 642 | 350 | 272 | 260 | 340 | 1.7 | -- | 3.7 | 15 |
| 15B | GADU MOR | LI | w.wt | | | | | | | | | | 60 | 104 | 99 | 66.5 | 97 | 118 | 112 | 140 | 110 | 98 | no | -- | no | 10 |
| 53B | GADU MOR | LI | w.wt | | | | | | | | | | 156 | 194 | 561 | 65 | | 61 | 262 | 219 | 986 | 190 | no | -- | 41.9 | 24 |
| 67B | GADU MOR | LI | w.wt | | | | | | | | | | 106 | 111 | 106 | 83.5 | 128 | 85 | 92 | 231 | 80 | 120 | no | -- | 1.4 | 13 |
| 23B | GADU MOR | LI | w.wt | | | | | | | | | | 80 | 104 | 86 | 79 | 48 | 75 | 73 | 52 | 80 | 100 | no | -- | no | 10 |
| 92B | GADU MOR | LI | w.wt | | | | | | | | | | | | | 51 | 51 | 102 | 129 | | | | no | -? | ? | 9 |
| 98B | GADU MOR | LI | w.wt | | | | | | | | | | | | 65 | 73 | 33 | 55 | 80 | 129 | 62 | 43 | no | -- | no | 15 |
| 43B | GADU MOR | LI | w.wt | | | | | | | | | | | | | | 110 | 113 | 50 | | | | no | -? | ? | 13 |
| 10B | GADU MOR | LI | w.wt | | | | | | | | | | | | | | 201 | 171 | 66 | 55 | 46 | 61 | no | D- | no | 13 |
| 30B | GADU MOR | MU | w.wt | | | | | | | | | | 1.47 | 3.7 | 9.2 | 3.3 | 1.23 | 0.89 | 2.54 | 3.71 | 7.79 | 8.4 | m | -- | m | 20 |
| 36B | GADU MOR | MU | w.wt | | | | | | | | | | 0.63 | 0.45 | 0.7 | 1.3 | 0.15 | 5.42 | 1.37 | 1.87 | 1.3 | 1.2 | m | -- | m | 25 |
| 15B | GADU MOR | MU | w.wt | | | | | | | | | | 0.52 | 0.39 | 0.49 | 0.2 | 0.13 | 0.36 | 0.43 | 0.503 | 0.58 | 0.25 | m | -- | m | 15 |
| 53B | GADU MOR | MU | w.wt | | | | | | | | | | 3.36 | 0.97 | 4.79 | 0.4 | | 0.12 | 6.43 | 1.34 | 32.2 | 2.9 | m | -- | m | >25 |
| 67B | GADU MOR | MU | w.wt | | | | | | | | | | 0.24 | 0.559 | 0.4 | 0.141 | 0.474 | 0.19 | 1.23 | 2.65 | 0.26 | 0.78 | m | -- | m | 24 |
| 23B | GADU MOR | MU | w.wt | | | | | | | | | | 0.26 | 0.94 | 0.2 | 0.2 | 0.05 | 0.27 | 0.16 | 0.31 | 0.66 | 0.39 | m | -- | m | 20 |
| 92B | GADU MOR | MU | w.wt | | | | | | | | | | | | | 0.1 | 0.06 | 0.1 | 0.26 | | | | m | -? | m | 16 |
| 98B | GADU MOR | MU | w.wt | | | | | | | | | | | | 0.2 | 0.3 | 0.03 | 0.08 | 0.12 | 0.5 | 0.13 | 0.13 | m | -- | m | 24 |
| 43B | GADU MOR | MU | w.wt | | | | | | | | | | | | | | 0.14 | 0.21 | 0.13 | | | | m | -? | m | 13 |
| 10B | GADU MOR | MU | w.wt | | | | | | | | | | | | | | 0.55 | 0.85 | 0.11 | 0.2 | 0.2 | 0.3 | m | -- | m | 20 |
| 33B | PLAT FLE | LI | w.wt | | | | | | | | | | 11 | 10 | 30 | 22 | 17 | 17 | 9.4 | 11.1 | 8.7 | 14 | no | -- | no | 13 |
| 53B | PLAT FLE | LI | w.wt | | | | | | | | | | 123 | 126 | 80 | 10 | | 7.94 | 37 | 39 | 38 | 52 | 1 | -- | 14 | 20 |
| 33B | PLAT FLE | MU | w.wt | | | | | | | | | | 0.65 | 1.24 | 0.5 | 0.3 | 0.12 | 0.22 | 0.34 | 0.22 | 0.2 | 1.6 | m | -- | m | 19 |
| 53B | PLAT FLE | MU | w.wt | | | | | | | | | | 5.88 | 8.2 | 3.4 | 0.4 | | 0.224 | 0.93 | 0.92 | 0.7 | 0.9 | m | D- | m | 21 |
| 36F | LIMA LIM | LI | w.wt | | | | | | | | | | 129 | 92.5 | 138 | 171 | 148 | 161 | 151 | 155 | 89 | 150 | no | -- | no | 10 |
| 15F | LIMA LIM | LI | w.wt | | | | | | | | | | | 53 | | 21.5 | 28.9 | 28 | 22.8 | 25 | 20 | 41 | no | -- | no | 12 |
| 22F | LIMA LIM | LI | w.wt | | | | | | | | | | 65.4 | 49 | 52.4 | | 24 | 29.6 | | | | | no | D? | ? | 9 |
| 36F | LIMA LIM | MU | w.wt | | | | | | | | | | 1.13 | 2.7 | 2.3 | 3.2 | 2.06 | 3.22 | 3.33 | 1.63 | 3.1 | 1.4 | m | -- | m | 13 |
| 15F | LIMA LIM | MU | w.wt | | | | | | | | | | | 1.42 | | 0.245 | 0.118 | 0.41 | 0.69 | 0.48 | 0.53 | 0.73 | m | -- | m | 21 |
| 22F | LIMA LIM | MU | w.wt | | | | | | | | | | 0.7 | 2 | 1.28 | | 0.5 | 1.66 | | | | | m | -? | m | 19 |
| 98F | LIMA LIM | MU | w.wt | | | | | | | | | | | | | | 0.27 | 0.44 | 1.16 | | | | m | -? | m | 9 |
| 67B | LEPI WHI | LI | w.wt | | | | | | | | | | 37 | 42 | 61 | 45 | 87 | 79 | 38.8 | 35 | 49 | 36 | m | -- | m | 12 |
| 67B | LEPI WHI | MU | w.wt | | | | | | | | | | 0.27 | 0.33 | 0.6 | 0.1 | 0.17 | 0.63 | 0.17 | 0.24 | 0.12 | 0.4 | m | -- | m | 21 |

Annual median concentration of DDEPP (ppb)

| | | | | | | | | | | | | | | | | | | | | | | ANALYSIS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | OC | TRND | UP95+3 | POWER |
| 30A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 5.2 | 3.9 | 7.1 | 5.7 | 2.6 | 5.9 | 3.9 | 5.9 | no | -- | 1.3 | 14 |
| 31A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 3.3 | 1.9 | 3.4 | 1.8 | 0.5 | 3.4 | 3.5 | 5.5 | no | -- | 5.1 | 19 |
| 35A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 4.9 | 2.1 | 3.1 | 2.8 | 0.57 | 3.9 | 3.7 | 5.9 | no | -- | 5.3 | 20 |
| 36A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 2.8 | 1.1 | 1 | 1.8 | 0.44 | 2.1 | 1.8 | 3 | no | -- | 2 | 18 |
| 71A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 2.6 | 1.6 | 3.2 | 1.3 | 0.74 | 1 | 2.2 | 2.4 | no | -- | no | 16 |
| 76A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 1.4 | 0.79 | | | 0.36 | 1.2 | 2.3 | 2.5 | no | -- | 4.9 | 20 |
| 15A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | 0.98 | 1.7 | 0.73 | 0.29 | 1 | 1.4 | 2.1 | no | -- | 1.4 | 18 |
| 51A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 34 | 6.7 | 15 | 17 | 13 | 1.3 | -? | ? | 19 |
| 52A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 12 | 25 | 19 | 18 | 9.5 | 13 | 17 | 14 | 1.4 | -- | 2.7 | 13 |
| 56A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 50 | 48 | 110 | 41 | 34 | 72 | 53 | 40 | 4 | -- | 11.2 | 15 |
| 57A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 26 | 18 | 35 | 25 | 16 | 50 | 83 | 35 | 3.5 | -- | 29.6 | 16 |
| 63A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 13 | 9.3 | 9.7 | 8.4 | 5.5 | 13 | 16 | 11 | 1.1 | -- | 3.9 | 12 |
| 65A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 7.6 | 5.2 | 7.8 | 4.1 | 5 | 6.9 | 12 | 7.4 | no | -- | 2.7 | 12 |
| 69A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 3.6 | 3.2 | 3.5 | 2.9 | 0.4 | 3.7 | 6.5 | 2.6 | no | -- | 4.7 | 23 |
| 22A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 2.2 | 1.3 | 1.9 | 1.5 | 0.39 | 1.4 | 5.1 | 2 | no | -- | 2.8 | 20 |
| 84A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 3.1 | 2.2 | | 0.99 | 0.74 | | | | no | D? | ? | <=5 |
| 92A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 0.68 | 2.1 | 1.4 | 0.77 | 0.28 | 1.9 | | | no | -- | 3.8 | 22 |
| 98A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 5.8 | 2.3 | | | | 1.6 | 1.9 | 0.87 | no | -? | ? | 14 |
| 98X | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 32 | 23 | 5.2 | | | | no | -? | ? | 15 |
| 41A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.62 | 0.42 | 0.29 | 0.61 | | | no | -? | ? | 15 |
| 44A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 0.49 | 0.34 | 1.4 | | | no | -? | ? | 20 |
| 46A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 1 | 0.76 | 0.27 | | | | no | -? | ? | 11 |
| 48A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 1.7 | 1.1 | 0.29 | | | | no | -? | ? | 14 |
| 10A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.85 | 0.78 | 0.44 | 1.5 | | 1.5 | no | -? | ? | 16 |
| 11A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 1.3 | 1.9 | 0.41 | 1.2 | | | no | -? | ? | 21 |
| 30B | GADU MOR | LI | w.wt | | | | | | | | | | 160 | 440 | 180 | 160 | 190 | 190 | 310 | 380 | 260 | 230 | 1.2 | -- | 3.5 | 14 |
| 36B | GADU MOR | LI | w.wt | | | | | | | | | | 92 | 51 | 50 | 75 | 55 | 110 | 140 | 130 | 45 | 86 | no | -- | no | 14 |
| 15B | GADU MOR | LI | w.wt | | | | | | | | | | 50 | 140 | 48 | 57 | 86 | 33 | 75 | 140 | 72 | 76 | no | -- | 1.7 | 16 |
| 53B | GADU MOR | LI | w.wt | | | | | | | | | | 640 | 810 | 940 | 85 | | 42 | 490 | 940 | 490 | 160 | no | -- | 44.9 | >25 |
| 67B | GADU MOR | LI | w.wt | | | | | | | | | | 780 | 550 | 350 | 390 | 470 | 110 | 460 | 2100 | 270 | 200 | no | -- | 10.3 | 23 |
| 23B | GADU MOR | LI | w.wt | | | | | | | | | | 68 | 85 | 42 | 41 | 35 | 31 | 49 | 33 | 49 | 48 | no | -- | no | 10 |
| 92B | GADU MOR | LI | w.wt | | | | | | | | | | | | | 53 | 50 | 50 | 200 | | | | no | -? | ? | 17 |
| 98B | GADU MOR | LI | w.wt | | | | | | | | | | | | 73 | 83 | 43 | 49 | 140 | 200 | 78 | 41 | no | -- | 1.2 | 18 |
| 43B | GADU MOR | LI | w.wt | | | | | | | | | | | | | | 130 | 69 | 60 | | | | no | -? | ? | 9 |
| 10B | GADU MOR | LI | w.wt | | | | | | | | | | | | | | 210 | 71 | 75 | 99 | 65 | 90 | no | -- | no | 14 |
| 33B | PLAT FLE | LI | w.wt | | | | | | | | | | 13 | 9.1 | 24 | 14 | 13 | 7 | 10 | 9.7 | 8.6 | 6.8 | no | -- | no | 13 |
| 53B | PLAT FLE | LI | w.wt | | | | | | | | | | 94 | 70 | 32 | 41 | | 8 | 25 | 45 | 38 | 44 | 1.5 | -- | 9.9 | 17 |
| 36F | LIMA LIM | LI | w.wt | | | | | | | | | | 28 | 34 | 28 | 21 | 50 | 40 | 40 | 22 | 18 | 52 | no | -- | no | 15 |
| 15F | LIMA LIM | LI | w.wt | | | | | | | | | | | 39 | | 13 | 23 | 9 | 21 | 20 | 13 | 40 | no | -- | 1.4 | 16 |
| 22F | LIMA LIM | LI | w.wt | | | | | | | | | | 69 | 48 | 40 | | 21 | 9.2 | | | | | no | D? | ? | 10 |
| 67B | LEPI WHI | LI | w.wt | | | | | | | | | | 290 | 240 | 180 | 160 | 250 | 140 | 140 | 170 | 160 | 160 | m | -- | m | 9 |

Annual median concentration of HCHG (ppb)

| | | | | | | | | | | | | | | | | | | | | | | ANALYSIS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | OC | TRND | UP95+3 | POWER |
| 30A | MYTI EDU | SB | d.wt | | | | | | | | | | 2 | 3.6 | 1.5 | 1.6 | 1.7 | 1.5 | 0.65 | 1.6 | 1.8 | 1.2 | no | -- | no | 14 |
| 31A | MYTI EDU | SB | d.wt | | | | | | | | | | 2 | 3.7 | 2.2 | 1.4 | 1.4 | 0.78 | 0.66 | 2.7 | 1.2 | 0.94 | no | -- | no | 16 |
| 35A | MYTI EDU | SB | d.wt | | | | | | | | | | 2.7 | 4.1 | 2.3 | 1.5 | 1.6 | 1.1 | 0.84 | 4.5 | 1 | 0.67 | no | -- | no | 18 |
| 36A | MYTI EDU | SB | d.wt | | | | | | | | | | 3.6 | 5.5 | 2.8 | 1.6 | 0.77 | 1.3 | 0.56 | 2.9 | 2 | 1.7 | no | -- | 2.3 | 17 |
| 71A | MYTI EDU | SB | d.wt | | | | | | | | | | 2.1 | 4.8 | 2 | 2.1 | 0.96 | 0.79 | 0.48 | 1 | 1.9 | 1.1 | no | -- | 1.1 | 16 |
| 76A | MYTI EDU | SB | d.wt | | | | | | | | | | 1.6 | 2.2 | 1.4 | 2.4 | | | 0.61 | 1.7 | 2.4 | 1.2 | no | -- | 1.1 | 17 |
| 15A | MYTI EDU | SB | d.wt | | | | | | | | | | 1.7 | | | 2 | 1.1 | 1.1 | 0.37 | 2 | 2.3 | 1.4 | no | -- | 2.4 | 18 |
| 51A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 1.7 | 1.1 | 1.2 | 2.3 | 1.1 | no | -? | ? | 13 |
| 52A | MYTI EDU | SB | d.wt | | | | | | | | | | 1 | | 0.94 | 1.1 | 1.3 | 1.3 | 2.6 | 1.2 | 2.2 | 1.1 | no | -- | no | 12 |
| 56A | MYTI EDU | SB | d.wt | | | | | | | | | | 1.8 | 2.4 | 0.93 | 1 | 1.2 | 1.2 | 1.7 | 1.3 | 2.3 | 1 | no | -- | no | 13 |
| 57A | MYTI EDU | SB | d.wt | | | | | | | | | | | 2.3 | 1.4 | 0.79 | 0.86 | 1 | 2.5 | 1 | 3.6 | 1 | no | -- | 1.4 | 17 |
| 63A | MYTI EDU | SB | d.wt | | | | | | | | | | | 2.9 | 1.5 | 0.71 | 0.98 | 0.86 | 1.3 | 0.78 | 2.8 | 1.1 | no | -- | 1.3 | 16 |
| 65A | MYTI EDU | SB | d.wt | | | | | | | | | | 2.2 | 2.6 | 1.3 | 0.74 | 1.2 | 0.65 | 2.9 | 1 | 2.9 | 1.1 | no | -- | 1.4 | 17 |
| 69A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 1.6 | 1.1 | 0.94 | 0.65 | 0.36 | 1.3 | 3.1 | 0.79 | no | -- | 2.2 | 19 |
| 22A | MYTI EDU | SB | d.wt | | | | | | | | | | 0.8 | 1.9 | 1.7 | 1.3 | 1.1 | 1 | 0.58 | 1.2 | 2.3 | 0.8 | no | -- | no | 16 |
| 84A | MYTI EDU | SB | d.wt | | | | | | | | | | | 1.5 | 0.63 | 1.1 | | 0.79 | 0.52 | | | | no | -? | ? | 13 |
| 92A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 0.68 | 0.84 | 0.99 | 0.77 | 0.41 | 0.86 | | | no | -- | no | 13 |
| 98A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 0.62 | 0.57 | | | | 0.6 | 1.2 | 0.75 | no | -? | ? | 12 |
| 98X | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 1.5 | 0.64 | 0.42 | | | | no | -? | ? | 8 |
| 41A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.68 | 0.53 | 0.29 | 0.43 | | | no | -? | ? | 12 |
| 43A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.52 | 0.41 | | 0.45 | | | no | -? | ? | 8 |
| 44A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 0.54 | 0.29 | 0.64 | | | no | -? | ? | 18 |
| 46A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.44 | 0.47 | 0.33 | | | | no | -? | ? | 8 |
| 48A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.34 | 0.48 | 0.33 | | | | no | -? | ? | 12 |
| 10A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.52 | 0.54 | 0.44 | 0.4 | | 1.1 | no | -? | ? | 13 |
| 11A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.44 | 0.51 | 0.34 | 0.46 | | | no | -? | ? | 10 |
| 30B | GADU MOR | LI | w.wt | | | | | | | | | | 3 | 15 | 5 | 5 | 10 | 7 | 10 | 11 | 4 | 2.5 | no | -- | no | 17 |
| 36B | GADU MOR | LI | w.wt | | | | | | | | | | 6.5 | 14 | 9 | 9 | 17 | 3 | 11 | 6 | 8.1 | 6.9 | no | -- | no | 17 |
| 15B | GADU MOR | LI | w.wt | | | | | | | | | | 11 | 37 | 7 | 9 | 10 | 6 | 13 | 10 | 8.1 | 6.5 | no | -- | no | 17 |
| 53B | GADU MOR | LI | w.wt | | | | | | | | | | 12 | 8.5 | 5 | 6 | | 6 | 7 | 8 | 10 | 3.5 | no | -- | no | 13 |
| 67B | GADU MOR | LI | w.wt | | | | | | | | | | 12 | 7 | 10 | 7 | 6.3 | 5 | 10 | 11 | 21 | 4.8 | no | -- | no | 16 |
| 23B | GADU MOR | LI | w.wt | | | | | | | | | | 13 | 5.9 | 11 | 5 | 8 | 5 | 13 | 8 | 9.4 | 5.5 | no | -- | no | 14 |
| 92B | GADU MOR | LI | w.wt | | | | | | | | | | | | | 6 | 6 | 4 | 6 | | | | no | -? | ? | 10 |
| 98B | GADU MOR | LI | w.wt | | | | | | | | | | | | 5 | | 8 | 3 | 6 | 3 | 8 | 5 | no | -- | no | 15 |
| 43B | GADU MOR | LI | w.wt | | | | | | | | | | | | | | 3 | 3 | 4 | | | | no | -? | ? | 7 |
| 10B | GADU MOR | LI | w.wt | | | | | | | | | | | | | | 3 | 3 | 4 | 3 | 8 | 4.2 | no | -- | no | 13 |
| 33B | PLAT FLE | LI | w.wt | | | | | | | | | | 2 | 0.5 | 5 | 2 | 2 | 1 | 1.9 | 1.8 | 1.1 | 0.69 | no | -- | no | 20 |
| 53B | PLAT FLE | LI | w.wt | | | | | | | | | | 3 | 2 | 5 | 2 | | 1.4 | 2 | 3 | 2 | 2.4 | no | -- | no | 14 |
| 36F | LIMA LIM | LI | w.wt | | | | | | | | | | 8.9 | 3 | 5 | 1 | 4 | 3 | 8 | 5 | 2 | 3.8 | no | -- | no | 19 |
| 15F | LIMA LIM | LI | w.wt | | | | | | | | | | | 3 | | 4 | 3.5 | 3 | 5.1 | 5.6 | 4.1 | 3.4 | no | -- | no | 10 |
| 22F | LIMA LIM | LI | w.wt | | | | | | | | | | 6.9 | 3 | 5 | | 1 | 1 | | | | | no | D? | ? | 14 |
| 67B | LEPI WHI | LI | w.wt | | | | | | | | | | 3 | 2 | 5 | 2 | 2 | 1 | 3.7 | 3 | 4.6 | 1.1 | m | -- | m | 18 |

Annual median concentration of HCB (ppb)

