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Abstract

The Norwegian contribution to OSPAR's Coordinated Environmental Monitoring Programme (CEMP) in 2010 included the monitoring of micropollutants (contaminants) in blue mussel (40 stations), dogwhelk (8 stations), common periwinkle (1 station), cod (11 stations) and flatfish (dab, flounder, plaice, megrim; 8 stations) along the coast of Norway from the Oslofjord and Hvaler region in the southeast to the Varangerfjord in the northeast. The stations are located both in areas with known or presumed point sources of contaminants, in areas of diffuse load of contamination like city areas, and in more remote areas exposed to presumed low and diffuse pollution. The mussel sites include supplementary stations for the Norwegian Index Programme. The results from 2010 supplied data to a total of 1039 time series of selected contaminants or biomarkers. Of these, 280 showed statistically significant trends of which 248 were downwards and 32 upwards. The dominance of downward trends indicates that contamination is decreasing. In 154 cases, concentrations were above what is expected in only diffusely contaminated areas.

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Foreword

This report represents the Norwegian national comments on the 2010 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 2010 was carried out by the Norwegian Institute for Water Research (NIVA) by contract from the Climate and Pollution Agency, Klif (former Norwegian Pollution Control Authority, SFT). The project leader at Klif was Jon L. Fuglestad.

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, 30th November 2011.

Norman W. Green
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Contents

1. Executive Summary/Sammendrag

The Norwegian contribution to OSPAR's Coordinated Environmental Monitoring Programme (CEMP) in 2010 included the monitoring of micropollutants (contaminants) in blue mussel (40 stations), dogwhelk (8 stations), common periwinkle (1 station), cod (11 stations) and flatfish (dab, flounder, plaice, megrim; 8 stations) along the coast of Norway from the Oslofjord and Hvaler region in the southeast to the Varangerfjord in the northeast. The stations are located both in areas with known or presumed point sources of contaminants, in areas of diffuse load of contamination like city areas, and in more remote areas exposed to presumed low and diffuse pollution. The mussel sites include supplementary stations for the Norwegian Index Programme. The results from 2010 supplied data to a total of 1039 time series of selected contaminants or biomarkers. Of these, 280 showed statistically significant trends of which 248 were downwards and 32 upwards. The dominance of downward trends indicates that contamination is decreasing. In 154 cases, concentrations were above what is expected in only diffusely contaminated areas (collectively termed 'over presumed high background concentrations'). The general situation for the two major impacted areas of CEMP is as follows:

Concentrations of contaminants in the Oslofjord, Hvaler and Grenlandsfjord areas

Metals in cod

Cod fillet from the Inner Oslofjord was moderately polluted by mercury, which had a significant upward trend for the period 1984-2010. Cod liver from the Inner Oslofjord had median concentrations of lead and cadmium higher than presumed high background, and there was a significant upward trend for cadmium in cod liver from the Inner Oslofjord for the same period. The concentration of mercury in cod fillet from the outer part of the Oslofjord (Færder) had increased slightly since 2009. The fillet was moderately polluted by mercury, but with no significant trend.

PCBs in cod

Cod liver from the Inner Oslofjord was markedly polluted with polychlorinated biphenyls (PCBs), but showed no significant trend. Cod fillet from the Inner Oslofjord was moderately polluted with PCBs, and here a significant upward trend was detected for the period 2001-2010.

Metals in blue mussel

Blue mussel stations in the Inner Oslofjord area were only insignificantly polluted by mercury. Blue mussel from Gressholmen, Akershuskaia, Ramtonholmen, Solbergstrand and Mølen were insignificantly polluted by cadmium but had upward trends for the whole monitoring period. Blue mussel from three stations in the Hvaler area and two in the Grenlandsfjord area were moderately polluted by mercury. Blue mussel from Bjørkøy in the Grenlandsfjord area and West Damholmen in the Hvaler area were moderately polluted by cadmium. Mussel from one station in the Inner Oslofjord (Gressholmen) and one from the Grenlandsfjord area (Croftholmen) were polluted by lead.

PCBs in blue mussel

Blue mussel from Gressholmen, Akershuskaia and Gåsøya in the Inner Oslofjord were moderately polluted by PCBs and at Solbergerstrand markedly polluted by PCBs. There were significant downward trends for PCBs at Gressholmen, Gåsøya and Solbergstrand for the whole monitoring period. The other blue mussel stations in the Oslofjord area were insignificantly polluted by PCBs.

Dioxins in blue mussel

Blue mussel from the stations in the Grenlandsfjord area were extremely polluted by dioxins. The blue mussel have been severely to extremely polluted by dioxins for the whole monitoring period. There was a tendency towards an increase at the two stations Bjørkøya and Strømtangen, but there were no significant trends.

Concentrations of contaminants in the Sørfjord and Hardangerfjord area

Metals in cod

Cod fillet from the Inner Sørfjord was moderately polluted by mercury. Cod from the Hardangerfjord (Strandebarm) was only insignificantly polluted by mercury. Cod liver from the Inner Sørfjord had concentrations of cadmium and lead that exceeded presumed high background levels. There was a significant upward trend for cadmium and a significant downward trend for lead in cod liver from the Inner Sørfjord for the monitoring period 1986-2010. Cod from Strandebarm in the Hardangerfjord had a significant downward trend for these metals. Cod from the Inner Sørfjord had a median concentration of lead in the liver that exceeded presumed high background level. Inhibition of ALA-D in cod has been frequently observed in the Sørfjord, also in 2010, as a result of the lead exposure. Cod liver from Strandebarm had a median concentration of lead below presumed high background level in 2010.

Organic contaminants in cod

Liver and fillet of cod from the Inner Sørfjord were moderately polluted by PCBs. Liver and fillet of cod from the Hardangerfjord were insignificantly polluted by PCBs. There was a significant downward trend for PCBs in cod liver from Strandebarm for the period 1990-2010. Cod liver and fillet from the Inner Sørfjord and Strandebarm was moderately polluted by ppDDE. Cod from Strandebarm showed significant downward trends for ppDDE in both liver and fillet for the same period.

Hg in flounder

There were concentrations above presumed high background levels and an upward trend for the period 1986-2010 for mercury in flounder fillet from the Inner Sørfjord.

PCBs in flounder

Flounder from the Inner Sørfjord was moderately polluted with PCB in fillet and showed concentrations of PCB in liver that exceeded presumed high background level.

Metals in blue mussel

In 2010 the blue mussel from the Inner and Mid Sørfjord were moderately to markedly polluted by mercury. Blue mussel from the Mid part of the Sørfjord were markedly polluted with cadmium. Mussel from Byrkenes were markedly polluted with lead. Significant downward trends have been observed for cadmium in blue mussel at all seven mussel stations in the in the Sørfjord and Hardangerfjord for time periods that spanned at least 20 years.

ppDDE in blue mussel

Blue mussel from Kvalnes in the Mid part of the Sørfjord were severely polluted with ppDDE.

Biological effects

Biological effects methods are included in the monitoring programme to evaluate whether marine organisms are affected by contaminants in their environment, something that cannot be assessed from concentrations of chemicals in tissues alone. Biological effects were investigated in cod from four areas: Inner Oslofjord, Lista (OH-pyrene only), Bømlo-Sotra (Karihavet) and the Inner Sørfjord. The median concentration of CYP1A protein levels was higher in the Inner Oslofjord compared to the Inner Sørfjord and Karihavet on the west coast, as was observed for the EROD activities. An explanation could be that the exposure to PCBs is higher in the Inner Oslofjord than in the Sørfjord and Karihavet. Since the year 2000, investigations have shown that EROD-activity in fish from the Inner Oslofjord is often higher than presumed cleaner stations.

In 2010, the median concentration of OH-pyrene metabolites in bile from cod was higher in the Inner Oslofjord compared to samples from the Inner Sørfjord, the Bømlo-Sotra area and Lista. Changes in concentrations of PAHs measured in blue mussel from the Inner Oslofjord correlate moderately well with alterations in OH-pyrene concentrations in the bile of cod from the same area.

Reduced activities of ALA-D were shown in the Inner Oslofjord and the Inner Sørfjord, as compared to the Bømlo-Sotra area. This reflects the higher exposure of lead in these areas.

Of the time series investigated for biological effects (imposex) of TBT in dogwhelk, seven stations showed significant downward trends. One station showed little effects and had no significant trend for the entire monitoring period. The effects from TBT were low (VDSI<2) at seven of eight stations investigated in 2010.

Other important results

PBDEs and PFCs in cod

Polybrominated diphenyl ethers (PBDEs) and perfluroalkyl compounds (PFCs) have been investigated in cod liver since 2005. In 2010, the concentration of sum PBDE and PFOS (the most abundant PFC) was highest in cod from the Inner Oslofjord. PFOS was low in the Sørfjord, Tromsø harbour and Trondheim harbour areas. PBDE was lowest in cod from Lofoten. BDE47 was the dominant PBDE in all samples.

PAHs and B[a]P in blue mussel

Blue mussel from two stations in the Ranfjord were markedly polluted by PAHs of which one station was extremely polluted by benzo[a]pyrene (B[a]P). One blue mussel station in the Kristiansandsfjord was markedly polluted with B[a]P.

Less contaminated areas

Cod and blue mussel from the outer parts of western and northern Norway were in general insignificantly polluted.

Blue mussel pollution index and reference index

Based on the occurrence of certain contaminants in blue mussel, a blue mussel pollution index and a reference index have been calculated from results of a group of polluted and non-polluted fjord areas. Based on nine fjord areas, that are affected by point sources of contaminants, the Pollution Index for 2010 was 2.6, which was 0.2 lower than in 2009. A value between 2 and 3 would be termed by the Klif environmental classification system as “markedly” polluted. For the Reference Index based on four fjord areas that are presumably little polluted with contaminants, the Index value for 2010 was 1.0, which was 0.2 lower than the index 2009. A reduction in the Pollution Index value indicates that contamination has decreased.

Sammendrag

Det norske bidraget til OSPARs felles overvåkingsprogram CEMP i 2010 inkluderer overvåking av miljøgifter i blåskjell (40 stasjoner inkludert stasjoner for beregning av forurensningsindeks), purpursnegl (8 stasjoner), strandsnegl (1 stasjon), torsk (11 stasjoner) og flatfisk (sandflyndre, skrubbe, rødspette, glassvar; 8 stasjoner) langs kysten fra Oslofjordområdet til Varangerfjorden. Stasjonene er lokalisert i områder med kjente eller antatte punktkilder av miljøgifter, i områder med diffus belastning som f.eks. byområder, og i mer avsidesliggende områder med antatt lav og diffus forurensning. Undersøkelsene i 2010 bidrar med resultater til totalt 1039 tidsserier av utvalgte representative miljøgifter eller biomarkører. 280 av disse viste signifikante trender hvorav 248 viste en nedadgående og 32 viste en oppadgående trend. Dominans av nedadgående trender tyder på mindre forurensning av miljøgifter. Det var 154 tilfeller hvor resultatene viste konsentrasjoner over antatt høyt bakgrunnsnivå. Tilstand og utvikling i to områder som er påvirket av forurensninger er som følger:

Konsentrasjoner av miljøgifter i Oslofjorden, Hvaler og Grenlandsfjorden

Metaller i torsk

Filet av torsk fra Indre Oslofjord var moderat forurenset av kvikksølv, og det var en signifikant oppadgående trend for perioden 1984-2010. Torskelever fra Indre Oslofjord hadde nivåer av bly og kadmium som var over antatt høyt bakgrunnsnivå, og det var signifikant oppadgående trend for kadmium i torskelever for den samme perioden. Torsk fra Ytre Oslofjord (Færder) var bare moderat forurenset av kvikksølv og uten noen trend.

PCB i torsk

Torskelever fra Indre Oslofjord var markert forurenset av PCB, men uten entydig trend. Filet av torsk fra Indre Oslofjord var i 2010 moderat forurenset av PCB og noe mindre forurenset enn i 2009. Det var en signifikant oppadgående trend for PCB i torskefilet for perioden 2001 til 2010.

Metaller i blåskjell

Blåskjell fra tre stasjoner på Hvaler og to stasjoner i Grenlandsområdet var moderat forurenset av kvikksølv. De andre blåskjellstasjonene i Oslofjordområdet var ubetydelig forurenset av kvikksølv. Blåskjell fra Bjørkøy i Grenlandfjordsområdet og Damholmen på Hvaler var moderat forurenset av kadmium. Blåskjell fra Gressholmen, Akershuskaia, Ramtonholmen, Solbergstrand og Mølen var ubetydelig forurenset av kadmium, men hadde oppadgående trender for hele undersøkelsesperioden. Blåskjell fra en stasjon i Indre Oslofjord (Gressholmen) og en stasjon i Grenlandfjordsområdet (Croftholmen) var forurenset av bly.

PCB i blåskjell

Blåskjell fra Gressholmen, Akershuskaia og Gåsøya i Indre Oslofjord var moderat forurenset av PCB, og blåskjell fra Solbergstrand var markert forurenset av PCB. Det var signifikant nedadgående trender for PCB i blåskjell fra Gressholmen, Gåsøya og Solbergstrand for hele overvåkingsperioden fram til 2010. De andre blåskjellstasjonene i Oslofjordområdet var ubetydelig forurenset av PCB.

Dioksiner i blåskjell

Blåskjell fra stasjonene i Grenlandsfjorden var meget sterkt forurenset av dioksiner. Blåskjellene i dette området har vært sterkt til meget sterkt forurenset av dioksiner i hele overvåkingsperioden. Det var også økende tendens for dioksiner i blåskjell fra Bjørkøya og Strømtangen. Økningen var imidlertid ikke signifikant.

Konsentrasjoner av miljøgifter i Sørfjorden og Hardangerfjorden

Metaller i torsk

Torskefilet fra Indre Sørfjorden var moderat forurenset av kvikksølv. Torsk fra Hardangerfjorden (ved Strandebarm) var bare ubetydelig forurenset av kvikksølv. Torskelever fra Indre Sørfjorden hadde nivåer av kadmium og bly høyere enn antatt høyt bakgrunnsnivå. Det har vært oppadgående trend for kadmium og nedadgående trend for bly for de siste 20 årene. Torsk fra Strandebarm hadde signifikant nedadgående trend for disse metallene, og konsentrasjonene var på under antatt høyt

bakgrunnsnivå. Inhibering av ALA-D i torsk har ofte vært registrert i Sørfjorden, også i 2010, som et resultat av torskens eksponering for bly.

Organiske miljøgifter i torsk
Lever og filet av torsk fra Indre Sørfjorden var moderat forurenset av PCB. Lenger ut i Hardangerfjorden derimot (Strandebarm), var torskelever og -filet ubetydelig forurenset av PCB. Det var en signifikant nedadgående trend for PCB i lever i torsk fra Strandebarm for perioden 1990-2010. Torskelever og -filet fra både Indre Sørfjorden og Strandebarm var moderat forurenset av DDE. Torsk fra Strandebarm hadde nedadgående trender for DDE i lever og filet for årene 1990-2010.

Hg i skrubbe
I skrubbefilet fra Indre Sørfjorden var det kvikksølv over antatt høyt bakgrunnsnivå, og stigende trend for perioden 1986-2010.

PCB i skrubbe
Skrubbe fra Indre Sørfjorden var moderat forurenset av PCB i fileten og hadde nivå av PCB i lever som var over antatt høyt bakgrunnsnivå.

Metaller i blåskjell
I 2010 var blåskjellene i den indre- og midtre delen av Sørfjorden moderat til markert forurenset av kvikksølv. Blåskjell fra den midtre delen av Sørfjorden (Kvalnes) var markert forurenset av kadmium. Innerst i Sørfjorden var blåskjellene markert forurenset av bly. Det var signifikant nedadgående trender for kadmium i blåskjell fra Indre- og Midtre Sørfjorden for de siste 20 årene.

ppDDE i blåskjell
Blåskjell fra den midtre delen av Sørfjorden (Kvalnes) var sterkt forurenset av ppDDE.

Biologiske effekter

Biologiske effekt-parametre er inkludert i overvåkingsprogrammet for å bedømme eventuell forurensningspåvirkning på organismer, noe som ikke kan gjøres på basis av konsentrasjoner av kjemikalier i vevsprøver alene. Biologiske effekt-parametre ble undersøkt i torsk fra fire stasjoner langs kysten: Indre Oslofjord, Lista (bare OH-pyren), Bømlo–Sotra og Indre Sørfjorden. Effekt-parametrene 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 dioksiner). Konsentrasjonen av CYP1A protein i torskelever var høyere i Indre Oslofjord enn i Sørfjorden og Karihavet i 2010. Dette ble også funnet for EROD aktivitet. En mulig forklaring kan være at eksponering for PCB er høyere i Indre Oslofjord enn i Sørfjorden og Karihavet.

I 2010 var konsentrasjonen av OH-pyren metabolitter i galle fra torsk høyere i Indre Oslofjord enn fra Indre Sørfjorden, Karihavet og Lista. Endringer i PAH-konsentrasjoner i blåskjell fra Indre Oslofjord korrelerte bra med OH-pyren i torskegalle fra samme område. Siden 2000 har EROD-aktivitet i torsk fra dette området ofte vært noe høyere enn antatt mindre belastede steder.

Redusert ALA-D aktivitet ble observert i Indre Oslofjord og Indre Sørfjorden, sammenlignet med Bømlo-Sotra-området. Dette gjenspeiler den høyere eksponeringen for bly i disse områdene.

Biologiske effekter av TBT (imposex) ble undersøkt på purpursnegl. Sju av åtte stasjoner hadde signifikant nedadgående trender. En av stasjonene hadde ingen signifikant trend, og har vært meget lav i hele overvåkingsperioden. Effektene av TBT var lave (VDSI<2) på sju av de åtte undersøkte stasjonene i 2010.

Andre viktige resultater

PBDEer og PFCer i torsk

Polybrominerte difenyletere (PBDE) og perfluroalkylstoffer (PFC) har vært undersøkt i torskelever siden 2005. I 2010 var konsentrasjonen av sum-PBDE og PFOS (det PFC-stoffet som det er mest av) høyest i Indre Oslofjord. Det var lave nivåer av PFOS i Sørfjorden, Tromsø havn og Trondheim havn. Det var lavest konsentrasjon av PBDE i torsk fra Lofotenområdet. Av PBDE-forbindelsene var det mest av BDE47.

PAH og B[a]P i blåskjell

Blåskjell fra to stasjoner i Ranfjorden var markert forurenset av PAH, og en av stasjonene var meget sterkt forurenset av benzo[a]pyren. Blåskjell fra en stasjon i Kristiansandsfjorden var markert forurenset av benzo[a]pyren.

Mindre forurensede områder

Torsk og blåskjell fra de ytre områdene av Vestlandet og Nord-Norge var generelt lite forurenset.

Forurensnings- og referanseindeks for blåskjell

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 referansefjordområder. Basert på ni påvirkede fjordområder var forurensningsindeksen for 2010 på 2,6, som er 0,2 lavere enn i 2009. En verdi mellom 2 og 3 blir klassifisert som "markert" forurenset i henhold til Klifs klassifiseringssystem. Referanseindeksen er basert på fire antatt lite påvirkede fjordområder, og var i 2010 på 1,0, som er 0,2 lavere enn i 2009. At indeksene i hvert tilfelle har avtatt indikerer at områdene har blitt mindre forurenset av miljøgifter.

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 of 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 E and maps in Appendix F. The program has included the monitoring of sediment, seawater 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 and 2008-2010 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 PCBs 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 PCBs, DDT, cadmium, mercury and lead. The Norwegian Food Safety Authority (*Mattilsynet*[1]) 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 again in 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).

In addition to the monitoring of Oslofjord area and Sørfjord/Hardangerfjord CEMP also includes the annual monitoring contaminants at selected stations in Lista and Bømlo areas on the south and west coast of Norway, respectively. During the periods 1993-1996 and 2006-2007 CEMP also included sampling of blue mussel from reference areas along the coast from Lofoten to the Russian border. The sampling also includes fish from four key areas north of Lofoten in the Finnsnes-Skjervøy area, Hammerfest-Honningsvåg area, and Varanger Peninsula area. Fish from the Lofoten and Varanger Peninsula areas are sampled annually. 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.

Concentrations of metals, organochlorines (including pesticides), polycyclic aromatic hydrocarbons, polybrominated diphenyl ethers or perfluorinated compounds in 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). TBT analyses on blue mussel and dogwhelk were done at Eurofins.

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

[1] see http://www.miljostatus.no/Tema/Hav-og-vann/Pavirkninger-pa-livet-i-vann/Miljogifter_vann/Miljogifter_marint/Kostholdsrad/

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 cannot 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. The Norwegian contribution to CEMP is designed to address issues relevant to OSPAR (cf. OSPAR 2007, SIME 2004a) including OSPAR priority substances (SIME 2004b). Moreover, in this regard it will be relevant to implementation of international initiatives such as The Water Framework Directive (WFD) (2000/60/EC) and the Marine Strategy Framework Directive (MSFD) (2008/56/EC). 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 1998).

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 stations, remote from known point sources, along the entire coast of Norway
- Selected impacted blue mussel stations 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.

3. Materials and methods

3.1. Sampling

The objective for the performed monitoring is to obtain updated information on levels and trends of selected hazardous substances, which are known to have a potential for causing detrimental biological effects on humans and wildlife that feed on marine organisms. In the marine environment, these substances may accumulate in the bottom sediment/porewater 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 problems. 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 cannot be disregarded in this respect.

Concentrations of hazardous substances in sediment/porewater, 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 in some cases also sediment). Hence, it follows that the substances may be detected, which would otherwise be difficult when analysing water or sediment. Another advantage of 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 health considerations and quality assurance related to 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). Mussels 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, will reflect contamination levels in their prey.

Samples were collected and analysed, where practical, according to OSPAR guidelines (more explicitly for 2010 sampling: OSPAR 2003b and OSPAR 2009)[1] and screened and submitted to ICES by agreed procedures (ICES 1996).

The sampling for 2010 involved blue mussel (40 stations), dogwhelk (eight stations), cod (11 stations), and flatfish (eight stations) (Figure 1, cf. Appendix E). Since 2009, this included the three cod-stations in the harbour areas of: Kristiansand (st. 13BH), Trondheim (st. 80BH) and Tromsø (st. 43BH). 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 E), as either 25 individuals or five bulked samples consisting of five fish per bulked sample, was not always met.

[1] See also www.ospar.org/eng/ > measures > list of other agreements

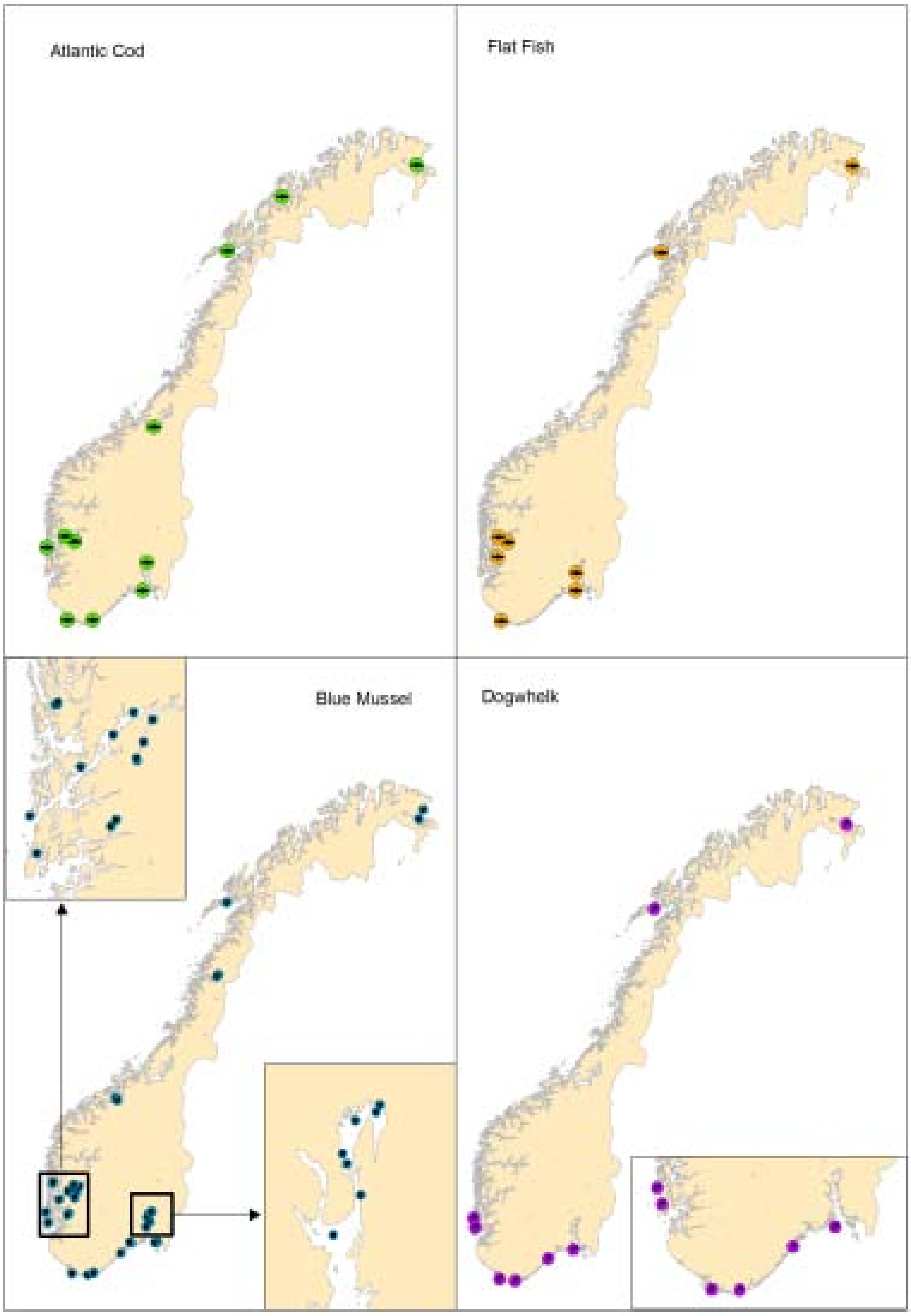

Figure 1. *Stations samples where sampling of blue mussel, dogwhelk, cod and flatfish in 2010 is indicated. See also station information in Appendix E and detailed maps in Appendix F.*

Fish
For fish, 25 individuals of Atlantic Cod (*Gadus morhua)* or one flatfish species have been sampled for each station. If possible, the same species as collected in previous years at the selected stations where used. The order of preference for flatfish species is according to the OSPAR guidelines: dab (*Limanda limanda*), flounder (*Platichthys flesus*), plaice (*Pleuronectes platessa*), and megrim (*Lepidorhombus wiffiagonis*). For some areas the first preferred flatfish species was not available. In such cases the same species collected as in previous years at the selected stations were used 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 (-20°C) until analysis or the fish is frozen directly and later prepared at NIVA.

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

Size-class	Cod (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
Cod were sampled at 11 stations along the Norwegian coast (Appendix E and maps in Appendix F). Cod have been collected in the port areas in Kristiansand (st. 13BH), Trondheim (st. 80BH) and Tromsø (st. 43BH) since 2009. The cod were generally sampled from September 9th to November 22nd 2010. All the cod were sampled by local fishermen except for the cod in the Inner Oslofjord (st. 30B) that was collected by NIVA on November 10th 2010 by trawling from the research vessel *F/F Trygve Braarud* owned by University of Oslo.

Flatfish
Flatfish were collected at 8 stations along the Norwegian coast (Appendix E and maps in Appendix F). The flatfish species were dab (*Limanda limanda*), flounder (*Platichthys flesus*), plaice (*Pleuronectes platessa*) and megrim (*Lepidorhombus wiffiagonis*). The flatfish were collected in the period from October 1st-26th 2010. All flatfish were sampled by local fishermen.

Blue mussel
Blue mussel (*Mytilus edulis*) were sampled at 40 stations (including supplementary stations for Index and TBT) located along the coast of Norway (Appendix E and maps in Appendix F). The Index Programme in Norway started in 1995. It 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, the monitoring programme covers a number of 25 pollution and 6 reference site stations in all five fjords.

Locations of stations are shown in Figure 1 and Appendix F. Trends and median concentrations for 2010 for a selection of the stations are shown from Figure ***3*** to Figure 11. The stations were chosen to show highly polluted stations and reference stations distributed along the Norwegian coast. A summary of the results for 2010 are shown in Table 10 and more details are given in Appendix H. The trend analyses for the entire monitored period are shown in Appendix H. Geographical distributions of contaminants are also shown in Appendix I.

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). However, for historical reasons, three size groups 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 about 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 revision of the guidelines, all blue mussel samples from the new stations are collected according to this ICES method. Shell length was measured by slide callipers. The blue mussel were scraped clean on the outside by using knives or scalpels before taking out the tissue for the analysis.

To empty the intestinal canal (depuration) the mussel were kept alive for 12-24 hours in seawater (about 15 litres) collected in close proximity to the station. The shells were spread out on a perforated polyethylene platform and submerged in the seawater in a container and an aquarium pump pumped air to bottom of the aquarium, which kept 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 (-20°C) to avoid excessive cutting of the soft tissue. 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 1989; Green *et al.* 1996). With one exception (st. 227A2, Høgevarde in the Haugesund area) 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 August 27th to November 22nd, 2010. Generally, blue mussel are not abundant on the exposed coastline from Lista (southern Norway) to the north of Norway. A number of samples were collected from dock areas, buoys or anchor lines. All blue mussel were collected by NIVA except for the blue mussel collected in the Ranfjord, Lofoten and Varangerfjord, which were collected by local contacts.

Dogwhelk

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

Effects (imposex) and concentrations of organotin in dogwhelk were investigated using 50 individuals from each station. Individuals were kept alive in a refrigerator (at +4°C) until the effects (imposex) were quantified. All dogwhelk were sampled by NIVA except for the dogwhelk collected in Lofoten and in the Varangerfjord. The dogwhelk samples were collected from September 3rd to October 20th 2010.

3.2. Chemical variables

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

Table 2. *Number of stations (see Appendix E) analysed for each of the parameters and indicator media with results for 2010. Indicator media include: selected tissues from blue mussel, dogwhelk, Atlantic cod and flatfish species. (See Appendix C for description of chemical codes.)*

Description	Blue mussel, soft body	Dog-whelk, soft body	Common periwinkle soft body	Atlantic cod bile	Atlantic cod blood	Atlantic cod liver	Atlantic cod fillet	Flatfish liver	Flatfish fillet
Cd, Cu, Pb, Zn, Ag, As, Co, Cr, Ni	38					11		8	
Ba, Mo, V	1								
Hg	38						11		8
TBT [1)]	14	8	1						
PCBs [2)]	33					11	11	8	8
HCB	33					11	11	8	8
DDT, DDE, DDD	33					11	11	8	8
α-, γ-HCH	33					11	11	8	8
Dioxins [3)]	7								
PBDE [4)]						8			
PFC [5)]						8			
PAHs [6)]	16								
Biological effects methods		8 imposex		4 OH-pyrene	3 ALA-D	3 EROD-activity, CYP1A			

[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.

An overview of the applied analytic methods are presented in Table 3. Chemical analyses were performed on each cod liver. Mercury was analysed on fillet samples of each cod. Furthermore, Biological Effects Methods (BEM) were performed on individual cod. The remaining chemical analyses were performed on homogenates of each size class.

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

Medium analysed	Basis	Detection limit.	Methods	Sample description
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
Persistent 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		bulk
PBDE except for BDE-209[4)]	w.w.	0.1-0.5	NIVA method	bulk or individual
BDE-209[5)]	w. w	0.5-5	NIVA method	bulk or individual
HBCD	w.w.	50-100		bulk or individual
PFCs except for PFOSA[6)]	w.w.	0.3-1	NIVA method	bulk or individual
PFOSA[7)]	w.w.	1-10	NIVA method	bulk or individual
Dioxins[8)]	w.w.	0.0001-0.00002	NILU method	bulk
OH-pyrene[9)]			NIVA method	individual samples of cod bile
Dry matter			NIVA accredited method B3	bulk or individual
Biological Effect Methods (BEM)				
EROD[9)]			NIVA method, after ICES (TIMES no. 13)	individual fish liver samples
CYP1A (when EROD is analysed)[9)]			NIVA method, after ICES (TIMES no. 23)	individual fish liver samples
ALA-D[9)]			NIVA method, after ICES-TIMES (in press)	individual fish blood samples
Other analyses				
Age determination			Otolith	individual fish
Imposex			After ICES (TIMES no. 24)	one station with 50 individuals

[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)] Polycyclic 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), see parameter group OC-BB in Appendix C.
[5)] Limit of detection is higher in some of the samples.
[6)] Perfluorinated alkylated substances and includes PFOS, see parameter group PFAS in Appendix C.
[7)] Limit of detection is higher in some of the samples.
[8)] Includes a number of dibenzodioxins and dibenzo furans, see parameter group OC-DX in Appendix C.
[9)] Cod only.

Several laboratories have been used in performing the chemical analysis since 1981 (cf. Green *et al.* 2008a). However, in general chemical analyses have been done at NIVA. Two exceptions are the analyses of dioxins that are carried out by the Norwegian Institute for Air Research (NILU) and analyses of TBT that are carried out by Eurofins. 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 (PCBs) and other chlororganic hazardous substances in biota were analysed at Foundation for Scientific and Industrial Research at the Norwegian Institute of Technology-SINTEF and at 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) in cod liver were 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.

Analysis of perfluoralkyl compounds (PFCs) in cod liver were done at NIVA. The analysis procedure for determination of PFC were different in 2010 compared to 2009. The previous method including 2009-samples were done by using wet material (1g) that was added internal standards and extracted with a mixture of 0,25M Na2CO3 and 0,5M tetrabutyl ammonium hydrogensulphate using ultrasonic bath. After pH-adjustment the sample was extracted with diethyl ether. The ether extract was evaporated and the sample was dissolved in methanol before the LC/MS/MS-analysis (ESI negative mode). Method for 2010-samples were done by using wet material (1g) that was added internal standards and extracted with acetonitrile using ultrasonic bath. The sample extract was added water and applied on an OASIS WAX SPE column. After several cleaning steps the PFC-compounds were eluted with 2% ammonium hydroxide in methanol. The extract was evaporated and further cleaned with EnviroCarb before the LC/MS/MS-analysis (ESI negative mode).

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 5). The fish fillet are analysed for the mercury and PCBs 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. These measurements are stored in the database and published periodically.

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

3.3. Biological-effect analyses

There are currently five biological effects methods (BEM) applied on an annual basis. Each method is more or less specific for one or a group of contaminants. An overview of the methods, tissues sampled and contaminant specificity is shown in Table 5. One of the major benefits of 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. Sampling for BEM-analysis are performed by trained personnel, most often under field conditions. Immediately after the fish are inactivated by a blow to the head 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	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 62 of July-October 2010 and Round 64 of January-May, which both apply to the 2010 samples. These QUASIMEME exercises included nearly all the contaminants as well as imposex analysed in this programme. The Quality assurance programme for NIVA is similar to the 2009 programme (cf. Green *et al.* 2010b). In addition, NIVAs laboratory was accredited in 1993 by Norwegian Accreditation and is since 2001 accredited in accordance with NS-EN ISO/IEC 17025 (Test 009). A summary of the quality assurance programme at NIVA can be found in Appendix B.

NIVA participated in the QUASIMEME Laboratory Performance Studies "Exercise 846-Round 57 imposex and intersex in Marine Snails BE1" in April-August 2009. Shell height, penis-length-male, penis-length-female, average-shell-height and female-male-ratio were measured. NIVA got the score satisfactory for average-shell-height and female-male-ratio. The assigned value for VDSI (imposex stage values of all females sampled/number of females) was 0.868 compared to NIVAs lab average of 1.474, which resulted in a high z score and was deemed unsatisfactory. This could be due to the fact that the snails examined varied from stage 0 up to stage 4. NIVA was signed up to participate in the

[1] Vas Deferens Stage Index

QUASIMEME Laboratory Performance Studies for imposex and intersex for Marine Snails in 2010 and 2011, but both exercises have been cancelled by the organiser.

In addition to the QUASIMEME exercises, certified reference materials (CRM) and in-house reference materials (HSD) 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 analysis. 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. Norwegian blue mussel Pollution and Reference Indices (The Index Programme)

The Climate and Pollution Agency (Klif) is interested in obtaining a small group of indices to assess the united quality of the environment with respect to a selected group of contaminants and stations. The blue mussel have been selected as the target medium since 1995.

The Index scale varies from 1 to 5, where 1 means that stations within an area are insignificantly polluted (Class I in Klif’s classification system) with respect to contaminants measured. Index of 5 would mean that at least one station from any fjord or area is classified as “Extremely” (Class V in the Klif system) for at least one of the contaminants measured. More details concerning the methods and results for 2010 are shown in Appendix J.

3.6. 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.* 2007a) are used for sediments (not investigated in 2010). 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 part of 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 presumed high background values were used (cf. Appendix D). The factor by which this limit or the Class I limit is exceeded is calculated (cf. Appendix H). High background concentration corresponds to the upper limit to Class I; insignificantly polluted, which in this context has no statistical implications.

The median concentration are assessed according to the Klif system, but where this is not possible, presumed high background levels 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 H or figures in Appendix I. 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 presumed high background levels 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 H). 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 (*Mattilsynet*[1]) 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 late 2011 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 and chemical" (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 15th 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 hexachlorobutadiene (HCBD)) in “prey tissue” (Table 6). 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 set for water. It should be noted that application of the EQS 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. 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 (Hg)	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.

[1] see http://www.miljostatus.no/Tema/Hav-og-vann/Pavirkninger-pa-livet-i-vann/Miljogifter_vann/Miljogifter_marint/Kostholdsrad/

3.7. Statistical time trends analyses

A simple three-model approach has been developed to study time trends for contaminants in biota based on median concentration (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 G. The results are presented in a type as shown in Figure 2.

A Loess smoother is based on a running six-year interval, a non-parametric curve fitted to median log-concentration (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 log-normally 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 presumed high background levels (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 three 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.

