CLIMATE AND POLLUTION AGENCY

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Levels, trends and effects

# Hazardous substances in fjords and coastal waters-2008

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: **Hazardous substances in fjords and coastal waters-2008. Levels, trends and effects.**

Report 1062/2010

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Abstract
This report is part of the Norwegian contribution to OSPAR's Coordinated Environmental Monitoring Programme (CEMP). CEMP 2008 included the monitoring of contaminants in blue mussel (51 stations), dogwhelk (8 stations), cod (11 stations), tusk (1 station), ling (3 stations), prawn (5 stations), flatfish (10 stations) and sediments (5 stations) along the coast of Norway from the Oslofjord to the Varangerfjord. Of the 890 time series in this project, 256 were statistically significant trends, 228 (89 %) of these were downward trends and 28 were upwards. In 142 cases concentrations were above what is expected in only diffusely contaminated areas (collectively termed overconcentrations). The results showed elevated levels of contaminants, in a few cases up to extremely polluted, in blue mussel in the Frierfjord (dioxins/TCDDN), in the Ranfjord (B[a]P) and in the Sørfjord (ppDDE). Blue mussel in the Kristiansandsfjord and the Ranfjord were up to severely polluted with B[a]P. Cod liver from Inner Oslofjord was markedly polluted, and the fillet was moderately polluted with PCBs. There was a significant downward trend for PCBs in blue mussel from Gressholmen in the Inner Oslofjord. Fillet of cod from the Inner Oslofjord was moderately polluted with mercury, a significant upward trend was detected for the period 1984-2008. A significant downward trend was found for lead, cadmium and mercury in blue mussel from Sørfjord/ Hardangerfjord. Fillet of cod from the Inner Sørfjord was moderately polluted with mercury, and cod liver was insignificantly polluted with ppDDE and PCBs. Fillet of ling from the Inner Sørfjord had a median concentration of mercury of 0.48 mg/kg, which is close to the lower limit of Class IV (severely polluted). Fillet of both tusk and ling from the Høyanger area were moderately contaminated with mercury. Contamination of organotin in blue mussel and imposex in dogwhelk were still apparent, however, most of the trends were downwards indicating that regulatory action has lead to an improvement in the investigated areas. The results from studies using biological effects methods in cod, indicated reduced exposure to planar organic contaminants in the Oslofjord. In the Grenlandsfjord area there was a significant downward trend for HCB in blue mussel. No overconcentrations of contaminants were found in prawns. A reduction since 1990-1999 was found for mercury in sediment at Mølen-Moss and Steilene, and for PCBs (50 %) at Steilene. A decrease of PCBs, PAH and sum KPAH in sediment was found at all stations since 1990-1999. The sediment at Steilene was moderately polluted with TBT. No overconcentrations were found in sediment for cadmium (Cd), dichlorodiphenyldichloroethylene (ppDDE), lindane (g-HCH) and hexachlorobenzene (HCB).

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# *Foreword*

This report represents the Norwegian national comments on the 2008 investigations for the Coordinated Environmental Monitoring Programme (CEMP–a part of and referred to in earlier reports as the Joint Assessment and Monitoring Programme JAMP). CEMP is administered by the Oslo and Paris Commissions (OSPAR) in their effort to assess and remedy anthropogenic impact on the marine environment of the North East Atlantic. The current focus of the Norwegian contribution is on the levels, trends and effects of hazardous substances. CEMP-results from Norway and other OSPAR countries provide a basis for a paramount evaluation of the state of the marine environment. OSPAR receives guidance from the International Council for the Exploration of the Sea (ICES).

The Norwegian CEMP for 2008 was carried out by the Norwegian Institute for Water Research (NIVA) by contract from the The Climate and Pollution Agency, Klif (former Norwegian Pollution Control Authority, SFT).

The Norwegian contribution to the CEMP was initiated by Klif in 1981 as part of the national monitoring programme. It now comprises three areas: the Oslofjord and adjacent areas (Hvaler-Singlefjord area and Grenlandsfjord, 1981-), Sørfjord/Hardangerfjord (1983-84, 1987-) and Orkdalsfjord area (1984-89, 1991-93, 1995-96, 2004-05), and stations in merely diffusely contaminated areas of Arendal, Lista and Bømlo-Sotra (1990-), areas from Bergen to Lofoten (1992-) and areas from Lofoten to the Norwegian-Russian border (1994-).

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Oslo, March 16th 2010.

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# Contents

# 1. Executive Summary/Sammendrag

The Norwegian CEMP 2008 investigations included the monitoring of micropollutants (contaminants) in blue mussel (51 stations), dogwhelk (8 stations), cod (11 stations), tusk (1 station), ling (3 stations), prawn (5 stations), flatfish (dab, flounder, plaice, megrim; 10 stations) and sediments (5 stations) along the coast of Norway from the Oslofjord and Hvaler region in the south-east to the Varangerfjord in the north-east. The mussel sites include supplementary stations for the Norwegian Index programme. There were 890 time series that included results from 2008. Of these, 256 showed statistically significant trends; 228 (89 %) were downwards and 28 were upwards. In 142 cases concentrations were above what is expected in only diffusely contaminated areas (collectively termed overconcentrations). The general situation for the two major impacted areas of CEMP is as follows:

- **The Oslofjord/Hvaler/Grenlandsfjord area**
  The Oslofjord was contaminated with PCBs, mercury and cadmium. Fillet of cod from the Inner Oslofjord was moderately polluted with mercury, and the trend was upwards. Cod fillet from the Færder area was moderately polluted with mercury. An upward trend for mercury was found for two of the five mussel stations in the area (st. I 301 Akershuskaia and st. 31A Solbergstrand). An upward trend was found for cadmium in cod liver from the Inner Oslofjord 1984-2008, as well as at four mussel stations (st. 30A Gressholmen, st. 31A Solbergstrand, st. I301Akershuskaia and st. I307 Ramtonholmen). There were overconcentrations of PCBs in cod liver (markedly polluted) and fillet (moderately polluted) in Inner Oslofjord. Overconcentrations of PCBs were found in blue mussel at four stations in the Oslofjord, up to markedly polluted at Akershuskaia (st. I301) in the harbour area. The Grenlandsfjord area has been an area of concern partly due to elevated concentrations of HCB in blue mussel. However, since 2002, with the exception of 2005, the blue mussel at Bjørkøya/Risøyodden (st. 71A) was insignificantly or moderately polluted with respect to HCB. A downward trend was found at this station not only for the period 1983-2008 but also for the period 1990-2008 following remedial action in 1989. Blue mussel from Bjørkøya/Risøyodden (st. 71A), Gjemesholmen (st. I712) and Strømtangen (st. I713) were extremely polluted with dioxins.

- **The Sørfjord/Hardangerfjord area**
  The Sørfjord and Hardangerfjord were contaminated with ppDDE, cadmium, mercury and to a lesser degree PCB. Cod fillet from the Inner Sørfjord was moderately polluted with mercury. There was an upward trend and overconcentration for Cd in cod liver in the Inner Sørford. Significant downward trends have been observed for Cd in blue mussel in the inner and mid Sørfjord during the last two decades. Cod fillet were moderately polluted with PCBs in the Inner Sørfjord. There were overconcentrations of ppDDE in all four blue mussel stations in the Sørfjord and at Ranaskjær close to Ålvik in the Hardangerfjord. In addition, an upward trend was found at Kvalnes in the mid Sørfjord where the blue mussel were extremely polluted by ppDDE.

Results from analyses for KPAH in blue mussel from Kristiansandfjord and the Ranfjord showed overconcentrations (up to severely polluted) but no trend. Trend analysis on B[a]P in the Ranfjord mussel showed no trends but the mussel were severely and extremely polluted. Mussel in the Kristiansandfjord were severely contaminated with B[a]P. HCB in cod liver and fillet were at background leve at all 11 stations. Blue mussel in the Frierfjord and the Kristiansandfjord were up to markedly polluted with HCB.

Since 2005 flame retardants (PBDE) and perfluoroalkyl compounds (PFC) have been investigated on an annual basis in cod liver from three stations. Concentrations of PBDE and PFC were higher in the fish from the Inner Oslofjord compared to fish either from Inner Sørfjord or fish from the reference station in Karihavet in the Bømlo-Sotra area on the West Coast. The median concentration of PBDE in the Inner Sørfjord was higher than the reference station, but for PFC concentrations were similar in the two areas.

Blue mussel from the three stations in the Frierfjord (Grenlandsfjord area) were extremely polluted with dioxin (Class V). Blue mussel were insignificantly (Class I) and markedly polluted (Class III) with dioxin in the Kristiansand harbour. There were no trends in dioxin concentration for the entire CEMP-investigation period 2002-2008.

The presence of organotin (as TBT) in Norwegian waters exceeded acceptable median levels (overconcentrations) at 8 of the 15 blue mussel stations monitored in 2008, not only in harbour areas like Gjemesholmen (st. I712) in the Frierfjord and Høgevarde (st. 227A2) in the Karmsund close to Haugesund, but also at stations presumably remote from known point sources such as Espevær (st. 22A). However, of the time series investigated for median concentrations of TBT in blue mussel, 10 stations had significant downward trends, and two stations had no significant trends. Significant downward trends for TBT concentrations in gastropods were found at Lista (st. 15G) and Færder (st. 36G). Biological effects from organotin (TBT) were found in dogwhelk from all but 2 of the 8 stations investigated. However, of the time series investigated for biological effects (imposex) of TBT in dogwhelk, 7 were significant downward trends and one had no significant trend.

Two environmental indices have been applied annually since 1995 to assess the total level of pollution in blue mussel from assumed impacted and non-impacted areas; the so-called Pollution Index and Reference Index. Calculation of this index based on results from mussel from nine fjord areas in 2008 indicated markedly to severely pollution (Class III-IV). This was one pollution class higher than in 2007. The Reference Index, based on four fjord areas, was between insignificantly and moderately polluted (Class I-II), as it has been since the programme was initiated in 1995.

Biological effects methods are included in the monitoring programme to evaluate whether marine organisms are affected by contaminants in their environment. Such knowledge can not be derived from tissue levels of contaminants alone. The biological effect parameters OH-pyrene (pyrene metabolite; marker for PAH exposure), δ-aminolevulinic acid dehydrase (ALA-D; marker for lead exposure), and cytochrome P450 1A (EROD-activity; marker for planar hydrocarbons, such as certain PCBs/PCNs, PAHs and dioxins) were determined in cod from the Inner Oslofjord. OH-pyrene was also determined in cod from Lista, Bømlo-Sotra and Sørfjord (samples could not be conserved for analysis of ALA-D and cytochrome P450 1A from Karihavet and the Inner Sørfjord). In 2008, the median concentrations of OH-pyrene metabolites in bile from cod were higher in the Inner Oslofjord compared to samples from the Inner Sørfjord, the Bømlo-Sotra area (reference) and Lista. No significant trends for the period 2000-2008 were detected. In other words, the concentrations have fluctuated around the same levels, with a trend towards an apparent reduction at Lista towards the last few years (not significant). A significant reduction in hepatic EROD activity in fish from the Inner Oslofjord could be shown for the period 1997-2008. On the other hand, the median amount of CYP1A protein in the liver of cod from the Inner Oslofjord in 2008 was 50 % higher as in 2007, but there was no significant trend. In 2008, ALA-D activities appeared slightly lower (stronger inhibition, indicating response to higher exposure to lead) in the Inner Oslofjord compared to 2007. Most years, the activity of ALA-D in the Inner Oslofjord and the Inner Sørfjord was somewhat inhibited, compared to the activities at the reference stations. In summary, the only significant trend found for the biological effects parameters was a downward trend for EROD in cod liver from the Inner Oslofjord for the period 1997–2008.

Two deepwater fish species from the Inner Sørfjord, Strandebarm in the Hardangerfjord and from the Høyanger area in the Sognefjord were analysed in 2008. Fillet of ling from the Inner Sørfjord had a median concentration of mercury of 0.48 mg/kg, which is close to the lower limit of Class IV. Fillet from both tusk and ling from the Høyanger area were moderately contaminated by mercury. Fillet of ling from Strandebarm was insignificantly contaminated by mercury. Liver of ling from the Inner Sørfjord was moderately contaminated by PCBs. Classes for cod was used to classify the contamination levels since there are no classes for ling and tusk.

No overconcentrations of contaminants were found in prawns.

Relatively low concentrations (Class II, good) was found for mercury in surfcial sediment at Steilene in the Oslofjord. The mercury concentration at Steilene had decreased since 1990-1999. Slightly enhanced concentration of Hg (Class II, good) was also found at Mølen-Moss (st. 35S). Slightly enhanced concentrations (Class II, good) was also found for PCBs in surficial sediment at Steilene (st. 30S) in the Oslofjord and represents a 50 % decrease since 1990-1999. The concentration of PCBs was at background level for the other four stations, and the concentrations found were lower than in 1990-1999. The sediments from the stations Steilene (st. 30S), Færder (st. 36S), Arendal area (st. 77S) and Lista (st. 15S) showed slight overconcentrations (Class II, good) for PAH. All five stations investigated revealed a decrease since 1990-1999. The sediment at Steilene was moderately polluted with TBT. No overconcentrations were found for cadmium (Cd), dichlorodiphenyldichloroethylne (ppDDE), lindane (g-HCH) and hexachlorobenzene (HCB).

# Sammendrag

Det norske bidraget til OSPARs felles overvåkingsprogram CEMP 2008 inkluderer overvåking av miljøgifter i blåskjell (51 stasjoner inkludert stasjoner for beregning av forurensningsindeks), purpursnegl (8 stasjoner), torsk (11 stasjoner), brosme (1 stasjon), lange (3 stasjoner), reker (5 stasjoner), flatfisk (sandflyndre, skrubbe, rødspette, glassvar; 10 stasjoner) og sedimenter (5 stasjoner) langs kysten fra Oslofjordområdet til Varangerfjorden. Undersøkelsene i 2008 omfatter resultater fra 890 tidsserier, hvorav 256 visste signifikante trender. Av disse 256 viste 228 (89 %) en nedadgående og 28 en oppadgående trend. Det var 142 tilfeller hvor resultatene viste overkonsentrasjoner dvs konsentrasjoner over antatt høyt bakgrunnsnivå. Tilstand og utvikling i to områder som hovedsakelig er påvirket av forurensninger er som følgende:

- **Oslofjorden/Hvaler/Grenlandsfjorden.** Oslofjorden er forurenset med PCB, kvikksølv og kadmium. Filet av torsk fra Indre Oslofjord var moderat forurenset av kvikksølv, og det var en oppadgående trend. Torskefilet fra Færder var også moderat forurenset av kvikksølv. Det ble funnet en oppadgående trend for kvikksølv i blåskjell for to av fem stasjoner i dette området (st. I301 Akershuskaia og st. 31A Solbergstrand). Det var en oppadgående trend for kadmium i torskelever og for fire blåskjellstasjoner fra Indre Oslofjord (st. 30A Gressholmen, st. 31A Solbergstrand, st. I301 Akershuskaia og st. I307 Ramtonholmen). Det var overkonsentrasjoner av PCB i torskelever (markert forurenset) og torskefilet (moderat forurenset) i Indre Oslofjord. Det ble funnet overkonsentrasjoner av PCB i blåskjell for fire stasjoner i Oslofjorden, opp til markert forurenset ved Akershuskaia (st. I301). I Grenlandsfjord-området har det tidligere i flere år vært observert høye konsentrasjoner av HCB i blåskjell. Siden 2002 (med unntak av 2005) har en imidlertid kunne klassifisere HCB-konsentrasjonene i skjell fra Bjørkøya/Risøyodden (st. 71A) som ubetydelige eller moderat forurenset. En nedadgående trend i HCB-konsentrasjonen ble også funnet på denne stasjonen, ikke bare for perioden 1983-2008 men også for perioden 1990-2008 etter tiltaket i 1989. Blåskjellene fra Bjørkøya/Risøyodden (st. 71A), Gjemesholmen (st. I712) og Strømtangen (st. I713) var meget sterkt forurenset av dioksiner.

- **Sørfjorden/Hardangerfjorden**. Sørfjorden og Hardangerfjorden var forurenset med ppDDE, kadmium, kvikksølv og i mindre grad PCB. Torskefilet fra Indre Sørfjorden var moderat forurenset av kvikksølv. Det var også oppadgående trend og overkonsentrasjon av kadmium i torskelever i Indre Sørfjorden. I indre- og midtre del av Sørfjorden var det signifikant nedadgående trender for kadmium i blåskjell. Torskefilet var moderat forurenset av PCB i Indre Sørfjorden. Det var overkonsentrasjoner av ppDDE på alle blåskjellstasjonene i Sørfjorden og ved Ranaskjær nær Ålvik i Hardangerfjorden. Det var en oppadgående trend for ppDDE i blåskjell ved Kvalnes i Sørfjorden, og der var skjellene meget sterkt forurenset av ppDDE.

I Kristiansandsfjorden og Ranfjorden var blåskjellene opptil sterkt forurenset av KPAH, men det var ingen signifikante tidstrender. Blåskjellene i Ranfjorden var opptil meget sterkt forurenset av B[a]P og i Kristiansandsfjorden var skjellene opptil sterkt forurenset av B[a]P. Konsentrasjonen av HCB i torskelver var lav (bakgrunnsnivå) på alle stasjonene i undersøkelsen. Blåskjell i Frierfjorden og Kristiansandsfjorden var opptil markert forurenset av HCB.

Hvert år siden 2005 har en spesiell gruppe flammehemmere (PBDE) og perfluoroalkylerte stoffer (PFC) blitt undersøkt i torskelever fra tre stasjoner. Konsentrasjonene av PBDE og PFC var høyere i fisk fra Indre Oslofjord sammenlignet med fisk fra både Sørfjorden og Karihavet (referanse stasjonen i Bømlo-Sotra området). Median konsentrasjon av PBDE i Sørfjorden var høyere enn referanse-stasjonen, men PFC-konsentrasjonene var mer lik i disse to områdene.

Når det gjelder dioksin var tre blåskjellstasjoner i Frierfjorden meget sterkt forurenset. Blåskjell fra Kristiansandsområdet var opptil markert forurenset av dioksin. Ingen trend ble registrert for i perioden 2002-2008.

Effekter av organotin (bl.a. TBT) kunne fortsatt registreres i 2008, tydeligst i havner eller i områder med mye skipstrafikk, men også på stasjoner som var antatt lite påvirket. Konsentrasjoner av TBT i blåskjell viste en høyere forurensningsgrad enn klasse I (ubetydelig forurenset) på fem av tolv

stasjoner. Biologiske effekter av TBT (imposex) ble registrert på seks av åtte stasjoner. Ti av tolv tidsserier for TBT i blåskjell 1999-2008 visste signifikante nedadgående trender. Det ble også registrert en nedadgående trend for imposex på sju av åtte stasjoner. Disse resultatene kan tyde på at forbud mot bruk av TBT som begroingshindrende middel på småbåter og skip har ført til forbedring i de undersøkte områdene.

På basis av forekomst av noen utvalgte miljøgifter i blåskjell har en siden 1995 beregnet en blåskjell-forurensningsindeks og en blåskjell-referanseindeks på basis av resultatene fra en gruppe forurensede og referanse fjordområder. Forurensningsindeksen for 2008 var basert på ni fjordområder og lå mellom markert og sterkt forurenset (klasse III-IV), dvs. en tilstandklasse dårligere enn i 2007. Referanseindeksen var basert på fire fjordområder og lå mellom ubetydelig og moderat forurenset (klasse I-II).

Biologiske-effekt-parametre er inkludert i overvåkingsprogrammet for å evaluere eventuell påvirking på organismer av forurensning. Slik kunnskap kan ikke tilegnes kun fra konsentrasjoner av kjemikalier i vevsprøver alene. Biomarkøranalyser muliggjør vurderinger av helsetilstanden til organismer. Biologiske effekt-parametre ble undersøkt i torsk fra fire stasjoner langs kysten: Indre Oslofjord, Lista, Bømlo–Sotra og Indre Sørfjorden (bare OH-pyren på de tre sistnevnte stasjonene). Effektparameterene er: OH-pyren (pyren metabolitt; markør for PAH-eksponering), δ-aminolevulinsyre dehydrase (ALA-D; markør for bly-eksponering), og mengde protein (CYP1A), samt aktivitet av cytokrom P4501A (EROD; markør for plane hydrokarboner, slik som PCB/PCN, PAH og dioksoiner). I 2008 var OH-pyren høyere i Indre Oslofjord, enn i Sørfjorden, på Lista og i Karihavet (referanse). Ingen signifikante trender ble observert for perioden 2000-2008. Med andre ord har konsentrasjonene fluktuert i omtrent samme nivå, med en indikasjon på en nedgang på Lista (ikke signifikant) de siste årene. En signifikant nedgang i EROD-aktivitet i perioden 1997-2008 ble observert for fisk fra Indre Oslofjord. På den annen side var median mengde CYP1A-protein i lever av torsk fra Oslofjorden 50 % høyere i 2008, enn i 2007, men ingen signifikant trend kunne påvises. I 2008 var aktiviteten av ALA-D tilsynelatende marginalt lavere (indikasjon på større eksponering til bly) i Indre Oslofjord sammenlignet med 2007. De fleste år har aktiviteten av ALA-D i indre Oslofjord og Indre Sørfjorden vært noe hemmet, sammenlignet med aktiviteten på referansestasjonene. Oppsummert var en nedadgående trend for EROD i torskelever fra indre Oslofjord for perioden 1997-2008 den eneste signifikante trenden registrert for disse biologiske effekt-parametrene.

I 2008 ble det analysert dypvannsfisk fra Indre Sørfjorden og Strandebarm i Hardangerfjorden, og fra Høyangerområdet i Sognefjorden. Lange fra Sørfjorden ble funnet å ha mediankonsentrasjon av kvikksølv i filet på 0.48 mg/kg, som ligger såvidt under nedre grenseverdi for klasse IV for torsk (sterkt forurenset). Klassegrenser for torsk ble brukt for å vurdere forurensningsnivåene i lange og brosme siden det ikke finnes tilsvarende klassifisering for disse artene. Både lange og brosme fra Høyangerområdet var moderat forurenset av kvikksølv i fileten, med stor individuell variasjon for langen. Filet av lange fra Strandebarm var ikke signifikant forurenset av kvikksølv. Lever av lange fra Sørfjorden var moderat forurenset av PCB.

Det ble analysert reker fra fem områder. Det ble ikke funnet overkonsentrasjoner av miljøgifter i reker.

Det ble funnet relativt lave konsentrasjoner av kvikksølv (klasse II, god) i overflatesedimentet ved Mølen-Moss og ved Steilene, og resultatene viste en nedgang fra perioden 1990-1999 for Steilene. Resultatene viste også relativt lave konsentrasjoner (klasse II, god) for sum PCB-7 ved Steilene (st. 30S) og resultatene representerer en nedgang på 50 % siden 1990-1999. Konsentrasjonen av sum PCB-7 var på bakgrunnsnivåer for de fire øvrige stasjonene og konsentrasjonene var lavere enn i 1990-1999. Sedimentene ved Steilene, Mølen-Moss, Arendal og Lista kun svake overkonsentrasjoner (klasse II, god) av PAH, og alle viste en reduksjon siden 1990-1999. Det ble funnet avtagende konsentrasjon av sum KPAH ved alle de fem sedimentstasjonene. Overkonsentrasjon (klasse III, moderat) ble funnet for TBT ved Steilene og de øvrige fire stasjonene (klasse II). Det ble ikke funnet overkonsentrasjoner for kadmium (Cd), diklordifenyldikloretylen (ppDDE), lindan (g-HCH) og heksaklorbenzen (HCB).

# 2. Introduction

## 2.1. Background

Environmental concerns include the risks due to the pollution of air, soil and water. The Norwegian Pollution Monitoring Programme, administered by the Norwegian Climate and Pollution Agency (Klif), is designed to deal with these aspects. A part of this programme focuses on the levels, trends and effects of hazardous substances in fjords and coastal waters, which also represents the Norwegian contribution to the Coordinated Environmental Monitoring Programme (CEMP). CEMP is a common European monitoring programme under the auspices of Oslo and Paris Commissions (OSPAR). The Norwegian contribution to CEMP addresses several aspects of OSPAR's assessment hazardous substances. For this report the term CEMP only refers to the Norwegian contribution.

An overview of CEMP stations in Norway is shown in the tables in Appendix G and maps in Appendix H. It has included the monitoring of sediment, sea water and biota since 1981 with particular emphasis on three areas:

- Oslofjord-area (including the Hvaler area, Singlefjord and Grenland fjords area)
- Sørfjord/Hardangerfjord
- Orkdalsfjord area

During 1990-1995 Norway has also included

- Arendal and Lista areas

The previous investigations (cf. Appendix A) have shown that the Inner Oslofjord area has enhanced levels of PCB in cod liver, mercury, lead and zinc in sediments and moderately elevated values of mercury in cod fillet. Investigations of the Sørfjord/Hardangerfjord have shown elevated levels of PCB, DDT, cadmium, mercury and lead. The Norwegian Food Safety Authority (Mattilsynet) has issued warnings about the consumption of fish and/or mussel in the Oslofjord and Sørfjord partly based on these investigations. Investigations in Orkdalsfjord were discontinued during the period 1996 to 2003 and from 2006. Blue mussel from the Orkdalsfjord were monitored for the period 1984-1996, and then not again until 2004-2005 when bulk samples from three stations were investigated. The results from these investigations have been reported earlier (Green et al. 2007, Green & Ruus 2008). These stations will probably be revisited within in 2010.

In addition to the monitoring of Oslofjord area and Sørfjord/Hardangerfjord CEMP also includes selected stations in Lista and Bømlo areas on the south and west coast of Norway, respectively. CEMP includes sampling of blue mussel from reference areas along the coast from Lofoten to the Russian border, which were included in a 1993-1996 and 2006-2007 survey. The sampling also includes fish from four key areas north of Lofoten: Finnsnes-Skjervøy area, Hammerfest-Honningsvåg area, and Varanger Peninsula area. The intention is to assess the level of contaminants in reference areas, areas that are considered to be little affected by contaminants, and to assess possible temporal trends.

The sampling for 2008 involved blue mussel (51 stations), dogwhelk (8 stations), cod (11 stations), flatfish (10 stations) and sediments (5 stations) (Figure 1, cf. Appendix G). The Norwegian CEMP has been expanded since 1989 to include monitoring in more diffusely polluted areas. Sufficient samples have not always been practical to obtain. When this applies to blue mussel, a new site in the vicinity is often chosen. As for fish, the quota of 25 individuals (±10 %), indicated in (Appendix G), as either 25 individuals or 5 bulked samples consisting of 5 fish per bulked sample, was met for all stations in 2008.

Concentrations of metals, organochlorines (including pesticides), polycyclic aromatic hydrocarbons, polybrominated diphenyl ethers or perfluorinated compounds in sediment, blue mussel or fish were determined at the Norwegian Institute for Water Research (NIVA). Dioxins were analysed by the Norwegian Institute for Air Research (NILU).

Analytical methods have been described previously (Green et al. 2008a). Parameter abbreviations are given in Appendix C.

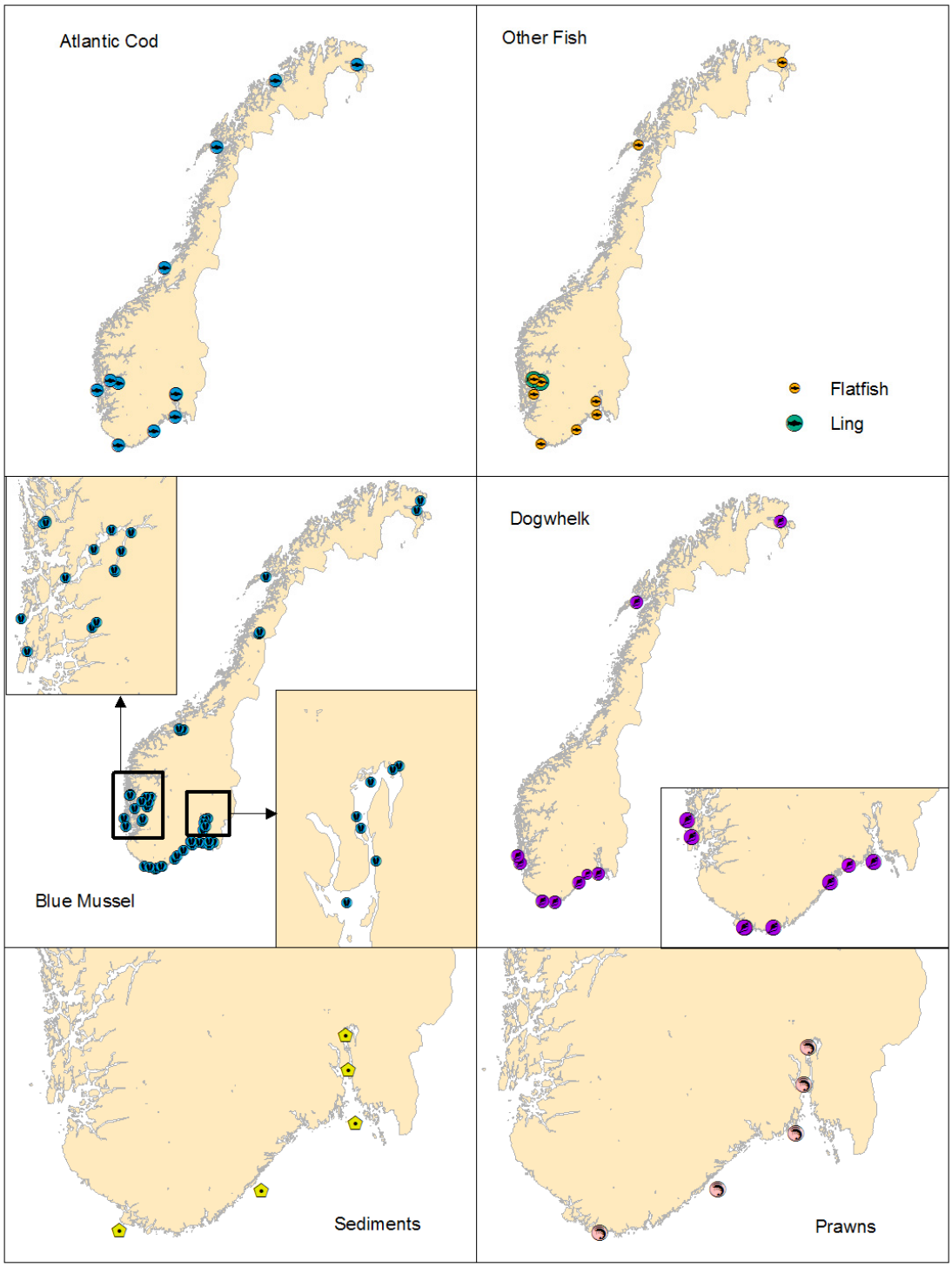



***Figure 1.*** *Stations samples where sampling of sediment, blue mussel, prawns dogwhelk, cod and flatfish in 2008 is indicated. See also station information in Appendix G and detailed maps in Appendix H.*

Biological effects methods, BEM or biomarkers were introduced in the Norwegian CEMP (former JAMP) in 1997. The purpose of these markers is, by investigations on molecular/cell/individual level,

to give warning signals if ecosystems are affected by toxic compounds, i.e. contaminants, and to assist in establishing an understanding of the specific mechanisms involved. 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. Just one reason is the vast number of chemicals (known and unknown) that organisms are exposed to, in combination, in the environment. 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 CEMP is possibly the most extensive of its type in Europe and includes imposex in gastropods as well as biomarkers in fish. The 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.

## 2.2. Purpose

The general purpose of CEMP is to assess the state of contamination in the marine environments in order to provide a basis for remedial action. International initiatives such as The Water Framework Directive (WFD) (2000/60/EC) and the Marine Strategy Framework Directive (MSFD) (2008/56/EC) help drive this process. One of the goals of both of these EU directives is to achieve concentrations of hazardous substances in the marine environment near background values for naturally occurring substances and close to zero for manmade synthetic substances. OSPAR has also adopted this goal (OSPAR 1998b). The Norwegian contribution to CEMP is designed to address issues relevant to OSPAR (cf., OSPAR 2007, SIME 2004a) including OSPAR priority substances (SIME 2004b). Furthermore it should ensure that their respective experts are as familiar as possible with the detail of their national submissions (ASMO 2007).

The state of contamination is divided into three issues of concern: levels, trends and effects. These are applied to the following regions:

- Oslofjord, Hvaler and Grenland area
- Sørfjord/Hardangerfjord
- Selected sites, remote from known point sources, along the entire coast of Norway
- Selected impacted blue mussel sites used for determination of Klif's pollution index

Different monitoring strategies are used, in particular with regard to the selection of indicator media (sediment, blue mussel, cod liver etc.) and sampling frequencies (generally every 5-10 years for sediment, annually for biota). The programme may be supplemented with long or short-term investigations of hazardous substances that are not routinely monitored.

Where possible CEMP is integrated with other national monitoring programmes to achieve a better practical and scientific solution to assessing the levels, trends and effects of micropollutants. In particular, this concerns Comprehensive Study on Riverine Inputs and Direct Discharges (RID) and The Norwegian Costal Monitoring Programme (Kystovervåkingsprogrammet; KYO). Both programmes are operated by NIVA on behalf of Klif and coordinated through NIVA's Land Ocean Interaction Monitoring Programme (LOIMP).

# 3. Materials and methods

## 3.1. Sampling

The objective is to obtain updated information on levels and trends of selected hazardous substances, which are known to have detrimental biological effects on humans and wildlife that feed on marine organisms. In the marine environment, these substances may accumulate on the bottom sediment and in fish and shellfish. Because these fish and shellfish are a food source for marine wildlife and humans, the substances may be transferred to higher levels in the food chain. In humans, long-term exposure to or consumption of sea foods contaminated with these substances can cause severe health damage. The pathway of contamination is not always obvious. Although hot spots tend to be directly linked to particular human activities, the substances are also found in organisms that are collected far away from point sources because of transport by ocean currents, atmosphere or migration of prey species. The transport of these substances by these means can not be disregarded in this respect.

Concentrations of hazardous substances in sediment, mussel and fish constitute time-integrating state indicators for coastal water quality. With respect to organism, these substances have a tendency to accumulate in their tissues (bioaccumulation), and show higher concentrations relative to their surroundings (water and sediment). Hence, it follows that the substances may be detected, which would otherwise be difficult when analysing water or sediment. Another advantage to using biota concentrations as indicators, as opposed to using water or sediment, is that they are of direct ecological importance as well as being important for human consumption and commercial interests involved in harvesting marine resources.

CEMP uses sediment monitored at about 10-year intervals and blue mussel, cod, and several flatfish species on a yearly basis. Mussels are attached to shallow-water surfaces, thus reflecting exposure at a fixed point (local pollution). They are also abundant, robust and widely monitored in a comparable way. Mussels are, however, restricted to the coastal zone. Cod is a widely distributed and commercially important fish species. Fish are predators and, as such, it will reflect contamination levels in its prey.

Samples were collected and analysed, where practical, according to OSPAR guidelines[1] and screened and submitted to ICES by agreed procedures (ICES 1996). The 2008 sampling of biota follows the OSPAR guidelines (2003b, 2009) as closely as possible.

**Blue mussel**
There is some evidence that the effect of shell length and difference in bulk sample size are of little or no significance (WGSAEM 1993; Bjerkeng & Green 1994). For historical reasons, three sizes of blue mussel (*Mytilus edulis*) have been sampled from most of the stations: 2-3 cm (100 individuals), 3-4 cm (50 individuals) and 4-5 cm (50 individuals). In order to obtain ca. 50 g wet weight, which is necessary for analyses and potential reanalyses of all variables, fifty to hundred individuals were sampled for each class. In 1992 a stricter approach (ICES 1992) was applied for new stations north of the Bømlo area at which 3 pooled samples of 20 individuals each were collected in the size range of 3-5 cm. Pending further investigation, all blue mussel samples from the new stations are collected according to this ICES method. Shell length was measured by slide calipers. The blue mussel were scraped clean on the outside by using knives or scalpels.

To empty the intestinal canal (depuration) the mussel were kept alive for 12-24 hours in sea water (about 15 litres) collected in close proximity to the station. The shells were spread out on a perforated polyethylene platform and submerged in the sea water in a container and an aquarium pump with an airstone was used to keep the water oxygenated. The container used was lined with polyethylene plastic bags and the bags were replaced for each station or sample. The temperature was kept at ambient conditions. Following depuration, the mussel were shucked and frozen. The depuration was omitted if there was sufficient evidence that for a specific population/place the process has no significant influence on the body burden of the contaminants measured (cf. Green 1989a; Green et al.

[1] OSPAR 2002, 2003b, see also www.ospar.org/eng/ > measures > list of other agreements

1996). Those samples that were not depurated were part of the Klif blue mussel pollution index (see Appendix M1).

The blue mussel samples were collected from September 1st to Desember 9th 2008. Generally, blue mussel 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. All blue mussel were sampled by NIVA except for the blue mussel collected in the Ranfjord and Varangerfjord which were collected by local contacts.

**Fish**
For fish, 25 individuals of Atlantic Cod (*Gadus morhua)* or one flatfish species are sampled for each station. If possible, the same species collected in previous years at the selected stations where collected. The order of preference for flatfish species is according the OSPAR guidelines: dab (*Limanda limanda*), flounder (*Platichthys flesus*), plaice (*Pleuronectes platessa*), and megrim (*Lepidorhombus wiffiagonis*). For some areas the first preferred flatfish species have not been available. Then the same species collected in previous years at the selected stations have been collected to obtain best possible time series. Occasionally ling (*Molva molva*) and/or tusk (*Brosme brosme*) are collected to investigate conditions in deeper waters.

If possible, the 25 individuals were sampled with five individuals within each of the five length classes (Table 1). The fish are either prepared in the field and the samples are stored frozen until analysis or the fish is frozen directly and later prepared at NIVA.

***Table 1.*** *Target length groups for sampling of cod, ling, tusk and flatfish.*

| Size-class | Cod, ling, tusk (mm) | Flatfish (mm) |
|---|---|---|
| **1** | 370-420 | 300-320 |
| **2** | 420-475 | 320-340 |
| **3** | 475-540 | 340-365 |
| **4** | 540-615 | 365-390 |
| **5** | 615-700 | 390-420 |

**Cod**
The cod were generally sampled from September 1st to Desember 9th 2008. All the cod were sampled by local fishermen except for the cod in the Inner Oslofjord (st. 30B) that NIVA collected by trawling (F/F Trygve Braarud, University of Oslo) in November 13th 2008.

**Flatfish**
Dab were collected in the period from November 1st 2008 to January 10th 2009, flounder were sampled from September 25th 2008 to February 1st 2009, plaice were collected from September 1st to December 1st 2008 and megrim were sampled between September 25th 2008 to February 1st 2009. All flatfish were sampled by local fishermen.

**Deep water fish**
Ling (*Molva molva*) and/or tusk (*Brosme brosme*) were collected to investigate conditions in deeper waters. The deep water fish were sampled by local fishermen from October 1st 2008 to March 1st 2009.

**Prawn**
Concentrations of hazardous substances have periodically been investigated in prawn (*Pandalus borealis*) using 150 individuals that have been frozen directly after catch. The prawns in the Oslofjord (st. 36C and st. 30C) were sampled by NIVA by trawling (F/F Trygve Braarud, University of Oslo) in November 12th and 13th 2008, while prawns at the other three stations were collected by local fishermen. The prawns were samples from November 1st 2008 to January 13th 2009.

**Dogwhelk**
Effects (imposex) and concentrations of organotin in dogwhelk (*Nucella lapillus*) were investigated using 50 individuals from each station. Individuals were kept alive in a refrigerator (at + 4 °C) until the effects (imposex) were measured as soon as possible after collection. All dogwhelk were sampled by NIVA except for the dogwhelk collected in Lofoten and the Varangerfjord. The dogwhelk samples were collected from September 5th to November 19th 2008.

TBT-induced development of male sex-characters in females, known as imposex. Imposex was quantified by the Vas Deferens Sequence Index (VDSI) analysed according to OSPAR-CEMP guidelines. The VDSI ranges from zero (no effect) to six (maximum effect) (Gibbs et al. 1987). Detailed information about the chemical analyses of the animals is given in Følsvik et al. (1999).

**Sediments**
Sediments were sampled by a double Gemini corer (10 cm inner diameter) and a 0,1 $m^2$ van Veen grab when the corer did not get good samples. The surface sediment layer (between 0 and 2 cm) was cut off. The sediments were sampled through the inspection opening on the top of the grab. Two parallels were taken from each sediment station. All sediments were sampled by NIVA from May 26th to November 13th 2008.

## 3.2. Chemical variables

Hazardous substances have been analysed in sediment and different species tissues (Table 2).

***Table 2**. Number of stations (see Appendix F and Appendix G) and indicator media used in CEMP. Indicator media include: sediments, selected tissues from blue mussel, dogwhelk, Atlantic cod and flatfish species. (See Appendix C for description of chemical codes.)*

| Description | Sediments | Blue mussel, soft body | Dog-whelk, soft body | Atlantic cod bile | Atlantic cod blood | Atlantic cod liver | Atlantic cod fillet | Flatfish liver | Flatfish fillet |
|---|---|---|---|---|---|---|---|---|---|
| Cd, Cu, Pb, Zn | 5 | 30 | | | | 11 | | 10 | |
| Hg | 5 | 32 | | | | | 11 | | 10 |
| TBT [1)] | 5 | 12 | 8 | | | 11 [7)] | | 10 | |
| PCBs [2)] | 5 | 29 | | | | 11 | 11 | 10 | 10 |
| HCB | 5 | 32 | | | | 11 | 11 | 10 | 10 |
| DDT, DDE, DDD | 5 | 32 | | | | 11 | 11 | 10 | 10 |
| α-, γ-HCH | 5 | 42 | | | | 11 | 11 | 10 | 10 |
| Dioxins [3)] | | 7 | | | | | | | |
| PBDE [4)] | | | | | | 3 [7)] | | | |
| PFC [5)] | | | | | | 3 [7)] | | | |
| PAHs [6)] | 5 | 10 | | | | | | | |
| Biological effects methods [7)] | | | Imposex | OH-pyrene [7)] | ALA-D [7)] | EROD-activity, CYP1A [7)] | | | |

1) Includes: DBTIN, DPTIN, MBTIN, MPTIN, TBTIN, TPTIN
2) Includes the congeners: CB-28,-52,-101,-105,-118,-138,-153,-156,-180, 209, 5-CB, OCS and, when dioxins are analysed, the non-orto-PCBs, i.e. CB-77, -81, -126, -169
3) Includes: CDD1N, CDD4X, CDD6P, CDD6X, CDD9X, CDDO, CDF2N, CDF2T, CDF4X, CDF6P, CDF6X, CDF9P, CDF9X, CDFDN, CDFDX, CDFO,TCDD
4) Polybrominated diphenyl ethers (PBDE), including brominated flame retardants and includes: BDE28, BDE47, BDE49, BDE66, BDE71, BDE77, BDE85, BDE99, BDE100, BDE119, BDE138, BDE153, BDE154, BDE183, BDE205 (and for some samples BDE196 and BDE209)
5) Includes: PFNA, PFOA, PFHpA, PFHxA, PFOS, PFBS, PFOSA
6) Includes (with NPDs): ACNE, ACNLE, ANT, BAP, BBJF, BEP, BGHIP, BKF. BAA. CHR, DBA3A, DBT, DBTC1, DBTC2, DBTC3, FLE, FLU, ICDP, NAP, NAPC1, NAPC2, NAPC3, PA, PAC1, PAC2, PAC3, PER, PYR.
7) Cod only

***Table 3.*** *Overview of method of analyses (See Appendix C for description of chemical codes).*

| Medium analysed | Basis | Detection limit. | Methods | Sample descrip. |
|---|---|---|---|---|
| **Biota** | w.w. | µg/kg | | |
| Mercury (Hg) | w.w. | 5 | NS-EN 1483 + NIVA's accredited method E4-3 | bulk or individual |
| Cadmium (Cd) | w.w. | 100 | NIVA's accredited method E10-4 and E8-3 | bulk or individual |
| Lead (Pb) | w.w. | 1000 | NIVA's accredited method E10-4 and E8-3 | bulk or individual |
| Copper (Cu) | w.w. | 200 | NIVA's accredited method E10-4 and E8-3 | bulk or individual |
| Zinc (Zn) | w.w. | 150 | NIVA's accredited method E10-4 and E8-3 | bulk or individual |
| Arsenic (As) | w.w. | 2000 | NIVA's accredited method E10-4 and E8-3 | bulk or individual |
| Barium (Ba) | w.w. | 100 | NIVA's accredited method E10-4 and E8-3 | bulk or individual |
| Cobalt (Co) | w.w. | 200 | NIVA's accredited method E10-4 and E8-3 | bulk or individual |
| Chromium (Cr) | w.w. | 200 | NIVA's accredited method E10-4 and E8-3 or E9-5 | bulk or individual |
| Nickel (Ni) | w.w. | 400 | NIVA's accredited method E10-4 and E8-3 | bulk or individual |
| Vanadium (V) | w.w. | 100 | NIVA's accredited method E10-4 and E8-3 | bulk or individual |
| Persitent organic pollutants [1)] | w.w. | 0.05-0.1 | NIVA's accredited method H3-4 | bulk or individual |
| PAH [2)] | w.w. | 0.2-0.5 | NIVA's accredited method H2-4 | bulk or individual |
| TBT and others [3)] | w.w. | 0.2-2 | NIVA's method H14-2 | bulk |
| PBDE [4)] | w.w. | 0.01-0.03 | | |
| HBCD (and BDE209) | w.w. | | | |
| PFCs: [5)] | w.w. | | | |
| Dioxsins:[6)] | w.w. | 0.0001-0.00002 | NILU's method | bulk |
| OH-pyrene[7)] | | | NIVA's method | Ind. samples of cod bile |
| Dry matter | | | NIVA's accredited method B3 | bulk or individual |
| **Sediment** | | | | |
| Mercury (Hg) | d.w | 5 | NS-EN 1483 + NIVA's accredited method E4-3 | single slices |
| Cadmium (Cd) | d.w. | 1500 | NIVA's accredited method E10-2 and E9-5 | single slices |
| Lead (Pb) | d.w. | 1000 | NIVA's accredited method E10-2 and E9-5 | single slices |
| Copper (Cu) | d.w. | 1000 | NIVA's accredited method E10-2 and E9-5 | single slices |
| Zinc (Zn) | d.w. | 5000 | NIVA's accredited method E10-2 and E9-5 | single slices |
| Arsenic (As) | d.w. | 15000 | NIVA's accredited method E10-2 and E9-5 | single slices |
| Barium (Ba) | d.w. | 5000 | NIVA's accredited method E10-2 and E9-5 | single slices |
| Cobalt (Co) | d.w. | 1500 | NIVA's accredited method E10-2 and E9-5 | single slices |
| Chromium (Cr) | d.w. | 1500 | NIVA's accredited method E10-2 and E9-5 | single slices |
| Nickel (Ni) | d.w. | 2000 | NIVA's accredited method E10-2 and E9-5 | single slices |
| Maganese (Mn) | d.w. | 250 | NIVA's accredited method E10-2 and E9-5 | single slices |
| Aluminium (Al) | d.w. | 10000 | NIVA's accredited method E10-2 and E9-5 | single slices |
| Persistent organic pollutants [1)] | d.w. | 0.5 | NIVA's accredited method H3-3 | single slices |
| PAH [2)] | d.w. | 1 | NIVA's accredited method H2-3 | single slices |
| TBT [3)] | d.w. | 1 | NIVA's method H14-1 | single slices |
| Total nitrogen (TN) | | | NIVA's accredited method G6 | single slices |
| Total organic carbon (TOC) | d.w. | 1 | NIVA's accredited method G6 | single slices |
| Grain size (KF) | | | NIVA method H19, after ICES | single slices |
| **Water** | | | | |
| Suspended material (SPM) | | | NVIA's accredited method B4, after NS 4733 (modified) | 1 litre sample |
| **Biological Effect Methods (BEM)** | | | | |
| EROD [7)] | | | NIVA-internal method, after ICES (TIMES no. 13) | Ind. fish liver samples |
| CYP1A (when EROD is analysed)[7)] | | | NIVA-internal method, after ICES (TIMES no. 23) | Ind. fish liver samples |
| ALA-D[7)] | | | NIVA internal method, after ICES-TIMES (in press) | Ind. fish blood samples |
| **Other analyses** | | | | |
| Age determination | | | Otolith | Individual fish |
| IMPOSEX | | | NIVA-internal method, after ICES (TIMES no. 24) | One station with ca. 60 ind. |

1) Includes the congeners: CB-28,-52,-101,-105,-118,-138,-153,-156,-180, 209, 5-CB, OCS and, when dioxins are analysed, the non-orto-PCBs, i.e. CB-77, -81, -126, -169, see parameter group OC-CB, OC-DD, OC-CL, in Appendix C.
2) Polycydlic aromatic hydrocarbons and includes (with NPDs): ACNE, ACNLE, ANT, BAP, BBJF, BEP, BGHIP, BKF. BAA. CHR, DBA3A, DBT, DBTC1, DBTC2, DBTC3, FLE, FLU, ICDP, NAP, NAPC1, NAPC2, NAPC3, PA, PAC1, PAC2, PAC3, PER, PYR.
3) Includes the mono-, di- and tri forms of both butyltin and phenyltin, see parameter group O-MET in Appendix C.
4) Polybrominated diphenyl ethers (PBDE), and includes: BDE28, BDE47, BDE49, BDE66, BDE71, BDE77, BDE85, BDE99, BDE100, BDE119, BDE138, BDE153, BDE154, BDE183, BDE205 (and for some samples BDE196 and BDE209), see parameter group OC-BB in Appendix C.
5) Perfluorinated alkylated substances and includes PFOS, see parameter group PFAS in Appendix C.
6) Includes a number of dibenzodioxins and dibenzo furans, see parameter group OC-DX in Appendix C.
7) Cod only

Several laboratories have been used since 1981 (cf. Green et al. 2008a). However, in general chemical analyses have been done at NIVA. One major exception has been analyses of dioxins carried out by the Norwegian Institute for Air Research (NILU). A brief description of the analytical methods used follows (from Green et al. 2008a) below.

Metals were analysed at NIVA. Before 2002, these were done using Atomic Absorption Spectrometry (AAS). Biota samples were extracted using nitric acid. Sediment samples were extracted using 'Total' digestion with mineral acids including hydrofluoric acid (HF). Concentrations are determined either by Flame AAS (FAAS, for high concentrations) or Graphite furnace AAS (GAAS, for low concentrations). GAAS was always used for zinc and often for copper determinations. Since 2002, metals have been determined using Inductively Coupled Plasma Mass Spectrometry (ICP-MS), except for chromium, which was determined using GAAS or ICP-Atomic Emission Spectroscopy (ICP-AES). Mercury (total) has been analysed using Cold-Vapour AAS (CVAAS).

Polychlorinated biphenyls (PCB) and other chlororganic hazardous substances in biota were analysed at Foundation for Scientific and Industrial Research at the Norwegian Institute of Technology – SINTEF or NIVA. Both laboratories have used gas chromatograph, with capillary column, (GC) and an electron capture detector (ECD). Fat content was extracted using a mixture of cyclohexane and acetone on the target tissue. Among the individual PCBs quantified, seven (ΣPCB-7) are commonly used for interpretation of the results[1] (Table 4).

***Table 4.*** *Suggested PCB-congeners which are to be quantified in biota (ICES 1986).*

| IUPAC/CB no. | Structure |
|---|---|
| 28 | 2 4 - 4' |
| 52 | 2 5 - 2'5' |
| 101 | 2 4 5 - 2'5' |
| 118 | 2 4 5 - 3'4' |
| 138 | 2 3 4 - 2'4'5' |
| 153 | 2 4 5 - 2'4'5' |
| 180 | 2 3 4 5 - 2'4'5' |

Polycyclic aromatic hydrocarbons (PAH) have been analysed at NIVA using a GC coupled to a Mass-selective detector (MSD). The individual PAHs are distinguished by the retention time and/or significant ions. All seven potentially carcinogen PAHs (IARC 1987) are included in the list of single components determined to constitute the total concentration of PAH.

Organic tin compounds have been analysed at NIVA except for the years 2001-2002 when GALAB (Germany) and Eurofins (Denmark) did the analyses. Analyses at NIVA were done using a GC-MSD in Selected Ion Monitoring mode (SIM). The other laboratories used a GC equipped with Atomic Emission Detector (AED), a method comparable to NIVA's.

Analyses of polybrominated diphenylether (PBDE) have been done at NIVA. Determinations are made on the fat content of the target tissue using a GC-MSD-SIM. Some alterations were needed to analyse BDE196 and BDE209 *inter alia* with respect to the temperature programme and steps taken to reduce the samples exposure to light.

Perfluorinated compounds (PFC) are determined using liquid-chromatography coupled to tandem MS (LC/MS/MS) operated in negative electro-spray-ionisation (ESI) mode using multiple reaction monitoring.

For fish, the target tissues are; liver and fillet for hazardous substance and liver; blood and bile for the biological effects methods (BEM) (cf. Table 2). The fish fillet are analysed for the mercury and PCB content. In addition, the age, sex, and visual pathological state for each individual are determined. Other measurements include: fish weight and length, weight of liver, liver dry weight and fat content

[1] Several marine conventions (e.g. OSPAR and HELCOM[1]) use ΣPCB-7 to provide a common basis for PCB assessment.

(% total extractable fat), the fillet dry weight and its % fat content. These measurements are stored in the database and published periodically (e.g. Shi et al. 2008).

The mussel are analysed for all contaminants including organotin. The shell length of each mussel is measured. On a bulk basis the total shell weight, total soft tissue weight, dry weight and % fat content is measured.

The dogwhelk are analysed for all organotin compounds and biological effects (imposex[1]).

## 3.3. Biological-effect analyses

There are currently five BEM applied on an annual basis. Each method is more or less specific on various contaminants. An overview of the methods, tissues sampled and contaminant specificity is shown in Table 5. One of the major benefits of biological effects methods (BEM) used at the individual level (biomarkers) is the feasibility of integrating biological and chemical methods, as both analyses are done on the same individual.

BEM-sampling requires that the target fish are kept alive until just prior to sampling in the field by trained personnel. Immediately after the fish are rendered unconscious samples are collected and stored in liquid nitrogen. OH-pyrene analyses can also be done on bile samples stored at -20°C.

***Table 5.*** *The relevant contaminant-specific biological effects methods applied on an annual basis.*

| Code | Name | Tissue sampled | Specificity |
|---|---|---|---|
| OH-pyrene | Pyrene metabolite | fish bile | PAH |
| ALA-D | δ-aminolevulinic acid dehydrase inhibition | fish red blood cells | Pb |
| EROD-activity | Cytochrome P4501A-activity (CYP1A/P4501A1, EROD) | fish liver | planar PCB/PCNs, PAHs, dioxins |
| CYP1A | Relative amount of cytochrome P450 1A-protein | fish liver | Supporting parameter for EROD-activity |
| TBT | Imposex/Intersex | snail soft tissue | organotin |

## 3.4. Information on Quality Assurance

NIVA has participated in all the QUASIMEME international intercalibration exercises relevant to chemical and imposex analyses. For chemical analyses, these include Round 52 of January-April 2009 which would apply to the 2008 samples. These QUASIMEME exercises have included nearly all the contaminants as well as imposex analysed in this programme. Quality assurance programme for NIVA is similar to the 2007 programme (cf. Green et al. 2008b). In addition, NIVA was accredited in 1993 and since 2001 accredited in accordance with the NS-EN ISO/IEC 17025 standard by the Norwegian Accreditation (reference P009). A summary of the quality assurance programme at NIVA is given in Appendix B.

NIVA participated in the QUASIMEME Laboratory Performance Studies "Exercise 801-Round 53 Imposex in Marine Snails BE1" in June 2008. Measures were taken of shell height, penis-length-male, penis-length-female, average-shell-length and female-male-ratio. NIVA got the score satisfactory (which is the top score ranked after the following system: Satisfactory, Questionable, Unsatisfactory, Consistent, Inconsistent and Blanc). VDSI (imposex stage values of all females sampled/number of females) was 1.545 compared to lab average 1.821. NIVA got satisfactory on all measured parameters in 2008.

In addition to these QUASIMEME exercises, certified reference materials (CRM) are also analysed routinely with the CEMP samples. It should be noted that for biota the type of tissue used in the

[1] Vas Deferens Stage Index

CRMs do not always match the target tissue for analyses. Uncertain values identified by the analytical laboratory or the reporting institute are flagged in the database. The results are also "screened" during the import to the database at NIVA and ICES.

## 3.5. INDEX - Pollution and reference indices

The Climate and Pollution Agency (Klif) is interested in obtaining a small group of indices to assess the quality of the environment with respect to contaminants. The target medium indices may vary depending on the purpose, though sediment, cod and mussel are considered to be the most likely choices. The blue mussel have been selected as the target medium since 1995 (Appendix M) mainly because it is widely distributed and more practical to sample. The index for the blue mussel is based on the levels and trends of contaminants in the organism collected annually. Since 1995, 10 of the more contaminated fjords in Norway (Walday et al. 1995) have been used as a basis for Pollution Index. Analyses are selected for substances that are presumed most relevant for the fjord chosen. Another set of blue mussel stations remote from known point sources were sampled to assess a Reference Index. These stations were located along the entire coast of Norway. Reference stations are important for the assessment of contaminated fjords (cf. Green 1987b), and are of national and international interest. A general suite of chemicals are analysed at these stations. Some CEMP results could be used to calculate these indices and it was practical to organize sampling within CEMP.

The Index scale varies from 1 to 5. Based on the analyses each station is classified according to Klif's classification system. Each area or fjord is given an index number according to the station with highest classification, e.g. if one station within an area is classified as Class V, the area is classified as index 5. Index 1 means that all stations within an area are insignificantly polluted (Class I in Klif's classification system). The Pollution (or the Reference) Index is the average of the index numbers from each area and fjords. An Index value between 4 and 5 would be between severe and extreme (Class IV and V) in the Klif system. A value between 3 and 4 would be between marked and severe (Class III and IV). A value between 2 and 3 would be between moderate and marked (Class II and III). A value between 1 and 2 would be between insignificant and moderate (Class I and II).

The use of the indices to assess the general level of pollution in contaminated or reference areas of coastal water for the period 1995 to 1999 has been reviewed by Green & Knutzen (2001). The conclusions were mainly that the sample and analytical strategies lacked adequate coverage of the relevant contaminants and geographical areas. There have been several cases where mussels have not been found at a particular station in the Grenland fjords area, Inner Sunndalsfjord and Inner Ranfjord. The "pollution" index is particularly sensitive to stations closest to sources of pollution. To reduce random fluctuations in the index due to incomplete sampling an additional station was added to each of these fjord areas. Furthermore, additional relevant chemical analyses were added. The affect of these adjustments was investigated in 2002 and 2003.

Some slight adjustments in the selection of stations, analyses and calculation procedures of the indices have been described in Green et al. (2004a, b). A detailed discussion of calculation of the Pollution Index has been given in Walday et al. (1995). It should be noted that the supplementary blue mussel stations monitored explicitly for indices, utilized 3 pooled samples of 20 individuals and no depuration procedures have been applied. The relevant contaminants for each of the Pollution Index fjords are summarized in Appendix M. Two to five stations were sampled from each area. One to three stations are sampled from selected areas for the determination of the Reference Index. Some samples were also analysed for PAHs, TBT and dioxins.

Concentrations were classified according to Klif's classification system for contaminants in the marine environment (Molvær et al. 1997, Appendix D). The lowest Index value is 1 and means that all median values were in Class I (insignificantly contaminated). The highest Index value is 5 and means that all median values were in Class V (extremely contaminated).

The results for 2008 have been reported based on investigations in nine fjords for the Pollution Index and 4 fjord/areas for the Reference Index (Green et al. 2008b).

## 3.6. Overconcentrations and classification of environmental quality

Classifications used in earlier CEMP-reports are based on the Climate and Pollution agency environmental classification system (Molvær et al. 1997). The revised classification system (Bakke et al. 2007c) are used for sediments. Focus is on the principle cases where median concentrations exceeded the upper limit to Class I in the Climate and Pollution Agency's (Klif's) environmental quality classification system (cf. Molvær et al. 1997). The relevant extract from the system is shown in Appendix D, and includes unofficial conversion to other bases. The system has five classes from Class I, insignificantly polluted, to Class V, extremely polluted. However, the system does not cover all the contaminants in indicator species-tissues used in CEMP. To assess concentrations not included in the system provisional high background values were used (cf. Appendix D). The factor by which concentrations exceeded high background is termed overconcentration. High background concentration corresponds to the upper limit to Class I; insignificantly polluted, which in this context has no statistical implications.

The median concentrations are assessed according to the Klif system, but where this is not possible overconcentrations are used. The term “significant” refers to the results of a statistical analysis of linear trends and can be found in the tables in Appendix J or figures in Appendix K. It should be noted that there is in general a need for periodic 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 over the years may not correspond.

Recommendations for changes to Class I (cf. Knutzen & Green 2001b, Green & Knutzen 2003) have been taken into account in this report. Revisions to corresponding Classes II-V have not been done, Klif is considering these recommendations in a current review of their classification system.

No attempt has been made to compensate for differences in size groups or number of individuals of blue mussel or fish. The exception was with mercury in fish fillet where six data sets in both cod and flatfish in this study showed significant differences between “small” and “large” fish (Appendix J). With respect to blue mussel, 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 Safety Authority (SNT) is responsible for official commentary as to possible health risk due to consumption of seafood. Hence, the results of the CEMP pertaining to this purpose are presented only as a partial basis for evaluation.

The results can also be useful as part of the implementation of The Water Framework Directive (WFD) (2000/60/EC) ratified by Norway in 2009, and the Marine Strategy Directive (MSFD) (2008/56/EC), which by early 2010 has not yet been ratified by Norway. These two directives together concern all waters out to territorial borders. They are the main policies at the EU level designed to achieve good "ecological" (WFD) or "environmental" (MSFD) status, herein termed GES, in the European marine environment, by the year 2015 (2021 for Norway) and 2020 at the latest, respectively. The directives also set out to ensure the continued protection and preservation of the environment and the prevention of deterioration. The Norwegian framework regulation on water management (the Water Regulation) was adopted on December 15$^{th}$ 2006, and incorporates the WFD into Norwegian law. The Environmental Quality Standards (EQS) for 33 priority substances or groups of substances have been outlined in the EQS Directive (EQSD) (2008/105/EC). Several of these substances are monitored by CEMP. The EQS apply to concentrations in water, and for three substances (mercury, hexachlorobenzene (HCB) and hexachlrorbutadiene (HCBD)) in “prey tissue” There is also a provision which allows a country to use other EQS in sediment and biota provided these offer the same level of protection as the EQS for set for water. It should be noted that application of the EQS in set for “prey tissue” is in conflict with the best class in the Climate and Pollution Agency system for classification of environmental quality; e.g. lower than the Class I for mercury and higher for Class V for HCB in blue mussel (Table 6). This has not been resolved and for this report only the Klif system will be used.

***Table 6.*** *The Water Framework Directive (WFD) Environmental Quality Standards for "prey tissue" (cf. Environmental Quality Standard Directive – 2008/105/EC) and the Class I and V (upper limit to insignificant and extreme degree of pollution, respectively) in the Klif environmental classification system (Molvær et al. 1997). Concentrations in µg/kg wet weight.*

| Media | Class | Mercury | Hexachlorobenzene (HCB) | Hexachlorobutadiene (HCBD) |
|---|---|---|---|---|
| "Prey tissue" | | 20 | 10 | 55 |
| Blue mussel | Class I [1)] | 40 | 0.1 | - |
| | Class V [1)] | 40000 | 5 | - |
| Cod liver | Class I | - | 20 | - |
| | Class V | - | 40 | - |
| Cod fillet | Class I | 100 | 0.2 | - |
| | Class V | 1000 | 5 | - |

1) Conversion assuming 20% dry weight

## 3.7. 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). 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 I. The results are presented in a type as shown in Figure 2.

A Loess smoother is based on a running seven-year interval, a non-parametric curve fitted to median log-concentrations (Nicholson et al. 1991, 1994 and 1997 with revisions noted by Fryer & Nicholson 1999). 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). No transformation was applied to the imposex (VSDI) data.

The smoothed median for the last three sampling years is linearly projected for the next three years to assess the likelihood of overconcentrations (not shown in figures).

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 by 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 mussel from Grenland fjords area (Figure 2).

The statistical analysis was carried out on temporal trend data series for cadmium, mercury, lead, ΣPCB-7 (sum of congeners: 28, 52, 101, 118, 138, 153, 180), ppDDE (ICES code DDEPP), HCB, non-dicyclic PAHs, sum carcinogenic PAHs, B[a]P, TBT, and the biological effects parameters imposex (VSDI), OH-pyrene, ALA-D and EROD-activity.

**A**


**B**

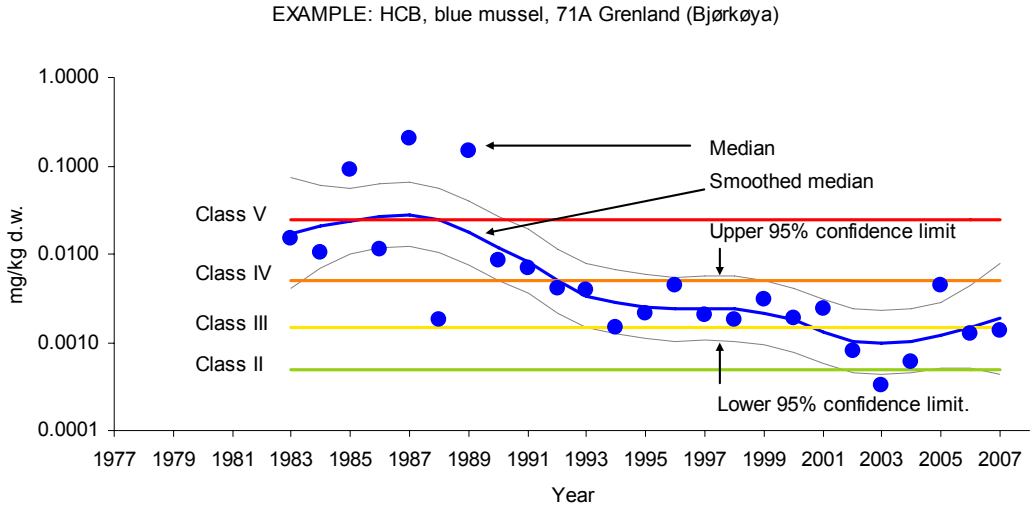



***Figure 2.*** *Example time trend with map (**A**) with arrows or circles to indicate upward/downward trend or circles if no trend. The symbols are coloured blue if the sample for the last year in the time series was insignificantly polluted (Class I in Klif's environmental classification system or lacking this, below the upper limit to the provisional "high background") or orange if it was not (i.e. in Class II moderately polluted or worse). The symbol is grey if the limit is lacking. The detail of a time series (**B**) indicates the median concentrations, running mean of median values (Loess smoother), 95 % confidence intervals. The horizontal lines indicate the lower boundaries to Klif classes of pollution: Class II (moderate=upper boundary to Class I (insignificant)), III (marked), IV (severe) and V (extreme), or alternatively the Class II boundary is replaced by the upper boundary to provisional "high background level" as in which case no class-boundaries are shown. (see text and refer to Appendix D).*

# 4. Results and discussion

## 4.1. General information on measurements

The stations and number of samples relevant to the 2008 investigations are noted in the tables in Appendix G. Samples were collected from the border to Sweden in the south to the border to Russia in the north (cf. Appendix H). There were performed time trend analyses on a selection of representative contaminants and totalled 890 data series (cf. Appendix J). The focus of the overview presented below is on these time series that included results from 2008, of which 228 (89 %) were downwards and 28 were upwards. The priorities of the results were systematized in order of overconcentrations (>Class I, insignificantly polluted, acceptable/background levels) in combination with significant upward trends, no trends or downward trends. Then results with no overconcentrations in combination with significant upward trends or downward trends were remarked. Overview table that shows trends, classification and median concentrations is presented in Table 8.

## 4.2. National levels and trends

An overview of all the results is presented in Table 8.

### Cod

There were sampled Cod (*Gadus morhua*) at 11 stations along the Norwegian coast (Appendix G and maps in Appendix H).

### Flatfish

There were collected flatfish at 10 stations along the Norwegian coast (Appendix G and maps in Appendix H). The flatfish species were dab (*Limanda limanda*), flounder (*Platichthys flesus*), plaice (*Pleuronectes platessa*) and megrim (*Lepidorhombus wiffiagonis*) (Appendix G and maps in Appendix H).

### Blue mussel

Blue mussel (*Mytilus edulis*) were sampled at 51 stations (including supplementary stations for Index and TBT) located along the coast of Norway (Appendix G and maps in Appendix H). The Index Programme in Norway started in 1995 and is a set of key contaminants monitored in blue mussel from selected fjords with historical discharges of contaminants. The indexes from the contaminated areas ("Pollution Index") are related to corresponding measurements at reference sites ("Reference Index"). In total, a number of 26 pollution and 8 reference site stations in all five fjords are covered by the monitoring programme.

Locations of stations, and trends and median concentrations for a selection of the stations are shown in Figure 4 to 23. The stations selected for the figures of trends and median concentrations were chosen to show highly polluted stations and reference stations distributed along the Norwegian coast.

### Dogwhelk

Concentrations and effects of organotin in dogwhelk (*Nucella lapillus*) were quantified at 8 stations located along the coast of Norway (Appendix G and maps in Appendix H).

### Mercury (Hg)

#### Cod fillet

The median concentration of Hg in cod fillet exceeded acceptable/background levels (overconcentrations, > Class I, insignificantly polluted) at 4 of 11 cod stations analysed (all Class II, moderately polluted). In addition of overconcentrations, a significant upward trend was found at the Inner Oslofjord (st. 30B) and Karihavet area (st. 23B) on the West coast, and no significant trends were found in the Færder area (st. 36B) or in the Inner Sørfjord (st. 53B) (Figure 3). Cod in the

Strandebarm area (st. 67B) and in the Varangerfjord (st. 10B) had a median acceptable level of Hg (Class I) and a significant downward trend in cod fillet. Cod from Ullerø area (st. 15B), Bjørnerøya (st. 98B1) and Stokkken area (st. 92B) had also a median acceptable level of Hg (Class I) but no significant trends.

**Flounder fillet**
Three flounder stations were analysed for Hg in fillet and only flounder in the Inner Sørfjord (st. 53F) showed median overconcentration and had a significant upward trend. The two other stations in Sande (st. 33F) and Strandebarm area (st. 67F) had a median acceptable level of Hg and the flounder in Strandebarm showed no trend while the flounder in the Sande area showed a significant downward trend.

**Dab fillet**
Three stations were analysed for Hg in dab fillet; Færder area (st. 36F), Ullerø area (st. 15F) and Borøy area (st. 77F). Only the station in Ullerø area (st. 15F) exceeded median overconcentration and there was a significant upward trend. Dab in the Færder area (st. 36F) showed no significant trend. No trend could bee calculated at Borøy area (st. 77F) because of only one year of measurements.

**Plaice fillet**
The presence of Hg in plaice fillet showed no median overconcentrations in neither of the two plaice stations analysed, and no trends were found at Husholmen (st. 98F2) or in Lofoten and Skogerøy (st. 10F) in the Varangerfjord.

**Megrim fillet**
Two megrim stations on the West coast were analysed for Hg in megrim fillet. The station in the Strandebarm area (st. 67F) in the Hardangerfjord showed a significant downward trend while the megrim in the Åkrafjord (st. 21F) had no significant trend.

**Blue mussel**
The presence of Hg in blue mussel exceeded acceptable median levels (overconcentrations, > Class I, insignificantly polluted) at 8 of 42 blue mussel stations analysed (all Class II, moderately polluted) (an overview of all the results are presented in Table 8 and a graphical presentation of results from some of the stations is shown in Figure 4). In addition to overconcentrations, a significant upward trend was found at Bølsnes (st. I205) but no significant trends were found at Byrkjenes (st. 51A), West of Damholmen (st. I022), Kirkøy (st. I024), Gjemesholmen (st. I712) or Ekkjegrunn (st. I201). There was a significant downward trend found at Kvalnes (st. 56A). In blue mussel that had an acceptable median level of Hg (Class I), a significant upward trend was found at Akershuskaia (st. I301), Solbergstrand (st. 31A) and Espevær (st. 22A). A significant downward trend was found at Bjørkøya (st. 71A), Eitrheimsneset (st. 52A), Krossanes (st. 57A) and Skallneset (st. 10A2).

**Concluding remarks**
Trend analyses of Hg showed overconcentrations and upward trends for cod fillet in the Inner Oslofjord and Karihavet, for flounder fillet in the Saudafjord and Inner Sørfjord, for dab in the Ullerø area and for blue mussel in the Saudafjord. The fillet of cod from the Inner Sørfjord was moderately polluted with Hg but no trend was observed.

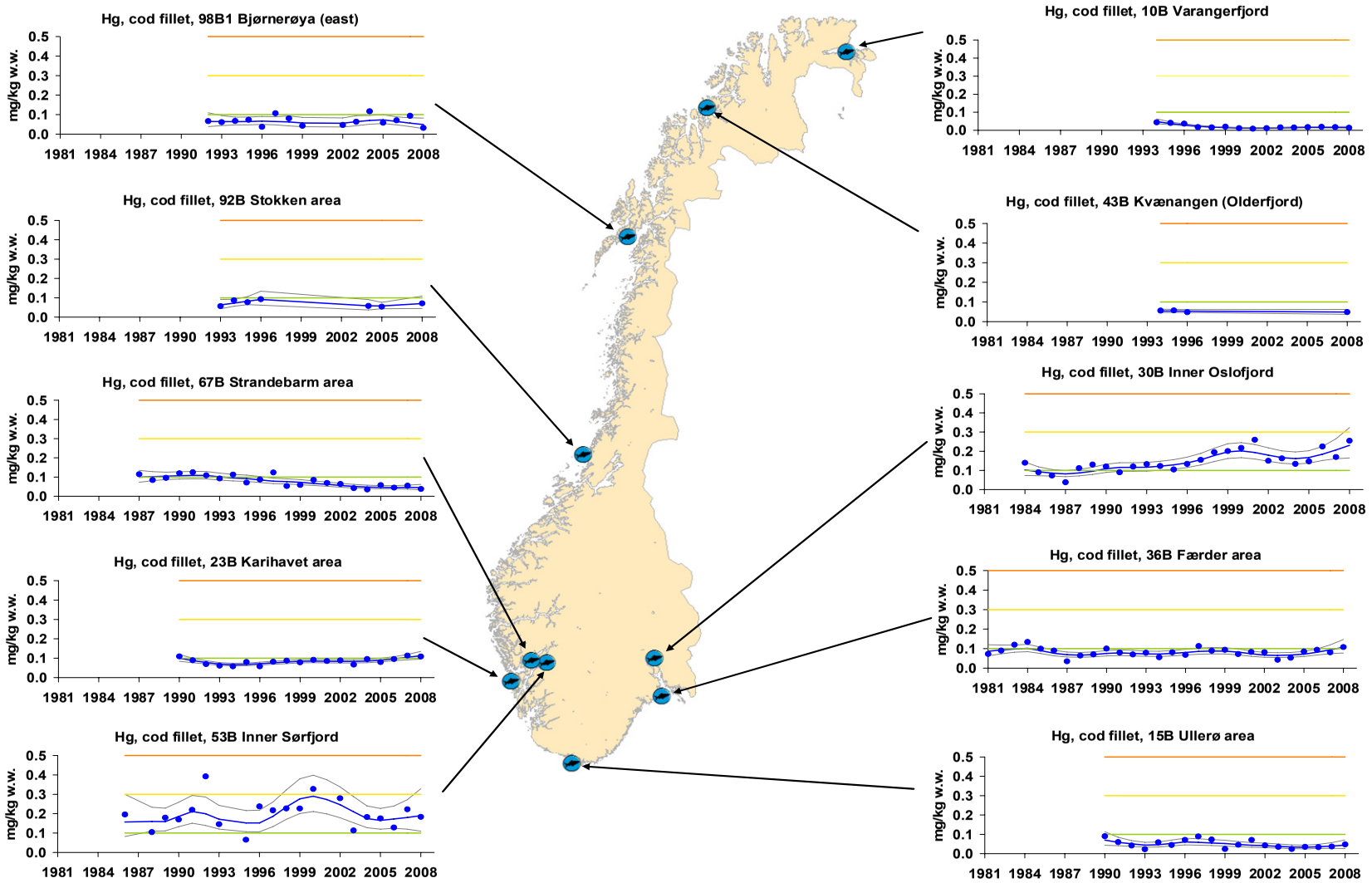



***Figure 3.*** *Trend and median concentration of Hg in cod fillet, mg/kg (mg Hg/kg) wet weight (see key to detail in Figure 2).*

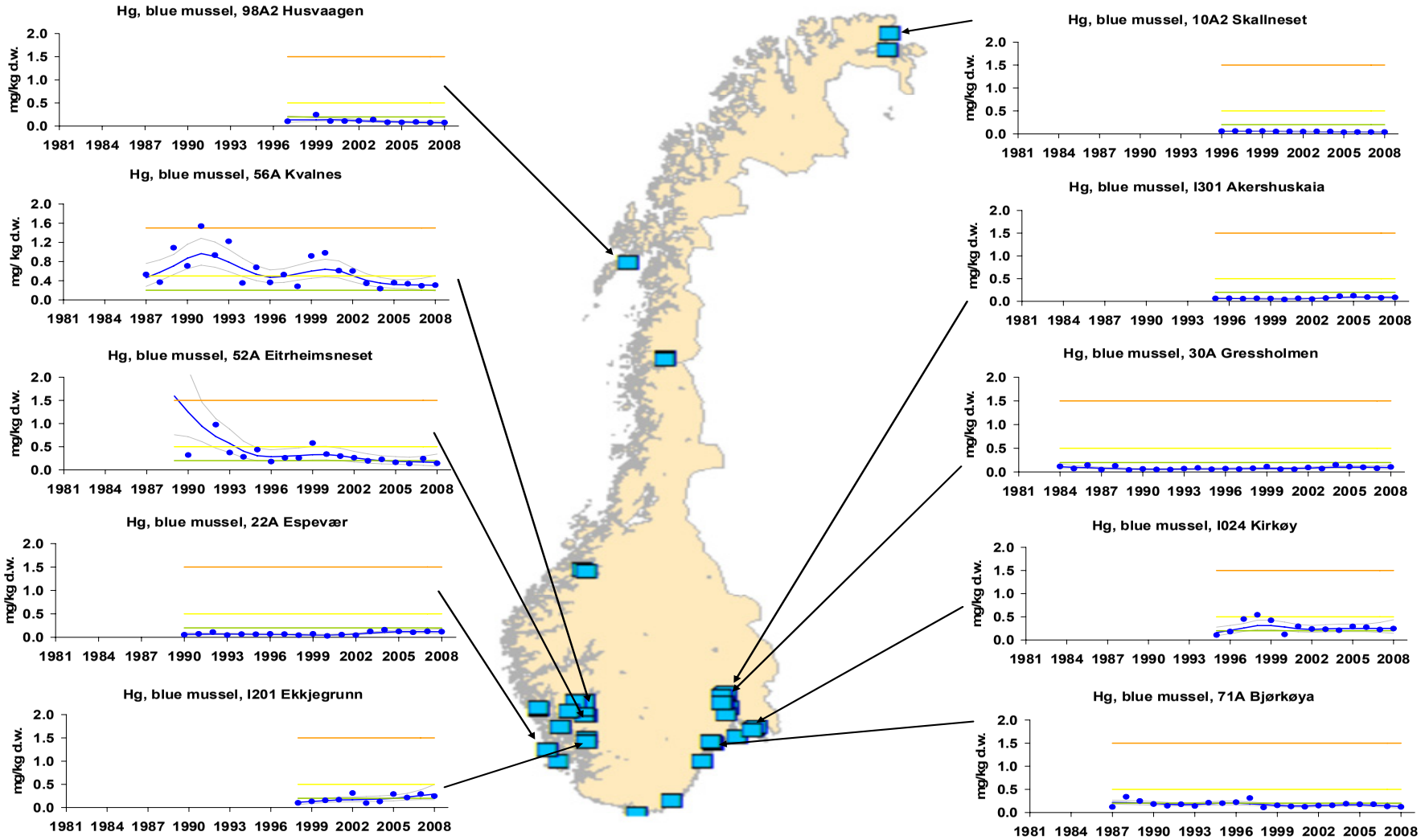



***Figure 4.*** *Trend and median concentration of Hg in blue mussel, mg/kg (mg Hg/kg) dry weight for selected stations (cf. Table 8) (see key to detail in Figure 2).*

## Cadmium (Cd)

An overview of all the results is presented in Table 8.

**Cod liver**
The median concentration of Cd in cod liver exceeded overconcentrations at 2 of 11 cod stations analysed. A significant upward trend was also observed at these two stations, one in the Inner Oslofjord (st. 30B) and the second in the Inner Sørfjord (st. 53B) (Figure 5). Three cod stations had no overconcentration of Cd and a significant downward trend; the Færder area (st. 36B), the Strandebarm area in the Hardangerfjord (st. 67B) and in the Varangerfjord (st. 10B).

**Flounder liver**
Three flounder stations were analysed for Cd in liver and only the flounders in the Inner Sørfjord (st. 53F) showed median overconcentration but no significant trend. The two other stations in Sande (st. 33F) and Strandebarm area (st. 67F) had no median overconcentration of Cd and a significant downward trend.

**Dab liver**
Three stations were analysed for Cd in dab liver; Færder area (st. 36F), Ullerø area (st. 15F) and Borøy area (st. 77F). No overconcentrations were observed and no significant trends were found at Færder area (st. 36F) and Ullerø area (st. 15F). No trend could be calculated at Borøy area (st. 77F) because of only two years of measurements.

**Plaice liver**
The concentration of Cd in plaice liver exceeded median overconcentrations in both of the two plaice stations analysed, but no significant trends were found at Husholmen (st. 98F2) in Lofoten or at Skogerøy (st. 10F) in the Varangerfjord.

**Megrim liver**
The two megrim stations on the West coast in the Åkrafjord (st. 21F) and in the Strandebarm area (st. 67F) in the Hardangerfjord were analysed for Cd in liver. The station in Strandebarm showed a significant downward trend.

**Blue mussel**
The presence of Cd in blue mussel exceeded acceptable levels (overconcentrations, > Class I, insignificantly polluted) at 10 of 40 blue mussel stations analysed. In addition to overconcentrations, no significant trends were found West of Damholmen (st. I022), at Kirkøy (st. I024), Bølsnes (st. I205), Moholmen (st. I965), Toraneskaien (st. I964) and Skallneset (st. 10A2) (all Class II, moderately polluted) (some of the stations are presented in Figure 6). In addition to median overconcentrations, a significant downward trend was found at the four stations outward the Sørfjord; Byrkjenes (st. 51A), Eitrheimsneset (st. 52A), Krossanes (st. 57A) (all Class II), and Kvalnes (st. 56A) (Class III, markedly polluted). In blue mussel that had a median acceptable level of Cd (Class I), significant upward trends were found at stations from the Inner Oslofjord and out to the Skagerrak area. These stations were Akershuskaia (st. I301), Gressholmen (st. 30A), Ramtonholmen (st. I307), Solbergstrand (st. 31A), Mølen (st. 35A) and Færder (st. 36A). Significant downward trends were also found at the three stations in the outer part of the Hardangerfjord; Ranaskjær (st. 63A), Vikingneset (st. 65A) and Lille Terøy (st. 69A).

**Concluding remarks**
Trend analyses of Cd showed overconcentrations and upward trends for cod liver in the Inner Oslofjord and in the Inner Sørfjord. Significant downward trends have been observed for Cd in blue mussel in the inner and mid Sørfjord during the last two decades.

## Lead (Pb)

### Cod liver

The median concentration of Pb in cod liver exceeded overconcentrations at 2 of 11 cod stations (st. 30B and st. 53B). The station in the Inner Oslofjord (st. 30B) showed no significant trend, while the station in the Inner Sørfjord (st. 53B) had a significant downward trend (Figure 7, se also Table 8). Some stations showed low levels of Pb (no overconcentrations) and significant downward trends This combination was observed in the Færder area (st. 36B), Ullerø area (st. 15B), Strandebarm area (st. 67B), Karihavet area (st. 23B), east of Bjørnerøya (st. 98B1), Kvænangen (st. 43B) and in the Varangerfjord (st. 10B).

### Flounder liver

Three flounder stations were analysed for Pb in liver and only the one in the Inner Sørfjord (st. 53F) showed overconcentration but no significant trend. The two other stations, Sande (st. 33F) and Strandebarm (st. 67F) showed no overconcentration of Pb and a significant downward trend.

### Dab liver

Three stations were analysed for Pb in dab liver. There were not observed any overconcentrations of Pb at these stations (st 36F, st. 15F and st. 77F, see also Table 8). Dab from the Ullerø area (st. 15F) showed no significant trend while dab from the Færder area (st. 36F) had a significant downward trend. Because of only two years of sampling no trend measurements were done for Pb in dab from the Borøy station (st. 77F).

### Plaice liver

The were no overconcentrations of Pb in place liver from Husholmen (st. 98F2) in Lofoten and Skogerøy (st. 10F) in the Varangerfjord. A significant downward trend was detected in plaice from the Varangerfjord (st. 10F).

### Megrim liver

Megrim from two stations were analysed for Pb, on the West coast in the Åkrafjord (st. 21F) and the second in the Strandebarm area (st. 67F) in the Hardangerfjord. Megrim in the Åkrafjord showed no significant trend while megrim in Strandebarm showed a significant downward trend.

### Blue mussel

The presence of Pb in blue mussel exceeded median acceptable levels (overconcentrations, > Class I, insignificantly polluted) at 9 of the 39 blue mussel stations analysed (some of the stations are presented in Figure 8 and an overview of all the results is found in Table 8). A combination of overconcentrations of Pb and no significant trends were observed in mussel from Gressholmen (st. 30A), Ekkjegrunn (st. 201), Bølsnes (st. I205) and Eitrheimsneset (st. 52A) (all Class II, moderately polluted). In addition of median overconcentrations, no significant trends were found at Byrkjenes (st. 51A), Kvalnes (st. 56A), Moholmen (st. I965) and Toraneskaien (st. I964) (all Class III, markedly polluted). In addition of median overconcentrations, a significant downward trend was found at Krossanes (st. 57A) (Class II). In blue mussel that had an acceptable median level of Pb (Class I), a significant downward trend was found at the stations Mølen (st. 35A), Færder (st. 36A), Ranaskjær (st. 63A), Vikingneset (st. 65A), Lille Terøy (st. 69A) and Husvaagen area (st. 98A2).

### Concluding remarks

No upward trends of Pb were found. Overconcentrations of Pb were found in cod liver from the Inner Oslofjord and the Inner Sørfjord, but the trend was downwards in the Inner Sørfjord. Blue mussel at two stations in the Sørfjord and two stations in the Ranfjord were markedly polluted with Pb.

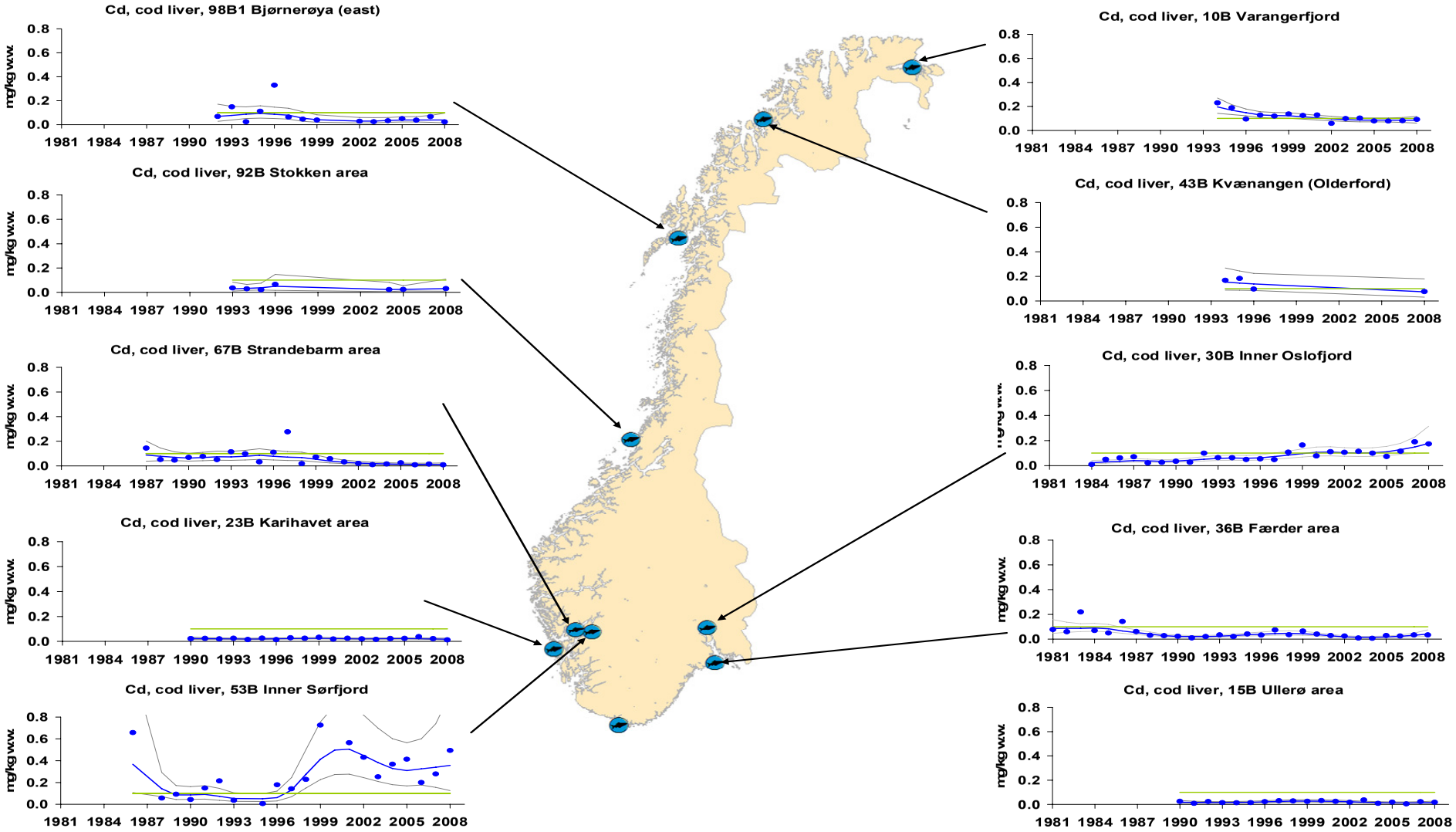



***Figure 5.*** *Trend and median concentration of Cd in cod liver, mg/kg (mg Cd/kg) wet weight (see key to detail in Figure 2).*

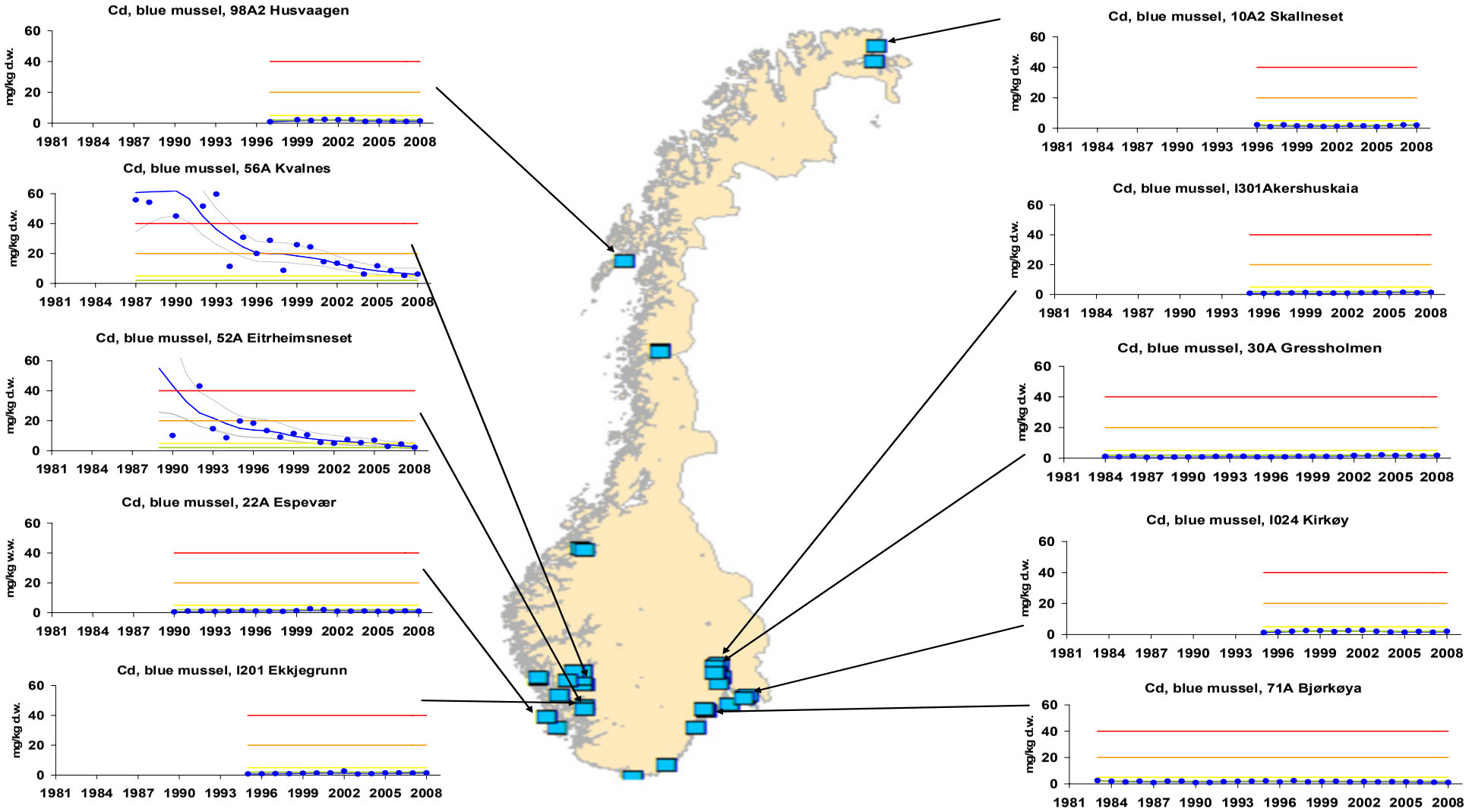



***Figure 6.*** *Trend and median concentration of Cd in blue mussel, mg/kg (mg Cd/kg) dry weight for selected stations (cf. Table 8) (see key to detail in Figure 2).*

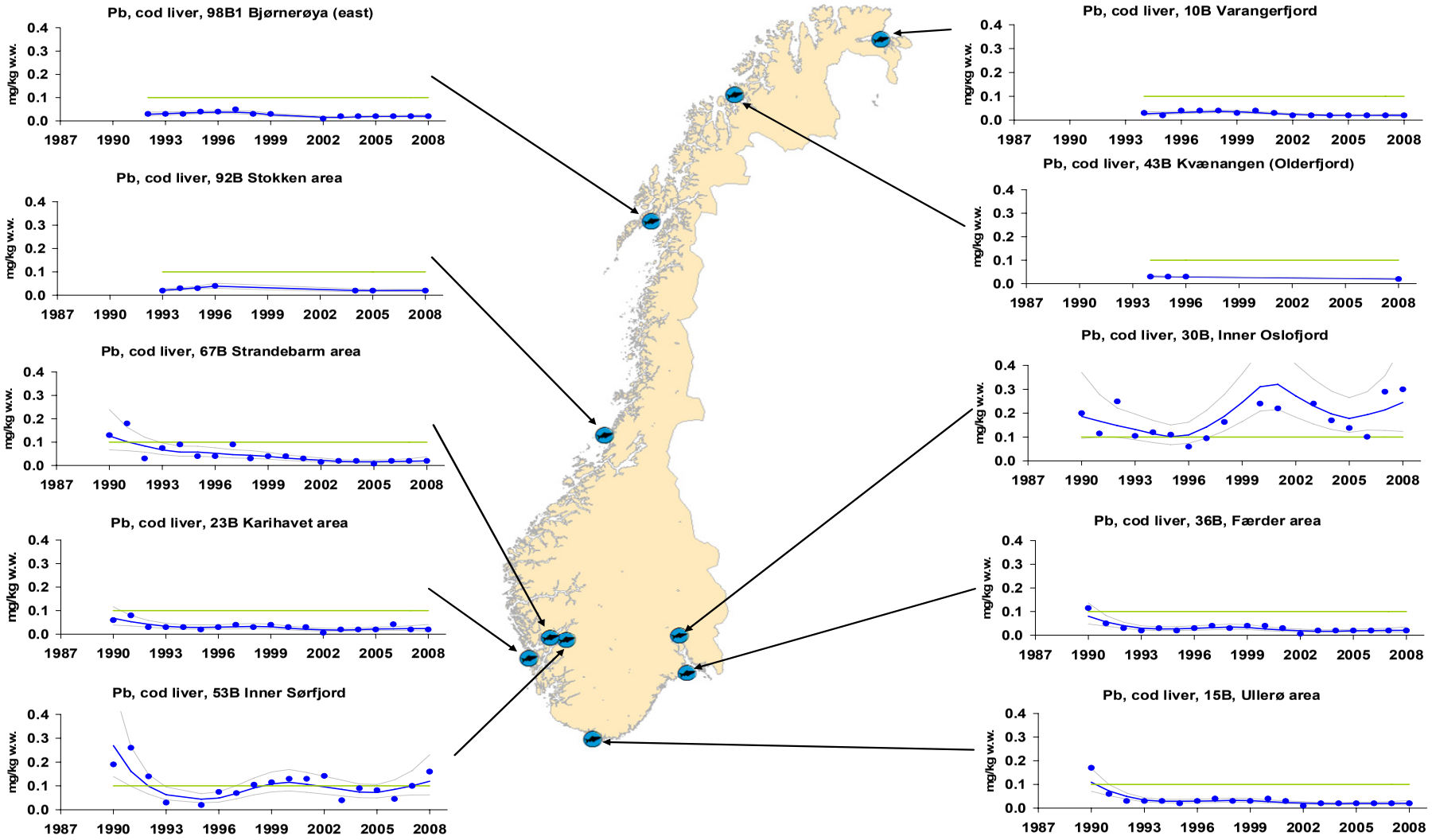



***Figure 7.*** *Trend and median concentration of Pb in cod liver, mg/kg (mg Pb/kg) wet weight. (see key to detail in Figure 2).*

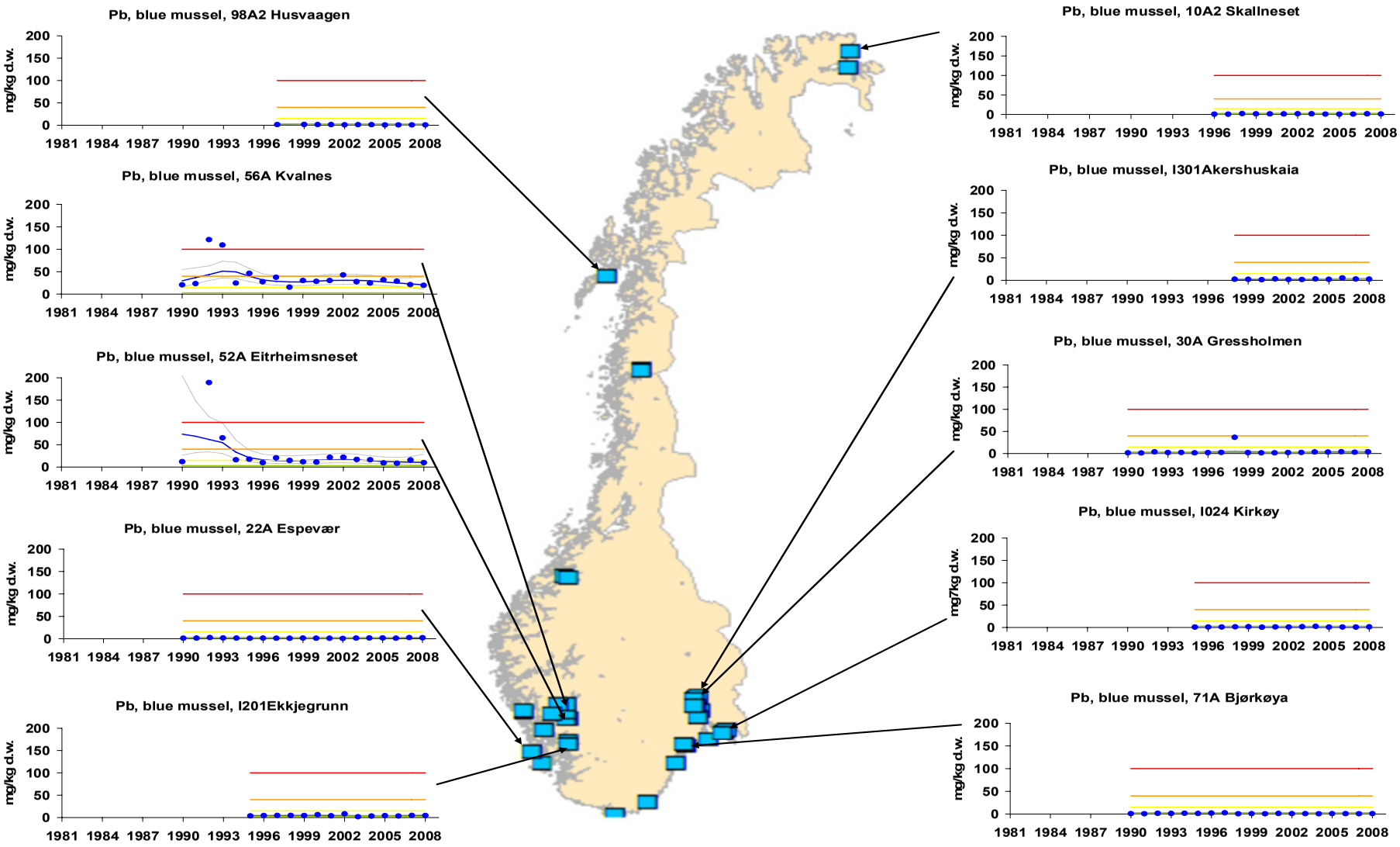



***Figure 8.*** *Trend and median concentration of Pb in blue mussel, mg/kg (mg Pb/kg) dry weight for selected stations (cf. Table 8) (see key to detail in Figure 2).*

## Copper (Cu)

**Flounder liver**
Overconcentrations of Cu were observed in liver from flounder caught in the Inner Sørfjord (st. 53F), Sande (st. 33F) and Strandebarm area (st. 67F).

**Dab liver**
No overconcentrations of Cu were observed in dab from the Færder area (st. 36F), Ullerø area (st. 15F) and Borøy area station (st. 77F).

**Plaice liver**
No overconcentrations of Cu were observed in plaice from Husholmen (st. 98F2) in Lofoten and Skogerøy (st. 10F) in the Varangerfjord.

**Megrim liver**
Two megrim stations on the West coast in the Åkrafjord (st. 21F) and in the Strandebarm area (st. 67F) in the Hardangerfjord were analysed for Cu in megrim liver but values for median overconcentration or trend analyses were not given.

**Blue mussel**
The presence of Cu in blue mussel exceeded acceptable median levels (overconcentrations, > Class I, insignificantly polluted) at only 1 of the 26 blue mussel stations analysed; at Fugleskjær (st. 02A) (Class II, moderately polluted). No significant trends were found at the 17 stations that had sufficient data for trend analysis.

**Concluding remarks**
The median concentration of Cu in mussel from Espevær was 145 ppm d.w. in 2007 (Class IV, severely polluted) and 9.8 ppm d.w. (Class I, insignificantly polluted) in 2008. Prior to 2007 the Cu concentrations at this station varied between 4 and 15 ppm d.w. since monitoring started in 1990. The 2007 value was the highest recorded in CEMP and 50 % higher than the previous record of 96 ppm d.w. found in the Orkdalsfjord in 1986. Possible contamination from mariculture activity in the Espevær vicinity can not be disregarded.

## Zinc (Zn)

**Cod liver**
Overconcentrations of Zn were found in cod liver from the Inner Sørfjord (st. 53B) and the Inner Oslofjord (st. 30B). No overconcentrations were found in cod liver from the seven other stations.

**Flounder liver**
Flounder from the Strandebarm area (st. 67F) showed overconcentrations of Zn, while the two other stations in the Inner Sørfjord (st. 53F) and Sande (st. 33F) showed no overconcentrations.

**Dab liver**
Dab liver from the three stations; Færder area (st. 36F), Ullerø area (st. 15F) and Borøy area station (st. 77F) showed no overconcentrations of Zn.

**Plaice liver**
Plaice liver from the stations at Husholmen (st. 98F2) in Lofoten and Skogerøy (st. 10F) in the Varangerfjord showed no overconcentrations of Zn.

**Megrim liver**
Two megrim stations on the West coast in the Åkrafjord (st. 21F) and in the Strandebarm area (st. 67F) in the Hardangerfjord were analysed for Zn in liver but values for overconcentration or trend analyses are not given.

**Blue mussel**
Only mussels from the two stations Toraneskaien (st. I964) and Moholmen (st. I965) showed overconcentrations of Zn of the 29 blue mussel stations analysed (both Class II, moderately polluted) but trend analyses were not given for these areas. Significant upward trends were found at the stations Mølen (st. 35A) and Færder (st. 36A) and a significant downward trend were observed in mussel from Bjørkøya (st. 71A) and stations in the Sørfjord and Hardangerfjord; Eitrheimsneset (st. 52A), Kvalnes (st. 56A), Krossanes (st. 57A), Ranaskjær (st. 63A) and Lille Terøy (st. 69A).

**Concluding remarks**
The two blue mussel stations in the Ranfjord were moderately polluted by Zn and had the highest concentration of all stations. No overconcentrations but upward trends for Zn were observed in blue mussel from the Mølen and Færder area.

## Polychlorinated biphenyls (ΣPCB-7)

**Cod liver**
The median concentration of ΣPCB-7 in cod liver exceeded acceptable/background levels (overconcentrations, > Class I, insignificantly polluted) at only 1 of the 11 stations The observations from this station (Class III, markedly polluted, Figure 9) in Inner Oslofjord (st. 30B) revealed no significant trend. There were found acceptable levels of ΣPCB-7 (Class I) and significant downward trends at the four stations; Færder area (st. 36B), Ullerø area (st. 15B), Strandebarm area (st. 67B) and in the Varangerfjord (st. 10B).

**Cod fillet**
The median concentration of ΣPCB-7 in cod fillet exceeded acceptable/background levels (overconcentrations, > Class I, insignificantly polluted) at 2 of the 11 cod stations (Figure 10). These two stations in Inner Oslofjord (st. 30B) and in Inner Sørfjord (st. 53B) (both Class II, moderately polluted) showed no significant trends.

**Flounder liver**
Results from the three flounder stations that were analysed for ΣPCB-7 in liver; the Inner Sørfjord (st. 53F), Sande (st. 33F) and Strandebarm area (st. 67F) showed that there were no overconcentrations. The ΣPCB-7 concentration in flounder from the Inner Sørfjord and in Strandebarm revealed a significant downward trend.

**Flounder fillet**
Observations of ΣPCB-7 in fillet from flounder caught in the Inner Sørfjord (st. 53F), Sande (st. 33F) and Strandebarm area (st. 67F) showed no overconcentrations. The flounder in Inner Sørfjord and in Strandebarm showed a significant downward trend.

**Dab liver**
Results from analysis for ΣPCB-7 in dab liver showed an overconcentration at the Færder area (st. 36F) but no overconcentrations at the Ullerø area (st. 15F). The data from two stations showed no significant trends. There were no overconcentrations at Borøy area (st. 77F), and no values were given for trend analyses.

**Dab fillet**
Results from analysis for ΣPCB-7 in fillet of dab showed an overconcentration at the Færder area (st. 36F) but no overconcentrations at the Ullerø area (st. 15F) or Borøy area station (st. 77F). In addition, the data from dab at Færder revealed a significant upward trend, while the dab from Ullerø showed no significant trends. No values were given for trend analyses for dab fillet from Borøy.

**Plaice liver**
The presence of ΣPCB-7 in liver showed no overconcentration in plaice from the stations at Husholmen (st. 98F2) in Lofoten and Skogerøy (st. 10F) in the Varangerfjord. Plaice in Lofoten showed a significant downward trend.

**Plaice fillet**
There were no overconcentration of ΣPCB-7 in fillet from plaice from the stations at Husholmen (st. 98F2) and Skogerøy (st. 10F) and no significant trends.

**Megrim liver**
Megrim liver from fish caught at two stations on the West coast in the Åkrafjord (st. 21F) and in the Strandebarm area (st. 67F) in the Hardangerfjord were analysed for ΣPCB-7. Values for overconcentration are not given but the megrim in Strandebarm showed a significant downward trend.

**Megrim fillet**
ΣPCB-7 were analysed in megrim fillet from fish from the same two stations as analysed for ΣPCB-7 in megrim liver. Values for overconcentration are not given, but both stations had no significant trends.

**Blue mussel**
The presence of ΣPCB-7 in blue mussel exceeded acceptable levels (overconcentrations, > Class I, insignificantly polluted) at 10 of the 42 blue mussel stations (some of the stations are presented in Figure 11). The combination overconcentrations and no significant trends were found at Gåsøya (st. I304), Ramtonholmen (st. I307) and Nordnes (st. I241) (all Class II, moderately polluted). Significant downward trends were found at Gressholmen (st. 30A) and Gjemesholmen (st. I712) (both Class II), and Akershuskaia (st. I301) (Class III, markedly polluted). Median overconcentrations were found at Sponvika (st. 01A), Gravdalsneset (st. I242), Hegreneset (st. I243) and Nordstrand (st. 77A) between Risør and Arendal (all Class II) but no values for trend analyses were given. The combination of no overconcentrations (all Class I) and significant downward trends were observed at 13 stations; Solbergstrand (st. 31A), Mølen (st. 35A), Færder (st. 36A), Bjørkøya (st. 71A), Risøy (st. 76A), Gåsøy (st. 15A), West of Damholmen (st. I022), Singlekalven (st. I023), Kirkøy (st. I024), Svensholmen (st. I132), Odderø (st. I133), Vikingneset (st. 65A) and Husvaagen area (st. 98A2).

**Concluding remarks**
It can be noted that the Norwegian Food Safety Authority (Mattilsynet) had issued consumption advice for som areas along the coast due to concern about PCB in cod liver (Table 16). There were overconcentrations of ΣPCB-7 in cod liver (markedly polluted) and fillet (moderately polluted) in Inner Oslofjord and in cod fillet (moderately polluted) in Inner Sørfjord but no significant trends were found. Overconcentrations of ΣPCB-7 were found in blue mussel at four stations in the Oslofjord, up to markedly polluted at Akershuskaia (st. I301) in the harbour area.

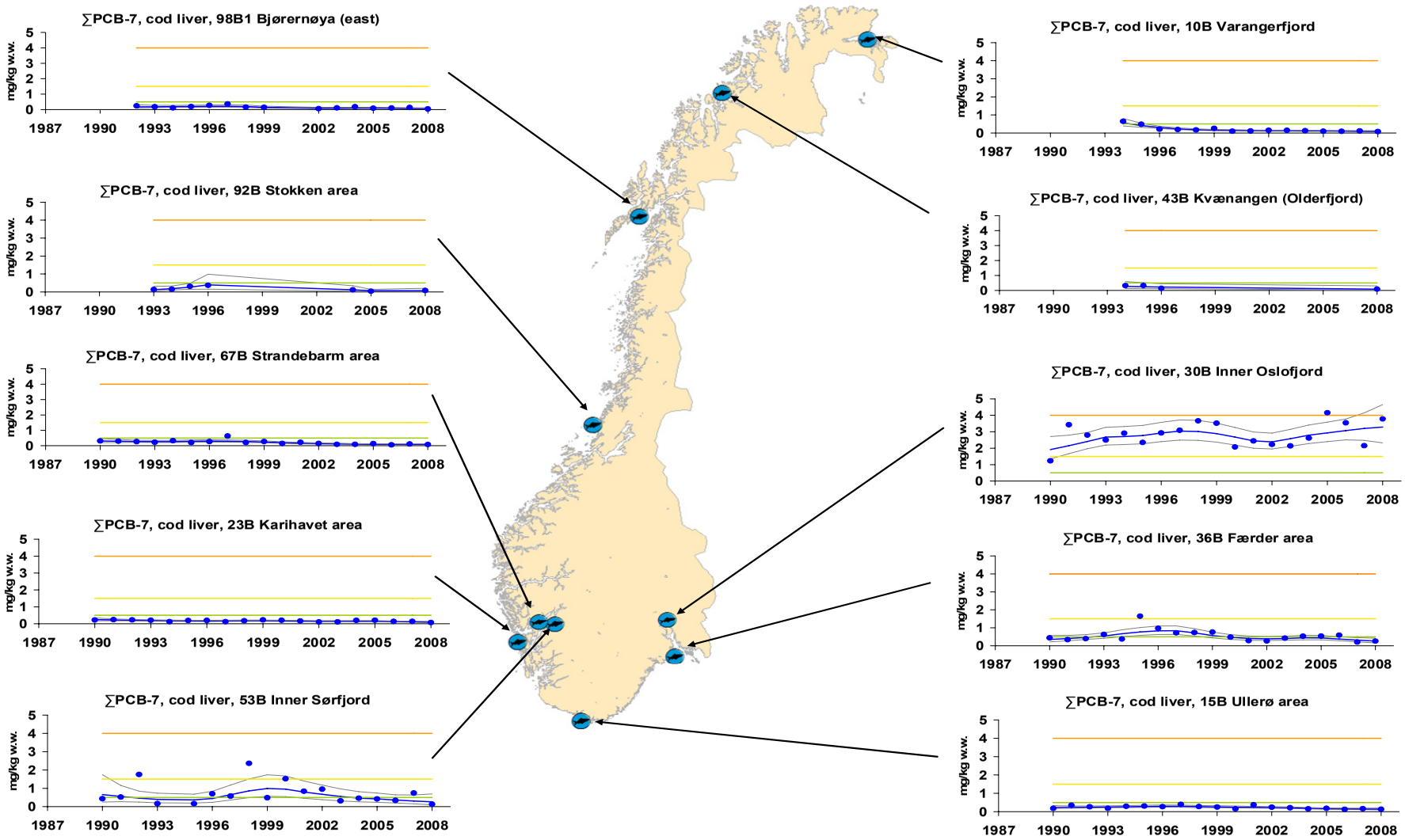



***Figure 9.*** *Trend and median concentration of ΣPCB-7 in cod liver, mg/kg (mg ΣPCB-7/kg) wet weight (see key to detail in Figure 2).*

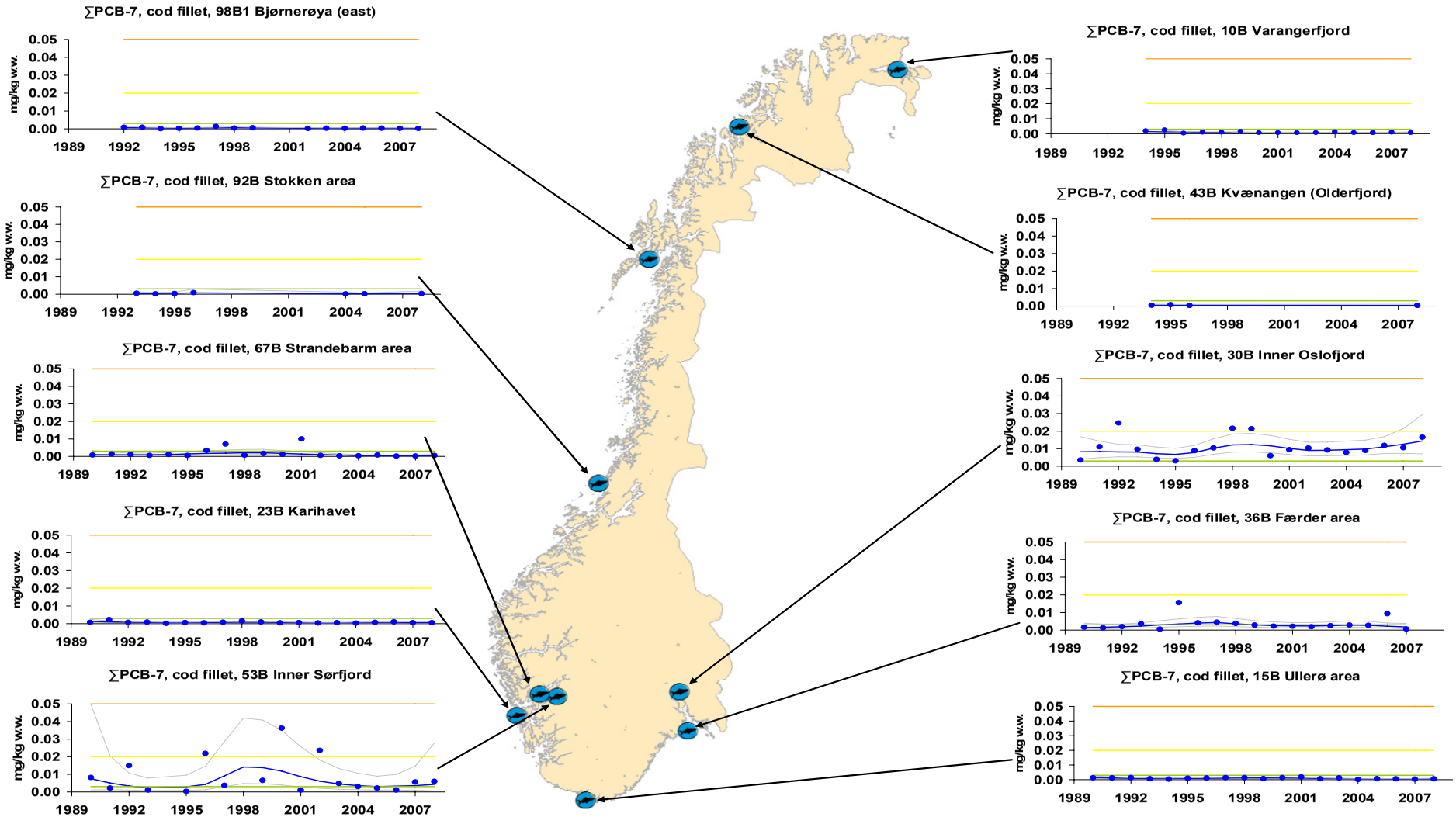



***Figure 10.*** *Trend and median concentration of ΣPCB-7 in cod fillet, mg/kg (mg ΣPCB-7 /kg) wet weight (see key to detail in Figure 2).*

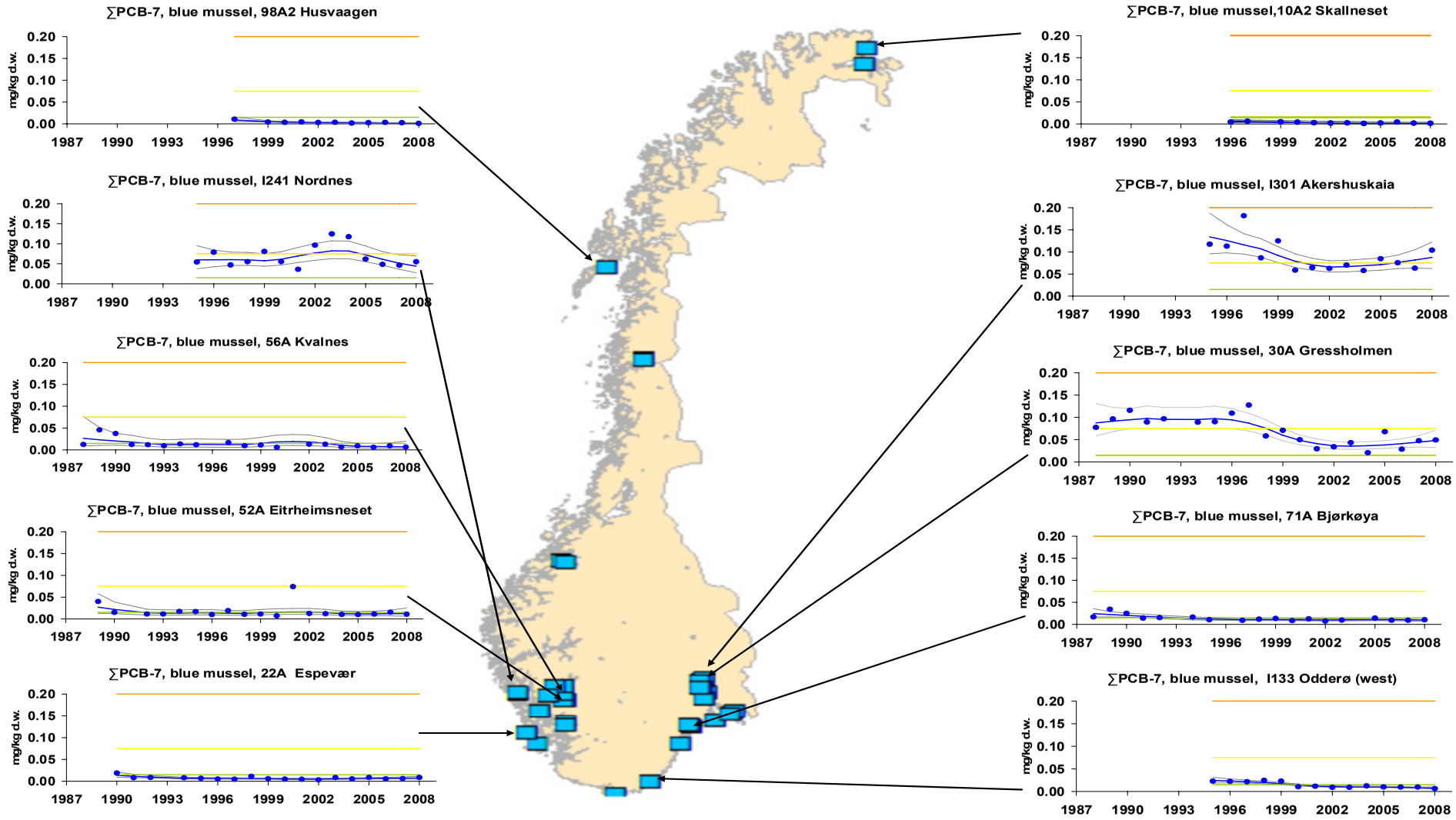



***Figure 11.*** *Trend and median concentration of ΣPCB-7 in blue mussel mg/kg (mg ΣPCB-7/kg) dry weight for selected stations (cf. Table 8) (see key to detail in Figure 2).*

## Polycyclic aromatic hydrocarbons (PAH)

### Blue mussel

The presence of PAH in blue mussel exceeded acceptable levels (overconcentrations, > Class I, insignificantly polluted) at 3 of the 10 blue mussel stations (some of the stations are presented in Figure 12). The combination of overconcentrations (all Class III, markedly polluted) and no significant trends was observed in mussel from Odderø (st. I133) in the Kristiansandfjord, Toraneskaien (st. I964) and Moholmen (st. I965) in the Ranfjord. The blue mussel from Honnhammer (st. I912) and Fjøseid (st. I913) in the Sunndalsfjord contained acceptable levels of PAH (Class I) and a significant downward trend was also observed.

### Concluding remarks

Trend analyses for PAH showed no trends in the Ranfjord. Norwegian Food Safety Authority (Mattilsynet) has issued consumption advice due to concern about PAH in blue mussel in the Ranfjord (Table 16).

There was a significant downward trend in concentration of PAH in Sunndalsfjorden. Norwegian Food Safety Authority has issued advice due to concern about PAH in blue mussel in the Sunndalsfjord (Table 16). Changes in the production process from Søderberg plant to 100 % Prebake in autumn-spring 2002-2003 seem to have resulted in a reduction in dissolved PAH in sea water around the outlet from the treatment plant during summer 2003 (Bakke and Uriansrud 2004). Measurements outside the industrial land fill and in the sea water intake at The Norwegian Institute of Food, Fisheries and Aquaculture Research (former Akvaforsk) also indicated that the total concentration of dissolved PAH in the Inner part of the fjord has decreased during 2003. Measurements should continue to document this tendency. The concentration of dissolved PAH components in the sea water outside Hydro Aluminium Sunndal AS were to expected to be high compared to other harbor areas, but much lower then from areas with analogous industrial activity. The PAH accumulated from the sea water intake at The Norwegian Institute of Food, Fisheries and Aquaculture Research was 2-20 times higher than has been found with the same methodology in assumed clean fjord areas.

## Sum carcinogenic polycyclic aromatic hydrocarbons (KPAH)

### Blue mussel

The presence of KPAH in blue mussel exceeded acceptable levels (overconcentrations, > Class I, insignificantly polluted) at 3 of 10 stations. No significant trends were observed at these three stations; Moholmen (st. I965) (Class III, markedly polluted), Odderø (st. I133) and Toraneskaien (st. I964) (both Class IV, severely polluted). The combination of acceptable levels of KPAH (Class I) and significant downward trends were observed in blue mussel from Honnhammer (st. I912) and Fjøseid (st. I913) in the Sunndalsfjord.

### Concluding remarks

Trend analyses for KPAH in blue mussel showed overconcentrations, up to severely polluted, but no trend in the Kristiansandfjord and the Ranfjord. There was a significant downward trend in concentration of KPAH in the Sunndalsfjord.

## Benzo[a]pyrene B[a]P

### Blue mussel

The presence of B[a]P in blue mussel exceeded acceptable levels (overconcentrations, > Class I, insignificantly polluted) at 11 of the 17 stations (some of the stations are presented in Figure 13). The combination of overconcentrations and no significant trends were observed in mussel from Akershuskaia (st. I301), Honnhammer (st. I912), Fjøseid (st. I913) (all Class II, moderately polluted), Bjørnbærviken (st. I969) (Class III, markedly polluted), Svensholmen (st. I132), Odderø (st. I133), Moholmen (st. I965) (all Class IV, severely polluted) and Toraneskaien (st. I964) (Class V, extremely polluted).

A significant downward trend was found at Ekkjegrunn (st. I201) (Class II, moderately polluted). No trends were given for the stations Flåøya (st. I915) and Mølen (st. 35A) (Class II). In blue mussel that had an acceptable level of B[a]P (Class I), significant upward trends were found at the two stations in the Inner Oslofjord; Håøya (st. I306) and Ramtonholmen (st. I307).

### Concluding remarks

Blue mussel in the Ranfjord were up to extremely polluted with B[a]P, and blue mussel in the Kristiansandsfjord were severely polluted. There were no trends for these stations. A downward trend was found at Ekkjegrunn in Inner Saudafjord, and upward trends were found at two stations in the Inner Oslofjord; Håøya and Ramtonholmen.