| | | | | | | | | | | | | | | | | | | | | | | | ANALYSIS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | OC | TRND | UP95+3 | POWER |
| 30A | MYTI EDU | SB | d.wt | | | | 1.2 | 0.88 | 2.1 | 0.92 | 1.1 | 0.87 | 0.35 | 0.59 | 0.95 | 0.54 | 0.27 | 0.24 | 0.25 | 0.27 | 0.3 | | no | D- | no | 14 |
| 31A | MYTI EDU | SB | d.wt | | | 13 | 1.4 | 3.8 | 1.9 | 0.93 | 0.89 | 0.36 | 0.32 | 0.61 | 0.55 | 0.45 | 0.24 | 0.31 | 0.22 | 0.26 | 0.21 | | no | D- | no | 16 |
| 35A | MYTI EDU | SB | d.wt | | | 13 | 0.95 | 3.3 | 0.79 | 0.98 | 1.1 | 0.47 | 0.42 | 0.58 | 0.58 | 0.51 | 0.23 | 0.28 | 0.22 | 0.52 | 0.2 | 0.34 | no | D- | 2.1 | 18 |
| 36A | MYTI EDU | SB | d.wt | | | 15 | 0.95 | 3.8 | 2.9 | 2.4 | 0.96 | 0.43 | 0.33 | 0.55 | 0.39 | 0.53 | 0.24 | 0.33 | 0.28 | 0.31 | 0.15 | | no | D- | no | 19 |
| 71A | MYTI EDU | SB | d.wt | | | 15 | 10 | 91 | 11 | 210 | 1.8 | 150 | 8.5 | 6.9 | 4.1 | 3.9 | 1.5 | 2.1 | 4.5 | 2 | 1.8 | 3.1 | 6.2 | -- | 70.1 | >25 |
| 76A | MYTI EDU | SB | d.wt | | | | | | | | | | 0.38 | 0.57 | 0.5 | 0.79 | | | 0.25 | 0.29 | 0.4 | 0.26 | no | -- | no | 14 |
| 15A | MYTI EDU | SB | d.wt | | | | | | | | | | 0.2 | | | 0.49 | 0.25 | 0.22 | 0.29 | 0.25 | 0.16 | 0.22 | no | -- | no | 13 |
| 51A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 0.61 | 0.33 | 0.31 | 0.4 | 0.4 | no | -? | ? | 11 |
| 52A | MYTI EDU | SB | d.wt | | | | | | | | | 0.85 | 0.38 | | 0.81 | 0.81 | 0.28 | 0.32 | 0.26 | 0.33 | 0.21 | 0.33 | no | -- | 1.3 | 14 |
| 56A | MYTI EDU | SB | d.wt | | | | | | | | 0.2 | 0.79 | 0.41 | 0.79 | 0.93 | 1 | 0.31 | 0.38 | 0.31 | 0.44 | 0.35 | 0.7 | 1.4 | -- | 3.8 | 15 |
| 57A | MYTI EDU | SB | d.wt | | | | | | | | | 0.77 | | 0.76 | 0.72 | 0.79 | 0.36 | 0.3 | 0.26 | 0.43 | 0.58 | 0.63 | 1.3 | DY | 3.5 | 11 |
| 63A | MYTI EDU | SB | d.wt | | | | | | | | | 1 | | 0.97 | 0.74 | 0.63 | 0.32 | 0.33 | 0.33 | 0.41 | 0.45 | 0.51 | 1 | DY | 1.9 | 9 |
| 65A | MYTI EDU | SB | d.wt | | | | | | | | 0.2 | 0.43 | 0.52 | 0.86 | 0.62 | 0.67 | 0.28 | 0.3 | 0.29 | 0.34 | 0.38 | 0.52 | 1 | DY | 2.3 | 12 |
| 69A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 0.53 | 0.53 | 0.29 | 0.25 | 0.29 | 0.5 | 0.48 | 0.36 | no | -- | 2.2 | 12 |
| 22A | MYTI EDU | SB | d.wt | | | | | | | | | | 0.26 | 0.61 | 0.56 | 0.44 | 0.25 | 0.25 | 0.3 | 0.31 | 0.17 | 0.32 | no | -- | 1.1 | 13 |
| 82A | MYTI EDU | SB | d.wt | | | | 2.3 | 11 | 0.66 | 0.62 | 0.8 | 0.53 | | | | | | | | | | | 1.1 | -- | 9.7 | 24 |
| 84A | MYTI EDU | SB | d.wt | | | | 3.4 | 8.8 | 3.3 | 2 | 1.2 | 0.48 | | 0.51 | 0.63 | 0.53 | | 0.25 | 0.21 | | | | no | D- | no | 15 |
| 92A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 0.68 | 0.42 | 0.24 | 0.23 | 0.23 | 0.25 | | | no | D- | 1.2 | 12 |
| 98A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 0.62 | 0.57 | | | | 0.34 | 0.31 | 0.43 | no | -? | ? | 9 |
| 98X | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.56 | 0.32 | 0.26 | | | | no | -? | ? | 8 |
| 41A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.29 | 0.26 | 0.29 | 0.3 | | | no | -? | ? | 6 |
| 43A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.32 | 0.34 | | 0.45 | | | no | -? | ? | <=5 |
| 44A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 0.27 | 0.29 | 0.33 | | | no | -? | ? | <=5 |
| 46A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.26 | 0.29 | 0.27 | | | | no | -? | ? | 6 |
| 48A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.28 | 0.29 | 0.24 | | | | no | -? | ? | 7 |
| 10A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.29 | 0.27 | 0.25 | 0.31 | | 0.28 | no | -? | ? | 7 |
| 11A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.35 | 0.43 | 0.34 | 0.46 | | | no | -? | ? | 8 |
| 30B | GADU MOR | LI | w.wt | | | | | | | | | | 10 | 17 | 7.5 | 16 | 11 | 11 | 12 | 7 | 5.3 | 5.1 | no | -- | no | 12 |
| 36B | GADU MOR | LI | w.wt | | | | | | | | | | 7 | 9 | 9 | 10 | 9 | 5 | 9 | 6 | 4.4 | 6.5 | no | -- | no | 11 |
| 15B | GADU MOR | LI | w.wt | | | | | | | | | | 5 | 20 | 10 | 14 | 14 | 9 | 11 | 13 | 11 | 11 | no | -- | 1.3 | 14 |
| 53B | GADU MOR | LI | w.wt | | | | | | | | | | 10 | 10 | 16 | 7 | | 5 | 7 | 7 | 5 | 4.7 | no | -- | no | 12 |
| 67B | GADU MOR | LI | w.wt | | | | | | | | | | 14 | 8 | 7.9 | 8 | 8.5 | 10 | 8 | 15 | 9.9 | 4.6 | no | -- | no | 13 |
| 23B | GADU MOR | LI | w.wt | | | | | | | | | | 6 | 9.5 | 12 | 9 | 8 | 6 | 10 | 6 | 8.4 | 7.8 | no | -- | no | 11 |
| 92B | GADU MOR | LI | w.wt | | | | | | | | | | | | | 17 | 11 | 14 | 13 | | | | no | -? | ? | 9 |
| 98B | GADU MOR | LI | w.wt | | | | | | | | | | | | 20 | 9.9 | 12 | 18 | 35 | 20 | 16 | 13 | no | -- | 1.6 | 14 |
| 43B | GADU MOR | LI | w.wt | | | | | | | | | | | | | | 15 | 16 | 13 | | | | no | -? | ? | 8 |
| 10B | GADU MOR | LI | w.wt | | | | | | | | | | | | | | 13 | 11 | 16 | 17 | 17 | 25 | 1.3 | U- | 3 | 8 |
| 33B | PLAT FLE | LI | w.wt | | | | | | | | | | 1 | 0.5 | 5 | 2 | 1 | 1 | 0.6 | 0.8 | 0.59 | 0.54 | no | -- | no | 19 |
| 53B | PLAT FLE | LI | w.wt | | | | | | | | | | 6 | 4.5 | 5 | 2 | | 1 | 2 | 3 | 1.8 | 2.5 | no | -- | 1.6 | 14 |
| 36F | LIMA LIM | LI | w.wt | | | | | | | | | | 5.5 | 3 | 5 | 2 | 3 | 2 | 2.3 | 3 | 1.1 | 2.5 | no | -- | no | 14 |
| 15F | LIMA LIM | LI | w.wt | | | | | | | | | | | 4 | | 4 | 4 | 2 | 3 | 3.2 | 3 | 4.7 | no | -- | no | 10 |
| 22F | LIMA LIM | LI | w.wt | | | | | | | | | | 6 | 3 | 5 | | 1 | 1.4 | | | | | no | -? | ? | 15 |
| 67B | LEPI WHI | LI | w.wt | | | | | | | | | | 9 | 4 | 5 | 4 | 5 | 2 | 4.6 | 4 | 5 | 2.8 | m | -- | m | 13 |

# Appendix I.
# Geographical distribution of contaminants in biota 1998-1999

**Sorted by contaminant and species:**

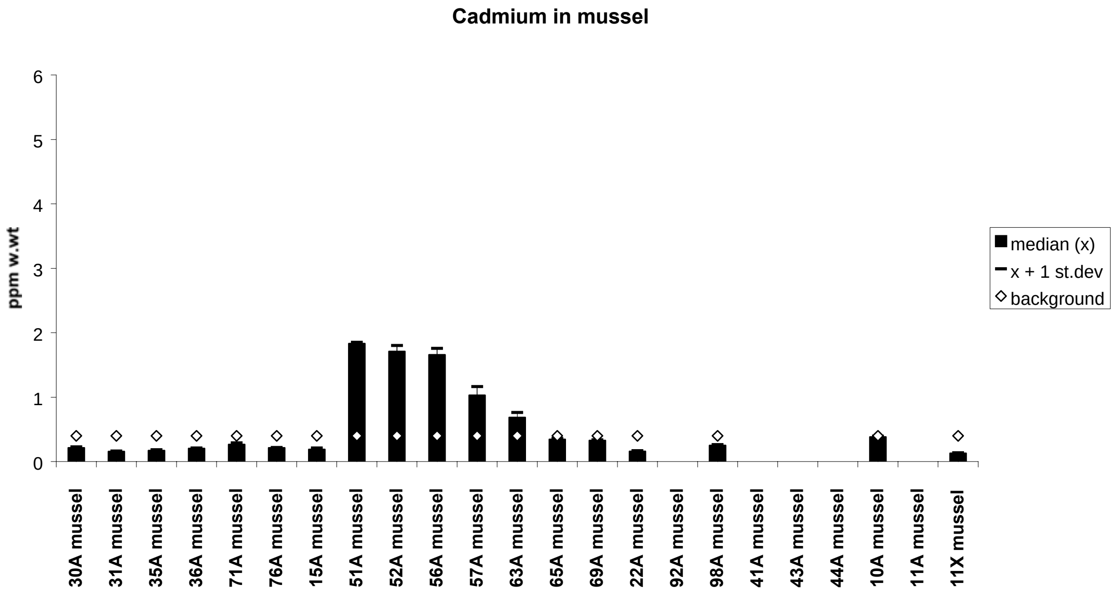
**Cadmium (Cd)**
**Copper (Cu)**
**Mercury (Hg)**
**Lead (Pb)**
**Zinc (Zn)**
**Sum of 7 CBs (CB-28, -52, 101, -118, -138, -153 and -180)**
**CB-153**
**DDEPP (ppDDE)**
**γ-HCH**
**HCB**

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

**Station positions are shown on maps in Appendix F. .**

# Appendix I.
# Geographical distribution of contaminants in biota 1998-1999 (cont.)

**A**



**B**

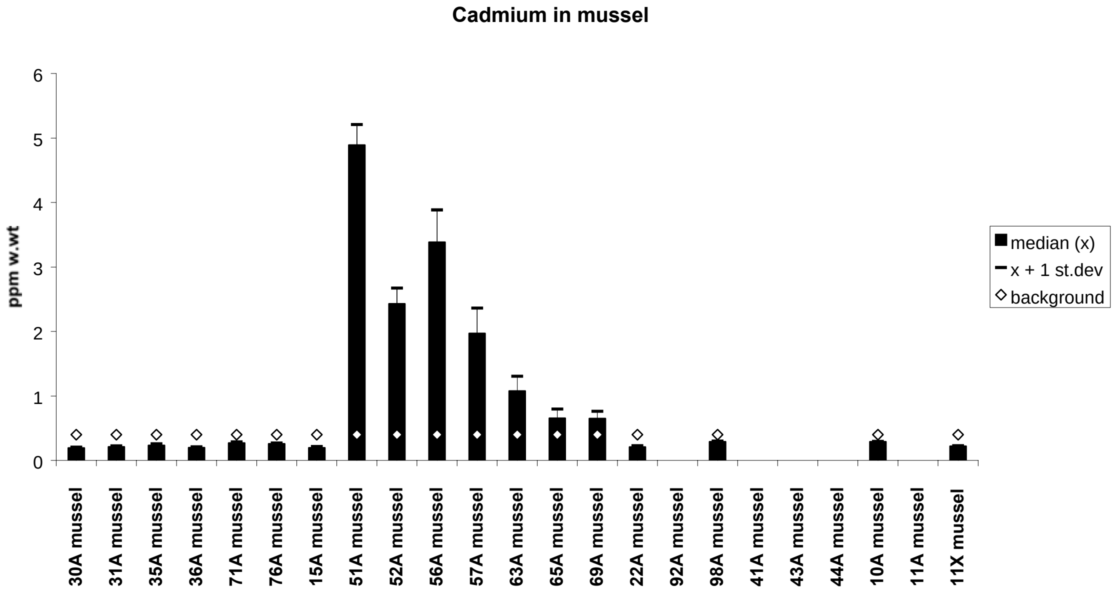
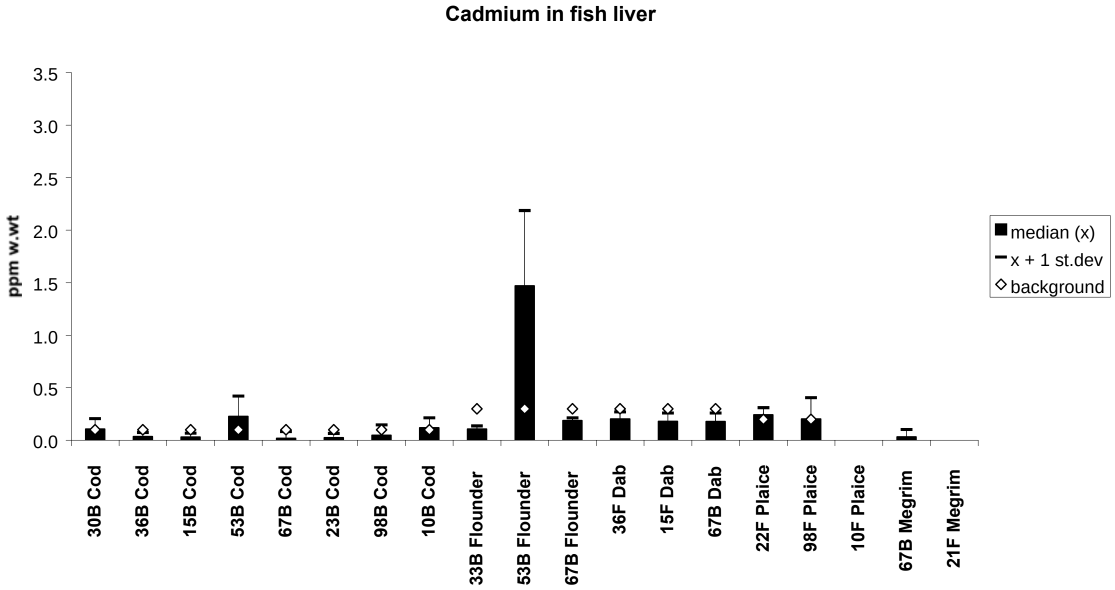


**Figure 22.** Median, standard deviation and provisional "high background" concentration for cadmium in mussels (*Mytilus edulis*) 1998 (**A**) and 1999 (**B**), ppm wet weight (see maps in Appendix F. ).

**A**



**B**

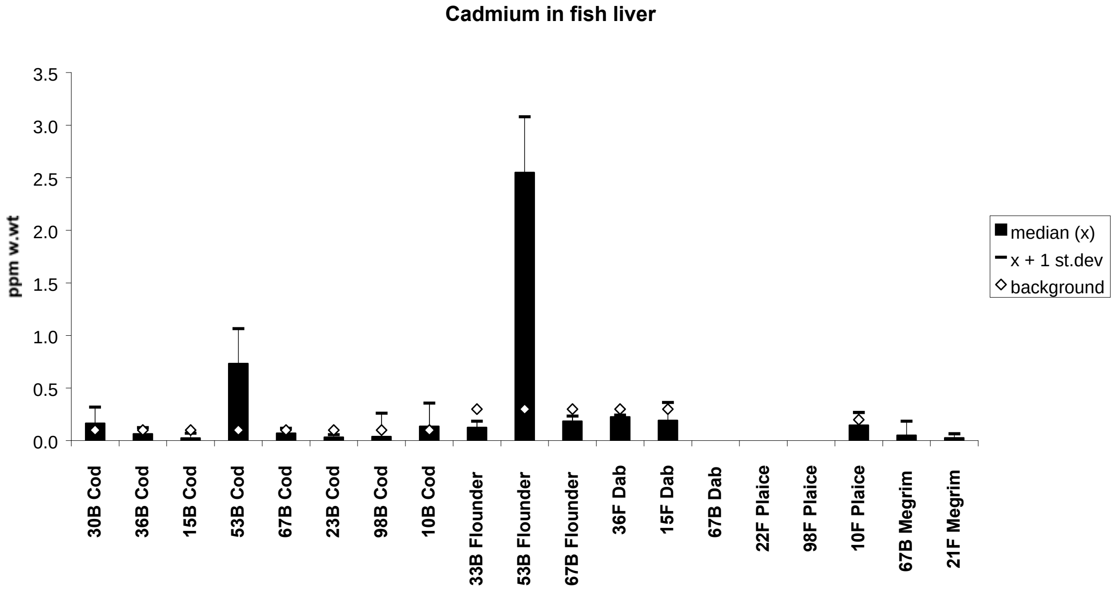
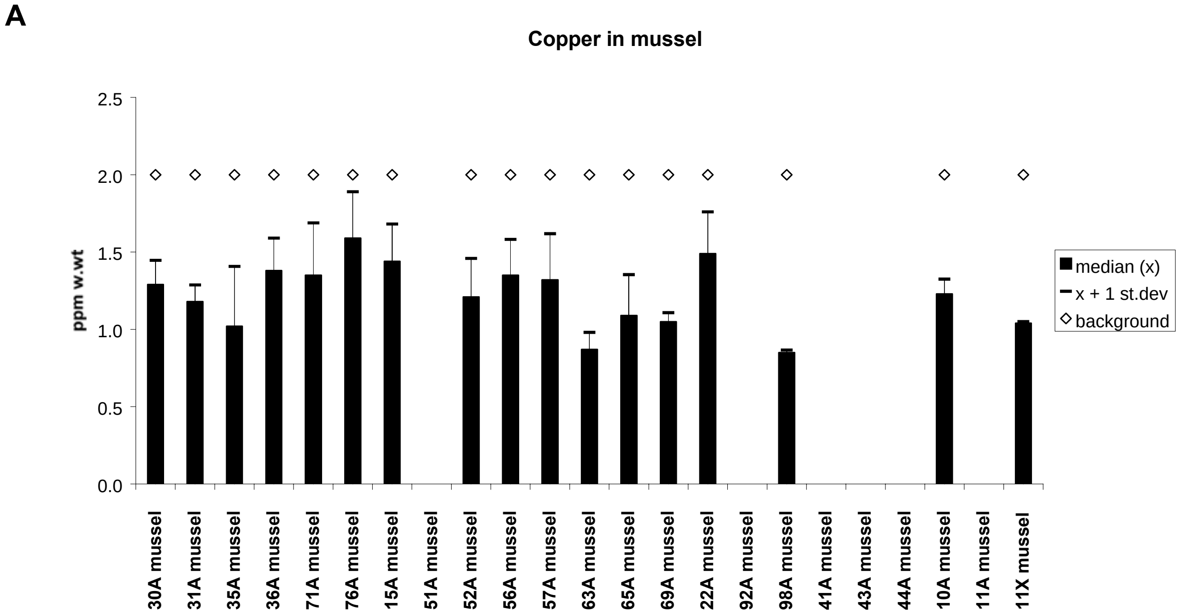


**Figure 23.** Median, standard deviation and provisional "high background" concentration for cadmium in fish liver 1998 (**A**) and 1999 (**B**), ppm wet weight (see maps in Appendix F. ).



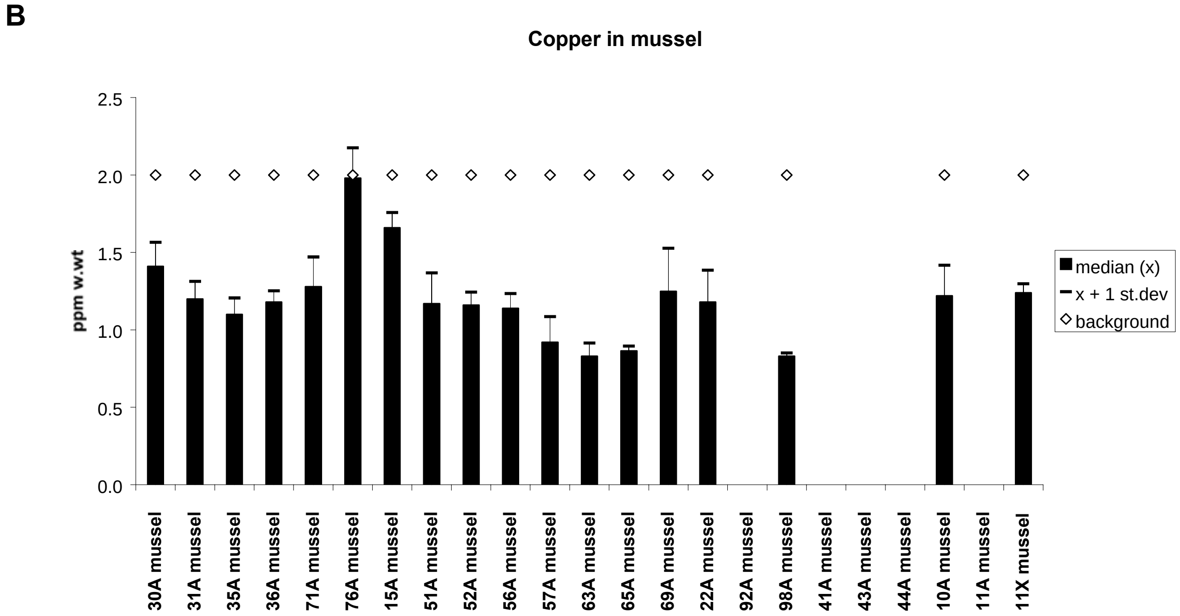
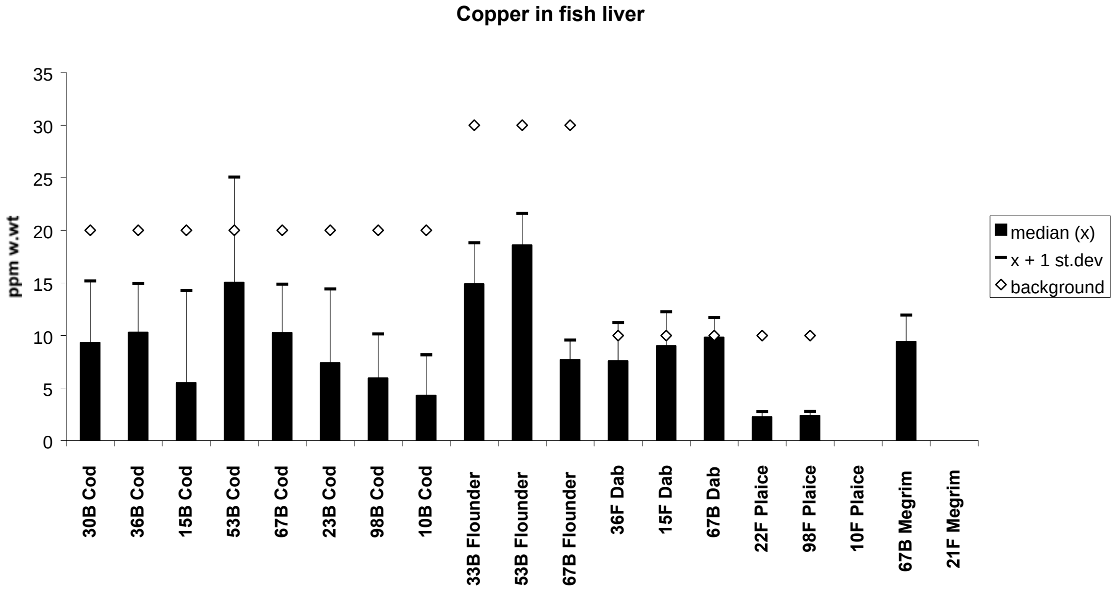


**Figure 24.** Median standard deviation and provisional "high background" concentration for copper in mussels (*Mytilus edulis*) 1998 (**A**) and 1999 (**B**), ppm wet weight (see maps in Appendix F. ).

**A**



**B**

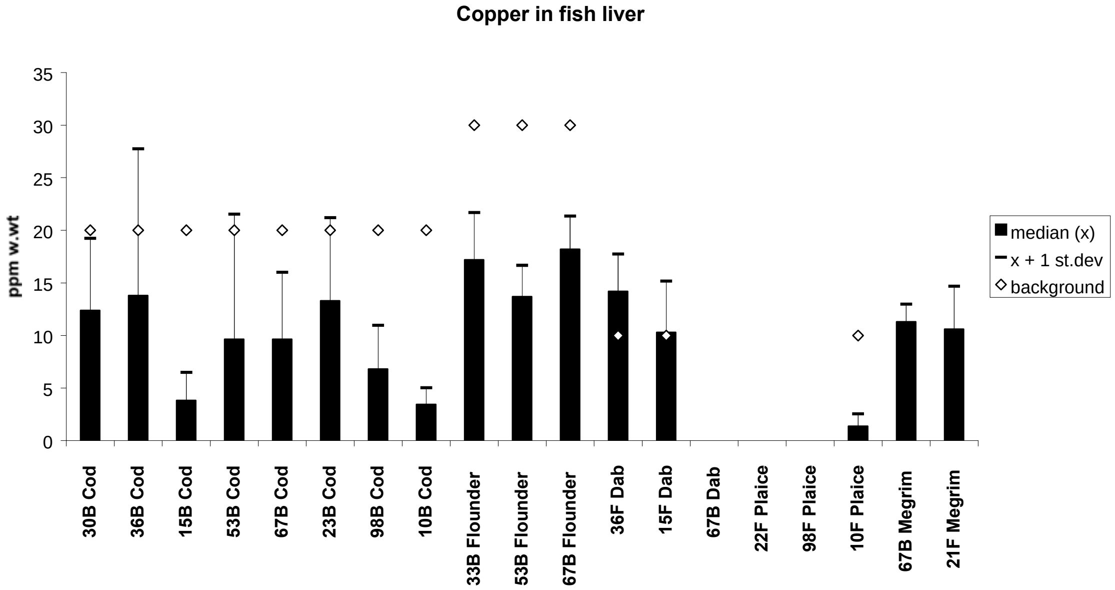
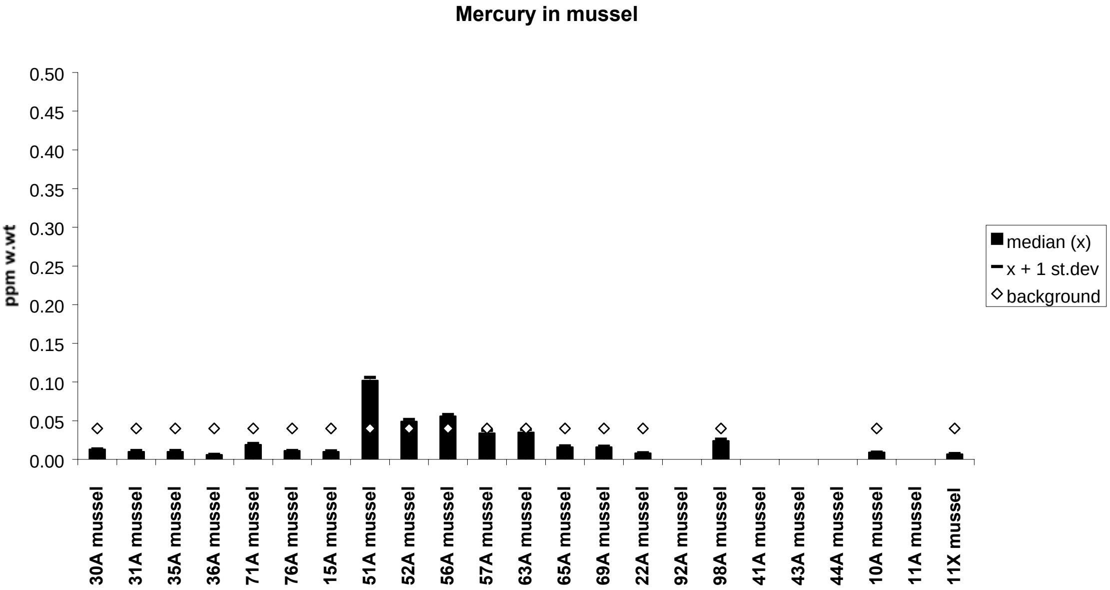


**Figure 25.** Median, standard deviation and provisional "high background" concentration for copper in fish liver 1998 (**A**) and 1999 (**B**), ppm wet weight (see maps in Appendix F. ).