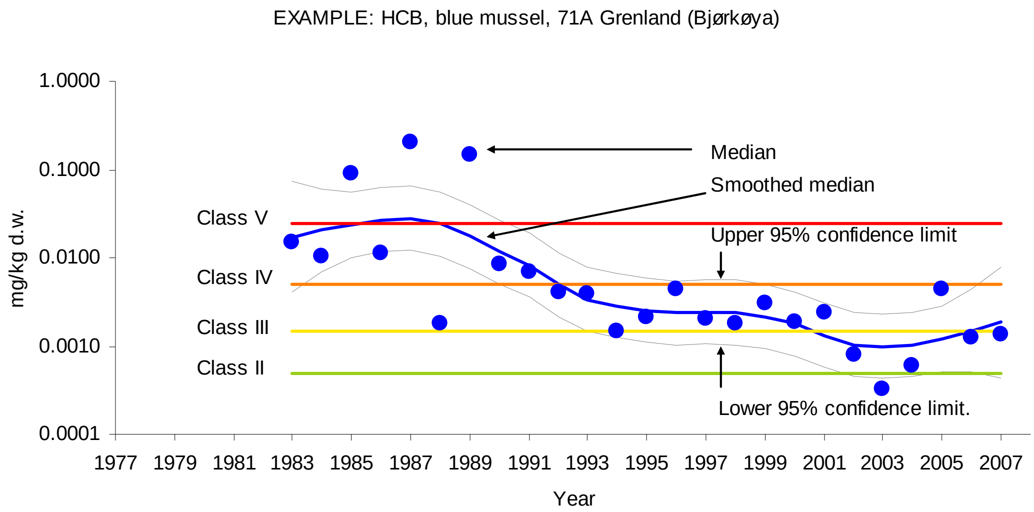

Figure 2. *Example time series that indicates the median concentration, running mean of median values (Loess smoother), 95 % confidence intervals. The horizontal lines indicate the lower boundaries to Klif classes of pollution: Class II (moderate=upper boundary to Class I (insignificant)), III (marked), 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

Samples for the investigation of contaminants were collected along the Norwegian coast, from the boarder to Sweden in the south to the border to Russia in the north (cf. Appendix F, Figure 1). The stations and number of samples relevant for the 2010 investigations are noted in the tables in Appendix E. Time trend analyses were performed on a selection of representative contaminants where the results included data for 2010 and totalled 1039 data series (Table 7). In 154 of the 1039 cases, concentrations were above what is expected in only diffusely contaminated areas (collectively termed: “over presumed high background concentrations”). The focus of the overview presented below is based on these time series, of which 248 were downwards trends and 32 were upwards trends. Generally the evaluation of the results focused primarily on those cases where concentrations over presumed high background level (>Class I, insignificantly polluted, acceptable levels) occurred and where significant upward trends were found and to a lesser degree where there were no significant trends or significant downward trends were found. The evaluation focused secondarily on cases where concentrations were below presumed high background level (<Class I, insignificantly polluted) in combination with significant upward trends, no significant trends or significant downward trends. An overview of trends, classification and median concentrations is presented in Appendix H. The results are presented by classes and with results for observed trend analyses. For some stations, there were insufficient data to do trend analyses and the term “no trends” was used.

Table 7. *Selection of representative contaminants and biological effects methods/BEM and number of time series assessed.*

Contaminant/BEM	Description	Cod	Megrim	Dab	Blue mussel	Dog whelk	Common periwinkle	Flounder	Plaice	Total
Ag	silver	11	2	2	38			2	2	57
ALAD	δ– aminolevulinic acid dehydrase inhibition	3								3
As	arsenic	11	2	2	38			2	2	57
B[a]P	benzo[a]pyrene				16					16
BDESS	sum of brominated diphenyl ethers	8								8
Ba	barium				1					1
PCB-7 (CB_S7)	sum of PCB congeners 28+52+101+118+138+153+180	22	4	4	33			4	4	71
Cd	cadmium	11	2	2	38			2	2	57
Co	cobalt	11	2	2	38			2	2	57
Cr	chromium	11	2	2	38			2	2	57
Cu	copper	11	2	2	38			2	2	57
ppDDE (DDEpp)	p,p'-DDE (a DDT metabolite)	22	4	4	33			4	4	71
EROD	cytochrome P4501A-activity	3								3
CYP1A	cytochrome P450 1A-protein	3								3
HCB	hexachlorobenzene	22	4	4	33			4	4	71
HCHG	γ HCH (Lindane)	22	4	4	33			4	4	71
Hg	mercury	11	2	2	38			2	2	57
Mo	molybden				1					1
Ni	nickel	11	2	2	38			2	2	57
OCS	octachlorostyren	21	4	3	33		4	2		67
PAHs (P_S)	sum nondicyclic PAHs				16					16
Pb	lead	11	2	2	38			2	2	57
PFOS	perfluoroctanoic sulfonate	8								8
KPAHs (PK_S)	sum carcinogen PAHs				16					16
Pyr10	pyrene (PAH compound) metabolite	4								4
TBT	tributyltin (formulation basis)				14	8	1			23
TCDDN	sum of TCDD-toxicity equivalents after Nordic model				7					7
VDSI	Vas Deferens Sequence Index					8				8
V	vanadium				1					1
Zn	zinc	11	2	2	38			2	2	57
TOTAL		248	40	39	617	16	1	40	38	1039

4.2. National levels and trends

An overview of samples collected in 2010 with results is presented in Figure 3, Figure 19, Table 10 and Appendix H.

Mercury (Hg)

Cod fillet

The median concentration of Hg in cod fillet exceeded Class I (insignificantly polluted) at three of 11 cod stations analysed (Figure 3). The three stations were the Inner Oslofjord (st. 30B), Færder (st. 36B) and the Inner Sørfjord (st. 53B), all classified to Class II (moderately polluted). A significant upward trend was found for cod from the Inner Oslofjord (st. 30B) for the entire sampling period (1984-2010), but no trend was found during the period 2001-2010. No significant trends were observed in the cod from Færder (st. 36B) or the Inner Sørfjord (st. 53B). The cod fillet from Karihavet area (st. 23B) showed a significant upward trend and acceptable low levels of Hg (Class I). The cod fillet from Ullerø area (st. 15B) and Bjørnerøya (st. 98B1) showed acceptable levels of Hg (Class I) and no significant trends. The cod fillet from Strandebarm (st. 67B) and Varangerfjorden (st. 10B) showed significant downward trends and acceptable low levels of Hg (Class I). No trends could be calculated for cod from the Kristiansand harbour (st. 13BH) (0.026 mg/kg w.w.), Trondheim harbour (st. 80BH) (0.044 mg/kg w.w.) and Tromsø harbour (st. 43BH) (0.031 mg/kg w.w.) because of few years of measurements, but there were acceptable levels of Hg (Class I) at all three stations.

Flounder fillet
Two flounder stations were analysed for Hg in fillet and the station in the Inner Sørfjord (st. 53F) showed a significant upward trend and the flounder and concentrations exceeded presumed high background (0.36 mg/kg w.w.). Flounder fillet at Sande (st. 33F) showed a significant downward trend (Table 10) and an acceptable level of Hg (below upper limit to presumed background) in 2010.

Dab fillet
Fish from two stations (Færder area (st. 36F) and Ullerø area (st. 15F) (see Table 10) were analysed. The median concentrations Hg observed in dab from the Færder area (st. 36F) exceeded the presumed high background, but showed no significant trend. The dab at the Ullerø area (st. 15F) showed an acceptable level and no significant trend.

Plaice fillet
Fish from two stations were analysed. Plaice fillet from the Skogerøy area (st. 10F) in the Varangerfjord and from Husholmen area (st. 98F2) were not polluted by Hg (below presumed high background) nor had any significant trend.

Megrim fillet
Megrim fillet from two stations on the west coast of Norway were analysed for Hg. 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 Class I (insignificantly polluted) at seven of 38 blue mussel stations analysed (cf. Table 10). A graphical presentation of results from some of the stations is shown in Figure 4. Of these seven stations, no significant trends were found at Damholmen (st. I022), Kirkøy (st. I024) and Singlekalven (st. I023) in the Hvaler area, Croftholmen (st. I712, earlier called Gjemesholmen) in the Grenlandsfjord area, Bjørkøya/Risøyodden (st. 71A) and Byrkjenes (st. 51A) (all Class II, moderately polluted). The combination of concentration being over presumed high background and a significant downward trend was found in mussels from Kvalnes (st. 56A) (Class II, moderately polluted).

In blue mussel that were not polluted by Hg (Class I), significant upward trends were found at Akershuskaia (st. I301), Solbergstrand (st. 31A) (not taken at the same location as earlier years), Risøy (st. 76A) and Espevær (st. 22A).

Mussels from the majority of the stations did however revealed acceptable median level of Hg (Class I) in combination with no significant trend (Table 10). This was the case for Gressholmen (st. 30A), Gåsøya (st. I304), Ramtonholmen (st. I307), Håøya (st. I306) and Mølen (st. 35A) in the Oslofjord and Strømtangen (st. I713) in the Grenlandsfjord area. This was also the result for Gåsøy/Ullerø (st. 15A) and Lastad (st. I131A) in the southern part of Norway. Further, this was the case for Ekkjegrunn (st. I201) and Bølsnes (st. I205) in the Inner part of the Saudafjord, and at Ranaskjær (st. 63A), Vikingneset (st. 65A) and Lille Terøy (st. 69A) in the Hardangerfjord. Blue mussel at Moholmen (st. I965), Toraneskaien (st. I964) and Bjørnbærviken (st. I969) in the Ranfjord, Husvaagen area (st. 98A2) in Lofoten and Brashavn (st. 11X) in the Varangerfjord showed also the same.

In blue mussel that were not polluted by Hg (Class I), significant downward trends were found at Eitrheimsneset (st. 52A) and Krossanes (st. 57A) in the Sørfjord, and Skallneset (st. 10A2) in the Varangerfjord.

Blue mussel from Svensholmen (st. I132), Odderøy (st. I133), Høgevarde (st. 227A2), Nordnes (st. I241), Gravdalsneset (st. I242), Hegreneset (st. I243) were also insignificantly polluted (Class I) by Hg, but no trends could be calculated because of insufficient data.

Concluding remarks on Hg

All time series were at background or moderately polluted and inconclusive regarding overall Norwegian time trend.

Trend analyses of Hg showed upward trends for cod fillet in the Inner Oslofjord and the cod fillet was moderately polluted. Concentrations in flounder fillet from the Inner Sørfjord were above presumed high background in 2010 while it had an acceptable level of Hg in 2009. The median concentration of Hg in dab fillet in the Færder area was also above presumed high background, but showed no significant trend. The cod fillet from the Færder area and the Inner Sørfjord were moderately polluted with Hg but no trends were observed.

Blue mussel from Akershuskaia, Solbergstrand, Risøy and Espevær showed significant upward trends but acceptable levels of Hg. All the blue mussel stations in the Inner and Mid Oslofjord had low levels of Hg.

Blue mussel in the Kristiansandsfjord had an acceptable level of Hg. Schøyen *et al.* (2010) also reported that blue mussel at Odderøy and Svensholmen, among five other stations in the Kristiansandsfjord, were insignificantly polluted by Hg in 2010. Blue mussel at Svensholmen had an acceptable level of Hg, not only in September when the CEMP-blue mussel were collected, but also in May and July in 2010.

Blue mussel in the Sørfjord were up to moderately polluted at the four stations monitored. Three of the stations like Eitrheimsneset, Kvalnes and Krossanes showed significant downward trends. Ruus *et al.* 2011 also reported the Hg-concentration to be up to moderately polluted in blue mussel in the Sørfjord in 2010.

It can be noted that the EU has provided Environmental Quality Stanadard (EQS) for “prey tissue” (cf. 2000/60/EC). The EQS for mercury is 0.02 mg/kg w.w. which is below the upper limit to insignificantly polluted (Class I) for blue mussel (0.04 mg/kg w.w.). No concentrations were below the EQS in blue mussel. The EQS can not be directly compared to concentrations found in different tissues of fish.

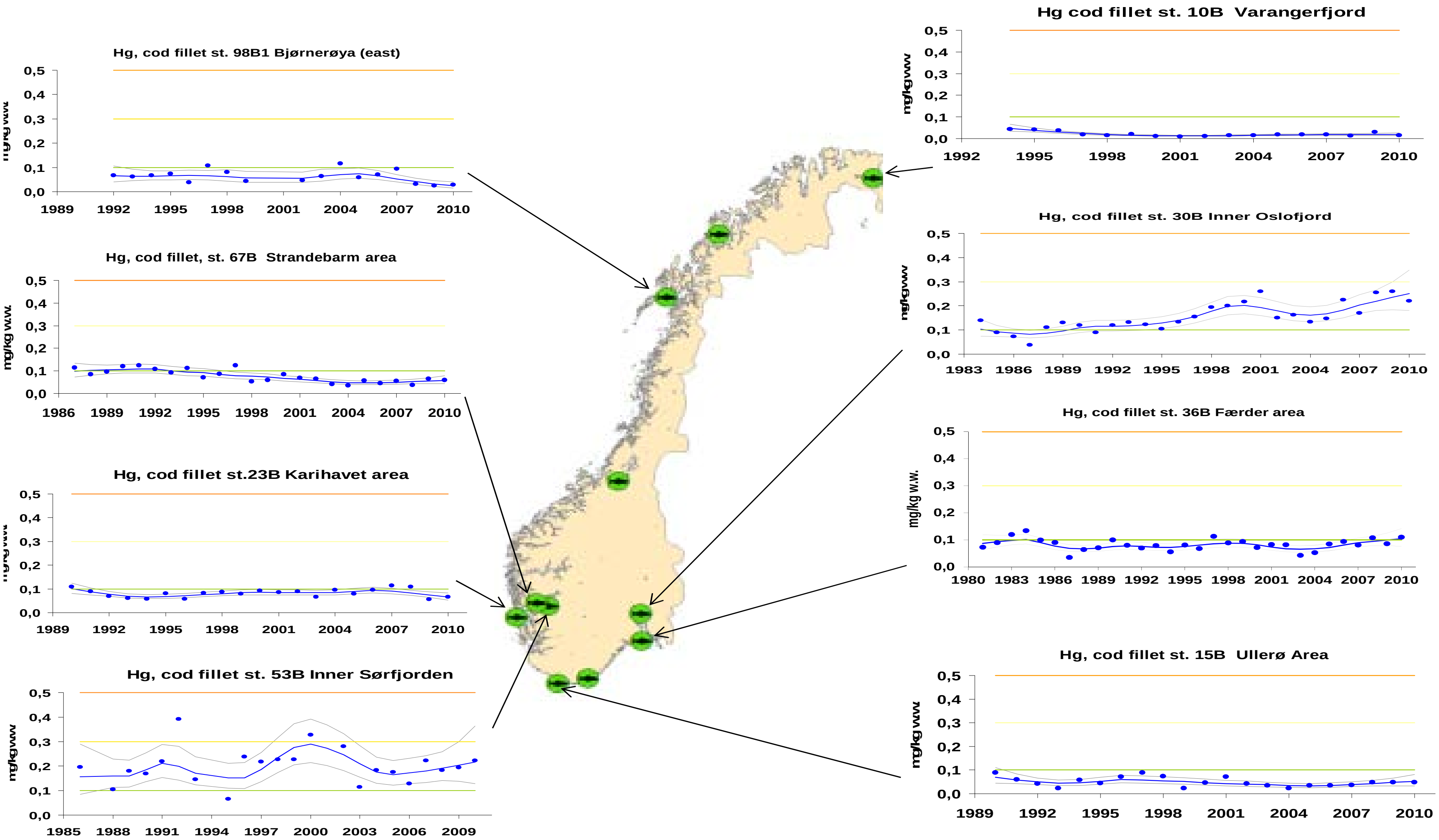

Figure 3. *Median concentration of Hg in cod fillet, mg/kg (mg Hg/kg) wet weight (cf. Appendix H, see otherwise key to detail in Figure 2).*

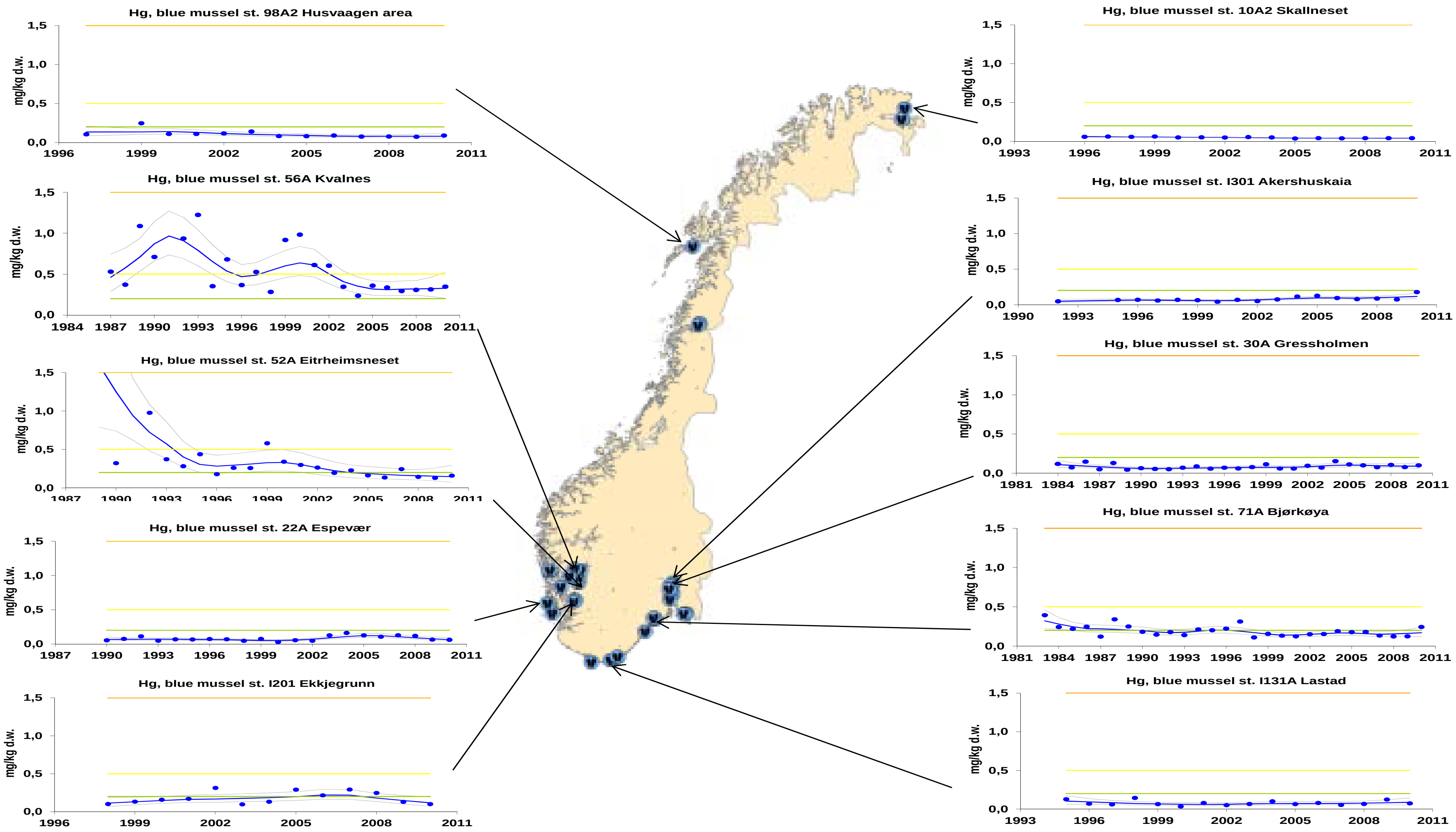

Figure 4. *Median concentration of Hg in blue mussel, mg/kg (mg Hg/kg) dry weight for selected stations (cf. Appendix H, see otherwise key to detail in Figure 2).*

Cadmium (Cd)

Cod liver

Acceptable levels (below presumed high background) for Cd in cod liver is set to 0.3 mg/kg w.w. for the 2010-results and not 0.1 mg/kg w.w. as for the 2009-results to comply with earlier investigations of background concentrations (Green & Knutzen 2003). The concentrations of Cd in cod liver had acceptable background levels (Class I) at all the11 stations along the Norwegian coast (Table 10, Figure 5). A significant upward trend was observed at two stations, one in the Inner Oslofjord (st. 30B) and the second in the Inner Sørfjord (st. 53B). Cod liver from Ullerø area (st. 15B), the Karihavet area (st. 23B) and from Bjørnerøya (st. 98B1) showed no significant trends. Significant downward trends were observed in liver samples from the Færder area (st. 36B), the Strandebarm area (st. 67B) in the Hardangerfjord and in the Varangerfjord (st. 10B). The number of data points for Kristiansand harbour (st. 13BH), Trondheim harbour (st. 80BH) and Tromsø harbour (st. 43BH) were not sufficient to do a trend analysis, but all showed acceptable levels of Cd (Class I).

Flounder liver

Flounder from two stations were analysed for Cd in liver and they were both under presumed high background level. The flounder liver at Sande (st. 33F) and in the Inner Sørfjord (st. 53F) showed both a significant downward trend.

Dab liver

Dab from the two stations Færder area (st. 36F) and Ullerø area (st. 15F) were analysed for Cd in liver. The dab at Ullerø revealed concentrations over acceptable level while the fish at Færder had an acceptable concentration. The results from both stations showed no significant trends.

Plaice liver

The concentrations of Cd in liver from plaice caught at Husholmen (st. 98F2) in the Lofoten and Skogerøy (st. 10F) in the Varangerfjord contained concentrations of Cd over acceptable levels in liver, but no significant trends were observed.

Megrim liver

The megrim from Strandebarm (st. 67F) in the Hardangerfjord showed a significant downward trend while the megrim in the Åkrafjord (st. 21F) showed no significant trend. There is insufficient data from other investigations to assess what is a presumed background concentration.

Blue mussel

The presence of Cd exceeded Class I (insignificantly polluted) in mussel samples from eight out of 38 stations. Results from some of the stations are presented in Figure 6.

Significant downward trend was observed in mussel from Kvalnes (st. 56A) which was markedly polluted (Class III). Significant downward trends were also observed in mussels from Byrkjenes (st. 51A), Eitrheimsneset (st. 52A) and Krossanes (st. 57A) in the Sørfjord, and Ranaskjær (st. 63A) and Vikingneset (st. 65A) in the Hardangerfjord, and all were moderately polluted (Class II). Mussels at Damholmen (st. I022) in the Hvaler area and Bjørkøya (st. 71A) in the Grenlandsfjord area were also moderately polluted (Class II), but no trends were observed.

In blue mussel that showed an acceptable level of Cd (Class I), significant upward trends were found at stations from the Inner Oslofjord and outward the fjord at Akershuskaia (st. I301), Gressholmen (st. 30A), Ramtonholmen (st. I307), Solbergstrand (st. 31A, not taken at the same position as earlier years), Mølen (st. 35A) and Risøy (st. 76A). Significant downward trends were observed at Kirkøy (st. I024), Lille Terøy (st. 69A) in the Hardangerfjord and at Husvaagen area (st. 98A2) in the Lofoten, all were also insignificantly polluted (Class I).

Blue mussel stations that had low levels of Cd (Class I) and showed no trends were Gåsøya (st. I304) and Håøya (st. I306) in the Inner Oslofjord. This was also found at Singlekalven (st. I023) in the Hvaler area, and at Lastad (st. I131A) and Gåsøy/Ullerø (st. 15A) in the southern part of Norway. Further, this was also found at Ekkjegrunn (st. I201) and Bølsnes (st. I205) in the Saudafjord, at

Espevær (st. 22A) on the west coast, at Moholmen (st. I965), Toraneskaien (st. I964) and Bjørnbærviken (st. I969) in the Ranfjord and at Skallneset (st. 10A2) and Brashavn (st. 11X) in the Varangerfjord.

Blue mussel from the Grenland area (Croftholmen (st. I712), Strømtangen (st. I713)), the Kristiansandsfjord (Svensholmen (st. I132), Odderøy (st. I133)), in the Karmsund (Høgevarde st. 227A2), and in the Bergen area (Nordnes (st. I241), Gravdalsneset (I242) and Hegreneset (I243)) had all acceptable levels of Cd, but no trend analyses were calculated because the data was insufficient for trend analyses.

Concluding remarks on Cd

Trend analyses of Cd showed concentrations below high background levels at all cod liver stations but upward trends in the Inner Oslofjord and in the Inner Sørfjord.

Significant upward trends were found at several blue mussel stations in the Inner Oslofjord, but all had acceptable levels of Cd.

Blue mussel in the Kristiansandsfjord were insignificantly polluted by Cd. Schøyen *et al.* (2010) also reported that blue mussel at Odderøy and Svensholmen, among seven blue mussel stations in the Kristiansandsfjord, were insignificantly polluted by Cd in 2010. Blue mussel at Svensholmen had an acceptable level of Cd, not only in September when the CEMP-blue mussel were collected, but also in May and July in 2010.

Significant downward trends have been observed for Cd in blue mussel in the Inner and Mid Sørfjord during the last two decades although they were moderately polluted except for Kvalnes where they were markedly polluted. Ruus *et al.* (2011) also reported that blue mussel at Kvalnes in the Sørfjord was markedly polluted with Cd.

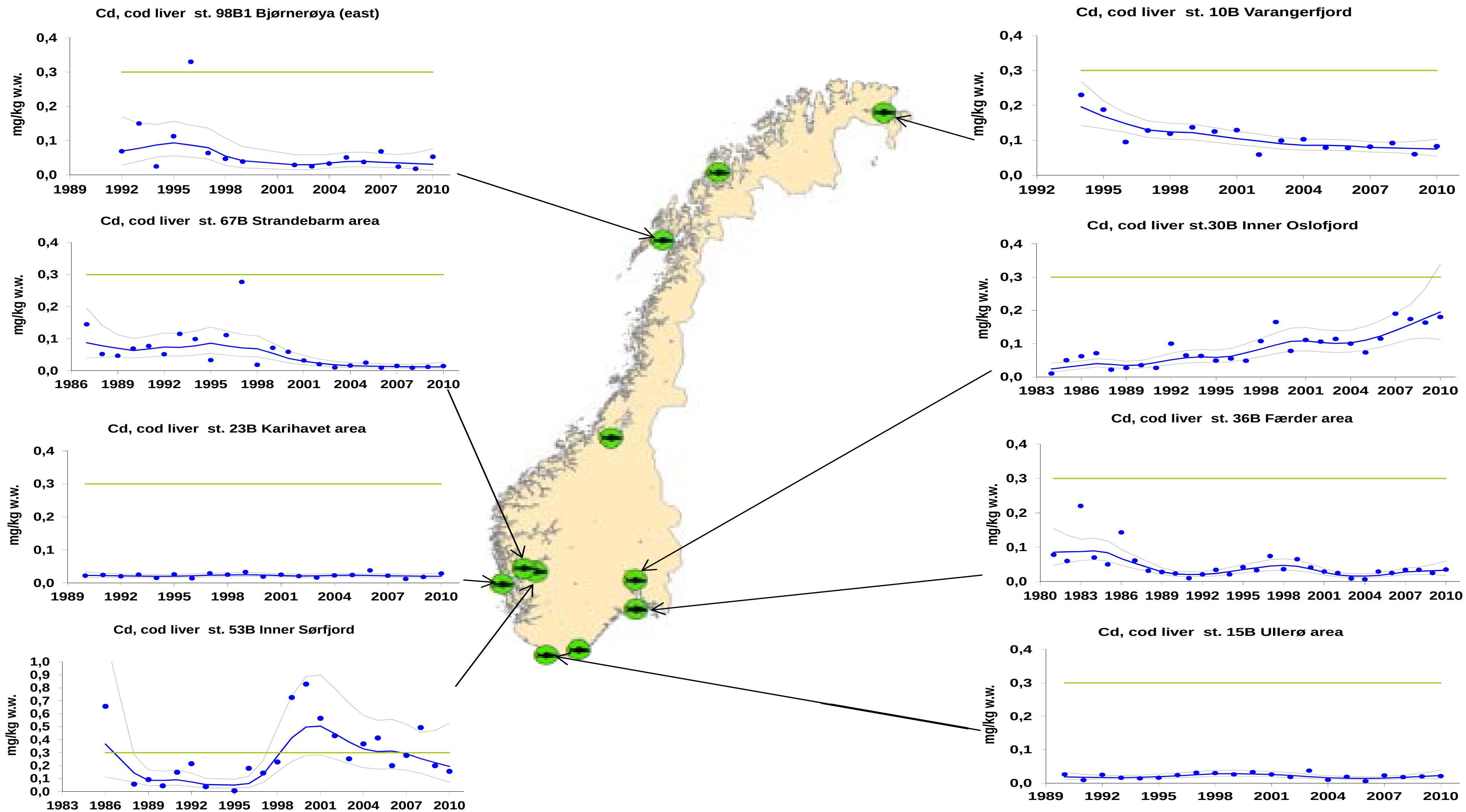

Figure 5. *Median concentration of Cd in cod liver, mg/kg (mg Cd/kg) wet weight (cf. Appendix H, see otherwise key to detail in Figure 2).*

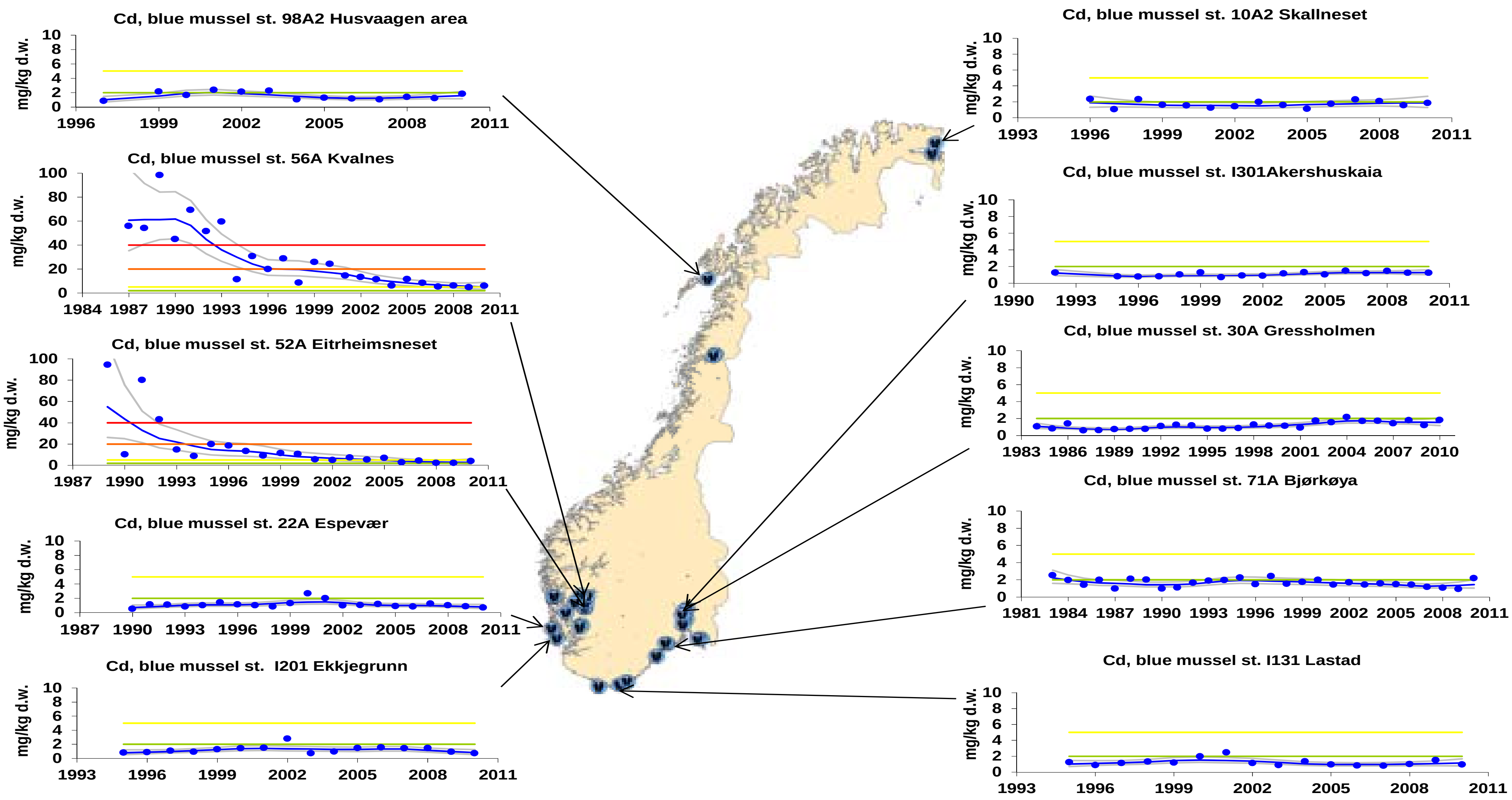

Figure 6. *Median concentration of Cd in blue mussel, mg/kg (mg Cd/kg) dry weight for selected stations (cf. Appendix H, see otherwise key to detail in Figure 2).*

Lead (Pb)

Cod liver

The median concentration of Pb in cod liver exceeded presumed high background levels at two of 11 cod stations (the Inner Oslofjord st. 30B and the Inner Sørfjord st. 53B) (Figure 7). The station in the Inner Sørfjord (st. 53B) had a significant downward trend for the period 1990 to 2010. If one looks at the period from 2001 to 2010, no significant trend can be observed. The station in the Inner Oslofjord (st. 30B) showed no significant trend (see also Table 10). Most of the stations showed acceptable levels of Pb 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), Bjørnerøya (st. 98B1) and in the Varangerfjord (st. 10B). The median concentration of Pb in cod liver revealed acceptable concentrations at Trondheim harbour (st. 80BH), Kristiansand harbour (st. 13BH) and Tromsø harbour (st. 43BH). No trends could be calculated for these stations due to two years of monitoring only.

Flounder liver

Two flounder stations were analysed for Pb in liver. The flounder in the Inner Sørfjord (st. 53F) exceeded presumed high background level of Pb and showed no significant trend. The flounder at Sande (st. 33F) had acceptable concentrations of Pb but showed a significant downward trend.

Dab liver

There were observed acceptable levels of Pb in dab samples from the two stations analysed (Færder area st. 36F and Ullerø area st. 15F, see also Table 10) and both showed significant downward trends.

Plaice liver

An acceptable level and a significant downward trend were observed for Pb in plaice liver from Skogerøy (st. 10F) in the Varangerfjord. Plaice at Husholmen in the Lofoten (st. 98F2) had an acceptable level of Pb and no significant trend.

Megrim liver

Megrim from the Strandebarm area (st. 67F) in the Hardangerfjord showed a significant downward trend for Pb in liver. No significant trend was found for the megrim in the Åkrafjord (st. 21F).

Blue mussel

The presence of Pb in blue mussel exceeded Class I (insignificantly polluted) at 15 of the 38 blue mussel stations analysed (some of the stations are presented in Figure 8 and an overview of all the results is found in Table 10).

No significant trends were observed in mussel from Byrkjenes (st. 51A) and Kvalnes (st. 56A) in the Sørfjord (both Class III, markedly polluted). Blue mussel at Odderøy (st. I133) were markedly polluted (Class III) but no trend could be calculated because due to short data series. No significant trends were observed at Gressholmen (st. 30A) in the Inner Oslofjord, and Moholmen (st. I965) and Toraneskaien in the Ranfjord (st. I964) (all Class II, moderately polluted). Significant downward trends were found at Eitrheimsneset (st. 52A) and Krossanes (st. 57A) in the Sørfjord, and at Ranaskjær (st. 63A) and Vikingneset (st. 65A) in the Hardangerfjord (all Class II, moderately polluted). Blue mussel at Croftholmen (st. I712), Svensholmen (st. I132) in the Kristiansandsfjord, Nordnes (st. I241), Gravdalsneset (st. I242) and Hegreneset (st. I243) close to Bergen were moderately polluted (Class II) but no trends could be calculated because of lack of long enough data series.

In blue mussel that were insignificantly polluted (Class I) of Pb, no significant trends were found in the Oslofjord at Akershuskaia (st. I301), Gåsøya (st. I304), Ramtonholmen (st. I307) and Håøya (st. I306). The same results were found in the Hvaler area in the Outer Oslofjord at Damholmen (st. I022), Singlekalven (st. I023) and at Kirkøy (st. I024), as well as at Risøy (st. 76A) and Gåsøy/Ullerø (st. 15A) in the southern part of Norway. Further, insignificantly polluted mussels (Class I) and no significant trends were found at Ekkjegrunn (st. I201) and Bølsnes (st. I205) in the

Saudafjord, at Espevær (st. 22A) on the west coast, at Bjørnbærviken (st. I969) in the Ranfjord and at Skallneset (st. 10A2) and Brashavn (st. 11X) in the Varangerfjord.

In blue mussel that were insignificantly polluted (Class I) of Pb, a significant downward trend was found at Solbergstrand (st. 31A), Mølen (st. 35A), Bjørkøya/Risøyodden (st. 71A), Lille Terøy (st. 69A) and Husvaagen area (st. 98A2).

Blue mussel at Strømtangen (st. I713), Lastad (st. I131A) and Høgevarde (st. 227A2) had acceptable levels of Pb (Class I) but no trends could be calculated because of few data.

Concluding remarks on Pb

Only one upward trend of Pb were found in cod liver in the Inner Sørfjord. Concentrations over presumed high background levels of Pb were found in cod liver from the Inner Oslofjord and the Inner Sørfjord.

Blue mussel at Gressholmen were moderately polluted by Pb while all the other stations in the Inner Oslofjord had acceptable levels of Pb. Berge (2011) found that a decrease in Pb in blue mussel in the Inner Oslofjord in 2010 compared to 2006.

Blue mussel at Odderøy in the Kristiansandsfjord were markedly polluted with Pb. Schøyen *et al.* (2010) reported that blue mussel at Svensholmen were moderately polluted by Pb, not only in September when the CEMP-blue mussel were collected, but also in May and July in 2010. This study also showed that the other blue mussel stations (Lagmannsholmen, Voie/Kjosbukta, Bragdøy and Flekkerøy/Kjeholmen) in the Kristiansandsfjord were moderately polluted by Pb.

Blue mussel at Byrkjenes and Kvalnes in the Sørfjord were markedly polluted with Pb. Ruus *et al.* (2011) found that analyses of Pb in blue mussel showed acceptable levels only at Utne and Digranes, while the other stations were had up to markedly degree of pollution in the Sørfjord in 2010.

Blue mussel at Nordnes and Moholmen were moderately polluted in 2010, while they were markedly polluted in 2009.

The low levels of Pb in cod and the significant downward trends, even close to highly populated areas such as Oslo, indicate that the ban of Pb in gasoline has had a positive effect.