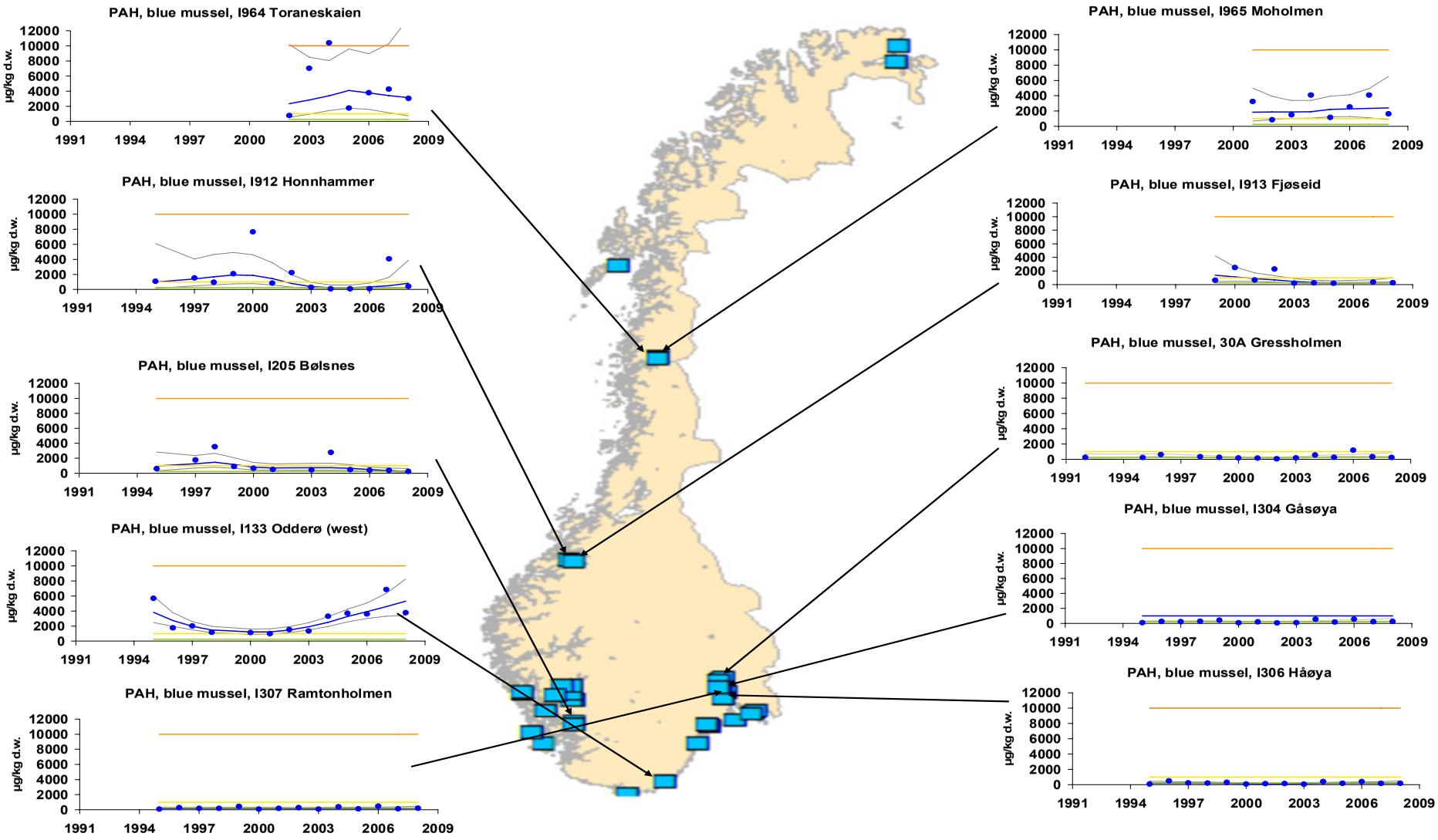



***Figure 12.*** *Trend and median concentration of PAH in blue mussel, µg/kg (µg PAH/kg) dry weight for selected stations (cf. Table 8) (see key to detail in Figure 2).*

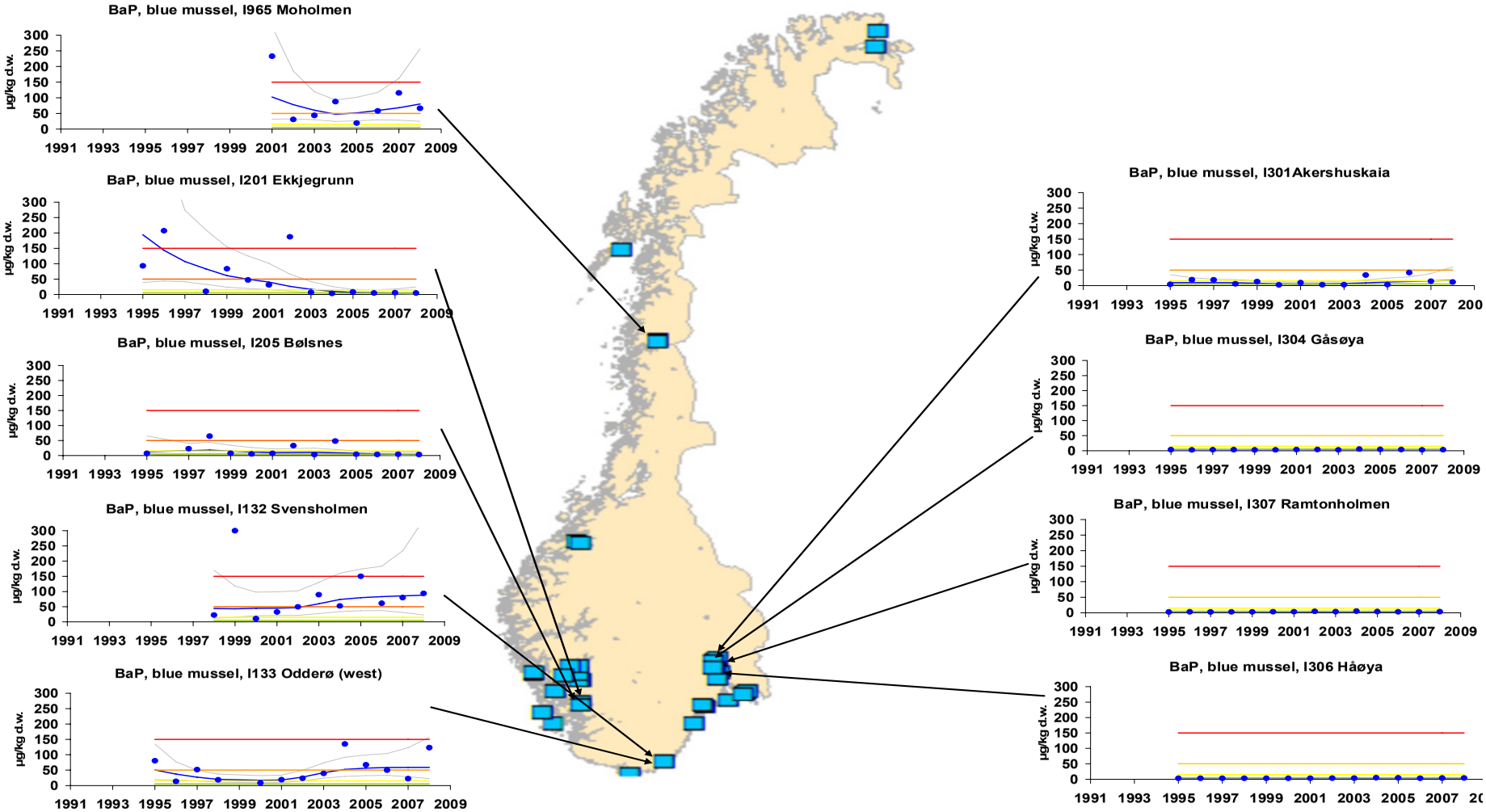



***Figure 13.*** *Trend and median concentration of B[a]P in blue mussel, µg/kg (µg B[a]P /kg) dry weight for selected stations (cf. Table 8) (see key to detail in Figure 2).*

## Dichlorodiphenyldichloroethylene (ppDDE)

### Cod liver

No overconcentrations of ppDDE (insignificantly polluted, Class I, compared to Class limits for **Σ**DDT) were observed in cod liver from the 11 stations sampled for cod (Figure 14). A downward trend was observed at four of these 11 stations; Færder area (st. 36B), Strandebarm area (st. 67B), Karihavet area (st. 23B) and in the Varangerfjord (st. 10B).

### Cod fillet

There were only observed overconcentration of ppDDE in cod fillet from the Inner Sørfjord station (st. 53B). No significant trends was found at this station. For the two stations Borøy (st. 77B) and Kvænangen (st. 43B), there were no values for trend analyses. A downward trend was observed at the station in the Strandebarm area (st. 67B) in the Hardangerfjord. All the other stations had no significant trends.

### Flounder liver

Flounder liver from three stations were analysed for ppDDE. The results from two stations, one in the Inner Sørfjord (st. 53F) and the second in the Strandebarm area (st. 67F) indicated overconcentrations but no significant trends. The station in Sande (st. 33F) showed no overconcentration and no significant trend.

### Flounder fillet

There were not observed any overconcentrations (insignificantly polluted, Class I, compared to Class limits for **Σ**DDT) of ppDDE in flounder from the station in Strandebarm area (st. 67F), in the Inner Sørfjord (st. 53F) and in Sande (st. 33F). The data revealed significant downward trends for stations in the Hardangerfjord and Sørfjord.

### Dab liver

The stations Færder area (st. 36F) and Ullerø area (st. 15F) were analysed for ppDDE in liver, and had no median overconcentrations and no significant trends. Dab from Borøy area (st. 77F) was also analysed for ppDDE but values for trend analyses were not given.

### Dab fillet

Dab from the Færder area (st. 36F) and the Ullerø area (st. 15F) were analysed for ppDDE in fillet, and had no median overconcentration and no significant trends. Dab from Borøy area (st. 77F) was also analysed for ppDDE but values for trend analyses were not given.

### Plaice liver

There were no overconcentrations of ppDDE in plaice liver from Husholmen (st. 98F2) in Lofoten and Skogerøy (st. 10F) in the Varangerfjord. No significant trend was observed in the data from Varangerfjord, and a significant downward trend was observed in the data from Lofoten.

### Plaice fillet

There were not observed any overconcentrations of ppDDE in samles of plaice fillet from Husholmen (st. 98F2) in Lofoten and Skogerøy (st. 10F) in the Varangerfjord. No significant trend was observed in the data from the Varangerfjord, and a significant downward trend was observed in the results from Lofoten.

### Megrim liver

Two megrim stations on the West coast were analysed for ppDDE in liver, the Åkrafjord (st. 21F) and the Strandebarm area (st. 67F). The results from the station in Strandebarm showed a significant downward trend.

### Megrim fillet

Two megrim stations on the West coast were analysed for ppDDE in fillet, the Åkrafjord (st. 21F) and the Strandebarm area (st. 67F). The results from the station in Strandebarm showed a significant downward trend.

**Blue mussel**

The presence of ppDDE in blue mussel exceeded the limit for overconcentrations in samples from 6 of the 42 blue mussel stations (some of the stations are presented in Figure 15). A significant upward trend was found in the Sørfjord at Kvalnes (st. 56A) and the blue mussel from this station were extremely polluted by ppDDE (Class V compared to Class limits for **Σ**DDT). No significant trends were observed from the data from the Sørfjord at Byrkjenes (st. 51A), Eitrheimsneset (st. 52A) (both Class II, moderately polluted) or at Krossanes (st. 57A) (Class III, markedly polluted). No significant trends were observed in the samples from the Hardangerfjord at Ranaskjær (st. 63A) and at Nordnes (st. I241) close to Bergen (both Class II, markedly polluted). In blue mussel without overconcentrations of ppDDE, significant downward trends were observed in samples from the Inner Oslofjord at Gressholmen (st. 30A), and in the Hvaler area; West of Damholmen (st. I022), Singlekalven (st. I023) and Kirkøy (st. I024), and at Svensholmen (st. I132) close to Kristiansand.

**Concluding remarks**

There were observed overconcentrations of ppDDE in mussel from all four stations in the Sørfjord and at Ranaskjær close to Ålvik in the Hardangerfjord. The blue mussel from these stations were moderately to markedly polluted. An upward trend was observed in mussel from Kvalnes in the mid Sørfjord, and the mussel from this station were extremely polluted by ppDDE. Downward trends were found in blue mussel from Gressholmen in Inner Oslofjord and in the Hvaler area.

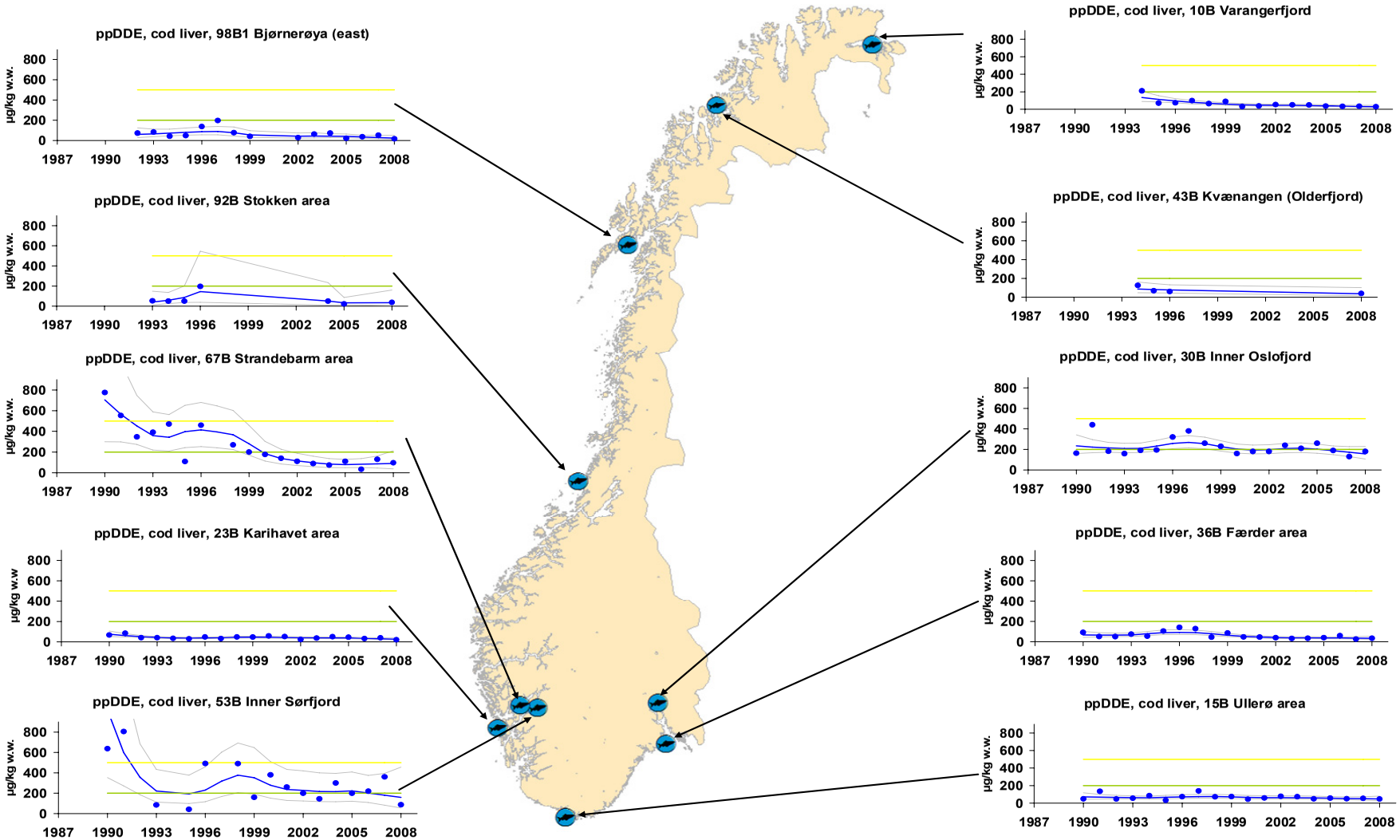



***Figure 14.*** *Trend and median concentration of ppDDE in cod liver, µg/kg (µg ppDDE/kg) wet weight (see key to detail in Figure 2).* ***Note: Class limits for ΣDDT used.***

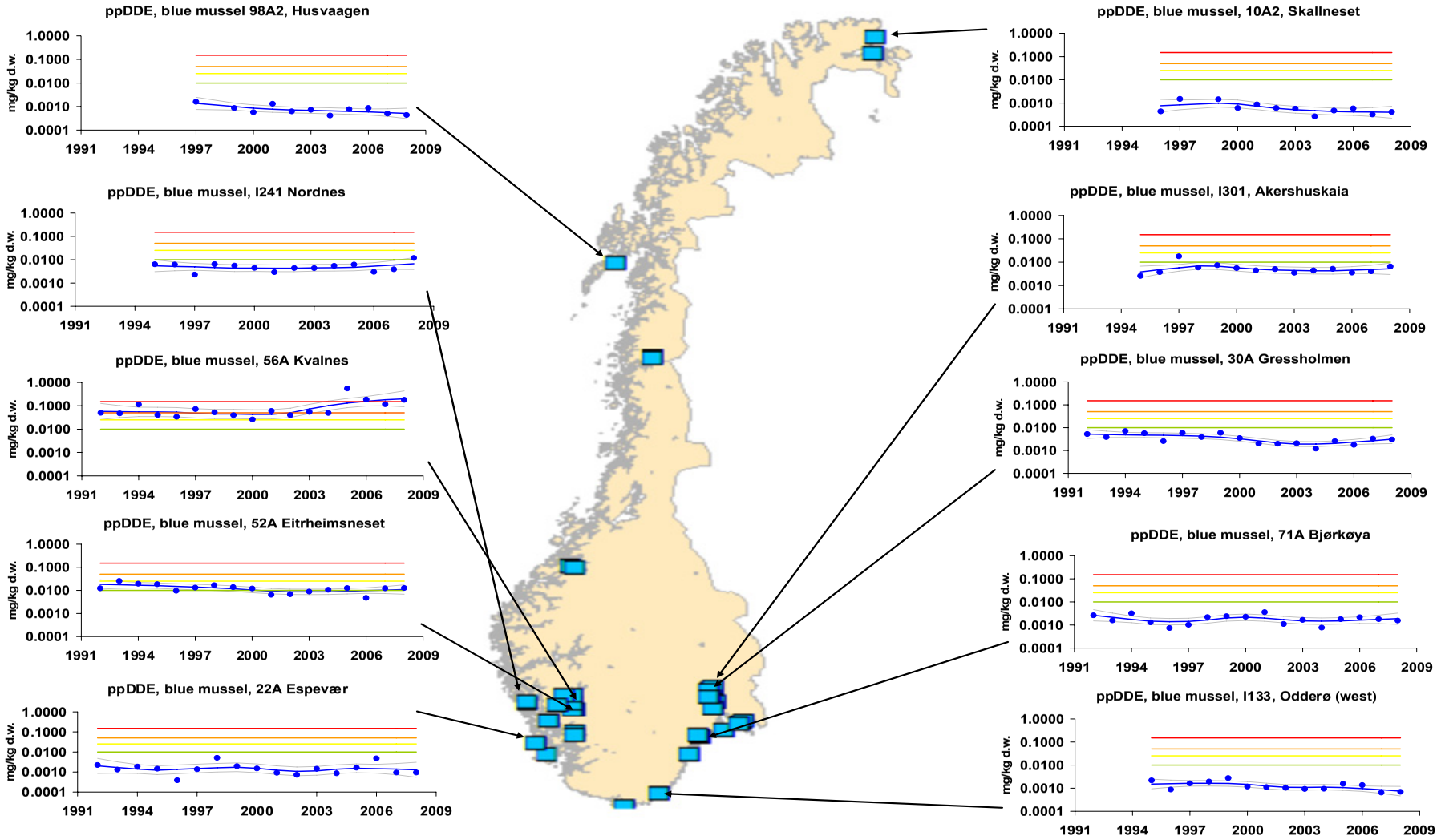



***Figure 15.*** *Trend and median concentration of ppDDE in blue mussel, mg/kg (mg ppDDE/kg) dry weight for selected stations (cf. Table 8) (see key to detail in Figure 2).* ***Note: Log-scale and Class limits for ΣDDT used.***

## Hexachlorobenzene (HCB)

### Cod liver

There were no concentration of HCB in cod liver that exceeded acceptable/background levels (overconcentrations, > Class I, insignificantly polluted) in the 11 cod stations investigated (Figure 16). There were found acceptable levels of HCB (Class I) and downward trends at the five stations; Inner Oslofjord (st. 30B), Færder area (st. 36B), Inner Sørfjord (st. 53B), Strandebarm area (st. 67B) and in the Varangerfjord (st. 10B).

### Cod fillet

There were no concentration of HCB in cod fillet that exceeded acceptable/background levels (overconcentrations, > Class I, insignificantly polluted) in the 11 stations sampled for cod (Figure 16). There were found acceptable levels of HCB (Class I) and significant downward trends at the four stations; Inner Oslofjord (st. 30B), Færder area (st. 36B), Ullerø area (st. 15B) and Strandebarm area (st. 67B).

### Flounder liver

Flounder liver from three stations were analysed for HCB. None of the results from the samples from stations in the Inner Sørfjord (st. 53F), the Strandebarm area (st. 67F) and Sande (st. 33F) revealed overconcentrations of HCB. A significant downward trend was found in the station in the Inner Sørfjord.

### Flounder fillet

Flounder fillet from three stations were analysed. Only the station in the Strandebarm area (st. 67F) showed overconcentration but no significant trend. The stations in Sande (st. 33F) and Inner Sørfjord (st. 53F) showed no overconcentration of HCB. The station in the Inner Sørfjord showed a significant downward trend.

### Dab liver

Overconcentrations of HCB were not observed in dab liver from three investigated stations. There were not observed any significant trend at Ullerø area (st. 15F). The results from dab from the Færder area (st. 36F) revealed a significant downward trend. Values for trend analyses were not given for dab from the Borøy area (st. 77F).

### Dab fillet

Overconcentrations of HCB were not observed in dab fillet from three investigated stations. There were not observed any significant trend at Ullerø area (st. 15F), and dab from the Færder area (st. 36F) showed a significant downward trend. Values for trend analyses were not given for dab at Borøy area (st. 77F).

### Plaice liver

The results from analysis of HCB in plaice liver showed no overconcentration in plaice from Husholmen (st. 98F2) in Lofoten and Skogerøy (st. 10F) in the Varangerfjord. A significant downward trend was observed for HCB in mussel from the Varangerfjord.

### Plaice fillet

The data on HCB in plaice from Husholmen (st. 98F2) in Lofoten and Skogerøy (st. 10F) in the Varangerfjord did not show overconcentrations. No significant trends were found.

### Megrim liver

Two stations on the West coast were sampled for analysed for HCB in megrim liver. The stations were: Åkrafjord (st. 21F) and the Strandebarm area (st. 67F) in the mid Hardangerfjord. The station in Strandebarm showed a significant downward trend.

**Megrim fillet**
The same two stations (st. 21F and st. 67F) were used for analysis of fillet and liver. The station in Strandebarm showed a significant downward trend.

**Blue mussel**
The presence of HCB in blue mussel exceeded acceptable levels (overconcentrations, > Class I, insignificantly polluted) in samples from 16 of the 42 blue mussel stations investigated (some of the stations are presented in Figure 17). The combination overconcentrations (Class II, moderately polluted) and no significant trends were observed in mussel from Akershuskaia (st. I301), Gåsøya (st. I304), Ramtonholmen (st. I307), West of Damholmen (st. I022), Singlekalven (st. I023), Kirkøy (st. I024), Nordnes (st. I241) and Hegreneset (st. I243). The combination of overconcentration (Class III, markedly polluted) and no significant trends were observed at Gjemesholmen (st. I712), Strømtangen (st. I713), Svensholmen (st. I132) and Odderø (st. I133) (all Class III, markedly polluted).

There were significant downward trends at Bjørkøya (st. 71A) and Gravdalsneset (st. I242) (both Class II, moderately polluted). There were acceptable levels of HCB (Class I) and significant downward trends at the stations in the Oslofjord area; Gressholmen (st. 30A), Solbergstrand (st. 31A), Mølen (st. 35A) and Færder (st. 36A), in the Inner Sørfjord at Eitrheimsneset (st. 52A), at Espevær (st. 22A) on the west coast and at Skallneset (st. 10A2) north in the Varangerfjord. Blue mussel at Sponvika (st. 01A) and Lastad (st. I131A) were moderately polluted (Class II), but no values for trend analyses were given.

**Concluding remarks**
Generally, no significant upward trends were found regarding HCB. For all 11 stations, HCB in cod liver and fillet were at background level. Blue mussel in the Frierfjord and the Kristiansandfjord were up to markedly polluted with HCB.

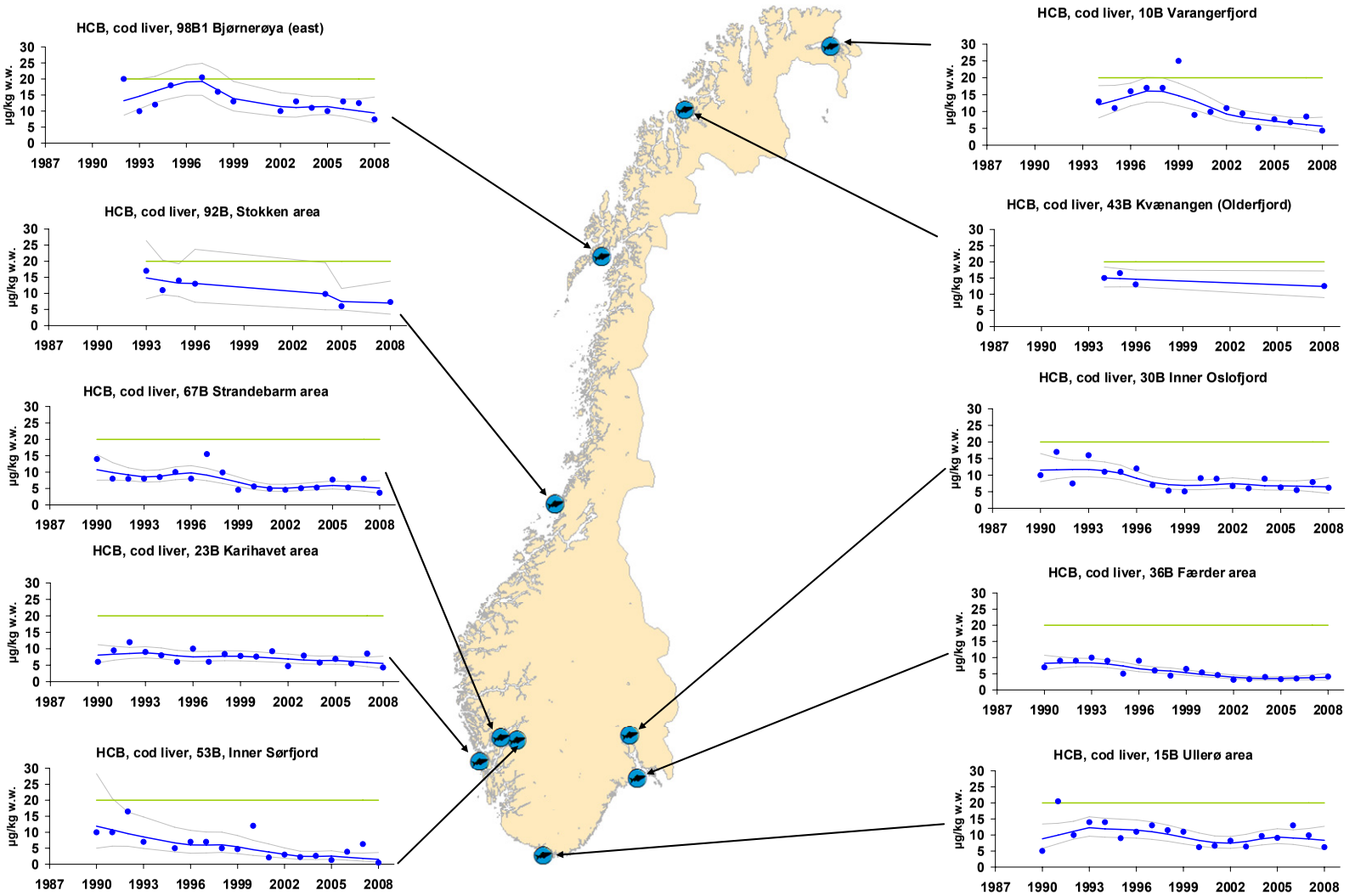



***Figure 16.*** *Trend and median concentration of HCB in cod liver, µg/kg (µg HCB/kg) wet weight (see key to detail in Figure 2).*

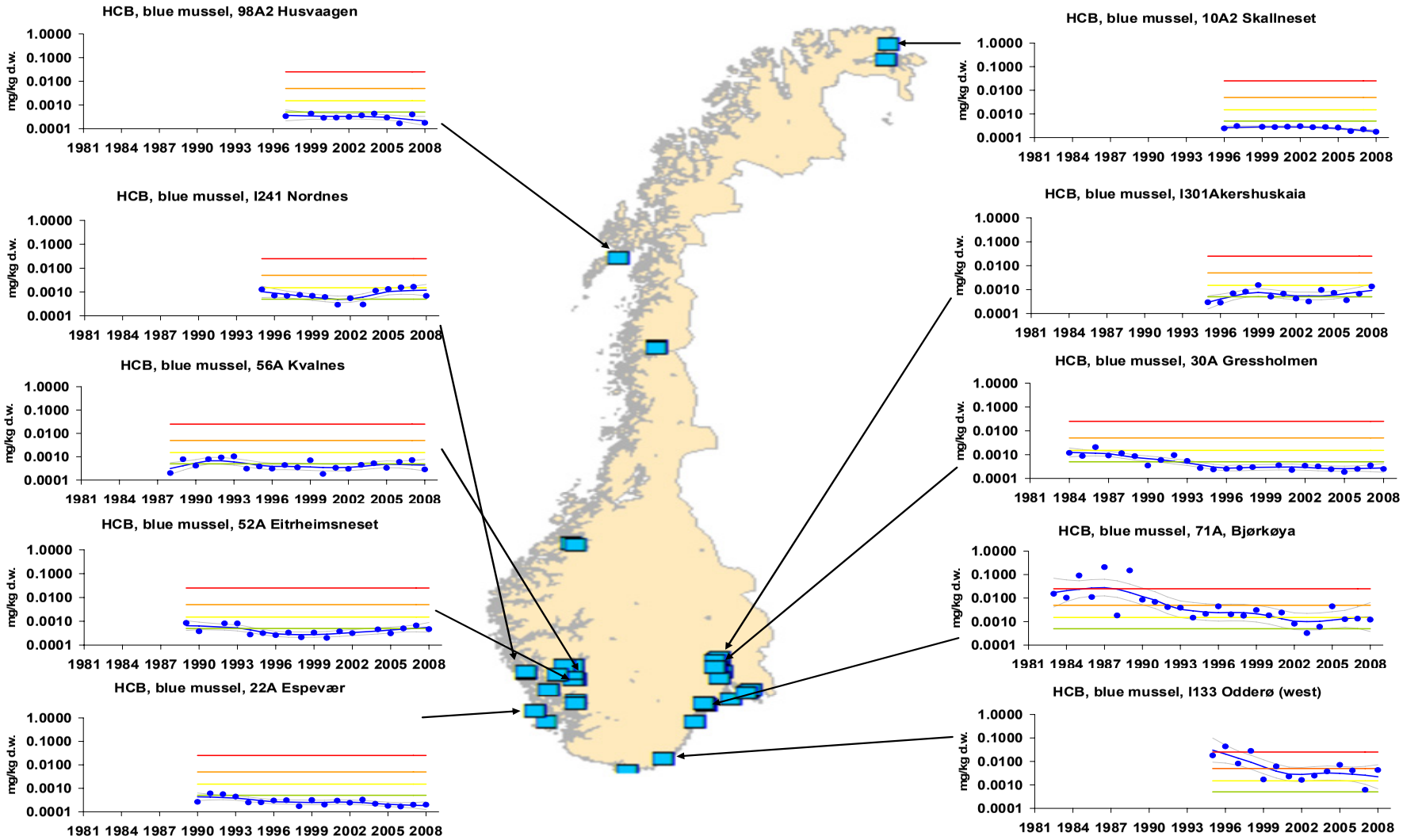



***Figure 17.*** *Trend and median concentration of HCB in blue mussel, mg/kg (mgHCB/kg) dry weight for selected stations (cf. Table 8) (see key to detail in Figure 2).* ***NB: log-scale.***

## Dioxins (dioxin toxicity equivalents – Nordic model, TCDDN)

### Cod liver

Cod from five stations were analysed for dioxins; Færder area (st. 36B), Ullerø area (st. 15B), Karihavet area (st. 23B), Bjørnerøya east (st. 98B1) and in the Varangerfjord (st. 10B). Only cod from Karihavet area (st. 23B) north of Bømlo showed overconcentrations (Class II, moderately polluted) by dioxins. There were insufficient data to do trend analyses.

### Cod fillet

Cod from three stations were analysed for dioxins; Bjørnerøya east (st. 98B1) (Class I, insignificantly polluted), Færder area (st. 36B) and the Varangerfjord (st. 10B) (both Class II, moderately polluted). There was insufficient data to do trend analyses.

### Blue mussel

Mussels from seven stations were investigated; in the Inner Oslofjord (Gressholmen st. 30A), the Grenlandsfjord area (Bjørkøya st. 71A, Risøy st. 76A, Gjemesholmen st. I712 and Strømtangen st. I713) and the Kristiansand harbour at Svensholmen (st. I132) and Odderø (st. I133) (Figure 18). Blue mussel at Gressholmen (st. 30A) in the Inner Oslofjord was insignificantly (Class I) polluted by dioxins. In the Kristiansand area, blue mussel samples were insignificantly polluted (Class I) at Odderøy (st. I133) and markedly polluted (Class III) at Svensholmen (st. I132). Blue mussel from three stations in the Grenlandsfjord were extremely polluted (Class V) with dioxins based on the ”toxicity equivalency factors” after the Nordic model (Ahlborg 1989). No significant trends were detected for the period 2002-2008.

### Concluding remarks

Dioxins (TCDDN) have been included in Klif’s Pollution Index for blue mussel since 2002 (cf. chapter Figure 18). No significant trends were observed for dioxins in blue mussel but three of the stations in the Grenlandsfjord were extremely polluted (Class V). Consumption advice has been issued for fish and shellfish in the Grenlandsfjord area due to the high concentrations of dioxins.

Recent assessment of dioxin data from the regional Grenlandsfjord monitoring in cod liver (Bakke et al. 2007b) has shown that the downward trend in wet-weight concentrations over the last 16 years in the most polluted fjord area is not confirmed by a corresponding trend in concentrations normalised against fat content. In other words, the fat content in cod liver wet weight has decreased at a rated corresponding to the decrease of dioxins in cod liver wet weight. The decrease in fat content may be due to (unknown) changes in general life conditions for cod in the fjord. Cod liver samples from the other fjord areas do not show a similar long-term decrease in fat content, and there is not a clear relationship between fat and wet weight normalised dioxin levels for these fjords. This emphasizes the need to investigate the relations between contaminant levels and biological characteristics to interpret observed time series of contaminant levels in biota as evidence for changes in the external environment.

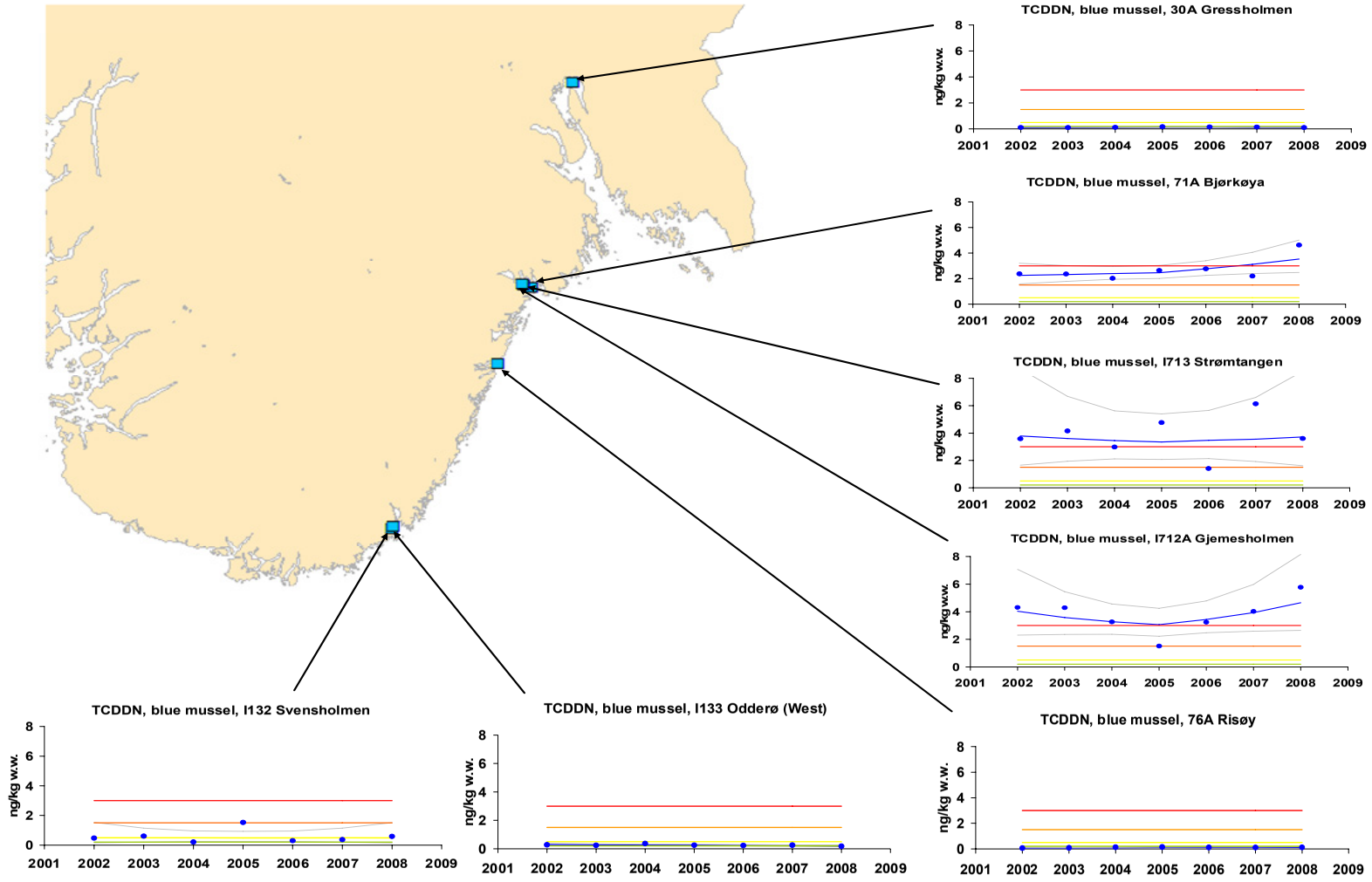



***Figure 18.*** *Trend and median concentration of dioxins TCDD-toxicity equivalents after Nordic model (TCDDN) in blue mussel, ng/kg TCDDN/kg (cf. Appendix H and Appendix J).*

## Polybrominated diphenyl ethers (PBDE)

### Cod liver

Polybrominated diphenyl ethers (PBDEs) have been investigated in cod liver since 2005. PBDEs were analysed in cod from three stations; the Inner Oslofjord (st. 30B), the Inner Sørfjord (st. 53B), and the Karihavet area (st. 23B). In 2008, the median concentration of sum PBDE was highest in cod from the Inner Oslofjord (98.1 µg/kg w.w.) and lowest in samples from the reference area Karihavet (10.8 µg/kg w.w.). Median concentrations found at presumed reference stations like Svolvær, Færder, Utsira and Bømlo-Sotra indicate that a high background level in diffusely contaminated areas might be 30 µg/kg w.w. for cod liver (Fjeld et al. 2005), which was higher than the median found in the Karihavet area.

### Concluding remarks

The concentration of PBDE was highest in cod liver from the Inner Oslofjord.

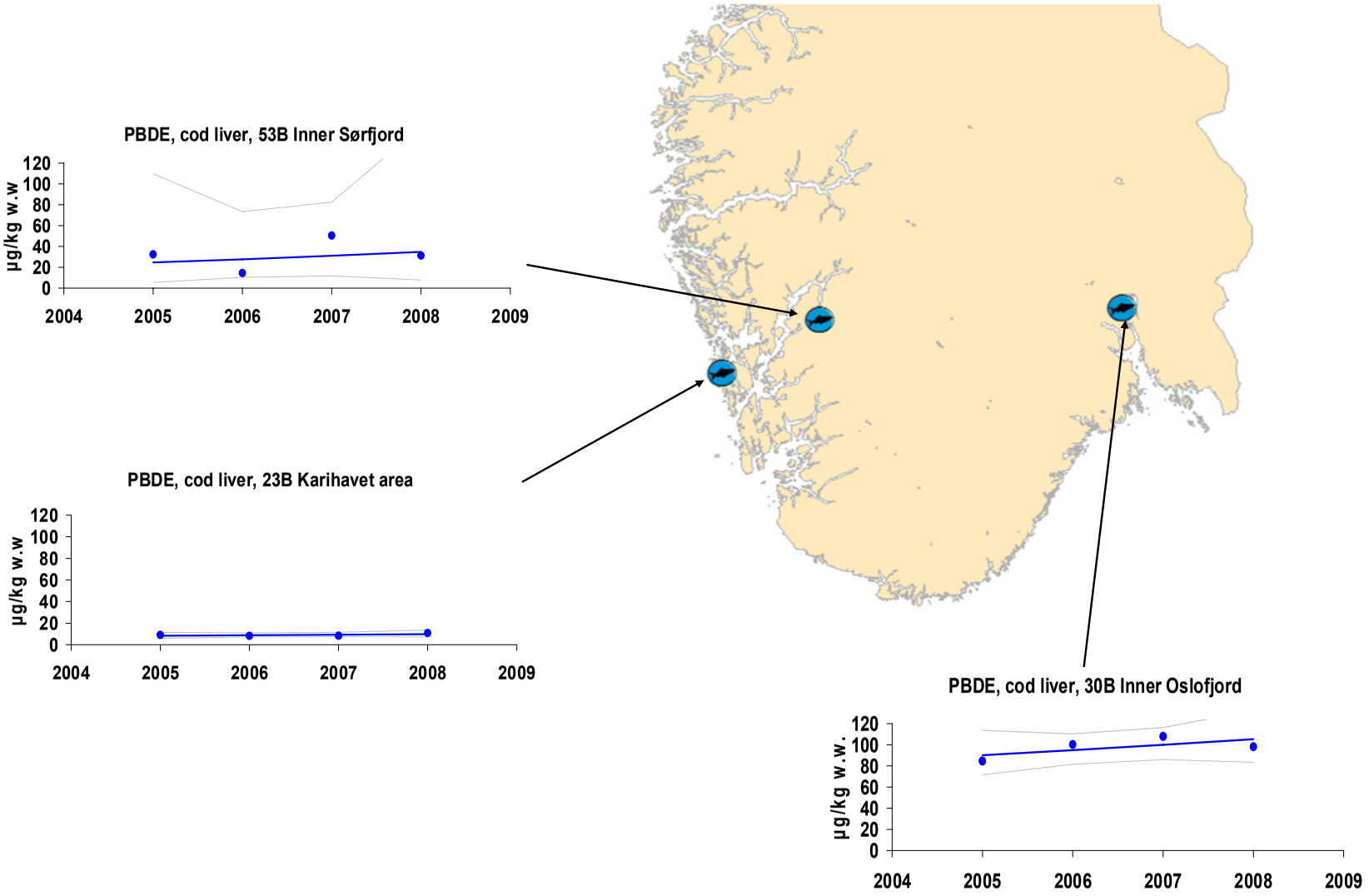



***Figure 19.*** *Trend and median concentration of PBDE in cod liver from Karihavet (st. 23B), Inner Sørfjord (st. 53B) and Inner Oslofjord (st. 30B), µg/kg (µg PBDE/kg) wet weight.*

## Perfluoroctanoic sulphonate (PFOS)

### Cod liver

Perfluroalkyl compounds (PFC[1]) have been investigated in cod liver since 2005. PFOS were analysed in cod from five stations; the Inner Oslofjord (st. 30B), the Inner Sørfjord (st. 53B), the Karihavet area (st. 23B), Kvænangen (st. 43B) and the Stokken area (st. 92B) (Figure 20). The median concentration of the indicator PFC compound perfluoroctonoic sulfonate (PFOS) was highest in Inner Oslofjord (42 µg/kg w.w.) and the lowest median concentration was found in the Karihavet area (6,9 µg/kg w.w.) (Table 7).

***Table 7**. Concentrations of PFOS analysed in 2008.*

| Stations | PFOS (µg/kg w.w.) |
|---|---|
| Inner Oslofjord (st. 30B) | 42,0 |
| Inner Sørfjord (st. 53B) | 10,0 |
| Stokken (st. 92B) | 13,0 |
| Kvænangen (st. 43B) | 26,98 |
| Karihavet area (st. 23B) | 6,9 |

### Concluding remarks

Median concentrations observed in cod from presumed reference stations like Svolvær, Kvænangen-Leisundet north of Skjervøy and the Varangerfjord indicated that a high background concentration in only diffusely contaminated areas might be around 10 µg/kg w.w. (Bakke et al. 2007a). The concentrations observed in the Inner Sørfjord and in the Karihavet area were quite near this level. PFOS found in cod in the Inner Oslofjord was clearly higher than for the other stations.

[1] PFCs included PFBS, PFHpA, PFHxA, PFNA, PFOA, PFOS, and PFOSA

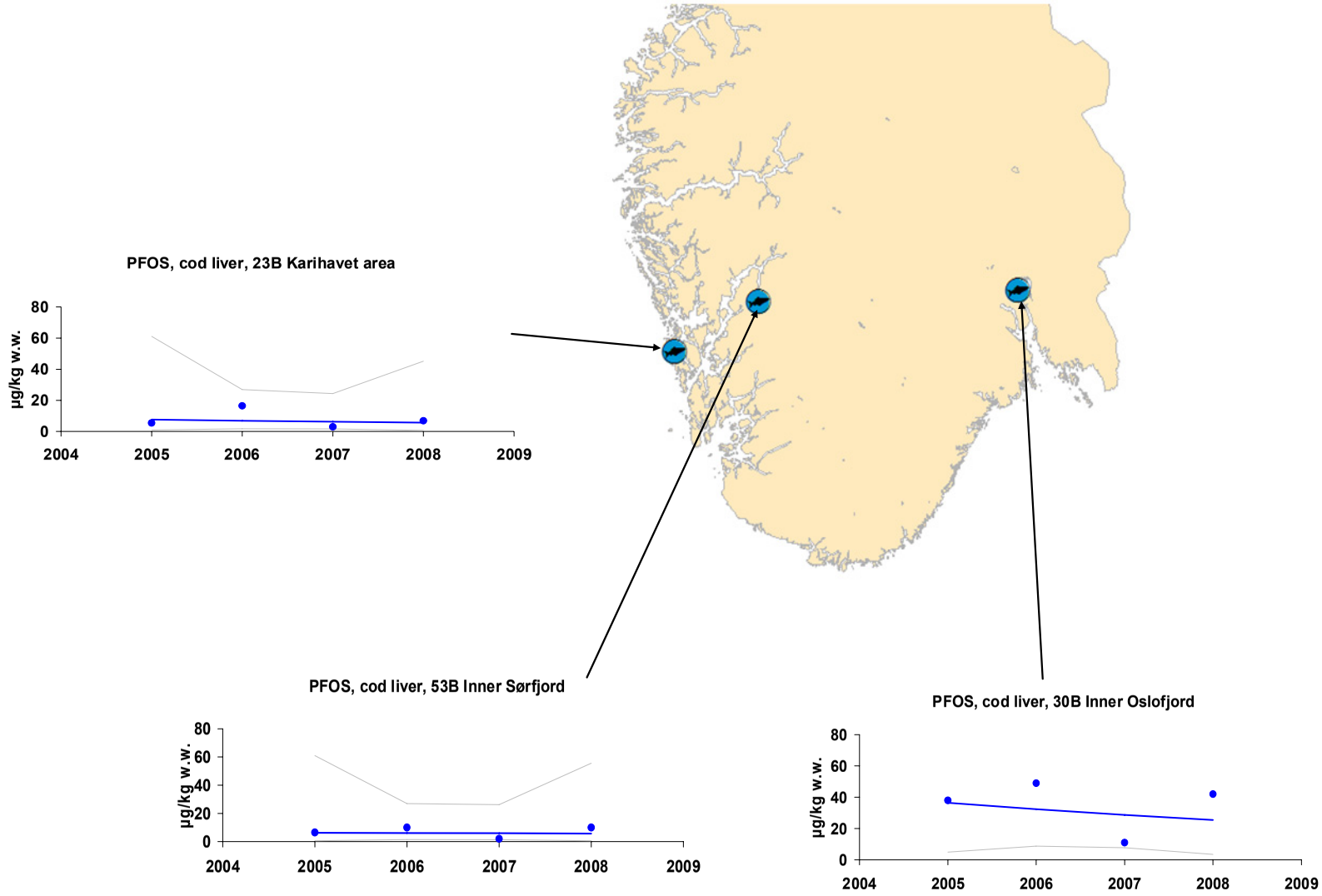



***Figure 20.*** *Trend and median concentration of PFOS in cod liver from Karihavet (st. 23B), Inner Sørfjord (st. 53B) and Inner Oslofjord (st. 30B), µg/kg (µg PFOS/kg) wet weight.*

## Tributyltin (TBT)

### Blue mussel

Concentrations of organotin (TBT) in blue mussel were quantified at 15 stations (some of the stations are presented in Figure 21). The presence of TBT exceeded acceptable levels (overconcentrations, >Class I, insignificantly polluted) at 8 blue mussel stations. The combination of overconcentrations of TBT and significant downward trends were observed at Gressholmen (st. 30A), Gjemesholmen (st. I712), Høgevarde (st. 227A2) (all Class II, moderately polluted), and Akershuskaia (st. I301) (Class III, markedly polluted). There was no significant trend at Espevær (st. 22A) (Class II). In blue mussel that showed acceptable level of TBT (Class I), significant downward trends were found at Bjørkøya (st. 71A), Risøy (st. 76A), Gåsøy (st. 15A), Husvaagen area (st. 98A2), Brashavn (st. 11X) and Strømtangen (st. I713). Blue mussel at the Færder area (st. 36A) were insignificantly polluted (Class I) by TBT and showed no significant trend.

Blue mussel at Mølen (st. 35A), Svensholmen (st. I132) and west of Odderø (st. I133) were all moderately polluted by TBT (Class II), but values for trend analyses were not given.

### Concentration of TBT in dogwhelk

The concentration of TBT in dogwhelks from the 8 stations investigated were relatively low (<0.165 mg/kg d.w.). As in 2003, 2004, 2005 and 2007 the highest organotin levels were found at Melandsholmen-Flatskjær (st. 227G2, Appendix J, Appendix K, Figure 22) on the West coast. Significant downward trends were found at Lista (st. 15G) during the period 2001-2008 (Figure 22), and at Færder (st. 36G). There were no significant trends for Espevær (st. 22G), Lastad (st. 131G), Risøy (st. 76G), Svolvær (st. 98G) or at Brashavn (st. 11G). The lowest organotin levels (0,0014 mg/kg d.w.) were found at Brashavn (st. 11G) in the Varangerfjord. Values for trend analyses for Melandsholmen-Flatskjær (st. 227G2) were not given.

### Biological effects of TBT (Imposex/VDSI) in dogwhelk

The effects from TBT were low (VDSI<2) at 7 of 8 stations investigated in 2008. A pronounced effect of TBT was however observed in dogwhelks from Melandsholmen-Flatskjær (st. 227 G2) which showed a VDSI of 3.67 (Appendix K). No effects (VDSI = 0) were found at Brashavn (st. 11G) and Lastad (st. 131 G) (Figure 23). There were significant downward trends at all the stations except for at Brashavn (st. 11G) (Appendix J) (Figure 23).

### Concluding remarks

The presence of organotin (as TBT) in Norwegian waters exceeded acceptable median levels (overconcentrations) at 8 of the 15 blue mussel stations monitored in 2008. This was observed not only in harbour areas like Gjemesholmen (st. I712) in the Frierfjord and Høgevarde (st. 227A2) in the Karmsund close to Haugesund, but also in mussel from stations presumably remote from known point sources like in Espevær (st. 22A). However, of the time series investigated for median concentrations of TBT in blue mussel, 10 stations showed significant downward trends, and two stations showed no significant trends.

Significant downward trends for TBT concentrations in gastropods were found at Lista (st. 15G) and Færder (st. 36G). The effects from TBT were low at 7 of 8 stations investigated in 2008. Of the time series investigated for biological effects (imposex) of TBT in dogwhelk, 7 showed a significant downward trends and one had no significant trend. The results show that the restrictions introduced in Norway banning the use of organotins on ships shorter than 25 meters in 1990 and longer than 25 meters in 2003 have been effective in reducing imposex in dogwhelk populations and some of the gastropod populations have re-established. The international convention that was adopted at the International Maritime Organization (IMO) also bans the presence of organotin-based antifouling paints on ship hulls from 2008.

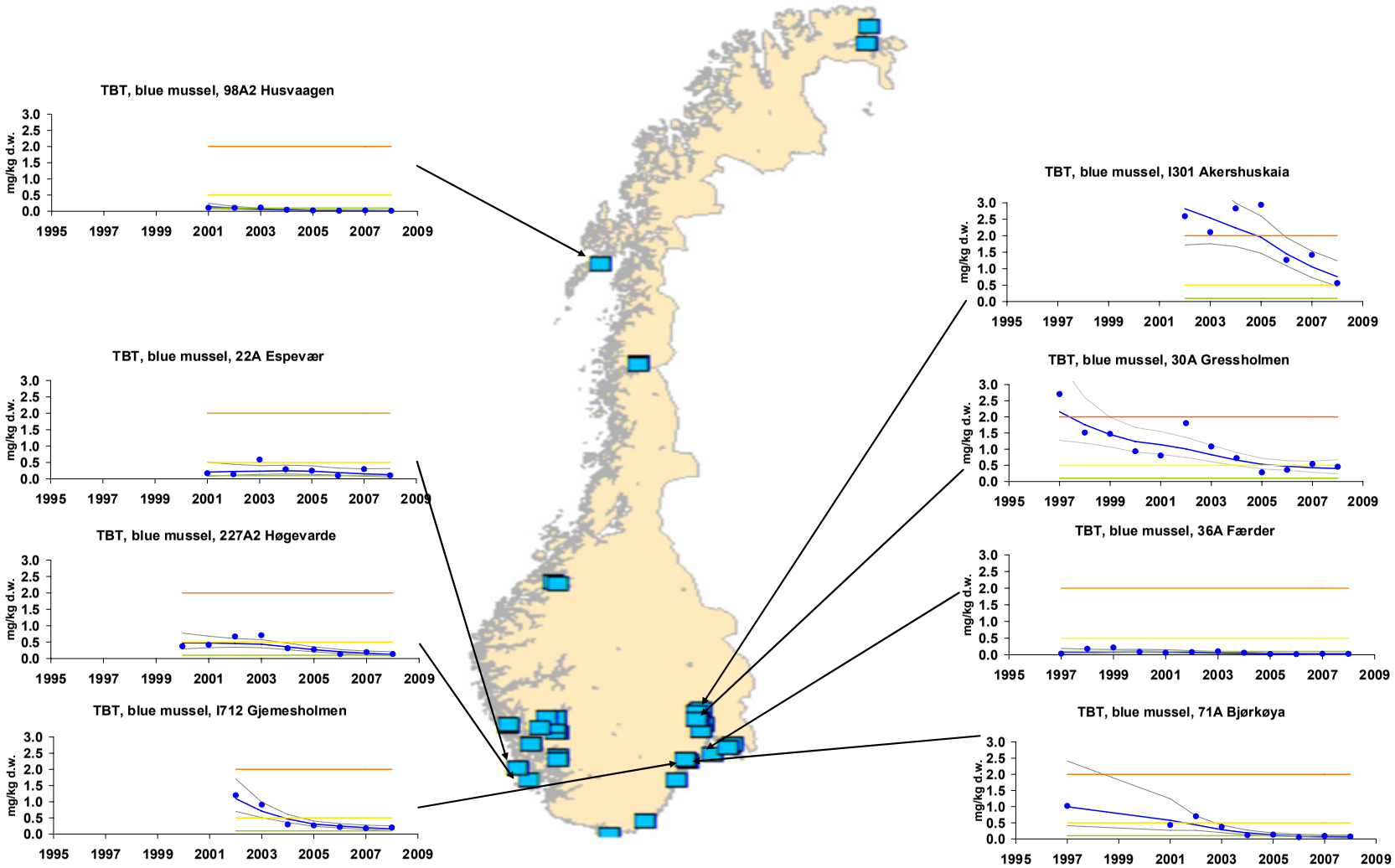



***Figure 21.*** *Trend and median concentration of TBT (on a formulation basis) in blue mussel, mg/kg (mg TBT/kg) dry weight. (cf. Appendix H and Appendix J). See key to detail in Figure 2.*

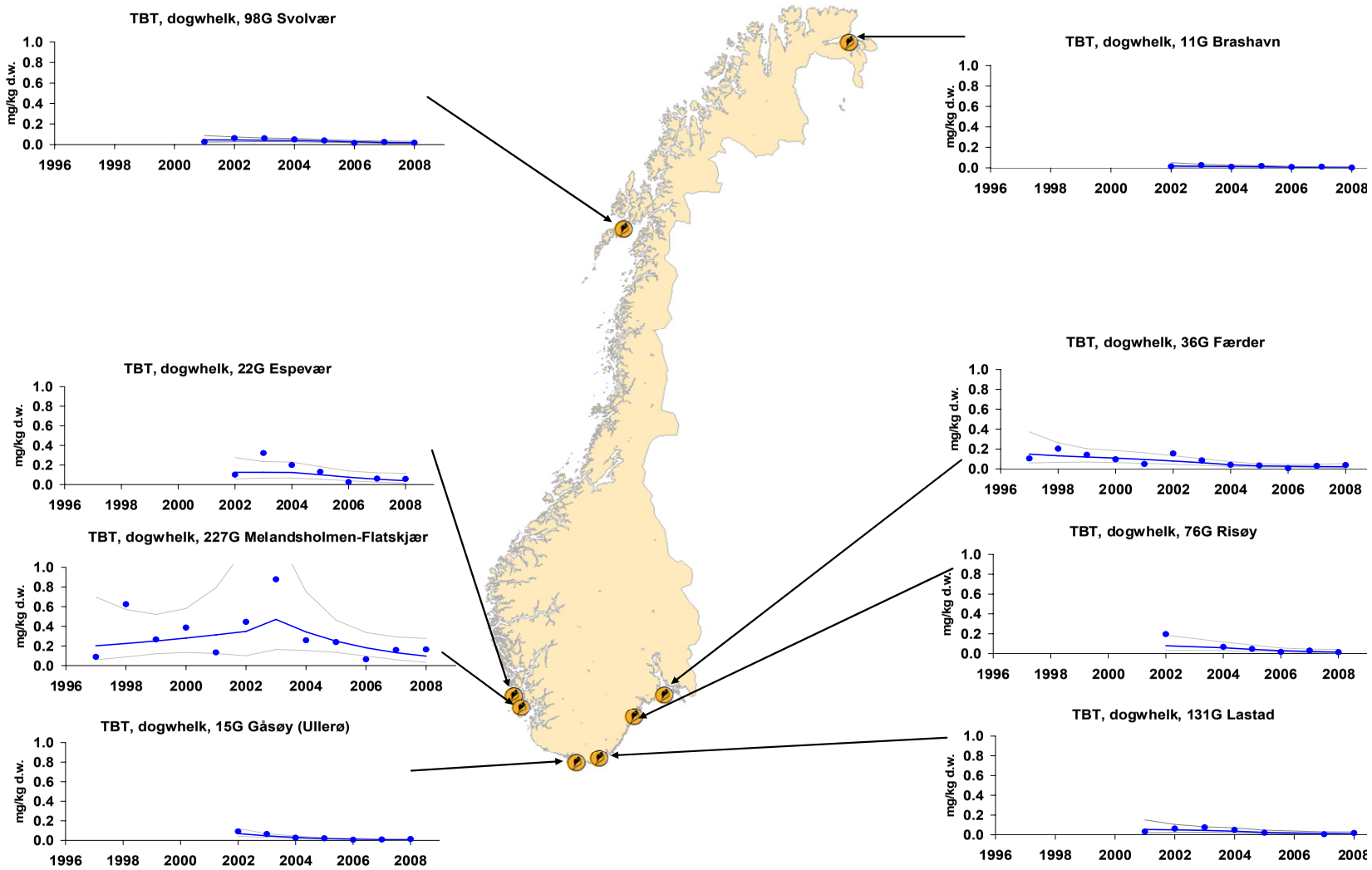



***Figure 22.*** *Trend and median concentration of TBT (on a formulation basis) in dogwhelk at 8 stations, mg/kg (mg TBT/kg) dry weight. NB: (cf. Appendix H and Appendix J).*

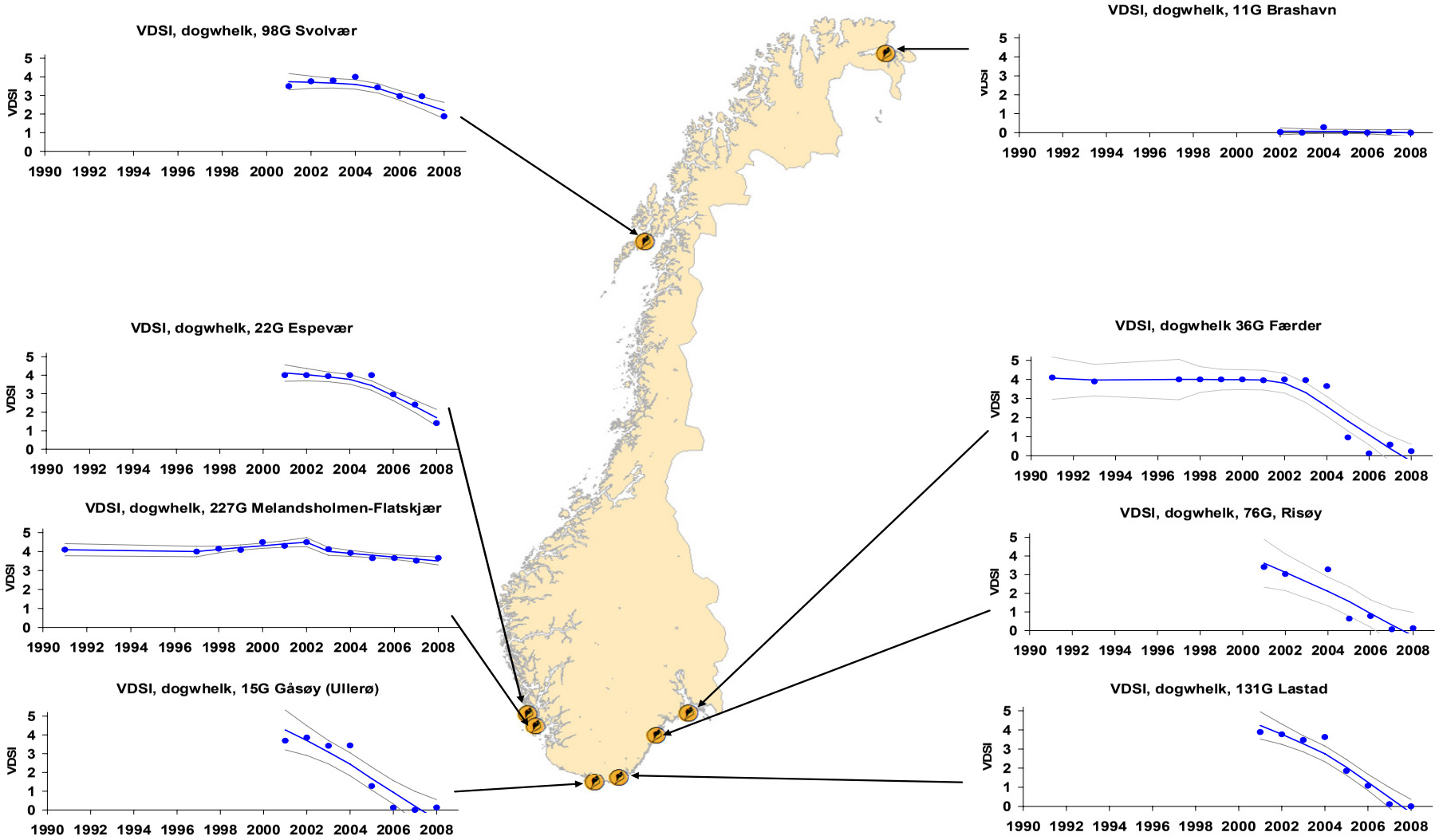



***Figure 23.*** *Trends in imposex (VDSI) in dogwhelk at 8 stations. Data from 1991 (Harding et al. 1992) and 1993 (Walday et al. 1997). (cf. Appendix H and Appendix J).*

***Table 8.*** *Overview of samples collected in 2008 with indication of levels and trends in concentrations of contaminants monitored. Classification is based on observed concentrations in cod, ling, tusk, flatfish, prawn, blue mussel and sediment. Tissues: soft body (SB), muscle (MU), liver (LI), whole organism (WO), tail muscle (TM), fish bile (BI), fish blood (BL). Klif Classification system is used for sediment (Bakke et al. 2007c) and biota (Molvær et al. 1997) for Classes: I (blue), II (green), III (yellow), IV (orange) and V (red) (see Appendix D). For biota, trend analyses were done on time series with three or more years and the results are indicated by an upward or downward arrow where significant trends were found, or a zero if no trend was detected. A small filled square (▪) indicates that chemical analysis has been performed, but the data were insufficient to do a trend analysis. Dark grey indicates concentration higher than estimated high background levels. Light grey indicates concentration lower than high background levels. Note: Class limits for ΣDDT are used for ppDDE.*

| Station | Station name | Medium | Tissue | Hg | Cd | Pb | Cu | Cr | Zn | PCB-7 | PAH | PAH-K | B[a]P | ppDDE | HCB | gHCH | TCDDN | PFOS | PBDE | TBT | VDSI | PYR1O | ALAD | EROD | CYP1A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 01A | Sponvika | Mussel | SB | ▪ | ▪ | ▪ | ▪ | ▪ | ▪ | ▪ | | | | ▪ | ▪ | ▪ | | | | | | | | | |
| 02A | Fugleskjær | Mussel | SB | ▪ | ▪ | ▪ | ▪ | ▪ | ▪ | ▪ | | | | ▪ | ▪ | ▪ | | | | | | | | | |
| 03A | Tisler | Mussel | SB | ▪ | ▪ | ▪ | ▪ | ▪ | ▪ | ▪ | | | | ▪ | ▪ | ▪ | | | | | | | | | |
| 10A2 | Skallneset | Mussel | SB | ↓ | ○ | ○ | ○ | ○ | ○ | ○ | | | | ○ | ↓ | ↓ | | | | | | | | | |
| 10B | Varangerfjorden | Cod | MU | ↓ | | | | | | ○ | | | | ○ | ○ | ▪ | ▪ | | | | | | | | |
| 10B | Varangerfjorden | Cod | LI | | ↓ | ↓ | | | ▪ | ↓ | | | | ↓ | ↓ | ▪ | ▪ | | | ▪ | | | | | |
| 10F | Skogerøy | Plaice | LI | | ○ | ↓ | ▪ | ▪ | ▪ | ○ | | | | ○ | ↓ | ▪ | | | | | | | | | |
| 10F | Skogerøy | Plaice | MU | ○ | | | | | | ○ | | | | ↓ | ○ | ▪ | | | | | | | | | |
| 11G | Brashavn | Dogwhelk | SB | | | | | | | | | | | | | | | | | ○ | | | | | |
| 11G | Brashavn | Dogwhelk | WO | | | | | | | | | | | | | | | | | | ○ | | | | |
| 11X | Brashavn | Mussel | SB | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | | | ○ | ○ | ↓ | | | | ↓ | | | | | |
| 131G | Lastad | Dogwhelk | SB | | | | | | | | | | | | | | | | | ○ | | | | | |
| 131G | Lastad | Dogwhelk | WO | | | | | | | | | | | | | | | | | | ↓ | | | | |
| 13A | Lastad | Mussel | SB | ▪ | ▪ | ▪ | ▪ | ▪ | ▪ | ▪ | | | | ▪ | ▪ | ▪ | | | | | | | | | |
| 14A | Lastad | Mussel | SB | ▪ | ▪ | ▪ | ▪ | ▪ | ▪ | ▪ | | | | ▪ | ▪ | ▪ | | | | | | | | | |
| 15A | Gåsøy (Ullerø) | Mussel | SB | ○ | ○ | ○ | ○ | ○ | ○ | ↓ | | | | ○ | ○ | ↓ | | | | ↓ | | | | | |
| 15B | Ullerø area | Cod | MU | ○ | | | | | | ○ | | | | ○ | ↓ | ▪ | | | | | | | | | |
| 15B | Ullerø area | Cod | LI | | ○ | ↓ | | | ▪ | ↓ | | | | ○ | ○ | ▪ | ▪ | | | ▪ | | | | | |
| 15B | Ullerø area | Cod | BI | | | | | | | | | | | | | | | | | | | ○ | | | |
| 15C | Gåsøy (Ullerø) | Prawn | TM | | ▪ | ▪ | ▪ | ▪ | ▪ | ▪ | | | | ▪ | ▪ | ▪ | | | | | | | | | |
| 15F | Ullerø area | Dab | LI | | ○ | ○ | ▪ | ▪ | ▪ | ○ | | | | ○ | ○ | ↓ | | | | | | | | | |
| 15F | Ullerø area | Dab | MU | ↑ | | | | | | ○ | | | | ○ | ○ | ↓ | | | | | | | | | |
| 15G | Gåsøy (Ullerø) | Dogwhelk | SB | | | | | | | | | | | | | | | | | ↓ | | | | | |
| 15G | Gåsøy (Ullerø) | Dogwhelk | WO | | | | | | | | | | | | | | | | | | ↓ | | | | |
| 15S | Lista area | Sediment | <> | ▪ | ▪ | ▪ | | ▪ | ▪ | | ▪ | ▪ | ▪ | ▪ | ▪ | ▪ | | | | ▪ | | | | | |
| 21F | Åkrafjord | Megrim | LI | | ○ | ○ | ▪ | ▪ | ▪ | ○ | | | | ○ | ○ | ▪ | | | | | | | | | |
| 21F | Åkrafjord | Megrim | MU | ○ | | | | | | ○ | | | | ○ | ○ | ↓ | | | | | | | | | |
| 227A2 | Høgevarde | Mussel | SB | | | | | | | | | | | | | | | | | ↓ | | | | | |
| 227G2 | Flatskjær | Dogwhelk | SB | | | | | | | | | | | | | | | | | ▪ | | | | | |

| Station | Station name | Medium | Tissue | Hg | Cd | Pb | Cu | Cr | Zn | PCB-7 | PAH | PAH-K | B[a]P | ppDDE | HCB | gHCH | TCDDN | PFOS | PBDE | TBT | VDSI | PYR1O | ALAD | EROD | CYP1A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 227G2 | Flatskjær | Dogwhelk | WO | | | | | | | | | | | | | | | | | | ↓ | | | | |
| 22A | Espevær (west) | Mussel | SB | ↑ | ○ | ○ | ○ | ○ | ○ | ○ | | | | ○ | ↓ | ↓ | | | | ○ | | | | | |
| 22G | Espevær (west) | Dogwhelk | SB | | | | | | | | | | | | | | | | | ○ | | | | | |
| 22G | Espevær (west) | Dogwhelk | WO | | | | | | | | | | | | | | | | | | ↓ | | | | |
| 23B | Karihavet area | Cod | LI | | ○ | ↓ | | | ▪ | ○ | | | | ↓ | ○ | ▪ | ▪ | ▪ | ▪ | ▪ | | | | | |
| 23B | Karihavet area | Cod | MU | ↑ | | | | | | ○ | | | | ○ | ○ | ▪ | | | | | | | | | |
| 23B | Karihavet area | Cod | BI | | | | | | | | | | | | | | | | | | | ○ | | | |
| 29D | Høyanger area | Ling | LI | | ▪ | ▪ | ▪ | ▪ | ▪ | ▪ | | | | ▪ | ▪ | ▪ | | | | | | | | | |
| 29D | Høyanger area | Ling | MU | ▪ | | | | | | ▪ | | | | ▪ | ▪ | ▪ | | | | | | | | | |
| 29D | Høyanger area | Tusk | LI | | ▪ | ▪ | ▪ | ▪ | ▪ | | | | | | | | | | | | | | | | |
| 29D | Høyanger area | Tusk | MU | ▪ | | | | | | | | | | | | | | | | | | | | | |
| 30A | Gressholmen | Mussel | SB | ○ | ↑ | ○ | ○ | ○ | ○ | ↓ | ○ | ○ | ○ | ↓ | ↓ | ↓ | ○ | | | ↓ | | | | | |
| 30B | Oslo City area | Cod | BL | | | | | | | | | | | | | ▪ | | | | | | | ○ | | |
| 30B | Oslo City area | Cod | LI | | ↑ | ○ | | | ▪ | ○ | | | | ○ | ↓ | ▪ | | ▪ | ↑ | | | | | ↓ | ○ |
| 30B | Oslo City area | Cod | MU | ↑ | | | | | | ○ | | | | ○ | ↓ | ▪ | | | | | | | | | |
| 30B | Oslo City area | Cod | BI | | | | | | | | | | | | | | | | | | | ○ | | | |
| 30C | Oslo City area | Prawn | TM | | ▪ | ▪ | ▪ | ▪ | ▪ | ▪ | | | | ▪ | ▪ | ▪ | | | | | | | | | |
| 30S | Steilene | Sediment | <> | ▪ | ▪ | ▪ | | ▪ | ▪ | | ▪ | ▪ | ▪ | ▪ | ▪ | ▪ | | | | ▪ | | | | | |
| 31A | Solbergstrand | Mussel | SB | ↑ | ↑ | ○ | ○ | ○ | ○ | ↓ | | | | ○ | ↓ | ↓ | | | | | | | | | |
| 33F | Sande (east side) | Flounder | LI | | ↓ | ↓ | ▪ | ▪ | ▪ | ○ | | | | ○ | ○ | ↓ | | | | | | | | | |
| 33F | Sande (east side) | Flounder | MU | ↓ | | | | | | ○ | | | | ○ | ○ | ▪ | | | | | | | | | |
| 35A | Mølen | Mussel | SB | ○ | ↑ | ↓ | ○ | ○ | ↑ | ↓ | | | ▪ | ○ | ↓ | ↓ | | | | ▪ | | | | | |
| 35C | Mølen-Moss | Prawn | TM | | ▪ | ▪ | ▪ | ▪ | ▪ | ▪ | | | | ▪ | ▪ | ▪ | | | | | | | | | |
| 35S | Mølen-Moss | Sediment | <> | ▪ | ▪ | ▪ | | ▪ | ▪ | | ▪ | ▪ | ▪ | ▪ | ▪ | ▪ | | | | ▪ | | | | | |
| 36A | Færder | Mussel | SB | ○ | ↑ | ↓ | ○ | ○ | ↑ | ↓ | | | | ○ | ↓ | ↓ | | | | ○ | | | | | |
| 36B | Færder area | Cod | MU | ○ | | | | | | ○ | | | | ○ | ↓ | ↓ | ▪ | | | | | | | | |
| 36B | Færder area | Cod | LI | | ↓ | ↓ | | | ▪ | ↓ | | | | ↓ | ↓ | ▪ | ▪ | | | ▪ | | | | | |
| 36C | Færder area | Prawn | TM | | ▪ | ▪ | ▪ | ▪ | ▪ | ▪ | | | | ▪ | ▪ | ▪ | | | | | | | | | |
| 36F | Færder area | Dab | LI | | ○ | ↓ | ▪ | ▪ | ▪ | ○ | | | | ○ | ↓ | ↓ | | | | | | | | | |
| 36F | Færder area | Dab | MU | ○ | | | | | | ↑ | | | | ○ | ↓ | ↓ | | | | | | | | | |
| 36G | Færder | Dogwhelk | SB | | | | | | | | | | | | | | | | | ↓ | | | | | |
| 36G | Færder | Dogwhelk | WO | | | | | | | | | | | | | | | | | | ↓ | | | | |
| 36S | Færder area | Sediment | <> | ▪ | ▪ | ▪ | | ▪ | ▪ | | ▪ | ▪ | ▪ | ▪ | ▪ | ▪ | | | | ▪ | | | | | |
| 43B | Kvænangen (Olderfjord) | Cod | LI | | ▪ | ↓ | | | | ▪ | | | | ▪ | ▪ | ▪ | | ▪ | ▪ | | | | | | |
| 43B | Kvænangen (Olderfjord) | Cod | MU | ▪ | | | | | | ▪ | | | | ▪ | ▪ | ▪ | | | | | | | | | |
| 51A | Byrkjenes | Mussel | SB | ○ | ↓ | ○ | | | | ○ | | | | ○ | ○ | ↓ | | | | | | | | | |
| 52A | Eitrheimsneset | Mussel | SB | ↓ | ↓ | ○ | ○ | ○ | ↓ | ○ | | | | ○ | ↓ | ↓ | | | | | | | | | |

| Station | Station name | Medium | Tissue | Hg | Cd | Pb | Cu | Cr | Zn | PCB-7 | PAH | PAH-K | B[a]P | ppDDE | HCB | gHCH | TCDDN | PFOS | PBDE | TBT | VDSI | PYR1O | ALAD | EROD | CYP1A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 53B | Inner Sørfjord | Cod | LI | | ↑ | ↓ | | | ▪ | ○ | | | | ○ | ↓ | ▪ | | ▪ | ▪ | | | | | | |
| 53B | Inner Sørfjord | Cod | MU | ○ | | | | | | ○ | | | | ○ | ○ | ▪ | | | | | | | | | |
| 53B | Inner Sørfjord | Cod | BI | | | | | | | | | | | | | | | | | | | ○ | | | |
| 53D | Digraneset | Ling | LI | | ▪ | ▪ | ▪ | ▪ | ▪ | ▪ | | | | ▪ | ▪ | ▪ | | | | | | | | | |
| 53D | Digraneset | Ling | MU | ▪ | | | | | | ▪ | | | | ▪ | ▪ | ▪ | | | | | | | | | |
| 53F | Inner Sørfjord | Flounder | LI | | ○ | ○ | ▪ | ▪ | ▪ | ↓ | | | | ○ | ↓ | ↓ | | | | | | | | | |
| 53F | Inner Sørfjord | Flounder | MU | ↑ | | | | | | ↓ | | | | ↓ | ↓ | ↓ | | | | | | | | | |
| 56A | Kvalnes | Mussel | SB | ↓ | ↓ | ○ | ○ | ○ | ↓ | ○ | | | | ↑ | ○ | ↓ | | | | | | | | | |
| 57A | Krossanes | Mussel | SB | ↓ | ↓ | ↓ | ○ | ○ | ↓ | ○ | | | | ○ | ○ | ↓ | | | | | | | | | |
| 63A | Ranaskjær | Mussel | SB | ○ | ↓ | ↓ | ○ | ○ | ↓ | ○ | | | | ○ | ○ | ↓ | | | | | | | | | |
| 65A | Vikingneset | Mussel | SB | ○ | ↓ | ↓ | ○ | ○ | ○ | ↓ | | | | ○ | ○ | ↓ | | | | | | | | | |
| 67B | Strandebarm area | Cod | MU | ↓ | | | | | | ○ | | | | ↓ | ↓ | ▪ | | | | | | | | | |
| 67B | Strandebarm area | Cod | LI | | ↓ | ↓ | | | ▪ | ↓ | | | | ↓ | ↓ | ▪ | | | | | | | | | |
| 67D | Strandebarm area | Ling | LI | | ▪ | ▪ | ▪ | ▪ | ▪ | ▪ | | | | ▪ | ▪ | ▪ | | | | | | | | | |
| 67D | Strandebarm area | Ling | MU | ▪ | | | | | | ▪ | | | | ▪ | ▪ | ▪ | | | | | | | | | |
| 67F | Strandebarm area | Megrim | MU | ↓ | | | | | | ○ | | | | ↓ | ↓ | ▪ | | | | | | | | | |
| 67F | Strandebarm area | Megrim | LI | | ↓ | ↓ | ▪ | ▪ | ▪ | ↓ | | | | ↓ | ↓ | ▪ | | | | | | | | | |
| 67F | Strandebarm area | Flounder | LI | | ↓ | ↓ | ▪ | ▪ | ▪ | ↓ | | | | ○ | ○ | ↓ | | | | | | | | | |
| 67F | Strandebarm area | Flounder | MU | ○ | | | | | | ↓ | | | | ↓ | ○ | ▪ | | | | | | | | | |
| 69A | Lille Terøy | Mussel | SB | ○ | ↓ | ↓ | ○ | ○ | ↓ | ○ | | | | ○ | ○ | ↓ | | | | | | | | | |
| 71A | Bjørkøya (Risøyodden) | Mussel | SB | ↓ | ○ | ○ | ○ | ○ | ↓ | ↓ | | | | ○ | ↓ | ▪ | ○ | | | ↓ | | | | | |
| 71G | Fugløyskjær | Dab | SB | | | | | | | | | | | | | | | | | ▪ | | | | | |
| 73A | Lyngholmen | Mussel | SB | ▪ | ▪ | ▪ | ▪ | ▪ | ▪ | ▪ | | | | ▪ | ▪ | ▪ | | | | | | | | | |
| 74A | Langholmane | Mussel | SB | ▪ | ▪ | ▪ | ▪ | ▪ | ▪ | ▪ | | | | ▪ | ▪ | ▪ | | | | | | | | | |
| 76A | Risøy | Mussel | SB | ○ | ○ | ○ | ○ | ○ | ○ | ↓ | | | | ○ | ○ | ↓ | ○ | | | ↓ | | | | | |
| 76G | Risøy | Dogwhelk | SB | | | | | | | | | | | | | | | | | ○ | | | | | |
| 76G | Risøy | Dogwhelk | WO | | | | | | | | | | | | | | | | | | ↓ | | | | |
| 77A | Nordstrand | Mussel | SB | ▪ | ▪ | ▪ | ▪ | ▪ | ▪ | ▪ | | | | ▪ | ▪ | ▪ | | | | | | | | | |
| 77B | Borøy area | Cod | LI | | ▪ | ▪ | | | ▪ | ▪ | | | | ▪ | ▪ | ▪ | | | | | | | | | |
| 77B | Borøy area | Cod | MU | ▪ | | | | | | ▪ | | | | ▪ | ▪ | ▪ | | | | | | | | | |
| 77C | Borøy area | Prawn | TM | | ▪ | ▪ | ▪ | ▪ | ▪ | ▪ | | | | ▪ | ▪ | ▪ | | | | | | | | | |
| 77F | Borøy area | Dab | LI | | ▪ | ▪ | ▪ | ▪ | ▪ | ▪ | | | | ▪ | ▪ | ▪ | | | | | | | | | |
| 77F | Borøy area | Dab | MU | ▪ | | | | | | ▪ | | | | ▪ | ▪ | ▪ | | | | | | | | | |
| 77S | Arendal area | Sediment | <> | ▪ | ▪ | ▪ | | ▪ | ▪ | | ▪ | ▪ | ▪ | ▪ | ▪ | ▪ | | | | ▪ | | | | | |
| 79A | Gjerdsvoldsøyen (east) | Mussel | SB | ▪ | ▪ | ▪ | ▪ | ▪ | ▪ | ▪ | | | | ▪ | ▪ | ▪ | | | | | | | | | |
| 92B | Stokken area | Cod | LI | | ○ | ○ | | | | ○ | | | | ○ | ○ | ▪ | | ▪ | ▪ | | | | | | |
| 92B | Stokken area | Cod | MU | ○ | | | | | | ○ | | | | ○ | ○ | ▪ | | | | | | | | | |

| Station | Station name | Medium | Tissue | Hg | Cd | Pb | Cu | Cr | Zn | PCB-7 | PAH | PAH-K | B[a]P | ppDDE | HCB | gHCH | TCDDN | PFOS | PBDE | TBT | VDSI | PYR1O | ALAD | EROD | CYP1A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 98A2 | Husvaagen area | Mussel | SB | o | o | ↓ | o | o | o | ↓ | | | | o | o | ↓ | | | | ↓ | | | | | |
| 98B1 | Bjørnerøya (east) | Cod | LI | | o | ↓ | | | ▪ | o | | | | o | o | ▪ | ▪ | | | ▪ | | | | | |
| 98B1 | Bjørnerøya (east) | Cod | MU | o | | | | | | o | | | | o | o | ▪ | ▪ | | | | | | | | |
| 98F2 | Husholmen | Plaice | MU | o | | | | | | o | | | | o | o | ▪ | | | | | | | | | |
| 98F2 | Husholmen | Plaice | LI | | o | o | ▪ | ▪ | ▪ | ↓ | | | | ↓ | o | ▪ | | | | | | | | | |
| 98G | Svolvær området | Dogwhelk | SB | | | | | | | | | | | | | | | | | o | | | | | |
| 98G | Svolvær området | Dogwhelk | WO | | | | | | | | | | | | | | | | | | ↓ | | | | |
| I022 | West Damholmen | Mussel | SB | o | o | o | | | | ↓ | | | | ↓ | o | ↓ | | | | | | | | | |
| I023 | Singlekalven (south) | Mussel | SB | o | o | o | | | | ↓ | | | | ↓ | o | ↓ | | | | | | | | | |
| I024 | Kirkøy (north west) | Mussel | SB | o | o | o | | | | ↓ | | | | ↓ | o | ↓ | | | | | | | | | |
| I131A | Lastad | Mussel | SB | ▪ | ▪ | | | | | ▪ | | | ▪ | ▪ | ▪ | ↓ | | | | | | | | | |
| I132 | Svensholmen | Mussel | SB | | | | | | | ↓ | | | o | ↓ | o | ▪ | o | | | ▪ | | | | | |
| I133 | Odderø (west) | Mussel | SB | | | | | | | ↓ | o | o | o | o | o | ↓ | o | | | ▪ | | | | | |
| I201 | Ekkjegrunn (G1) | Mussel | SB | o | o | o | | | | | | | ↓ | | | | | | | | | | | | |
| I205 | Bølsnes (G5) | Mussel | SB | ↑ | o | o | | | | | o | o | o | | | | | | | | | | | | |
| I241 | Nordnes | Mussel | SB | | | | | | | o | | | | o | o | ↓ | | | | | | | | | |
| I242 | Gravdalsneset | Mussel | SB | | | | | | | ▪ | | | | o | ↓ | ↓ | | | | | | | | | |
| I243 | Hegreneset | Mussel | SB | | | | | | | ▪ | | | | o | o | ↓ | | | | | | | | | |
| I301 | Akershuskaia | Mussel | SB | ↑ | ↑ | o | | | | ↓ | | | o | o | o | ↓ | | | | ↓ | | | | | |
| I304 | Gåsøya | Mussel | SB | o | o | o | | | | o | o | o | o | o | o | ↓ | | | | | | | | | |
| I306 | Håøya | Mussel | SB | o | o | o | | | | ▪ | o | o | ↑ | o | o | ↓ | | | | | | | | | |
| I307 | Ramtonholmen | Mussel | SB | o | ↑ | o | | | | o | o | o | ↑ | o | o | ↓ | | | | | | | | | |
| I712 | Gjemesholmen | Mussel | SB | o | | | | | | ↓ | | | | o | o | ↓ | o | | | ↓ | | | | | |
| I713 | Strømtangen | Mussel | SB | o | | | | | | o | | | | o | o | ▪ | o | | | ↓ | | | | | |
| I912 | Honnhammer | Mussel | SB | | | | | | | | ↓ | ↓ | o | | | | | | | | | | | | |
| I913 | Fjøseid | Mussel | SB | | | | | | | | ↓ | ↓ | o | | | | | | | | | | | | |
| I915 | Flåøya (northwest) | Mussel | SB | | | | | | | | | | ▪ | | | | | | | | | | | | |
| I964 | Toraneskaien (B4) | Mussel | SB | o | o | o | | | ▪ | | o | o | o | | | | | | | | | | | | |
| I965 | Moholmen (B5) | Mussel | SB | o | o | o | | | ▪ | | o | o | o | | | | | | | | | | | | |
| I969 | Bjørnbærviken (B9) | Mussel | SB | o | o | o | | | ▪ | | | | o | | | | | | | | | | | | |

## 4.3. Areas of special concern (Impacted)

### Oslofjord/Hvaler/Grenlandsfjord area and Sørfjord/Hardangerfjord area

This report focus on two main areas of special concern; the Oslofjord/Hvaler/Grenlandsfjord area and the Sørfjord/Hardangerfjord area. Of the 473 time series that included 2008 samples, 170 concerned the Oslofjord area, including the Hvaler area and Grenlandsfjord area, 138 of these had a concentration in 2008 that could be classed as insignificantly polluted (Class I), or did not exceed provisional "high background". Most of the time series from this region showed no significant trend, and of the 64 significant trends, 75 % were downwards.

Of the 473 time series that included 2008 results, 105 concerned the Sørfjord and Hardangerfjord area. Of these, 26 had a concentration in 2008 that could be classed as insignificantly polluted (Class I), or did not exceed provisional "high background". Most of the time series from this region showed no significant trend, and of the 53 significant trends, all but three were downwards.

### Oslofjord/Hvaler/Grenlandsfjord area

The investigations in 2008 included 13 blue mussel stations (Figure 24A) and two cod stations (Figure 25A) in the Oslofjord. One flounder station near Mølen in the mid Oslofjord and one dogwhelk station at Færder were also investigated. In addition, six blue mussel stations in the Hvaler area, three in the Grenlandsfjord area, one west of Færder and one near Risør were sampled. Points of concern are described below.

There was a significant downward trend for ΣPCB-7[1] in blue mussel from the Inner Oslofjord (st. 30A Gressholmen). The mussel were moderately polluted (Klif's Class II, Figure 24).

The Norwegian Food Safety Authority (Mattilsynet) has issued advice against consumption of eel and fish liver from the Inner Oslofjord due to high concentrations of PCB. Cod liver from Inner Oslofjord (st. 30B) was markedly polluted with ΣPCB-7, the median concentration was 3780 µg/kg w.w (Class III, Figure 25 B). These results may be in accordance with a higher amount of hepatic CYP1A proteins in the fish in 2008 compared to 2007, however, a significant reduction in EROD activity was shown for the period 1997-2008, indicating an overall reduction in exposure to planar organic contaminants. The range for ΣPCB-7 in cod liver observed in 2008 was 1140-4215 µg/kg w.w. The fillets from the same fish were moderately polluted with ΣPCB-7 as it has been since 2000 (Class II, Figure 25 C). Blue musseles are found in shallow water, and are filterfeeders. Cod are found in the whole water body, and feed on fish, prawns and bentic fauna. Cod will therefore bioaccumulate contaminants like PCBs from sediments to a higher extent than blue mussels. This might be the reason for the observed differences in trends for ΣPCB-7 in blue mussel and cod. Cod liver and fillet from the outer Oslofjord were insignificantly polluted (Class I) with regard to ΣPCB-7 (st. 36B Færder).

A significant downward trend was detected for ΣPCB-7 in blue mussel from seven stations in the Oslofjord-Hvaler area (Figure 24 A) for the period 1988 to 2008. Power analyses indicated that a hypothetical trend of 10 % change per year in ΣPCB-7 concentration in the blue mussel in this area would take 10 to 14 years to be detected with 90 % significance (Appendix J). No trends were found in cod, flounder or dab from this area.

[1] ΣPCB-7 is the sum of PCB 28, 52, 101, 118, 138, 153 and 180

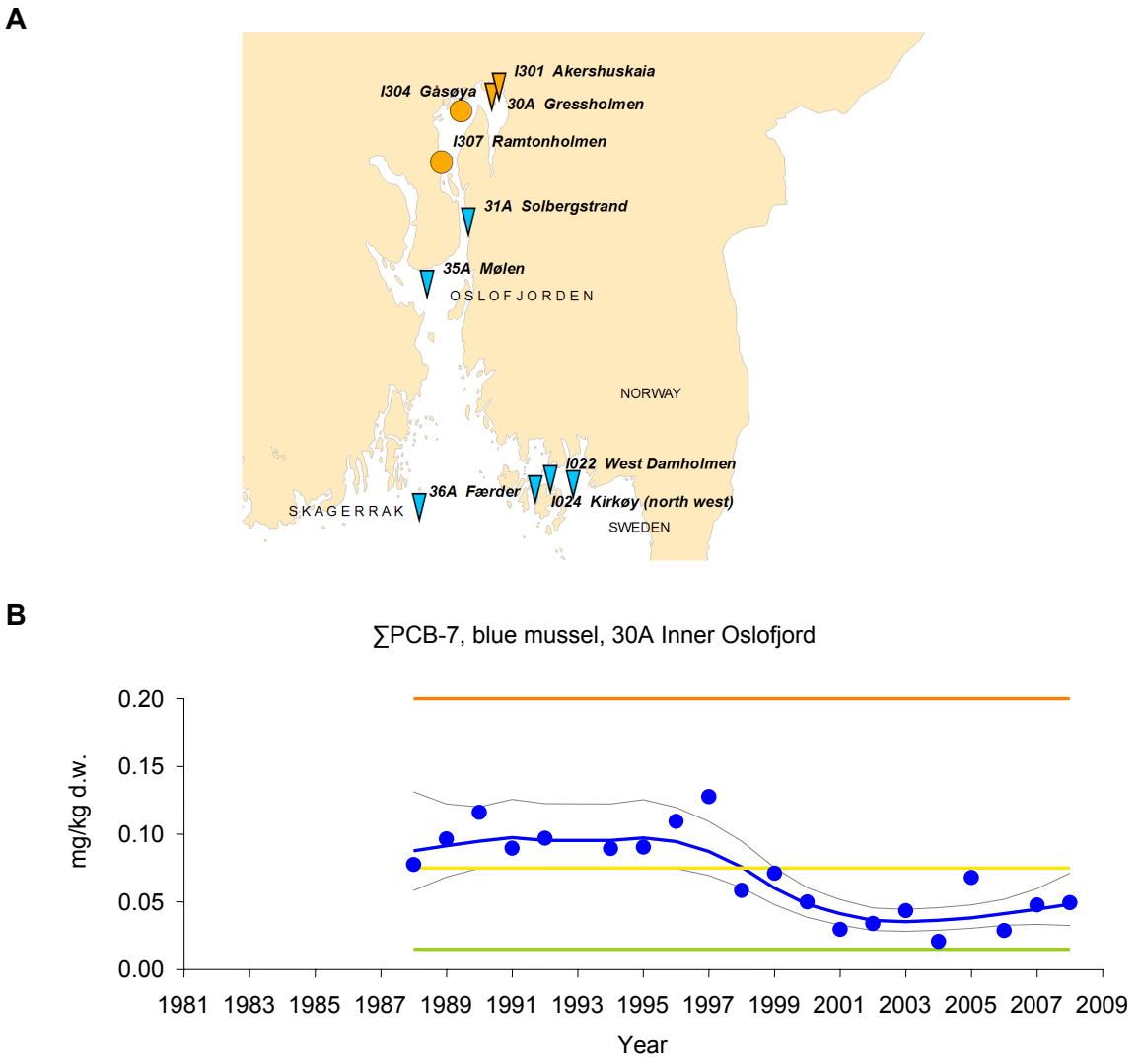
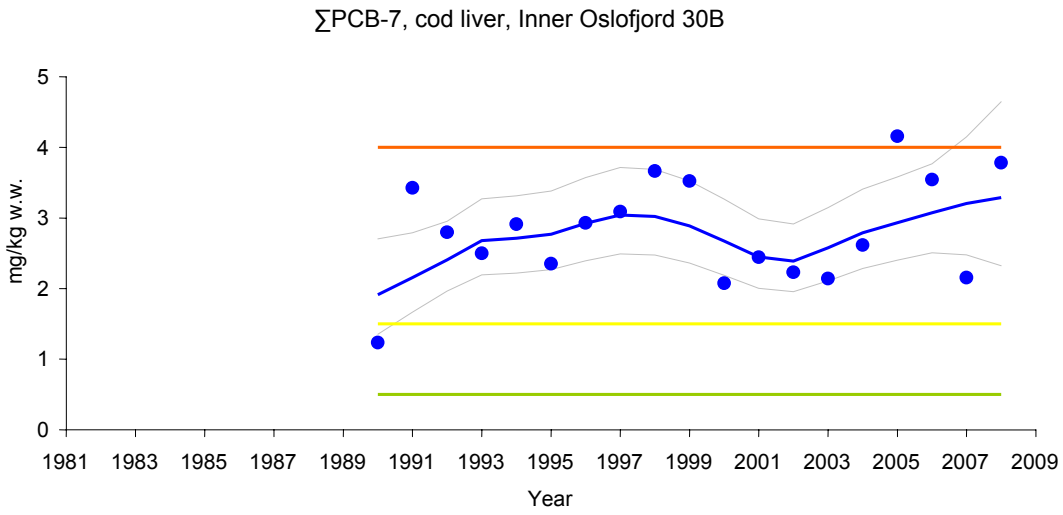



***Figure 24.*** *Trend for median ΣPCB-7 concentrations in blue mussel from the Oslofjord and detail for Gressholmen (st. 30A) in the Inner Oslofjord (cf. Appendix H and Appendix J. Directions of significant trends are indicated in the map and blue symbols indicate insignificant pollution in 2008. See otherwise key to map and detail in Figure 2).*

**A**


**B**




**C**

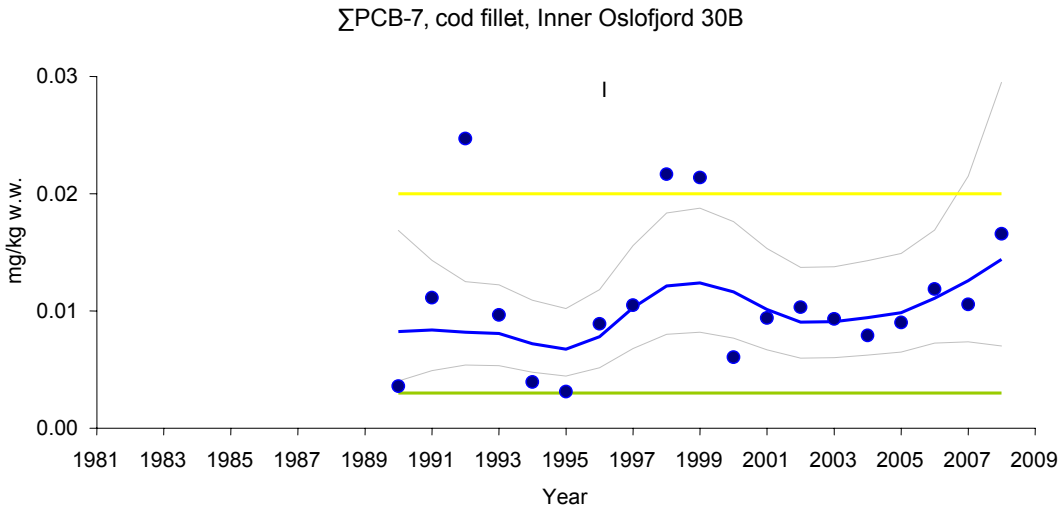
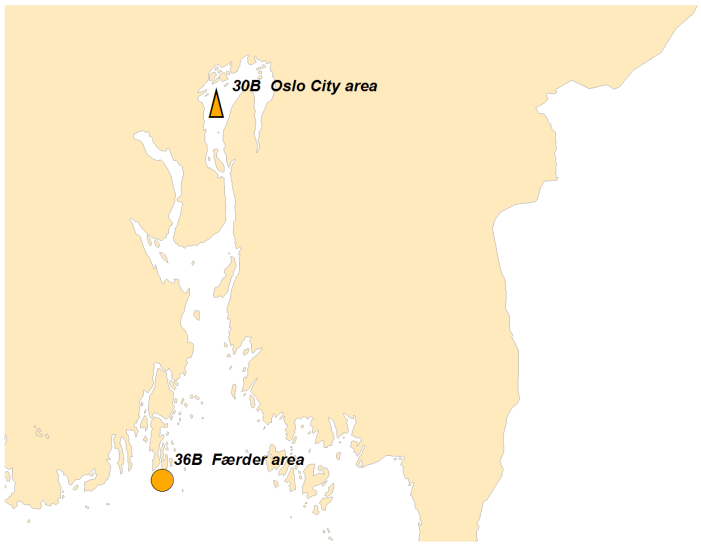



***Figure 25.*** *Trend for median ΣPCB-7 concentrations in liver and fillet of cod from the Oslofjord region and detail for the Inner Oslofjord (st. 30B) (cf. Appendix H and Appendix J. Circles in maps indicate no significant trends and blue symbols indicate insignificant pollution in 2008. See otherwise key to map and detail in Figure 2).*

The fillet of cod collected in the Inner Oslofjord (st. 30B) in 2008 were moderately polluted with mercury (Class II, Figure 26 A and B). A significant upward trend was detected for the period 1984-2008. No significant trend was found for the period 1998-2008. Considering the entire period, the power analysis, indicated as number of years to detect a hypothetical 10 % change per year for mercury in cod fillet from either the Inner Oslofjord station or the outer Oslofjord station (st. 36B Færder), was 11 years (cf. Appendix J). An upward trend for mercury in cod was observed only at one other cod station in (st. 23B Karihavet on the west coast). Two upward trends were found in blue mussel from the mid Oslofjord at Solbergstrand (st. 31A) and the Inner Oslofjord at Akershuskaia (st. I301) but concentrations in 2008 were low (Class I).

From 2006 to 2008 approximately 440 000 $m^3$ polluted sediment was dredged from the harbour area in the Inner Oslofjord. Monitoring of contaminants in blue mussels in this period showed relatively high levels of PCB (Class II-III) but no significant increase. Berge et al. (2009) concluded that the dredging activity probably was not the most important explanation for the observed elevated concentrations of contaminants in blue mussel in the harbour area. The concentration of mercury in fillet of cod from Inner Oslofjord (st. 30B) is similar to the concentrations found in Bekkelagsbassenget and Frognerkilen in 2006, inner basin and Bekkelagsbassenget (1997 and 1998), and Hvervenbukta and Breivold/Bunnefjorden in 1997 and 1998 (Berge 2009). The discharge of mercury in Norway has been reduced by 60 % from 1995 to 2005. From 2008 products containing mercury was prohibited in Norway. In 2009 a survey of contaminants in freshwater fish in Norway revealed very high concentrations of mercury (Fjeld and Rognerud 2009). This increase is unexpected as the atmospheric mercury depositions most likely have decreased in South-East Norway since the beginning of the 1990s. Mercury in fish exists mainly as methyl mercury, and factors stimulating the mercury methylation, such as warmer and wetter climate and also forestry lumbering, may have contributed to the observed increase. This might also be the case for the contamination of cod in the Oslofjord. The mechanism for the increase of Hg in fish in Norway is not fully understood.

**A**




**B**

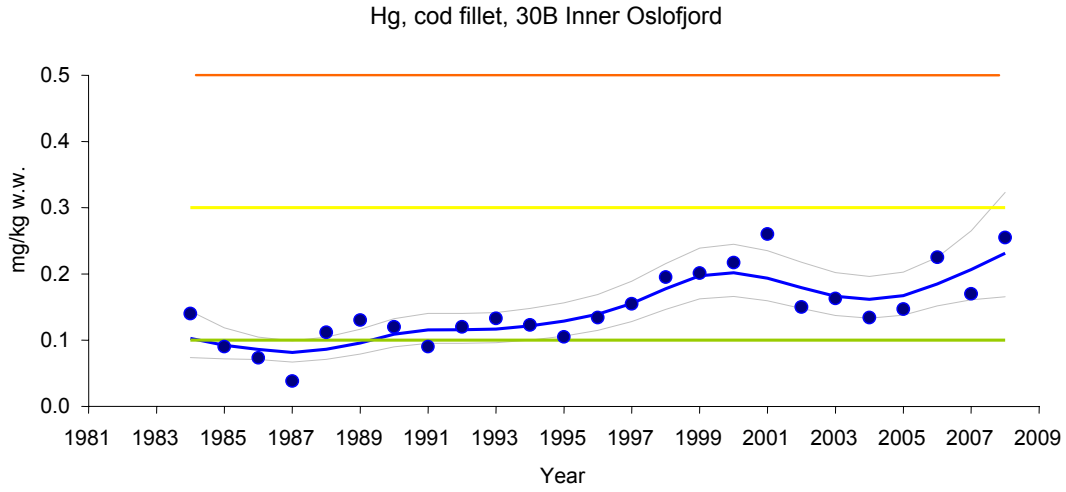



***Figure 26.*** *Trend for median mercury (Hg) concentration in fillet of cod from the Oslofjord region and detail for the Inner Oslofjord (st. 30B) (cf. Appendix H and Appendix J. Direction of significant trend indicated in the map where blue symbol indicate insignificant pollution in 2008. See otherwise key to map and detail in Figure 2).*

Like for mercury, lead in cod liver had a peak in 1999-2002, then a little decrease and then started a new increase from 2005. Median concentration of lead in cod liver from the Inner Oslofjord (st. 30B) in 2008 was 0.30 mg/kg w.w. "High background" for this metal is 0.1 mg/kg w.w. Blue mussel from Gressholmen in the Inner Oslofjord (st. 30A) was moderately (Class II) polluted with respect to lead in 2008.

Overconcentration of cadmium in cod liver from the Inner Oslofjord (st. 30B) was found for 2008, and the trend was found to be upward for the period 1984-2008. Two of the five blue mussel stations in this area of the fjord also showed upward trends, Gressholmen (st. 30A) for the period 1984-2008 and Ramtonholmen (st. I307) for the period 1995-2008, but concentrations were low (Class I). The Klif's environmental quality classification system does not include cadmium and lead in cod liver. It should be noted that the Index programme indicated marked concentrations of TBT in blue mussel from a station located in the Inner Oslofjord (see chapter 4.2.18, Figure 21).

## Grenlandsfjord area

In the Grenlandsfjord area there is advice against consumption of all fish and shellfish due to high concentration of PCB and dioxins. Blue mussel from Bjørkøy (st. 71A Risøyodden) in 2008 were moderately polluted with HCB (Class II, Figure 27 A and B). The median concentration for 2008 was 1.21 mg/kg d.w., about 10 % lower than the 2007 median. Median values found at two nearby index stations near the mouth of the Frierfjord (st. I712 Gjemesholmen and st. I713 Strømtangen, Figure 27 A) were markedly polluted (Class III), but also lower in 2008 compared to 2006 (Appendix J). Concentrations have varied greatly since 1983 but median values have decreased distinctly since 1989 Figure 27 B) due to about 99 % reduction in discharge of HCB and other organochlorines from a magnesium factory (cf. Knutzen et al. 2001).

The 1983-2008 data series for HCB in blue mussel had a significant downward trend and also a significant downward trend was found for the recent period (1990-2008).

Median concentrations of ΣPCB-7 in blue mussel from Gjemesholmen have showed a significant downward trend since 1995, as well as TBT concentrations from Gjemesholmen and Strømtangen since 2002.

It should be noted that dioxin is one of the contaminants monitored in order to calculate the Pollution Index (see chapter 3.5). Dioxin toxicity equivalents based on the Nordic model (TCDDN) showed that the blue mussel were extremely polluted (Class V) at Bjørkøy (st. 71A), and at both nearby Index stations (st. I712 Gjemesholmen and st. I713 Strømtangen, Figure 18).

Large reductions in the industrial effluents resulted in a strong decline in contaminant levels in fish and shellfish around 1990, but still the dioxin concentration in seafood from the Grenlandsfjord is too high. Concentrations of dioxins in blue mussel showed no reduction in the Grenlandsfjord area from 1997 to 2007 (Bakke et al. 2009).

**A**


**B**

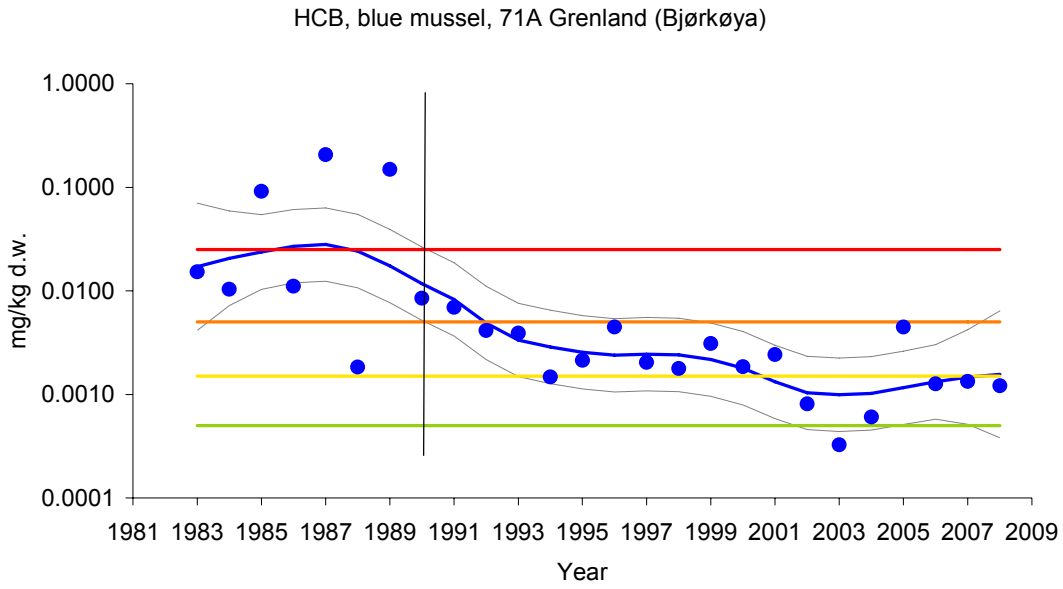



***Figure 27.*** *Trend for median HCB concentrations in blue mussel from the Grenlandsfjord area – Frierfjord region (southwest of Oslofjord) and (B) detail for the Grenlandsfjord station Bjørkøya (st. 71A) (cf. Appendix H and Appendix J. Direction of significant trend is indicated in the map where orange symbols indicate that pollution in 2008 was not insignificant. See otherwise key to map and detail in Figure 2). Vertical line indicates when a magnesium factory reduced its discharge by 99%.* ***NB: log-scale.***

## Sørfjord/Hardangerfjord area

Investigations for 2008 in this area included seven blue musses stations, two cod and three flatfish stations in the Sørfjord and Hardangerfjord area. Flounder was collected from Inner Sørfjord and both flounder and megrim were collected from the Hardangerfjord. Points of concern are described below.

The development of the contaminant conditions in these connected fjords and the main remedial actions that have been taken, have been outlined earlier 1989 (Green 1991a) and in reports concerning Sørfjord in particular (Skei et al. 1998, Skei 2000, 2001, Skei & Knutzen 2000). The CEMP 2008- results are coupled to other studies in this area (cf. Knutzen & Green 2001a, Ruus & Green 2002, 2003, 2004, 2005, 2006, 2007 and Ruus et al. 2008, 2009) and confirm that the Sørfjord, and in some cases also Hardangerfjord, continue to be contaminated especially with cadmium (Figure 28), lead (Figure 29), mercury (Figure 30 and Figure 31), ppDDE (Figure 32 and Figure 33) and to a lesser extent PCB (Figure 34). It can be noted that the Norwegian Food Safety Authority (*Mattilsynet*) has issued advice due to concerns about metals and PCB in seafood including deep-water fish (Appendix E).

**Cadmium (Cd)**

Results for blue mussel collected from the Sørfjord indicated that these were moderately (Class II) or markedly polluted (Class III) with cadmium (Figure 28, Appendix J). Blue mussel as far as Ranaskjær (st. 63A), ca. 50 km from Odda at the innermost of the Sørfjord were moderately polluted with cadmium. Over the past ca. 20 years a significant downward trend was observed for cadmium at three stations in the Sørfjord (st. 52A Eitrheimsneset, st. 56A Kvalnes and st. 57A Krossanes) and two in Hardangerfjord (st. 63A Ranaskjær and st. 65A Vikingneset) (Appendix J). There was also a downward trend for Cd in cod from Hardangerfjord, but in contrast, an upward trend was found in cod from the Inner Sørfjord. Overconcentrations were observed for cadmium in liver of cod and liver of flounder from Inner Sørfjord (4.9 and 4.5 times background level, respectively).

**A**


**B**

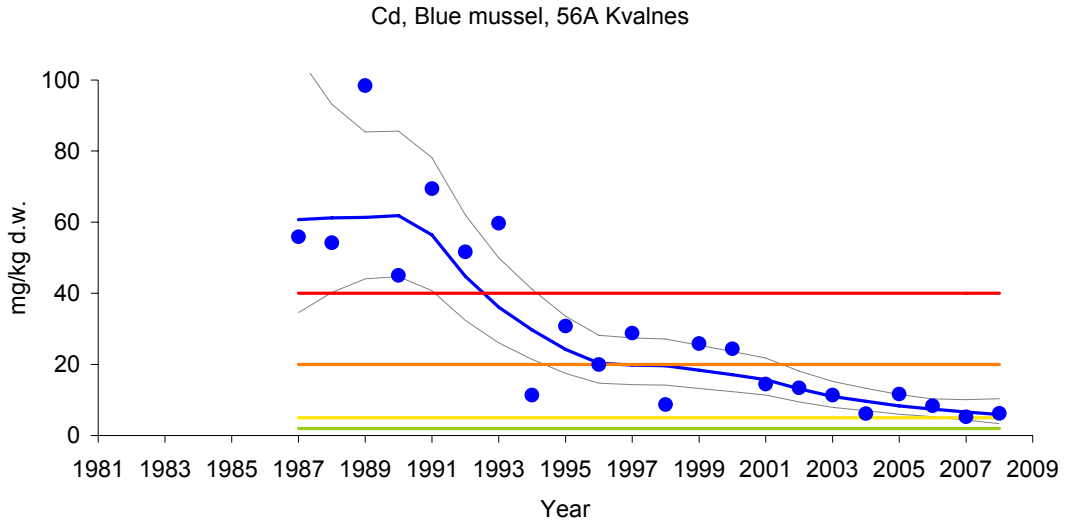



***Figure 28.*** *Trend for median cadmium (Cd) concentrations in blue mussel from the Sørfjord and Hardangerfjord region and detail for Kvalnes (st. 56A) in the mid Sørfjord (cf. Appendix H and Appendix J. Directions of significant trends are indicated in the map where blue symbols indicate insignificant pollution in 2008. See otherwise key to map and detail in Figure 2).* ***Note: horizontal lines for Classes I and II are near x-axis.***

**Lead (Pb)**
The median lead concentration at Byrkjenes (st. 51A) close to Odda, Eitreheimsneset (st. 52A) and Kvalnes (st. 56A), were markedly polluted (Class III), whereas the station farther out in the Sørfjord (st. 57A Krossanes) and the station nearest to Sørfjorden in the Hardangerfjord (st. 63A Ranaskjær) were moderately polluted (Figure 29). A downward trend was found for lead at Ranaskjær (st. 63A), 1990-2008, as well as the other blue mussel and fish stations in the Hardangerfjord.

The power of the sampling strategies for blue mussel was relatively poor for samples collected from Odda; the innermost part of the Sørfjord (st. 51A Byrkjenes or st. 52A Eitrheimsneset). For example for lead in blue mussel from these stations, it is estimated that it would take 18-22 years to detect a hypothetical trend of 10 % per year with 90 % significance (Appendix J). 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 at stations more distant to Odda. For example at Ranaskjær (st. 63A) and Vikingneset (st. 65A), it would take 13 years to detect a hypothetical trend of 10 % per year with 90 % significance for lead.

A downward trend was detected for lead in cod liver from the Inner Sørfjord. The presence lead contamination in the Sørfjord is also indicated by the lower ALA-D activities observed most years in cod.

**A**


**B**

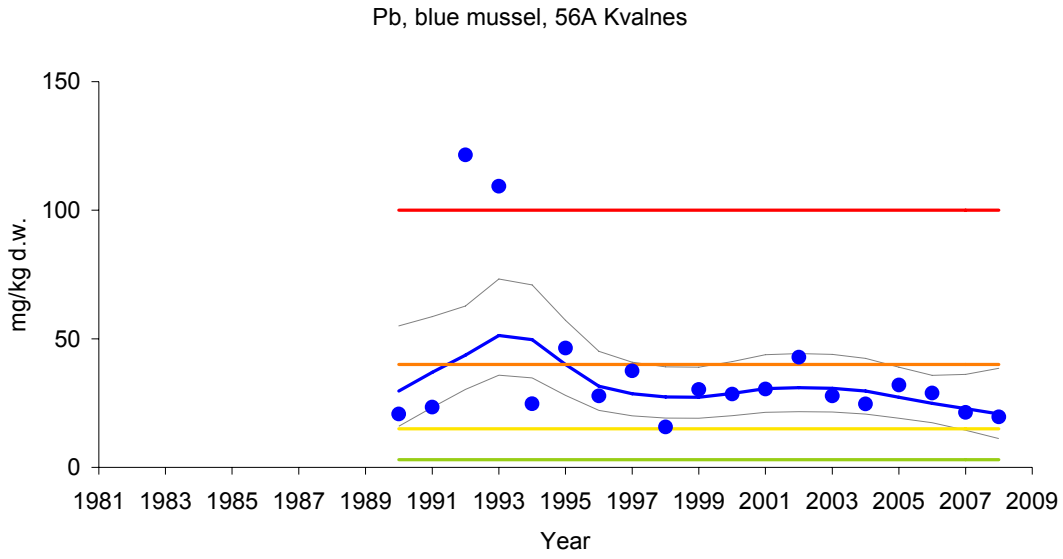



***Figure 29.*** *Trend for median lead (Pb) concentrations in blue mussel from the Sørfjord and Hardangerfjord region and detail for the mid Sørfjord (st. 56A Kvalnes). NB: (cf. Appendix H and Appendix J. Direction of significant trends are indicated in the map. Blue symbols indicate insignificant pollution in 2008. See otherwise key to map and detail in Figure 2).*

**Mercury (Hg)**

Two blue mussel stations in Sørfjord nearest Odda were moderately polluted with respect to mercury (Figure 30). Of the seven significant trends found in blue mussel and fish from the Sørfjord and Hardangerfjord, six were downward and the only upward trend (recorded for 1988-2008) was found in flounder from the Inner Sørfjord. Fillet of cod from the Inner Sørfjord (st. 53B) was moderately polluted with mercury (Class II) (Figure 31).

**A**


**B**

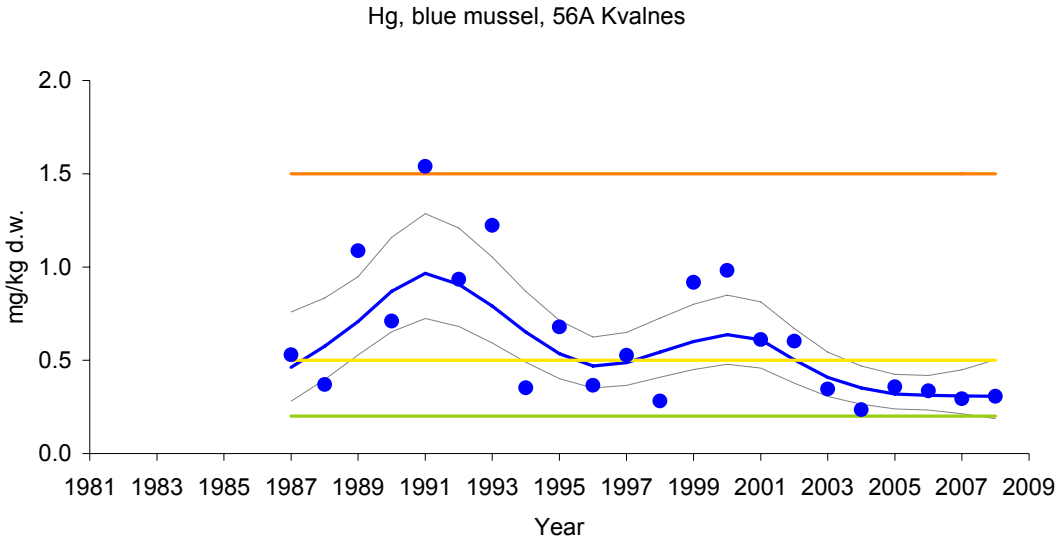



***Figure 30.*** *Trend for median mercury (Hg) concentrations in blue mussel from the Sørfjord and Hardangerfjord region and detail for Kvalnes (st. 56A) the mid Sørfjord. NB: (cf. Appendix H and Appendix J. Directions of significant trends are indicated in the map, and blue symbols indicate insignificant pollution in 2008. See otherwise key to map and detail in Figure 2).*

**A**


**B**

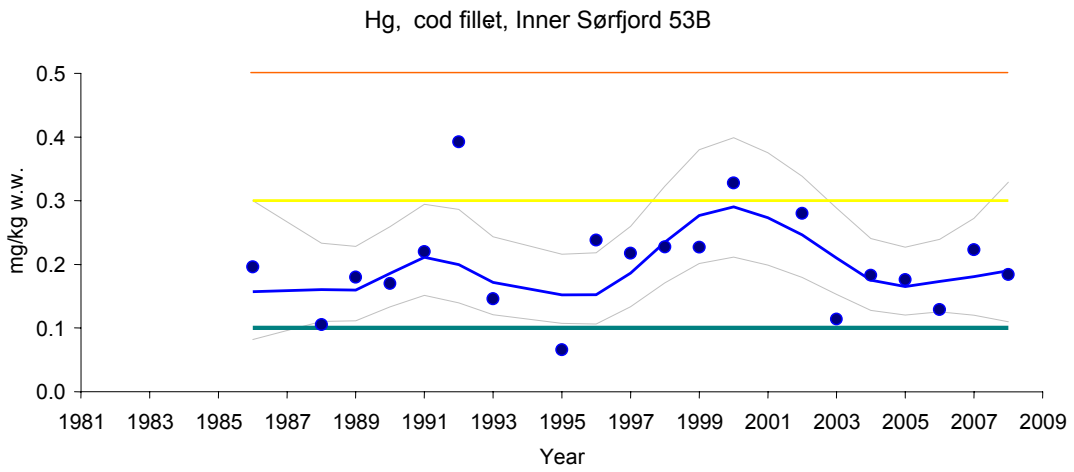
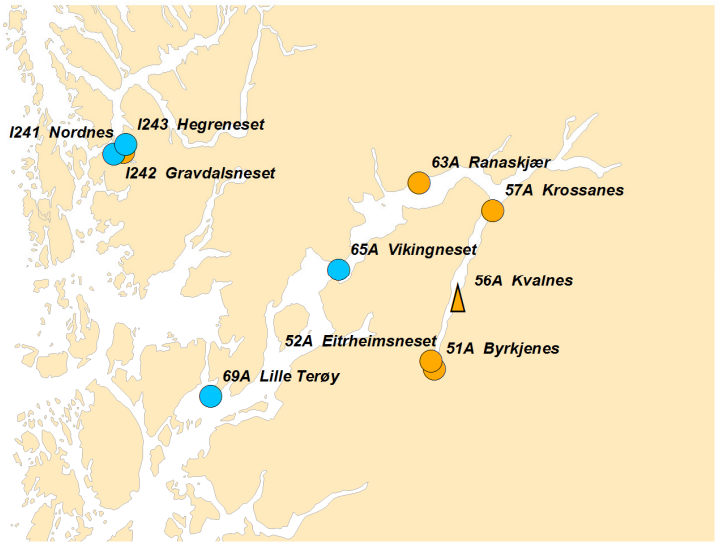



***Figure 31.*** *Trend for median mercury (Hg) concentrations in fillet of cod from the Sørfjord and Hardangerfjord region and detail for the Inner Sørfjord (st. 53B) (cf. Appendix H and Appendix J. Directions of significant trends are indicated in the map where blue symbols indicate insignificant pollution in 2008. See otherwise key to map and detail in Figure 2).*

**Dichlorodiphenyldichlorethylene (ppDDE)**
An upward trend was found for ppDDE (a degradation product of DDT) in blue mussel from the Sørfjord at Kvalnes. Blue mussel from Kvalnes (st. 56A) in the mid Sørfjord region were extremely polluted with ppDDE (Class V); with a median concentration of 180 µg/kg d.w., and about 54 % higher than the 2007 value (Figure 32). The upper limit to Class IV is 150 µg/kg d.w. Blue mussel at the mouth of the Sørfjord, Krossanes (st. 57A) about 20 km north of Kvalnes, was moderately polluted (Class II, Figure 32). Cod liver from the Sørfjord was insignificantly polluted (Class I) with ppDDE (Figure 33 B, Appendix J), while in 2007 it was moderately polluted (Class II) with ppDDE. A downward trend since 1990 was found for ppDDE in cod liver from the Hardangerfjord (st. 67 B).

The Sørfjord area has a considerable number of fruit orchards and earlier use and persistence of DDT and leaching from contaminated soil is probably the main reason for the observed high concentrations of ppDDE in the Sørfjorden area. It must however be noted that the use of DDT products have been prohibited in Norway since 1970. Green et al. (2004) concluded that the source of ppDDE was uncertain. Analyses of supplementary stations between Kvalnes (st. 56A) and Krossanes (st. 57A) in 1999 indicated that there could be several sources (Green et al. 2001). A more intensive investigation in 2002 with seven sampling stations confirmed that there were two main areas with high concentrations north of Kvalnes and near Urdheim south of Krossanes (Green et al. 2004). Skei et al. (2005) concluded that the variations in concentrations of ΣDDT and the ratio between p,p'-DDT/p,p'DDE (insecticide vs. metabolite) in blue mussel from Byrkjenes and Krossanes corresponds with periods with much precipitation and is most likely a result of wash-out from sources on shore. Botnen and Johansen (2006) set out passive samplers (SPMD- and PCC-18 samplers) at 12 locations along the Sørfjord to sample for DDT and its derivates in sea water. Blue mussels and sediments were also taken at fewer stations. The results indicated that further and more detailed surveys should be undertaken along the west side of the Sørfjord between Måge and Jåstad, and that replanting of old orchards might release DDT through erosion. Concentrations of ΣDDT in blue mussel in the Sørfjord in 2008 showed up to Class V (extremely polluted) at Utne and at Kvalnes (Ruus et al. 2009). There was high variability in the concentrations of ΣDDT in replicate samples from Utne, indicating that the station is affected by DDT-compounds in varying degree, dependent on local conditions.

**A**



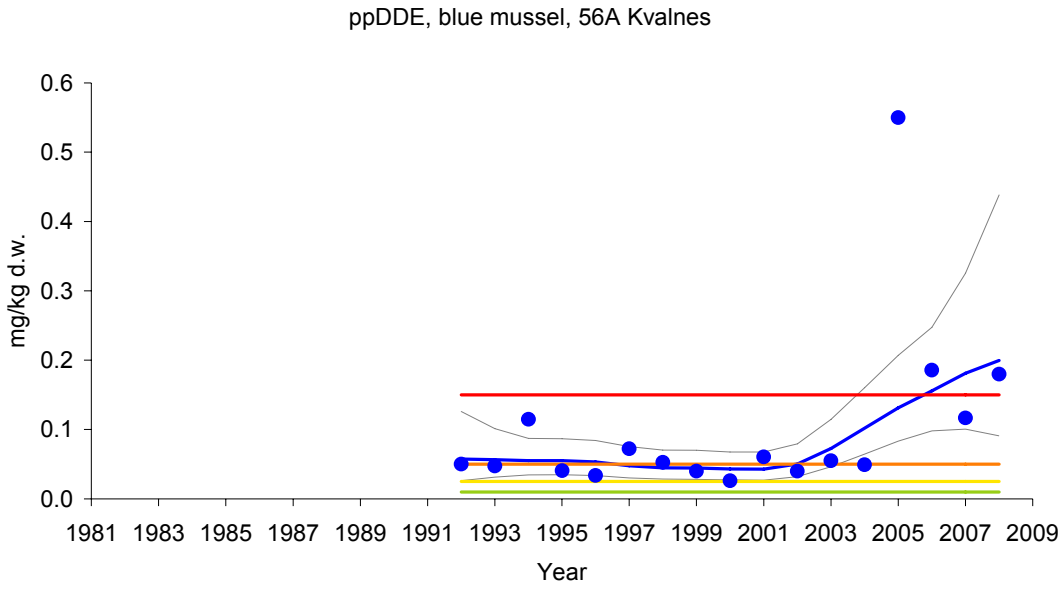




***Figure 32.*** *Trend and median ppDDE concentrations in blue mussel from the Sørfjord and Hardangerfjord region and detail for the mid Sørfjord (st. 56A Kvalnes) (cf. Appendix H and Appendix J. Circles in the map indicate that no significant trend was detected and blue symbols in the map indicate insignificant pollution in 2008. See otherwise key to map and detail in Figure 2).* ***Note: Class limits for ΣDDT used. Horizontal line for Class I is near x-axis.***

**A**


**B**

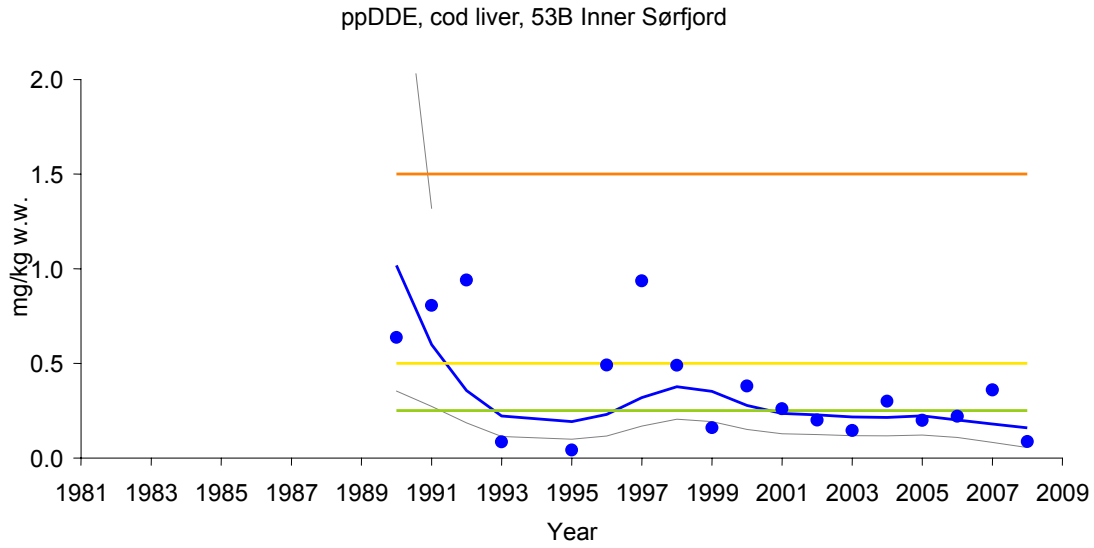


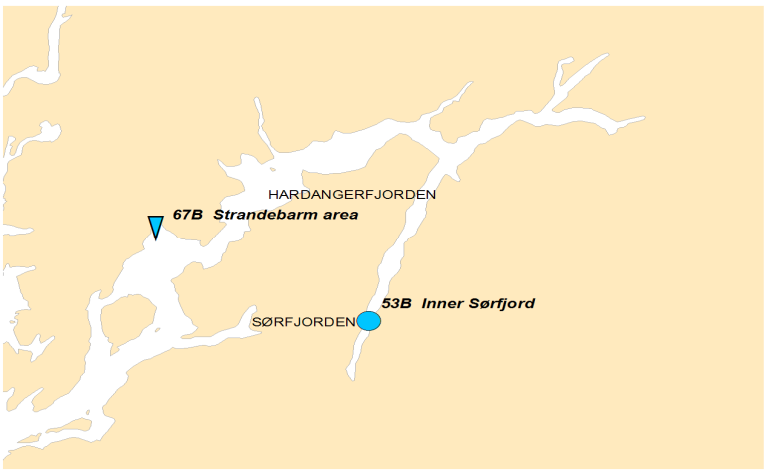

***Figure 33.*** *Trend for median ppDDE concentrations in liver of cod from the Sørfjord and Hardangerfjord region and detail for the Inner Sørfjord (st. 53B) (cf. Appendix H and Appendix J. Directions of significant trends are indicated in the map where blue symbols indicate insignificant pollution in 2008. See otherwise key to map and detail in Figure 2).* ***Note: Class limits for ΣDDT used for ppDDE.***

**Polychlorinated biphenyls (ΣPCB-7)**

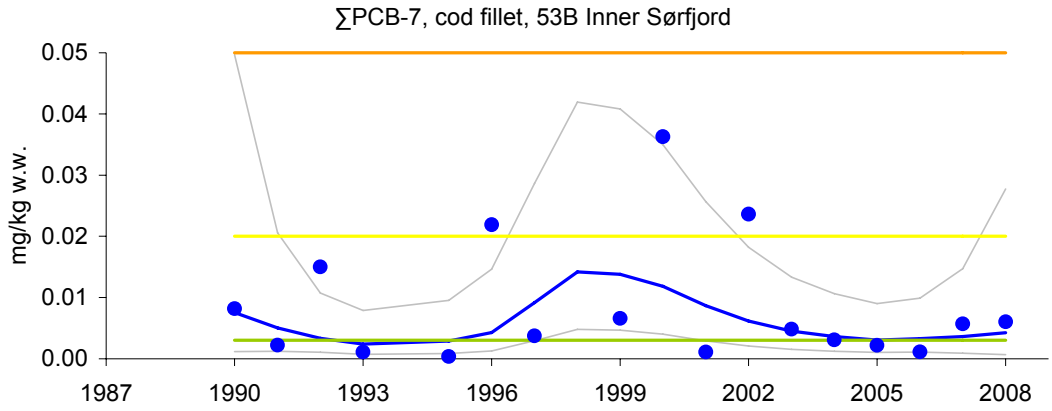
The liver of cod from the Sørfjord for 2008 was insignificantly polluted (Class I) with respect to ΣPCB-7 (Figure 34 A and C). The cod fillet was moderately polluted with ΣPCB-7 (Figure 34B). Since CEMP monitoring started in the Sørfjord and Hardangerfjord the median values have varied between 100 and 2400 µg/kg w.w. (Appendix J). This indicated that cod is subject to a variable exposure from PCB, but the cause of this variation is not clear. A downward trend since 1990 was found for ΣPCB-7 in cod liver from the Hardangerfjord.