**A**



**B**

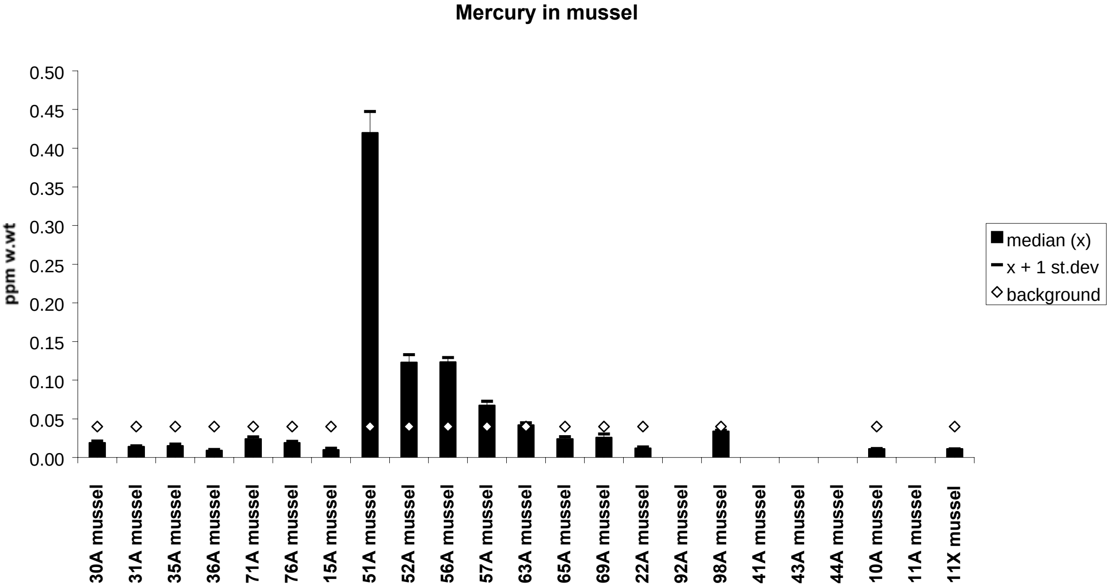
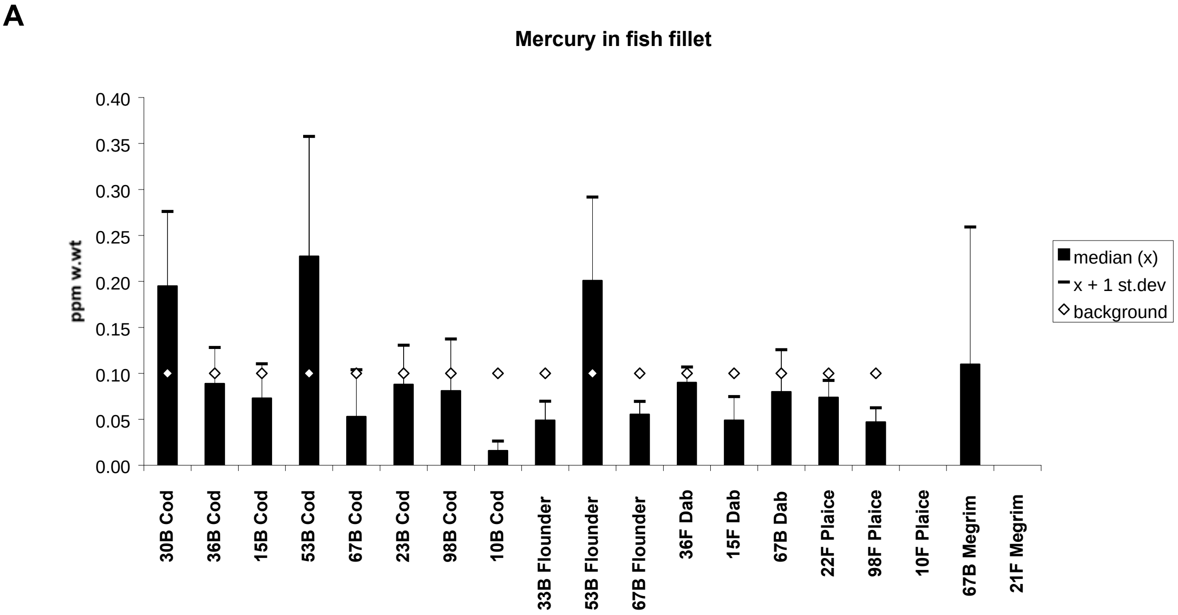


**Figure 26.** Median, standard deviation and provisional "high background" concentration for mercury in mussels (*Mytilus edulis*) 1998 (**A**) and 1999 (**B**), ppm wet weight (see maps in Appendix F. ).



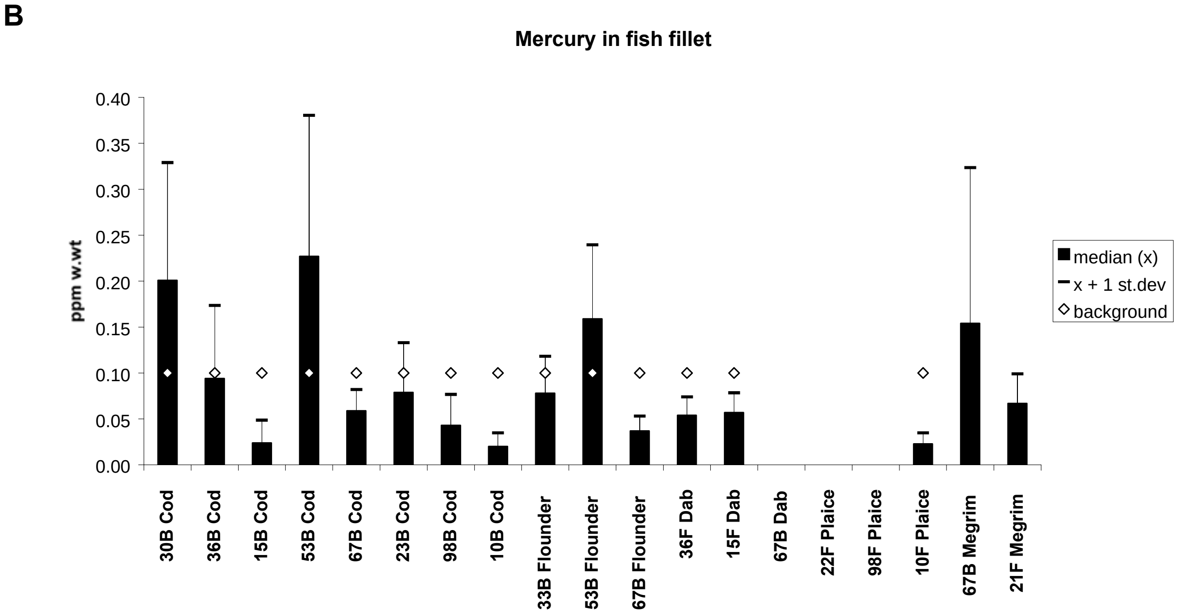


**Figure 27.** Median, standard deviation and provisional "high background" concentration for mercury in fish fillet 1998 (**A**) and 1999 (**B**), ppm wet weight (see maps in Appendix F. ).

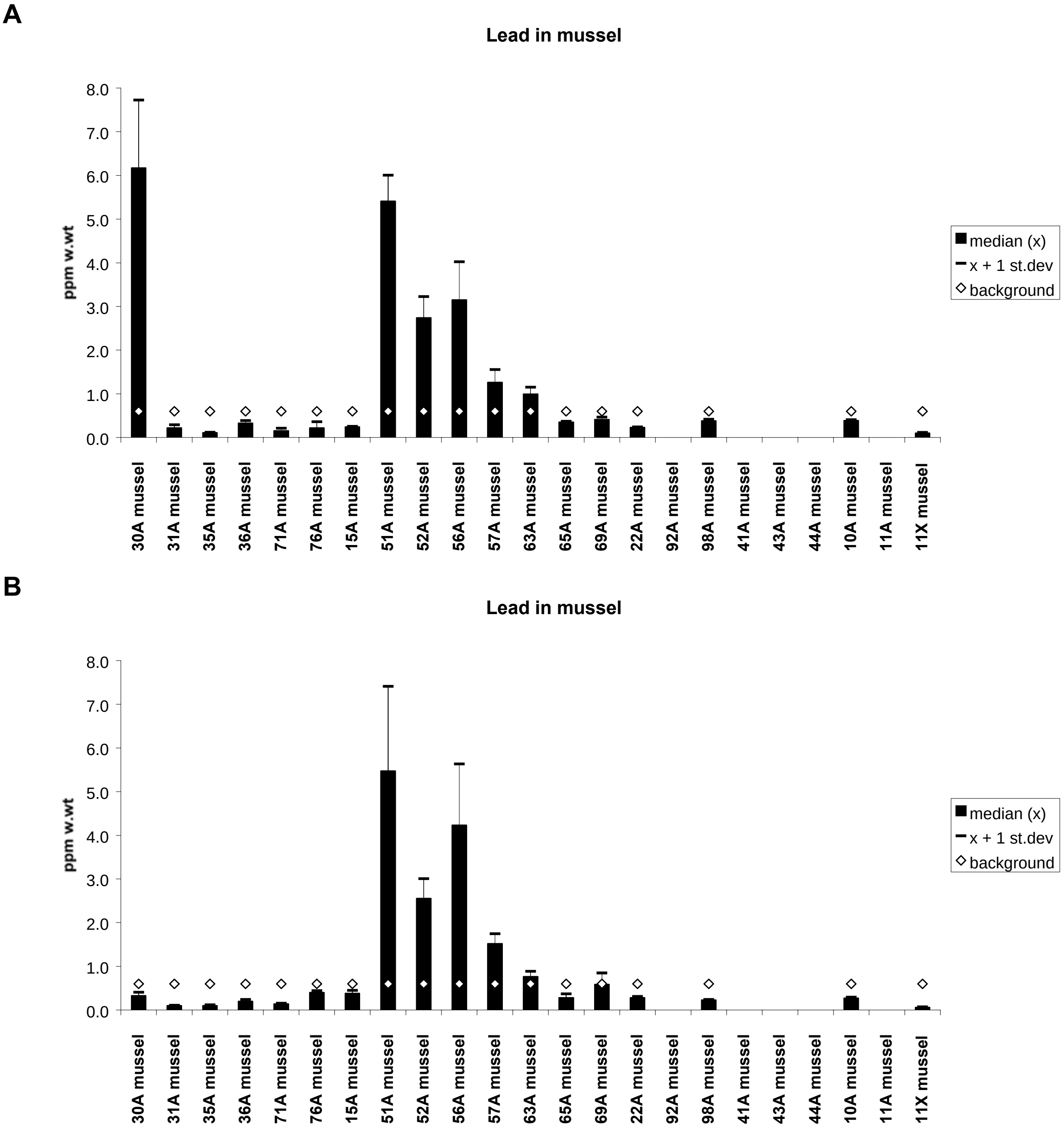


**Figure 28.** Median, standard deviation and provisional "high background" concentration for lead in mussels (*Mytilus edulis*) 1998 (**A**) and 1999 (**B**), ppm wet weight (see maps in Appendix F. ).

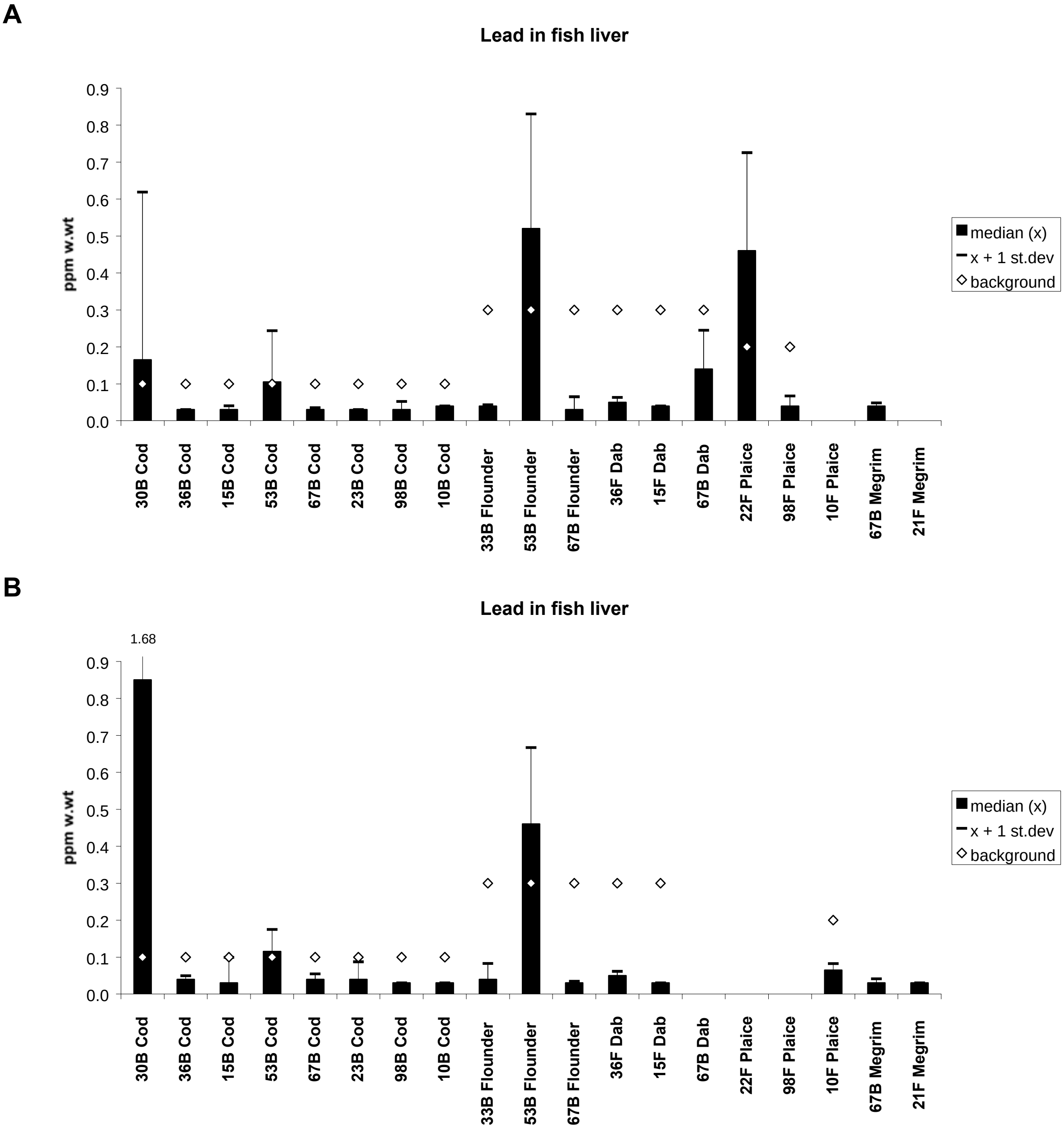


**Figure 29.** Median, standard deviation and provisional "high background" concentration for lead in fish liver 1998 (**A**) and 1999 (**B**), ppm wet weight (see maps in Appendix F. ).

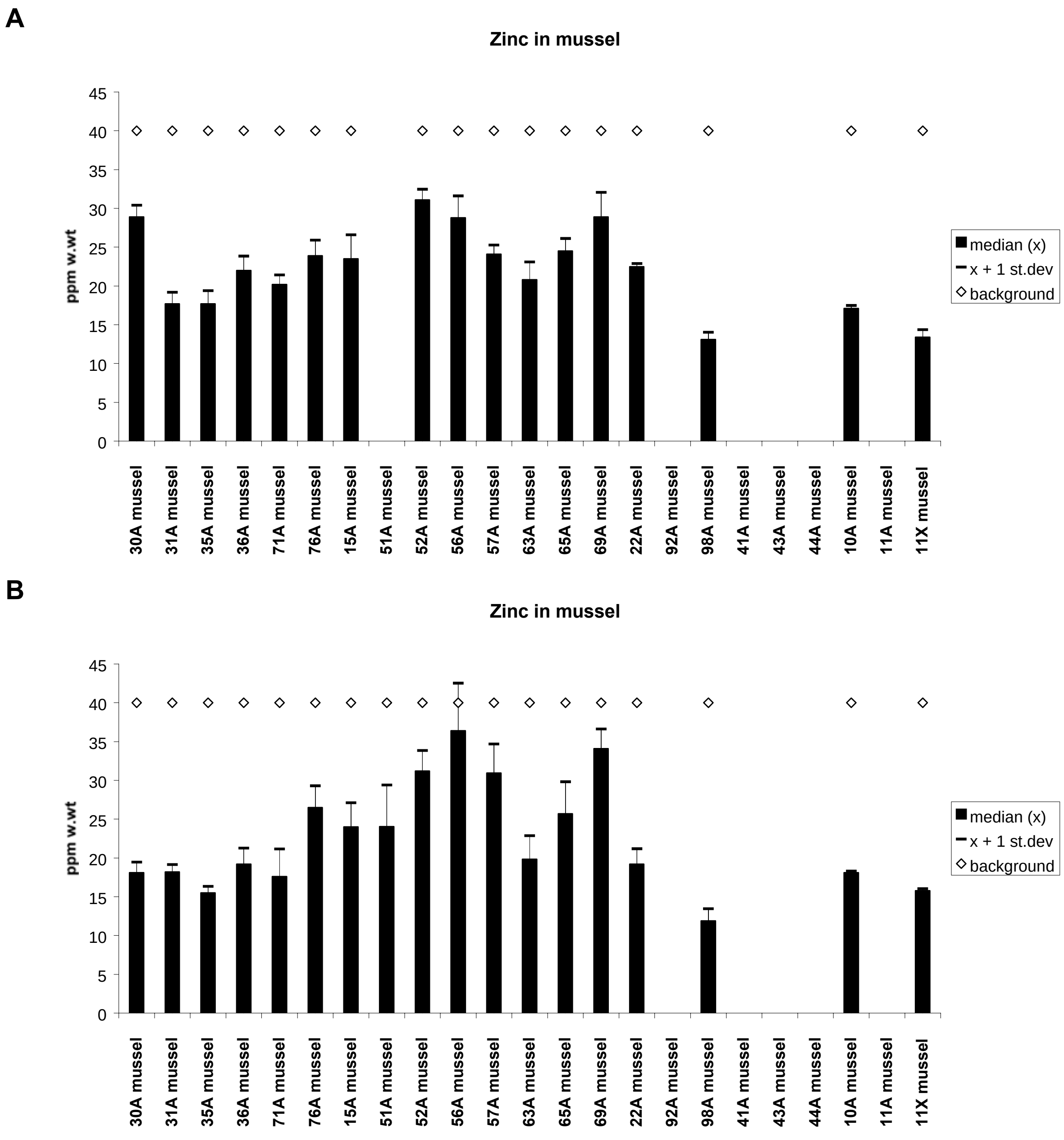
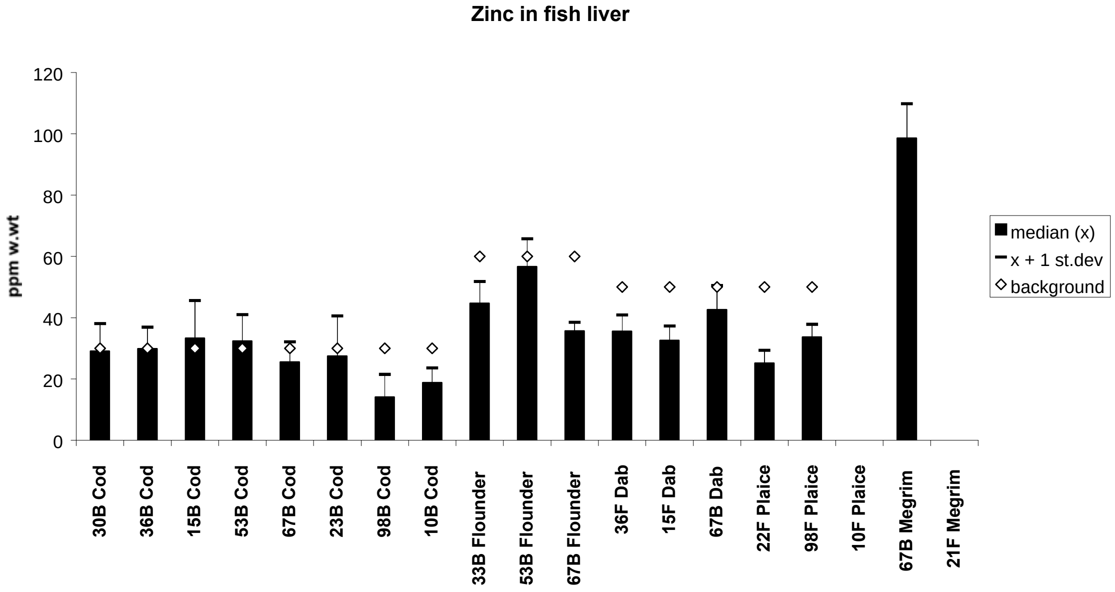


**Figure 30.** Median, standard deviation and provisional "high background" concentration for zinc in mussels (*Mytilus edulis*) 1998 (**A**) and 1999 (**B**), ppm wet weight (see maps in Appendix F. ).

**A**



**B**

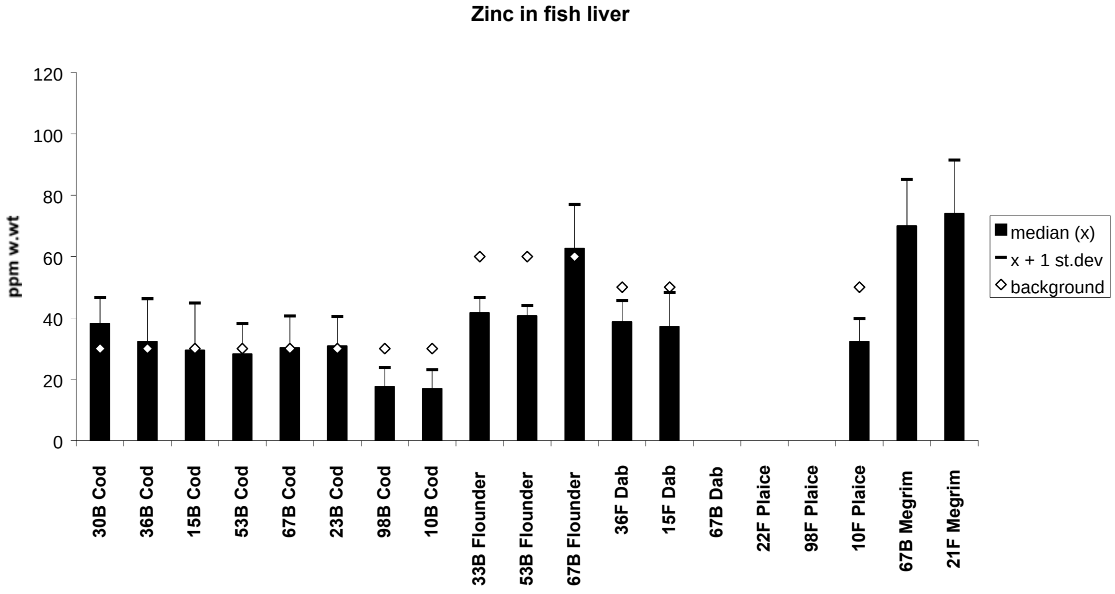


**Figure 31.** Median, standard deviation and provisional "high background" concentration for zinc in fish liver 1998 (**A**) and 1999 (**B**), ppm wet weight (see maps in Appendix F. ).