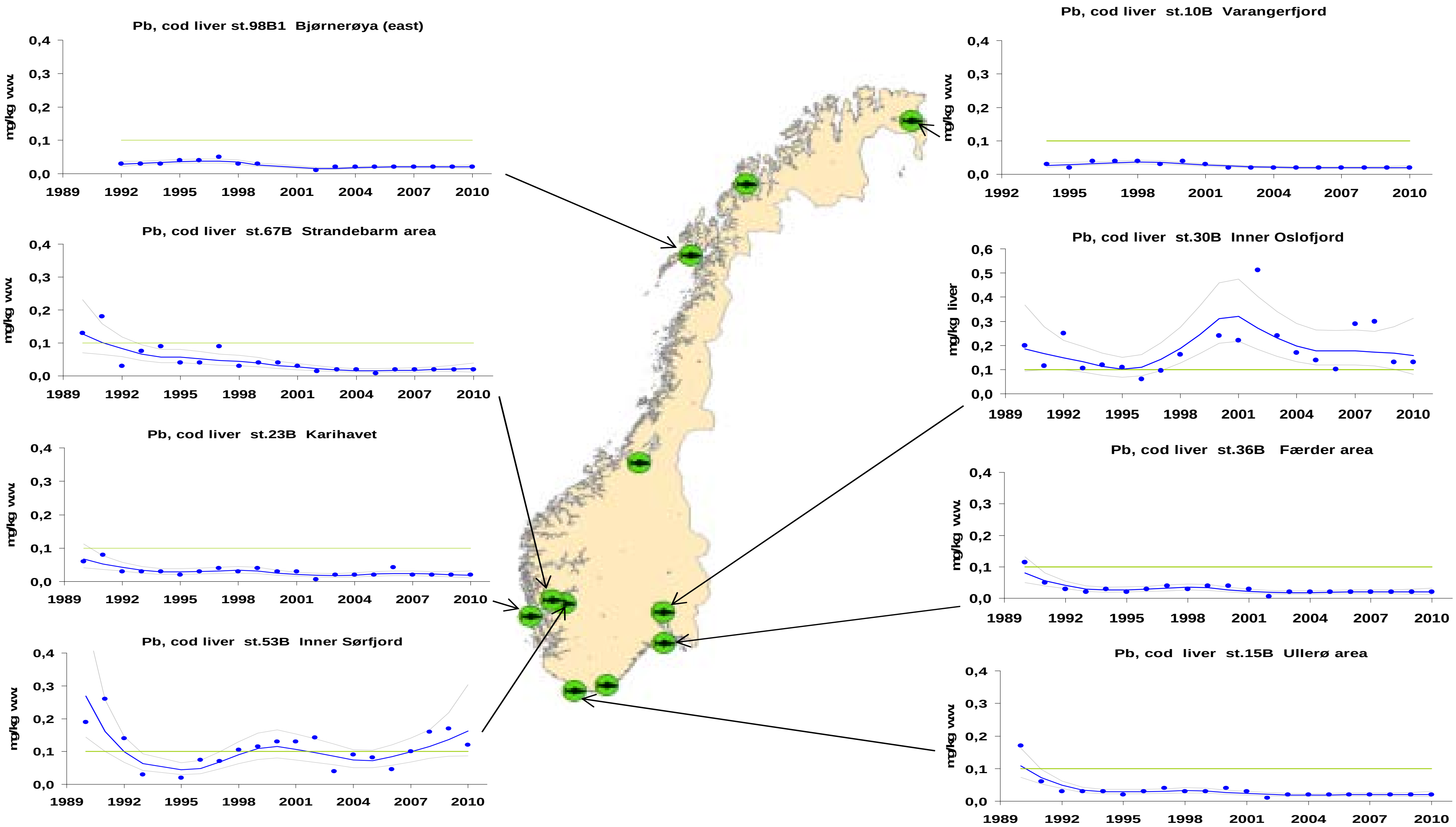

Figure 7. *Median concentration of Pb in cod liver, mg/kg (mg Pb/kg) wet weight (cf. Appendix H, see otherwise key to detail in Figure 2).*

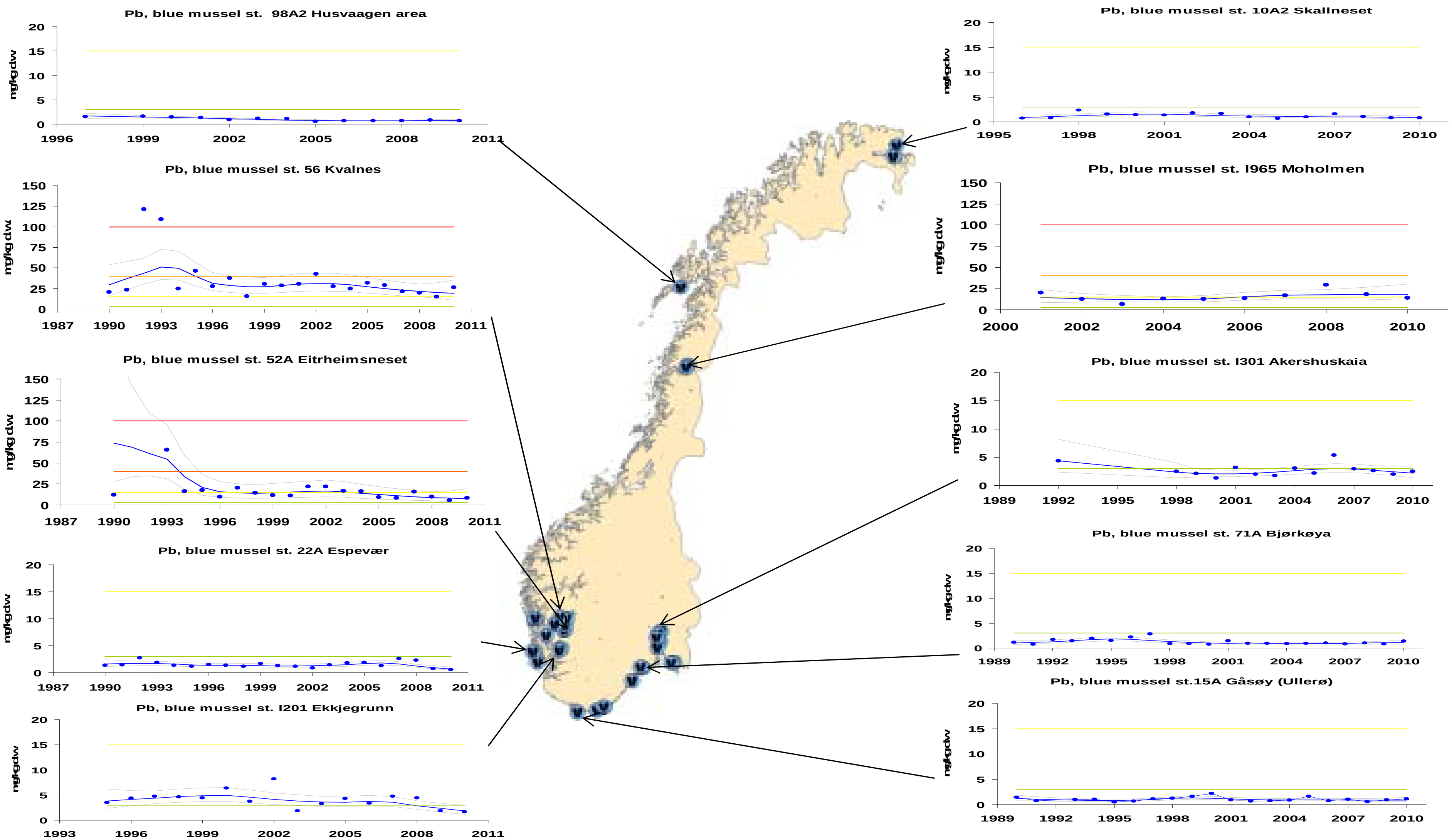

Figure 8. *Median concentration of Pb in blue mussel, mg/kg (mg Pb/kg) dry weight for selected stations (cf. Appendix H, see otherwise key to detail in Figure 2).*

Copper (Cu)

Results for Cu are presented in Table 10, Appendix H and Appendix I. Trend analyses are only presented for some blue mussel stations (cf. Appendix H).

Cod liver
Cod from all 11 stations along the coast; the Inner Oslofjord (st. 30B), Færder area (st. 36B), Ullerø area (st. 15B), Kristiansand harbour (st. 13 BH), the Inner Sørfjord (st. 53B), Strandebarm area (st. 67B), Karihavet area (st. 23B), Trondheim (st. 80BH), Tromsø harbour (st. 43BH), Bjørnerøya (st. 98B1) and the Varangerfjord (st. 10B) had all concentrations below background levels. Three significant trends were found: two downward at Færder and Varangerfjord and one upward at the Inner Sørfjord.

Flounder liver
Flounder at both stations at Sande (st. 33F) and in the Inner Sørfjord (st. 53F) had concentrations of Cu over background level in liver. A significant downward trend was detected at Sande while no significant trend was found in the Inner Sørfjord.

Dab liver
Dab at Færder (st. 36F) and Ullerø area (st. 15F) showed acceptable concentrations of Cu. No significant trends were detected.

Plaice liver
Plaice at Skogerøy (st. 10F) had acceptable levels of Cu, but a significant upward trend was found. Plaice at Husholmen (st. 98F2) in Lofoten had acceptable levels of Cu-concentrations in the liver and no trend was detected.

Megrim liver
Two megrim stations were analysed for Cu in liver. No significant trend was found in the Åkrafjord (st. 21F) on the west coast, but a significant downward trend was found in the Strandebarm area (st. 67F) in the Hardangerfjord. Relevant values for median presumed high background levels were not available.

Blue mussel
The presence of Cu in blue mussel exceeded Class I (insignificantly polluted) at four of 38 stations. The blue mussel were moderately polluted (Class II) but no trends were observed at Solbergstrand (st. 31A) in the Oslofjord, at Kirkøy (st. I024) in the Hvaler area and Toraneskaien (st. I964) in the Ranfjord. The values at Solbergstrand were 29.4 mg/kg d. w. in 2010 and 6.2 mg/kg d. w. in 2009. In 2010, this location was not at the same place as earlier years. Blue mussel at Svensholmen (st. I132) in the Kristiansandsfjord were also moderately polluted (Class II), but no trend could be calculated because of lack of enough data for trend calculations.

Blue mussel were insignificantly polluted (Class I) and showed no significant trends at all the stations in the Oslofjord at Akershuskaia (st. I301), Gressholmen (st. 30A), Gåsøya (st. I304), Ramtonholmen (st. I307), Håøya (st. I306) and Mølen (st. 35A). The same could be observed in the Hvaler area at Damholmen (st. I022) and Singlekalven (st. I023), and in the southern part of Norway at Bjørkøya/Risodden (st. 71A), Risøy (st. 76A), Lastad (st. I131A) and Gåsøy/Ullerø (st. 15A). Insignificant Cu-pollution (Class I) and no significant trends were observed in the Sørfjord at Byrkjenes (st. 51A), Eitrheimsneset (st. 52A), Kvalnes (st. 56A) and Krossanes (st. 57A), and outwards the Hardangerfjord at Ranaskjær (st. 63A), Vikingneset (st. 65A) and Lille Terøy (st. 69A). The same could be observed at Espevær (st. 22A) on the west coast, in Bjørnbærviken (st. I969) and Moholmen (st. I965) in the Ranfjord, in the Husvaagen area (st. 98A2) in Lofoten and in Skallneset (st. 10A2) and Brashavn (st. 11X) in the northern part of Norway.

Blue mussel at Croftholmen (st. I712) and Strømtangen (st. I713) in the Frierfjord, Odderøy (st. I133) in the Kristiansandsfjord, Bølsnes (st. I205) and Ekkjegrunn (st. 201) in the Saudafjord, Høgevarde (st. 227A2) in the Karmsundet and Nordnes (st. I241), Gravdalsneset (I242) and Hegreneset (st. I243) close to Bergen had all acceptable levels of Cu (Class I) but no trends could be calculated because of few data.

Concluding remarks on Cu

Blue mussel were no more than moderately polluted by Cu (four stations above Class I) and no upward trends were found. The median concentration of Cu has decreased the recent years at Espevær were the blue mussel were severely polluted in 2007 and insignificantly polluted in 2008, 2009 and 2010. Although, no significant trend was observed at Espevær.

All blue mussel stations in the Inner and Mid Oslofjord had an acceptable level of Cu. Berge (2011) found a decrease in Cu in blue mussel in the Inner Oslofjord in 2010 compared to 2006.

Schøyen *et al.* (2010) also reported that blue mussel at Odderøy and Svensholmen in the Kristiansandsfjord were insignificantly polluted by Cu in 2010 (based on one of the three CEMP-replicates). Blue mussel at Svensholmen had an acceptable level of Cu, not only in September when the CEMP-blue mussel were collected, but also in May and July in 2010.

Blue mussel from all stations in the Sørfjord had an acceptable level of Cu. This corresponds with the results in Ruus *et al.* (2011) where blue mussel generally showed no exceedance of Class I (insignificantly polluted) for Cu, except at station Utne in the Outer Sørfjord where the concentrations corresponded to Class II (moderately polluted).

Zinc (Zn)

Results for Zn are presented in Table 10, Appendix H and Appendix I. Trend analyses are only presented for some blue mussel stations (cf. Appendix H).

Cod liver

Cod from all 11 stations in the Inner Oslofjord (st. 30B), Færder area (st. 36B), Borøy area (st. 77B), Ullerø area (st. 15B), Kristiansand harbour (st. 13 BH), the Inner Sørfjord (st. 53B), Strandebarm area (st. 67B), Karihavet area (st. 23B), Trondheim (st. 80BH), Tromsø harbour (st. 43BH), Bjørnerøya east (st. 98B1) and the Varangerfjord (st. 10B) had all concentrations below background levels. The only significant trends were downward and these were found at Færder, Ullerø area and in the Varangerfjord.

Flounder liver

Flounder at both stations at Sande (st. 33F) and in the Inner Sørfjord (st. 53F) had acceptable levels of Zn in liver. No significant trend was detected in the Inner Sørfjord, and a significant downward trend was found at Sande.

Dab liver

Dab at Færder (st. 36F) and Ullerø area (st. 15F) showed acceptable concentrations of Zn. No trends were detected.

Plaice liver

Plaice at Husholmen (st. 98F2) in Lofoten and Skogerøy (st. 10F) in the Varangerfjord had both acceptable levels of Zn-concentrations in the liver. No significant trends were detected.

Megrim liver

Two megrim stations were analysed for Zn in liver. No significant trends could be detected at either Åkrafjord (st. 21F) on the west coast or the Strandebarm area (st. 67F) in the Hardangerfjord. Relevant values for median presumed high background levels were not available.

Blue mussel

Blue mussel at 38 locations were analysed for Zn. Blue mussel at Moholmen (st. I965) and Toraneskaien (st. I964) in the Ranfjord were moderately polluted (Class II) by Zn, and a significant upward trend was observed for Moholmen while no significant trend was found at Toraneskaien.

Blue mussel from 36 stations were insignificantly polluted (Class I) by Zn. A significant upward trend was only found at Mølen (st. 35A).

No significant trends were observed in the Oslofjord at Akershuskaia (st. I301), Gressholmen (st. 30A), Gåsøya (st. I304), Ramtonholmen (st. I307), Håøya (st. I306) and Solbergstrand (st. 31A), and in the Hvaler area at Damholmen (st. I022), Singlekalven (st. I023) and Kirkøy (st. I024). The same result was found at Risøy (st. 76A), Lastad (st. I131A) and Gåsøy/Ullerø (st. 15A) in the southern part of Norway. Further, no trends were found at Espevær (st. 22A) on the west coast and at Byrkjenes (st. 51A) in the Sørfjord, and at Nordnes (st. I241), Gravdalsneset (st. I242) and Hegreneset (st. I243) close to Bergen. No trends were also observed at Bjørnbærviken (st. I969) in the Ranfjord, at Husvaagen area (st. 98A2) in the Lofoten or at Skallneset (st. 10A2) and Brashavn (st. 11X) in the Varangerfjord. Significant downward trends were observed in mussel from Bjørkøya/Risøyodden (st. 71A) and stations in the Sørfjord and Hardangerfjord; Eitrheimsneset (st. 52A), Kvalnes (st. 56A), Krossanes (st. 57A), Ranaskjær (st. 63A), Vikingneset (st. 65A) and Lille Terøy (st. 69A).

Blue mussel at Croftholmen (st. I712) and Strømtangen (st. I713) in the Frierfjord, Odderøy (st. I133) and Svensholmen (st. I132) in the Kristiansandsfjord, Bølsnes (st. I205) and Ekkjegrunn (st. I201) in the Saudafjord and Høgevarde (st. 227A2) in the Karmsundet had all acceptable levels of Zn (Class I) but no trends could be calculated because of few data.

Concluding remarks on Zn
All results for cod and flatfish showed acceptable levels of Zn.

Of the 38 investigated blue mussel locations, 36 were insignificantly polluted. The two blue mussel stations with highest concentrations (moderately polluted) were found in the Ranfjord. The only upward trend for Zn was observed in blue mussel from Mølen and Moholmen. All blue mussel stations in the Inner and Mid Oslofjord had an acceptable level of Zn.

Schøyen *et al.* (2010) found that seven blue mussel stations in the Kristiansandsfjord, Odderøy and Svensholmen included, were insignificantly polluted by Zn in 2010. Blue mussel at Svensholmen had an acceptable level of Zn, not only in September when the CEMP-blue mussel were collected, but also in May and July in 2010.

All blue mussel stations in the Sørfjord had an acceptable level of Zn. Ruus *et al.* (2011) showed no exceedance of Class I (insignificantly polluted) of Zn in blue mussel in the Sørfjord in 2010.

Silver (Ag)

Results for Ag are presented in Table 10, Appendix H and Appendix I. Relevant values for median presumed high background levels of Ag are not available for any of the analysed fish samples. Except for two cod stations (the Inner Oslofjord and Karihavet), no trends could be calculated for fish since the data was insufficient for trend analysis because of too short time series.

Cod liver
Cod liver from 11 stations were analysed for Ag with a range of median concentrations of 0.054-10.1 mg/kg w.w. The two highest levels were from the Inner Oslofjord (st. 30B) and Færder (st. 36B) with concentrations of 10.1 and 1.03 mg/kg w.w., respectively (cf. Appendix H). There were no significant trends in the Inner Oslofjord (st. 30B) and Karihavet (st. 23B) on the west coast.

Flounder liver
Flounder from Sande (st. 33F) and the Inner Sørfjord (st. 53F) were analysed for Ag in liver with a range in median concentrations of 0.075 and 0.043 mg/kg w.w., respectively.

Dab liver
Dab liver at the two stations, Færder area (st. 36F) and Ullerø area (st. 15F) were analysed for Ag with a range of median concentrations of 0.046 and 0.058 mg/kg w.w., respectively.

Plaice liver
Ag in plaice liver was analysed at the two stations Husholmen (st. 98F2) in Lofoten and at Skogerøy (st. 10F) in the Varangerfjord with median concentrations of 0.13 and 0.193 mg/kg w.w., respectively.

Megrim liver
Two megrim stations were analysed for Ag in liver; the Åkrafjord (st. 21F) on the west coast and the in the Strandebarm area (st. 67F) in the Hardangerfjord with median concentrations of 0.14 and 0.069 mg/kg w.w., respectively.

Blue mussel
Blue mussel were insignificantly polluted (Class I) at all 38 stations that were analysed in 2010 (see Table 10). No trends were found at Gressholmen (st. 30A), Gåsøya (st. I304) and Ramtonholmen (st. I307) in the Inner Oslofjord, Bjørkøya/Risøyodden (st. 71A) in the Frierfjord, Espevær (st. 22A) on the Norwegian west coast, Eitrheimsneset (st. 52A) in the Sørfjord, Husvaagen area (st. 98A2) in the Lofoten area or Skallneset (st. 10A2) in the Northern part of Norway.

There was acceptable levels (Class I) of Ag at all the 30 other blue mussel stations, but no trends could be calculated because of few data.

Concluding remarks on Ag
The levels of Ag in the cod from the Inner Oslofjord seems to be higher than from other sites. The Ag-values in cod liver at Kristiansand harbour and Karihavet on the west coast have decreased by a factor of seven from 2009 to 2010. The cod in the Varangerfjord had 0.054 mg Ag/kg w.w., which was the lowest value of all cod stations.

All blue mussel were classified as insignificantly polluted by Ag. Blue mussel in the Kristiansandsfjord and in the Varangerfjord had the highest Ag-levels. Schøyen *et al.* (2010) found that blue mussel at Odderøy and Svensholmen in the Kristiansandsfjord were insignificantly polluted by Ag in 2010. Blue mussel at Svensholmen had an acceptable level of Ag, not only in September when the CEMP-blue mussel were collected, but also in May and July in 2010.

Arsenic (As)

Results for As is presented in Table 10, Appendix H and Appendix I. No trends for As in fish were measured because the data was insufficient for trend analysis. Relevant values for median presumed high background levels of As are not available for any of the analysed fish samples.

Cod liver
Cod at 11 stations were analysed for As and median concentrations varied between 2.36 mg/kg w.w. in the Varangerfjord (st. 10B) and 8.2 mg/kg w.w. in the Færder area (st. 36B), with one exception; 30.9 mg/kg w.w. in the Inner Oslofjord (st. 30B). The reason for these maxima has not yet been determined.

Flounder liver
The As-levels of flounder were 1.47 mg/kg w.w. at Sande (st. 33F) and 2.07 mg/kg w.w. in the Inner Sørfjord (st. 53F).

Dab liver
Dab liver at the two stations Ullerø area (st. 15F) and Færder area (st. 36F) were analysed for As and median concentration range was 10.1 to 19.3 mg/kg w.w, respectively.

Plaice liver
Liver in the two plaice stations at Husholmen (st. 98F2) in Lofoten and at Skogerøy (st. 10F) in the Varangerfjord were analysed for As with median concentrations of 4.44 and 7.52 mg/kg w.w., respectively.

Megrim liver
Liver samples from the two stations Åkrafjord (st. 21F) on the west coast and the Strandebarm area (st. 67F) in the Hardangerfjord were analysed for As with median concentrations of 14.87 and 5.64 mg/kg w.w., respectively.

Blue mussel
Blue mussel at 38 stations were analysed for As (see Appendix H). Only four of these blue mussel stations had acceptable levels (Class I) of As.

Blue mussel at Risøy (st. 76A) and Høgevarde (st. 227A2) were markedly polluted (Class III) of As, but no trends could be calculated because of short time series. Blue mussel were moderately polluted (Class II) and no significant trends were found at Gressholmen (st. 30A), Gåsøya (st. I304), Ramtonholmen (st. I307) and Mølen (st. 35A) in the Oslofjord and at Bjørkøya/Risøyodden (st. 71A) in the Frierfjord. Moderately polluted (Class II) and no significant trends were also documented at Espevær (st. 22A) on the west coast, at Toraneskaien (st. I964), Moholmen (st. I965) and Bjørnbærviken (st. I969) in the Ranfjord, at Husvaagen area (st. 98A2) in the Lofoten area or in the Varangerfjord area at Skallneset (st. 10A2).

Blue mussel were moderately polluted (Class II) but no trends could be calculated because of few data were observed at Akershuskaia (st. I301) and Håøya (st. I306) in the Inner Oslofjord and at Damholmen (st. I022), Singlekalven (st. I023) and Kirkøy (st. I024) in the Hvaler area. Similar results were also observed at Croftholmen (st. I712) and Strømtangen (st. I713) in the Frierfjord, at Svensholmen (st. I132) and Odderøy (st. I138) in the Kristiansandsfjord and at Lastad (st. I131A) and Gåsøy/Ullerøy (st. 15A) in the southern part of the country. This was also observed at Byrkjenes (st. 51A), Kvalnes (st. 56A) and Krossanes (st. 57A) in the Sørfjord, at Ranaskjær (st. 63A), Vikingneset (st. 65A) and Lille Terøy (st. 69A) in the Hardangerfjord, and at Nordnes (st. I241), Gravdalsneset (st. I242) and Hegreneset (st. I243) close to Bergen.

Blue mussel were insignificantly polluted (Class I) and showed no significant trend at Eitrheimsneset (st. 52A) in the Inner Sørfjord. Blue mussel at Ekkjegrunn (st. I201) and Bølsnes (st. I205) in the Saudafjord, and Brashavn (st. 11X) in the Varangerfjord had an acceptable level of As, but no trend could be calculated due to few data in the data series.

Concluding remarks on As

Most of the blue mussel were moderately polluted by As, but Risøy close to Risør and Høgevarde in the Karmsund were markedly polluted.

Schøyen *et al.* (2010) found that all seven blue mussel stations in the Kristiansandsfjord, including Odderøy and Svensholmen, were moderately polluted by As in 2010. Blue mussel at Svensholmen were moderately polluted by As, not only in September when the CEMP-blue mussel were collected, but also in May and July in 2010.

Nickel (Ni)

Results for Ni are presented in Table 10, Appendix H and Appendix I. No trends for Ni in fish were measured because the data was insufficient for trend analysis. Relevant values for median presumed high background levels of Ni are not available for any of the analysed fish samples.

Cod liver
Cod at 11 stations were analysed for Ni with a range of median concentrations of 0.05-0.5 mg/kg w.w. The highest concentration was found in the Strandebarm area (st. 67B) and the next highest was found in Kristiansand harbour (st. 13BH).

Flounder liver
The Ni-levels of flounder were 0.04 mg/kg w.w. at Sande (st. 33F) and 0.042 mg/kg w.w. in the Inner Sørfjord (st. 53F).

Dab liver
Dab liver at the two stations Færder area (st. 36F) and Ullerø area (st. 15F) were analysed for Ni and both stations had concentrations of 0.07 mg/kg w.w.

Plaice liver
Liver samples from the station at Husholmen (st. 98F2) in Lofoten and at Skogerøy (st. 10F) in the Varangerfjord had median concentrations of 0.15 and 0.135 mg/kg w.w., respectively.

Megrim liver
Samples from the two stations that were analysed for Ni in liver were Åkrafjord (st. 21F) on the west coast and the Strandebarm area (st. 67F) in the Hardangerfjord with median concentrations of 0.02 mg/kg w.w. and 0.04 mg/kg w.w., respectively.

Blue mussel
Blue mussel at 38 stations were analysed for Ni and four of these exceeded acceptable levels of pollution (see Appendix H). At Kirkøy (st. I204) in the Hvaler area, Svensholmen (st. I132) in the Kristiansandsfjord and Moholmen (st. I965) and Toreneskaien (st. I964) in the Ranfjord, blue mussel were moderately polluted (Class II) by Ni.

All the 10 blue mussel stations that had values for trend analyses were insignificantly polluted (Class I). Significant upward trend was only found at Ramtonholmen (st. I307). No significant trends were observed at Gressholmen (st. 30A), Gåsøya (st. I304), Solbergstrand (st. 31A) and Mølen (st. 35A) in the Oslofjord, at Bjørkøya/Risøyodden (st. 71A) in the Frierfjord, at Espevær (st. 22A) on the west coast, at Eitrheimsneset (st. 52A) in the Inner Sørfjord, at Husvaagen area (st. 98A2) in the Lofoten area or at Skallneset (st. 10A2) in the Varangerfjord. Blue mussel were insignificantly polluted (Class I) and no trends could be calculated at 24 stations analysed for Ni.

Concluding remarks on Ni
Significant upward trend was only found at Ramtonholmen in the Inner Oslofjord, although the blue mussel had an acceptable level of Ni.

Two blue mussel stations in the Ranfjord, Moholmen and Toraneskaien, were moderately polluted by Ni in 2010. These blue mussel were markedly polluted in 2009.

Blue mussel were also moderately polluted at Kirkøy in the Hvaler area and Svendsholmen in the Kristiansandsfjord. Schøyen *et al.* (2010) found that blue mussel at Svensholmen were insignificantly polluted in May and July, but markedly polluted by Ni in September when the CEMP-samples were taken.

Chromium (Cr)

Results for Cr are presented in Table 10, Appendix H and Appendix I. No trends for Cr in flatfish were measured because the data was insufficient for trend analysis. Relevant values for median presumed high background levels of Cr are not available for any of the analysed fish samples.

Cod liver
Cod at 11 stations were analysed for Cr and 10 of these stations had a median concentration of 0.2 mg/kg w.w. Cod in the Strandebarm area (st. 67B) had the highest level (0.7 mg/kg w.w.) There were significant upward trends in the Færder area (st. 36B), Ullerø (st. 15B) abd Bjørnerøya (st. 98B1). There were no significant trends in the Inner Oslofjord (st. 30B) and in the Karihavet (st. 23B).

Flounder liver
The values for Cr in flounder at Sande (st. 33F) and in the Inner Sørfjord (st. 53F) were both 0.2 mg/kg w.w.

Dab liver
Dab liver at the two stations Færder area (st. 36F) and Ullerø area (st. 15F) were analysed for Cr. Both had median concentrations of 0.2 mg/kg w.w.

Plaice liver
Liver samples from Husholmen (st. 98F2) in Lofoten and at Skogerøy (st. 10F) in the Varangerfjord were analysed with median concentrations of 0.2 mg/kg w.w.

Megrim liver
Megrim liver from the Åkrafjord (st. 21F) on the Norwegian west coast and the Strandebarm area (st. 67F) in the Hardangerfjord were analysed for Cr with median concentrations of 0.2 mg/kg w.w.

Blue mussel
Blue mussel at 38 stations were analysed for Cr (see Appendix H). Blue mussel at Kirkøy (st. I024) in the Hvaler area and Toraneskaien (st. I964) and Moholmen (st. I965) in the Ranfjord were markedly polluted (Class III) but no trends could be calculated due to few data. At Damholmen (st. I022) and Singlekalven (st. I023) in the Hvaler area, and Byrkjenes (st. 51A) in the Inner Sørfjord, the mussel were moderately polluted (Class II). No trend-calculations could be done because of too few years of data.

All the nine blue mussel stations that had values for trend analyses were insignificantly polluted (Class I). A significant upward trend was found at Gåsøya (st. I304). No trends were observed at Gressholmen (st. 30A), Ramtonholmen (st. I307) and Mølen (st. 35A) in the Oslofjord, at Bjørkøya/Risøyodden (st. 71A) in the Frierfjord, at Espevær (st. 22A) on the west coast, at Eitrheimsneset (st. 52A) in the Inner Sørfjord, at Husvaagen area (st. 98A2) in the Lofoten area and Skallneset (st. 10A2) in the Varangerfjord.

Blue mussel were insignificantly polluted (Class I) and no trends could be calculated at 23 stations analysed for Cr (see Appendix H).

Concluding remarks on Cr
All flatfish had Cr-concentrations of 0.2 mg/kg w.w.

Blue mussel were moderately polluted at Odderøy in 2009, but had an acceptable level in 2010. Schøyen *et al.* (2010) reported that seven blue mussel stations in the Kristiansandsfjord, including Odderøy and Svensholmen, were insignificantly polluted by Cr in 2010. Blue mussel at Svensholmen had an acceptable level of Cr, not only in September when the CEMP-blue mussel were collected, but also in the summertime in May and July in 2010.

Two blue mussel stations in the Ranfjord were markedly polluted by Cr in 2010, but severely polluted in 2009.

Cobalt (Co)

Cod liver
Cod at 11 stations were analysed for Cr with a range of median concentrations of 0.017 mg/kg w.w (Tromsø havn st. 43BH) to 0.064 mg/kg w.w (the Inner Oslofjord st. 30B).

Flounder liver
The median concentrations of Co in flounder liver were 0.069 mg/kg w.w. at Sande (st. 33F) and 0.103 mg/kg w.w. in the Inner Sørfjord (st. 53F).

Dab liver
Dab liver at the two stations Færder area (st. 36F) and Ullerø area (st. 15F) were analysed for Cr with median concentrations of 0.2 mg/kg w.w. and 0.176 mg/kg w.w., respectively.

Plaice liver
Liver samples from Husholmen (st. 98F2) in Lofoten and at Skogerøy (st. 10F) in the Varangerfjord were analysed with median concentrations of <0.2 mg/kg w.w.

Megrim liver
Megrim liver from the Åkrafjord (st. 21F) on the Norwegian west coast and the Strandebarm area (st. 67F) in the Hardangerfjord were analysed for Cr with median concentrations of 0.097 mg/kg w.w. and 0.064 mg/kg w.w., respectively.

Blue mussel
Blue mussel at 38 stations were analysed for Co. There was no significant trend at Mølen (st. 35A). There were not enough data for trend analyses at the rest of the blue mussel stations. There were highest concentrations of Co at the two stations Odderøy (st. I133) (1.48 mg/kg d.w.) and Svensholmen (st. I132) (1.21 mg/kg d.w.) in the Kristiansandsfjord. The Co-concentrations at Kirkøy (st. I024) (1.15 mg/kg d.w.) and Damholmen (st. I022) (1.08 mg/kg d.w.) in the Hvaler area were also high compared with the rest of the data. The values at Toraneskaien (st. I964) (0.977 mg/kg d.w.) and Moholmen (st. I965) (0.822 mg/kg d.w.) in the Ranfjord were also higher than for the rest of the blue mussel stations. There is no Klif classification for Co in blue mussel.

Concluding remarks on Co
The highest Co-concentrations were found in blue mussel in the Kristiansandsfjord and in the Hvaler area. The Co-levels in plaice liver were highest of all flatfish and cod tissues.

Vanadium (V)

Blue mussel were analysed for V at Mølen (st. 35A) and the concentration has increased to 7.38 mg/kg d. w. in 2010 from 2.6 mg/kg d. w. in 2009. There was no significant trend. There is no Klif classification for V in blue mussel.

Molybden (Mo)

Blue mussel were analysed for Mo at Mølen (st. 35A) and the concentration was 0.688 mg/kg d. w. in 2010. There was no significant trend. There is no Klif classification for Mo in blue mussel.

Tributyltin (TBT)

Blue mussel

Concentrations of organotin (TBT) in blue mussel were quantified at 14 stations (results from some of the stations are presented in Figure 9). The presence of TBT exceeded Class I (insignificantly polluted) at four blue mussel stations (Gressholmen (st. 30A), Akershuskaia (st. I301), Odderøy (st. I133) and Høgevarde (st. 227A2), all Class II, moderately polluted). Significant downward trends were observed at Gressholmen, Akershuskaia and Høgevarde. Blue mussel at Odderøy in the Kristiansandsfjord showed no significant trend. Blue mussel at Mølen (st. 35A), Svensholmen (st. I132) and Lastad (st. I131A) was insignificantly polluted (Class I) by TBT but no significant trend was observed. Significant downward trends were found in mussel at Bjørkøya/Risøyodden (st. 71A), Risøy (st. 76A), Gåsøy/Ullerø (st. 15A), Espevær (st. 22A), Husvaagen area (st. 98A2) and Brashavn (st. 11X) (all Class I). Blue mussel at Ramtonholmen (st, I307) were insignificantly polluted, but no trend could be calculated because of few years of measurements.

Concentrations of TBT in dogwhelk (*Nucella lapillus*)

Significant downward trends were found on the data from all the eight gastropod stations: Færder (st. 36G), Risøy (st. 76G), Lista at Gåsøy/Ullerø (st. 15G), Lastad (st. 131G), Melandsholmen/Flatskjær (st. 227G1), Espevær (st. 22G), Svolvær (st. 98G) and Brashavn (st. 11G). The concentrations of TBT were relatively low. As in 2003, 2004, 2005, 2007, 2008 and 2009 the highest organotin level was found at Melandsholmen/Flatskjær (st. 227G1, Figure 10) close to Haugesund (10.6 µg/kg w.w.) on the west coast of Norway. The lowest organotin level (0.15 µg/kg w.w.) was found at Brashavn (st. 11G) in the Varangerfjord.

Concentrations of TBT in common periwinkle (*Littorina littorea*)

There was no significant trend of TBT at Fugløyskjær (st. 71G) in the Grenland area. The concentration of TBT was 0.016 mg/kg d.w. in 2010 and 0.021 mg/kg d.w. in 2009.

Biological effects of TBT (imposex/VDSI) in dogwhelk

The effects from TBT were low (VDSI<1.12) at all eight stations investigated in 2010. There were significant downward trends at all the stations except for at Brashavn (st. 11G) where no significant trend was found and where VDSI values have been low during the whole monitoring period (Figure 11). The VDSI in dogwhelk from the Svolvær area (st. 98G) had decreased from 3.03 in 2009 to 1.12 in 2010. This was also the case at the Melandholmen/Flatskjær (st. 227G1) where VDSI was 2.32 in 2009 and 0.636 in 2010 (Figure 11). This could also be observed at Espevær (st. 22G) where VDSI was 1.58 in 2009 and 0.125 in 2010. No effects (VDSI = 0) were found at Færder (st. 36G), Risøy (st. 76G), Lastad (st. 131G), Gåsøy/Ullerø (st. 15G) and Brashavn (st. 11G) (Figure 11).

Concluding remarks on TBT

No significant upward trends were found in either blue mussel or snails. All of the 14 blue mussel stations monitored in 2010 were insignificantly or just moderately polluted by TBT in Norwegian waters. However, of the time series investigated, seven snail stations and seven mussel stations showed significant downward trends for TBT.

Berge (2011) observed a decrease in TBT in blue mussel in the Inner Oslofjord in 2010 compared to 2006.

Schøyen *et al.* (2010) found that blue mussel were moderately polluted by TBT at Odderøy and insignificantly polluted at Svensholmen in the Kristiansandsfjord in 2010. The concentration of TBT at Svensholmen was highest in May (moderately polluted) and decreased through the summer in July and in September to an acceptable level. The TBT-concentrations were lowest in the Inner (Marvika) and Outer (Flekkerøy/Kjeholmen) Kristiansandsfjord, and highest in the Mid part of the fjord.

The effects from TBT on dogwhelk were low (VDSI<1.12) at all eight stations investigated in 2010. Dogwhelks from the Svolvær area showed a VDSI of 3.03 in 2009, but had decreased to 1.12 in 2010 and showed a significant downward trend.

The results show that the Norwegian legislation banning the use of organotins on ships shorter than 25 meters in 1990 and longer than 25 meters in 2003 has been effective in reducing imposex in dogwhelk populations and some of the gastropod populations have re-established. The international convention that was initiated by the International Maritime Organization (IMO) has also resulted in a ban on the presence of organotin-based antifouling paints on the hulls of large ships from 2008.