Blue mussel in the Sørfjord were insignificantly polluted with ΣPCB-7, and there were no trends. Blue mussel in the mid Hardangerfjord (st. 65A Vikingneset) were insignificantly polluted and had a downward trend.

A




B




C

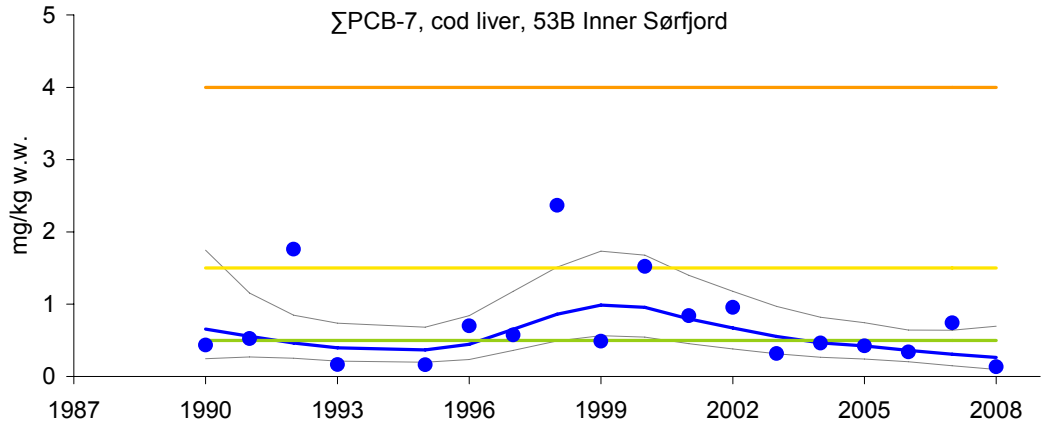



***Figure 34.*** *Trend for median ΣPCB-7 concentrations in liver (A) of cod from the Sørfjord and Hardangerfjord region and detail for ΣPCB-7 in fillet (B) and liver (C) in the Inner Sørfjord (st. 53B) (cf. Appendix H and Appendix J. Directions of significant trends are indicated in the map where blue symbols indicate insignificant pollution in 2008. See otherwise key to map and detail in Figure 2).*

## Norwegian Pollution and Reference Indices (The Index Programme)

A specific and small group of indices has been developed to assess the quality of the environment with respect to contaminants-The Index Programme. One index, the Pollution Index is based on the levels and trends of contaminant concentrations in blue mussel collected annually from a selection of the more contaminated fjords in Norway (Appendix M). Another index, the Reference Index is based on the levels of trends of contaminant concentrations in blue mussel collected in area remote from know points sources of pollution. The Pollution Index is based on a total of 26 blue mussel stations from nine fjord areas regarded as polluted areas. The Reference Index is based on results from 8 blue mussel stations remote from known point sources of pollution in five fjord areas along the coast.

The Pollution Index was 3.0, unchanged from 2007 (cf. Appendix M). A value between 3 and 4 would be between marked and severe (Class III and IV) in the Klif classification system. The Reference Index was 1.4 for 2008, unchanged since 2004. A value between 1 and 2 would be between insignificant and moderate (Class I and II).

It is not the intent of the application of the indices to give a station by station account. However, time trend analyses for the entire period (1995-2008) have been calculated and show both significant upward and downward trends in blue mussel (cf. Appendix J). Some cases are worth noting (2008 median Class/trend):

Downward trends

- Inner Oslofjord, Gressholmen (st. 30A, Map 1, Appendix H)-TBT, ΣPCB-7, Class II/downward
- Frierfjord area, Bjørkøya (Risøyodden) (st. 71A, Map 3, Appendix H)-HCB, Class III/downward
- Frierfjord area, Gjemesholmen (st. I712) (Map 3, Appendix H)-TBT, Class II/downward
- Saudafjord, Ekjegrunn (st. I201, Map 5, Appendix H)-B[a]P, Class II/downward
- Sørfjord, Eitrheimsneset (st. 52A, Map 6, Appendix H)-Cd, DDE, Pb, Class II /downward
- Byfjorden (Bergen), Gravdalsneset (st. I242) in Bergen harbour (Map 7, Appendix H)-HCB, Class II/downward

Upward trends

- Saudafjord, Bølsneset (st. I205, Map 5, Appendix H)-Hg, Class II/upward

## 4.4. Biological effects methods for cod

### Rationale and overview

The rationale to use biological effects methods (BEM) 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. Just one reason is the vast number of chemicals (known and unknown) that organisms are exposed to, in combination, in the environment. In addition to enable conclusions on the health of marine organisms, some biomarkers assist in the interpretation of contaminant exposure and bioaccumulation. The biological effects component of the Norwegian CEMP 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 (see Table 5 for parameter list with method specificity and Appendix H for map of stations).

A thorough analysis and review of BEM-results has been performed twice since their inclusion in 1997 (Ruus et al. 2003; Hylland et al. 2009). Clear relationships were shown between tissue contaminants, physiological status, and responses in BEM parameters in cod (Hylland et al. 2009). Although metals contributed substantially to the models for ALA-D and metallothionein (MT; included in the programme 1997-2001) and organochlorines in the model for CYP1A activity, other factors were also shown to be important. Liver lipid and liver somatic index (LSI) contributed for all three BEM-parameters, presumably reflecting the general health of the fish. Size or age of the fish also exerted significant contributions to the regression models. It was concluded that the biological effect methods clearly reflected relevant processes in the fish even if they may not be used singly to indicate pollution status for specific locations at given times. Furthermore, the study showed that it is important to integrate a range of biological and chemical methods in any assessment of contaminant impacts. Through continuous monitoring within CEMP, a unique BEM timeseries/dataset is generated, that will also be of high value as a basis of comparison for future enviromental surveys.

Biological effect methods were first included in the programme in 1997, after which some modifications have been done. In 2002, reductions were made in parameters and species analysed. There have also been improvements in the methods, such as discontinuation of single wavelength fluorescence and use of HPLC in the analysis of bile metabolites (2000).

The CEMP-programme for 2008 included four biological effects methods (BEM) (cf. Table 5). For the 2008 investigations OH-pyrene, ALA-D, EROD-activity and CYP1A were measured in Atlantic cod from the Inner Oslofjord (st. 30B). Except for OH-pyrene, samples conserved for the BEM parameters were not available (could not be conserved) from Karihavet (st. 23B) and Inner Sørfjord (st. 53B) in 2008. OH-pyrene was also analysed in cod from Lista (st. 15B).

Under controlled conditions the measures derived from OH-pyrene, EROD-activity and CYP1A increase with increased exposure to their respective inducing contaminants. The activity of ALA-D on the other hand is inhibited by contamination (i.e., lead), thus lower activity means a response to higher exposure.

As in most previous years, 25 individual cod were sampled for biological effects measurements. Since 2002 three stations (four for OH-pyrene) have been sampled, instead of eight stations as in previous years. No samples for BEM have taken from flatfish since 2002. All fish were collected by local fishermen and kept alive until sampling by NIVA staff within 5 days.

## OH-pyrene metabolites in bile

Detection methods for OH-pyrene have been improved two times since the initiation of these analyses in the CEMP programme. In 1998, the wavelength for measurement of light absorbance of the support/normalisation parameter biliverdin was changed to 380 nm. In 2000, the use of single-wavelength fluorescence for quantification of OH-pyrene was replaced with HPLC separation proceeding fluorescence detection. The single wavelength fluorescence method is much less specific than the HPLC method. Although there is a good correlation between results from the two methods they can not be compared directly. The interpretation of OH-pyrene data is therefore primarily focused on the differences between the stations within each year.

PAH compounds are effectively metabolized in vertebrates. As such, when fish are exposed to and take up PAHs, the compounds are biotransformed into polar metabolites which enhances the efficiency of excretion. It is therefore not suitable to analyse fish tissues for PAH parent compounds as a measure of exposure. However, since the bile is a dominant exretion route of PAH metabolites, and since the metabolites are stored for some time in the gall bladder, the bile is regarded as a suitable matrix for analyses of PAH metabolites as a measure of PAH exposure.

In 2008, the median concentrations of OH-pyrene metabolites in bile from cod were higher in the Inner Oslofjord (st. 30B) compared to samples from the Inner Sørfjord (st. 53B), the Bømlo-Sotra area (reference, st. 23B) and Lista (st. 15B). No significant trends for the period 2000-2008 were detected (cf. Appendix J). In other words, the concentrations have fluctuated around the same levels, with a trend towards an apparent reduction at Lista (st. 15B) towards the last few years (not significant; Figure 36, and Appendix J).

PAHs are measured in blue mussel from the Inner Oslofjord (st. 30A). The changes in concentrations correlate moderately well to the changes in OH-pyrene in cod from the same area (st. 30B) (Figure 35). These results indicate general changes in PAH exposure in this fjord area, since cod and blue mussel appearantly experience similar alterations in PAH exposure, despite biological differences. Blue mussel is a sessile, filtering organism, while cod is mobile and exposed to PAHs both through food and through direct partitioning from water (over respiratory surfaces).

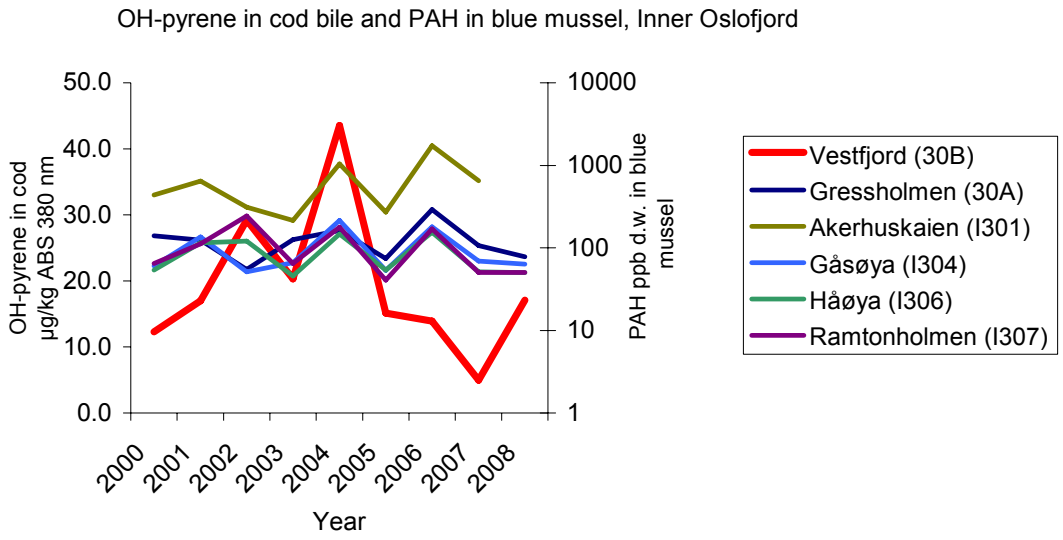
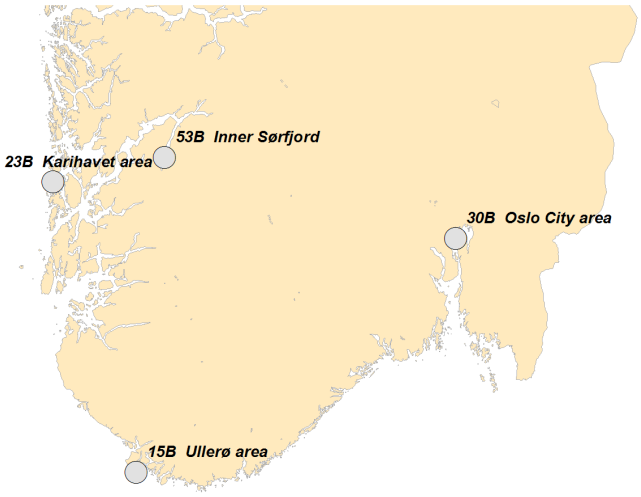



***Figure 35.*** *Changes in median concentration of OH-pyrene (µg/kg ABS 380 nm) in bile from Atlantic cod collected from the Inner Oslofjord (st. 30B Vestfjord; thick red line) and total PAH in blue mussel from the same area.* ***NB: concentrations of PAH are on a log scale.***

**A**




**B**

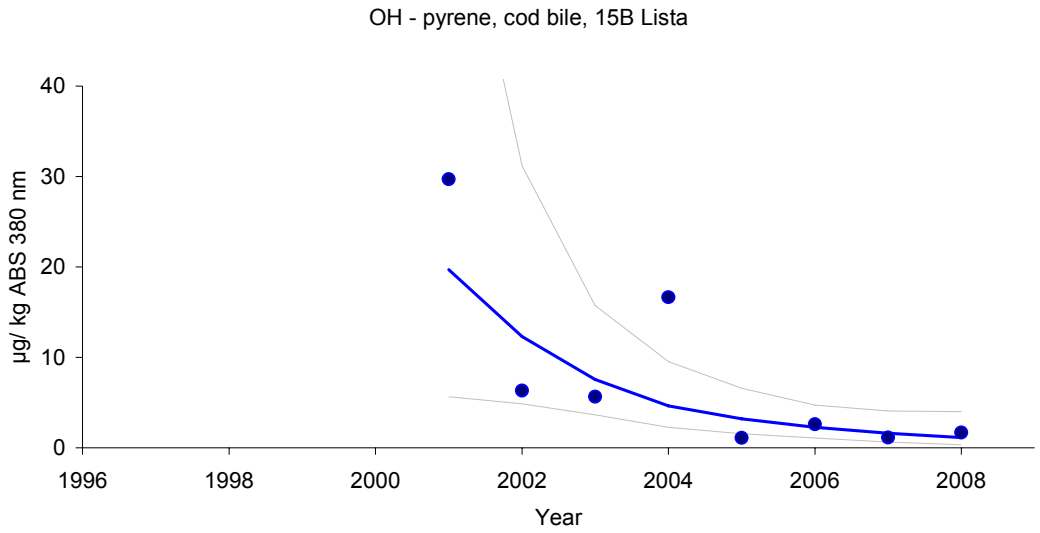



***Figure 36.*** *Trend and median concentration of OH-pyrene (µg/kg ABS 380 nm) in bile from Atlantic cod collected from southern Norway and detail for Lista (st. 15B). (cf. Appendix H and Appendix J. Grey circles in map indicate that no significant trends were detected and that there is no limit to classify the result from 2008. See otherwise key to map and detail in Figure 2).*

### ALA-D in blood cells

Inhibited activity of ALA-D indicates the influence of lead contamination. Although ALA-D inhibition is lead-specific, it is not possible to rule out interference by other metals or organic contaminants. Previous studies indicate that zinc may ameliorate the effect of lead to some extent, but the effect is variable and weak. Other studies have also shown ALA-D to be a remarkably robust biomarker and factors such as sex, age or season do not appear to affect the response.

Most years the activity of ALA-D in cod was somewhat inhibited in the Inner Oslofjord (st. 30B) and Inner Sørfjord (st. 53B), compared to reference stations, i.e. outer Oslofjord (st. 36B; only data to 2001), Karihavet in the Bømlo-Sotra area (st. 23B), and Varangerfjord (st. 10B; only data to 2001, not shown) (Figure 37 and Appendix J). For the years 1997-2007 the median activity of the enzyme in cod from Inner Sørfjord (st. 53B) was generally lower than on the open coast (Karihavet, st. 23B), about 130 km to the west. As mentioned (chapter 4.3), the lower activities of ALA-D in cod from the Sørfjord compared to the reference station (basis for comparison prior to 2006) indicate the contamination of lead in the Sørfjord. In 2008, only cod from the Inner Oslofjord was monitored. Samples conserved for analysis of ALA-D could not be secured from Karihavet and the Inner Sørfjord.

In 2008 ALA-D levels appeared slightly lower in the blood of cod from the Inner Oslofjord (st. 30B) as compared to 2007. However, no trend could be shown for the period 1997-2008 (Figure 37, Appendix J), indicating fluctuations in the enzyme activity around a similar level for the whole period.

**A**


**B**

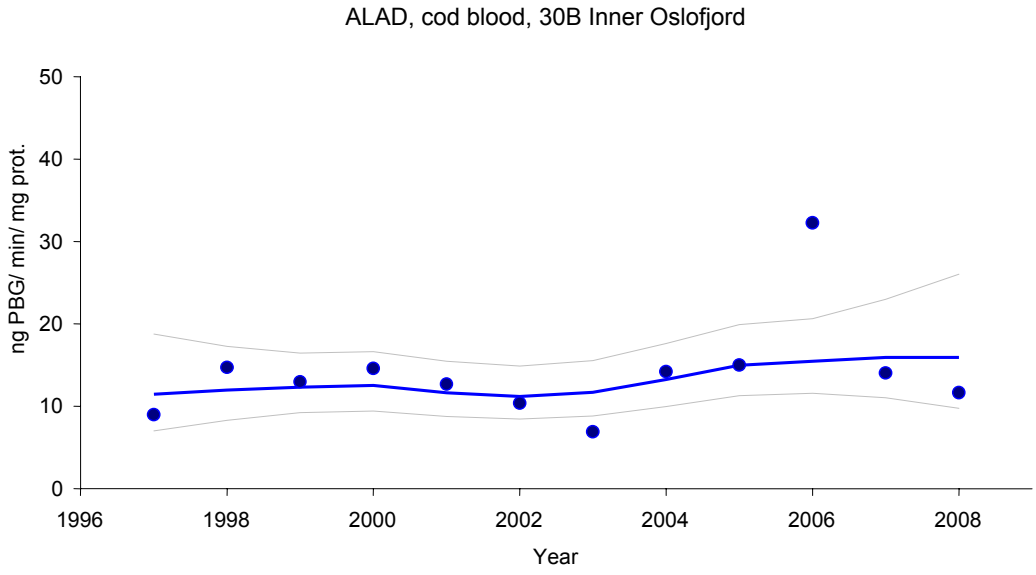



***Figure 37.*** *Trend and median activity of δ-aminolevulinic acid dehydrase (ALA-D, ng PBG/min/mg protein) in red blood cells from Atlantic cod collected from southern Norway and detail for the Inner Oslofjord (st. 30B). (cf. Appendix H and Appendix J. Grey circles in map indicate that no significant trends were detected and that there is no limit to classify the results from 2008. See otherwise key to map and detail in Figure 2). Note that lower activity means higher exposure and vice versa.*

## EROD-activity and amount of CYP1A protein in liver

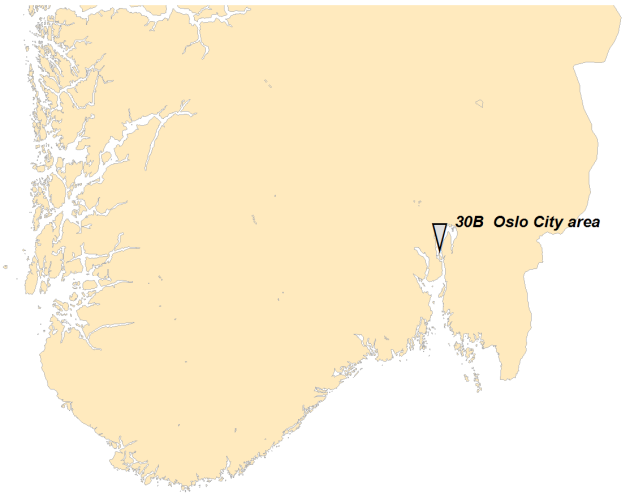
*EROD-activity*

High activity of hepatic cytochrome P4501A activity (EROD-activity) normally occurs as a response to the contaminants indicated in Table 5. It was expected that higher activity would be found at the stations that were presumed to be most impacted by planar PCBs, PCNs, PAHs or dioxins, i.e. Inner Oslofjord (st. 30B) and Inner Sørfjord (st. 53B/F). In 2005, no such differences were evident. In 2006 median EROD-activity was highest in the Oslofjord (st. 30B), although variability was high. In 2008, samples conserved for analysis of EROD and CYP1A could not be secured from Karihavet (st. 23B) and Inner Sørfjord (st. 53B). A significant downward trend for EROD in cod liver in the Inner Oslofjord could be shown for the period 1997-2008 (st. 30B, Figure 38, Appendix J). Previous years have shown that EROD-activity in both fish from the Inner Oslofjord and from the Inner Sørfjord is not consistently higher than at the reference station on the west coast (st. 23B Karihavet). No significant temporal trends were found at stations Sørfjord (st. 53B) and Karihavet (st. 23B) (no data from 2008).

No adjustment for water temperature has been made. Fish are sampled at the same time of year (September-November) when differences between the sexes should be at a minimum. Statistical analyses indicate no clear difference in activity between the sexes (Ruus et al. 2003). It has been shown that generally higher activity occurs at more contaminated stations (Ruus et al. 2003). However, the response is inconsistent (cf. Appendix J), perhaps due to sampling of populations with variable exposure history. Besides, there is evidence from other fish species that continuous exposure to e.g. PCBs may cause adaptation, i.e. decreased EROD-activity response.

The median amount of CYP1A protein in the liver of cod from the Inner Oslofjord (st. 30B) in 2008 was 50 % higher in 2008 as compared to 2007, but there was no significant trend (Figure 39). As mentioned (chapter 4.3), these results may be in accordance with elevated concentrations of PCBs in cod liver from the Oslofjord in 2008. However, the significant reduction in EROD activity, shown for the period 1997-2008, indicates an overall reduction in exposure to planar organic contaminants.

**A**




**B**

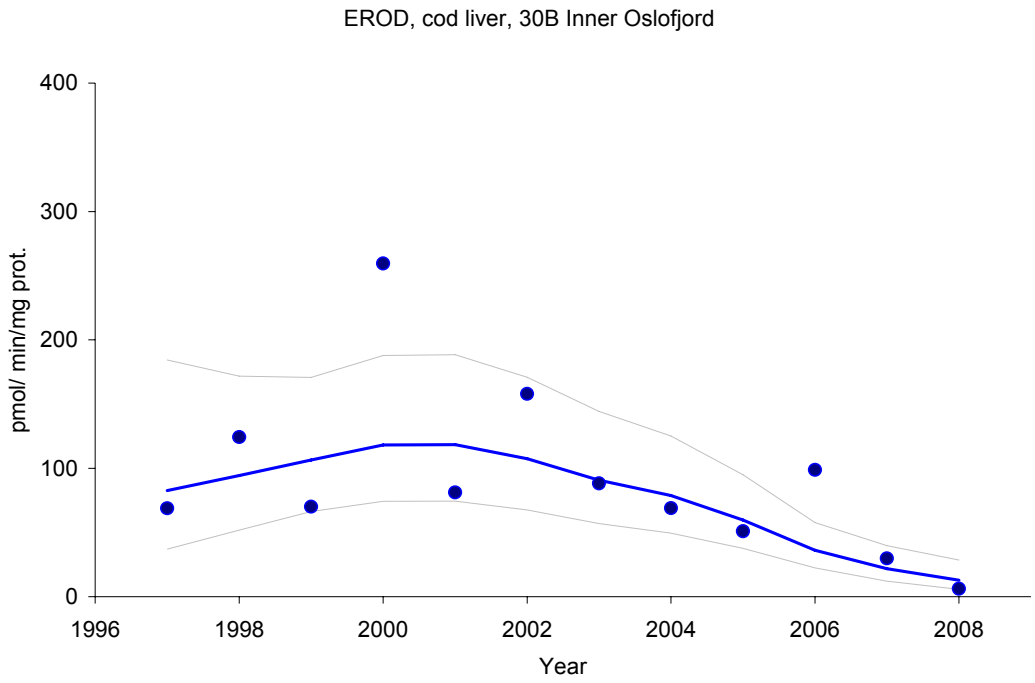



***Figure 38.*** *Trend and median activity of cytochrome P4501A (EROD-activity, pmol/min/mg protein) in liver from Atlantic cod collected from southern Norway and detail for the Inner Oslofjord (st. 30B). (cf. Appendix H and Appendix J. Grey symbol in map indicate that there is no limit to classify the results from 2008. Directions of significant trends are indicated in the map. See otherwise key to map and detail in Figure 2).*

**A**


**B**

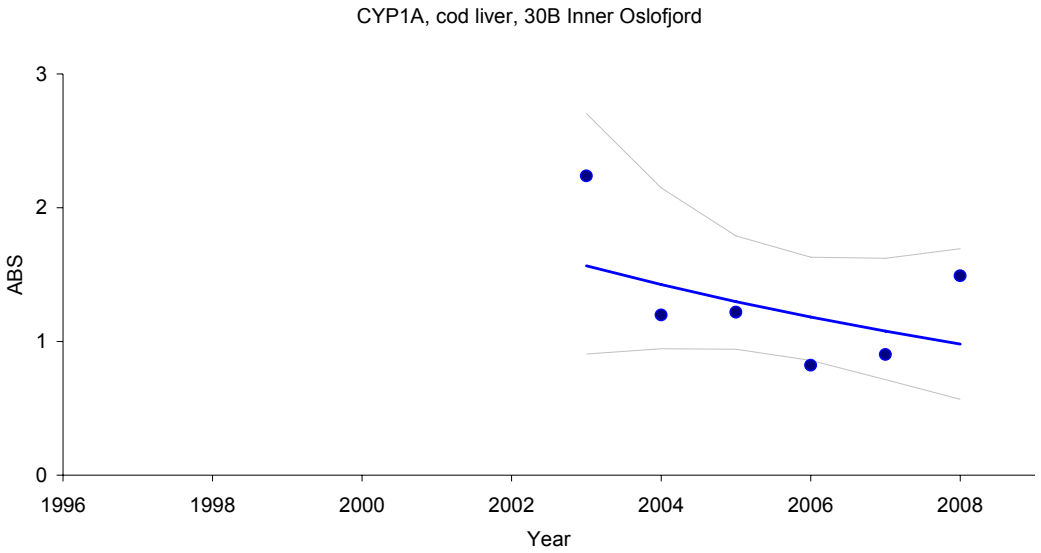



***Figure 39.*** *Trend and median activity of cytochrome CYP1A (relative amount of cytochrome P4501A-protein) in liver from Atlantic cod collected from southern Norway and detail for the Inner Oslofjord (st. 30B). (cf. Appendix H and Appendix J. Grey circles in map indicate that no significant trends were detected and that there is no limit to classify the results from 2008. See otherwise key to map and detail in Figure 2).*

## Concluding remarks

The application of BEM methods within CEMP through the years 1997-2001 indicated that the location Lista (st. 15B), which was previously regarded as only diffusely polluted, had an input of PAH which was sufficient to affect fish in the area. However, in 2002 and 2003 the median concentrations of OH-pyrene in cod from Lista were lower than those from the Inner Oslofjord (st. 30B) and Inner Sørfjord (st. 53B). Since 2005, the OH-pyrene concentrations in cod from Lista have been low (the same level as the reference). No significant time-trends could be detected for the period 2000-2008 at any stations. In other words, the concentrations have fluctuated around the same levels, with a trend towards an apparent reduction at Lista towards the last few years. In 2008, the median concentration of OH-pyrene metabolites in bile from cod was higher in the Inner Oslofjord (st. 30B) compared to samples from the Inner Sørfjord (st. 53B), the Bømlo-Sotra area (st. 23B) and Lista (st. 15B). Changes in concentrations of PAH measured in blue mussel from the Inner Oslofjord correlate moderately well to alterations in OH-pyrene concentrations in the bile of cod from the same area.

Results for the period 1997-2005 indicated that there are lead effects, shown by decreased activity of the enzyme ALA-D in the two most contaminated areas, i.e. cod from the Inner Oslofjord (st. 30B) and cod from the Inner Sørfjord (st. 53B). This indication was less evident in 2006. In 2008 ALA-D levels appeared slightly lower in the Oslofjord (st. 30B), compared to 2007. However, no trend could be shown for the period 1997-2008.

A significant downward trend for EROD activity in cod from the Inner Oslofjord (st. 30B) could be shown for the period 1997-2008. Samples preserved for biological effect methods (BEM; except OH-pyrene) were not obtained from the reference station (st. 23B Karihavet) and Inner Sørfjord (st. 53B). Previous years, however, have shown that EROD-activity in fish from the Inner Oslofjord and Sørfjord stations are not consistently higher than at other, presumed cleaner stations. An explanation may be that the inducing effect of specific contaminants may be inhibited by other contaminants present. The median amount of CYP1A protein in the liver of cod from the Inner Oslofjord (st. 30B) in 2008 was 50 % higher as in 2007, but no significant time-trend could be observed.

## Dioxins in cod

Samples of 18 cod from 5 stations were analysed individually for dioxins and dioxin-like PCBs (Figure 40). Samples of cod with large livers were chosen for the analyses. Geographical differences were found. The highest concentration was found for ind.no. 3 from Karihavet (st. 23B), Class II. The individuals from Karihavet had higher concentration of dioxins in liver than cod from Lofoten, Varangerfjord, Lista and outer Oslofjord (except for individual no 25) (Figure 41 A). Individuals from the outer Oslofjord and Karihavet also had higher concentrations of dioxin-like PCBs in liver than the individuals from Lista. Some cod from Lofoten and the Varangerfjord had dioxin-levels in the fillet that was very much higher relative to the concentration in the liver compared to other individuals from Lofoten and the outer Oslofjord (Figure 42 A).

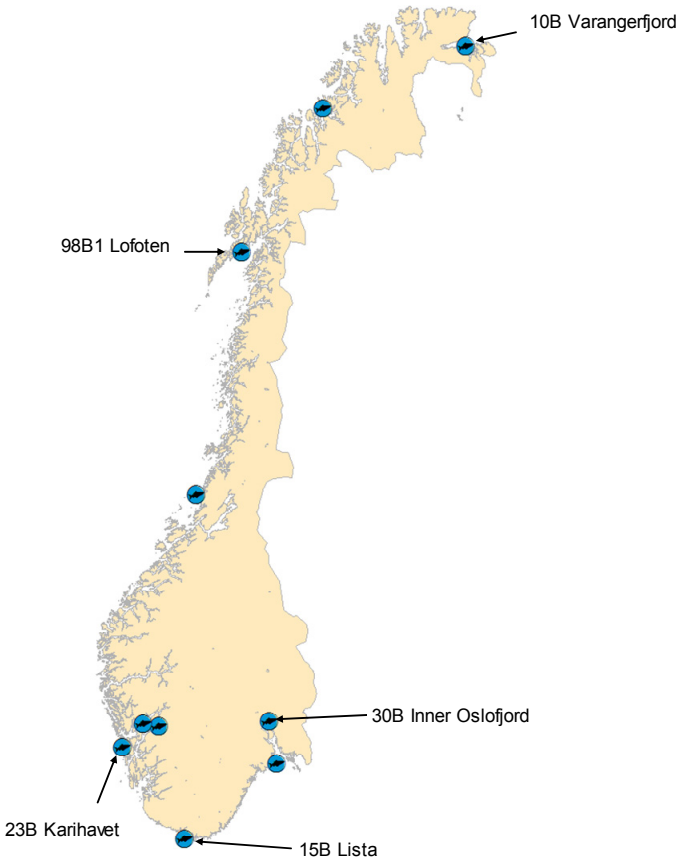
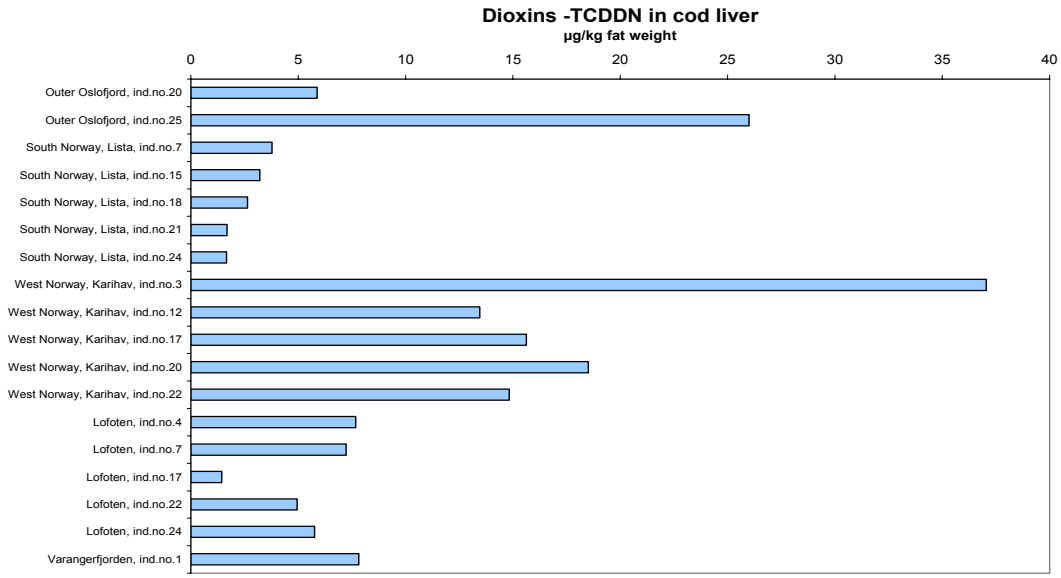



***Figure 40.*** *Sampling sites for cod from the Inner Oslofjord, Lista, Karihavet, Lofoten and Varangerfjord areas (cf. Appendix J).*

**A**




**B**

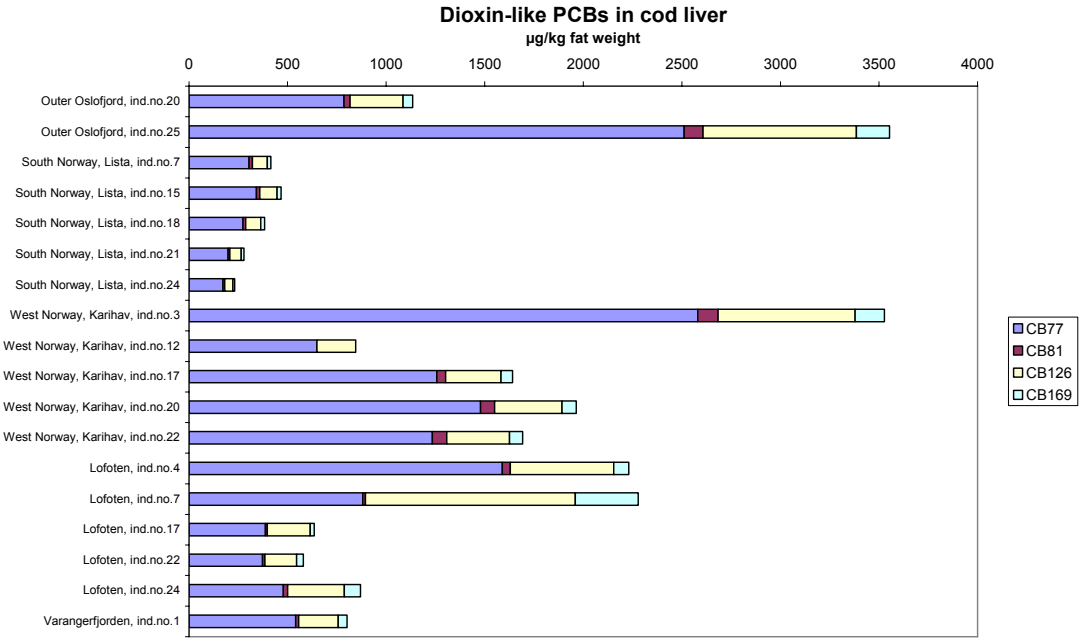
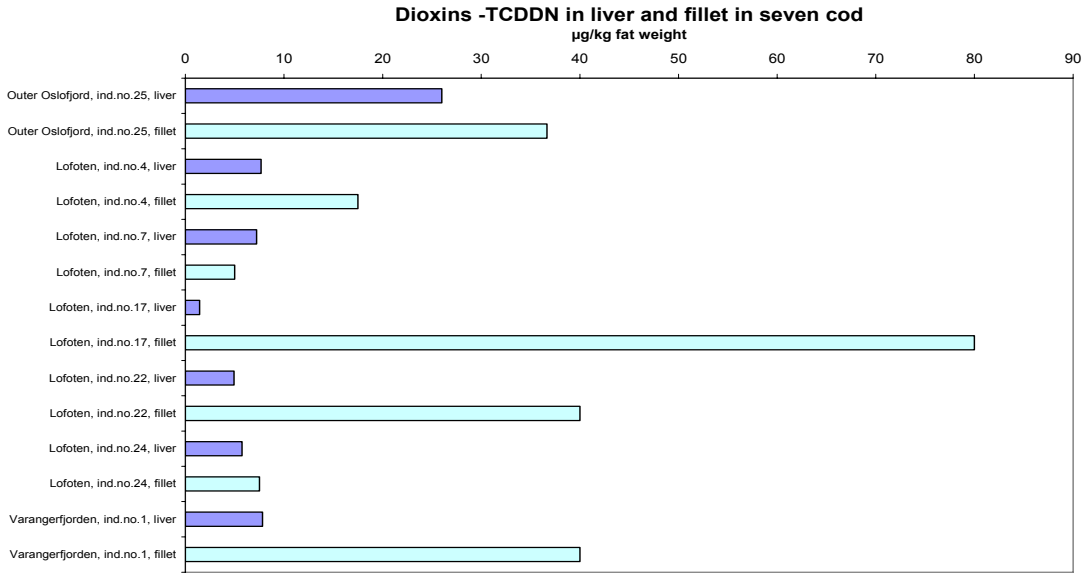



***Figure 41.*** *Concentration of dioxins TCDD-toxicity equivalents after nordic model (TCDDN) (**A**) and dioxin-like PCBs (CB77, -81, -126, -169) (**B**) in liver from 18 individual cod (ppb-µg/kg-fat weight) from the Outer Oslofjord, Lista area, Karihavet, Lofoten and Varangerfjord in 2008 (cf. Appendix J.).*

**A**




**B**

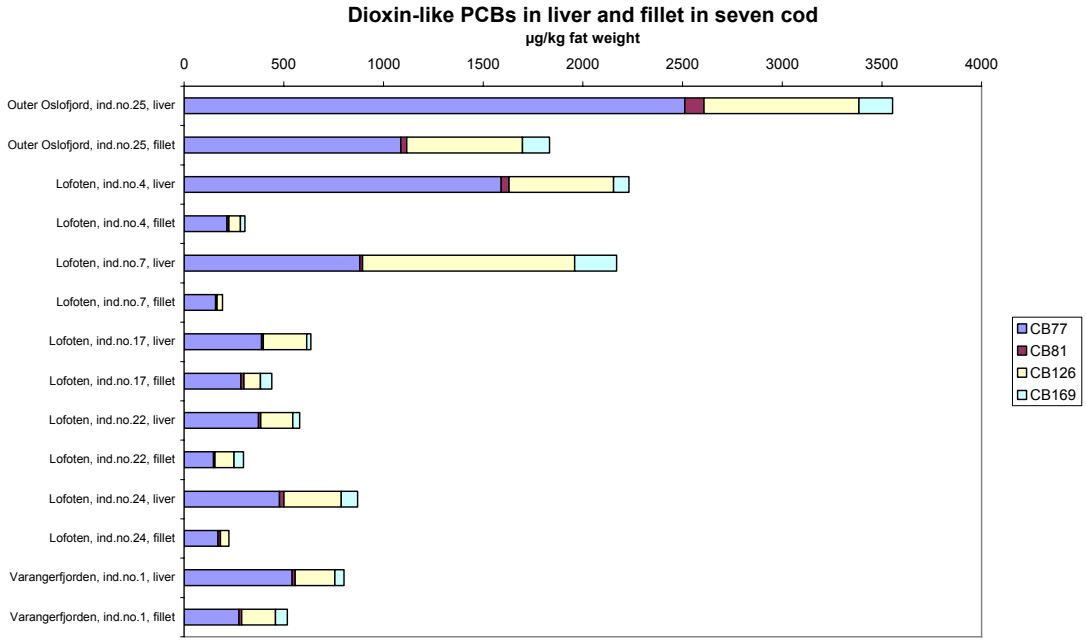



***Figure 42.*** *Concentration of dioxins TCDD-toxicity equivalents after nordic model (TCDDN) (**A**) and dioxin-like PCBs (CB77, -81, -126, -169) (**B**) in liver and fillet of 8 individual cod (ppb-µg/kg-fat weight) from the Outer Oslofjord, Lista area, Karihavet, Lofoten and Varangerfjord in 2008 (cf. Appendix J.).*

## Deep water fish

Two deepwater fish species from the Inner Sørfjord (st. 53D)and Strandebarm (st. 67D) in the Hardangerfjord and from the Høyanger area (st. 29D) in the Sognefjord were analysed in 2008 (Figure 43). Fillet of ling from the Inner Sørfjord had a median concentration of mercury of 0.48 mg/kg, which is close to the lower limit of Class IV for cod (there are no classification for ling and tusk) (Figure 44 A) but the individual variation was very high. The concentraion of mercury in fillet of ling from the Inner Sørfjord was much higher than in fillet of cod from the the same fjord. Fillet from both tusk and ling from the Høyanger area were moderately contaminated by mercury, with a very high individual variation especially for ling. There have been very high discharges of mercury from a factory in Høyanger. The discharges may have been as high as 55 kg mercury per year, while authorized for only one kg per year (Klif letter ref 2008/28, 408/2002-032). The high levels of mercury in the fish fillet from the Høyanger area might be due to this extreme discharge of mercury. Fillet of ling from Strandebarm was insignificantly contaminated by mercury. Liver of ling from the Inner Sørfjord was moderately contaminated by PCBs (Figure 44 B).

**A**

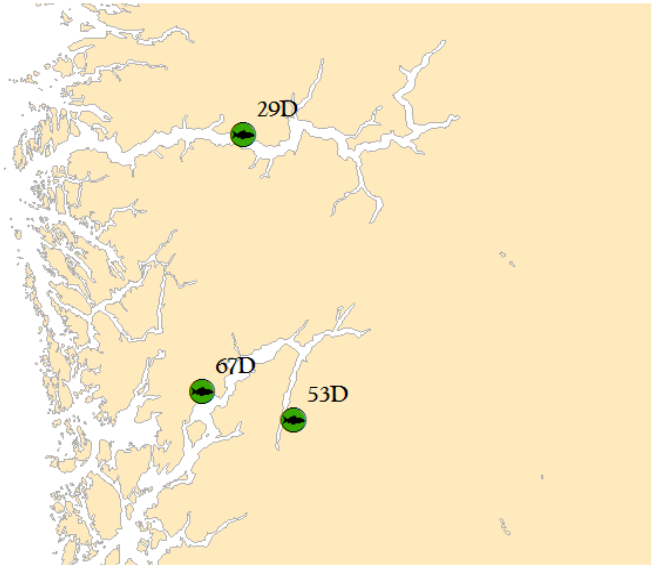
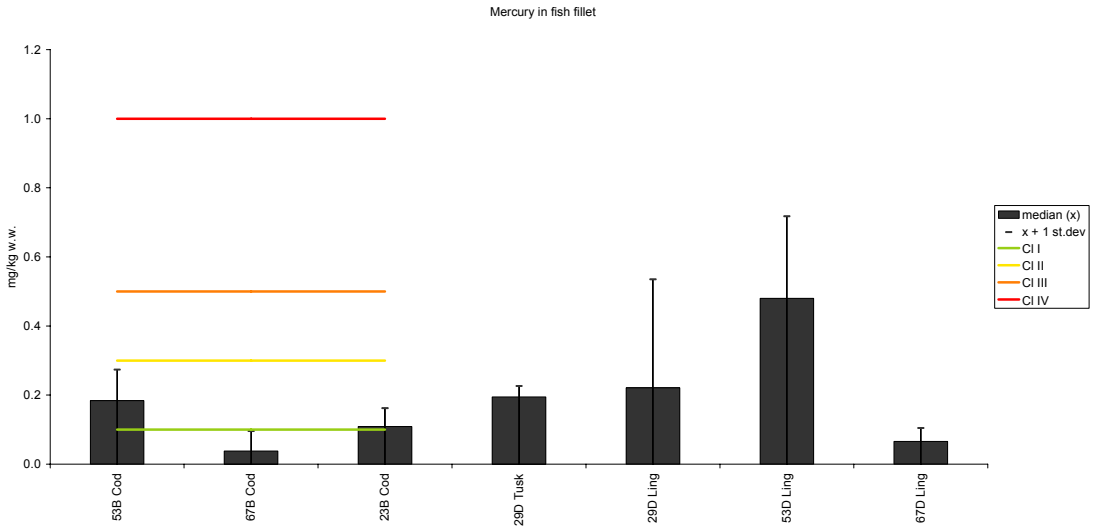



***Figure 43.*** *Sampling sites for the deep water fish ling, tusk and cod from the Sørfjord (st. 53D), Hardangerfjord (st. 67D) and Høyangerfjord (st. 29D) in the Sognefjord (cf. Appendix J). See otherwise key to map and detail in Figure 2.*

**A**




**B**

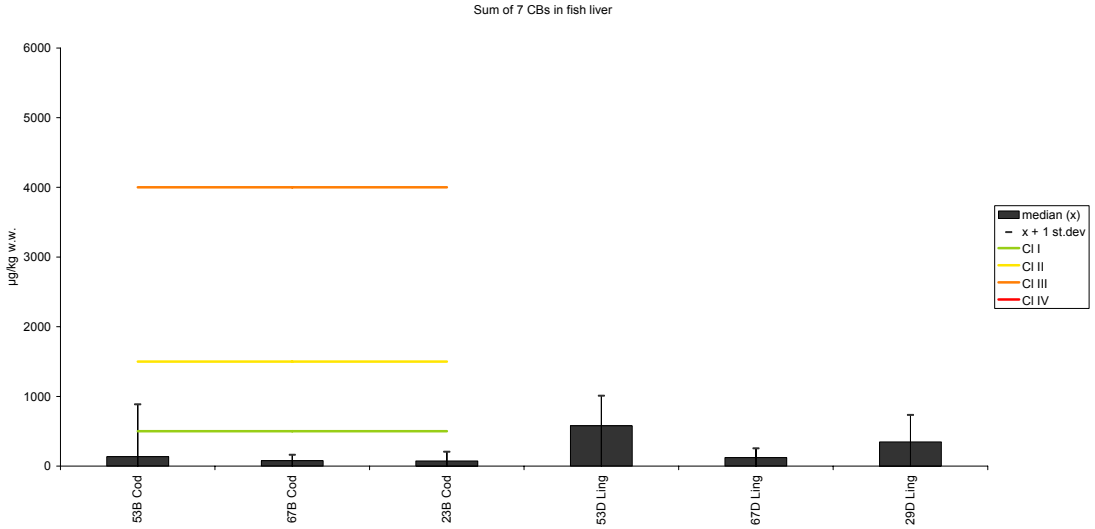
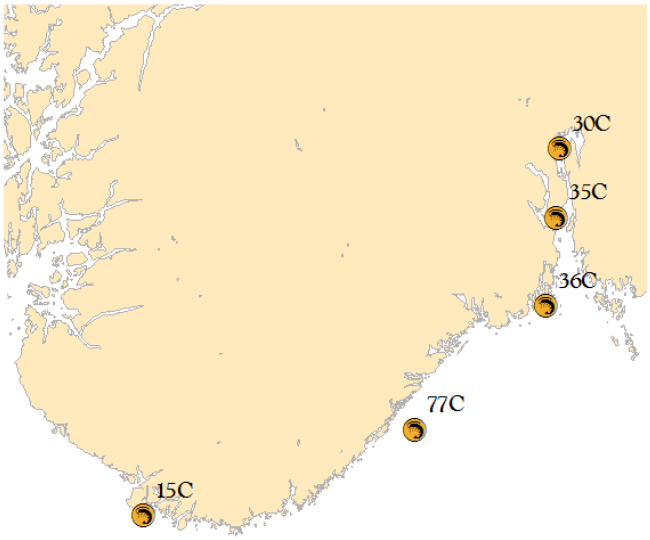



***Figure 44.*** *Median, standard deviation and upper limit to Klif Classes or provisional "high background" concenrations of mercury (**A**) (ppm-mg/kg-wet weight) in fish fillet and ΣPCB-7 (**B**) (ppb-µg/kg-wet weight) in fish liver for the deep water fish ling and tusk, and cod from the Sørfjord, Hardangerfjord and Høyangerfjord in the Sognefjord areas in 2008 (cf. Appendix J).* ***NB: classes for cod have been used.***

## Prawn

In 2008, prawn were collected at five stations: Inner Oslofjord (st. 30C), Mølen-Moss (st. 35C), Færder (st. 36C), Ullerø area (st. 15C) and Borøy area (st. 77C) (Figure 45 A). No overconcentrations were found for any of the contaminants investigated. Classes for blue mussel were used to classify the contamination level in prawns. Concentrations of cadmium in prawn is shown in Figure 45B.

**A**




**B**

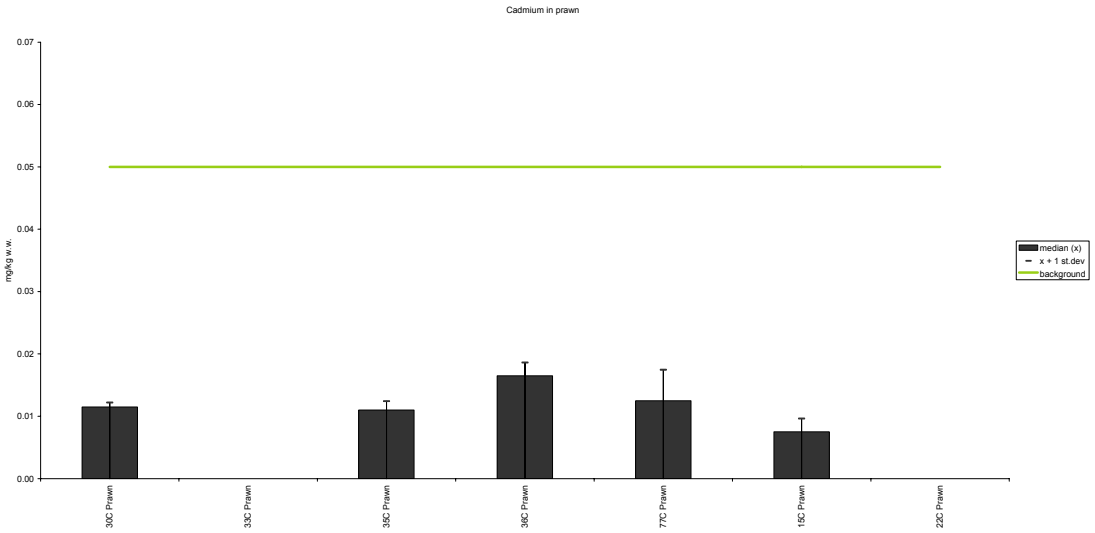



***Figure 45. A.*** *Sampling sites for the prawn from the southern part of Norway (cf. Appendix J).* ***B****. Concentrations of cadmium.*

## Extended investigations of selected priority substances

The purpose of this national screening survey was to obtain an overview of the occurrence of selected contaminants relevant to the Water Framework Directive 2000/60/EC as noted by the daughter directive Environmental Quality Standard Directive 2008/105/EC, as well as the pending Marine Framework Strategy Directive 2008/56/EC. Furthermore, this study was to assess whether or not this would warrant inclusion in routine monitoring. The investigation was based on CEMP samples and the results have been presented (Green et al. 2009), only a summary is present below.

The substances of concern were brominated compounds including PBDEs and HBCDD, perfluorinated organic compounds including PFOS and PFOSA, organochlorines including trichloroethylene, endosulfan, trichlororbenzene, HCBD, cyclodiene pesticides, selected phenols and chlorophenols, isoproturon and DEHP and the metals silver, arsenic, chromium and nickel (Table 9). Concentrations of PBDEs and PFCs were investigated in additional cod from stations 30B, 53B and 67B as routine of CEMP. Analyses were done on 10 samples of sediment from 6 sites during the period 2004-2008, and 9 samples of blue mussel and 25 samples of cod liver from 5 stations in 2008 (Table 10, Figure 46). Samples were collected in southern Norway (from Oslofjord to Lista), Lofoten and Varangerfjord; 6 sediment stations, 9 blue mussel stations and 5 cod stations. The results will be used as a guideline in the planning of future environmental monitoring.

***Table 9**. Overview of the compounds and metals investigated with notation as to which are listed in Environmental Quality Standard Directive – EQSD (2008/105/EC) as either priority substances (PS), including priority hazardous substances (PHS)[6], or other substances (OS) for which Environmental Quality Standards are specified, or substances under review as to be included as a priority substance (RS).*

| Compound | Abbreviation | CAS-no.[7] | EQSD substance no. |
|---|---|---|---|
| **Brominated compounds** | | | |
| 2,4,4'-tribromodiphenylether | BDE28 | 41318756 | PHS |
| 2,2',4,4'-tetrabromodiphenylether | BDE47 | 5436431 | PHS |
| 2,2',4,5'-tetrabromodiphenylether | BDE49 | 243982823 | |
| 2,3'4,4'-tetrabromodiphenylether | BDE66 | 187084615 | |
| 2,3',4',6-tetrabromodiphenylether | BDE71 | 189084626 | |
| 3,3',4,4'-tetrabromdiphenyleter | BDE77 | 93703481 | |
| 2,2',3,4,4'-pentabromodiphenylether | BDE85 | 182346210 | |
| 2,2',4,4',5-pentabromodiphenylether | BDE99 | 60348609 | PHS |
| 2,2',4,4',6-pentabromodiphenylether | BDE100 | 189084648 | PHS |
| 2,3',4,4',6-pentabromodiphenylether | BDE119 | 189084660 | |
| 2,2',3,4,4',5'-hexabromodiphenylether | BDE138 | 182677301 | |
| 2,2',4,4',5,5'-hexabromodiphenylether | BDE153 | 68631492 | PHS |
| 2,2',4,4',5,6'-hexabromodiphenylether | BDE154 | 207122154 | PHS |
| 2,2',3,4,4',5',6-heptabromdiphenyleter | BDE183 | 68928803 | |
| 2,2′,3,3′,4,4′,5,6′-octabromodiphenylether | BDE196 | 32536520 | |
| 2,2′,3,3′,4,4′,5,5′,6-nonabromodiphenylether | BDE206 | | |
| 2,2′,3,3′,4,4′,5,5′,6,6′-decabromodiphenylether | BDE209 | 1163195 | |
| α-, β-, and γ-hexabromcyclododecane | HBCDD | 25637994 | |
| bis-1,2(2,4,6-tribromphenoxy)ethane | BTBPE | | |
| Dimethyltetrabrombisphenol A | TBBPA | 79947 | |
| **Perfluorinated organic compounds** | | | |
| perfluorobutane sulfonate | PFBS | 29420493 | |
| perfluroroheptanoic acid | PFHPA | 375859 | |
| perflurorohexanoic acid | PFHXA | 307244 | |
| Perfluorononanoic acid | PFNA | 375951 | |
| perfluorooctanoic acid (PFOA) | PFOA | 335671 | |
| Sulfuramid or N-ethyl-1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-1-octanesulfonamide | PFOSA | 4151502 | |
| perfluorooctanyl sulphonic acid (perfluoroctanoic sulfonate, perfluorooctane sulfonate) | PFOS | 1763231 | RS |
| **Organochlorines** | | | |
| trichloroethylene (TRI) | TRI | 79016 | OS |
| Tetrachloroethylene (=perchloroethylene) | TET | 127184 | OS |
| Alachlor | ALA | 15972608 | PS |
| Endosulfan | ENDOA ENDOB | 115297 | PHS |
| 1,2,3-trichlorobenzene | TRCB0 | 87616 | PS |
| 1,2,4-trichlorobenzene | TRCB1 | 120821 | PS |
| 1,3,5-trichlorobenzene | TRCB2 | 108703 | PS |
| Hexachlorobutadiene | HCBD | 87683 | PHS |

[6] The Water Framework Directive (2000/60/EC, article 1) requires progressive reduction of discharges, emissions and losses of Priority Substances (PS), whereas for Priority Hazardous Substances, the requirement is a cessation or phasing-out of discharges, emissions and losses, with the ultimate aim of achieving concentrations in the marine environment near background values for naturally occurring substances and close to zero for man-made synthetic substances.
[7] For some compounds CAS-no. were not available.

| Compound | Abbreviation | CAS-no.[7] | EQSD substance no. |
|---|---|---|---|
| 4-chlor-a-(4-chlorphenyl)-a-(trichlormethyl)-benzenmethanol, | DICOFOL | 3380345 | RS |
| **Cyclodienes** | | | |
| Aldrin | ALD | 309002 | OS |
| Dieldrin | DIELD | 60571 | OS |
| Endrin | END | 72208 | OS |
| Isodrin* | ISOD | 465736 | OS |
| **Phenols/ chlorophenols** | | | |
| Pentachlorophenol (PCP) | PCP | 87865 | PS |
| octylphenol (4-(1.1,3,3-tetramethylbutyl)-phenol) | OCP | 140669 | PS |
| Nonylphenol (4-Nonylphenol) | NOP | 104405 | PHS |
| **Isoproturon** | | | |
| Isoproturon | ISO | 34123596 | PS |
| **Phthalate** | | | |
| Di(2-ethylhexyl)-phthalate | DEHP | 117817 | PS |
| **Metals** | | | |
| Silver | Ag | 7440224, 7783906, 7785231, 7761888 | |
| Arsenic | As | | |
| Chromium | Cr | | |
| Nickel | Ni | 7440020 | PS |

[1] For some compounds CAS-no. were not available

***Table 10**. Overview of sample location, matrix and count (N) (see also Figure 46). Samples were collected in 2008 with noted exceptions.*

| Site/Map ID | Area | Area specification | Latitude° | Longitude° | Matrix | N |
|---|---|---|---|---|---|---|
| 30S | Inner Oslofjord | Steilene | 59° 49.1 | 10° 33.8 | Sediment | 2 |
| 36S | Outer Oslofjord | Færder area | 59° 0.4 | 10° 41.6 | Sediment | 1 |
| 15S | South Norway | Lista area | 58° 1 | 6° 34.3 | Sediment | 2 |
| 24S | West Norway | Sotra | 60° 15.1 | 4° 33.3 | Sediment | 1* |
| 98S | Lofoten | Skrova (south) | 68° 7 | 14° 41 | Sediment | 2* |
| 10S | North Norway | Varangerfjorden | 69° 56.07 | 30° 6.7 | Sediment | 2** |
| 30A | Inner Oslofjord | Gressholmen | 59° 52.89 | 10° 42.71 | Blue mussel | 1 |
| I304 | Inner Oslofjord | Gåsøya | 59° 51.08 | 10° 35.34 | Blue mussel | 1 |
| I307 | Inner Oslofjord | Ramtonholmen | 59° 44.67 | 10° 31.37 | Blue mussel | 1 |
| 36A | Outer Oslofjord | Færder | 59° 1.63 | 10° 31.53 | Blue mussel | 1 |
| 71A | South Norway | Bjørkøya | 59° 1.4 | 9° 45.22 | Blue mussel | 1 |
| 52A | Sørfjord | Eitrheimsneset | 60° 5.8 | 6° 31.97 | Blue mussel | 1 |
| 22A | West Norway | Espevær (west) | 59° 35.05 | 5° 8.63 | Blue mussel | 1 |
| 98A2 | Lofoten | Husvaagen area | 68° 15.46 | 14° 39.83 | Blue mussel | 1 |
| 10A2 | Varangerfjord | Skallneset | 70° 6.21 | 30° 15.75 | Blue mussel | 1 |
| 30B | Inner Oslofjord | Oslo City area | 59° 47.96 | 10° 33.6 | Cod | 5 |
| 36B | Outer Oslofjord | Færder area | 59° 2.43 | 10° 26.15 | Cod | 5 |
| 15B | South Norway | Ullerø area | 58° 3 | 6° 43 | Cod | 5 |
| 23B | West Norway | Karihavet area | 59° 54 | 5° 8 | Cod | 5 |
| 98B1 | Lofoten | Bjørnerøya (east) | 68° 14.8 | 14° 48.2 | Cod | 5 |

*) 2004.
**) 2006.

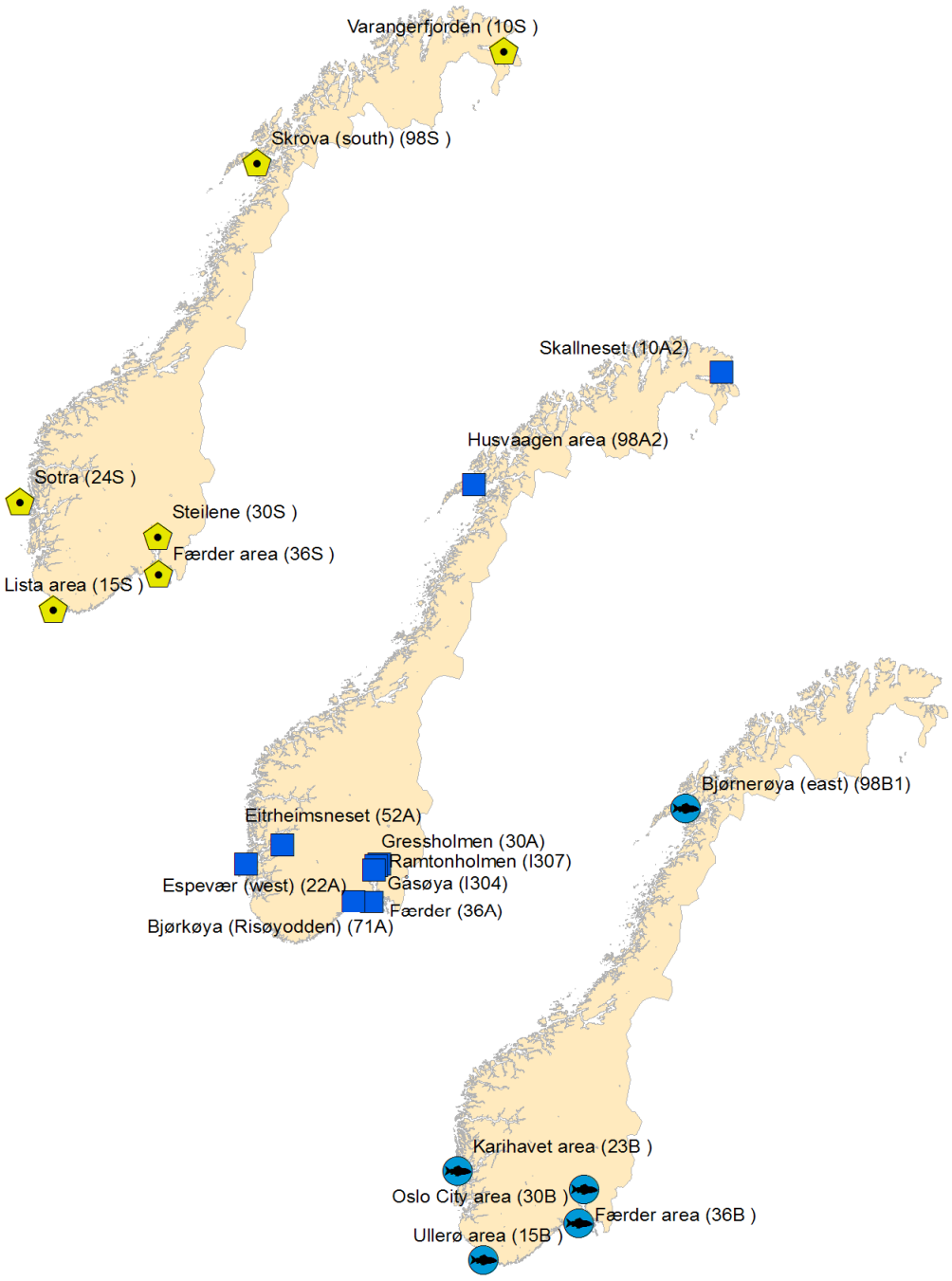



***Figure 46.*** *Map of sampling sites for sediment (yellow pentagon), blue mussel (blue square), and cod (blue circle).*

## Sediments

In 2008 sediments were collected at 5 stations: Steilene (st. 30S), Mølen-Moss (st. 35S), Færder area (st. 36S), Arendal area (st. 77S) and Lista area (st. 15S).

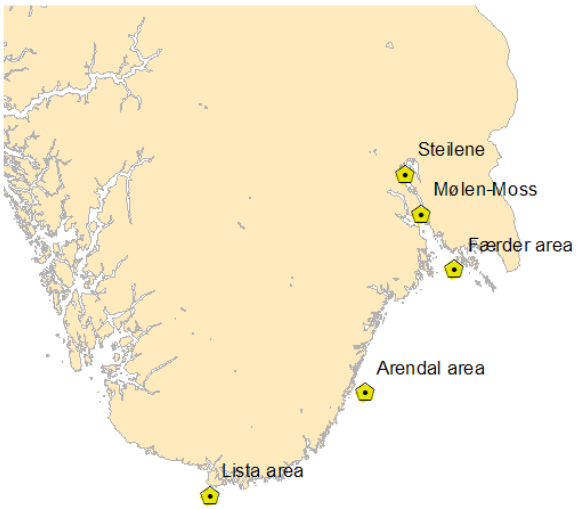



***Figure 47.*** *Sampling sites for the sediments.*

**Mercury (Hg)**
Overconcentration (Class II, good) was found for Hg in surficial sediment at Steilene (st. 30S) in the Oslofjord. This was a decrease since 1990-1999 (Figure 82). Overconcentration (Class II) was also found at Mølen-Moss (st. 35S).

**Lead (Pb)**
Overconcentration (Class III, moderate) was found for Pb in surficial sediment at Steilene (st. 30S) in the Oslofjord (Figure 83). This was a decrease since 1990-1999, when it was Class IV (bad). The other four stations had overconcentrations (Class II) for Pb.

**Copper (Cu)**
Overconcentration (Class II) was found for Cu in surficial sediment at Steilene (st. 30S) in the Oslofjord (Figure 84). This was a decrease since 1990-1999, when it was Class V (very bad).

**Zinc (Zn)**
Overconcentration (Class II) was found for Zn in surficial sediment at Steilene (st. 30S) in the Oslofjord (Figure 85). This was a decrease since 1990-1999, when it was Class III. Overconcentration (Class II) was also found at Mølen-Moss (st. 35S).

**Polychlorinated biphenyls (∑PCB-7)**
Overconcentration (Class II) was found for ∑PCB-7 in surficial sediment at Steilene (st. 30S) in the Oslofjord (Figure 86).This was a 50 % decrease since 1990-1999. The concentration of ∑PCB-7 was at background level for the other four stations, and the concentrations found were lower than in 1990-1999.

**Benzo[a]pyrene, (B[a]P)**
All the five stations had overconcentrations of B[a]P (Class II) in the surficial sediment (Figure 90).

**Polycyclic aromatic hydrocarbons (PAH)**
The stations Steilene (st. 30S), Færder area (st. 36S), Arendal area (st. 77S) and Lista area (st. 15S) had overconcentrations (Class II) for PAH. All five stations investigated had a decrease since 1990-1999 (Figure 91).

**Sum carcinogen polycyclic aromatic hydrocarbons (PAH-K)**
All five stations investigated had a decrease in concentration for sum of carcinogen PAHs in surficial sediment (Figure 92).

**Tributyltin (TBT)**
Overconcentration (Class III) was found for TBT in surficial sediment at Steilene (st. 30S) in the Oslofjord (Figure 93). The other four stations had overconcentrations (Class II) for TBT.

**Other substances**
No overconcentrations were found for cadmium (Cd), dichlorodiphenyldichloroethylene (ppDDE), lindane (g-HCH) and hexachlorobenzene (HCB).

# 5. Conclusions

This report is part of the Norwegian contribution to OSPAR's Coordinated Environmental Monitoring Programme (CEMP). CEMP 2008 included the monitoring of contaminants in blue mussel (51 stations), dogwhelk (8 stations), cod (11 stations), tusk (1 station), ling (3 stations), prawn (5 stations), flatfish (10 stations) and sediments (5 stations) along the coast of Norway from the Oslofjord to the Varangerfjord. Of the 890 time series in this project, 256 were statistically significant trends, 228 (89 %) of these were downward trends and 28 were upwards. There were 142 cases of overconcentrations or concentratons higher than high background levels in 2008.

The results showed elevated levels of contaminants, in a few cases up to extremely polluted, in blue mussel in the Frierfjord (dioxins/TCDDN), in the Ranfjord (B[a]P) and in the Sørfjord (ppDDE). Blue mussel in the Kristiansandsfjord and the Ranfjord were up to severely polluted with B[a]P. Cod liver from Inner Oslofjord was markedly polluted, and the fillet was moderately polluted with ∑PCB-7. There was a significant downward trend for ∑PCB-7 in blue mussel from Gressholmen in the Inner Oslofjord. Fillet of cod from the Inner Oslofjord was moderately polluted with mercury, a significant upward trend was detected for the period 1984-2008. A significant downward trend was found for lead, cadmium and mercury in blue mussel from Sørfjord/ Hardangerfjord. Fillet of cod from the Inner Sørfjord was moderately polluted with mercury, and cod liver was insignificantly polluted with ppDDE and ∑PCB-7. Fillet of ling from the Inner Sørfjord had a median concentration of mercury of 0.48 mg/kg, which is close to the lower limit of Class IV (severely polluted). Fillet of both tusk and ling from the Høyanger area were moderately contaminated with mercury. Contamination of organotin in blue mussel and imposex in dogwhelk were still apparent, however, most of the trends were downward indicating that regulatory action has lead to an improvement in the investigated areas. The results from studies using biological effects methods in cod, indicated reduced exposure to planar organic contaminants in the Oslofjord. In the Grenlandsfjord area there was a significant downward trend for HCB in blue mussel. No overconcentrations of contaminants were found in prawns. A reduction since 1990-1999 was found for mercury in sediment at Mølen-Moss and Steilene, and for ∑PCB-7 (50 %) at Steilene. A decrease of ∑PCB-7, PAH and ∑KPAH in sediment was found at all stations since 1990-1999. The sediment at Steilene was moderately polluted with TBT. No overconcentrations were found in sediment for cadmium (Cd), dichlorodiphenyldichloroethylene (ppDDE), lindane (g-HCH) and hexachlorobenzene (HCB).

# 6. References

Titles translated to English in square brackets [ ] are not official.

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# Appendix A
# Overview of previous CEMP investigations

**Previous investigations**

The results for CEMP have previously been presented for:

- 1981-1983 (only Oslofjord; Enger et al. 1984, 1985)
- 1984-1985 (Green 1988)
- 1986 (Green 1987; SFT 1987)
- 1987 (SFT 1988)
- 1988 (Green 1989b; SFT 1989)
- 1989 (Green 1991a, SFT 1990)
- 1990 (Green 1992, JMG 1994)
- 1991 (Green 1993a)
- 1992 (Green 1994, Green & Knutzen 1994)
- 1993 (Green 1995a)
- 1994 (Green 1995b)
- 1995 (Green 1997a)
- 1996 (Green 1997b)
- 1997 (Green et al. 1999)
- 1998 (Green et al. 2000)
- 1999 (Green et al. 2001a)
- 2000 (Green et al. 2002a)
- 2001 (Green, et al. 2003)
- 2002 (Green, et al. 2004a)
- 2003 (Green, et al. 2004b)
- 2004 (Green, et al. 2005)
- 2005 (Green, et al. 2007)
- 2006 (Green, et al. 2008b)
- 2007 (Green, et al. 2009)

The results have been incorporated in OSPAR's European regional assessments of sediment (JMG 1993) and biota (ICES 1988, JMG 1992) and temporal trends in biota (ICES 1989; 1991; ASMO 1994).

An overview of the analytical methods (1981-2000) has been presented in Green 1993b; Green et al. 2001b, Green et al. 2008a.

The raw data or statistical summaries have been presented for:

- sediment 1986-1997 (Green & Klungsøyr 1994; Green et al. 2002b)
- biota 1981-1992 (Green & Rønningen 1994)
- biota 1993-1997 (Green & Severinsen 1999a, b)
- biota 1998-2001 (Green et al. 2002c, d) and
- sediment and biota 1981-2006 (cf. Shi et al. 2008)

Summary assessments have been made for the periods:

- 1981-1992 (Green et al. 1995)
- 1981-1999 (Green et al. 2002c)
- 1981-2006 (Green & Ruus 2008)

An evaluation of "background" levels of contaminants in biota based on CEMP data has been done by Knutzen & Green (1995, 2001a) and Green & Knutzen (2003). Application of pollution and reference indices using the blue mussel and coordinated with CEMP has also been assessed (Green & Knutzen 2001). Results from biological effects methods 1997-2001 have been assessed as well (Ruus et al. 2003).

# Appendix B
# Quality assurance programme

# Information on Quality Assurance

NIVA has participated in all the QUASIMEME international intercalibration exercises relevant to chemical and imposex analyses. For chemical analyses, these include Round 56 of January-April 2009, which would apply to the 2008 samples. These QUASIMEME exercises have included nearly all the contaminants as well as imposex analysed in this programme. In addition, NIVA was accredited in 1993 and since 2001 accredited in accordance with the NS-EN ISO/IEC 17025 standard by the Norwegian Accreditation (reference P009). In addition to these QUASIMEME exercises, certified reference materials (CRM) are also analysed routinely with the CEMP samples. It should be noted that for biota the type of tissue used in the CRMs do not always match the target tissue for analyses. Uncertain values identified by the analytical laboratory or the reporting institute are flagged in the database. The results are also "screened" during the import to the database at NIVA and ICES.

**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/ISO71EC Guide 25. NIVA has reference number P009. The chemical laboratory has satisfied the requirements in NS-EN ISO/IEC 17025 since 2001.

**Summary of quality control results**
Standard reference materials were analysed regularly (Table 11, Table 12). Fish protein (DORM-3) or dogfish liver (DOLT-3) was used as SRM for the control of the determination of metals. Cod liver oil (1588) and mussel tissue (2977) was used as SRM for controls of PCBs and PAHs, respectively. NIES 11 was used for tin organic compounds. Cyprinid fish (EDF2525) at NILU was used as SRM for control of determination of dioxins. For sediments, MESS-3 was used as SRM for trace metals, and the SRM 1944 for the determination of selected polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyl (PCB) congeners, and chlorinated pesticides.

Following results for round QUASIMEME –Round 56, January-April 2009, were used. This round would apply to the 2008 samples, except for PAH in biota, where round 54 were used, July – October 2008.

- QTM081BT (no. 1) and QTM082BT (no. 2) for metals in biota.
  The results were all very good (z-scores between -2 and 2)
- QOR0986BT (no. 1) and QOR099BT (no. 2) for organochlorines in biota
  The results were acceptable except for one result which were classified as questionable, and that was for CB105 (no. 2) which had z-scores higher than 2. For CB105 (no.2) the result is too high, the result is at the present time being checked by NIVA's laboratory
- QPH051BT (no. 1) and QPH052BT (no. 2) for PAH in biota
  The results were acceptable except forflouranthene and phenanthrene (no. 2) where the results were too high. The deviations are being checked by NIVA's laboratory.
- QTM086MS (no. 1) and QTM087MS (no. 2) for metals in sediments
  All results were very good (z-scores between -2 and 2)
- QOR096MS (no.1) and QOR097MS (no. 2) for organochlorines in sediments
  The results were acceptable (z-scores between -2 and 2), except for two results which was classified as questionable and these were CB118 and CB156 in sample no. 1
- QPH060MS (no. 1) and QPH061MS (no. 2) for PAH in sediments
  Three of the results were not acceptable. One of these were benzo[b]fluoranthene .This is likely due to that the results submitted included benzo[j]fluoranthene which, by the methods currently in use, can not be distinguished from the former PAH-compound. The other two were acenaphthyleneand dibenz[a,h] anthracene which were classified as not acceptable. The deviations are being checked by NIVA's laboratory

***Table 11.*** *Summary of the quality control of results for the 2008 sediment samples analysed in 2009. The Standard Reference Materials (SRM) were MESS-3 for trace metals in marine sediment (mg/kg d.w) and 1944 for the determination of selected polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyl (PCB) congeners, chlorinated pesticides, and trace elements (µg/kg d.w) in marine sediment. These SRM were analysed in series with the CEMP-samples for analyses of metals and the organic compounds.*

| Code | Contaminant | Tissue type | SRM type | SRM value confidence interval | N | W | Mean value | Standard deviation |
|---|---|---|---|---|---|---|---|---|
| **AL** | **Aluminium** | SM | MESS-3 | 8.59 ± 0.23 | 1 | 1 | 7.67 | - |
| **AS** | **Arsenic** | SM | MESS-3 | 21.2 ± 1.1 | 10 | 23 | 18.9 | 1.21 |
| **CD** | **Cadmium** | SM | MESS-3 | 0.24 ± 0.01 | 10 | 23 | 0.28 | 0.02 |
| **CR** | **Chromium** | SM | MESS-3 | 105 ± 4 | 1 | 1 | 92 | - |
| **CU** | **Copper** | SM | MESS-3 | 33.9 ± 1.6 | 10 | 23 | 31.8 | 1.4 |
| **LI** | **Lithium** | SM | MESS-3 | 73.6 ± 5.2 | 1 | 1 | 65.8 | - |
| **MN** | **Magnesium** | SM | MESS-3 | 324 ± 12 | 1 | 1 | 1.5 | - |
| **NI** | **Nickel** | SM | MESS-3 | 46.9 ± 2.2 | 1 | 1 | 45.4 | - |
| **PB** | **Lead** | SM | MESS-3 | 21.1 ± 0.7 | 10 | 23 | 17.7 | 0.81 |
| **ZN** | **Zinc** | SM | MESS-3 | 159 ± 8 | 10 | 23 | 130 | 3.59 |
| **ACNE** | **Acenaphthene** | SM | 1944 | 570 ± 30 | 8 | 25 | 294 | 58 |
| **ANT** | **Anthracene** | SM | 1944 | 1770 ± 330 | 8 | 25 | 1047 | 249 |
| **BAP** | **Benzo(a)pyrene** | SM | 1944 | 4300 ± 130 | 8 | 25 | 3800 | 754 |
| **BBJF** | **Benzo(b+j)fluoranthene** | SM | 1944 | 5960 ± 608* | 8 | 25 | 5888 | 832 |
| **BGHIP** | **Benzo(ghi)perylene** | SM | 1944 | 2780 ± 100 | 8 | 25 | 2963 | 832 |
| **BAA** | **Benzo(a)anthracene** | SM | 1944 | 4720 ± 110 | 8 | 25 | 4213 | 467 |
| **CB101** | **CB101(IUPAC)** | SM | 1944 | 73.4 ± 2.5 | 5 | 9 | 61 | 4.8 |
| **CB105** | **CB105(IUPAC)** | SM | 1944 | 24.5 ± 1.1 | 5 | 9 | 24 | 1.7 |
| **CB118** | **CB118(IUPAC)** | SM | 1944 | 58.0 ± 4.3 | 5 | 9 | 53 | 4 |
| **CB138** | **CB138(IUPAC)** | SM | 1944 | 62.1 ± 3.0 | 5 | 9 | 57 | 5.0 |
| **CB153** | **CB153(IUPAC)** | SM | 1944 | 74.0 ± 2.9 | 5 | 9 | 64 | 4.9 |
| **CB156** | **CB156(IUPAC)** | SM | 1944 | 6.52 ± 0.66 | 5 | 9 | 6.1 | 0.8 |
| **CB180** | **CB180(IUPAC)** | SM | 1944 | 44.3 ± 1.2 | 5 | 9 | 40.8 | 1.8 |
| **CB209** | **CB209(IUPAC)** | SM | 1944 | 6.81 ± 0.33 | 5 | 9 | 6.7 | 0,5 |
| **CB28** | **CB28(IUPAC)** | SM | 1944 | 80.8 ± 2.7 | 5 | 9 | 83.4 | 4.5 |
| **CB52** | **CB52(IUPAC)** | SM | 1944 | 79.4 ± 2.0 | 5 | 9 | 67.6 | 4.4 |
| **CHR** | **Chrysene** | SM | 1944 | 4860 ± 100 | 8 | 25 | 5138 | 727 |
| **DBA3A** | **Dibenz(a,c/a,h)anthracene** | SM | 1944 | 759 ± 70** | 8 | 25 | 790 | 162 |
| **DDEPP** | **p,p'-DDE** | SM | 1944 | 86 ± 12 | 5 | 9 | 68 | 7.4 |
| **FLE** | **Fluorene** | SM | 1944 | 850 ± 30 | 8 | 25 | 348 | 88.4 |
| **FLU** | **Fluoranthene** | SM | 1944 | 8920 ± 320 | 8 | 25 | 8363 | 986 |
| **HCB** | **Hexaclorobenzene** | SM | 1944 | 6.03 ± 0.35 | 4 | 9 | 5.38 | 0.39 |
| **HCHA** | **alpha-HCH** | SM | 1944 | 2.0 ± 0.3 | 1 | 1 | 1.1 | - |
| **ICDP** | **Indeno(1,2,3-cd)pyrene** | SM | 1944 | 2780 ± 100 | 8 | 25 | 2850 | 496 |
| **NAP** | **Naphthalene** | SM | 1944 | 1650 ± 310 | 8 | 25 | 1118 | 204 |
| **PA** | **Phenanthrene** | SM | 1944 | 5270 ± 220 | 8 | 25 | 5200 | 821 |
| **PYR** | **Pyrene** | SM | 1944 | 9700±420 | 8 | 25 | 8538 | 1105 |
| **TDEPP** | **p,p'-TDE = p,p'-DDD** | SM | 1944 | 108 ± 16 | 5 | 9 | 88 | 6.9 |

*) Calculated from separate values for **Benzo(b)fluoranthene** and **Benzo(j)fluoranthene**

**) Calculated from separate values for **Dibenz(a,c)anthracene and Dibenz(a,h)anthracene**,

***Table 12.*** *Summary of the quality control of results for the 2008 biota samples analysed in 2008-2009. The Standard Reference Materials (SRM) were DORM-3* (fish protein) for blue mussel and fish fillet, DOLT-3* (dogfish liver) for fish liver, 1588** (cod liver oil) for blue mussel and fish liver and 2977** (mussel tissue) for blue mussel. SRM was analysed in series with the CEMP-samples for analyses of metals (mg/kg d.w.), NIES 11 for organochlorines or PAH (μg/kg d.w.) and EDF2525**** for fish (cyprinid) was analysed for dioxin (ng/kg) by NILU (Norwegian Institute for Air Research – results for 2008 material are shown here; cf. Green et al.2007). 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 |
|---|---|---|---|---|---|---|---|---|
| **As** | **Arsenic** | LI | DOLT-3 | 10.2 ± 0.5 | 21 | 19 | 10.91 | 0.52 |
| **Cd** | **cadmium** | LI | DOLT-3 | 19.4 ± 0.6 | 21 | 19 | 18,94 | 0.84 |
| **Cr** | **Chromium** | LI | DOLT-3 | missing | 19 | 19 | 3,77 | 0.57 |
| **Cu** | **copper** | LI | DOLT-3 | 31.2 ± 1.0 | 21 | 19 | 31.63 | 1.27 |
| **Ni** | **Nickel** | LI | DOLT-3 | 2.72 ± 0.35 | 19 | 19 | 3.01 | 0,28 |
| **Pb** | **lead** | LI | DOLT-3 | 0.319 ± 0.045 | 21 | 19 | 0.32 | 0.03 |
| **Zn** | **zinc** | LI | DOLT-3 | 86.6 ± 2.4 | 21 | 19 | 91.80 | 4.11 |
| **As** | **Arsenic** | SB | DORM-3 | 6.88±0.30 | 12 | 22 | 8.24 | 0.38 |
| **Cd** | **cadmium** | SB | DORM-3 | 0.290 ± 0.020 | 12 | 22 | 0.317 | 0.008 |
| **Co** | **Cobalt** | SB | DORM3 | missing | 11 | 22 | 0.261 | 0.008 |
| **Cr** | **Chromium** | SB | DORM | 1.89 ± 5.5 | 12 | 22 | 1.79 | 0.13 |
| **Cu** | **copper** | SB | DORM3 | 15.5 ± 0.63 | 12 | 22 | 15.2 | 0.36 |
| **Hg** | **Mercury** | MU | DORM3 | 0.409 ± 0.027 | 38 | 23 | 0.408 | 0.03 |
| **Hg** | **mercury** | SB | DORM | 0.409 ± 0.027 | 38 | 23 | 0.408 | 0.03 |
| **Ni** | **Nickel** | SB | DORM3 | 1.28± 0.24 | 12 | 22 | 1.28 | 0.11 |
| **Pb** | **lead** | SB | DORM3 | 0.395 ± 0.050 | 12 | 22 | 0.415 | 0.013 |
| **Zn** | **zinc** | SB | DORM3 | 51.3 ± 3.1 | 12 | 22 | 53.1 | 2.16 |
| **MPTIN** | **Monophenyltin (MPT)** | SB | NIES-11 | missing | 11 | 21 | 281.55 | 125.38 |
| **TBTIN** | **Tributyltin** | SB | NIES-11 | 1159 ± 88 | 9 | 16 | 1558.5 | 680.81 |
| **TPTIN** | **Triphenyl-tin** | SB | NIES-11 | 5109 ± 363 | 8 | 16 | 6392.5 | 2923.17 |
| **BDE100** | **2,2',4,4',6-Pentabromidiphenylether** | LI | SRM1588b | 1.89 ± 0.45 | 11 | 10 | 2.10 | 0.37 |
| **BDE154** | **2,2',4,4',5,6'-Hexabromidiphenylether** | LI | SRM1588b | 0.495 ± 0.069 | 11 | 10 | 0.31 | 0.13 |
| **BDE28** | **2,2',4,4'-Tribromodiphenylether** | LI | SRM1588b | 1.08 ± 0.23 | 11 | 10 | 0.625 | 0.43 |
| **BDE47** | **2,2',4,4',-Tetrabromidiphenylether** | LI | SRM1588b | 17.8 ± 2.0 | 11 | 10 | 20.25 | 2.05 |
| **BDE49** | **2,2',4,5'-Tetrabromidiphenylether** | LI | SRM1588b | 2.25 ± 0.24 | 11 | 10 | 2.3 | 0.23 |
| **BDE99** | **2,2',4,4',5-Pentabromidiphenylether** | LI | SRM1588b | 0.56 ± 0.20 | 10 | 10 | 0.57 | 0.22 |
| **CB101** | **PCB congener CB-101** | LI | SRM1588b | 127 ± 9 | 19 | 23 | 142.6 | 23.8 |
| **CB105** | **PCB congener CB-105** | LI | SRM1588b | 59.2 ± 1.2 | 19 | 23 | 52 | 8.44 |
| **CB118** | **PCB congener CB-118** | LI | SRM1588b | 172 ± 7 | 19 | 23 | 213.7 | 32.0 |
| **CB138** | **PCB congener CB-138** | LI | SRM1588b | 212 ± 29 | 18 | 23 | 206.1 | 16.1 |
| **CB153** | **PCB congener CB-153** | LI | SRM1588b | 275 ± 4 | 19 | 23 | 241.6 | 41.8 |
| **CB156** | **PCB congener CB-156** | LI | SRM1588b | 18.0 ± 2.1 | 19 | 23 | 17.8 | 3.17 |
| **CB180** | **PCB congener CB-180** | LI | SRM1588b | 98.5 ± 6.3 | 18 | 23 | 90.8 | 8.1 |
| **CB209** | **PCB congener CB-209** | LI | SRM1588b | 3.2 ± 0.26 | 14 | 13 | 2.95 | 0.65 |
| **CB28** | **PCB congener CB-28** | LI | SRM1588b | 27.8 ± 1.4 | 19 | 23 | 22.1 | 3.53 |
| **CB52** | **PCB congener CB-52** | LI | SRM1588b | 82.4 ± 1.7 | 19 | 23 | 67.9 | 14.0 |
| **DDEPP** | **4.4'-DDE** | LI | SRM1588b | 676 ± 36 | 19 | 23 | 560.5 | 99.5 |
| **DDTPP** | **4.4'-DDT** | LI | SRM1588b | 570 ± 27 | 19 | 23 | 499.5 | 181.7 |
| **HCB** | **Hexachlorobenzene** | LI | SRM1588b | 163 ± 16 | 19 | 23 | 130.5 | 21.2 |
| **HCHA** | **α -hexachlorohexene** | LI | SRM1588b | 99 ± 15 | 19 | 23 | 77.8 | 12.4 |
| **HCHG** | **γ -hexachlorohexene** | LI | SRM1588b | 23.3 ± 1.7 | 19 | 23 | 17.2 | 3.68 |
| **OCS** | **Octachlorostyrene** | LI | SRM1588b | 9.14 ± 0.74 | 17 | 23 | 12.1 | 3.19 |
| **QCB** | **Pentachlorobenzene** | LI | SRM1588b | 16.1 ± 0.6 | 16 | 23 | 12.1 | 3.83 |
| **TDEPP** | **4.4'-DDD** | LI | SRM1588b | 285 ± 37 | 19 | 23 | 231.6 | 41.3 |
| **ACNE** | **Acenaphthene** | SB | SRM2977 | 4.2 ± 0.4 | 7 | 14 | 2.86 | 0.80 |
| **ACNLE** | **Acenaphthylene** | SB | SRM2977 | m | 9 | 14 | 2.86 | 0.79 |
| **ANT** | **Anthracene** | SB | SRM2977 | 8 ± 4 | 9 | 14 | 3.3 | 0.90 |
| **BAP** | **benzo[a]pyrene[1)]** | SB | SRM2977 | 8.35 ± 0.72 | 9 | 14 | 5.12 | 0.87 |
| **BBJF** | **Benzo(b+j)flouranthene[2)]** | SB | SRM2977 | m | 9 | 14 | 17.22 | 3.31 |
| **BEP** | **benzo[e]pyrene** | SB | SRM2977 | 13.1 ± 1.1 | 9 | 14 | 17.9 | 4.1 |

| Code | Contaminant | Tis-sue type | SRM type | SRM value confidence interval | N | W | Mean value | Standard deviation |
|---|---|---|---|---|---|---|---|---|
| **BGHIP** | **benzo[ghi]perylene** | SB | SRM2977 | 9.53 ± 0.43 | 9 | 14 | 8.4 | 2.4 |
| **BKF** | **benzo[k]fluoranthene** | SB | SRM2977 | 4 ± 1 | 9 | 14 | 5.84 | 1.27 |
| **BAA** | **benzo[a]anthracene**[1)] | SB | SRM2977 | 20.34 ± 0.78 | 9 | 14 | 18.55 | 1.42 |
| **CHR** | **Chrysene** | SB | SRM2977 | 49 ± 2 | 9 | 14 | 45 | 9.75 |
| **DBA3A** | **Dibenz[a,h]anthracene/ Dibenz[a,c]anthracene**[3)] | SB | SRM2977 | 2.0 ± 0.2 | 8 | 14 | 1.8 | 0.31 |
| **FLE** | **Fluorene** | SB | SRM2977 | 10.24 ± 0.43 | 9 | 14 | 7.16 | 2.5 |
| **FLU** | **fluoranthene** | SB | SRM2977 | 38.7 ± 1.0 | 9 | 14 | 30.6 | 5.0 |
| **ICDP** | **indeno[1,2,3-cd]pyrene** | SB | SRM2977 | 4.84 ± 0.81 | 9 | 14 | 3.77 | 0.7 |
| **NAP** | **Naphthalene** | SB | SRM2977 | 19 ± 5 | 9 | 14 | 15.0 | 9.3 |
| **PA** | **Phenanthrene** | SB | SRM2977 | 35.1 ± 3.8 | 9 | 14 | 35.1 | 6.93 |
| **PER** | **perylene** | SB | SRM2977 | 3.50 ± 0.76 | 9 | 14 | 2.28 | 0.54 |
| **PYR** | **pyrene** | SB | SRM2977 | 78.9 ± 3.5 | 9 | 14 | 64.1 | 14.2 |
| **CB126** | **3,3',4,4',5-PeCB** | SB | EDF2525 | 647 ± 211 | 7 | 55 | 618 | 28,6 |
| **CB169** | **3,3',4,4',5,5'-HxCB** | SB | EDF2525 | 55.8 ± 12.6 | 7 | 55 | 48.2 | 7.6 |
| **CB77** | **3,3',4,4'-TeCB** | SB | EDF2525 | 1980 ± 659 | 7 | 55 | 1939 | 40.6 |
| **CB81** | **3,4,4',5-TeCB** | SB | EDF2525 | 179 ± 35.1 | 7 | 55 | 178.3 | 0.73 |
| **CDD1N** | **1,2,3,7,8-PeCDD** | SB | EDF2525 | 3.88 ± 1.22 | 7 | 55 | 3.80 | 0.08 |
| **CDD4X** | **1,2,3,4,7,8-HxCDD** | SB | EDF2525 | 0.31 ± 0.14 | 7 | 55 | 0.62 | 0.31 |
| **CDD6X** | **1,2,3,6,7,8-HxCDD** | SB | EDF2525 | 2.19 ± 0.76 | 7 | 55 | 1.75 | 0,44 |
| **CDD9X** | **1,2,3,7,8,9-HxCDD** | SB | EDF2525 | 0.32 ± 0.11 | 7 | 55 | 0.46 | 0.02 |
| **CDDO** | **OCDD** | SB | EDF2525 | 2.57 ± 2.59 | 7 | 55 | 2.09 | 0.48 |
| **CDF2N** | **2,3,4,7,8-PeCDF** | SB | EDF2525 | 14.5 ± 2.41 | 7 | 55 | 14.54 | 0.04 |
| **CDF2T** | **2,3,7,8-TCDF** | SB | EDF2525 | 24.5 ± 5.52 | 7 | 55 | 22.25 | 2.25 |
| **CDF4X** | **2,3,4,6,7,8-HxCDF** | SB | EDF2525 | 1.09 ± 0.55 | 7 | 55 | 0.88 | 0.21 |
| **CDF6P** | **1,2,3,4,6,7,8-HpCDF** | SB | EDF2525 | 0.59 ± 0.61 | 7 | 55 | 0,34 | 0.25 |
| **CDF6X** | **1,2,3,6,7,8-HxCDF** | SB | EDF2525 | 1.65 ± 0.56 | 7 | 55 | 1.75 | 0.10 |
| **CDF9P** | **1,2,3,4,7,8,9-HpCDF** | SB | EDF2525 | 0.08 ± 0.11 | 7 | 55 | 0.18 | 0.10 |
| **CDFDN** | **1,2,3,7,8/1,2,3,4,8-PeCDF** | SB | EDF2525 | 4.88 ± 1.46 | 7 | 55 | 4.31 | 0.57 |
| **CDFDX** | **1,2,3,4,7,8/1,2,3,4,7,9-HxCDF** | SB | EDF2525 | 5.8 ± 0.99 | 7 | 55 | 6.15 | 0.35 |
| **CDFO** | **OCDF** | SB | EDF2525 | 0.78 ± 1 | 7 | 55 | 0.64 | 0.14 |
| **TCDD** | **2,3,7,8-tetrachl-DiBpD (TCDD)** | SB | EDF2525 | 17.3 ± 2.58 | 7 | 55 | 17.51 | 0,21 |

*) 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)
****) CIL, US
1) Not certified (see NIST certificate)
2) Calculated from separate values for **Benzo(b)fluoranthene** and **Benzo(j)fluoranthene**
3) Calculated from separate values for **Dibenz(a,c)anthracene and Dibenz(a,h)anthracene**

# Appendix C
# Abbreviations

| Abbreviation[1] | English | *Norwegian* | Param. group |
|---|---|---|---|
| **ELEMENTS** | | | |
| **Al** | aluminium | *aluminium* | I-MET |
| **As** | arsenic | *arsen* | I-MET |
| **Cd** | cadmium | *kadmium* | I-MET |
| **Co** | cobalt | *kobolt* | I-MET |
| **Cr** | chromium | *krom* | I-MET |
| **Cu** | copper | *kobber* | I-MET |
| **Fe** | iron | *jern* | I-MET |
| **Hg** | mercury | *kvikksølv* | I-MET |
| **Li** | lithium | *litium* | I-MET |
| **Mn** | manganese | *mangan* | I-MET |
| **Ni** | nickel | *nikkel* | I-MET |
| **Pb** | lead | *bly* | I-MET |
| **Pb210** | lead-210 | *bly-210* | I-RNC |
| **Se** | selenium | *selen* | I-MET |
| **Ti** | titanium | *titan* | I-MET |
| **Zn** | zinc | *sink* | I-MET |
| | | | |
| **METAL COMPOUNDS** | | | |
| **TBT** | tributyltin | *tributyltinn* | O-MET |
| **MBTIN** | monobutyltin | *monobutyltinn* | O-MET |
| **DBTIN** | dibutyltin | *dibutyltinn* | O-MET |
| **TBTIN** | tributyltin | *tributyltinn* | O-MET |
| **MPTIN** | monophenyltin | *monofenyltinn* | O-MET |
| **DPTIN** | diphenyltin | *difenyltinn* | O-MET |
| **TPTIN** | triphenyltin | *trifenyltinn* | O-MET |
| | | | |
| **PAHs** | | | |
| **PAH** | polycyclic aromatic hydrocarbons | *polysykliske aromatiske hydrokarboner* | |
| | | | |
| **ACNE** [3] | acenaphthene | *acenaften* | PAH |
| **ACNLE** [3] | acenaphthylene | *acenaftylen* | PAH |
| **ANT** [3] | anthracene | *antracen* | PAH |
| **BAA** [3, 4] | benzo[*a*]anthracene | *benzo[a]antracen* | PAH |
| **BAP** [3, 4] | benzo[*a*]pyrene | *benzo[a]pyren* | PAH |
| **BBF** [3, 4] | benzo[*b*]fluoranthene | *benzo[b]fluoranten* | PAH |
| **BBJKF** [3, 4] | benzo[*b,j,k*]fluoranthene | *benzo[b,j,k]fluoranten* | PAH |
| **BBJKF** [3, 4] | benzo[b+j,k]fluoranthene | *benzo[b+j,k]fluoranten* | PAH |
| **BBKF** [3, 4] | benzo[*b+k*]fluoranthene | *benzo[b+k]fluoranten* | PAH |
| **BEP** | benzo[e]pyrene | *benzo[e]pyren* | PAH |
| **BGHIP** [3] | benzo[*ghi*]perylene | *benzo[ghi]perylen* | PAH |
| **BIPN** [2] | biphenyl | *bifenyl* | PAH |
| **BJKF** [3, 4] | benzo[*j,k*]fluoranthene | *benzo[j,k]fluorantren* | PAH |
| **BKF** [3, 4] | benzo[*k*]fluoranthene | *benzo[k]fluorantren* | PAH |
| **CHR** [3, 4] | chrysene | *chrysen* | PAH |
| **CHRTR** [3, 4] | chrysene+triphenylene | *chrysen+trifenylen* | PAH |
| **COR** | coronene | *coronen* | PAH |
| **DBAHA** [3, 4] | dibenz[*a,h*]anthracene | *dibenz[a,h]anthracen* | PAH |
| **DBA3A** [3, 4] | dibenz[*a,c/a,h*]anthracene | *dibenz[a,c/a,h]antracen* | PAH |
| **DBP** [4] | dibenzopyrenes | *dibenzopyren* | PAH |
| **DBT** | dibenzothiophene | *dibenzothiofen* | PAH |
| **DBTC1** | $C_1$-dibenzothiophenes | *$C_1$-dibenzotiofen* | PAH |
| **DBTC2** | $C_2$-dibenzothiophenes | *$C_2$-dibenzotiofen* | PAH |
| **DBTC3** | $C_3$-dibenzothiophenes | *$C_3$-dibenzotiofen* | PAH |
| **FLE** [3] | fluorene | *fluoren* | PAH |
| **FLU** [3] | fluoranthene | *fluoranten* | PAH |
| **ICDP** [3, 4] | indeno[*1,2,3-cd*]pyrene | *indeno[1,2,3-cd]pyren* | PAH |
| **NAP** [2] | naphthalene | *naftalen* | PAH |
| **NAPC1** [2] | $C_1$-naphthalenes | *$C_1$-naftalen* | PAH |
| **NAPC2** [2] | $C_2$-naphthalenes | *$C_2$-naftalen* | PAH |
| **NAPC3** [2] | $C_3$-naphthalenes | *$C_3$-naftalen* | PAH |
| **NAP1M** [2] | 1-methylnaphthalene | *1-metylnaftalen* | PAH |
| **NAP2M** [2] | 2-methylnaphthalene | *2-metylnaftalen* | PAH |
| **NAPD2** [2] | 1,6-dimethylnaphthalene | *1,6-dimetylnaftalen* | PAH |
| **NAPD3** [2] | 1,5-dimethylnaphthalene | *1,5-dimetylnaftalen* | PAH |

| **Abbreviation**[1] | English | *Norwegian* | Param. group |
|---|---|---|---|
| **NAPDI**[2] | 2,6-dimethylnaphthalene | *2,6-dimetylnaftalen* | PAH |
| **NAPT2**[2] | 2,3,6-trimethylnaphthalene | *2,3,6-trimetylnaftalen* | PAH |
| **NAPT3**[2] | 1,2,4-trimethylnaphthalene | *1,2,4-trimetylnaftalen* | PAH |
| **NAPT4**[2] | 1,2,3-trimethylnaphthalene | *1,2,3-trimetylnaftalen* | PAH |
| **NAPTM**[2] | 2,3,5-trimethylnaphthalene | *2,3,5-trimetylnaftalen* | PAH |
| **NPD** | Collective term for naphthalenes, phenanthrenes and dibenzothiophenes | *Sammebetegnelse for naftalen, fenantren og dibenzotiofens* | PAH |
| **PA**[3] | phenanthrene | *fenantren* | PAH |
| **PAC1** | $C_1$-phenanthrenes | *$C_1$-fenantren* | PAH |
| **PAC2** | $C_2$-phenanthrenes | *$C_2$-fenantren* | PAH |
| **PAC3** | $C_3$-phenanthrenes | *$C_3$-fenantren* | PAH |
| **PAM1** | 1-methylphenanthrene | *1-metylfenantren* | PAH |
| **PAM2** | 2-methylphenanthrene | *2-metylfenantren* | PAH |
| **PADM1** | 3,6-dimethylphenanthrene | *3,6-dimetylfenantren* | PAH |
| **PADM2** | 9,10-dimethylphenanthrene | *9,10-dimetylfenantren* | PAH |
| **PER** | perylene | *perylen* | PAH |
| **PYR**[3] | pyrene | *pyren* | PAH |
| **DI-Σn** | sum of "n" dicyclic "PAH"s (footnote 2) | *sum "n" disykliske "PAH" (fotnote 2)* | |
| **P-Σn / P_S** | sum "n" PAH (DI-Σn not included, footnote 3) | *sum "n" PAH (DI-Σn ikke inkludert, fotnot 3)* | |
| **PK-Σn / PK_S** | sum carcinogen PAHs (footnote 4) | *sum kreftfremkallende PAH (fotnote 4)* | |
| **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)* | |
| **BAP_P** | % BAP of PAHΣΣ | *% BAP av PAHΣΣ* | |
| **BAPPP** | % BAP of P-Σn | *% BAP av P-Σn* | |
| **BPK_P** | % BAP of PK-Σn | *% BAP av PK-Σn* | |
| **PKn_P** | % PK-Σn of PAHΣΣ | *% PK-Σn av PAHΣΣ* | |
| **PKnPP** | % PK-Σn of P-Σn | *% PK-Σn av P-Σn* | |
| | | | |
| **PCBs** | | | |
| **PCB** | polychlorinated biphenyls | *polyklorerte bifenyler* | |
| **CB** | individual chlorobiphenyls (CB) | *enkelte klorobifenyl* | |
| **CB28** | CB28 (IUPAC) | *CB28 (IUPAC)* | OC-CB |
| **CB31** | CB31 (IUPAC) | *CB31 (IUPAC)* | OC-CB |
| **CB44** | CB44 (IUPAC) | *CB44 (IUPAC)* | OC-CB |
| **CB52** | CB52 (IUPAC) | *CB52 (IUPAC)* | OC-CB |
| **CB77**[5] | CB77 (IUPAC) | *CB77 (IUPAC)* | OC-CB |
| **CB81**[5] | CB81 (IUPAC) | *CB81 (IUPAC)* | OC-CB |
| **CB95** | CB95 (IUPAC) | *CB95 (IUPAC)* | OC-CB |
| **CB101** | CB101 (IUPAC) | *CB101 (IUPAC)* | OC-CB |
| **CB105** | CB105 (IUPAC) | *CB105 (IUPAC)* | OC-CB |
| **CB110** | CB110 (IUPAC) | *CB110 (IUPAC)* | OC-CB |
| **CB118** | CB118 (IUPAC) | *CB118 (IUPAC)* | OC-CB |
| **CB126**[5] | CB126 (IUPAC) | *CB126 (IUPAC)* | OC-CB |
| **CB128** | CB128 (IUPAC) | *CB128 (IUPAC)* | OC-CB |
| **CB138** | CB138 (IUPAC) | *CB138 (IUPAC)* | OC-CB |
| **CB149** | CB149 (IUPAC) | *CB149 (IUPAC)* | OC-CB |
| **CB153** | CB153 (IUPAC) | *CB153 (IUPAC)* | OC-CB |
| **CB156** | CB156 (IUPAC) | *CB156 (IUPAC)* | OC-CB |
| **CB169**[5] | CB169 (IUPAC) | *CB169 (IUPAC)* | OC-CB |
| **CB170** | CB170 (IUPAC) | *CB170 (IUPAC)* | OC-CB |
| **CB180** | CB180 (IUPAC) | *CB180 (IUPAC)* | OC-CB |
| **CB194** | CB194 (IUPAC) | *CB194 (IUPAC)* | OC-CB |
| **CB209** | CB209 (IUPAC) | *CB209 (IUPAC)* | OC-CB |
| **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*** | |

| Abbreviation[1] | English | *Norwegian* | Param. group |
|---|---|---|---|
| **DIOXINs** | | | |
| **TCDD** | 2, 3, 7, 8-tetrachloro-dibenzo dioxin | *2, 3, 7, 8-tetrakloro-dibenzo dioksin* | OC-DX |
| **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* | OC-DX |
| **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* | OC-DX |
| **CDD6X** | 1, 2, 3, 6, 7, 8-hexachloro-dibenzo dioxin | *1, 2, 3, 6, 7, 8-heksakloro-dibenzo dioksin* | OC-DX |
| **CDD9X** | 1, 2, 3, 7, 8, 9-hexachloro-dibenzo dioxin | *1, 2, 3, 7, 8, 9-heksakloro-dibenzo dioksin* | OC-DX |
| **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* | OC-DX |
| **CDDSP** | Sum of heptachloro-dibenzo dioxins | *Sum heptakloro-dibenzo dioksiner* | |
| **CDDO** | Octachloro-dibenzo dioxin | *Oktakloro-dibenzo dioksin* | OC-DX |
| **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* | OC-DX |
| **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* | OC-DX |
| **CDF2N** | 2, 3, 4, 7, 8-pentachloro-dibenzofuran | *2, 3, 4, 7, 8-pentakloro-dibenzofuran* | OC-DX |
| **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* | OC-DX |
| **CDF6X** | 1, 2, 3, 6, 7, 8-hexachloro-dibenzofuran | *1, 2, 3, 6, 7, 8-heksakloro-dibenzofuran* | OC-DX |
| **CDF9X** | 1, 2, 3, 7, 8, 9-hexachloro-dibenzofuran | *1, 2, 3, 7, 8, 9-heksakloro-dibenzofuran* | OC-DX |
| **CDF4X** | 2, 3, 4, 6, 7, 8-hexachloro-dibenzofuran | *2, 3, 4, 6, 7, 8-heksakloro-dibenzofuran* | OC-DX |
| **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* | OC-DX |
| **CDF9P** | 1, 2, 3, 4, 7, 8, 9-heptachloro-dibenzofuran | *1, 2, 3, 4, 7, 8, 9-heptakloro-dibenzofuran* | OC-DX |
| **CDFSP** | Sum of heptachloro-dibenzofurans | *Sum heptakloro-dibenzofuraner* | OC-DX |
| **CDFO** | Octachloro-dibenzofurans | *Octakloro-dibenzofuran* | OC-DX |
| **PCDF** | Sum of polychlorinated dibenzo-furans | *Sum polyklorinated dibenzo-furaner* | |
| **CDDFS** | Sum of PCDD and PCDF | *Sum PCDD og PCDF* | |
| **TCDNN** | Sum of TCDD-toxicity equivalents after Nordic model, see **TEQ** | *Sum TCDD- toksitets ekvivalenter etter Nordisk modell, se **TEQ*** | |
| **TCDDI** | Sum of TCDD-toxicity equivalents after international model, see **TEQ** | *Sum TCDD-toksitets ekvivalenter etter internasjonale modell, se **TEQ*** | |
| **PESTICIDES** | | | |
| **ALD** | aldrin | *aldrin* | OC-DN |
| **DIELD** | dieldrin | *dieldrin* | OC-DN |
| **ENDA** | endrin | *endrin* | OC-DN |
| **CCDAN** | cis-chlordane (=$\alpha$-chlordane) | *cis-klordan (=$\alpha$-klordan)* | OC-DN |
| **TCDAN** | trans-chlordane (=$\gamma$-chlordane) | *trans-klordan (=$\gamma$-klordan)* | OC-DN |
| **OCDAN** | oxy-chlordane | *oksy-klordan* | OC-DN |
| **TNONC** | trans-nonachlor | *trans-nonaklor* | OC-DN |
| **TCDAN** | trans-chlordane | *trans-klordan* | OC-DN |
| **OCS** | octachlorostyrene | *oktaklorstyren* | OC-CL |
| **QCB** | pentachlorobenzene | *pentaklorbenzen* | OC-CL |
| **DDD** | dichlorodiphenyldichloroethane 1,1-dichloro-2,2-bis-(4-chlorophenyl)ethane | *diklordifenyldikloretan 1,1-dikloro-2,2-bis-(4-klorofenyl)etan* | OC-DD |

| Abbreviation[1] | English | *Norwegian* | Param. group |
|---|---|---|---|
| **DDE** | dichlorodiphenyldichloroethylene (principle metabolite of DDT)<br>1,1-dichloro-2,2-bis-(4-chlorophenyl)ethylene* | *diklordifenyldikloretylen (hovedmetabolitt av DDT)*<br>*1,1-dikloro-2,2-bis-(4-klorofenyl)etylen* | OC-DD |
| **DDT** | dichlorodiphenyltrichloroethane<br>1,1,1-trichloro-2,2-bis-(4-chlorophenyl)ethane | *diklordifenyltrikloretan*<br>*1,1,1-trikloro-2,2-bis-(4-klorofenyl)etan* | OC-DD |
| **DDEOP** | o,p'-DDE | *o,p'-DDE* | OC-DD |
| **DDEPP** | p,p'-DDE | *p,p'-DDE* | OC-DD |
| **DDTOP** | o,p'-DDT | *o,p'-DDT* | OC-DD |
| **DDTPP** | p,p'-DDT | *p,p'-DDT* | OC-DD |
| **TDEPP** | p,p'-DDD | *p,p'-DDD* | OC-DD |
| **DDTEP** | p,p'-DDE + p,p'-DDT | *p,p'-DDE + p,p'-DDT* | OC-DD |
| **DD-nΣ** | sum of DDT and metabolites, n = number of compounds | *sum DDT og metabolitter, n = antall forbindelser* | OC-DD |
| **HCB** | hexachlorobenzene | *heksaklorbenzen* | OC-CL |
| **HCHG** | Lindane<br>γ HCH = gamma hexachlorocyclohexane<br>(γ BHC = gamma benzenehexachloride, outdated synonym) | *Lindan*<br>*γ HCH = gamma heksaklorsykloheksan*<br>*(γ BHC = gamma benzenheksaklorid, foreldret betegnelse)* | OC-HC |
| **HCHA** | α HCH = alpha HCH | *α HCH = alpha HCH* | OC-HC |
| **HCHB** | β HCH = beta HCH | *β HCH = beta HCH* | OC-HC |
| **HC-nΣ** | sum of HCHs, n = count | *sum av HCHs, n = antall* | |
| **EOCl** | extractable organically bound chlorine | *ekstraherbart organisk bundet klor* | OC-CL |
| **EPOCl** | extractable persistent organically bound chlorine | *ekstraherbart persistent organisk bundet klor* | OC-CL |
| **PBDEs** | | | |
| **PBDE** | polybrominated diphenyl ethers | *polybromerte difenyletere* | OC-BB |
| **BDE** | brominated diphenyl ethers | | OC-BB |
| **BDE-28** | 2,4,4'-tribromodiphenyl ether | *2,4,4'-tribromdifenyleter* | OC-BB |
| **BDE-47** | 2,2',4,4'-tetrabromodiphenyl ether | *2,2',4,4'-tetrabromdifenyleter* | OC-BB |
| **BDE-49*** | 2,2',4,5'- tetrabromodiphenyl ether | *2,2',4,5'- tetrabromdifenyleter* | OC-BB |
| **BDE-66*** | 2,3',4',6- tetrabromodiphenyl ether | *2,3',4',6- tetrabromdifenyleter* | OC-BB |
| **BDE-71*** | 2,3',4',6- tetrabromodiphenyl ether | *2,3',4',6- tetrabromdifenyleter* | OC-BB |
| **BDE-77** | 3,3',4,4'-tetrabromodiphenyl ether | *3,3',4,4'-tetrabromdifenyleter* | OC-BB |
| **BDE-85** | 2,2',3,4,4'-pentabromodiphenyl ether | 2,2',3,4,4'-pentabromdifenyleter | OC-BB |
| **BDE-99** | 2,2',4,4',5-pentabromodiphenyl ether | *2,2',4,4',5-pentabromdifenyleter* | OC-BB |
| **BDE-100** | 2,2',4,4',6-pentabromodiphenyl ether | *2,2',4,4',6-pentabromdifenyleter* | OC-BB |
| **BDE-119** | 2,3',4,4',6-pentabromodiphenyl ether | *2,3',4,4',6-pentabromdifenyleter* | OC-BB |
| **BDE-138** | 2,2',3,4,4',5'-hexabromodiphenyl ether | *2,2',3,4,4',5'-heksabromdifenyleter* | OC-BB |
| **BDE-153** | 2,2',4,4',5,5'-hexabromodiphenyl ether | *2,2',4,4',5,5'-heksabromdifenyleter* | OC-BB |
| **BDE-154** | 2,2',4,4',5,6'-hexabromodiphenyl ether | *2,2',4,4',5,6'-heksabromdifenyleter* | OC-BB |
| **BDE-183** | 2,2',3,4,4',5',6-heptabromodiphenyl ether | *2,2',3,4,4',5',6-heptabromdifenyleter* | OC-BB |
| **BDE-205** | 2,2',3,3',4,4',5,5',6'-nonabromodiphenyl ether | *2,2',3,3',4,4',5,5',6'-nonabromdifenyleter* | OC-BB |
| **BDE-209** | Decabromodiphenyl ether | *Dekabromdifenyleter* | OC-BB |
| **PFAS** | perfluorinated alkylated substances | perfluoralkylertestoffer | |
| **PFBS** | perfluorobutane sulfonate | perfluorbutan sulfonat | PFAS |
| **PFHxA** | perfluorohexanoic acid | perfluorhexansyre | PFAS |
| **PFHpA** | perfluoroheptanoic acid | perfluorheptansyre | PFAS |
| **PFOA** | perfluorooctanoic acid | perfluoroktansyre | PFAS |
| **PFNA** | perfluorononanoic acid | perfluornonansyre | PFAS |

| Abbreviation[1] | English | *Norwegian* | Param. group |
|---|---|---|---|
| **PFOS** | perfluoroctanoic sulfonate | perfluoroktansulfonat | PFAS |
| **NTOT** | total organic nitrogen | *total organisk nitrogen* | I-NUT |
| **CTOT** | total organic carbon | *total organisk karbon* | O-MAJ |
| **CORG** | organic carbon | *organisk karbon* | O-MAJ |
| **GSAMT** | grain size | *kornfordeling* | P-PHY |
| **MOCON** | moisture content | *vanninnhold* | P-PHY |
| **INSTITUTES** | | | |
| **EFDH** | Eurofins [DK] | *Eurofins [DK]* | |
| **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]* | |
| **GALG** | GALAB Laboratories Gmbh [D] | *GALAB Laboratories Gmbh [D]* | |
| **IFEN** | Institute for Energy Technology | *Institutt for energiteknikk* | |
| **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* | |
| **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)* | |
| **VETN** | Norwegian Veterinary Institute | *Veterinærinstituttet* | |
| **VKID** | Water Quality Institute [DK] | *Vannkvalitetsintitutt [DK]* | |

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 PCBs and “dioxins” (ICES pers. comm.)

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

3) Indicates the sum of tri- to hexacyclic PAH compounds named in EPA protocol 8310 minus naphthalene (dicyclic), so that the SFT classification system can be applied

4) Indicates PAH compounds potentially cancerogenic for humans according to IARC (1987, updated 14.August 2007 at http://monographs.iarc.fr/ENG/Classification/crthgr01.php), i.e., categories 1, 2A, and 2B (are, possibly and probably carcinogenic). NB.: the update inlcludes Chrysene as cancerogenic and hence, KPAH with Chrysene should not be used in Klif's classification system for this sum-variable (Molvær *et al.* 1997).