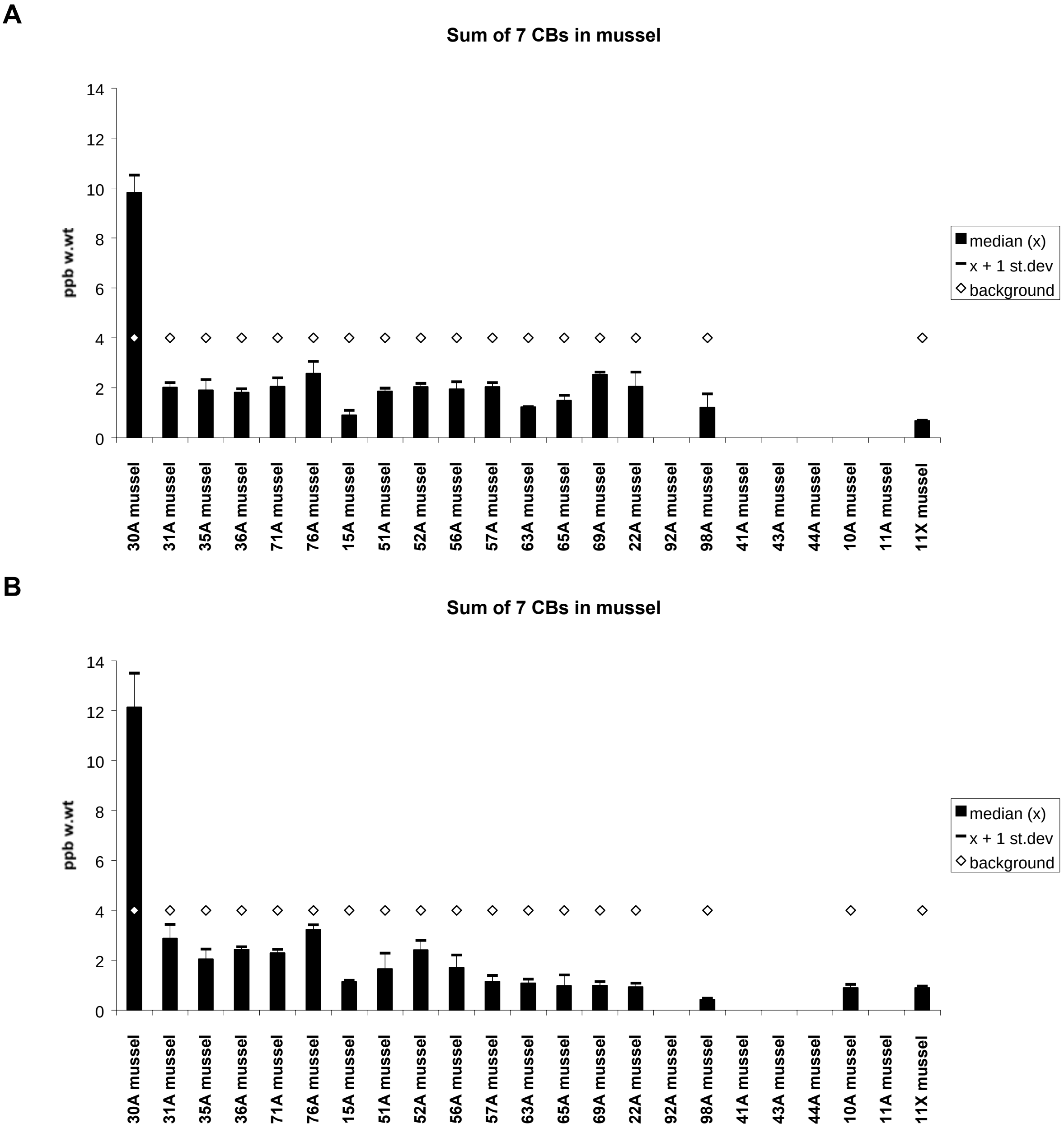
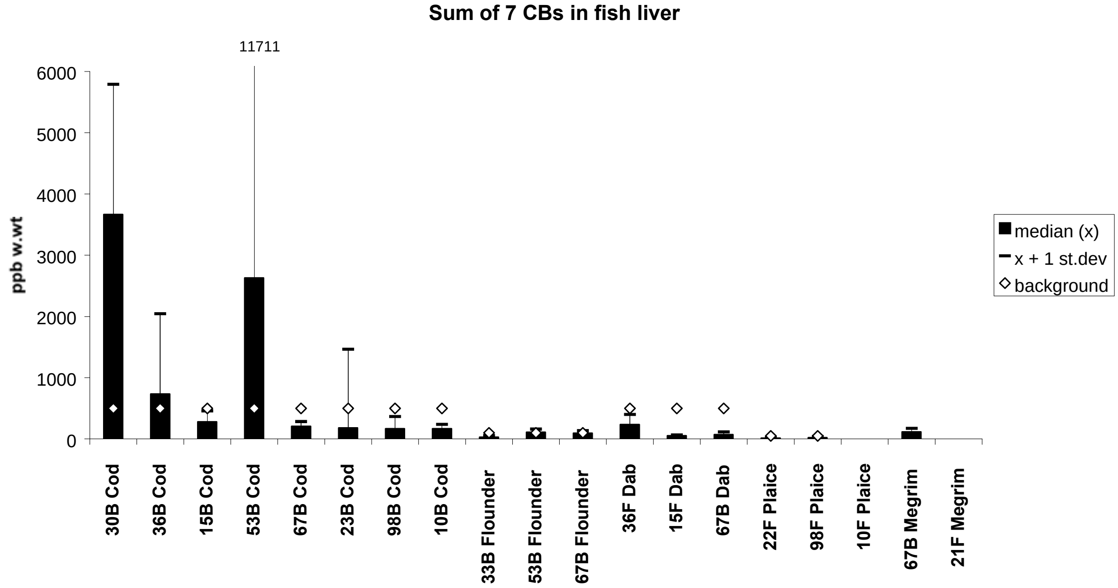


**Figure 32.** Median, standard deviation and provisional "high background" concentration for sum of 7 PCBs (CB-28, -52, 101, -118, -138, -153 and -180) in mussels (*Mytilus edulis*) 1998 (**A**) and 1999 (**B**), ppb wet weight (see maps in Appendix F. ).

A



B

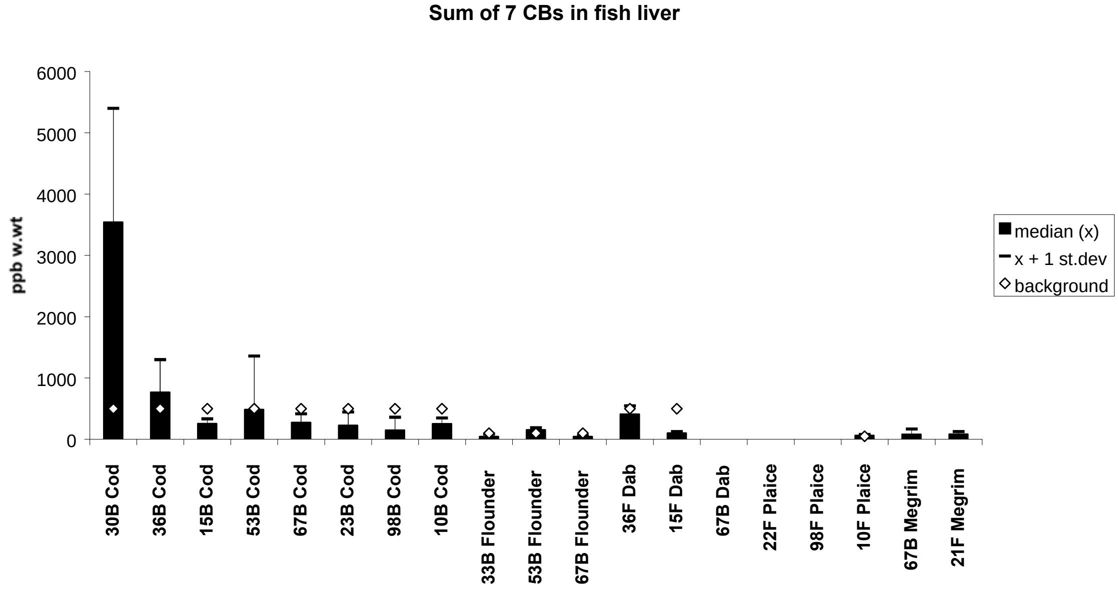
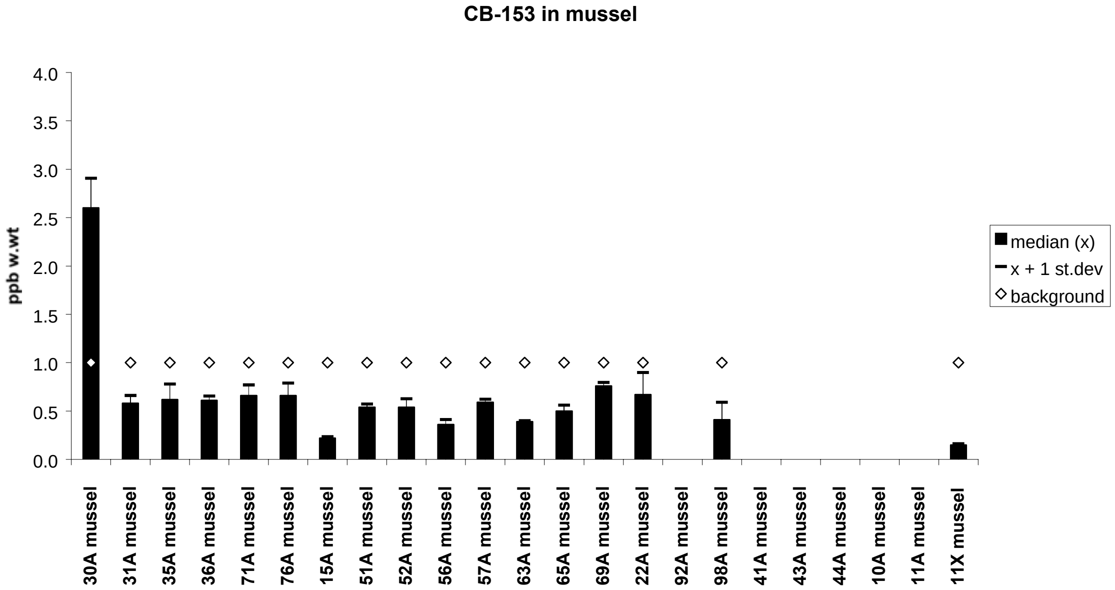


**Figure 33.** Median, standard deviation and provisional "high background" concentration for sum of 7 PCBs (CB-28, -52, 101, -118, -138, -153 and -180) in fish liver 1998 (**A**) and 1999 (**B**), ppb wet weight (see maps in Appendix F. ).

**A**



**B**

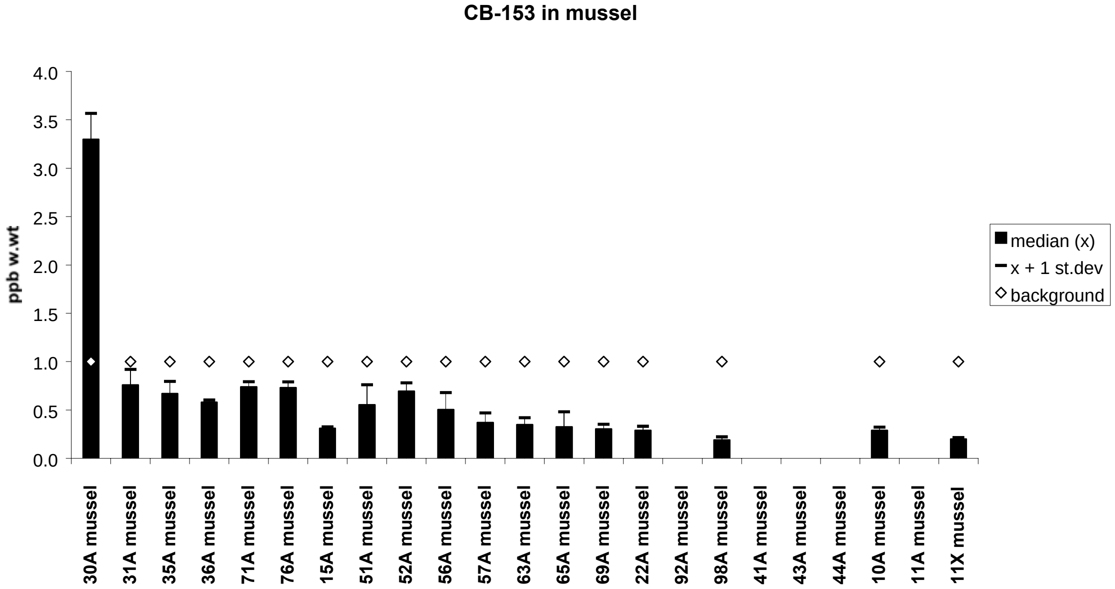
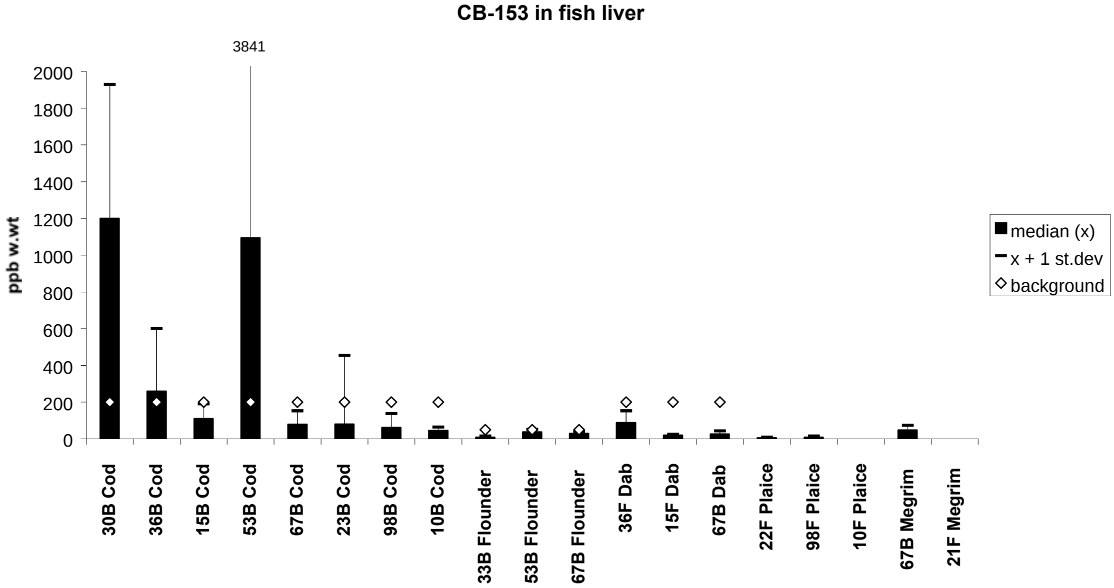


**Figure 34.** Median, standard deviation and provisional "high background" concentration for CB-153 in mussels (*Mytilus edulis*) 1998 (**A**) and 1999 (**B**), ppb wet weight (see maps in Appendix F. ).

**A**



**B**

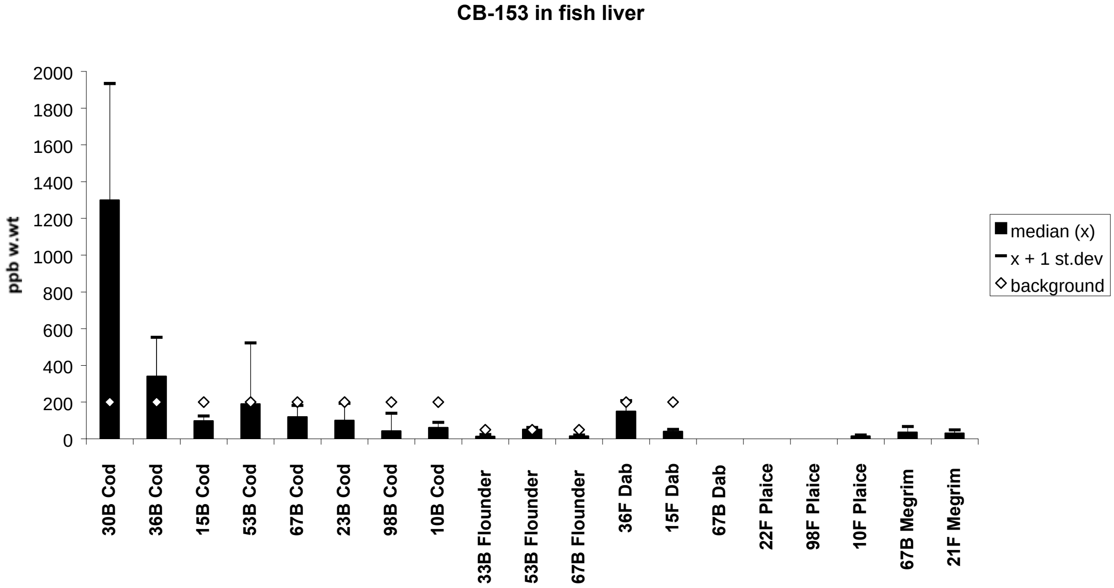
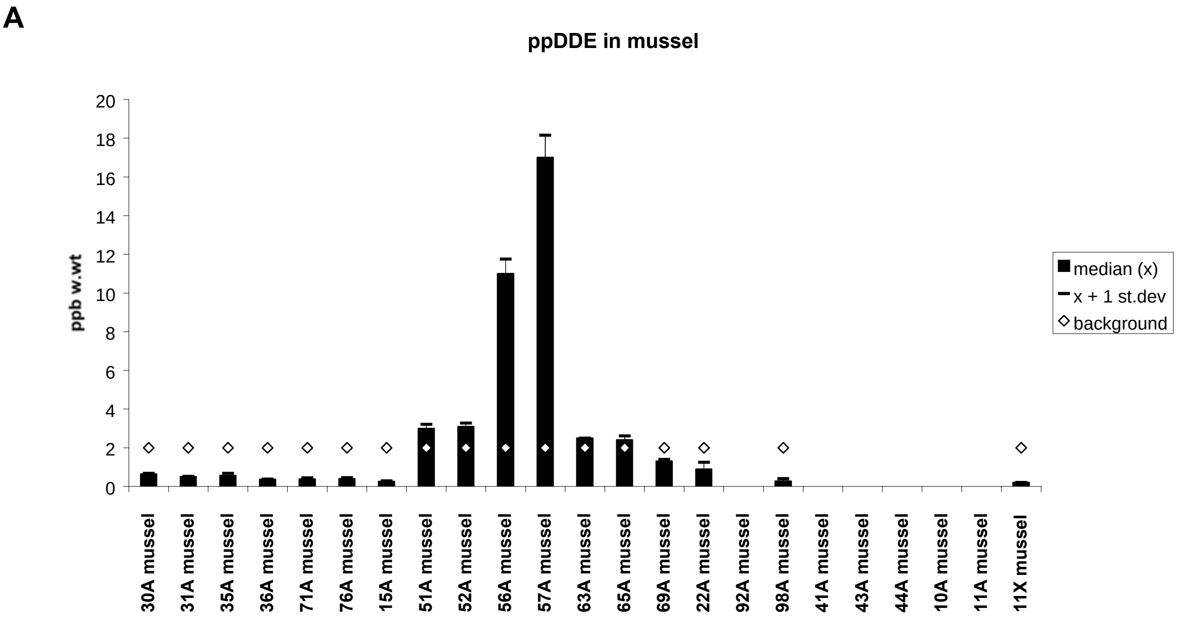


**Figure 35.** Median, standard deviation and provisional "high background" concentration for CB-153 in fish liver 1998 (**A**) and 1999 (**B**), ppb wet weight (see maps in Appendix F. ).



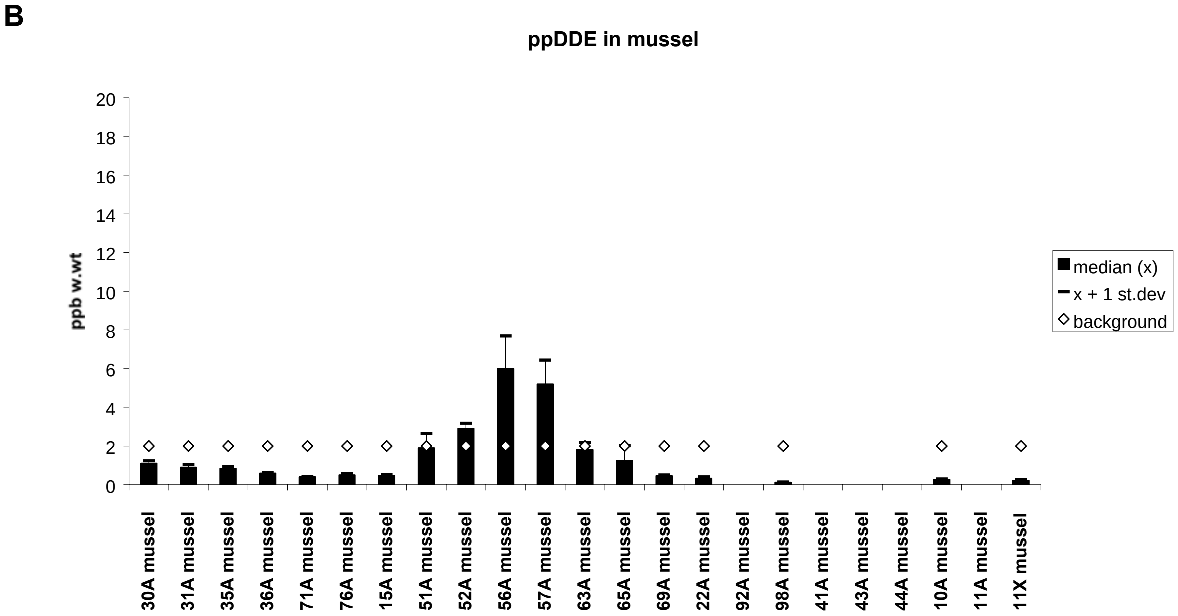


**Figure 36.** Median, standard deviation and provisional "high background" concentration for ppDDE (DDEPP) in mussels (*Mytilus edulis*) 1998 (**A**) and 1999 (**B**), ppb wet weight (see maps in Appendix F. ). (See also footnote in Table 5.)

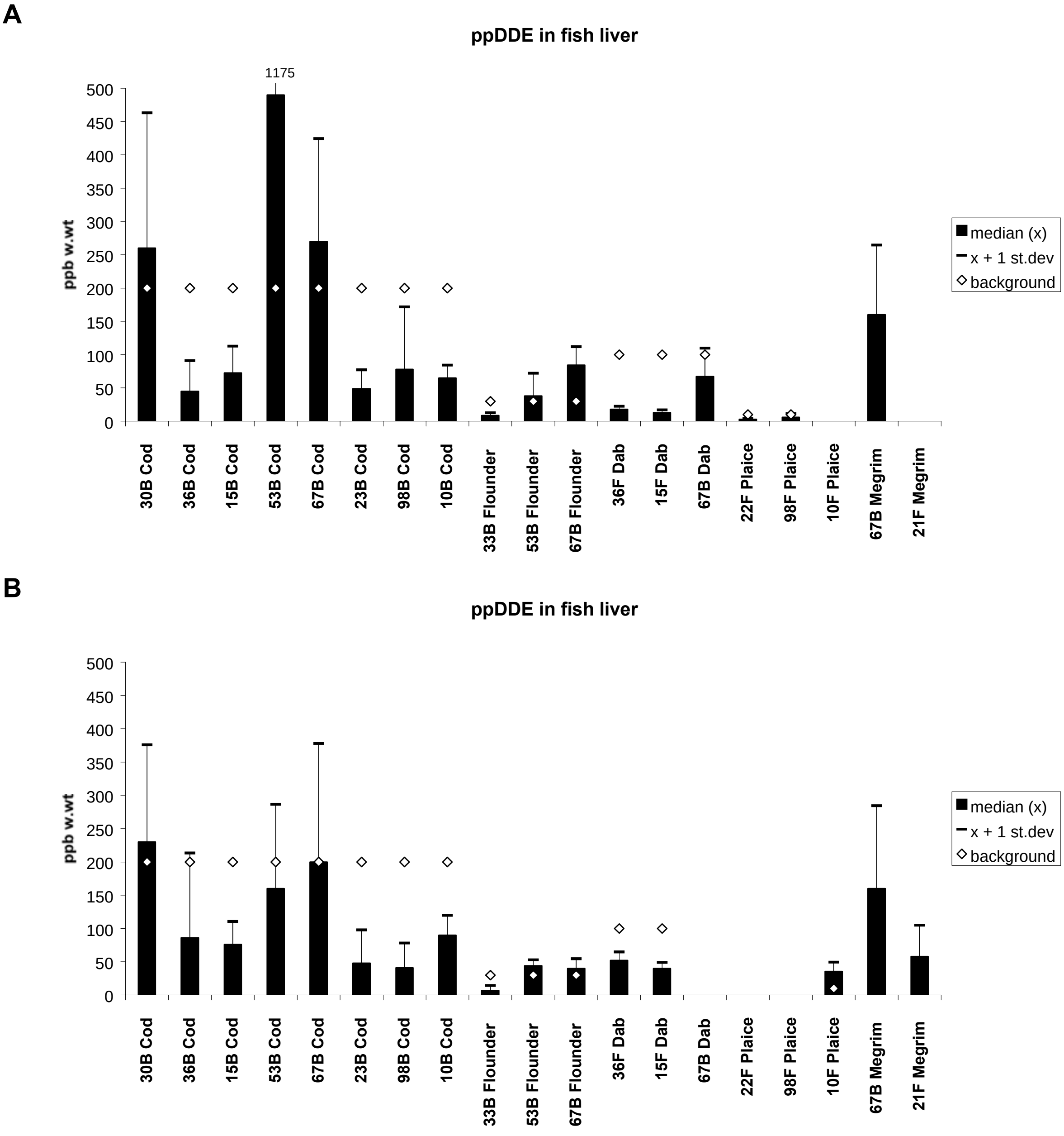
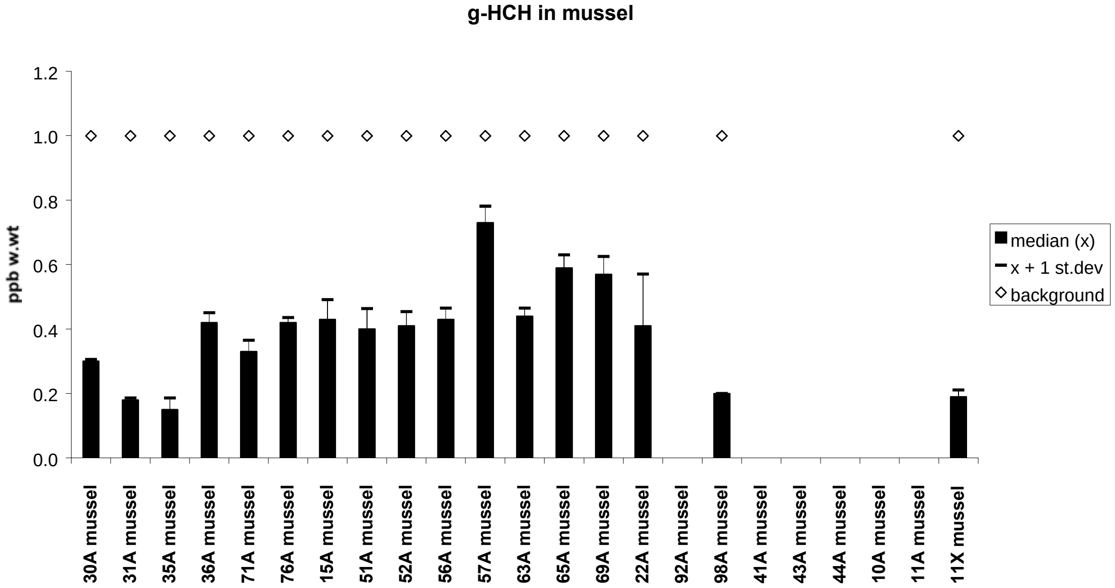


**Figure 37.** Median, standard deviation and provisional "high background" concentration for ppDDE (DDEPP) in fish liver 1998 (**A**) and 1999 (**B**), ppb wet weight (see maps in Appendix F. ). (See also footnote in Table 5.)