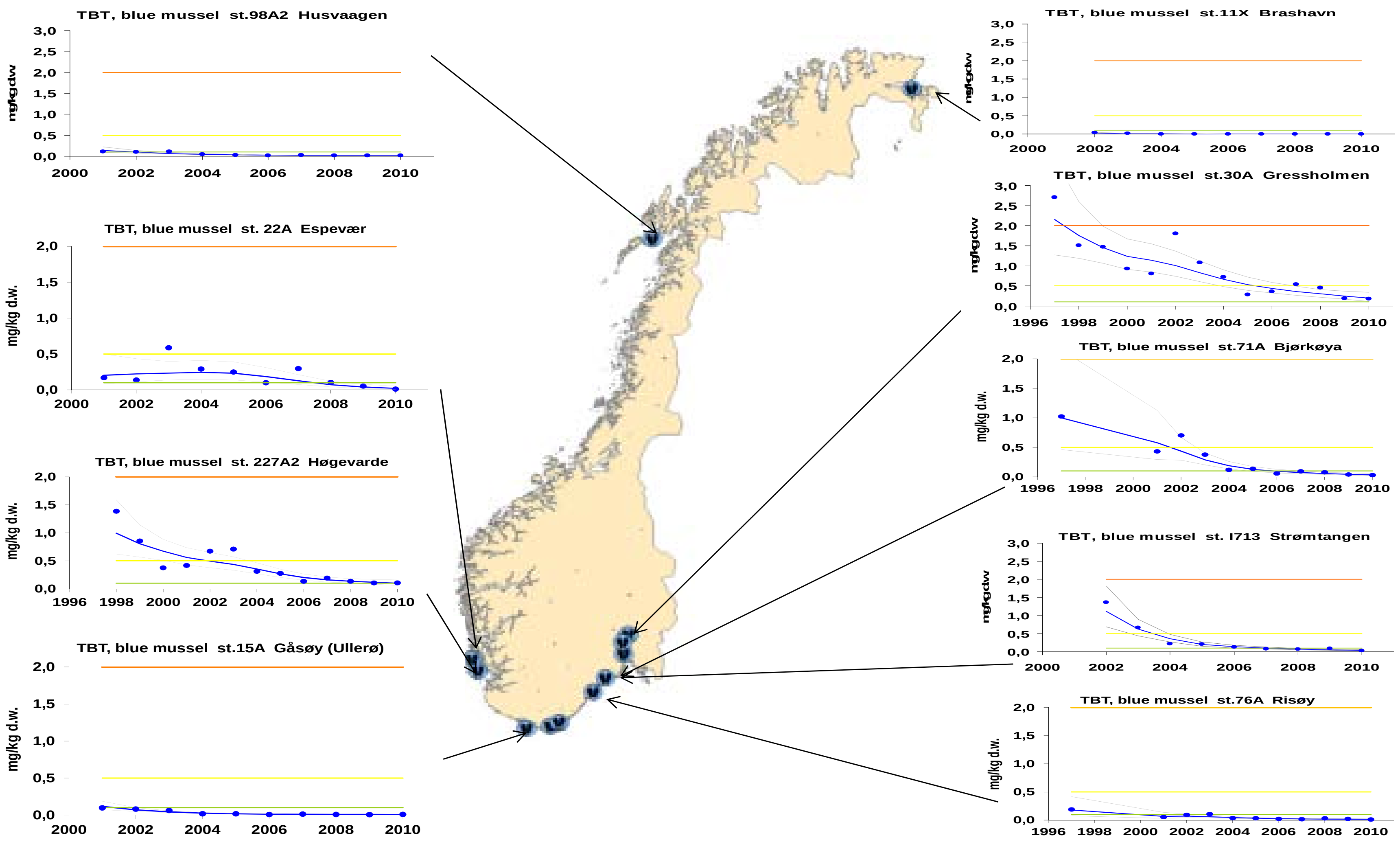

Figure 9. *Median concentration of TBT (on a formulation basis) in blue mussel, mg/kg (mg TBT/kg) dry weight (cf. Appendix H, see otherwise key to detail in Figure 2).*

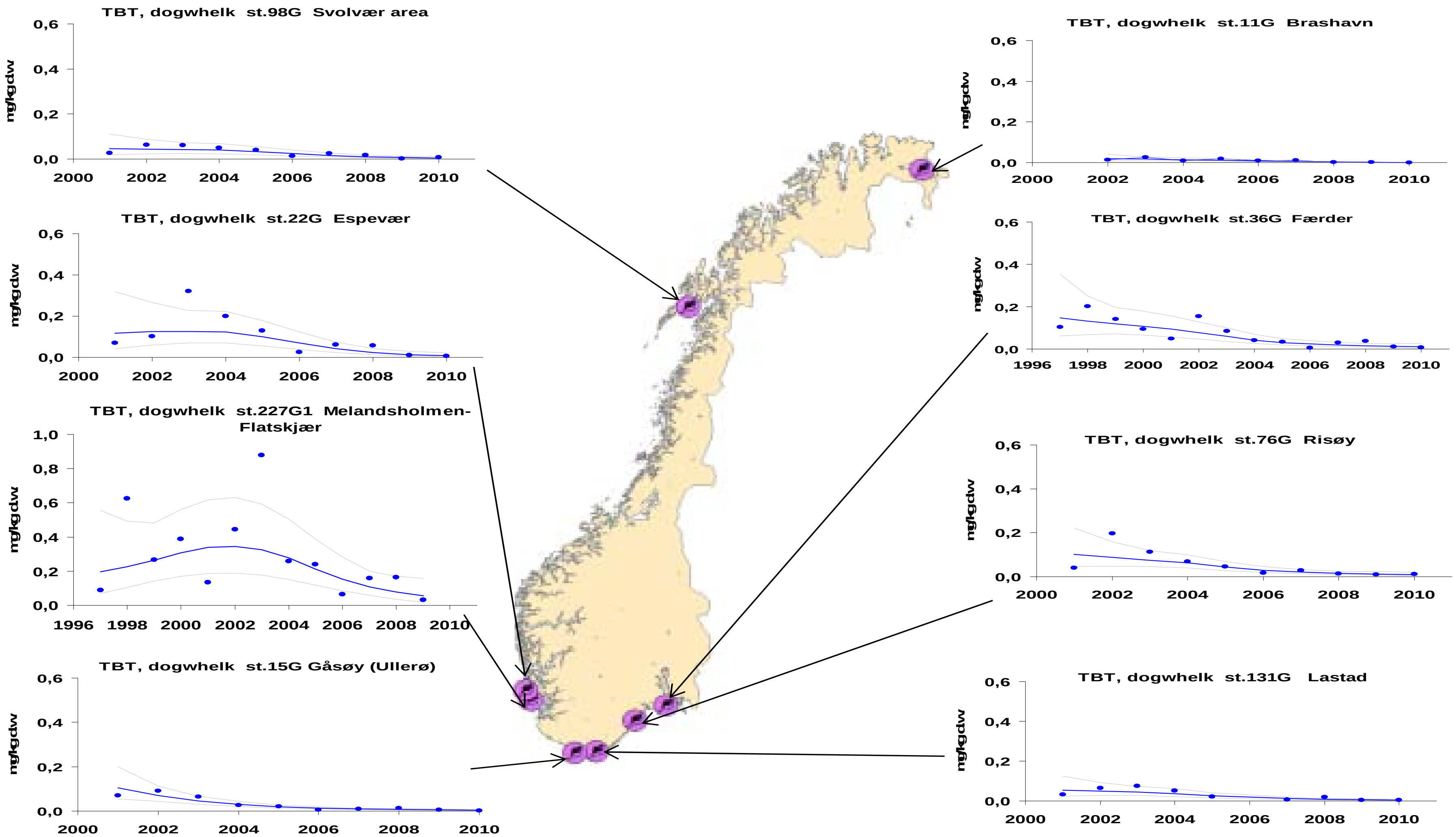

Figure 10. *Median concentration of TBT (on a formulation basis) in dogwhelk at eight stations, mg/kg (mg TBT/kg) dry weight (cf. Appendix H, see otherwise key to detail in Figure 2).The TBT-concentration at Melandsholmen/Flatskjær (st. 227G1) is not presented for 2010 in the figure. There are no limits to classify the results.*

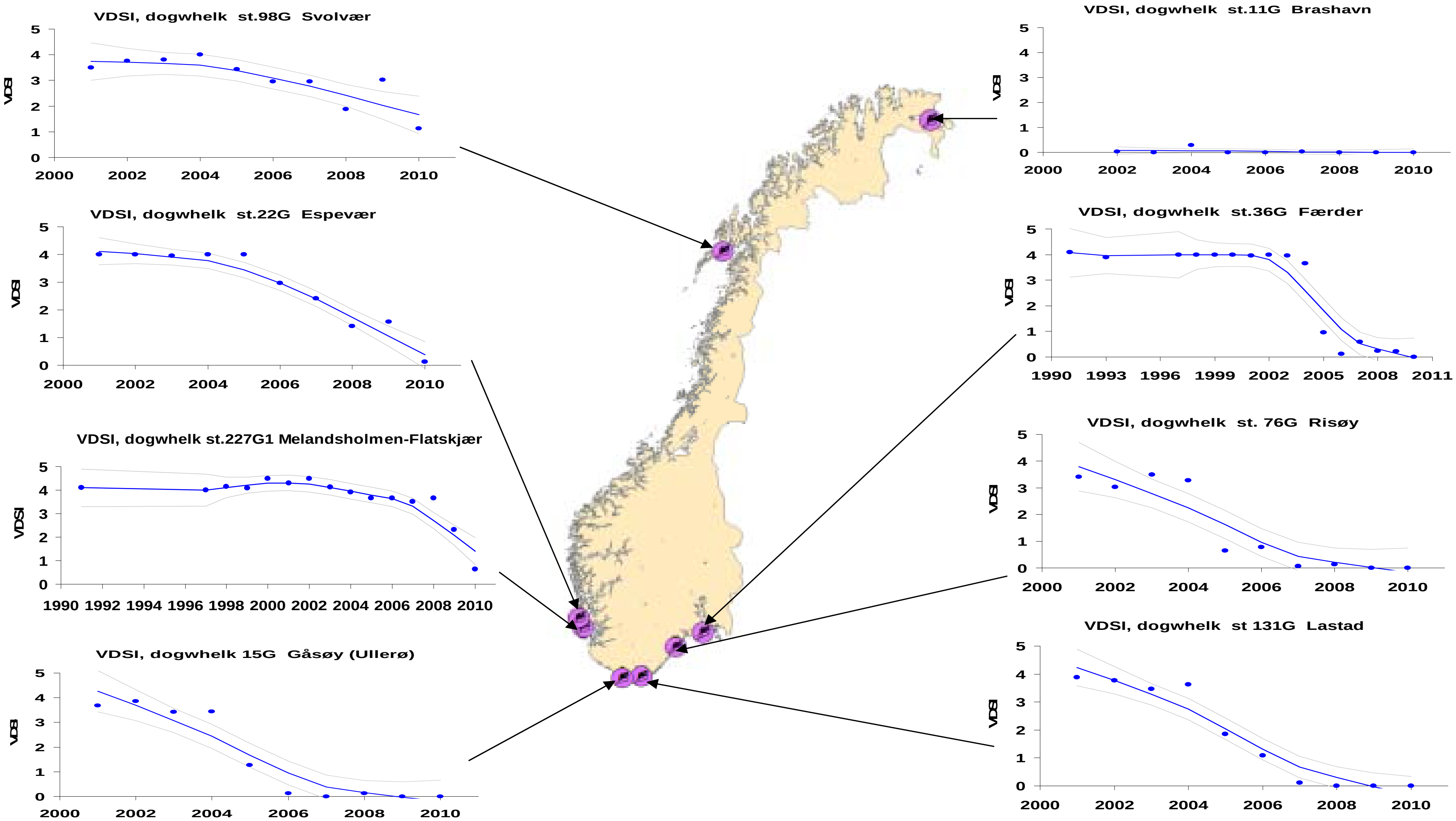

Figure 11. *Median values of imposex (VDSI) in dogwhelk at eight stations. Data from 1991 (Harding et al. 1992) and 1993 (Walday et al. 1997) (cf. Appendix H, see otherwise key to detail in Figure 2). There are no limits to classify the results.*

Polychlorinated biphenyls (ΣPCB-7)

Cod liver

The median concentration of ΣPCB-7 in cod liver exceeded Class I (insignificantly polluted) in only diffusely contaminated areas at four of the 11 stations (Figure 12). The observations from the station in the Inner Oslofjord (st. 30B) (Class III, markedly polluted) revealed no significant trend for the entire period and also for the period 2001 to 2010. Cod liver in the Inner Sørfjord (st. 53B) was moderately polluted (Class II) by ΣPCB-7, but no significant trend could be observed. Cod liver in the harbours in Kristiansand (st. 13 BH) and Trondheim (st. 80BH) were moderately polluted (Class II) by PCBs, but no trend measurements could be done because of insufficient data. Cod liver that were insignificantly polluted of ΣPCB-7 and had a significant downward trend, were found at the six stations; Færder area (st. 36B), Ullerø area (st. 15B), Strandebarm area (st. 67B), Karihavet area (st. 23B), Bjørnerøya east (st. 98B1) and in the Varangerfjord (st. 10B). Due to insufficient data, no trend could be calculated for the cod from Tromsø harbour (st. 43BH).

Cod fillet

The median concentration of ΣPCB-7 in cod fillet exceeded Class I (insignificantly polluted) at three of the 11 cod stations (Figure 13). The stations in Inner Oslofjord (st. 30B) and the Inner Sørfjord (st. 53B) were moderately polluted (Class II) and showed no significant trends, but the cod in the Inner Oslofjord (st. 30B) had a significant upward trend for the period 2001 to 2010. The cod fillet in samples from Kristiansand harbour (st. 13BH) was moderately polluted (Class II) by PCBs, but no trend could be calculated.

The cod fillet in the Færder area (st. 36B), the Strandebarm area (st. 67B), the Karihavet area (st. 23B), Bjørnerøya east (st. 98B1) and the Varangerfjord (st. 10B) had acceptable levels of ΣPCB-7 (Class I) and showed no significant trends. A significant downward trend was found for the cod fillet at Ullerø area (st. 15B) and the level of ΣPCB-7 was acceptable (Class I). No trends could be calculated for the cod at the harbours in Trondheim (st. 80BH) and Tromsø (st. 43BH) because the data were insufficient for trend analyses.

Flounder liver

Results from liver samples from the two stations that were analysed for ΣPCB-7 (Sande (st. 33F) and the Inner Sørfjord (st. 53F)) showed levels below the presumed high background level at Sande and over acceptable level in the Inner Sørfjord. The ΣPCB-7 concentrations in flounder from both stations revealed no significant trends.

Flounder fillet

Observations of ΣPCB-7 in fillet from flounder caught at Sande (st. 33F) showed concentrations below presumed high background level and no significant trend. The flounder in the Inner Sørfjord (st. 53F) showed a significant downward trend and concentrations over presumed high background level.

Dab liver

Results from analysis for ΣPCB-7 in liver of dab showed acceptable concentrations in samples from the Færder area (st. 36F) and Ullerø area (st. 15F). In addition, the data from both stations showed no significant trends.

Dab fillet

Results from analysis for ΣPCB-7 in fillet of dab showed acceptable levels at Færder (st. 36F) and Ullerø area (st. 15F). In addition, no significant trends could be found at the two stations.

Plaice liver

The presence of ΣPCB-7 in liver showed values below presumed high background level at Husholmen (st. 98F2) in the Lofoten area and Skogerøy (st. 10F) in the Varangerfjord. Both stations showed significant downward trends.

Plaice fillet
The value in fillet from fish from Husholmen (st. 98F2) and Skogerøy (st. 10F) was below presumed high background level of ΣPCB-7. No significant trend was observed in plaice from Husholmen while a significant downward trend was found in fish from Skogerøy.

Megrim liver
Megrim liver from fish caught at two stations on the west coast of Norway (Åkrafjord (st. 21F) and Strandebarm area (st. 67F) in the Hardangerfjord) were analysed for ΣPCB-7. The results from megrim in Strandebarm showed a significant downward trend while the results from megrim in the Åkrafjord showed no significant trend. Values for background concentrations for ΣPCB-7 in liver from megrim are not given.

Megrim fillet
The results from megrim fillet from the Strandebarm area (st. 67F) and Åkrafjord (st. 21F) showed no significant trends. Values for background concentrations for ΣPCB-7 in fillet from megrim are not available.

Blue mussel
Blue mussel at 33 stations were analysed for ΣPCB-7. The presence of ΣPCB-7 in blue mussel exceeded Class I (insignificantly polluted) at nine blue mussel stations (some of the stations are presented in Figure 14).

Blue mussel at Solbergstrand (st. 31A) in the Oslofjord were markedly polluted (Class III) by ΣPCB-7, probably because mussel were not found at their usual location and were collected in a small marina within 100 m. The 2010-value was the highest found since monitoring of this station began. In spite of this maxima a significant downward trend was found.

No significant trends were found at Gåsøya (st. I304) in the Inner Oslofjord, at Strømtangen (st. I713) in the Frierfjord or at Nordnes (st. I241) and Gravdalsneset (st. I242) close to Bergen (all Class II, moderately polluted). Significant downward trends were found at Akershuskaia (st. I301) and Gressholmen (st. 30A) in the Inner Oslofjord, and Hegreneset close to Bergen (st. I243) (all Class II, moderately polluted). Blue mussel at Høgevarde (st. 227A2) were moderately polluted but no trend could be calculated because the data were insufficient for trend analyses.

Blue mussel were insignificant polluted (Class I) and no significant trends were found at Håøya (st. I306) in the Inner Oslofjord and at Svensholmen (st. I132), Lastad (st. I131A) and Gåsøy/Ullerø (st. 15A) close to Farsund in the southern part of Norway. This was also found at Byrkjenes (st. 51A), Eitrheimsneset (st. 52A), Kvalnes (st. 56A) and Krossanes (st. 57A) in the Sørfjord and at Ranaskjær (st. 63A) and Lille Terøy (st. 69A) in the Hardangerfjord. Insignificantly polluted mussels (Class I) and no significant trends was also the case at Espevær (st. 22A) on the west coast and at Husvaagen area (st. 98A2) in Lofoten.

Blue mussel were insignificantly polluted (Class I) and significant downward trends were observed at the 12 stations. These stations are: Ramtonholmen (st. I307) in the Inner Oslofjord, Mølen (st. 35A) in the Outer Oslofjord, Damholmen (st. I022), Singlekalven (st. I023) and Kirkøy (st. I024) in the Hvaler area, Bjørkøya/Risøyodden (st. 71A) and Croftholmen (st. I712) in the Frierfjord, Risøy (st. 76A) close to Risør and Odderøy (st. I133) in the Kristiansandsfjord. These were also the results at Vikingneset (st. 65A) in the Hardangerfjord and Skallneset (st. 10A2) and at Brashavn (st. 11X) in the Varangerfjord.

Concluding remarks on ΣPCB-7
Cod liver was markedly polluted by ΣPCB-7 in the Inner Oslofjord and an upward significant trend was observed for the period 2001-2010. Cod fillet in the Inner Oslofjord was also markedly polluted in 2009 but had decreased to moderately polluted in 2010 (as also was the result in 2008).

The cod liver in the Inner Sørfjord was insignificantly polluted by ΣPCB-7 in 2009, but had increased to moderately polluted in 2010 and no significant trend was observed. The cod fillet in the Inner Sørfjord was moderately polluted and showed no significant trend. The average ∑PCB-7-concentration in cod liver from the Sørfjord in 2010 was classified as markedly polluted and cod fillet was moderately polluted with PCBs (Ruus *et al.* 2011). Flounder fillet in the Inner Sørfjord had increased from acceptable levels of ΣPCB-7 in 2009 (0.59 µg/kg w.w.) to levels over presumed high background in 2010 (6.3 µg/kg w.w.).

It can be noted that the Norwegian Food Safety Authority (*Mattilsynet*[1]) has issued consumption advice for some areas along the coast, including those monitored by CEMP, due to concern about PCBs in cod liver.

Concentrations above presumed high background levels of ΣPCB-7 were found in blue mussel at 10 stations but no significant upward trends were observed. Solbergstrand was the only station that had markedly polluted blue mussel by ΣPCB-7. Three blue mussel stations (Akershuskaia, Gressholmen and Gåsøya) in the Inner Oslofjord were moderately polluted by ΣPCB-7. All four blue mussel stations in the Sørfjord were insignificantly polluted by ΣPCB-7. Ruus *et al.* (2010) also found that blue mussel from all stations in the Sørfjord were insignificantly polluted with ∑PCB-7 in 2010 except for Tyssedal where the blue mussel were moderately polluted.

Schøyen *et al.* (2010) found that all seven blue mussel stations in the Kristiansandsfjord, including the CEMP stations at Odderøy and Svensholmen, were insignificantly polluted by ΣPCB-7 in 2010. Blue mussel at Svensholmen had an acceptable level of ΣPCB-7, not only in September when the CEMP-blue mussel were collected, but also in May and July in 2010.

[1] see http://www.miljostatus.no/Tema/Hav-og-vann/Pavirkninger-pa-livet-i-vann/Miljogifter_vann/Miljogifter_marint/Kostholdsrad/

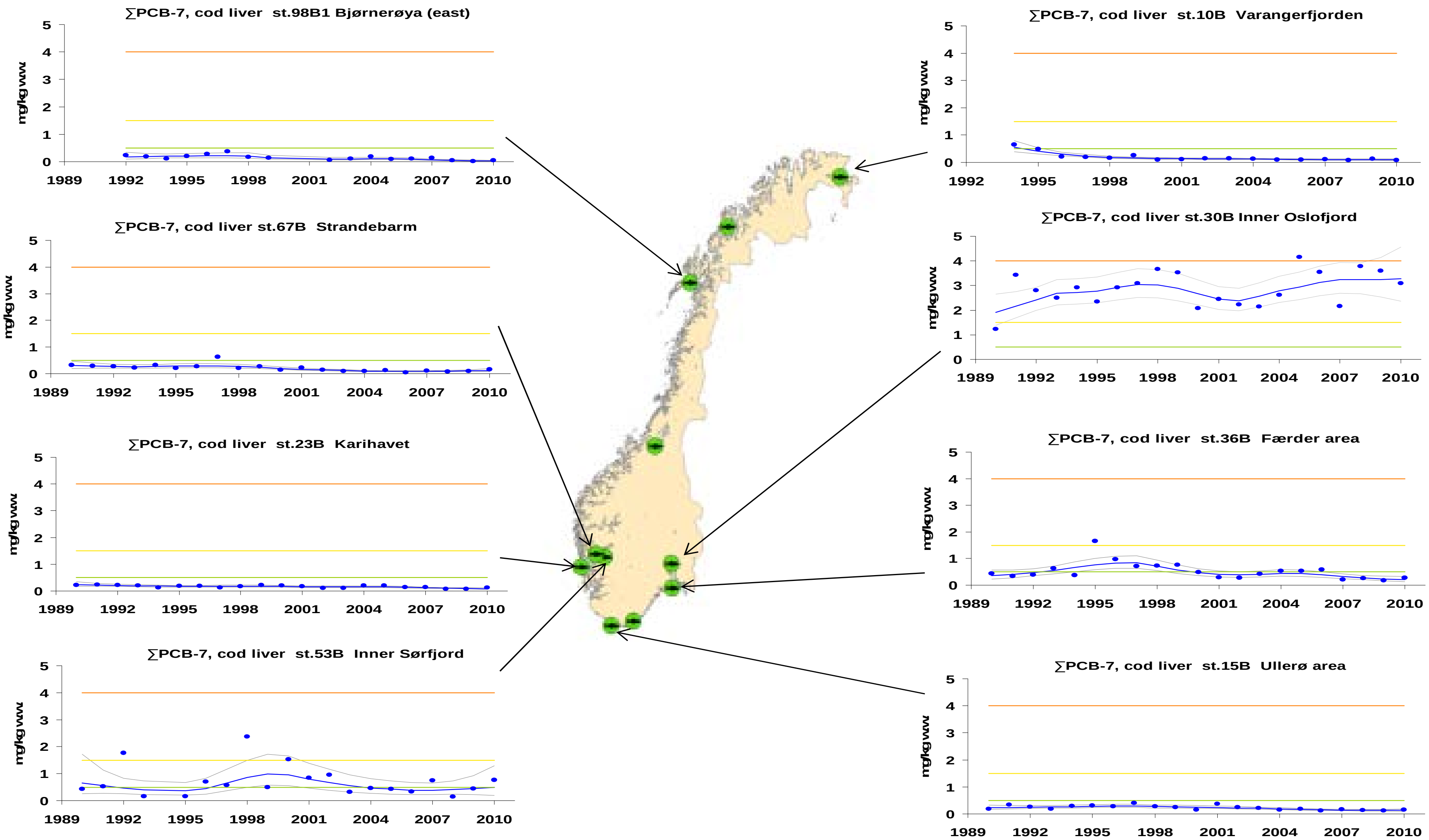

Figure 12. *Median concentration of ΣPCB-7 in cod liver, mg/kg (mg ΣPCB-7/kg) wet weight (cf. and Appendix H, see otherwise key to detail in Figure 2).*

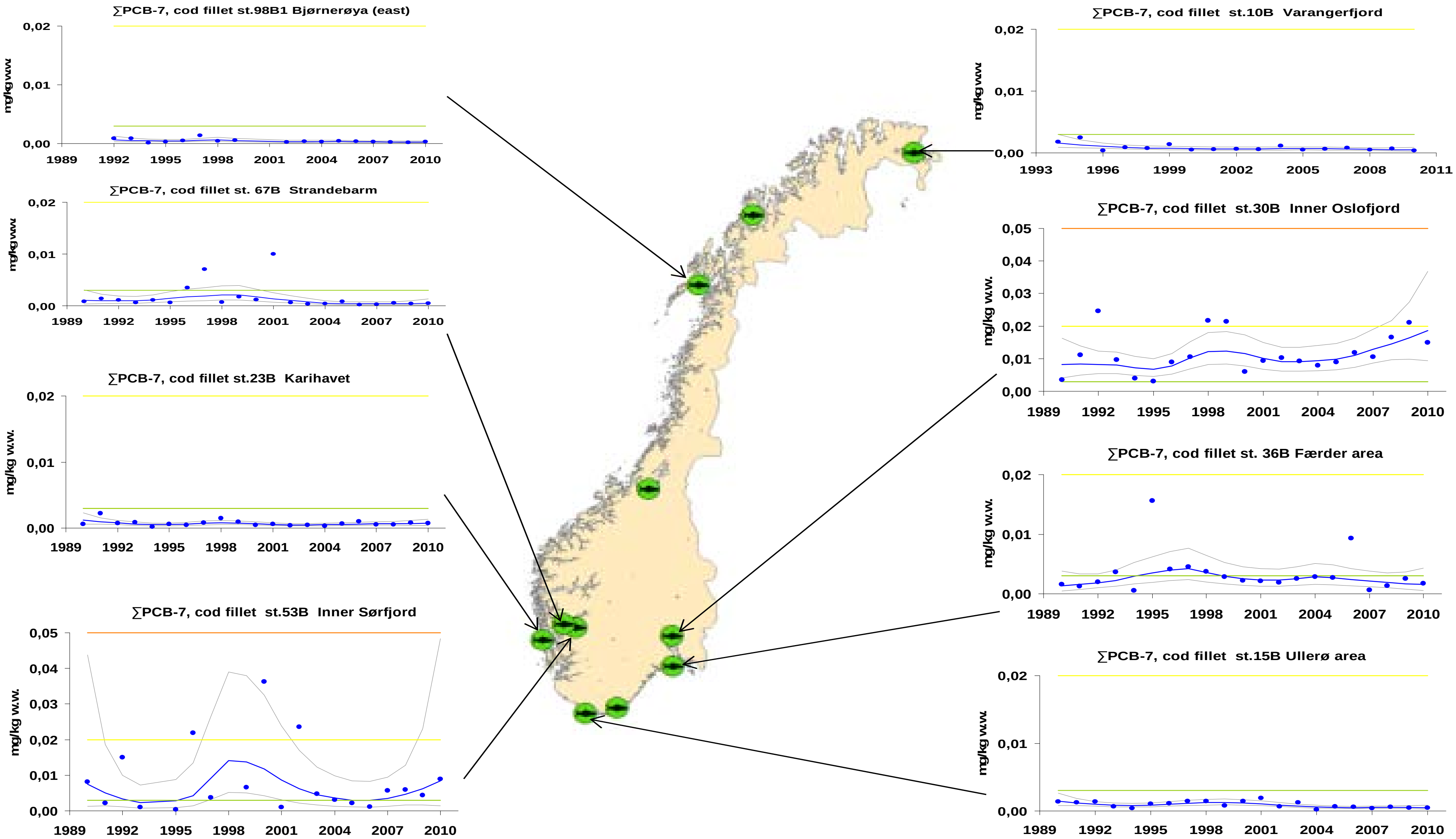

Figure 13. *Median concentration of ΣPCB-7 in cod fillet, mg/kg (mg ΣPCB-7 /kg) wet weight (cf. Appendix H, see otherwise key to detail in Figure 2).*

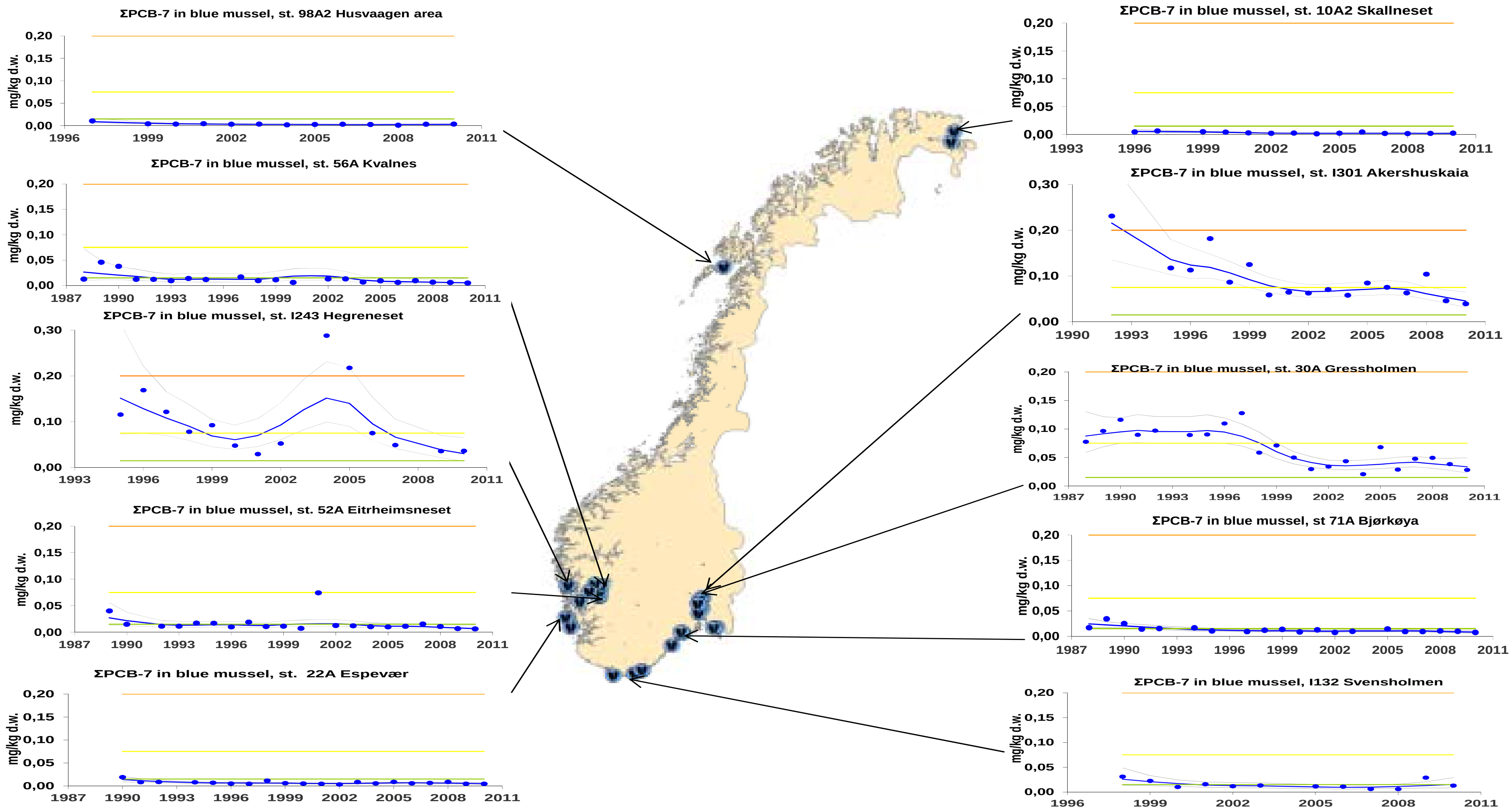

Figure 14. *Median concentration of ΣPCB-7 in blue mussel mg/kg (mg ΣPCB-7/kg) dry weight for selected stations (cf. Appendix H, see otherwise key to detail in Figure 2).*

Dichlorodiphenyldichloroethylene (ppDDE)

The concentrations of ppDDE are compared with Class limits for ΣDDT.

Cod liver

The concentrations of ppDDE in cod liver exceeded Class I (insignificantly polluted) in two of the 11 stations investigated (Figure 15). These stations were located in the Inner Sørfjord (st. 53B) and the Strandebarm (st. 67B) in the Hardangerfjord, both moderately polluted (Class II). In the Sørfjord, there was no significant trend while there was a significant downward trend in the Strandebarm area. Cod in the Færder area (st. 36B), Ullerø area (st. 15B), Karihavet (st. 23B), Bjørnøya (st. 98B1) in the Lofoten area, and in the Varangerfjord (st. 10B), as well as cod from the harbours of Kristiansand (st. 13BH), Trondheim (st. 80BH) and Tromsø (st. 43BH) contained ppDDE-levels equivalent to Class I (Class limits for ΣDDT). Though no significant trends were found for the period 2001-2010, however, significant downward trends were observed for five of the stations and Strandebarm for the whole sampling period (1990/1994-2010). Trends for cod from the harbours of Kristiansand, Trondheim and Tromsø could not be calculated due to insufficient data.

Cod fillet

Concentrations of ppDDE exceeding background levels in only diffusely contaminated areas were only observed in cod fillet from the Inner Sørfjord (st. 53B) and Strandebarm (st. 67B) in the Hardangerfjord (Class II, moderately polluted).

Cod at the other stations contained ppDDE -levels equivalent to Class I (insignificantly polluted). There were significant downward trends concerned the entire sampling period in the Ullerø area (st. 15B), Færder (st. 36B) and Strandebarm (st. 67B) in the Hardangerfjord. There were no significant trends in the Inner Oslofjord (st. 30B), the Inner Sørfjord (st. 53B), Kariahavet (st. 23B), Bjørnerøya (st. 98B) and in the Varangerfjord (st. 10B). For the stations in the harbours of Kristiansand (st. 13BH), Trondheim (st. 80BH) and Tromsø (st. 43BH) there were no values for trend analyses due to insufficient data.

Flounder liver

Flounder liver from two stations were analysed for ppDDE. The results from the station in Sande (st. 33F) and the Inner Sørfjord (st. 53F) revealed concentrations of ppDDE below background levels in only diffusely contaminated area. No significant trend was observed at Sande while a significant downward trend was found in the Inner Sørfjord.

Flounder fillet

There observed concentrations of ppDDE were in Class I (insignificantly polluted) in flounder from Sande (st. 33F) and from the Inner Sørfjord (st. 53F). The data revealed significant downward trends at both stations.

Dab liver

Both stations, Færder area (st. 36F) and the Ullerø area (st. 15F), analysed for ppDDE in dab liver revealed concentrations of ppDDE below background levels in only diffusely contaminated area (Class I). No significant trends were detected.

Dab fillet

The results from Færder area (st. 36F) and the Ullerø area (st. 15F) revealed concentrations of ppDDE below background levels in only diffusely contaminated area. A significant downward trend was detected at Færder while the dab at Ullerø showed no significant trend.

Plaice liver

There were an acceptable level and a significant downward trend of ppDDE in plaice liver from Skogerøy (st. 10F) in the Varangerfjord and at Husholmen (st. 98F2) in the Lofoten area.

Plaice fillet
The results revealed concentrations of ppDDE below background levels in only diffusely contaminated area in plaice fillet from Skogerøy (st. 10F) in the Varangerfjord and from Husholmen (st. 98F2). A significant downward trend in plaice fillet from Skogerøy (st. 10F) was detected, and no significant trend was observed at Husholmen.

Megrim liver
Fish from two stations on the west coast were analysed for ppDDE, the Åkrafjord (st. 21F) and the Strandebarm area (st. 67F). The results from the station in Strandebarm showed a significant downward trend while the megrim in the Åkrafjord had no significant trend. There is insufficient data from reference areas to assess background conditions.

Megrim fillet
Fish from the Åkrafjord (st. 21F) and the Strandebarm area (st. 67F) were analysed for ppDDE. The results from the station in Strandebarm showed a significant downward trend while the megrim in the Åkrafjord revealed no significant trend. There is insufficient data from reference areas to assess background conditions.

Blue mussel
The presence of ppDDE in blue mussel exceeded Class I (insignificantly polluted) in mussel from only one of the 33 blue mussel stations (results from some of the stations are presented in Figure 16). The station was in the Sørfjord at Kvalnes (st. 56A) (severely polluted, Class IV) and showed no significant trend.

Concentrations of ppDDE were below background level in only diffusely contaminated area (Class I) and no significant trends were observed in most of the data. This was the case for Akershuskaia (st. I301), Gåsøya (st. I304), Ramtonholmen (st. I307), Håøya (st. I306), Solbergstrand (st. 31A) and Mølen (st. 35A) in the Oslofjord. Similar results were also observed in mussel from Croftholmen (st. I712), Strømtangen (st. I713) and Bjørkøya/Risøyodden (st. 71A) in the Frierfjord, Risøy (st. 76A) close to Risør, Odderø (st. I133) and Svensholmen (st. I132) in the Kristiansandsfjord, Lastad (st. I131A) in the southern part of Norway and Gåsøy/Ullerø (st. 15A) close to Farsund. Further, this was also the result at Byrkjenes (st. 51A) and Krossanes (st. 57A) in the Sørfjord, Ranaskjær (st. 63A), Vikingneset (st. 65A) and Lille Terøy (st. 69A) in the Hardangerfjord, Espevær (st. 22A) on the west coast, and Nordnes (st. I241), Gravdalsneset (st. I242) and Hegreneset (st. I243) close to Bergen. Acceptable levels of ppDDE and no significant trends were also observed at Husvaagen area (st. 98A2) in the Lofoten, and Skallneset (st. 10A2) and Brashavn (st. 11X) in the Varangerfjord.

A significant downward trend and insignificantly polluted blue mussel were observed in samples from the Inner Oslofjord at Gressholmen (st. 30A), in the Inner Sørfjord at Eitrheimsneset (st. 52A) and in the Hvaler area; Damholmen (st. I022), Singlekalven (st. I023) and Kirkøy (st. I024). For the period 2001-2010, significant downward trend were detected for the two stations in the Hvaler area (cf. Appendix H). No trend could be calculated at Høgevarde (st. 227A2) due to short time series.

Concluding remarks on ppDDE
No upward trends for ppDDE were observed. The 2010-levels of ppDDE in cod liver in the Inner Sørfjord and in the Strandebarm area in the Hardangerfjord have increased the last three years. None of the flatfish series the last 10 years showed a significant trend.

Blue mussel from one station in the Sørfjord were classified as severely polluted with ppDDE. The concentrations in blue mussel at Kvalnes in the Mid Sørfjord have increased from markedly polluted in 2009 to severely polluted in 2010. Ruus *et al.* (2011) found that concentrations of ∑DDT in blue mussel were classified up to extremely polluted at Utne (Outer Sørfjord). At the other stations, concentrations in mussel corresponded to be classified as insignificantly polluted to severely polluted. Downward trends were found in blue mussel from Gressholmen in the Inner Oslofjord, the two inner most station in the Sørfjord and the three locations in the Hvaler area. Concentrations of ∑DDT in blue mussel showed up to Class V (extremely polluted) at Utne in the Sørfjord in 2010, and at the other stations, concentrations corresponding to Class I (insignificantly polluted) to Class IV (severely polluted) were observed (Ruus *et al.* 2011). Both cod liver and fillet from the Inner Sørfjord and Hardangerfjord were moderately polluted by ppDDE.