5) Indicates non ortho- co-planer PCB compounds i.e., 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: | *"Toxisitetsekvivalentfaktorer" for de giftigste forbindelsene innen følgende grupper.* |
| | • polychlorinated dibenzo-p-dioxins and dibenzofurans (**PCDD/PCDFs**). Equivalents calculated after Nordic model (Ahlborg 1989) [1] or international model (Int./EPA, cf. Van den Berg et al. 1998) [2] | • *polyklorerte dibenzo-p-dioksiner og dibenzofuraner (**PCDD/PCDF**). Ekvivalentberegning etter nordisk modell (Ahlborg 1989) [1] eller etter internasjonal modell (Int./EPA, cf. Van den Berg et al. 1998) [2]* |
| | • non-ortho and mono-ortho substituted chlorobiphenyls after WHO model (Ahlborg et al. 1994) [3] or Safe (1994, cf. NILU pers. comm.) | • *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 D
# Overconcentrations and classification of environmental quality

***Table 13.*** *Climate and Pollution Agency environmental classification system of contaminants in sediments (Bakke et al. 2007c).*

| Contaminant | Classification (upper limit for Classes I-IV) | | | | |
|---|---|---|---|---|---|
| | *Degree of pollution* | | | | |
| | I | II | III | IV | V |
| | *Background* | *Good* | *Moderate* | *Bad* | *Very bad* |
| **Metals** | | | | | |
| Arsene (mg As/Kg) | <20 | 52 | 76 | 580 | >580 |
| Lead (mg Pb/Kg) | <30 | 83 | 100 | 720 | >720 |
| Cadmium (mg Cd/Kg) | <0.25 | 2.6 | 15 | 140 | >140 |
| Copper (mg Cu/Kg) | <35 | 51 | 55 | 220 | >220 |
| Chromium (mg Cr/Kg) | <70 | 560 | 5900 | 59000 | >59000 |
| Mercury (mg Hg/Kg) | <0.15 | 0.63 | 0.86 | 2 | >1.6 |
| Nickel (mg Ni/Kg) | <30 | 46 | 120 | 840 | >840 |
| Zink (mg Zn/Kg) | <150 | 360 | 590 | 4500 | >4500 |
| **PAH** | | | | | |
| Naphtalene (µg/Kg) | <2 | 290 | 1000 | 2000 | >2000 |
| Acenaphtylene (µg/Kg) | <1.6 | 33 | 85 | 850 | >850 |
| Acenaphtene (µg/Kg) | <4.8 | 160 | 360 | 3600 | >3600 |
| Fluorene (µg/Kg) | <6.8 | 260 | 510 | 5100 | >5100 |
| Phenantrene (µg/Kg) | <6.8 | 500 | 1200 | 2300 | >2300 |
| Anthracene (µg/Kg) | <1.2 | 31 | 100 | 1000 | >1000 |
| Fluoranthene (µg/Kg) | <8 | 170 | 1300 | 2600 | >2600 |
| Pyrene (µg/Kg) | <5.2 | 280 | 2800 | 5600 | >5600 |
| Benzo[a]antracene (µg/Kg) | <3.6 | 60 | 90 | 900 | >900 |
| Chrysene (µg/Kg) | <4.4 | 280 | 280 | 560 | >560 |
| Benzo[b]fluorantene (µg/Kg) | <46 | 240 | 490 | 4900 | >4900 |
| Benzo[k]fluorantene (µg/Kg) | | <210 | 480 | 4800 | >4800 |
| Benzo(a)pyrene (µg/Kg) | <6 | 420 | 830 | 4200 | >4200 |
| Indeno[123cd]pyrene (µg/Kg) | <20 | 47 | 70 | 700 | >700 |
| Dibenzo[ah]antracene (µg/Kg) | <12 | 590 | 1200 | 12000 | >12000 |
| Benzo[ghi]perylene (µg/Kg) | <18 | 21 | 31 | 310 | >310 |
| PAH16 [1] (µg/kg) | <300 | 2000 | 6000 | 20000 | >20000 |
| **Other organic compounds** | | | | | |
| PCB7 [2] (µg/Kg) | <5 | 17 | 190 | 1900 | >1900 |
| PCDD/F [3] (TEQ) (µg/Kg) | <0.01 | 0.03 | 0.10 | 0.50 | >0.50 |
| ΣDDT [4] (µg/kg) | <0.5 | 20 | 490 | 4900 | >4900 |
| Lindane (µg/kg) | | <1.1 | 2.2 | 11 | >11 |
| Heksachlorobenzene (HCB) (µg/kg) | 0.5 | 17 | 61 | 610 | >610 |
| Pentachlorobenzene (µg/kg) | | <400 | 800 | 4000 | >4000 |
| Trichlorobenzene (µg/kg) | | <56 | 700 | 1400 | >1400 |
| Hexachlorobutadiene (µg/kg) | | <49 | 66 | 660 | >660 |
| SCCP [6] (µg/kg) | | <1000 | 2800 | 5600 | >5600 |
| MCCP [7] (µg/kg) | | <4600 | 27000 | 54000 | >54000 |
| Pentachlorophenol (µg/kg) | | <12 | 34 | 68 | >68 |
| Octylphenol (µg/kg) | | <3.3 | 7.3 | 36 | >36 |
| Nonylphenol (µg/kg) | | <18 | 110 | 220 | >220 |
| Bisphenol A (µg/kg) | | <11 | 79 | 790 | >790 |
| TBBPA [8] (µg/kg) | | <63 | 1100 | 11000 | >11000 |

| Contaminant | Classification (upper limit for Classes I-IV) *Degree of pollution* | | | | |
|---|---|---|---|---|---|
| | I *Background* | II *Good* | III *Moderate* | IV *Bad* | V *Very bad* |
| PBDE [9] (µg/kg) | | <62 | 7800 | 16000 | >16000 |
| HBCDD [10] (µg/kg) | <0.3 | 86 | 310 | 610 | >610 |
| PFOS [11] (µg/kg) | <0.17 | 220 | 630 | 3100 | >3100 |
| Diuron (µg/kg) | | <0.71 | 6.4 | 13 | >13 |
| Irgarol (µg/kg) | | <0.08 | 0.50 | 2.5 | >2.5 |
| **Tributyl tin** | | | | | |
| TBT [12] (µg/kg) – effects based | <1 | <0.002 | 0.016 | 0.032 | >0.032 |
| TBT [12] (µg/kg) – for management | <1 | 5 | 20 | 100 | >100 |

1) PAH: Polycyclic aromaic hydrocarbons
2) PCB: Polychlorinated biphenyls
3) PCDD/F: Polychlorinated dibenzodioxines/furanes
4) DDT: Dichlorodiphenyltrichloroethane. ΣDDT is the sum of DDT and the degradation products DDE and DDD
5) HCB: Heksachlorobenzene
6) SCCP: Short chained (C10-13) polychlorinated paraffins
7) MCCP: Middle chained (C14-17) polychlorinated paraffins
8) TBBPA: Tetrabromobiphenol A
9) PBDE: Pentabromodiphenylether
10) HBCDD: Heksabromocyklododecane
11) PFOS: Perfluorated octylsulphonate
12) TBT: Tributyl tin

***Table 14.*** *Climate and Pollution Agency environmental classification system of contaminants in blue mussel and fish (Molvær et al. 1997) and proposed revisions (shaded) for Class I concentrations (Knutzen & Green 2001b) used in this report.*

| Contaminant | | | Classification (upper limit for Classes I-IV) *Degree of pollution* | | | | |
|---|---|---|---|---|---|---|---|
| | | | I *Insignificant* | II *Moderate* | III *Marked* | IV *Severe* | V *Extreme* |
| **Blue mussel** | | | | | | | |
| **Lead (Pb)** | mg/kg | w.w. [2] | 0.6 | 3 | 8 | 20 | >20 |
| | mg/kg | d.w. | 3 | 15 | 40 | 100 | >100 |
| **Cadmium (Cd)** | mg/kg | w.w. [2] | 0.4 | 1 | 4 | 8 | >8 |
| | mg/kg | d.w. | 2 | 5 | 20 | 40 | >40 |
| **Copper (Cu)** | mg/kg | w.w. [2] | 2 | 6 | 20 | 40 | >40 |
| | mg/kg | d.w. | 10 | 30 | 100 | 200 | >200 |
| **Mercury (Hg)** | mg/kg | w.w. [2] | 0.04 | 0.1 | 0.3 | 0.8 | >0.8 |
| | mg/kg | d.w. | 0.2 | 0.5 | 1.5 | 4 | >4 |
| **Zinc (Zn)** | mg/kg | w.w. [2] | 40 | 80 | 200 | 500 | >500 |
| | mg/kg | d.w. | 200 | 400 | 1000 | 2500 | >2500 |
| **TBT** [1] | mg/kg | d.w. | 0.1 | 0.5 | 2 | 5 | >5 |
| **∑PCB-7** | µg/kg | w.w. | 3 [5] | 15 | 40 | 100 | >100 |
| | | d.w. [2] | 15 [2] | 75 | 200 | 500 | >500 |
| **∑DDT** | µg/kg | w.w. | 2 | 5 | 10 | 30 | >30 |
| | | d.w. [2] | 10 | 25 | 50 | 150 | >150 |
| **∑HCH** | µg/kg | w.w. | 1 | 3 | 10 | 30 | >30 |
| | | d.w. [2] | 5 | 15 | 50 | 150 | >150 |
| **HCB** | µg/kg | w.w. | 0.1 | 0.3 | 1 | 5 | >5 |
| | | d.w. [2] | 0.5 | 1.5 | 5 | 25 | >25 |
| **∑PAH** | µg/kg | w.w. | 50 | 200 | 2000 | 5000 | >5000 |
| | | d.w. [2] | 250 | 1000 | 10000 | 25000 | >25000 |
| **∑KPAH** | µg/kg | w.w. | 10 | 30 | 100 | 300 | >300 |
| | | d.w. [2] | 50 | 150 | 500 | 1500 | >1500 |
| **B[*a*]P** | µg/kg | w.w. | 1 | 3 | 10 | 30 | >30 |
| | | d.w. [2] | 5 | 15 | 50 | 150 | >150 |
| **$TE_{PCDF/D}$** [3] | µg/t [4] | w.w. | 0.2 | 0.5 | 1.5 | 3 | >3 |
| **Cod, fillet** | | | | | | | |
| **Mercury (Hg)** | mg/kg | w.w. | 0.1 | 0.3 | 0.5 | 1 | >1 |
| **∑PCB-7** | µg/kg | w.w. | 3 [6] | 20 | 50 | 150 | >150 |
| **∑DDT** | µg/kg | w.w. | 1 | 3 | 10 | 25 | >25 |
| **∑HCH** | µg/kg | w.w. | 0.3 [7] | 2 | 5 | 15 | >15 |
| **HCB** | µg/kg | w.w. | 0.2 | 0.5 | 2 | 5 | >5 |
| **$TE_{PCDF/D}$** | ng/kg | w.w. | < 0.1 | 0.3 | 1 | 2 | > 2 |
| **Cod, liver** | | | | | | | |
| **∑PCB-7** | µg/kg | w.w. | 500 | 1500 | 4000 | 10000 | >10000 |
| **∑DDT** | µg/kg | w.w. | 200 [8] | 500 | 1500 | 3000 | >3000 |
| **∑HCH** | µg/kg | w.w. | 30 [9] | 200 | 500 | 1000 | >1000 |
| **HCB** | µg/kg | w.w. | 20 | 50 | 200 | 400 | >400 |
| **$TE_{PCDF/D}$** [3] | µg/t [4] | w.w. | 10 [10] | 40 | 100 | 300 | >300 |
| **Flounder, fillet** | | | | | | | |
| **∑PCB-7** | µg/kg | w.w. | <5 | 20 | 50 | 150 | >150 |
| **∑DDT** | µg/kg | w.w. | <2 | 4 | 15 | 40 | >40 |
| **∑HCH** | µg/kg | w.w. | <1 | 3 | 10 | 30 | >30 |
| **HCB** | µg/kg | w.w. | <0.2 | 0.5 | 2 | 5 | >5 |
| **$TE_{PCDF/D}$** | ng/kg | w.w. | <0.1 | 0.3 | 1 | 3 | >3 |

[1]) Tributyltin on a formula basis

[2]) Conversion assuming 20% dry weight

[3]) TCDDN (Appendix C)

[4]) µg/1000 kg (Appendix C)

[5]) Blue mussel - ΣPCB7: Decrease limit from 4 to 3

[6]) Cod fillet - ΣPCB7: Decrease limit from 5 to 3

[7]) Cod fillet - ΣHCH: Decrease limit from 0.5 to 0.3

[8]) Cod liver - ΣDDT: Proposal to either increase limit from 200 to 300 or, preferably, replace ΣDDT with p,p-DDE and keep the limit (Knutzen & Green 2001b)

[9]) Cod liver - ΣHCH: Decrease limit from 50 to 30

[10]) Cod liver: TEPCDD/PCDF: Decrease limit from 0.015 to 0.010

***Table 15.*** *Provisional "high background levels" of selected contaminants, in* ***mg/kg dry weight*** *(blue mussel) and* ***mg/kg wet weight*** *(blue mussel and fish) used in this report. The respective "high background" limits are from Knutzen & Skei (1990) with mostly minor adjustments (Knutzen & Green 1995, 2001b; Molvær et al. 1997), except for dab where the suggested limit is based on CEMP-data (Knutzen & Green 1995). Especially uncertain values are marked with "?".*

| Cont. | Blue mussel [1] | | Cod [1] | | Flounder [1] | | Dab [1] | | Plaice [1] | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | liver | fillet | liver | fillet | liver | fillet | liver | fillet |
| | mg/kg d.w. | mg/kg w.w. | mg/kg w.w. | mg/kg w.w. | mg/kg w.w. | mg/kg w.w. | mg/kg w.w. | mg/kg w.w. | mg/kg w.w. | mg/kg w.w. |
| **Lead** | 3.0 [2] | 0.6 [3] | 0.1 | | 0.3 ? | | 0.3 ? | | 0.2 ? | |
| **Cadmium** | 2.0 [2] | 0.4 [3] | 0.3 | | 0.3 ? | | 0.3 ? | | 0.2 ? | |
| **Copper** | 10 [2] | 2 [3] | 20 | | 10 ? | | 30 ? | | 10 ? | |
| **Mercury** | 0.2 [2] | 0.04 [3] | | 0.1 [2] | | 0.1 | | 0.1 | | 0.1 |
| **Zinc** | 200 [2] | 40 [3] | 30 | | 50 ? | | 60 ? | | 50 ? | |
| **∑PCB-7** [8] | 0.015 [3,9] | 0.003 [2 9] | 0.50 [2] | 0.003 [9] | 0.1 | 0.003 [9] | 0.5 | 0.005 [9] | 0.05 ? | 0.004 [9] |
| **ppDDE** | 0.010 [3] | 0.002 [6] | 0.2 [9] | | 0.03 | 0.001 [9] | 0.1 | 0.002 [9] | 0.01 ? [6] | 0.001 [9] |
| **γ HCH** | 0.005 [3] | 0.001 [6] | 0.03 [9] | 0.0003 [9] | 0.01 | 0.0003 [9] | 0.03 | 0.0005 [9] | 0.005 ? [6] | 0.0003 [9] |
| **HCB** | 0.0005 [3] | 0.0001 [2] | 0.02 [2] | | 0.005 | 0.0001 [9] | 0.01 | 0.0002 [9] | 0.005 ? | 0.0002 [9] |
| **TCDDN** | 0.000001 [3] | | 0.00001 [9] | | | | | | | |
| | 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

[9] ) Flounder liver: Decrease limit from 5 to 3 and from 2 to 1 for ΣPCB7 and p,p-DDE, respectively, with regard to revisions suggested by Knutzen & Green (2001b) and Green & Knutzen (2003)

# Appendix E
# Summary of action taken by Norwegian Food Safety Authority

***Table 16.*** *Summary of action taken by the Norwegian Food Safety Authority (Mattilsynet) concerning the consumption and sale of fish products along the Norwegian Coast (see www.miljostatus.no > tema/Hav-og-vann/pavikninger-pa-livet-i-vann > miljøgifter_vann > miljøgifter_marint > kostholdsråd and review by Økland 2005). Restrictions on sale vary and may concern the whole or part of fish product.*

| **Area of concern ($km^2$)** | **Main parameters of concern** | **Last year of issue/ adjustment** | **Main fish/shellfish product of concerned** | **Recommendations or restrictions of concern:** |
|---|---|---|---|---|
| Mid [1] and Inner Oslofjord (498.9) (includes Drammensfj.) | PCB | 2002 | fish liver, eel | Consumption and sale |
| Tønsberg area (23.7) (includes (Vrengen) | PCB | 2003 | fish liver, eel, mussels | Consumption |
| Inner Sandefjordfjord (1.5) | PCB | 1999 | fish liver | Consumption and sale |
| Grenland fjords, Langesundsfjord (90.3) | Chl.org [2]/ Dioxins | 2004 | fish, shellfish | Consumption and sale |
| Kragerø (3.2) | PAH Dioxins | 2002 | eel, mussels | Consumption |
| Tvedestrand (2.3) | PCB | 2000 | fish liver | Consumption and sale |
| Arendal (8.0) | PCB | 2000 | fish liver | Consumption and sale |
| Inner Kristiansandsfjord (33.3) | Chl.org [2]/ Dioxins/PCB | 2000 | fish, shellfish | Consumption and sale |
| Farsund area (42.0) | PCB PAH | 2000 | fish liver, mussels | Consumption and sale |
| Fedafjord (11.2) | PAH | 2002 | mussels | Consumption and sale |
| Flekkefjord (4.2) | PCB | 2000 | fish liver | Consumption and sale |
| Stavanger (4.0) | PCB PAH | 2001 | fish liver, mussels | Consumption |
| Sandnes (1.7) | PAH | 2001 | mussels | Consumption |
| Karmsund-Eidsbotn, Vedavågen (24.1 [6]) | PCB, PAH | 2005 | fish liver [3], shellfish | Consumption and sale |
| Saudafjord (16.6 [7]) | PAH | 2007 | fish liver, mussels | Consumption and sale |
| Sørfjord (62.2) | Cd Pb Hg PCB | 2005 | fish, shellfish | Consumption and sale |
| Bergen area (169.9) | PCB Hg | 2007 | fish, shellfish | Consumption and sale |
| Høyangerfjorden (10.2 [7]) | Cd Pb | 2008 | fish liver, shellfish | Consumption |
| Årdalsfjord (30.4) | PAH | 2002 | mussels | Consumption and sale |
| Åsefjorden/Ellingsøyfjorden (8 [7]) | HBCDD [4] Hg | 2006/2007 | fish, shellfish | Consumption |
| Sunndalsfjord (100.1) | PAH | 2005 | fish liver, mussels | Consumption and sale |
| Hommelvik (2.6) | PAH | 1985 | mussels | Consumption and sale |
| Inner Trondheimfjorden (1.2) | PAH PCB | 2002 | fish liver, mussels | Consumption |
| Brønnøysund (7.0) | PAH | 2003 | mussels | Consumption |
| Vefsnfjord (76.4) [5] | | | | |
| Sandnessjøen (0.4) | PAH | 2005 | mussels | Consumption |
| Inner Ranfjord (16.6) | PAH | 2005 | mussels | Consumption and sale |
| Ramsund (5.4) | PCB | 2000 | fish, shellfish | Consumption and sale |
| Harstad (2.9) | PCB Pb Cd | 2003 | fish liver, mussels | Consumption and sale |
| Narvik (11.6) | PCB PAH | 2005 | fish liver, mussels | Consumption |
| Tromsø (17.7) | PAH | 2006 | fish liver, mussels | Consumption and sale |
| Hammerfest (4.1) | PAH | 2003 | mussels | Consumption and sale |
| Honningsvåg (3.3) | PAH | 2000 | mussels | Consumption and sale |

[1] Includes, Hvitsten, Moss, Horten og Holmenstrand
[2] Organochlorine compounds
[3] Concerns only Eidsbotn
[4] A brominated flame retardant
[5] Grounds for concern were cleared in 2005
[6] Exclusive Vedavågen
[7] Estimated from map shown in www.miljostatus.no

# Appendix F
# Overview of localities and sample count for sediment
# 1981-2008

**Nominel station positions are shown on maps in Appendix H**

jmpco:JAMP area code (J99 = unclassified)
jmpst: station code
stnam: station name
nom_lon: Longitude (nominel)
nom_lat: Latitude (nominel)

# STATIONS AND SAMPLE COUNT FOR SEDIMENT

| jmpst | stnam | lat | lon | icear | 1986 | 1987 | 1990 | 1992 | 1994 | 1996 | 1997 | 2004 | 2006 | 2008 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30S | Steilene | 59° 49.1 | 10° 33.8 | 48G05 | 8 | | 34 | | | 5 | | | | 3 |
| 35S | Mølen-Moss | 59° 28.96 | 10° 31.74 | 47G04 | 6 | | | | | 5 | | | | 3 |
| 35S | Mølen-Moss | 59° 30 | 10° 35.7 | 47G04 | 2 | | 3 | | | | | | | |
| 36S | Færder area | 59° 0.4 | 10° 41.6 | 47G09 | 2 | | 40 | | | | | | | |
| 36S | Færder area | 59° 1.55 | 10° 32.99 | 47G09 | 6 | | | | | | | | | |
| 36S | Færder area | 59° 2.5 | 10° 46.6 | 47G09 | | | | | | 56 | | | | 3 |
| 77S | Arendal area | 58° 24.2 | 9° 1.8 | 45F91 | | | 43 | | | | 29 | | | 3 |
| 15S | Lista area | 58° 1 | 6° 34.3 | 45F66 | | | 32 | | | | 5 | | | 3 |
| 52S | Tyssedal | 60° 6.9 | 6° 32.9 | 49F66 | | | 3 | | | | 5 | | | |
| 52S | Tyssedal | 60° 6.92 | 6° 32.6 | 49F66 | | | | | | | | 3 | | |
| 56S | Kvalnes | 60° 13.7 | 6° 35.6 | 49F65 | | | 29 | | | | 5 | | | |
| 56S | Kvalnes | 60° 13.72 | 6° 35.6 | 49F65 | | | | | | | | 3 | | |
| 57S | Krossanes | 60° 23.1 | 6° 40.7 | 49F67 | | | 3 | | | | 5 | 3 | | |
| 63S | Ranaskjær | 60° 23.34 | 6° 26.7 | 49F64 | | | | | | | | 3 | | |
| 63S | Ranaskjær | 60° 23.6 | 6° 27.1 | 49F64 | | | 3 | | | | 5 | | | |
| 67S | Strandebarm area | 60° 13.12 | 6° 4.6 | 49F62 | | | | | | | | 3 | | |
| 67S | Strandebarm area | 60° 13.5 | 6° 5.1 | 49F62 | | | 28 | | | | 28 | | | |
| 69S | Kvinnheradsfjorden | 60° 1.3 | 5° 56.1 | 49F59 | | | 3 | | | | 5 | 3 | | |
| 22S | Bømlo area | 59° 25.9 | 4° 50.2 | 47F47 | | | 29 | | | | 5 | 3 | | |
| 24S | Sotra | 60° 15.1 | 4° 33.3 | 49F45 | | | 3 | | | | | 3 | | |
| 82S | Flakk | 63° 27.5 | 10° 11.8 | 55G01 | | 8 | | | | | | 3 | | |
| 89S | Thamshavn | 63° 19.7 | 9° 52.5 | 55F98 | | | | | | | | 3 | | |
| 89S | Thamshavn | 63° 19.8 | 9° 52.5 | 55F98 | | 4 | | 3 | | | | | | |
| 84S | Trossavika | 63° 21.7 | 9° 57.4 | 55F97 | | 8 | | 3 | | | | 3 | | |
| 90S | Outer Orkdalsfjord | 63° 27.3 | 10° 2.6 | 55G01 | | | | | | | | 3 | | |
| 90S | Outer Orkdalsfjord | 63° 27.4 | 10° 2.6 | 55G01 | | 8 | | 30 | | | | | | |
| 27S | Stadtlandet (east) | 62° 9.3 | 5° 21.3 | 53F56 | | | | 30 | | | | 3 | | |
| 93S | Raudøya (northeast) | 64° 22.7 | 10° 27.8 | 57G04 | | | | 30 | | | | 3 | | |
| 95S | Rodø (east) | 66° 41.8 | 13° 10 | 62G32 | | | | | | | | 3 | | |
| 95S | Rodø (east) | 66° 41.8 | 13° 9.9 | 62G32 | | | | 31 | | | | | | |
| 98S | Skrova (south) | 68° 7 | 14° 41 | 65G49 | | | | 30 | | | | 3 | | |
| 99S | Lundøy (north) | 68° 5.8 | 15° 10.1 | 65G53 | | | | 30 | | | | 3 | | |
| 41S | Vågsfjorden | 68° 56.25 | 17° 5.24 | 66G71 | | | | | 34 | | | | 3 | |
| 42S | Malangen | 69° 30.38 | 18° 6.77 | 68G83 | | | | | 3 | | | | 3 | |
| 43S | Kvænangen | 70° 3.31 | 21° 7.94 | 69H13 | | | | | 34 | | | | 3 | |
| 44S | Sørøysund | 70° 25.91 | 22° 31.83 | 69H24 | | | | | 3 | | | | 3 | |
| 45S | Revsbotn | 70° 42.86 | 24° 26.65 | 70H45 | | | | | 34 | | | | 3 | |
| 46S | Porsangerfjorden | 70° 52.93 | 26° 11.89 | 70H61 | | | | | 28 | | | | 3 | |
| 47S | Laksfjord | 70° 54.96 | 26° 55.11 | 70H67 | | | | | 3 | | | | 3 | |
| 48S | Tanafjord | 70° 52.54 | 28° 38.53 | 70H84 | | | | | 33 | | | | 3 | |
| 49S | Syltefjord | 70° 33.94 | 30° 19.91 | 70J03 | | | | | 3 | | | | 3 | |
| 10S | Varangerfjorden | 69° 56.01 | 30° 6.7 | 68J01 | | | | | | | | | 3 | |
| 10S | Varangerfjorden | 69° 56.07 | 30° 6.7 | 68J01 | | | | | 29 | | | | | |

# Appendix G
# Overview of localities and sample count for biota
# 1981-2008

**Nominel station positions are shown on maps in Appendix H**

jmpco:CEMP area code (J99 = unclassified)
jmpst: station code
stnam: station name
nom_lon: Longitude (nominel)
nom_lat: Latitude (nominel)
speci: species code (English, Norwegian (Latin))
MYTI EDU - blue mussel, blåskjell (*Mytilus edulis*)
NUCE LAP - dogwhelk, purpursnegl (*Nucella lapillus*)
BROS BRO - tusk, brosme (*Brosme brosme)*
CHIM MON - rat fish, havmus (*Chimaera monstrosa*)
GADU MOR - Atlantic cod, torsk (*Gadus morhua*)
LEPI WHI - megrim, glassvar (*Lepidorhombus whiff-iagonis*)
LIMA LIM - dab, sandflyndre (*Limanda limanda*)
MICR KIT - lemon sole, lomre (*Microstomus kitt*)
MOLV MOL - ling, lange (*Molva molva*)
PAND BOR - shrimp, reker (*Pandalus borealis)*
PLAT FLE - flounder, skrubbe (*Platichthys flesus*)
PLEU PLA - plaice, rødspette (*Pleuronectes platessa*)
tissu: tissue:
SB - soft body
LI - liver
MU - fillet
TM - tail muscle

# STATIONS AND SAMPLE COUNT FOR BIOTA

| jmpst | stnam | nomlat | nomlon | icear | speci | tissu | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 01A | Sponvika | 59° 5.31 | 11° 13.57 | 47G13 | MYTI EDU | SB | | 3 | | | 3 | | | | | 3 | | | | | | | | | | | | | | | | | | | 3 |
| 02A | Fugleskjær | 59° 6.9 | 10° 59 | 47G09 | MYTI EDU | SB | | 3 | | | 3 | | | | | 3 | | | | | | | | | | | | | | | | | | | 2 |
| 03A | Tisler | 58° 58.8 | 10° 57.5 | 46G07 | MYTI EDU | SB | | 2 | | | 3 | | | | | 3 | | | | | | | | | | | | | | | | | | | 3 |
| 301 | Akershuskaia | 59° 54.32 | 10° 44.18 | 48G07 | MYTI EDU | SB | | | | | | | | | | | | 2 | | | | | | | | | | | | | | | | |
| 302 | Ormøya | 59° 52.69 | 10° 45.46 | 48G07 | MYTI EDU | SB | | | | | | | | | | | | 2 | | | | | | | | | | | | | | | | |
| 303 | Malmøya | 59° 51.78 | 10° 45.95 | 48G07 | MYTI EDU | SB | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | |
| 304 | Gåsøya | 59° 51.08 | 10° 35.32 | 48G04 | MYTI EDU | SB | | | | | | | | | | | | 3 | | | | | | | | | | | | | | | | |
| 305 | Lysaker | 59° 54.36 | 10° 38.6 | 48G04 | MYTI EDU | SB | | | | | | | | | | | | 2 | | | | | | | | | | | | | | | | |
| 306 | Håøya | 59° 42.8 | 10° 33.31 | 48G05 | MYTI EDU | SB | | | | | | | | | | | | 3 | | | | | | | | | | | | | | | | |
| 30A | Gressholmen | 59° 52.89 | 10° 42.71 | 48G07 | MYTI EDU | SB | | | | 3 | 3 | 3 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 30B | Oslo City area | 59° 47.96 | 10° 33.6 | 48G05 | GADU MOR | BI | | | | | | | | | | | | | | | | | | 18 | 23 | 23 | 25 | 24 | 25 | 25 | 23 | 24 | 24 | 25 |
| 30B | Oslo City area | 59° 47.96 | 10° 33.6 | 48G05 | GADU MOR | BL | | | | | | | | | | | | | | | | | 20 | 20 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | |
| 30B | Oslo City area | 59° 47.96 | 10° 33.6 | 48G05 | GADU MOR | LI | | | | 29 | 25 | 25 | 25 | 25 | 25 | 25 | 24 | 21 | 24 | 25 | 25 | 40 | 49 | 50 | 25 | 25 | 28 | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
| 30B | Oslo City area | 59° 47.96 | 10° 33.6 | 48G05 | GADU MOR | MU | | | | 29 | 25 | 25 | 25 | 26 | 26 | 30 | 30 | 21 | 29 | 30 | 30 | 48 | 48 | 60 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 |
| 30C | Oslo City area | 59° 49 | 10° 33 | 48G05 | PAND BOR | TM | | | | 1 | | | | | | | | 2 | | | | | | | | | | | | | | | | |
| 30F | Oslo City area | 59° 47 | 10° 34 | 48G05 | PLEU PLA | LI | | | | | | | | | | | | 2 | | 5 | 5 | | | | | | | | | | | | | |
| 30F | Oslo City area | 59° 47 | 10° 34 | 48G05 | PLEU PLA | MU | | | | | | | | | | | | 2 | | 5 | 5 | | | | | | | | | | | | | |
| 30J | Spro | 59° 47.96 | 10° 33.6 | 48G05 | PAND BOR | TM | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | |
| 30K | Storegrunn | 59° 47.96 | 10° 33.6 | 48G05 | PAND BOR | TM | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | |
| 30X | West of Nesodden | 59° 48.5 | 10° 36 | 48G05 | GADU MOR | LI | | | | | | | | | | | | 22 | | | | | | | | | | | | | | | | |
| 30X | West of Nesodden | 59° 48.5 | 10° 36 | 48G05 | GADU MOR | MU | | | | | | | | | | | | 22 | | | | | | | | | | | | | | | | |
| 31A | Solbergstrand | 59° 37.13 | 10° 38.99 | 48G06 | MYTI EDU | SB | 2 | | 6 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 31B | Solbergstrand | 59° 36.9 | 10° 38.4 | 48G06 | GADU MOR | LI | 10 | 27 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31B | Solbergstrand | 59° 36.9 | 10° 38.4 | 48G06 | GADU MOR | MU | 10 | 27 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31F | Solbergstrand | 59° 36.9 | 10° 38.4 | 48G06 | PLAT FLE | LI | 8 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31F | Solbergstrand | 59° 36.9 | 10° 38.4 | 48G06 | PLAT FLE | MU | 8 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31C | Solbergstrand | 59° 36.9 | 10° 38.4 | 48G06 | PAND BOR | TM | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | |
| 32A | Rødtangen | 59° 31.5 | 10° 25.6 | 48G06 | MYTI EDU | SB | 1 | 3 | | | 3 | | | | | | | | | | | | | | | | | | | | | | | |
| 33F | Sande (east side) | 59° 31.7 | 10° 21 | 48G06 | PLAT FLE | LI | | | 25 | | 1 | 1 | 1 | 1 | 1 | 5 | 5 | 5 | 5 | 5 | 5 | 10 | 10 | 8 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 3 | 5 |
| 33F | Sande (east side) | 59° 31.7 | 10° 21 | 48G06 | PLAT FLE | MU | | | 25 | | 25 | 1 | 1 | 1 | 1 | 5 | 5 | 5 | 5 | 5 | 5 | 10 | 10 | 8 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 3 | 5 |
| 33C | Sande | 59° 31.7 | 10° 21 | 48G06 | PAND BOR | TM | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | |
| 33X | Sande (west side) | 59° 31.7 | 10° 20.4 | 48G06 | PLAT FLE | LI | | | | | | | | | | 3 | | | | | | | | | | | | | | | | | | |
| 33X | Sande (west side) | 59° 31.7 | 10° 20.4 | 48G06 | PLAT FLE | MU | | | | | | | | | | 3 | | | | | | | | | | | | | | | | | | |
| 35A | Mølen | 59° 29.29 | 10° 29.88 | 47G04 | MYTI EDU | SB | 1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 35C | Mølen-Moss | 59° 28.96 | 10° 31.74 | 47G04 | PAND BOR | TM | | 1 | | | | | | 1 | | 2 | | | | | | | | | | | | | | | | | | |
| 35C | Mølen-Moss | 59° 28.96 | 10° 31.74 | 47G04 | PAND BOR | XX | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | |
| 36A | Færder | 59° 1.63 | 10° 31.53 | 47G06 | MYTI EDU | SB | 1 | | 5 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 5 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 36G | Færder | 59° 1.63 | 10° 31.53 | 47G06 | NUCE LAP | SB | | | | | | | | | | | | | | | | | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | |
| 36B | Færder area | 59° 2.43 | 10° 26.15 | 47G06 | GADU MOR | BI | | | | | | | | | | | | | | | | | 21 | 25 | 25 | 23 | 25 | | | | | | | |
| 36B | Færder area | 59° 2.43 | 10° 26.15 | 47G06 | GADU MOR | BL | | | | | | | | | | | | | | | | | 20 | 25 | 25 | 23 | 25 | | | | | | | |
| 36B | Færder area | 59° 2.43 | 10° 26.15 | 47G06 | GADU MOR | LI | 10 | 27 | 23 | 24 | 14 | 25 | 25 | 25 | 25 | 24 | 25 | 25 | 25 | 25 | 25 | 26 | 25 | 25 | 25 | 23 | 28 | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
| 36B | Færder area | 59° 2.43 | 10° 26.15 | 47G06 | GADU MOR | MU | 10 | 27 | 23 | 24 | 14 | 25 | 25 | 26 | 26 | 29 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 27 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 25 |
| 36F | Færder area | 59° 4 | 10° 23 | 47G06 | LIMA LIM | BI | | | | | | | | | | | | | | | | | | | 11 | 9 | 20 | | | | | | | |
| 36F | Færder area | 59° 4 | 10° 23 | 47G06 | LIMA LIM | BL | | | | | | | | | | | | | | | | | | | 20 | 9 | 20 | | | | | | | |
| 36F | Færder area | 59° 4 | 10° 23 | 47G06 | LIMA LIM | LI | | | | | | | | | | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 25 | 14 | 24 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 36F | Færder area | 59° 4 | 10° 23 | 47G06 | LIMA LIM | MU | | | | | | | | | | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 73A | Lyngholmen | 59° 2.68 | 10° 17.72 | 47G03 | MYTI EDU | SB | | | | | | | | | | 3 | | | | | | | | | | | | | | | | | | 3 |
| 74A | Langholmane | 58° 57.3 | 9° 52.1 | 46F97 | MYTI EDU | SB | | | | | | | | | | 3 | | | | | | | | | | | | | | | | | | 3 |
| 71G | Fugløyskjær | 58° 58.85 | 9° 48.46 | 46F97 | LITT LIT | SB | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| 71A | Bjørkøya (Risøyodden) | 59° 1.4 | 9° 45.22 | 47F99 | MYTI EDU | SB | 1 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 3 |
| 71G | Fugløyskjær | 58° 58.85 | 9° 48.46 | 46F97 | NUCE LAP | SB | | | | | | | | | | | | | | | | | | | | | 1 | 1 | 1 | 1 | 1 | 1 | 2 | |
| 76A | Risøy | 58° 43.85 | 9° 16.32 | 46F92 | MYTI EDU | SB | | | | | | | | | | 3 | 3 | 3 | 3 | | | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 5 |
| 76A | Risøy | 58° 43.85 | 9° 16.32 | 46F92 | NUCE LAP | SB | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | | |
| 76G | Risøy | 58° 43.68 | 9° 16.53 | 46F92 | NUCE LAP | SB | | | | | | | | | | | | | | | | | | | | | 1 | 1 | | 1 | 2 | 2 | 2 | 2 |
| 77A | Nordstrand | 58° 31.42 | 8° 56.51 | 46F89 | MYTI EDU | SB | | | | | | | | | | 3 | 3 | | | | | | | | | | | | | | | | | 3 |
| 77B | Borøy area | 58° 33 | 9° 1 | 45F93 | GADU MOR | LI | | | | | | | | | | 14 | 25 | | | | | | | | | | | | | | | | | 25 |
| 77B | Borøy area | 58° 33 | 9° 1 | 45F93 | GADU MOR | MU | | | | | | | | | | 17 | 30 | | | | | | | | | | | | | | | | | 30 |
| 77F | Borøy area | 58° 33 | 9° 1 | | LIMA LIM | LI | | | | | | | | | | | 3 | | | | | | | | | | | | | | | | | 5 |
| 77F | Borøy area | 58° 33 | 9° 1 | | LIMA LIM | MU | | | | | | | | | | | | | | | | | | | | | | | | | | | | 5 |
| 77C | Borøy area | 58° 29 | 9° 10 | 45F91 | PAND BOR | TM | | | | | | | | | | 2 | | | | | | | | | | | | | | | | | | |
| 79A | Gjerdsvoldsøyen (east) | 58° 24.8 | 8° 44.5 | 45F87 | MYTI EDU | SB | | | | | | | | | | 3 | 3 | | | | | | | | | | | | | | | | | 3 |
| 13A | Langøsund | 57° 59.87 | 7° 34.6 | 45F74 | MYTI EDU | SB | | | | | | | | | | 1 | 4 | | | | | | | | | | | | | | | | | 4 |
| 131G | Lastad | 58° 3.33 | 7° 42.52 | 45F79 | NUCE LAP | SB | | | | | | | | | | | | | | | | | | | | | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 1 |
| 14A | Aavigen | 58° 1.96 | 7° 12.97 | 45F73 | MYTI EDU | SB | | | | | | | | | | 3 | 4 | | | | | | | | | | | | | | | | | 3 |
| 15A | Gåsøy (Ullerø) | 58° 2.87 | 6° 53.72 | 45F69 | MYTI EDU | SB | | | | | | | | | | 4 | 4 | | 3 | 3 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 15G | Gåsøy (Ullerø) | 58° 2.98 | 6° 53.74 | 45F69 | NUCE LAP | SB | | | | | | | | | | | | | | | | | | | | | 1 | 1 | 1 | 2 | 2 | 2 | 1 | 2 |

| jmpst | stnam | nomlat | nomlon | icear | speci | tissu | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15B | Ullerø area | 58° 3 | 6° 43 | 45F69 | GADU MOR | BI | | | | | | | | | | | | | | | | | 10 | 25 | 25 | | 24 | 18 | 24 | 22 | 24 | 24 | 25 | 17 |
| 15B | Ullerø area | 58° 3 | 6° 43 | 45F69 | GADU MOR | BL | | | | | | | | | | | | | | | | | 24 | 25 | 25 | | 23 | | | | | | | |
| 15B | Ullerø area | 58° 3 | 6° 43 | 45F69 | GADU MOR | LI | | | | | | | | | | 25 | 24 | 23 | 25 | 23 | 24 | 26 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
| 15B | Ullerø area | 58° 3 | 6° 43 | 45F69 | GADU MOR | MU | | | | | | | | | | 30 | 29 | 27 | 30 | 28 | 29 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 |
| 15F | Ullerø area | 58° 3 | 6° 43 | 45F69 | LIMA LIM | BI | | | | | | | | | | | | | | | | | | | 20 | | 22 | | | | | | | |
| 15F | Ullerø area | 58° 3 | 6° 43 | 45F69 | LIMA LIM | BL | | | | | | | | | | | | | | | | | | | 25 | | 25 | | | | | | | |
| 15F | Ullerø area | 58° 3 | 6° 43 | 45F69 | LIMA LIM | LI | | | | | | | | | | | 3 | | 2 | 4 | 5 | 5 | 5 | 5 | 30 | 5 | 30 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 15F | Ullerø area | 58° 3 | 6° 43 | 45F69 | LIMA LIM | MU | | | | | | | | | | | 3 | | 2 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 15F | Ullerø area | 58° 3 | 6° 43 | 45F69 | PLEU PLA | LI | | | | | | | | | | | | 3 | 2 | | | | | | | | | | | | | | | |
| 15F | Ullerø area | 58° 3 | 6° 43 | 45F69 | PLEU PLA | MU | | | | | | | | | | | | 3 | 2 | | | | | | | | | | | | | | | |
| 15F | Ullerø area | 58° 3 | 6° 43 | 45F69 | MICR KIT | LI | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | |
| 15F | Ullerø area | 58° 3 | 6° 43 | 45F69 | MICR KIT | MU | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | |
| 51A | Byrkjenes | 60° 5.03 | 6° 33.03 | 49F66 | MYTI EDU | SB | | | | | | | 3 | 3 | | | | | | | 1 | 3 | 3 | 3 | 6 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 52A | Eitrheimsneset | 60° 5.8 | 6° 31.97 | 49F66 | MYTI EDU | SB | | | | | | | | | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 6 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 53B | Inner Sørfjord | 60° 10 | 6° 34 | 49F65 | GADU MOR | BI | | | | | | | | | | | | | | | | | 15 | 28 | 24 | 25 | 25 | 24 | 24 | 25 | 24 | 24 | 25 | 22 |
| 53B | Inner Sørfjord | 60° 10 | 6° 34 | 49F65 | GADU MOR | BL | | | | | | | | | | | | | | | | | 15 | 30 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | |
| 53B | Inner Sørfjord | 60° 10 | 6° 34 | 49F65 | GADU MOR | LI | | | | | | | 13 | 1 | 12 | 25 | 25 | 22 | 25 | 25 | 25 | 50 | 30 | 30 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
| 53B | Inner Sørfjord | 60° 10 | 6° 34 | 49F65 | GADU MOR | MU | | | | | | | 12 | 1 | 15 | 30 | 30 | 26 | 30 | 30 | 30 | 56 | 36 | 36 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 |
| 53F | Inner Sørfjord | 60° 10 | 6° 34 | | PLAT FLE | BI | | | | | | | | | | | | | | | | | | | 25 | 11 | 12 | | | | | | | |
| 53F | Inner Sørfjord | 60° 10 | 6° 34 | | PLAT FLE | BL | | | | | | | | | | | | | | | | | | | 23 | 11 | 12 | | | | | | | |
| 53F | Inner Sørfjord | 60° 10 | 6° 34 | | PLAT FLE | LI | | | | 22 | | | | 1 | 30 | 5 | 5 | 5 | 5 | 4 | 4 | 11 | 15 | 11 | 30 | 13 | 17 | 5 | 5 | 5 | 5 | | 5 | 5 |
| 53F | Inner Sørfjord | 60° 10 | 6° 34 | | PLAT FLE | MU | | | | 22 | | | | 1 | 30 | 5 | 5 | 5 | 5 | 4 | 4 | 11 | 15 | 11 | 5 | 2 | 5 | 5 | 5 | 5 | 5 | | 5 | 5 |
| 53F | Inner Sørfjord | 60° 10 | 6° 34 | | GLYP CYN | LI | | | | | | | 3 | | | | | | | | | | | | | | | | | | | | | |
| 53F | Inner Sørfjord | 60° 10 | 6° 34 | | GLYP CYN | MU | | | | | | | 3 | | | | | | | | | | | | | | | | | | | | | |
| 53B | Inner Sørfjord | 60° 10 | 6° 34 | 49F65 | SALM TRU | LI | | | | | | | | | | 12 | | | | | | | | | | | | | | | | | | |
| 53B | Inner Sørfjord | 60° 10 | 6° 34 | 49F65 | SALM TRU | MU | | | | | | | | | | 12 | | | | | | | | | | | | | | | | | | |
| 53D | Digraneset | 60° 11 | 6° 34.5 | 49F65 | BROS BRO | LI | | | | | | | | | | | | | | | | | | | | | 4 | | | | | | | |
| 53D | Digraneset | 60° 11 | 6° 34.5 | 49F65 | BROS BRO | MU | | | | | | | | | | | | | | | | | | | | | 4 | | | | | | | |
| 53D | Digraneset | 60° 11 | 6° 34.5 | 49F65 | MOLV MOL | LI | | | | | | | | | | | | | | | | | | | | | 5 | | | | | | | 25 |
| 53D | Digraneset | 60° 11 | 6° 34.5 | 49F65 | MOLV MOL | MU | | | | | | | | | | | | | | | | | | | | | 5 | | | | | | | 30 |
| 53D | Digraneset | 60° 11 | 6° 34.5 | 49F65 | CHIM MON | LI | | | | | | | | | | | | | | | | | | | | | 2 | | | | | | | |
| 53D | Digraneset | 60° 11 | 6° 34.5 | 49F65 | CHIM MON | MU | | | | | | | | | | | | | | | | | | | | | 2 | | | | | | | |
| 56A | Kvalnes | 60° 13.23 | 6° 36.12 | 49F65 | MYTI EDU | SB | | | | | | | 3 | 15 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 6 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 56A1 | Kvalnes (north) | 60° 13.51 | 6° 36.26 | 49F65 | MYTI EDU | SB | | | | | | | | | | | | | | | | | | | 3 | | | 2 | | | | | | |
| 56A2 | Kjeken | 60° 20.33 | 6° 39.27 | 49F64 | MYTI EDU | SB | | | | | | | | | | | | | | | | | | | 3 | | | 2 | | | | | | |
| 56A3 | Sekse | 60° 15.68 | 6° 37.4 | 49F65 | MYTI EDU | SB | | | | | | | | | | | | | | | | | | | | | | 2 | | | | | | |
| 56A4 | Rosstadnes | 60° 17.22 | 6° 37.43 | 49F65 | MYTI EDU | SB | | | | | | | | | | | | | | | | | | | | | | 2 | | | | | | |
| 56A5 | Lofthus (south) | 60° 19.35 | 6° 39.12 | 49F65 | MYTI EDU | SB | | | | | | | | | | | | | | | | | | | | | | 2 | | | | | | |
| 56D | Kvalnes | 60° 15 | 6° 36 | 49F65 | BROS BRO | LI | | | | | | | | | | | | | | | | | | | 3 | | | | | | | | | |
| 56D | Kvalnes | 60° 15 | 6° 36 | 49F65 | BROS BRO | MU | | | | | | | | | | | | | | | | | | | 3 | | | | | | | | | |
| 56D | Kvalnes | 60° 15 | 6° 36 | 49F65 | MOLV MOL | LI | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | |
| 56D | Kvalnes | 60° 15 | 6° 36 | 49F65 | MOLV MOL | MU | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | |
| 56D | Kvalnes | 60° 15 | 6° 36 | 49F65 | CHIM MON | LI | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | |
| 56D | Kvalnes | 60° 15 | 6° 36 | 49F65 | CHIM MON | MU | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | |
| 57A | Krossanes | 60° 23.23 | 6° 41.34 | 49F67 | MYTI EDU | SB | | | | | | | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 6 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 57A1 | Urdheim | 60° 22.35 | 6° 40.69 | 49F67 | MYTI EDU | SB | | | | | | | | | | | | | | | | | | | 3 | | | 2 | | | | | | |
| 57A2 | Ernes | 60° 21.19 | 6° 39.74 | 49F64 | MYTI EDU | SB | | | | | | | | | | | | | | | | | | | | | | 2 | | | | | | |
| 63A | Ranaskjær | 60° 25.25 | 6° 25.32 | 49F64 | MYTI EDU | SB | | | | | | | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 6 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 65A | Vikingneset | 60° 14.54 | 6° 9.16 | 49F62 | MYTI EDU | SB | | | | | | | 3 | 15 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 6 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 67B | Strandebarm area | 60° 16 | 6° 2 | 49F62 | GADU MOR | BI | | | | | | | | | | | | | | | | | 25 | 24 | 25 | 15 | 25 | | | | | | | |
| 67B | Strandebarm area | 60° 16 | 6° 2 | 49F62 | GADU MOR | BL | | | | | | | | | | | | | | | | | 25 | 25 | 25 | 13 | 24 | | | | | | | |
| 67B | Strandebarm area | 60° 16 | 6° 2 | 49F62 | GADU MOR | LI | | | | | | | 22 | 1 | 22 | 16 | 19 | 8 | 12 | 18 | 25 | 35 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 20 |
| 67B | Strandebarm area | 60° 16 | 6° 2 | 49F62 | GADU MOR | MU | | | | | | | 22 | 1 | 23 | 16 | 24 | 9 | 14 | 22 | 30 | 40 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 24 |
| 67F | Strandebarm area | 60° 16 | 6° 2 | | PLAT FLE | BI | | | | | | | | | | | | | | | | | | | 25 | 22 | 25 | | | | | | | |
| 67F | Strandebarm area | 60° 16 | 6° 2 | | PLAT FLE | BL | | | | | | | | | | | | | | | | | | | 25 | 23 | 23 | | | | | | | |
| 67F | Strandebarm area | 60° 16 | 6° 2 | | PLAT FLE | LI | | | | | | | | | | | | | | | | 3 | | 4 | 30 | 28 | 30 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 67F | Strandebarm area | 60° 16 | 6° 2 | | PLAT FLE | MU | | | | | | | | | | | | | | | | 3 | | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 67F | Strandebarm area | 60° 16 | 6° 2 | | LIMA LIM | LI | | | | | | | | | | | | | | | | | | 5 | | | | | | | | | | |
| 67F | Strandebarm area | 60° 16 | 6° 2 | | LIMA LIM | MU | | | | | | | | | | | | | | | | | | 5 | | | | | | | | | | |
| 67F | Strandebarm area | 60° 16 | 6° 2 | | LEPI WHI | LI | | | | 19 | | | 1 | 1 | 30 | 5 | 5 | 3 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 2 | 5 | 4 | 5 | 5 |
| 67F | Strandebarm area | 60° 16 | 6° 2 | | LEPI WHI | MU | | | | 19 | | | 1 | 1 | 30 | 5 | 5 | 3 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 2 | 5 | 4 | 5 | 5 |
| 67D | Strandebarm area | 60° 16 | 6° 2 | | MOLV MOL | LI | | | | | | | | | | | | | | | | | | | | | | | | | | | | 17 |
| 67D | Strandebarm area | 60° 16 | 6° 2 | | MOLV MOL | MU | | | | | | | | | | | | | | | | | | | | | | | | | | | | 21 |
| 69A | Lille Terøy | 59° 58.91 | 5° 45.15 | 48F57 | MYTI EDU | SB | | | | | | | | | | | | 3 | 1 | 3 | 3 | 3 | 3 | 3 | 6 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 22A | Espevær (west) | 59° 35.05 | 5° 8.63 | 48F53 | MYTI EDU | SB | | | | | | | | | | 3 | 3 | 3 | 3 | 3 | 3 | 5 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 224G | Heggjelen | 59° 24.96 | 5° 13.9 | 47F51 | NUCE LAP | SB | | | | | | | | | | | | | | | | | 1 | 1 | 1 | 1 | | | | | | | | |
| 22G | Espevær vest | 59° 35.02 | 5° 8.67 | 46F53 | NUCE LAP | SB | | | | | | | | | | | | | | | | | | | | | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 |
| 220G | Smørstakk | 59° 15.15 | 5° 21.11 | 47F55 | NUCE LAP | SB | | | | | | | | | | | | | | | | | 1 | 1 | 1 | | | | | 2 | | | | |
| 22C | Bømlofjord | 59° 34 | 5° 11 | 48F53 | PAND BOR | TM | | | | | | | | | | 2 | | | | | | | | | | | | | | | | | | |
| 221A | Stangeland | 59° 16.62 | 5° 19.7 | 47F52 | MYTI EDU | SB | | | | | | | | | | | | | | | | | | 2 | 3 | | | | | | | | | |

| jmpst | stnam | nomlat | nomlon | icear | speci | tissu | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 221G | Stangeland | 59° 16.21 | 5° 19.8 | 47F52 | NUCE LAP | SB | | | | | | | | | | | | | | | | | | 1 | 1 | | | | | | | | | | |
| 21F | Åkrafjord | 59° 45 | 6° 7 | 48M62 | PLAT FLE | BI | | | | | | | | | | | | | | | | | | | 11 | | | | | | | | | | |
| 21F | Åkrafjord | 59° 45 | 6° 7 | 48M62 | PLAT FLE | BL | | | | | | | | | | | | | | | | | | | 11 | 25 | | | | | | | | | |
| 21F | Åkrafjord | 59° 45 | 6° 7 | 48M62 | PLAT FLE | LI | | | | | | | | | | | | | | | | | | | 14 | 11 | 5 | 5 | | 1 | 5 | 5 | | | |
| 21F | Åkrafjord | 59° 45 | 6° 7 | 48M62 | PLAT FLE | MU | | | | | | | | | | | | | | | | | | | 3 | 5 | 5 | 5 | | 1 | 5 | 5 | | | |
| 21F | Åkrafjord | 59° 45 | 6° 7 | 48M62 | LIMA LIM | LI | | | | | | | | | | | | | | | | | | | | | | 5 | 5 | 5 | 5 | | 5 | | |
| 22F | Borøyfjorden | 59° 42.6 | 5° 19.8 | 48F55 | LIMA LIM | LI | | | | | | | | | | 5 | 5 | 4 | | 5 | 2 | | | | | | | | | | | | | |
| 21F | Åkrafjord | 59° 45 | 6° 7 | 48M62 | LIMA LIM | MU | | | | | | | | | | | | | | | | | | | | | | 5 | 5 | 5 | 5 | | 5 | | |
| 22F | Borøyfjorden | 59° 42.6 | 5° 19.8 | 48F55 | LIMA LIM | MU | | | | | | | | | | 5 | 5 | 4 | | 5 | 2 | | | | | | | | | | | | | |
| 22F | Borøyfjorden | 59° 42.6 | 5° 19.8 | 48F55 | PLEU PLA | LI | | | | | | | | | | | | | | | | 5 | 5 | 5 | | | | | | | | | | |
| 22F | Borøyfjorden | 59° 42.6 | 5° 19.8 | 48F55 | PLEU PLA | MU | | | | | | | | | | | | | | | | 5 | 5 | 5 | | | | | | | | | | |
| 21F | Åkrafjord | 59° 45 | 6° 7 | 48M62 | LEPI WHI | LI | | | | | | | | | | | | | | | | | | | 5 | | | | 5 | 5 | 5 | 3 | 5 | 5 |
| 21F | Åkrafjord | 59° 45 | 6° 7 | 48M62 | LEPI WHI | MU | | | | | | | | | | | | | | | | | | | 5 | | | | 5 | 5 | 5 | 3 | 5 | 5 |
| 22F | Borøyfjorden | 59° 42.6 | 5° 19.8 | 48F55 | MICR KIT | LI | | | | | | | | | | | | | 5 | | | | | | | | | | | | | | | |
| 22F | Borøyfjorden | 59° 42.6 | 5° 19.8 | 48F55 | MICR KIT | MU | | | | | | | | | | | | | 5 | | | | | | | | | | | | | | | |
| 21D | Åkrafjord | 59° 48 | 6° 11 | 48F62 | BROS BRO | LI | | | | | | | | | | | | | | | | | | | 1 | | 4 | | | | | | | |
| 21D | Åkrafjord | 59° 48 | 6° 11 | 48F62 | BROS BRO | MU | | | | | | | | | | | | | | | | | | | 1 | | 4 | | | | | | | |
| 21D | Åkrafjord | 59° 48 | 6° 11 | 48F62 | MOLV MOL | LI | | | | | | | | | | | | | | | | | | | 1 | | 4 | | | | | | | |
| 21D | Åkrafjord | 59° 48 | 6° 11 | 48F62 | MOLV MOL | MU | | | | | | | | | | | | | | | | | | | 1 | | 4 | | | | | | | |
| 21D | Åkrafjord | 59° 48 | 6° 11 | 48F62 | CHIM MON | LI | | | | | | | | | | | | | | | | | | | 1 | | 2 | | | | | | | |
| 21D | Åkrafjord | 59° 48 | 6° 11 | 48F62 | CHIM MON | MU | | | | | | | | | | | | | | | | | | | 1 | | 2 | | | | | | | |
| 222A | Kopervik harbour | 59° 16.98 | 5° 18.94 | 47F52 | MYTI EDU | SB | | | | | | | | | | | | | | | | | | | | 3 | | | | | | | | |
| 226X | Karmsund bridge (east) | 59° 22.68 | 5° 17.91 | 47F51 | MYTI EDU | SB | | | | | | | | | | | | | | | | | | 1 | 3 | 3 | | | | | | | | |
| 226G | Karmsund bridge (east) | 59° 22.68 | 5° 17.91 | 47F51 | NUCE LAP | SB | | | | | | | | | | | | | | | | | | 1 | 1 | 1 | | | | | | | | |
| 226H | Karmsund bridge (west) | 59° 22.66 | 5° 17.55 | | NUCE LAP | SB | | | | | | | | | | | | | | | | | 1 | | | 1 | | | | | | | | |
| 227A1 | Melandholmen | 59° 19.56 | 5° 19.05 | | MYTI EDU | SB | | | | | | | | | | | | | | | | | | 2 | 3 | | | | | | | | | |
| 227A2 | Høgevarde | 59° 19.56 | 5° 19.05 | | MYTI EDU | SB | | | | | | | | | | | | | | | | | | | | 3 | 3 | 3 | 3 | 1 | 2 | 2 | 1 | 1 |
| 227G | Melandholmen | | | 47F51 | NUCE LAP | SB | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 227G1 | Melandholmen | 59° 20.24 | 5° 18.75 | | NUCE LAP | SB | | | | | | | | | | | | | | | | | 1 | 1 | 1 | 1 | 1 | 1 | | | | | | |
| 227G2 | Flatskjær | 59° 20.24 | 5° 18.75 | | NUCE LAP | SB | | | | | | | | | | | | | | | | | | | | | | | 1 | 1 | 2 | 2 | 1 | 2 |
| 23A | Austvik | 59° 52.22 | 5° 6.47 | 48F51 | MYTI EDU | SB | | | | | | | | | | 3 | 3 | | | | | | | | | | | | | 3 | 3 | | | |
| 23B | Karihavet area | 59° 54 | 5° 8 | 48F51 | GADU MOR | BI | | | | | | | | | | | | | | | | | 22 | 23 | 24 | 23 | 25 | 25 | 25 | 24 | 25 | 25 | 23 | 23 |
| 23B | Karihavet area | 59° 54 | 5° 8 | 48F51 | GADU MOR | BL | | | | | | | | | | | | | | | | | 25 | 25 | 25 | 24 | 25 | 25 | 25 | 25 | 25 | 25 | | |
| 23B | Karihavet area | 59° 54 | 5° 8 | 48F51 | GADU MOR | LI | | | | | | | | | | 25 | 25 | 25 | 25 | 25 | 25 | 26 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
| 23B | Karihavet area | 59° 54 | 5° 8 | 48F51 | GADU MOR | MU | | | | | | | | | | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 |
| 23F | Karihavet area | 59° 54 | 5° 8 | | PLAT FLE | LI | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | |
| 23F | Karihavet area | 59° 54 | 5° 8 | | PLAT FLE | MU | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | |
| 23F | Karihavet area | 59° 54 | 5° 8 | | PLEU PLA | LI | | | | | | | | | | | | | | 3 | | | | | | | | | | | | | | |
| 23F | Karihavet area | 59° 54 | 5° 8 | | PLEU PLA | MU | | | | | | | | | | | | | | 3 | | | | | | | | | | | | | | |
| 23F | Karihavet area | 59° 54 | 5° 8 | | MICR KIT | LI | | | | | | | | | | | | | | 1 | 4 | | | | | | | | | | | | | |
| 23F | Karihavet area | 59° 54 | 5° 8 | | MICR KIT | MU | | | | | | | | | | | | | | 1 | 4 | | | | | | | | | | | | | |
| 24A | Vardøy | 60° 10.27 | 5° 0.62 | 49F52 | MYTI EDU | SB | | | | | | | | | | 3 | 3 | | | | | | | | | | | | | 3 | 3 | | | |
| 24G | Vardøy | 60° 10.27 | 5° 0.62 | 49F52 | NUCE LAP | SB | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | |
| 29D | Høyanger Area | 61° 9 | 5° 50.24 | | BROS BRO | LI | | | | | | | | | | | | | | | | | | | | | | | | | | | | 25 |
| 29D | Høyanger Area | 61° 9 | 5° 50.24 | | BROS BRO | MU | | | | | | | | | | | | | | | | | | | | | | | | | | | | 4 |
| 29D | Høyanger Area | 61° 9 | 5° 50.24 | | MOLV MOL | LI | | | | | | | | | | | | | | | | | | | | | | | | | | | | 25 |
| 29D | Høyanger Area | 61° 9 | 5° 50.24 | | MOLV MOL | MU | | | | | | | | | | | | | | | | | | | | | | | | | | | | 30 |
| 80A | Østmarknes | 63° 27.44 | 10° 26.97 | 55G04 | MYTI EDU | SB | | | | 1 | 2 | | | | | | | | | | | | | | | | | | | | | | | |
| 81A | Biologisk Stasjon | 63° 26.5 | 10° 20.95 | 55G04 | MYTI EDU | SB | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | |
| 82A | Flakk | 63° 27.02 | 10° 12.38 | 55G01 | MYTI EDU | SB | | | | 1 | 2 | 2 | 3 | 1 | 2 | | 3 | 2 | 2 | | 3 | 3 | | | | | | | | 3 | 3 | | | |
| 82G | Flakk | 63° 27.04 | 10° 12.15 | 55G01 | NUCE LAP | SB | | | | | | | | | | | | 1 | | | | | | | | | | | | 1 | | | | |
| 83A | Frøsetskjær | 63° 25.69 | 10° 6.4 | 55G01 | MYTI EDU | SB | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | |
| 84A | Tråsåvika | 63° 20.79 | 9° 57.43 | 55F97 | MYTI EDU | SB | | | | 2 | 3 | 3 | 3 | 3 | 3 | | 3 | 3 | 3 | | 3 | 3 | | | | | | | | 3 | 3 | | | |
| 84G | Tråsåvika | 63° 20.79 | 9° 57.43 | 55F97 | NUCE LAP | SB | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | |
| 84B | Tråsåvika | 63° 20.92 | 9° 57.68 | 55F97 | GADU MOR | LI | | | | 13 | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | | |
| 84B | Tråsåvika | 63° 20.92 | 9° 57.68 | 55F97 | GADU MOR | MU | | | | 13 | 10 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | | |
| 84F | Tråsåvika | 63° 20.92 | 9° 57.68 | | MICR KIT | LI | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | |
| 84F | Tråsåvika | 63° 20.92 | 9° 57.68 | | MICR KIT | MU | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | |
| 84B | Tråsåvika | 63° 20.92 | 9° 57.68 | 55F97 | MELA AEG | LI | | | | | | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | | |
| 84B | Tråsåvika | 63° 20.92 | 9° 57.68 | 55F97 | MELA AEG | MU | | | | | | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | | |
| 84B | Tråsåvika | 63° 20.92 | 9° 57.68 | 55F97 | MERL MNG | LI | | | | | | | 1 | 1 | | | | | | | | | | | | | | | | | | | | |
| 84B | Tråsåvika | 63° 20.92 | 9° 57.68 | 55F97 | MERL MNG | MU | | | | | | | 1 | 1 | | | | | | | | | | | | | | | | | | | | |
| 84B | Tråsåvika | 63° 20.92 | 9° 57.68 | 55F97 | POLL POL | LI | | | | | 1 | 1 | | 1 | | | | | | | | | | | | | | | | | | | | |
| 84B | Tråsåvika | 63° 20.92 | 9° 57.68 | 55F97 | POLL POL | MU | | | | | 16 | 1 | | 1 | | | | | | | | | | | | | | | | | | | | |
| 84B | Tråsåvika | 63° 20.92 | 9° 57.68 | 55F97 | POLL VIR | LI | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | |
| 84B | Tråsåvika | 63° 20.92 | 9° 57.68 | 55F97 | POLL VIR | MU | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | |
| 85A | Geitstrand | 63° 21.84 | 9° 55.65 | 55F97 | MYTI EDU | SB | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | |
| 86A | Geitnes | 63° 26.57 | 9° 58.66 | 55F97 | MYTI EDU | SB | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | |
| 87A | Ingdalsbukt | 63° 27.71 | 9° 54.43 | 55F97 | MYTI EDU | SB | | | | 1 | 1 | 1 | 1 | 1 | 1 | | 1 | 1 | 1 | | 2 | 2 | | | | | | | | 1 | 3 | | | |
| 87G | Ingdalsbukt | 63° 27.71 | 9° 54.43 | 55F97 | NUCE LAP | SB | | | | | | | | | | | | 1 | | | | | | | | | | | | 1 | | | | |

| jmpst | stnam | nomlat | nomlon | icear | speci | tissu | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 88A | Rødberg | 63° 29.2 | 10° 0 | 55G01 | MYTI EDU | SB | | | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | |
| 25A | Hinnøy | 61° 22.17 | 4° 52.74 | 51F47 | MYTI EDU | SB | | | | | | | | | | | | 3 | 3 | | | | | | | | | | | 3 | 3 | | | |
| 25G | Hinnøy | 61° 22.17 | 4° 52.74 | 51F47 | NUCE LAP | SB | | | | | | | | | | | | 1 | | | | | | | | | | | | 1 | | | | |
| 26A | Hamnen | 61° 52.56 | 5° 13.3 | 52F51 | MYTI EDU | SB | | | | | | | | | | | | 6 | 3 | | | | | | | | | | | 3 | 3 | | | |
| 26G | Hamnen | 61° 52.52 | 5° 13.3 | 52F51 | NUCE LAP | SB | | | | | | | | | | | | 1 | | | | | | | | | | | | 1 | | | | |
| 27A | Grinden | 62° 12.11 | 5° 25.27 | 53F55 | MYTI EDU | SB | | | | | | | | | | | | 2 | | | | | | | | | | | | 3 | 3 | | | |
| 27G | Røydeskjær | 62° 11 | 5° 44.42 | 53F58 | NUCE LAP | SB | | | | | | | | | | | | 1 | | | | | | | | | | | | 1 | | | | |
| 27H | Storholmen | 62° 11.38 | 5° 23.59 | 53F55 | NUCE LAP | SB | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | |
| 28A | Eiksundet | 62° 15.1 | 5° 51.84 | 53F58 | MYTI EDU | SB | | | | | | | | | | | | 5 | 3 | | | | | | | | | | | 3 | 3 | | | |
| 28G | Grønevikholmen (Eiksundet) | 62° 14.8 | 5° 53 | 53F58 | NUCE LAP | SB | | | | | | | | | | | | 1 | | | | | | | | | | | | 1 | | | | |
| 28H | Øveråneset (Hareid) | 62° 21.69 | 6° 4.67 | 49F66 | NUCE LAP | SB | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | |
| 91A | Nerdvika | 63° 21.16 | 8° 9.43 | 55F81 | MYTI EDU | SB | | | | | | | | | | | | 3 | 3 | 3 | | | | | | | | | | | 3 | | | |
| 92A1 | Krokholmen | 64° 3.21 | 10° 1.79 | | MYTI EDU | SB | | | | | | | | | | | | 6 | 3 | 3 | 3 | 3 | 3 | | | | | | | | | | | |
| 92A2 | Nygården | 64° 3.21 | 10° 1.79 | | MYTI EDU | SB | | | | | | | | | | | | | | | | | | | | | | | | | 3 | | | |
| 92B | Stokken area | 64° 10.28 | 9° 53.24 | 57F98 | GADU MOR | LI | | | | | | | | | | | | | 25 | 24 | 25 | 25 | | | | | | | | 25 | 25 | | | 25 |
| 92B | Stokken area | 64° 10.28 | 9° 53.24 | 57F98 | GADU MOR | MU | | | | | | | | | | | | | 30 | 29 | 30 | 30 | | | | | | | | 30 | 30 | | | 30 |
| 92F | Stokken area | 64° 10.28 | 9° 53.24 | | LIMA LIM | LI | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | |
| 92F | Stokken area | 64° 10.28 | 9° 53.24 | | LIMA LIM | MU | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | |
| 92F | Stokken area | 64° 10.28 | 9° 53.24 | | PLEU PLA | LI | | | | | | | | | | | | | | | 1 | | | | | | | | | | 5 | | | |
| 92F | Stokken area | 64° 10.28 | 9° 53.24 | | PLEU PLA | MU | | | | | | | | | | | | | | | 1 | | | | | | | | | | 5 | | | |
| 93A | Sætervik | 64° 23.68 | 10° 29 | 57G04 | MYTI EDU | SB | | | | | | | | | | | | 3 | 3 | | | | | | | | | | | 3 | 3 | | | |
| 93G | Sætervika (Stadsvikskjæret) | 64° 23.69 | 10° 30 | 57G04 | NUCE LAP | SB | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | |
| 94A | Landfast | 65° 38.62 | 12° 0.36 | 60G23 | MYTI EDU | SB | | | | | | | | | | | | 3 | 3 | | | | | | | | | | | 3 | 3 | | | |
| 94G | Steinskjær (Landfast) | 65° 38.44 | 11° 59.89 | 60G23 | NUCE LAP | SB | | | | | | | | | | | | 1 | | | | | | | | | | | | 1 | | | | |
| 95A | Sleipnesodden (south) | 66° 42.61 | 13° 15.17 | 62G32 | MYTI EDU | SB | | | | | | | | | | | | 3 | 3 | | | | | | | | | | | 3 | 3 | | | |
| 95G | Sleipnesodden (south) | 66° 42.4 | 13° 14.3 | 62G32 | NUCE LAP | SB | | | | | | | | | | | | 1 | | | | | | | | | | | | 1 | | | | |
| 96A | Breiviken | 66° 17.77 | 12° 50.02 | 61G28 | MYTI EDU | SB | | | | | | | | | | | | 6 | 3 | | | | | | | | | | | 3 | 3 | | | |
| 97A | Klokkholmen | 67° 39.88 | 14° 44.57 | 64G49 | MYTI EDU | SB | | | | | | | | | | | | 3 | 3 | | | | | | | | | | | 3 | 3 | | | |
| 97G | Varnesodden | 67° 48.08 | 14° 45.02 | 64G48 | NUCE LAP | SB | | | | | | | | | | | | 1 | | | | | | | | | | | | 1 | | | | |
| 97H | Småfloholmene | 67° 53.45 | 14° 49.1 | 64G47 | NUCE LAP | SB | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | |
| 98A1 | Ytit-Skarvsundet | 68° 9.45 | 14° 39.2 | | MYTI EDU | SB | | | | | | | | | | | | 3 | 3 | | | | | | | | | | | | | | | |
| 98A2 | Husvaagen area | 68° 15.46 | 14° 39.83 | | MYTI EDU | SB | | | | | | | | | | | | | | | | | 3 | | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 98A3 | Vatterfjord | 68° 15.46 | 14° 39.83 | | MYTI EDU | SB | | | | | | | | | | | | | | | | | | 3 | | | | | | | | | | |
| 98G | Svolvær området | 68° 14.92 | 14° 39.8 | 65G48 | NUCE LAP | SB | | | | | | | | | | | | | | | | | | | | | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 |
| 98B2 | Austnesfjorden | 68° 14.8 | 14° 48.2 | | GADU MOR | BI | | | | | | | | | | | | | | | | | | | | 14 | 22 | | | | | | | |
| 98B2 | Austnesfjorden | 68° 14.8 | 14° 48.2 | | GADU MOR | BL | | | | | | | | | | | | | | | | | | | | 5 | 25 | | | | | | | |
| 98B1 | Bjørnerøya (east) | 68° 14.8 | 14° 48.2 | | GADU MOR | LI | | | | | | | | | | | | 25 | 24 | 25 | 24 | 26 | 25 | 25 | 25 | | | 25 | 21 | 25 | 25 | 25 | 8 | 25 |
| 98B2 | Austnesfjorden | 68° 14.8 | 14° 48.2 | | GADU MOR | LI | | | | | | | | | | | | | | | | | | | | 25 | 25 | | | | | | | |
| 98B1 | Bjørnerøya (east) | 68° 14.8 | 14° 48.2 | | GADU MOR | MU | | | | | | | | | | | | 30 | 29 | 30 | 29 | 30 | 30 | 30 | 30 | | | 30 | 25 | 30 | 30 | 30 | 10 | 30 |
| 98B2 | Austnesfjorden | 68° 14.8 | 14° 48.2 | | GADU MOR | MU | | | | | | | | | | | | | | | | | | | | 30 | 30 | | | | | | | |
| 98F1 | Bjørnerøya (east) | 68° 13.13 | 14° 48.48 | | LIMA LIM | LI | | | | | | | | | | | | | 4 | 1 | 1 | 5 | | | | | | | | | | | | |
| 98F1 | Bjørnerøya (east) | 68° 13.13 | 14° 48.48 | | LIMA LIM | MU | | | | | | | | | | | | | 4 | 1 | 1 | 5 | | | | | | | | | | | | |
| 98F2 | Husholmen | 68° 13.13 | 14° 48.48 | | PLEU PLA | BI | | | | | | | | | | | | | | | | | | | | 18 | 24 | | | | | | | |
| 98F2 | Husholmen | 68° 13.13 | 14° 48.48 | | PLEU PLA | BL | | | | | | | | | | | | | | | | | | | | 13 | 19 | | | | | | | |
| 98F1 | Bjørnerøya (east) | 68° 13.13 | 14° 48.48 | | PLEU PLA | LI | | | | | | | | | | | | | 3 | | 5 | | 4 | 5 | 1 | | | | | | | | | |
| 98F2 | Husholmen | 68° 13.13 | 14° 48.48 | | PLEU PLA | LI | | | | | | | | | | | | | | | | | | | | 22 | 30 | 4 | 3 | 5 | 2 | 5 | 5 | 5 |
| 98F1 | Bjørnerøya (east) | 68° 13.13 | 14° 48.48 | | PLEU PLA | MU | | | | | | | | | | | | | 3 | | 5 | | 4 | 5 | 1 | | | | | | | | | |
| 98F2 | Husholmen | 68° 13.13 | 14° 48.48 | | PLEU PLA | MU | | | | | | | | | | | | | | | | | | | | 4 | 5 | 4 | 3 | 5 | 2 | 5 | 5 | 5 |
| 98F1 | Bjørnerøya (east) | 68° 13.13 | 14° 48.48 | | MICR KIT | LI | | | | | | | | | | | | | | 1 | 1 | | | | | | | | | | | | | |
| 98F1 | Bjørnerøya (east) | 68° 13.13 | 14° 48.48 | | MICR KIT | MU | | | | | | | | | | | | | | 1 | 1 | | | | | | | | | | | | | |
| 98F1 | Bjørnerøya (east) | 68° 13.13 | 14° 48.48 | | GLYP CYN | LI | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | |
| 98F1 | Bjørnerøya (east) | 68° 13.13 | 14° 48.48 | | GLYP CYN | MU | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | |
| 98X | Skrova harbour | 68° 9.91 | 14° 39.53 | 65G48 | MYTI EDU | SB | | | | | | | | | | | | | | 3 | 4 | 4 | | | | | | | | | | | | |
| 99A | Brunvær | 68° 0.3 | 15° 5.6 | 65G53 | MYTI EDU | SB | | | | | | | | | | | | 6 | 3 | | | | | | | | | | | 3 | 3 | | | |
| 41A | Fensneset (Grytøya) | 68° 56.1 | 16° 38.47 | 66G64 | MYTI EDU | SB | | | | | | | | | | | | | | 3 | 3 | 4 | 3 | | | | | | | | | 3 | 3 | |
| 41G | Harstad (Trondenes) | 68° 49.3 | 16° 33.92 | 66G65 | NUCE LAP | SB | | | | | | | | | | | | | | | | | | | | 1 | | | | | | 2 | | |
| 41G1 | Feneset | 68° 56.1 | 16° 38.46 | | NUCE LAP | SB | | | | | | | | | | | | | | | | | | | | | | | | | | 2 | | |
| 42A | Tennskjær (Malangen) | 69° 28.65 | 18° 18.12 | 67G81 | MYTI EDU | SB | | | | | | | | | | | | | | 3 | 3 | | | | | | | | | | | 3 | 3 | |
| 42G | Finnsnes | 69° 13.55 | 17° 58.5 | 67G78 | NUCE LAP | SB | | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | |
| 43A | Lyngneset (Langfjord) | 70° 6.03 | 20° 32.79 | 69H06 | MYTI EDU | SB | | | | | | | | | | | | | | 3 | 3 | | 3 | | | | | | | | | 3 | 3 | |
| 43G1 | Lyngneset (Langfjord) | 70° 6.04 | 20° 32.79 | | NUCE LAP | SB | | | | | | | | | | | | | | | | | | | | | | | | | | 2 | | |
| 43B1 | Leisundet | 70° 13.56 | 21° 23.81 | | GADU MOR | LI | | | | | | | | | | | | | | | | | | | | | | | | | | 25 | 25 | |
| 43B1 | Leisundet | 70° 13.56 | 21° 23.81 | | GADU MOR | MU | | | | | | | | | | | | | | | | | | | | | | | | | | 30 | 30 | |
| 43F1 | Leisundet | 70° 13.43 | 21° 23.84 | | PLEU PLA | LI | | | | | | | | | | | | | | | | | | | | | | | | | | 4 | 5 | |
| 43F1 | Leisundet | 70° 13.43 | 21° 23.84 | | PLEU PLA | MU | | | | | | | | | | | | | | | | | | | | | | | | | | 4 | 5 | |
| 43B | Kvænangen (Olderfjord) | 70° 13.56 | 21° 23.81 | 69H16 | GADU MOR | LI | | | | | | | | | | | | | | 25 | 25 | 25 | | | | | | | | | | | | 20 |
| 43B | Kvænangen (Olderfjord) | 70° 13.56 | 21° 23.81 | 69H16 | GADU MOR | MU | | | | | | | | | | | | | | 30 | 30 | 30 | | | | | | | | | | | | 24 |
| 43G | Skjervøy | 70° 2.17 | 20° 59.76 | 69H09 | NUCE LAP | SB | | | | | | | | | | | | | | | | | | | | 1 | | | | | | 2 | | |
| 43F | Kvænangen (Olderfjord) | 70° 13.43 | 21° 23.84 | 69H16 | LIMA LIM | LI | | | | | | | | | | | | | | | | 3 | | | | | | | | | | | | |
| 43F | Kvænangen (Olderfjord) | 70° 13.43 | 21° 23.84 | 69H16 | LIMA LIM | MU | | | | | | | | | | | | | | | | 3 | | | | | | | | | | | | |

| jmpst | stnam | nomlat | nomlon | icear | speci | tissu | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 43F | Kvænangen (Olderfjord) | 70° 13.43 | 21° 23.84 | 69H16 | MICR KIT | LI | | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | |
| 43F | Kvænangen (Olderfjord) | 70° 13.43 | 21° 23.84 | 69H16 | MICR KIT | MU | | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | |
| 44A | Elenheimsundet | 70° 30.97 | 22° 14.76 | 70H23 | MYTI EDU | SB | | | | | | | | | | | | | | 3 | 3 | 4 | 3 | | | | | | | | | 3 | 3 | |
| 44G | Alta | 69° 59.4 | 23° 18.35 | 68H31 | NUCE LAP | SB | | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | |
| 44G1 | Elenheimsundet | 70° 30.97 | 22° 14.73 | | NUCE LAP | SB | | | | | | | | | | | | | | | | | | | | | | | | | | 2 | | |
| 45A | Sauhamneset | 70° 45.82 | 24° 19.2 | 70H42 | MYTI EDU | SB | | | | | | | | | | | | | | 3 | 3 | | | | | | | | | | | 3 | 3 | |
| 45G | Sauhamneset | 70° 45.82 | 24° 19.2 | 70H42 | NUCE LAP | SB | | | | | | | | | | | | | | | | | | | | 1 | | | | | | 2 | | |
| 45B | Hammerfest area | 70° 46 | 24° 6.5 | | GADU MOR | LI | | | | | | | | | | | | | | 24 | 25 | | | | | | | | | | | | | |
| 45B1 | Revsbotn | 70° 46 | 24° 6.5 | | GADU MOR | LI | | | | | | | | | | | | | | | | | | | | | | | | | | 25 | 25 | |
| 45B | Hammerfest area | 70° 46 | 24° 6.5 | | GADU MOR | MU | | | | | | | | | | | | | | 29 | 30 | | | | | | | | | | | | | |
| 45B1 | Revsbotn | 70° 46 | 24° 6.5 | | GADU MOR | MU | | | | | | | | | | | | | | | | | | | | | | | | | | 30 | 30 | |
| 45F | Hammerfest area | 70° 40 | 24° 40 | | PLEU PLA | LI | | | | | | | | | | | | | | | | | | | | | | | | | | 5 | 5 | |
| 45F | Hammerfest area | 70° 40 | 24° 40 | | PLEU PLA | MU | | | | | | | | | | | | | | | | | | | | | | | | | | 5 | 5 | |
| 46A | Smines (Altesula) | 70° 58.37 | 25° 48.1 | 70H57 | MYTI EDU | SB | | | | | | | | | | | | | | 3 | 3 | 5 | | | | | | | | | | 3 | 3 | |
| 46H | Honningsvåg | 70° 59.11 | 25° 57.96 | | MYTI EDU | SB | | | | | | | | | | | | | | | | | | | | | | | | | | 3 | | |
| 46H | Honningsvåg | 70° 59.11 | 25° 57.96 | | NUCE LAP | SB | | | | | | | | | | | | | | | | | | | | 1 | | | | | | 2 | | |
| 47A | Kifjordneset | 70° 52.87 | 27° 22.19 | 70H74 | MYTI EDU | SB | | | | | | | | | | | | | | 3 | 3 | | | | | | | | | | | 2 | 3 | |
| 47G | Kifjordneset | 70° 52.87 | 27° 22.19 | 70H74 | NUCE LAP | SB | | | | | | | | | | | | | | | | | | | | 1 | | | | | | 2 | | |
| 48A | Trollfjorden (Tanafjord) | 70° 41.61 | 28° 33.28 | 70H85 | MYTI EDU | SB | | | | | | | | | | | | | | 3 | 3 | 3 | | | | | | | | | | 3 | 3 | |
| 48G | Mehamn | 71° 2.55 | 27° 50.35 | 71H79 | NUCE LAP | SB | | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | |
| 48G1 | Trollfjorden (Tanafjord) | 70° 41.61 | 28° 33.28 | | NUCE LAP | SB | | | | | | | | | | | | | | | | | | | | | | | | | | 2 | | |
| 49G | Syltefjorden | 70° 33.01 | 30° 5.17 | | NUCE LAP | SB | | | | | | | | | | | | | | | | | | | | | | | | | | 2 | | |
| 49A | Nordfjorden (Syltefjord) | 70° 33.01 | 30° 5.17 | 70J03 | MYTI EDU | SB | | | | | | | | | | | | | | 3 | 3 | | | | | | | | | | | 3 | 3 | |
| 10A1 | Skagodden | 70° 6.21 | 30° 15.75 | | MYTI EDU | SB | | | | | | | | | | | | | | 3 | 3 | | | | | | | | | | | | | |
| 10A2 | Skallneset | 70° 6.21 | 30° 15.75 | 69J06 | MYTI EDU | SB | | | | | | | | | | | | | | | | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 10G3 | Vardø | 70° 22.65 | 31° 6.5 | | NUCE LAP | SB | | | | | | | | | | | | | | | | | | | | | | | | | | 2 | | |
| 10G4 | Vadsø | 70° 4.48 | 29° 42.9 | | NUCE LAP | SB | | | | | | | | | | | | | | | | | | | | | | | | | | 2 | | |
| 10B | Varangerfjorden | 69° 56 | 29° 40 | 68H97 | GADU MOR | BI | | | | | | | | | | | | | | | | | | | | 22 | 21 | | | | | | | |
| 10B | Varangerfjorden | 69° 56 | 29° 40 | 68H97 | GADU MOR | BL | | | | | | | | | | | | | | | | | | | | 25 | 25 | | | | | | | |
| 10B | Varangerfjorden | 69° 56 | 29° 40 | 68H97 | GADU MOR | LI | | | | | | | | | | | | | | 21 | 25 | 25 | 23 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 10 | 25 | 25 |
| 10B | Varangerfjorden | 69° 56 | 29° 40 | 68H97 | GADU MOR | MU | | | | | | | | | | | | | | 25 | 30 | 30 | 27 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 12 | 30 | 30 |
| 10B | Varangerfjorden | 69° 56 | 29° 40 | 68H97 | BROS BRO | LI | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | |
| 10B | Varangerfjorden | 69° 56 | 29° 40 | 68H97 | BROS BRO | MU | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | |
| 10F | Skogerøy | 69° 55 | 29° 51 | 68H97 | PLEU PLA | BI | | | | | | | | | | | | | | | | | | | | 15 | 25 | | | | | | | |
| 10F | Skogerøy | 69° 55 | 29° 51 | 68H97 | PLEU PLA | BL | | | | | | | | | | | | | | | | | | | | 11 | 24 | | | | | | | |
| 10F | Skogerøy | 69° 55 | 29° 51 | 68H97 | PLEU PLA | LI | | | | | | | | | | | | | | | | | 5 | | 4 | 18 | 30 | 5 | 4 | 4 | 5 | | 4 | 2 |
| 10F | Skogerøy | 69° 55 | 29° 51 | 68H97 | PLEU PLA | MU | | | | | | | | | | | | | | | | | 5 | | 4 | 3 | 5 | 5 | 4 | 4 | 5 | | 4 | 2 |
| 11A1 | Sildkrokneset (south) | 69° 47.11 | 30° 11.1 | | MYTI EDU | SB | | | | | | | | | | | | | | 3 | 3 | | | | | | | | | | | | | |
| 11A2 | Sildkrokneset (north) | 69° 47.11 | 30° 11.1 | | MYTI EDU | SB | | | | | | | | | | | | | | | | 4 | 3 | | | | | | | | | | | |
| 11G | Brashavn | 69° 53.92 | 29° 44.65 | 68H97 | NUCE LAP | SB | | | | | | | | | | | | | | | | | | | | | | 1 | 1 | 2 | 2 | 2 | 2 | 2 |
| 11X | Brashavn | 69° 53.92 | 29° 44.65 | 68H97 | MYTI EDU | SB | | | | | | | | | | | | | | | | | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| I001 | Sponvikskansen | 59° 5.41 | 11° 12.61 | 47G13 | MYTI EDU | SB | | | | | | | | | | | | | | | 3 | 3 | | | | | | | | | | | | |
| I011 | Kråkenebbet | 59° 6.05 | 11° 17.33 | 47G13 | MYTI EDU | SB | | | | | | | | | | | | | | | 3 | 3 | | | | | | | | | | | | |
| I021 | Kjøkø (south) | 59° 7.79 | 10° 57.11 | 47G09 | MYTI EDU | SB | | | | | | | | | | | | | | | 3 | 3 | 3 | 3 | | 3 | 3 | 3 | | | | | | |
| I022 | West Damholmen | 59° 6.11 | 11° 2.69 | 47G09 | MYTI EDU | SB | | | | | | | | | | | | | | | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| I023 | Singlekalven (south) | 59° 5.7 | 11° 8.2 | 47G13 | MYTI EDU | SB | | | | | | | | | | | | | | | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| I024 | Kirkøy (north west) | 59° 4.8 | 10° 59.18 | 47G09 | MYTI EDU | SB | | | | | | | | | | | | | | | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| I301 | Akershuskaia | 59° 54.32 | 10° 44.18 | 48G07 | MYTI EDU | SB | | | | | | | | | | | | | | | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| I304 | Gåsøya | 59° 51.08 | 10° 35.34 | 48G04 | MYTI EDU | SB | | | | | | | | | | | | | | | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| I306 | Håøya | 59° 42.8 | 10° 33.31 | 48G05 | MYTI EDU | SB | | | | | | | | | | | | | | | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| I307 | Ramtonholmen | 59° 44.67 | 10° 31.37 | 48G05 | MYTI EDU | SB | | | | | | | | | | | | | | | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| I711 | Steinholmen | 59° 3.11 | 9° 40.62 | 47F99 | MYTI EDU | SB | | | | | | | | | | | | | | | 3 | 4 | 3 | 3 | 3 | 3 | | 3 | | | | | | |
| I712 | Gjemesholmen | 59° 2.72 | 9° 42.41 | 47F99 | MYTI EDU | SB | | | | | | | | | | | | | | | 3 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| I713 | Strømtangen | 59° 3.02 | 9° 41.5 | 47F99 | MYTI EDU | SB | | | | | | | | | | | | | | | | | | | | | | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| I131 | Lastad | ° | ° | 45F79 | MYTI EDU | SB | | | | | | | | | | | | | | | | | | | | | | | | | | | | 3 |
| I131A | Lastad | 58° 3.33 | 7° 42.52 | | MYTI EDU | SB | | | | | | | | | | | | | | | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | |
| I132 | Svensholmen | 58° 7.5 | 7° 59.33 | 45F79 | MYTI EDU | SB | | | | | | | | | | | | | | | | | | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 4 |
| I1321 | Fiskåtangen | 58° 7.7 | 7° 58.6 | | MYTI EDU | SB | | | | | | | | | | | | | | | 4 | 4 | 3 | | | | | | | | | | | |
| I133 | Odderø (west) | 58° 7.9 | 8° 0.1 | 45F83 | MYTI EDU | SB | | | | | | | | | | | | | | | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| I201 | Ekkjegrunn (G1) | 59° 38.6 | 6° 21.44 | 48F66 | MYTI EDU | SB | | | | | | | | | | | | | | | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| I205 | Bølsnes (G5) | 59° 35.5 | 6° 18.01 | 48F63 | MYTI EDU | SB | | | | | | | | | | | | | | | 3 | | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| I241 | Nordnes | 60° 24.04 | 5° 18.1 | 49F51 | MYTI EDU | SB | | | | | | | | | | | | | | | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| I242 | Gravdalsneset | 60° 23.69 | 5° 16.01 | 49F51 | MYTI EDU | SB | | | | | | | | | | | | | | | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| I916 | Sundalsfjord (Hydro kai) | 62° 41.05 | 8° 33.11 | 54F85 | MYTI EDU | SB | | | | | | | | | | | | | | | | | | | | | | | | | 3 | 3 | | |
| I243 | Hegreneset | 60° 24.92 | 5° 18.29 | 49F51 | MYTI EDU | SB | | | | | | | | | | | | | | | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| I914 | Flåøya (southeast) | 62° 45.35 | 8° 26.7 | 54F85 | MYTI EDU | SB | | | | | | | | | | | | | | | | | | | | | | | 3 | | | | | |
| I915 | Flåøya (northwest) | 62° 45.48 | 8° 26.39 | 54F85 | MYTI EDU | SB | | | | | | | | | | | | | | | | | | | | | | | 3 | 3 | 3 | 3 | 3 | 3 |
| I911 | Horvika | 62° 44.1 | 8° 31.4 | 54F85 | MYTI EDU | SB | | | | | | | | | | | | | | | 3 | 3 | | | | | | | | | | | | |
| I913 | Fjøseid | 62° 48.59 | 8° 16.48 | 54F82 | MYTI EDU | SB | | | | | | | | | | | | | | | | | | | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| I912 | Honnhammer | 62° 51.2 | 8° 9.7 | 54F81 | MYTI EDU | SB | | | | | | | | | | | | | | | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

| jmpst | stnam | nomlat | nomlon | icear | speci | tissu | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| I080 | Østmerknes | 63° 27.44 | 10° 26.97 | 55G04 | MYTI EDU | SB | | | | | | | | | | | | | | | 3 | 3 | | | | | | | | | | | | |
| I965 | Moholmen (B5) | 66° 18.72 | 14° 7.55 | 61G42 | MYTI EDU | SB | | | | | | | | | | | | | | | | | | | | | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 4 |
| I962 | Koksverktomta (B2) | 66° 19.57 | 14° 8.38 | 61G42 | MYTI EDU | SB | | | | | | | | | | | | | | | 3 | 3 | 2 | 3 | | | | | | | | | | |
| I964 | Toraneskaien | 66° 19.3 | 14° 7.97 | 61G42 | MYTI EDU | SB | | | | | | | | | | | | | | | | | | | | | | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| I969 | Bjørnbærviken (B9) | 66° 16.81 | 14° 2.08 | 61G42 | MYTI EDU | SB | | | | | | | | | | | | | | | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| R096 | Breiviken (Tomma) | 66° 17.65 | 12° 50.48 | 61G28 | MYTI EDU | SB | | | | | | | | | | | | | | | 3 | 3 | | | | | | | | | | | | |
| A3* | Svartskjær | ° | ° | 46F97 | MYTI EDU | SB | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | |

# Appendix H
# Map of stations

**Nominel station positions 1981-2008**
**(cf. Appendix I and Appendix M)**

# Appendix H (cont.) Map of stations

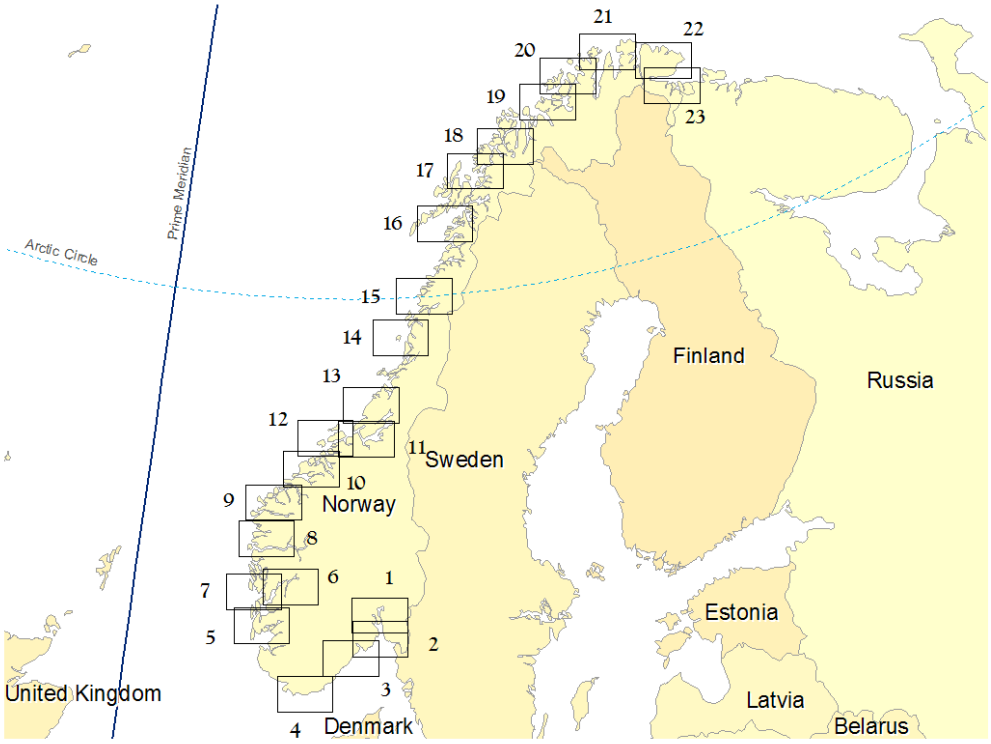
## NOTES

The station's nominal position is plotted, and not the specific positions that may have differed from one year to another. The maps are generated using ArcGIS version 9.1.

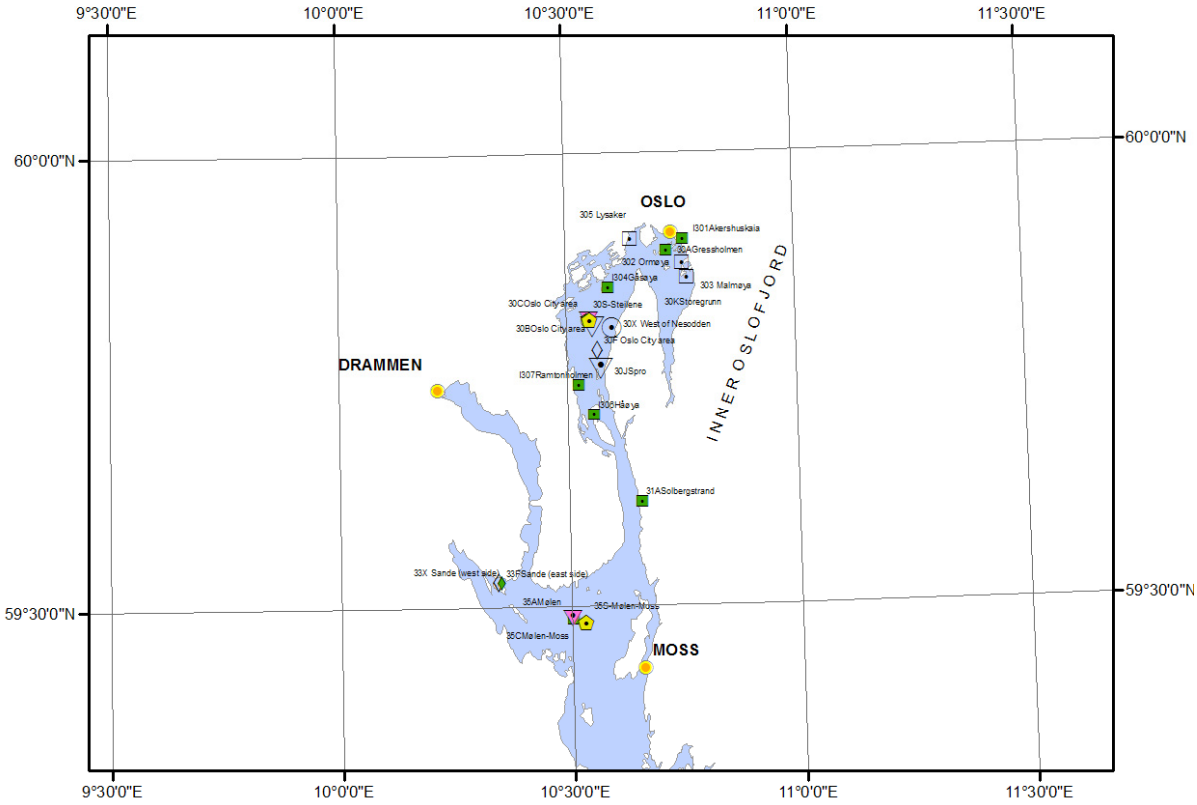
The following symbols and codes apply:

| All years | 2008 | Explanation | Station code |
|---|---|---|---|
|  |  | Sediment | <number>S |
|  |  | Blue mussel | <number>A |
|  |  | Blue mussel | I<number/letter> [1] |
|  |  | Blue mussel | R<number/letter> [1] |
|  |  | Dogwhelk | <number>F |
|  |  | Prawn | <number>C |
|  |  | Atlantic cod | <number>A |
|  |  | Flatfish | <number>D/E |
|  |  | Other round fish | |
|  | | Town or city | |

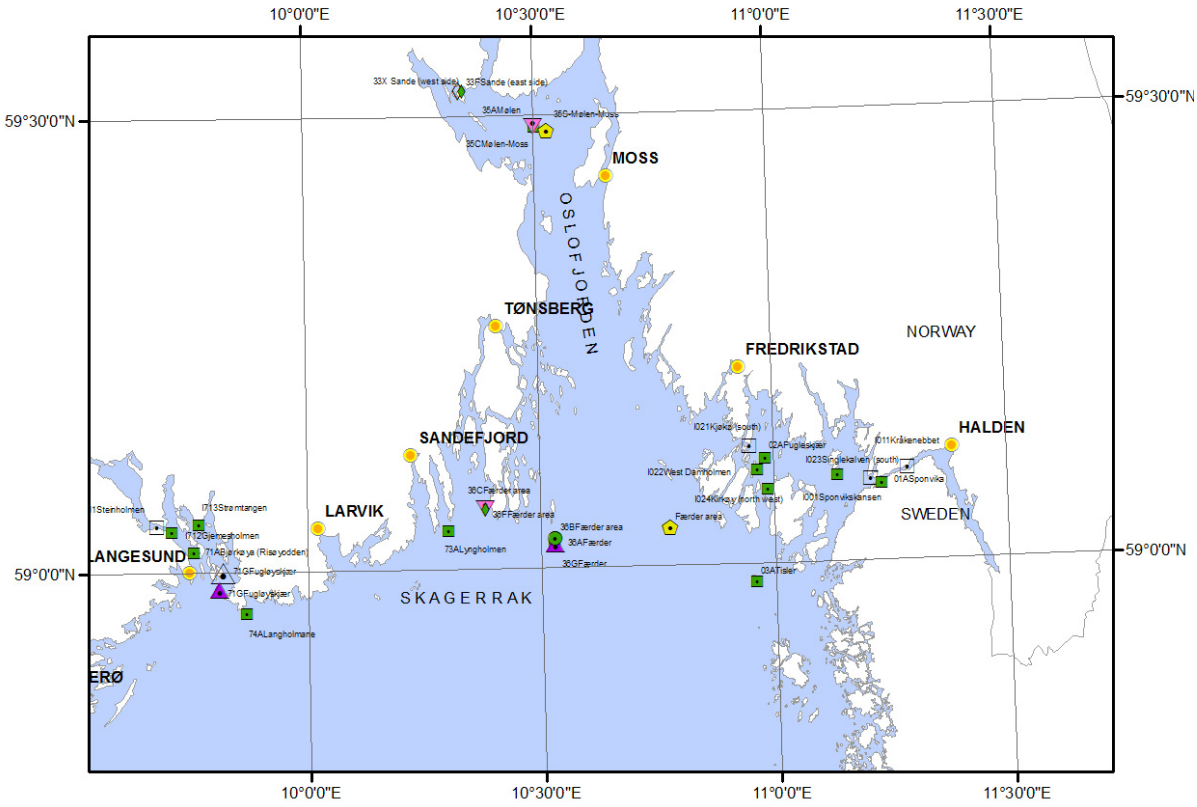
1) Supplementary station used in Klif blue mussel pollution (I) or reference (R) index (cf. Appendix M).



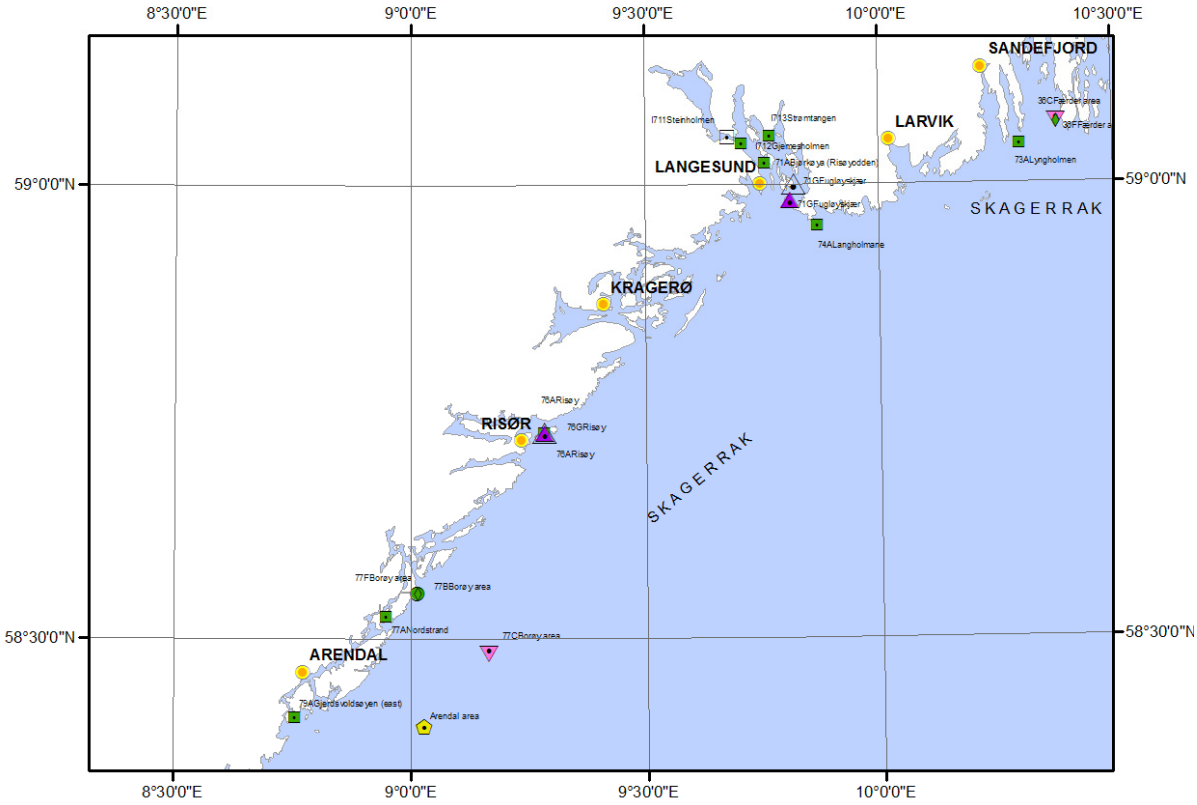

CEMP stations Norway. Numbers indicate map reference that follow.
Note: distance between two lines of latitude is 15 nautical miles (= 27.8 km).


9°30'0"E
10°0'0"E
10°30'0"E
11°0'0"E
11°30'0"E
60°0'0"N
59°30'0"N
OSLO
305 Lysaker
I301Akershuskaia
302A Gressholmen
302 Ormøya
I304Gåsøya
303 Malmøya
30COslo City area
30S-Steilene
30KStoregrunn
30BOslo City area
30X West of Nesodden
30F Oslo City area
DRAMMEN
I307Ramtonkilomen
30JSpro
I306Håøya
INNER OSLOFJORD
31ASolbergstrand
33X Sande (west side)
33FSande (east side)
35AMalen
35C-Malen-Moss
35CMalen-Moss
MOSS

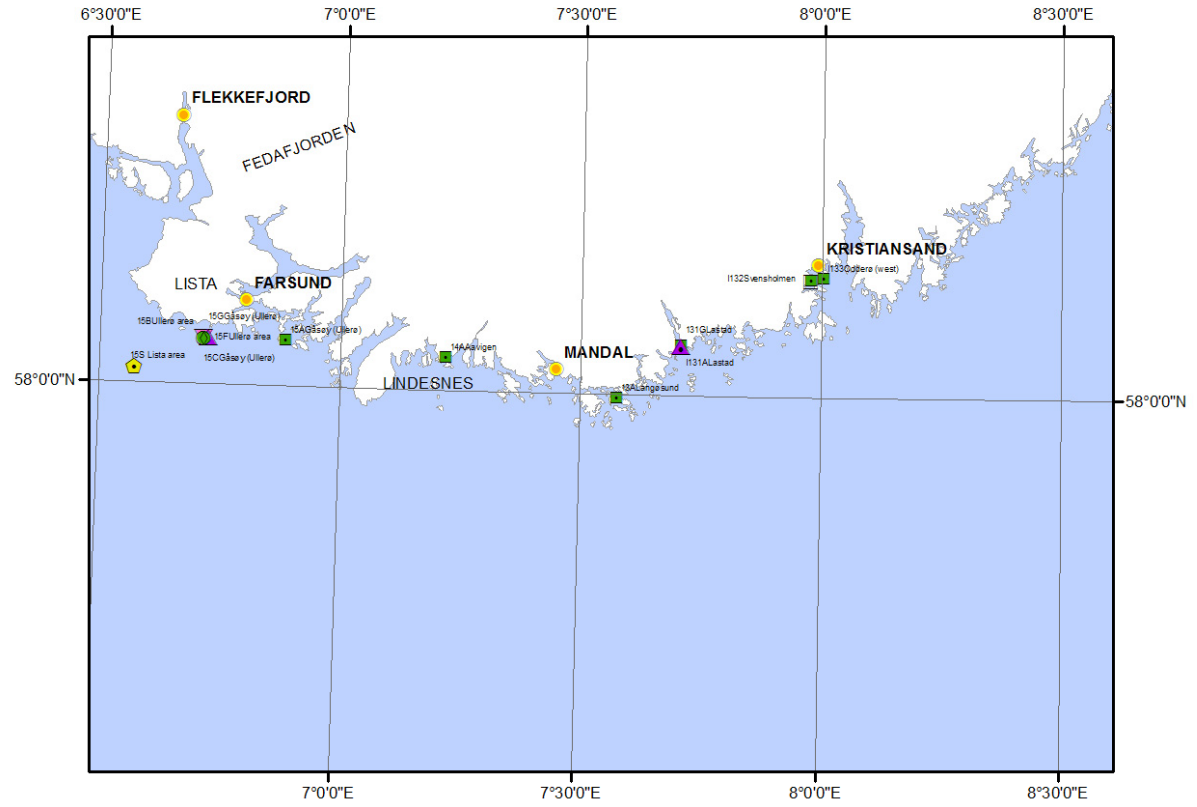
**MAP 1**


10°0'0"E
10°30'0"E
11°0'0"E
11°30'0"E
59°30'0"N
59°0'0"N
33X Sande (west side)
33FSande (east side)
35AMalen
35C-Malen-Moss
35CMalen-Moss
MOSS
OSLOFJORDEN
TØNSBERG
NORWAY
FREDRIKSTAD
I021Kjøkø (south)
02APugleskjær
I022West Dammholmen
I023Singlekalven (south)
01ASponvika
I001Sponvikskansen
HALDEN
011Kråkenebbet
SANDEFJORD
35CFærder area
36FFærder area
36BFærder area
36AFærder
36GFærder
Færder area
I024Kirkøy (north west)
LARVIK
SWEDEN
1Steinholmen
I713Strømtangen
I712Gjeitesholmen
71AEgerkøya (Risøyodden)
71GFugleøystjær
71GFugleøyskjær
74ALangholmane
73ALyngholmen
LANGESUND
SKAGERRAK
03ATisler
ERØ

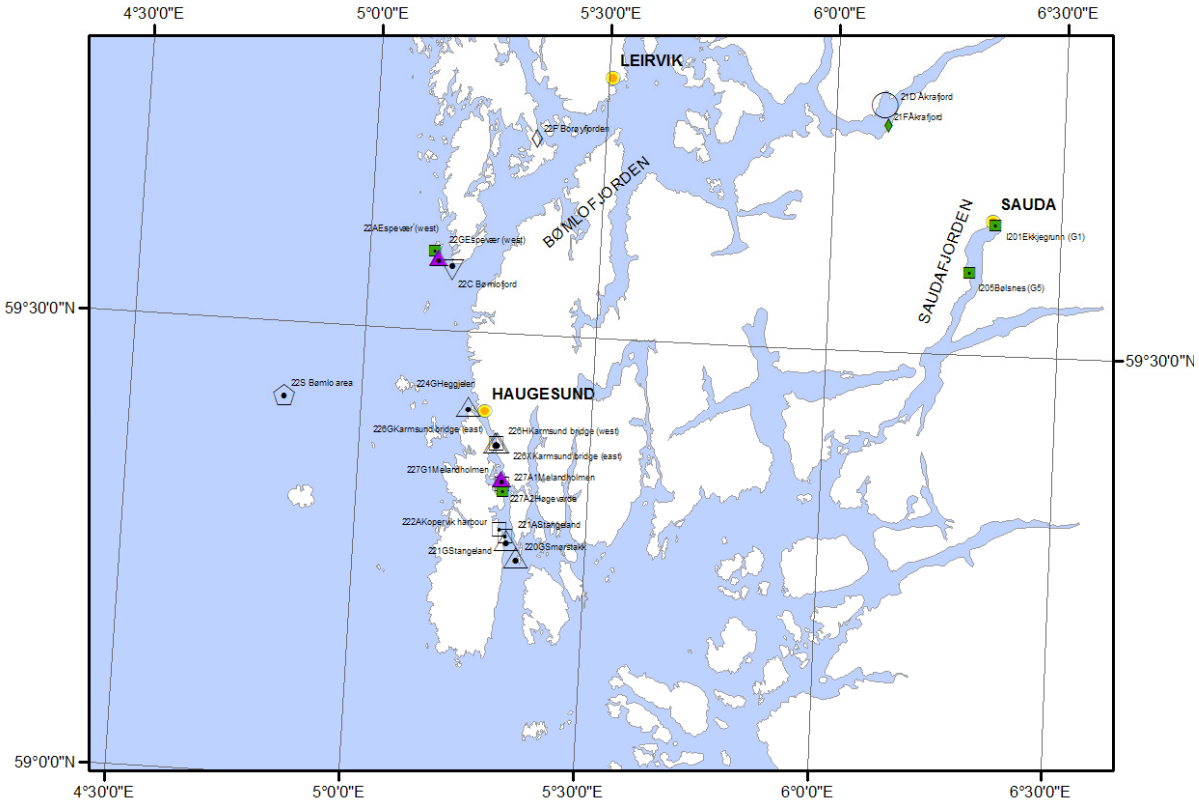
**MAP 2**


8°30'0"E
9°0'0"E
9°30'0"E
10°0'0"E
10°30'0"E
59°0'0"N
58°30'0"N
SANDEFJORD
LARVIK
LANGESUND
KRAGERØ
RISØR
ARENDAL
SKAGERRAK
SKAGERRAK
36CFærder area
36FFærder a
I711Steinholmen
I713Strømtangen
I712Gjemesholmen
71ABjørkøya (Risøyodden
71GFuglaskjær
71GFuglaskjær
73ALyngholmen
74ALangholmane
76ARisøy
76GRisøy
76ARisøy
77FBorøy area
77BBorøy area
77ANordstrand
77CBorøy area
75AGjeldsvoldsøyen (east)
Arendal area

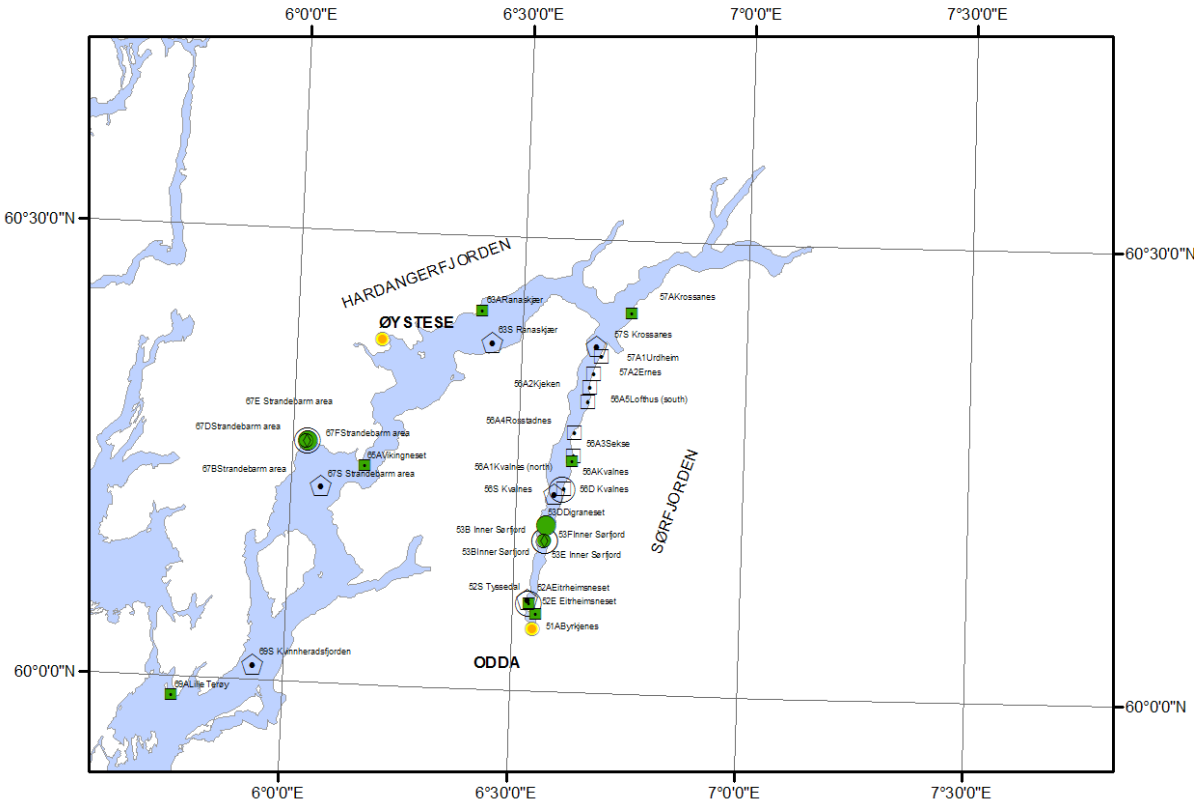
**MAP 3**


6°30'0"E
7°0'0"E
7°30'0"E
8°0'0"E
8°30'0"E
58°0'0"N
FLEKKEFJORD
FEDAFJORDEN
LISTA
FARSUND
KRISTIANSAND
MANDAL
LINDESNES
I132Svensholmen
I133Odderø (west)
131GLaastad
I131ALaastad
15BUllerø area
15GGåsøy (Ullerø)
15AGåsøy (Ullerø)
15FUllerø area
15S Lista area
15CGåsøy (Ullerø)
14AAdsvigen
13ALangesund

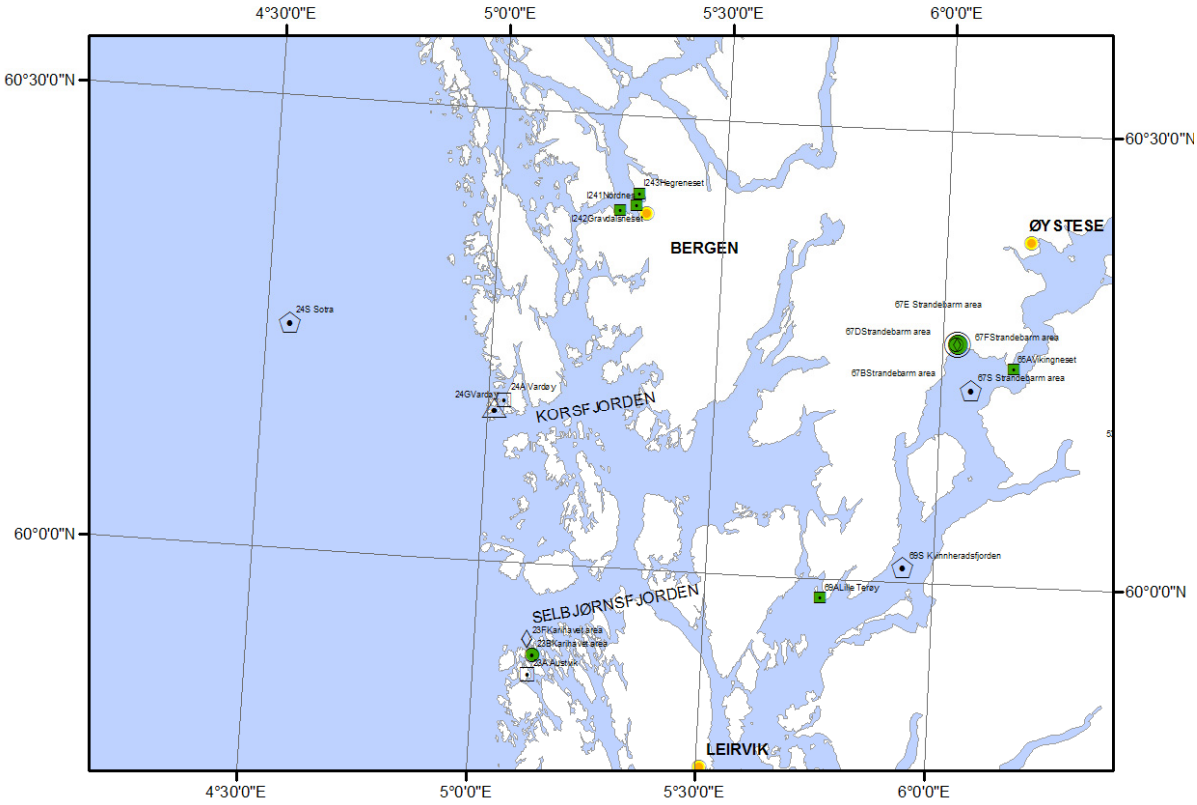
**MAP 4**


4°30'0"E
5°0'0"E
5°30'0"E
6°0'0"E
6°30'0"E
59°30'0"N
59°0'0"N
LEIRVIK
HAUGESUND
SAUDA
BØMLOFJORDEN
SAUDAFJORDEN
21D Åkrafjord
21FÅkrafjord
22F Børøyfjorden
22AEspevær (west)
22GEspevær (west)
22C Bømlofjord
22S Bømlo area
224GHeggjeler
226GKarmsundbridge (east)
226HKarmsund bridge (west)
226KKarmsundbridge (east)
227G1Melandholmen
227A1Melandholmen
227A2Hogevikø
222AKopervik harbour
221AStangeland
221GStangeland
220GSmørstakk
I201Ekkjegrunn (G1)
I205Bølsnes (G5)

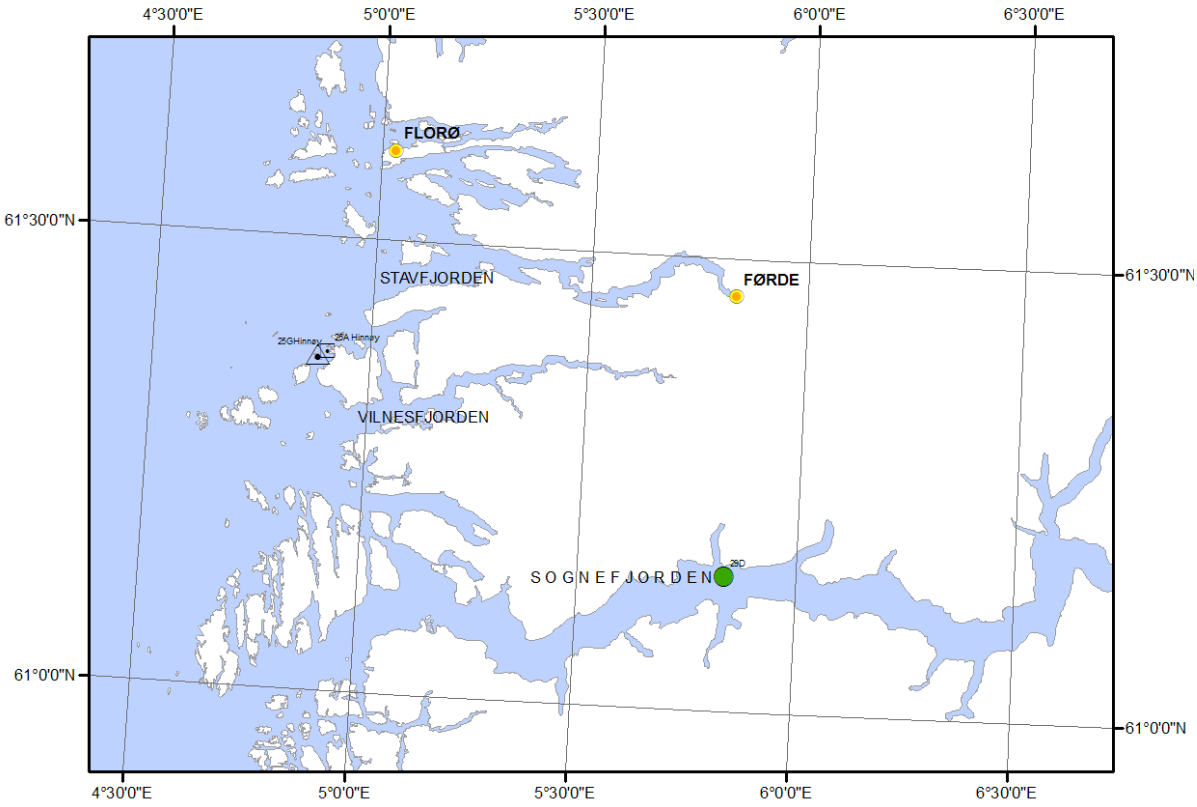
**MAP 5**


6°0'0"E
6°30'0"E
7°0'0"E
7°30'0"E
60°30'0"N
60°0'0"N
HARDANGERFJORDEN
SØRFJORDEN
ØYSTESE
ODDA
69ARanaskjær
69S Ranaskjær
57AKrossanes
57S Krossanes
57A1Urdheim
57A2Ernes
56A2Kjeken
56A5Lofthus (south)
56A4Rosstadnes
56A3Sekse
56AKvalnes
56D Kvalnes
56S Kvalnes
56A1Kvalnes (north)
56DDigraneset
53B Inner Sørfjord
53FInner Sørfjord
53BInner Sørfjord
53E Inner Sørfjord
52S Tyssedal
52AEitrheimsneset
52E Eitrheimsneset
51AByrkjenes
67E Strandebarm area
67DStrandebarm area
67FStrandebarm area
67BStrandebarm area
67S Strandebarm area
66AVikingneset
69S Kvinnheradsfjorden
69ALille Terøy

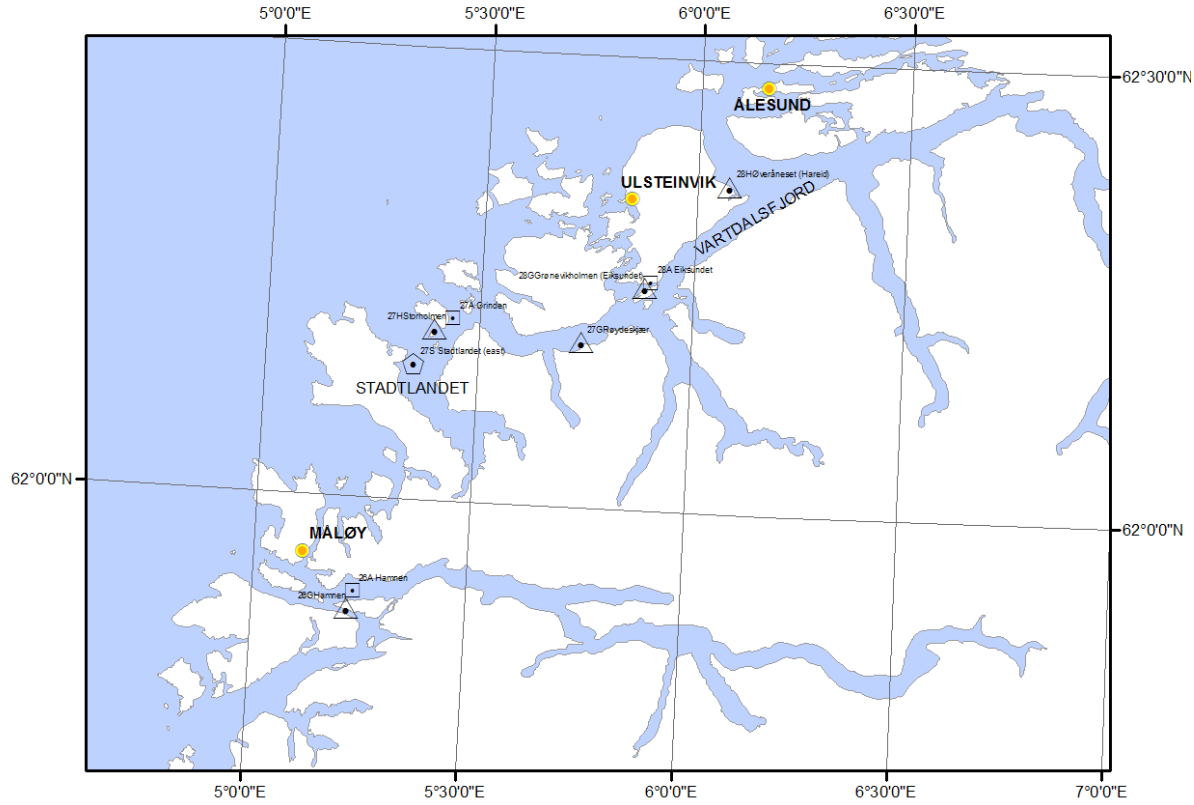
**MAP 6**


4°30'0"E
5°0'0"E
5°30'0"E
6°0'0"E
60°30'0"N
60°0'0"N
BERGEN
ØYSTESE
KORSFJORDEN
SELBJØRNSFJORDEN
LEIRVIK
24S Sotra
24A Vardøy
24G Vardøy
67E Strandebarm area
67D Strandebarm area
67F Strandebarm area
67B Strandebarm area
67S Strandebarm area
69S Kvinnheradsfjorden
69A Lille Terøy
23F Kvanhovet area
23B Kvanhovet area
23A Austvik

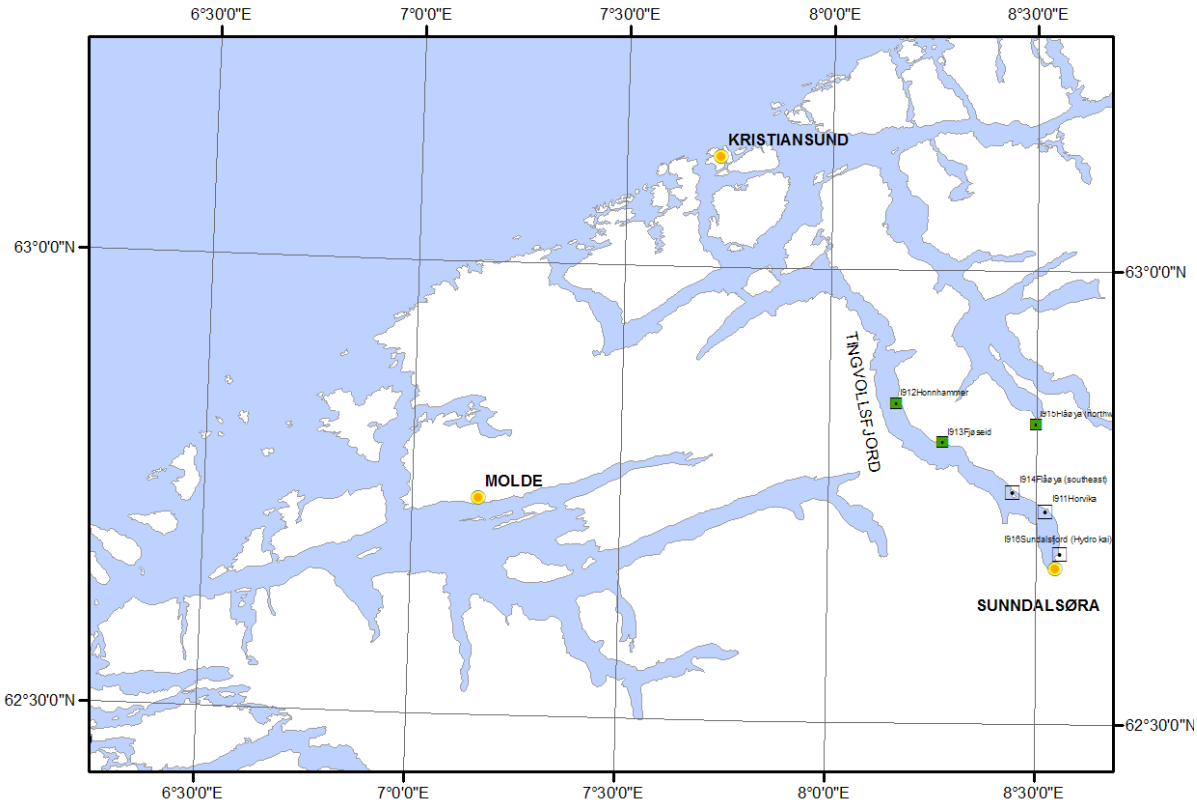
**MAP 7**


4°30'0"E
5°0'0"E
5°30'0"E
6°0'0"E
6°30'0"E
61°30'0"N
61°0'0"N
FLORØ
FØRDE
STAVFJORDEN
VILNESFJORDEN
SOGNEFJORDEN
25G Hinnøy
25A Hinnøy
29D

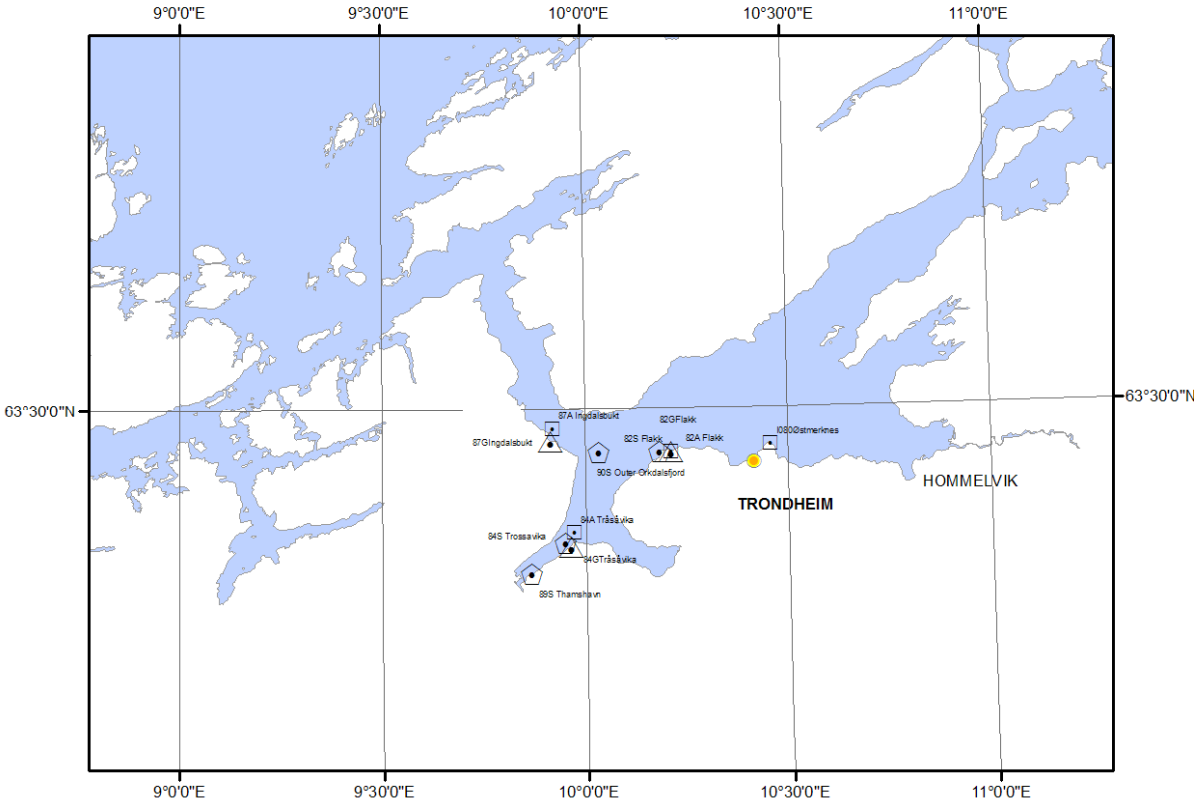
**MAP 8**


5°0'0"E
5°30'0"E
6°0'0"E
6°30'0"E
7°0'0"E
62°30'0"N
62°0'0"N
ÅLESUND
ULSTEINVIK
28HØveråneset (Hareid)
VARTDALSFJORD
28GGrønevikholmen (Eksundet)
28A Eiksundet
27A Grinden
27HStorholmen
27S Stadtlandet (east)
27GRøydeskjær
STADTLANDET
MÅLØY
28A Hamnen
28GHamnen

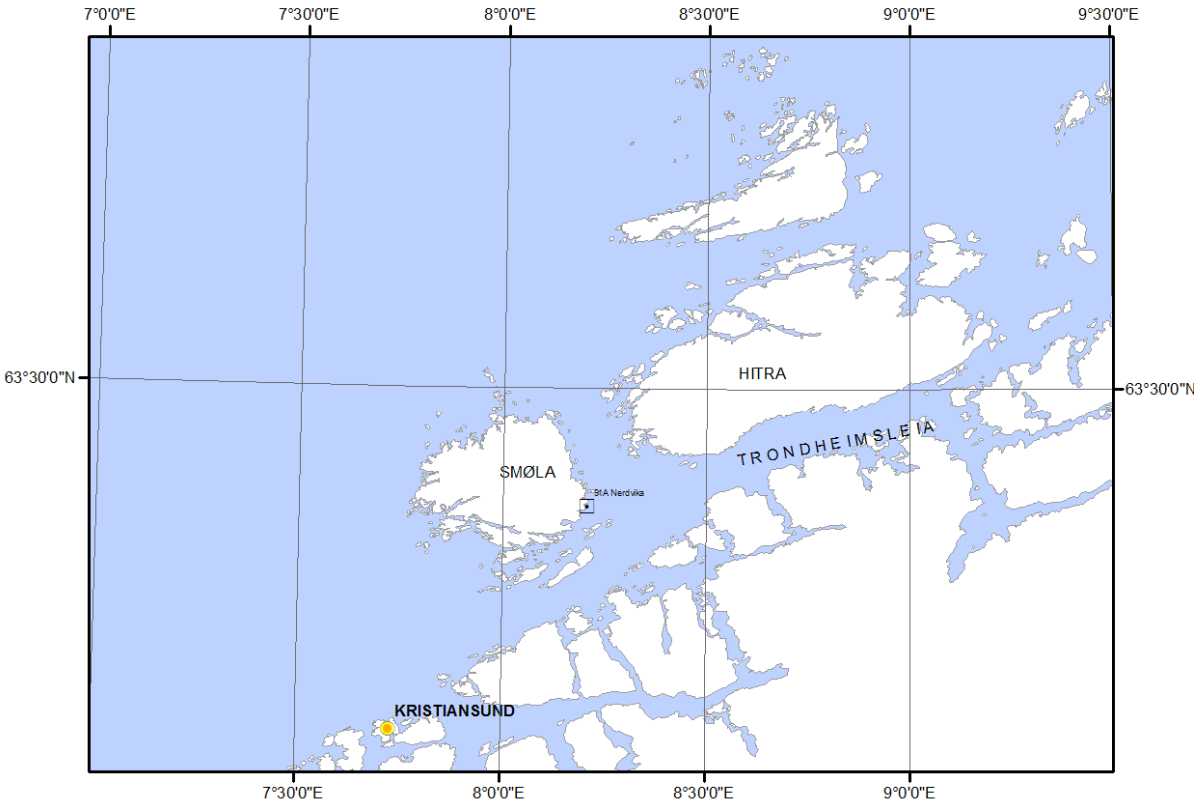
**MAP 9**


6°30'0"E
7°0'0"E
7°30'0"E
8°0'0"E
8°30'0"E
63°0'0"N
62°30'0"N
KRISTIANSUND
TINGVOLLSFJORD
I912Honnhammer
I913Fjæseid
I914Flåøya (southeast)
I911Horvika
I916Sunndalsfjord (Hydro kai)
MOLDE
SUNNDALSØRA