A



B

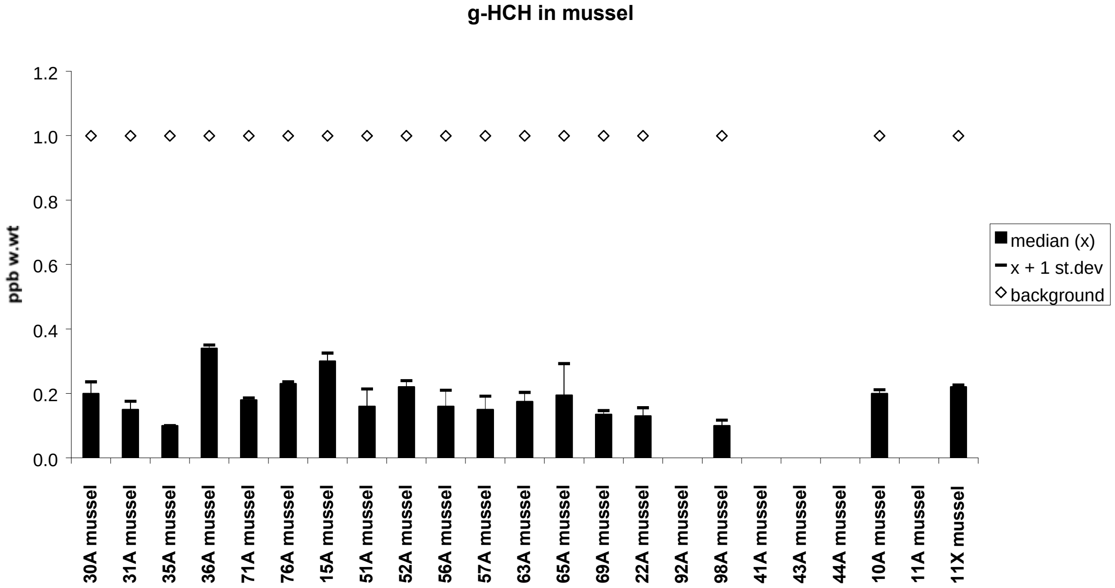


**Figure 38.** Median, standard deviation and provisional "high background" concentration for γ-HCH (Lindane) in mussels (*Mytilus edulis*) 1998 (**A**) and 1999 (**B**), ppb wet weight (see maps in Appendix F. ). (See also footnote in Table 5.)

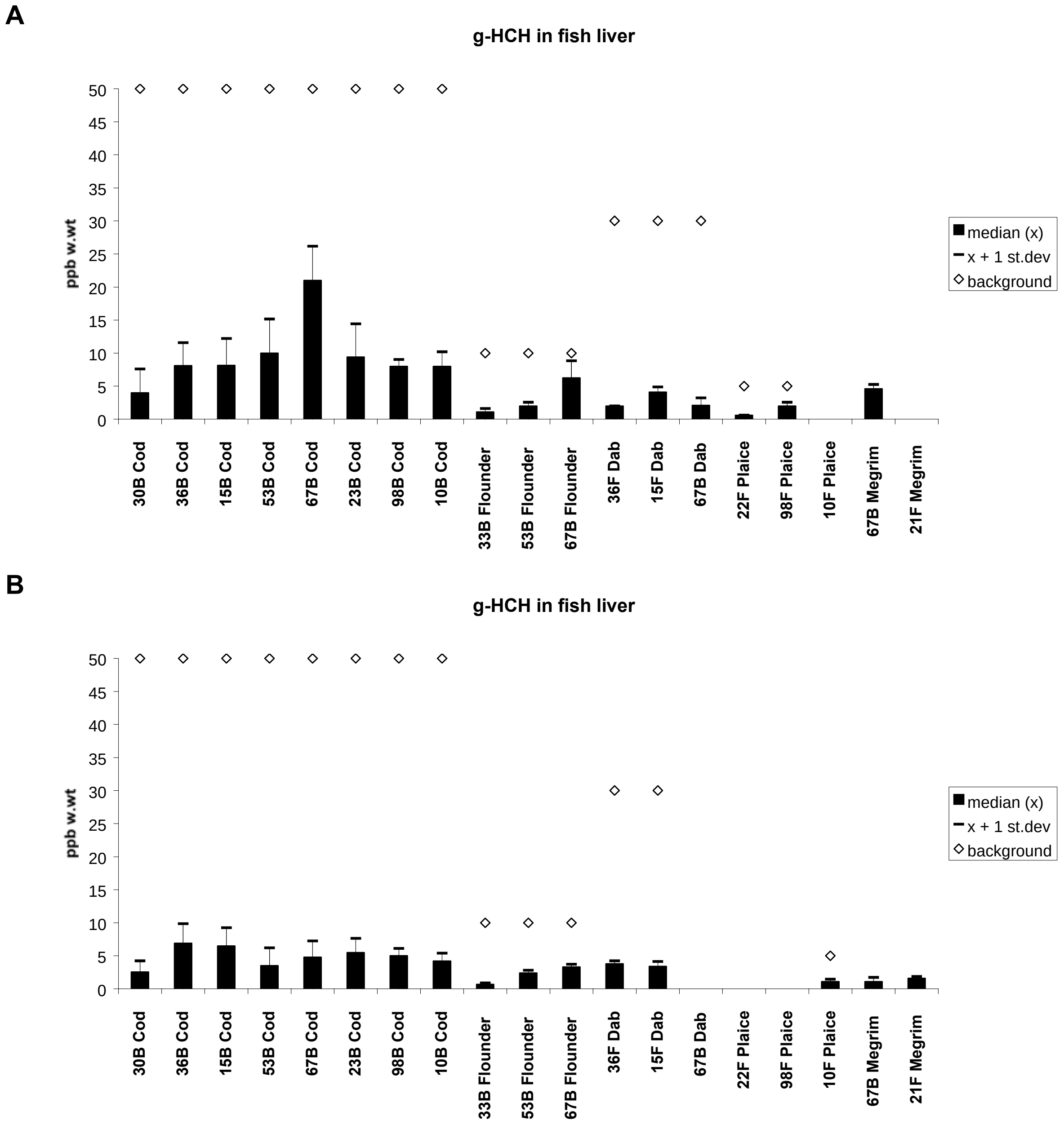


**Figure 39.** Median, standard deviation and provisional "high background" concentration for γ-HCH (Lindane) in fish liver 1998 (**A**) and 1999 (**B**), ppb wet weight (see maps in Appendix F. ). (See also footnote in Table 5.)

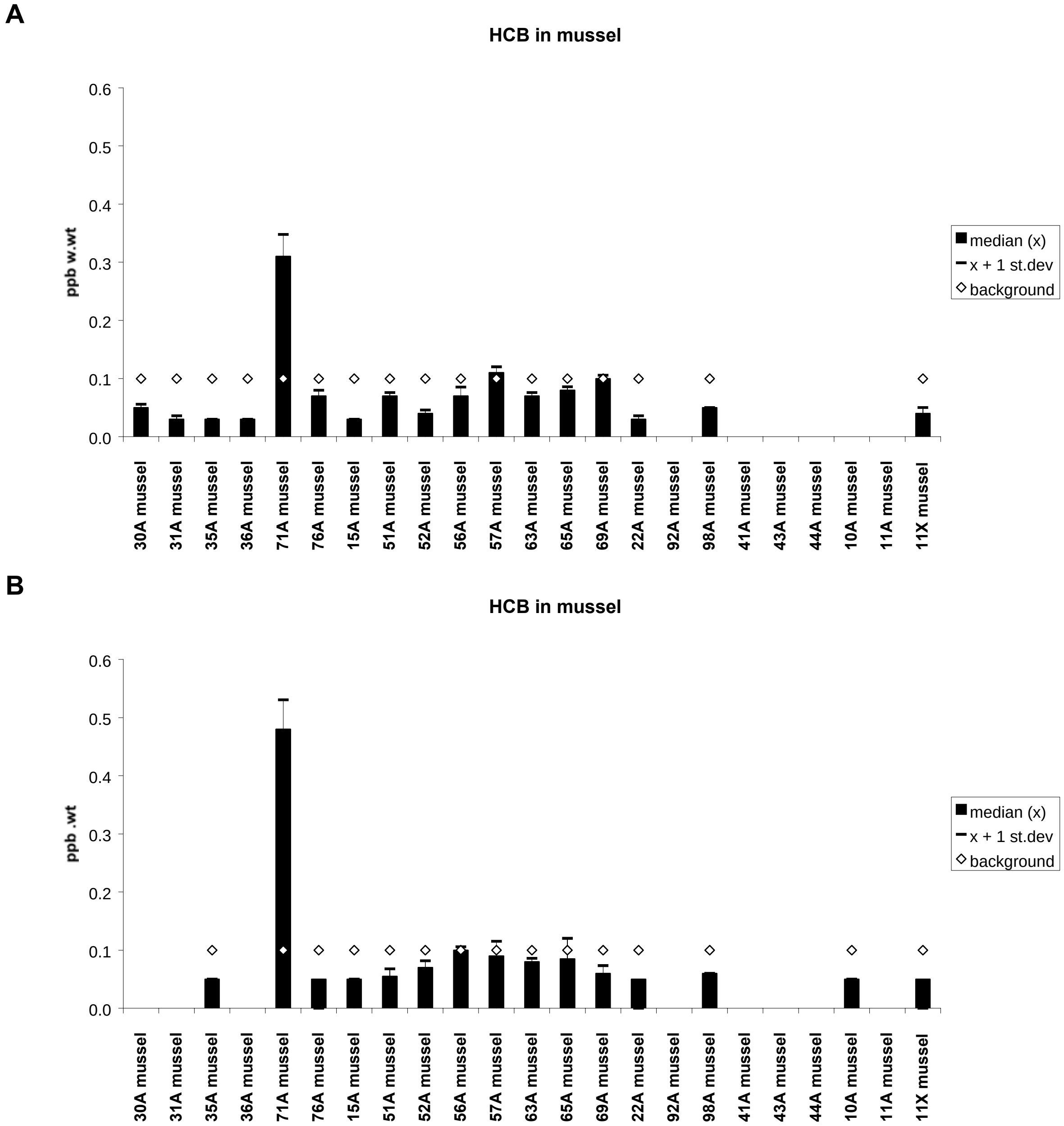


**Figure 40.** Median, standard deviation and provisional "high background" concentration for HCB in mussels (*Mytilus edulis*) 1998 (**A**) and 1999 (**B**), ppb wet weight (see maps in Appendix F. ).

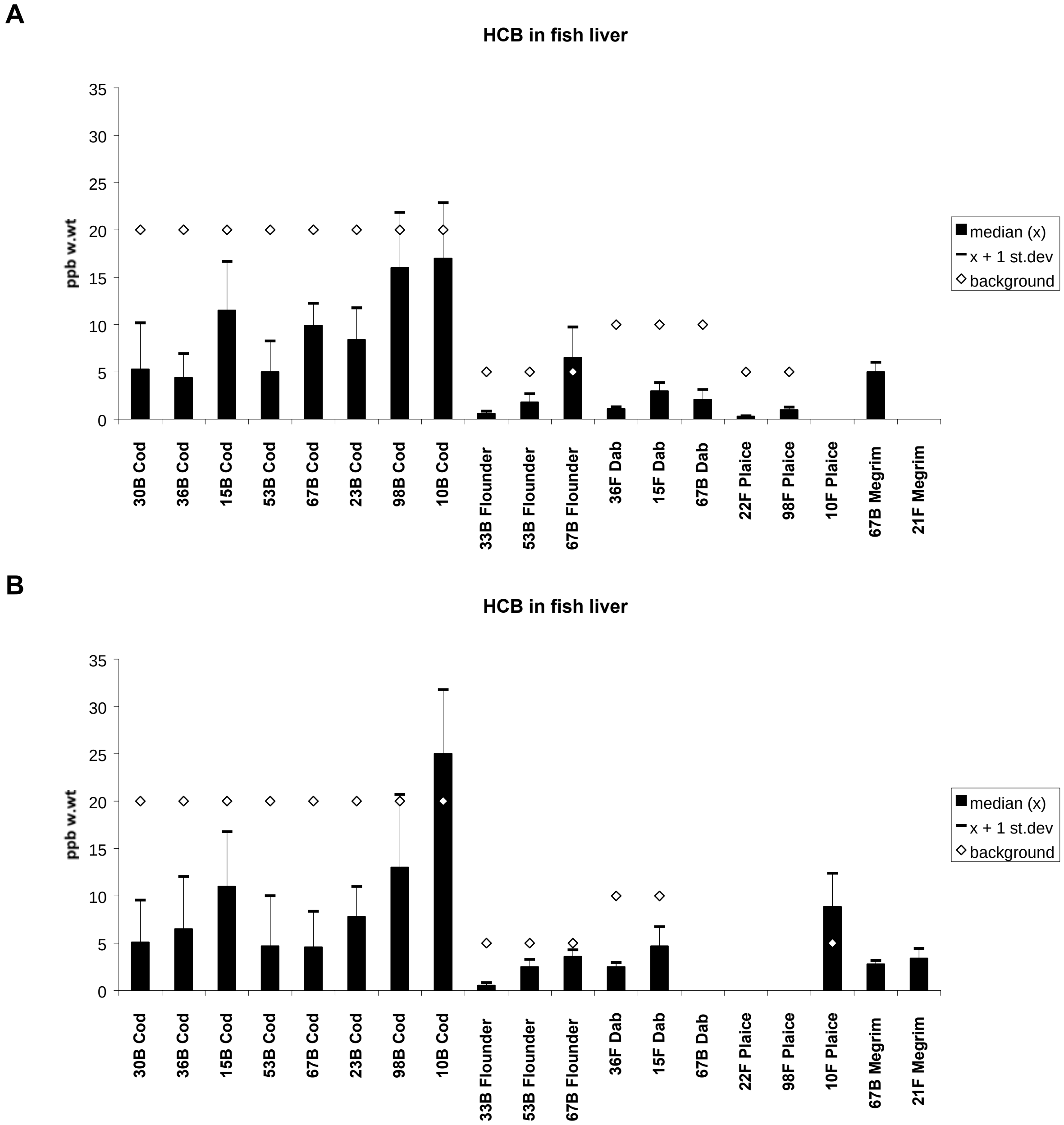


**Figure 41.** Median, standard deviation and provisional "high background" concentration for HCB in fish liver 1998 (**A**) and 1999 (**B**), ppb wet weight (see maps in Appendix F. ).

# Appendix J.
# Results from INDEX determinations 1995-1999

# Introduction

The Norwegian Pollution Control Authority (SFT) has requested that a small group of indices be established to assess the quality of the environment with respect to contaminants. The target medium for both indices may vary depending on the purpose, however sediment, cod and mussels are considered to be the most likely choices. Blue mussels were selected for this investigation (Appendix J. 1 and Appendix J. 2).

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

In addition, a "Reference Index" was initiated in 1995 based on annual contaminant concentrations in the blue mussel. The mussels were collect at JAMP stations along the entire coast where there is presumably low levels of contamination. The importance of "reference" stations for monitoring of contaminants has been discussed earlier (cf. Green 1987). One of the main reasons for this work is to establish points of reference for contaminated fjords. Initially 8 areas were involved but since 1998 only 5 have been sampled.

# Calculation of the index

Sampling strategy and a detailed discussion of calculation of the Pollution Index has been given earlier (cf. Walday *et al.* 1995) and only a brief summary will be given here. The relevant contaminants for each of the Pollution Index fjords are summarised in Appendix J. 2 and 3. Their selection is based on earlier investigations. Two to five stations were sampled from each area. Three parallels of 20 individuals from 3-5 cm are collected from each station. Each sample was analysed for the contaminants according to the scheme in Appendix J. 3. "Dioxins" were only investigated in 1995-96.

One to three stations were sampled from selected areas for the determination of the Reference Index. Each station included three parallels which were analysed for the usual JAMP contaminants (cf. analysis code A, Appendix J. 3). Some samples were also analysed for PAHs and dioxins.

The strategy for sampling mussels differed depending on whether the mussels were to be used for the Index or for JAMP and Index in that stations that were exclusively to be used for Index calculations allowed a slightly greater size range (3-5 cm) compared to JAMP and that the mussels were frozen directly and 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 J. 4). The highest class found for any contaminant measured in an area determined the index value for that area.

The SFT Classes are based on the provisional "high background" levels. This system has been 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 excluding the dicyclic PAHs (PAH_Σ) was compared to the system's "sum-PAH". Previously the calculation of sum-PAH included the dicyclic PAHs. For this report PAH_Σ was calculated for previous years and hence, the classification may vary a class from what has been previously reported. "Dioxins" were assessed based on toxicity equivalency factors (TEQ) according to a Nordic model (Ahlborg 1989) which differs insignificantly from the recently revised WHO-model (van den Berg *et al.* 1998). 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 (e.g., tributyltin (TBT), arsenic, fluoride, nickel, silver).

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 at least one median value from each of the areas was in Class V ("Very bad").

## Conclusion from application of the indices

To compare the 1999 results with previous years the calculations were done on a common basis with respect to areas and contaminants. Nine fjord areas were used to calculate the Pollution Index for 1998-1999 compared to eight for 1995-97. No special considerations were made when one but not all the stations within an area were sampled. This occurred five times for the Pollution Index (st. I205 Bølsnes from Saudafjord 1996, st.I911 Horvika in the Sunndalsfjord 1997 and 1998, st. I021 in the Hvaler area and st.I962 in the Inner Ranfjord 1999). Because insufficient amount of mussels were not found at station I911 Horvika 1997-1998, a new station (I913 Fjøseid) was introduced in 1999 between st.I911 and I912 Honnhammer about 15km farther out the fjord. The Pollution Index for 1999 is 3.1 (Table 8, Appendix J. 5). A value between 3 and 4 would be termed by the SFT system as “Bad”.

Only 5 fjords/areas were monitored for the Reference Index for 1998-1999 compared to 7 for 1997 and 8 for 1995-1996 (Table 9, Appendix J. 6). However only four of these provided a common basis (cf., Table 9). As for Pollution Index, no special considerations were made when one but not all the stations within an area were sampled. This occurred five times in these four areas for the Reference Index (Varangerfjord st.48A 1997-1999 and st.11A 1998-1999). The value for 1999 is 1.3 and the same as for 1997-1998. A value between 1 and 2 would be termed by the SFT system as “Fair”.

**Table 8.** Maximum environmental classification for fjords selected for Pollution INDEX. (See text and Appendix J. 5).

| **Index Area** [1] | **1995** | **1996** | **1997** [2] | **1998** | **1999** |
|---|---|---|---|---|---|
| Hvaler/Singlefjord | 2 | 2 | 2 | 3 | 2 |
| Iddefjord | - | - | - | - | - |
| Inner Oslofjord | 3 | 3 | 4 | 2 | 3 |
| Frierfjord, Grenlandsfjords | 3 | 4 | 3 | 3 | 3 |
| Inner Kristiansandsfjord | 5 | 5 | 5 | 5 | 5 |
| Saudafjord | 4 | 5 | 5 | 3 | 4 |
| Sørfjord | 5 | 4 | 3 | 3 | 4 |
| Byfjorden, Bergen [3] | 3 | 3 | 3 | 2 | 2 |
| Sunndalsfjord | 3 | 3 | 3 [4] | 2 | 3 |
| Orkdalsfjord | - | - | - | - | - |
| Inner Ranfjord | 5 | 3 | 3 [5] | 4 | 2 |
| **AVERAGE (Pollution INDEX)** | **3.7** | **3.6** | **3.4** | **3.0** | **3.1** |

[1] Iddefjord and Orkdalsfjord not sampled since 1997, hence the indices 1995-96 do not include the local indices from these fjords

[2] Copper, zinc and TCDDN excluded since 1997, hence indices for 1995-96 excludes these contaminants

[3] PCB (DDTΣ, HCB, HCHΣΣ and CBΣΣ) analysed in stored samples for 1995-1996

[4] Change in classification (cf. Green *et al.* 1999) due to recalculation of PAHs that excluded the dicyclic compounds

[5] Change in classification (cf. Green *et al.* 1999) due to calculation error

**Table 9.** Maximum environmental classification for fjords selected for Reference INDEX. (See text and Appendix J. 6).

| **Index Area** | **1995** | **1996** | **1997** | **1998** | **1999** |
|---|---|---|---|---|---|
| Mid and outer Oslofjord [1] | 2 | 2 | 2 | 1 | 1 |
| Lista | 1 | 1 | 1 | 1 | 2 |
| Bømlo-Sotra | 1 | 1 | 1 | 1 | 1 |
| Outer Ranfjord, Helgeland [2] | (1) | (1) | - | - | - |
| Lofoten [3] | (2) | (2) | (1) | (2) | (2) |
| Finnsnes-Skjervøy [2] | (2) | (1) | (1) | - | - |
| Hammerfest-Honningsvåg [2] | (2) | (3) [4] | (2) | - | - |
| Varanger Peninsula | 1 | 2 | 1 | 2 | 1 |
| **AVERAGE (Reference INDEX)** | **1.3** | **1.5** | **1.3** | **1.3** | **1.3** |

[1] Inclusion of results for arsenic, nickel and silver in 1996 (see Appendix J. 6) did not affect the classification

[2] Outer Ranfjord, Finnsnes-Skjervøy and Hammerfest-Honningsvåg stations were not sampled in 1998, hence, the index for 1995-97 did not take these results into account. See cf., Green *et al.* 2000 for more details for outer Ranfjord.

[3] Inconsistency in sampling site, st.98X in 1995-96 and st.98A in 1997, hence, results from Lofoten excluded. See cf., Green *et al.* 2000 for more details for st 98X.