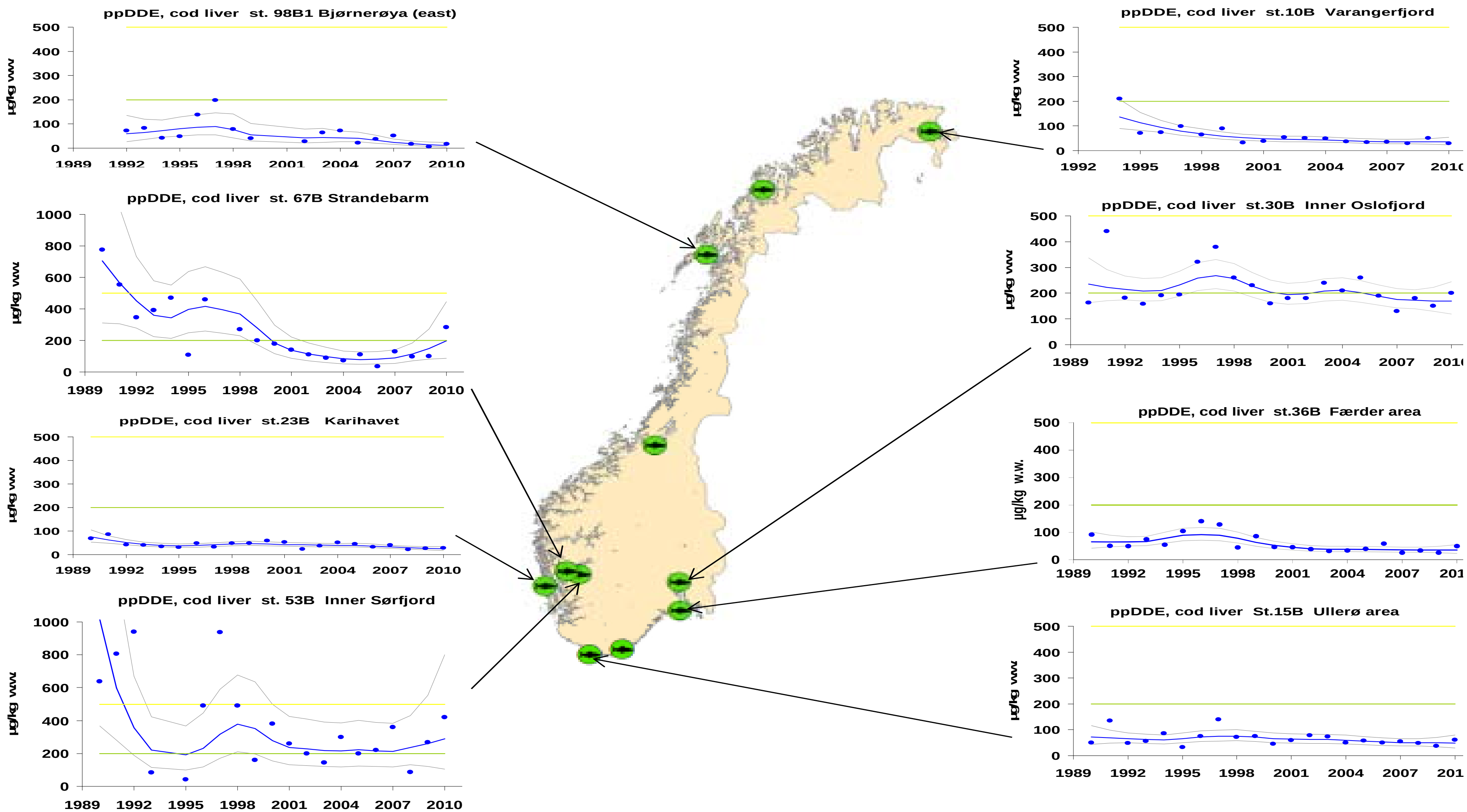

Figure 15. *Median concentration of ppDDE in cod liver, µg/kg (µg ppDDE/kg) wet weight (cf. Appendix H, see otherwise key to detail in Figure 2). Note: Class limits for ΣDDT used.*

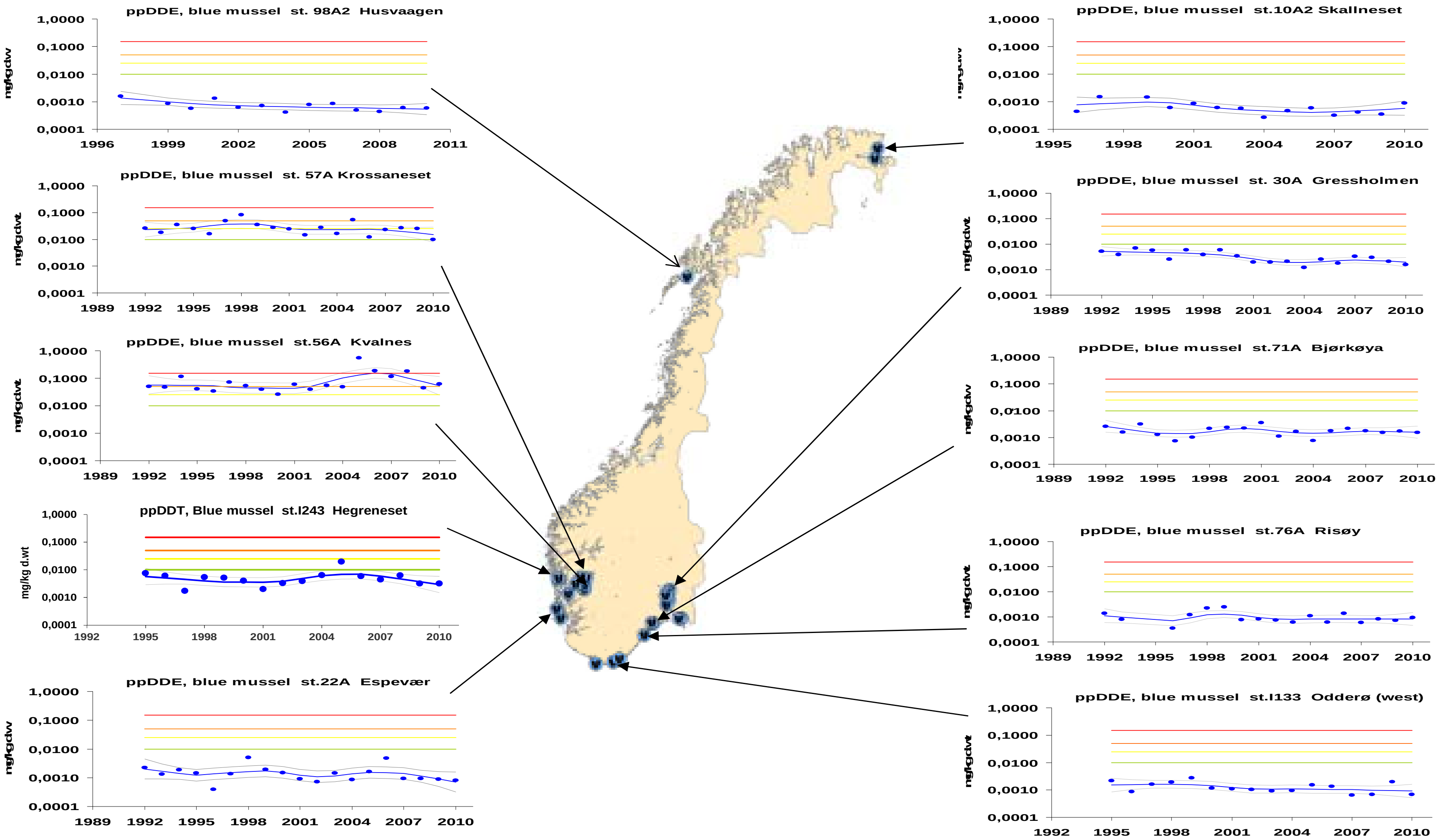

Figure 16. *Median concentration of ppDDE in blue mussel, mg/kg (mg ppDDE/kg) dry weight for selected stations (cf. Appendix H, see otherwise key to detail in Figure 2).* ***Note: Log-scale and Class limits for ΣDDT used.***

Hexachlorobenzene (HCB)

Cod liver

Concentrations in cod liver from 10 out of 11 stations revealed an acceptable level of HCB (Class I, insignificantly polluted) (Figure 17). There were observed low levels of HCB (Class I) and downward trends for data from six stations: the Inner Oslofjord (st. 30B), Færder area (st. 36B), the Inner Sørfjord (st. 53B), Strandebarm area (st. 67B), Bjørnerøya in the Lofoten (st. 98B1) and in the Varangerfjord (st. 10B). Similar low levels of HCB and no significant trends were observed for data from Karihavet (st. 23B) and Ullerø (st. 15B). Cod liver in the Kristiansand harbour (st. 13BH) was classified as moderately polluted (Class II) by HCB, and cod from the harbours in Trondheim (st. 80BH) and Tromsø (st. 43BH) were below background level (Class I). No trend measurements were done for these three locations, due to insufficient data.

Cod fillet

There were acceptable levels (Class I, insignificantly polluted) of HCB in cod fillet in 10 out of 11 stations investigated (some of the result are shown in Figure 17), the exception being cod from the Kristiansand harbour (st. 13BH) that was markedly polluted (Class III) by HCB and no trend could be detected due to insufficient data. A significant downward trend was observed in the data from five stations; the Inner Oslofjord (st. 30B), Færder area (st. 36B), Ullerø area (st. 15B), Strandebarm area (st. 67B) and Bjørnerøya in Lofoten (st. 98B1). No significant trend was observed in the data from the Inner Sørfjord (st. 53B), Karihavet (st. 23B) and in the Varangerfjord (st. 10B). There were insufficient data to evaluate trends in cod in the harbours in Trondheim (st. 80BH) and Tromsø (st. 43BH) and both were insignificantly polluted (Class I).

Flounder liver

Flounder liver from two stations were analysed for HCB. None of the results from the samples from stations in Sande (st. 33F) and in the Inner Sørfjord (st. 53F) revealed concentrations of HCB over presumed high background. A significant downward trend was found at both stations.

Flounder fillet

Flounder fillet from two stations were analysed for HCB. The results from stations in Sande (st. 33F) and the Inner Sørfjord (st. 53F) showed concentrations below a high background level for HCB. Both stations showed significant downward trends.

Dab liver

Concentrations below presumed high background levels of HCB were observed in dab liver from two investigated stations. There was not observed any significant trend for the data from Ullerø area (st. 15F). The results from dab from the Færder area (st. 36F) revealed a significant downward trend.

Dab fillet

Concentrations below presumed high background levels were observed in dab fillet from both investigated stations. No significant trend was observed in the data from the Ullerø area (st. 15F). The data for dab from the Færder area (st. 36F) did show a significant downward trend.

Plaice liver

The results from Husholmen (st. 98F2) in the Lofoten area and Skogerøy (st. 10F) in the Varangerfjord revealed concentrations below presumed high background levels. Both showed a significant downward trend.

Plaice fillet

The data from plaice fillet from Husholmen (st. 98F2) in the Lofoten area and Skogerøy (st. 10F) in the Varangerfjord showed HCB concentrations below the presumed high background level. A significant downward trend was found at Skogerøy while no significant trend was seen at Husholmen.

Megrim liver
The two stations Åkrafjord (st. 21F) and the Strandebarm area (st. 67F) in the Mid Hardangerfjord were analysed for HCB in megrim liver. The data from the station in Strandebarm showed a significant downward trend while the data for megrim in the Åkrafjord showed no significant trend.

Megrim fillet
The same two stations Åkrafjord (st. 21F) and Strandebarm (st. 67F) were used for analysis of megrim fillet. Both showed no significant trend.

Blue mussel
The presence of HCB in blue mussel exceeded Class I (insignificantly polluted) in samples from six out of 33 stations investigated (some of the stations are presented in Figure 18).

In the Kristiansandsfjord, blue mussel were severely polluted (Class IV) at Svensholmen (st. I132) and Odderøy (st. I133) and no significant trend was found at Svensholmen while a significant downward trend was observed at Odderøy. Blue mussel were markedly polluted (Class III) at Croftholmen (st. I712) and Strømtangen (st. I713) in the Frierfjord. The data from Strømtangen showed no significant trend whereas a significant downward trend was observed in the data from Croftholmen.

Blue mussel at Akershuskaia (st. I301) in the Inner Oslofjord and Bjørkøya/Risøyodden (st. 71A) were both moderately polluted (Class II). There was no significant trend at Akershuskaia, whereas a significant downward trend was found at Bjørkøya/Risøyodden in the Frierfjord.

Blue mussel from Nordnes (st. I241) were insignificantly polluted (Class I) and the data showed a significant upward trend.

Acceptable levels of HCB (Class I) and no significant trends were observed in the data from Gåsøya (st. I304), Ramtonholmen (st. I307) and Håøya (st. I306) in the Inner Oslofjord and at Damholmen (st. I022), Singlekalven (st. I023) and Kirkøy (st. I024) in the Hvaler area. Similar observations were also made based on the data from Risøy (st. 76A), Lastad (st. I131A) and Gåsøy/Ullerøy (st. 15A) in the southern part of Norway and at Byrkjenes (st. 51A), Eitrheimsneset (st. 52A), Kvalnes (st. 56A) and Krossanes (st. 57A) in the Inner Sørfjord, and at Ranaskjær (st. 63A), Vikingneset (st. 65A) and Lille Terøy (st. 69A) in the Hardangerfjord. Acceptable levels of HCB (Class I) and no significant trends were observed at Hegreneset (st. I243) close to Bergen, at Husvaagen (st. 98A2) in the Lofoten area, and Skallneset (st. 10A2) and Brashavn (st. 11X) in the northern part of Norway. There were acceptable levels of HCB (Class I) and significant downward trends in the data from Gressholmen (st. 30A), Solbergstrand (st. 31A) and Mølen (st. 35A) in the Oslofjord and Espevær (st. 22A) and Gravdalsneset (st. I242) on the west coast. Blue mussel from Melandsholmen/Høgevarde (st. 227A) in the Karmsund had also acceptable level of HCB, but the data were insufficient to calculate trends.

Concluding remarks on HCB
Cod in the Kristiansand harbour were markedly polluted in fillet and moderately polluted in liver by HCB. For all other stations, HCB in cod liver and fillet were at background level and no upward trends were observed. All flat fish in the survey had acceptable levels of HCB in liver and fillet.

Blue mussel in the Kristiansandsfjord in 2010 were severely polluted with HCB. Only blue mussel from Nordnes close to Bergen showed a significant upward trend with levels classified as insignificantly polluted.

It can be noted that the EU has provided Environmental Quality Stanadard (EQS) for “prey tissue” (cf. 2000/60/EC). The EQS for mercury is 0.01 mg/kg w.w. which is above the upper limit to insignificantly polluted (Class I) for blue mussel (0.0001 mg/kg w.w.). All concentrations were well below the EQS in blue mussel where the whole soft tissue was measured. As noted above (see text for mercury) the EQS can not be directly compared to concentrations found in different tissues of fish.

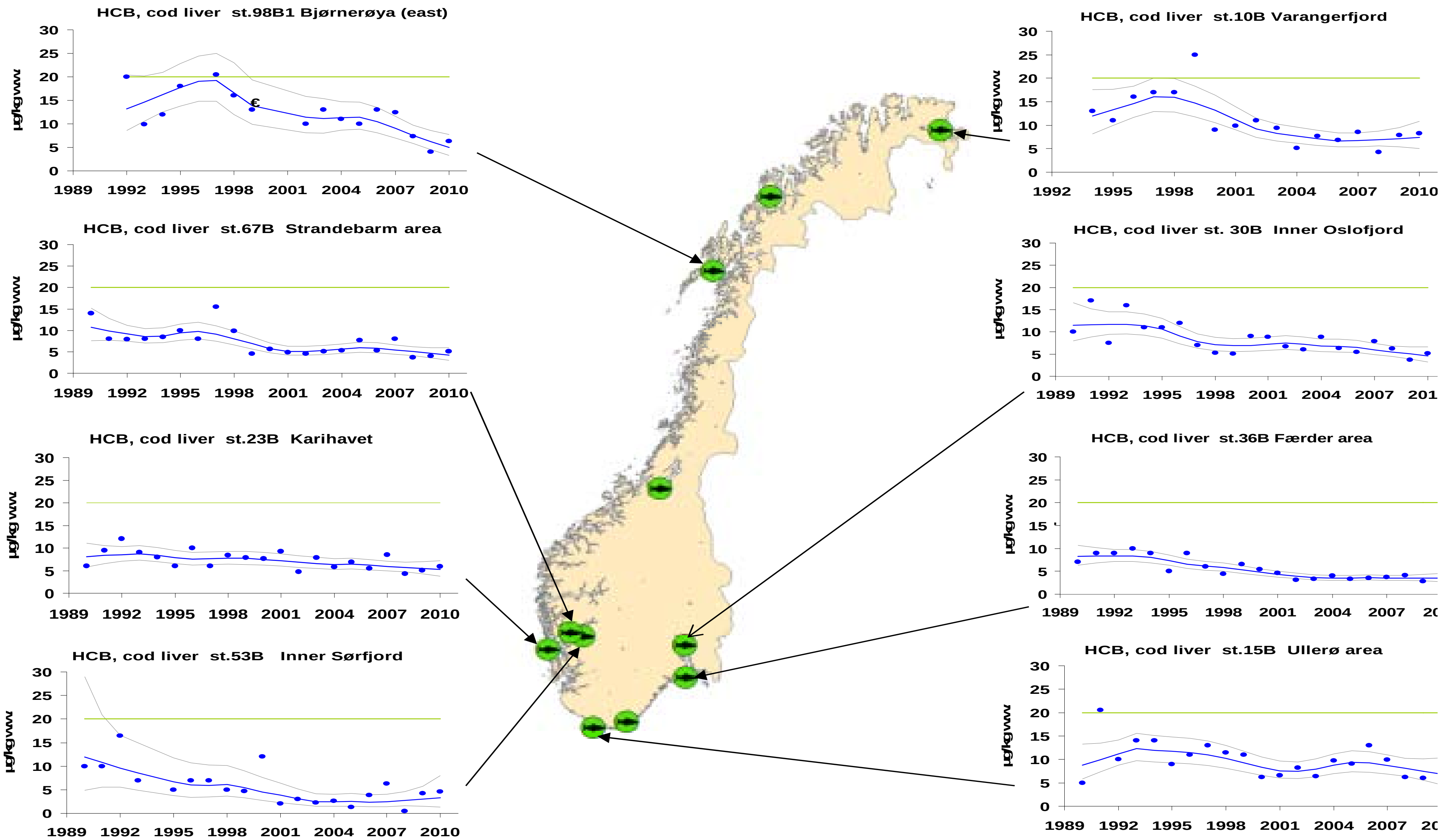

Figure 17. *Median concentration of HCB in cod liver, µg/kg (µg HCB/kg) wet weight (cf. Appendix H, see otherwise key to detail in Figure 2).*

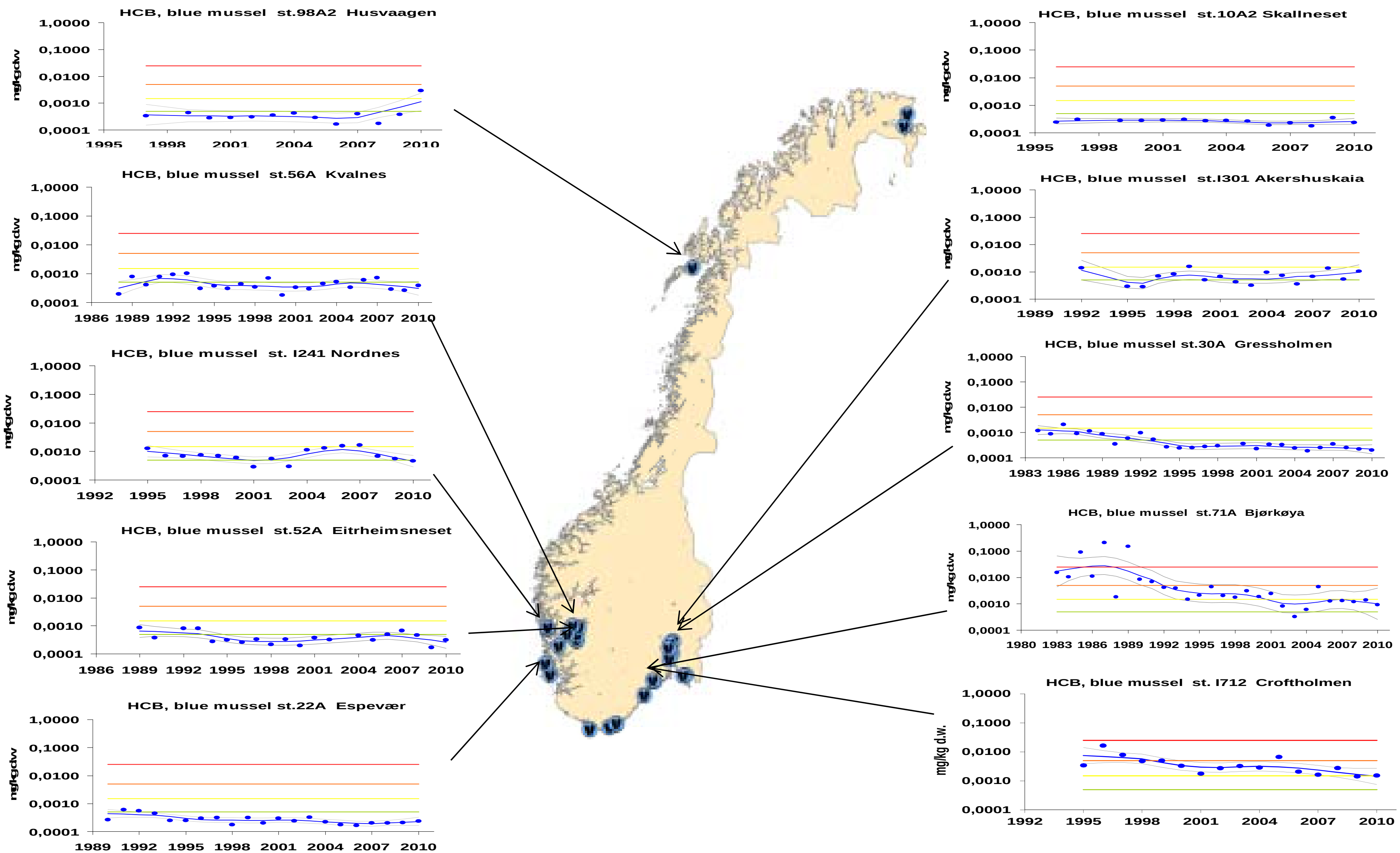

Figure 18. *Median concentration of HCB in blue mussel, mg/kg (mg HCB/kg) dry weight for selected stations (cf. Appendix H, see otherwise key to detail in Figure 2).* ***NB: log-scale.***

Gamma-hexachlorocyclohexane (HCHG)

There are class limits for ΣHCH, which is the sum of alpha-, beta- and gamma isomers (Molvær *et al.* 1997). However, not all isomers are analysed and hence, the system was applied to HCHG, the results are shown in Appendix H.

Cod liver
Samples of cod liver from all 11 cod stations that were analysed were insignificantly polluted (Class I) by HCHG. Significant downward trends were detected at all stations (where there was sufficient data); and also recently for the period 2001-2010 for the Inner Oslofjord (st. 30B), Færder (st. 36B) and Ullerø (st. 15B). This result was also found in the Inner Sørfjord (st. 53B), Karihavet area (st. 23B) on the west coast, at Strandebarm (st. 67B) in the Hardangerfjord, Bjørnerøya (st. 98B1) in Lofoten and in the Varangerfjord (st. 10B). The results for the harbours in Kristiansand (st. 13BH), Trondheim (st. 80BH) and Tromsø (st. 43BH) had insufficient data to do trend analysis.

Cod fillet
Samples of cod fillet from all 11 cod stations that were analysed were insignificantly polluted by HCHG (Class I). Significant downward trends were found at Færder (st. 36B), and Strandebarm (st. 67B). No significant trends were found in the Inner Oslofjord (st. 30B), Ullerø area (st. 15B), the Inner Sørfjord (st. 53B), Karihavet area (st. 23B) on the west coast, Bjørnerøya (st. 98B1) in the Lofoten area and in the Varangerfjorden (st. 10B) in the northern part of Norway. No trends were found at the remaining stations due to insufficient data (i.e. the harbours in Kristiansand (st. 13BH), Trondheim (st. 80BH) and Tromsø (st. 43BH)).

Flounder liver
The sample from the two flounder stations in Sande (st. 33F) and in the Inner Sørfjord (st. 53F) showed levels of HCHG in liver which were below a high background level. Both stations showed significant downward trends.

Flounder fillet
Both flounder stations showed levels of HCHG in fillet that were insignificantly polluted and both showed significant downward trends.

Dab liver
Dab samples at both stations, Færder (st. 36F) and Ullerø (st. 15F), showed levels of HCHG which were below a high background level for liver. The results also indicated a significant downward trend at Færder and Ullerø.

Dab fillet
Both stations showed levels of HCHG which were below a high background level for fillet. The results from Færder and Ullerø also showed a significant downward trend.

Plaice liver
Plaice from Husholmen (st. 98F2) in Lofoten and Skogerøy (st. 10F) in the Varangerfjord showed levels of HCHG below a high background level for plaice liver. No significant trend were detected at Husholmen while a significant downward trend was observed at Skogerøy.

Plaice fillet
Plaice from Husholmen (st. 98F2) and Skogerøy (st. 10F) showed both levels of HCHG below a high background level for fillet in plaice. No significant trends were detected.

Megrim liver
Megrim from the Åkrafjord (st. 21F) showed no significant trend for HCHG in liver while the megrim from Strandebarm (st. 67F) showed a significant downward trend.

Megrim fillet
Both megrim stations showed no significant trends for HCHG in fillet.

Blue mussel
All 33 blue mussel stations where HCHG was analysed were insignificantly polluted (Class I), and all significant trends were downward except for Strømtangen (st. I713) in the Frierfjord where no significant trend was detected. There were not enough data for trend analysis at Høgevarde (st. 227A2) in the Karmsund.

Concluding remarks on HCHG
All cod liver and fillet, and blue mussel samples that were analysed for HCHG were insignificantly polluted. All dab, flounder and megrim liver and fillet samples had acceptable levels of HCHG.

Dioxins (dioxin toxicity equivalents-Nordic model, TCDDN)

Blue mussel
The classifications are based on analysis of TCDD/F and subsequent calculation of dioxin toxicity equivalents (TCDDN) after the Nordic model (Ahlborg 1989). Mussel from seven stations were investigated; in the Oslofjord (Gressholmen st. 30A), the Grenlandsfjord area (Bjørkøya/Risøyodden st. 71A, Risøy st. 76A, Croftholmen st. I712 and Strømtangen st. I713), and in the Kristiansandsfjord at Svensholmen (st. I132) and Odderøy (st. I133) (Figure 19). Blue mussel at Bjørkøya/Risodden, Croftholmen and Strømtangen in the Frierfjord were extremely polluted (Class V) by dioxins but no significant trends were observed. In the Kristiansandsfjord, blue mussel samples were markedly polluted (Class III) at Odderøy, and moderately polluted (Class II) at Svensholmen but no significant trends were found. Blue mussel at Gressholmen and Risøy were insignificantly polluted (Class I) by dioxins. An upward trend could be seen at Risøy, but no significant trend was documented at Gressholmen.

Concluding remarks on dioxins
Dioxins have been included in Klif's Pollution Index for blue mussel since 2002 (cf. chapter Appendix J). No significant trends were observed for dioxins in blue mussel, except for at Risøy where an upward trend was seen. Blue mussel from three stations in the Grenlandsfjord were extremely polluted by dioxins in 2008, 2009 and 2010. Consumption advice has been issued for fish and shellfish in the Grenlandsfjord area due to the high concentrations of organochlorines including dioxins. It can be noted that environmental status is classified according to environmental quality criteria (based in this case on presumed background levels) and must not be confused with limit values for human consumption and associated advices issued by the Norwegian Food Safety Authorities (*Mattilsynet*[1]). Monitoring of contaminants in organisms from the Grenlandsfjord showed that the dioxins content in blue mussel is far above presumed high background level, and this has not changed systematically since 1995 (Bakke *et al.* 2010). Results presented by Bakke *et al.* (2011) also indicated that dioxin concentrations have shown a tendency to increase during the period 2002 to 2009 both in the Langesundfjord (Croftholmen) and at Helgeroa and Klokkartangen further out.

In the Kristiansandsfjord, blue mussel were markedly polluted at Odderøy in 2009 and 2010, but insignificant polluted in 2008. The blue mussel at Svensholmen were moderately polluted in 2009 and 2010, and markedly polluted in 2008. Schøyen *et al.* (2010) found that blue mussel at Odderøy in the Kristiansandsfjord was markedly polluted by dioxins, and that blue mussel at Svensholmen was insignificantly polluted by dioxins in 2010. The dioxin-concentrations at Svensholmen were highest in May and July (moderately polluted) and lowest in September. The dioxin-concentrations were lowest in the Inner (Marvika) and Outer (Flekkerøy/Kjeholmen) part of the Kristiansandsfjord, and highest in the Mid part of the fjord.

Dioxins in blue mussel in the Sørfjord were not a part of the CEMP-program. Ruus *et al.* (2011) analysed dioxins and dioxin-like PCBs (non-*ortho* substituted) in three (pooled) samples of blue mussel from the Sørfjord (two from Tyssedal and one from Eitrheim) in 2010. The samples were classified as moderately to markedly polluted with dioxins. The concentrations were lower than in blue mussel from areas with known dioxin load (e.g. the Grenlandfjords), but higher than in the Inner Oslofjord.

[1] see http://www.miljostatus.no/Tema/Hav-og-vann/Pavirkninger-pa-livet-i-vann/Miljogifter_vann/Miljogifter_marint/Kostholdsrad/

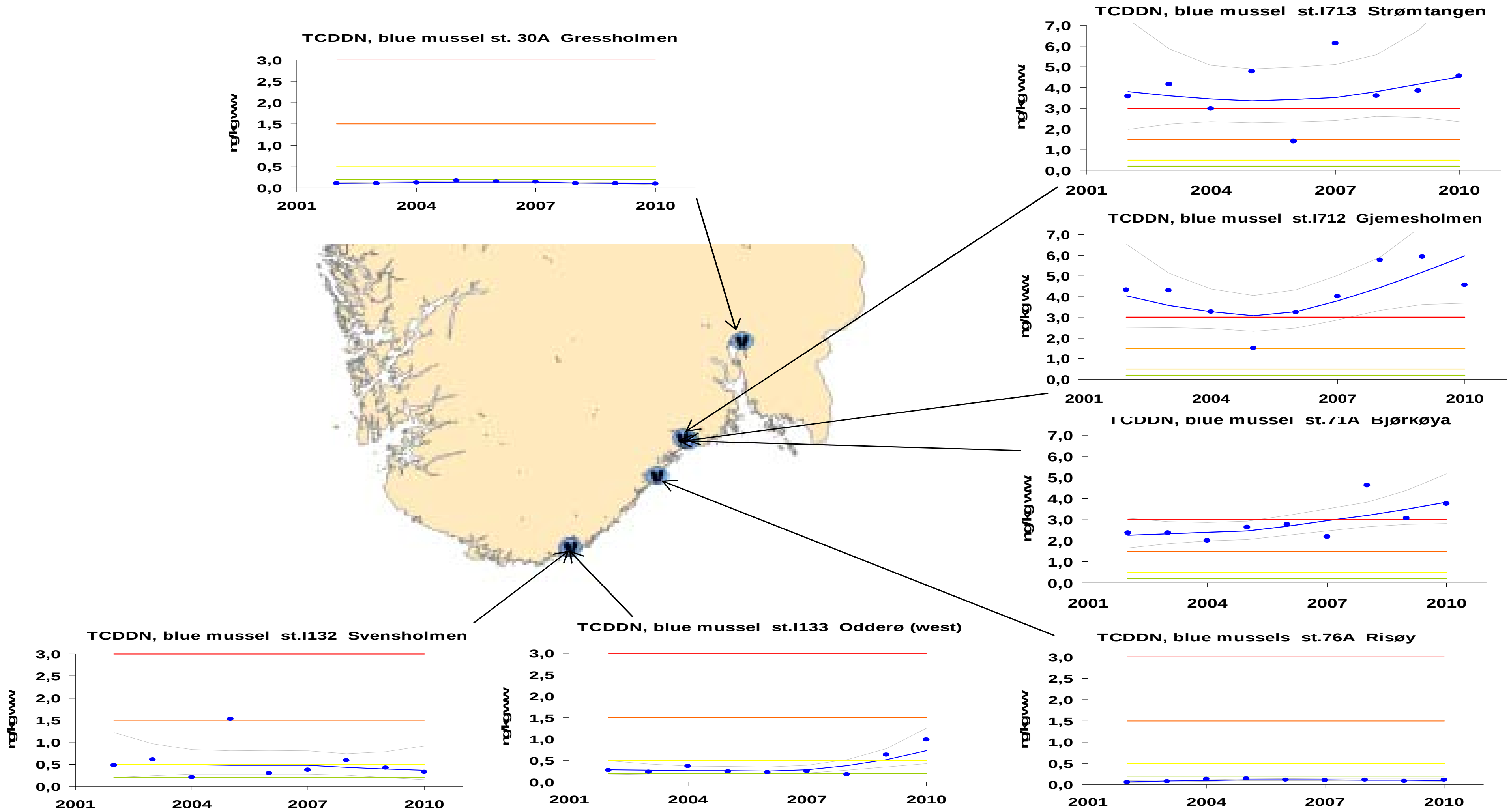

Figure 19. *Median concentration of dioxins TCDD-toxicity equivalents after Nordic model (TCDDN cf. Appendix C) in blue mussel, ng/kg TCDDN/kg) (cf. Appendix H, see otherwise key to detail in Figure 2).*

Polycyclic aromatic hydrocarbons (PAHs)

Blue mussel
The presence of PAHs in blue mussel exceeded Class I (insignificantly polluted) at six of the 16 blue mussel stations (results from 10 of the stations are presented in Figure 20). No significant trends were observed in mussel from Toraneskaien (st. I964) and Moholmen (st. I965) in the Ranfjord (both Class III, markedly polluted) and Akershuskaia (st. I301) in the harbour of Oslo, Svensholmen (st. I132) and Odderø (st. I133) in the Kristiansandsfjord, and Bjørnebærviken (st. I969) in the Ranfjord (all Class II, moderately polluted). No upward or downward trends for PAHs were observed in blue mussel with concentrations exceeding background levels in only diffusely contaminated areas. No upward trends for PAHs were observed in blue mussel from stations with concentrations below background levels in only diffusely contaminated areas. Blue mussel from Gressholmen (st. 30A), Gåsøya (st. I304), Ramtonholmen (st. I307), Håøya (st. I306) and Mølen (st. 35A) in the Oslofjord were insignificantly polluted (Class I) of PAHs and revealed no significant trends. The blue mussel from Lastad (st. I131A) close to Mandal, Ekkjegrunn (st. I201) and Bølsnes (st. I205) in the Saudafjord, and Honnhammer (st. I912) and Fjøseid (st. I913) in the Sunndalsfjord were also insignificantly polluted by PAHs, but for these stations significant downward trends were also observed.

Concluding remarks PAHs
No upward trends for PAHs in blue mussel were observed. Blue mussel at Mølen had acceptable levels of PAHs[1] and no significant trend could be observed. Walday *et al.* (2011) found that levels of PAH were elevated at Langøya and speculated that this could be caused by ship traffic and/or polluted harbour sediments.

Blue mussel at Odderøy and Svensholmen in the Kristiansandsfjord were moderately polluted by PAHs. Schøyen *et al.* (2010) reported that blue mussel at Odderøy were insignificantly polluted by PAHs and moderately polluted at Svensholmen, not only in September when the CEMP-blue mussel were collected, but also at Svensholmen in May and July in 2010.

There was a significant downward trend in concentrations of PAHs in the Sunndalsfjord, although the blue mussel had an acceptable level of PAHs. The Norwegian Food Safety Authority issued recommendations/restrictions in 2005 regarding consumption and trade of seafood from the area due to PAHs in blue mussel and fish liver from the Sunndalsfjord (cf. Green *et al.* 2010b). Changes in the production process at the aluminium plant in Sunndalsfjord in 2002-2003 resulted in a reduction in dissolved PAHs in seawater around the outlet from the treatment plant from summer 2003 (Bakke and Uriansrud 2004).

Mussel from the Ranfjord were markedly polluted by PAHs, but no significant trend was observed. Norwegian Food Safety Authority (*Mattilsynet*[2]) has issued recommendations regarding consumption of seafood from the Ranfjord area due to the high levels of PAHs in blue mussel from the fjord.

[1] Sum of 15 PAH compounds, see Appendix C and Appendix D
[2] see http://www.miljostatus.no/Tema/Hav-og-vann/Pavirkninger-pa-livet-i-vann/Miljogifter_vann/Miljogifter_marint/Kostholdsrad/

Sum carcinogenic polycyclic aromatic hydrocarbons (KPAHs)

Blue mussel

The presence of the potentially carcinogenic PAHs (KPAHs) in blue mussel exceeded Class I (insignificantly polluted) at seven of 16 stations. Blue mussel at Moholmen (st. I965) and Toraneskaien (st. I964) in the Ranfjord was markedly polluted (Class III) by KPAHs and no significant trend were observed. At Akershuskaia (st. I301) and Ramtonholmen (st. I307) in the Inner Oslofjord, Odderøy (st. I133) and Svensholmen (st. I132) in the Kristiansandsfjord and Bjørnebærviken (st. I969) in the Ranfjord, blue mussel were moderately polluted (Class II) and showed no significant trends. The combination of insignificantly polluted (Class I) blue mussel of KPAHs and no significant trends were found at Gressholmen (st. 30A), Gåsøya (st. I304), Håøya (st. I306) and Mølen (st. 35A) in the Oslofjord and Lastad (I131A) close to Mandal. Blue mussel were insignificantly polluted (Class I) of KPAHs and significant downward trends were observed at Bølsnes (st. I205) and Ekkjegrunn (st. I201) in the Saudafjord, and Honnhammer (st. I912) and Fjøseid (st. I913) in the Sunndalsfjord.

Concluding remarks on KPAHs

No upward trends for KPAHs were observed in blue mussel from any of the analysed stations. The results from the analyses showed concentrations over presumed high background levels at seven of 16 stations. The highest concentrations were observed in mussel from the Ranfjord (markedly polluted) and no trends were observed in the mussel form this area. The blue mussel here have decreased two Klif classes from extremely polluted in 2009.

The blue mussel from the Kristiansandsfjord were at worst moderately polluted. In 2009 they were up to severely polluted. No trends were observed in mussels from the Kristiansandsfjord. Schøyen *et al.* (2010) reported that blue mussel at Odderøy in the Kristiansandsfjord were moderately polluted by KPAH, and that blue mussel at Svensholmen were markedly polluted by KPAH in 2010. Blue mussel at Svensholmen were markedly polluted by KPAH, not only in September when the CEMP-blue mussel were collected, but also in May and July in 2010. Schøyen *et al.* (2010) observed acceptable levels of KPAHs in the Inner part (Marvika) and the Outer part (Flekkerøy/Kjeholmen) of the Kristiansandsfjord.

Benzo[a]pyrene B[a]P

Blue mussel
The presence of B[a]P in blue mussel exceeded Class I (insignificantly polluted) at eight of the 16 stations (some of the stations are presented in Figure 21). Blue mussel at Toraneskaien (st. I964) in the Ranfjord were severely polluted (Class IV) and no significant trend were found. Moholmen (st. I965), also in the Ranfjord, and Svensholmen (st. I132) in the Kristiansandsfjord were markedly polluted (Class III) and no significant trends were observed. No significant trends were observed in blue mussel from Akershuskaia (st. I301), Gåsøya (st. I304) and Ramtonholmen (st. I307) from the Inner Oslofjord, at Odderøy (st. I133) in the Kristiansandsfjord, or at Bjørnbærviken (st. I969) in the Ranfjord (all Class II, moderately polluted). Blue mussel at Håøya (st. I306) in the Inner Oslofjord were insignificantly polluted (Class I) and a significant upward trend was observed. Similar levels of B[a]P (Class I, insignificantly polluted) were observed in mussel from Gressholmen (st. 30A) in the Inner Oslofjord and Mølen (st. 35A) in the Outer Oslofjord, but no significant trends were detected. Low levels of B[a]P (Class I) and no significant trends were also observed in mussels from Lastad (st. I131A) close to Mandal, Bølsnes (st. I205) in the Saudafjord, and Honnhammer (st. I912) and Fjøseid (st. I913) in the Sunndalsfjord. A significant downward trend was found at Ekkjegrunn (st. I201) in the Inner Saudafjord (Class I, insignificantly polluted).

Concluding remarks on B[a]P
Blue mussel in the Ranfjord were up to severely polluted with B[a]P. The concentrations of B[a]P have decreased one classification level at Toraneskaien and two classes at Moholmen in 2010 from extremely polluted in 2009.

The only downward trend was found at Ekkjegrunn in the Inner Saudafjord where the mussel were insignificantly polluted by B[a]P. The only upward trend of B[a]P was observed at Håøya in the Inner Oslofjord, even though the pollution was insignificant.

A decrease in concentrations by B[a]P from 2009 was observed at several blue mussel stations. Three of these seven stations are in the Inner Oslofjord (Akershuskaia, Gåsøya, Ramtonholmen) and were moderately polluted by B[a]P, but were insignificantly polluted in 2009. All three of these stations revealed no trend.