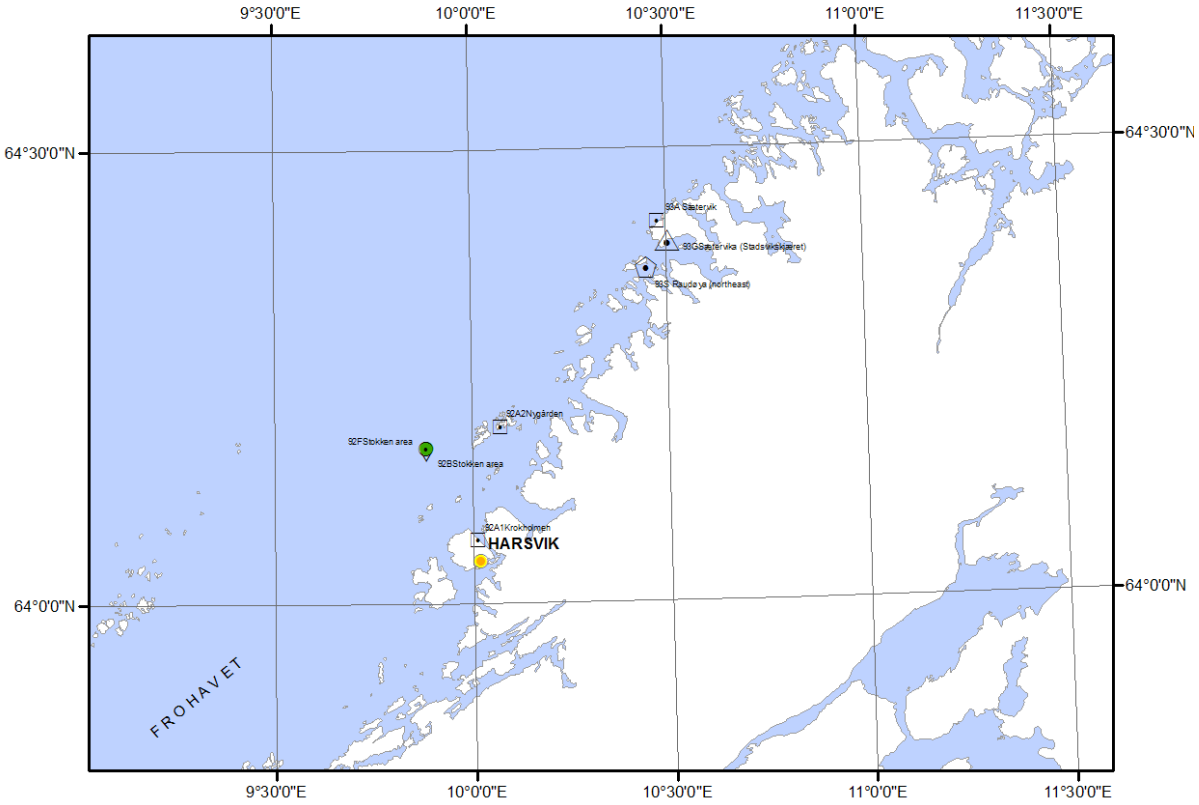
**MAP 10**


9°0'0"E
9°30'0"E
10°0'0"E
10°30'0"E
11°0'0"E
63°30'0"N
87A Ingdalsbukt
87GIngdalsbukt
82GFlakk
82S Flakk
82A Flakk
I080Østmerknes
90S Outer Orkdalsfjord
TRONDHEIM
HOMMELVIK
84A Tråsåvika
84S Trossavika
84GTråsåvika
89S Thamshavn

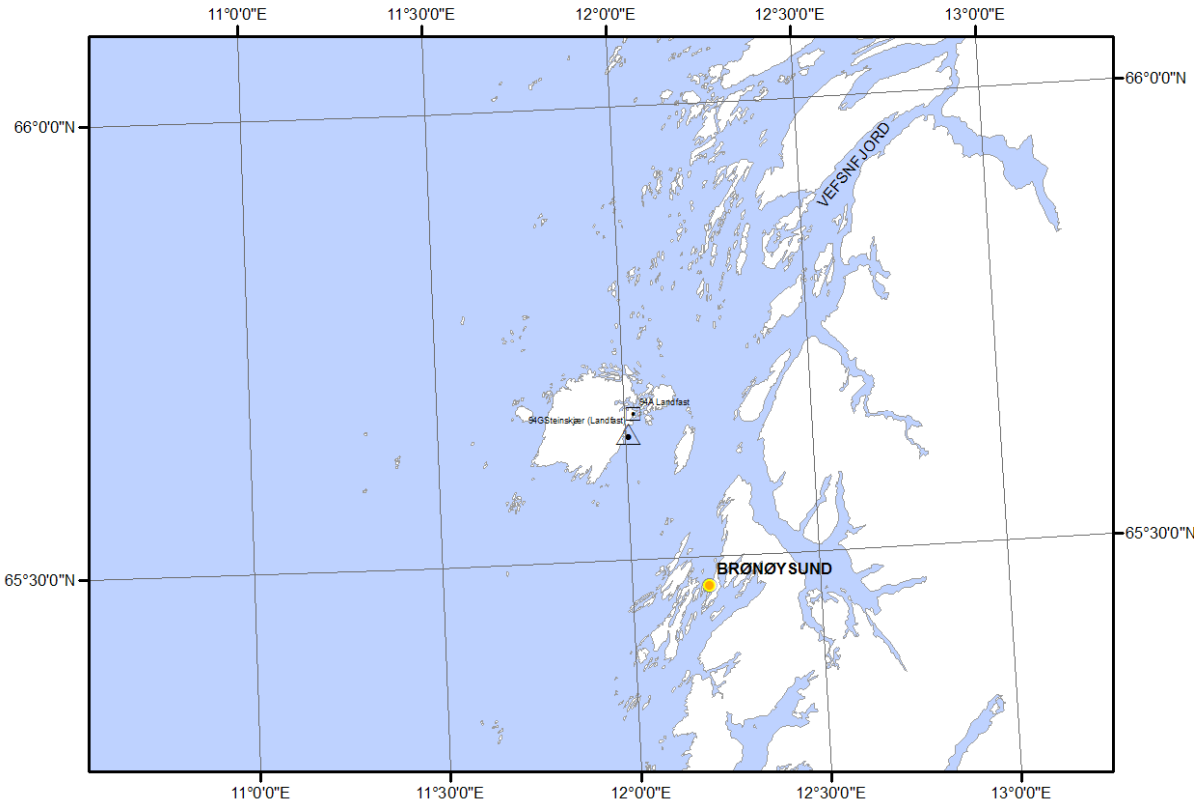
**MAP 11**


7°0'0"E
7°30'0"E
8°0'0"E
8°30'0"E
9°0'0"E
9°30'0"E
63°30'0"N
HITRA
TRONDHEIMSLEIA
SMØLA
91A Nerdvika
KRISTIANSUND

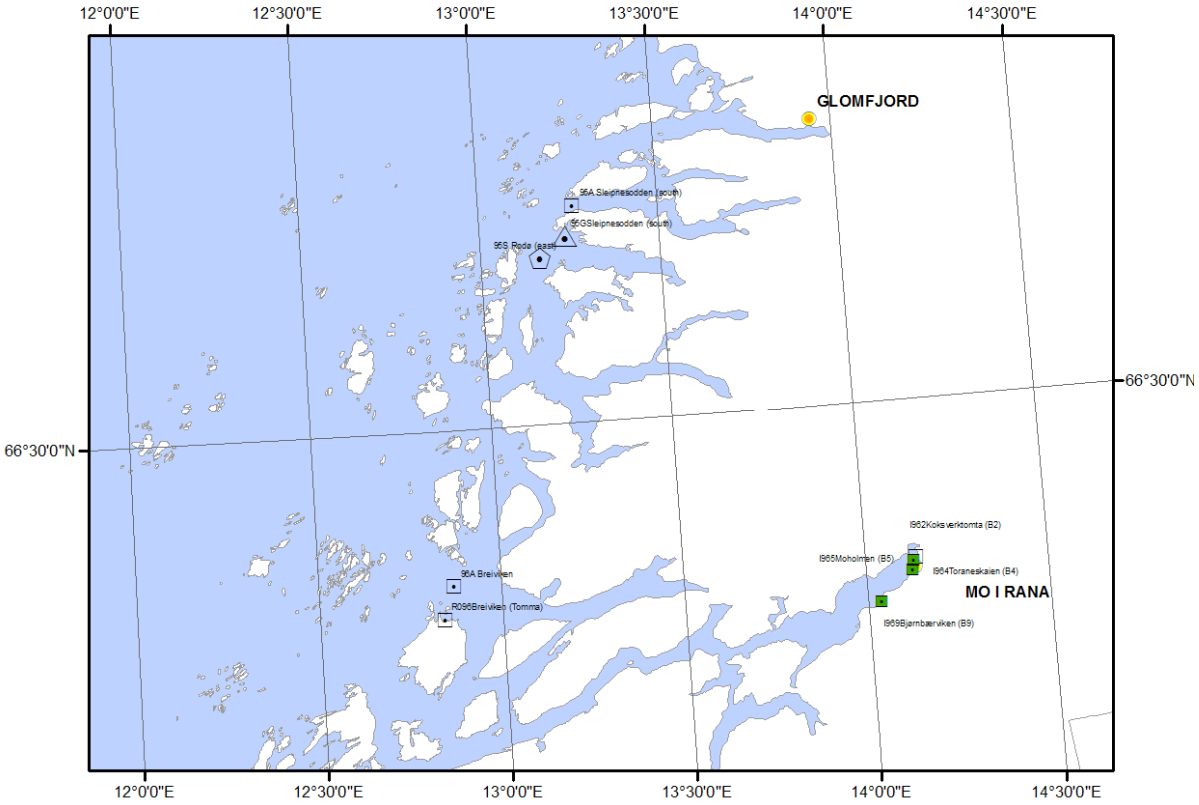
**MAP 12**


9°30'0"E
10°0'0"E
10°30'0"E
11°0'0"E
11°30'0"E
64°30'0"N
64°0'0"N
92A Slaterøy
92GSlaterøya (Stadsvikskjæret)
92B Raudøya (northeast)
92A2Nygården
92FStokken area
92BStokken area
92A1Krokholmen
HARSVIK
FROHAVET

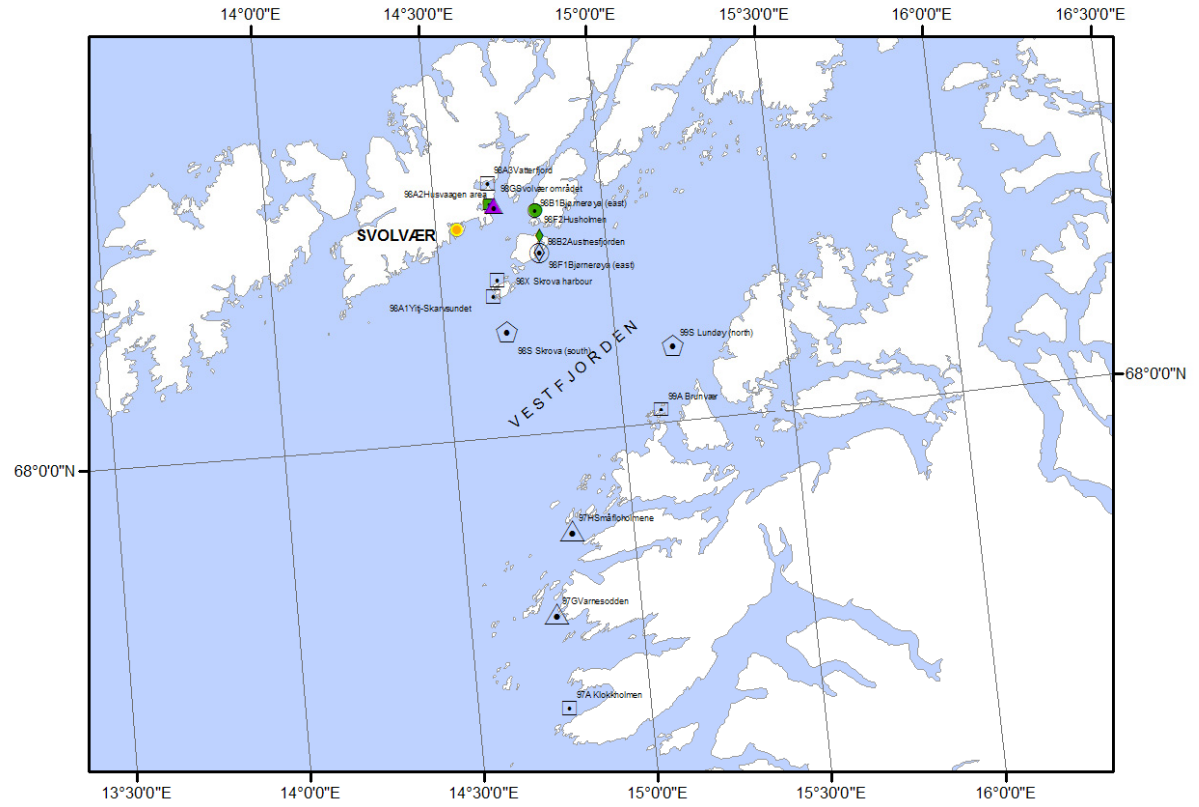
**MAP 13**


11°0'0"E
11°30'0"E
12°0'0"E
12°30'0"E
13°0'0"E
66°0'0"N
65°30'0"N
VEFSNFJORD
64A Landfast
64GSteinskjær (Landfast)
BRØNØYSUND

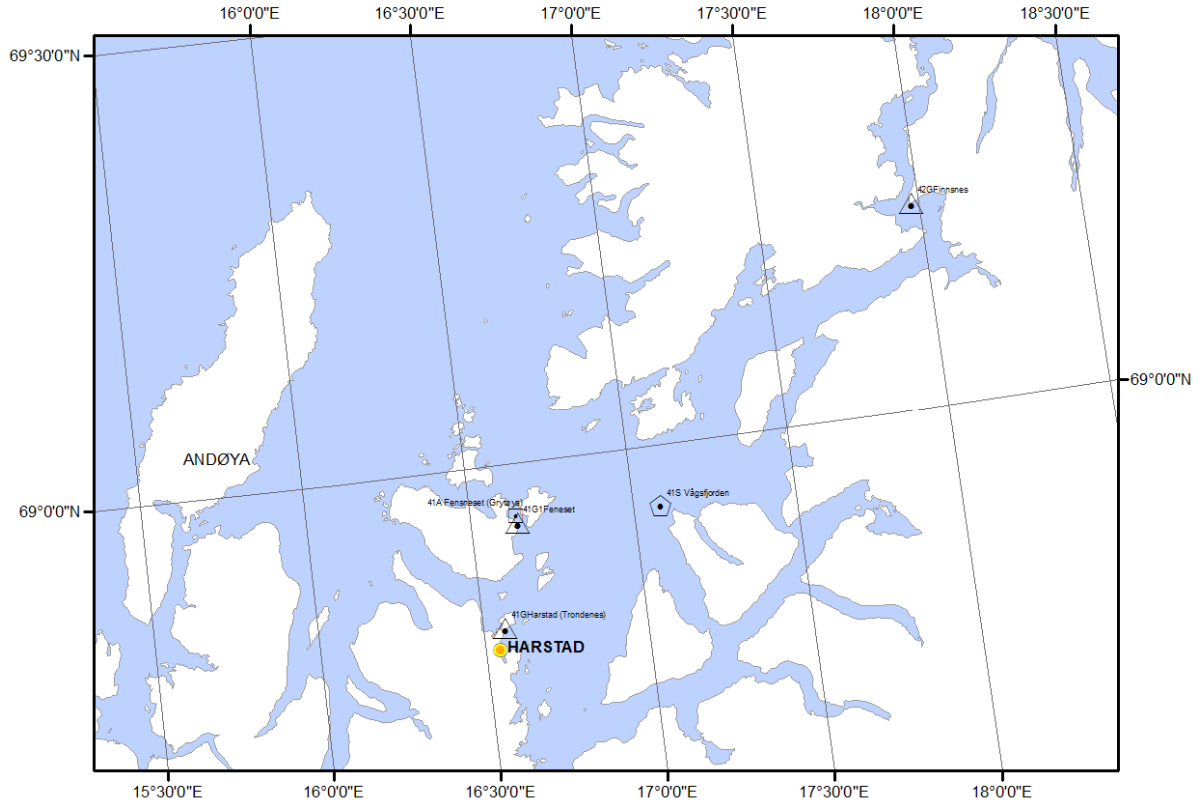
**MAP 14**


12°0'0"E
12°30'0"E
13°0'0"E
13°30'0"E
14°0'0"E
14°30'0"E
66°30'0"N
GLOMFJORD
96A Sleipnesodden (south)
95GSleipnesodden (south)
95S Rødø (east)
96A Breivika
R096Breivika (Tomma)
I962Koksverktomta (B2)
I965Moholmen (B5)
I964Toraneskaien (B4)
MO I RANA
I969Bjørnbærvika (B9)

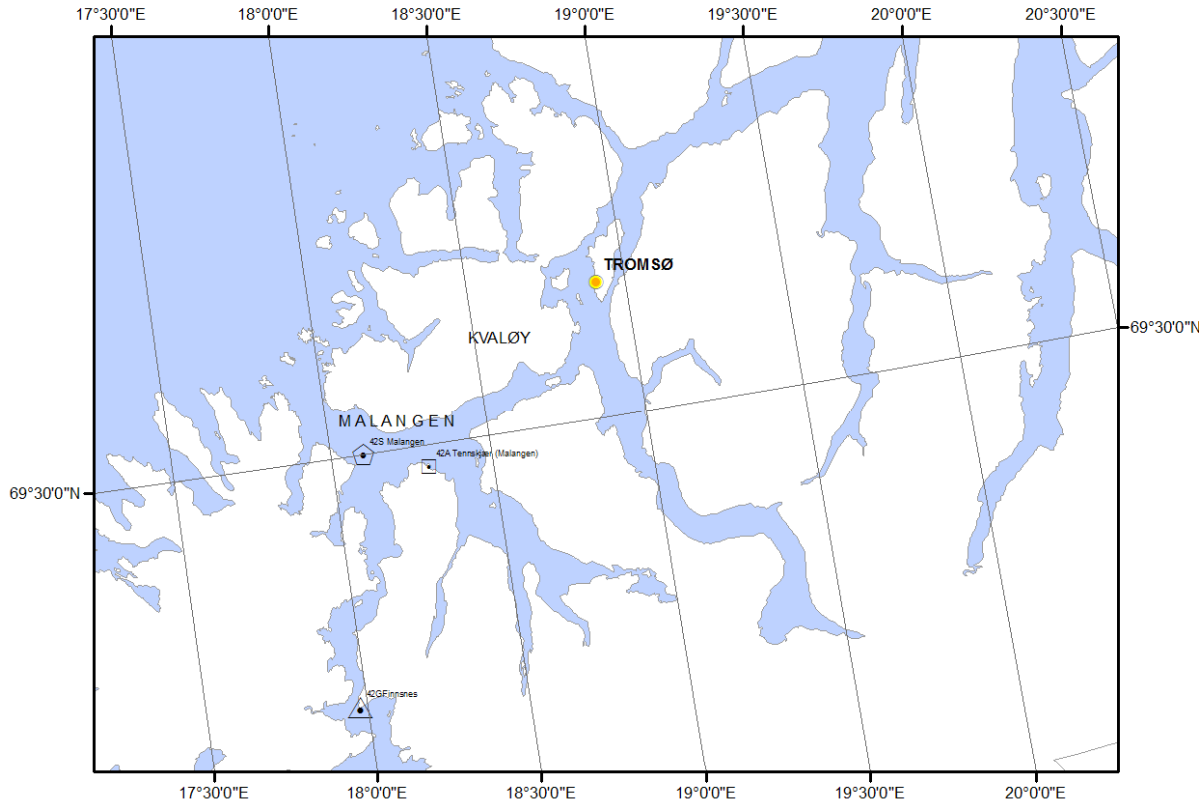
**MAP 15**


14°0'0"E
14°30'0"E
15°0'0"E
15°30'0"E
16°0'0"E
16°30'0"E
68°0'0"N
96A3Vatterfjord
96GSvolvær området
96A2Husvaagen area
96B1Bjørnerøya (east)
96F2Husholmen
SVOLVÆR
96B2Austnesfjorden
96F1Bjørnerøya (east)
96X Skrova harbour
96A1Yttj-Skansundet
96S Skrova (south)
96S Lundøy (north)
VESTFJORDEN
99A Brunvær
97HSmåfiskholmene
97GVarnesodden
97A Klokkholmen
13°30'0"E
14°0'0"E
14°30'0"E
15°0'0"E
15°30'0"E
16°0'0"E

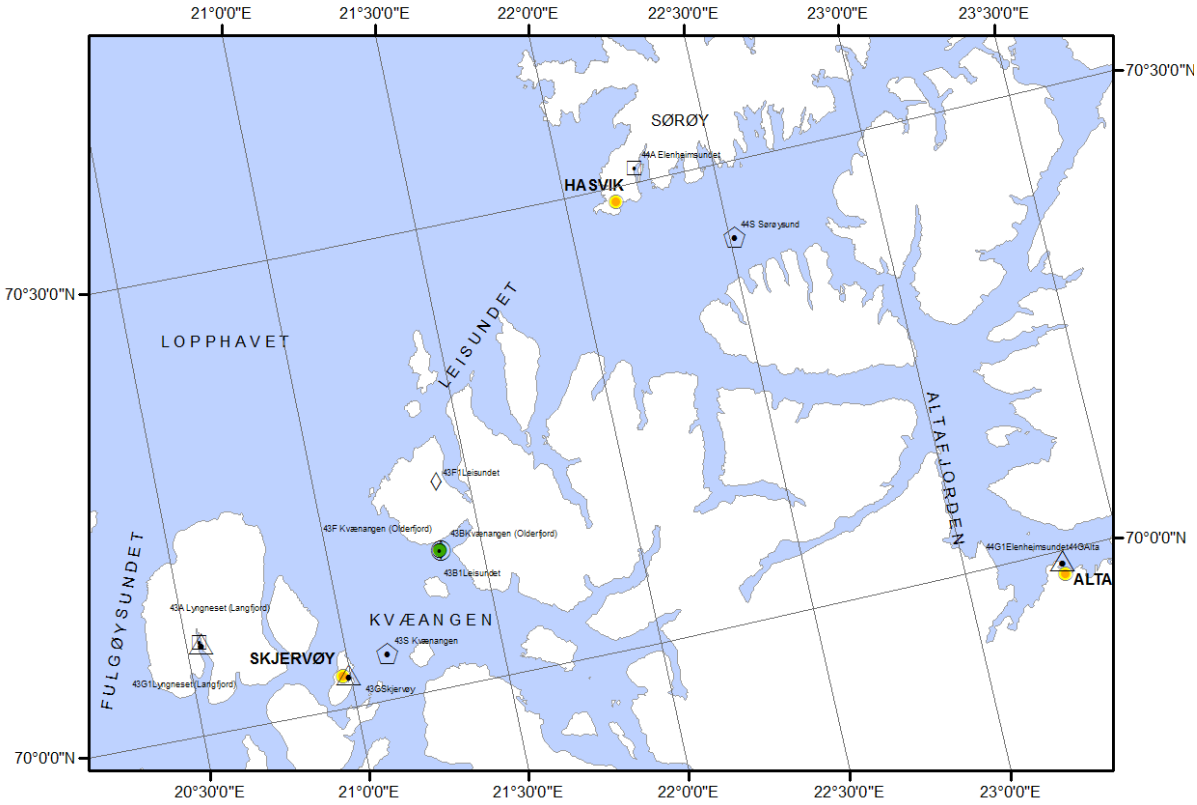
**MAP 16**


16°0'0"E
16°30'0"E
17°0'0"E
17°30'0"E
18°0'0"E
18°30'0"E
69°30'0"N
69°0'0"N
ANDØYA
42GFinnsnes
41S Vågsfjorden
41A Fensneset (Grytøya)
41G1Feneset
41GHarstad (Trondenes)
HARSTAD
15°30'0"E
16°0'0"E
16°30'0"E
17°0'0"E
17°30'0"E
18°0'0"E

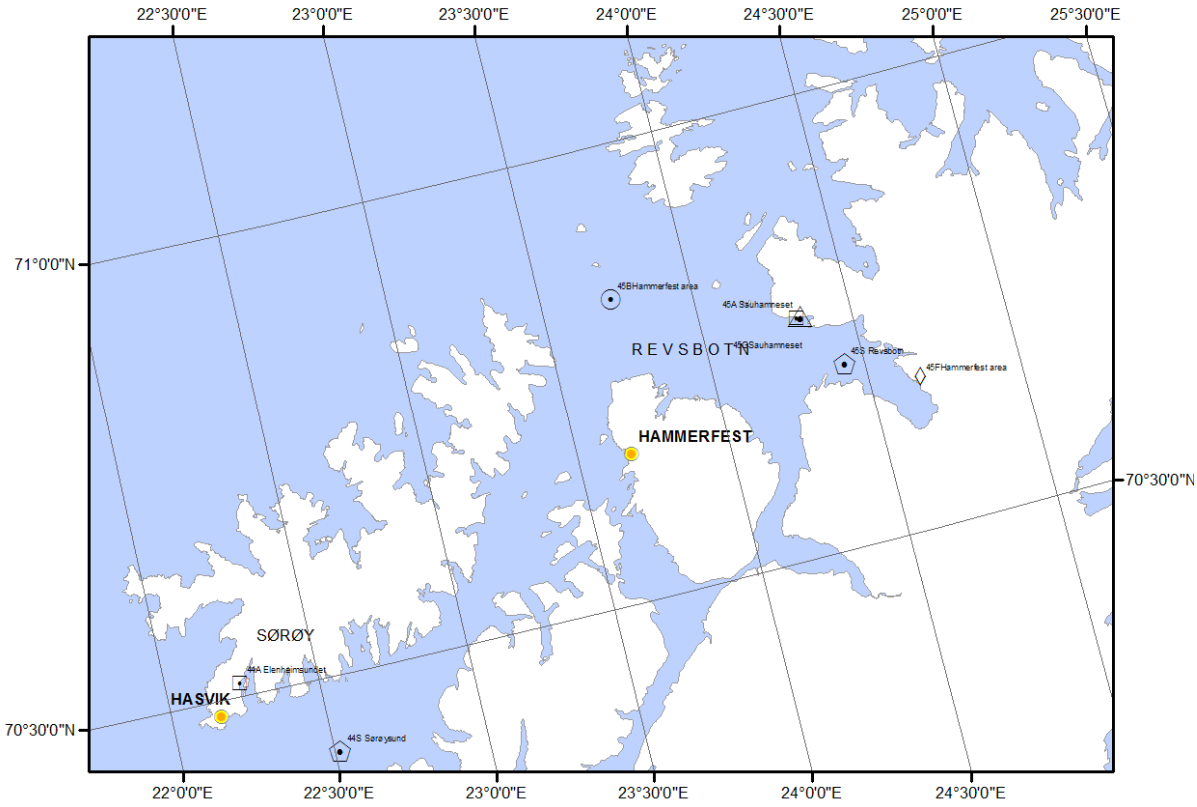
**MAP 17**


17°30'0"E
18°0'0"E
18°30'0"E
19°0'0"E
19°30'0"E
20°0'0"E
20°30'0"E
69°30'0"N
TROMSØ
KVALØY
MALANGEN
42S Malangen
42A Tennskjær (Malangen)
42GFinnsnes
17°30'0"E
18°0'0"E
18°30'0"E
19°0'0"E
19°30'0"E
20°0'0"E

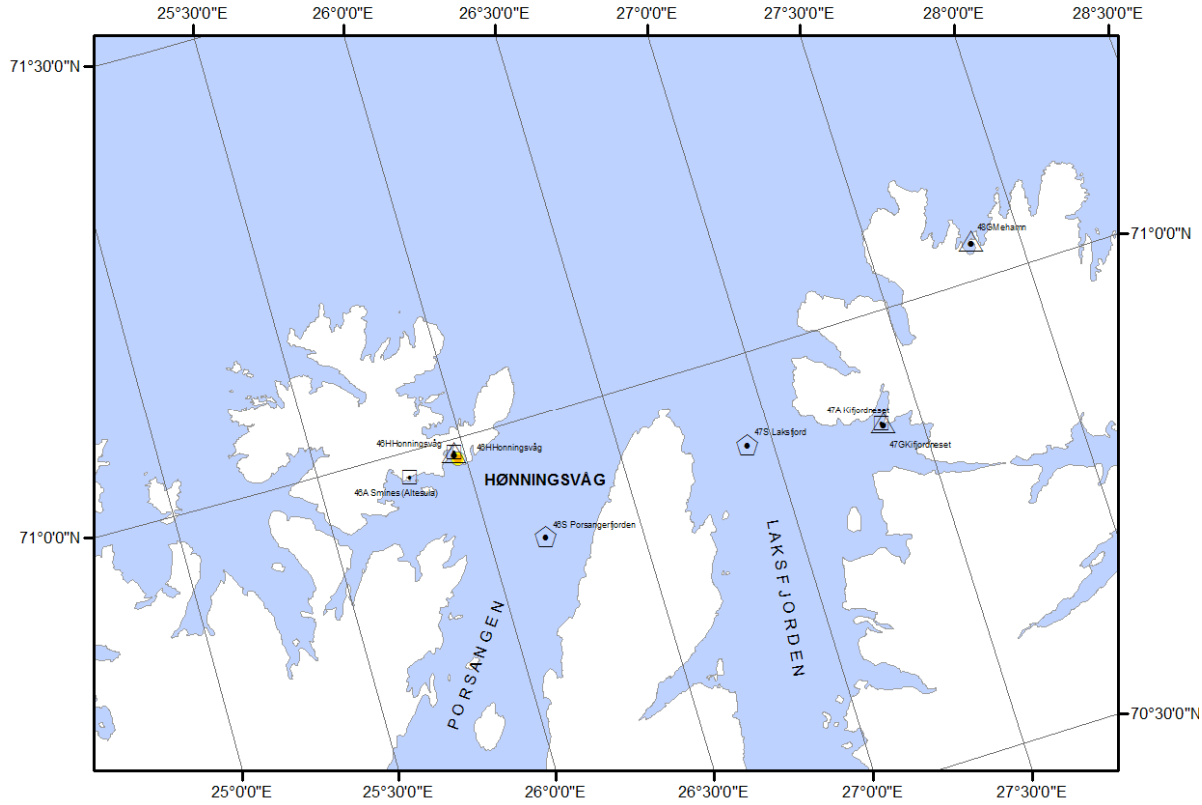
**MAP 18**


21°0'0"E
21°30'0"E
22°0'0"E
22°30'0"E
23°0'0"E
23°30'0"E
70°30'0"N
70°0'0"N
20°30'0"E
SØRØY
44A Elenheimsundet
HASVIK
44S Sørøysund
LOPPHAVET
LEISUNDET
ALTAFJORDEN
43F1 Leisundet
43F Kvænangen (Olderfjord)
43BKvænangen (Olderfjord)
43B1 Leisundet
44G1 Elenheimsundet
44GAlta
ALTA
FULGØYSUNDET
43A Lyngneset (Langfjord)
KVÆANGEN
43S Kvænangen
SKJERVØY
43G1 Lyngneset (Langfjord)
43GSkjervøy

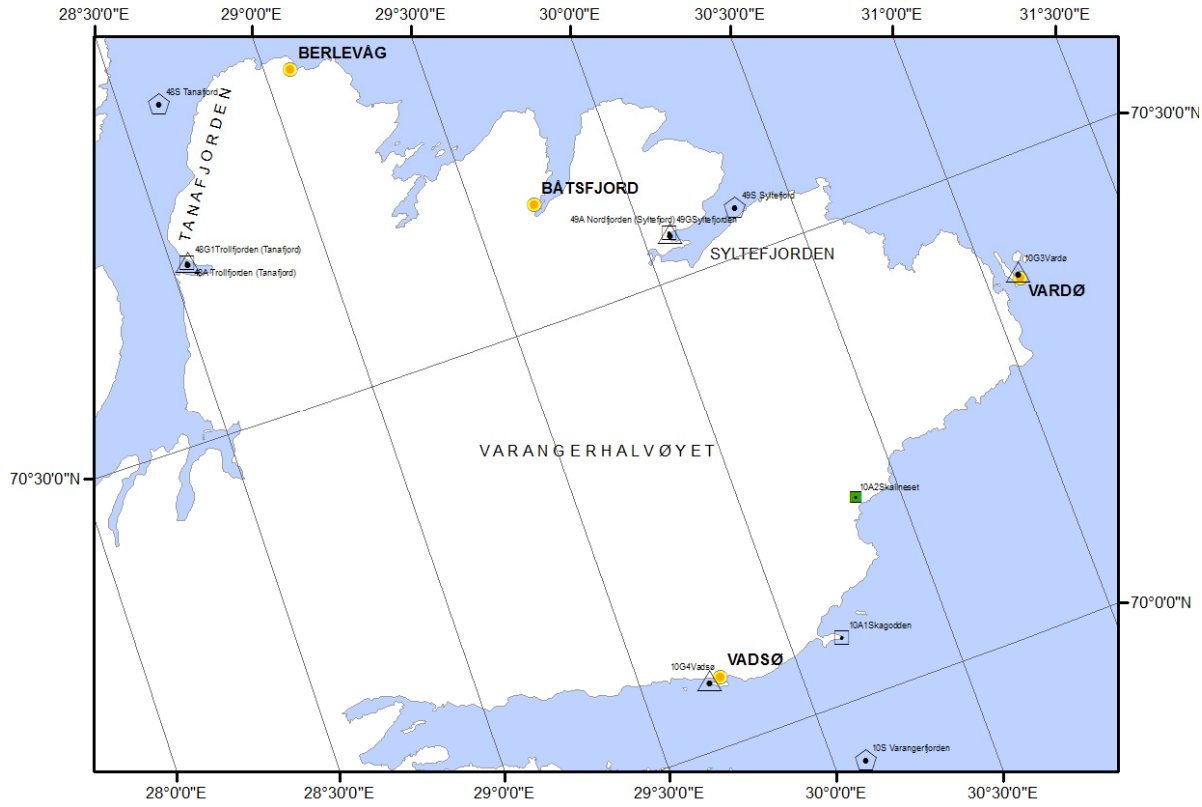
**MAP 19**


22°30'0"E
23°0'0"E
23°30'0"E
24°0'0"E
24°30'0"E
25°0'0"E
25°30'0"E
71°0'0"N
70°30'0"N
22°0'0"E
22°30'0"E
23°30'0"E
45BHammerfest area
45A Stáuhamneset
REVSBOTN
45GStáuhamneset
45S Revsbotn
45FHammerfest area
HAMMERFEST
SØRØY
44A Elenheimsundet
HASVIK
44S Sørøysund

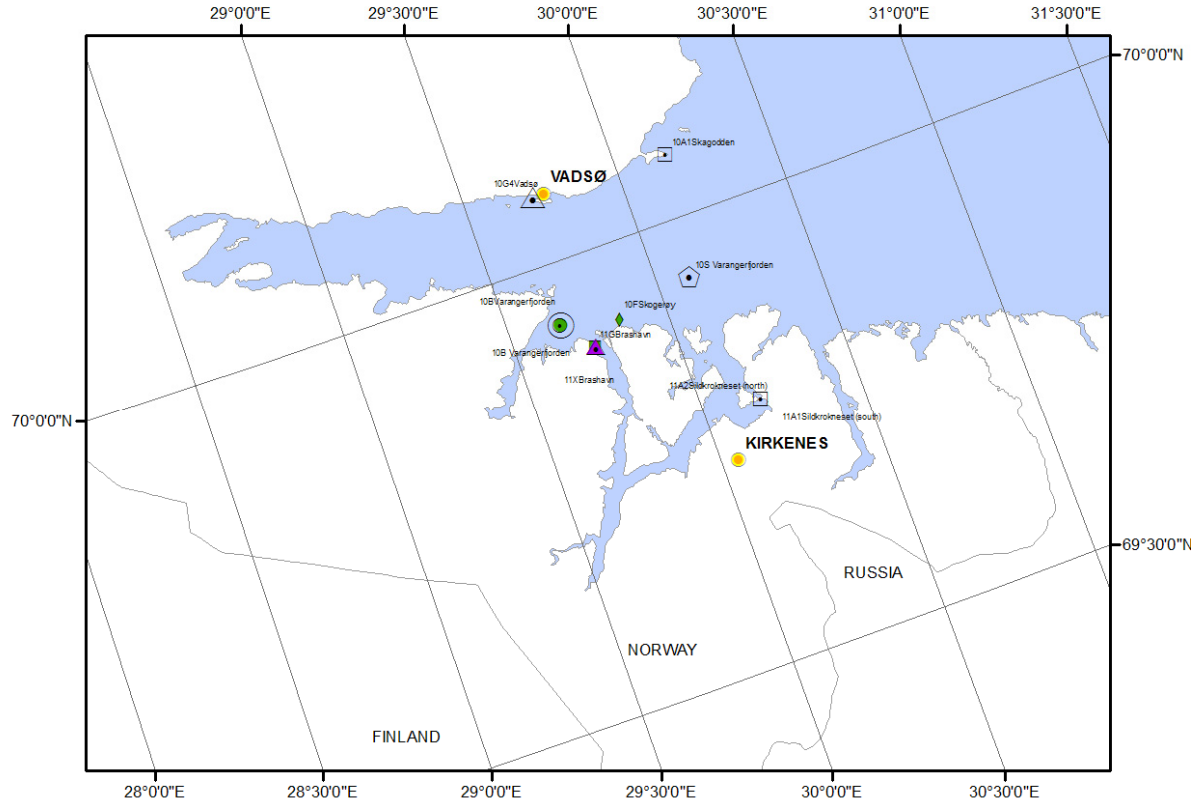
**MAP 20**


25°30'0"E
26°0'0"E
26°30'0"E
27°0'0"E
27°30'0"E
28°0'0"E
28°30'0"E
71°30'0"N
71°0'0"N
70°30'0"N
HØNNINGSVÅG
PORSANGEN
LAKSFJORDEN
46S Porsangerfjorden
46A Smines (Altesula)
47S Laksfjord
47GKjfjordneset
47A Kjfjordneset
48GMehamn

**MAP 21**


28°30'0"E
29°0'0"E
29°30'0"E
30°0'0"E
30°30'0"E
31°0'0"E
31°30'0"E
70°30'0"N
70°0'0"N
BERLEVÅG
TANAFJORDEN
BATSFJORD
SYLTEFJORDEN
VARDØ
VARANGERHALVØYET
VADSØ
49S Tanafjord
49G1Trollfjorden (Tanafjord)
49ATrollfjorden (Tanafjord)
49A Nordfjorden (Syltefjord)
49GSyltefjorden
49S Syltefjord
10G3Vardø
10A2Skallneset
10A1Skagodden
10G4Vadsø
10S Varangerfjorden

**MAP 22**


29°0'0"E
29°30'0"E
30°0'0"E
30°30'0"E
31°0'0"E
31°30'0"E
70°0'0"N
69°30'0"N
28°0'0"E
28°30'0"E
10A1Skagodden
VADSØ
10G4Vadsø
10S Varangerfjorden
10BVarangerfjorden
10FSkogerøy
11GBrashavn
10B Varangerfjorden
11XBrashavn
11A2Sildkrokneset (north)
11A1Sildkrokneset (south)
KIRKENES
RUSSIA
NORWAY
FINLAND

**MAP 23**

# Appendix I
# Overview of materials and analyses 2008

**Nominal station positions are shown on maps in Appendix H**

**Me - Blue Mussel (***Mytilus edulis***)**
**Nl – Dog whelk (***Nucella lapillus***)**
**Gm - Atlantic cod (***Gadus morhua***)**
**Fl – flat fish:**
**Megrim (***Lepidorhombus whiff-iagonis***)**
**Dab (***Limanda limanda***)**
**Flounder (***Platichthys flesus***)**

**Tissue:**
**SB - Soft body tissue**
**LI - Liver tissue, in fish**
**MU - Muscle tissue, in fish**
**BL – Blood, in fish**
**BI – Bile, fish**

**ICES-parameter-group codes** (See Appendix C for descriptions of codes):

| ICES code | Description | Me-SB | Nl-SB | Gm-Bl | Gm-BL | Gm/Ff-LI | Gm/Ff-MU |
|---|---|---|---|---|---|---|---|
| **I-MET** | Cd, Cu, Pb, Zn | x | | | | x | |
| **I-MET** | Hg | x | | | | | x |
| **O-MET** | TBT [1)] | x | x | | | x [3)] | |
| **OC-CB** | PCBs [2)] | x | | | | x | x |
| **OC-CL** | HCB | x | | | | x | x |
| **OC-DD** | DDT, DDE, DDD | x | | | | x | x |
| **OC-HC** | α-, γ-HCH | x | | | | x | x |
| **OC-DX** | Dioxins [3)] | x | | | | | |
| **OC-BB** | PBDE [4)] | | | | | x [3)] | |
| **OC-PF** | PFC [5)] | | | | | x [3)] | |
| **PAH** | PAHs [6)] | x | | | | | |
| **BEM** [7)] | Biological effects met. | | Impo-sex | OH-pyrene | ALA-D | EROD-activity, CYP1A [8)] | |

1) Includes: DBTIN, DPTIN, MBTIN, MPTIN, TBTIN, TPTIN
2) Includes the congeners: CB-28,-52,-101,-105,-118,-138,-153,-156,-180, 209, 5-CB, OCS and, when dioxins are analysed, the non-orto-PCBs, i.e. CB-77, -81, -126, -169
3) Includes: CDD1N, CDD4X, CDD6P, CDD6X, CDD9X, CDDO, CDF2N, CDF2T, CDF4X, CDF6P, CDF6X, CDF9P, CDF9X, CDFDN, CDFDX, CDFO,TCDD
4) Polybrominated diphenyl ethers (PBDE), including brominated flame retardents and includes: BDE28, BDE47, BDE49, BDE66, BDE71, BDE77, BDE85, BDE99, BDE100, BDE119, BDE138, BDE153, BDE154, BDE183, BDE205
5) Includes: PFNA, PFOA, PFHpA, PFHxA, PFOS, PFBS, PFOSA
6) Includes (with NPDs): ACNE, ACNLE, ANT, BAP, BBJF, BEP, BGHIP, BKF. BAA. CHR, DBA3A, DBT, DBTC1, DBTC2, DBTC3, FLE, FLU, ICDP, NAP, NAPC1, NAPC2, NAPC3, PA, PAC1, PAC2, PAC3, PER, PYR.
7) Biological effects methods
8) Cod only

**Appendix I.** Sampling and analyses for 2008 –sediment.

| myear | jmpst | nomi_lat | nomi_lon | N | APAH | I-NUT | I-RNC | MET | OC-CL | OC-DD | OC-DN | OC-HC | O-MAJ | PAH | PCB | P-PHY | TBT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2008 | 30S | +59 49.10 | +10 33.80 | 160 | 24 | | | 33 | 6 | 6 | | 4 | 2 | 32 | 20 | 15 | 18 |
| 2008 | 35S | +59 29.48 | +10 33.72 | 160 | 24 | | | 33 | 6 | 6 | | 4 | 2 | 32 | 20 | 15 | 18 |
| 2008 | 36S | +59 01.48 | +10 40.40 | 91 | 12 | | | 22 | 3 | 3 | | 2 | 1 | 16 | 10 | 10 | 12 |
| 2008 | 15S | +58 01.00 | +06 34.30 | 138 | 24 | | | 22 | 6 | 6 | | 4 | 2 | 32 | 20 | 10 | 12 |
| 2008 | 77S | +58 24.20 | +09 01.80 | 160 | 24 | | | 33 | 6 | 6 | | 4 | 2 | 32 | 20 | 15 | 18 |

**Appendix I.** Sampling and analyses for 2008 –biota.

| jmpst | stnam | nom_lat | nom_lon | speci | tissu | N | I-MET | O-BR | OC-CB | OC-CL | OC-DD | OC-DX | OC-HC | O-FL | O-MET | O-PAH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 01A | Sponvika | 59.0885 | 11.2262 | MYTI EDU | SB | 3 | 3 | | 3 | 3 | 3 | | 3 | | | |
| 02A | Fugleskjær | 59.1150 | 10.9833 | MYTI EDU | SB | 2 | 2 | | 2 | 2 | 2 | | 2 | | | |
| 03A | Tisler | 58.9800 | 10.9583 | MYTI EDU | SB | 3 | 3 | | 3 | 3 | 3 | | 3 | | | |
| 30B | Oslo City area | 59.7993 | 10.5600 | GADU MOR | LI | 25 | 25 | 25 | 25 | 25 | 25 | | 25 | 25 | | |
| 30B | Oslo City area | 59.7993 | 10.5600 | GADU MOR | MU | 30 | 25 | | 5 | 5 | 5 | | 5 | | | |
| 30A | Gressholmen | 59.8815 | 10.7118 | MYTI EDU | SB | 3 | 3 | | 3 | 3 | 3 | 2 | 3 | | 2 | 3 |
| 31A | Solbergstrand | 59.6188 | 10.6498 | MYTI EDU | SB | 3 | 3 | | 3 | 3 | 3 | | 3 | | | |
| 33F | Sande (east side) | 59.5283 | 10.3500 | PLAT FLE | LI | 5 | 5 | | 5 | 5 | 5 | | 5 | | | |
| 33F | Sande (east side) | 59.5283 | 10.3500 | PLAT FLE | MU | 5 | 5 | | 5 | 5 | 5 | | 5 | | | |
| 35A | Mølen | 59.4882 | 10.4980 | MYTI EDU | SB | 3 | 3 | | 3 | 3 | 3 | | 3 | | 1 | 1 |
| 36B | Færder area | 59.0405 | 10.4358 | GADU MOR | LI | 25 | 25 | | 25 | 25 | 25 | 2 | 25 | | 4 | |
| 36F | Færder area | 59.0667 | 10.3833 | LIMA LIM | LI | 5 | 5 | | 5 | 5 | 5 | | 5 | | | |
| 36B | Færder area | 59.0405 | 10.4358 | GADU MOR | MU | 25 | 25 | | 6 | 5 | 5 | 1 | 5 | | | |
| 36F | Færder area | 59.0667 | 10.3833 | LIMA LIM | MU | 5 | 5 | | 5 | 5 | 5 | | 5 | | | |
| 36A | Færder | 59.0272 | 10.5255 | MYTI EDU | SB | 3 | 3 | | 3 | 3 | 3 | | 3 | | 2 | |
| 36G | Færder | 59.0272 | 10.5255 | NUCE LAP | SB | 1 | | | | | | | | | 1 | |
| 73A | Lyngholmen | 59.0447 | 10.2953 | MYTI EDU | SB | 3 | 3 | | 3 | 3 | 3 | | 3 | | | |
| 74A | Langholmane | 58.9550 | 9.8683 | MYTI EDU | SB | 3 | 3 | | 3 | 3 | 3 | | 3 | | | |
| 71A | Bjørkøya (Risøyodden) | 59.0233 | 9.7537 | MYTI EDU | SB | 3 | 3 | | 3 | 3 | 3 | 1 | 3 | | 1 | |
| 71G | Fugløyskjær | 58.9808 | 9.8077 | LITT LIT | SB | 1 | | | | | | | | | 1 | |
| 76A | Risøy | 58.7308 | 9.2720 | MYTI EDU | SB | 5 | 5 | | 5 | 5 | 5 | 2 | 5 | | 1 | |
| 76G | Risøy | 58.7280 | 9.2755 | NUCE LAP | SB | 1 | | | | | | | | | 1 | |
| 77B | Borøy area | 58.5500 | 9.0167 | GADU MOR | LI | 25 | 25 | | 25 | 25 | 25 | | 25 | | | |
| 77F | Borøy area | 58.5500 | 9.0167 | LIMA LIM | LI | 5 | 5 | | 5 | 5 | 5 | | 5 | | | |
| 77B | Borøy area | 58.5500 | 9.0167 | GADU MOR | MU | 30 | 25 | | 5 | 5 | 5 | | 5 | | | |
| 77F | Borøy area | 58.5500 | 9.0167 | LIMA LIM | MU | 5 | 5 | | 5 | 5 | 5 | | 5 | | | |
| 77A | Nordstrand | 58.5237 | 8.9418 | MYTI EDU | SB | 3 | 3 | | 3 | 3 | 3 | | 3 | | | |
| 79A | Gjerdsvoldsøyen (east) | 58.4133 | 8.7417 | MYTI EDU | SB | 3 | 3 | | 3 | 3 | 3 | | 3 | | | |
| 131G | Lastad | 58.0555 | 7.7087 | NUCE LAP | SB | 1 | | | | | | | | | 1 | |
| 13A | Langøsund | 57.9978 | 7.5767 | MYTI EDU | SB | 4 | 4 | | 4 | 4 | 4 | | 4 | | | |
| 14A | Aavigen | 58.0327 | 7.2162 | MYTI EDU | SB | 3 | 3 | | 3 | 3 | 3 | | 3 | | | |
| 15B | Ullerø area | 58.0500 | 6.7167 | GADU MOR | LI | 25 | 25 | | 25 | 25 | 25 | 5 | 25 | | 5 | |
| 15F | Ullerø area | 58.0500 | 6.7167 | LIMA LIM | LI | 5 | 5 | | 5 | 5 | 5 | | 5 | | | |
| 15B | Ullerø area | 58.0500 | 6.7167 | GADU MOR | MU | 30 | 25 | | 5 | 5 | 5 | | 5 | | | |
| 15F | Ullerø area | 58.0500 | 6.7167 | LIMA LIM | MU | 5 | 5 | | 5 | 5 | 5 | | 5 | | | |
| 15A | Gåsøy (Ullerø) | 58.0478 | 6.8953 | MYTI EDU | SB | 3 | 3 | | 3 | 3 | 3 | | 3 | | 2 | |
| 15G | Gåsøy (Ullerø) | 58.0497 | 6.8957 | NUCE LAP | SB | 1 | | | | | | | | | 1 | |
| 51A | Byrkjenes | 60.0838 | 6.5505 | MYTI EDU | SB | 3 | 3 | | 3 | 3 | 3 | | 3 | | | |
| 52A | Eitrheimsneset | 60.0967 | 6.5328 | MYTI EDU | SB | 3 | 3 | | 3 | 3 | 3 | | 3 | | | |
| 53B | Inner Sørfjord | 60.1667 | 6.5667 | GADU MOR | LI | 25 | 25 | 25 | 25 | 25 | 25 | | 25 | 25 | | |
| 53D | Digraneset | 60.1833 | 6.5750 | MOLV MOL | LI | 25 | 25 | | 25 | 25 | 25 | | 25 | | | |
| 53F | Inner Sørfjord | 60.1667 | 6.5667 | PLAT FLE | LI | 5 | 5 | | 5 | 5 | 5 | | 5 | | | |
| 53B | Inner Sørfjord | 60.1667 | 6.5667 | GADU MOR | MU | 30 | 25 | | 5 | 5 | 5 | | 5 | | | |
| 53D | Digraneset | 60.1833 | 6.5750 | MOLV MOL | MU | 30 | 25 | | 5 | 5 | 5 | | 5 | | | |
| 53F | Inner Sørfjord | 60.1667 | 6.5667 | PLAT FLE | MU | 5 | 5 | | 5 | 5 | 5 | | 5 | | | |
| 56A | Kvalnes | 60.2205 | 6.6020 | MYTI EDU | SB | 3 | 3 | | 3 | 3 | 3 | | 3 | | | |
| 57A | Krossanes | 60.3872 | 6.6890 | MYTI EDU | SB | 3 | 3 | | 3 | 3 | 3 | | 3 | | | |
| 63A | Ranaskjær | 60.4208 | 6.4220 | MYTI EDU | SB | 3 | 3 | | 3 | 3 | 3 | | 3 | | | |
| 65A | Vikingneset | 60.2423 | 6.1527 | MYTI EDU | SB | 3 | 3 | | 3 | 3 | 3 | | 3 | | | |
| 67B | Strandebarm area | 60.2667 | 6.0333 | GADU MOR | LI | 20 | 20 | | 20 | 20 | 20 | | 20 | | | |
| 67F | Strandebarm area | 60.2667 | 6.0333 | LEPI WHI | LI | 5 | 5 | | 5 | 5 | 5 | | 5 | | | |
| 67F | Strandebarm area | 60.2667 | 6.0333 | PLAT FLE | LI | 5 | 5 | | 5 | 5 | 5 | | 5 | | | |
| 67B | Strandebarm area | 60.2667 | 6.0333 | GADU MOR | MU | 24 | 20 | | 4 | 4 | 4 | | 4 | | | |
| 67F | Strandebarm area | 60.2667 | 6.0333 | LEPI WHI | MU | 5 | 5 | | 5 | 5 | 5 | | 5 | | | |
| 67F | Strandebarm area | 60.2667 | 6.0333 | PLAT FLE | MU | 5 | 5 | | 5 | 5 | 5 | | 5 | | | |
| 69A | Lille Terøy | 59.9818 | 5.7525 | MYTI EDU | SB | 3 | 3 | | 3 | 3 | 3 | | 3 | | | |
| 22A | Espevær (west) | 59.5842 | 5.1438 | MYTI EDU | SB | 3 | 3 | | 3 | 3 | 3 | | 3 | | 2 | |
| 22G | Espevær vest | 59.5837 | 5.1445 | NUCE LAP | SB | 1 | | | | | | | | | 1 | |
| 21F | Åkrafjord | 59.7500 | 6.1167 | LEPI WHI | LI | 5 | 5 | | 5 | 5 | 5 | | 5 | | | |
| 21F | Åkrafjord | 59.7500 | 6.1167 | LEPI WHI | MU | 5 | 5 | | 5 | 5 | 5 | | 5 | | | |
| 227A2 | Høgevarde | 59.3260 | 5.3175 | MYTI EDU | SB | 1 | | | | | | | | | 1 | |
| 227G2 | Flatskjær | 59.3373 | 5.3125 | NUCE LAP | SB | 1 | | | | | | | | | 1 | |
| 23B | Karihavet area | 59.9000 | 5.1333 | GADU MOR | LI | 25 | 25 | 25 | 25 | 25 | 25 | 5 | 25 | 25 | 5 | |
| 23B | Karihavet area | 59.9000 | 5.1333 | GADU MOR | MU | 30 | 25 | | 5 | 5 | 5 | | 5 | | | |
| 92B | Stokken area | 64.1713 | 9.8873 | GADU MOR | LI | 25 | 25 | 25 | 25 | 25 | 25 | | 25 | 25 | | |
| 92B | Stokken area | 64.1713 | 9.8873 | GADU MOR | MU | 30 | 25 | | 5 | 5 | 5 | | 5 | | | |
| 98B1 | Bjørnerøya (east) | 68.2467 | 14.8033 | GADU MOR | LI | 25 | 25 | | 25 | 25 | 25 | 5 | 25 | | 5 | |
| 98F2 | Husholmen | 68.2188 | 14.8080 | PLEU PLA | LI | 5 | 5 | | 5 | 5 | 5 | | 5 | | | |
| 98B1 | Bjørnerøya (east) | 68.2467 | 14.8033 | GADU MOR | MU | 30 | 25 | | 10 | 5 | 5 | 5 | 5 | | | |
| 98F2 | Husholmen | 68.2188 | 14.8080 | PLEU PLA | MU | 5 | 5 | | 5 | 5 | 5 | | 5 | | | |
| 98A2 | Husvaagen area | 68.2577 | 14.6638 | MYTI EDU | SB | 3 | 3 | | 3 | 3 | 3 | | 3 | | 2 | |
| 98G | Svolvær området | 68.2487 | 14.6633 | NUCE LAP | SB | 1 | | | | | | | | | 1 | |
| 43B | Kvænangen (Olderfjord) | 70.2260 | 21.3968 | GADU MOR | LI | 20 | 20 | 20 | 20 | 20 | 20 | | 20 | 20 | | |
| 43B | Kvænangen (Olderfjord) | 70.2260 | 21.3968 | GADU MOR | MU | 24 | 20 | | 4 | 4 | 4 | | 4 | | | |
| 10B | Varangerfjorden | 69.9333 | 29.6667 | GADU MOR | LI | 25 | 25 | | 25 | 25 | 25 | 1 | 25 | | 1 | |
| 10F | Skogerøy | 69.9167 | 29.8500 | PLEU PLA | LI | 2 | 2 | | 2 | 2 | 2 | | 2 | | | |
| 10B | Varangerfjorden | 69.9333 | 29.6667 | GADU MOR | MU | 30 | 25 | | 6 | 5 | 5 | 1 | 5 | | | |
| 10F | Skogerøy | 69.9167 | 29.8500 | PLEU PLA | MU | 2 | 2 | | 2 | 2 | 2 | | 2 | | | |
| 10A2 | Skallneset | 70.1035 | 30.2625 | MYTI EDU | SB | 3 | 3 | | 3 | 3 | 3 | | 3 | | | |

| jmpst | stnam | nom_lat | nom_lon | speci | tissu | N | I-MET | O-BR | OC-CB | OC-CL | OC-DD | OC-DX | OC-HC | O-FL | O-MET | O-PAH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11G | Brashavn | 69.8987 | 29.7442 | NUCE LAP | SB | 1 | | | | | | | | | 1 | |
| 11X | Brashavn | 69.8987 | 29.7442 | MYTI EDU | SB | 3 | 3 | | 3 | 3 | 3 | | 3 | | 2 | |
| I022 | West Damholmen | 59.1018 | 11.0448 | MYTI EDU | SB | 3 | 3 | | 3 | 3 | 3 | | 3 | | | |
| I023 | Singlekalven (south) | 59.0950 | 11.1367 | MYTI EDU | SB | 3 | 3 | | 3 | 3 | 3 | | 3 | | | |
| I024 | Kirkøy (north west) | 59.0800 | 10.9863 | MYTI EDU | SB | 3 | 3 | | 3 | 3 | 3 | | 3 | | | |
| I301 | Akershuskaia | 59.9053 | 10.7363 | MYTI EDU | SB | 3 | 3 | | 3 | 3 | 3 | | 3 | | 2 | 3 |
| I304 | Gåsøya | 59.8513 | 10.5890 | MYTI EDU | SB | 3 | 3 | | 3 | 3 | 3 | | 3 | | | 3 |
| I306 | Håøya | 59.7133 | 10.5552 | MYTI EDU | SB | 3 | 3 | | 3 | 3 | 3 | | 3 | | | 3 |
| I307 | Ramtonholmen | 59.7445 | 10.5228 | MYTI EDU | SB | 3 | 3 | | 3 | 3 | 3 | | 3 | | | 3 |
| I712 | Gjemesholmen | 59.0453 | 9.7068 | MYTI EDU | SB | 3 | 3 | | 3 | 3 | 3 | 2 | 3 | | 2 | |
| I713 | Strømtangen | 59.0503 | 9.6917 | MYTI EDU | SB | 3 | 3 | | 3 | 3 | 3 | 1 | 3 | | 2 | |
| I131A | Lastad | 58.0555 | 7.7087 | MYTI EDU | SB | 3 | 3 | | 3 | 3 | 3 | | 3 | | | 3 |
| I132 | Svensholmen | 58.1250 | 7.9888 | MYTI EDU | SB | 4 | | | 4 | 4 | 4 | 1 | 4 | | 2 | 4 |
| I133 | Odderø (west) | 58.1317 | 8.0017 | MYTI EDU | SB | 3 | | | 3 | 3 | 3 | 1 | 3 | | 2 | 3 |
| I201 | Ekkjegrunn (G1) | 59.6433 | 6.3573 | MYTI EDU | SB | 3 | 3 | | | | | | | | | 3 |
| I205 | Bølsnes (G5) | 59.5917 | 6.3002 | MYTI EDU | SB | 3 | 3 | | | | | | | | | 3 |
| I241 | Nordnes | 60.4007 | 5.3017 | MYTI EDU | SB | 3 | | | 3 | 3 | 3 | | 3 | | | |
| I242 | Gravdalsneset | 60.3948 | 5.2668 | MYTI EDU | SB | 3 | | | 3 | 3 | 3 | | 3 | | | |
| I243 | Hegreneset | 60.4153 | 5.3048 | MYTI EDU | SB | 3 | | | 3 | 3 | 3 | | 3 | | | |
| I915 | Flåøya (northwest) | 62.7580 | 8.4398 | MYTI EDU | SB | 3 | | | | | | | | | | 3 |
| I913 | Fjøseid | 62.8098 | 8.2747 | MYTI EDU | SB | 3 | | | | | | | | | | 3 |
| I912 | Honnhammer | 62.8533 | 8.1617 | MYTI EDU | SB | 3 | | | | | | | | | | 3 |
| I965 | Moholmen (B5) | 66.3120 | 14.1258 | MYTI EDU | SB | 4 | 4 | | | | | | | | | 4 |
| I964 | Toraneskaien | 66.3217 | 14.1328 | MYTI EDU | SB | 3 | 3 | | | | | | | | | 3 |
| I969 | Bjørnbærviken (B9) | 66.2802 | 14.0347 | MYTI EDU | SB | 3 | 3 | | | | | | | | | 3 |

# Appendix J
# Temporal trend analyses of contaminants and biomarkers in biota 1981-2008

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

**Cadmium (Cd)**
**Mercury (Hg)**
**Lead (Pb)**
**Copper (Cu)**
**Zinc (Zn)**
**Sum PCB-7** or **CB_S7** (CB: 28+52+101+118+138+153+180)
**DDEPP (ppDDE)**
**HCB**
**BAP** (benzo[*a*]pyrene)
**PK-Σn or PK_S** (sum carcinogen PAHs, cf. Appendix B)
**P-Σn or P_S** (sum of PAHs, dicyclic "PAHs" not included, cf. Appendix B)
**TBT** (Tributyltin)
**TCDDN** (Dioxin toxicity equivalents – Nordic model)
**BDESS** (Sum brominated flame retardents)
**ALA-D** (δ-amino levulinic acid dehydrase inhibition)
**EROD-activity** (Cytochrome P4501A-activity)
**CYP1A** (relative amount of Cytochrome P4501A protein)
**OH-pyrene or PYR10** (Pyrene metabolite)
**VDSI** (measurement of imposex)

**CEMP-stations**
**"Index"-stations**
**MYTI EDU - Blue Mussel (***Mytilus edulis***)**
**NUCE LAP – Dog whelk (***Nucella lapillus***)**
**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**

**Tsu -tissue:**
**SB - Soft body tissue**
**LI - Liver tissue**
**MU - Muscle tissue**
**BL - Blood**
**BI - Bile**

**OC** Overconcentration expressed as quotient of median of last year and "high background" ("m" missing background value)

**TRD** 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 (<7 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 |

**SM3** Projected smoothed median for three years expressed as quotient of value and "high background" ("?" if missing background or if number of years is less than seven)

**PWR** POWER; estimated number of years to detect a hypothetical situation of 10% trend a year with a 90% power

**Note on detection limit: for values designated below detection limit, half of this limit is used.**

Annual median concentration of Cd (ppm)

| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | ANALYSIS OC | TRD | SM3 | PWR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30A | MYTI EDU | SB | d.wt | | | | 1.07 | 0.81 | 1.41 | 0.6 | 0.61 | 0.736 | 0.769 | 0.769 | 1.12 | 1.26 | 1.17 | 0.776 | 0.8 | 0.857 | 1.27 | 1.16 | 1.13 | 0.914 | 1.75 | 1.56 | 2.16 | 1.7 | 1.72 | 1.42 | 1.81 | no | U- | no | 10 |
| 31A | MYTI EDU | SB | d.wt | | | 1.39 | 1.31 | 0.89 | 1.93 | 0.4 | 0.43 | 0.412 | 0.719 | 0.727 | 0.914 | 0.933 | 0.781 | 1.32 | 0.789 | 0.854 | 1.07 | 1.25 | 1 | 1.76 | 1.14 | 1.33 | 1.4 | 1.28 | 1.11 | 1.16 | 1.21 | no | UY | no | 12 |
| 35A | MYTI EDU | SB | d.wt | | | 1.35 | 0.952 | 1.17 | 1.3 | 0.52 | 0.66 | 0.647 | 0.926 | 1.05 | 1.35 | 1.11 | 0.958 | 0.894 | 0.766 | 0.965 | 1.14 | 1.53 | 1.33 | 1.53 | 1.16 | 1.06 | 1.23 | 1.33 | 0.86 | 0.855 | 1.01 | no | UY | no | 9 |
| 36A | MYTI EDU | SB | d.wt | | | 0.845 | 1.19 | 0.84 | 1.38 | 0.59 | 0.56 | 0.502 | 0.407 | 1.22 | 1.06 | 0.899 | 1.22 | 1.17 | 1.6 | 1.84 | 0.965 | 1.01 | 1.65 | 2.59 | 1 | 0.848 | 0.956 | 0.9 | 0.586 | 0.633 | 0.735 | no | UY | no | 12 |
| 71A | MYTI EDU | SB | d.wt | | | 2.52 | 1.98 | 1.42 | 2 | 0.98 | 2.11 | 2.02 | 0.968 | 1.09 | 1.66 | 1.89 | 1.97 | 2.25 | 1.5 | 2.44 | 1.53 | 1.76 | 1.99 | 1.43 | 1.69 | 1.44 | 1.57 | 1.48 | 1.43 | 1.17 | 1.07 | no | -- | no | 10 |
| 76A | MYTI EDU | SB | d.wt | | | | | | | | | | 0.638 | 0.86 | 0.957 | 1.1 | | | 1.17 | 1.19 | 1.2 | 1.28 | 0.823 | 1.82 | 1.45 | 1.05 | 1.01 | 0.829 | 0.816 | 1.03 | 0.953 | no | -- | no | 9 |
| 15A | MYTI EDU | SB | d.wt | | | | | | | | | | 0.505 | 0.831 | | 1.18 | 0.794 | 1.44 | 1.22 | 1.07 | 1.03 | 0.841 | 1.44 | 4.4 | 1.31 | 0.737 | 0.926 | 0.788 | 1.01 | 0.718 | 0.622 | no | -- | no | 14 |
| 51A | MYTI EDU | SB | d.wt | | | | | | | 42.8 | 58.2 | | | | | | | 36.8 | 25.3 | 5.45 | 10.3 | 34.6 | 27.3 | 5.35 | 16.6 | 14.7 | 5.21 | 13.8 | 2.35 | 3.42 | 2.84 | 1.4 | D- | no | 20 |
| 52A | MYTI EDU | SB | d.wt | | | | | | | | | 94.4 | 10.2 | 80.1 | 43.1 | 14.7 | 8.71 | 19.8 | 18.4 | 13.4 | 9.14 | 11.4 | 10.5 | 5.59 | 5 | 7.38 | 5.37 | 7 | 2.88 | 4.41 | 2.22 | 1.1 | D- | no | 18 |
| 56A | MYTI EDU | SB | d.wt | | | | | | | 55.9 | 54.2 | 98.4 | 45 | 69.4 | 51.7 | 59.7 | 11.4 | 30.8 | 20 | 28.8 | 8.71 | 25.9 | 24.4 | 14.5 | 13.4 | 11.4 | 6.18 | 11.7 | 8.4 | 5.29 | 6.21 | 3.1 | D- | 1.8 | 15 |
| 57A | MYTI EDU | SB | d.wt | | | | | | | 21.1 | 43.2 | 36.7 | 25.7 | 32.8 | 32.1 | 15.4 | 11.8 | 12.2 | 8.48 | 13.6 | 5.02 | 13.6 | 10.3 | 8.19 | 6.96 | 6.32 | 3.12 | 5.94 | 6.21 | 2.34 | 2.43 | 1.2 | D- | no | 13 |
| 63A | MYTI EDU | SB | d.wt | | | | | | | 47.2 | 10.3 | 19 | 30.4 | 35.1 | 18.2 | 7.81 | 4.23 | 8.16 | 5.4 | 6.62 | 4.43 | 6.87 | 5.97 | 6.73 | 5.38 | 5.69 | 1.3 | 4 | 3.98 | 3.07 | 1.81 | no | D- | no | 16 |
| 65A | MYTI EDU | SB | d.wt | | | | | | | 15 | 5.96 | 8.29 | 14.6 | 24 | 5.09 | 7.73 | 3.01 | 5.37 | 3.53 | 4.28 | 1.72 | 3.82 | 3.85 | 4.5 | 3.74 | 3.4 | 1.31 | 3.42 | 3.98 | 1.87 | 1.47 | no | D- | no | 16 |
| 69A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 4.26 | 2.37 | 2.08 | 2.91 | 3.2 | 3.53 | 1.58 | 3.76 | 2.87 | 3.8 | 2.41 | 2.36 | 1.19 | 2.26 | 1.51 | 1.41 | 1.23 | no | D- | no | 12 |
| 22A | MYTI EDU | SB | d.wt | | | | | | | | | | 0.532 | 1.14 | 1.12 | 0.844 | 1.02 | 1.41 | 1.14 | 1.01 | 0.851 | 1.32 | 2.69 | 2.01 | 0.976 | 1.04 | 1.18 | 0.912 | 0.844 | 1.24 | 1.02 | no | -- | no | 12 |
| 23A | MYTI EDU | SB | d.wt | | | | | | | | | | 0.406 | 0.994 | | | | | | | | | | | | | 0.832 | 1.11 | | | | no | -? | ? | 15 |
| 24A | MYTI EDU | SB | d.wt | | | | | | | | | | 0.52 | 0.816 | | | | | | | | | | | | | 0.958 | 0.944 | | | | no | -? | ? | 10 |
| 82A | MYTI EDU | SB | d.wt | | | | 1.41 | 1.15 | 2.31 | 0.99 | 0.4 | 1.26 | | 1.2 | 1.21 | 1.15 | | 0.981 | 1.22 | | | | | | | | 0.944 | 1.51 | | | | no | -- | no | 15 |
| 84A | MYTI EDU | SB | d.wt | | | | 1.39 | 1.86 | 2.38 | 2.1 | 0.96 | 1.19 | | 1.82 | 2.11 | 1.6 | | 1.64 | 1.29 | | | | | | | | 1.54 | 2.05 | | | | 1.0 | -- | 1.5 | 11 |
| 87A | MYTI EDU | SB | d.wt | | | | 0.968 | 1.02 | 1.93 | 0.77 | 0.69 | 0.756 | | 0.872 | 0.978 | 0.927 | | 1.15 | 1.27 | | | | | | | | 1 | 1.08 | | | | no | -- | no | 11 |
| 25A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 1.38 | 1.05 | | | | | | | | | | | 1.25 | 1.46 | | | | no | -? | ? | 8 |
| 26A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 1.07 | 1 | | | | | | | | | | | 1.24 | 1.13 | | | | no | -? | ? | <=5 |
| 27A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 1.1 | | | | | | | | | | | | 0.856 | 0.894 | | | | no | -? | ? | <=5 |
| 28A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 1.12 | 0.841 | | | | | | | | | | | 0.947 | 1.04 | | | | no | -? | ? | 8 |
| 91A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 1.68 | 1.27 | 1.82 | | | | | | | | | | | 1.16 | | | | no | -? | ? | 9 |
| 92A1 | MYTI EDU | SB | d.wt | | | | | | | | | | | | 1.08 | 0.544 | 0.939 | 0.743 | 0.691 | 0.716 | | | | | | | | | | | | no | -- | no | 11 |
| 93A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 1.23 | 0.645 | | | | | | | | | | | 0.888 | 0.68 | | | | no | -? | ? | 13 |
| 94A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 0.87 | 0.846 | | | | | | | | | | | 1.13 | 1.2 | | | | no | U? | ? | <=5 |
| 95A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 1.21 | 1.47 | | | | | | | | | | | 1 | 1.11 | | | | no | -? | ? | 7 |
| 96A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 0.963 | 0.782 | | | | | | | | | | | 0.718 | 1.03 | | | | no | -? | ? | 10 |
| 97A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 1.31 | 1.55 | | | | | | | | | | | 1.44 | 1.44 | | | | no | -? | ? | 6 |
| 98A2 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | 0.854 | | 2.17 | 1.68 | 2.38 | 2.13 | 2.27 | 1.07 | 1.29 | 1.18 | 1.05 | 1.42 | no | -- | no | 11 |
| 98X | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.712 | 0.688 | 0.781 | | | | | | | | | | | | | no | -? | ? | 6 |
| 99A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 1.43 | 1.28 | | | | | | | | | | | 1.35 | 1.27 | | | | no | -? | ? | <=5 |
| 41A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 1.89 | 2.95 | 1.63 | 1.88 | | | | | | | | | 2.67 | 1.68 | | no | -- | 1.0 | 11 |
| 42A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 1.05 | 1.59 | | | | | | | | | | | 0.952 | 1.2 | | no | -? | ? | 11 |
| 43A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 3.47 | 4.32 | | 3.85 | | | | | | | | | 2.53 | 3.26 | | 1.6 | -? | ? | 8 |
| 44A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 1.69 | 2.74 | 1.95 | 1.51 | | | | | | | | | 1.86 | 1.15 | | no | -- | no | 11 |
| 45A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 1.81 | 1.61 | | | | | | | | | | | 1.88 | 2.02 | | 1.0 | -? | ? | 6 |
| 46A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 2.7 | 2.06 | 2.72 | | | | | | | | | | 2.53 | 1.63 | | no | -? | ? | 10 |
| 47A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 4.55 | 3.01 | | | | | | | | | | | 2.29 | 2.51 | | 1.3 | -? | ? | 9 |
| 48A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 1.35 | 1.31 | 1.38 | | | | | | | | | | 2.64 | 1.97 | | no | U? | ? | 8 |
| 49A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 1.57 | 1.16 | | | | | | | | | | | 4.07 | 2.33 | | 1.2 | -? | ? | 13 |
| 10A2 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | 2.34 | 1.06 | 2.32 | 1.61 | 1.53 | 1.23 | 1.41 | 1.98 | 1.59 | 1.12 | 1.74 | 2.28 | 2.07 | 1.0 | -- | 1.3 | 12 |
| 11X | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | 1.65 | 0.67 | 1.13 | 1.07 | 1.32 | 1.36 | 1.36 | 0.911 | 0.981 | 0.933 | 1.16 | 1.14 | no | -- | no | 11 |

Annual median concentration of Cd (ppm)

| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | ANALYSIS OC | TRD | SM3 | PWR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30A | MYTI EDU | SB | d.wt | | | | 1.07 | 0.81 | 1.41 | 0.6 | 0.61 | 0.736 | 0.769 | 0.769 | 1.12 | 1.26 | 1.17 | 0.776 | 0.8 | 0.857 | 1.27 | 1.16 | 1.13 | 0.914 | 1.75 | 1.56 | 2.16 | 1.7 | 1.72 | 1.42 | 1.81 | no | U- | no | 10 |
| 71A | MYTI EDU | SB | d.wt | | | 2.52 | 1.98 | 1.42 | 2 | 0.98 | 2.11 | 2.02 | 0.968 | 1.09 | 1.66 | 1.89 | 1.97 | 2.25 | 1.5 | 2.44 | 1.53 | 1.76 | 1.99 | 1.43 | 1.69 | 1.44 | 1.57 | 1.48 | 1.43 | 1.17 | 1.07 | no | -- | no | 10 |
| 51A | MYTI EDU | SB | d.wt | | | | | | | 42.8 | 58.2 | | | | | | | 36.8 | 25.3 | 5.45 | 10.3 | 34.6 | 27.3 | 5.35 | 16.6 | 14.7 | 5.21 | 13.8 | 2.35 | 3.42 | 2.84 | 1.4 | D- | no | 20 |
| 52A | MYTI EDU | SB | d.wt | | | | | | | | | 94.4 | 10.2 | 80.1 | 43.1 | 14.7 | 8.71 | 19.8 | 18.4 | 13.4 | 9.14 | 11.4 | 10.5 | 5.59 | 5 | 7.38 | 5.37 | 7 | 2.88 | 4.41 | 2.22 | 1.1 | D- | no | 18 |
| 10A2 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | 2.34 | 1.06 | 2.32 | 1.61 | 1.53 | 1.23 | 1.41 | 1.98 | 1.59 | 1.12 | 1.74 | 2.28 | 2.07 | 1.0 | -- | 1.3 | 12 |
| I021 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 1.73 | 2.26 | 2.48 | 3.31 | | 1.83 | 2.53 | 2.41 | | | | | | | 1.2 | -- | 1.0 | 10 |
| I022 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 1.43 | 1.36 | 1.26 | 2.09 | 1.94 | 1.33 | 1.7 | 2.69 | 1.61 | 1.25 | 1.42 | 1.74 | 2 | 2.37 | 1.2 | -- | 1.4 | 10 |
| I023 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 1.61 | 1.4 | 1.77 | 2.04 | 1.45 | 0.948 | 0.873 | 1.55 | 1.48 | 1.03 | 1.39 | 1.79 | 1.15 | 1.28 | no | -- | no | 11 |
| I024 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 1.31 | 1.63 | 2.04 | 2.56 | 2.45 | 1.83 | 2.53 | 2.7 | 2.03 | 1.57 | 1.46 | 1.97 | 1.39 | 2.04 | 1.0 | -- | no | 9 |
| I301 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 0.824 | 0.795 | 0.817 | 1.03 | 1.29 | 0.716 | 0.902 | 0.888 | 1.15 | 1.32 | 1.03 | 1.49 | 1.18 | 1.45 | no | U- | no | 9 |
| I304 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 1.33 | 0.719 | 0.784 | 1.05 | 0.994 | 0.921 | 1.16 | 1.3 | 1.37 | 1.1 | 1.34 | 1.35 | 0.889 | 1.46 | no | -- | no | 9 |
| I306 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 0.81 | 0.779 | 0.646 | 0.707 | 0.842 | 0.592 | 0.734 | 0.872 | 1.28 | 0.992 | 1.11 | 0.806 | 0.65 | 1.16 | no | -- | no | 10 |
| I307 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 0.94 | 0.815 | 0.687 | 0.72 | 0.826 | 0.719 | 0.899 | 1.46 | 1.44 | 1.14 | 1.26 | 0.933 | 0.876 | 1.33 | no | U- | no | 9 |
| I131A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 1.24 | 0.875 | 1.14 | 1.31 | 1.18 | 1.98 | 2.48 | 1.13 | 0.862 | 1.34 | 0.965 | 0.831 | 0.787 | | no | -- | no | 11 |
| I201 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 0.801 | 0.856 | 1.06 | 0.927 | 1.27 | 1.42 | 1.49 | 2.8 | 0.707 | 0.957 | 1.47 | 1.55 | 1.44 | 1.48 | no | -- | no | 13 |
| I205 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 0.819 | | 1.37 | 0.858 | 1.49 | 1.99 | 1.42 | 2.43 | 1.25 | 1.02 | 2.02 | 1.91 | 1.28 | 2.41 | 1.2 | -- | 1.3 | 12 |
| I965 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | | | | | 2.02 | 2.15 | 0.813 | 1.9 | 1.8 | 1.78 | 2.08 | 2.91 | 1.5 | -- | 1.8 | 13 |
| I962 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 0.746 | 0.606 | 0.645 | 0.518 | | | | | | | | | | | no | -? | ? | 6 |
| I964 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | | | | | | 1.57 | 0.652 | 0.92 | 2.15 | 2.11 | 2.04 | 2.06 | 1.0 | -- | 1.7 | 15 |
| I969 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 0.502 | 0.599 | 0.318 | 0.611 | 0.588 | 0.827 | 0.76 | 0.8 | 0.557 | 0.615 | 1.19 | 0.432 | 0.461 | 0.564 | no | -- | no | 12 |

Annual median concentration of Cd (ppm)

| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | ANALYSIS OC | TRD | SM3 | PWR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | OC | TRND | SM+3 | POWER |
| 30B | GADU MOR | LI | w.wt | | | | 0.01 | 0.05 | 0.0619 | 0.0711 | 0.0218 | 0.0267 | 0.035 | 0.027 | 0.1 | 0.0645 | 0.063 | 0.049 | 0.055 | 0.0485 | 0.107 | 0.165 | 0.078 | 0.111 | 0.106 | 0.114 | 0.1 | 0.0734 | 0.115 | 0.19 | 0.174 | 1.7 | U- | 2.5 | 15 |
| 36B | GADU MOR | LI | w.wt | 0.078 | 0.06 | 0.22 | 0.07 | 0.05 | 0.143 | 0.0611 | 0.0314 | 0.028 | 0.0235 | 0.01 | 0.021 | 0.034 | 0.021 | 0.042 | 0.033 | 0.0741 | 0.036 | 0.065 | 0.041 | 0.029 | 0.0247 | 0.0088 | 0.0067 | 0.029 | 0.025 | 0.034 | 0.034 | no | DY | no | 16 |
| 77B | GADU MOR | LI | w.wt | | | | | | | | | | 0.0375 | 0.018 | | | | | | | | | | | | | | | | | 0.017 | no | -? | ? | 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 | 0.033 | 0.026 | 0.0183 | 0.0374 | 0.0097 | 0.019 | 0.0058 | 0.023 | 0.018 | no | -- | no | 15 |
| 53B | GADU MOR | LI | w.wt | | | | | | 0.658 | | 0.058 | 0.0929 | 0.045 | 0.149 | 0.215 | 0.038 | | 0.007 | 0.18 | 0.143 | 0.228 | 0.726 | 0.829 | 0.565 | 0.431 | 0.253 | 0.368 | 0.414 | 0.2 | 0.279 | 0.494 | 4.9 | UY | 4.0 | 22 |
| 67B | GADU MOR | LI | w.wt | | | | | | | 0.145 | 0.0519 | 0.0467 | 0.069 | 0.077 | 0.0514 | 0.115 | 0.0989 | 0.033 | 0.111 | 0.277 | 0.0185 | 0.0715 | 0.059 | 0.032 | 0.0203 | 0.01 | 0.016 | 0.0252 | 0.0092 | 0.015 | 0.009 | no | D- | no | 19 |
| 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 | 0.019 | 0.025 | 0.0206 | 0.0163 | 0.0228 | 0.024 | 0.0379 | 0.022 | 0.012 | no | -- |
| 84B | GADU MOR | LI | w.wt | | | | 0.13 | 0.1 | 0.0688 | | 0.0291 | | | | | | | | | | | | | | | | | | | | | no | D? | ? | 6 |
| 92B | GADU MOR | LI | w.wt | | | | | | | | | | | | | 0.036 | 0.029 | 0.022 | 0.066 | | | | | | | | 0.0229 | 0.024 | | | 0.031 | no | -- | no | 15 |
| 98B1 | GADU MOR | LI | w.wt | | | | | | | | | | | | 0.069 | 0.15 | 0.025 | 0.113 | 0.33 | 0.064 | 0.047 | 0.039 | | | 0.0291 | 0.0254 | 0.0332 | 0.051 | 0.0379 | 0.0686 | 0.024 | no | -- | no | 19 |
| 43B | GADU MOR | LI | w.wt | | | | | | | | | | | | | | 0.168 | 0.183 | 0.097 | | | | | | | | | | | | 0.0765 | no | -? | ? | 12 |

Annual median concentration of Cd (ppm)

| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | ANALYSIS OC | TRND | SM+3 | POWER |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 33F | PLAT FLE | LI | w.wt | | | 0.19 | | 0.2 | 0.176 | 0.257 | 0.061 | 0.106 | 0.234 | 0.196 | 0.16 | 0.184 | 0.087 | 0.091 | 0.114 | 0.119 | 0.0952 | 0.126 | 0.071 | 0.091 | 0.0569 | 0.0627 | 0.0313 | 0.025 | 0.0677 | 0.039 | 0.067 | no | D- | no | 13 |
| 53F | PLAT FLE | LI | w.wt | | | | | | | | 2.24 | 1.53 | 1.54 | 1.72 | 1.79 | 0.789 | | 0.135 | 2.53 | 0.892 | 1.47 | 2.55 | 1.77 | 2.74 | 2.74 | 4.56 | 1.46 | 1.31 | | 0.765 | 1.34 | 4.5 | -- | no | 19 |
| 67F | PLAT FLE | LI | w.wt | | | | | | | | | | | | | | | | 2.48 | | 0.187 | 0.185 | 0.148 | 0.059 | 0.065 | 0.0802 | 0.0605 | 0.124 | 0.14 | 0.093 | 0.126 | no | DY | no | 14 |
| 21F | PLAT FLE | LI | w.wt | | | | | | | | | | | | | | | | | | | 0.052 | 0.0979 | 0.141 | 0.22 | | 0.0473 | 0.125 | 0.129 | | | no | -- | no | 18 |
| 36F | LIMA LIM | LI | w.wt | | | | | | | | | | 0.106 | 0.112 | 0.23 | 0.295 | 0.135 | 0.147 | 0.139 | 0.123 | 0.202 | 0.227 | 0.139 | 0.232 | 0.127 | 0.142 | 0.188 | 0.144 | 0.128 | 0.208 | 0.139 | no | -- | no | 12 |
| 15F | LIMA LIM | LI | w.wt | | | | | | | | | | | | | 0.0992 | 0.136 | 0.125 | 0.153 | 0.076 | 0.181 | 0.167 | | 0.313 | 0.129 | 0.11 | 0.189 | 0.225 | 0.377 | 0.153 | 0.284 | no | -- | 1.1 | 14 |
| 22F | LIMA LIM | LI | w.wt | | | | | | | | | | 0.095 | 0.091 | 0.128 | | 0.169 | 0.125 | | | | | | | | | | | | | | no | -? | ? | 9 |
| 21F | LIMA LIM | LI | w.wt | | | | | | | | | | | | | | | | | | | | | | 0.0166 | 0.0085 | 0.0747 | 0.014 | | 0.029 | | no | -? | ? | 23 |
| 30F | PLEU PLA | LI | w.wt | | | | | | | | | | | | 0.11 | | 0.101 | 0.222 | | | | | | | | | | | | | | 1.1 | -? | ? | 15 |
| 22F | PLEU PLA | LI | w.wt | | | | | | | | | | | | | | | | 0.23 | 0.231 | 0.244 | | | | | | | | | | | 1.2 | -? | ? | <=5 |
| 98F2 | PLEU PLA | LI | w.wt | | | | | | | | | | | | | | | | | | | | 0.821 | 0.521 | 0.217 | 0.218 | 0.0726 | 1.01 | 0.593 | 0.287 | 0.205 | 1.0 | -- | 1.7 | 22 |
| 10F | PLEU PLA | LI | w.wt | | | | | | | | | | | | | | | | | 0.571 | | 0.141 | 0.248 | 0.302 | 0.204 | 0.316 | 0.307 | 0.271 | | 0.627 | 0.409 | 2.0 | -- | 3.7 | 14 |
| 67F | LEPI WHI | LI | w.wt | | | 0.181 | | | | 0.18 | 0.109 | 0.066 | 0.197 | 0.085 | 0.1 | 0.12 | 0.304 | 0.259 | 0.2 | 0.097 | 0.033 | 0.051 | 0.037 | 0.049 | 0.0342 | 0.0543 | 0.0485 | 0.0609 | 0.0449 | 0.028 | 0.026 | m | DY | m | 14 |
| 21F | LEPI WHI | LI | w.wt | | | | | | | | | | | | | | | | | | | | | | | 0.0592 | 0.0812 | 0.112 | 0.186 | 0.049 | 0.041 | m | -- | m | 18 |

Annual median concentration of Hg (ppm)

| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | ANALYSIS OC | TRD | SM3 | PWR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30A | MYTI EDU | SB | d.wt | | | | 0.118 | 0.073 | 0.147 | 0.05 | 0.13 | 0.0437 | 0.0641 | 0.0533 | 0.0508 | 0.0703 | 0.0865 | 0.0574 | 0.07 | 0.0604 | 0.0778 | 0.114 | 0.0599 | 0.0586 | 0.0952 | 0.071 | 0.153 | 0.113 | 0.1 | 0.0765 | 0.106 | no | -- | no | 12 |
| 31A | MYTI EDU | SB | d.wt | | | 0.0757 | 0.164 | 0.086 | 0.12 | 0.05 | 0.09 | 0.0225 | 0.0599 | 0.0485 | 0.0508 | 0.0446 | 0.0502 | 0.0623 | 0.0435 | 0.0515 | 0.0699 | 0.0881 | 0.0464 | 0.051 | 0.0577 | 0.0577 | 0.0935 | 0.11 | 0.18 | 0.159 | 0.0867 | no | UY | no | 13 |
| 35A | MYTI EDU | SB | d.wt | | | 0.0933 | 0.0741 | 0.084 | 0.17 | 0.05 | 0.18 | 0.05 | 0.0617 | 0.0585 | 0.0578 | 0.0537 | 0.0607 | 0.0369 | 0.0383 | 0.0354 | 0.0667 | 0.101 | 0.028 | 0.0472 | 0.0575 | 0.0574 | 0.0938 | 0.12 | 0.045 | 0.045 | 0.0632 | no | -- | no | 14 |
| 36A | MYTI EDU | SB | d.wt | | | 0.0516 | 0.0427 | 0.084 | 0.14 | 0.05 | 0.14 | 0.034 | 0.0452 | 0.0476 | 0.0394 | 0.0321 | 0.0481 | 0.0333 | 0.0442 | 0.0743 | 0.0299 | 0.0455 | 0.0377 | 0.0245 | 0.0342 | 0.0526 | 0.108 | 0.05 | 0.0364 | 0.0267 | 0.0353 | no | -- | no | 14 |
| 71A | MYTI EDU | SB | d.wt | | | 0.393 | 0.242 | 0.218 | 0.247 | 0.12 | 0.34 | 0.249 | 0.182 | 0.145 | 0.178 | 0.14 | 0.212 | 0.201 | 0.222 | 0.312 | 0.11 | 0.155 | 0.132 | 0.123 | 0.15 | 0.154 | 0.189 | 0.177 | 0.18 | 0.133 | 0.122 | no | D- | no | 11 |
| 76A | MYTI EDU | SB | d.wt | | | | | | | | | | 0.0709 | 0.0682 | 0.0498 | 0.0205 | | | 0.057 | 0.0824 | 0.0632 | 0.101 | 0.0328 | 0.0634 | 0.0585 | 0.0843 | 0.101 | 0.0824 | 0.0579 | 0.0824 | 0.0933 | no | -- | no | 13 |
| 15A | MYTI EDU | SB | d.wt | | | | | | | | | | 0.0561 | 0.0522 | | 0.0244 | 0.0503 | 0.0217 | 0.0488 | 0.0558 | 0.0529 | 0.0437 | 0.163 | 0.0354 | 0.0452 | 0.0596 | 0.0946 | 0.075 | 0.0632 | 0.0471 | 0.0526 | no | -- | no | 15 |
| 51A | MYTI EDU | SB | d.wt | | | | | | | 0.24 | 0.25 | | | | | | | 1.51 | 0.901 | 0.175 | 0.577 | 2.89 | 3.86 | 0.774 | 1.45 | 1.47 | 0.304 | 0.607 | 0.231 | 0.292 | 0.257 | 1.3 | -- | no | 21 |
| 52A | MYTI EDU | SB | d.wt | | | | | | | | | 2.35 | 0.321 | 3.01 | 0.976 | 0.372 | 0.282 | 0.437 | 0.178 | 0.26 | 0.258 | 0.58 | 0.34 | 0.298 | 0.264 | 0.195 | 0.228 | 0.163 | 0.135 | 0.244 | 0.143 | no | D- | no | 17 |
| 56A | MYTI EDU | SB | d.wt | | | | | | | 0.53 | 0.37 | 1.09 | 0.71 | 1.54 | 0.935 | 1.22 | 0.352 | 0.679 | 0.365 | 0.526 | 0.282 | 0.917 | 0.982 | 0.611 | 0.602 | 0.346 | 0.235 | 0.358 | 0.336 | 0.294 | 0.307 | 1.5 | D- | 1.5 | 14 |
| 57A | MYTI EDU | SB | d.wt | | | | | | | 0.17 | 0.21 | 0.269 | 0.411 | 0.758 | 0.576 | 0.349 | 0.35 | 0.26 | 0.155 | 0.319 | 0.166 | 0.467 | 0.451 | 0.349 | 0.277 | 0.193 | 0.115 | 0.229 | 0.229 | 0.139 | 0.133 | no | DY | no | 12 |
| 63A | MYTI EDU | SB | d.wt | | | | | | | 0.31 | 0.14 | 0.177 | 0.394 | 0.468 | 0.294 | 0.143 | 0.19 | 0.252 | 0.172 | 0.203 | 0.226 | 0.268 | 0.299 | 0.365 | 0.289 | 0.213 | 0.0695 | 0.18 | 0.187 | 0.194 | 0.116 | no | -- | no | 14 |
| 65A | MYTI EDU | SB | d.wt | | | | | | | 0.1 | 0.15 | 0.104 | 0.312 | 0.328 | 0.124 | 0.119 | 0.134 | 0.148 | 0.118 | 0.136 | 0.0792 | 0.142 | 0.155 | 0.189 | 0.132 | 0.135 | 0.0638 | 0.133 | 0.156 | 0.114 | 0.09 | no | -- | no | 13 |
| 69A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 0.106 | 0.0263 | 0.0829 | 0.0704 | 0.104 | 0.111 | 0.0773 | 0.161 | 0.107 | 0.146 | 0.106 | 0.0989 | 0.0586 | 0.1 | 0.0778 | 0.0882 | 0.0789 | no | -- | no | 14 |
| 22A | MYTI EDU | SB | d.wt | | | | | | | | | | 0.0529 | 0.0732 | 0.112 | 0.0476 | 0.0673 | 0.0657 | 0.0723 | 0.0683 | 0.046 | 0.0736 | 0.0288 | 0.0545 | 0.0461 | 0.126 | 0.161 | 0.125 | 0.106 | 0.127 | 0.119 | no | UY | no | 12 |
| 23A | MYTI EDU | SB | d.wt | | | | | | | | | | 0.0543 | 0.0759 | | | | | | | | | | | | | 0.0855 | 0.107 | | | | no | -? | ? | 9 |
| 24A | MYTI EDU | SB | d.wt | | | | | | | | | | 0.0578 | 0.0748 | | | | | | | | | | | | | 0.0903 | 0.075 | | | | no | -? | ? | 8 |
| 82A | MYTI EDU | SB | d.wt | | | | 0.0508 | 0.11 | 0.17 | 0.08 | 0.12 | 0.0668 | | 0.0743 | 0.0519 | 0.0787 | | 0.0493 | 0.0691 | | | | | | | | 0.0508 | 0.0941 | | | | no | -- | no | 13 |
| 84A | MYTI EDU | SB | d.wt | | | | 0.0766 | 0.112 | 0.15 | 0.08 | 0.24 | 0.0571 | | 0.0657 | 0.0902 | 0.0568 | | 0.0542 | 0.0433 | | | | | | | | 0.0511 | 0.0824 | | | | no | -- | no | 15 |
| 87A | MYTI EDU | SB | d.wt | | | | 0.178 | | 0.15 | 0.05 | 0.26 | 0.0462 | | 0.0564 | 0.0543 | 0.0488 | | 0.0439 | 0.0623 | | | | | | | | 0.0467 | 0.045 | | | | no | -- | no | 18 |
| 25A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 0.141 | 0.0368 | | | | | | | | | | | 0.0952 | 0.0727 | | | | no | -? | ? | 19 |
| 26A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 0.0959 | 0.0459 | | | | | | | | | | | 0.0843 | 0.0789 | | | | no | -? | ? | 14 |
| 27A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 0.107 | | | | | | | | | | | | 0.0824 | 0.0722 | | | | no | -? | ? | 6 |
| 28A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 0.0765 | 0.0619 | | | | | | | | | | | 0.0851 | 0.125 | | | | no | -? | ? | 10 |
| 91A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 0.0539 | 0.0758 | 0.0943 | | | | | | | | | | | 0.0647 | | | | no | -? | ? | 12 |
| 92A1 | MYTI EDU | SB | d.wt | | | | | | | | | | | | 0.0548 | 0.0335 | 0.0521 | 0.0407 | 0.0234 | 0.067 | | | | | | | | | | | | no | -- | no | 14 |
| 93A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 0.0679 | 0.118 | | | | | | | | | | | 0.202 | 0.126 | | | | no | -? | ? | 13 |
| 94A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 0.082 | 0.0631 | | | | | | | | | | | 0.0508 | 0.0591 | | | | no | -? | ? | 8 |
| 95A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 0.0765 | 0.0598 | | | | | | | | | | | 0.0526 | 0.0667 | | | | no | -? | ? | 9 |
| 96A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 0.0481 | 0.0304 | | | | | | | | | | | 0.039 | 0.04 | | | | no | -? | ? | 10 |
| 97A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 0.0765 | 0.0703 | | | | | | | | | | | 0.0594 | 0.0619 | | | | no | -? | ? | <=5 |
| 98A2 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | 0.104 | | 0.246 | 0.109 | 0.109 | 0.115 | 0.14 | 0.0817 | 0.08 | 0.0889 | 0.075 | 0.0765 | no | -- | no | 12 |
| 98X | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.335 | 0.34 | 0.328 | | | | | | | | | | | | | 1.6 | -? | ? | <=5 |
| 99A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 0.0881 | 0.0487 | | | | | | | | | | | 0.0552 | 0.0588 | | | | no | -? | ? | 12 |
| 41A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.0686 | 0.0635 | 0.064 | 0.0848 | | | | | | | | | 0.05 | 0.0471 | | no | -- | no | 8 |
| 42A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.0449 | 0.0492 | | | | | | | | | | | 0.0348 | 0.0333 | | no | D? | ? | <=5 |
| 43A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.0844 | 0.0946 | | 0.104 | | | | | | | | | 0.075 | 0.0733 | | no | -? | ? | 7 |
| 44A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.0552 | 0.05 | 0.0517 | 0.0592 | | | | | | | | | 0.0444 | 0.045 | | no | -- | no | 6 |
| 45A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.0819 | 0.0667 | | | | | | | | | | | 0.0474 | 0.05 | | no | D? | ? | 7 |
| 46A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.0387 | 0.0618 | 0.0564 | | | | | | | | | | 0.04 | 0.0227 | | no | -? | ? | 12 |
| 47A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.064 | 0.0425 | | | | | | | | | | | 0.0579 | 0.0368 | | no | -? | ? | 12 |
| 48A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.0726 | 0.0599 | 0.0524 | | | | | | | | | | 0.125 | 0.1 | | no | -? | ? | 10 |
| 49A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.0651 | 0.0543 | | | | | | | | | | | 0.0474 | 0.0389 | | no | -? | ? | 7 |
| 10A2 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | 0.0588 | 0.0617 | 0.0581 | 0.0625 | 0.0503 | 0.052 | 0.0494 | 0.0549 | 0.0503 | 0.0368 | 0.0412 | 0.0391 | 0.0412 | no | D- | no | 6 |
| 11X | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | 0.0811 | 0.0366 | 0.0564 | 0.0667 | 0.065 | 0.0372 | 0.0372 | 0.037 | 0.0429 | 0.0389 | 0.0421 | 0.0471 | no | -- | no | 11 |

Annual median concentration of Hg (ppm)

| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | ANALYSIS OC | TRD | SM3 | PWR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30A | MYTI EDU | SB | d.wt | | | | 0.118 | 0.073 | 0.147 | 0.05 | 0.13 | 0.0437 | 0.0641 | 0.0533 | 0.0508 | 0.0703 | 0.0865 | 0.0574 | 0.07 | 0.0604 | 0.0778 | 0.114 | 0.0599 | 0.0586 | 0.0952 | 0.071 | 0.153 | 0.113 | 0.1 | 0.0765 | 0.106 | no | -- | no | 12 |
| 71A | MYTI EDU | SB | d.wt | | | 0.393 | 0.242 | 0.218 | 0.247 | 0.12 | 0.34 | 0.249 | 0.182 | 0.145 | 0.178 | 0.14 | 0.212 | 0.201 | 0.222 | 0.312 | 0.11 | 0.155 | 0.132 | 0.123 | 0.15 | 0.154 | 0.189 | 0.177 | 0.18 | 0.133 | 0.122 | no | D- | no | 11 |
| 51A | MYTI EDU | SB | d.wt | | | | | | | 0.24 | 0.25 | | | | | | | 1.51 | 0.901 | 0.175 | 0.577 | 2.89 | 3.86 | 0.774 | 1.45 | 1.47 | 0.304 | 0.607 | 0.231 | 0.292 | 0.257 | 1.3 | -- | no | 21 |
| 52A | MYTI EDU | SB | d.wt | | | | | | | | | 2.35 | 0.321 | 3.01 | 0.976 | 0.372 | 0.282 | 0.437 | 0.178 | 0.26 | 0.258 | 0.58 | 0.34 | 0.298 | 0.264 | 0.195 | 0.228 | 0.163 | 0.135 | 0.244 | 0.143 | no | D- | no | 17 |
| 10A2 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | 0.0588 | 0.0617 | 0.0581 | 0.0625 | 0.0503 | 0.052 | 0.0494 | 0.0549 | 0.0503 | 0.0368 | 0.0412 | 0.0391 | 0.0412 | no | D- | no | 6 |
| I021 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 0.212 | 0.397 | 0.496 | 0.859 | | 0.356 | 0.436 | 0.319 | | | | | | | 1.6 | -- | no | 13 |
| I022 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 0.13 | 0.134 | 0.321 | 0.404 | 0.415 | 0.182 | 0.238 | 0.289 | 0.197 | 0.155 | 0.243 | 0.215 | 0.242 | 0.264 | 1.3 | -- | 1.6 | 12 |
| I023 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 0.14 | 0.143 | 0.295 | 0.31 | 0.263 | 0.0944 | 0.0959 | 0.15 | 0.142 | 0.129 | 0.164 | 0.177 | 0.138 | 0.131 | no | -- | no | 12 |
| I024 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 0.107 | 0.18 | 0.45 | 0.543 | 0.425 | 0.12 | 0.295 | 0.238 | 0.233 | 0.21 | 0.291 | 0.275 | 0.225 | 0.245 | 1.2 | -- | 1.2 | 14 |
| I301 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 0.0656 | 0.0682 | 0.0582 | 0.0675 | 0.0625 | 0.0408 | 0.0677 | 0.05 | 0.0732 | 0.114 | 0.125 | 0.0929 | 0.0778 | 0.0857 | no | U- | no | 10 |
| I304 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 0.047 | 0.0694 | 0.0395 | 0.0541 | 0.0503 | 0.0294 | 0.0513 | 0.0462 | 0.0491 | 0.063 | 0.0702 | 0.0615 | 0.0471 | 0.0467 | no | -- | no | 10 |
| I306 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 0.0447 | 0.0617 | 0.0387 | 0.061 | 0.0508 | 0.0355 | 0.0353 | 0.0403 | 0.0507 | 0.0744 | 0.069 | 0.05 | 0.05 | 0.0692 | no | -- | no | 10 |
| I307 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 0.0383 | 0.0705 | 0.0337 | 0.0465 | 0.0542 | 0.0327 | 0.0488 | 0.0541 | 0.062 | 0.0893 | 0.0952 | 0.0438 | 0.0438 | 0.0714 | no | -- | no | 12 |
| I711 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | | 0.382 | 0.287 | 0.198 | | 0.2 | | | | | | | no | -? | ? | 9 |
| I712 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | | 0.181 | 0.257 | 0.214 | 0.218 | 0.211 | 0.145 | 0.178 | 0.184 | 0.218 | 0.163 | 0.231 | 1.2 | -- | 1.2 | 9 |
| I713 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | | | | | | 0.111 | 0.177 | 0.157 | 0.108 | 0.164 | 0.117 | 0.192 | no | -- | no | 11 |
| I131A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 0.127 | 0.0691 | 0.0601 | 0.144 | 0.0635 | 0.0337 | 0.0784 | 0.0503 | 0.0652 | 0.1 | 0.0634 | 0.0786 | 0.0533 | | no | -- | no | 14 |
| I201 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | | 0.101 | 0.132 | 0.157 | 0.169 | 0.313 | 0.0964 | 0.13 | 0.291 | 0.215 | 0.292 | 0.247 | 1.2 | -- | 1.9 | 14 |
| I205 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | | 0.0974 | 0.171 | 0.205 | 0.167 | 0.218 | 0.151 | 0.142 | 0.306 | 0.285 | 0.267 | 0.314 | 1.6 | U- | 2.2 | 11 |
| I965 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | | | | | | 0.2 | 0.0904 | 0.168 | 0.124 | 0.107 | 0.123 | 0.15 | no | -- | no | 12 |
| I964 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | | | | | | 0.136 | 0.0592 | 0.0494 | 0.155 | 0.17 | 0.163 | 0.157 | no | -- | 1.4 | 16 |
| I969 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | | | | | | 0.0632 | 0.0419 | 0.0359 | 0.103 | 0.0421 | 0.0667 | 0.0467 | no | -- | no | 14 |

Annual median concentration of Hg (ppm)

| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | ANALYSIS OC | TRND | SM+3 | POWER |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30B | GADU MOR | MU | w.wt | | | | 0.14 | 0.09 | 0.0732 | 0.0382 | 0.112 | 0.13 | 0.12 | 0.09 | 0.12 | 0.133 | 0.123 | 0.105 | 0.134 | 0.155 | 0.195 | 0.201 | 0.217 | 0.26 | 0.15 | 0.163 | 0.134 | 0.147 | 0.225 | 0.17 | 0.255 | 2.6 | U- | 3.0 | 11 |
| 36B | GADU MOR | MU | w.wt | 0.0729 | 0.09 | 0.12 | 0.134 | 0.0995 | 0.0905 | 0.0352 | 0.0644 | 0.0708 | 0.1 | 0.08 | 0.07 | 0.079 | 0.056 | 0.081 | 0.068 | 0.113 | 0.089 | 0.094 | 0.072 | 0.083 | 0.082 | 0.043 | 0.053 | 0.085 | 0.094 | 0.081 | 0.108 | 1.1 | -- | 1.4 | 11 |
| 77B | GADU MOR | MU | w.wt | | | | | | | | | | 0.13 | 0.07 | | | | | | | | | | | | | | | | | 0.048 | no | -? | ? | 14 |
| 15B | GADU MOR | MU | w.wt | | | | | | | | | | 0.09 | 0.06 | 0.042 | 0.023 | 0.059 | 0.0445 | 0.071 | 0.089 | 0.073 | 0.024 | 0.046 | 0.071 | 0.043 | 0.035 | 0.024 | 0.035 | 0.034 | 0.037 | 0.048 | no | -- | no | 13 |
| 53B | GADU MOR | MU | w.wt | | | | | | 0.196 | | 0.105 | 0.18 | 0.17 | 0.22 | 0.392 | 0.146 | | 0.066 | 0.238 | 0.217 | 0.227 | 0.227 | 0.328 | 0.51 | 0.28 | 0.114 | 0.183 | 0.176 | 0.129 | 0.223 | 0.184 | 1.8 | -- | 2.1 | 15 |
| 67B | GADU MOR | MU | w.wt | | | | | | | 0.115 | 0.0847 | 0.0957 | 0.12 | 0.125 | 0.109 | 0.0925 | 0.113 | 0.071 | 0.087 | 0.124 | 0.053 | 0.059 | 0.085 | 0.069 | 0.064 | 0.042 | 0.035 | 0.058 | 0.045 | 0.055 | 0.038 | no | D- | no | 10 |
| 23B | GADU MOR | MU | w.wt | | | | | | | | | | 0.11 | 0.09 | 0.07 | 0.062 | 0.058 | 0.081 | 0.058 | 0.082 | 0.088 | 0.079 | 0.092 | 0.086 | 0.089 | 0.067 | 0.096 | 0.08 | 0.096 | 0.114 | 0.109 | 1.1 | UY | 1.4 | 8 |
| 84B | GADU MOR | MU | w.wt | | | | 0.05 | 0.04 | 0.0246 | | 0.0439 | | | | | | | | | | | | | | | | | | | | | no | -? | ? | 13 |
| 92B | GADU MOR | MU | w.wt | | | | | | | | | | | | | 0.057 | 0.087 | 0.077 | 0.093 | | | | | | | | 0.058 | 0.054 | | | 0.071 | no | -- | no | 8 |
| 98B1 | GADU MOR | MU | w.wt | | | | | | | | | | | | 0.067 | 0.0615 | 0.068 | 0.074 | 0.038 | 0.107 | 0.081 | 0.043 | | | 0.047 | 0.064 | 0.117 | 0.059 | 0.071 | 0.0938 | 0.032 | no | -- | no | 14 |
| 43B | GADU MOR | MU | w.wt | | | | | | | | | | | | | | 0.056 | 0.057 | 0.048 | | | | | | | | | | | | 0.0485 | no | -? | ? | 6 |
| 10B | GADU MOR | MU | w.wt | | | | | | | | | | | | | | 0.044 | 0.041 | 0.037 | 0.018 | 0.016 | 0.02 | 0.012 | 0.009 | 0.012 | 0.016 | 0.015 | 0.018 | 0.019 | 0.018 | 0.014 | no | DY | no | 10 |

Annual median concentration of Hg (ppm)

| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | ANALYSIS OC | TRND | SM+3 | POWER |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 33F | PLAT FLE | MU | w.wt | | | 0.12 | | 0.09 | 0.0769 | 0.019 | 0.0694 | | 0.18 | 0.11 | 0.126 | 0.081 | 0.074 | 0.051 | 0.052 | 0.0795 | 0.049 | 0.078 | 0.05 | 0.049 | 0.042 | 0.038 | 0.036 | 0.045 | 0.031 | 0.071 | 0.04 | no | DY | no | 13 |
| 53F | PLAT FLE | MU | w.wt | | | | | | | | 0.111 | 0.107 | 0.12 | 0.14 | 0.124 | 0.104 | | 0.0352 | 0.207 | 0.185 | 0.201 | 0.159 | 0.259 | 0.338 | 0.625 | 0.5 | 0.328 | 0.845 | | 0.231 | 0.224 | 2.2 | U- | no | 15 |
| 67F | PLAT FLE | MU | w.wt | | | | | | | | | | | | | | | | 0.18 | | 0.0555 | 0.037 | 0.069 | 0.05 | 0.057 | 0.066 | 0.064 | 0.061 | 0.041 | 0.045 | 0.071 | no | -- | no | 12 |
| 21F | PLAT FLE | MU | w.wt | | | | | | | | | | | | | | | | | | | 0.075 | 0.078 | 0.04 | 0.042 | | 0.021 | 0.046 | 0.043 | | | no | -- | no | 13 |
| 36F | LIMA LIM | MU | w.wt | | | | | | | | | | 0.07 | 0.06 | 0.086 | 0.078 | 0.056 | 0.058 | 0.073 | 0.038 | 0.09 | 0.054 | 0.066 | 0.053 | 0.068 | 0.061 | 0.074 | 0.12 | 0.1 | 0.111 | 0.054 | no | -- | no | 11 |
| 15F | LIMA LIM | MU | w.wt | | | | | | | | | | | 0.09 | | 0.0359 | 0.036 | 0.034 | 0.056 | 0.055 | 0.049 | 0.0459 | | 0.064 | 0.07 | 0.045 | 0.082 | 0.115 | 0.074 | 0.076 | 0.13 | 1.3 | U- | 1.4 | 11 |
| 22F | LIMA LIM | MU | w.wt | | | | | | | | | | 0.13 | 0.08 | 0.257 | | 0.082 | 0.153 | | | | | | | | | | | | | | 1.5 | -? | ? | 17 |
| 21F | LIMA LIM | MU | w.wt | | | | | | | | | | | | | | | | | | | | | | 0.021 | 0.006 | 0.084 | 0.009 | | 0.137 | | 1.4 | -? | ? | >25 |
| 30F | PLEU PLA | MU | w.wt | | | | | | | | | | | | 0.0451 | | 0.038 | 0.039 | | | | | | | | | | | | | | no | -? | ? | <=5 |
| 22F | PLEU PLA | MU | w.wt | | | | | | | | | | | | | | | | 0.045 | 0.051 | 0.074 | | | | | | | | | | | no | -? | ? | 7 |
| 98F2 | PLEU PLA | MU | w.wt | | | | | | | | | | | | | | | | | | | | 0.115 | 0.072 | 0.032 | 0.041 | 0.016 | 0.0732 | 0.045 | 0.044 | 0.02 | no | -- | no | 17 |
| 10F | PLEU PLA | MU | w.wt | | | | | | | | | | | | | | | | | 0.038 | | 0.0216 | 0.029 | 0.023 | 0.023 | 0.0155 | 0.0273 | 0.024 | | 0.0364 | 0.0272 | no | -- | no | 10 |
| 67F | LEPI WHI | MU | w.wt | | | 0.39 | | | | 0.35 | 0.329 | 0.253 | 0.52 | 0.07 | 0.174 | 0.205 | 0.477 | 0.379 | 0.418 | 0.284 | 0.11 | 0.154 | 0.114 | 0.111 | 0.123 | 0.131 | 0.199 | 0.096 | 0.108 | 0.09 | 0.098 | m | D- | m | 15 |
| 21F | LEPI WHI | MU | w.wt | | | | | | | | | | | | | | | | | | | | | | | 0.122 | 0.19 | 0.192 | 0.215 | 0.203 | 0.13 | m | -- | m | 11 |

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 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | ANALYSIS OC | TRD | SM3 | PWR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30A | MYTI EDU | SB | d.wt | | | | | | | | | | 1.86 | 1.36 | 3.95 | 2.27 | 2.54 | 1.58 | 2.12 | 2.69 | 36.7 | 2.13 | 1.74 | 1.76 | 2.24 | 2.58 | 3.74 | 3.38 | 4.12 | 3.06 | 3.94 | 1.3 | -- | 1.4 | 20 |
| 31A | MYTI EDU | SB | d.wt | | | | | | | | | | 1.38 | 1.21 | 1.26 | 1.03 | 1.37 | 1.68 | 1.79 | 0.732 | 1.54 | 0.629 | 0.629 | 0.51 | 1.43 | 0.805 | 0.781 | 0.869 | 0.855 | 0.647 | 0.667 | no | -- | no | 12 |
| 35A | MYTI EDU | SB | d.wt | | | | | | | | | | 1.44 | 1.07 | 1.68 | 1.2 | 1.28 | 0.507 | 0.628 | 0.664 | 0.759 | 0.714 | 0.522 | 0.866 | 0.571 | 0.574 | 0.813 | 1.21 | 0.805 | 0.571 | 1.11 | no | D- | no | 12 |
| 36A | MYTI EDU | SB | d.wt | | | | | | | | | | 1.01 | 0.847 | 0.787 | 1.12 | 1.39 | 1.24 | 2.04 | 2.17 | 1.57 | 0.995 | 0.943 | 0.618 | 0.449 | 0.585 | 0.956 | 0.578 | 0.559 | 1.13 | 0.471 | no | DY | no | 12 |
| 71A | MYTI EDU | SB | d.wt | | | | | | | | | | 1.16 | 0.745 | 1.72 | 1.42 | 1.92 | 1.49 | 2.21 | 2.83 | 0.867 | 0.903 | 0.774 | 1.45 | 0.919 | 0.915 | 0.866 | 0.962 | 0.98 | 0.797 | 1 | no | -- | no | 12 |
| 76A | MYTI EDU | SB | d.wt | | | | | | | | | | 1.77 | 0.968 | 1.5 | 0.913 | | | 0.796 | 1.84 | 1.23 | 1.99 | 0.602 | 0.829 | 0.766 | 0.938 | 1.48 | 0.778 | 1.19 | 1.06 | 1.76 | no | -- | no | 13 |
| 15A | MYTI EDU | SB | d.wt | | | | | | | | | | 1.46 | 0.777 | | 0.976 | 1.05 | 0.522 | 0.671 | 1.12 | 1.28 | 1.66 | 2.2 | 0.96 | 0.714 | 0.76 | 0.857 | 1.66 | 0.781 | 1.06 | 0.545 | no | -- | no | 13 |
| 51A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 149 | 60.3 | 17.2 | 29.6 | 37.1 | 91.7 | 32.4 | 98.4 | 108 | 42.2 | 77.5 | 17.6 | 29.8 | 23.4 | 7.8 | -- | no | 18 |
| 52A | MYTI EDU | SB | d.wt | | | | | | | | | | 12.1 | 313 | 189 | 65.5 | 16.4 | 17.5 | 9.84 | 20.6 | 14.7 | 11.6 | 11 | 21.8 | 21.8 | 16.9 | 16.3 | 9.27 | 8.44 | 15.8 | 9.86 | 3.3 | -- | 2.8 | 21 |
| 56A | MYTI EDU | SB | d.wt | | | | | | | | | | 20.7 | 23.4 | 121 | 109 | 24.7 | 46.4 | 27.8 | 37.5 | 15.7 | 30.3 | 28.5 | 30.5 | 42.9 | 27.8 | 24.7 | 32 | 28.9 | 21.4 | 19.6 | 6.5 | -- | 4.9 | 16 |
| 57A | MYTI EDU | SB | d.wt | | | | | | | | | | 10.5 | 12.1 | 33.3 | 19.2 | 15.1 | 13.2 | 5.6 | 13.7 | 6.15 | 10.4 | 10.3 | 11.9 | 9.59 | 7.02 | 5.79 | 11.3 | 10.4 | 4.57 | 4.78 | 1.6 | D- | 1.0 | 14 |
| 63A | MYTI EDU | SB | d.wt | | | | | | | | | | 12.1 | 10.1 | 15.4 | 10.9 | 7.22 | 12.1 | 7.6 | 6.1 | 6.39 | 4.84 | 4.52 | 7.05 | 6.57 | 6.3 | 1.92 | 4.53 | 5.36 | 4.05 | 2.63 | no | D- | no | 13 |
| 65A | MYTI EDU | SB | d.wt | | | | | | | | | | 5.61 | 3.78 | 5.19 | 6.53 | 3.28 | 4.73 | 2.41 | 3 | 1.77 | 1.63 | 2.45 | 2.84 | 3.05 | 2.82 | 1.25 | 3 | 4.01 | 1.56 | 1.75 | no | D- | no | 13 |
| 69A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 4.62 | 3.42 | 2.8 | 3.17 | 4.02 | 3.66 | 1.98 | 3.4 | 2.27 | 3.91 | 2.76 | 2.53 | 0.957 | 1.74 | 2.01 | 1.65 | 1.84 | no | D- | no | 12 |
| 22A | MYTI EDU | SB | d.wt | | | | | | | | | | 1.37 | 1.46 | 2.78 | 1.87 | 1.39 | 1.18 | 1.51 | 1.37 | 1.21 | 1.7 | 1.3 | 1.21 | 0.884 | 1.46 | 1.79 | 1.88 | 1.31 | 2.6 | 2.29 | no | -- | no | 11 |
| 23A | MYTI EDU | SB | d.wt | | | | | | | | | | 1.42 | 1.47 | | | | | | | | | | | | | 0.878 | 2.13 | | | | no | -? | ? | 15 |
| 24A | MYTI EDU | SB | d.wt | | | | | | | | | | 1.42 | 1.21 | | | | | | | | | | | | | 2.01 | 1.44 | | | | no | -? | ? | 9 |
| 82A | MYTI EDU | SB | d.wt | | | | | | | | | | | 1.28 | 0.933 | 0.916 | | 0.622 | 0.674 | | | | | | | | 0.558 | 0.529 | | | | no | -- | no | 7 |
| 84A | MYTI EDU | SB | d.wt | | | | | | | | | | | 1.01 | 1.15 | 1.38 | | 1.38 | 0.833 | | | | | | | | 1.11 | 1 | | | | no | -- | no | 9 |
| 87A | MYTI EDU | SB | d.wt | | | | | | | | | | | 0.974 | 0.87 | 0.634 | | 1.4 | 2.47 | | | | | | | | 0.421 | 0.3 | | | | no | -- | no | 13 |
| 25A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 2.68 | 1.77 | | | | | | | | | | | 2.01 | 1.09 | | | | no | -? | ? | 13 |
| 26A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 1.42 | 1.38 | | | | | | | | | | | 1.87 | 1.4 | | | | no | -? | ? | 8 |
| 27A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 1.83 | | | | | | | | | | | | 0.941 | 0.833 | | | | no | D? | ? | <=5 |
| 28A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 1.39 | 1.87 | | | | | | | | | | | 0.957 | 1.29 | | | | no | -? | ? | 10 |
| 91A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 0.898 | 1.46 | 2.01 | | | | | | | | | | | 0.778 | | | | no | -? | ? | 15 |
| 92A1 | MYTI EDU | SB | d.wt | | | | | | | | | | | | 0.933 | 0.628 | 1.09 | 0.664 | 0.654 | 2.18 | | | | | | | | | | | | no | -- | no | 16 |
| 93A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 1.14 | 1.62 | | | | | | | | | | | 2.13 | 1.05 | | | | no | -? | ? | 14 |
| 94A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 0.765 | 1.18 | | | | | | | | | | | 0.305 | 0.482 | | | | no | -? | ? | 13 |
| 95A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 1.04 | 2.16 | | | | | | | | | | | 0.585 | 0.463 | | | | no | -? | ? | 14 |
| 96A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 1.13 | 0.988 | | | | | | | | | | | 0.488 | 0.835 | | | | no | -? | ? | 12 |
| 97A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 1.37 | 1.26 | | | | | | | | | | | 0.495 | 0.47 | | | | no | D? | ? | <=5 |
| 98A2 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | 1.54 | | 1.59 | 1.49 | 1.34 | 0.892 | 1.16 | 1.09 | 0.54 | 0.667 | 0.699 | 0.706 | no | D- | no | 10 |
| 98X | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 4.34 | 3.12 | 4.11 | | | | | | | | | | | | | 1.4 | -? | ? | 11 |
| 99A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 1.2 | 0.752 | | | | | | | | | | | 0.697 | 0.529 | | | | no | -? | ? | 11 |
| 41A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 1.29 | 0.9 | 0.793 | 0.651 | | | | | | | | | 0.63 | 0.356 | | no | Dm | no | 11 |
| 42A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 1.54 | 0.761 | | | | | | | | | | | 0.557 | 0.384 | | no | -? | ? | 13 |
| 43A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 1.56 | 1.51 | | 0.855 | | | | | | | | | 0.713 | 0.572 | | no | D? | ? | 10 |
| 44A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 2.81 | 2.57 | 1.66 | 1.15 | | | | | | | | | 0.82 | 1.81 | | no | -- | no | 14 |
| 45A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 1.1 | 1.99 | | | | | | | | | | | 0.69 | 0.639 | | no | -? | ? | 12 |
| 46A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 1.26 | 1.57 | 1.38 | | | | | | | | | | 0.87 | 0.681 | | no | D? | ? | 8 |
| 47A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 1.09 | 1.18 | | | | | | | | | | | 0.603 | 0.675 | | no | D? | ? | 7 |
| 48A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.682 | 1.08 | 0.333 | | | | | | | | | | 0.451 | 0.448 | | no | -? | ? | 15 |
| 49A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 2.38 | 7.65 | | | | | | | | | | | 2.73 | 1.87 | | no | -? | ? | 18 |
| 10A2 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | 0.735 | 0.807 | 2.34 | 1.57 | 1.44 | 1.39 | 1.8 | 1.65 | 1.02 | 0.674 | 0.988 | 1.63 | 1.06 | no | -- | no | 13 |
| 11X | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | 0.743 | 0.521 | 0.314 | 1.09 | 2.32 | 0.74 | 0.279 | 0.37 | 0.323 | 0.539 | 0.331 | 0.389 | no | -- | no | 18 |

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 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | ANALYSIS OC | TRD | SM3 | PWR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30A | MYTI EDU | SB | d.wt | | | | | | | | | | 1.86 | 1.36 | 3.95 | 2.27 | 2.54 | 1.58 | 2.12 | 2.69 | 36.7 | 2.13 | 1.74 | 1.76 | 2.24 | 2.58 | 3.74 | 3.38 | 4.12 | 3.06 | 3.94 | 1.3 | -- | 1.4 | 20 |
| 71A | MYTI EDU | SB | d.wt | | | | | | | | | | 1.16 | 0.745 | 1.72 | 1.42 | 1.92 | 1.49 | 2.21 | 2.83 | 0.867 | 0.903 | 0.774 | 1.45 | 0.919 | 0.915 | 0.866 | 0.962 | 0.98 | 0.797 | 1 | no | -- | no | 12 |
| 51A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 149 | 60.3 | 17.2 | 29.6 | 37.1 | 91.7 | 32.4 | 98.4 | 108 | 42.2 | 77.5 | 17.6 | 29.8 | 23.4 | 7.8 | -- | no | 18 |
| 52A | MYTI EDU | SB | d.wt | | | | | | | | | | 12.1 | 313 | 189 | 65.5 | 16.4 | 17.5 | 9.84 | 20.6 | 14.7 | 11.6 | 11 | 21.8 | 21.8 | 16.9 | 16.3 | 9.27 | 8.44 | 15.8 | 9.86 | 3.3 | -- | 2.8 | 21 |
| 10A2 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | 0.735 | 0.807 | 2.34 | 1.57 | 1.44 | 1.39 | 1.8 | 1.65 | 1.02 | 0.674 | 0.988 | 1.63 | 1.06 | no | -- | no | 13 |
| I021 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 1.06 | 2.29 | 1.65 | 2.12 | | 0.99 | 1.65 | 1.19 | | | | | | | no | -- | no | 13 |
| I022 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 1 | 0.599 | 1.18 | 1.31 | 1.94 | 1.05 | 0.952 | 1.27 | 1.36 | 3.51 | 1.26 | 1.34 | 1.67 | 1.55 | no | -- | no | 13 |
| I023 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 0.774 | 1.27 | 1.38 | 1.7 | 1.38 | 0.636 | 0.616 | 0.754 | 1.28 | 2.34 | 0.901 | 1.05 | 0.846 | 0.769 | no | -- | no | 13 |
| I024 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 0.971 | 1.1 | 1.16 | 1.7 | 1.79 | 0.617 | 1.33 | 1.1 | 1.73 | 2.68 | 1.06 | 1.18 | 0.917 | 1.45 | no | -- | no | 13 |
| I301 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | | 2.47 | 2.11 | 1.32 | 3.16 | 1.98 | 1.77 | 3.07 | 2.15 | 5.38 | 2.94 | 2.63 | no | -- | 1.2 | 13 |
| I304 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | | 2.23 | 1.19 | 0.765 | 1.88 | 1.3 | 1.16 | 1.73 | 1.95 | 2.16 | 1.59 | 1.47 | no | -- | no | 13 |
| I306 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | | 1.34 | 0.678 | 0.542 | 1.03 | 0.658 | 0.704 | 1.08 | 1.09 | 0.938 | 0.867 | 1.15 | no | -- | no | 11 |
| I307 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | | 1.05 | 0.798 | 0.513 | 1.01 | 1.26 | 1.01 | 1.07 | 1.39 | 1.04 | 0.875 | 1.21 | no | -- | no | 11 |
| I201 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 3.54 | 4.39 | 4.77 | 4.67 | 4.43 | 6.41 | 3.78 | 8.21 | 1.87 | 3.33 | 4.31 | 3.41 | 4.75 | 4.44 | 1.5 | -- | 1.9 | 13 |
| I205 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 4.77 | | 6.96 | 4 | 5.97 | 7.09 | 6.15 | 9.27 | 3.4 | 2.76 | 6.3 | 5.26 | 3.33 | 7.29 | 2.4 | -- | 2.4 | 14 |
| I965 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | | | | | 20 | 12.7 | 6.45 | 13.1 | 12.5 | 13.7 | 16.6 | 29.4 | 9.8 | -- | 12.4 | 13 |
| I962 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 4.44 | 5.34 | 3.55 | 2.99 | | | | | | | | | | | no | -? | ? | 9 |
| I964 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | | | | | | 8.75 | 3.49 | 6.57 | 13 | 13.3 | 13.7 | 15.4 | 5.1 | -- | 8.7 | 14 |
| I969 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 2.47 | 2.08 | 1.62 | 2.91 | 5.13 | 3 | 2.57 | 2.58 | 1.85 | 1.59 | 3.92 | 2.11 | 1.94 | 1.93 | no | -- | no | 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 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | ANALYSIS OC | TRD | SM3 | PWR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30B | GADU MOR | LI | w.wt | | | | | | | | | | 0.2 | 0.115 | 0.249 | 0.105 | 0.12 | 0.11 | 0.06 | 0.0949 | 0.163 | 0.85 | 0.24 | 0.22 | 0.513 | 0.24 | 0.17 | 0.138 | 0.101 | 0.29 | 0.3 | 3.0 | -- | 3.2 | 17 |
| 36B | GADU MOR | LI | w.wt | | | | | | | | | | 0.115 | 0.05 | 0.03 | 0.02 | 0.03 | 0.02 | 0.03 | 0.04 | 0.03 | 0.04 | 0.04 | 0.03 | 0.0061 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | no | D- | no | 14 |
| 77B | GADU MOR | LI | w.wt | | | | | | | | | | 0.135 | 0.195 | | | | | | | | | | | | | | | | | 0.02 | no | -? | ? | 13 |
| 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 | 0.04 | 0.03 | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | no | DY | no | 12 |
| 53B | GADU MOR | LI | w.wt | | | | | | | | | | 0.19 | 0.26 | 0.14 | 0.03 | | 0.02 | 0.0748 | 0.07 | 0.105 | 0.115 | 0.13 | 0.13 | 0.142 | 0.04 | 0.09 | 0.082 | 0.0453 | 0.1 | 0.16 | 1.6 | DY | 1.7 | 16 |
| 67B | GADU MOR | LI | w.wt | | | | | | | | | | 0.13 | 0.18 | 0.03 | 0.0748 | 0.09 | 0.04 | 0.04 | 0.09 | 0.03 | 0.04 | 0.04 | 0.03 | 0.0149 | 0.02 | 0.02 | 0.0075 | 0.02 | 0.02 | 0.02 | no | D- | no | 16 |
| 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 | 0.03 | 0.03 | 0.0061 | 0.02 | 0.02 | 0.02 | 0.0423 | 0.02 | 0.02 | no | D- | no | 14 |
| 92B | GADU MOR | LI | w.wt | | | | | | | | | | | | | 0.02 | 0.03 | 0.03 | 0.04 | | | | | | | | 0.02 | 0.02 | | | 0.02 | no | -- | no | 7 |
| 98B1 | GADU MOR | LI | w.wt | | | | | | | | | | | | 0.03 | 0.03 | 0.03 | 0.04 | 0.04 | 0.05 | 0.03 | 0.03 | | | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | no | DY | no | 10 |
| 43B | GADU MOR | LI | w.wt | | | | | | | | | | | | | | 0.03 | 0.03 | 0.03 | | | | | | | | | | | | 0.02 | no | D? | ? | <=5 |
| 10B | GADU MOR | LI | w.wt | | | | | | | | | | | | | | 0.03 | 0.02 | 0.04 | 0.04 | 0.04 | 0.03 | 0.04 | 0.03 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | no | DY | no | 9 |