[4] Change in classification (cf. Green *et al.* 1999) due to recalculation of PAHs that excluded the dicyclic compounds

# Appendix J. 1.
# INDEX - Stations and programme 1995-99

**Appendix J. 1.** INDEX station positions and sampling overview for blue mussels 1995-98, where P = "Pollution Index" and R = "Reference Index" (contaminated and assumed "background" stations, respectively). Mussels were sampled from rock surfaces unless otherwise noted. See Walday *et al.* (1995) for discussion of station selection and analyses.

| Station | Locality name | North latitude | East longitude | ICES position | INDEX type P/R | notes |
|---|---|---|---|---|---|---|
| **HVALER/SINGLEFJORDEN**, east of outer OSLOFJORD | | | | | | |
| I021 | Kjøkø, south | 59°07.8' | 10°57.1' | 47G13 | P | |
| I024 | Kirkø, north west | 59°04.9' | 10°59.2' | 47G09 | P | |
| I022 | West Damholmen | 59°06.2' | 10°57.9' | 47G09 | P | |
| I023 | Kirkø, north west | 59°05.7' | 11°08.2' | 47G09 | P | |
| **IDDEFJORD**, east of outer OSLOFJORD | | | | | | |
| I001 | Sponvikskansen | 59°05.4' | 11°12.5' | 47G09 | P | |
| I011 | Kråkenebbet | 59°06.1' | 11°17.3' | 47G09 | P | |
| **INNER OSLOFJORD** | | | | | | |
| JAMP 30A | Gressholmen | 59°52.5' | 10°43.0' | 48G07 | P | |
| I301 | Akershuskaia | 59°54.2' | 10°45.5' | 48G07 | P | |
| I304 | Gåsøya | 59°51.0' | 10°35.5' | 48G04 | P | |
| I307 | Ramtonholmen | 59°44.7' | 10°31.4' | 48G05 | P | |
| I306 | Håøya | 59°24.7' | 10°33.4' | 48G04 | P | |
| **MID and OUTER OSLOFJORD** | | | | | | |
| JAMP 31A | Solbergstrand | 59°36.9' | 10°39.4' | 48G06 | R | |
| JAMP 35A | Mølen | 59°29.2' | 10°30.1' | 47G04 | R | |
| JAMP 36A | Færder | 59°01.6' | 10°31.7' | 47G06 | R | |
| **FRIERFJORD AREA**, west of outer Oslofjord | | | | | | |
| I711 | Steinholmen | 59°31.7' | 09°40.7' | 48F99 | P | |
| I712 | Gjermundsholmen | 59°21.7' | 09°42.6' | 47F99 | P | |
| JAMP 71A | Bjørkøya (Risøyodden) | 59°01.4' | 09°45.4' | 47F99 | P | |
| **INNER KRISTIANSANDSFJORD** | | | | | | |
| I132 | Fiskåtangen | 57°07.7' | 07°59.2' | 43F79 | P | |
| I133 | Odderø, west | 57°07.9' | 08°00.3' | 43F83 | P | |
| **LISTA AREA** | | | | | | |
| JAMP 15A | Gåsøy (Ullerø area) | 58°03.1' | 06°53.3' | 45F69 | R | |
| I131 | Lastad | 58°03.3' | 07°42.4' | 45F79 | R | 7 |
| **SAUDAFJORD** | | | | | | |
| I201 | Ekkjegrunn (G1) | 59°38.7' | 06°21.4' | 48F66 | P | |
| ** I205 | Bølsnes (G5) | 59°35.5' | 06°18.3' | 48F63 | P | |
| **BØMLO AREA** | | | | | | |
| JAMP 22A | Espevær, west | 59°35.2' | 05°58.5' | 48F59 | R | C, 1 |
| **SØRFJORD** | | | | | | |
| * 51A | Byrkjenes | 60°05.1' | 06°33.1' | 49F66 | P | |
| JAMP 52A | Eitrheimsneset | 60°05.8' | 06°32.2' | 49F66 | P | 3 |

**Appendix J. 1 (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 | |
| **SUNNDALSFJORD**en | | | | | | |
| I912 | Honnhammer | 62°51.2' | 08°09.7' | 54F81 | P | |
| I911 | Horvika | 62°44.1' | 08°31.4' | 54F85 | P | |
| I913 | Fjøseid | 62°49.0' | 08°16.48' | 54F85 | P | |
| **[TRONDHEIM AREA** - not related to INDEX investigation**]** | | | | | | |
| * 80A | Østmerknes | 63°27.5' | 10°27.5' | 56G04 | P | |
| **ORKDALSFJORD AREA**, supplementary area (cf. Walday *et al*. 1995) | | | | | | |
| JAMP 82A | Flakk | 63°27.1' | 10°12.6' | 56G01 | P | |
| JAMP 84A | Trossavika | 63°20.8' | 09°57.8' | 55F97 | P | |
| JAMP 87A | Ingdalsbukt | 63°27.8' | 09°54.8' | 55F97 | P | |
| **INNER RANFJORD** | | | | | | |
| I969 | Bjørnbærviken (B9) | 66°16.8' | 14°02.1' | 61G42 | P | |
| I962 | Koksverkkaien (B2) | 66°19.4' | 14°08.0' | 61G42 | P | 3 |
| **OUTER RANFJORD**, Helgeland area | | | | | | |
| * 96A | Breiviken | 66°17.6' | 12°50.5' | 61G28 | R | 1 |
| **LOFOTEN AREA** | | | | | | |
| JAMP 98A | Husvågen (1997) | 68°15.4' | 14°40.6' | 65G46 | R | 5 |
| JAMP 98A | Husvågen (1998) | 68°16.9' | 14°40.1' | 65G46 | 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 Annex 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
7 - mussels collected from tire on jetty

# Appendix J. 2.
# INDEX - Sampling and analyses for 1995-99

**Appendix J. 2.** Blue mussel samples planned or used in INDEX 1995-99, 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 analysed. Codes for analysis (A, B etc.) are defined in Appendix J. 3. See Walday *et al.* (1995) for discussion of selection of stations and analyses.

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

*) indicates Toxaphene included

**Appendix J. 2 (cont'd)**

| | **STATION** | **INDEX** | **ANALYSIS CODE** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAMP st. | | | + | 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 | . | . |
| 913 | Fjøseid | 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 | . | . | . | . | . | . | . | . | . | 0 | . |
| 969 | Bjørnbærvikenn (B9) | P | . | . | . | . | . | . | . | . | . | 3 | . |
| | **OUTER RANFJORD, HELGELAND AREA** | | | | | | | | | | | | |
| 96A | Breivika, Tomma | R | . | 3 | . | . | . | . | . | . | . | . | . |
| | **LOFOTEN AREA** | | | | | | | | | | | | |
| 98A | Husvågen | R | + | . | . | . | . | . | . | . | . | . | 1 |
| | **FINNSNES-SKJERVØY AREA** | | | | | | | | | | | | |
| 41A | Fensneset, Grytøya | R | + | . | . | . | . | . | . | . | 3 | . | 1 |
| | **HAMMERFEST-HONNINGSVÅG AREA** | | | | | | | | | | | | |
| 44A | Elenheimsundet | R | + | . | . | . | . | . | . | . | 3 | . | 2* |
| 46A | Smineset in Altesula | R | + | . | . | . | . | . | . | . | 3 | . | 1* |
| | **VARANGER PENINSULA AREA** | | | | | | | | | | | | |
| 48A | Trollfjorden i Tanafjord | R | + | . | . | . | . | . | . | . | 3 | . | . |
| 10A | Skagoodden | R | + | . | . | . | . | . | . | . | 3 | . | 1 |
| 11A | Sildkroneset | R | + | . | . | . | . | . | . | . | . | . | 1 |

*) indicates Toxaphene included

# Appendix J. 3.
# INDEX - Key to analysis codes and sample counts

(Used in Appendix J. 2.)

**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 [2)] | x | x | x | . | . | . | . | . | . | . |
| Mercury | x | x | x | . | . | . | . | . | . | . |
| Zinc [2)] | x | x | x | . | . | . | x | . | x | . |
| EPOCl | . | . | . | . | x | . | . | . | . | . |
| PAHs | . | . | x | . | x | x | . | x | x | . |
| PCBs | x | . | x | x | x | . | x | . | . | . |
| “Dioxin” [3)] | . | . | . | . | . | . | . | . | . | x |

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

# Appendix J. 4.
# INDEX - SFT Environmental quality classes

(Molvær *et al.* 1997)

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

* ) See also Appendix B. for definitions.

# Appendix J. 5.
# INDEX - Summary table “Pollution index” 1995-1999

Max(median). Statistics for all areas: (n = Index-station measured, N = Station programmed for index)

**Average of Max E.C is 3.7**

| Index areaname (Pollution area) **1995** | n | N | As ppm d.wt | Pb ppm d.wt | F ppm d.wt | Cd ppm d.wt | Cu ppm d.wt | Cr ppm d.wt | Hg ppm d.wt | Ni ppm d.wt | Zn ppm d.wt | Ag ppm d.wt | PAH_S ppb w.wt | BAP ppb w.wt | DDTSS ppb w.wt | HCB ppb w.wt | HCHSS ppb w.wt | CBSSe ppb w.wt | TCDDN ppp w.wt | Max E.C I:V |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hvaler/Singlefjorden | 4 | 4 | i | 1.06 | i | 1.73 | i | i | 0.2 | i | i | i | i | i | 0.93 | 0.1 | 0.53 | 6.73 | i | II |
| Iddefjord | 1 | 2 | i | i | i | i | i | i | i | i | i | i | i | i | i | i | i | i | i | miss |
| Inner Oslofjord | 5 | 5 | i | i | i | 1.33 | i | i | 0.1 | i | i | i | <132.90 | 0.8 | 1.95 | <0.05 | 0.41 | 20.6 | i | III |
| Frierfjorden | 3 | 3 | i | i | i | i | i | i | i | i | i | i | i | i | 0.85 | 0.6 | 0.27 | 4.74 | i | III |
| Inner Kristiandsfjord | 2 | 2 | i | i | i | i | i | i | i | i | i | i | 1088.5 | 15 | 0.65 | 9.6 | 0.76 | 5.08 | i | V |
| Saudafjord | 2 | 2 | i | 4.77 | i | 0.82 | i | i | i | i | i | i | <428.80 | 15 | i | i | i | i | i | IV |
| Sørfjord | 2 | 2 | i | 149 | i | 36.8 | i | i | 1.5 | i | i | i | i | i | 6.01 | 0.1 | 0.28 | 2.67 | i | V |
| Byfjorden | 3 | 3 | i | i | i | i | i | i | i | i | i | i | i | i | 3.76 | 0.2 | 0.74 | 19 | i | III |
| Sunndalsfjord | 2 | 2 | i | i | i | i | i | i | i | i | i | i | 809.8 | 8 | i | i | i | i | i | III |
| Orkdalsfjord area | 3 | 3 | i | i | i | i | i | i | i | i | i | i | i | i | i | i | i | i | i | miss |
| Inner Ranfjord | 2 | 2 | i | 4.44 | i | 0.75 | i | i | i | i | i | i | 785.7 | 31 | i | i | i | i | i | V |

| | |
|---|---|
| I | 20 |
| II | 10 |
| III | 9 |
| IV | 4 |
| V | 3 |

Max(median). Statistics for all areas: (n = Index-station measured, N = Station programmed for index)

**Average of Max E.C is 3.6**

| Index areaname (Pollution area) **1996** | n | N | As ppm d.wt | Pb ppm d.wt | F ppm d.wt | Cd ppm d.wt | Cu ppm d.wt | Cr ppm d.wt | Hg ppm d.wt | Ni ppm d.wt | Zn ppm d.wt | Ag ppm d.wt | PAH_S ppb w.wt | BAP ppb w.wt | DDTSS ppb w.wt | HCB ppb w.wt | HCHSS ppb w.wt | CBSSe ppb w.wt | TCDDN ppp w.wt | Max E.C I:V |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hvaler/Singlefjorden | 4 | 4 | i | 2.29 | i | 2.26 | i | i | 0.4 | i | i | i | i | i | <0.56 | 0.1 | 0.27 | 4.83 | i | II |
| Iddefjord | 1 | 2 | i | i | i | i | i | i | i | i | i | i | i | i | i | i | i | i | i | miss |
| Inner Oslofjord | 5 | 5 | i | i | i | 0.82 | i | i | 0.1 | i | i | i | <644.80 | 3.3 | 1.08 | <0.05 | 0.3 | 20.86 | i | III |
| Frierfjorden | 3 | 3 | i | i | i | i | i | i | i | i | i | i | i | i | 0.26 | 2.2 | 0.19 | 4.18 | i | IV |
| Inner Kristiandsfjord | 2 | 2 | i | i | i | i | i | i | i | i | i | i | <542.40 | 17 | 0.61 | 18 | 1.32 | 6.64 | i | V |
| Saudafjord | 1 | 2 | i | 4.39 | i | 0.86 | i | i | i | i | i | i | 891.4 | 35 | i | i | i | i | i | V |
| Sørfjord | 2 | 2 | i | 60.3 | i | 25.3 | i | i | 0.9 | i | i | i | i | i | 4.08 | <0.05 | 0.6 | 1.92 | i | IV |
| Byfjorden | 3 | 3 | i | i | i | i | i | i | i | i | i | i | i | i | 7.8 | 0.2 | 1.03 | 30.72 | i | III |
| Sunndalsfjord | 2 | 2 | i | i | i | i | i | i | i | i | i | i | <290.00 | 3.8 | i | i | i | i | i | III |
| Orkdalsfjord area | 3 | 3 | i | i | i | i | i | i | i | i | i | i | i | i | i | i | i | i | i | miss |
| Inner Ranfjord | 2 | 2 | i | 5.34 | i | 0.61 | i | i | i | i | i | i | 301.9 | 6.2 | i | i | i | i | i | III |

| | |
|---|---|
| I | 16 |
| II | 12 |
| III | 12 |
| IV | 4 |
| V | 2 |

Max(median). Statistics for all areas: (n = Index-station measured, N = Station programmed for index)

**Average of Max E.C is 3.4**

| Index areaname (Pollution area) **1997** | n | N | As ppm d.wt | Pb ppm d.wt | F ppm d.wt | Cd ppm d.wt | Cu ppm d.wt | Cr ppm d.wt | Hg ppm d.wt | Ni ppm d.wt | Zn ppm d.wt | Ag ppm d.wt | PAH_S ppb w.wt | BAP ppb w.wt | DDTSS ppb w.wt | HCB ppb w.wt | HCHSS ppb w.wt | CBSSe ppb w.wt | TCDDN ppp w.wt | Max E.C I:V |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hvaler/Singlefjorden | 4 | 4 | i | 1.65 | i | 2.48 | i | i | 0.5 | i | i | i | i | i | 1.14 | 0.1 | 0.42 | 5.61 | i | II |
| Iddefjord | 0 | 2 | i | i | i | i | i | i | i | i | i | i | i | i | i | i | i | i | i | miss |
| Inner Oslofjord | 5 | 5 | i | i | i | 0.86 | i | i | 0.1 | i | i | i | <409.10 | 3.5 | 12.08 | 0.1 | 0.79 | 33.81 | i | IV |
| Frierfjorden | 3 | 3 | i | i | i | i | i | i | i | i | i | i | i | i | 0.65 | 0.8 | 0.26 | <2.68 | i | III |
| Inner Kristiandsfjord | 2 | 2 | i | i | i | i | i | i | i | i | i | i | 356 | 9.1 | 1.22 | 7.6 | 0.81 | <6.00 | i | V |
| Saudafjord | 2 | 2 | i | 6.96 | i | 1.37 | i | i | i | i | i | i | 2726.5 | 108 | i | i | i | i | i | V |
| Sørfjord | 2 | 2 | i | 20.6 | i | 13.4 | i | i | 0.3 | i | i | i | i | i | 5.07 | <0.05 | 0.29 | <2.71 | i | III |
| Byfjorden | 3 | 3 | i | i | i | i | i | i | i | i | i | i | i | i | 2.94 | 0.1 | 0.4 | 24.54 | i | III |
| Sunndalsfjord | 1 | 2 | i | i | i | i | i | i | i | i | i | i | <238.90 | 1.4 | i | i | i | i | i | III |
| Orkdalsfjord area | 0 | 3 | i | i | i | i | i | i | i | i | i | i | i | i | i | i | i | i | i | miss |
| Inner Ranfjord | 2 | 2 | i | 3.55 | i | 0.64 | i | i | i | i | i | i | <132.90 | 3.1 | i | i | i | i | i | III |

| | |
|---|---|
| I | 17 |
| II | 13 |
| III | 12 |
| IV | 2 |
| V | 2 |

Max(median). Statistics for all areas: (n = Index-station measured, N = Station programmed for index)

**Average of Max E.C is 3.0**

| Index areaname (Pollution area) **1998** | n | N | As ppm d.wt | Pb ppm d.wt | F ppm d.wt | Cd ppm d.wt | Cu ppm d.wt | Cr ppm d.wt | Hg ppm d.wt | Ni ppm d.wt | Zn ppm d.wt | Ag ppm d.wt | PAH_S ppb w.wt | BAP ppb w.wt | DDTSS ppb w.wt | HCB ppb w.wt | HCHSS ppb w.wt | CBSSe ppb w.wt | TCDDN ppp w.wt | Max E.C I:V |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hvaler/Singlefjorden | 4 | 4 | i | 2.12 | i | 3.31 | i | i | 0.9 | i | i | i | i | i | 1.13 | 0.1 | <0.23 | <4.42 | i | III |
| Iddefjord | 0 | 2 | i | i | i | i | i | i | i | i | i | i | i | i | i | i | i | i | i | miss |
| Inner Oslofjord | 5 | 5 | i | i | i | 1.27 | i | i | 0.1 | i | i | i | <149.20 | 1 | 2.34 | 0.1 | 0.59 | 13.75 | i | II |
| Frierfjorden | 3 | 3 | i | i | i | i | i | i | i | i | i | i | i | i | <0.63 | 0.7 | 0.41 | 3.18 | i | III |
| Inner Kristiandsfjord | 2 | 2 | i | i | i | i | i | i | i | i | i | i | <279.00 | 3.8 | 0.53 | 7.2 | <0.65 | <5.09 | i | V |
| Saudafjord | 2 | 2 | i | 4.67 | i | 0.93 | i | i | i | i | i | i | <550.50 | 9.8 | i | i | i | i | i | III |
| Sørfjord | 2 | 2 | i | 29.6 | i | 10.3 | i | i | 0.6 | i | i | i | i | i | w | 0.1 | 0.51 | 2.04 | i | III |
| Byfjorden | 3 | 3 | i | i | i | i | i | i | i | i | i | i | i | i | <2.83 | 0.2 | 0.79 | 10.87 | i | II |
| Sunndalsfjord | 1 | 2 | i | i | i | i | i | i | i | i | i | i | <180.00 | 1 | i | i | i | i | i | II |
| Orkdalsfjord area | 0 | 3 | i | i | i | i | i | i | i | i | i | i | i | i | i | i | i | i | i | miss |
| Inner Ranfjord | 2 | 2 | i | 2.99 | i | 0.61 | i | i | i | i | i | i | 257.5 | 12 | i | i | i | i | i | IV |

| | |
|---|---|
| I | 19 |
| II | 14 |
| III | 10 |
| IV | 1 |
| V | 1 |

Max(median). Statistics for all areas: (n = Index-station measured, N = Station programmed for index)

**Average of Max E.C is 3.1**

| Index areaname (Pollution area) **1999** | n | N | As ppm d.wt | Pb ppm d.wt | F ppm d.wt | Cd ppm d.wt | Cu ppm d.wt | Cr ppm d.wt | Hg ppm d.wt | Ni ppm d.wt | Zn ppm d.wt | Ag ppm d.wt | PAH_S ppb w.wt | BAP ppb w.wt | DDTSS ppb w.wt | HCB ppb w.wt | HCHSS ppb w.wt | CBSSe ppb w.wt | TCDDN ppp w.wt | Max E.C I:V |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hvaler/Singlefjorden | 3 | 4 | i | 1.94 | i | 2.45 | i | i | 0.4 | i | i | i | i | i | <1.15 | 0.1 | <0.26 | 3.27 | i | II |
| Iddefjord | 0 | 2 | i | i | i | i | i | i | i | i | i | i | i | i | i | i | i | i | i | miss |
| Inner Oslofjord | 5 | 5 | i | i | i | 1.29 | i | i | 0.1 | i | i | i | 211.7 | 2.1 | 2.2 | 0.3 | <0.34 | 20.01 | i | III |
| Frierfjorden | 3 | 3 | i | i | i | i | i | i | i | i | i | i | i | i | 0.76 | 0.6 | <0.28 | <2.64 | i | III |
| Inner Kristiandsfjord | 2 | 2 | i | i | i | i | i | i | i | i | i | i | <1163.40 | 48 | 0.73 | 0.3 | 0.29 | <4.10 | i | V |
| Saudafjord | 2 | 2 | i | 5.97 | i | 1.49 | i | i | i | i | i | i | 620.8 | 14 | i | i | i | i | i | IV |
| Sørfjord | 2 | 2 | i | 37.1 | i | 34.7 | i | i | 2.9 | i | i | i | i | i | 6.21 | 0.1 | 0.35 | <2.42 | i | IV |
| Byfjorden | 3 | 3 | i | i | i | i | i | i | i | i | i | i | i | i | 4.5 | 0.1 | 0.28 | 13.88 | i | II |
| Sunndalsfjord | 2 | 3 | i | i | i | i | i | i | i | i | i | i | 360.5 | 3 | i | i | i | i | i | III |
| Orkdalsfjord area | 0 | 3 | i | i | i | i | i | i | i | i | i | i | i | i | i | i | i | i | i | miss |
| Inner Ranfjord | 1 | 2 | i | 5.13 | i | 0.59 | i | i | i | i | i | i | <172.90 | 2 | i | i | i | i | i | II |

| | |
|---|---|
| I | 19 |
| II | 13 |
| III | 10 |
| IV | 3 |
| V | 1 |

# Appendix J. 6.
# INDEX - Summary table “Reference Index”
# 1995-1999

Max(median). Statistics for all areas: (n = Index-station measured, N = Station programmed for index)

**Average of Max E.C is 1.5**

| Index areaname (Reference area) **1995** | n | N | As ppm d.wt | Pb ppm d.wt | F ppm d.wt | Cd ppm d.wt | Cu ppm d.wt | Cr ppm d.wt | Hg ppm d.wt | Ni ppm d.wt | Zn ppm d.wt | Ag ppm d.wt | PAH_S ppb w.wt | BAP ppb w.wt | DDTSS ppb w.wt | HCB ppb w.wt | HCHSS ppb w.wt | CBSSe ppb w.wt | TCDDN ppp w.wt | Max E.C I:V |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mid and outer Oslofjord | 3 | 3 | w | 1.68 | w | 1.32 | i | w | 0.1 | w | i | w | w | w | <0.95 | 0.1 | 0.4 | 7.86 | i | II |
| Lista area | 2 | 2 | w | 0.52 | w | 1.44 | i | w | 0.1 | w | i | w | <31.60 | 0.5 | <0.34 | <0.05 | 0.38 | <1.28 | i | I |
| Bømlo-Sotra area | 1 | 1 | w | 1.18 | w | 1.41 | i | w | 0.1 | w | i | w | w | w | <0.46 | <0.05 | 0.31 | <1.38 | i | I |
| Outer Ranfjord, Helgeland area | 1 | 2 | w | 1.12 | w | 0.96 | i | w | 0.1 | w | i | w | <37.70 | <0.50 | 0.21 | <0.05 | 0.38 | <0.90 | i | I |
| Lofoten area | 1 | 2 | w | 3.12 | w | 0.69 | i | w | 0.3 | w | i | w | w | w | 4.42 | 0.1 | 0.15 | 12.31 | i | II |
| Finnsnes- Skjervøy area | 1 | 1 | w | 0.9 | w | 2.95 | i | w | 0.1 | w | i | w | w | w | <0.18 | <0.05 | 0.16 | <0.81 | i | II |
| Hammerfest- Honningsvåg area | 2 | 2 | w | 2.57 | w | 2.74 | i | w | 0.1 | w | i | w | <129.90 | 0.7 | <0.23 | <0.05 | <0.15 | <1.34 | i | II |
| Varanger peninsula area | 3 | 3 | w | 2.78 | w | 1.71 | i | w | 0.2 | w | i | w | <6.90 | <0.50 | <0.36 | <0.05 | 0.16 | <0.88 | i | I |

| | |
|---|---|
| I | 56 |
| II | 8 |
| III | 0 |
| IV | 0 |
| V | 0 |

Max(median). Statistics for all areas: (n = Index-station measured, N = Station programmed for index)

**Average of Max E.C is 1.6**

| Index areaname (Reference area) **1996** | n | N | As ppm d.wt | Pb ppm d.wt | F ppm d.wt | Cd ppm d.wt | Cu ppm d.wt | Cr ppm d.wt | Hg ppm d.wt | Ni ppm d.wt | Zn ppm d.wt | Ag ppm d.wt | PAH_S ppb w.wt | BAP ppb w.wt | DDTSS ppb w.wt | HCB ppb w.wt | HCHSS ppb w.wt | CBSSe ppb w.wt | TCDDN ppp w.wt | Max E.C I:V |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mid and outer Oslofjord | 3 | 3 | 7 | 2.04 | w | 1.6 | i | 0.5 | 0 | 0.9 | i | 0.1 | w | w | <0.25 | <0.05 | 0.25 | 13.95 | i | II |
| Lista area | 2 | 2 | w | 0.67 | w | 1.22 | i | w | 0.1 | w | i | w | <44.60 | <0.50 | <0.20 | <0.05 | 0.29 | <2.14 | i | I |
| Bømlo-Sotra area | 1 | 1 | w | 1.51 | w | 1.14 | i | w | 0.1 | w | i | w | w | w | <0.11 | <0.05 | <0.14 | <0.78 | i | I |
| Outer Ranfjord, Helgeland area | 1 | 2 | w | 0.9 | w | 0.78 | i | w | 0.1 | w | i | w | w | w | <0.12 | <0.05 | 0.21 | <0.62 | i | I |
| Lofoten area | 1 | 2 | w | 4.11 | w | 0.78 | i | w | 0.3 | w | i | w | w | w | <1.15 | <0.05 | <0.13 | 8.9 | i | II |
| Finnsnes- Skjervøy area | 1 | 1 | w | 0.79 | w | 1.63 | i | w | 0.1 | w | i | w | <24.25 | <0.50 | <0.05 | <0.05 | <0.05 | <0.40 | i | I |
| Hammerfest- Honningsvåg area | 2 | 2 | w | 1.66 | w | 2.72 | i | w | 0.1 | w | i | w | <212.50 | 0.8 | <0.11 | <0.05 | <0.11 | <1.59 | i | III |
| Varanger peninsula area | 3 | 3 | w | 0.74 | w | 2.34 | i | w | 0.1 | w | i | w | <21.30 | <0.50 | <0.14 | <0.05 | 0.14 | <0.98 | i | II |

| | |
|---|---|
| I | 61 |
| II | 6 |
| III | 1 |
| IV | 0 |
| V | 0 |

Max(median). Statistics for all areas: (n = Index-station measured, N = Station programmed for index)