Blue mussel in the Kristiansandsfjord were markedly polluted at Svensholmen and moderately polluted at Odderøy (based on three replicates). Blue mussel at Odderøy were severely polluted in 2009 and have decreased two classification levels. Schøyen *et al.* (2010) reported that blue mussel at Odderøy in the Kristiansandsfjord were insignificantly polluted by B[a]P, and that blue mussel at Svensholmen were moderately polluted by B[a]P in 2010 (based on one sample of the three replicates from the CEMP-results for 2010). The concentration of B[a]P at Svensholmen was highest in May, decreased through the summer in July and were lowest in September. The B[a]P-concentrations were lowest in the Inner (Marvika) and Outer (Flekkerøy/Kjeholmen) Kristiansandsfjord, and highest in the Mid part of the fjord.

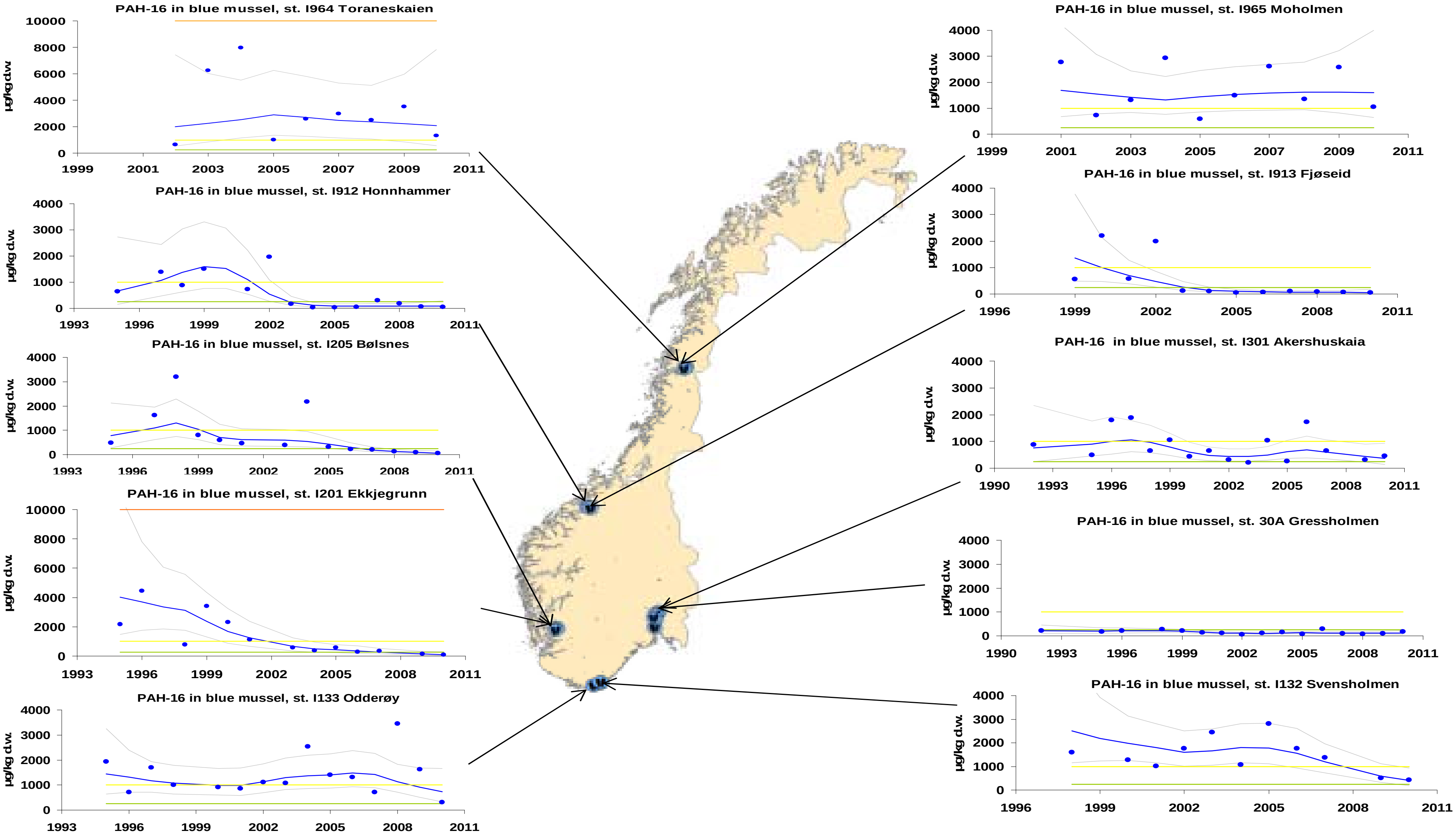

Figure 20. *Median concentration of PAH in blue mussel, µg/kg (µg PAH/kg) dry weight for selected stations (cf. Appendix H, see otherwise key to detail in Figure 2).*

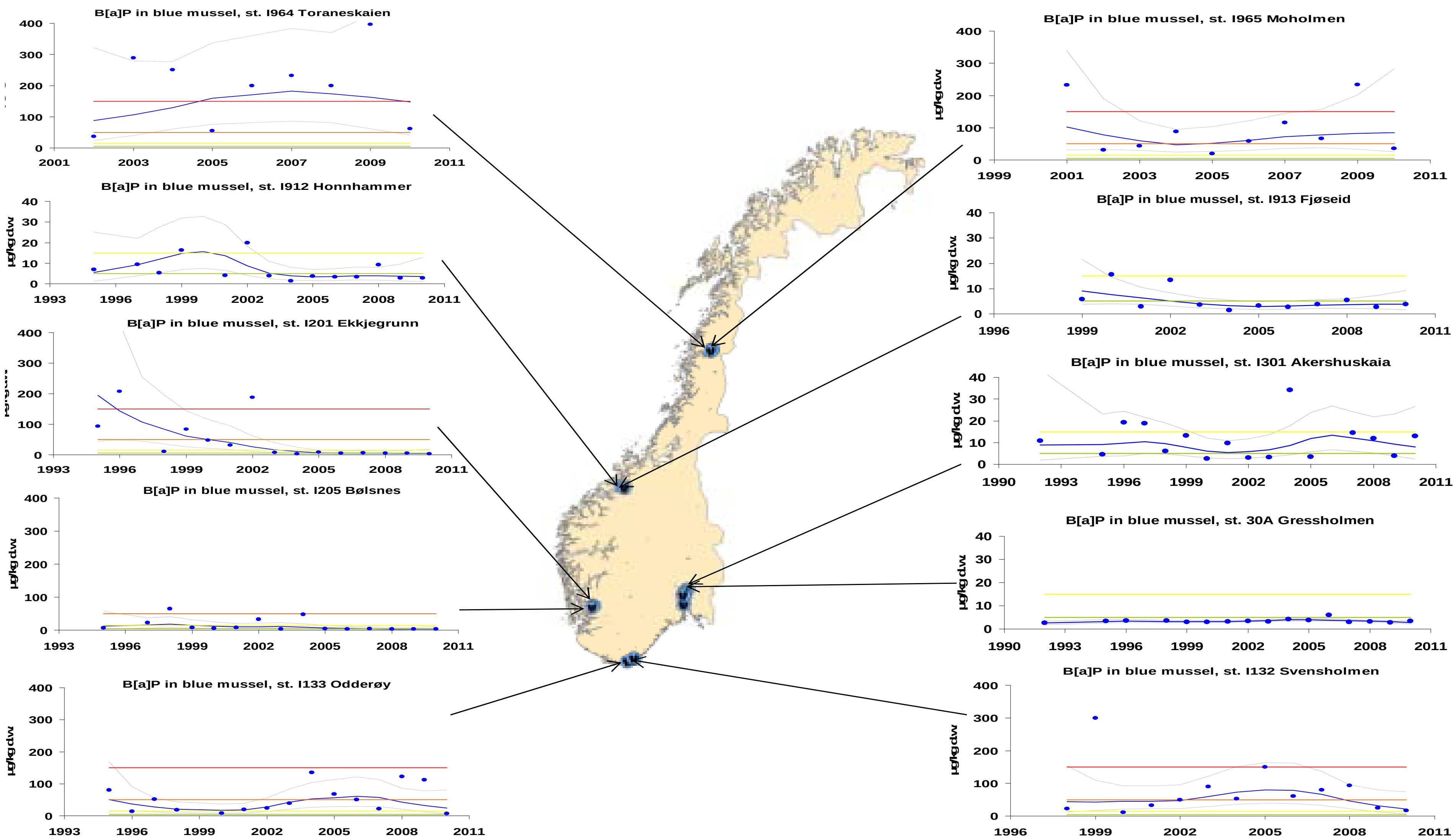

Figure 21. *Median concentration of B[a]P in blue mussel, µg/kg (µg B[a]P /kg) dry weight for selected stations (cf. Appendix H, see otherwise key to detail in Figure 2).*

Polybrominated diphenyl ethers (PBDEs)

Cod liver

Polybrominated diphenyl ethers (PBDEs) have been investigated in cod liver annually since 2005. Samples from the Inner Oslofjord have also been analysed for 1993, 1996 and 2001. Samples from the Færder area have been analysed for 1993 and 1996, and samples from Karihavet on the west coast have been analysed for 1996 and 2001. In 2010, PBDEs were analysed in cod from eight stations (see Table 8, Figure 22 and Figure 23). Selected time-series are also seen in Figure 24. The median concentration of sum PBDE was highest in the Inner Oslofjord (st. 30B) (86.8 µg/kg w.w.) and no significant trend was observed. No significant trends were observed at Færder (st. 36B), in the Inner Sørfjord (st. 53B) or at Bjørnerøya (st. 98B1) in Lofoten where the median concentration was lowest (6.14 µg/kg w.w.). A significant downward trend was observed in Karihavet (st. 23B) on the west coast. No trends could be calculated at the stations in the harbours of Kristiansand (st. 13BH), Trondheim (st. 80BH) or Tromsø (st. 43BH) because of lack of enough data to do a trend analysis.

Table 8 *Median concentrations (µg/kg w.w.) of sum PBDE analysed in cod liver in 2010.*

Station	Sum PBDE	BDE47	BDE100	BDE49
The Inner Oslofjord (st. 30B)	86.8	61	13	2.9
Færder (st. 36B)	8.79	5.5	0.789	0.415
Kristiansand harbour (st. 13BH)	13.0	7	1.24	0.845
The Inner Sørfjord (st. 53B)	64.9	46	9.9	3.9
Karihavet area (st. 23B)	8.81	5	0.93	0.459
Trondheim harbour (st. 80BH)	14.9	10.7	1.8	0.48
Bjørnerøya (st. 98B1)	6.14	3.2	0.41	0.5
Tromsø harbour (st. 43BH)	35.9	22	4.4	2.4

The tetrabromodiphenyl ether BDE47 was the most dominant PBDE, whereas the pentabromodiphenyl ether BDE100 and the tetrabromodiphenyl ether BDE49 were either the second or the third most dominant (Figure 22 and Figure 23).

Concluding remarks on PBDEs

The median concentration of PBDE was highest in cod liver from the Inner Oslofjord and the values were lower in 2010 (86.8 µg/kg w.w.) than in 2009 (98.9 µg/kg w.w.). The values at Færder, the Inner Sørfjord and Bjørnerøya in Lofoten have increased slightly from 2009.

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). This is higher than the median found in Færder, Kristiansand, Karihavet and Bjørnerøya in Lofoten and higher than the average concentrations found at two cod stations in the north sea (14.6 and 15.4 µg/kg w.w.) (Green *et al.* 2011*)*. It can not be disregarded that this high background concentration might be too high. The median found in the Inner Oslofjord was 60 µg/kg w.w. and in the interval of 37-112 µg/kg w.w. found in other contaminated areas (Fjeld *et al.* 2005, Berge *et al.* 2006). Bakke *et al.* (2008) found a range of mean concentrations in remote areas to be 3.4-29.0 µg/kg w.w.

The congeners BDE47, BDE 100 and BDE49 were observed to be most dominant. The low concentrations of BDE99 are probably due to the debromination to BDE47.

Fjeld *et al.* (2011) found that mean concentrations of sum PBDE9 (nine major congeners) in trout, vendace and smelt caught in 2010 in lake Mjøsa were respectively 9.9, 2.8 and 7.4 ng/g w.w. The dominant congeners were BDE47, -99 and -100. The reduction through time was greatest for BDE99, which probably is due to a biotransformations (debromination) to BDE47.

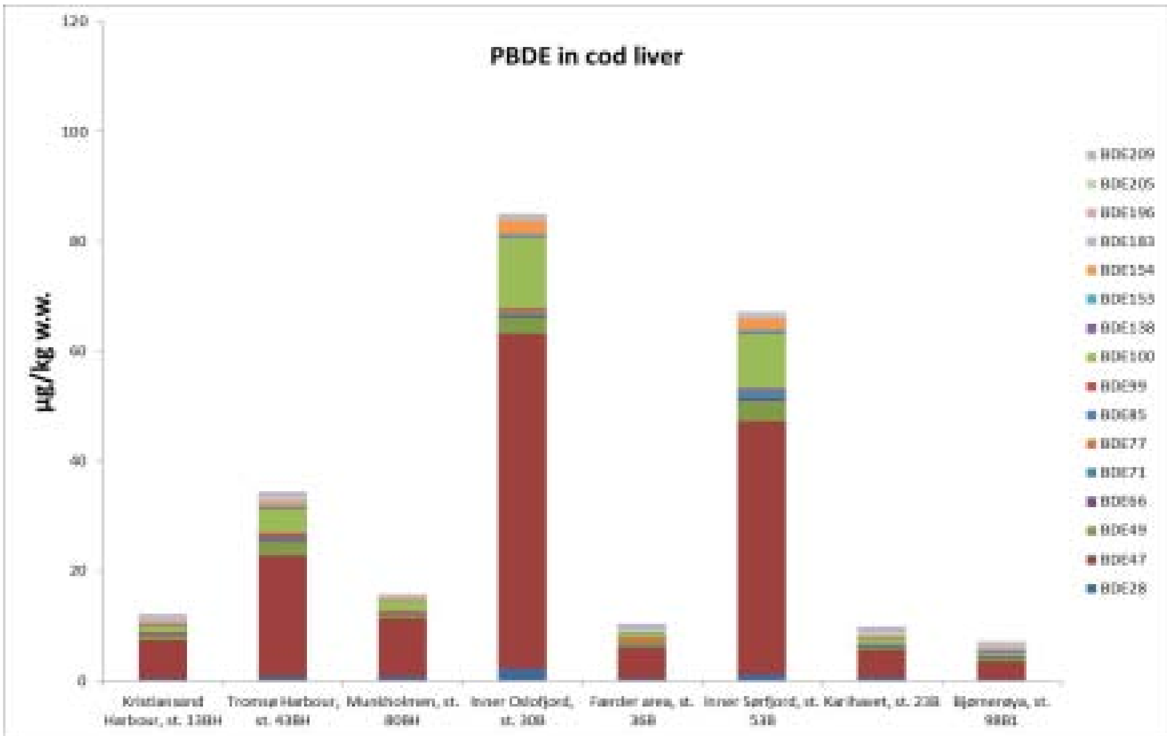

Figure 22. *Median concentrations (µg/kg w.w.) of PBDEs in cod liver in 2010.*

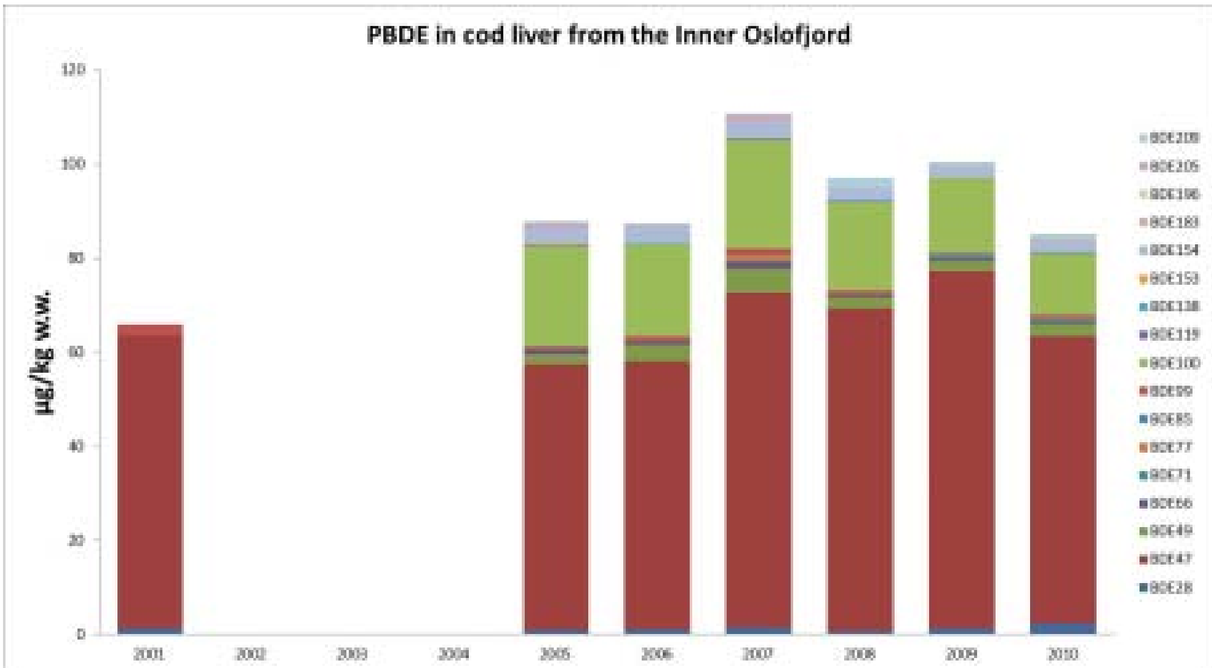

Figure 23*. Median concentrations (µg/kg w.w.) of PBDEs in cod liver from 2001 to 2010 in the Inner Oslofjord (st. 30B).*

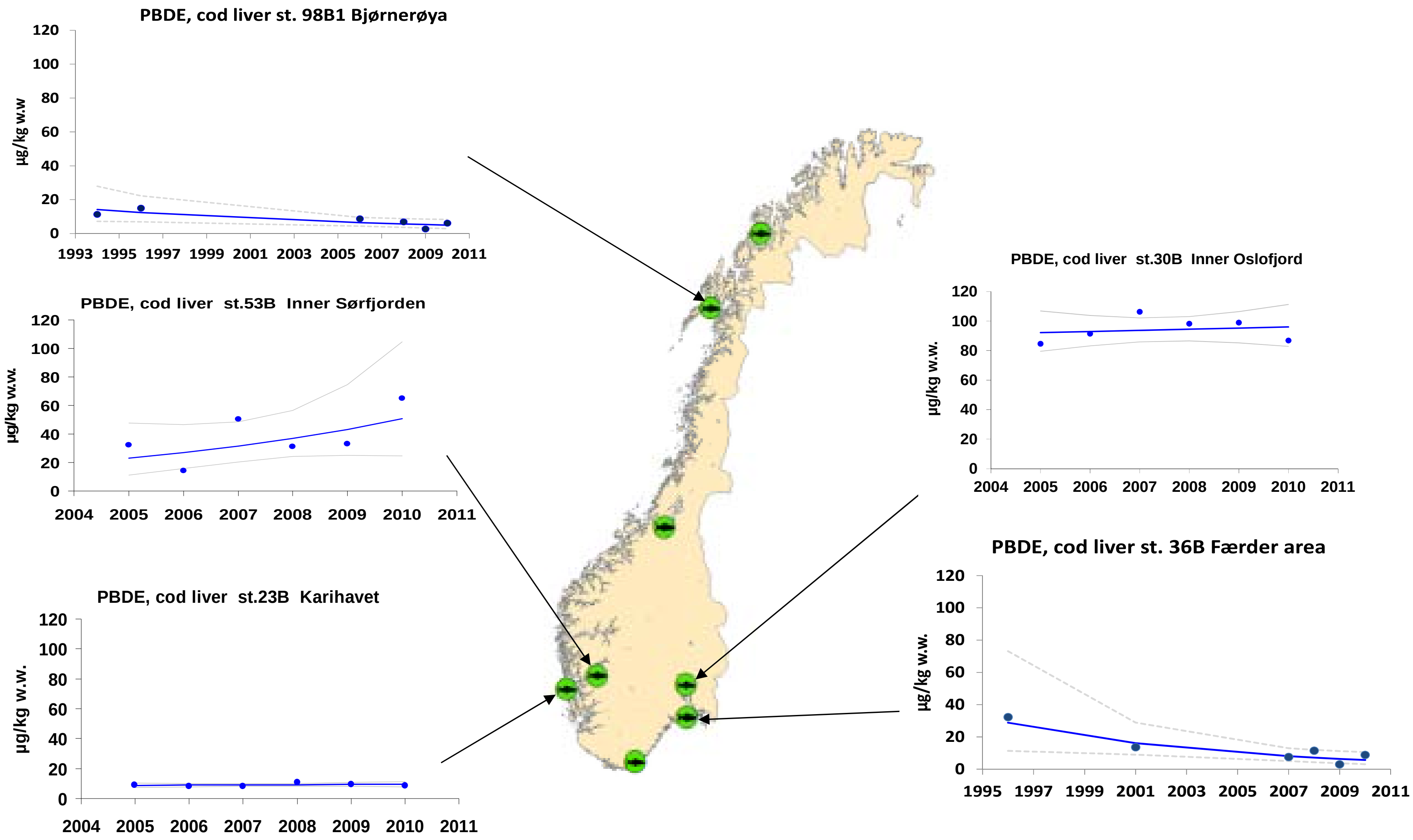

Figure 24. *Median concentration of PBDE in cod liver from Karihavet (st. 23B), Inner Sørfjord (st. 53B) and Inner Oslofjord (st. 30B), µg/kg (µg PBDE/kg) wet weight (cf. Appendix H, see otherwise key to detail in Figure 2). There are no limits to classify the results.*

Perfluoralkyl compounds (PFCs)

Cod liver

Perfluroalkyl compounds (PFCs[1]) have in this monitoring programme been analysed in cod liver annually since 2005. Samples from 1993 have also been analysed for PFCs from the Inner Oslofjord (st. 30B) and Karihavet (st. 23B). In 2010, these compounds were analysed in cod liver from eight stations (Figure 25 and Figure 26).

The median concentration of perfluoroctonoic sulphonate (PFOS) was highest in the Inner Oslofjord (st. 30B) and Bjørnerøya (st. 98B1) in Lofoten (both 16.0 µg/kg w.w.) and lowest in the Inner Sørfjord (st. 53B) (2.4 µg/kg w.w.) Table 9. There were no significant trends for PFOS in the Inner Oslofjord (st. 30B), Færder (st. 36B), the Inner Sørfjord (st. 53B), in the Karihavet area (st. 23B) on the west coast or at Bjørnerøya (st. 98B1) in Lofoten. No trends could be calculated in the harbour areas in Kristiansand (st. 13BH), Trondheim (st. 80BH) and Tromsø (st. 43BH) because of short time series.

Table 9 *Median concentrations (µg/kg w.w.) of the PFC-compounds PFOS and PFOSA analysed in cod liver in 2010.*

Stations	PFOS	PFOSA
The Inner Oslofjord (st. 30B)	16.0	18.0
Færder (st. 36B)	8.94	8.15
Kristiansand harbour (st. 13BH)	6.9	4.0
The Inner Sørfjord (st. 53B)	2.4	8.0
Karihavet area (st. 23B)	4.0	3.0
Trondheim harbour (st. 80BH)	3.1	2.0
Bjørnerøya (st. 98B1)	16	2
Tromsø harbour (st. 43BH)	3.3	5.0

The concentrations of PFOS from the Inner Oslofjord and Bjørnerøya in Lofoten were higher than for all the other stations. PFOS was lower at all stations in 2010 compared to 2009 except for Bjørnerøya were the median concentration was 16 µg/kg w.w. in 2010 and 6.8 µg/kg w.w. in 2009. PFOS in the Inner Oslofjord has decreased to 16 µg/kg w.w. in 2010 from 48 µg/kg w.w. in 2009 and at Færder to 8.94 µg/kg w.w. in 2010 from 29 µg/kg w.w. in 2009.

Perfluorooctane sulphonamid (PFOSA) had a maximum median concentration of 18.0 µg/kg w.w. in the Inner Oslofjord and a minimum at Trondheim and at Bjørnerøya in Lofoten (2.0 µg/kg w.w.).

The concentration of PFOSA was higher than PFOS in the Inner Oslofjord, the Inner Sørfjord and Tromsø harbour. The median concentrations of the remaining PFCs (perfluorononanoic acid (PFNA), perfluorobutane sulphonate (PFBS), perfluoroheptanoic acid (PFHpA), perfluorohexanoic acid (PFHxA) and perfluorooctanoic acid (PFOA)) were not dominant as PFOSA and PFOS.

Concluding remarks on PFCs

Median concentrations in cod from presumed reference stations like Svolvær, Kvænangen/Olderfjord north of Skjervøy and the Varangerfjord indicated that high background concentrations in only diffusely contaminated areas might be around 10 µg/kg w.w. (Bakke *et al.* 2007b). Only the concentrations observed in the Inner Oslofjord and Bjørnerøya in Lofoten were higher. The other stations were quite near this level or lower. Lack of sufficient data prevented trend analysis to be made for Færder, Kristiansand, Trondheim, Bjørnerøya and Tromsø.

PFOS was the dominant PFC in cod liver in the Inner Oslofjord in 2009 (median 48 µg/kg w.w.) compared with PFOSA (41.5 µg/kg w.w.). In 2010, PFOSA dominated (18 µg/kg w.w.) but only slightly more than PFOS (16 µg/kg w.w.) The average concentration of PFOS in cod from two stations in the North Sea was 1.55 and 0.95 µg/kg w.w. (Green *et al.* 2011). Schøyen and Kringstad

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

(2011) analysed PFCs in cod blood samples from the same individuals which were analysed in the CEMP-programme in 2009 from the Inner Oslofjord (Green *et al.* 2010b). They found that PFOSA was the most dominant PFC-compound with a median level 6 times higher than for PFOS. The median level of PFOSA in cod blood was about 5 times higher than in liver. The median level of PFOS in cod liver was about 1.5 times higher than in blood. Further, PFNA was also detected in cod blood.

Fjeld *et al.* (2011) found only PFOS in quantifiable amounts in the three fish species brown trout (*Salmo trutta)*, smelt (*Osmerus eperlanus*) and vendace (*Coregonus albula*) in lake Mjøsa, whereas PFOSA was found in quantifiable amounts only in smelt. Only PFOS was found in quantifiable amounts in the zooplankton *Mysis relicta*.

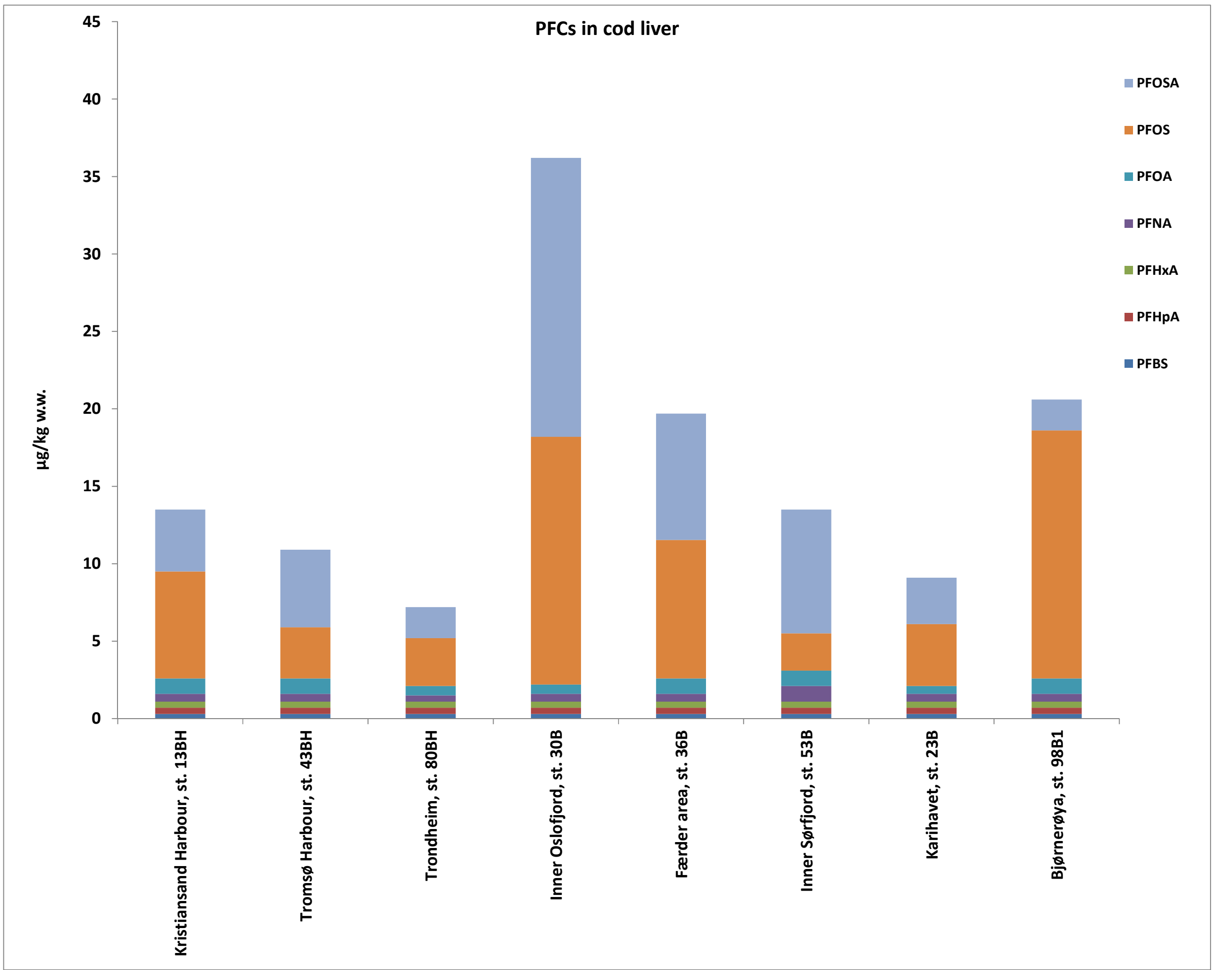

Figure 25. *Median concentrations (µg/kg w.w.) of PFCs in cod liver in 2010.*

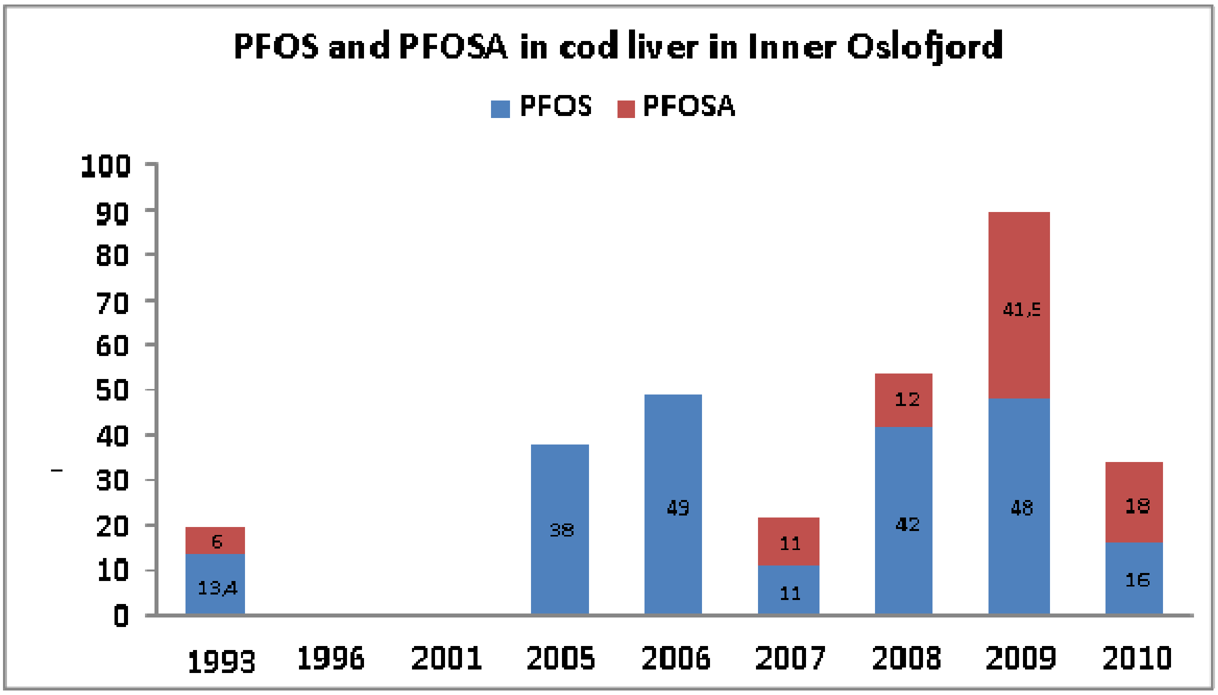

Figure 26. *Median concentrations (µg/kg w.w.) of PFOS and PFOSA in cod liver from 1993 to 2010 in the Inner Oslofjord (st. 30B).*

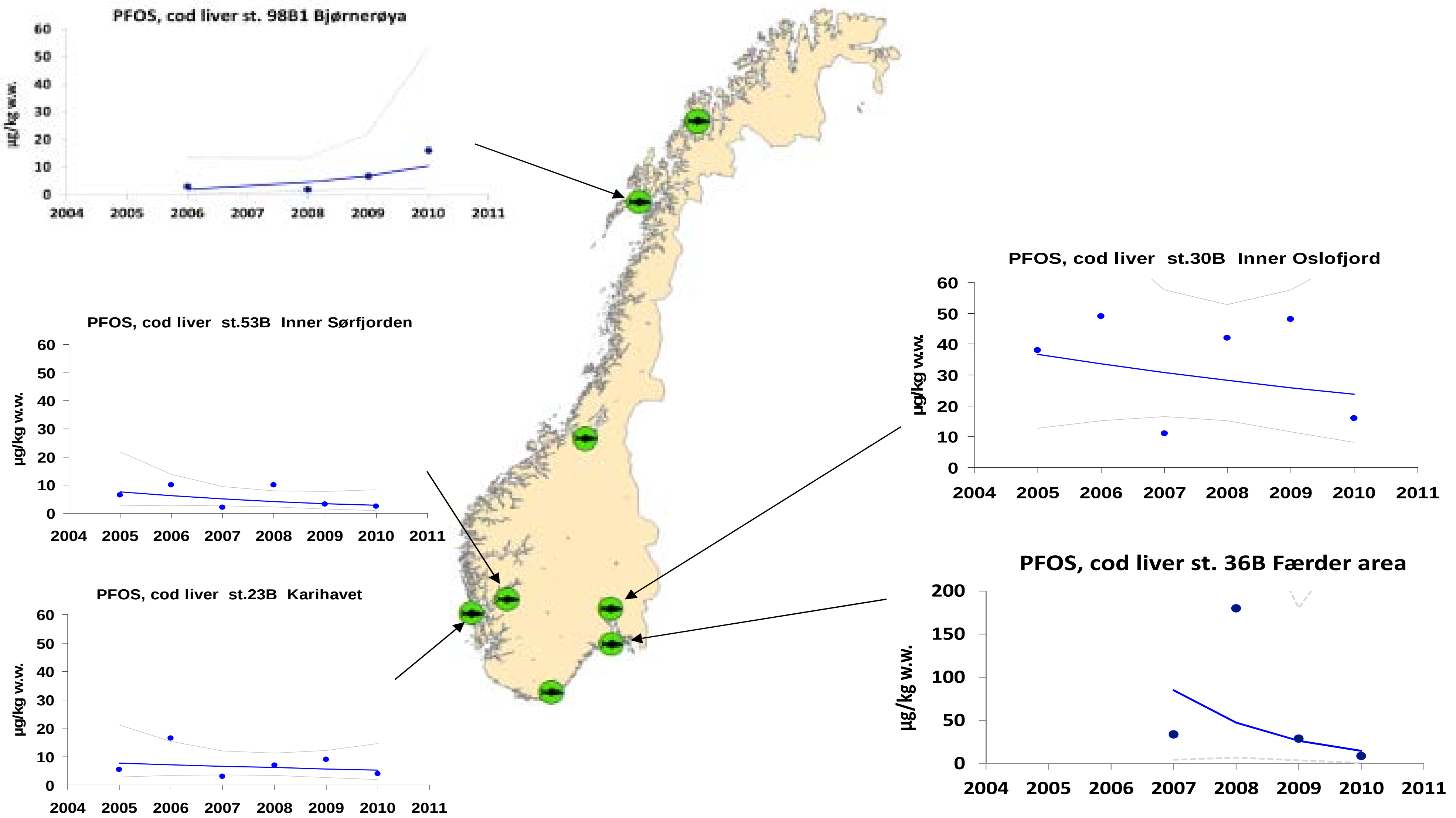

Figure 27. *Median concentration of PFOS in cod liver from Karihavet (st. 23B), Inner Sørfjord (st. 53B) and Inner Oslofjord (st. 30B), µg/kg (µg PFOS/kg) wet weight (cf. Appendix H, see otherwise key to detail in Figure 2). There is no limit to classify the results from 2009.*

Table 10. *Overview of samples collected in 2010 with indication of levels and trends in concentrations of contaminants monitored. Classification is based on observed concentrations in cod, flatfish and blue mussel. Tissues: soft body (SB), muscle (MU), liver (LI), whole organism (WO), fish bile (BI) and fish blood (BL). Klif Classification system is used for biota (Molvær et al. 1997: 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. Where there was sufficient data a time series analysis was performed for the period 2001-2010 and the result is shown after the slash "/" A small filled square (▪) indicates that chemical analysis has been performed, but either data were insufficient to do a trend analysis or was not presented. Dark grey indicates concentrations higher than estimated high background levels. Light grey indicates concentrations lower than high background levels.* ***Note: Class limits for ΣDDT are used for ppDDE. Class limits for ΣHCH are used for HCHG.***