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 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | ANALYSIS OC | TRND | SM+3 | POWER |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 33F | 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 | 0.04 | 0.03 | 0.0295 | 0.03 | 0.02 | 0.03 | 0.0439 | 0.02 | 0.03 | no | DY | no | 13 |
| 53F | PLAT FLE | LI | w.wt | | | | | | | | | | 0.71 | 0.81 | 0.41 | 0.23 | | 0.0245 | 0.46 | 0.35 | 0.52 | 0.46 | 0.357 | 0.57 | 1.29 | 0.73 | 0.44 | 1.35 | | 0.56 | 0.7 | 2.3 | -- | 1.9 | 20 |
| 67F | PLAT FLE | LI | w.wt | | | | | | | | | | | | | | | | 0.35 | | 0.03 | 0.03 | 0.03 | 0.03 | 0.0078 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | no | DY | no | 16 |
| 21F | PLAT FLE | LI | w.wt | | | | | | | | | | | | | | | | | | | 0.04 | 0.0447 | 0.06 | 0.0461 | | 0.04 | 0.1 | 0.11 | | | no | -- | no | 12 |
| 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 | 0.06 | 0.04 | 0.0477 | 0.03 | 0.05 | 0.05 | 0.0473 | 0.05 | 0.06 | no | DY | no | 15 |
| 15F | LIMA LIM | LI | w.wt | | | | | | | | | | | 0.07 | | 0.0408 | 0.03 | 0.02 | 0.03 | 0.05 | 0.04 | 0.0346 | | 0.05 | 0.0212 | 0.02 | 0.03 | 0.03 | 0.037 | 0.02 | 0.03 | no | -- | no | 12 |
| 22F | LIMA LIM | LI | w.wt | | | | | | | | | | 0.25 | 0.16 | 0.0424 | | 0.06 | 0.07 | | | | | | | | | | | | | | no | -? | ? | 18 |
| 21F | LIMA LIM | LI | w.wt | | | | | | | | | | | | | | | | | | | | | | 0.0293 | 0.02 | 0.05 | 0.02 | | 0.08 | | no | -? | ? | 17 |
| 30F | PLEU PLA | LI | w.wt | | | | | | | | | | | | 0.739 | | 0.54 | 0.57 | | | | | | | | | | | | | | 2.9 | -? | ? | 7 |
| 22F | PLEU PLA | LI | w.wt | | | | | | | | | | | | | | | | 0.28 | 0.28 | 0.46 | | | | | | | | | | | 2.3 | -? | ? | 9 |
| 98F2 | PLEU PLA | LI | w.wt | | | | | | | | | | | | | | | | | | | | 0.104 | 0.04 | 0.0682 | 0.04 | 0.02 | 0.204 | 0.15 | 0.06 | 0.02 | no | -- | no | 23 |
| 10F | PLEU PLA | LI | w.wt | | | | | | | | | | | | | | | | | 0.15 | | 0.0648 | 0.08 | 0.05 | 0.0583 | 0.0447 | 0.0447 | 0.03 | | 0.0346 | 0.0592 | no | D- | no | 10 |
| 67F | 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 | 0.03 | 0.04 | 0.0312 | 0.02 | 0.0245 | 0.02 | 0.02 | 0.02 | 0.02 | m | D- | m | 11 |
| 21F | LEPI WHI | LI | w.wt | | | | | | | | | | | | | | | | | | | | | | | 0.02 | 0.02 | 0.02 | 0.031 | 0.02 | 0.02 | m | -- | m | 9 |

Annual median concentration of Cu (ppm)

| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | OC | ANALYSIS TRD | SM3 | PWR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30A | MYTI EDU | SB | d.wt | | | | 4.57 | | 7.45 | 4.96 | 5.48 | 5.97 | 10.3 | 10.5 | 5.84 | 6.67 | 8.56 | 6.94 | 7.69 | 9.47 | 7.72 | 8.01 | 6.49 | 5.81 | 6.29 | 7.68 | 8.55 | 9.31 | 8.2 | 7.35 | 7.44 | no | -- | no | 9 |
| 31A | MYTI EDU | SB | d.wt | | | 7.03 | 6.57 | | | 4.44 | 4.52 | 4.51 | 9.04 | 11 | 5.49 | 5.67 | 6.21 | 7.26 | 6.61 | 6.08 | 8.08 | 7.55 | 5.54 | 5.82 | 5.47 | 6.31 | 6.73 | 6.86 | 8.4 | 6.38 | 5.87 | no | -- | no | 9 |
| 35A | MYTI EDU | SB | d.wt | | | 6.32 | 3.62 | | 8.06 | 4.89 | 4.58 | 5.26 | 8.02 | 10.1 | 6.56 | 6.34 | 6.61 | 6.41 | 6.94 | 6.81 | 7.23 | 7.14 | 5.49 | 6.19 | 6.51 | 7.38 | 8.31 | 7.94 | 6.55 | 5.57 | 6.58 | no | -- | no | 10 |
| 36A | MYTI EDU | SB | d.wt | | | 6.29 | 3.57 | | 6.08 | 4.47 | 4.87 | 4.3 | 5.5 | 9.23 | 5.16 | 5.51 | 5.63 | 7.67 | 9.06 | 6.86 | 6.83 | 6.2 | 5.52 | 5.83 | 5.21 | 6.32 | 6.96 | 6.24 | 6.27 | 6.19 | 6.29 | no | -- | no | 9 |
| 71A | MYTI EDU | SB | d.wt | | | 8.47 | 5.24 | | | 6.08 | 8.43 | 6.99 | 8.33 | 10.3 | 7.4 | 7.88 | 7.18 | 8.11 | 7.66 | 9.44 | 7.5 | 7.57 | 8.81 | 7.53 | 7.12 | 11.2 | 8.81 | 8.93 | 10.1 | 8.13 | 7.72 | no | -- | no | 8 |
| 76A | MYTI EDU | SB | d.wt | | | | | | | | | | 8.51 | 10.8 | 5.65 | 5.57 | | | 6.65 | 7.8 | 9.14 | 10.2 | 6.93 | 7.67 | 6.39 | 9.76 | 7.99 | 7.76 | 7 | 6.29 | 6.86 | no | -- | no | 9 |
| 15A | MYTI EDU | SB | d.wt | | | | | | | | | | 5.72 | 7.21 | | 5.5 | 5.25 | 5.26 | 7.32 | 6.14 | 7.62 | 7.34 | 7.62 | 9.47 | 5.68 | 8.07 | 6.47 | 6.81 | 6.81 | 7.59 | 5.89 | no | -- | no | 8 |
| 51A | MYTI EDU | SB | d.wt | | | | | | | 7.14 | 6.14 | | | | | | | 10.2 | 10.2 | 7.44 | | 8.21 | | | | | | | | | | no | -- | 1.0 | 9 |
| 52A | MYTI EDU | SB | d.wt | | | | | | | | | 8.4 | 7.49 | 72.1 | 9.35 | 8.45 | 6.98 | 7.03 | 6.28 | 7.73 | 6.47 | 5.53 | 6.97 | 5.88 | 7.45 | 9.19 | 6.21 | 7.47 | 5.56 | 8.11 | 5.27 | no | -- | no | 16 |
| 56A | MYTI EDU | SB | d.wt | | | | | | | 8.07 | 7.87 | 8.82 | 5.37 | 7.54 | 7.4 | 9.15 | 6.36 | 7.71 | 6.59 | 7.79 | 7.18 | 8.17 | 8.72 | 5.77 | 6 | 9.1 | 5.36 | 8 | 7.47 | 5.61 | 7 | no | -- | no | 9 |
| 57A | MYTI EDU | SB | d.wt | | | | | | | 8.21 | 6.33 | 6.01 | 6.16 | 7.27 | 6.59 | 6.77 | 6.43 | 5.62 | 5.54 | 6.98 | 6.91 | 6.39 | 5.13 | 5.81 | 7.21 | 5.98 | 3.26 | 6.88 | 8.29 | 4.33 | 5.22 | no | -- | no | 10 |
| 63A | MYTI EDU | SB | d.wt | | | | | | | 9.84 | 6.16 | 5.11 | 6.84 | 11.1 | 6.32 | 6.11 | 6.71 | 6.84 | 6.56 | 6.12 | 5.61 | 5.13 | 5.69 | 5.46 | 6.67 | 7.95 | 2.39 | 6.27 | 7 | 5.57 | 4.11 | no | -- | no | 12 |
| 65A | MYTI EDU | SB | d.wt | | | | | | | 7.98 | 4.94 | 5.19 | 12.2 | 8.14 | 5.51 | 6 | 5.12 | 5.66 | 5.82 | 5.59 | 5.14 | 5.05 | 5.27 | 5.93 | 6.54 | 7.71 | 2.81 | 6.94 | 6.76 | 4.62 | 6.75 | no | -- | no | 12 |
| 69A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 6.19 | 5.32 | 5.41 | 6.26 | 7.28 | 5.56 | 5.22 | 7.22 | 8.51 | 6.82 | 5.81 | 12.6 | 3.06 | 5.84 | 5.55 | 6.06 | 6.39 | no | -- | no | 12 |
| 22A | MYTI EDU | SB | d.wt | | | | | | | | | | 6.35 | 6.69 | 5.38 | 5.76 | 6.28 | 6.81 | 9.29 | 4.16 | 8.56 | 7.47 | 8.54 | 5.27 | 5.86 | 7.81 | 14.9 | 6.82 | 8.72 | 145 | 9.82 | no | -- | 4.2 | 20 |
| 23A | MYTI EDU | SB | d.wt | | | | | | | | | | 5.58 | 6.52 | | | | | | | | | | | | | 6.64 | 6.93 | | | | no | -? | ? | 6 |
| 24A | MYTI EDU | SB | d.wt | | | | | | | | | | 5.78 | 7.01 | | | | | | | | | | | | | 6.78 | 5.91 | | | | no | -? | ? | 7 |
| 82A | MYTI EDU | SB | d.wt | | | | 6.38 | | | 4.69 | 5.77 | 7.49 | | 11.8 | 6.87 | 9.61 | | 7.44 | 7.93 | | | | | | | | 5.52 | 6.94 | | | | no | -- | no | 10 |
| 84A | MYTI EDU | SB | d.wt | | | | 10.3 | | 96.8 | 56.8 | 39.3 | 26.8 | | 17.1 | 22.2 | 24 | | 9.51 | 7.21 | | | | | | | | 8.07 | 8.39 | | | | no | -- | 1.1 | 17 |
| 87A | MYTI EDU | SB | d.wt | | | | 4.57 | | | 20.1 | 8.35 | 5.88 | | 7.28 | 6.3 | 6.88 | | 7.63 | 7.52 | | | | | | | | 6.92 | 5.95 | | | | no | -- | no | 13 |
| 25A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 6.48 | 5.77 | | | | | | | | | | | 6.48 | 6.05 | | | | no | -? | ? | 6 |
| 26A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 6.98 | 6.28 | | | | | | | | | | | 6.41 | 6.75 | | | | no | -? | ? | <=5 |
| 27A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 6.92 | | | | | | | | | | | | 5.89 | 5.52 | | | | no | -? | ? | <=5 |
| 28A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 5.36 | 5.18 | | | | | | | | | | | 5.69 | 8.12 | | | | no | -? | ? | 9 |
| 91A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 6.59 | 6.36 | 8.36 | | | | | | | | | | | 7.33 | | | | no | -? | ? | 8 |
| 92A1 | MYTI EDU | SB | d.wt | | | | | | | | | | | | 6.65 | 6.03 | 7.56 | 6.26 | 7.48 | 6.4 | | | | | | | | | | | | no | -- | no | 7 |
| 93A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 6.46 | 6.79 | | | | | | | | | | | 7.93 | 8.11 | | | | no | U? | ? | <=5 |
| 94A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 6.81 | 6.72 | | | | | | | | | | | 6.72 | 5.77 | | | | no | -? | ? | 6 |
| 95A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 7.84 | 6.44 | | | | | | | | | | | 7.95 | 7.28 | | | | no | -? | ? | 7 |
| 96A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 7.22 | 6.2 | | | | | | | | | | | 6.46 | 6.68 | | | | no | -? | ? | 6 |
| 97A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 8.12 | 7.01 | | | | | | | | | | | 6.77 | 7.35 | | | | no | -? | ? | 6 |
| 98A2 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | 5.5 | | 5.94 | 6.84 | 6.1 | 6.58 | 7.22 | 8.34 | 7.13 | 8.2 | 5.94 | 7.12 | no | -- | no | 7 |
| 98X | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 8.99 | 8.91 | 7.74 | | | | | | | | | | | | | no | -? | ? | <=5 |
| 99A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 8.65 | 7.29 | | | | | | | | | | | 6.72 | 7.11 | | | | no | -? | ? | 6 |
| 41A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 6.83 | 8.16 | 7.64 | 4.76 | | | | | | | | | 7.5 | 7.29 | | no | -- | no | 10 |
| 42A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 7.4 | 7.61 | | | | | | | | | | | 7.09 | 6.33 | | no | -? | ? | <=5 |
| 43A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 7.79 | 9.32 | | 6.32 | | | | | | | | | 9.38 | 5.84 | | no | -? | ? | 11 |
| 44A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 6.56 | 9.56 | 7.78 | 6.86 | | | | | | | | | 9.1 | 5.81 | | no | -- | no | 10 |
| 45A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 6.22 | 7.39 | | | | | | | | | | | 5.95 | 5.89 | | no | -? | ? | 6 |
| 46A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 6.63 | 7.43 | 8 | | | | | | | | | | 8.15 | 6.61 | | no | -? | ? | 7 |
| 47A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 5.7 | 5.84 | | | | | | | | | | | 6.5 | 6.32 | | no | U? | ? | <=5 |
| 48A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 6.57 | 7.74 | 7.1 | | | | | | | | | | 5.76 | 5.26 | | no | D? | ? | 6 |
| 49A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 7.36 | 9.68 | | | | | | | | | | | 8 | 6.17 | | no | -? | ? | 9 |
| 10A2 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | 7.84 | 5.71 | 7.9 | 6.93 | 6.17 | 5.43 | 6.4 | 7.42 | 6.95 | 6.79 | 8 | 6.26 | 6.41 | no | -- | no | 7 |
| 11X | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | 5.51 | 5.45 | 6.49 | 5.27 | 5.45 | 6.51 | 7.07 | 6.54 | 6.1 | 8.61 | 5.9 | 5.82 | no | -- | no | 8 |

Annual median concentration of Zn (ppm)

| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | ANALYSIS OC | TRD | SM3 | PWR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 | 93.4 | 92.3 | 116 | 123 | 141 | 118 | 125 | 106 | 134 | no | -- | no | 9 |
| 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 | 84 | 83.1 | 92.9 | 127 | 128 | 116 | 108 | 100 | 104 | no | -- | no | 10 |
| 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 | 66.1 | 72.3 | 84.6 | 106 | 131 | 118 | 80.5 | 83.5 | 92.6 | 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 | 125 | 100 | 102 | 125 | 98.6 | 90.6 | 83.6 | 91.9 | 90.6 | no | UY | 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 | 99.4 | 97.9 | 134 | 121 | 117 | 105 | 95.3 | 85.6 | 104 | no | DY | no | 9 |
| 76A | MYTI EDU | SB | d.wt | | | | | | | | | | 158 | 127 | 124 | 57.6 | | | 112 | 135 | 137 | 132 | 83.1 | 116 | 123 | 127 | 128 | 107 | 92.6 | 121 | 116 | no | -- | no | 9 |
| 15A | MYTI EDU | SB | d.wt | | | | | | | | | | 157 | 144 | | 71.4 | 88.9 | 62.6 | 232 | 107 | 127 | 105 | 127 | 83.3 | 110 | 101 | 114 | 103 | 112 | 102 | 92.6 | no | -- | no | 11 |
| 51A | MYTI EDU | SB | d.wt | | | | | | | 378 | 253 | | | | | | | 386 | 223 | 120 | | 170 | | | | | | | | | | no | -- | no | 14 |
| 52A | MYTI EDU | SB | d.wt | | | | | | | | | 824 | 272 | 453 | 408 | 218 | 141 | 196 | 183 | 247 | 160 | 143 | 134 | 180 | 90.6 | 137 | 106 | 104 | 90.6 | 106 | 95 | no | D- | no | 11 |
| 56A | MYTI EDU | SB | d.wt | | | | | | | 869 | 410 | 1170 | 572 | 479 | 418 | 388 | 211 | 290 | 246 | 377 | 143 | 271 | 225 | 158 | 146 | 151 | 178 | 171 | 140 | 99.3 | 125 | no | D- | no | 12 |
| 57A | MYTI EDU | SB | d.wt | | | | | | | 378 | 263 | 441 | 520 | 292 | 256 | 147 | 173 | 182 | 115 | 223 | 121 | 207 | 167 | 124 | 108 | 98.8 | 84.4 | 112 | 105 | 63.8 | 78.9 | no | D- | no | 11 |
| 63A | MYTI EDU | SB | d.wt | | | | | | | 579 | 216 | 241 | 509 | 392 | 207 | 122 | 122 | 189 | 147 | 170 | 129 | 115 | 115 | 127 | 106 | 119 | 54.6 | 110 | 113 | 98.2 | 77.9 | no | D- | no | 13 |
| 65A | MYTI EDU | SB | d.wt | | | | | | | 191 | 156 | 199 | 424 | 308 | 131 | 139 | 118 | 166 | 147 | 184 | 121 | 152 | 154 | 155 | 145 | 151 | 69.6 | 139 | 147 | 94.8 | 128 | no | -- | no | 12 |
| 69A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 135 | 102 | 135 | 163 | 161 | 218 | 144 | 201 | 133 | 190 | 136 | 177 | 84 | 123 | 92.5 | 106 | 114 | no | D- | no | 10 |
| 22A | MYTI EDU | SB | d.wt | | | | | | | | | | 172 | 162 | 135 | 116 | 98 | 144 | 221 | 110 | 128 | 122 | 72.1 | 117 | 90.3 | 134 | 142 | 121 | 88.8 | 147 | 118 | no | -- | no | 10 |
| 23A | MYTI EDU | SB | d.wt | | | | | | | | | | 136 | 133 | | | | | | | | | | | | | 105 | 113 | | | | no | D? | ? | <=5 |
| 24A | MYTI EDU | SB | d.wt | | | | | | | | | | 175 | 133 | | | | | | | | | | | | | 130 | 99.4 | | | | no | -? | ? | 9 |
| 82A | MYTI EDU | SB | d.wt | | | | 127 | 106 | 132 | 109 | 76.1 | 129 | | 145 | 123 | 112 | | 109 | 87.6 | | | | | | | | 81.2 | 88.2 | | | | no | -- | no | 9 |
| 84A | MYTI EDU | SB | d.wt | | | | 118 | 160 | 163 | 133 | 132 | 142 | | 185 | 180 | 113 | | 121 | 85.8 | | | | | | | | 93 | 108 | | | | 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 | | | | | | | | 72.4 | 75.7 | | | | no | -- | no | 6 |
| 25A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 184 | 117 | | | | | | | | | | | 119 | 111 | | | | no | -? | ? | 10 |
| 26A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 125 | 118 | | | | | | | | | | | 146 | 110 | | | | no | -? | ? | 8 |
| 27A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 164 | | | | | | | | | | | | 128 | 131 | | | | no | -? | ? | <=5 |
| 28A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 141 | 96.1 | | | | | | | | | | | 103 | 174 | | | | no | -? | ? | 12 |
| 91A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 96.2 | 102 | 116 | | | | | | | | | | | 99.4 | | | | no | -? | ? | 7 |
| 92A1 | MYTI EDU | SB | d.wt | | | | | | | | | | | | 88.7 | 61.1 | 90.2 | 77.5 | 59.2 | 97.8 | | | | | | | | | | | | no | -- | no | 10 |
| 93A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 94.4 | 95.9 | | | | | | | | | | | 103 | 89.5 | | | | no | -? | ? | 6 |
| 94A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 74.3 | 81.3 | | | | | | | | | | | 65.9 | 59.5 | | | | no | -? | ? | 6 |
| 95A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 94.7 | 81 | | | | | | | | | | | 76.6 | 71.7 | | | | no | -? | ? | 6 |
| 96A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 102 | 71.6 | | | | | | | | | | | 68.3 | 82 | | | | no | -? | ? | 9 |
| 97A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 91.7 | 91.6 | | | | | | | | | | | 89.6 | 79 | | | | no | -? | ? | <=5 |
| 98A2 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | 89.9 | | 82.1 | 96 | 100 | 84.5 | 87 | 88 | 91.7 | 81.7 | 97.9 | 108 | no | -- | no | 6 |
| 98X | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 187 | 182 | 146 | | | | | | | | | | | | | no | -? | ? | 6 |
| 99A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 107 | 70.3 | | | | | | | | | | | 84 | 77.6 | | | | no | -? | ? | 10 |
| 41A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 85.1 | 89 | 94.8 | 90.9 | | | | | | | | | 81 | 83.9 | | no | -- | no | <=5 |
| 42A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 87.1 | 80.9 | | | | | | | | | | | 64.3 | 68.1 | | no | D? | ? | <=5 |
| 43A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 98.7 | 96.6 | | 89.2 | | | | | | | | | 75 | 82.1 | | no | D? | ? | <=5 |
| 44A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 67.2 | 91.3 | 81 | 78.8 | | | | | | | | | 71.9 | 85 | | no | -- | no | 7 |
| 45A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 115 | 117 | | | | | | | | | | | 97.9 | 102 | | no | D? | ? | <=5 |
| 46A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 88.4 | 112 | 93.3 | | | | | | | | | | 85 | 73.3 | | no | -? | ? | 7 |
| 47A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 122 | 88.2 | | | | | | | | | | | 121 | 109 | | no | -? | ? | 9 |
| 48A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 74.9 | 87 | 68.8 | | | | | | | | | | 69.4 | 73.1 | | no | -? | ? | 7 |
| 49A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 95.7 | 101 | | | | | | | | | | | 64.8 | 66.5 | | no | D? | ? | <=5 |
| 10A2 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | 94.6 | 114 | 102 | 103 | 125 | 114 | 134 | 100 | 149 | 87.4 | 87.5 | 100 | 108 | no | -- | no | 8 |
| 11X | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | 104 | 70.2 | 81 | 101 | 121 | 89.6 | 72.4 | 78.2 | 80.5 | 85.6 | 59.5 | 85 | no | -- | no | 9 |

Annual median concentration of ∑PCB-7 (ppb)

| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | ANALYSIS OC | TRD | SM3 | PWR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30A | MYTI EDU | SB | d.wt | | | | | | | | 77.5 | 96.5 | 116 | 89.6 | 97 | | 89.3 | 90.4 | 110 | 128 | 58.5 | 71.1 | 49.9 | 29.6 | 33.9 | 43.4 | 20.7 | 67.9 | 28.8 | 47.7 | 49.4 | 3.3 | D- | 3.9 | 12 |
| 31A | MYTI EDU | SB | d.wt | | | | | | | | 21.7 | 24.9 | 37.1 | 24.7 | 34.6 | | 52.2 | 49 | 63.8 | 24.6 | 12.9 | 18 | 6.49 | 8.87 | 8.97 | 7.58 | 3.79 | 13.8 | 9.3 | 5.83 | 11.5 | no | DY | no | 14 |
| 35A | MYTI EDU | SB | d.wt | | | | | | | | 21.5 | 33.6 | 27.5 | 14.2 | 22.1 | | 13.4 | 13.6 | 10.7 | 16.5 | 12.5 | 14.6 | 5.52 | 7.32 | 6.97 | 8.2 | | 12.3 | 4.91 | 5.06 | 9.45 | no | D- | no | 13 |
| 36A | MYTI EDU | SB | d.wt | | | | | | | | 11 | 17.9 | 19.3 | 7.94 | 11.2 | | 5.69 | 10.5 | 12.3 | 12.7 | 8.62 | 12.1 | 5.28 | 5.54 | 6.03 | 5.75 | 5.58 | 6.92 | 3.61 | 2.94 | 5.56 | no | D- | no | 12 |
| 71A | MYTI EDU | SB | d.wt | | | | | | | | 17 | 34.4 | 25 | 14.2 | 15.3 | | 16.5 | 10.5 | | 9.27 | 11.8 | 13.6 | 8.52 | 12.7 | 7.55 | 9.74 | | 14.3 | 9.33 | 9.3 | 10.5 | no | D- | no | 11 |
| 76A | MYTI EDU | SB | d.wt | | | | | | | | | | 16.6 | 6.49 | 7.21 | | | | 16.3 | 19.1 | 14.4 | 16.4 | 6.34 | 6.78 | 5.12 | 5.06 | | 3.29 | 4.59 | 4.68 | 5.91 | no | DY | no | 11 |
| 15A | MYTI EDU | SB | d.wt | | | | | | | | | | 11.8 | | | | 6.29 | 3.06 | 2.41 | 3.88 | 4.72 | 5.28 | 2.56 | 4.19 | 3.15 | 2.73 | 2.74 | 3.34 | 2.56 | 4.38 | 4.18 | no | DY | no | 11 |
| 51A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 26.2 | 9.69 | 14.7 | 10.5 | 11.5 | 12 | 28 | 16.9 | 16 | 10.6 | 14.5 | 11.2 | 11.2 | 9.89 | no | -- | no | 12 |
| 52A | MYTI EDU | SB | d.wt | | | | | | | | | 40.2 | 14.9 | | 11.3 | 11.3 | 17.1 | 16.9 | 10 | 19 | 10.6 | 11.2 | 7.19 | 74.2 | 12.5 | 12 | 10.3 | 9.97 | 11.1 | 15.4 | 10.7 | no | -- | no | 17 |
| 56A | MYTI EDU | SB | d.wt | | | | | | | | 12.5 | 45.8 | 37.7 | 12.1 | 12 | 9.41 | 13.8 | 11.9 | | 16.8 | 9.55 | 11.2 | 5.98 | 216 | 13 | 13.1 | 6.73 | 9.33 | 6.04 | 9.53 | 6.5 | no | -- | no | 22 |
| 57A | MYTI EDU | SB | d.wt | | | | | | | | | 28 | | 7.63 | 7.55 | 4.74 | 8.38 | 6.54 | 4.18 | 8.41 | 10.3 | 8.16 | 3.89 | 55.9 | 5.89 | 6.16 | 2.89 | 7.47 | 4.28 | 3.74 | 4.65 | no | -- | no | 19 |
| 63A | MYTI EDU | SB | d.wt | | | | | | | | | 21.8 | | 9.71 | 6.45 | 3.68 | 5.7 | 5.72 | | 4.15 | 7.95 | 7.26 | 4.09 | 13.8 | 3.54 | 6.05 | 1.25 | 5.3 | 4.09 | 5.07 | 3.3 | no | -- | no | 16 |
| 65A | MYTI EDU | SB | d.wt | | | | | | | | 6.05 | 11.1 | 33.4 | 9.29 | 5.59 | 3.69 | 5.55 | 3.37 | 5.19 | 3.76 | 7.62 | 6.44 | 3 | 8.31 | 2.73 | 3.73 | 1.24 | 4.75 | 3.28 | 3.9 | 1.73 | no | D- | no | 17 |
| 69A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 4.82 | | 4.97 | 4.51 | 2.77 | 5.41 | 12.6 | 5.83 | 2.53 | 5.7 | 3.18 | 4.01 | 1.27 | 4.03 | 2.48 | 2.18 | 1.28 | no | -- | no | 16 |
| 22A | MYTI EDU | SB | d.wt | | | | | | | | | | 18.9 | 8.23 | 8.61 | | 7.97 | 6.84 | 5.19 | 4.69 | 11.5 | 6.01 | 5.14 | 4.69 | 3.24 | 8.5 | 5.51 | 8.74 | 5.76 | 6.43 | 8.68 | no | -- | no | 12 |
| 82A | MYTI EDU | SB | d.wt | | | | | | | | 8.4 | 15.6 | | | | | | | | | | | | | | | 2.39 | 3.09 | | | | no | -? | ? | 14 |
| 84A | MYTI EDU | SB | d.wt | | | | | | | | 5.25 | 20.5 | | 5.05 | 8.44 | | | 3.6 | 6.37 | | | | | | | | 0.852 | 5.11 | | | | no | -- | no | 21 |
| 87A | MYTI EDU | SB | d.wt | | | | | | | | 3.9 | 12.8 | | | | | | | | | | | | | | | | 3.38 | | | | no | -? | ? | 23 |
| 91A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 2.81 | | 7.64 | | | | | | | | | | | 3.14 | | | | no | -? | ? | 20 |
| 92A1 | MYTI EDU | SB | d.wt | | | | | | | | | | | | 4.46 | 2.49 | 5.83 | 4.05 | 2.89 | 7.74 | | | | | | | | | | | | no | -- | no | 15 |
| 96A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 3.35 | 1.52 | | | | | | | | | | | 0.785 | 2.83 | | | | no | -? | ? | 21 |
| 98A2 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | 10.7 | | 4.14 | 3.54 | 4.56 | 3.23 | 3.62 | 1.85 | 2.72 | 3.27 | 2.7 | 1.09 | no | D- | no | 13 |
| 98X | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 87.3 | 78.4 | 46.4 | | | | | | | | | | | | | 3.1 | -? | ? | 9 |
| 99A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 3.42 | 1.97 | | | | | | | | | | | 0.871 | 1.29 | | | | no | -? | ? | 13 |
| 41A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 3.49 | 4.26 | 2.39 | 2.58 | | | | | | | | | 2.35 | 1.78 | | no | -- | no | 10 |
| 43A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 2.92 | 3.1 | | 3.02 | | | | | | | | | 2.5 | 1.57 | | no | -? | ? | 9 |
| 44A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 7.31 | 8.46 | 29.4 | | | | | | | | | 15.7 | 11.1 | | no | -? | ? | 18 |
| 45A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 6.45 | 5.31 | | | | | | | | | | | 4.25 | 2.7 | | no | -? | ? | 10 |
| 46A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 5.74 | 4.16 | 3.11 | | | | | | | | | | 5.53 | 2.86 | | no | -? | ? | 13 |
| 48A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 6.22 | 4.04 | 3.1 | | | | | | | | | | 5.16 | 2.21 | | no | -? | ? | 15 |
| 10A2 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | 4.66 | 6.29 | | 5.11 | 4.33 | 3.03 | 2.13 | 2.58 | 1.28 | 2.29 | 4.59 | 1.89 | 1.65 | no | -- | no | 13 |
| 11X | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | 3.34 | 3.56 | 4.48 | 2.79 | 3.1 | 1.93 | 1.93 | 1.28 | 3.02 | 2.11 | 1.9 | 2.25 | no | -- | no | 11 |

Annual median concentration of ∑PCB-7 (ppb)

| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | ANALYSIS OC | TRD | SM3 | PWR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30A | MYTI EDU | SB | d.wt | | | | | | | 34.9 | 77.5 | 96.5 | 116 | 89.6 | 97 | | 89.3 | 90.4 | 110 | 128 | 58.5 | 71.1 | 49.9 | 29.6 | 33.9 | 43.4 | 20.7 | 67.9 | 28.8 | 47.7 | 49.4 | 3.3 | DY | 3.9 | 12 |
| 71A | MYTI EDU | SB | d.wt | | | | | | | 13.9 | 17 | 34.4 | 25 | 14.2 | 15.3 | | 16.5 | 10.5 | | 9.27 | 11.8 | 13.6 | 8.52 | 12.7 | 7.55 | 9.74 | | 14.3 | 9.33 | 9.3 | 10.5 | no | D- | no | 11 |
| 51A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 26.2 | 9.69 | 14.7 | 10.5 | 11.5 | 12 | 28 | 16.9 | 16 | 10.6 | 14.5 | 11.2 | 11.2 | 9.89 | no | -- | no | 12 |
| 52A | MYTI EDU | SB | d.wt | | | | | | | | | 40.2 | 14.9 | | 11.3 | 11.3 | 17.1 | 16.9 | 10 | 19 | 10.6 | 11.2 | 7.19 | 74.2 | 12.5 | 12 | 10.3 | 9.97 | 11.1 | 15.4 | 10.7 | no | -- | no | 17 |
| 10A2 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | 4.66 | 6.29 | | 5.11 | 4.33 | 3.03 | 2.13 | 2.58 | 1.28 | 2.29 | 4.59 | 1.89 | 1.65 | no | -- | no | 13 |
| I021 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 43.1 | 31.8 | 32.2 | 24.1 | | 22.2 | 20 | 25.1 | | | | | | | 1.7 | D- | 1.3 | 7 |
| I022 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 32.1 | 25.9 | 41.2 | 22.4 | 28.9 | 19.2 | 22.4 | 20.8 | 15.2 | 17.1 | 11 | 11.1 | 5.79 | 8.13 | no | D- | no | 10 |
| I023 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 19.6 | 20.9 | 26 | 15 | 22.2 | 10.8 | 17.4 | 15.9 | 12.3 | 12.6 | 9.73 | 8.91 | | 5.04 | no | D- | no | 10 |
| I024 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 31.8 | 36.1 | 45.6 | 36.6 | 28.7 | 16.8 | 17.7 | 26 | 15 | 15.8 | 11.3 | 10.6 | 3.54 | 6.14 | no | D- | no | 12 |
| I301 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 118 | 113 | 182 | 86.5 | 125 | 58.7 | 64.6 | 62.6 | 70.4 | 57.9 | 84.7 | 75.4 | 63.2 | 104 | 6.9 | D- | 7.0 | 11 |
| I304 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 35.2 | 23.8 | 44.4 | 35.9 | | 19.9 | 25 | 24.4 | 27.5 | 30 | 21.4 | 23.4 | 23.9 | 33.1 | 2.2 | -- | 2.0 | 10 |
| I306 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 16.4 | 15.7 | 54.2 | 26.1 | | 21.8 | 17.2 | 15.7 | 15.4 | 17.9 | 12.9 | 20.1 | 20.7 | | 1.4 | -- | 1.5 | 13 |
| I307 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 20.6 | 28.5 | 40.2 | 17.3 | | 20.3 | 16.9 | 17.5 | 15.4 | 13 | 11.7 | | 15.4 | 16.5 | 1.1 | -- | 1.3 | 10 |
| I711 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 24.8 | 13.3 | 13.3 | 20.6 | 21.6 | 18.4 | | 13.4 | | | | | | | no | -- | no | 11 |
| I712 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 33.3 | 31.2 | 25.3 | 22.4 | 24.9 | 13.9 | 12.5 | 10.9 | 16.9 | | 16.2 | 14.2 | | 19.4 | 1.3 | DY | 1.5 | 9 |
| I713 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | | | | | | 12.5 | 15 | 21.4 | 18.1 | 15.7 | | 13.7 | no | -- | 1.1 | 10 |
| I131A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 7.94 | 11.7 | 13.1 | 22.4 | 12.7 | 10.1 | 14 | 29.4 | 8.13 | 3.98 | 9.65 | 4.65 | 3.53 | | no | -- | no | 16 |
| I132 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | | 31.1 | 22.5 | 10.2 | 15.8 | 11.8 | 13.3 | | 11.5 | 10.9 | 6.19 | 5.92 | no | D- | no | 11 |
| I133 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 22.8 | 22.3 | 21.5 | 24.7 | 23 | 10.4 | 11.7 | 9.24 | 9.23 | 12.5 | 10 | 9.68 | 9.58 | 6.42 | no | D- | no | 9 |
| I241 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 54.3 | 78.9 | 47.2 | 55.2 | 80.8 | 55.5 | 36.3 | 96.4 | 125 | 118 | 61.8 | 48.5 | 46.4 | 55 | 3.7 | -- | 1.2 | 13 |
| I242 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 63 | 81.6 | 29.6 | 45.6 | 59.5 | 36.6 | 26.2 | 44.6 | 81.9 | 55.9 | 36.8 | 31.7 | 29.4 | | 2.0 | -- | no | 13 |
| I243 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 115 | 169 | 122 | 78.2 | 92.4 | 47.9 | 29.3 | 52.5 | 326 | 288 | 217 | 75.2 | 48.9 | | 3.3 | -- | no | 18 |

Annual median concentration of ∑PCB-7 (ppb)

| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | ANALYSIS OC | TRD | SM3 | PWR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30B | GADU MOR | LI | w.wt | | | | | | | | | | 1240 | 3430 | 2800 | 2500 | 2910 | 2350 | 2930 | 3090 | 3660 | 3520 | 2080 | 2440 | 2230 | 2140 | 2620 | 4160 | 3550 | 2160 | 3780 | 7.6 | -- | 7.2 | 11 |
| 36B | GADU MOR | LI | w.wt | | | | | | | | | | 441 | 344 | 396 | 636 | 376 | 1650 | 974 | 720 | 736 | 766 | 482 | 288 | 269 | 425 | 535 | 542 | 591 | 210 | 261 | no | DY | no | 13 |
| 77B | GADU MOR | LI | w.wt | | | | | | | | | | 305 | 386 | | | | | | | | | | | | | | | | | 134 | no | -? | ? | 10 |
| 15B | GADU MOR | LI | w.wt | | | | | | | | | | 182 | 349 | 266 | 182 | 295 | 307 | 274 | 399 | 279 | 257 | 153 | 377 | 244 | 213 | 154 | 186 | 131 | 166 | 135 | no | D- | no | 11 |
| 53B | GADU MOR | LI | w.wt | | | | | | | | | | 435 | 524 | 1760 | 166 | | 162 | 701 | 576 | 2370 | 487 | 1520 | 842 | 956 | 317 | 463 | 422 | 340 | 742 | 136 | no | -- | no | 20 |
| 67B | GADU MOR | LI | w.wt | | | | | | | | | | 316 | 293 | 268 | 226 | 329 | 210 | 269 | 627 | 206 | 273 | 148 | 225 | 145 | 92.6 | 94.4 | 134 | 56.1 | 109 | 77.1 | no | D- | no | 13 |
| 23B | GADU MOR | LI | w.wt | | | | | | | | | | 222 | 244 | 228 | 208 | 128 | 193 | 196 | 125 | 179 | 229 | 207 | 167 | 111 | 114 | 202 | 210 | 141 | 146 | 72.9 | no | -- | no | 11 |
| 92B | GADU MOR | LI | w.wt | | | | | | | | | | | | | 135 | 152 | 311 | 369 | | | | | | | | 119 | 42.8 | | | 78 | no | -- | no | 13 |
| 98B1 | GADU MOR | LI | w.wt | | | | | | | | | | | | 239 | 183 | 114 | 197 | 278 | 372 | 165 | 147 | | | 62.6 | 110 | 183 | 91.6 | 102 | 132 | 41.2 | no | -- | no | 14 |
| 43B | GADU MOR | LI | w.wt | | | | | | | | | | | | | | 325 | 329 | 140 | | | | | | | | | | | | 94.1 | no | -? | ? | 14 |
| 10B | GADU MOR | LI | w.wt | | | | | | | | | | | | | | 645 | 485 | 210 | 189 | 168 | 255 | 99.4 | 109 | 151 | 146 | 127 | 104 | 96.6 | 116 | 82.4 | no | D- | no | 11 |
| 30B | GADU MOR | MU | w.wt | | | | | | | | | | 3.58 | 11.1 | 24.7 | 9.65 | 3.94 | 3.12 | 8.9 | 10.5 | 21.7 | 21.4 | 6.06 | 9.4 | 10.3 | 9.31 | 7.91 | 9.01 | 11.9 | 10.6 | 16.6 | 5.5 | -- | 6.4 | 17 |
| 36B | GADU MOR | MU | w.wt | | | | | | | | | | 1.62 | 1.29 | 2 | 3.65 | 0.525 | 15.6 | 4.14 | 4.54 | 3.78 | 2.86 | 2.26 | 2.19 | 1.9 | 2.52 | 2.88 | 2.71 | 9.34 | 0.63 | 1.36 | no | -- | no | 21 |
| 77B | GADU MOR | MU | w.wt | | | | | | | | | | 0.88 | 3.05 | | | | | | | | | | | | | | | | | 0.9 | no | -? | ? | 23 |
| 15B | GADU MOR | MU | w.wt | | | | | | | | | | 1.35 | 1.22 | 1.38 | 0.65 | 0.38 | 1.03 | 1.14 | 1.44 | 1.41 | 0.81 | 1.42 | 1.88 | 0.655 | 1.23 | 0.2 | 0.675 | 0.575 | 0.421 | 0.575 | no | -- | no | 16 |
| 53B | GADU MOR | MU | w.wt | | | | | | | | | | 8.2 | 2.23 | 15 | 1.1 | | 0.37 | 21.9 | 3.76 | 138 | 6.61 | 36.3 | 1.08 | 23.6 | 4.84 | 3.09 | 2.2 | 1.12 | 5.72 | 6.02 | 2.0 | -- | 1.9 | >25 |
| 67B | GADU MOR | MU | w.wt | | | | | | | | | | 0.835 | 1.43 | 1.1 | 0.624 | 1.15 | 0.605 | 3.5 | 7.07 | 0.73 | 1.72 | 1.18 | 9.98 | 0.61 | 0.35 | 0.407 | 0.865 | 0.235 | 0.255 | 0.557 | no | -- | no | 23 |
| 23B | GADU MOR | MU | w.wt | | | | | | | | | | 0.64 | 2.26 | 0.75 | 0.85 | 0.18 | 0.625 | 0.46 | 0.81 | 1.49 | 0.95 | 0.45 | 0.62 | 0.38 | 0.495 | 0.325 | 0.7 | 1.01 | 0.53 | 0.515 | no | -- | no | 17 |
| 92B | GADU MOR | MU | w.wt | | | | | | | | | | | | | 0.55 | 0.225 | 0.36 | 0.905 | | | | | | | | 0.225 | 0.255 | | | 0.365 | no | -- | no | 17 |
| 98B1 | GADU MOR | MU | w.wt | | | | | | | | | | | | 0.9 | 0.9 | 0.135 | 0.34 | 0.475 | 1.4 | 0.44 | 0.585 | | | 0.24 | 0.385 | 0.32 | 0.435 | 0.385 | 0.307 | 0.25 | no | -- | no | 18 |
| 43B | GADU MOR | MU | w.wt | | | | | | | | | | | | | | 0.515 | 0.815 | 0.39 | | | | | | | | | | | | 0.362 | no | -? | ? | 13 |
| 10B | GADU MOR | MU | w.wt | | | | | | | | | | | | | | 1.77 | 2.49 | 0.367 | 0.9 | 0.79 | 1.39 | 0.5 | 0.55 | 0.635 | 0.555 | 1.15 | 0.535 | 0.609 | 0.804 | 0.495 | no | -- | no | 16 |

Annual median concentration of ∑PCB-7 (ppb)

| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | ANALYSIS OC | TRND | SM+3 | POWER |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 33F | PLAT FLE | LI | w.wt | | | | | | | | | | 36 | 31.1 | 97.5 | 69 | 57 | 86 | 54.9 | 30.3 | 35.3 | 47.2 | 90.7 | 158 | 53 | 60.1 | 62.8 | 63.4 | 68.9 | 67.3 | 72.8 | no | -- | no | 13 |
| 53F | PLAT FLE | LI | w.wt | | | | | | | | | | 509 | 517 | 309 | 36 | | 22.8 | 115 | 113 | 111 | 156 | 95.8 | 95.1 | 158 | 165 | 108 | 363 | | 119 | 80.7 | no | DY | no | 18 |
| 67F | PLAT FLE | LI | w.wt | | | | | | | | | | | | | | | | 70 | | 96.9 | 45.8 | 44 | 36.3 | 32 | 27.6 | 33.1 | 39 | 42.7 | 42.5 | 34.4 | no | DY | no | 10 |
| 21F | PLAT FLE | LI | w.wt | | | | | | | | | | | | | | | | | | | 22.9 | 6.97 | 33.6 | 48.9 | | 121 | 15.5 | 20.1 | | | no | -- | no | 23 |
| 33F | PLAT FLE | MU | w.wt | | | | | | | | | | 2.04 | 3.96 | 1.8 | 0.95 | 0.51 | 1.37 | 1.91 | 0.935 | 1.14 | 5.32 | 1.14 | 1.76 | 1.53 | 1.25 | 0.675 | 0.48 | 0.805 | 0.675 | 1.38 | no | -- | no | 17 |
| 53F | PLAT FLE | MU | w.wt | | | | | | | | | | 27.4 | 33.2 | 14.2 | 1.45 | | 0.757 | 3.19 | 2.74 | 2.19 | 2.73 | 3 | 2.67 | 2.02 | 1.13 | 1.96 | 6.73 | | 1.76 | 2.19 | no | DY | no | 19 |
| 67F | PLAT FLE | MU | w.wt | | | | | | | | | | | | | | | | 0.775 | | 1.8 | 1.66 | 1.48 | 0.95 | 0.845 | 0.82 | 0.295 | 0.565 | 0.47 | 1.1 | 1.56 | no | DY | no | 13 |
| 21F | PLAT FLE | MU | w.wt | | | | | | | | | | | | | | | | | | | 0.76 | 0.2 | 0.61 | 1.33 | | 1.56 | 0.957 | 1.19 | | | no | -- | no | 18 |
| 36F | LIMA LIM | LI | w.wt | | | | | | | | | | 301 | 217 | 339 | 418 | 404 | 433 | 386 | 387 | 236 | 412 | 838 | 527 | 297 | 272 | 538 | 511 | 620 | 650 | 721 | 1.4 | -- | 2.0 | 12 |
| 15F | LIMA LIM | LI | w.wt | | | | | | | | | | | 124 | | 58.2 | 77 | 74 | 62.5 | 64.5 | 51.1 | 69.6 | | 106 | 50.2 | 49.8 | 66.8 | 105 | 47.1 | 55.5 | 74.9 | no | -- | no | 12 |
| 22F | LIMA LIM | LI | w.wt | | | | | | | | | | 170 | 127 | 140 | | 60 | 88.7 | | | | | | | | | | | | | | no | -? | ? | 11 |
| 21F | LIMA LIM | LI | w.wt | | | | | | | | | | | | | | | | | | | | | | 149 | 115 | 136 | 123 | | 115 | | no | -? | ? | 7 |
| 36F | LIMA LIM | MU | w.wt | | | | | | | | | | 2.76 | 7.05 | 5.6 | 7.8 | 5.9 | 8.18 | 9.62 | 5.19 | 9.41 | 3.88 | 8.38 | 7.73 | 6.56 | 3.73 | 4.34 | 4.47 | 7.18 | 10.4 | 12.1 | 2.4 | UY | 3.9 | 12 |
| 15F | LIMA LIM | MU | w.wt | | | | | | | | | | | 3.72 | | 0.806 | 0.369 | 1.14 | 1.81 | 1.28 | 1.42 | 0.959 | | 1.21 | 0.665 | 0.94 | 0.349 | 1.25 | 0.695 | 0.575 | 0.98 | no | -- | no | 16 |
| 22F | LIMA LIM | MU | w.wt | | | | | | | | | | 1.97 | 5 | 3.82 | | 1.24 | 5.14 | | | | | | | | | | | | | | 1.0 | -? | ? | 20 |
| 21F | LIMA LIM | MU | w.wt | | | | | | | | | | | | | | | | | | | | | | 1.54 | 1.12 | 1.12 | 1.62 | | 1.82 | | no | -? | ? | 10 |
| 30F | PLEU PLA | LI | w.wt | | | | | | | | | | | | 313 | | 207 | 216 | | | | | | | | | | | | | | 4.3 | -? | ? | 8 |
| 22F | PLEU PLA | LI | w.wt | | | | | | | | | | | | | | | | 21 | 20.1 | 14.5 | | | | | | | | | | | no | -? | ? | 7 |
| 98F2 | PLEU PLA | LI | w.wt | | | | | | | | | | | | | | | | | | | | 40.8 | 25.5 | 10.3 | 10.5 | 8.4 | 24.1 | 13.8 | 5.53 | 3.49 | no | D- | no | 16 |
| 10F | PLEU PLA | LI | w.wt | | | | | | | | | | | | | | | | | 42.1 | | 62.8 | 45 | 24.9 | 86.2 | 16.6 | 22.3 | 25.7 | | 14.9 | 23.8 | no | -- | no | 17 |
| 30F | PLEU PLA | MU | w.wt | | | | | | | | | | | | 6.82 | | 3.01 | 1.46 | | | | | | | | | | | | | | no | -? | ? | 9 |
| 22F | PLEU PLA | MU | w.wt | | | | | | | | | | | | | | | | 1.39 | 0.95 | 3.33 | | | | | | | | | | | 1.7 | -? | ? | 19 |
| 98F2 | PLEU PLA | MU | w.wt | | | | | | | | | | | | | | | | | | | | 1.54 | 0.6 | 0.291 | 0.25 | 0.175 | 0.862 | 0.74 | 0.285 | 0.225 | no | -- | no | 19 |
| 10F | PLEU PLA | MU | w.wt | | | | | | | | | | | | | | | | | 0.97 | | 2.58 | 1.78 | 1.12 | 1 | 0.457 | 0.175 | 0.435 | | | 0.986 | no | -- | no | 15 |
| 67F | LEPI WHI | LI | w.wt | | | | | | | | | | 111 | 100 | 143 | 101 | 172 | 166 | 97.2 | 91.5 | 118 | 82.3 | 83.9 | 63.8 | 105 | 85.2 | 73.3 | 58 | 52.5 | 50.4 | 40.4 | m | D- | m | 9 |
| 21F | LEPI WHI | LI | w.wt | | | | | | | | | | | | | | | | | | | | | | | 101 | 78.5 | 101 | 112 | 87.6 | 59.7 | m | -- | m | 10 |
| 67F | LEPI WHI | MU | w.wt | | | | | | | | | | 0.84 | 0.935 | 1.4 | 0.55 | 0.48 | 1.46 | 0.445 | 0.68 | 0.42 | 1.03 | 0.82 | 0.673 | 0.37 | 0.43 | 0.464 | 0.639 | 0.428 | 0.22 | 0.64 | m | -- | m | 15 |
| 21F | LEPI WHI | MU | w.wt | | | | | | | | | | | | | | | | | | | | | | | 0.45 | 0.345 | 1.11 | 0.93 | 0.855 | 0.63 | m | -- | m | 15 |

Annual median concentration of ppDDE (ppb)

| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | ANALYSIS OC | TRD | SM3 | PWR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 5.24 | 3.86 | 7.08 | 5.7 | 2.56 | 5.88 | 3.87 | 5.91 | 3.47 | 1.99 | 1.97 | 2.08 | 1.22 | 2.56 | 1.77 | 3.29 | 3 | no | D- | no | 13 |
| 31A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 3.3 | 1.89 | 3.45 | 1.84 | 0.505 | 3.37 | 3.49 | 5.47 | 1.19 | 2.1 | 1.79 | 1.01 | 1.25 | 3.17 | 6.32 | 3.94 | 3.47 | no | -- | no | 18 |
| 35A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 4.91 | 2.08 | 3.13 | 2.84 | 0.57 | 3.91 | 3.73 | 5.93 | 1.61 | 3.29 | 2.17 | 1.8 | 2.94 | 5.47 | 2.4 | 2.86 | 3.95 | no | -- | no | 18 |
| 36A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 2.76 | 1.06 | 1.03 | 1.76 | 0.442 | 2.11 | 1.79 | 2.98 | 1.48 | 1.51 | 1.34 | 0.76 | 1.47 | 1.56 | 1.41 | 0.733 | 1.24 | no | -- | no | 15 |
| 71A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 2.61 | 1.58 | 3.21 | 1.29 | 0.736 | 1.02 | 2.2 | 2.41 | 2.26 | 3.58 | 1.1 | 1.67 | 0.763 | 1.8 | 2.17 | 1.8 | 1.56 | no | -- | no | 15 |
| 76A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 1.4 | 0.794 | | | 0.355 | 1.21 | 2.29 | 2.49 | 0.779 | 0.829 | 0.746 | 0.621 | 1.1 | 0.611 | 1.38 | 0.588 | 0.824 | no | -- | no | 16 |
| 15A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | 0.976 | 1.72 | 0.735 | 0.294 | 1.02 | 1.41 | 2.05 | 0.536 | 0.622 | 0.854 | 0.667 | 0.857 | 0.688 | 0.722 | 0.706 | 1.17 | no | -- | no | 16 |
| 51A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 33.9 | 6.67 | 14.7 | 17.1 | 13.2 | 16.9 | 5.48 | 9.52 | 10 | 10.5 | 14.7 | 7.5 | 11.7 | 13.3 | 1.3 | -- | 1.3 | 15 |
| 52A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 12.3 | 25.5 | 19.4 | 18.5 | 9.53 | 13.1 | 16.7 | 13.7 | 11.9 | 6.47 | 6.82 | 8.86 | 10.5 | 12.5 | 4.71 | 12.2 | 12.7 | 1.3 | -- | 1.3 | 13 |
| 56A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 50 | 47.5 | 115 | 40.8 | 33.9 | 72.3 | 52.6 | 39.8 | 26.2 | 60.6 | 40 | 55.1 | 49.3 | 550 | 186 | 117 | 180 | 18.0 | U- | 26.7 | 18 |
| 57A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 25.9 | 18.3 | 35 | 25.3 | 15.8 | 50 | 82.9 | 35.2 | 27.5 | 24.7 | 14.7 | 27.8 | 16.6 | 53.3 | 12.1 | 23 | 26.7 | 2.7 | -- | 2.3 | 16 |
| 63A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 12.9 | 9.29 | 9.68 | 8.36 | 5.53 | 13 | 15.5 | 11.4 | 10.2 | 7.09 | 4.76 | 11.3 | 3.82 | 14 | 5.67 | 13.6 | 12.1 | 1.2 | -- | 1.7 | 14 |
| 65A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 7.6 | 5.19 | 7.79 | 4.12 | 5 | 6.9 | 11.9 | 7.38 | 6.76 | 5.43 | 3.61 | 6.47 | 2.55 | 8.33 | 3.63 | 6.67 | 7 | no | -- | no | 13 |
| 69A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 3.55 | 3.16 | 3.54 | 2.91 | 0.4 | 3.69 | 6.52 | 2.61 | 2.7 | 2.25 | 1.61 | 2.62 | 0.909 | 3 | 0.85 | 3.29 | 0.778 | no | -- | no | 20 |
| 22A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 2.22 | 1.31 | 1.88 | 1.45 | 0.387 | 1.37 | 5.11 | 1.96 | 1.49 | 0.909 | 0.725 | 1.46 | 0.861 | 1.65 | 4.78 | 0.933 | 0.938 | no | -- | no | 19 |
| 84A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 3.13 | 2.23 | | 0.985 | 0.736 | | | | | | | | 0.509 | 0.889 | | | | no | -- | no | 16 |
| 25A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 1.29 | 1.03 | | | | | | | | | | | 0.879 | 1.05 | | | | no | -? | ? | 8 |
| 26A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 2.74 | | | | | | | | | | | | 1.35 | 1.84 | | | | no | -? | ? | 11 |
| 27A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 1.8 | | | | | | | | | | | | 0.442 | 0.833 | | | | no | -? | ? | 16 |
| 28A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 1.11 | 0.858 | | | | | | | | | | | 0.378 | 0.765 | | | | no | -? | ? | 14 |
| 91A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 0.625 | | 1.32 | | | | | | | | | | | 0.667 | | | | no | -? | ? | 17 |
| 92A1 | MYTI EDU | SB | d.wt | | | | | | | | | | | | 0.68 | 2.09 | 1.41 | 0.766 | 0.275 | 1.93 | | | | | | | | | | | | no | -- | no | 22 |
| 96A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 1.03 | 0.435 | | | | | | | | | | | 0.262 | 0.7 | | | | no | -? | ? | 19 |
| 98A2 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | 1.59 | | 0.87 | 0.575 | 1.31 | 0.625 | 0.725 | 0.415 | 0.778 | 0.867 | 0.5 | 0.438 | no | -- | no | 13 |
| 98X | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 31.6 | 22.9 | 5.16 | | | | | | | | | | | | | no | -? | ? | 15 |
| 99A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 0.621 | 0.873 | | | | | | | | | | | 0.254 | 0.294 | | | | no | -? | ? | 10 |
| 41A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.621 | 0.423 | 0.291 | 0.61 | | | | | | | | | 0.35 | 0.333 | | no | -- | no | 12 |
| 43A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 0.608 | | 0.855 | | | | | | | | | 0.313 | 0.357 | | no | -? | ? | 11 |
| 44A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 0.486 | 0.343 | 1.41 | | | | | | | | | 3.3 | 1.35 | | no | -? | ? | 19 |
| 45A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 1.74 | 2 | | | | | | | | | | | 0.8 | 0.889 | | no | D? | ? | 8 |
| 46A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 1.05 | 0.756 | 0.273 | | | | | | | | | | 0.6 | 0.524 | | no | -? | ? | 17 |
| 48A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 1.71 | 1.13 | 0.286 | | | | | | | | | | 1.24 | 0.438 | | no | -? | ? | 22 |
| 10A2 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | 0.439 | 1.49 | | 1.45 | 0.611 | 0.867 | 0.61 | 0.576 | 0.267 | 0.474 | 0.588 | 0.318 | 0.412 | no | -- | no | 15 |
| 11X | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | 0.811 | 1.04 | 1.04 | 0.769 | 0.758 | 0.472 | 0.465 | 0.317 | 0.524 | 0.389 | 0.286 | 1.17 | no | -- | no | 13 |

Annual median concentration of ppDDE (ppb)

| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | ANALYSIS OC | TRD | SM3 | PWR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 5.24 | 3.86 | 7.08 | 5.7 | 2.56 | 5.88 | 3.87 | 5.91 | 3.47 | 1.99 | 1.97 | 2.08 | 1.22 | 2.56 | 1.77 | 3.29 | 3 | no | D- | no | 13 |
| 71A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 2.61 | 1.58 | 3.21 | 1.29 | 0.736 | 1.02 | 2.2 | 2.41 | 2.26 | 3.58 | 1.1 | 1.67 | 0.763 | 1.8 | 2.17 | 1.8 | 1.56 | no | -- | no | 15 |
| 51A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 33.9 | 6.67 | 14.7 | 17.1 | 13.2 | 16.9 | 5.48 | 9.52 | 10 | 10.5 | 14.7 | 7.5 | 11.7 | 13.3 | 1.3 | -- | 1.3 | 15 |
| 52A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 12.3 | 25.5 | 19.4 | 18.5 | 9.53 | 13.1 | 16.7 | 13.7 | 11.9 | 6.47 | 6.82 | 8.86 | 10.5 | 12.5 | 4.71 | 12.2 | 12.7 | 1.3 | -- | 1.3 | 13 |
| 10A2 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | 0.439 | 1.49 | | 1.45 | 0.611 | 0.867 | 0.61 | 0.576 | 0.267 | 0.474 | 0.588 | 0.318 | 0.412 | no | -- | no | 15 |
| I021 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 4.6 | 1.45 | 4.8 | 3.25 | | 5.19 | 2.73 | 4.73 | | | | | | | no | -- | no | 16 |
| I022 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 3.95 | 1.38 | 7.13 | 4.58 | 7.96 | 4.92 | 3.73 | 4.51 | 2.54 | 2.7 | 1.43 | 1.31 | 0.75 | 1.09 | no | DY | no | 15 |
| I023 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 1.81 | 1.32 | 3.79 | 2.32 | 6.1 | 2.39 | 2.91 | 3.31 | 1.42 | 1.29 | 1.47 | 1.45 | 0.923 | 1 | no | DY | no | 13 |
| I024 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 3.5 | 3.52 | 8.91 | 7.17 | 8.96 | 4.94 | 2.52 | 5.15 | 2.4 | 2.32 | 1.7 | 1.33 | 0.615 | 1.09 | no | DY | no | 13 |
| I301 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 2.59 | 3.75 | 17.8 | 5.96 | 7.45 | 5.58 | 4.51 | 5.06 | 3.54 | 4.47 | 5.17 | 3.57 | 4.06 | 6.53 | no | -- | no | 15 |
| I304 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 2.14 | 0.751 | 3.42 | 3.89 | | 1.95 | 2.71 | 2.62 | 1.73 | 2.71 | 1.43 | 1.85 | 3.17 | 3.07 | no | -- | no | 15 |
| I306 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 1.84 | 0.455 | 4.25 | 3.31 | | 2.37 | 1.88 | 1.92 | 1.12 | 1.74 | 1.09 | 2.47 | 1.86 | 2.46 | no | -- | no | 17 |
| I307 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 2.18 | 1.03 | 3.42 | 2.74 | | 2.12 | 4.13 | 2.28 | 1.09 | 1.34 | 0.873 | 2.5 | 2.31 | 2.07 | no | -- | no | 15 |
| I711 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 3.46 | 0.719 | 1.49 | 2.19 | 2.18 | 3.85 | | 1.26 | | | | | | | no | -- | no | 19 |
| I712 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 2.43 | 1.34 | 3.14 | 3.09 | 3.49 | 3.46 | 2.48 | 1.6 | 2.65 | 2.94 | 1.36 | 2.36 | 1.75 | 2.38 | no | -- | no | 12 |
| I713 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | | | | | | 1.61 | 2.26 | 2.96 | 0.676 | 2.19 | 2.17 | 1.69 | no | -- | no | 17 |
| I131A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 1.46 | 0.691 | 1.89 | 2.06 | 1.67 | 1.11 | 0.915 | 1.11 | 0.942 | 1.37 | 2.39 | 0.846 | 0.733 | | no | -- | no | 14 |
| I132 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | | 2.02 | 2.06 | 1.19 | 1.15 | 1.26 | 1.17 | 0.917 | 1.83 | 1.13 | 0.5 | 0.548 | no | D- | no | 12 |
| I133 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 2.16 | 0.879 | 1.62 | 1.93 | 2.73 | 1.16 | 1.11 | 1.03 | 0.925 | 0.94 | 1.55 | 1.35 | 0.643 | 0.692 | no | -- | no | 13 |
| I241 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 6.4 | 6.21 | 2.3 | 6.49 | 5.59 | 4.45 | 2.93 | 4.4 | 4.37 | 5.49 | 6.17 | 3 | 3.88 | 11.9 | 1.2 | -- | no | 15 |
| I242 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 6.52 | 9.74 | 1.58 | 3.53 | 9.47 | 3.52 | 2.22 | 2.88 | 3.38 | 4.41 | 2.57 | 1.93 | 3.06 | 2.43 | no | -- | no | 17 |
| I243 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 7.47 | 6.12 | 1.72 | 5.43 | 5.11 | 4.01 | 1.99 | 3.32 | 3.88 | 6.41 | 19.5 | 5.88 | 4.41 | 6.23 | no | -- | no | 17 |

Annual median concentration of ppDDE (ppb)

| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | ANALYSIS OC | TRD | SM3 | PWR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30B | GADU MOR | LI | w.wt | | | | | | | | | | 163 | 440 | 182 | 159 | 191 | 194 | 321 | 380 | 260 | 230 | 160 | 180 | 180 | 240 | 210 | 260 | 190 | 130 | 180 | no | -- | no | 12 |
| 36B | GADU MOR | LI | w.wt | | | | | | | | | | 91.9 | 51 | 50 | 75 | 55 | 105 | 141 | 129 | 45 | 86 | 47 | 46 | 39 | 32 | 34 | 40 | 59 | 26 | 34 | no | D- | no | 13 |
| 77B | GADU MOR | LI | w.wt | | | | | | | | | | 46 | 63.4 | | | | | | | | | | | | | | | | | 20 | no | -? | ? | 11 |
| 15B | GADU MOR | LI | w.wt | | | | | | | | | | 50 | 136 | 48 | 57 | 86 | 33.5 | 75 | 140 | 72.5 | 76 | 46 | 60 | 78 | 74 | 50 | 58 | 51 | 55 | 48 | no | -- | no | 14 |
| 53B | GADU MOR | LI | w.wt | | | | | | | | | | 637 | 806 | 939 | 85 | | 42 | 491 | 936 | 490 | 160 | 380 | 260 | 200 | 145 | 300 | 199 | 220 | 360 | 87 | no | -- | no | 22 |
| 67B | GADU MOR | LI | w.wt | | | | | | | | | | 776 | 554 | 347 | 392 | 471 | 109 | 460 | 2060 | 270 | 200 | 177 | 140 | 110 | 89 | 74 | 110 | 34 | 130 | 96.5 | no | D- | no | 19 |
| 23B | GADU MOR | LI | w.wt | | | | | | | | | | 68 | 85.4 | 42 | 41 | 35 | 31 | 49 | 33 | 49 | 48 | 59 | 52.9 | 24 | 37 | 52 | 46 | 33 | 40 | 21.4 | no | D- | no | 11 |
| 92B | GADU MOR | LI | w.wt | | | | | | | | | | | | | 53 | 50.5 | 50 | 196 | | | | | | | | 50 | 22 | | | 38 | no | -- | no | 16 |
| 98B1 | GADU MOR | LI | w.wt | | | | | | | | | | | | 73 | 83.4 | 43 | 49 | 138 | 198 | 78 | 41 | | | 29 | 64 | 73 | 22 | 37 | 52.2 | 17 | no | -- | no | 17 |
| 43B | GADU MOR | LI | w.wt | | | | | | | | | | | | | | 126 | 69 | 60 | | | | | | | | | | | | 39.5 | no | -? | ? | 13 |
| 10B | GADU MOR | LI | w.wt | | | | | | | | | | | | | | 211 | 71 | 75 | 99 | 65 | 90 | 32 | 38.5 | 54 | 51.5 | 50 | 37 | 34 | 35 | 30 | no | D- | no | 12 |
| 30B | GADU MOR | MU | w.wt | | | | | | | | | | 0.45 | 1.21 | 2 | 1 | 0.32 | 0.29 | 1.01 | 0.989 | 1.5 | 1.5 | 0.44 | 0.67 | 0.73 | 0.7 | 0.66 | 0.73 | 0.65 | 0.58 | 0.82 | no | -- | no | 16 |
| 36B | GADU MOR | MU | w.wt | | | | | | | | | | 0.34 | 0.29 | 0.2 | 0.5 | 0.09 | 0.93 | 0.58 | 0.88 | 0.31 | 0.32 | 0.171 | 0.24 | 0.22 | 0.21 | 0.26 | 0.41 | 0.38 | 0.08 | 0.22 | no | -- | no | 18 |
| 77B | GADU MOR | MU | w.wt | | | | | | | | | | 0.14 | 0.7 | | | | | | | | | | | | | | | | | 0.13 | no | -? | ? | >25 |
| 15B | GADU MOR | MU | w.wt | | | | | | | | | | 0.47 | 0.36 | 0.346 | 0.2 | 0.12 | 0.26 | 0.35 | 0.514 | 0.23 | 0.32 | 0.31 | 0.19 | 0.22 | 0.39 | 0.07 | 0.21 | 0.18 | 0.15 | 0.15 | no | -- | no | 15 |
| 53B | GADU MOR | MU | w.wt | | | | | | | | | | 2.36 | 2.16 | 6.75 | 1.8 | | 0.08 | 4.09 | 4.59 | 4.64 | 3.2 | 2.5 | 0.6 | 1.79 | 2.4 | 1.9 | 4.2 | 0.63 | 1.9 | 1.8 | 1.8 | -- | 1.1 | >25 |
| 67B | GADU MOR | MU | w.wt | | | | | | | | | | 2.25 | 3.03 | 1.4 | 1 | 2.46 | 1.08 | 6.96 | 19 | 1 | 1.1 | 1.1 | 1.8 | 0.44 | 0.24 | 0.31 | 0.66 | 0.12 | 0.34 | 0.554 | no | D- | no | 22 |
| 23B | GADU MOR | MU | w.wt | | | | | | | | | | 0.21 | 0.59 | 0.1 | 0.2 | 0.04 | 0.16 | 0.14 | 0.18 | 0.14 | 0.18 | 0.12 | 0.16 | 0.1 | 0.13 | 0.08 | 0.17 | 0.29 | 0.15 | 0.07 | no | -- | no | 17 |
| 92B | GADU MOR | MU | w.wt | | | | | | | | | | | | | 0.1 | 0.09 | 0.17 | 0.49 | | | | | | | | 0.11 | 0.1 | | | 0.14 | no | -- | no | 13 |
| 98B1 | GADU MOR | MU | w.wt | | | | | | | | | | | | 0.4 | 0.4 | 0.06 | 0.05 | 0.24 | 0.6 | 0.18 | 0.15 | | | 0.09 | 0.12 | 0.21 | 0.14 | 0.09 | 0.148 | 0.05 | no | -- | no | 20 |
| 43B | GADU MOR | MU | w.wt | | | | | | | | | | | | | | 0.23 | 0.23 | 0.14 | | | | | | | | | | | | 0.0949 | no | -? | ? | 10 |
| 10B | GADU MOR | MU | w.wt | | | | | | | | | | | | | | 0.74 | 0.68 | 0.12 | 0.4 | 0.26 | 0.41 | 0.15 | 0.18 | 0.23 | 0.18 | 0.41 | 0.17 | 0.175 | 0.26 | 0.19 | no | -- | no | 16 |

Annual median concentration of ppDDE (ppb)

| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | ANALYSIS OC | TRND | SM+3 | POWER |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 33F | PLAT FLE | LI | w.wt | | | | | | | | | | 13 | 9.1 | 24 | 14 | 13 | 7 | 12.7 | 9.29 | 8.99 | 6.8 | 27 | 27 | 17 | 22 | 19 | 16 | 20 | 16 | 18 | no | -- | no | 13 |
| 53F | PLAT FLE | LI | w.wt | | | | | | | | | | 94 | 70.1 | 32 | 41 | | 8 | 25 | 45 | 38 | 44 | 17.5 | 39 | 42 | 40 | 29 | 45 | | 51 | 30 | 1.0 | -- | 1.2 | 15 |
| 67F | PLAT FLE | LI | w.wt | | | | | | | | | | | | | | | | 27 | | 84.5 | 40 | 35 | 25 | 24 | 20 | 21 | 22 | 26 | 26 | 33 | 1.1 | -- | 1.3 | 12 |
| 21F | PLAT FLE | LI | w.wt | | | | | | | | | | | | | | | | | | | 11 | 2.6 | 16 | 7.4 | | 90 | 7.7 | 4.8 | | | no | -- | no | >25 |
| 33F | PLAT FLE | MU | w.wt | | | | | | | | | | 0.9 | 1.93 | 0.6 | 0.2 | 0.15 | 0.25 | 0.495 | 0.299 | 0.26 | 1.5 | 0.3 | 0.56 | 0.43 | 0.53 | 0.25 | 0.16 | 0.25 | 0.22 | 0.29 | no | -- | no | 17 |
| 53F | PLAT FLE | MU | w.wt | | | | | | | | | | 4.67 | 5.3 | 3.8 | 1.3 | | 0.373 | 1.79 | 1.36 | 0.96 | 0.93 | 0.61 | 0.88 | 0.66 | 0.81 | 0.57 | 1.3 | | 0.67 | 0.73 | no | D- | no | 15 |
| 67F | PLAT FLE | MU | w.wt | | | | | | | | | | | | | | | | 0.85 | | 1.31 | 1.4 | 1.2 | 0.54 | 0.63 | 0.68 | 0.11 | 0.33 | 0.26 | 0.7 | 1 | no | D- | 1.3 | 17 |
| 21F | PLAT FLE | MU | w.wt | | | | | | | | | | | | | | | | | | | 0.32 | 0.1 | 0.43 | 0.16 | | 1.2 | 0.61 | 0.3 | | | no | -- | no | 22 |
| 36F | LIMA LIM | LI | w.wt | | | | | | | | | | 28 | 34.4 | 28 | 21 | 50 | 40 | 40 | 22 | 18 | 52 | 45 | 27 | 31 | 36 | 17 | 21 | 35 | 19 | 22 | no | -- | no | 13 |
| 15F | LIMA LIM | LI | w.wt | | | | | | | | | | | 39 | | 13.4 | 23.5 | 9 | 20.7 | 20 | 13 | 32 | | 41 | 15 | 17 | 23 | 26 | 15 | 16 | 22 | no | -- | no | 14 |
| 22F | LIMA LIM | LI | w.wt | | | | | | | | | | 68.9 | 48 | 39.9 | | 21 | 9.17 | | | | | | | | | | | | | | no | D? | ? | 10 |
| 21F | LIMA LIM | LI | w.wt | | | | | | | | | | | | | | | | | | | | | | 74 | 82 | 56 | 69 | | 40 | | no | -? | ? | 9 |
| 36F | LIMA LIM | MU | w.wt | | | | | | | | | | 0.41 | 1.15 | 0.7 | 0.5 | 0.96 | 0.91 | 0.91 | 0.46 | 0.67 | 0.49 | 0.52 | 0.51 | 0.61 | 0.53 | 0.13 | 0.31 | 0.38 | 0.46 | 0.35 | no | -- | no | 14 |
| 15F | LIMA LIM | MU | w.wt | | | | | | | | | | | 1.21 | | 0.173 | 0.143 | 0.3 | 0.55 | 0.42 | 0.38 | 0.324 | | 0.55 | 0.18 | 0.28 | 0.1 | 0.46 | 0.24 | 0.16 | 0.35 | no | -- | no | 17 |
| 22F | LIMA LIM | MU | w.wt | | | | | | | | | | 1.1 | 2 | 1.18 | | 0.56 | 0.83 | | | | | | | | | | | | | | no | -? | ? | 14 |
| 21F | LIMA LIM | MU | w.wt | | | | | | | | | | | | | | | | | | | | | | 1.4 | 0.82 | 0.51 | 1.1 | | 0.79 | | no | -? | ? | 14 |
| 30F | PLEU PLA | LI | w.wt | | | | | | | | | | | | 21.2 | | 13 | 12 | | | | | | | | | | | | | | 1.2 | -? | ? | 6 |
| 22F | PLEU PLA | LI | w.wt | | | | | | | | | | | | | | | | 7.8 | 12 | 2.8 | | | | | | | | | | | no | -? | ? | 21 |
| 98F2 | PLEU PLA | LI | w.wt | | | | | | | | | | | | | | | | | | | | 10.8 | 8 | 5.1 | 3.6 | 2.8 | 9.19 | 4.6 | 1.7 | 1.2 | no | D- | no | 16 |
| 10F | PLEU PLA | LI | w.wt | | | | | | | | | | | | | | | | | 15 | | 34.7 | 28 | 8.9 | 19 | 4.74 | 5.79 | 10 | | 3.9 | 5.02 | no | -- | no | 17 |
| 30F | PLEU PLA | MU | w.wt | | | | | | | | | | | | 0.693 | | 0.32 | 0.17 | | | | | | | | | | | | | | no | -? | ? | 8 |
| 22F | PLEU PLA | MU | w.wt | | | | | | | | | | | | | | | | 0.47 | 0.34 | 0.76 | | | | | | | | | | | no | -? | ? | 15 |
| 98F2 | PLEU PLA | MU | w.wt | | | | | | | | | | | | | | | | | | | | 0.465 | 0.24 | 0.135 | 0.09 | 0.05 | 0.434 | 0.34 | 0.08 | 0.05 | no | -- | no | 22 |
| 10F | PLEU PLA | MU | w.wt | | | | | | | | | | | | | | | | | 0.4 | | 0.859 | 1.1 | 0.3 | 0.4 | 0.134 | 0.0671 | 0.18 | | 0.2 | 0.139 | no | D- | no | 17 |
| 67F | LEPI WHI | LI | w.wt | | | | | | | | | | 294 | 240 | 183 | 163 | 250 | 145 | 143 | 167 | 160 | 160 | 130 | 58 | 64 | 73 | 71.1 | 55 | 61.6 | 48 | 61 | m | D- | m | 10 |
| 21F | LEPI WHI | LI | w.wt | | | | | | | | | | | | | | | | | | | | | | | 44 | 27.9 | 48 | 45 | 36 | 38 | m | -- | m | 10 |
| 67F | LEPI WHI | MU | w.wt | | | | | | | | | | 2.56 | 1.51 | 2.5 | 0.8 | 0.8 | 3.04 | 0.78 | 1.27 | 0.56 | 1.4 | 1.1 | 0.54 | 0.39 | 0.59 | 0.483 | 0.57 | 0.37 | 0.28 | 0.76 | m | D- | m | 16 |
| 21F | LEPI WHI | MU | w.wt | | | | | | | | | | | | | | | | | | | | | | | 0.27 | 0.15 | 0.6 | 0.38 | 0.46 | 0.43 | m | -- | m | 15 |

Annual median concentration of HCB (ppb)

| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | ANALYSIS OC | TRND | SM+3 | POWER |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30A | MYTI EDU | SB | d.wt | | | | 1.18 | 0.877 | 2.06 | 0.917 | 1.15 | 0.866 | 0.35 | 0.592 | 0.952 | 0.541 | 0.27 | 0.239 | 0.251 | 0.275 | 0.298 | | 0.361 | 0.225 | 0.34 | 0.323 | 0.242 | 0.188 | 0.25 | 0.353 | 0.25 | no | D- | no | 13 |
| 31A | MYTI EDU | SB | d.wt | | | 13.4 | 1.38 | 3.83 | 1.89 | 0.93 | 0.893 | 0.361 | 0.317 | 0.606 | 0.549 | 0.446 | 0.243 | 0.312 | 0.219 | 0.258 | 0.21 | | 0.226 | 0.265 | 0.321 | 0.327 | 0.216 | 0.207 | 0.421 | 0.5 | 0.2 | no | DY | no | 15 |
| 35A | MYTI EDU | SB | d.wt | | | 12.8 | 0.952 | 3.33 | 0.793 | 0.976 | 1.12 | 0.474 | 0.42 | 0.585 | 0.578 | 0.505 | 0.234 | 0.276 | 0.219 | 0.522 | 0.2 | 0.336 | 0.36 | 0.3 | 0.287 | 0.273 | 0.313 | 0.533 | 0.35 | 0.381 | 0.333 | no | DY | no | 16 |
| 36A | MYTI EDU | SB | d.wt | | | 15 | 0.948 | 3.83 | 2.9 | 2.37 | 0.957 | 0.426 | 0.33 | 0.546 | 0.394 | 0.529 | 0.24 | 0.333 | 0.276 | 0.311 | 0.149 | | 0.252 | 0.197 | 0.214 | 0.292 | 0.216 | 0.353 | 0.182 | 0.2 | 0.294 | no | DY | no | 16 |
| 71A | MYTI EDU | SB | d.wt | | | 15.3 | 10.4 | 91.4 | 11.1 | 207 | 1.83 | 149 | 8.48 | 6.91 | 4.14 | 3.91 | 1.47 | 2.13 | 4.48 | 2.04 | 1.78 | 3.1 | 1.85 | 2.42 | 0.809 | 0.327 | 0.606 | 4.47 | 1.27 | 1.33 | 1.21 | 2.4 | D- | 3.9 | >25 |
| 76A | MYTI EDU | SB | d.wt | | | | | | | | | | 0.378 | 0.568 | 0.498 | 0.794 | | | 0.254 | 0.289 | 0.4 | 0.256 | 0.216 | 0.244 | 0.299 | 0.311 | 0.974 | 0.294 | 0.188 | 0.235 | 0.353 | no | -- | no | 14 |
| 15A | MYTI EDU | SB | d.wt | | | | | | | | | | 0.203 | | | 0.488 | 0.253 | 0.217 | 0.294 | 0.254 | 0.159 | 0.224 | 0.179 | 0.253 | 0.296 | 0.331 | 0.291 | 0.313 | 0.167 | 0.353 | 0.222 | no | -- | no | 11 |
| 51A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 0.612 | 0.333 | 0.313 | 0.4 | 0.4 | 0.385 | 0.196 | 0.476 | 0.403 | 0.49 | 0.575 | 0.5 | 0.769 | 0.467 | no | -- | 1.3 | 12 |
| 52A | MYTI EDU | SB | d.wt | | | | | | | | | 0.855 | 0.378 | | 0.813 | 0.811 | 0.276 | 0.316 | 0.262 | 0.333 | 0.214 | 0.334 | 0.199 | 0.376 | 0.318 | | 0.458 | 0.313 | 0.5 | 0.667 | 0.467 | no | DY | 1.4 | 13 |
| 56A | MYTI EDU | SB | d.wt | | | | | | | | 0.2 | 0.787 | 0.413 | 0.794 | 0.935 | 1.04 | 0.309 | 0.382 | 0.309 | 0.442 | 0.348 | 0.704 | 0.183 | 0.336 | 0.301 | 0.451 | 0.526 | 0.333 | 0.6 | 0.722 | 0.286 | no | -- | no | 15 |
| 57A | MYTI EDU | SB | d.wt | | | | | | | | | 0.769 | | 0.763 | 0.719 | 0.794 | 0.357 | 0.301 | 0.262 | 0.431 | 0.576 | 0.625 | 0.262 | 0.361 | 0.254 | 0.397 | 0.237 | 0.533 | 0.538 | 0.696 | 0.278 | no | -- | no | 13 |
| 63A | MYTI EDU | SB | d.wt | | | | | | | | | 1.05 | | 0.971 | 0.74 | 0.625 | 0.316 | 0.329 | 0.333 | 0.407 | 0.452 | 0.51 | 0.23 | 0.321 | 0.329 | 0.352 | 0.154 | 0.533 | 0.235 | 0.882 | 0.263 | no | -- | 1.0 | 14 |
| 65A | MYTI EDU | SB | d.wt | | | | | | | | 0.2 | 0.427 | 0.516 | 0.862 | 0.621 | 0.667 | 0.284 | 0.296 | 0.294 | 0.345 | 0.377 | 0.524 | 0.15 | 0.272 | 0.258 | 0.294 | 0.179 | 0.556 | 0.188 | 1.1 | 0.2 | no | -- | no | 16 |
| 69A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 0.532 | 0.526 | 0.286 | 0.251 | 0.286 | 0.5 | 0.483 | 0.361 | 0.207 | 0.331 | 0.311 | 0.266 | 0.247 | 0.368 | 0.158 | 1.3 | 0.167 | no | -- | no | 17 |
| 22A | MYTI EDU | SB | d.wt | | | | | | | | | | 0.265 | 0.61 | 0.559 | 0.444 | 0.248 | 0.253 | 0.301 | 0.311 | 0.172 | 0.316 | 0.202 | 0.298 | 0.242 | 0.329 | 0.219 | 0.176 | 0.167 | 0.2 | 0.2 | no | D- | no | 12 |
| 82A | MYTI EDU | SB | d.wt | | | | 2.26 | 10.7 | 0.656 | 0.617 | 0.8 | 0.535 | | | | | | | | | | | | | | | 0.181 | 0.235 | | | | no | -- | no | 25 |
| 84A | MYTI EDU | SB | d.wt | | | | 3.41 | 8.79 | 3.33 | 2.04 | 1.23 | 0.476 | | 0.505 | 0.625 | 0.532 | | 0.246 | 0.215 | | | | | | | | 0.292 | 0.188 | | | | no | DY | no | 15 |
| 87A | MYTI EDU | SB | d.wt | | | | | | | | 0.917 | 0.42 | | | | | | | | | | | | | | | 0.14 | 0.19 | | | | no | -? | ? | 14 |
| 25A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 0.704 | 0.513 | | | | | | | | | | | 0.35 | 0.364 | | | | no | -? | ? | 8 |
| 26A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 0.614 | | | | | | | | | | | | 0.318 | 0.474 | | | | no | -? | ? | 12 |
| 27A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 0.599 | | | | | | | | | | | | 0.188 | 0.222 | | | | no | -? | ? | 9 |
| 28A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 0.556 | 0.429 | | | | | | | | | | | 0.16 | 0.353 | | | | no | -? | ? | 15 |
| 91A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 0.625 | | 0.314 | | | | | | | | | | | 0.278 | | | | no | -? | ? | 14 |
| 92A1 | MYTI EDU | SB | d.wt | | | | | | | | | | | | 0.68 | 0.418 | 0.244 | 0.225 | 0.23 | 0.254 | | | | | | | | | | | | no | Dm | no | 12 |
| 96A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 0.525 | 0.422 | | | | | | | | | | | 0.146 | 0.3 | | | | no | -? | ? | 14 |
| 98A2 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | 0.336 | | 0.435 | 0.286 | 0.291 | 0.313 | 0.362 | 0.433 | 0.294 | 0.167 | 0.4 | 0.176 | no | -- | no | 12 |
| 98X | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.559 | 0.318 | 0.26 | | | | | | | | | | | | | no | -? | ? | 8 |
| 99A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 0.621 | 0.442 | | | | | | | | | | | 0.152 | 0.176 | | | | no | D? | ? | 9 |
| 41A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.292 | 0.263 | 0.291 | 0.303 | | | | | | | | | 0.15 | 0.444 | | no | -- | no | 14 |
| 43A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.325 | 0.338 | | 0.45 | | | | | | | | | 0.188 | 0.286 | | no | -? | ? | 11 |
| 44A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 0.273 | 0.286 | 0.329 | | | | | | | | | 0.25 | 0.381 | | no | -? | ? | 9 |
| 45A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.292 | 0.278 | | | | | | | | | | | 0.263 | 0.222 | | no | -? | ? | 6 |
| 46A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.263 | 0.291 | 0.273 | | | | | | | | | | 0.15 | 0.391 | | no | -? | ? | 14 |
| 48A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.279 | 0.294 | 0.238 | | | | | | | | | | 0.188 | 0.25 | | no | -? | ? | 8 |
| 10A2 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | 0.245 | 0.309 | | 0.284 | 0.278 | 0.289 | 0.305 | 0.275 | 0.279 | 0.263 | 0.188 | 0.227 | 0.176 | no | DY | no | 7 |
| 11X | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | 0.34 | 0.208 | 0.249 | 0.242 | 0.253 | 0.236 | | 0.279 | 0.381 | 0.167 | 0.571 | 0.176 | no | -- | no | 14 |

Annual median concentration of HCB (ppb)

| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | ANALYSIS OC | TRD | SM3 | PWR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30A | MYTI EDU | SB | d.wt | | | | 1.18 | 0.877 | 2.06 | 0.917 | 1.15 | 0.866 | 0.35 | 0.592 | 0.952 | 0.541 | 0.27 | 0.239 | 0.251 | 0.275 | 0.298 | | 0.361 | 0.225 | 0.34 | 0.323 | 0.242 | 0.188 | 0.25 | 0.353 | 0.25 | no | D- | no | 13 |
| 71A | MYTI EDU | SB | d.wt | | | 15.3 | 10.4 | 91.4 | 11.1 | 207 | 1.83 | 149 | 8.48 | 6.91 | 4.14 | 3.91 | 1.47 | 2.13 | 4.48 | 2.04 | 1.78 | 3.1 | 1.85 | 2.42 | 0.809 | 0.327 | 0.606 | 4.47 | 1.27 | 1.33 | 1.21 | 2.4 | D- | 3.9 | >25 |
| 51A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 0.612 | 0.333 | 0.313 | 0.4 | 0.4 | 0.385 | 0.196 | 0.476 | 0.403 | 0.49 | 0.575 | 0.5 | 0.769 | 0.467 | no | -- | 1.3 | 12 |
| 52A | MYTI EDU | SB | d.wt | | | | | | | | | 0.855 | 0.378 | | 0.813 | 0.811 | 0.276 | 0.316 | 0.262 | 0.333 | 0.214 | 0.334 | 0.199 | 0.376 | 0.318 | | 0.458 | 0.313 | 0.5 | 0.667 | 0.467 | no | DY | 1.4 | 13 |
| 10A2 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | 0.245 | 0.309 | | 0.284 | 0.278 | 0.289 | 0.305 | 0.275 | 0.279 | 0.263 | 0.188 | 0.227 | 0.176 | no | DY | no | 7 |
| I021 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 0.833 | 0.916 | 0.48 | 0.375 | | 0.481 | 0.636 | 0.549 | | | | | | | 1.1 | -- | 1.3 | 10 |
| I022 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 0.421 | 0.479 | 0.97 | 0.312 | 0.783 | 0.455 | 0.543 | 0.549 | 0.379 | 0.513 | 0.476 | 0.692 | 0.667 | 0.545 | 1.1 | -- | 1.5 | 12 |
| I023 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 0.482 | 0.424 | 0.431 | 0.259 | 0.615 | 0.347 | 0.342 | 0.417 | 0.394 | 0.446 | 0.541 | 0.545 | 0.615 | 0.538 | 1.1 | -- | 1.4 | 10 |
| I024 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 0.488 | 0.602 | 1.16 | 0.426 | 0.66 | 0.556 | 0.536 | 0.495 | 0.388 | 0.404 | 0.532 | 0.615 | 0.308 | 0.636 | 1.3 | -- | 1.1 | 12 |
| I301 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 0.294 | 0.284 | 0.695 | 0.818 | 1.55 | 0.508 | 0.677 | 0.423 | 0.318 | 0.965 | 0.735 | 0.357 | 0.667 | 1.36 | 2.7 | -- | 2.5 | 16 |
| I304 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 0.336 | 0.281 | 0.719 | 0.486 | | 0.294 | 0.526 | 0.385 | 0.307 | 0.5 | 0.439 | 0.286 | 0.333 | 0.733 | 1.5 | -- | 1.2 | 13 |
| I306 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 0.299 | 0.307 | 0.774 | 0.253 | | 0.296 | 0.294 | 0.336 | 0.352 | 0.462 | 0.431 | 0.438 | 0.357 | 0.462 | no | -- | no | 12 |
| I307 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 0.273 | 0.318 | 0.674 | 0.174 | | 0.327 | 0.336 | 0.45 | 0.365 | 0.357 | 0.238 | 0.5 | 0.471 | 0.571 | 1.1 | -- | 1.5 | 14 |
| I711 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 4.45 | 5.54 | 0.575 | 4.46 | 6.96 | 2.56 | | 4 | | | | | | | 8.0 | -- | 11.2 | 24 |
| I712 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 3.43 | 16.4 | 7.9 | 4.83 | 5 | 3.31 | 1.78 | 2.75 | 3.27 | 2.9 | 6.72 | 2.09 | 1.64 | 2.77 | 5.5 | -- | 2.5 | 16 |
| I713 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | | | | | | 3.49 | 2.64 | 4.17 | 11.1 | 3.56 | 2.44 | 2.83 | 5.7 | -- | 2.7 | 16 |
| I131A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 0.316 | 0.298 | 0.273 | 0.196 | 0.582 | 0.288 | 0.327 | 0.292 | 0.373 | 1.4 | 0.724 | 0.643 | 0.625 | | 1.3 | -- | 1.8 | 14 |
| I132 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | | 44.2 | 1.89 | 4.73 | 3.11 | 2.36 | 1.56 | 1.94 | 6.42 | 4.93 | 0.625 | 3.55 | 7.1 | -- | 3.6 | 24 |
| I133 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 18.1 | 43.5 | 8.12 | 28 | 1.7 | 6.18 | 2.3 | 1.62 | 2.45 | 3.76 | 7.18 | 4.09 | 0.615 | 4.31 | 8.6 | -- | 2.5 | 23 |
| I241 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 1.28 | 0.706 | 0.69 | 0.753 | 0.698 | 0.618 | 0.293 | 0.55 | 0.299 | 1.14 | 1.33 | 1.55 | 1.65 | 0.688 | 1.4 | -- | 2.7 | 14 |
| I242 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 1.2 | 0.923 | 0.562 | 0.604 | 0.651 | 0.552 | 0.241 | 0.5 | 0.463 | 0.593 | 0.857 | 1.07 | 0.778 | 0.571 | 1.1 | DY | 1.5 | 12 |
| I243 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 1.03 | 0.663 | 0.516 | 1.24 | 0.662 | 0.67 | 0.262 | 0.444 | 0.34 | 0.611 | 0.92 | 1.19 | 0.889 | 0.5 | 1.0 | -- | 1.6 | 14 |

Annual median concentration of HCB (ppb)

| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | ANALYSIS OC | TRD | SM3 | PWR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30B | GADU MOR | LI | w.wt | | | | | | | | | | 10 | 17 | 7.48 | 16 | 11 | 11 | 12 | 7 | 5.3 | 5.1 | 9.1 | 8.9 | 6.7 | 6 | 8.9 | 6.3 | 5.5 | 7.9 | 6.2 | no | D- | no | 11 |
| 36B | GADU MOR | LI | w.wt | | | | | | | | | | 7 | 9 | 9 | 10 | 9 | 5 | 9 | 6 | 4.4 | 6.5 | 5.4 | 4.6 | 3.1 | 3.3 | 4 | 3.3 | 3.5 | 3.7 | 4.1 | no | D- | no | 10 |
| 77B | GADU MOR | LI | w.wt | | | | | | | | | | 9.49 | 8 | | | | | | | | | | | | | | | | | 3.7 | no | -? | ? | 6 |
| 15B | GADU MOR | LI | w.wt | | | | | | | | | | 5 | 20.5 | 10 | 14 | 14 | 9 | 11 | 13 | 11.5 | 11 | 6.2 | 6.6 | 8.2 | 6.4 | 9.7 | 9.1 | 13 | 9.9 | 6.2 | no | -- | no | 12 |
| 53B | GADU MOR | LI | w.wt | | | | | | | | | | 10 | 10 | 16.5 | 7 | | 5 | 7 | 7 | 5 | 4.7 | 12 | 2.1 | 3 | 2.25 | 2.6 | 1.3 | 3.9 | 6.3 | 0.5 | no | D- | no | 19 |
| 67B | GADU MOR | LI | w.wt | | | | | | | | | | 14 | 8 | 7.94 | 8 | 8.49 | 10 | 8 | 15.5 | 9.9 | 4.6 | 5.63 | 4.9 | 4.6 | 5.1 | 5.3 | 7.7 | 5.3 | 8 | 3.7 | no | D- | no | 11 |
| 23B | GADU MOR | LI | w.wt | | | | | | | | | | 6 | 9.49 | 12 | 9 | 8 | 6 | 10 | 6 | 8.4 | 7.8 | 7.6 | 9.25 | 4.7 | 7.9 | 5.8 | 6.9 | 5.5 | 8.5 | 4.3 | no | -- | no | 11 |
| 92B | GADU MOR | LI | w.wt | | | | | | | | | | | | | 17 | 11 | 14 | 13 | | | | | | | | 9.8 | 6 | | | 7.3 | no | -- | no | 10 |
| 98B1 | GADU MOR | LI | w.wt | | | | | | | | | | | | 20 | 9.95 | 12 | 18 | 35 | 20.5 | 16 | 13 | | | 10 | 13 | 11 | 10 | 13 | 12.5 | 7.4 | no | -- | no | 12 |
| 43B | GADU MOR | LI | w.wt | | | | | | | | | | | | | | 15 | 16.5 | 13 | | | | | | | | | | | | 12.5 | no | -? | ? | 7 |
| 10B | GADU MOR | LI | w.wt | | | | | | | | | | | | | | 13 | 11 | 16 | 17 | 17 | 25 | 9 | 9.9 | 11 | 9.43 | 5.1 | 7.7 | 6.8 | 8.5 | 4.3 | no | D- | no | 12 |
| 30B | GADU MOR | MU | w.wt | | | | | | | | | | 0.09 | 0.09 | 0.1 | 0.1 | 0.04 | 0.03 | 0.05 | 0.05 | 0.06 | 0.06 | 0.06 | 0.05 | 0.06 | 0.05 | 0.06 | 0.06 | 0.05 | 0.04 | 0.05 | no | DY | no | 10 |
| 36B | GADU MOR | MU | w.wt | | | | | | | | | | 0.11 | 0.07 | 0.1 | 0.1 | 0.04 | 0.05 | 0.06 | 0.06 | 0.05 | 0.06 | 0.04 | 0.05 | 0.03 | 0.03 | 0.03 | 0.04 | 0.04 | 0.03 | 0.04 | no | D- | no | 10 |
| 77B | GADU MOR | MU | w.wt | | | | | | | | | | 0.12 | 0.1 | | | | | | | | | | | | | | | | | 0.03 | no | D? | ? | 6 |
| 15B | GADU MOR | MU | w.wt | | | | | | | | | | 0.11 | 0.11 | 0.1 | 0.1 | 0.06 | 0.07 | 0.08 | 0.0748 | 0.1 | 0.06 | 0.1 | 0.04 | 0.06 | 0.07 | 0.05 | 0.06 | 0.07 | 0.06 | 0.06 | no | D- | no | 10 |
| 53B | GADU MOR | MU | w.wt | | | | | | | | | | 0.1 | 0.03 | 0.1 | 0.1 | | 0.03 | 0.0648 | 0.06 | 0.05 | 0.05 | 0.09 | 0.04 | 0.05 | 0.08 | 0.03 | 0.04 | 0.03 | 0.04 | 0.03 | no | -- | no | 15 |
| 67B | GADU MOR | MU | w.wt | | | | | | | | | | 0.1 | 0.0849 | 0.1 | 0.1 | 0.0748 | 0.06 | 0.05 | 0.07 | 0.06 | 0.05 | 0.05 | 0.04 | 0.05 | 0.05 | 0.04 | 0.07 | 0.04 | 0.05 | 0.05 | no | D- | no | 9 |
| 23B | GADU MOR | MU | w.wt | | | | | | | | | | 0.08 | 0.08 | 0.1 | 0.1 | 0.04 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.04 | 0.05 | 0.03 | 0.07 | 0.08 | 0.05 | 0.04 | no | -- | no | 11 |
| 92B | GADU MOR | MU | w.wt | | | | | | | | | | | | | 0.1 | 0.07 | 0.05 | 0.09 | | | | | | | | 0.07 | 0.07 | | | 0.08 | no | -- | no | 12 |
| 98B1 | GADU MOR | MU | w.wt | | | | | | | | | | | | 0.2 | 0.2 | 0.07 | 0.1 | 0.11 | 0.1 | 0.1 | 0.08 | | | 0.07 | 0.09 | 0.08 | 0.11 | 0.08 | 0.0949 | 0.07 | no | -- | no | 11 |
| 43B | GADU MOR | MU | w.wt | | | | | | | | | | | | | | 0.09 | 0.13 | 0.06 | | | | | | | | | | | | 0.124 | no | -? | ? | 14 |
| 10B | GADU MOR | MU | w.wt | | | | | | | | | | | | | | 0.16 | 0.11 | 0.09 | 0.2 | 0.17 | 0.26 | 0.09 | 0.11 | 0.13 | 0.09 | 0.09 | 0.1 | 0.0849 | 0.09 | 0.08 | no | -- | no | 12 |

Annual median concentration of HCB (ppb)

| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | ANALYSIS OC | TRND | SM+3 | POWER |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 33F | PLAT FLE | LI | w.wt | | | | | | | | | | 1 | 0.5 | 5 | 2 | 1 | 1 | 0.648 | 0.693 | 0.643 | 0.54 | 1.6 | 1.6 | 1.6 | 1.9 | 1.2 | 1.3 | 1.8 | 1.7 | 1.5 | no | -- | no | 16 |
| 53F | PLAT FLE | LI | w.wt | | | | | | | | | | 6 | 4.47 | 5 | 2 | | 1 | 2 | 3 | 1.8 | 2.5 | 2.39 | 2 | 2.9 | 1.4 | 1 | 1.2 | | 1.6 | 1.1 | no | D- | no | 12 |
| 67F | PLAT FLE | LI | w.wt | | | | | | | | | | | | | | | | 3 | | 6.39 | 3.6 | 4.2 | 4.3 | 3.5 | 3.7 | 3.1 | 4.3 | 3.8 | 4.5 | 2.9 | no | -- | no | 10 |
| 21F | PLAT FLE | LI | w.wt | | | | | | | | | | | | | | | | | | | 3.1 | 1.1 | 2.4 | 0.9 | | 3.6 | 2.1 | 1.2 | | | | no | -- | no | 18 |
| 33F | PLAT FLE | MU | w.wt | | | | | | | | | | 0.06 | 0.07 | 0.1 | 0.1 | 0.03 | 0.03 | 0.03 | 0.05 | 0.03 | 0.06 | 0.04 | 0.04 | 0.05 | 0.06 | 0.03 | 0.03 | 0.04 | 0.04 | 0.04 | no | -- | no | 13 |
| 53F | PLAT FLE | MU | w.wt | | | | | | | | | | 0.45 | 0.3 | 0.2 | 0.1 | | 0.0837 | 0.05 | 0.1 | 0.06 | 0.06 | 0.09 | 0.06 | 0.05 | 0.13 | 0.03 | 0.07 | | 0.04 | 0.08 | no | DY | no | 14 |
| 67F | PLAT FLE | MU | w.wt | | | | | | | | | | | | | | | | 0.05 | | 0.098 | 0.19 | 0.16 | 0.12 | 0.14 | 0.12 | 0.03 | 0.08 | 0.07 | 0.07 | 0.11 | 1.1 | -- | 1.2 | 14 |
| 21F | PLAT FLE | MU | w.wt | | | | | | | | | | | | | | | | | | | 0.1 | 0.03 | 0.06 | 0.04 | | 0.09 | 0.08 | 0.06 | | | no | -- | no | 15 |
| 36F | LIMA LIM | LI | w.wt | | | | | | | | | | 5.48 | 3 | 5 | 2 | 3 | 2 | 2.3 | 3 | 1.1 | 2.5 | 3 | 2.6 | 2 | 2.5 | 1.8 | 1.6 | 2.2 | 1.5 | 1.6 | no | D- | no | 12 |
| 15F | LIMA LIM | LI | w.wt | | | | | | | | | | | 4 | | 4 | 4 | 2 | 3 | 3.2 | 3 | 3.64 | | 5.9 | 2.5 | 4.3 | 3.1 | 4 | 2.6 | 3.7 | 2.5 | no | -- | no | 11 |
| 22F | LIMA LIM | LI | w.wt | | | | | | | | | | 6 | 3 | 5 | | 1 | 1.41 | | | | | | | | | | | | | | no | -? | ? | 15 |
| 21F | LIMA LIM | LI | w.wt | | | | | | | | | | | | | | | | | | | | | | 4.8 | 9.1 | 3.1 | 8 | | 2.6 | | no | -? | ? | 17 |
| 36F | LIMA LIM | MU | w.wt | | | | | | | | | | 0.1 | 0.09 | 0.1 | 0.1 | 0.06 | 0.06 | 0.07 | 0.05 | 0.05 | 0.05 | 0.05 | 0.06 | 0.06 | 0.05 | 0.03 | 0.03 | 0.04 | 0.04 | 0.04 | no | D- | no | 9 |
| 15F | LIMA LIM | MU | w.wt | | | | | | | | | | | 0.2 | | 0.1 | 0.0447 | 0.07 | 0.09 | 0.07 | 0.09 | 0.08 | | 0.15 | 0.04 | 0.09 | 0.03 | 0.09 | 0.05 | 0.06 | 0.07 | no | -- | no | 15 |
| 22F | LIMA LIM | MU | w.wt | | | | | | | | | | 0.12 | 0.2 | 0.1 | | 0.05 | 0.0742 | | | | | | | | | | | | | | no | -? | ? | 14 |
| 21F | LIMA LIM | MU | w.wt | | | | | | | | | | | | | | | | | | | | | | 0.13 | 0.13 | 0.06 | 0.15 | | 0.08 | | no | -? | ? | 14 |
| 30F | PLEU PLA | LI | w.wt | | | | | | | | | | | | 5 | | 2 | 2 | | | | | | | | | | | | | | no | -? | ? | 11 |
| 22F | PLEU PLA | LI | w.wt | | | | | | | | | | | | | | | | 0.5 | 0.9 | 0.3 | | | | | | | | | | | no | -? | ? | 19 |
| 98F2 | PLEU PLA | LI | w.wt | | | | | | | | | | | | | | | | | | | | 1.3 | 1.8 | 0.955 | 0.68 | 1.2 | 1.09 | 0.45 | 0.43 | 0.48 | no | -- | no | 13 |
| 10F | PLEU PLA | LI | w.wt | | | | | | | | | | | | | | | | | 6.1 | | 8.77 | 6.4 | 2.4 | 1.6 | 2.15 | 1.99 | 2.9 | | 1.35 | 1.59 | no | D- | no | 14 |
| 30F | PLEU PLA | MU | w.wt | | | | | | | | | | | | 0.141 | | 0.05 | 0.03 | | | | | | | | | | | | | | no | D? | ? | <=5 |
| 22F | PLEU PLA | MU | w.wt | | | | | | | | | | | | | | | | 0.03 | 0.03 | 0.04 | | | | | | | | | | | no | -? | ? | 7 |
| 98F2 | PLEU PLA | MU | w.wt | | | | | | | | | | | | | | | | | | | | 0.07 | 0.04 | 0.0447 | 0.04 | 0.03 | 0.0648 | 0.04 | 0.04 | 0.04 | no | -- | no | 11 |
| 10F | PLEU PLA | MU | w.wt | | | | | | | | | | | | | | | | | 0.22 | | 0.303 | 0.49 | 0.15 | 0.43 | 0.0648 | 0.0346 | 0.07 | | 0.06 | 0.0648 | no | -- | no | 18 |
| 67F | LEPI WHI | LI | w.wt | | | | | | | | | | 9 | 4 | 5 | 4 | 5 | 2 | 4.6 | 4 | 5 | 2.8 | 4.8 | 3.4 | 3.8 | 3.9 | 3.45 | 2 | 2.2 | 2.3 | 2 | m | D- | m | 12 |
| 21F | LEPI WHI | LI | w.wt | | | | | | | | | | | | | | | | | | | | | | | 4.8 | 1 | 2.9 | 4.2 | 3.2 | 2.7 | m | -- | m | 18 |
| 67F | LEPI WHI | MU | w.wt | | | | | | | | | | 0.09 | 0.07 | 0.1 | 0.1 | 0.03 | 0.04 | 0.03 | 0.07 | 0.03 | 0.04 | 0.05 | 0.03 | 0.04 | 0.04 | 0.0346 | 0.04 | 0.03 | 0.03 | 0.05 | m | D- | m | 13 |
| 21F | LEPI WHI | MU | w.wt | | | | | | | | | | | | | | | | | | | | | | | 0.04 | 0.03 | 0.07 | 0.06 | 0.03 | 0.04 | m | -- | m | 14 |

Annual median concentration of HCHG (ppb)

| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | ANALYSIS OC | TRND | SM+3 | POWER |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30A | MYTI EDU | SB | d.wt | | | | | | 15.5 | 23.5 | | 216 | 2.05 | 3.55 | 1.52 | 1.62 | 1.73 | 1.48 | 0.653 | 1.6 | 1.79 | 1.2 | 0.838 | 0.676 | 0.68 | 0.645 | 0.403 | 0.313 | 0.333 | 0.294 | 0.313 | no | D- | no | 21 |
| 31A | MYTI EDU | SB | d.wt | | | | | | 16.4 | 23.3 | | 181 | 2.04 | 3.66 | 2.2 | 1.42 | 1.37 | 0.779 | 0.658 | 2.73 | 1.23 | 0.938 | 0.686 | 0.769 | 0.753 | 0.654 | 0.36 | 0.338 | 0.263 | 0.313 | 0.333 | no | D- | no | 21 |
| 35A | MYTI EDU | SB | d.wt | | | | | | 16.8 | 24.4 | | 227 | 2.65 | 4.09 | 2.31 | 1.52 | 1.61 | 1.13 | 0.837 | 4.51 | 1 | 0.671 | 1.3 | 0.687 | 0.575 | 0.515 | 0.305 | 0.333 | 0.238 | 0.25 | 0.263 | no | D- | no | 21 |
| 36A | MYTI EDU | SB | d.wt | | | | | | 12.4 | 23.7 | | 209 | 3.63 | 5.46 | 2.76 | 1.59 | 0.769 | 1.25 | 0.556 | 2.88 | 2 | 1.74 | 0.909 | 0.656 | 0.651 | 0.585 | 0.36 | 0.278 | 0.227 | 0.333 | 0.294 | no | D- | no | 19 |
| 71A | MYTI EDU | SB | d.wt | | | | | | 15.9 | 28.7 | | 276 | 2.08 | 4.85 | 1.96 | 2.11 | 0.964 | 0.793 | 0.478 | 1.02 | 1.91 | 1.08 | 0.943 | 0.926 | 479 | 0.641 | 0.394 | 0.357 | 0.333 | 0.333 | 0.278 | no | -- | no | >25 |
| 76A | MYTI EDU | SB | d.wt | | | | | | | | | | 1.59 | 2.15 | 1.4 | 2.35 | | | 0.609 | 1.68 | 2.4 | 1.19 | 0.943 | 0.732 | 1.19 | 0.621 | 0.336 | 0.294 | 0.313 | 0.294 | 0.333 | no | D- | no | 14 |
| 15A | MYTI EDU | SB | d.wt | | | | | | | | | | 1.68 | | | 1.95 | 1.11 | 1.06 | 0.366 | 1.99 | 2.32 | 1.38 | 0.595 | 0.758 | 0.591 | 0.662 | 0.338 | 0.294 | 0.278 | 0.294 | 0.263 | no | D- | no | 15 |
| 51A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 1.73 | 1.13 | 1.22 | 2.29 | 1.1 | 0.923 | 0.347 | 0.787 | 0.806 | 0.345 | 0.562 | 0.313 | 0.417 | 0.333 | no | D- | no | 14 |
| 52A | MYTI EDU | SB | d.wt | | | | | | | | | 400 | 1.04 | | 0.943 | 1.15 | 1.3 | 1.27 | 2.57 | 1.22 | 2.2 | 1.08 | 0.995 | 1.13 | 0.5 | 0.671 | 0.327 | 0.313 | 0.313 | 0.313 | 1.07 | no | D- | no | 25 |
| 56A | MYTI EDU | SB | d.wt | | | | | | | | | 394 | 1.75 | 2.38 | 0.935 | 1.04 | 1.21 | 1.22 | 1.74 | 1.25 | 2.29 | 1.04 | 0.732 | 1.01 | 0.602 | 0.746 | 0.329 | 0.417 | 0.357 | 0.313 | 0.357 | no | DY | no | 23 |
| 57A | MYTI EDU | SB | d.wt | | | | | | | | | 350 | | 2.29 | 1.44 | 0.794 | 0.857 | 1.01 | 2.46 | 1.03 | 3.56 | 1.04 | 0.733 | 0.938 | 0.508 | 0.592 | 0.237 | 0.333 | 0.357 | 0.217 | 0.278 | no | DY | no | 18 |
| 63A | MYTI EDU | SB | d.wt | | | | | | | | | 276 | | 2.91 | 1.48 | 0.714 | 0.982 | 0.859 | 1.27 | 0.776 | 2.84 | 1.11 | 0.773 | 0.962 | 0.658 | 0.787 | 0.166 | 0.357 | 0.313 | 0.357 | 0.263 | no | DY | no | 17 |
| 65A | MYTI EDU | SB | d.wt | | | | | | | | | 214 | 2.16 | 2.59 | 1.27 | 0.741 | 1.22 | 0.651 | 2.88 | 1 | 2.92 | 1.14 | 0.821 | 0.815 | 0.515 | 0.588 | 0.128 | 0.333 | 0.313 | 0.238 | 0.25 | no | DY | no | 22 |
| 69A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 1.6 | 1.05 | 0.939 | 0.653 | 0.355 | 1.31 | 3.1 | 0.794 | 0.889 | 0.993 | 0.57 | 0.532 | 0.154 | 0.316 | 0.263 | 0.294 | 0.278 | no | D- | no | 16 |
| 22A | MYTI EDU | SB | d.wt | | | | | | | | | | 0.798 | 1.9 | 1.67 | 1.33 | 1.07 | 1.03 | 0.581 | 1.19 | 2.33 | 0.798 | 1.06 | 0.893 | 0.483 | 0.658 | 0.365 | 0.294 | 0.278 | 0.333 | 0.313 | no | D- | no | 13 |
| 82A | MYTI EDU | SB | d.wt | | | | | | 19.7 | 30.9 | | 267 | | | | | | | | | | | | | | | 0.254 | 0.313 | | | | no | -? | ? | >25 |
| 84A | MYTI EDU | SB | d.wt | | | | | | 20 | 43.1 | | 238 | | 1.52 | 0.625 | 1.06 | | 0.788 | 0.519 | | | | | | | | 0.284 | 0.294 | | | | no | -- | no | >25 |
| 87A | MYTI EDU | SB | d.wt | | | | | | | 27.8 | | 210 | | | | | | | | | | | | | | | 0.234 | 0.25 | | | | no | -? | ? | >25 |
| 25A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 1.45 | 1.03 | | | | | | | | | | | 0.265 | 0.273 | | | | no | D? | ? | 8 |
| 26A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 1.5 | | | | | | | | | | | | 0.318 | 0.263 | | | | no | D? | ? | <=5 |
| 27A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 0.599 | | | | | | | | | | | | 0.294 | 0.278 | | | | no | D? | ? | <=5 |
| 28A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 1.64 | 1.29 | | | | | | | | | | | 0.266 | 0.294 | | | | no | D? | ? | 8 |
| 91A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 0.884 | | 0.818 | | | | | | | | | | | 0.278 | | | | no | -? | ? | 6 |
| 92A1 | MYTI EDU | SB | d.wt | | | | | | | | | | | | 0.68 | 0.837 | 0.99 | 0.769 | 0.413 | 0.861 | | | | | | | | | | | | no | -- | no | 13 |
| 96A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 0.535 | 0.844 | | | | | | | | | | | 0.244 | 0.294 | | | | no | -? | ? | 12 |
| 98A2 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | 0.596 | | 0.746 | 0.575 | 0.872 | 0.625 | 0.725 | 0.256 | 0.294 | 0.278 | 0.333 | 0.294 | no | D- | no | 11 |
| 98X | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 1.45 | 0.637 | 0.417 | | | | | | | | | | | | | no | -? | ? | 8 |
| 99A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 0.621 | 0.442 | | | | | | | | | | | 0.254 | 0.263 | | | | no | D? | ? | 8 |
| 41A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.683 | 0.526 | 0.291 | 0.427 | | | | | | | | | 0.25 | 0.278 | | no | -- | no | 11 |
| 43A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.519 | 0.405 | | 0.45 | | | | | | | | | 0.313 | 0.357 | | no | -? | ? | 7 |
| 44A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 0.541 | 0.286 | 0.641 | | | | | | | | | 0.25 | 0.25 | | no | -? | ? | 13 |
| 45A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.409 | 0.524 | | | | | | | | | | | 0.263 | 0.278 | | no | -? | ? | 8 |
| 46A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.442 | 0.465 | 0.328 | | | | | | | | | | 0.25 | 0.227 | | no | D? | ? | 7 |
| 48A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | 0.335 | 0.479 | 0.333 | | | | | | | | | | 0.313 | 0.313 | | no | -? | ? | 9 |
| 10A2 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | 0.439 | 0.402 | | 1.08 | 0.503 | 0.867 | 0.61 | 0.549 | 0.267 | 0.263 | 0.313 | 0.227 | 0.294 | no | DY | no | 12 |
| 11X | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | 0.34 | 0.99 | 1.15 | 0.727 | 0.758 | 0.472 | 0.465 | 0.265 | 0.238 | 0.278 | 0.238 | 0.278 | no | D- | no | 12 |

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 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | OC | TRND | SM+3 | POWER |
| 30A | MYTI EDU | SB | d.wt | | | | | | 15.5 | 23.5 | | 216 | 2.05 | 3.55 | 1.52 | 1.62 | 1.73 | 1.48 | 0.653 | 1.6 | 1.79 | 1.2 | 0.838 | 0.676 | 0.68 | 0.645 | 0.403 | 0.313 | 0.333 | 0.294 | 0.313 | no | D- | no | 22 |
| 71A | MYTI EDU | SB | d.wt | | | | | | 15.9 | 28.7 | | 276 | 2.08 | 4.85 | 1.96 | 2.11 | 0.964 | 0.793 | 0.478 | 1.02 | 1.91 | 1.08 | 0.943 | 0.926 | 479 | 0.641 | 0.394 | 0.357 | 0.333 | 0.333 | 0.278 | no | -- | no | >25 |
| 51A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 1.73 | 1.13 | 1.22 | 2.29 | 1.1 | 0.923 | 0.347 | 0.787 | 0.806 | 0.345 | 0.562 | 0.313 | 0.417 | 0.333 | no | D- | no | 14 |
| 52A | MYTI EDU | SB | d.wt | | | | | | | | | 400 | 1.04 | | 0.943 | 1.15 | 1.3 | 1.27 | 2.57 | 1.22 | 2.2 | 1.08 | 0.995 | 1.13 | 0.5 | 0.671 | 0.327 | 0.313 | 0.313 | 0.313 | 1.07 | no | D- | no | 25 |
| 10A2 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | 0.439 | 0.402 | | 1.08 | 0.503 | 0.867 | 0.61 | 0.549 | 0.267 | 0.263 | 0.313 | 0.227 | 0.294 | no | DY | no | 12 |
| I021 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 1.47 | 0.916 | 1.12 | 1.22 | | 0.962 | 1.36 | 1.1 | | | | | | | no | -- | no | 9 |
| I022 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 1.58 | 1.05 | 2.28 | 1.04 | 0.932 | 0.873 | 1.17 | 1.1 | 0.758 | 0.455 | 0.467 | 0.385 | 0.417 | 0.455 | no | D- | no | 11 |
| I023 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 1.2 | 0.956 | 2.33 | 0.862 | 1.27 | 1.22 | 1.03 | 0.833 | 0.787 | 0.431 | 0.431 | 0.385 | 0.385 | 0.385 | no | D- | no | 11 |
| I024 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 1.66 | 1.38 | 1.88 | 1.08 | 0.943 | 0.926 | 0.893 | 0.99 | 0.775 | 0.505 | 0.485 | 0.583 | 0.417 | 0.455 | no | D- | no | 9 |
| I301 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 0.984 | 1.25 | 2.42 | 2.58 | 1.86 | 1.07 | 0.827 | 0.625 | 0.637 | 0.439 | 0.347 | 0.357 | 0.278 | 0.333 | no | DY | no | 10 |
| I304 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 1.14 | 0.867 | 2.48 | 2.5 | | 0.941 | 0.752 | 0.769 | 0.613 | 0.394 | 0.439 | 0.385 | 0.294 | 0.333 | no | D- | no | 12 |
| I306 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 1.44 | 0.679 | 3.27 | 2.28 | | 0.888 | 0.747 | 0.671 | 0.704 | 0.391 | 0.431 | 0.313 | 0.643 | 0.385 | no | D- | no | 15 |
| I307 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 1.61 | 1.02 | 2.83 | 2.2 | | 0.85 | 0.872 | 0.901 | 0.73 | 0.42 | 0.397 | 0.333 | 0.313 | 0.357 | no | D- | no | 12 |
| I711 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 1.46 | 0.719 | 0.879 | 1.04 | 1.15 | 1.03 | | 0.976 | | | | | | | no | -- | no | 11 |
| I712 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 1 | 1.04 | 1.81 | 1.73 | 1.13 | 0.846 | 0.99 | 0.813 | 0.68 | 0.459 | 0.4 | 0.455 | 0.313 | 0.357 | no | D- | no | 10 |
| I713 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | | | | | | 0.738 | 0.787 | 0.435 | 0.352 | 0.685 | 0.278 | 0.385 | no | -- | no | 13 |
| I131A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 0.909 | 1.12 | 2.3 | 2.19 | 0.729 | 1.06 | 0.654 | 0.559 | 0.725 | 0.333 | 0.34 | 0.385 | 0.333 | 0.333 | no | D- | no | 13 |
| I132 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | | 3.44 | 1.02 | 0.852 | 0.676 | 0.764 | 0.69 | 0.485 | 2.33 | 0.333 | 0.333 | 0.323 | no | -- | no | 18 |
| I133 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 2.9 | 4.4 | 1.45 | 1.86 | 1.02 | 1.01 | 0.794 | 0.791 | 0.845 | 0.431 | 0.455 | 0.521 | 0.385 | 0.385 | no | D- | no | 11 |
| I241 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 2.73 | 3.16 | 1.15 | 1.19 | 1.05 | 0.879 | 0.323 | 0.667 | 0.599 | 0.439 | 0.583 | 0.385 | 0.313 | 0.313 | no | D- | no | 12 |
| I242 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 2.23 | 2.41 | 1.12 | 1.47 | 0.947 | 0.852 | 0.359 | 0.611 | 0.704 | 0.413 | 0.357 | 0.357 | 0.294 | 0.357 | no | D- | no | 11 |
| I243 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 2.18 | 2.03 | 0.882 | 1.65 | 0.882 | 0.92 | 0.369 | 0.588 | 0.637 | 0.382 | 0.92 | 0.313 | 0.294 | 0.385 | no | D- | no | 14 |

Annual median concentration of HCHG (ppb)

| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | ANALYSIS OC | TRND | SM+3 | POWER |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30B | GADU MOR | MU | w.wt | | | | | | | | | | 0.08 | 0.05 | 0.1 | | 0.06 | 0.04 | 0.05 | 0.05 | 0.07 | 0.06 | 0.05 | 0.04 | 0.05 | 0.1 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | no | -- | no | 11 |
| 36B | GADU MOR | MU | w.wt | | | | | | | | | | 0.15 | 0.1 | 0.1 | 0.1 | 0.08 | 0.19 | 0.09 | 0.06 | 0.1 | 0.06 | 0.03 | 0.06 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | no | D- | no | 12 |
| 77B | GADU MOR | MU | w.wt | | | | | | | | | | 0.08 | 0.1 | | | | | | | | | | | | | | | | | 0.05 | no | -? | ? | 9 |
| 15B | GADU MOR | MU | w.wt | | | | | | | | | | 0.09 | 0.06 | 0.1 | | 0.04 | 0.06 | 0.09 | 0.06 | 0.09 | 0.06 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | no | -- | no | 10 |
| 53B | GADU MOR | MU | w.wt | | | | | | | | | | 0.12 | 0.02 | 0.1 | 0.1 | | 0.03 | 0.0812 | 0.05 | 0.07 | 0.06 | 0.05 | 0.04 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | no | -- | no | 16 |
| 67B | GADU MOR | MU | w.wt | | | | | | | | | | 0.11 | 0.07 | 0.1 | | 0.0447 | 0.22 | 0.16 | 0.06 | 0.09 | 0.06 | 0.04 | 0.04 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | no | -- | no | 14 |
| 23B | GADU MOR | MU | w.wt | | | | | | | | | | 0.11 | 0.09 | 0.1 | 0.1 | 0.03 | 0.06 | 0.08 | 0.07 | 0.07 | 0.06 | 0.03 | 0.06 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | no | -- | no | 12 |
| 92B | GADU MOR | MU | w.wt | | | | | | | | | | | | | | 0.03 | 0.03 | 0.05 | | | | | | | | 0.05 | 0.05 | | | 0.05 | no | -- | no | 9 |
| 98B1 | GADU MOR | MU | w.wt | | | | | | | | | | | | 0.1 | 0.1 | 0.05 | 0.03 | 0.03 | 0.1 | 0.04 | 0.05 | | | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | no | -- | no | 13 |
| 43B | GADU MOR | MU | w.wt | | | | | | | | | | | | | | 0.03 | | 0.06 | | | | | | | | | | | | 0.05 | no | -? | ? | 15 |
| 10B | GADU MOR | MU | w.wt | | | | | | | | | | | | | | 0.03 | 0.15 | 0.03 | 0.1 | 0.04 | 0.03 | 0.04 | 0.06 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | no | -- | no | 16 |

Annual median concentration of HCHG (ppb)

| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | ANALYSIS OC | TRND | SM+3 | POWER |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 33F | PLAT FLE | LI | w.wt | | | | | | | | | | 2 | 0.5 | 5 | 2 | 2 | 1 | 2.45 | 1.74 | 1.15 | 0.69 | 1.9 | 1.4 | 1.2 | 1.1 | 1 | 1 | 1 | 0.5 | 0.5 | no | -- | no | 17 |
| 53F | PLAT FLE | LI | w.wt | | | | | | | | | | 3 | 2 | 5 | 2 | | 1.41 | 2 | 3 | 2 | 2.4 | 0.941 | 0.86 | 1 | 0.5 | 1 | 0.21 | | 0.5 | 0.5 | no | D- | no | 15 |
| 67F | PLAT FLE | LI | w.wt | | | | | | | | | | | | | | | | 2 | | 6.19 | 3.3 | 3.1 | 1.7 | 1.1 | 2 | 2 | 1.2 | 1.2 | 0.5 | 0.5 | no | D- | no | 14 |
| 21F | PLAT FLE | LI | w.wt | | | | | | | | | | | | | | | | | | | 3.3 | 0.85 | 0.78 | 0.6 | | 1 | 0.2 | 0.2 | | | no | -- | no | 18 |
| 33F | PLAT FLE | MU | w.wt | | | | | | | | | | 0.19 | 0.05 | 0.1 | 0.1 | 0.05 | 0.13 | 0.155 | 0.0949 | 0.09 | 0.1 | 0.06 | 0.06 | 0.05 | 0.05 | 0.05 | 0.08 | 0.05 | 0.05 | 0.05 | no | -- | no | 13 |
| 53F | PLAT FLE | MU | w.wt | | | | | | | | | | 0.2 | 0.2 | 0.1 | 0.1 | | 0.125 | 0.0837 | 0.1 | 0.13 | 0.1 | 0.05 | 0.06 | 0.05 | 0.05 | 0.05 | 0.05 | | 0.05 | 0.05 | no | D- | no | 10 |
| 67F | PLAT FLE | MU | w.wt | | | | | | | | | | | | | | | | 0.06 | | 0.122 | 0.19 | 0.13 | 0.06 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | no | DY | no | 11 |
| 21F | PLAT FLE | MU | w.wt | | | | | | | | | | | | | | | | | | | 0.11 | 0.04 | 0.06 | 0.05 | | 0.05 | 0.05 | 0.05 | | | no | -- | no | 12 |
| 36F | LIMA LIM | LI | w.wt | | | | | | | | | | 8.94 | 3 | 5 | 1 | 4 | 3 | 8 | 5 | 2 | 3.8 | 4 | 1.8 | 1.6 | 2 | 1 | 1 | 0.5 | 0.6 | 0.5 | no | D- | no | 16 |
| 15F | LIMA LIM | LI | w.wt | | | | | | | | | | | 3 | | 4 | 3.46 | 3 | 5.1 | 5.6 | 4.1 | 3.25 | | 2.6 | 1 | 1 | 1 | 1 | 1 | 0.5 | 0.5 | no | DY | no | 11 |
| 22F | LIMA LIM | LI | w.wt | | | | | | | | | | 6.93 | 3 | 5 | | 1 | 1 | | | | | | | | | | | | | | no | D? | ? | 14 |
| 21F | LIMA LIM | LI | w.wt | | | | | | | | | | | | | | | | | | | | | | 1.6 | 2 | 2 | 0.6 | | 0.5 | | no | -? | ? | 15 |
| 36F | LIMA LIM | MU | w.wt | | | | | | | | | | 0.24 | 0.07 | 0.1 | 0.1 | 0.16 | 0.21 | 0.33 | 0.15 | 0.15 | 0.09 | 0.07 | 0.06 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | no | DY | no | 12 |
| 15F | LIMA LIM | MU | w.wt | | | | | | | | | | | 0.14 | | 0.1 | 0.0548 | 0.26 | 0.29 | 0.14 | 0.15 | 0.06 | | 0.06 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | no | D- | no | 14 |
| 22F | LIMA LIM | MU | w.wt | | | | | | | | | | 0.25 | 0.2 | 0.2 | | 0.08 | 0.0458 | | | | | | | | | | | | | | no | D? | ? | 10 |
| 21F | LIMA LIM | MU | w.wt | | | | | | | | | | | | | | | | | | | | | | 0.05 | 0.05 | 0.05 | 0.05 | | 0.05 | | no | u? | ? | ? |
| 30F | PLEU PLA | LI | w.wt | | | | | | | | | | | | 5 | | 1 | 1 | | | | | | | | | | | | | | no | -? | ? | 15 |
| 22F | PLEU PLA | LI | w.wt | | | | | | | | | | | | | | | | 0.9 | 0.7 | 0.6 | | | | | | | | | | | no | -? | ? | <=5 |
| 98F2 | PLEU PLA | LI | w.wt | | | | | | | | | | | | | | | | | | | | 0.71 | 0.67 | 0.219 | 0.22 | 1 | 0.2 | 0.2 | 0.1 | 0.6 | no | -- | no | 22 |
| 10F | PLEU PLA | LI | w.wt | | | | | | | | | | | | | | | | | 0.8 | | 1.1 | 1.3 | 0.6 | 1.2 | 0.5 | 0.5 | 1 | | 0.3 | 0.224 | no | -- | no | 14 |
| 30F | PLEU PLA | MU | w.wt | | | | | | | | | | | | 0.1 | | 0.06 | 0.0346 | | | | | | | | | | | | | | no | -? | ? | 8 |
| 22F | PLEU PLA | MU | w.wt | | | | | | | | | | | | | | | | 0.0995 | 0.06 | 0.07 | | | | | | | | | | | no | -? | ? | 11 |
| 98F2 | PLEU PLA | MU | w.wt | | | | | | | | | | | | | | | | | | | | 0.0548 | 0.06 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.1 | no | -- | no | 9 |
| 10F | PLEU PLA | MU | w.wt | | | | | | | | | | | | | | | | | 0.05 | | 0.06 | 0.07 | 0.06 | 0.05 | 0.05 | 0.05 | 0.05 | | 0.05 | 0.1 | no | -- | no | 9 |