**Average of Max E.C is 1.3**

| Index areaname (Reference area) **1997** | n | N | As ppm d.wt | Pb ppm d.wt | F ppm d.wt | Cd ppm d.wt | Cu ppm d.wt | Cr ppm d.wt | Hg ppm d.wt | Ni ppm d.wt | Zn ppm d.wt | Ag ppm d.wt | PAH_S ppb w.wt | BAP ppb w.wt | DDTSS ppb w.wt | HCB ppb w.wt | HCHSS ppb w.wt | CBSSe ppb w.wt | TCDDN ppp w.wt | Max E.C I:V |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mid and outer Oslofjord | 3 | 3 | w | 2.17 | w | 1.84 | i | w | 0.1 | w | i | w | w | w | 2.75 | 0.1 | 1.16 | 4.9 | i | II |
| Lista area | 2 | 2 | w | 1.12 | w | 1.14 | i | w | 0.1 | w | i | w | <36.70 | <0.50 | 0.58 | <0.05 | 0.53 | 2.43 | i | I |
| Bømlo-Sotra area | 1 | 1 | w | 1.37 | w | 1.01 | i | w | 0.1 | w | i | w | w | w | <0.39 | <0.05 | 0.26 | <0.73 | i | I |
| Outer Ranfjord, Helgeland area | 0 | 2 | w | w | w | w | i | w | w | w | i | w | w | w | w | w | w | w | i | miss |
| Lofoten area | 1 | 2 | w | 1.54 | w | 0.85 | i | w | 0.1 | w | i | w | w | w | 0.61 | <0.05 | 0.14 | <1.57 | i | I |
| Finnsnes- Skjervøy area | 1 | 1 | w | 0.65 | w | 1.88 | i | w | 0.1 | w | i | w | w | w | <0.15 | <0.05 | 0.12 | <0.40 | i | I |
| Hammerfest-Honningsvåg area | 1 | 2 | w | 1.15 | w | 1.51 | i | w | 0.1 | w | i | w | w | w | 0.27 | <0.05 | 0.18 | <4.49 | i | II |
| Varanger peninsula area | 2 | 3 | w | 0.81 | w | 1.59 | i | w | 0.2 | w | i | w | w | w | 0.33 | 0.1 | 0.13 | <1.07 | i | I |

| | |
|---|---|
| I | 46 |
| II | 5 |
| III | 0 |
| IV | 0 |
| V | 0 |

Max(median). Statistics for all areas: (n = Index-station measured, N = Station programmed for index)

**Average of Max E.C is 1.4**

| Index areaname (Reference area) **1998** | n | N | As ppm d.wt | Pb ppm d.wt | F ppm d.wt | Cd ppm d.wt | Cu ppm d.wt | Cr ppm d.wt | Hg ppm d.wt | Ni ppm d.wt | Zn ppm d.wt | Ag ppm d.wt | PAH_S ppb w.wt | BAP ppb w.wt | DDTSS ppb w.wt | HCB ppb w.wt | HCHSS ppb w.wt | CBSSe ppb w.wt | TCDDN ppp w.wt | Max E.C I:V |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mid and outer Oslofjord | 3 | 3 | w | 1.57 | w | 1.14 | i | w | 0.1 | w | i | w | w | w | <1.30 | <0.03 | <0.52 | <2.01 | i | I |
| Lista area | 2 | 2 | w | 1.28 | w | 1.31 | i | w | 0.1 | w | i | w | <42.70 | <0.50 | 0.6 | <0.03 | <0.53 | 3.58 | i | I |
| Bømlo-Sotra area | 1 | 1 | w | 1.21 | w | 0.85 | i | w | 0.1 | w | i | w | w | w | <1.61 | <0.03 | <0.51 | <2.05 | i | I |
| Outer Ranfjord, Helgeland area | 0 | 2 | w | w | w | w | i | w | w | w | i | w | w | w | w | w | w | w | i | miss |
| Lofoten area | 1 | 2 | w | 2.36 | w | 1.58 | i | w | 0.2 | w | i | w | w | w | <2.28 | <0.05 | <0.20 | <1.21 | i | II |
| Finnsnes- Skjervøy area | 0 | 1 | w | w | w | w | i | w | w | w | i | w | w | w | w | w | w | w | i | miss |
| Hammerfest- Honningsvåg area | 0 | 2 | w | w | w | w | i | w | w | w | i | w | w | w | w | w | w | w | i | miss |
| Varanger peninsula area | 1 | 3 | w | 2.34 | w | 2.32 | i | w | 0.1 | w | i | w | w | w | w | w | w | w | i | II |

| | |
|---|---|
| I | 31 |
| II | 2 |
| III | 0 |
| IV | 0 |
| V | 0 |

Max(median). Statistics for all areas: (n = Index-station measured, N = Station programmed for index)

**Average of Max E.C is 1.4**

| Index areaname (Reference area) **1999** | n | N | As ppm d.wt | Pb ppm d.wt | F ppm d.wt | Cd ppm d.wt | Cu ppm d.wt | Cr ppm d.wt | Hg ppm d.wt | Ni ppm d.wt | Zn ppm d.wt | Ag ppm d.wt | PAH_S ppb w.wt | BAP ppb w.wt | DDTSS ppb w.wt | HCB ppb w.wt | HCHSS ppb w.wt | CBSSe ppb w.wt | TCDDN ppp w.wt | Max E.C I:V |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mid and outer Oslofjord | 3 | 3 | w | 1 | w | 1.53 | i | w | 0.1 | w | i | w | w | w | 1.83 | <0.05 | <0.44 | 2.88 | i | I |
| Lista area | 2 | 2 | w | 1.66 | w | 1.18 | i | w | 0.1 | w | i | w | <68.05 | 1 | <0.67 | 0.1 | <0.40 | <2.49 | i | II |
| Bømlo-Sotra area | 1 | 1 | w | 1.7 | w | 1.32 | i | w | 0.1 | w | i | w | w | w | <0.54 | <0.05 | <0.23 | <0.93 | i | I |
| Outer Ranfjord, Helgeland area | 0 | 2 | w | w | w | w | i | w | w | w | i | w | w | w | w | w | w | w | i | miss |
| Lofoten area | 1 | 2 | w | 1.59 | w | 2.17 | i | w | 0.3 | w | i | w | w | w | <0.52 | <0.06 | <0.20 | <0.43 | i | II |
| Finnsnes- Skjervøy area | 0 | 1 | w | w | w | w | i | w | w | w | i | w | w | w | w | w | w | w | i | miss |
| Hammerfest-Honningsvåg area | 0 | 2 | w | w | w | w | i | w | w | w | i | w | w | w | w | w | w | w | i | miss |
| Varanger peninsula area | 1 | 3 | w | 1.57 | w | 1.61 | i | w | 0.1 | w | i | w | w | w | <0.47 | <0.05 | <0.30 | <0.90 | i | I |

| | |
|---|---|
| I | 33 |
| II | 4 |
| III | 0 |
| IV | 0 |
| V | 0 |

# Appendix K.
# Biological effects methods summary results 1997-1999

**Table 10.** Summary statistics for biological effects parameters measured in cod (*Gadus morhua*), 1997-1999.

| **Station:** | **36B** | **15B** | **23B** | **30B** | **53B** | **67B** |
|---|---|---|---|---|---|---|
| **1997** | | | | | | |
| count | 21 | 25 | 22 | 16 | 25 | 25 |
| **Weight, median** | **1.1** | **1.4** | **1.3** | **0.8** | **1.2** | **1.1** |
| Weight, st.dev. | 0.4 | 0.5 | 0.3 | 0.3 | 0.3 | 0.5 |
| **380 nm, median** | **966.7** | **628.0** | **674.4** | **--** | **410.0** | **663.4** |
| 380 nm, st.dev. | 806.1 | 173.1 | 363.0 | -- | 395.9 | 286.8 |
| **microsomal protein (mg/mL), median** | **8.5** | **5.3** | **6.1** | **3.9** | **6.6** | **6.4** |
| microsomal protein (mg/mL), st.dev. | 2.6 | 2.6 | 2.2 | 2.2 | 1.4 | 1.6 |
| **cytosol protein (mg/mL), median** | **16.8** | **13.3** | **14.4** | **8.5** | **17.9** | **17.4** |
| cytosol protein (mg/mL), st.dev. | 5.5 | 6.5 | 6.1 | 4.6 | 4.1 | 5.1 |
| **OH-pyrene/380 nm, median** | **22.5** | **265.1** | **15.9** | **--** | **113.3** | **71.1** |
| OH-pyrene/380 nm, st.dev. | 12.9 | 1073.1 | 12.5 | -- | 72.6 | 29.5 |
| **ALA-D (µg pbg/min/mg protein), median** | **3.6** | **4.5** | **4.2** | **2.4** | **2.0** | **1.9** |
| ALA-D (µg pbg/min/mg protein), st.dev. | 1.2 | 1.7 | 1.3 | 1.6 | 1.6 | 2.1 |
| **EROD (pmol/min/mg protein), median** | **110.0** | **44.5** | **94.1** | **68.8** | **429.6** | **103.4** |
| EROD (pmol/min/mg protein), st.dev. | 53.4 | 61.6 | 27.4 | 38.8 | 376.7 | 51.9 |
| **MT (µg/mg protein), median** | **0.9** | **2.1** | **1.1** | **1.3** | **0.4** | **1.5** |
| MT (µg/mg protein), st.dev. | 0.8 | 3.3 | 2.8 | 1.7 | 1.5 | 1.3 |
| **1998** | | | | | | |
| count | 27 | 25 | 25 | 30 | 30 | 30 |
| **Weight, median** | **0.6** | **1.1** | **1.2** | **1.0** | **1.1** | **0.5** |
| Weight, st.dev. | 0.2 | 0.3 | 0.5 | 0.1 | 0.4 | 0.5 |
| **380 nm, median** | **26.1** | **23.4** | **42.0** | **15.3** | **16.9** | **18.4** |
| 380 nm, st.dev. | 15.0 | 11.4 | 25.2 | 9.5 | 8.5 | 11.3 |
| **microsomal protein (mg/mL), median** | **1.6** | **3.2** | **2.7** | **3.6** | **2.8** | **1.2** |
| microsomal protein (mg/mL), st.dev. | 0.9 | 1.7 | 1.8 | 1.6 | 1.4 | 1.3 |
| **cytosol protein (mg/mL), median** | **5.3** | **10.4** | **8.0** | **10.2** | **9.1** | **3.1** |
| cytosol protein (mg/mL), st.dev. | 2.2 | 4.3 | 5.8 | 2.9 | 4.2 | 4.4 |
| **OH-pyrene/380 nm, median** | **42.7** | **3770.4** | **12.7** | **115.4** | **83.0** | **20.5** |
| OH-pyrene/380 nm, st.dev. | 16.9 | 3625.4 | 26.8 | 33.6 | 172.1 | 11.5 |
| **ALA-D (µg pbg/min/mg protein), median** | **3.3** | **2.9** | **3.0** | **1.9** | **1.2** | **3.4** |
| ALA-D (µg pbg/min/mg protein), st.dev. | 2.2 | 2.9 | 1.4 | 0.8 | 1.0 | 2.9 |
| **EROD (pmol/min/mg protein), median** | **9.1** | **14.8** | **20.2** | **33.0** | **39.7** | **60.8** |
| EROD (pmol/min/mg protein), st.dev. | 18.2 | 25.2 | 20.8 | 32.8 | 31.9 | 44.0 |
| **MT (µg/mg protein), median** | **1.2** | **1.4** | **2.5** | **1.3** | **1.6** | **1.7** |
| MT (µg/mg protein), st.dev. | 0.8 | 1.8 | 1.6 | 0.6 | 1.0 | 1.2 |

**Table 10** (cont.)

| Station: | 36B | 15B | 23B | 30B | 53B | 67B |
|---|---|---|---|---|---|---|
| **1999** | | | | | | |
| count | 25 | 25 | 25 | 25 | 25 | 25 |
| **Weight, median** | 0.89 | 0.99 | 1.02 | 0.99 | 0.93 | 1.00 |
| Weight, st.dev. | 0.09 | 0.09 | 0.09 | 0.10 | 0.09 | 0.14 |
| **380 nm, median** | 27.67 | 24.54 | 46.51 | 21.51 | 38.90 | 30.81 |
| 380 nm, st.dev. | 17.29 | 13.58 | 17.45 | 57.17 | 45.94 | 14.24 |
| **cytosol protein (mg/mL), median** | 6.51 | 5.34 | 7.72 | 9.41 | 7.73 | 7.25 |
| cytosol protein (mg/mL), st.dev. | 1.48 | 2.39 | 2.03 | 2.14 | 1.67 | 1.89 |
| **microsomal protein (mg/mL), median** | 2.36 | 2.26 | 2.59 | 3.82 | 3.11 | 3.07 |
| microsomal protein (mg/mL), st.dev. | 0.82 | 1.05 | 0.81 | 1.17 | 0.78 | 1.00 |
| **OH-pyrene/380 nm, median** | 28.9 | 252.9 | 11.2 | 129.7 | 58.6 | 16.5 |
| OH-pyrene/380 nm, st.dev. | 18.5 | 15819.6 | 9.5 | 45.5 | 1.9 | 1.3 |
| **ALA-D (µg pbg/min/mg protein), median** | 0.7 | 0.8 | 1.1 | 0.8 | 0.7 | 1.0 |
| ALA-D (µg pbg/min/mg protein), st.dev. | 0.4 | 0.4 | 0.3 | 0.2 | 0.2 | 0.3 |
| **EROD (pmol/min/mg protein), median** | 100.2 | 277.0 | 99.6 | 74.6 | 90.1 | 144.3 |
| EROD (pmol/min/mg protein), st.dev. | 75.3 | 271.5 | 55.6 | 223.8 | 74.0 | 209.9 |
| **MT (µg/mg protein), median** | n/r | n/r | n/r | n/r | n/r | n/r |
| MT (µg/mg protein), st.dev. | | | | | | |

**Table 11.** Summary statistics for biological effects parameters measured in dab, 1999 (*Limanda limanda*, st.36F, 15F and 218F (21F)) and flounder (*Platichthys flesus*, 53F and 67F) 1999.

| Station: | 36F | 15F | 218F | 53F | 67F |
|---|---|---|---|---|---|
| **1999** | | | | | |
| count | 25 | 21 | 11 | 25 | 25 |
| **Weight, median** | 0.76 | 0.90 | 0.96 | 0.97 | 1.01 |
| Weight, st.dev. | 0.21 | 0.22 | 0.18 | 0.08 | 0.08 |
| **380 nm, median** | 6.92 | 10.50 | 26.77 | 28.50 | 15.76 |
| 380 nm, st.dev. | 8.64 | 8.40 | 25.60 | 30.21 | 15.54 |
| **microsomal protein (mg/mL), median** | 3.34 | 3.10 | 3.16 | 4.74 | 3.48 |
| microsomal protein (mg/mL), st.dev. | 1.34 | 0.84 | 1.07 | 1.12 | 1.07 |
| **cytosol protein (mg/mL), median** | 7.07 | 7.32 | 7.42 | 8.48 | 7.03 |
| cytosol protein (mg/mL), st.dev. | 1.64 | 1.86 | 0.71 | 1.21 | 1.31 |
| **OH-pyrene/380 nm, median** | 333.8 | 48.8 | 50.00 | 74.63 | 41.05 |
| OH-pyrene/380 nm, st.dev. | 2968.5 | 45.1 | 35.01 | 6.26 | 5.56 |
| **ALA-D (µg pbg/min/mg protein), median** | 0.8 | 0.5 | 0.84 | 0.66 | 0.95 |
| ALA-D (µg pbg/min/mg protein), st.dev. | 0.4 | 0.3 | 0.19 | 0.21 | 0.32 |
| **EROD (pmol/min/mg protein), median** | 565.0 | 619.5 | 23.21 | 24.57 | 16.09 |
| EROD (pmol/min/mg protein), st.dev. | 2816.4 | 4312.0 | 26.35 | 30.99 | 35.84 |
| **MT (µg/mg protein), median** | 11.0 | 13.7 | 18.25 | 15.04 | 34.14 |
| MT (µg/mg protein), st.dev. | 7.9 | 10.8 | 9.27 | 6.75 | 15.28 |

# Appendix L.
# Effects and concentrations of organotin 1999

**Table 12.** Imposex (VDSI, RPSI) in dogwhelks (*Nucella lapillus*) in Haugesund (st. 224G, 226G, 227G, 220G, 221G) and Outer Oslofjord (36G), 1999. SH = avg. shell height in mm, PS = avg. penis length in mm, nm = not measured. (cf. Appendix F. , Maps 2 and 5).

| St. | Area | Sex | SH | VDSI | PS | RPSI |
|---|---|---|---|---|---|---|
| 224G | Heggjelen | F/M | 29.0/28.8 | 4 | 2.2/3.1 | 35.3 |
| 226G | Karmsund bridge (east) | F/M | 30.9/27.5 | 4.1 | 3.4/3.4 | 96 |
| 227G | Melandholmen | F/M | 27.7/26.6 | 4.1 | 3.1/3.4 | 77.4 |
| 220G | Smørstakk | F/M | 30.6/31.0 | 4 | 3.1/4.1 | 43 |
| 221G | Stangeland | F/M | 29.4/29.2 | 4.2 | 3.3/3.7 | 72 |
| 36G | Færder | F/M | 31.4/28.9 | 4 | 2.4/4.7 | 13.3 |

**Table 13.** Levels of organotin (µg Sn/kg d.w.) in mussels (*Mytilus edulis*) at five stations in Southern Norway; Oslofjord (st.30A, 36A) and Haugesund area (st.226X, 227A, 221A) in 1999. Sh.length = avg. shell length in mm, ∑BT = TBT+DBT+MBT. Class condition for TBT on a dry weight basis in the Norwegian classification system for environmental quality. (cf. Table 6) (cf. Appendix F. , Maps 2 and 5).

| St. | Area | Sh. length | TBT | ∑BT | TPhT | TBT* (ppm) | Class |
|---|---|---|---|---|---|---|---|
| 30A | Gressholmen | 33.4 | 630 | 982 | 46 | 1.41 | markedly polluted |
| 30A | Gressholmen | 44.1 | 578 | 1074 | 38 | 1.54 | markedly polluted |
| 36A | Færder | 35.2 | 100 | 123 | 5.2 | 0.24 | moderately polluted |
| 36A | Færder | 43.2 | 79 | 97.8 | 5.6 | 0.19 | moderately polluted |
| 226X | Karmsund bridge (east) | 36.4 | 350 | 476 | 21 | 0.85 | markedly polluted |
| 226X | Karmsund bridge (east) | 36.4 | 330 | 487 | 27 | 0.81 | markedly polluted |
| 226X | Karmsund bridge (east) | 36.1 | 350 | 464 | 22 | 0.85 | markedly polluted |
| 227A | Melandholmen | 38.0 | 600 | 789 | 34 | 1.46 | markedly polluted |
| 227A | Melandholmen | 37.2 | 350 | 467 | 25 | 0.85 | markedly polluted |
| 227A | Melandholmen | 38.0 | 310 | 447 | 22 | 0.76 | markedly polluted |
| 221A | Stangeland | 34.1 | 2100 | 2852 | 130 | 5.12 | extremely polluted |
| 221A | Stangeland | 34.1 | 1500 | 2286 | 100 | 3.66 | severely polluted |
| 221A | Stangeland | 34.2 | 1800 | 2450 | 70 | 4.39 | severely polluted |

*) TBT ppb dw converted to formulation basis ppm dw by a factor of 2.44/1000.

# Appendix M.

# Supplementary investigations of mussels from Sørfjord and Hardangerfjord 1999

## Introduction and methods

Concentration of DDT as well as metals and PCBs in blue mussels from the inner Sørfjord are difficult to understand for several reasons:

- Inconsistent relationship between depurated and non-depurated samples;
- Inconsistent DDT-gradient
- Unknown "normal" proportion between DDT and its' breakdown metabolites (DDE and DDD).

JAMP 2000 examined these problems by analysing parallel samples from stations 51A, 52A, 56A, 57A, 63A, 65A and 69A (cf. Appendix E. , Appendix F. Map 6) that have been frozen directly without depuration prior to cleaning. The three parallel samples from these seven stations were compared to three other parallel samples that were depurated and cleaned prior to freezing.

Furthermore three additional stations between st.56A and 57A (56A-1, 56A-2, and 57A-1, cf. Appendix E. , Appendix F. Map 6) were sampled in order to investigate the local DDT gradient.

## Results

The raw data is shown in Table 14 and the results from the paired t-test comparing the JAMP and INDEX methods are shown in Table 15. Results were not considered where a third or more of the comparisons involved a value below the detection limit.

**Table 14.** Levels of contaminants in mussels (*Mytilus edulis*) from six standard JAMP stations (52A, 56A, 57A, 63A, 67A and 69A) and four supplementary stations (51A, 56A-1, 56A-2 and 57A-1) (cf. Appendix E. , Appendix F. Map 6). Two methods of analysis pre-treatment were applied: cleaned after depuration (JAMP-method) and not depurated, frozen and then clean (Index-method). Distance from Odda at the head of Sørfjord is indicated (km). Metals are in ppm w.w. and organic contaminants in ppb ww. Code descriptions are given in Appendix B. Also shown are: dry weight percent (drywt), average weight of soft tissue (tiswt, g), lipid weight percent (exlip),