St. no.	Station	Species	Tissue	Ag	ALAD	As	Ba	B[a]P	PBDE	PCB-7	Cd	Co	Cr	Cu	CYP1A	ppDDE	EROD	HCHG	HCB	Hg	KPAH	Mo	Ni	OCS	PAH-16	Pb	PFOS	PYR1O	TBT	TCDDN	V	VDSI	Zn
71G	Fugløyskjær	Common periwinkle	SB																										o/o				
10A2	Skallneset	Blue mussel	SB	o/o		o/o				↓/o	o/o	▪	o/o	o/o		o/o		↓/↓	o/o	↓/↓			o/o	o/o		o/o							o/o
11X	Brashavn	Blue mussel	SB	▪		▪				↓/o	o/o	▪	▪	o/o		o/o		↓/↓	o/o	o/o			▪	o/o		o/↓			↓/↓				o/o
15A	Gåsøy (Ullerø)	Blue mussel	SB	▪		▪				o/o	o/↓	▪	▪	o/o		o/o		↓/↓	o/o	o/o			▪	o/o		o/o			↓/↓				o/o
227A2	Høgevarde	Blue mussel	SB	▪		▪				▪	▪	▪	▪	▪		▪		▪	▪	▪			▪	▪		▪			↓/↓				▪
22A	Espevær (west)	Blue mussel	SB	o/o		o/o				o/o	o/o	▪	o/o	o/o		o/o		↓/↓	↓/o	↑/↑			o/o	o/o		o/o			↓/↓				o/o
30A	Gressholmen	Blue mussel	SB	o/o		o/o		o/o		↓/o	↑/o	▪	o/o	o/↑		↓/o		↓/↓	↓/o	o/o	o/o		o/o	↓/o	o/o	o/↑			↓/↓	↓/o			o/o
31A	Solbergstrand	Blue mussel	SB	▪		▪				↓/o	↑/o	▪	▪	o/o		o/o		↓/↓	↓/o	↑/↑			o	↑/o		↓/o							o/o
35A	Mølen	Blue mussel	SB	▪		o/o	o/o	o/o		↓/o	↑/o	o/o	o/o	o/o		o/o		↓/↓	↓/↓	o/o	o/o	o/o	o/o	↓/o	o/o	↓/o			o/o		o/o		↑/o
51A	Byrkjenes	Blue mussel	SB	▪		▪				o/↓	↓/o	▪	▪	o		o/o		↓/o	o/↑	o/↓			▪	↑/↑		o/o							o
52A	Eitrheimsneset	Blue mussel	SB	o/o		o/o				o/↓	↓/o	▪	o/o	o/o		↓/o		↓/o	o/o	↓/o			o/o	o/o		↓/↓							↓/o
56A	Kvalnes	Blue mussel	SB	▪		▪				o/↓	↓/↓	▪	▪	o/o		o/o		↓/↓	o/o	↓/↓			▪	o/o		o/o							↓/↓
57A	Krossanes	Blue mussel	SB	▪		▪				o/o	↓/↓	▪	▪	o/o		o/o		↓/o	o/o	↓/o			▪	o/o		↓/o							↓/o
63A	Ranaskjær	Blue mussel	SB	▪		▪				o/o	↓/o	▪	▪	o/o		o/o		↓/o	o/o	o/o			▪	o/o		↓/o							↓/o
65A	Vikingneset	Blue mussel	SB	▪		▪				↓/o	↓/o	▪	▪	o/o		o/o		↓/o	o/o	o/o			▪	o/o		↓/o							↓/o
69A	Lille Terøy	Blue mussel	SB	▪		▪				o/o	↓/↓	▪	▪	o/o		o/o		↓/↓	o/o	o/o			▪	o/o		↓/↓							↓/o
71A	Bjørkøya (Risøyodden)	Blue mussel	SB	o/o		o/o				↓/o	o/o	▪	o/o	o/o		o/o		↓/o	↓/o	o/o			o/o	o/o		↓/o			↓/↓	↓/o			↓/o
76A	Risøy	Blue mussel	SB	▪		▪				↓/o	↑/↓	▪	▪	o/o		o/o		↓/↓	o/o	↑/o			▪	o/o		o/o			↓/↓	↑/↑			o/o
98A2	Husvaagen area	Blue mussel	SB	o/o		o/o				o/o	↓/↓	▪	o/o	o/o		o/o		↓/↓	o/o	o/o			o/o	o/o		↓/o			↓/↓				o/o

St. no.	Station	Species	Tissue	Ag	ALAD	As	Ba	B[a]P	PBDE	PCB-7	Cd	Co	Cr	Cu	CYP1A	ppDDE	EROD	HCHG	HCB	Hg	KPAH	Mo	Ni	OCS	PAH-16	Pb	PFOS	PYR1O	TBT	TCDDN	V	VDSI	Zn
I022	West Damholmen	Blue mussel	SB	▪		▪				↓/↓	o/o	▪	▪	o		↓/↓		↓/↓	o/o	o/o			▪	o/o		o/o							o
I023	Singlekalven (south)	Blue mussel	SB	▪		▪				↓/↓	o/o	▪	▪	o		↓/↓		↓/↓	o/↑	o/o			▪	o/o		o/o							o
I024	Kirkøy (north west)	Blue mussel	SB	▪		▪				↓/↓	↓/o	▪	▪	o		↓/↓		↓/o	o/o	o/o			▪	o/o		o/o							o
I131A	Lastad	Blue mussel	SB	▪		▪		o/o		o/o	o/o	▪	▪	o		o/o		↓/↓	o/o	o/o	o/o		▪	o/o	↓/o	▪			o/o				o
I132	Svensholmen	Blue mussel	SB	▪		▪		o/↓		o/o	▪	▪	▪	▪		o/o		↓/o	o/o	▪	o/↓		▪	o/o	o/↓	▪			o/o	o/o			▪
I133	Odderø (west)	Blue mussel	SB	▪		▪		o/o		↓/o	▪	▪	▪	▪		o/o		↓/↓	↓/o	▪	o/o		▪	↑/o	o/o	▪			o/o	o/o			▪
I201	Ekkjegrunn (G1)	Blue mussel	SB	▪		▪		↓/o			o/o	▪	▪	▪						o/o	↓/↓		▪		↓/↓	o/o							▪
I205	Bølsnes (G5)	Blue mussel	SB	▪		▪		o/o			o/o	▪	▪	▪						o/o	↓/↓		▪		↓/↓	o/o							▪
I241	Nordnes	Blue mussel	SB	▪		▪				o/o	▪	▪	▪	▪		o/o		↓/o	↑/↑	▪			▪	o/o		▪							o
I242	Gravdalsneset	Blue mussel	SB	▪		▪				o/o	▪	▪	▪	▪		o/o		↓/o	↓/↑	▪			▪	o/o		▪							o
I243	Hegreneset	Blue mussel	SB	▪		▪				↓/↓	▪	▪	▪	▪		o/o		↓/o	o/↑	▪			▪	o/o		▪							o
I301	Akershuskaia	Blue mussel	SB	▪		▪		o/o		↓/o	↑/o	▪	▪	o		o/o		↓/o	o/o	↑/o	o/o		▪	o/o	o/o	o/o			↓/↓				o
I304	Gåsøya	Blue mussel	SB	o/o		o/o		o/o		o/o	o/o	▪	↑/↑	o		o/o		↓/o	o/o	o/o	o/o		o/o	o/o	o/o	o/o							o
I306	Håøya	Blue mussel	SB	▪		▪		↑/o		o/o	o/o	▪	▪	o		o/o		↓/o	o/o	o/o	o/o		▪	o/o	o/o	o/o							o
I307	Ramtonholmen	Blue mussel	SB	o/o		o/o		o/o		↓/o	↑/o	▪	o/o	o		o/o		↓/↓	o/o	o/o	o/o		↑/↑	o/o	o/o	o/o			▪				o
I712	Croftholmen	Blue mussel	SB	▪		▪				↓/o	▪	▪	▪	▪		o/o		↓/↓	↓/o	o/o			▪	o/o		▪				o/o			▪
I713	Strømtangen	Blue mussel	SB	▪		▪				o/o	▪	▪	▪	▪		o/o		o/o	o/o	o/o			▪	o/o		▪				o/o			▪
I912	Honnhammer	Blue mussel	SB					o/o													↓/o				↓/o								
I913	Fjøseid	Blue mussel	SB					o/o													↓/↓				↓/↓								
I964	Toraneskaien	Blue mussel	SB	▪		o/o		o/o			o/o	▪	▪	o/o						o/o	o/o		▪		o/o	o/o							o/o
I965	Moholmen (B5)	Blue mussel	SB	▪		o/o		o/o			o/o	▪	▪	o/o						o/o	o/o		▪		o/o	o/o							↑/↑
I969	Bjørnbærviken (B9)	Blue mussel	SB	▪		o/o		o/o			o/o	▪	▪	o/o						o/o	o/o		▪		o/o	o/o							o/o
10B	Varangerfjorden	Cod	LI	▪		▪				↓/o	↓/o	▪	▪	↓/o		↓/o		↓/o	↓/o				▪	↓/o		↓/o							↓/↓
10B	Varangerfjorden	Cod	MU							o/o						o/o		o/o	o/o	↓/o				o/↑									
13BH	Kristiansand havn	Cod	LI	▪		▪			▪	▪	▪	▪	▪	▪		▪		▪	▪				▪	▪		▪	▪						▪
13BH	Kristiansand havn	Cod	MU							▪						▪		▪	▪	▪				▪									

St. no.	Station	Species	Tissue	Ag	ALAD	As	Ba	B[a]P	PBDE	PCB-7	Cd	Co	Cr	Cu	CYP1A	ppDDE	EROD	HCHG	HCB	Hg	KPAH	Mo	Ni	OCS	PAH-16	Pb	PFOS	PYR1O	TBT	TCDDN	V	VDSI	Zn
15B	Ullerø area	Cod	BI																									↓/↓					
15B	Ullerø area	Cod	LI	▪		▪				↓/↓	o/o	▪	▪/▪	o/o		o/o		↓/o	o/o				▪	↓/o		↓/o							↓/o
15B	Ullerø area	Cod	MU							↓/o						↓/o		o/o	↓/o	o/↑				o/↑									
23B	Karihavet area	Cod	LI	o/o		▪			↓/o	↓/o	o/o	▪	o/o	o/o	o/o	↓/o	o/o	↓/↓	o/o				o/o	↓/o		↓/o	o/o						o/o
23B	Karihavet area	Cod	BL		↑/↑																												
23B	Karihavet area	Cod	BI																									↓/o					
23B	Karihavet area	Cod	MU							o/o						o/o		o/o	o/o	↑/o				↓/↑									
30B	Oslo City area	Cod	MU							o/↑						o/o		o/o	↓/o	↑/o				o/o									
30B	Oslo City area	Cod	LI	o/o		▪			o/o	o/o	↑/↑	▪	o/o	o/o	o/o	↓/o	o/o	↓/↓	↓/o				o/o	↓/↓		o/o	o/o						o/o
30B	Oslo City area	Cod	BL		o/o																												
30B	Oslo City area	Cod	BI																									↓/o					
36B	Færder area	Cod	MU							o/o						↓/o		↓/o	↓/o	o/o				↓/↑									
36B	Færder area	Cod	LI	▪		▪			o/o	↓/o	↓/o	▪	▪/▪	↓/o		↓/o		↓/↓	↓/o				▪	↓/o		↓/o	o/o						↓/o
43BH	Tromsø havn	Cod	MU							▪						▪		▪	▪	▪				▪									
43BH	Tromsø havn	Cod	LI	▪		▪			▪	▪	▪	▪	▪	▪		▪		▪	▪				▪	▪		▪	▪						▪
53B	Inner Sørfjord	Cod	LI	▪		▪			o/o	o/o	↑/o	▪	▪	↑/o	o/o	o/o	o/o	↓/o	↓/o				▪	↓/o		↓/o	o/o						o/o
53B	Inner Sørfjord	Cod	BI																									↓/o					
53B	Inner Sørfjord	Cod	MU							o/o						o/o		o/o	o/o	o/o				o/↑									
53B	Inner Sørfjord	Cod	BL		o/o																												
67B	Strandebarm area	Cod	LI	▪		▪				↓/o	↓/o	▪	▪	o/o		↓/o		↓/↓	↓/o				▪	↓/o		↓/o							o/o
67B	Strandebarm area	Cod	MU							o/o						↓/o		↓/o	↓/o	↓/o				↓/↑									
80BH	Trondheim	Cod	LI	▪		▪			▪	▪	▪	▪	▪	▪		▪		▪	▪				▪	▪		▪	▪						▪
80BH	Trondheim	Cod	MU							▪						▪		▪	▪	▪													
98B1	Bjørnerøya (east)	Cod	MU							o/o						o/o		o/o	↓/o	o/o				o/↑									
98B1	Bjørnerøya (east)	Cod	LI	▪		▪			o/o	↓/o	o/o	▪	▪/▪	o/o		↓/o		↓/o	↓/o				▪	o/o		↓/o	o/o						o/o
15F	Ullerø area	Dab	MU							o/o						o/o		↓/o	o/o	o/o													

St. no.	Station	Species	Tissue	Ag	ALAD	As	Ba	B[a]P	PBDE	PCB-7	Cd	Co	Cr	Cu	CYP1A	ppDDE	EROD	HCHG	HCB	Hg	KPAH	Mo	Ni	OCS	PAH-16	Pb	PFOS	PYR1O	TBT	TCDDN	V	VDSI	Zn
15F	Ullerø area	Dab	LI	▪		▪				o/o	o/o	▪	▪	o/o		o/o		↓/o	o/o				▪	o/o		↓/o							o/o
36F	Færder area	Dab	MU							o/o						↓/o		↓/o	↓/o	o/o				↓/↑									
36F	Færder area	Dab	LI	▪		▪				o/o	o/o	▪	▪	o/o		o/o		↓/↓	↓/↓				▪	o/o		↓/o							o/o
11G	Brashavn	Dogwhelk	WO																													o/o	
11G	Brashavn	Dogwhelk	SB																										↓/↓				
131G	Lastad	Dogwhelk	SB																										↓/↓				
131G	Lastad	Dogwhelk	WO																													↓/↓	
15G	Gåsøy (Ullerø)	Dogwhelk	SB																										↓/↓				
15G	Gåsøy (Ullerø)	Dogwhelk	WO																													↓/↓	
227G1	Melandholmen/Flatskjær	Dogwhelk	WO																													↓/↓	
227G1	Melandholmen/Flatskjær	Dogwhelk	SB																										o/o				
22G	Espevær (west)	Dogwhelk	SB																										↓/↓				
22G	Espevær (west)	Dogwhelk	WO																													↓/↓	
36G	Færder	Dogwhelk	SB																										↓/o				
36G	Færder	Dogwhelk	WO																													↓/↓	
76G	Risøy	Dogwhelk	WO																													↓/↓	
76G	Risøy	Dogwhelk	SB																										↓/↓				
98G	Svolvær området	Dogwhelk	WO																													↓/↓	
98G	Svolvær området	Dogwhelk	SB																										↓/↓				
33F	Sande (east side)	Flounder	MU							o/↓						↓/o		↓/o	↓/o	↓/o				o/↑									
33F	Sande (east side)	Flounder	LI	▪		▪				o/o	↓/o	▪	▪	↓/o		o/o		↓/o	↓/o				▪	o/o		↓/o							↓/o
53F	Inner Sørfjord	Flounder	MU							↓/o						↓/o		↓/o	↓/o	↑/o				↓/o									
53F	Inner Sørfjord	Flounder	LI	▪		▪				o/o	↓/↓	▪	▪	o/o		↓/o		↓/o	↓/o				▪	↓/↑		o/o							o/o
21F	Åkrafjord	Megrim	LI	▪		▪				o/o	o/o	▪	▪	o/o		o/o		o/o	o/o				▪	o/o		o/o							o/o
21F	Åkrafjord	Megrim	MU							o/o						o/o		o/o	o/o	o/o				o/o									
67F	Strandebarm area	Megrim	LI	▪		▪				↓/o	↓/o	▪	▪	o/o		o/o		↓/o	o/o				▪	o/o		↓/o							o/o

St. no.	Station	Species	Tissue	Ag	ALAD	As	Ba	B[a]P	PBDE	PCB-7	Cd	Co	Cr	Cu	CYP1A	ppDDE	EROD	HCHG	HCB	Hg	KPAH	Mo	Ni	OCS	PAH-16	Pb	PFOS	PYR1O	TBT	TCDDN	V	VDSI	Zn
67F	Strandebarm area	Megrim	MU							o/o						↓/o		o/o	o/o	↓/o				↓/↑									
10F	Skogerøy	Plaice	LI	▪		▪				↓/o	o/o	▪	▪	↑/o		↓/o		↓/↓	↓/o				▪	o/o		↓/o							o/o
10F	Skogerøy	Plaice	MU							↓/o						↓/o		o/o	↓/o	o/o													
98F2	Husholmen	Plaice	LI	▪		▪				↓/↓	o/o	▪	▪	o/o		↓/o		o/o	↓/o				▪	o/o		o/o							o/o
98F2	Husholmen	Plaice	MU							o/o						o/o		o/o	o/o	o/o													

4.3. Areas of special concern (Impacted)

The Oslofjord, Hvaler and Grenlandsfjord areas and the Sørfjord and Hardangerfjord areas

This part of the report focuses on two main areas of special concern; the Oslofjord/Hvaler/Grenlandsfjord area, and the Sørfjord/Hardangerfjord area. There were 1039 time series for selected contaminants or results from biological effects methods (cf. Table 7) out of which 335 concerned the Oslofjord area, including the Hvaler area and Grenlandsfjord area. In 2010, 279 of the 335 series had a concentrations that could be classified as insignificantly polluted (Class I), or did not exceed provisional "high background". There were 104 significant trends, and 86 of these were downwards. The Sørfjord and Hardangerfjord area comprised 191 time series in 2010, and 156 of these had concentrations that could be classified as insignificantly polluted (Class I), or did not exceed provisional "high background" Of these 191 time series, 72 had significant trends, 68 were downwards and four were upwards.

The Oslofjord, Hvaler and Grenlandsfjord areas

The investigations for the Oslofjord/Hvaler/Grenlandsfjord area in 2010 included 13 blue mussel stations, two flatfish stations, two cod stations and one dogwhelk station. Points of concern are described below.

Mercury (Hg)
There has been a significant upward trend for Hg in cod fillet from the Inner Oslofjord (st. 30B). In 2010 the cod fillet from the Inner Oslofjord was moderately polluted (Class II) by Hg with a concentration of 0.22 mg/kg w.w. (slightly lower than in 2009) (Figure 28). Cod from the outer part of the Oslofjord, (Færder, st. 36B), had 50 % lower concentration of Hg in the fillet than was found in the Inner Oslofjord, but was still moderately polluted (Class II) by Hg.

Blue mussel from the Hvaler area and the Grenlandsfjord area were moderately polluted by Hg, but had no significant trends. Upward trends were found in blue mussel from the mid Oslofjord at Solbergstrand (st. 31A) and the Inner Oslofjord at Akershuskaia (st. I301), however concentrations in 2010 were low (Class I). The other blue mussel stations in the Oslofjord area were insignificantly polluted (Class I) by Hg.

The range of Hg concentrations in fillet of cod from Inner Oslofjord (st. 30B) was similar to the concentrations found in Bekkelagsbassenget and Frognerkilen in 2006 and Bekkelagsbassenget in 1997 and 1998, and Hvervenbukta and Breivold/Bunnefjorden in 1997 and 1998 (Berge 2009). The discharge of Hg in Norway has been reduced by 60 % from 1995 to 2005. From 2008, products containing Hg were prohibited in Norway. In 2009, a survey of contaminants in freshwater fish in Norway revealed very high concentrations of Hg (Fjeld and Rognerud 2009). This increase was unexpected as the atmospheric Hg depositions most likely have decreased in southeast Norway since the beginning of the 1990s. Mercury in fish exists mainly as methyl mercury, and factors stimulating the 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. An alternative explanation might be the increasing trends in dissolved organic carbon (DOC) that have been shown in surface waters in Norway (De Wit *et al.* 2007) and boreal areas elsewhere in North America and Europe (Monteith *et al.* 2007) which were attributed to a decline in sulphate deposition. The DOC is derived from soil organic material and may act as a carrier for organic pollutants (Ding and Wu 1997). Thus, the increase in DOC would contribute to increased transport of Hg sorbed to dissolved humic substances and wash-out to the fjord.

Cadmium (Cd)

There was a significant upward trend for Cd in cod liver from the Inner Oslofjord (st. 30B). The concentrations were still below presumed high background level (Figure 29). Cod from the Færder area (st. 36B) had concentrations of Cd that were below presumed high background level, and showed a downward trend. However, for the last 10 years there has been no significant trend for Cd on this station. Blue mussel from West Damholmen (st. I022) and Bjørkøy (st. 71A) were moderately polluted by Cd. Blue mussel from Gressholmen (st. 30A), Ramtonholmen (st. I307), Solbergstrand (st. 31A) and Mølen (st. 35A) were insignificantly/slightly polluted (Class I) by Cd but had upward trends. Blue mussel from Kirkøy (st. I024) was insignificantly/slightly polluted (Class I) by Cd and had a downward trend.

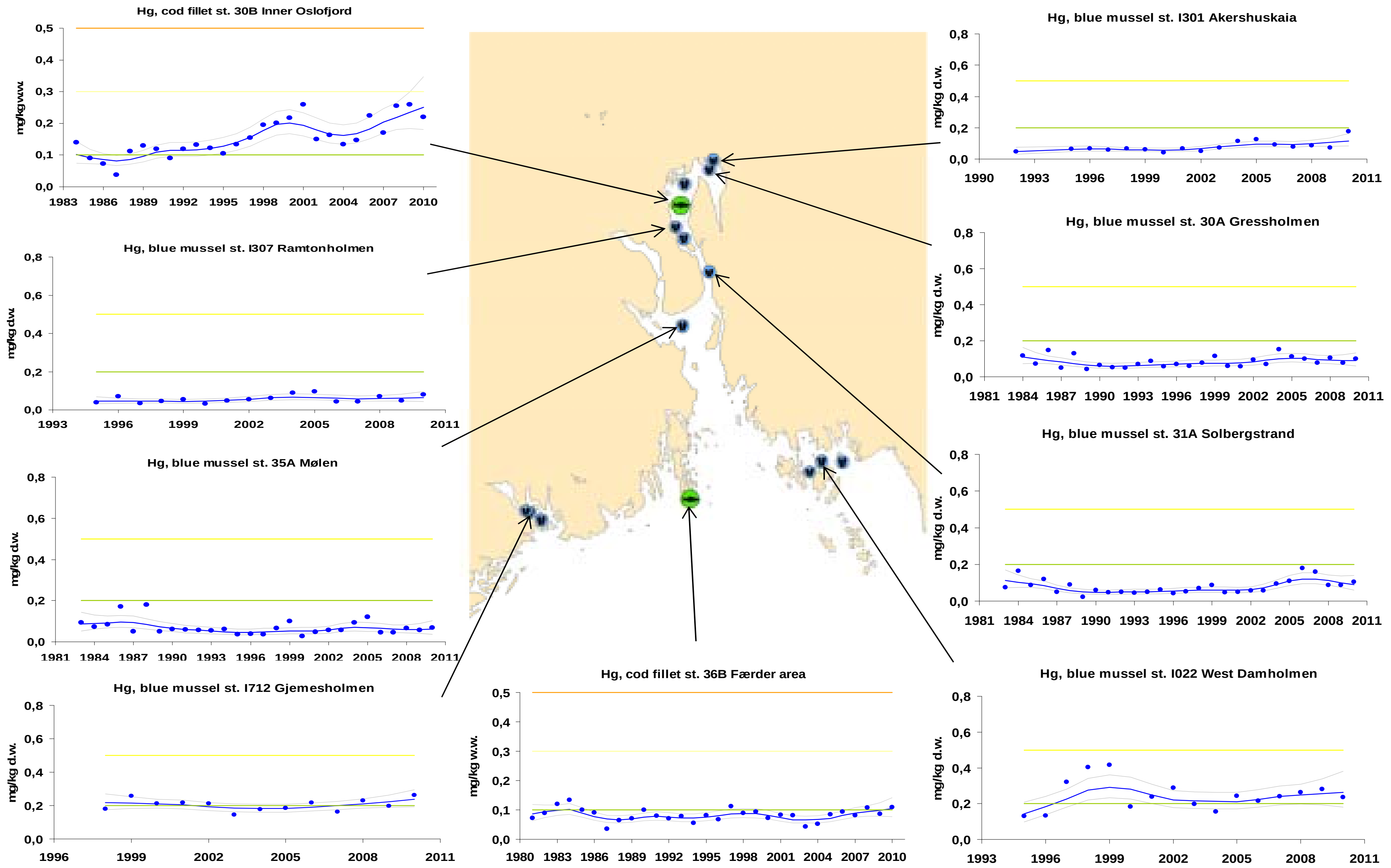

Figure 28*. Median Hg concentrations in cod and blue mussel from the Oslofjord area (cf. Appendix H, see otherwise key to detail in Figure 2).*

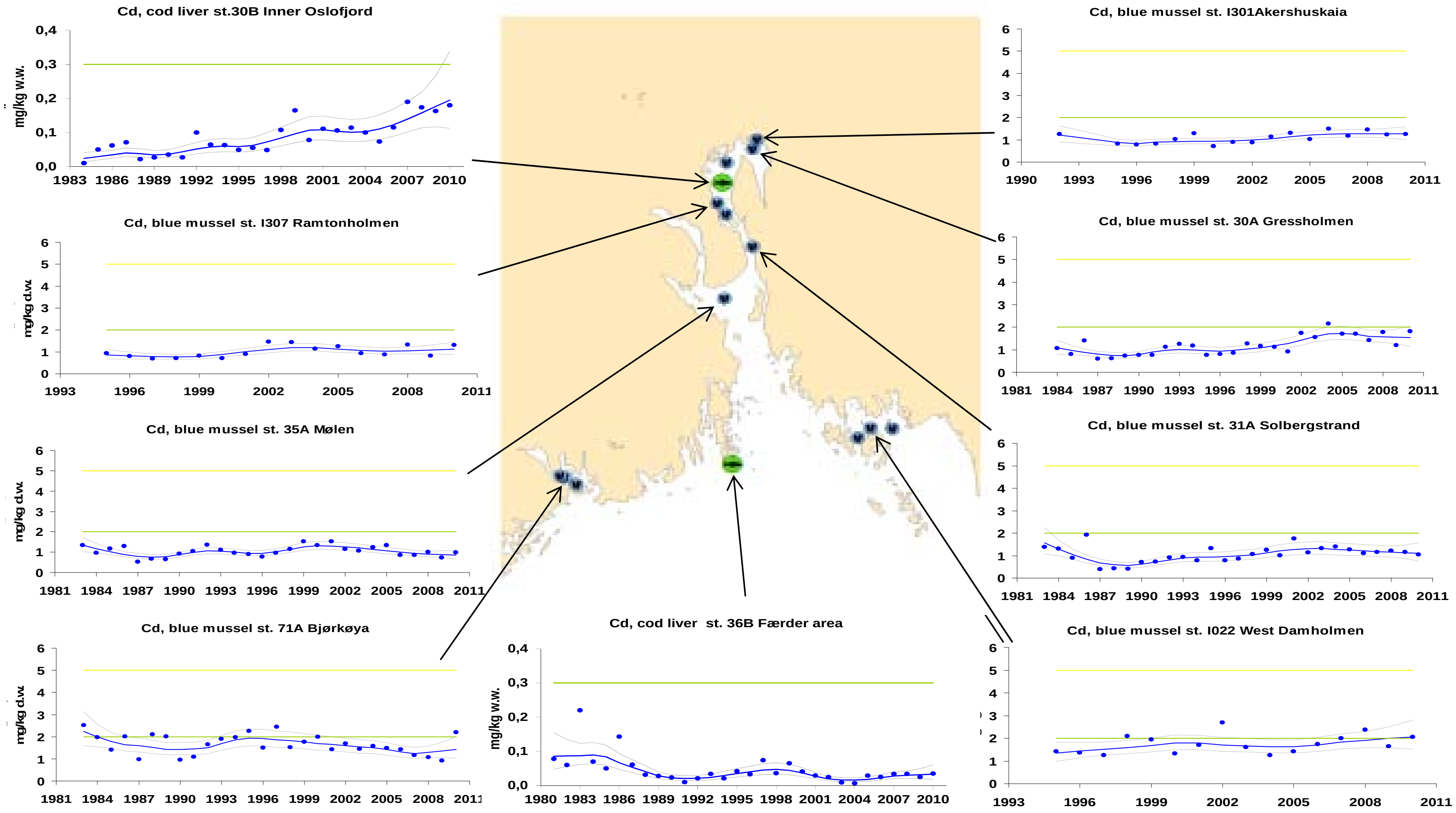

Figure 29. *Median Cd concentrations in cod and blue mussel from the Oslofjord area (cf. Appendix H, see otherwise key to detail in Figure 2).*

Lead (Pb)
The concentrations of Pb in cod liver exceeded presumed high background level in the Inner Oslofjord (st. 30B). The concentrations of Pb in cod liver from the Inner Oslofjord have been high most of the years since 1989 (Figure 30).The Pb contamination in the Inner Oslofjord is reflected in reduced ALA-D activities in blood of cod (see chapter 4.5) Cod from the Færder area (st. 36B) did not have elevated concentrations of Pb in the liver and had a downward trend. Blue mussel from Gressholmen (st. 30A) was moderately polluted (Class II) by Pb, and has had a significant upward trend for the last 10 years. Blue mussel from Croftholmen (st. I712) in the Grenlandsfjord area was also moderately polluted (Class II). The other blue mussel stations in the Oslofjord area were insignificantly polluted by Pb (Class I).

Polychlorinated biphenyls (ΣPCB-7)
Cod liver from the Inner Oslofjord was markedly polluted by PCBs (Class III), as it has been for many years (Figure 31). This may also be reflected in elevated levels of CYP 1A proteins and activities (see chapter 4.5).The concentration of ΣPCB-7 in cod fillet had decreased since 2009, and was in 2010 moderately polluted (Class II). There was a significant upward trend for ΣPCB-7 in cod fillet from the Inner Oslofjord for the last 10 years. Cod from the Færder area (st. 36B) was insignificantly polluted (Class I) by ΣPCB-7 in both liver and fillet, and there was a significant downward trend for ΣPCB-7 in cod liver. Blue mussel from Akershuskaia (st. I301), Gressholmen (st. 30A) and Gåsøya (st. I304) were moderately polluted (Class II) by ΣPCB-7, with significant downward trends. The other blue mussel stations in the Oslofjord area were insignificantly/slightly polluted (Class I) by PCBs.

The Norwegian Food Safety Authority (*Mattilsynet*[11]) has issued advice against consumption of eel and fish liver from the Inner Oslofjord due to high concentrations of PCBs. Blue mussel are found in shallow water, and are filter feeders. Cod are found in the whole water body, and feed on fish, prawns and benthic fauna. Cod will therefore presumably bioaccumulate contaminants like PCBs from sediments to a higher extent than blue mussel. This might be the reason for the observed differences in trends for ΣPCB-7 in blue mussel and cod. An alternative explanation might be that the upward trend in DOC might enhance the transport of organochlorines sorbed to dissolved humic substances, as explained for Hg.

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 mussel in this period showed relatively high levels of PCBs (Class II-III) but no significant increase over time. 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. It is surprising to find an increase of PCBs in cod liver and fillet from the Inner Oslofjord since polluted sediment has been removed from the harbour area and capped with clean sediments.

[11] see http://www.miljostatus.no/Tema/Hav-og-vann/Pavirkninger-pa-livet-i-vann/Miljogifter_vann/Miljogifter_marint/Kostholdsrad/

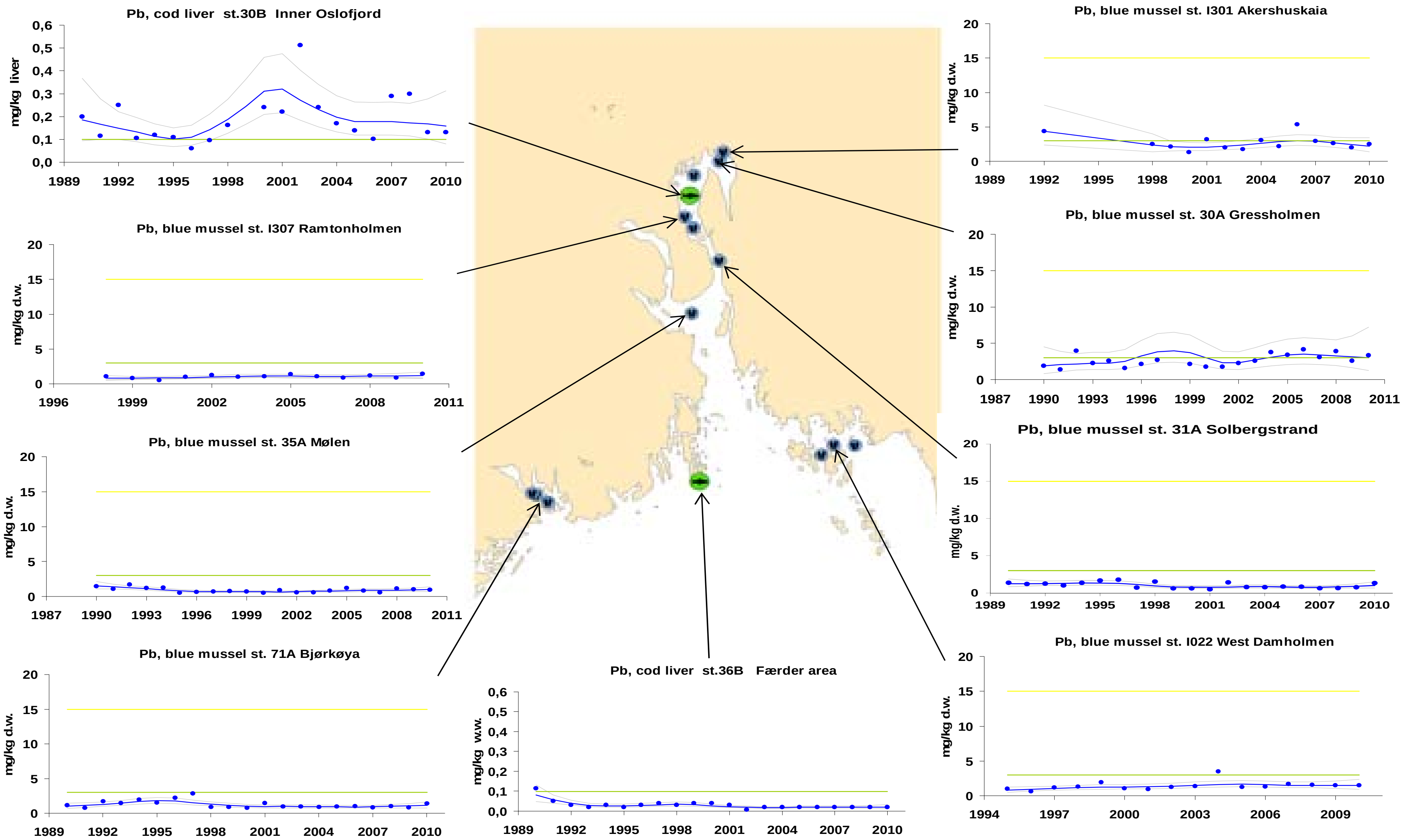

Figure 30. *Median Pb concentrations in cod liver and blue mussel from the Oslofjord area (cf. Appendix H, see otherwise key to detail in Figure 2).*

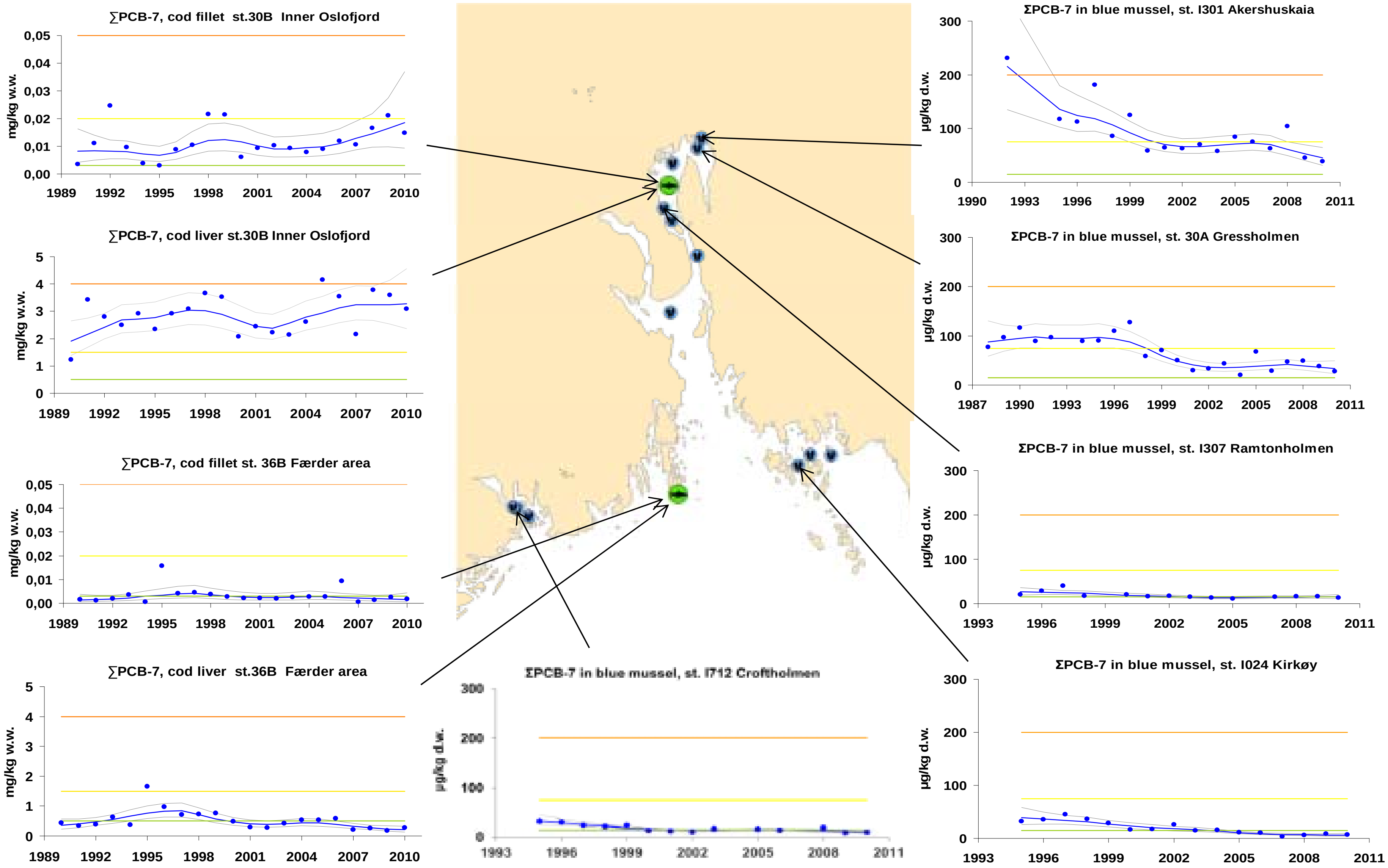

Figure 31. *Median ΣPCB-7 concentrations in cod and blue mussel from the Oslofjord area (cf. Appendix H, see otherwise key to detail in Figure 2).*

Hexachlorobenzene (HCB)
Cod from both the Inner Oslofjord (st. 30B) and the Færder area (st. 36B) were insignificantly polluted (Class I) by HCB in both liver and fillet and showed downward trends (Table 10 and Figure 32). Blue mussel from Strømtangen (st. I713) and Croftholmen (st. I712) in the Grenlandsfjord area were markedly polluted (Class III) by HCB. Blue mussel from Bjørkøya (st. 71A) and Akershuskaia (st. I301 were moderately polluted (Class II) by HCB. Blue mussel from the other stations in the Oslofjord area were insignificantly/slightly polluted (Class I) by HCB.

Dioxins (dioxin toxicity equivalents-Nordic model, TCDDN)
Blue mussel from Bjørkøya (st. 71A), Croftholmen (st. I712) and Strømtangen (st. I713) in the Grenlandsfjord area were extremely polluted (Class V) by dioxins (Figure 33). The concentration of dioxins in blue mussel from Croftholmen (st. I712) showed a small decrease in 2010. There was a tendency towards an increase at Bjørkøya (st. 71A) and Strømtangen (st. I713), but there were no significant trends for these stations. Blue mussel from Gressholmen (st. 30A) and Risøy (st. 76A) were insignificantly polluted by dioxins.

Large reductions in the industrial effluents resulted in a strong decline in contaminant levels in fish and shellfish around 1990, but still the dioxin concentrations in seafood from the Grenlandsfjord is strongly elevated. Concentrations of dioxins in blue mussel showed no reduction in the Grenlandsfjord area from 1997 to 2010.