Annual median concentration of PBDE (ppb)

| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | ANALYSIS OC | TRND | SM+3 | POWER |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30B | GADU MOR | LI | w.w. | | | | | | | | | | | | | | | | | | | | | | | | | 84.6 | 100 | 108 | 98.1 | m | -? | m | 6 |
| 53B | GADU MOR | LI | w.w. | | | | | | | | | | | | | | | | | | | | | | | | | 32.3 | 14.4 | 50.5 | 31.1 | m | -? | m | 18 |
| 23B | GADU MOR | LI | w.w. | | | | | | | | | | | | | | | | | | | | | | | | | 9.06 | 8.22 | 8.31 | 10.8 | m | -? | m | 7 |

Annual median concentration of PFOS (ppb)

| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | ANALYSIS OC | TRD | SM3 | PWR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30B | 30B | GADU MOR | LI | w.wt | | | | | | | | | | | | | | | | | | | | | | | | 38 | 49 | 11 | 42 | m | -? | m | 22 |
| 53B | 53B | GADU MOR | LI | w.wt | | | | | | | | | | | | | | | | | | | | | | | | 6.48 | 10 | 2 | 10 | m | -? | m | 23 |
| 23B | 23B | GADU MOR | LI | w.wt | | | | | | | | | | | | | | | | | | | | | | | | 5.48 | 16.5 | 3 | 6.9 | m | -? | m | 22 |

Annual median concentration of B[a]P (ppb)

| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | ANALYSIS OC | TRD | SM3 | PWR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 2.53 | | | 3.35 | 3.52 | | 3.57 | 2.99 | 2.99 | 3.29 | 3.4 | 3.23 | 4.26 | 3.85 | 6.07 | 2.94 | 3.13 | no | -- | no | 9 |
| I301 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 4.44 | 19.3 | 18.8 | 6.02 | 13.1 | 2.55 | 9.77 | 3.13 | 3.18 | 34.2 | 3.47 | 42.1 | 14.4 | 12 | 2.4 | -- | 4.5 | 24 |
| I304 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 3.36 | 2.81 | 3.29 | 3.38 | 2.76 | 2.94 | 3.76 | 3.85 | 3.07 | 5.33 | 4.39 | 3.85 | 2.94 | 3.33 | no | -- | no | 8 |
| I306 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 2.99 | 3.07 | 2.87 | 3.05 | 3.07 | 2.96 | 2.94 | 3.36 | 3.52 | 4.79 | 4.31 | 3.13 | 3.57 | 3.85 | no | U- | no | 7 |
| I307 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 2.73 | 3.21 | 2.75 | 2.91 | 3.01 | 3.27 | 3.36 | 4.5 | 3.65 | 5.27 | 3.97 | 3.13 | 3.13 | 3.57 | no | U- | no | 8 |
| I131A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 3.25 | 2.66 | 2.73 | 3.6 | 5.02 | 2.4 | 3.27 | 2.79 | 3.73 | 8 | 3.4 | 3.85 | 3.33 | | no | -- | no | 12 |
| I132 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | | 22.6 | 300 | 10.8 | 32.7 | 49.6 | 89.7 | 52.4 | 150 | 61.3 | 80 | 93.8 | 18.8 | -- | 18.9 | 24 |
| I133 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 80.6 | 13.7 | 51.7 | 18.6 | | 8.47 | 19 | 23.7 | 39.3 | 135 | 67.3 | 50 | 22.3 | 123 | 24.6 | -- | 12.1 | 20 |
| I201 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 93.2 | 207 | 679 | 10.5 | 83.8 | 47.4 | 31.7 | 188 | 7.23 | 3.79 | 8.55 | 5 | 6.08 | 5.2 | 1.0 | D- | no | >25 |
| I205 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 7.39 | | 23.1 | 64.5 | 7.51 | 5.59 | 7.55 | 33 | 3.16 | 48.2 | 4.5 | 3.85 | 4.17 | 3.57 | no | -- | no | 25 |
| I913 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | | | 5.85 | 15.6 | 2.96 | 13.3 | 3.65 | 1.36 | 3.29 | 2.78 | 3.85 | 5.42 | 1.1 | -- | 1.3 | 19 |
| I912 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 7.02 | | 9.46 | 5.35 | 16.4 | 135 | 4.17 | 20 | 3.97 | 1.46 | 3.65 | 3.33 | 3.38 | 9.29 | 1.9 | -- | 1.8 | 25 |
| I965 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | | | | | 233 | 30.8 | 43.6 | 87.7 | 19.3 | 58 | 115 | 66.5 | 13.3 | -- | 22.2 | 21 |
| I962 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 246 | 33.5 | | 87 | | | | | | | | | | | 17.4 | -? | ? | >25 |
| I964 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | | | | | | 37.3 | 289 | 251 | 55.4 | 200 | 232 | 200 | 40.0 | -- | 50.2 | 23 |
| I969 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 14.2 | 10.7 | 17.6 | 8.42 | 10.3 | 17.1 | 23.5 | 3.68 | 46.7 | 34.7 | 7.27 | 24.2 | 23.9 | 25 | 5.0 | -- | 5.1 | 21 |

Annual median concentration of ∑KPAH (ppb)

| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | ANALYSIS OC | TRD | SM3 | PWR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 38.1 | | | 27.5 | 28.3 | | 38.5 | 20.4 | 16.5 | 38.3 | 11.6 | 17.6 | 45.7 | 14.2 | 45.1 | 18.2 | 19.4 | no | -- | no | 16 |
| I301 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 73 | 257 | 197 | 100 | 175 | 32.4 | 112 | 43.7 | 38.4 | 313 | 40.9 | 269 | 109 | | 2.2 | -- | 4.3 | 22 |
| I304 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 14.4 | 16.7 | 13.7 | 36.8 | 33.2 | 7.62 | 21.4 | 9.62 | 8.01 | 69.9 | 15.5 | 27.7 | 10.1 | 10.5 | no | -- | no | 19 |
| I306 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 12.8 | 15.1 | 34.8 | 31.3 | 27.9 | 7.4 | 28.2 | 12.1 | 8.8 | 52.7 | 12.6 | 18.2 | 10.1 | 11.9 | no | -- | no | 18 |
| I307 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 11.8 | 18.9 | 19.9 | 27.7 | 41.7 | 11.6 | 27.2 | 29.3 | 9.69 | 74 | 13.6 | 16.8 | 9.65 | 11.4 | no | -- | no | 18 |
| I131A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 48.4 | 17.9 | 35.4 | 61.4 | 57.1 | 26.9 | 28 | 15.5 | 26.6 | 127 | 20.1 | 9.62 | 8.33 | | no | -- | no | 19 |
| I132 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | | 581 | 2730 | 243 | 389 | 783 | 1520 | 570 | 813 | 401 | 405 | | 8.1 | -- | 1.9 | 21 |
| I133 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 602 | 121 | 647 | 287 | | 150 | 339 | 476 | 580 | 1200 | 451 | 345 | 197 | 646 | 12.9 | -- | 4.1 | 19 |
| I201 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 705 | 1590 | 7970 | 281 | 999 | 903 | 638 | | 189 | 111 | 212 | 119 | 149 | | 3.0 | -- | 2.1 | 23 |
| I205 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 96.4 | | 470 | 1380 | 197 | 187 | 189 | 1650 | 97.5 | 808 | 98.2 | 57.2 | 56.3 | 34.5 | no | -- | no | 25 |
| I913 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | | | 107 | 604 | 76.7 | 405 | 28.8 | 20.9 | 8.22 | 8.67 | 14.3 | 20.6 | no | D- | no | 24 |
| I912 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 109 | | 342 | 195 | 187 | 1560 | 58.9 | 412 | 27.9 | 10.6 | 9.12 | 8.33 | 30.1 | 36.3 | no | D- | no | 25 |
| I965 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | | | | | 1330 | 431 | 468 | 854 | 181 | 357 | 612 | 398 | 8.0 | -- | 8.4 | 17 |
| I962 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 1450 | 265 | | 665 | | | | | | | | | | | 13.3 | -? | ? | >25 |
| I964 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | | | | | | 368 | 2370 | 2090 | 501 | 915 | 1070 | 993 | 19.9 | -- | 14.2 | 21 |
| I969 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 139 | 108 | 230 | 131 | 285 | 192 | 169 | 39.7 | 625 | 361 | 73.6 | 188 | 170 | | 3.4 | -- | 2.4 | 21 |

Annual median concentration of ∑PAH (ppb)

| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | ANALYSIS OC | TRD | SM3 | PWR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30A | MYTI EDU | SB | d.wt | | | | | | | | | | | | 215 | | | 179 | 219 | | 268 | 216 | 140 | 124 | 54.9 | 126 | 163 | 74.6 | 292 | 107 | 78.4 | no | -- | no | 15 |
| I301 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 486 | 1810 | 1880 | 657 | 1050 | 438 | 645 | 312 | 216 | 1040 | 271 | 1730 | 647 | | 2.6 | -- | 5.6 | 20 |
| I304 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 75.5 | 111 | 182 | 228 | 326 | 60.4 | 136 | 51.5 | 66.1 | 215 | 53.6 | 179 | 68.8 | 63.7 | no | -- | no | 18 |
| I306 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 73.7 | 87 | 188 | 172 | 225 | 53.8 | 115 | 121 | 45.9 | 147 | 53.9 | 155 | 51.5 | 49.9 | no | -- | no | 17 |
| I307 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 59.6 | 90.4 | 153 | 155 | 325 | 64.4 | 112 | 244 | 64.8 | 178 | 40.6 | 170 | 50.3 | 50.5 | no | -- | no | 19 |
| I131A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 120 | 98.4 | 140 | 213 | 240 | 181 | 91.8 | 95 | 133 | 344 | 109 | 80.6 | 70 | | no | -- | no | 14 |
| I132 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | | 1590 | 6470 | 1270 | 1000 | 1750 | 2440 | 1060 | 2800 | 1760 | 1380 | | 5.5 | -- | 6.0 | 18 |
| I133 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 1940 | 715 | 1710 | 1000 | | 908 | 863 | 1120 | 1070 | 2530 | 1410 | 1320 | 709 | 3450 | 13.8 | -- | 8.3 | 16 |
| I201 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 2170 | 4450 | 15500 | 793 | 3400 | 2300 | 1130 | | 579 | 381 | 569 | 303 | 358 | | 1.4 | D- | no | 21 |
| I205 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 476 | | 1630 | 3210 | 801 | 603 | 457 | | 384 | 2170 | 309 | 221 | 204 | 124 | no | -- | no | 20 |
| I913 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | | | 559 | 2200 | 578 | 2000 | 128 | 98.1 | 55.1 | 75.7 | 103 | 84.9 | no | D- | no | 22 |
| I912 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 648 | | 1390 | 873 | 1510 | 5990 | 735 | 1970 | 164 | 42.3 | 32.9 | 42.9 | 305 | 185 | no | DY | 1.1 | 23 |
| I965 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | | | | | 2770 | 720 | 1320 | 2930 | 587 | 1500 | 2620 | 1350 | 5.4 | -- | 7.6 | 20 |
| I962 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 3400 | 982 | | 1600 | | | | | | | | | | | 6.4 | -? | ? | 21 |
| I964 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | | | | | | 643 | 6270 | 7960 | 1010 | 2590 | 2990 | 2500 | 10.0 | -- | 6.9 | 25 |
| I969 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | 695 | 803 | 673 | 551 | 807 | 988 | 675 | 136 | 2340 | 1540 | 283 | 660 | 832 | | 3.3 | -- | 2.4 | 22 |

Annual median concentration of TBT (ppm)

| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | ANALYSIS OC | TRD | SM3 | PWR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | 2.71 | 1.51 | 1.47 | 0.935 | 0.802 | 1.81 | 1.08 | 0.723 | 0.282 | 0.36 | 0.543 | 0.455 | 4.6 | D- | 2.9 | 14 |
| 36A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | 0.0336 | 0.179 | 0.217 | 0.0831 | 0.0591 | 0.0792 | 0.103 | 0.0603 | 0.0224 | 0.0172 | 0.0283 | 0.0257 | no | -- | no | 18 |
| 71A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | 1.02 | | | | 0.431 | 0.702 | 0.375 | 0.119 | 0.136 | 0.0567 | 0.0934 | 0.0765 | no | D- | no | 15 |
| 76A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | 0.188 | | | | 0.0529 | 0.092 | 0.106 | 0.034 | 0.0318 | 0.0206 | 0.0135 | 0.03 | no | D- | no | 15 |
| 15A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | | | | | 0.098 | 0.0811 | 0.0622 | 0.0179 | 0.0179 | 0.0078 | 0.0137 | 0.00853 | no | D- | no | 13 |
| 22A | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | | | | | 0.17 | 0.138 | 0.587 | 0.291 | 0.249 | 0.1 | 0.297 | 0.103 | 1.0 | -- | no | 18 |
| 226X | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | | 1.61 | 0.854 | 0.555 | | | | | | | | | 5.6 | -? | ? | 6 |
| 227A2 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | | | | 0.375 | 0.417 | 0.672 | 0.709 | 0.314 | 0.277 | 0.134 | 0.193 | 0.135 | 1.4 | D- | no | 13 |
| 98A2 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | | | | | 0.108 | 0.105 | 0.114 | 0.0468 | 0.0252 | 0.0165 | 0.0268 | 0.0153 | no | D- | no | 13 |
| 10A2 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | | | | | 0.0224 | 0.0123 | 0.0067 | | | | | | no | D? | ? | <=5 |
| 11X | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | | | | | | 0.0348 | 0.0201 | 0.00401 | 0.00233 | 0.00278 | 0.00238 | 0.00286 | no | DY | no | 16 |
| I301 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | | | | | | 2.59 | 2.11 | 2.83 | 2.94 | 1.27 | 1.42 | 0.561 | 5.6 | D- | no | 12 |
| I712 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | | | | | | 1.2 | 0.912 | 0.3 | 0.268 | 0.219 | 0.18 | 0.204 | 2.0 | D- | no | 11 |
| I713 | MYTI EDU | SB | d.wt | | | | | | | | | | | | | | | | | | | | | | 1.37 | 0.668 | 0.22 | 0.213 | 0.13 | 0.0795 | 0.0686 | no | D- | no | 11 |
| 36G | NUCE LAP | SB | d.wt | | | | | | | | | | | | | | | | | 0.105 | 0.203 | 0.142 | 0.0951 | 0.0496 | 0.155 | 0.0846 | 0.0412 | 0.0344 | 0.00625 | 0.0293 | 0.0377 | m | D- | m | 19 |
| 71G | NUCE LAP | SB | d.wt | | | | | | | | | | | | | | | | | | | | | 0.133 | 0.344 | 0.235 | 0.115 | | 0.0429 | 0.0563 | | m | -- | m | 17 |
| 76G | NUCE LAP | SB | d.wt | | | | | | | | | | | | | | | | | | | | | 0.0409 | 0.196 | | 0.0679 | 0.0467 | 0.0165 | 0.0294 | 0.0139 | m | -- | m | 19 |
| 131G | NUCE LAP | SB | d.wt | | | | | | | | | | | | | | | | | | | | | 0.0326 | 0.064 | 0.075 | 0.0507 | 0.022 | | 0.00629 | 0.0189 | m | -- | m | 19 |
| 15G | NUCE LAP | SB | d.wt | | | | | | | | | | | | | | | | | | | | | 0.0706 | 0.091 | 0.0652 | 0.0264 | 0.0215 | 0.00641 | 0.00897 | 0.0132 | m | D- | m | 16 |
| 224G | NUCE LAP | SB | d.wt | | | | | | | | | | | | | | | | | 0.0769 | 0.295 | | 0.12 | | | | | | | | | m | -? | m | 24 |
| 22G | NUCE LAP | SB | d.wt | | | | | | | | | | | | | | | | | | | | | 0.0699 | 0.101 | 0.322 | 0.2 | 0.13 | 0.0262 | 0.0611 | 0.0581 | m | -- | m | 20 |
| 220G | NUCE LAP | SB | d.wt | | | | | | | | | | | | | | | | | 0.0815 | 0.1 | 0.0851 | | | | | 0.113 | | | | | m | -? | m | 7 |
| 226G | NUCE LAP | SB | d.wt | | | | | | | | | | | | | | | | | | 0.844 | 0.225 | 0.21 | | | | | | | | | m | -? | m | 16 |
| 227G1 | NUCE LAP | SB | d.wt | | | | | | | | | | | | | | | | | 0.0891 | 0.625 | 0.267 | 0.387 | 0.135 | 0.446 | | | | | | | m | -- | m | 21 |
| 227G2 | NUCE LAP | SB | d.wt | | | | | | | | | | | | | | | | | | | | | | | 0.878 | 0.258 | 0.239 | 0.065 | 0.16 | 0.165 | m | -? | m | 19 |
| 98G | NUCE LAP | SB | d.wt | | | | | | | | | | | | | | | | | | | | | 0.026 | 0.0629 | 0.0612 | 0.0492 | 0.0394 | 0.014 | 0.0253 | 0.0178 | m | -- | m | 15 |
| 11G | NUCE LAP | SB | d.wt | | | | | | | | | | | | | | | | | | | | | | 0.0133 | 0.0261 | 0.0103 | 0.0184 | 0.00862 | 0.0111 | 0.00145 | m | -- | m | 19 |

Annual median concentration of TCDDN (ppp)

| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | ANALYSIS OC | TRD | SM3 | PWR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30A | MYTI EDU | SB | w.wt | | | | | | | | | | | | | | | | | | | | | | 0.11 | 0.108 | 0.127 | 0.169 | 0.153 | 0.143 | 0.107 | m | -- | m | 8 |
| 71A | MYTI EDU | SB | w.wt | | | | | | | | | | | | | | | | | | | | | | 2.37 | 2.36 | 2.02 | 2.64 | 2.76 | 2.2 | 4.62 | m | -- | m | 10 |
| 76A | MYTI EDU | SB | w.wt | | | | | | | | | | | | | | | | | | | | | | 0.0566 | 0.078 | 0.133 | 0.142 | 0.111 | 0.106 | 0.119 | m | -- | m | 10 |
| I712 | MYTI EDU | SB | w.wt | | | | | | | | | | | | | | | | | | | | | | 4.31 | 4.29 | 3.26 | 1.51 | 3.24 | 4.02 | 5.77 | m | -- | m | 13 |
| I713 | MYTI EDU | SB | w.wt | | | | | | | | | | | | | | | | | | | | | | 3.59 | 4.16 | 2.98 | 4.77 | 1.41 | 6.14 | 3.61 | m | -- | m | 17 |
| I132 | MYTI EDU | SB | w.wt | | | | | | | | | | | | | | | | | | | | | | 0.479 | 0.611 | 0.211 | 1.53 | 0.303 | 0.373 | 0.593 | m | -- | m | 20 |
| I133 | MYTI EDU | SB | w.wt | | | | | | | | | | | | | | | | | | | | | | 0.277 | 0.24 | 0.371 | 0.249 | 0.227 | 0.256 | 0.178 | m | -- | m | 9 |

Annual median concentration of ALAD (NG/MIN/MG PROTEIN)

| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | ANALYSIS OC | TRD | SM3 | PWR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30B | GADU MOR | BL | w.wt | | | | | | | | | | | | | | | | | 8.98 | 14.7 | 13 | 14.6 | 12.7 | 10.4 | 6.91 | 14.2 | 15 | 32.3 | 14.1 | 11.7 | m | -- | m | 13 |
| 36B | GADU MOR | BL | w.wt | | | | | | | | | | | | | | | | | 13 | 26.2 | 9.93 | 22 | 19.4 | | | | | | | | m | -? | m | 15 |
| 15B | GADU MOR | BL | w.wt | | | | | | | | | | | | | | | | | 17.2 | 23.4 | 8.45 | | 18.9 | | | | | | | | m | -? | m | 17 |
| 53B | GADU MOR | BL | w.wt | | | | | | | | | | | | | | | | | 7.64 | 10.1 | 11.1 | 12.7 | 10 | 6.44 | 9.32 | 9.95 | 10.4 | 33.7 | 7.98 | | m | -- | m | 15 |
| 67B | GADU MOR | BL | w.wt | | | | | | | | | | | | | | | | | 7.17 | 28.2 | 16.9 | 22.4 | 19 | | | | | | | | m | -? | m | 16 |
| 23B | GADU MOR | BL | w.wt | | | | | | | | | | | | | | | | | 15.8 | 24.8 | 18.1 | 19.8 | 24 | 19.4 | 16.8 | 19.7 | 25.8 | 38 | | | m | -- | m | 9 |

Annual median concentration of EROD (PMOL/MIN/MG PROTEIN)

| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | ANALYSIS OC | TRD | SM3 | PWR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30B | GADU MOR | LI | w.wt | | | | | | | | | | | | | | | | | 68.8 | 124 | 70 | 260 | 81.2 | 158 | 88.3 | 69 | 50.9 | 98.7 | 29.7 | 6.12 | m | D- | m | 18 |
| 36B | GADU MOR | LI | w.wt | | | | | | | | | | | | | | | | | 95.1 | 11.4 | 60.2 | 64.9 | 76.2 | | | | | | | | m | -? | m | 24 |
| 15B | GADU MOR | LI | w.wt | | | | | | | | | | | | | | | | | 49.9 | 52.3 | 184 | | 61 | | | | | | | | m | -? | m | 20 |
| 53B | GADU MOR | LI | w.wt | | | | | | | | | | | | | | | | | 86.5 | 119 | 90.1 | 128 | 34.7 | 93.9 | 11.7 | 20 | 53.9 | 54.2 | 14.3 | | m | -- | m | 20 |
| 67B | GADU MOR | LI | w.wt | | | | | | | | | | | | | | | | | 103 | 76.2 | 84.6 | 103 | 72.9 | | | | | | | | m | -? | m | 9 |
| 23B | GADU MOR | LI | w.wt | | | | | | | | | | | | | | | | | 94.1 | 28.6 | 70.1 | 73.5 | 76.5 | 103 | 41.9 | 45.9 | 50.8 | 57.2 | | | m | -- | m | 15 |

Annual median concentration of CYP1A (ABS)

| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | ANALYSIS OC | TRD | SM3 | PWR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30B | GADU MOR | LI | w.wt | | | | | | | | | | | | | | | | | | | | | | | 2.24 | 1.2 | 1.22 | 0.822 | 0.902 | 1.49 | m | -- | m | 13 |
| 53B | GADU MOR | LI | w.wt | | | | | | | | | | | | | | | | | | | | | | | 0.132 | 0.207 | 0.201 | 0.0655 | 0.428 | | m | -? | m | 21 |
| 23B | GADU MOR | LI | w.wt | | | | | | | | | | | | | | | | | | | | | | | 0.113 | 0.212 | 0.199 | 0.0795 | | | m | -? | m | 17 |

Annual median concentration of PYR1O (µG/KG/ABS 380 NM)

Cursive values for 1998-1999 indicate data that were not included in the temporal trend analysis because they were derived from a method that can not be compared to method used during the following years

| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | ANALYSIS OC | TRD | SM3 | PWR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30B | GADU MOR | BI | w.wt | | | | | | | | | | | | | | | | | | *116* | *130* | 12.3 | 17 | 29.2 | 20.3 | 43.5 | 15.1 | 13.9 | 4.95 | 17.1 | m | -- | m | 14 |
| 36B | GADU MOR | BI | w.wt | | | | | | | | | | | | | | | | | | *42.9* | *28.9* | 5.14 | 3.72 | | | | | | | | m | -- | m | |
| 15B | GADU MOR | BI | w.wt | | | | | | | | | | | | | | | | | | *3770* | *253* | | 29.7 | 6.32 | 5.66 | 16.7 | 1.1 | 2.61 | 1.14 | 1.7 | m | -- | m | 23 |
| 53B | GADU MOR | BI | w.wt | | | | | | | | | | | | | | | | | | *83* | *58.6* | 9.23 | 3.81 | 18.8 | 3.65 | 3.39 | 3.04 | 2.18 | 4.84 | 3.19 | m | -- | m | 19 |
| 67B | GADU MOR | BI | w.wt | | | | | | | | | | | | | | | | | | *19.8* | *16.5* | 1.62 | 1.66 | | | | | | | | m | -- | m | |
| 23B | GADU MOR | BI | w.wt | | | | | | | | | | | | | | | | | | *12.7* | *11.2* | 4.15 | 2.55 | 3.1 | 5.32 | 1.62 | 3.46 | 1.34 | 1.72 | 1.67 | m | -- | m | 15 |

Annual median concentration of VDSI ()

| St | Species | Tissue | Base | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | ANALYSIS OC | TRD | SM3 | PWR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 36G | NUCE LAP | WO | w.wt | | | | | | | | | | | 4.1 | | 3.9 | | | | 4 | 4 | 4 | 4 | 3.95 | 4 | 3.96 | 3.65 | 0.96 | 0.125 | 0.583 | 0.24 | m | DY | m | 19 |
| 71G | NUCE LAP | WO | w.wt | | | | | | | | | | | | | | | | | | | | | 4 | 4.1 | 4 | 4 | 4 | 4 | 1.61 | | m | -- | m | 19 |
| 76G | NUCE LAP | WO | w.wt | | | | | | | | | | | | | | | | | | | | | 3.41 | 3.03 | | 3.28 | 0.643 | 0.778 | 0.0667 | 0.13 | m | D- | m | 21 |
| 131G | NUCE LAP | WO | w.wt | | | | | | | | | | | | | | | | | | | | | 3.89 | 3.77 | 3.47 | 3.63 | 1.86 | 1.08 | 0.118 | 0 | m | D- | m | 16 |
| 15G | NUCE LAP | WO | w.wt | | | | | | | | | | | | | | | | | | | | | 3.69 | 3.86 | 3.42 | 3.43 | 1.28 | 0.125 | 0 | 0.129 | m | D- | m | 20 |
| 22G | NUCE LAP | WO | w.wt | | | | | | | | | | | | | | | | | | | | | 4 | 4 | 3.95 | 4 | 4 | 2.96 | 2.41 | 1.41 | m | DY | m | 12 |
| 220G | NUCE LAP | WO | w.wt | | | | | | | | | | | | | | | | | 4.05 | 4 | 4 | | | | | 4 | | | | | m | -? | m | <=5 |
| 227G1 | NUCE LAP | WO | w.wt | | | | | | | | | | | 4.1 | | | | | | 4 | 4.15 | 4.09 | 4.5 | 4.3 | 4.5 | | | | | | | m | -- | m | 8 |
| 227G2 | NUCE LAP | WO | w.wt | | | | | | | | | | | | | | | | | | | | | | | 4.13 | 3.92 | 3.65 | 3.66 | 3.52 | 3.67 | m | D? | m | 6 |
| 98G | NUCE LAP | WO | w.wt | | | | | | | | | | | | | | | | | | | | | 3.5 | 3.76 | 3.8 | 4 | 3.43 | 2.97 | 2.95 | 1.88 | m | DY | m | 12 |
| 11G | NUCE LAP | WO | w.wt | | | | | | | | | | | | | | | | | | | | | | 0.0333 | 0 | 0.289 | 0 | 0 | 0.0345 | 0 | m | -- | m | 7 |

# Appendix K
# Geographical distribution of contaminants and biomarkers in biota 1990-2008

**Sorted by contaminant and species:**

**Cadmium (Cd)**
**Mercury (Hg)**
**Lead (Pb)**
**Sum of 7 CBs (CB-28, -52, 101, -118, -138, -153 and -180)**
**DDEPP (ppDDE)**
**HCB**
**TCDDN**
**PBDE**
**OH-pyrene**
**ALA-D** (δ-amino levulinic acid dehydrase inhibition)
**EROD-activity** (Cytochrome P4501A-activity)
**CYP1A** (relative amount of cytochrome P4501A-protein)
**TBT**
**VDSI**

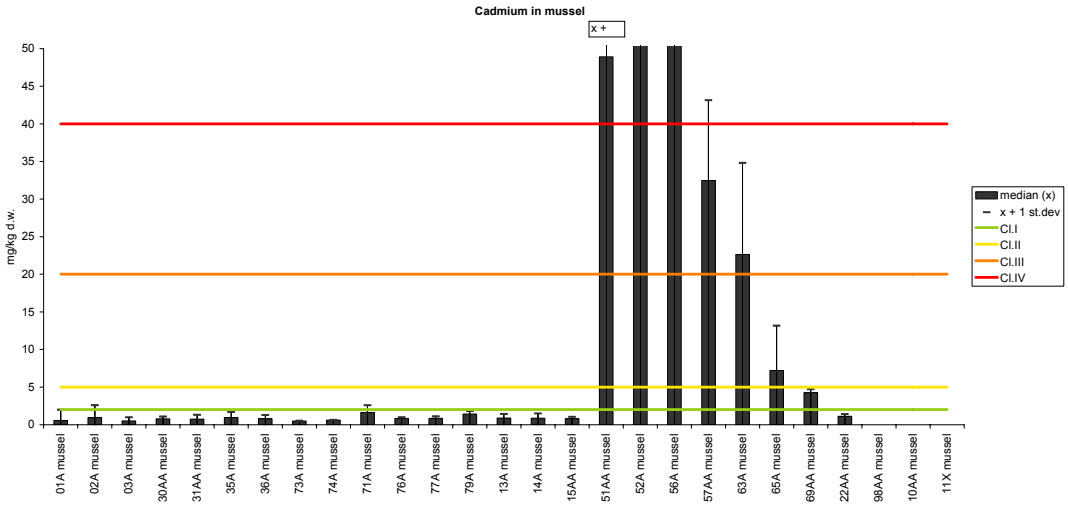
**MYTI EDU - Blue Mussel (*Mytilus edulis*)**
**GADU MOR - Atlantic cod (*Gadus morhua*)**
**PLAT FLE - Flounder (*Platichthys flesus*)**
**LIMA LIM - Dab (*Limanda limanda*)**
**PLEU PLA - Plaice (*Pleuronectes platessa*)**
**MICR KIT - Lemon sole (*Microstomus kitt*)**
**LEPI WHI - Megrim (*Lepidorhombus whiff-iagonis*)**
**PAND BOR – Prawn (*Pandalus borealus*)**
**MOLV MOL – Ling (*Molva molva*)**
**BROS BRO – Tusk (*Brosme brosme*)**

**Station positions are shown on maps in Appendix H**

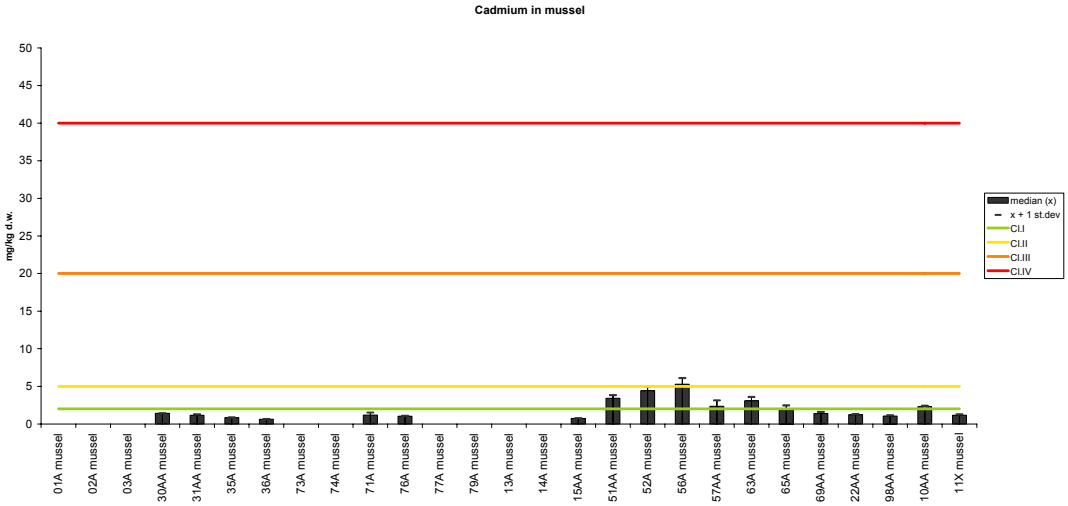
**Results are presented for three periods as noted in figure text**
**The average of the median concentrations was used for each period.**
**Cf. Appendix G. sample overview**

# Appendix K
# Geographical distribution of contaminants and biomarkers in biota 1990-2008
# (cont.)

**A**




**B**




**C**

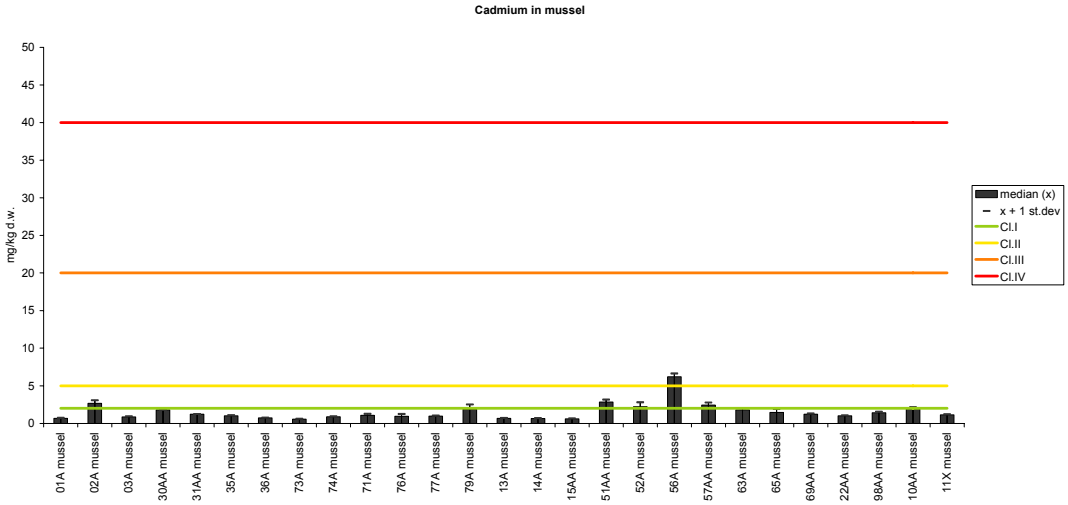



***Figure 48.*** *Median, standard deviation and upper limit to Klif Classes or provisional "high background" concentration for cadmium in blue mussel 1990-1996 (**A**), 2007 (**B**) and 2008 (**C**), ppm (mg/kg) wet weight (see maps in Appendix H).* ***Note: for some stations the standard deviation is off-scale in figures A.***

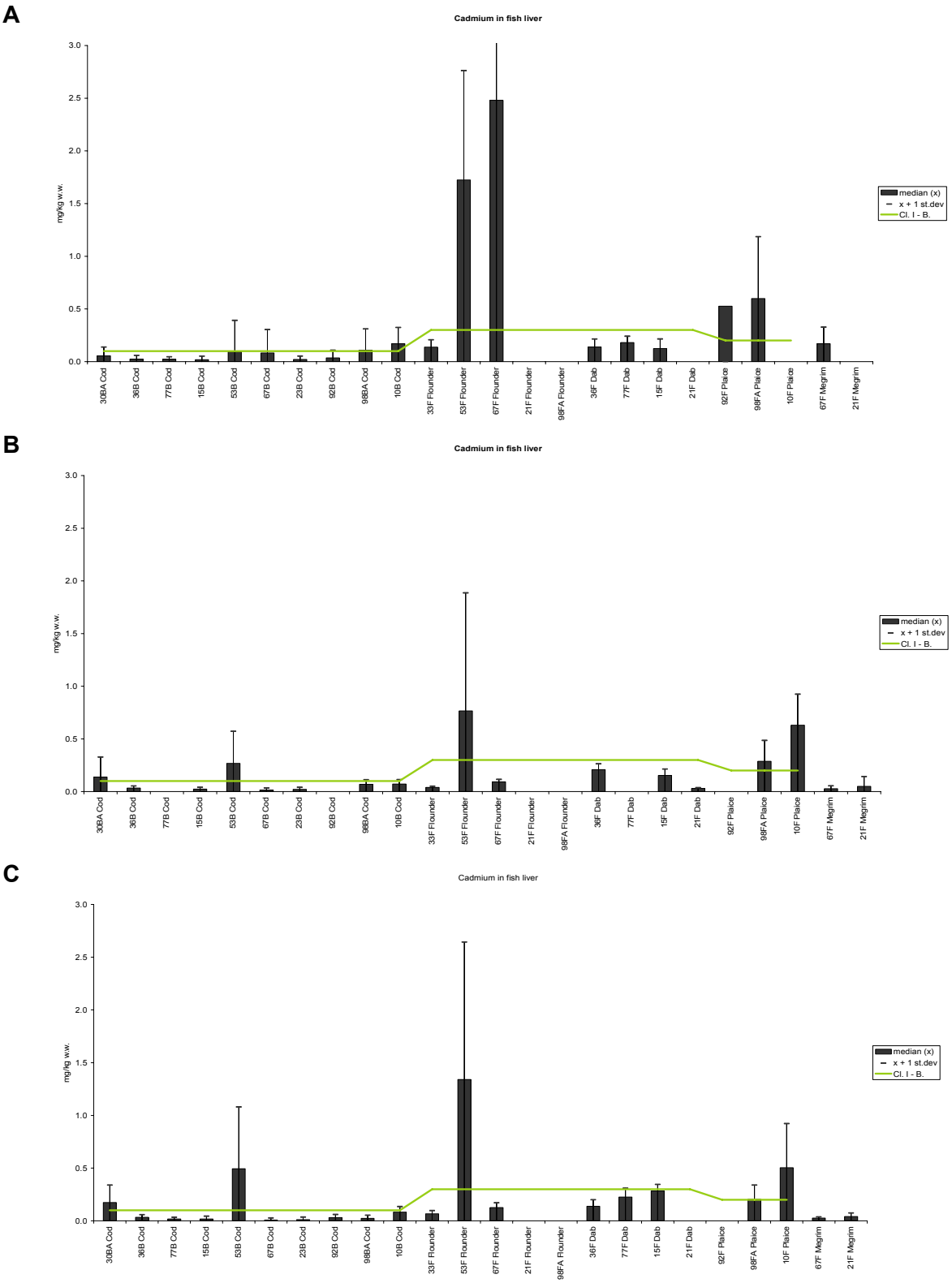



***Figure 49.*** *Median, standard deviation and upper limit to Klif Classes or provisional "high background" concentration for cadmium in fish liver 1990-1996* ***(A),*** *2007 (**B**) and 2008 (**C**), ppm (mg/kg) wet weight. "Cl. – B" indicates that only upper limit to Klif Classes or provisional high background concentration is indicated for all fish, (see maps in Appendix H).*

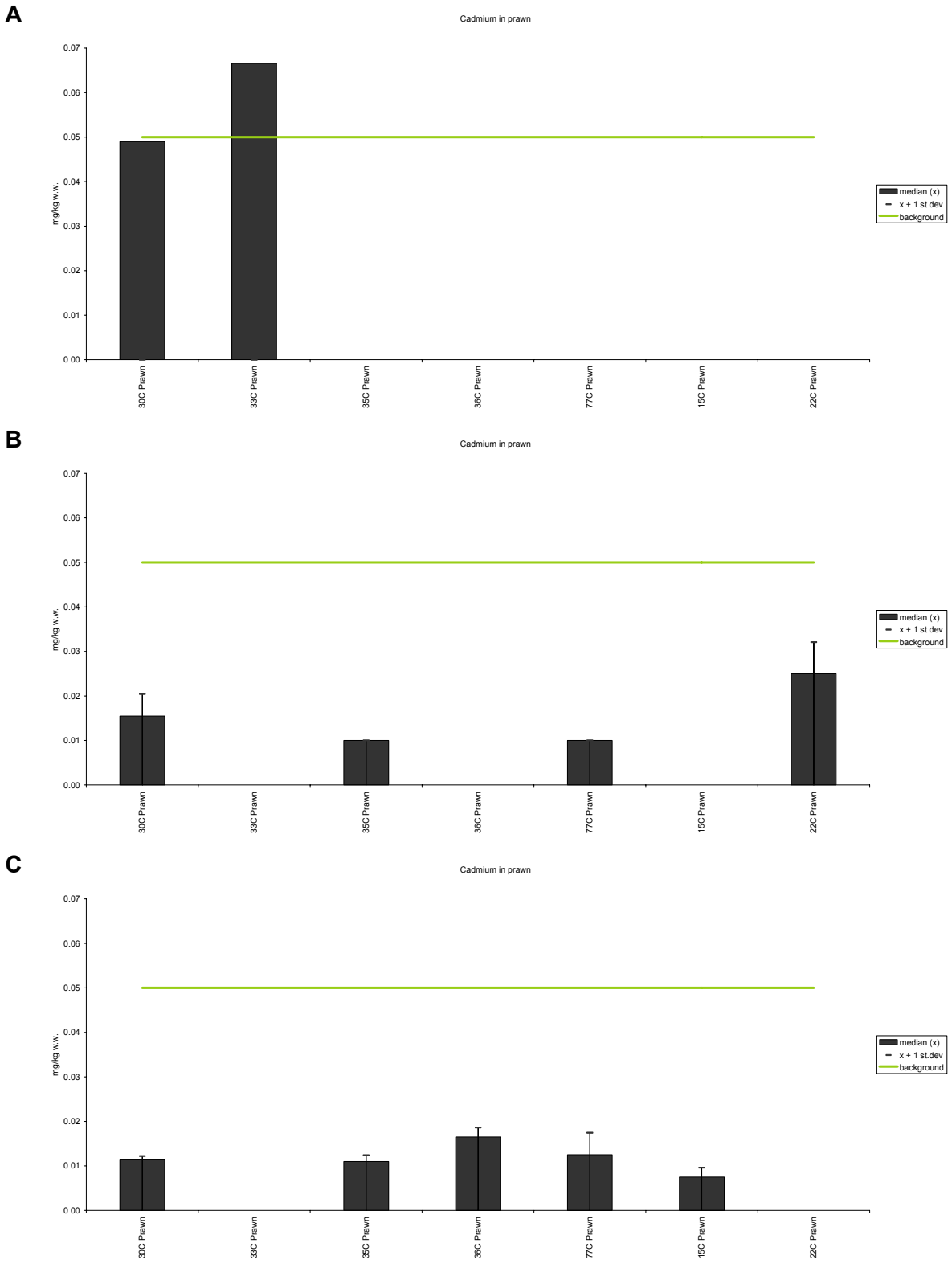



***Figure 50.*** *Median, standard deviation and presumed background concentration for cadmium in prawn 1981-1983 (**A**), 1989-1990 (**B**) and 2008 (**C**), ppm (mg/kg) wet weight, "background" indicates that only background concentration is indicated (see maps in Appendix H).*

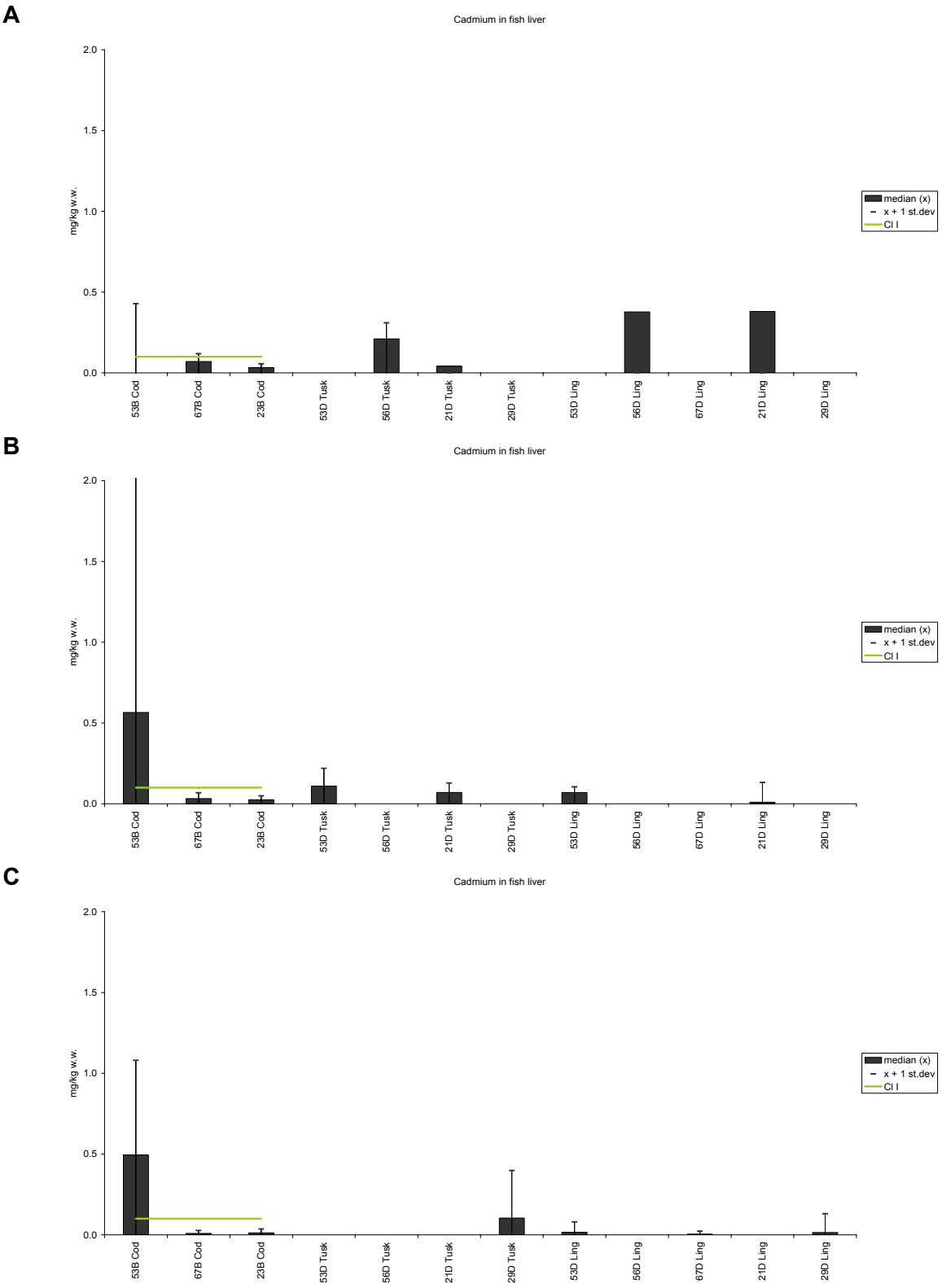



***Figure 51.*** *Median, standard deviation and upper limit to Klif Classes or provisional "high background" concentration for cadmium in ling, tusk and cod 1999* ***(A),*** *2001 (**B**) and 2008 (**C**), ppm (mg/kg) wet weight, "Cl. – B" indicates that only upper limit to Klif Classes or provisional high background concentration is indicated for all fish, (see maps in Appendix H).*

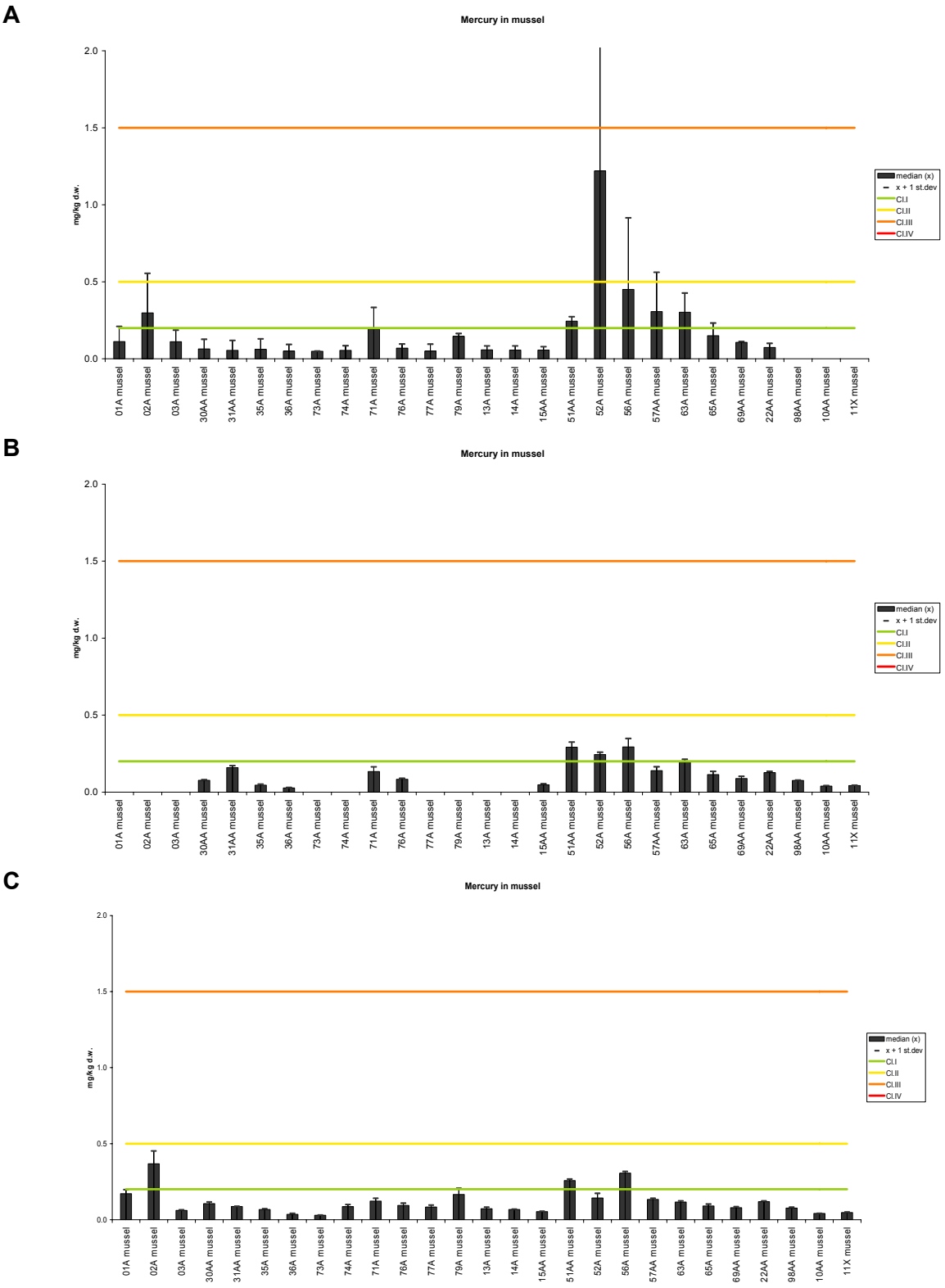



***Figure 52.*** *Median, standard deviation and upper limit to Klif Classes or provisional "high background" concentration for mercury in blue mussel 1990-1996 (**A**), 2007 (**B**) and 2008 (**C**), ppm (mg/kg) wet weight (see maps in Appendix H).*

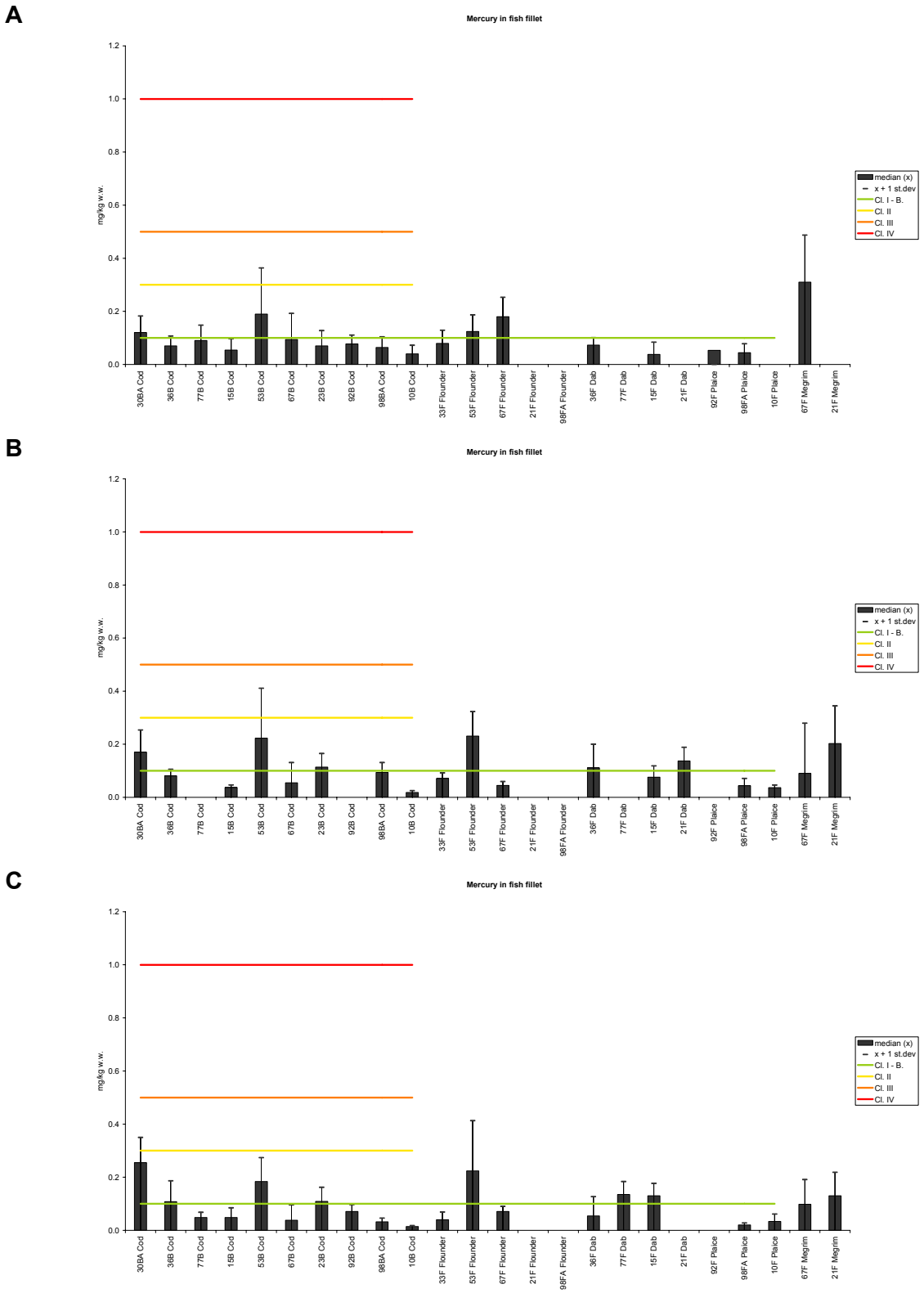



***Figure 53.*** *Median, standard deviation and upper limit to Klif Classes or provisional "high background" concentration for mercury in fish fillet 1990-1996 (**A**), 2007 (**B**) and 2008 (**C**), ppm (mg/kg) wet weight, "Cl. – B" indicates that only upper limit to Klif Classes or provisional high background concentration is indicated for flatfish, (see maps in Appendix H).*

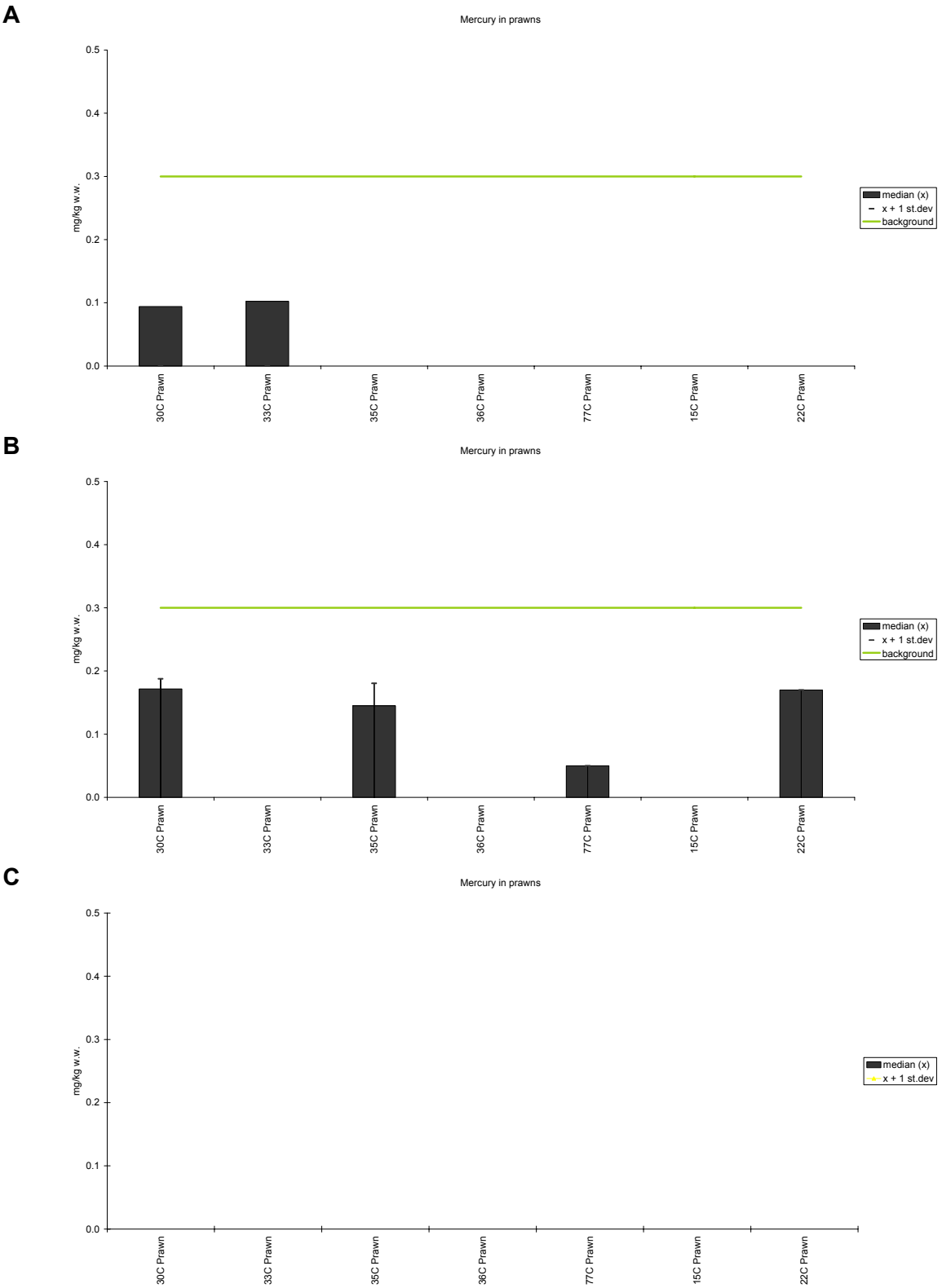



***Figure 54.*** *Median, standard deviation and presumed background concentration for mercury in prawn 1981-1983 (**A**), 1989-1990 (**B**) and 2008 (**C**), ppm (mg/kg) wet weight, "background" indicates that only background concentration is indicated (see maps in Appendix H).*

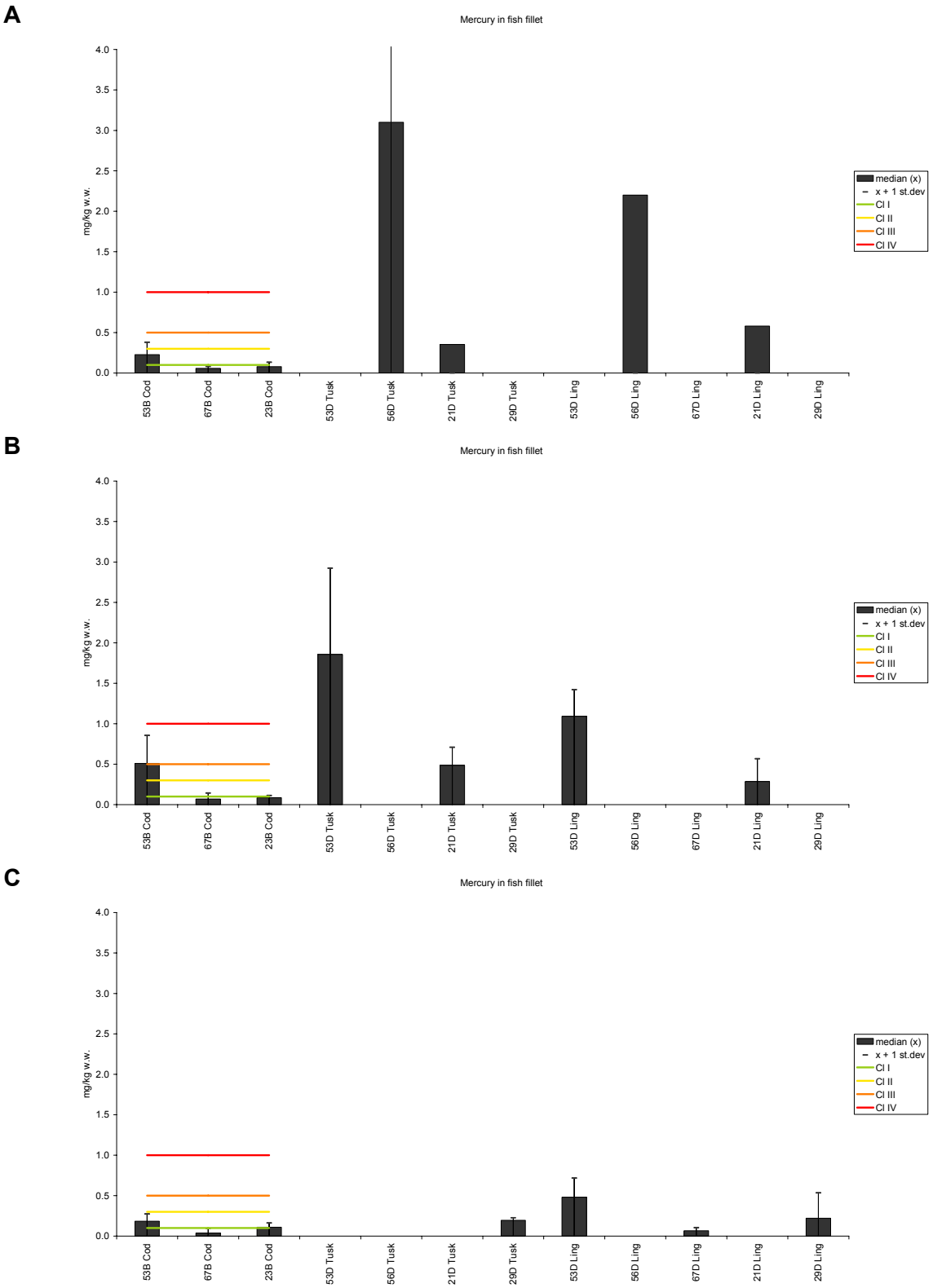



***Figure 55.*** *Median, standard deviation and upper limit to Klif Classes or provisional "high background" concentration for mercury in ling, tusk and cod 1999* ***(A),*** *2001 (**B**) and 2008 (**C**), ppm (mg/kg) wet weight, "Cl. – B" indicates that only upper limit to Klif Classes or provisional high background concentration is indicated for all fish, (see maps in Appendix H).* ***Note: classes for cod have been used.***

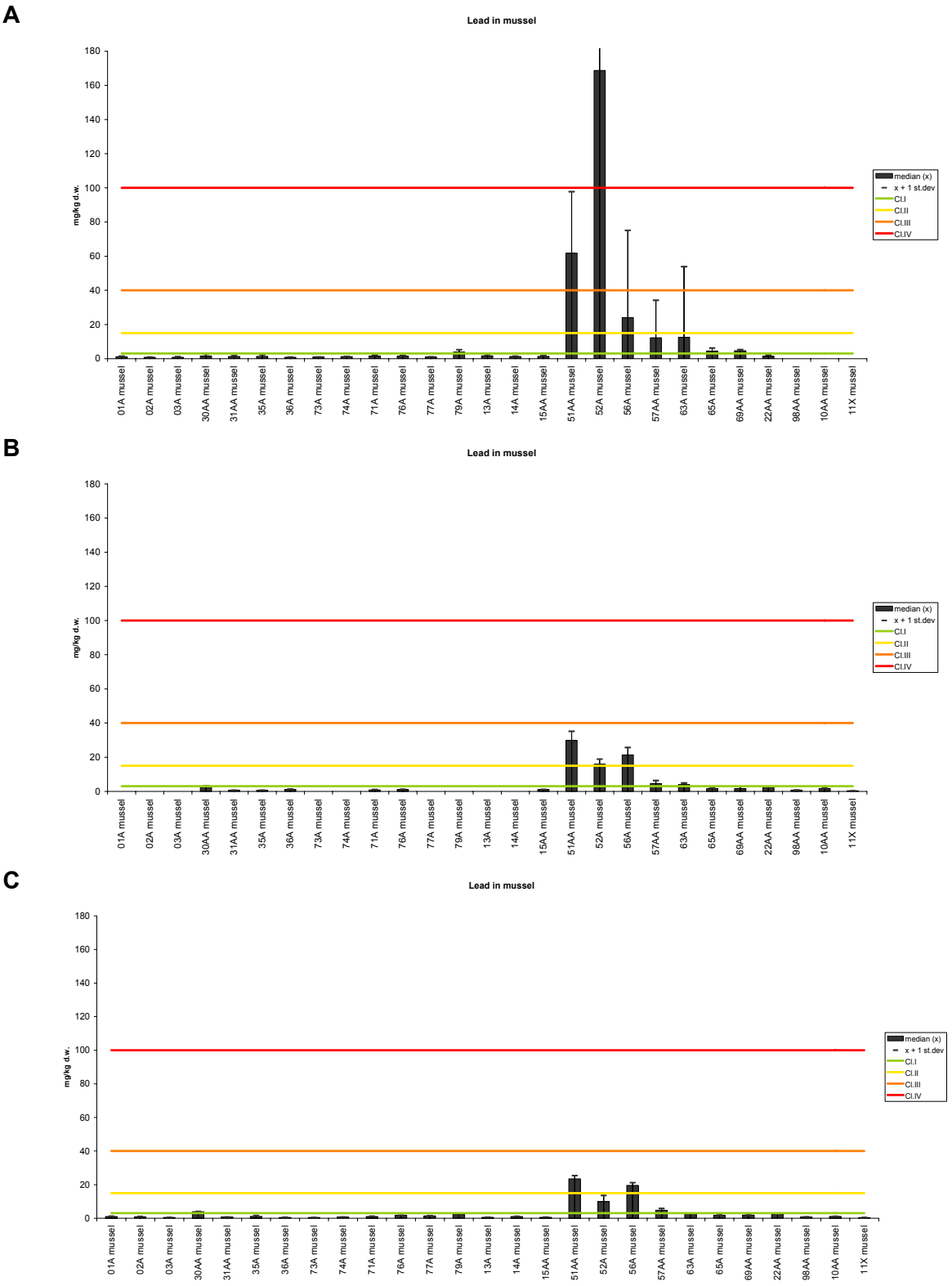



***Figure 56.*** *Median, standard deviation and upper limit to Klif Classes or provisional "high background" concentration for lead in blue mussel 1990-1996 (**A**), 2007 (**B**) and 2008 (**C**), ppm (mg/kg) wet weight (see maps in Appendix H).* ***Note: for some stations the standard deviation is off-scale in figure A.***

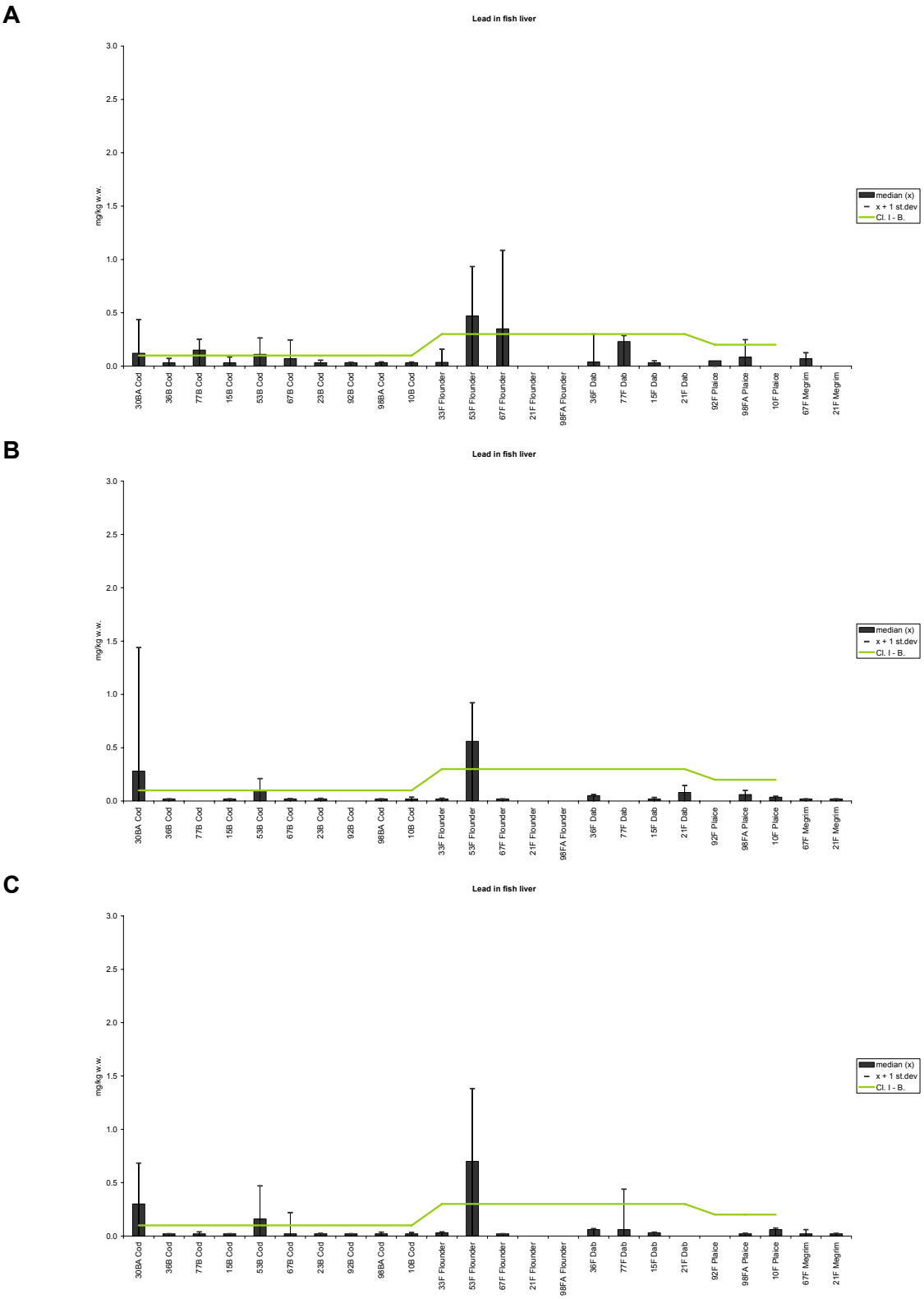



***Figure 57.*** *Median, standard deviation and upper limit to Klif Classes or provisional "high background" concentration for lead in fish liver 1990-1996 (**A**), 2007 (**B**) and 2008 (**C**), ppm (mg/kg) wet weight, "Cl. – B" indicates that only upper limit to Klif Classes or provisional high background concentration is indicated for all fish, (see maps in Appendix H).*

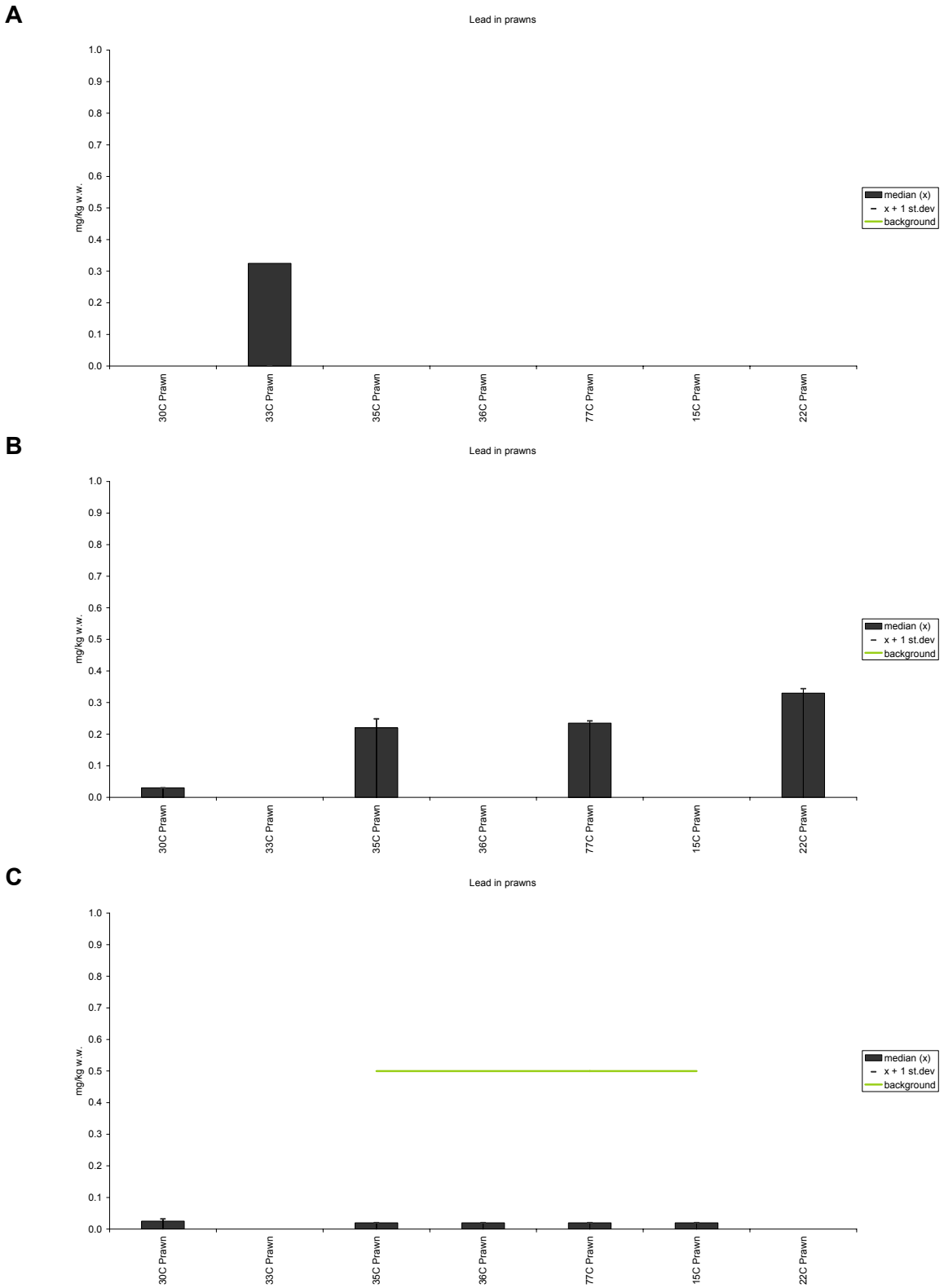



***Figure 58.*** *Median, standard deviation and presumed background concentration for lead in prawn 1981-1983 (**A**), 1989-1990 (**B**) and 2008 (**C**), ppm (mg/kg) wet weight, "background" indicates that only background concentration is indicated (see maps in Appendix H).*

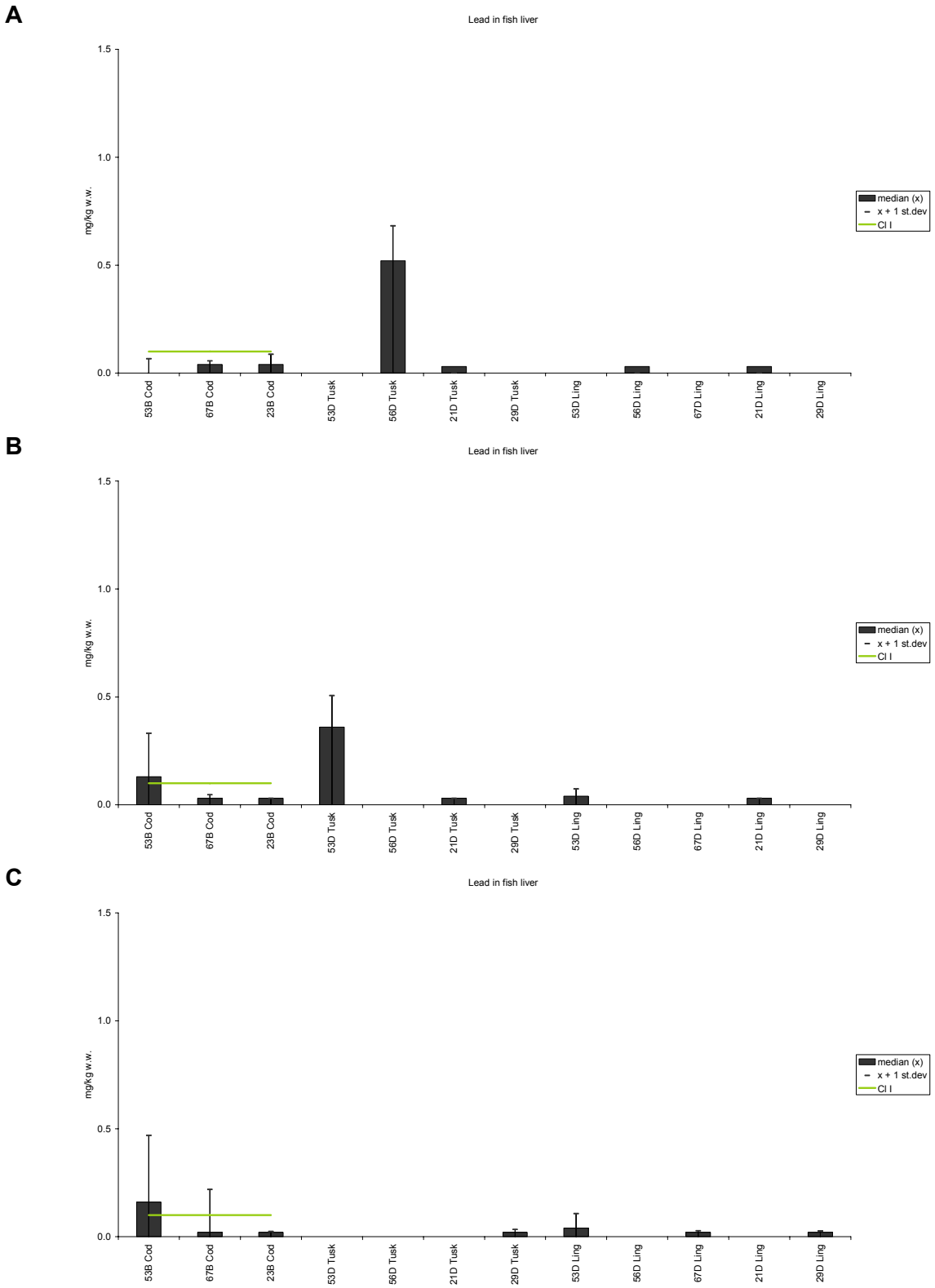
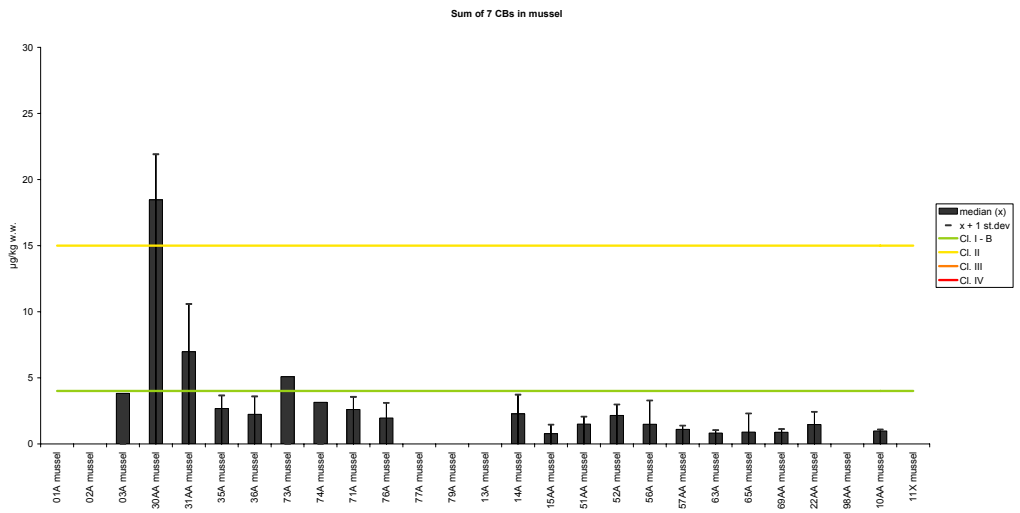
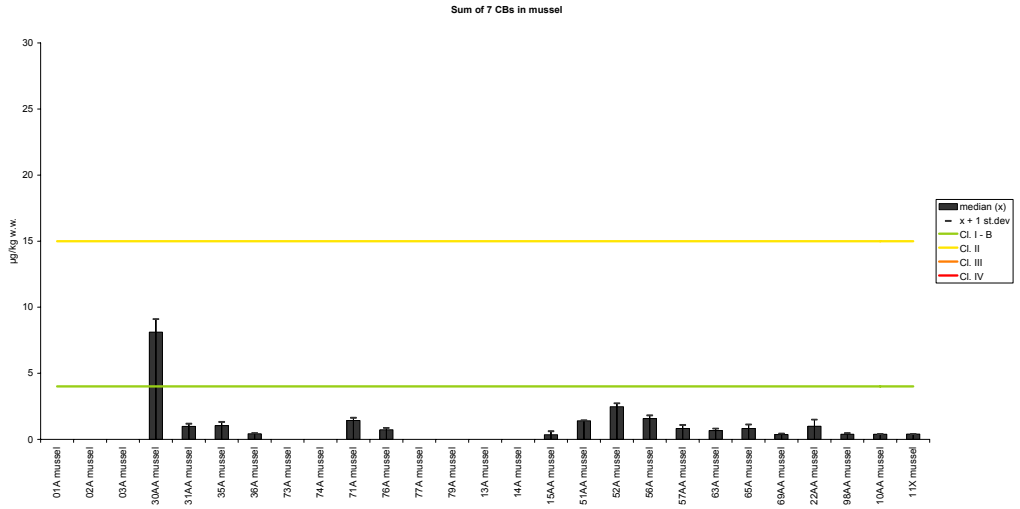



***Figure 59.*** *Median, standard deviation and upper limit to Klif Classes or provisional "high background" concentration for lead in ling, tusk and cod 1999* ***(A),*** *2001 (**B**) and 2008 (**C**), ppm (mg/kg) wet weight (see maps in Appendix H).*

**A**




**B**




**C**

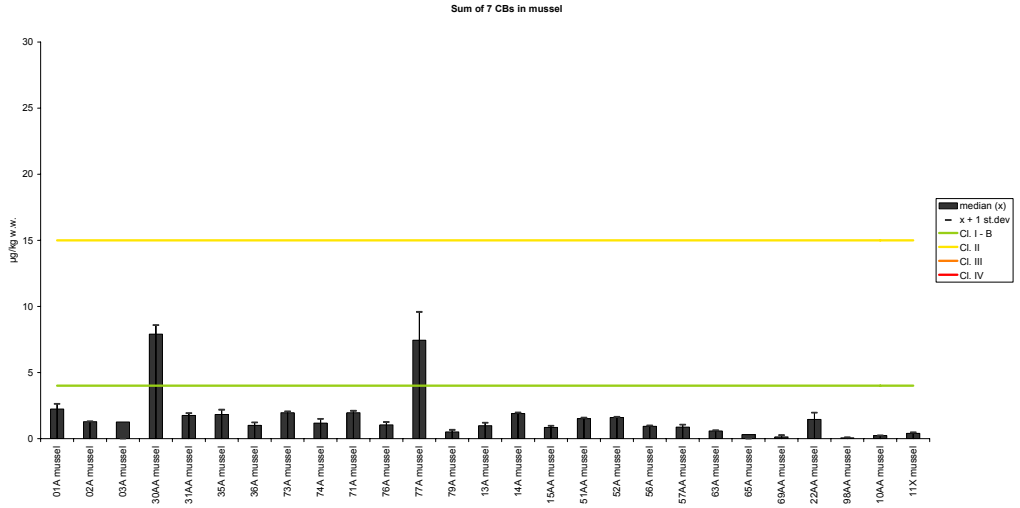



***Figure 60.*** *Median, standard deviation and upper limit to Klif Classes or provisional "high background" concentration for sum of 7 PCBs (CB-28, -52, 101, -118, -138, -153 and -180) in blue mussel 1990-1996 (**A**), 2007 (**B**) and 2008 (**C**), ppb (µg/kg) wet weight (see maps in Appendix H).*

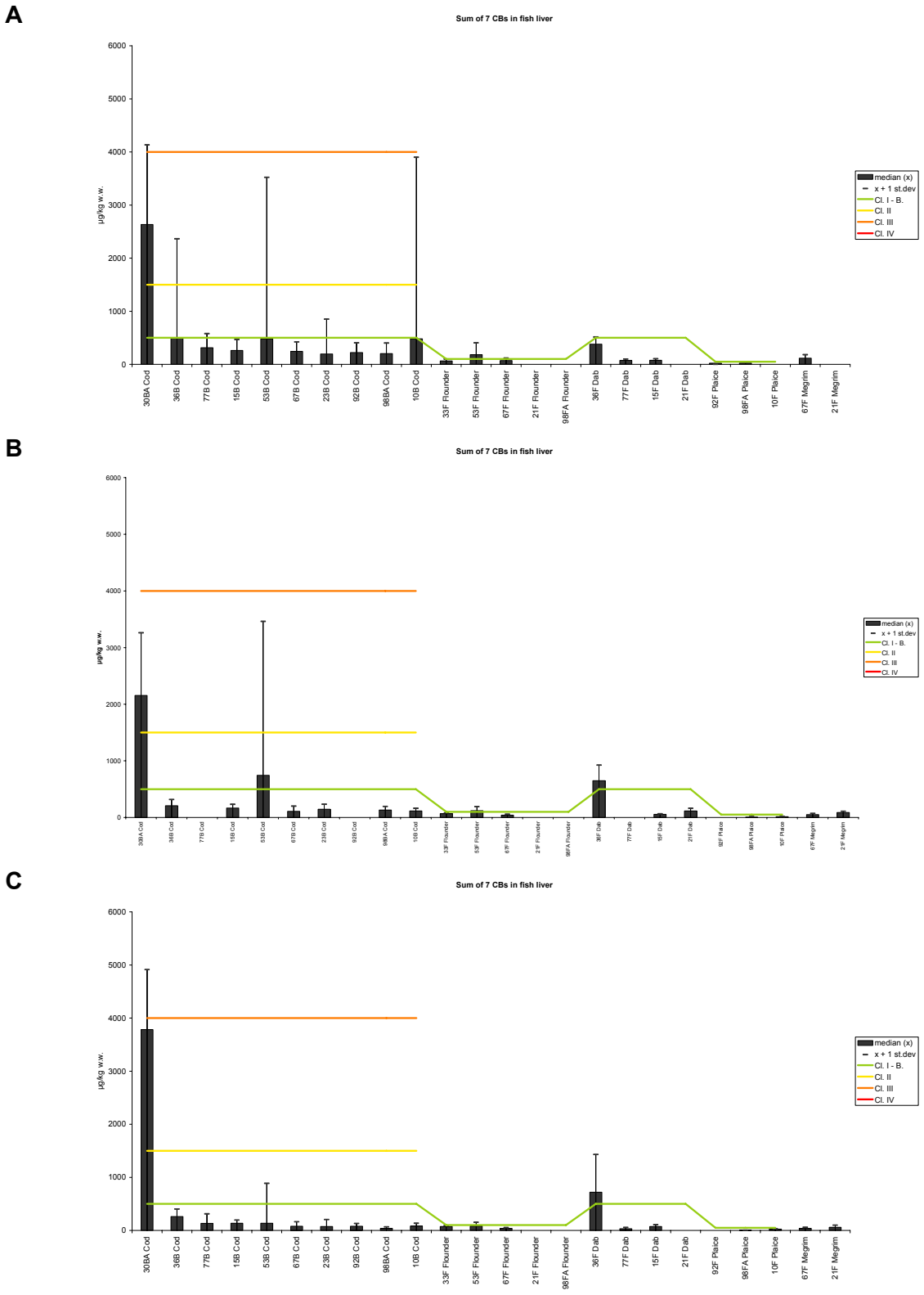



***Figure 61.*** *Median, standard deviation and upper limit to Klif Classes or provisional "high background" concentration for sum of 7 PCBs (CB-28, -52, 101, -118, -138, -153 and -180) in fish liver 1990-1996 (**A**), 2007 (**B**) and 2008 (**C**), ppb (µg/kg) wet weight, "Cl. I – B" indicates that only upper limit to Klif Classes or provisional high background concentration is indicated for flatfish, (see maps in Appendix H).*

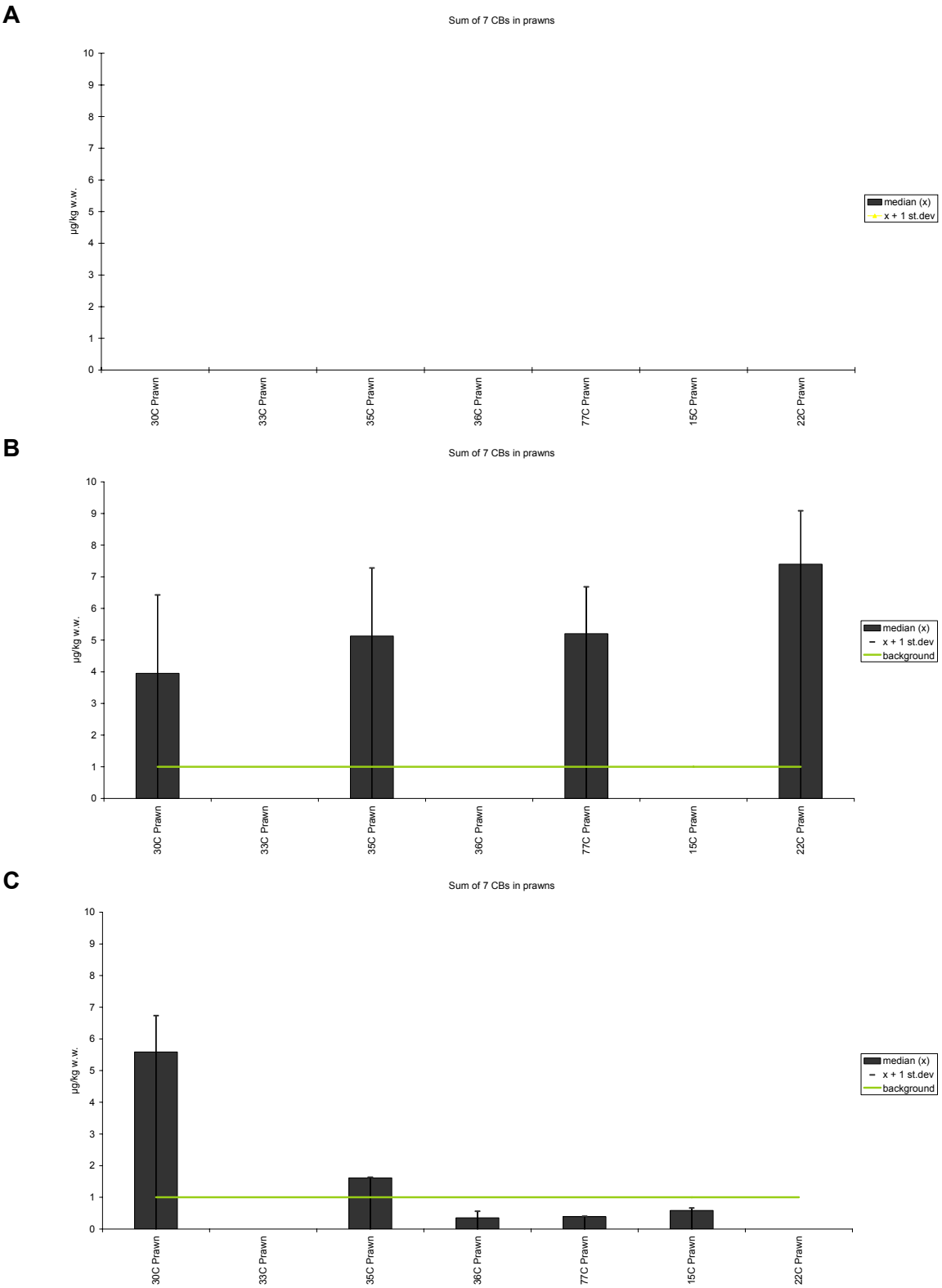



***Figure 62.*** *Median, standard deviation and presumed background concentration for sum of 7 PCBs (CB-28, -52, 101, -118, -138, -153 and -180) in prawn 1981-1983 (**A**), 1989-1990 (**B**) and 2008 (**C**), ppb (µg/kg) wet weight, "background" indicates that only background concentration is indicated (see maps in Appendix H).*

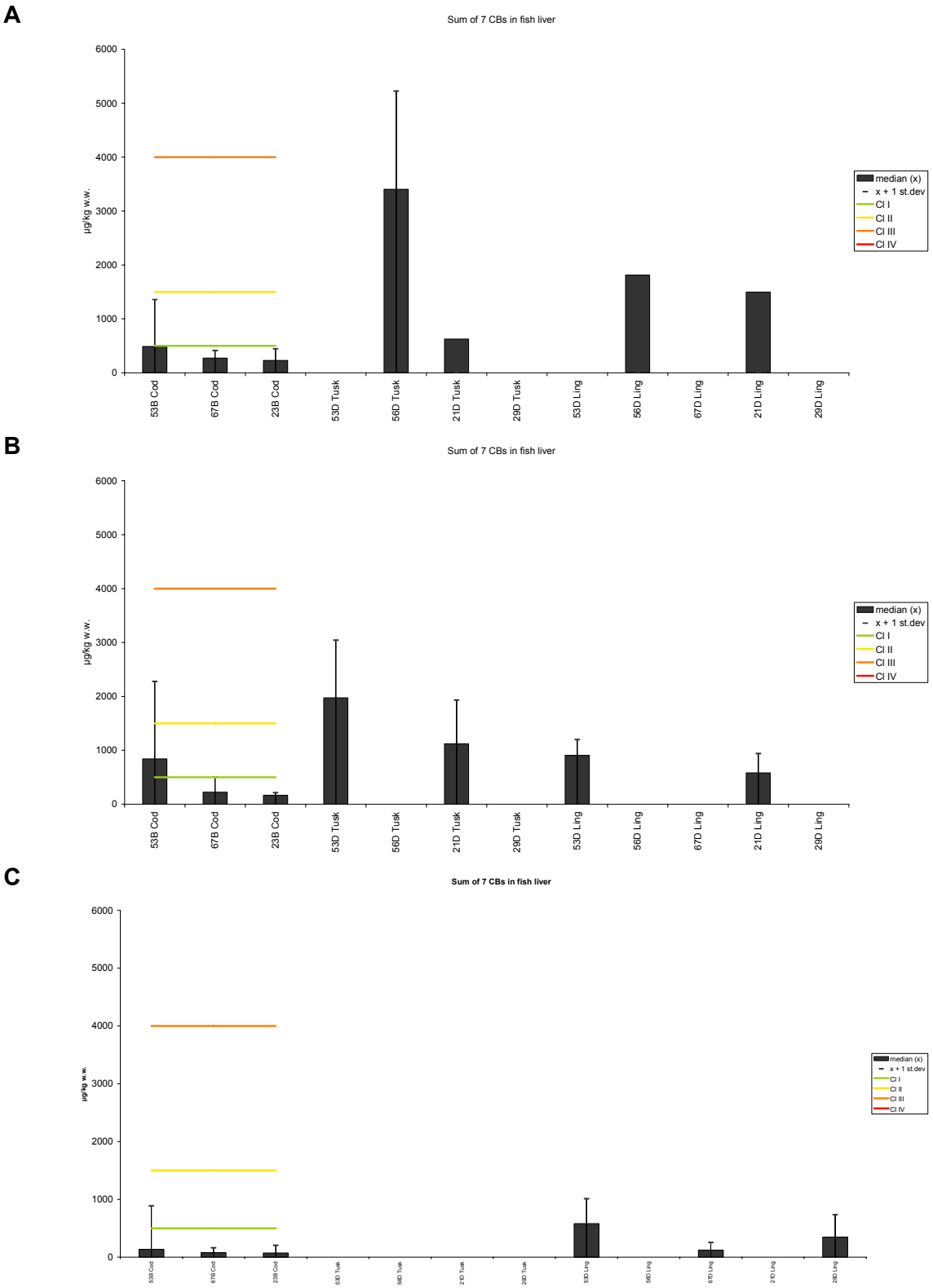



***Figure 63.*** *Median, standard deviation and upper limit to Klif Classes or provisional "high background" concentration for sum of 7 PCBs (CB-28, -52, 101, -118, -138, -153 and -180) in ling, tusk and cod 1999* ***(A),*** *2001 (**B**) and 2008 (**C**), ppb (µg/kg) wet weight (see maps in Appendix H).*

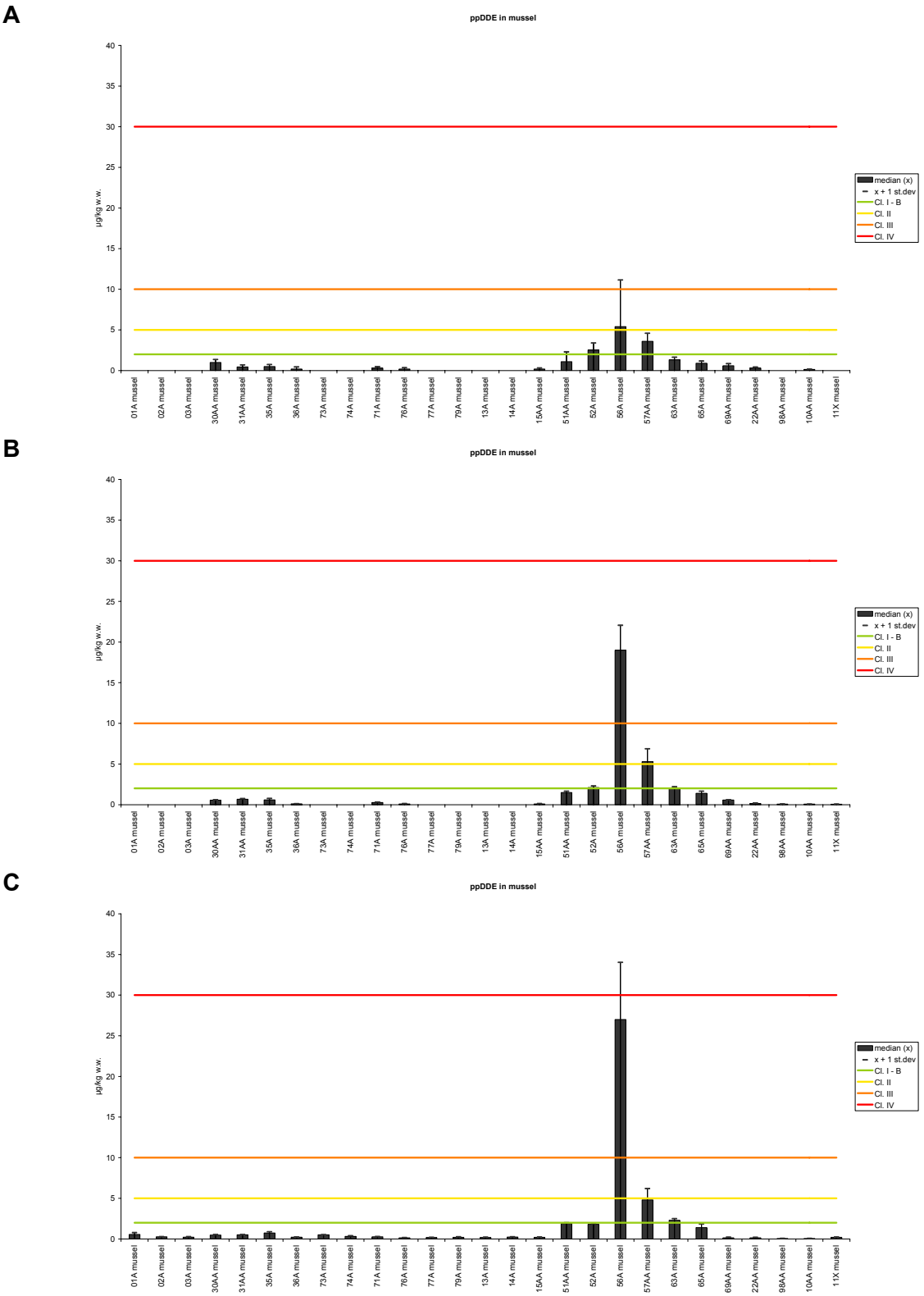



***Figure 64.*** *Median, standard deviation and upper limit to Klif Classes or provisional "high background" concentration for ppDDE (DDEPP) in blue mussel 1990-1996 (**A**), 2007 (**B**) and 2008 (**C**), ppb (µg/kg) wet weight (see maps in Appendix H). (See also footnote in Table 15).* ***Note: Class limits for ΣDDT used.***

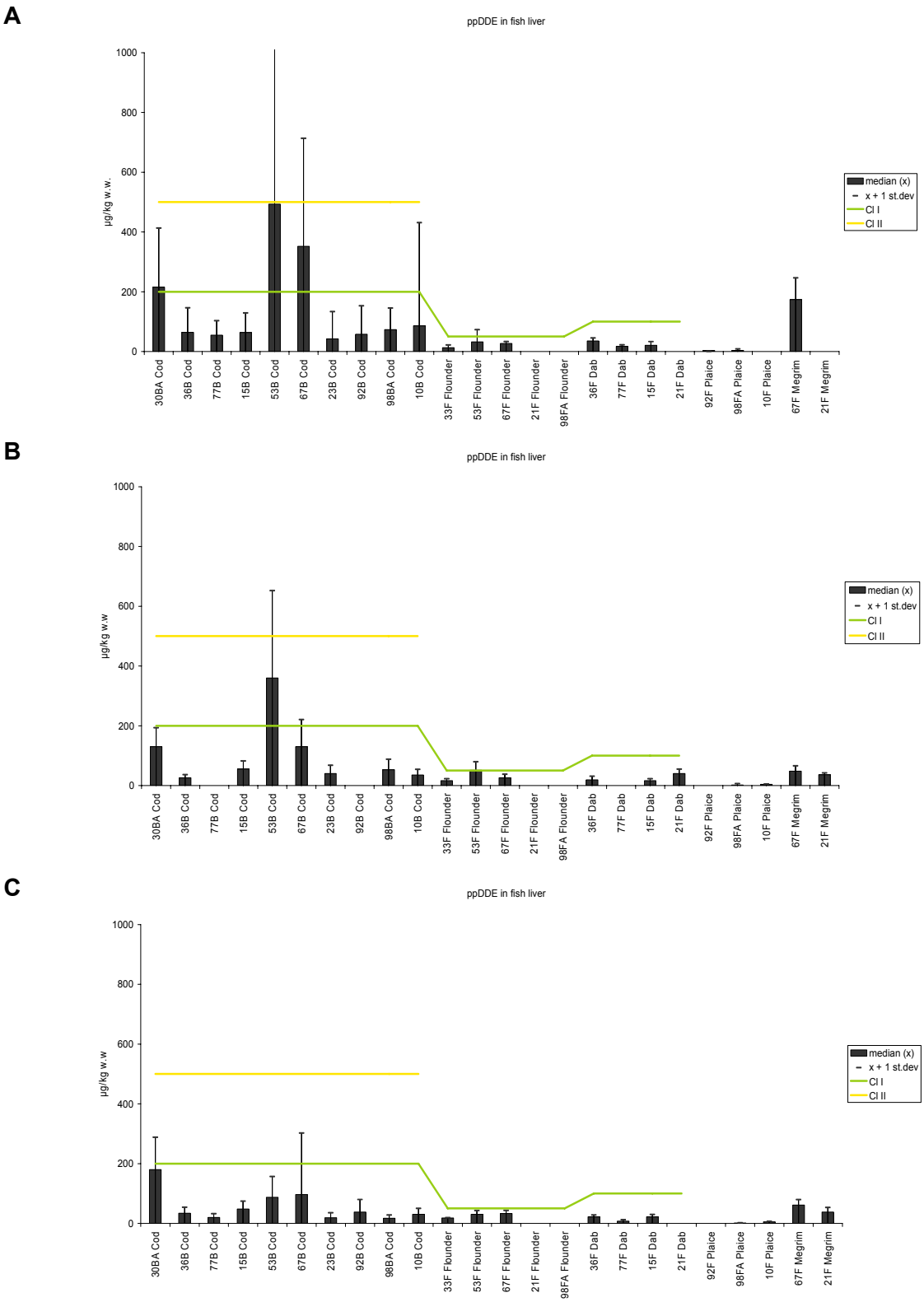



***Figure 65.*** *Median, standard deviation and upper limit to Klif Classes or provisional "high background" concentration for ppDDE (DDEPP) in fish liver 1990-1996 (**A**), 2007 (**B**) and 2008 (**C**), ppb (µg/kg) wet weight, "Cl. – B" indicates that only upper limit to Klif Classes or provisional high background concentration is indicated for flatfish, (see maps in Appendix H). (See also footnote in Table 15).* ***Note: Class limits for ΣDDT used.***

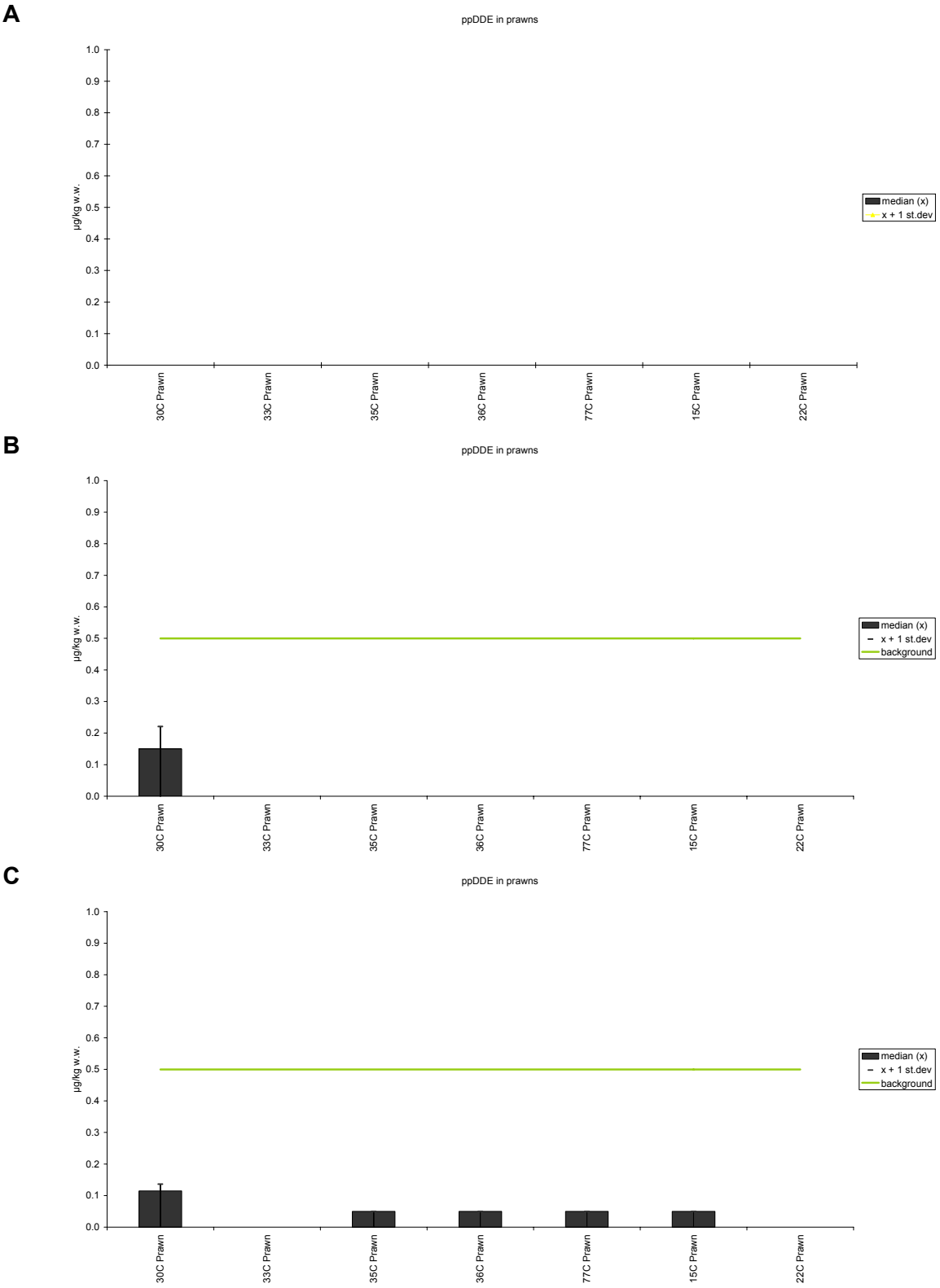



***Figure 66.*** *Median, standard deviation and presumed background concentration for ppDDE (DDEPP) in prawn 1981-1983 (**A**), 1989-1990 (**B**) and 2008 (**C**), ppb (µg/kg) wet weight, "background" indicates that only background concentration is indicated (see maps in Appendix H). (See also footnote in Table 15).* ***Note: Class limits for ΣDDT used.***

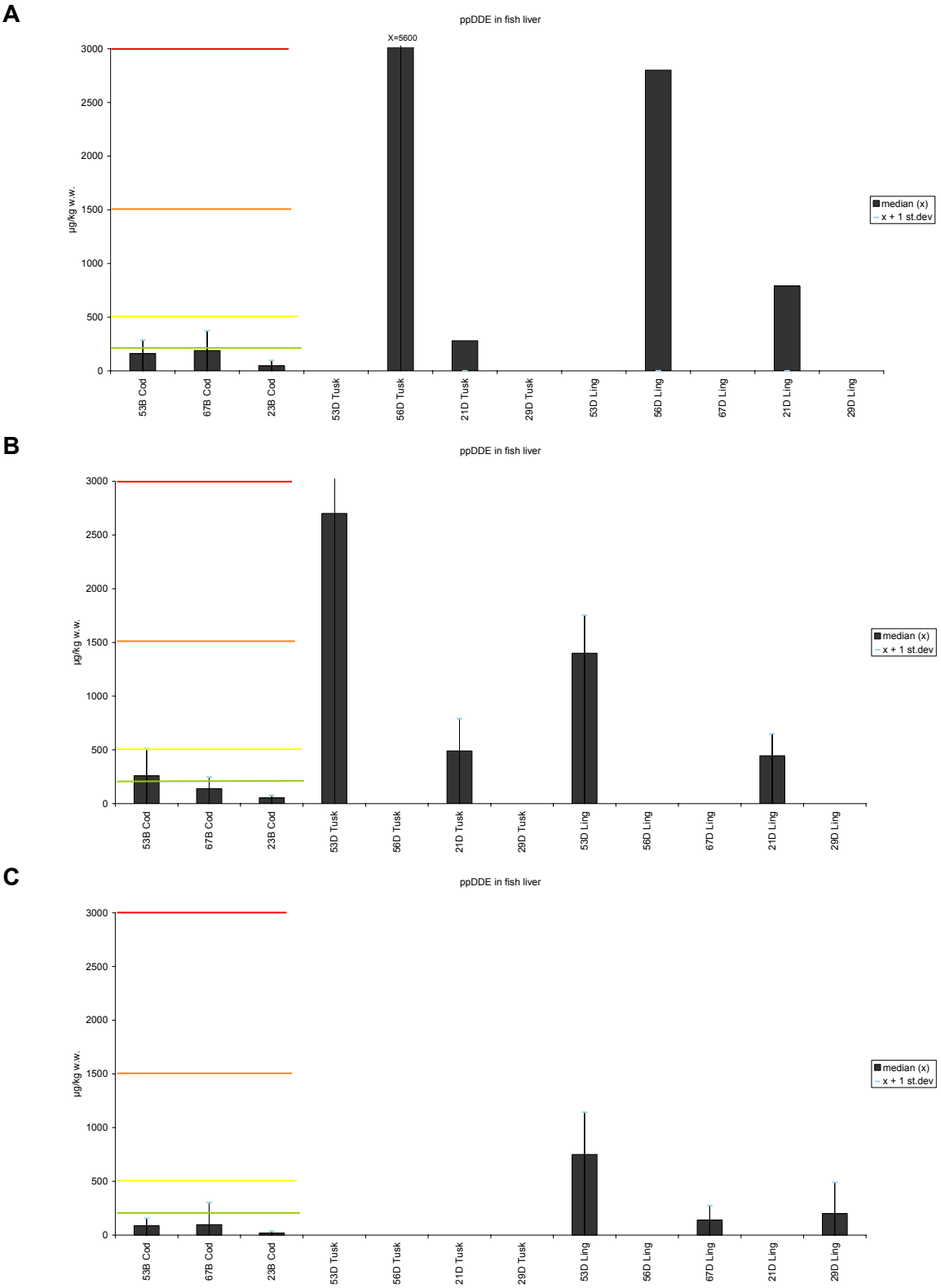



***Figure 67.*** *Median, standard deviation and upper limit to Klif Classes or provisional "high background" concentration for ppDDE (DDEPP) in ling, tusk and cod 1999* ***(A),*** *2001 (**B**) and 2008 (**C**), ppb (µg/kg) wet weight, (see maps in Appendix H). (See also footnote in Table 15).* ***Note: Class limits for ΣDDT in cod have been used.***

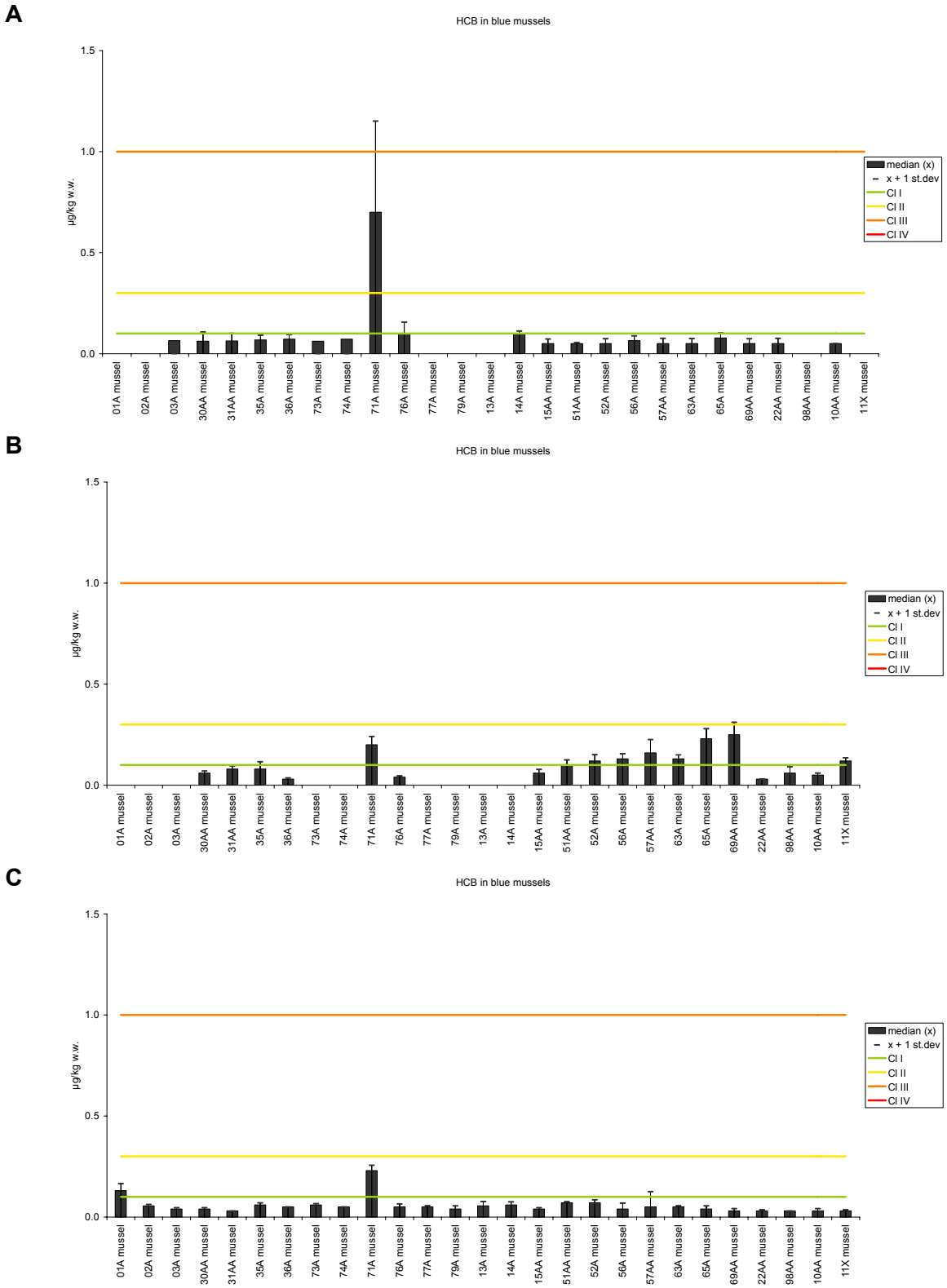
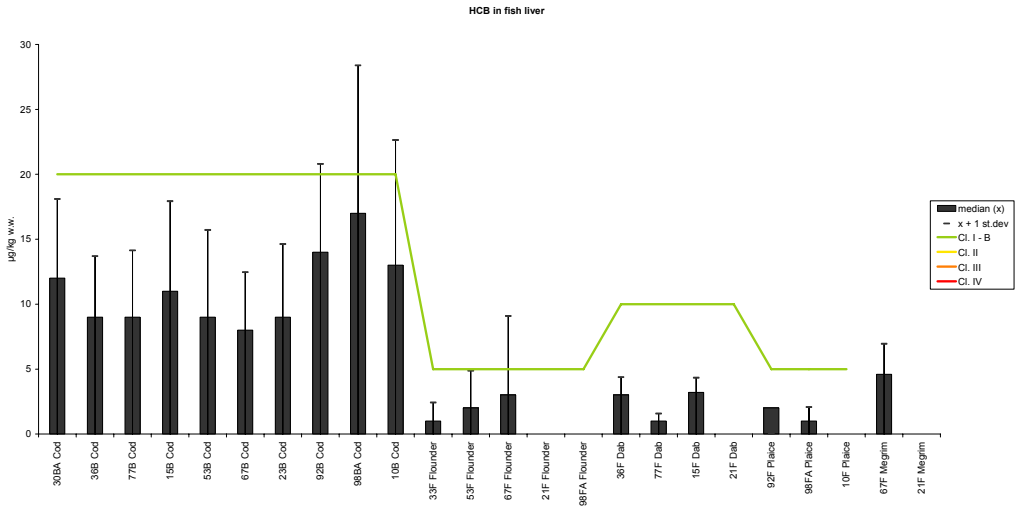
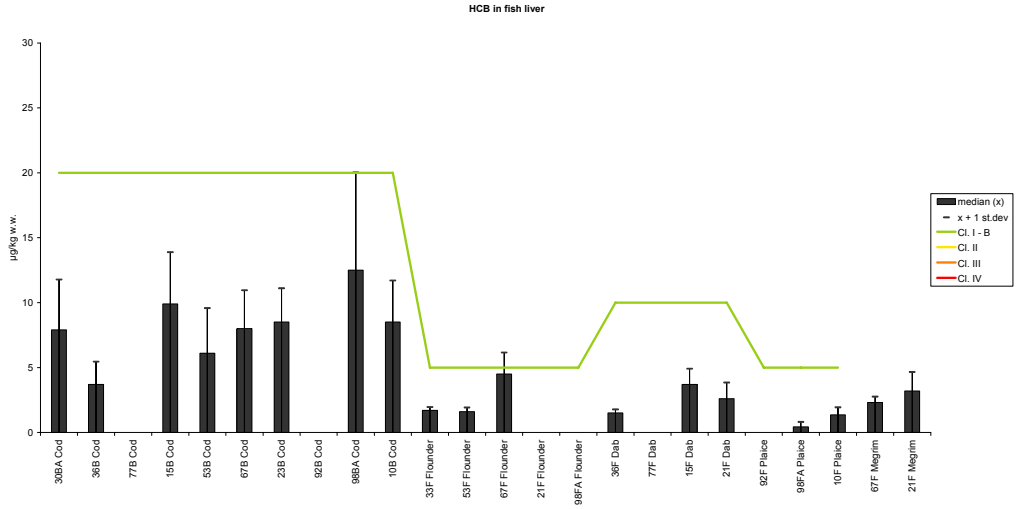



***Figure 68.*** *Median, standard deviation and upper limit to Klif Classes or provisional "high background" concentration for HCB in blue mussel 1990-1996 (**A**), 2007 (**B**) and 2008 (**C**), ppb (µg/kg) wet weight (see maps in Appendix H).*

**A**




**B**




**C**

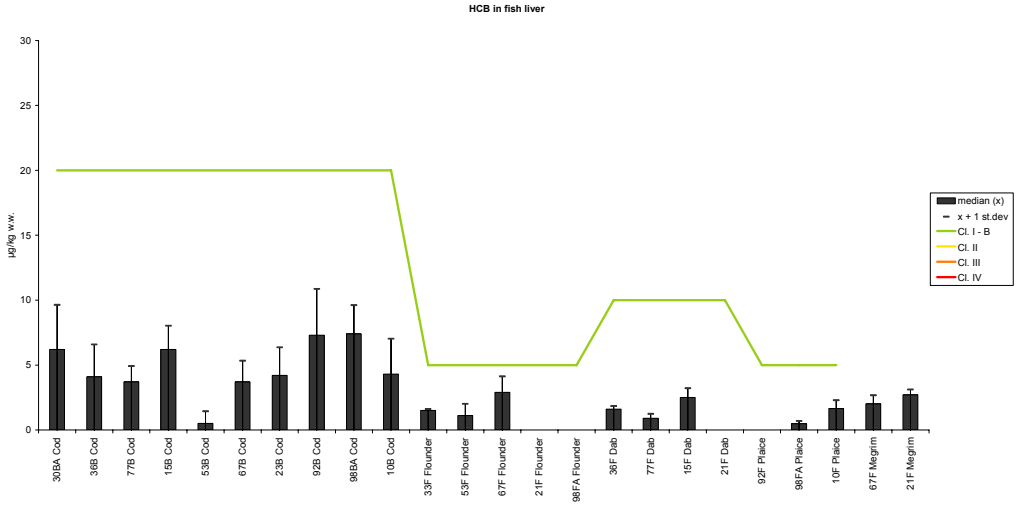



***Figure 69.*** *Median, standard deviation and upper limit to Klif Classes or provisional "high background" concentration for HCB in fish liver 1990-1996 (**A**), 2007 (**B**) and 2008 (**C**), ppb (µg/kg) wet weight, "Cl. – B" indicates that only upper limit to Klif Classes or provisional high background concentration is indicated for all fish, (see maps in Appendix H).*

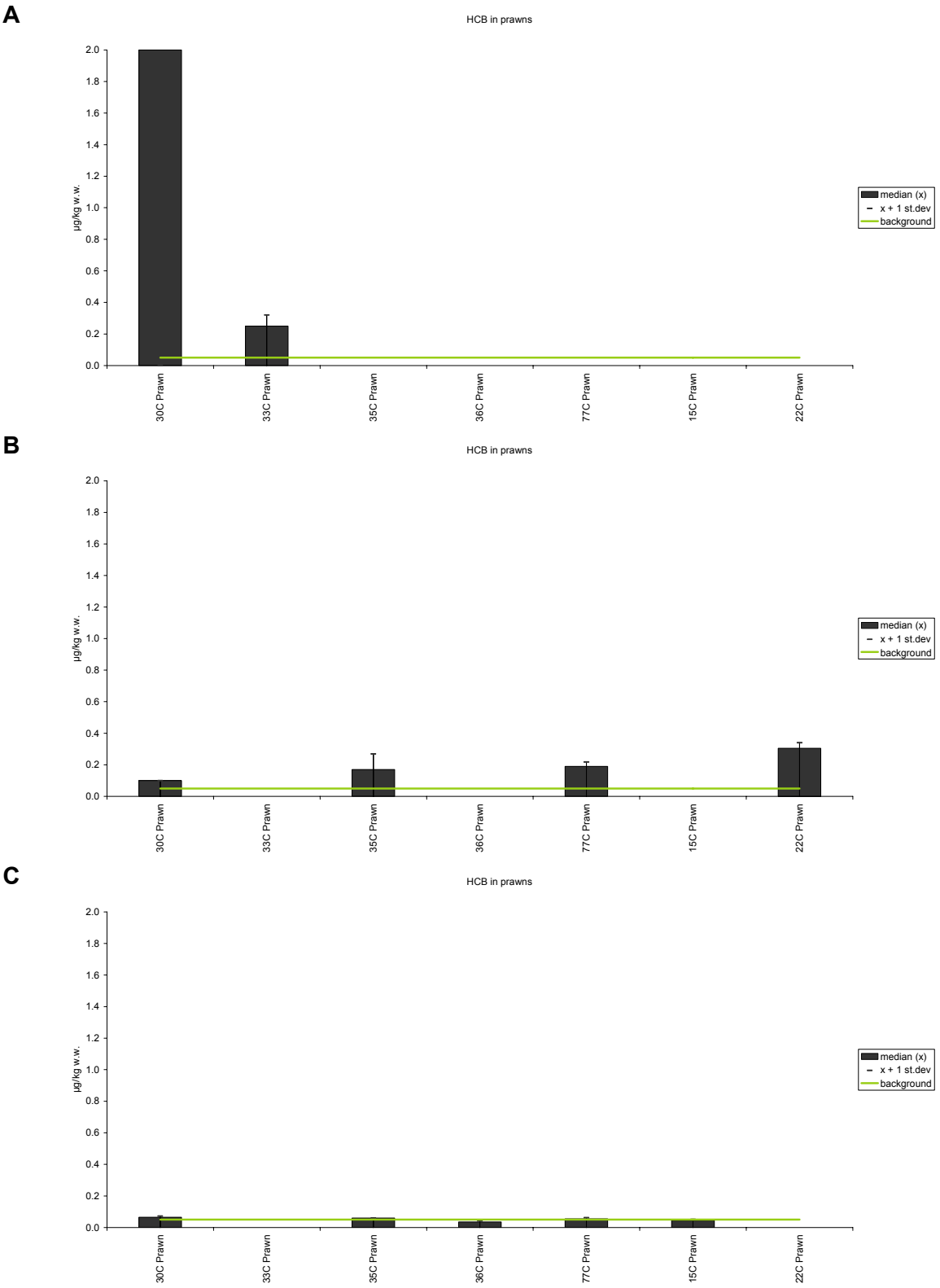



***Figure 70.*** *Median, standard deviation and presumed background concentration for HCB in prawn 1981-1983 (**A**), 1989-1990 (**B**) and 2008 (**C**), ppb (µg/kg) wet weight, "background" indicates that only background concentration is indicated (see maps in Appendix H).*