| jmpst | stnam | km | subno | drywt | tiswt | exlip | basis | CD | CU | HG | PB | ZN | CB101 | CB105 | CB118 | CB138 | CB153 | CB156 | CB180 | CB209 | CB28 | CB52 | DDEPP | DDTPP | HCB | HCHA | HCHG | OCS | QCB | TDEPP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **JAMP method** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **51A** | **Byrkjenes** | 0 | 1 | 13.4 | 1.45 | 1.19 | W | 5.07 | 1.2 | 0.38 | 4.7 | 19 | 0.22 | <0.1 | 0.19 | 0.39 | 0.49 | <0.1 | <0.1 | <0.1 | <0.1 | | 1.7 | 2.1 | <0.05 | <0.1 | 0.11 | <0.05 | <0.05 | 0.2 |
| **51A** | **Byrkjenes** | | 2 | 13 | 1.35 | 1.19 | W | 5.01 | 1.4 | 0.43 | 4.7 | 20 | 0.2 | <0.1 | 0.18 | 0.35 | 0.41 | <0.1 | <0.1 | <0.1 | <0.1 | | 1.6 | 1.9 | <0.05 | <0.1 | 0.12 | <0.05 | <0.05 | <0.2 |
| **51A** | **Byrkjenes** | | 3 | 12 | 1.32 | 1.08 | W | 5.16 | 1.6 | 0.38 | 4.1 | 21 | 0.17 | <0.1 | 0.15 | 0.3 | 0.36 | <0.1 | <0.1 | <0.1 | <0.1 | | 1.3 | 1.5 | <0.05 | <0.1 | 0.1 | <0.05 | <0.05 | <0.2 |
| **52A** | **Eitrheimsneset** | 1.5 | 1 | 19.1 | 0.92 | 2.23 | W | 2.63 | 1.4 | 0.14 | 1.9 | 27 | 0.38 | 0.12 | 0.29 | 0.55 | 0.59 | <0.1 | 0.11 | <0.1 | <0.1 | | 2.5 | 2.6 | 0.06 | 0.12 | 0.22 | <0.05 | 0.07 | 0.49 |
| **52A** | **Eitrheimsneset** | | 2 | 20.3 | 1.87 | 2.47 | W | 2.44 | 1.2 | 0.12 | 2 | 28 | 0.41 | 0.11 | 0.32 | 0.61 | 0.66 | <0.1 | 0.11 | <0.1 | <0.1 | | 2.9 | 2.7 | 0.07 | 0.13 | 0.25 | <0.05 | 0.08 | 0.62 |
| **52A** | **Eitrheimsneset** | | 3 | 19.9 | 3.88 | 2.33 | W | 2.56 | 1.2 | 0.12 | 2.7 | 34 | 0.38 | 0.1 | 0.28 | 0.5 | 0.59 | <0.1 | 0.1 | <0.1 | <0.1 | | 2.7 | 2.6 | 0.05 | 0.12 | 0.25 | <0.05 | 0.07 | 0.63 |
| **56A** | **Kvalnes** | 16 | 1 | 13.6 | 0.56 | 1.19 | W | 3.65 | 1.2 | 0.13 | 2.2 | 31 | 0.23 | 0.12 | 0.22 | 0.37 | 0.38 | <0.1 | 0.1 | <0.1 | <0.1 | <0.1 | 4.8 | 4.5 | | <0.1 | 0.12 | <0.05 | <0.05 | 0.86 |
| **56A** | **Kvalnes** | | 2 | 12.5 | 1.05 | 1.02 | W | 3.85 | 1.2 | 0.12 | 2.9 | 36 | 0.19 | 0.1 | 0.21 | 0.33 | 0.36 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 4.2 | 4 | | <0.1 | <0.1 | <0.05 | <0.05 | 0.77 |
| **56A** | **Kvalnes** | | 3 | 13.4 | 2.05 | 1.2 | W | 3.98 | 1 | 0.12 | 3.8 | 37 | 0.21 | 0.11 | 0.2 | 0.34 | 0.36 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 4.9 | 4.1 | | <0.1 | 0.11 | <0.05 | <0.05 | 0.89 |
| **57A** | **Krossanes** | 35 | 1 | 15 | 0.42 | 1.34 | W | 2.73 | 1.3 | 0.08 | 1.3 | 32 | 0.15 | <0.1 | 0.15 | 0.25 | 0.29 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 3.6 | 2.6 | | <0.1 | 0.12 | <0.05 | <0.05 | 0.44 |
| **57A** | **Krossanes** | | 2 | 14.7 | 0.99 | 1.23 | W | 2.15 | 0.9 | 0.06 | 1.3 | 28 | 0.14 | <0.1 | 0.13 | 0.21 | 0.24 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 3.6 | 2.5 | | <0.1 | 0.1 | <0.05 | <0.05 | 0.37 |
| **57A** | **Krossanes** | | 3 | 14.9 | 1.97 | 1.36 | W | 2.08 | 0.9 | 0.06 | 1.5 | 30 | 0.16 | <0.1 | 0.17 | 0.26 | 0.31 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 4.5 | 3.2 | | <0.1 | 0.14 | <0.05 | <0.05 | 0.54 |
| **63A** | **Ranaskjær** | 51 | 1 | 17.2 | 0.44 | 1.48 | W | 1.34 | 0.8 | 0.05 | 0.6 | 19 | 0.16 | <0.1 | 0.16 | 0.28 | 0.32 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 1.6 | 1.4 | | <0.1 | 0.16 | <0.05 | <0.05 | 0.24 |
| **63A** | **Ranaskjær** | | 2 | 16.7 | 1.16 | 1.42 | W | 1.22 | 0.7 | 0.05 | 0.7 | 21 | 0.15 | <0.1 | 0.15 | 0.26 | 0.3 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 1.5 | 1.3 | | <0.1 | 0.15 | <0.05 | <0.05 | 0.24 |
| **63A** | **Ranaskjær** | | 3 | 18.1 | 2.04 | 1.63 | W | 1.3 | 0.8 | 0.04 | 0.8 | 21 | 0.17 | <0.1 | 0.17 | 0.28 | 0.32 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 1.8 | 1.6 | | <0.1 | 0.17 | <0.05 | <0.05 | 0.29 |
| **65A** | **Vikingneset** | 74 | 1 | 18.7 | 0.57 | 1.67 | W | 0.79 | 0.9 | 0.03 | 0.3 | 22 | 0.16 | <0.1 | 0.16 | 0.26 | 0.31 | <0.1 | <0.1 | <0.1 | 0.18 | <0.1 | 1.2 | 1.3 | | <0.1 | 0.2 | <0.05 | <0.05 | 0.36 |
| **65A** | **Vikingneset** | | 2 | 18.5 | 1.40 | 1.62 | W | 0.75 | 0.8 | 0.03 | 0.3 | 24 | 0.13 | <0.1 | 0.11 | 0.2 | 0.23 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.92 | 0.89 | <0.05 | <0.1 | <0.1 | <0.05 | <0.05 | 0.27 |
| **65A** | **Vikingneset** | | 3 | 18.9 | 2.60 | 1.67 | W | 0.83 | 0.8 | 0.03 | 0.3 | 26 | 0.14 | <0.1 | 0.13 | 0.22 | 0.28 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 1.1 | 0.91 | | <0.1 | 0.13 | <0.05 | <0.05 | 0.36 |
| **69A** | **Lille Terøy** | 111 | 1 | 17.3 | 3.08 | 1.43 | W | 0.75 | 1.5 | 0.02 | 0.4 | 31 | 0.15 | <0.1 | 0.17 | 0.26 | 0.29 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.42 | 0.42 | <0.05 | <0.1 | 0.13 | <0.05 | <0.05 | <0.2 |
| **69A** | **Lille Terøy** | | 2 | 19.1 | 3.26 | 1.79 | W | 0.72 | 1.5 | 0.02 | 0.3 | 30 | 0.18 | 0.11 | 0.18 | 0.28 | 0.31 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.48 | 0.46 | <0.05 | <0.1 | 0.14 | <0.05 | <0.05 | <0.2 |
| **69A** | **Lille Terøy** | | 3 | 19 | 3.34 | 1.55 | W | 0.74 | 1.6 | 0.02 | 0.4 | 34 | 0.14 | <0.1 | 0.16 | 0.23 | 0.26 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.43 | 0.47 | <0.05 | <0.1 | 0.13 | <0.05 | <0.05 | <0.2 |

**Table 14** **(cont., INDEX-method)**

| jmpst | stnam | km | subno | drywt | tiswt | exlip | basis | CD | CU | HG | PB | ZN | CB101 | CB105 | CB118 | CB138 | CB153 | CB156 | CB180 | CB209 | CB28 | CB52 | DDEPP | DDTPP | HCB | HCHA | HCHG | OCS | QCB | TDEPP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **INDEX-method** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **51A** | **Byrkjenes** | 0 | 1 | 15.1 | 0.79 | 1.94 | W | 4.77 | 1.1 | 0.44 | 9.1 | 29 | 0.32 | <0.1 | 0.29 | 0.5 | 0.62 | <0.1 | <0.1 | <0.1 | <0.1 | 0.1 | 2.3 | 2.1 | 0.08 | <0.1 | <0.2 | <0.05 | 0.05 | 0.51 |
| **51A** | **Byrkjenes** | | 2 | 15.3 | 0.77 | 1.92 | W | 4.66 | 1.1 | 0.41 | 7.5 | 31 | 0.32 | 0.1 | 0.28 | 0.55 | 0.7 | <0.1 | 0.1 | <0.1 | <0.1 | <0.1 | 2.1 | 1.8 | 0.07 | <0.1 | <0.2 | <0.05 | <0.05 | 0.51 |
| **51A** | **Byrkjenes** | | 3 | 16.3 | 0.85 | 2.02 | W | 4.31 | 1.1 | 0.44 | 6.2 | 28 | 0.39 | 0.13 | 0.34 | 0.77 | 0.91 | <0.1 | 0.11 | <0.1 | <0.1 | 0.12 | 3.4 | 3.1 | 0.06 | 0.11 | 0.22 | <0.05 | <0.05 | 0.46 |
| **52A** | **Eitrheimsneset** | 1.5 | 1 | 22.3 | 1.44 | 3.07 | W | 2.42 | 1.2 | 0.13 | 2.7 | 31 | 0.52 | 0.15 | 0.42 | 0.71 | 0.78 | <0.1 | 0.14 | <0.1 | <0.1 | 0.17 | 3.3 | 2.9 | 0.08 | 0.14 | 0.22 | <0.05 | 0.08 | 0.71 |
| **52A** | **Eitrheimsneset** | | 2 | 21.7 | 1.55 | 2.98 | W | 2.03 | 1.2 | 0.12 | 2.5 | 32 | 0.5 | 0.14 | 0.37 | 0.65 | 0.73 | <0.1 | 0.11 | <0.1 | <0.1 | 0.16 | 2.9 | 2.6 | 0.07 | 0.13 | <0.2 | <0.05 | 0.07 | 0.7 |
| **52A** | **Eitrheimsneset** | | 3 | 21.6 | 1.57 | 2.78 | W | 2.11 | 1.1 | 0.14 | 3.1 | 32 | 0.52 | 0.13 | 0.39 | 0.67 | 0.77 | <0.1 | 0.13 | <0.1 | <0.1 | 0.15 | 3 | 2.7 | 0.08 | 0.12 | 0.22 | <0.05 | 0.07 | 0.68 |
| **56A** | **Kvalnes** | 16 | 1 | 14.2 | 0.85 | 1.74 | W | 2.75 | 1.2 | 0.13 | 4.7 | 38 | 0.35 | 0.13 | 0.36 | 0.66 | 0.73 | <0.1 | 0.12 | <0.1 | <0.1 | <0.1 | 8.4 | 9.5 | 0.1 | <0.1 | <0.2 | <0.05 | <0.05 | 1.8 |
| **56A** | **Kvalnes** | | 2 | 12.5 | 0.82 | 1.83 | W | 3.12 | 1 | 0.14 | 5.8 | 49 | 0.34 | 0.13 | 0.33 | 0.6 | 0.67 | <0.1 | 0.1 | <0.1 | <0.1 | <0.1 | 7.2 | 8.3 | 0.1 | <0.1 | <0.2 | <0.05 | <0.05 | 1.5 |
| **56A** | **Kvalnes** | | 3 | 16.4 | 0.85 | 1.68 | W | 3.03 | 1.1 | 0.12 | 5.3 | 35 | 0.3 | 0.12 | 0.3 | 0.57 | 0.63 | <0.1 | 0.11 | <0.1 | <0.1 | <0.1 | 7.1 | 5.7 | 0.09 | <0.1 | <0.2 | <0.05 | <0.05 | 1.8 |
| **5610** | **Kvalnes, north** | 17 | 1 | 16.6 | 1.17 | 2.11 | W | 2.61 | 1.1 | 0.11 | 4.1 | 41 | 0.4 | 0.16 | 0.35 | 0.75 | 0.78 | <0.1 | 0.14 | <0.1 | <0.1 | 0.12 | 21 | 22 | 0.11 | 0.13 | 0.24 | <0.05 | <0.05 | 2.8 |
| **5610** | **Kvalnes, north** | | 2 | 16 | 1.09 | 1.84 | W | 2.57 | 1 | 0.12 | 4.1 | 39 | 0.36 | 0.13 | 0.3 | 0.64 | 0.67 | <0.1 | 0.12 | <0.1 | <0.1 | 0.1 | 19 | 24 | 0.11 | 0.11 | 0.22 | <0.05 | <0.05 | 2.3 |
| **5610** | **Kvalnes, north** | | 3 | 15.6 | 1.08 | 1.84 | W | 2.52 | 1.1 | 0.12 | 6 | 37 | 0.35 | 0.13 | 0.3 | 0.64 | 0.69 | <0.1 | 0.12 | <0.1 | <0.1 | 0.1 | 19 | 26 | 0.1 | 0.11 | 0.21 | <0.05 | <0.05 | 2.2 |
| **5620** | **Kjeken (Helland)** | 30 | 1 | 16.9 | 0.89 | 2.38 | W | 2.13 | 1.1 | 0.09 | 2.5 | 30 | 0.41 | 0.15 | 0.36 | 0.7 | 0.77 | <0.1 | 0.15 | <0.1 | 0.1 | 0.18 | 17 | 16 | 0.15 | 0.15 | 0.29 | <0.05 | 0.06 | 2.1 |
| **5620** | **Kjeken (Helland)** | | 2 | 16.1 | 0.94 | 2.26 | W | 1.8 | 1 | 0.08 | 2.3 | 29 | 0.41 | 0.18 | 0.37 | 0.75 | 0.8 | <0.1 | 0.18 | <0.1 | <0.1 | 0.17 | 18 | 16 | 0.12 | 0.14 | 0.27 | <0.05 | 0.05 | 2.2 |
| **5620** | **Kjeken (Helland)** | | 3 | 16.6 | 1.00 | 2.26 | W | 2.26 | 1.1 | 0.08 | 2.1 | 32 | 0.39 | 0.14 | 0.34 | 0.73 | 0.78 | <0.1 | 0.16 | <0.1 | <0.1 | 0.17 | 18 | 17 | 0.14 | 0.14 | 0.28 | <0.05 | 0.06 | 2.2 |
| **5710** | **Urdhem, s.Kross** | 33 | 1 | 16.7 | 1.62 | 1.92 | W | 1.64 | 0.9 | 0.07 | 2 | 30 | 0.27 | 0.11 | 0.21 | 0.45 | 0.5 | <0.1 | <0.1 | <0.1 | <0.1 | 0.1 | 29 | 27 | 0.1 | 0.12 | 0.25 | <0.05 | <0.05 | 3.7 |
| **5710** | **Urdhem, s.Kross** | | 2 | 17.4 | 1.56 | 2.11 | W | 1.67 | 0.9 | 0.07 | 2.3 | 28 | 0.29 | 0.11 | 0.24 | 0.5 | 0.55 | <0.1 | 0.11 | <0.1 | <0.1 | 0.11 | 32 | 29 | 0.08 | 0.11 | 0.26 | <0.05 | <0.05 | 3.6 |
| **5710** | **Urdhem, s.Kross** | | 3 | 16.3 | 1.37 | 1.96 | W | 1.75 | 0.8 | 0.07 | 2.3 | 27 | 0.27 | 0.1 | 0.23 | 0.51 | 0.57 | <0.1 | 0.1 | <0.1 | <0.1 | 0.1 | 34 | 39 | 0.1 | 0.13 | 0.25 | <0.05 | <0.05 | 3.5 |
| **57A** | **Krossanes** | 35 | 1 | 14 | 0.73 | 1.7 | W | 1.85 | 0.9 | 0.07 | 1.9 | 35 | 0.2 | <0.1 | 0.18 | 0.4 | 0.49 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 6.2 | 4.5 | 0.06 | <0.1 | 0.16 | <0.05 | <0.05 | 0.78 |
| **57A** | **Krossanes** | | 2 | 14.4 | 0.74 | 1.6 | W | 1.59 | 1.1 | 0.07 | 1.6 | 24 | 0.21 | <0.1 | 0.19 | 0.37 | 0.44 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 5.9 | 4.9 | 0.09 | <0.1 | <0.2 | <0.05 | <0.05 | 0.82 |
| **57A** | **Krossanes** | | 3 | 14.5 | 0.80 | 1.71 | W | 1.86 | 0.9 | 0.07 | 1.6 | 32 | 0.22 | <0.1 | 0.21 | 0.36 | 0.43 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 6.1 | 5.3 | 0.11 | <0.1 | <0.2 | <0.05 | <0.05 | 0.77 |
| **63A** | **Ranaskjær** | 51 | 1 | 13.8 | 0.72 | 1.67 | W | 0.91 | 0.9 | 0.04 | 0.7 | 15 | 0.18 | <0.1 | 0.14 | 0.32 | 0.38 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 1.8 | 1.3 | 0.07 | 0.1 | 0.18 | <0.05 | <0.05 | 0.35 |
| **63A** | **Ranaskjær** | | 2 | 15.7 | 0.73 | 1.83 | W | 0.93 | 0.9 | 0.04 | 0.9 | 20 | 0.19 | <0.1 | 0.17 | 0.38 | 0.44 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 2.2 | 1.8 | 0.08 | 0.12 | 0.21 | <0.05 | <0.05 | 0.39 |
| **63A** | **Ranaskjær** | | 3 | 15.2 | 0.73 | 1.97 | W | 0.82 | 0.8 | 0.04 | 0.8 | 15 | 0.21 | <0.1 | 0.18 | 0.42 | 0.47 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 2.5 | 3.3 | 0.08 | 0.1 | 0.22 | <0.05 | <0.05 | 0.4 |
| **65A** | **Vikingneset** | 74 | 1 | 15.6 | 1.21 | 1.73 | W | 0.56 | 0.9 | 0.02 | 0.3 | 26 | 0.29 | <0.1 | 0.22 | 0.56 | 0.67 | <0.1 | <0.1 | <0.1 | <0.1 | 0.11 | 3 | 3.8 | 0.12 | 0.19 | 0.38 | <0.05 | <0.05 | 0.62 |
| **65A** | **Vikingneset** | | 2 | 15.3 | 1.12 | 1.68 | W | 0.5 | 0.9 | 0.02 | 0.4 | 25 | 0.14 | <0.1 | 0.11 | 0.27 | 0.35 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 1.3 | 1 | 0.06 | <0.1 | 0.2 | <0.05 | <0.05 | 0.27 |
| **65A** | **Vikingneset** | | 3 | 15.7 | 1.20 | 1.72 | W | 0.55 | 0.9 | 0.02 | 0.5 | 34 | 0.15 | <0.1 | 0.12 | 0.28 | 0.34 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 1.4 | 1.3 | 0.11 | <0.1 | 0.19 | <0.05 | <0.05 | 0.35 |
| **69A** | **Lille Terøy** | 111 | 1 | 15.5 | 1.63 | 1.71 | W | 0.52 | 1 | 0.03 | 0.7 | 34 | 0.11 | <0.1 | 0.13 | 0.29 | 0.38 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.53 | <0.8 | 0.08 | <0.1 | 0.16 | <0.05 | <0.05 | <0.2 |
| **69A** | **Lille Terøy** | | 2 | 15.5 | 1.48 | 1.58 | W | 0.58 | 1 | 0.03 | 1 | 36 | <0.1 | <0.1 | <0.1 | 0.23 | 0.3 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.42 | <0.8 | 0.07 | <0.1 | 0.13 | <0.05 | <0.05 | <0.2 |
| **69A** | **Lille Terøy** | | 3 | 15 | 1.47 | 1.35 | W | 0.52 | 1 | 0.03 | 0.8 | 36 | 0.12 | <0.1 | 0.13 | 0.31 | 0.37 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.5 | <0.8 | 0.07 | <0.1 | 0.14 | <0.05 | <0.05 | <0.2 |

**Table 15.** Comparison between the standard JAMP-method and Index-method for pre-treatment of mussels (*Mytilus edulis*) (cf. Table 14), using the paired t-test on ln-transformed data on a dry weight and wet weight basis. For each contaminant the following is indicated: total number of pairs (N), number of pairs where at least one sample was below the detection limit (d), the results from the test (ns, * - p<0.05, ** - p<0.01 or *** - p<0.001), average percent difference (%chg, JAMP - INDEX), average and standard deviation for difference (dif-x/-SD), JAMP-method (JAMP-x/-SD) and INDEX-method (INDEX-x/-SD). Results in bold type have not more than a third of the comparison involving a value below the detection limit. Code descriptions are given in Appendix B. .

| **contam.** | **units-basis** | **N** | **d** | **sign.** | **%chg** | **dif-x** | **dif-SD** | **JAMP -x** | **JAMP -SD** | **INDEX -x** | **INDEX -SD** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **CD** | ppm-dw | 21 | | *** | **-24.16** | -3.90 | 4.18 | 16.15 | 12.94 | 12.25 | 9.37 |
| **CU** | ppm-dw | 21 | | ns | -10.27 | -0.73 | 2.01 | 7.13 | 2.40 | 6.40 | 0.90 |
| **HG** | ppm-dw | 21 | | ns | -5.18 | -0.04 | 0.18 | 0.81 | 1.01 | 0.77 | 0.88 |
| **PB** | ppm-dw | 21 | | *** | **45.43** | 5.54 | 7.35 | 12.19 | 12.02 | 17.73 | 17.71 |
| **ZN** | ppm-dw | 21 | | * | **14.23** | 24.22 | 41.54 | 170.18 | 49.24 | 194.40 | 65.54 |
| **CB101** | ppb-dw | 21 | 1 | ** | **34.60** | 0.07 | 0.07 | 0.20 | 0.08 | 0.27 | 0.13 |
| CB105 | ppb-dw | 21 | 15 | * | 7.37 | 0.01 | 0.01 | 0.10 | 0.01 | 0.11 | 0.02 |
| **CB118** | ppb-dw | 21 | 1 | * | **27.84** | 0.05 | 0.07 | 0.18 | 0.05 | 0.24 | 0.10 |
| **CB138** | ppb-dw | 21 | | *** | **46.66** | 0.15 | 0.12 | 0.32 | 0.11 | 0.47 | 0.17 |
| **CB153** | ppb-dw | 21 | | *** | **51.44** | 0.19 | 0.13 | 0.36 | 0.12 | 0.55 | 0.18 |
| CB156 | ppb-dw | 21 | 21 | ns | 0.00 | 0.00 | 0.00 | 0.10 | 0.00 | 0.10 | 0.00 |
| CB180 | ppb-dw | 21 | 17 | * | 4.72 | 0.00 | 0.01 | 0.10 | 0.00 | 0.11 | 0.01 |
| CB209 | ppb-dw | 21 | 21 | ns | 0.00 | 0.00 | 0.00 | 0.10 | 0.00 | 0.10 | 0.00 |
| CB28 | ppb-dw | 21 | 21 | ns | -3.67 | 0.00 | 0.02 | 0.10 | 0.02 | 0.10 | 0.00 |
| CB52 | ppb-dw | 15 | 16 | ns | 0.67 | 0.00 | 0.00 | 0.10 | 0.00 | 0.11 | 0.02 |
| **DDEPP** | ppb-dw | 21 | | *** | **49.84** | 1.13 | 1.11 | 2.27 | 1.48 | 3.41 | 2.42 |
| **DDTPP** | ppb-dw | 21 | 3 | *** | **58.65** | 1.20 | 1.45 | 2.05 | 1.21 | 3.25 | 2.41 |
| HCB | ppb-dw | 10 | 7 | *** | 35.85 | 0.02 | 0.01 | 0.05 | 0.01 | 0.08 | 0.02 |
| HCHA | ppb-dw | 21 | 18 | ns | 6.45 | 0.01 | 0.02 | 0.10 | 0.01 | 0.11 | 0.02 |
| HCHG | ppb-dw | 21 | 9 | *** | 38.69 | 0.06 | 0.05 | 0.15 | 0.05 | 0.20 | 0.05 |
| OCS | ppb-dw | 21 | 21 | ns | 0.00 | 0.00 | 0.00 | 0.05 | 0.00 | 0.05 | 0.00 |
| QCB | ppb-dw | 21 | 18 | ns | 0.00 | 0.00 | 0.00 | 0.05 | 0.01 | 0.05 | 0.01 |
| **TDEPP** | ppb-dw | 21 | 5 | *** | **63.59** | 0.26 | 0.29 | 0.41 | 0.23 | 0.67 | 0.48 |
| | | | | | | | | | | | |
| **CD** | ppm-ww | 21 | | *** | **-18.81** | -0.45 | 0.26 | 2.37 | 1.55 | 1.92 | 1.41 |
| **CU** | ppm-ww | 21 | | ns | -10.86 | -0.12 | 0.24 | 1.13 | 0.28 | 1.01 | 0.11 |
| **HG** | ppm-ww | 21 | | ns | 5.37 | 0.01 | 0.02 | 0.12 | 0.13 | 0.12 | 0.14 |
| **PB** | ppm-ww | 21 | | *** | **56.63** | 1.00 | 1.22 | 1.76 | 1.51 | 2.76 | 2.62 |
| **ZN** | ppm-ww | 21 | | ns | 11.30 | 3.08 | 5.33 | 27.23 | 5.83 | 30.30 | 7.85 |
| **CB101** | ppb-ww | 21 | 1 | ** | **34.60** | 0.07 | 0.07 | 0.20 | 0.08 | 0.27 | 0.13 |
| CB105 | ppb-ww | 21 | 15 | * | 7.37 | 0.01 | 0.01 | 0.10 | 0.01 | 0.11 | 0.02 |
| **CB118** | ppb-ww | 21 | 1 | * | **27.84** | 0.05 | 0.07 | 0.18 | 0.05 | 0.24 | 0.10 |
| **CB138** | ppb-ww | 21 | | *** | **46.66** | 0.15 | 0.12 | 0.32 | 0.11 | 0.47 | 0.17 |
| **CB153** | ppb-ww | 21 | | *** | **51.44** | 0.19 | 0.13 | 0.36 | 0.12 | 0.55 | 0.18 |
| CB156 | ppb-ww | 21 | 21 | ns | 0.00 | 0.00 | 0.00 | 0.10 | 0.00 | 0.10 | 0.00 |
| CB180 | ppb-ww | 21 | 17 | * | 4.72 | 0.00 | 0.01 | 0.10 | 0.00 | 0.11 | 0.01 |
| CB209 | ppb-ww | 21 | 21 | ns | 0.00 | 0.00 | 0.00 | 0.10 | 0.00 | 0.10 | 0.00 |
| CB28 | ppb-ww | 21 | 21 | ns | -3.67 | 0.00 | 0.02 | 0.10 | 0.02 | 0.10 | 0.00 |
| CB52 | ppb-ww | 15 | 16 | ns | 0.67 | 0.00 | 0.00 | 0.10 | 0.00 | 0.11 | 0.02 |
| **DDEPP** | ppb-ww | 21 | | *** | **49.84** | 1.13 | 1.11 | 2.27 | 1.48 | 3.41 | 2.42 |
| **DDTPP** | ppb-ww | 21 | 3 | *** | **58.65** | 1.20 | 1.45 | 2.05 | 1.21 | 3.25 | 2.41 |
| HCB | ppb-ww | 10 | 7 | *** | 35.85 | 0.02 | 0.01 | 0.05 | 0.01 | 0.08 | 0.02 |
| HCHA | ppb-ww | 21 | 18 | ns | 6.45 | 0.01 | 0.02 | 0.10 | 0.01 | 0.11 | 0.02 |
| HCHG | ppb-ww | 21 | 9 | *** | 38.69 | 0.06 | 0.05 | 0.15 | 0.05 | 0.20 | 0.05 |
| OCS | ppb-ww | 21 | 21 | ns | 0.00 | 0.00 | 0.00 | 0.05 | 0.00 | 0.05 | 0.00 |
| QCB | ppb-ww | 21 | 18 | ns | 0.00 | 0.00 | 0.00 | 0.05 | 0.01 | 0.05 | 0.01 |
| **TDEPP** | ppb-ww | 21 | 5 | *** | **63.59** | 0.26 | 0.29 | 0.41 | 0.23 | 0.67 | 0.48 |