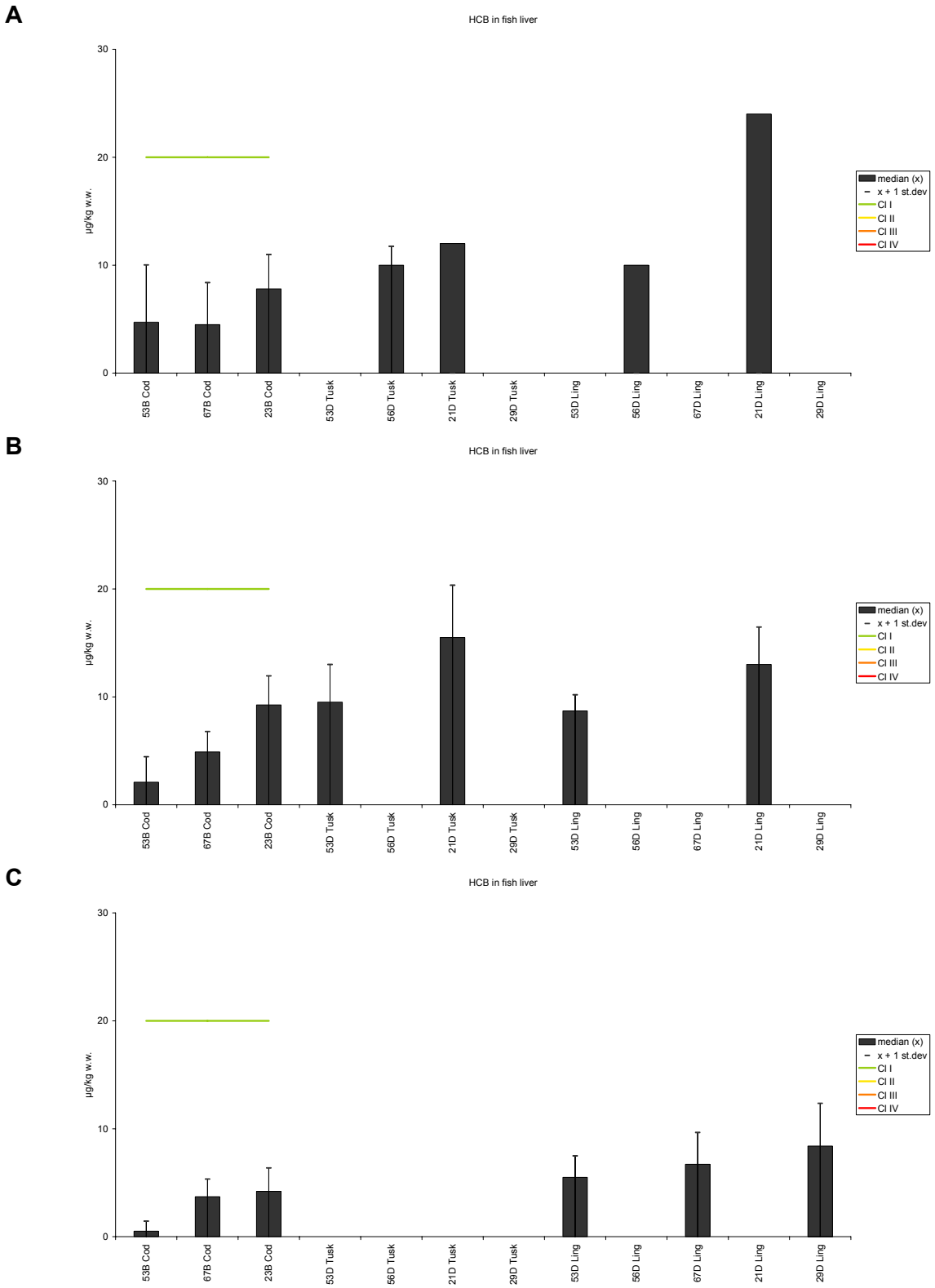



***Figure 71.*** *Median, standard deviation and upper limit to Klif Classes or provisional "high background" concentration for HCB in ling, tusk and cod 1999* ***(A),*** *2001 (**B**) and 2008 (**C**), ppb (µg/kg) wet weight (see maps in Appendix H).*

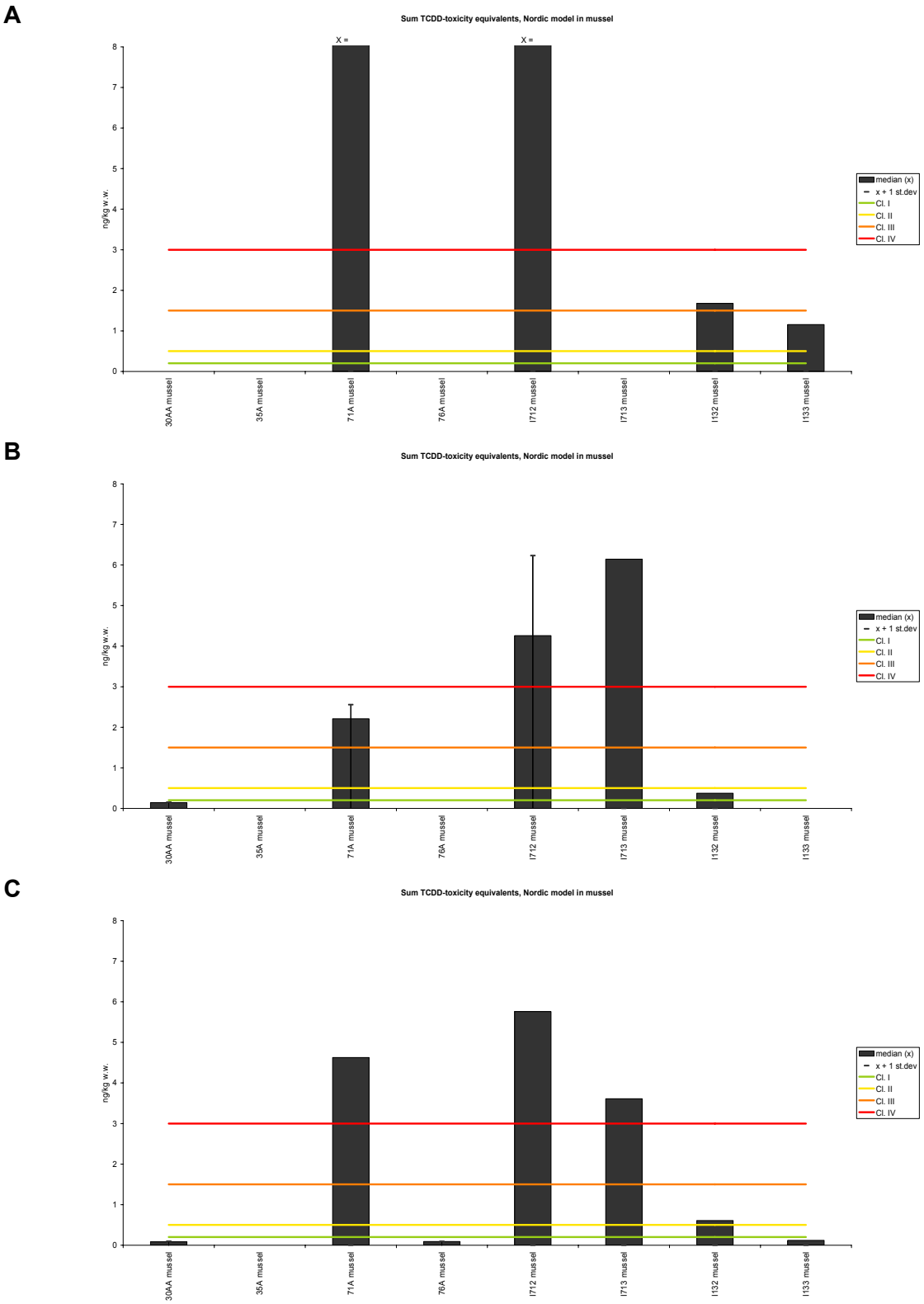



***Figure 72.*** *Median, standard deviation and upper limit to Klif Classes or provisional "high background" concentration for dioxin TCDD-toxicity equivalents after nordic model (TCDDN) in blue mussel 1990-1996 (**A**), 2007 (**B**) and 2008 (**C**), ppp (ng/kg) wet weight (see maps in Appendix H). NB: TCDDN is a sum of specific dioxin compounds of which may include compounds of uncertain quantification.*

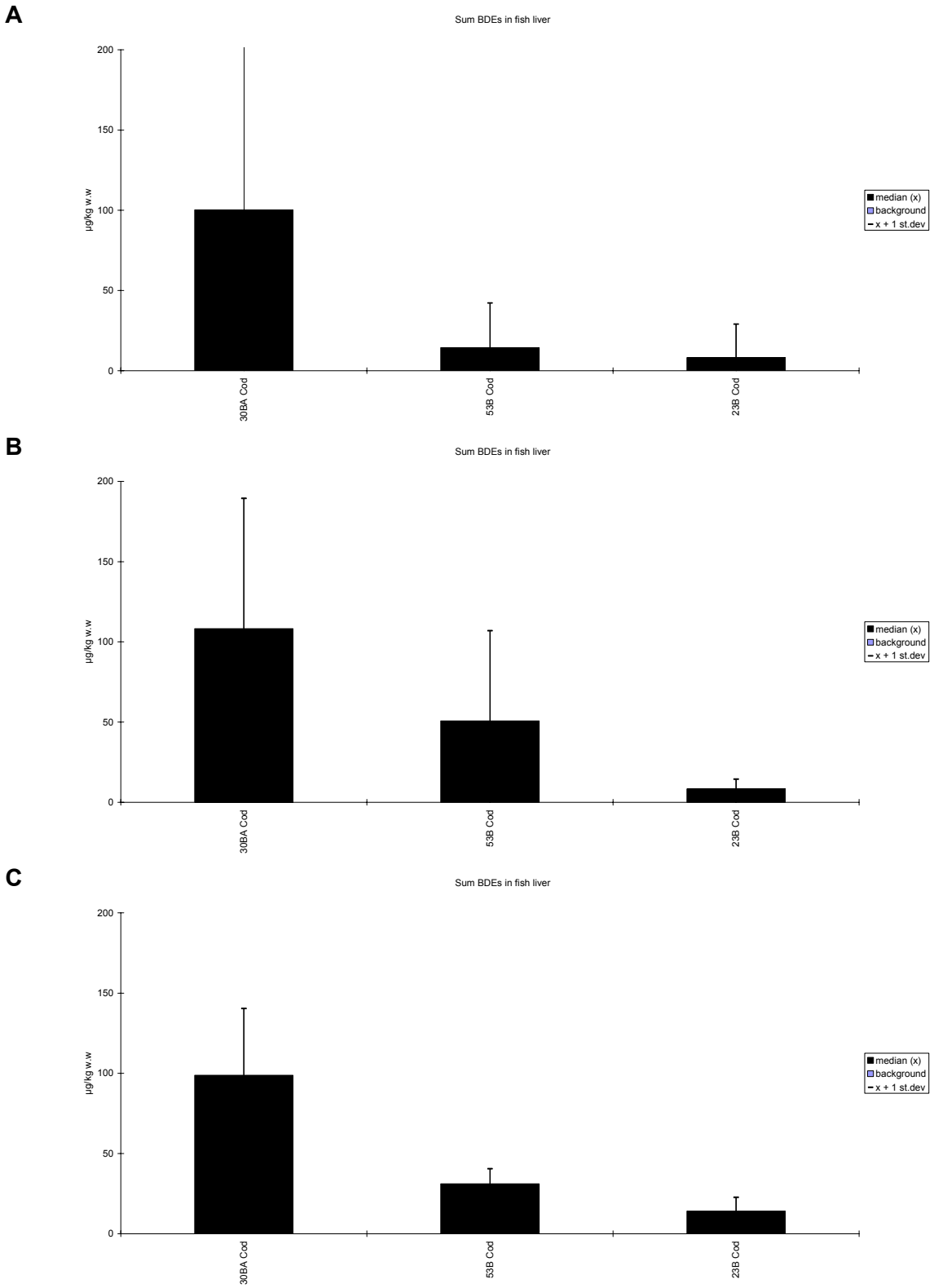



***Figure 73.*** *Median concentration for brominated flame retardent in cod liver 2006 (**A**), 2007 (**B**) and 2008 (**C**) ppb (µg/kg) wet weight for three CEMP stations (Inner Oslofjord - st. 30B, Inner Sørfjord - st. 53B and Karihavet - st. 23B) (see maps in Appendix H), and from two other investigations (see text).*

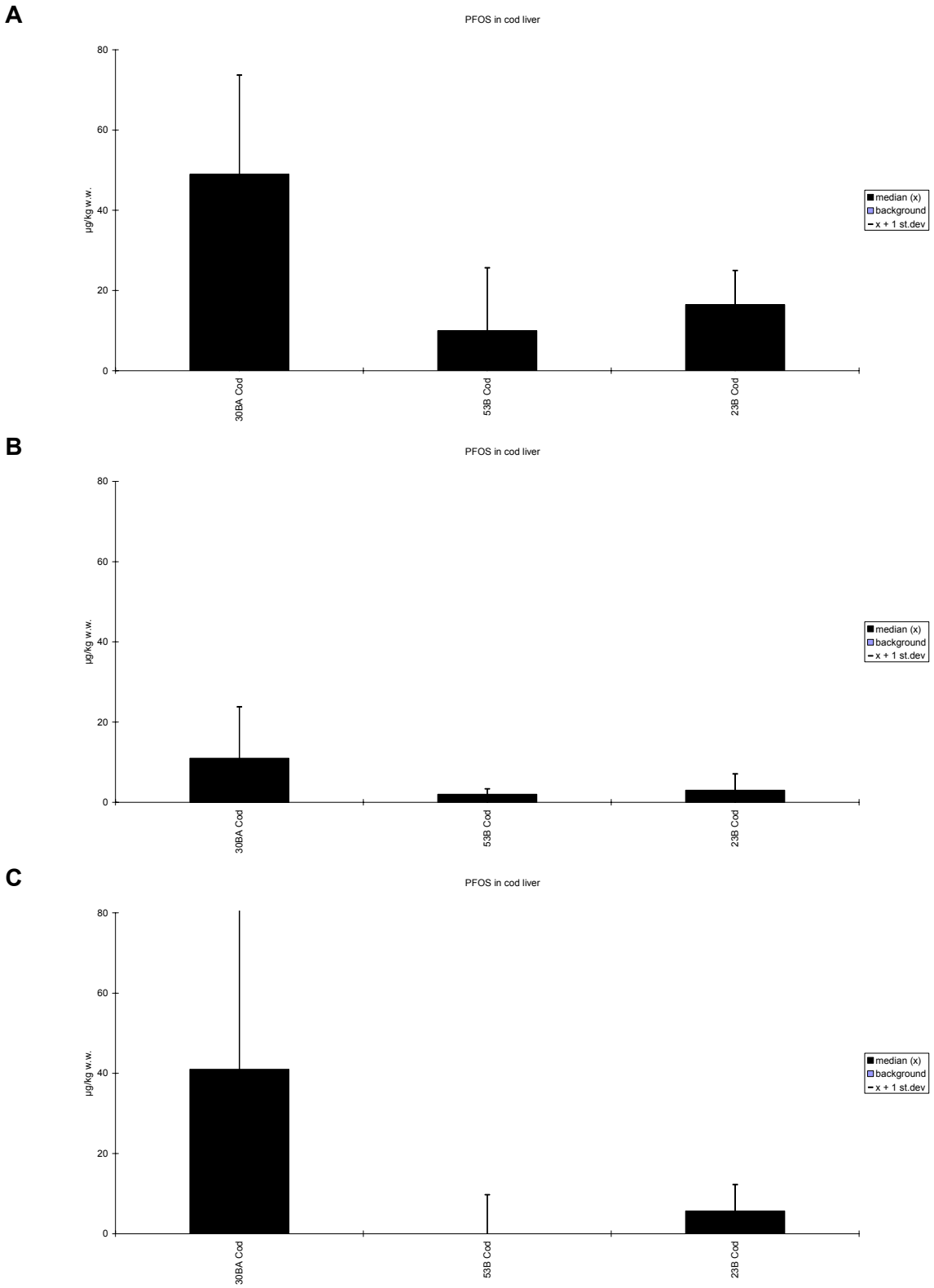



***Figure 74.*** *Median concentration for perfluoroctanoic sulfonate (PFOS) in cod liver 2006 (**A**), 2007 (**B**) and 2008 (**C**) ppb (µg/kg) wet weight for three CEMP stations (Inner Oslofjord - st. 30B, Inner Sørfjord - st. 53B and Karihavet - st. 23B) (see maps in Appendix H), and from two other investigations (see text).*

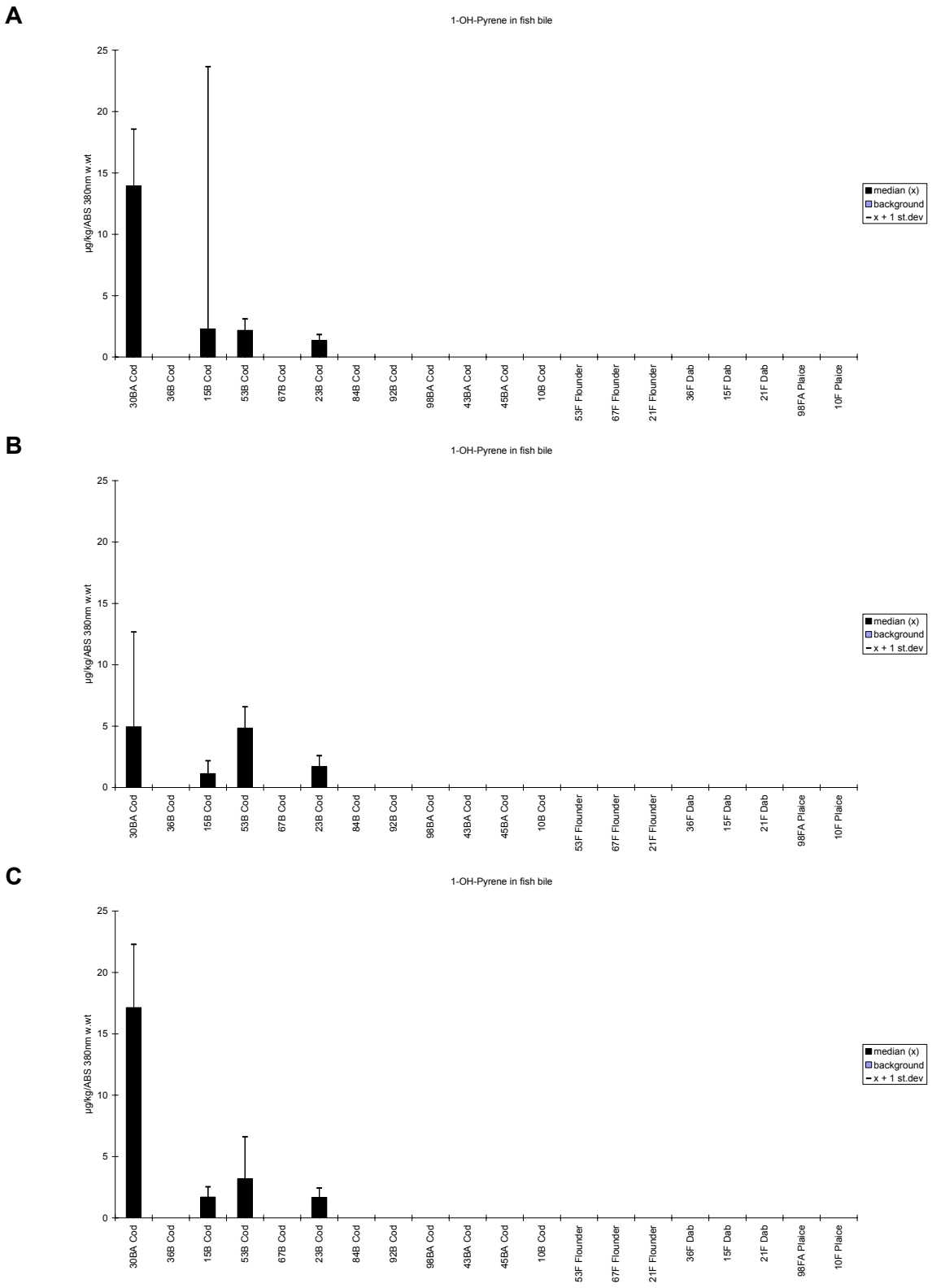



***Figure 75.*** *Median and standard deviation concentration for OH-pyrene (Pyrene metabolite) in fish bile 2006 (**A**), 2007 (**B**) and 2008 (**C**), µg/kg/ABS (absorbance) 380 nm (see maps in Appendix H).*

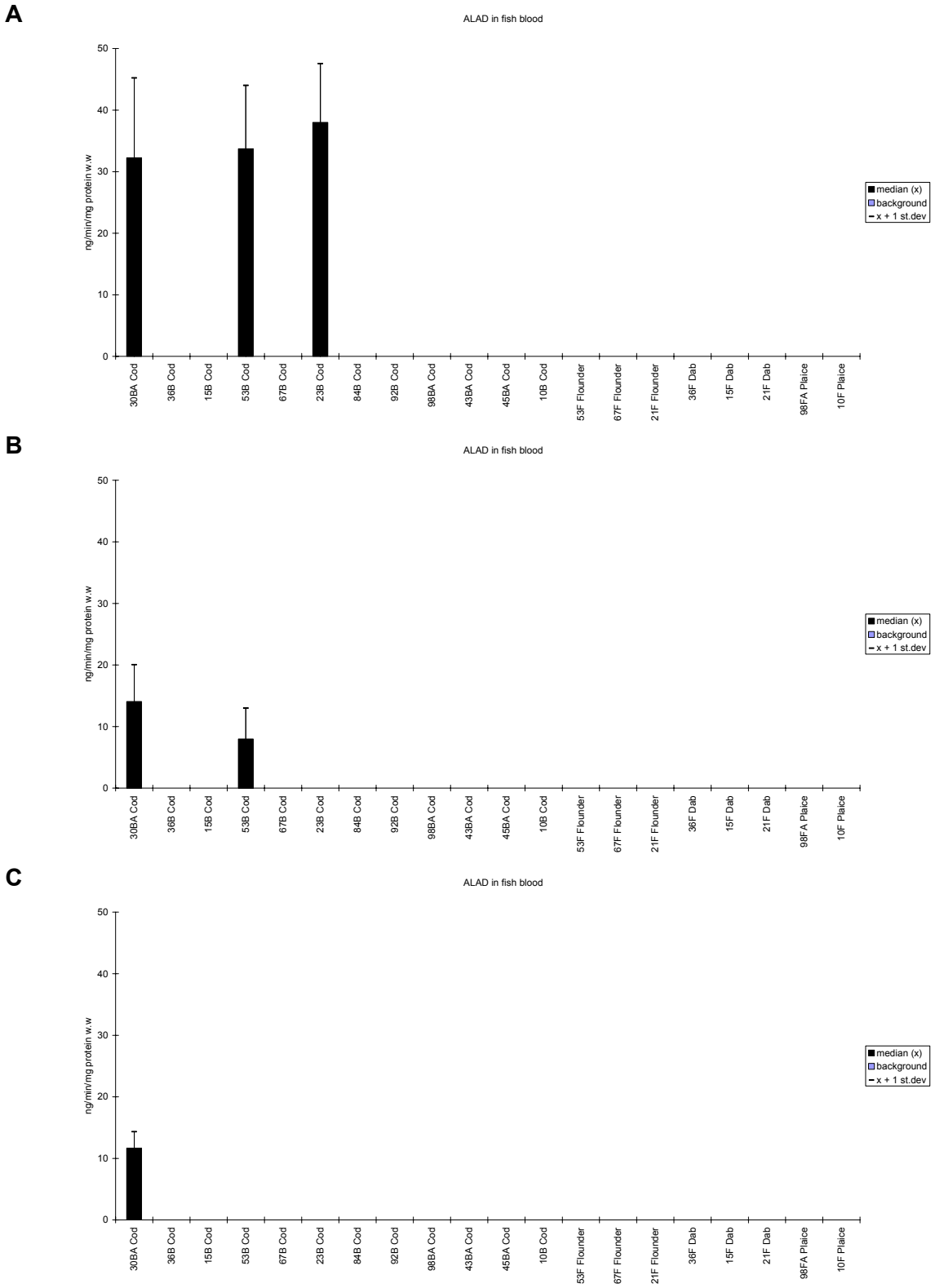



***Figure 76.*** *Median and standard deviation activity for ALA-D ($\delta$-amino levulinic acid dehydrase inhibition) in fish blood 2006 (**A**), 2007 (**B**) and 2008 (**C**), ng PBG (porphobilinogen)/min/mg protein (see maps in Appendix H).*

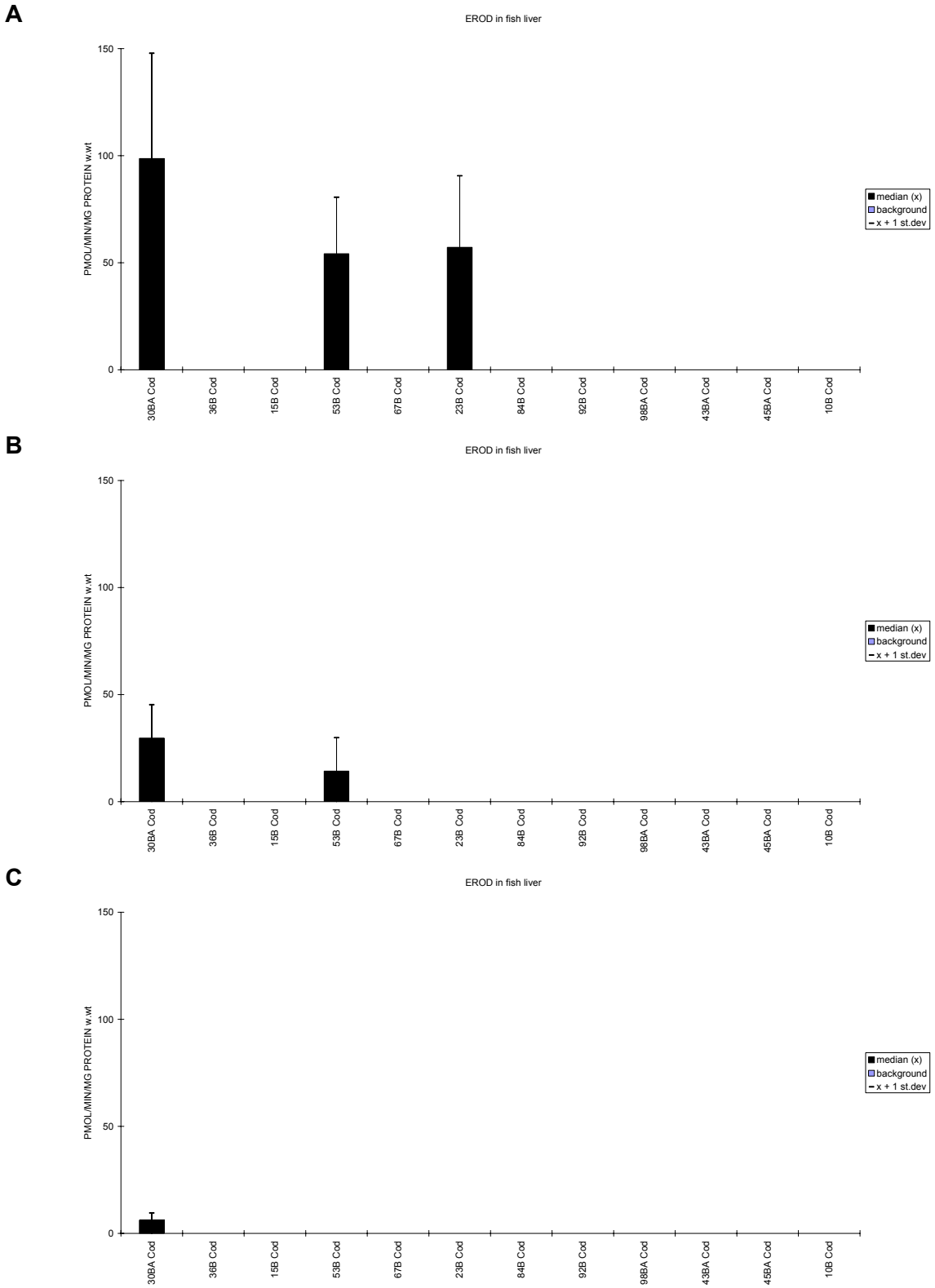



***Figure 77.*** *Median and standard deviation activity for EROD (Cytochrome P4501A-activity) in fish liver 2006 (**A**), 2007 (**B**) and 2008 (**C**), pmol/min/mg protein (see maps in Appendix H).*

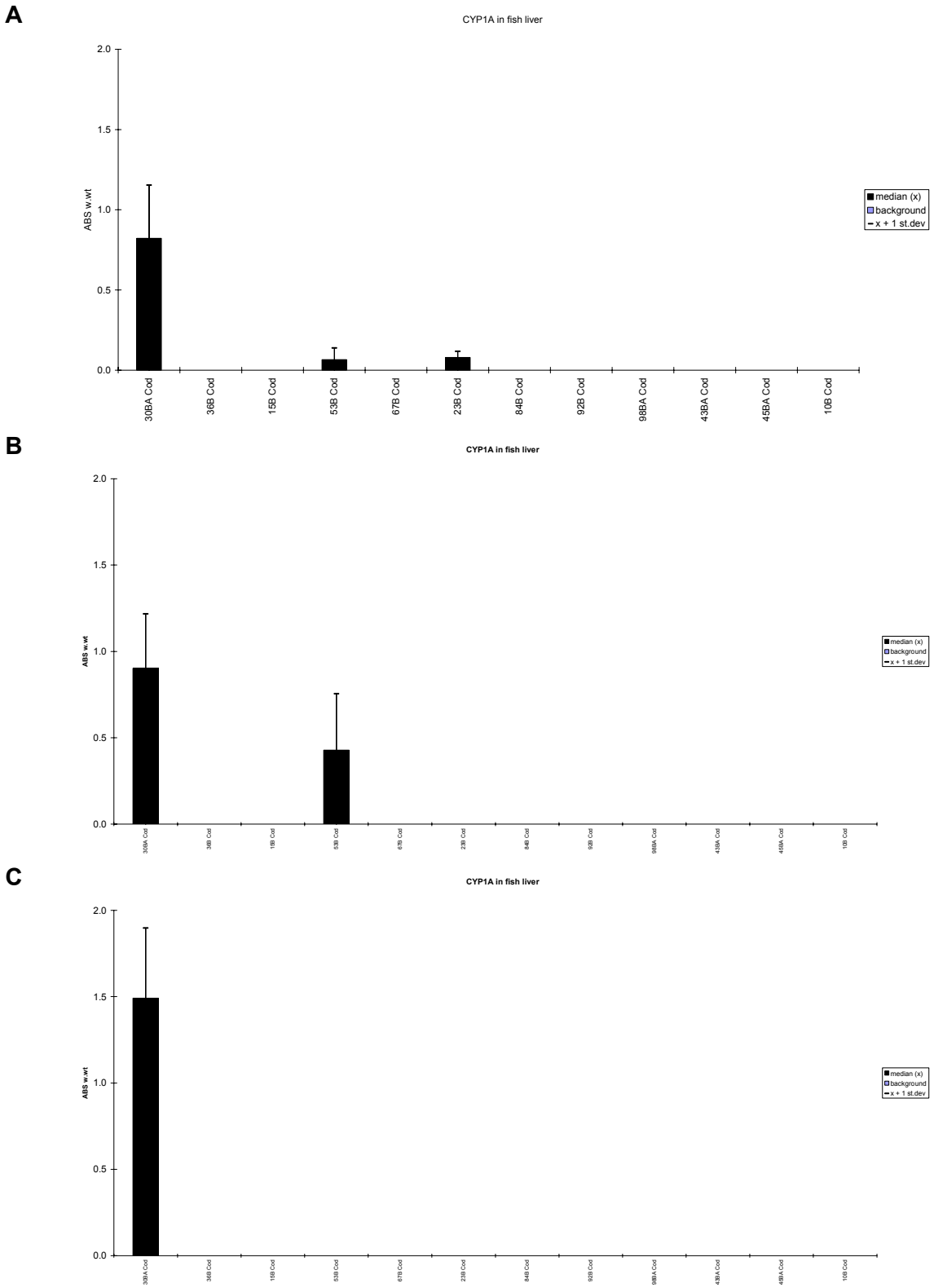



***Figure 78.*** *Median and standard deviation activity for CYP1A (relative amount of Cytochrome P4501A-protein) in fish liver 2006 (**A**), 2007 (**B**) and 2008 (**C**), pmol/min/mg protein (see maps in Appendix H).*

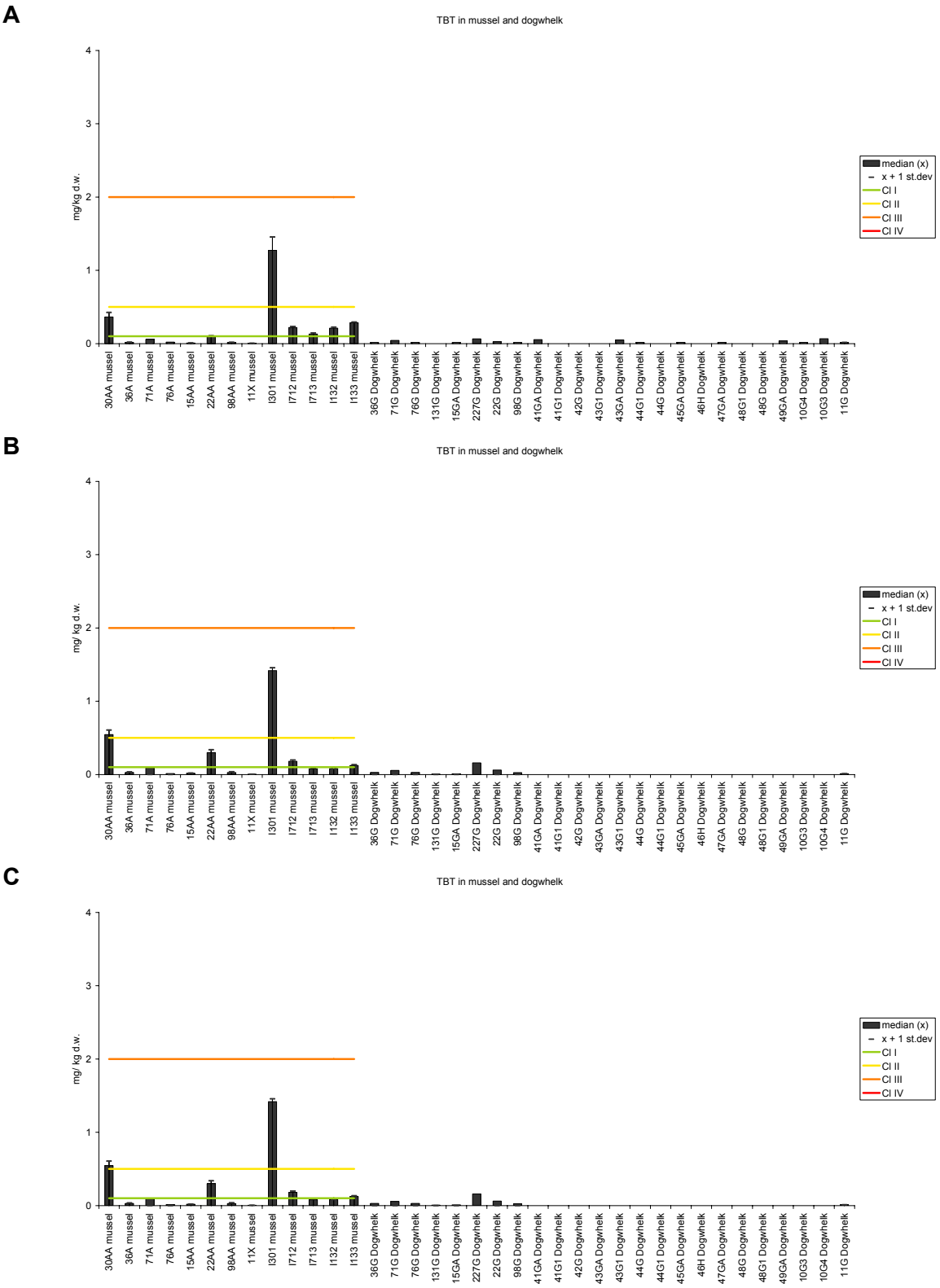



***Figure 79.*** *Median, standard deviation and upper limit to Klif Classes or provisional "high background" concentration for tributyl tin (TBT-concentration on a formulation basis) in blue mussel and dogwhelk 2006 (**A**), 2007 (**B**) and 2008 (**C**), ppm (2.44* mg Sn/kg) dry weight (see maps in Appendix H).*

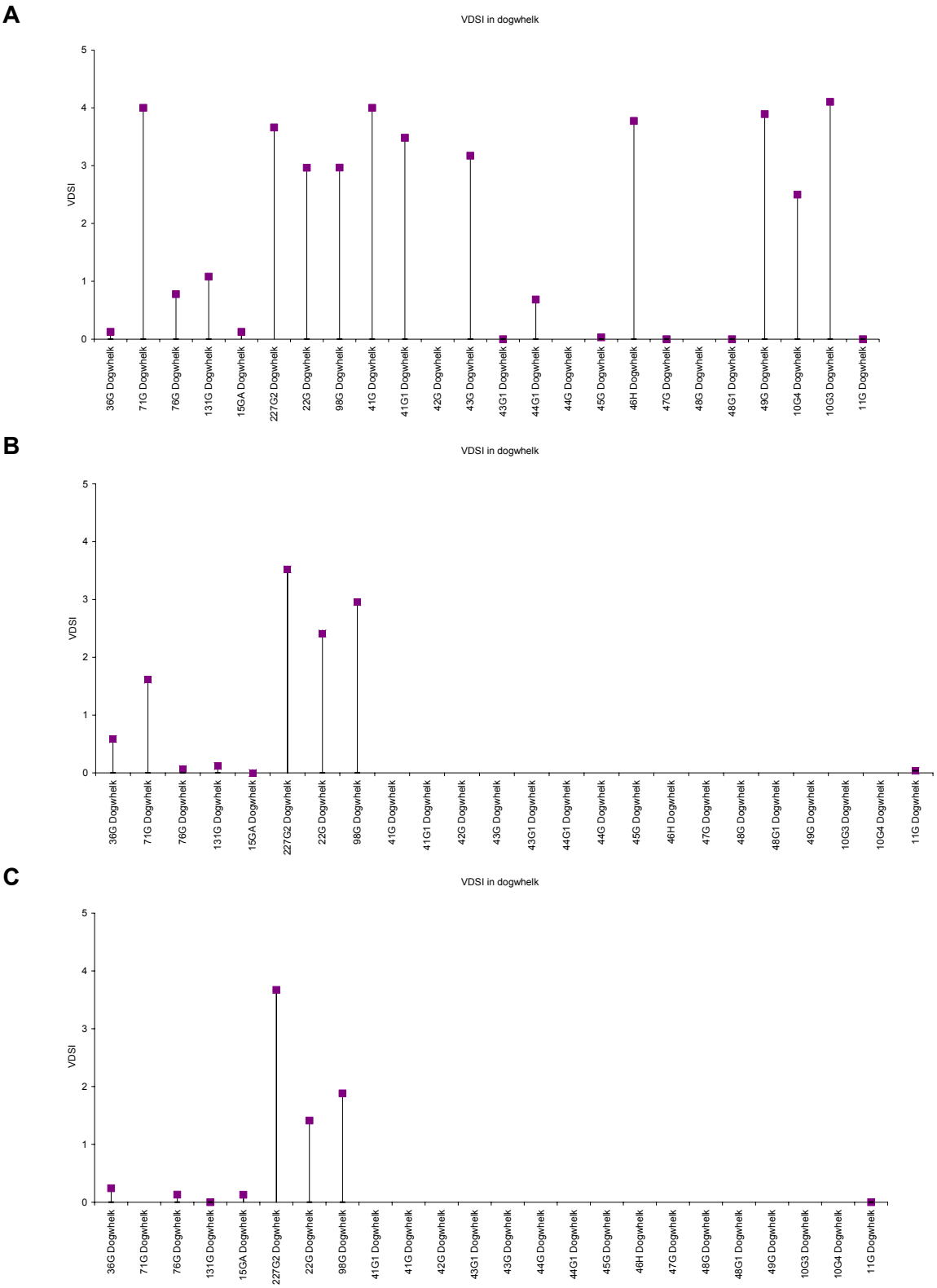



***Figure 80.*** *Average VDSI in dogwhelk 2006 (**A**), 2007 (**B**) and 2008 (**C**) (see maps in Appendix H).*

# Appendix L
# Geographical distribution of contaminants in surficial sediment 1981-2008

**Cadmium (Cd)**
**Mercury (Hg)**
**Lead (Pb)**
**Copper (Cu)**
**Zinc (Zn)**
**Sum of 7 CBs (CB-28, -52, 101, -118, -138, -153 and -180)**
**DDEPP (ppDDE)**
**γ-HCH**
**HCB**
**BAP** (benzo[*a*]pyrene)
**PK-Σn or PK_S** (sum carcinogen PAHs, cf. Appendix B)
**P-Σn or P_S** (sum of PAHs, dicyclic "PAHs" not included, cf. Appendix B)
**TBT**

**Station positions are shown on maps in Appendix H**

**Results are presented for three periods: 1981-1989, 1990-1999 and 2004-2008**
**A station was not monitored more than once during each period.**

# Appendix L
# Geographical distribution of contaminants in surficial sediment 1987 - 2008
# (cont.)

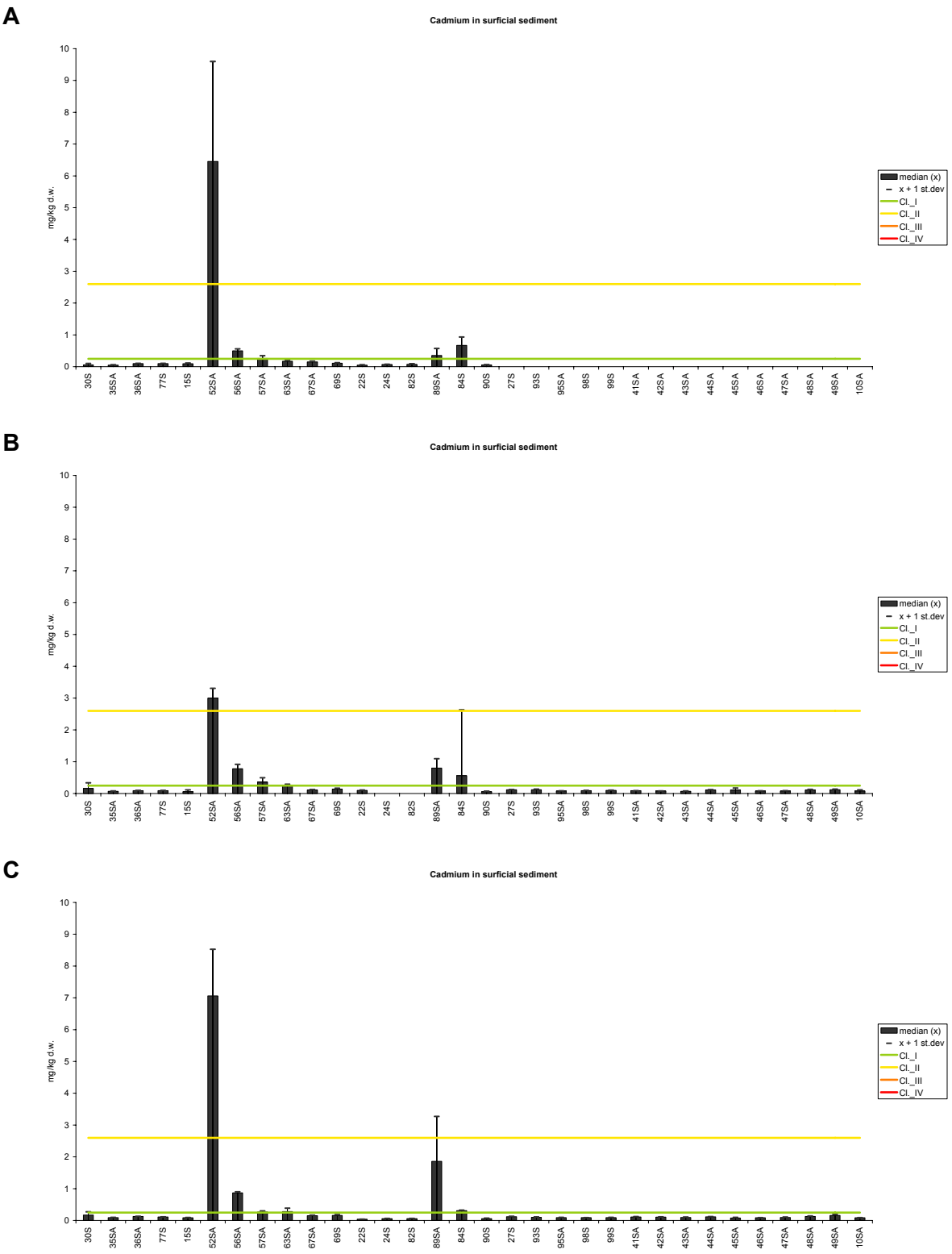



***Figure 81.*** *Median, standard deviation and provisional "high background" concentration for cadmium in surficial sediment (0-2 cm) 1981-1989 (**A**), 1990-1999 (**B**) and 2000-2008 (**C**), ppm (mg/kg) dry weight (see maps in Appendix H).*

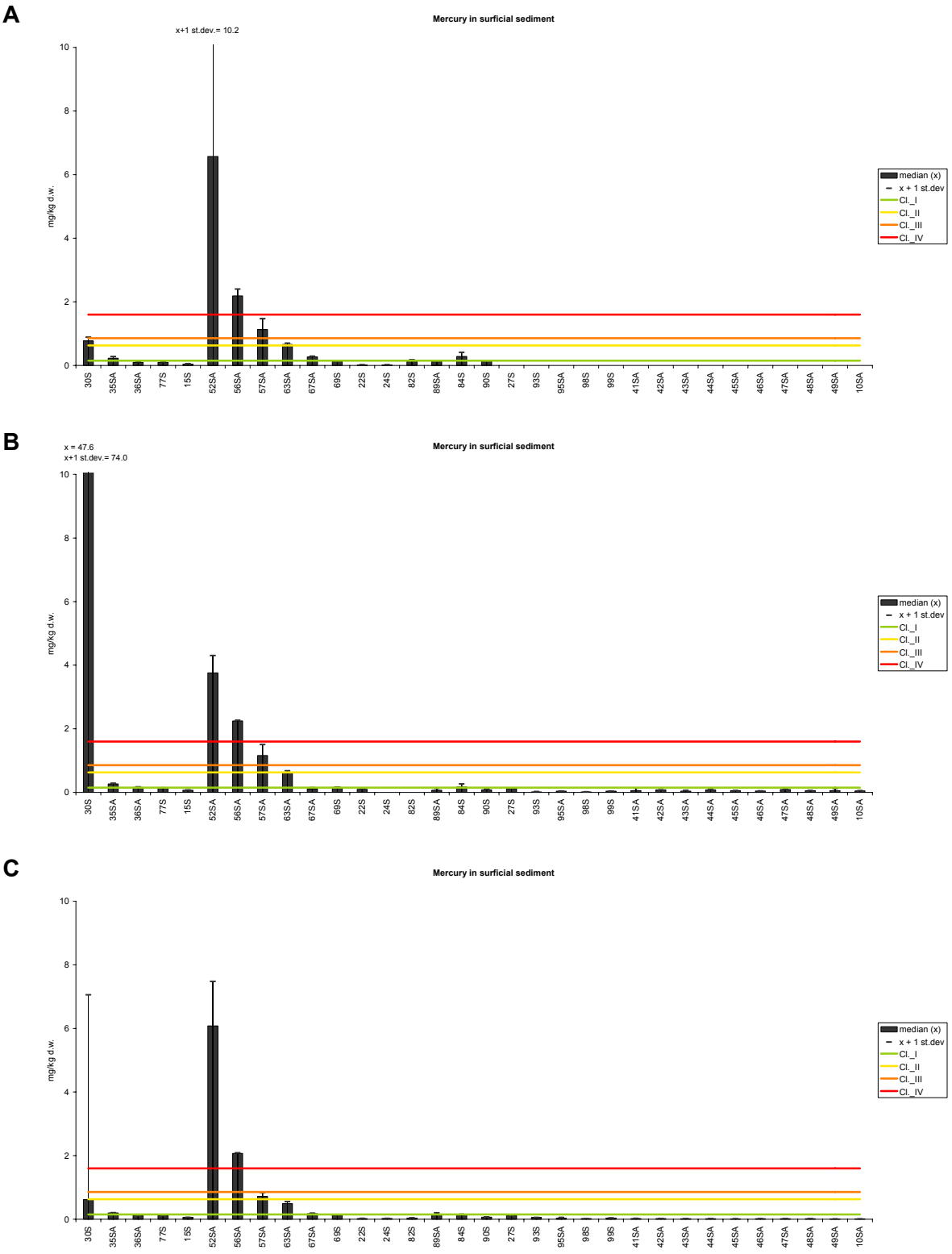



***Figure 82.*** *Median, standard deviation and provisional "high background" concentration for mercury in surficial sediment (0-2 cm) 1981-1989 (**A**), 1990-1999 (**B**) and 2004-2008 (**C**), ppm (mg/kg) dry weight (see maps in Appendix H).* ***Note: for some stations the standard deviation is off-scale in figures A and B.***

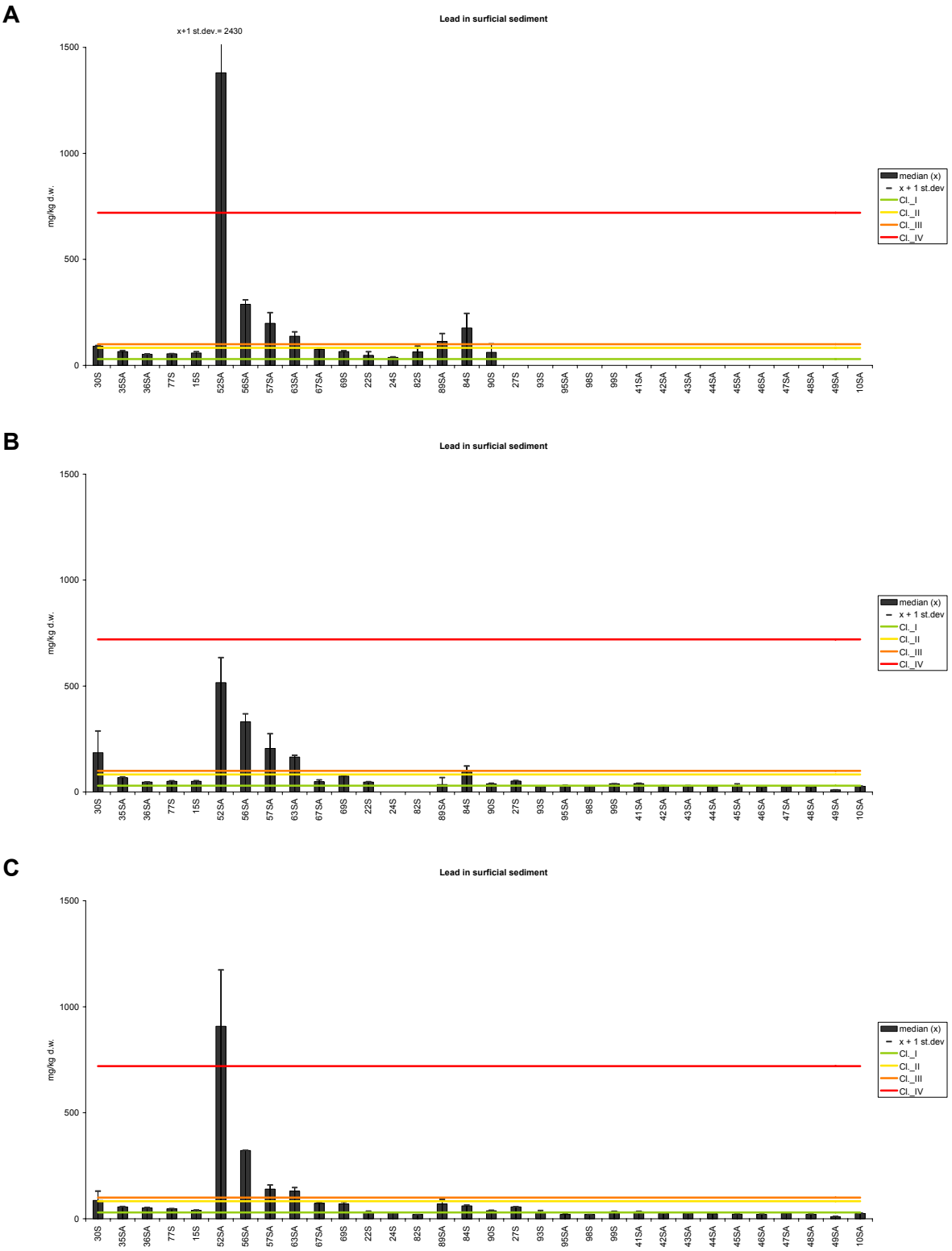



***Figure 83.*** *Median, standard deviation and provisional "high background" concentration for lead in surficial sediment (0-2 cm) 1981-1989 (**A**), 1990-1999 (**B**) and 2000-2008 (**C**), ppm (mg/kg) dry weight (see maps in Appendix H).* ***Note: for some stations the standard deviation is off-scale in figure A.***

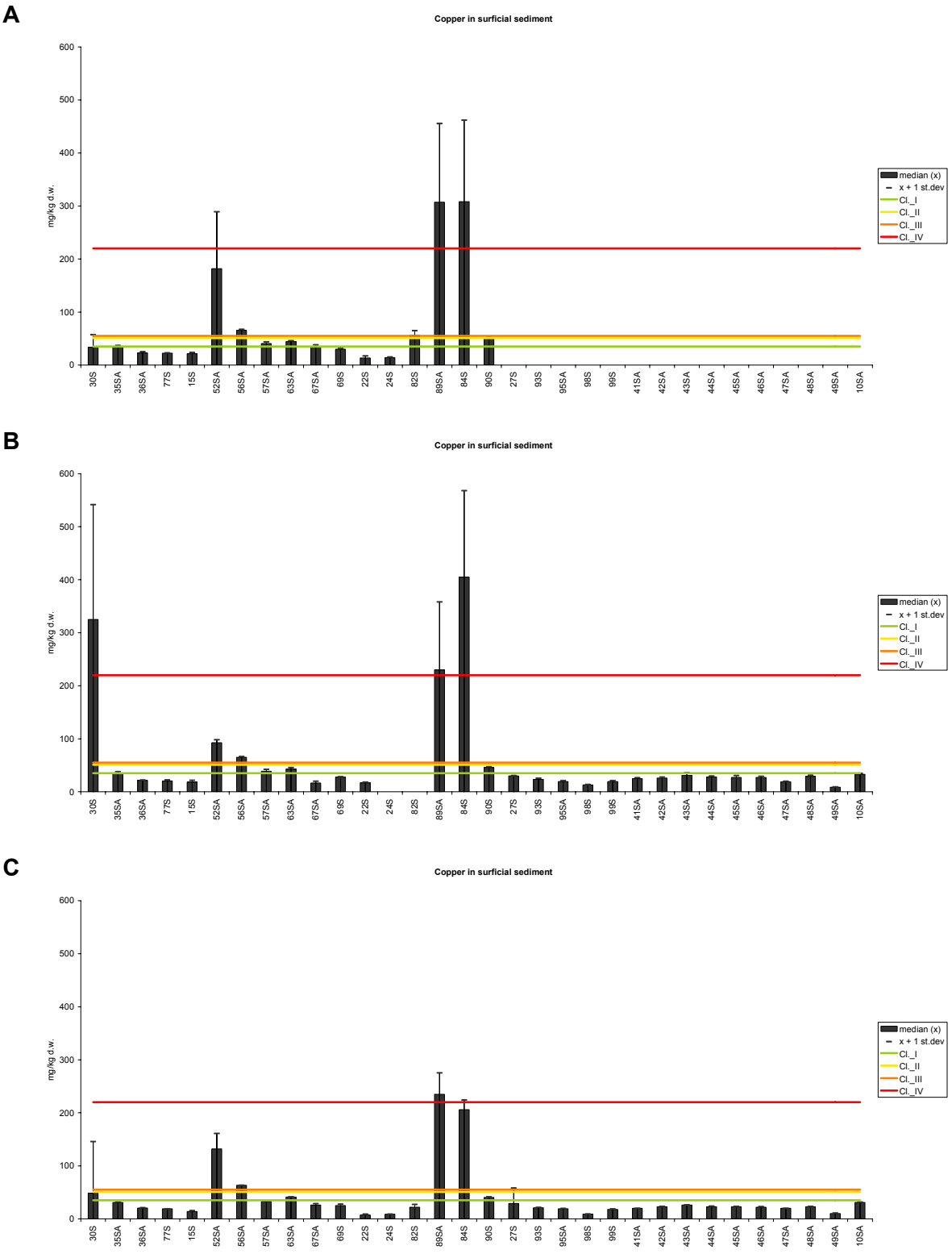



***Figure 84.*** *Median, standard deviation and provisional "high background" concentration for copper in surficial sediment (0-2 cm) 1981-1989 (**A**), 1990-1999 (**B**) and 2000-2008 (**C**), ppm (mg/kg) dry weight (see maps in Appendix H).*

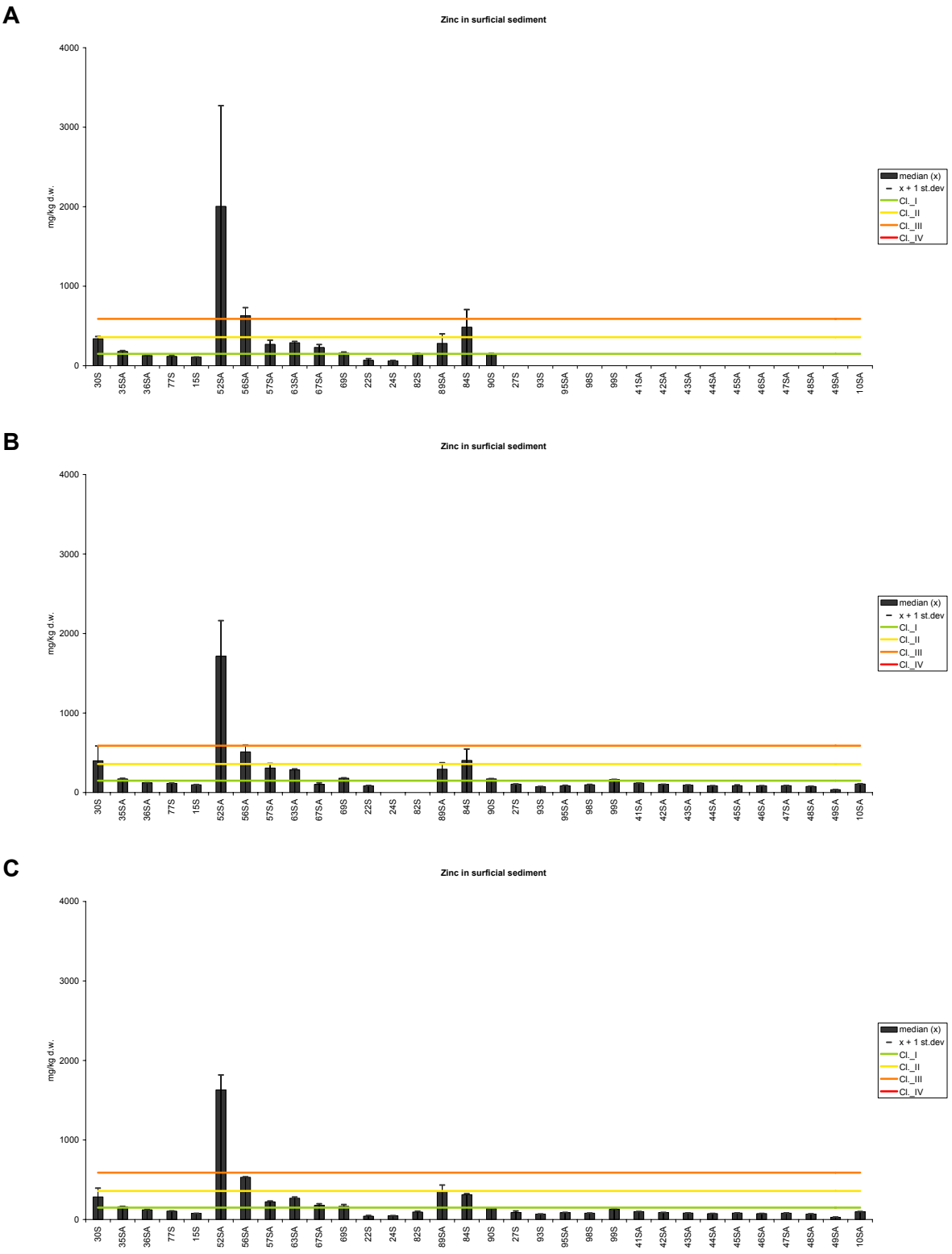



***Figure 85.*** *Median, standard deviation and provisional "high background" concentration for zinc in surficial sediment (0-2 cm) 1981-1989 (**A**), 1990-1999 (**B**) and 2000-2008 (**C**), ppm (mg/kg) dry weight (see maps in Appendix H).*

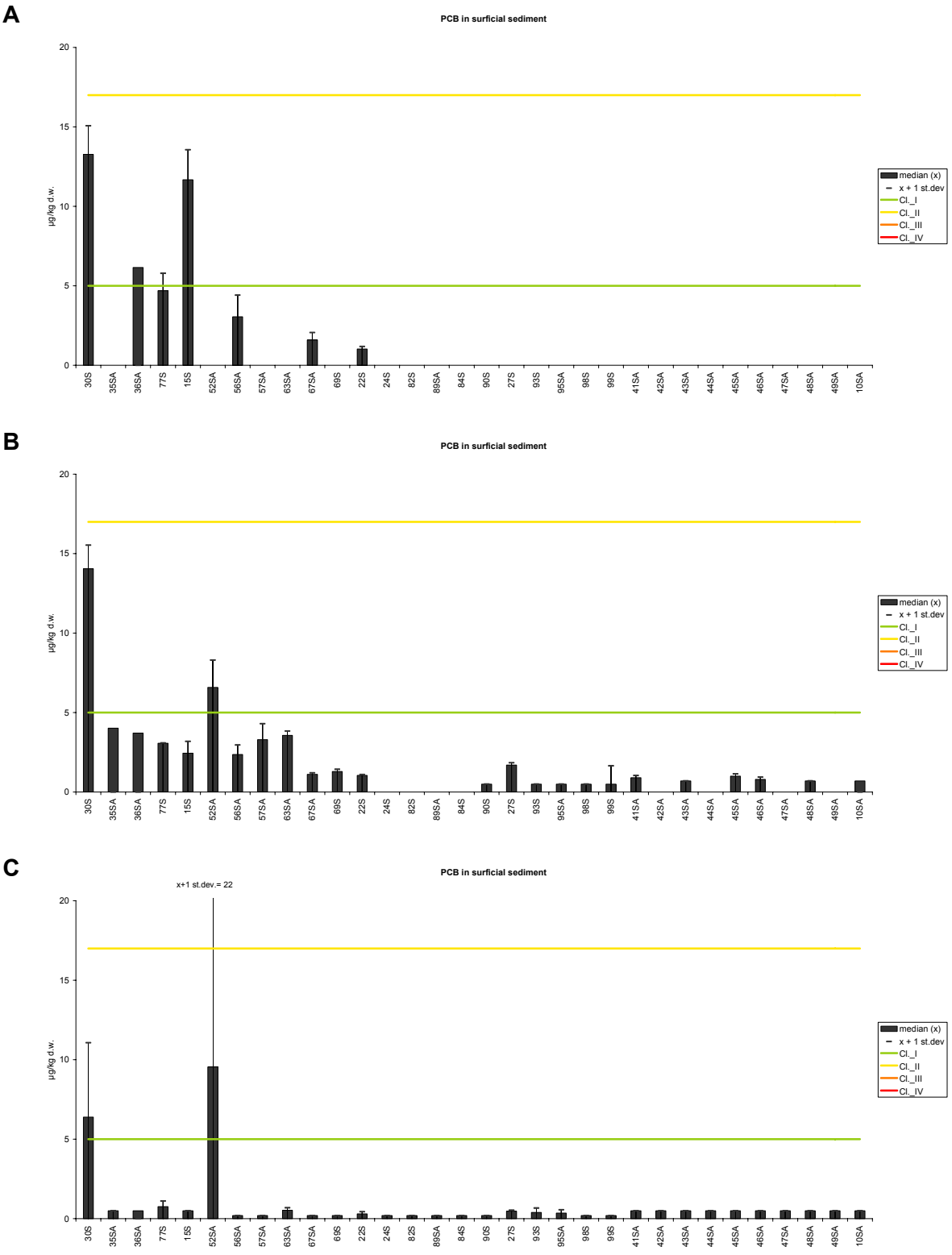



***Figure 86.*** *Median, standard deviation and provisional "high background" concentration for sum of 7 PCBs (CB-28, -52, 101, -118, -138, -153 and -180) in surficial sediment (0-2 cm) 1981-1989 (**A**), 1990-1999 (**B**) and 2000-2008 (**C**), ppb (µg/kg) dry weight (see maps in Appendix H).* ***Note: for some stations the standard deviation is off-scale in figure C.***

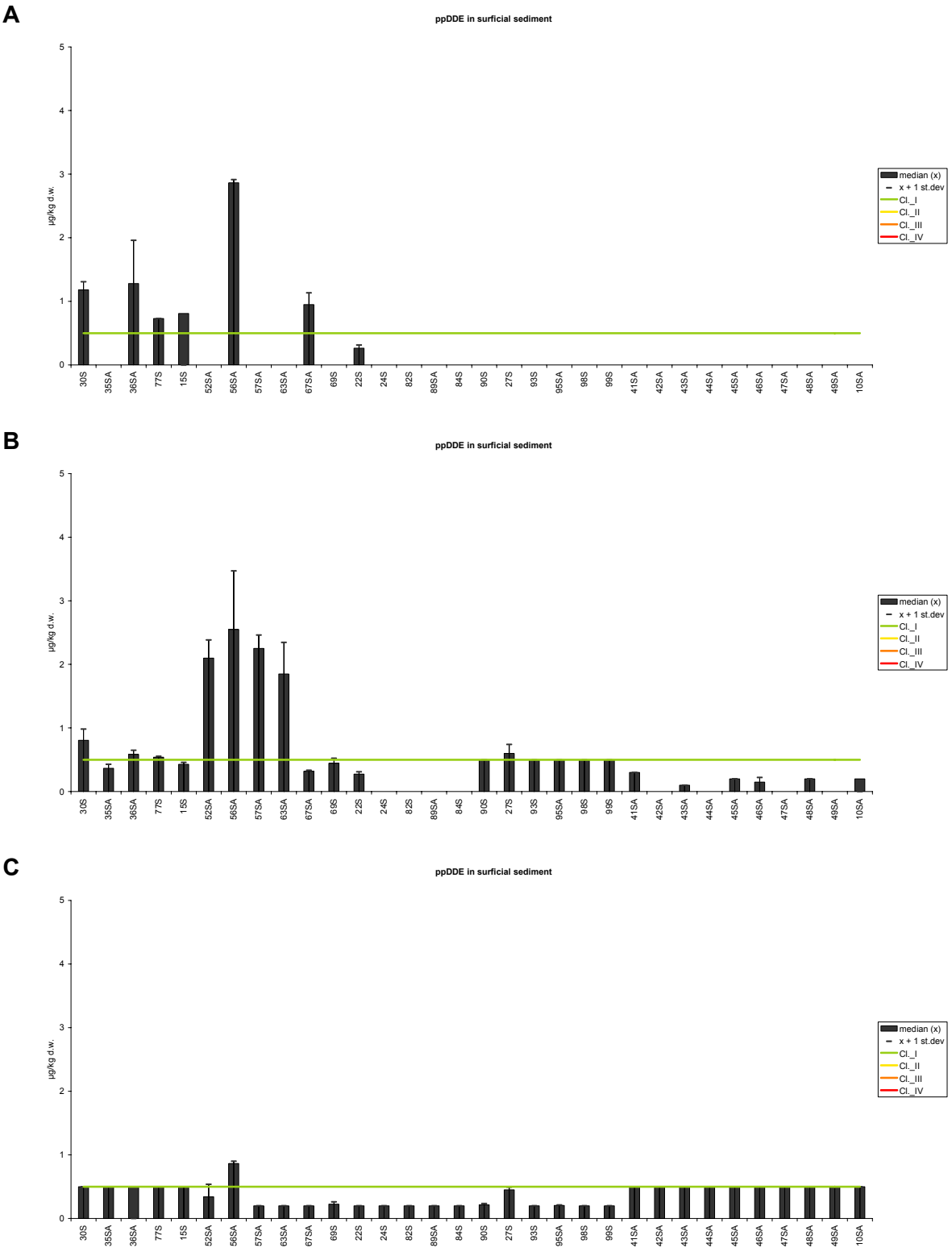



***Figure 87.*** *Median, standard deviation and provisional "high background" concentration for ppDDE (DDEPP) in surficial sediment (0-2 cm) 1981-1989 (**A**), 1990-1999 (**B**) and 2000-2008 (**C**), ppb (µg/kg) dry weight (see maps in Appendix H).* ***Note: Class limits for ΣDDT used.***

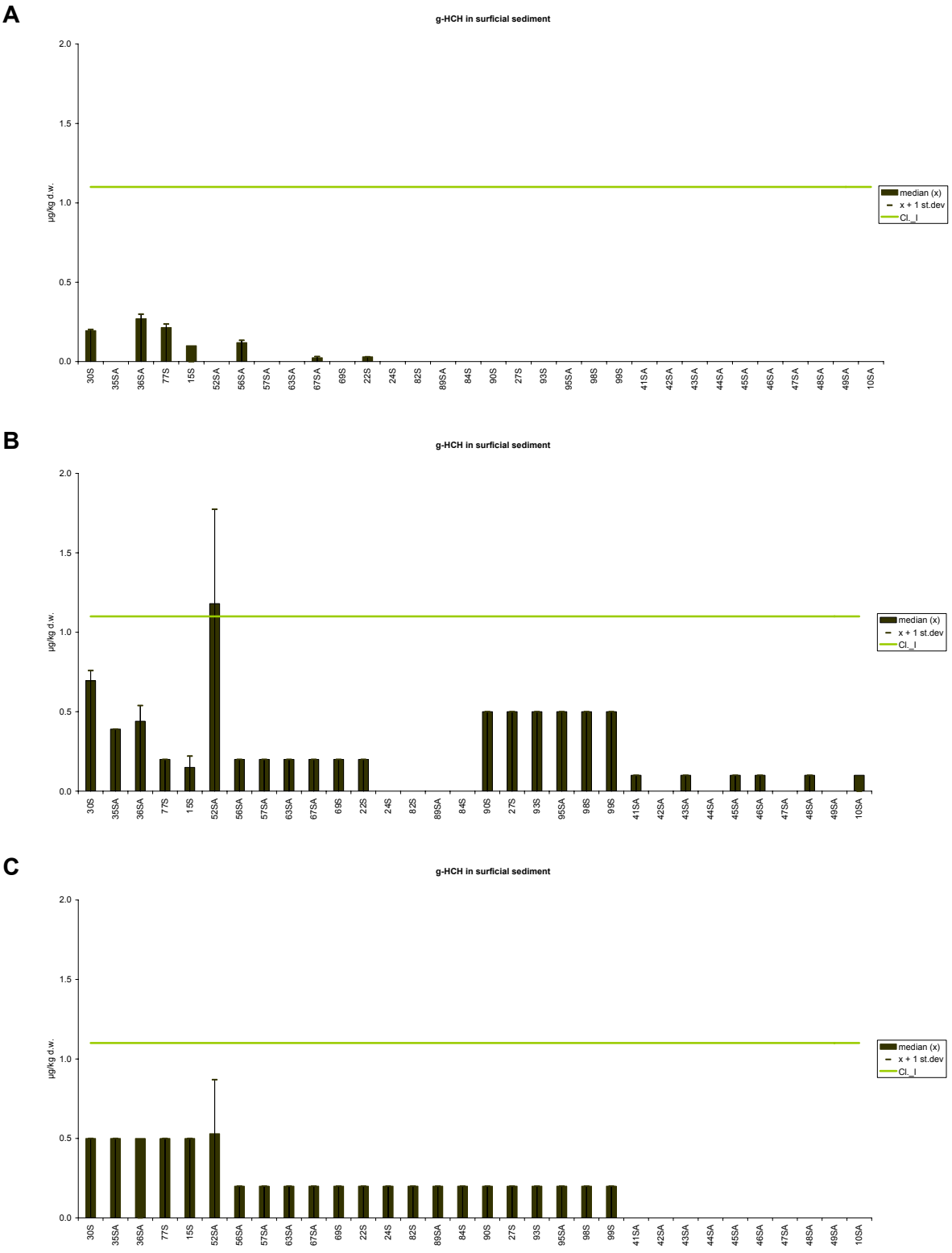



***Figure 88.*** *Median, standard deviation and provisional "high background" concentration for γ-HCH (Lindane) in surficial sediment (0-2 cm) 1981-1989 (**A**), 1990-1999 (**B**) and 2000-2008 (**C**), ppb (µg/kg) dry weight (see maps in Appendix H).*

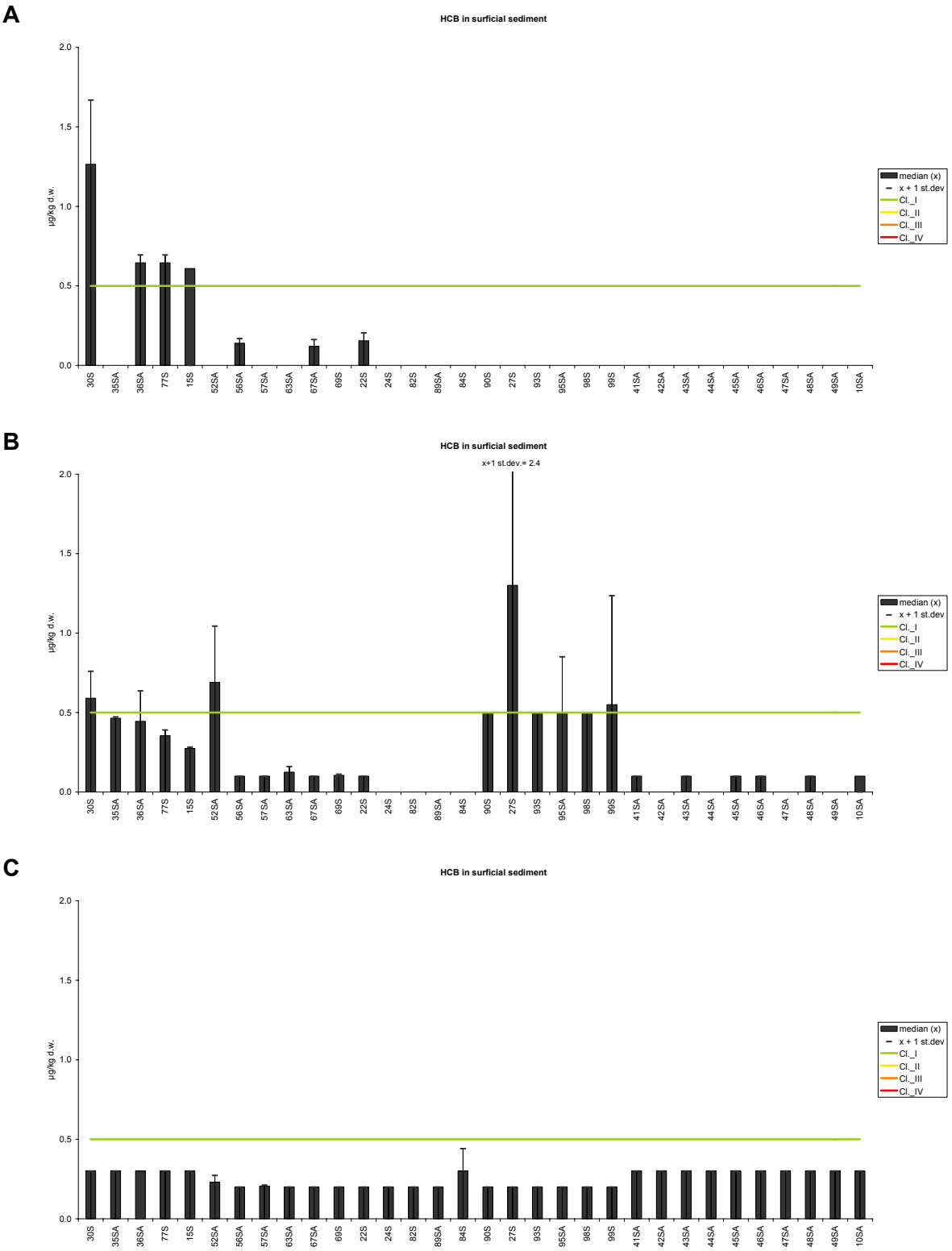



***Figure 89.*** *Median, standard deviation and provisional "high background" concentration for HCB in surficial sediment (0-2 cm) 1981-1989 (**A**), 1990-1999 (**B**) and 2000-2008 (**C**), ppb (µg/kg) dry weight (see maps in Appendix H).* ***Note: for some stations the standard deviation is off-scale in figure B.***

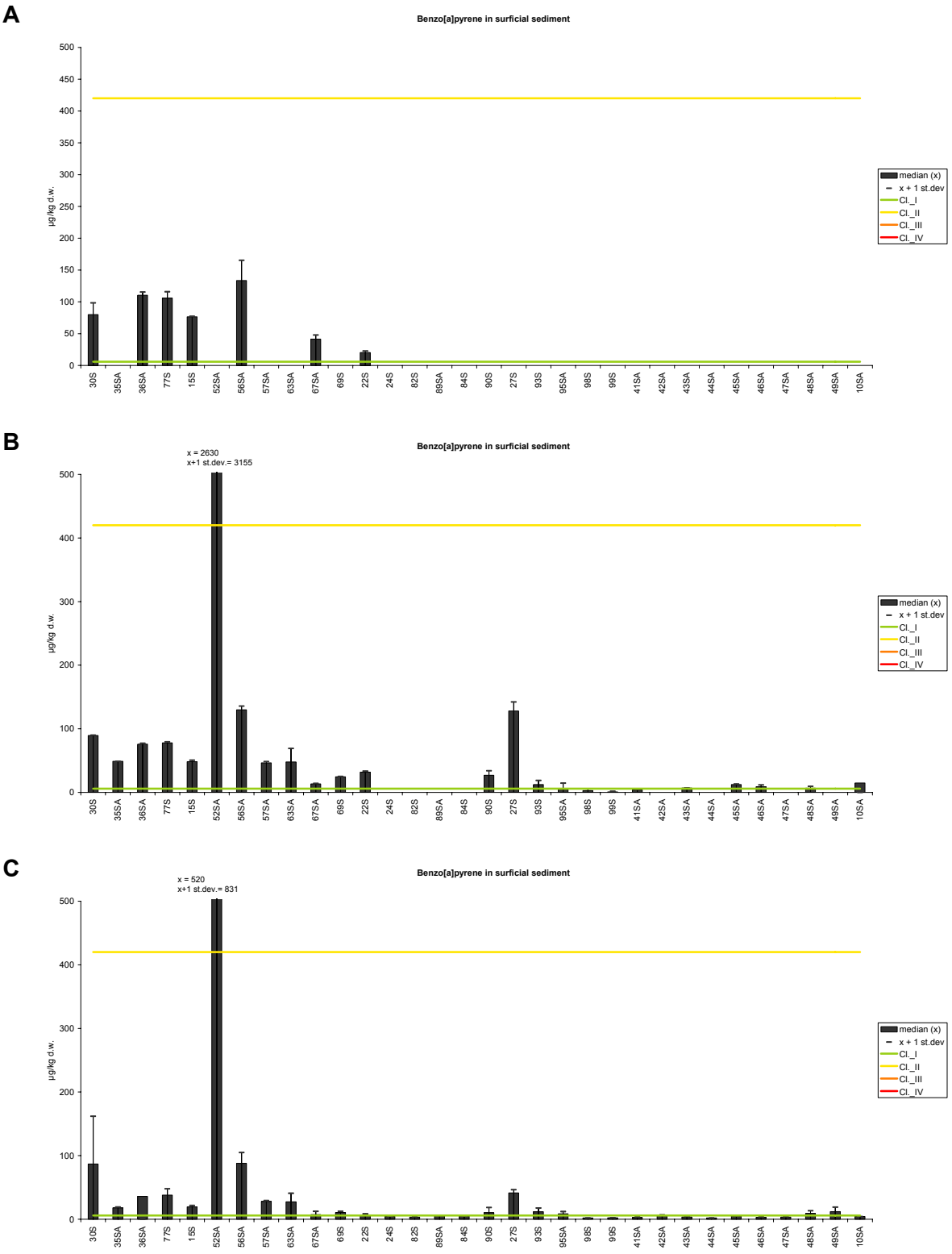



***Figure 90.*** *Median, standard deviation and provisional "high background" concentration for Benzo[a]pyrene (B[a]P) in surficial sediment (0-2 cm) 1981-1989 (**A**), 1990-1999 (**B**) and 2000-2008 (**C**), ppb (µg/kg) dry weight (see maps in Appendix H).* ***Note: for some stations the standard deviation is off-scale in figure B.***

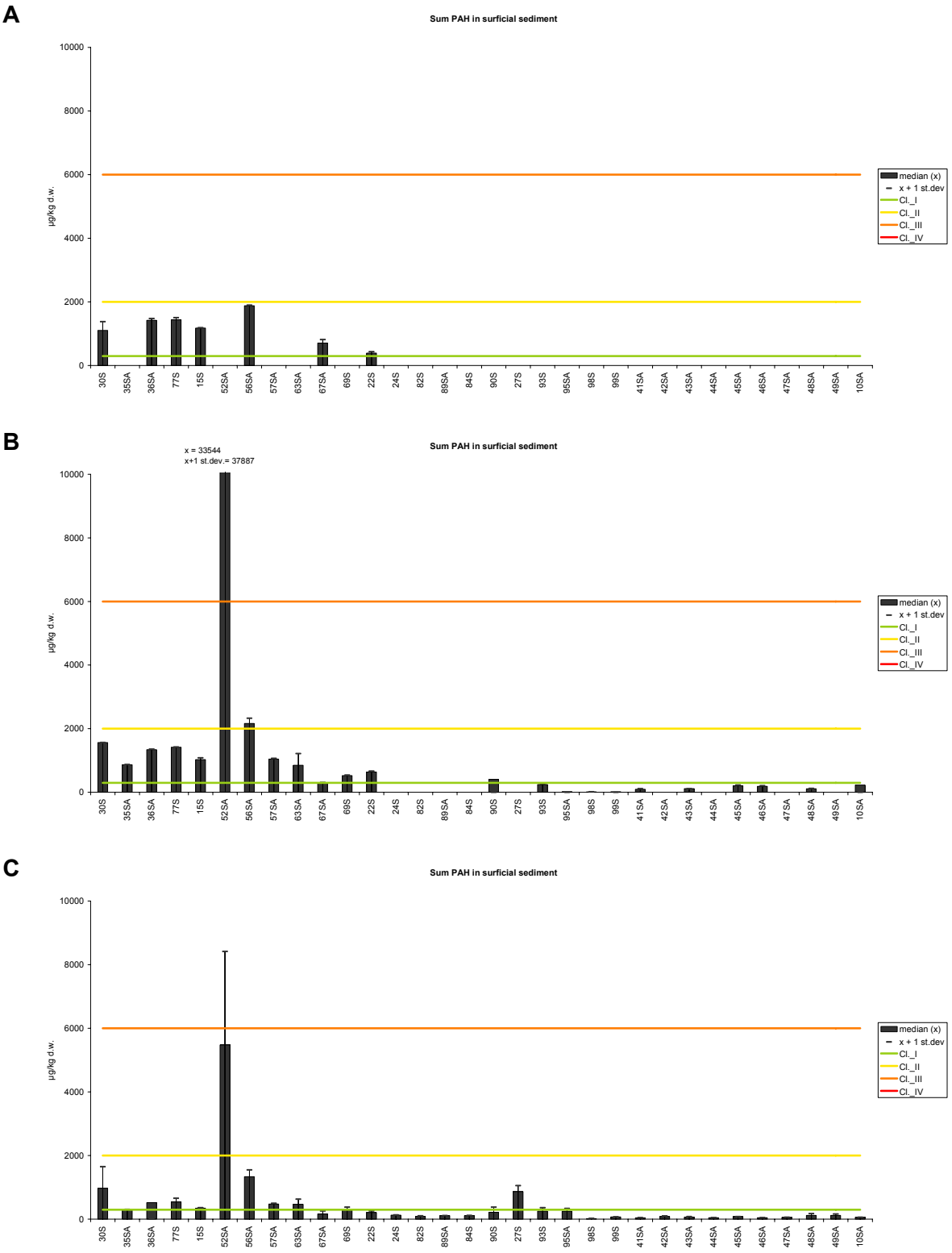



***Figure 91.*** *Median, standard deviation and provisional "high background" concentration for sum of PAH in surficial sediment (0-2 cm) 1981-1989 (**A**), 1990-1999 (**B**) and 2000-2008 (**C**), ppb (µg/kg) dry weight (see maps in Appendix H).* ***Note: for some stations the standard deviation is off-scale in figure B.***

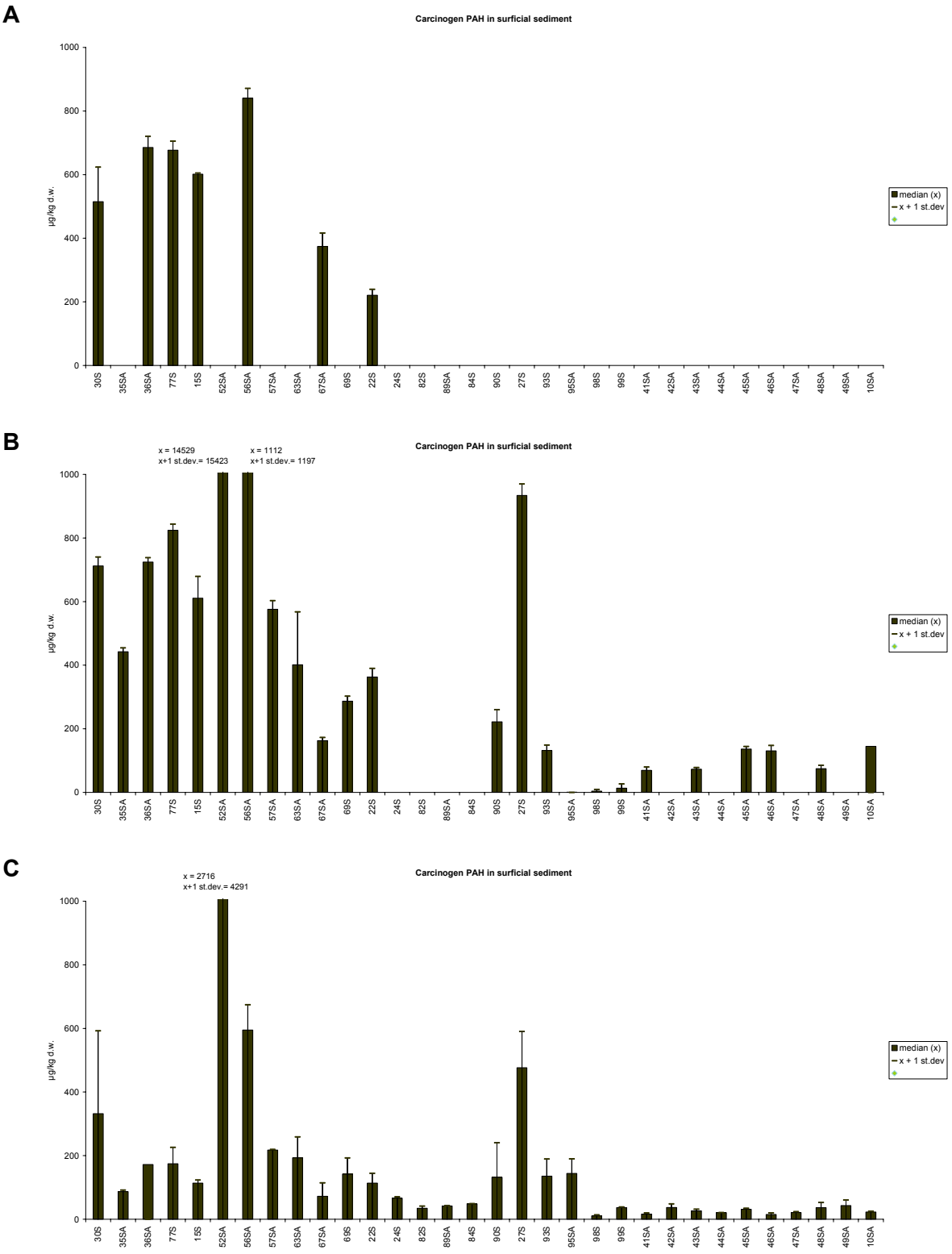



***Figure 92.*** *Median, standard deviation and provisional "high background" concentration for sum of carcinogen PAHs in surficial sediment (0-2 cm) 1981-1989 (**A**), 1990-1999 (**B**) and 2000-2008 (**C**), ppb (µg/kg) dry weight (see maps in Appendix H).* ***Note: for some stations the standard deviation is off-scale in figure B.***

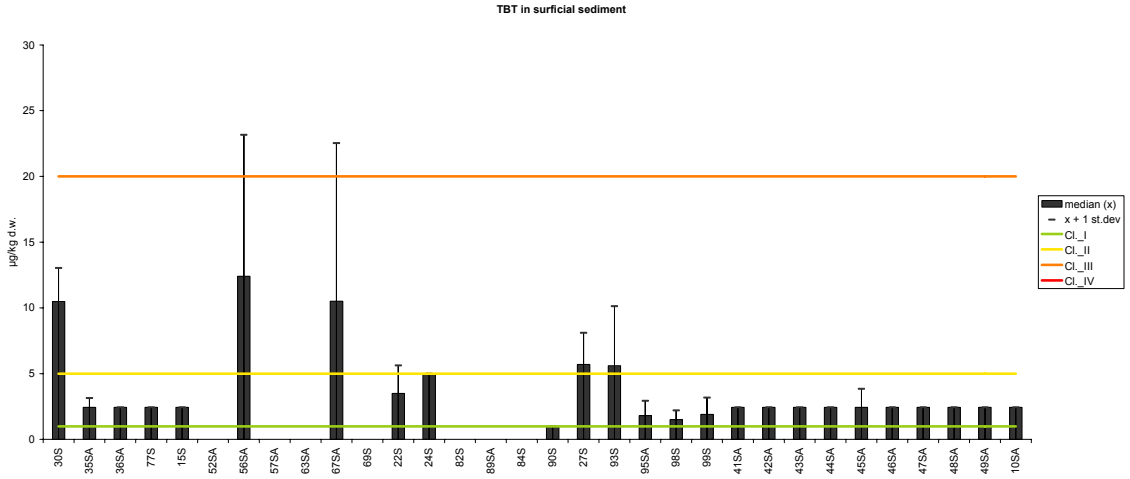



***Figure 93.*** *Median, standard deviation and provisional "high background" concentration for sum of TBT in surficial sediment (0-2 cm) 2000-2008 and ppm (mg/kg) dry weight (see maps in Appendix H).*

# Appendix M
# Results from INDEX determinations 1995-2008

# Introduction

The blue mussel pollution and reference indices are two indices used to evaluate trends of certain hazardous substances in blue mussels from 14 fjord areas in Norway (Figure 94). The Pollution Index is based on a total of 26 blue mussel stations from nine fjord areas regarded as polluted areas. The Reference Index is based on results from 8 blue mussel stations remote from known point sources of pollution in five fjord areas along the coast.

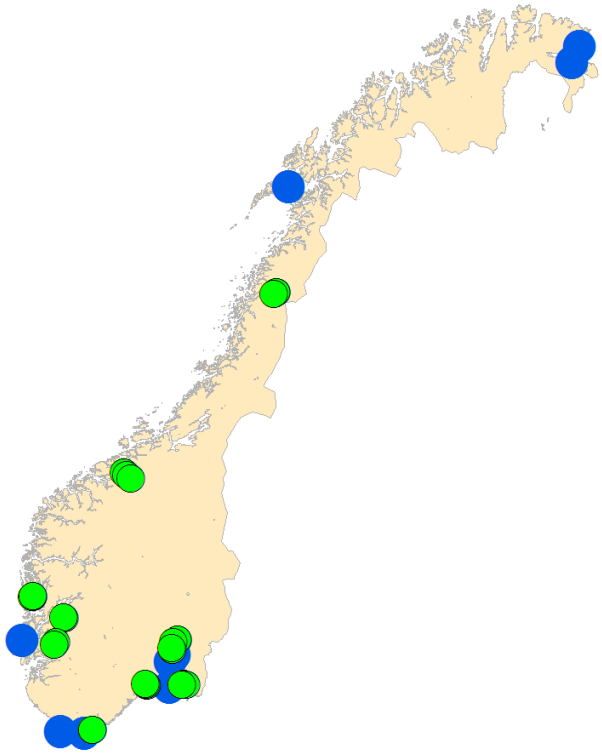


***Figure 94.*** *Blue mussel Index stations sampled in 2008; pollution (green circles), reference (blue circles).*

The Index scale varies from 1 to 5. Based on the analyses each station is classified according to Klif's classification system. Each area or fjord is given an index number according to the station with highest classification, e.g. if one station within an area is classified as Class V, the area is classified as index 5. Index 1 means that all stations within an area are insignificantly polluted (Class I in Klif's classification system). The Pollution (or the Reference) Index is the average of the index numbers from each area and fjords. An Index value between 4 and 5 would be between severe and extreme (Class IV and V) in the Klif system. A value between 3 and 4 would be between marked and severe (Class III and IV). A value between 2 and 3 would be between moderate and marked (Class II and III). A value between 1 and 2 would be between insignificant and moderate (Class I and II).

The Climate and pollution agency (Klif) has requested that a small group of indices be established to assess the quality of the environment with respect to contaminants. The target indicator medium for both indices may vary depending on what purpose is defined, however sediment, cod and blue mussel are considered to be the most relevant choices. Blue mussel was selected for this investigation (Appendix M1).

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 CEMP. Some CEMP 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 blue mussel were collected at CEMP 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 M2 and J3. Their selection is based on earlier investigations. Two to five stations were sampled from each area. Three replicate samples with 20 individuals with a shell length of 3-5 cm were collected from each station. Each sample was analysed for the contaminants according to the scheme in Appendix M2. "Dioxins" were only investigated in 1995-96, but reinstated for some stations in 2002 as part of the annual investigations. Assessment of TBT concentrations was introduced in 2002 even though it is not identified as a selection criteria by Walday et al. (1995).

One to three stations were sampled from selected areas for the determination of the Reference Index. Each station included three replicates which were analysed for the usual CEMP contaminants (cf. analysis code A, Appendix M2). Some samples were also analysed for PAHs and dioxins.

The strategy for sampling blue mussel differed depending on whether the blue mussel were to be used for the Index or for CEMP 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 CEMP and that the blue mussel 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 Klif’s classification system for contaminants in the marine environment (Appendix M4 and Appendix M5). The highest class found for any contaminant measured in an area determined the index value for that area.

The Klif 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 (herein referred to as PCB) is now a distinct parameter for classification. The sum of all PAHs excluding the dicyclic PAHs (herein referred to as PAH) was compared to the system’s “sum-PAH”. Previously this was the calculation of sum-PAH that included the dicyclic PAHs. As analytical methods improved through the years more non-dicyclic PAHs could be quantified, and included the C1-, C2-, and C3-dibenzpthiophenes, and C1-, C2-, C3- and methylated phenathrenes. These were included in the sum of all non-dicyclic PAHs, and comparison between years could be misleading. For this report, ΣPAH was re-calculated, also for previous years, using only the 15 non-dicyclic PAH

listed in the EPA protocol 8310[8]. The recalculation revealed only one difference from previously reported index values (se Green et al. 2008a).

"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 blue mussel. 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 (insignificantly polluted). The highest Index value is 5 and means that at least one median value from each of the areas was in Class V (extremely polluted).

## Conclusion from application of the indices

The indices have been in used since 1995 based on contaminant concentrations in blue mussel from 14-19 areas (cf. Green et al. 2004). Taking into consideration earlier recommendations (Green & Knutzen 2001) the index was adjusted in 2002 to include more stations and analyses of more contaminants. See Green et al. 2002 for detailed information about the revisions. There are currently 26 blue mussel stations used for the Pollution Index and 8 blue mussel stations used for Reference Index. Dioxin and TBT analyses were added to the programme in 2002 for samples collected in the Frierfjord area, Inner Oslofjord and the Inner Kristiansandsfjord. TBT-analyses were also included for some of the reference stations (see Annex). These changes affect the outcome of the index and comparison to previous years should be cautioned. For results up to and including 2001 the results are presented using the old method of calculation, for 2002 the results for both the old and new methods are presented, and for 2003 and since then only the results for the new method are presented (cf. Klif's website at www.miljøstatus.no >> Vannforurensning >> Miljøgifter, marint). Comparison of the two methods for 2002 and 2003 has been done earlier (Green et al. 2004 a, b).

The Klif 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 (PCB) is now a distinct parameter for classification. The sum of all PAHs excluding the dicyclic PAHs (PAH_Σ) was compared to the system's Σ PAH. Previously this was the calculation of sum-PAH that included the dicyclic PAHs. As analytical methods improved through the years more non-dicyclic PAHs could be quantified, and included the C1-, C2-, and C3-dibenzpthiophenes, and C1-, C2-, C3- and methylated phenathrenes. These were included in the sum of all non-dicyclic PAHs, and comparison between years could be misleading. For the National Comments 2006 (Green et al. 2008a), ΣPAH was re-calculated, also for previous years, using only the 15 non-dycyclic PAH listed in the EPA protocol 8310. The recalculation revealed only one difference from previously reported index values, and that was for the Reference Index 2006 reported to Klif as 1.6 in June of 2007, but the recalculation was 1.4 because ΣPAH at Lista dropped into Class I from Class II.

It should also be noted that the Klif classification system is under revision and may affect calculations of the indices in the future. For example, one possible change will be the lowering of limits to the

[8] Acenaphthene, acenaphthylene, anthracene, benzo[*a*]anthracene, benzo[*a*]pyrene, benzo[b]fluoranthene, benzo[ghi]perlyene, benzo[*k*]fluoranthene, chrysene, dibenzo[*a,h*]anthracene, fluoranthene, fluorene, indeno[*1,2,3-cd*]pyrene, phenanthrene and pyrene. NB. for NIVA's ΣPAH, a where these cannot be distinguished but included in a group, such as benzo[*b*]fluoranthene benzo[*b,b,f*]fluoranthene, the value for the group is used. A single compound can not be included in more than one group.

classes for PCBs taking into consideration a lower background from 4 to 3 ppb wet weight suggested by Green & Knutzen (2003).

No special considerations were made when one but not all the stations within an area were sampled. The lack of sufficient samples has occurred several times for the Pollution Index: (st. I205 Bølsnes from Saudafjord 1996, st. I911 Horvika in the Sunndalsfjord since 1999, st. I021 in the Hvaler area 1999, st. I962 in the Inner Ranfjord since 1999, and st. I711 Steinholmen in the Frierfjord 2001).

Because insufficient amount of blue mussel were found at station Horvika in the Sunndalsfjord, two new stations were introduced; Fjøseid (st. I913) in 1999 and Flåøya, northwest (st. I915), in 2003, about 15 and 5 km farther out the fjord from Horvika, respectively. It can be noted that inclusion of supplementary analyse of blue mussel from the "Hydro kai" (st. I916), innermost in Sunndalsfjord, would have increased the index. Because sufficient amount of blue mussel were not found at station I962 Koksverktomta in the Ranfjord since 1999, a new station (st. I965 - Moholmen) was introduced in 2001 about 2 km south of Koksverktomta.

Based on nine fjord areas and on the new calculation with the mentioned supplementary stations and supplementary analyses of dioxin and TBT, the Pollution Index for 2008 was 3.0, unchanged from 2007 (Table 17, Appendix M4). A value between 3 and 4 would be termed by the Klif system as between severe and marked.

Only 5 fjords/areas were monitored for the Reference Index for 1998-2007 compared to 7 for 1997 and 8 for 1995-1996 (Table 18, Appendix M5). However, only four of these provided a common basis (cf. Table 18). Similar to the application Pollution Index, the Reference Index made no special considerations when one but not all the stations within an area were sampled. For the four common areas, this has occurred several times, all in the Varangerfjord area (st. 48A since 1997 and st. 11A since 1998). With Lofoten and the supplementary analyses of TBT included, the Reference Index for 2007 was 1.4, unchanged from 2004 (Table 18, Appendix M5). All five fjords/areas included the TBT analyses. An index value between 1 and 2 would be termed by the Klif system as moderate. No statistically significant temporal trends were found for Cd from Varangerfjord (st. 10A2).

***Table 17.*** *Maximum environmental classification for fjords selected for Pollution INDEX. (See text and Appendix M4).*

| Index Area [1] | 1995 | 1996 | 1997 [2] | 1998 | 1999 | 2000 | 2001 | 2002 | 2002 new [7] | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hvaler/Singlefjord | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Iddefjord | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Inner Oslofjord | 3 | 3 | 4 | 2 | 3 | 2 | 2 | 2 | 4 | 4 | 4 | 4 | 3 | 3 | 3 |
| Frierfjord, Grenlandsfjords | 3 | 4 | 3 | 3 | 3 | 3 | 3 | 5 [6] | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Inner Kristiansandsfjord | 5 | 5 | 5 | 5 | 5 | 4 | 3 | 3 | 3 | 4 | 4 | 4 | 3 | 4 | 4 |
| Saudafjord | 4 | 5 | 5 | 3 | 4 | 3 | 3 | 4 | 4 | 2 | 3 | 2 | 2 | 2 | 2 |
| Sørfjord | 5 | 4 | 3 | 3 | 4 | 4 | 3 | 4 | 4 | 5 | 4 | 4 | 3 | 3 | 3 |
| Byfjorden, Bergen [3] | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 3 | 4 | 3 | 3 | 3 | 2 | 2 |
| Sunndalsfjord | 3 | 3 | 3 [4] | 2 | 3 | 4 | 2 | 3 | 3 | 1 | 1 | 1 | 1 | 2 | 2 |
| Orkdalsfjord | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Inner Ranfjord | 5 | 3 | 3 [5] | 4 | 2 | 2 | 3 | 3 [6] | 3 | 5 | 5 | 3 | 4 | 4 | 4 |
| **AVERAGE (Pollution INDEX)** | **3.7** | **3.6** | **3.4** | **3.0** | **3.1** | **2.9** | **2.7** | **3.2** | **3.4** | **3.6** | **3.4** | **3.1** | **2.9** | **3.0** | **3.0** |

[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

[6] Results from supplementary station would not influence the outcome of classification

[7] Inclusion of supplementary a station in Frierfjord, Inner Ranfjord, and Sunndalsfjord (2003), and supplementary dioxin and TBT analyses for Inner Oslofjord, Frierfjord, and Inner Kristiansandfjord.

[8] Results from supplementary station would influence the outcome of classification.

***Table 18.*** *Maximum environmental classification for fjords selected for Reference INDEX. (See text and Appendix M5).*

| Index Area | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2002 new [5] | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mid and outer Oslofjord [1] | 2 | 2 | 2 | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 1 | 1 | 2 | 1 | 1 |
| Lista | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 1 | 1 | 1 |
| Bømlo-Sotra | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 1 | 2 | 3 | 2 | 2 | 2 | 2 | 2 |
| Outer Ranfjord, Helgeland [2] | (1) | (1) | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Lofoten [3] | (2) | (2) | (1) | (2) | (2) | (1) | (2) | (2) | 2 | 2 | 1 | 1 | 1 | 1 | 1 |
| Finnsnes-Skjervøy [2] | (2) | (1) | (1) | - | - | - | - | - | - | - | - | - | - | - | - |
| Hammerfest-Honningsvåg [2] | (2) | (3) [4] | (2) | - | - | - | - | - | - | - | - | - | - | - | - |
| Varanger Peninsula | 1 | 2 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| **AVERAGE (Reference INDEX)** | **1.3** | **1.5** | **1.3** | **1.3** | **1.3** | **1.5** | **1.8** | **1.3** | **1.6** | **1.8** | **1.4** | **1.4** | **1.4** | **1.4** | **1.4** |

[1] Inclusion of results for arsenic, nickel and silver in 1996 did not affect the classification

[2] Inconsistency in sampling from sites from Outer Ranfjord, Finnsnes-Skjervøy and Hammerfest-Honningsvåg, hence, results were excluded. See cf., Green et al. 2000 for more details for outer Ranfjord.

[3] Inconsistency in sampling from this site, 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.

[5] Inclusion of supplementary TBT analyses for Mid and outer Oslofjord, Lista, Bømlo-Sotra, Lofoten and Varangerfjord Peninsula.

# Appendix M1
# INDEX - Sampling and analyses for 1995-2008

***Appendix M1.*** *Blue mussel samples planned or used in INDEX and other purposes besides CEMP 1995-2006, where P = "Pollution Index" and R = "Reference Index" (contaminated and assumed "background" stations, respectively). + indicates CEMP 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 M2. See Walday et al. (1995) for discussion of selection of stations and analyses.*

| | STATION | INDEX | | ANALYSIS CODE | | | | | | | | | | | CM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| st. | | | + | A | B | C | D | E | F | G | H | I | J | K | |
| | **HVALER/SINGLEFJORD AREA** | | | | | | | | | | | | | | |
| I021 | Kjøkø, south | P | | 3 | | | | | | | | | | | |
| I024 | Kirøy, north west | P | | 3 | | | | | | | | | | | |
| I022 | West Damholmen | P | | 3 | | | | | | | | | | | |
| I023 | Singlekalven, south | P | | 3 | | | | | | | | | | | |
| | **IDDEFJORD** | | | | | | | | | | | | | | |
| I001 | Sponvikskansen | P | | | 3 | | | | | | | | | | |
| I011 | Kråkenebbet | P | | | 3 | | | | | | | | | | |
| | **OSLOFJORD**, Inner | | | | | | | | | | | | | | |
| 30A | Gressholmen | P | + | 3 | | | | | | | 3 | | 2 | 2 | |
| I301 | Akershuskaia | P | | | | 3 | | | | | | | | 2 | |
| I304 | Gåsøya | P | | | | 3 | | | | | | | | | |
| I307 | Ramtonholmen | P | | | | 3 | | | | | | | | | |
| I306 | Håøya | P | | | | 3 | | | | | | | | | |
| | **OSLOFJORD**, mid and outer | | | | | | | | | | | | | | |
| 31A | Solbergstrand | R | + | 3 | | | | | | | | | | | |
| 35A | Mølen | R | + | 3 | | | | | | | | | | | |
| 36A | Færder | R | + | 3 | | | | | | | | | | 2 | |
| | **FRIERFJORD AREA**, west of outer Oslofjord | | | | | | | | | | | | | | |
| I712 | Gjermundsholmen | P | | | | | 3 | | | | | | 2 | 2 | |
| I713 | Strømtangen | P | | | | | 3 | | | | | | 1 | 2 | |
| 71A | Bjørkøya | P | + | 3 | | | | | | | | | 2 | 1 | |
| 76A | Risøy | R | + | 3 | | | | | | | | | 2 | 1 | |
| | **INNER KRISTRIANSANDSFJORD** | | | | | | | | | | | | | | |
| I1321 | Svensholmen | P | | | | | | 3 | | | | | 2 | 2 | |
| I133 | Odderø, west | P | | | | | | 3 | | | | | 1 | 2 | |
| | **LISTA AREA** | | | | | | | | | | | | | | |
| 15A | Gåsøya | R | + | 3 | | | | | | | | | | 2 | |
| I131A | Lastad | R | | | | 3. | | | | | | | | | g |
| | **SAUDAFJORD** | | | | | | | | | | | | | | |
| I201 | Ekkjegrunn (G1) | P | | | | | | | 3 | | | | | | |
| ** I205 | Bølsnes (G5) | P | | | | | | | 3 | | | | | | |
| | **[HAUGESUND AREA not related to INDEX investigation]** | | | | | | | | | | | | | | |
| 227A1 | Melandsholmen | O | | 3 | | | | | | | | | | 1 | |
| | **BØMLO-SOTRA AREA** | | | | | | | | | | | | | | |
| 22A | Espevær, west | R | + | 3 | | | | | | | | | | 2 | c,a |
| | **SØRFJORD** | | | | | | | | | | | | | | |
| * 51A | Byrkjeneset | P | | 3 | | | | | | | | | | | |
| 52A | Eirtrheimsneset | P | + | 3 | | | | | | | | | | | c |

**Appendix M1 (continued)**

| | STATION | INDEX | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | st. | | | | | | | + | A | B | C | D | E | F | G | H | I | J | K | CM |
| | | **BYFJORDEN, BERGEN** | | | | | | | | | | | | | | | | | | |
| | I242 | Valheimsneset | P | . | . | . | . | . | . | . | . | . | . | . | 3 | . | . | . | . | |
| | I241 | Nordnes | P | . | . | . | . | . | . | . | . | . | . | . | 3 | . | . | . | . | |
| | I243 | Hagreneset | P | . | . | . | . | . | . | . | . | . | . | . | 3 | . | . | . | . | |
| | | **SUNNDALSFJORD** | | | | | | | | | | | | | | | | | | |
| | I912 | Honnhammer | P | . | . | . | . | . | . | . | . | . | . | . | . | 3 | . | . | . | |
| | I913 | Fjøseid | P | . | . | . | . | . | . | . | . | . | . | . | . | 3 | . | . | . | |
| | I914 | Flåøya, southeast | P | . | . | . | . | . | . | . | . | . | . | . | . | 3 | . | . | . | |
| | I915 | Flåøya, northwest | P | . | . | . | . | . | . | . | . | . | . | . | . | 3 | . | . | . | |
| | | **[TRONDHEIM AREA - not related to index investigation]** | | | | | | | | | | | | | | | | | | |
| * | 80A | Østmarknes | - | . | . | . | . | . | . | . | . | . | . | . | . | . | 3 | . | . | |
| | | **ORKDALSFJORD AREA (not suggested in Walday et al. 1995)** | | | | | | | | | | | | | | | | | | |
| | 82A | Flakk | P | . | . | . | . | + | 3 | . | . | . | . | . | . | . | . | . | . | |
| | 84A | Trossavika | P | . | . | . | . | + | 3 | . | . | . | . | . | . | . | . | . | . | |
| | 87A | Ingdalsbukta | P | . | . | . | . | + | 3 | . | . | . | . | . | . | . | . | . | . | |
| | | **INNER RANFJORD** | | | | | | | | | | | | | | | | | | |
| | I962 | Koksverkkaien (B2) | P | . | . | . | . | . | . | . | . | . | . | . | . | . | 3 | . | . | c |
| | I964 | Toraneskaien | P | . | . | . | . | . | . | . | . | . | . | . | . | . | 3 | . | . | |
| | I965 | Moholmen (B5) | P | . | . | . | . | . | . | . | . | . | . | . | . | . | 3 | . | . | |
| | I969 | Bjørnbærviken (B9) | P | . | . | . | . | . | . | . | . | . | . | . | . | . | 3 | . | . | |
| | | **OUTER RANFJORD, HELGELAND AREA** | | | | | | | | | | | | | | | | | | |
| * | R096 | Breivika, Tomma | R | . | . | . | . | . | 3 | . | . | . | . | . | . | . | . | . | . | a |
| | 96A | Breivika, Tomma | R | . | . | . | . | . | 3 | . | . | . | . | . | . | . | . | . | . | a |
| | | **LOFOTEN AREA** | | | | | | | | | | | | | | | | | | |
| | 98A | Husvågen | R | . | . | . | . | + | 3 | . | . | . | . | . | . | . | . | . | 2 | e |
| | | **FINNSNES-SKJERVØY AREA** | | | | | | | | | | | | | | | | | | |
| | 41A | Fensneset, Grytøya | R | . | . | . | . | . | 3 | . | . | . | . | . | . | . | . | . | . | c |
| | | **HAMMERFEST-HONNINGSVÅG AREA** | | | | | | | | | | | | | | | | | | |
| | 44A | Elenheimsundet | R | . | . | . | . | . | 3 | . | . | . | . | . | . | . | . | . | . | a,f |
| | 46A | Smineset in Altesula | R | . | . | . | . | . | 3 | . | . | . | . | . | . | . | . | . | . | c,f |
| | | **VARANGER PENINSULA AREA** | | | | | | | | | | | | | | | | | | |
| | 48A | Trollfjorden i Tanafjord | R | . | . | . | . | . | 3 | . | . | . | . | . | . | . | . | . | . | |
| | 10A1 | Skagoodden | R | . | . | . | . | + | 3 | . | . | . | . | . | . | . | . | . | . | b |
| | 11X | Brashavn | R | . | . | . | . | + | 3 | . | . | . | . | . | . | . | . | . | 2 | |

* - CEMP station but not sampled in accordance to CEMP guidelines, see Appendix text.
** - Sufficient mussel-sample not found in 1996.

Notes (CM):
a - blue mussel collected from buoy and/or buoy anchor lines
b - blue mussel collected from sand/gravel bottom
c - blue mussel collected from iron/cement pilings
d - blue mussel collected from metal navigation buoys
e - blue mussel collected from floating dock
f - blue mussel collected from wooden docks
g - blue mussel collected from tire on jetty

# Appendix M2
# INDEX - Key to analysis codes and sample counts
(Used in Appendix M1)

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

| Contaminant | Analysis code | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K |
| 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 | .. |
| TBT [4]) | . | . | . | . | . | . | . | . | . | . | x |

[1]) Concerns MUSSEL - 1 size group (3-5 cm), 3 replicate samples each a bulk of 20 individuals (see text)
[2]) Concerns MUSSEL - discontinued since 1996
[3]) Concerns MUSSEL - discontinued since 1995, but reinstated 2002 for st.30A, 71A, I711, I712, I713, 76A, I132 and I133
[4]) Concerns MUSSEL – not included in Walday et al. (1995)

# Appendix M3
# INDEX - Klif Environmental quality classes
(Molvær *r* et al. 1997)

| Code | ICES code | Explanation |
|---|---|---|
| **As** | **As** | Arsenic |
| **Pb** | **Pb** | Lead |
| **F** | **F** | Fluoride |
| **Cd** | **Cd** | Cadmium |
| **Cu** | **Cu** | Copper |
| **Cr** | **Cr** | Chromium |
| **Hg** | **Hg** | Mercury |
| **Ni** | **Ni** | Nickel |
| **Zn** | **Zn** | Zinc |
| **Ag** | **Ag** | Silver |
| **TBT** | **TBT** | Tributyltin |
| **PAH** | **PAH_S** | total PAH excluding dicyclic (=PAH_Σ)* |
| **BAP** | **BAP** | benzo[*a*]pyrene |
| **DDT** | **DDTSS** | DDTPP+DDEPP+TDEPP (=DDTΣΣ)* |
| **HCB** | **HCB** | hexachlorobenzene |
| **HCH** | **HCHSS** | HCHG+HCHA+HCHB (=HCHΣΣ)* |
| **PCB** | **CBSSe** | sum of CB: 28+52+101+118+138+153+180 * |
| **TCDDN** | **TCDDN** | Sum of TCDD-toxicity equivalents * |

* ) See also Appendix C for definitions.

Basis: D = dry weight, W = wet weight
Units: M = ppm (mg/kg), U = ppb (μg/kg), P = ppp (ng/kg)

## Klif's Environmental quality classes for blue mussel (Molvær et al. 1997).

| Contaminant | basis | unit | Class I | Class II | Class III | Class IV | Class V |
|---|---|---|---|---|---|---|---|
| As | D | M | <10 | 10-30 | 30-100 | 100-200 | >200 |
| Pb | D | M | <3 | 3-15 | 15-40 | 40-100 | >100 |
| F | D | M | <15 | 15-50 | 50-150 | 150-300 | >300 |
| Cd | D | M | <2 | 2-5 | 5-20 | 20-40 | >40 |
| Cu | D | M | <10 | 10-30 | 30-100 | 100-200 | >200 |
| Cr | D | M | <3 | 3-10 | 10-30 | 30-60 | >60 |
| Hg | D | M | <0.2 | 0.2-0.5 | 0.5-1.5 | 1.5-4 | >4 |
| Ni | D | M | <5 | 5-20 | 20-50 | 50-100 | >100 |
| Zn | D | M | <200 | 200-400 | 400-1000 | 1000-2500 | >2500 |
| Ag | D | M | <0.3 | 0.3-1 | 1-2 | 2-5 | >5 |
| TBT | D | M | <0.1 | 0.1-0.5 | 0.5-2 | 2-5 | >5 |
| PAH | W | U | <50 | 50-200 | 200-2000 | 2000-5000 | >5000 |
| BAP | W | U | <1 | 1-3 | 3-10 | 10-30 | >30 |
| DDT | W | U | <2 | 2-5 | 5-10 | 10-30 | >30 |
| HCB | W | U | <0.1 | 0.1-0.3 | 0.3-1 | 1-5 | >5 |
| HCH | W | U | <1 | 1-3 | 3-10 | 10-30 | >30 |
| PCB | W | U | <4 | 4-15 | 15-40 | 40-100 | >100 |
| TCDDN | W | P | <0.2 | 0.2-0.5 | 0.5-1.5 | 1.5-3 | >3 |

# Appendix M4
# INDEX - Summary table "Pollution index"
# 2007-2008

## Pollution index 2007

Max(median). Statistics for all areas: (n = Index-station measured, N = Station programmed for index, "i" = not investigated)

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

| Index areaname (Pollution area) 2007 | 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 | AH_S ppb w.wt | BAP ppb w.wt | DTSS ppb w.wt | HCB ppb w.wt | HCHSS ppb w.wt | CBSSe ppb w.wt | DDN ppp w.wt | TBT ppm d.wt | Max E.C I:V |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hvaler/Singlefjorden | 3 | 4 | i | 1.67 | i | 2 | i | i | 0.24 | i | i | i | i | i | <0.35 | 0.08 | <0.05 | <0.67 | i | i | II |
| Iddefjord | 0 | 2 | i | 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 | 1.42 | i | i | 0.08 | i | i | i | 10.70 | 2.5 | <1.13 | 0.12 | <0.14 | 11.37 | 0.14 | 1.42 | III |
| Frierfjorden | 3 | 4 | i | i | i | i | i | i | i | i | i | i | i | i | 1.01 | 0.43 | <0.05 | <1.42 | 6.14 | 0.18 | V |
| Inner Kristiansandsfjord | 2 | 3 | i | i | i | i | i | i | i | i | i | i | 05.20 | 12 | <0.29 | 0.1 | <0.14 | <1.20 | 0.37 | 0.12 | IV |
| Saudafjord | 2 | 2 | i | 4.75 | i | 1.44 | i | i | i | i | i | i | 42.99 | 0.77 | i | i | i | i | i | i | II |
| Sørfjord | 2 | 2 | i | 29.8 | i | 4.41 | i | i | 0.29 | i | i | i | i | i | 3.5 | 0.12 | <0.05 | 2.47 | i | i | III |
| Byfjorden | 3 | 3 | i | i | i | i | i | i | i | i | i | i | i | i | 2.01 | 0.28 | <0.05 | 8.45 | i | i | II |
| Sunndalsfjord | 3 | 4 | i | i | i | i | i | i | i | i | i | i | 42.64 | 2.1 | i | 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 | i | miss |
| Inner Ranfjord | 3 | 4 | i | 16.6 | i | 2.11 | i | i | i | i | i | i | 15.67 | 21.5 | i | i | i | i | i | i | IV |

## Pollution index 2008

Max(median). Statistics for all areas: (n = Index-station measured, N = Station programmed for index, "i" = not investigated)

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

| Index areaname (Pollution area) **2008** | 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 | AH_S ppb w.wt | BAP ppb w.wt | DTSS ppb w.wt | HCB ppb w.wt | HCHSS ppb w.wt | CBSSe ppb w.wt | DDN ppp w.wt | TBT ppm d.wt | Max E.C I:V |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hvaler/Singlefjorden | 3 | 4 | i | 1.55 | i | 2.37 | i | i | 0.26 | i | i | i | i | i | <0.33 | 0.07 | <0.05 | <1.00 | i | i | II |
| Iddefjord | 0 | 2 | i | 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 | 1.79 | i | i | 0.11 | i | i | i | 10.20 | 1.8 | 2.49 | 0.19 | <0.05 | 15.57 | <0.08 | 0.56 | III |
| Frierfjorden | 3 | 4 | i | i | i | i | i | i | i | i | i | i | i | i | 1.49 | 0.36 | <0.10 | <2.65 | 5.76 | 0.2 | V |
| Inner Kristiansandsfjord | 2 | 3 | i | i | i | i | i | i | i | i | i | i | 66.00 | 16 | <0.30 | 0.56 | <0.15 | <0.95 | <0.61 | 0.25 | IV |
| Saudafjord | 2 | 2 | i | 7.29 | i | 2.41 | i | i | i | i | i | i | 16.07 | 0.8 | i | i | i | i | i | i | II |
| Sørfjord | 2 | 2 | i | 23.4 | i | 2.84 | i | i | 0.26 | i | i | i | i | i | 3.56 | 0.07 | <0.21 | <1.59 | i | i | III |
| Byfjorden | 3 | 3 | i | i | i | i | i | i | i | i | i | i | i | i | 2.91 | 0.11 | <0.05 | 8.8 | i | i | II |
| Sunndalsfjord | 3 | 4 | i | i | i | i | i | i | i | i | i | i | 21.23 | 1.8 | i | 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 | i | miss |
| Inner Ranfjord | 3 | 4 | i | 24.6 | i | 2.8 | i | i | i | i | i | i | 15.50 | 16 | i | i | i | i | i | i | IV |

# Appendix M5
# INDEX - Summary table "Reference Index"
# 2007-2008

## Reference index 2007

Max(median). Statistics for all areas: (n = Index-station measured, N = Station programmed for index, "i" = not investigated)

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

| Index areaname (Reference area) 2007 | 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 | AH_S ppb w.wt | BAP ppb w.wt | DTSS ppb w.wt | HCB ppb w.wt | HCHSS ppb w.wt | CBSSe ppb w.wt | DDN ppp w.wt | TBT ppm d.wt | Max E.C I:V |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mid and outer Oslofjord | 3 | 3 | i | 1.13 | w | 1.16 | i | 0.4 | 0.16 | 0.5 | i | w | w | w | 1.1 | 0.08 | <0.05 | 1.04 | w | 0.03 | I |
| Lista area | 2 | 3 | i | 1.06 | w | 0.79 | i | w | 0.05 | w | i | w | <7.09 | <0.50 | <0.30 | 0.09 | <0.05 | <0.53 | w | 0.02 | I |
| Bømlo-Sotra area | 1 | 1 | i | 2.6 | w | 1.24 | i | w | 0.13 | w | i | w | w | w | <0.24 | <0.03 | <0.05 | <0.99 | w | 0.3 | I |
| Outer Ranfjord, Helgelan | 0 | 2 | i | w | w | w | i | w | w | w | i | w | w | w | w | w | w | w | w | w | II |
| Lofoten area | 1 | 3 | i | 0.7 | w | 1.05 | i | w | 0.08 | w | i | w | w | w | <0.28 | 0.06 | <0.05 | <0.38 | w | 0.03 | II |
| Finnsnes- Skjervøy area | 0 | 1 | i | w | w | w | i | w | w | w | i | w | w | w | w | w | w | w | w | w | I |
| Hammerfest-Honningsvå | 0 | 2 | i | w | w | w | i | w | w | w | i | w | w | w | w | w | w | w | w | w | I |
| Varanger peninsula area | 1 | 5 | i | 1.63 | w | 2.28 | i | w | 0.04 | w | i | w | w | w | <0.27 | 0.05 | <0.05 | <0.39 | w | w | I |

## Reference index 2008

Max(median). Statistics for all areas: (n = Index-station measured, N = Station programmed for index, "i" = not investigated)

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

| Index areaname (Reference area) **2008** | 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 | AH_S ppb w.wt | BAP ppb w.wt | DTSS ppb w.wt | HCB ppb w.wt | HCHSS ppb w.wt | CBSSe ppb w.wt | DDN ppp w.wt | TBT ppm d.wt | Max E.C I:V |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mid and outer Oslofjord | 3 | 3 | i | 1.11 | w | 1.21 | i | 1.58 | 0.09 | 0.89 | i | 0.04 | w | 0.96 | <1.11 | 0.06 | <0.05 | <1.82 | w | 0.1 | I |
| Lista area | 2 | 3 | i | 0.55 | w | 1 | i | w | 0.07 | w | i | w | w | <0.50 | 0.58 | 0.09 | <0.05 | <1.80 | w | 0.01 | II |
| Bømlo-Sotra area | 1 | 1 | i | 2.29 | w | 1.02 | i | 0.71 | 0.12 | 1.06 | i | 0.02 | w | w | <0.53 | <0.03 | <0.05 | <1.45 | w | 0.1 | I |
| Outer Ranfjord, Helgelan | 0 | 2 | i | w | w | w | i | w | w | w | i | w | w | w | w | w | w | w | w | w | II |
| Lofoten area | 1 | 3 | i | 0.71 | w | 1.42 | i | 0.71 | 0.08 | 0.76 | i | 0.05 | w | w | <0.27 | 0.03 | <0.05 | <0.05 | w | 0.02 | II |
| Finnsnes- Skjervøy area | 0 | 1 | i | w | w | w | i | w | w | w | i | w | w | w | w | w | w | w | w | w | I |
| Hammerfest-Honningsvå | 0 | 2 | i | w | w | w | i | w | w | w | i | w | w | w | w | w | w | w | w | w | I |
| Varanger peninsula area | 1 | 5 | i | 1.06 | w | 2.07 | i | 2.76 | 0.04 | 1.88 | i | 0.11 | w | w | <0.27 | <0.03 | <0.05 | <0.22 | w | w | I |

**Long-term monitoring of environmental quality in Norwegian coastal waters**

**Coordinated Environmental Monitoring Programme (CEMP)**

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Title
Hazardous substances in fjords and coastal waters-2008. Levels, trends and effects.
Long-term monitoring of environmental quality in Norwegian coastal waters.

Summary
This report is part of the Norwegian contribution to OSPAR's Coordinated Environmental Monitoring Programme (CEMP). CEMP 2008 included the monitoring of contaminants in blue mussel (51 stations), dogwhelk (8 stations), cod (11 stations), tusk (1 station), ling (3 stations), prawn (5 stations), flatfish (10 stations) and sediments (5 stations) along the coast of Norway from the Oslofjord to the Varangerfjord. Of the nearly 890 time series in this project, 256 were statistically significant trends, 228 (89 %) of these were downward trends and 28 were upwards. There were 142 cases of overconcentrations or concentratons higher than high background levels in 2008. The results showed elevated levels of contaminants, in a few cases up to extremely polluted, in blue mussel in the Frierfjord (dioxins/TCDDN), in the Ranfjord (B[a]P) and in the Sørfjord (ppDDE). Blue mussel in the Kristiansandsfjord and the Ranfjord were up to severely polluted with B[a]P. Cod liver from Inner Oslofjord was markedly polluted, and the fillet was moderately polluted with PCBs. There was a significant downward trend for PCBs in blue mussel from Gressholmen in the Inner Oslofjord. Fillet of cod from the Inner Oslofjord was moderately polluted with mercury, a significant upward trend was detected for the period 1984-2008. A significant downward trend was found for lead, cadmium and mercury in blue mussel from Sørfjord/ Hardangerfjord. Fillet of cod from the Inner Sørfjord was moderately polluted with mercury, and cod liver was insignificantly polluted with ppDDE and PCBs. Fillet of ling from the Inner Sørfjord had a median concentration of mercury of 0.48 mg/kg, which is close to the lower limit of Class IV (severely polluted). Fillet of both tusk and ling from the Høyanger area were moderately contaminated with mercury. Contamination of organotin in blue mussel and imposex in dogwhelk were still apparent, however, most of the trends were downward indicating that regulatory action has lead to an improvement in the investigated areas. The results from studies using biological effects methods in cod, indicated reduced exposure to planar organic contaminants in the Oslofjord. In the Grenlandsfjord area there was a significant downward trend for HCB in blue mussel. No overconcentrations of contaminants were found in prawns. A reduction since 1990-1999 was found for mercury in sediment at Mølen-Moss and Steilene, and for PCBs (50 %) at Steilene. A decrease of PCBs, PAH and sum KPAH in sediment was found at all stations since 1990-1999. The sediment at Steilene was moderately polluted with TBT. No overconcentrations were found in sediment for cadmium (Cd), dichlorodiphenyldiichloroethylene (ppDDE), lindane (g-HCH) and hexachlorobenzene (HCB).

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**SFPO-nr 1062/2010**

Statlig program for forurensningsovervåking omfatter overvåking av forurensningsforholdene i luft og nedbør, skog, vassdrag, fjorder og havområder.
Overvåkingsprogrammet dekker langsiktige undersøkelser av:

- overgjødsling
- forsuring (sur nedbør)
- ozon (ved bakken og i stratosfæren)
- klimagasser
- miljøgifter

Overvåkingsprogrammmet skal gi informasjon om tilstanden og utviklingen av forurensningssituasjonen, og påvise eventuell uheldig utvikling på et tidlig tidspunkt. Programmet skal dekke myndighetenes informasjonsbehov om forurensningsforholdene, registrere virkningen av iverksatte tiltak for å redusere forurensningen, og danne grunnlag for vurdering av nye tiltak. Klif er ansvarlig for gjennomføringen av overvåkningsprogrammet.

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