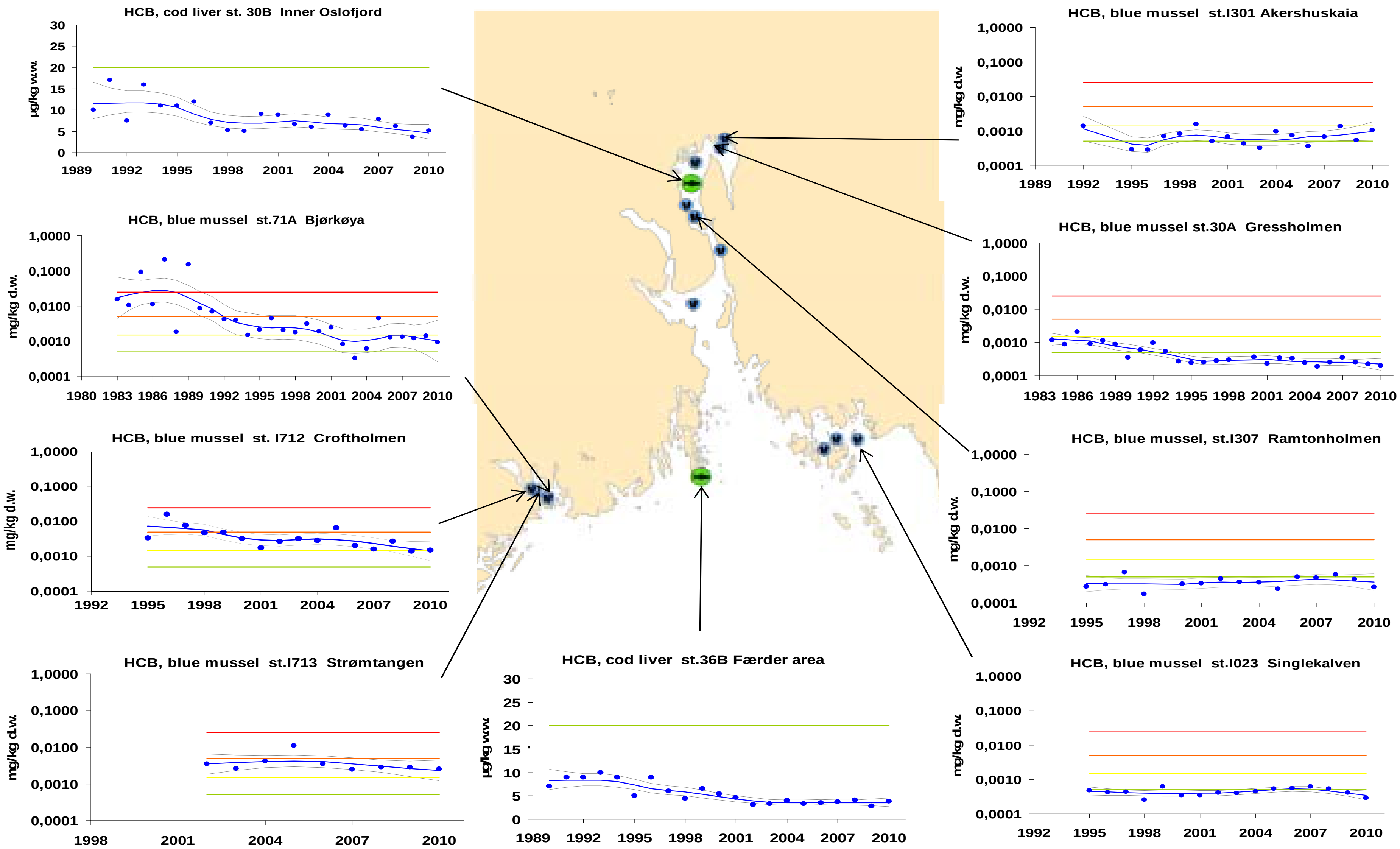

Figure 32. *Median HCB concentrations in cod and blue mussel from the Oslofjord area (cf. Appendix H, see otherwise key to detail in Figure 2).*

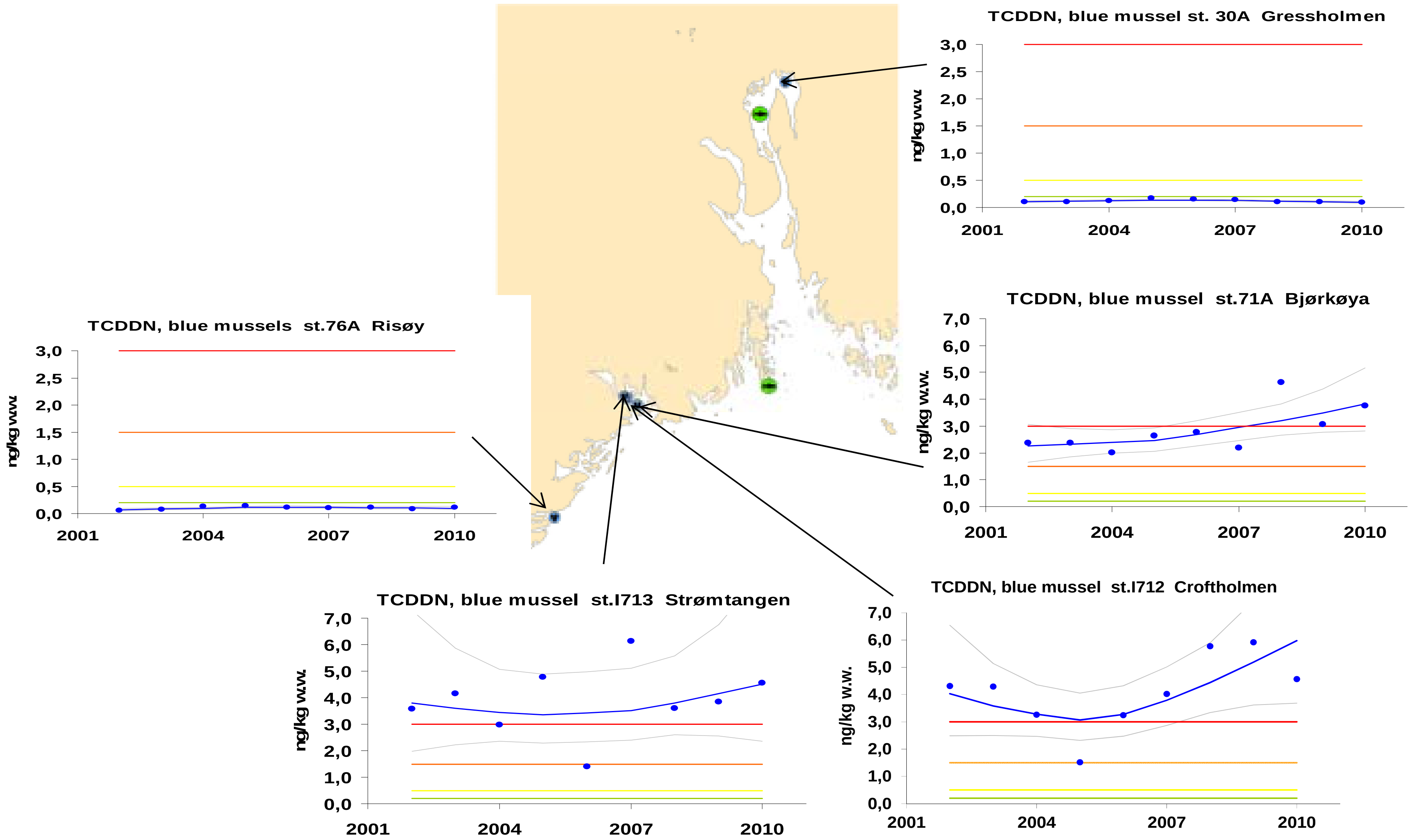

Figure 33. *Median concentrations for dioxins TCDDN-toxicity equivalents after Nordic model (TCDDN) in blue mussel, ng/kg TCDDN/kg from the Oslofjord area (cf. Appendix H, see otherwise key to detail in Figure 2).*

The Sørfjord and Hardangerfjord areas

Investigations for 2010 included seven blue mussel stations, two cod and three flatfish stations in the Sørfjord and Hardangerfjord area. Flounder were collected from Inner Sørfjord and both flounder and megrim were collected from the Hardangerfjord. Points of concern are described below.

Mercury (Hg)
Fillet of cod from the Inner Sørfjord (st. 53B) was moderately polluted (Class II) by Hg (Figure 34). The median concentration of Hg in the fillet had increased a little since 2009, but there was no significant trend. Cod from Strandebarm (st. 67B) was insignificantly polluted by Hg and had a significant downward trend.

Blue mussel from Kvalnes (st. 56A) in the mid part of the Sørfjord was moderately polluted by Hg, and showed a significant downward trend. Blue mussel from Byrkjenes was also moderately polluted by Hg. Blue mussel from Eitrheimsneset (st. 52A) and Krossanes (st. 57A) were insignificantly polluted (Class I) and showed significant downward trends. The other blue mussel stations in this area were only insignificantly polluted (Class I) by Hg.

Cadmium (Cd)
Cod from the Inner Sørfjord (st. 53B) showed concentrations of Cd in the liver that were below presumed high background level (Figure 29). There was a significant upward trend for Cd in cod liver from this station for the period 1986-2010. Cod from Strandebarm (st. 67B) in the Hardangerfjord had a significant downward trend for the period 1987-2010 and median concentration of Cd at this station was below presumed high background level (Table 10).

Blue mussel from Kvalnes (st. 56A) was markedly polluted (Class III) by Cd, and had a significant downward trend. Downward trends were also found for Cd in blue mussel from Byrkjenes (st. 51A), Eitrheimsneset (st. 52A), Krossanes (st. 57A), Ranaskjær (st. 63A) and Vikingneset (st. 65A). These stations had blue mussel that were moderately polluted (Class II) by Cd. Blue mussel from Lille Terøy (st. 69A) was not polluted by Cd (Class I), and had a significant downward trend.

Lead (Pb)
Cod from the Inner Sørfjord (st. 53B) had concentrations of Pb in the liver that exceeded presumed high background level (Figure 36) and showed a significant upward trend for the period 1990-2010. Inhibition of ALA-D in cod is commonly observed in the Sørfjord as a result of the Pb exposure (c.f. chapter 4.5). Cod liver from Strandebarm (st. 67B) had a concentration of Pb below presumed high background level and showed a significant downward trend for the same period.

Blue mussel from Byrkjenes (st. 51A) and Kvalnes (st. 56A) were markedly polluted (Class III) by Pb. At both stations, the concentrations of Pb had increased since 2009. At the stations Eitrheimsneset (st. 52A), Krossanes (st. 57A), Ranaskjær (st. 63A) and Vikingneset (st. 65A) the blue mussel were moderately contaminated (Class II) by Pb and showed significant downward trends. Blue mussel from Lille Terøy (st. 69A) was insignificantly polluted (Class I) by Pb and also had a significant downward trend.

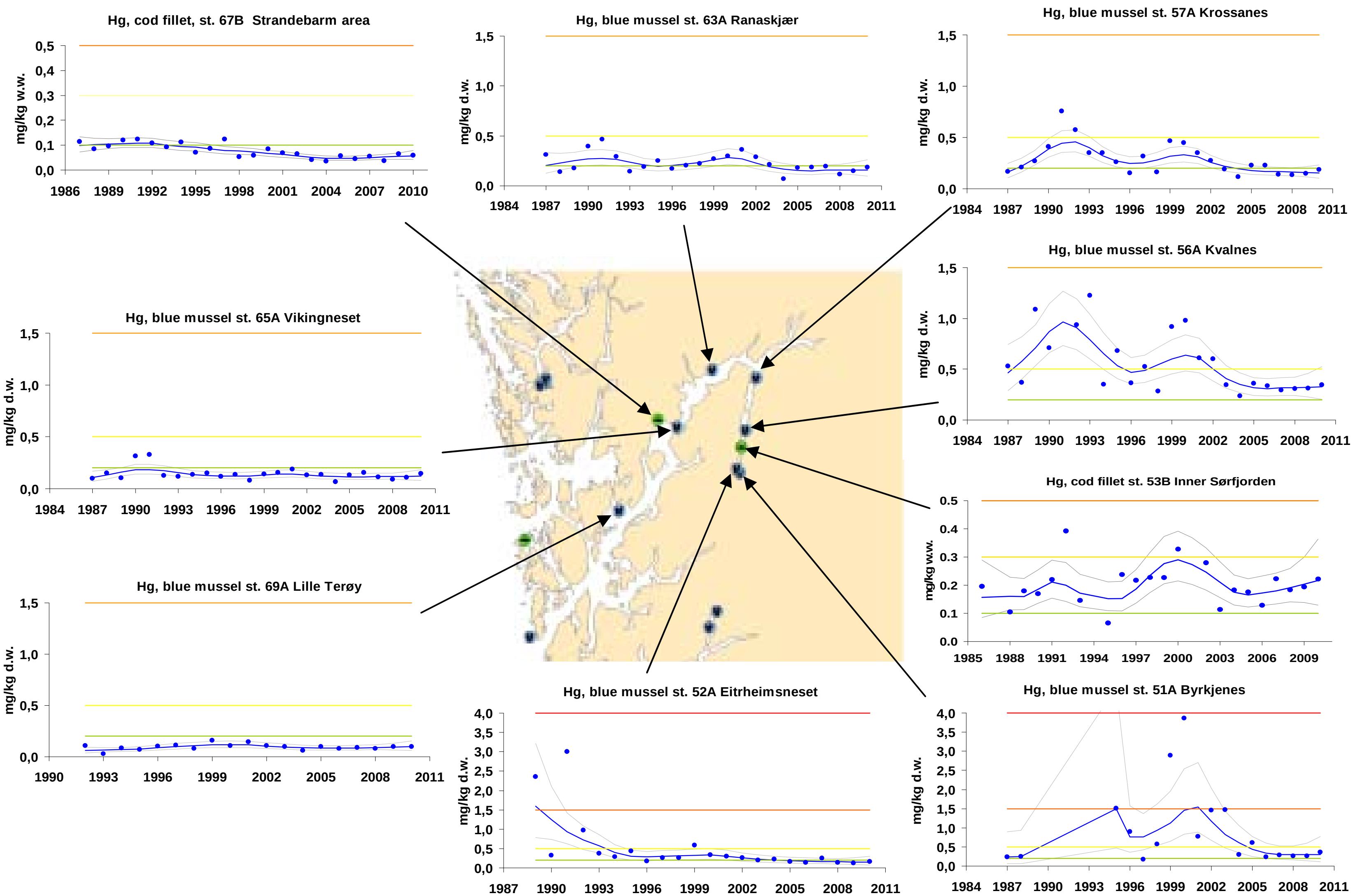

Figure 34. *Median concentrations for Hg in cod and blue mussel from the Sørfjord and Hardangerfjord area (cf. Appendix H, see otherwise key to detail in Figure 2).*

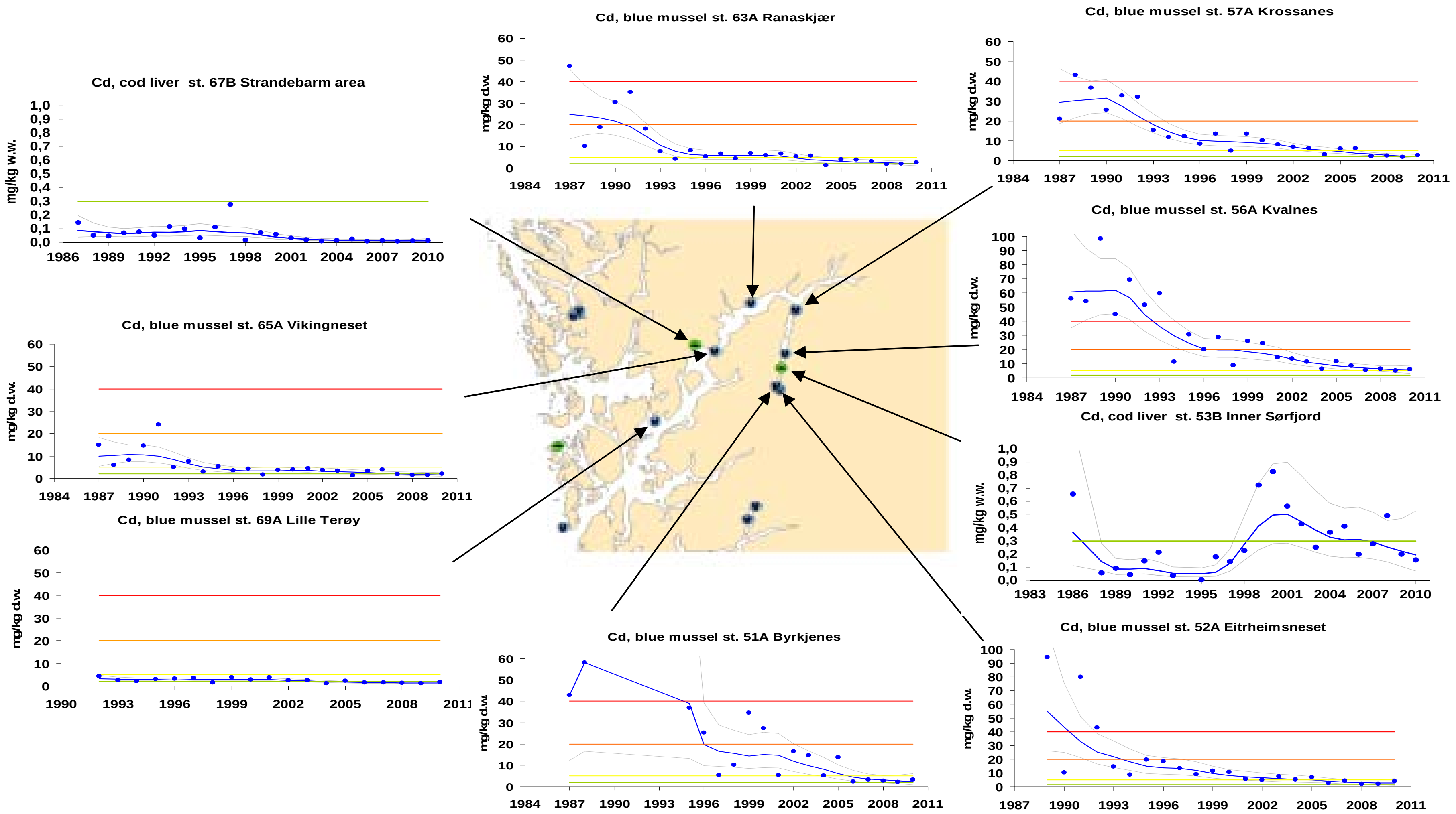

Figure 35. *Median concentrations for Cd in cod and blue mussel from the Sørfjord and Hardangerfjord area (cf. Appendix H, see otherwise key to detail in Figure 2).*

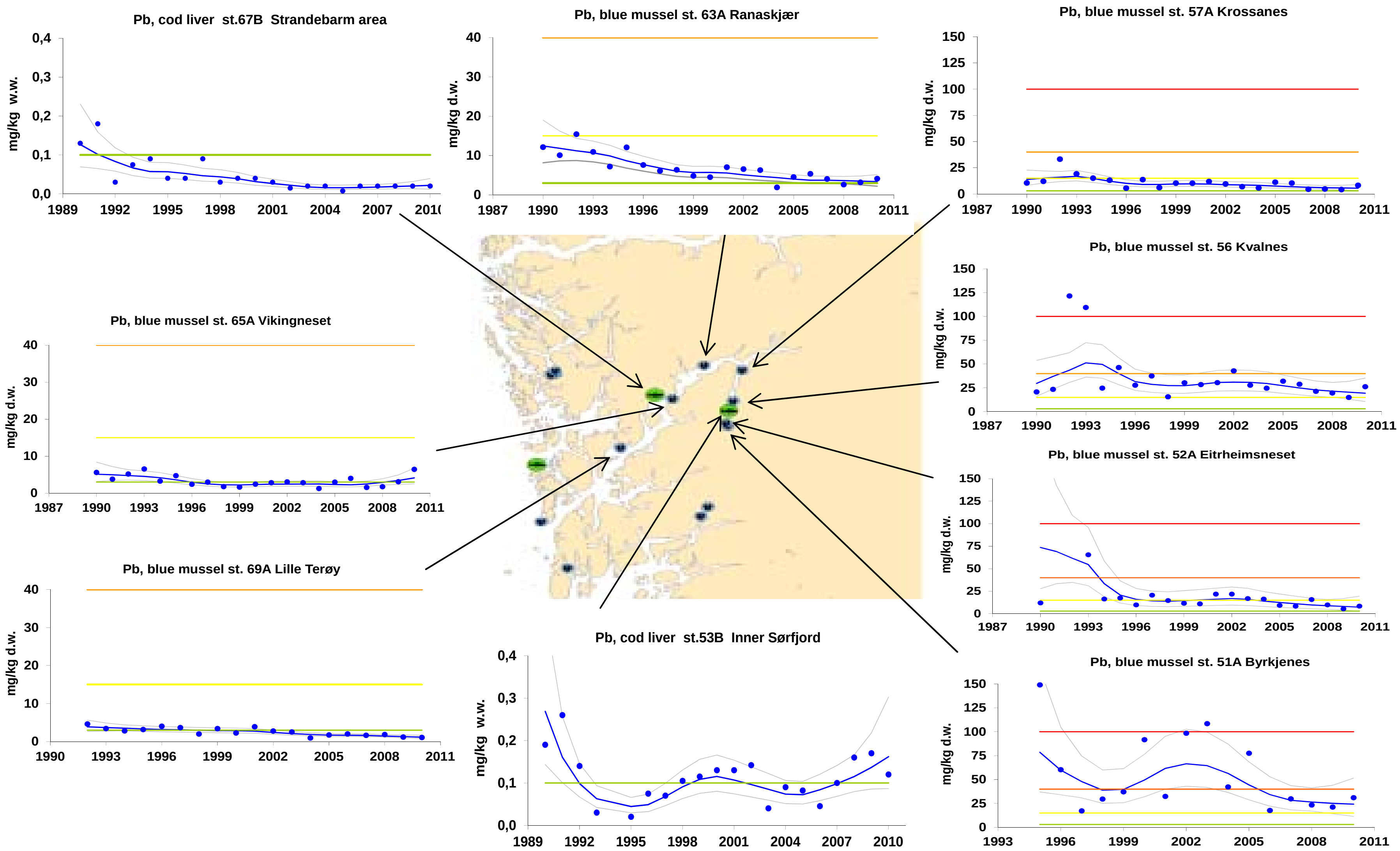

Figure 36. *Median concentrations of Pb in cod and blue mussel from the Sørfjord and Hardangerfjord area (cf. Appendix H, see otherwise key to detail in Figure 2).*

Polychlorinated biphenyls (ΣPCB-7)
Liver and fillet of cod from the Inner Sørfjord (st. 53B) was moderately polluted (Class II) by ΣPCB-7 (Figure 37). Liver and fillet of cod from Strandebarm (st. 67B) in the Hardangerfjord were insignificantly polluted (Class I) by ΣPCB-7. There was a significant downward trend for ΣPCB-7 in cod liver from Strandebarm. The blue mussel in the Hardangerfjord area was insignificantly polluted by PCBs.

Dichlorodiphenyldichloroethylene (ppDDE)
Cod liver and fillet from the Inner Sørfjord (st. 53B) were moderately polluted (Class II, limits for ΣDDT) by ppDDE (Figure 38). Both liver and fillet of cod from Strandebarm (st. 67B) in the Hardangerfjord were moderately polluted (Class II) by ppDDE, and showed significant downward trends.

Blue mussel from Kvalnes (st. 56A) was severely polluted (Class IV) by ppDDE. At all the other blue mussel stations in the Hardangerfjord area the mussels were insignificantly polluted (Class I) by ppDDE.

The Sørfjord area has a considerable number of fruit orchards. Earlier use and the persistence of DDT and leaching from contaminated soil are probably the main reason for the observed high concentrations of ppDDE in the Sørfjord 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.* 2004a). 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 mussel and sediments were also taken at some 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.

Increased ΣDDT-concentrations in blue mussel from the Sørfjord were discussed by Ruus *et al.* (2010). One possible explanation discussed was that an increase in DOC would contribute to increased transport of DDT sorbed to dissolved humic substances and wash-out to the fjord.

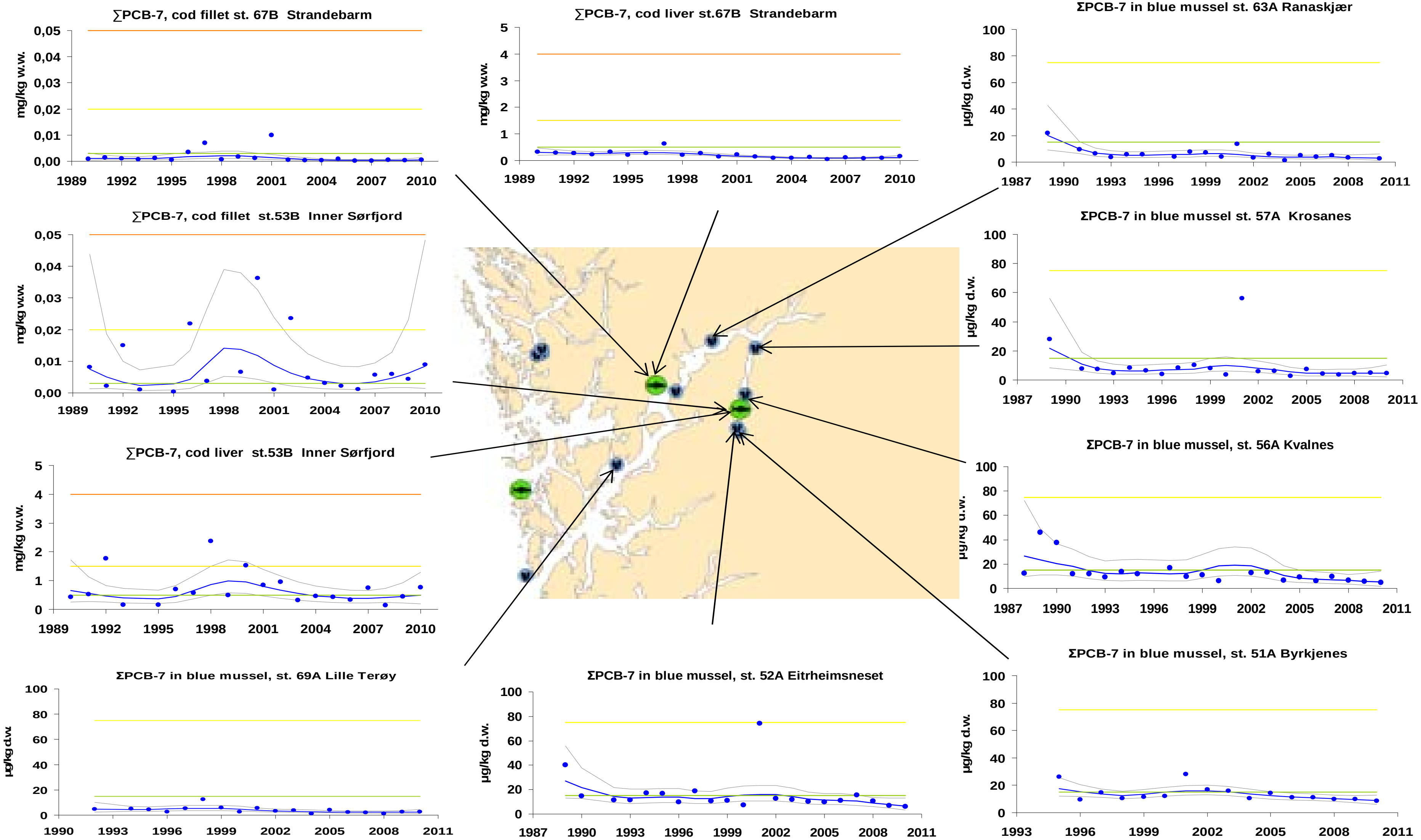

Figure 37. *Median concentrations of ΣPCB-7 in cod and blue mussel from the Sørfjord and Hardangerfjord area (cf. Appendix H, see otherwise key to detail in Figure 2).*

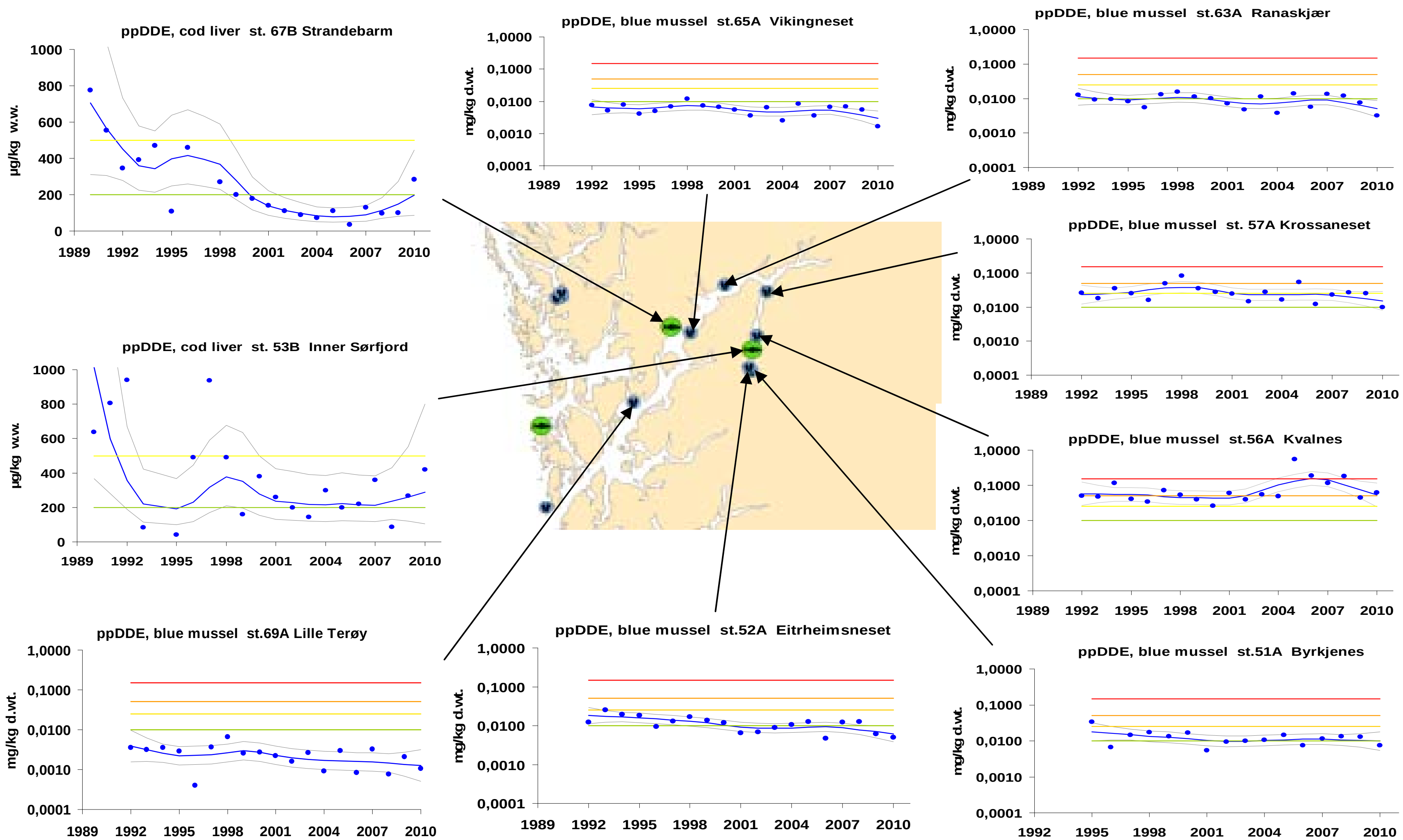

Figure 38. *Median concentrations of ppDDE in cod and blue mussel from the Sørfjord and Hardangerfjord area (cf. Appendix H and see otherwise key to map and detail in Figure 2).*

4.4. Cod from harbour areas of Kristiansand, Trondheim and Tromsø

In 2010, CEMP included investigations of cod in Kristiansand (st. 13BH), Trondheim (st. 80BH) and Tromsø (st. 43BH) harbours. Nineteen contaminants were analysed including 11 metals, organochlorines, PBDEs and PFCs (represented here by PFOS) (Figure 27). The Klif classification system for contaminants in cod has not been developed to include arsenic, nickel, chromium, cobalt, tin, octachlorostyrene, pentachlorobenzene, PBDEs and PFCs. Points of concern are described below.

Kristiansand harbour
Liver and fillet of cod from Kristiansand (st. 13BH) were moderately (Class II) and markedly polluted (Class III) with HCB respectively. Both tissues were moderately polluted (Class II) with ΣPCB-7. The classification system applied did not reveal any other elevated concentrations. Octachlorostyrene was 13 µg/kg w.w., over 6 times higher than in the four other harbour areas. The reason for this has not been determined. The concentration of PBDE was lower than in the range found in the inner Oslofjord and the inner Sørfjord areas. The concentration of PFOS was 6.9 µg/kg w.w. and was about half of the concentration found in the inner Oslofjord (16 µg/kg w.w.).

The Norwegian Food Safety Authority (*Mattilsynet*[12]) has issued advice against consumption of fish from the Kristiansand harbour area due to high concentrations of organochlorines including dioxins.

Trondheim harbour
The liver of cod from Trondheim (st. 80BH) was moderately polluted (Class II) with ΣPCB-7. The classification systems applied did not indicate any other elevated concentrations. PBDE was low, 14.86 µg/kg w.w. The concentration of PFOS was also low (3.1 µg/kg w.w.).

The Norwegian Food Safety Authority (*Mattilsynet*) has issued advice against consumption of fish and mussels from the Trondheim harbour area due to high concentrations of PCBs and PAHs.

Tromsø harbour
The median concentration of cadmium in cod liver in Tromsø harbour (st. 43BH) was above presumed high background (0.135 mg/kg w.w.), but lower than the range found in the Inner Oslofjord and Sørfjord areas (0.156-0.18 mg/kg w.w.). The classification systems applied did not reveal any other elevated concentrations. PBDE was about half of the range found in the inner Oslofjord and the inner Sørfjord areas. The concentration of PFOS was in the same range as found in the Trondheim harbour and the inner Sørfjord areas.

The Norwegian Food Safety Authority (*Mattilsynet*) has issued advice against consumption of fish and mussels from the Tromsø harbour area due to high concentrations of PAHs and PCBs.

[12] see http://www.miljostatus.no/Tema/Hav-og-vann/Pavirkninger-pa-livet-i-vann/Miljogifter_vann/Miljogifter_marint/Kostholdsrad/

4.5. Norwegian blue mussel Pollution and Reference Indices (The Index Programme)

Stations involved in 2010 are shown in Figure 39. More details on the methods and results for 2010 can be found in Appendix J.

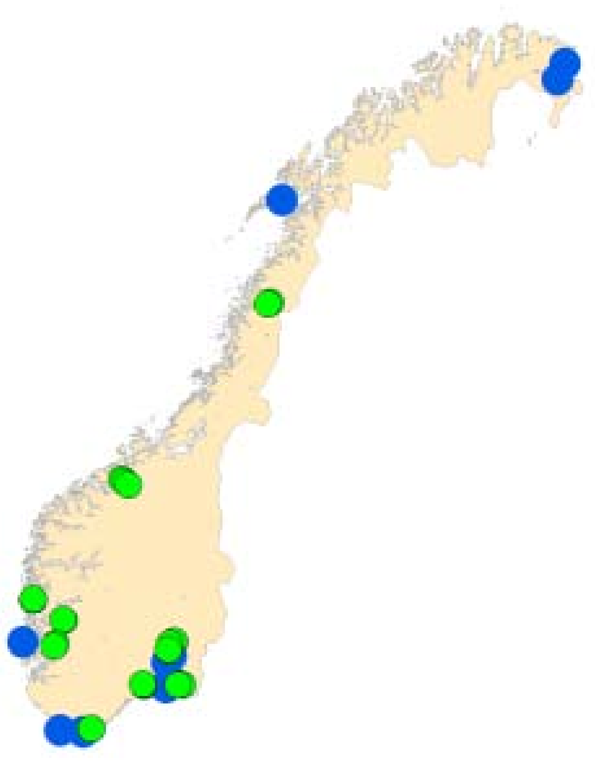

Figure 39. *Blue mussel Index stations sampled in 2010; pollution (green circles), reference (blue circles).*

Based on nine fjord areas the Pollution Index for 2010 was 2.6, 0.2 lower than in 2009 (Appendix M4, Green *et al.* 2010). A value between 2 and 3 would be termed by the Klif system as “markedly” and between 3 and 4 "severely".

For the Reference Index based on four fjord areas, the Index for 2010 was 1.0, 0.2 lower than the revised index 2009 (see Appendix J). An index value between 1 and 2 would be termed by the Klif system as “moderately”.

A decrease in the Pollution Index indicates that the respective fjord areas are less contaminated.

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 (1995-2010) and also for the last 10 years (2001-2010) have been calculated and show both significant upward and downward trends in blue mussel (cf. Appendix H). Some cases for downward and upward trends since 2001 are worth noting (classifications refer to 2010 median, maps refer to Appendix F):

Recent downward trends (2001-2010):

- Inner Oslofjord, Akershuskaia (st. I301) Gressholmen (st. 30A) (Map 1)-TBT, ΣPCB-7, Class II
- Sørfjord, Eitrheimsneset (st. 52A, Map-6)-Pb, Class II
- Sørfjord, Bjerkjenes (st. 51A), Kvalnes (st. 56A) (Map 6)-Hg, Class II
- Sørfjord, Kvalnes (st. 56A, Map 6)-Hg, Class III
- Sørfjord, Krossanes (st. 57A, Map 6)-Hg, Class II
- Kristiansand harbour, Svensholmen (st. I132)-PAH, carcinogen PAH, Class II, BaP, Class III
- Byfjorden (Bergen), Hegreneset (st. I243) in Bergen harbour (Map 7)-ΣPCB-7, Class II

Recent upward trends (2001-2010):

- Inner Oslofjord, Gressholmen (st. 30A) (Map 1)-Pb, Class II

4.6. 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 exposed to contaminants to a degree that triggers biological effects. 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 Figure 1 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 alone 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 time series /dataset is generated, that will also be of high value as a basis of comparison for future environmental 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 2010 included four biological effects methods (BEM) (cf. Table 5). For the 2010 investigations OH-pyrene, ALA-D, EROD-activity and CYP1A were measured in Atlantic cod from the Inner Oslofjord (st. 30B), the Inner Sørfjord (st. 53B) and Karihavet (st. 23B). 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 biliverdine 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.

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 excretion 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 2010, as it has been since 2002, the median concentration 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), most likely reflecting the differences in PAH exposure between the areas (see also below). One significant trend for the period 2001-2010 was detected; a downward trend at Lista (cf. Appendix H). As such, the concentrations have fluctuated around the same levels in the Inner Oslofjord and the Inner Sørfjord towards the last few years, with a trend towards a reduction at Lista (st. 15B). (Figure 41, and Appendix H).

PAHs are measured in blue mussel from the Inner Oslofjord (stations 30A, I301, I304, I306, I307). The changes in concentrations correlate moderately well to the changes in OH-pyrene in cod from the same area (st. 30B) (Figure 40). These results indicate general changes in PAH exposure in this fjord area, since cod and blue mussel apparently experience similar alterations in PAH exposure, despite biological differences. Blue mussel is a sessile, filtering organism in surface water, while cod is mobile, living in deeper part of the fjord and exposed to PAHs both through food and through direct partitioning from water (over respiratory surfaces).

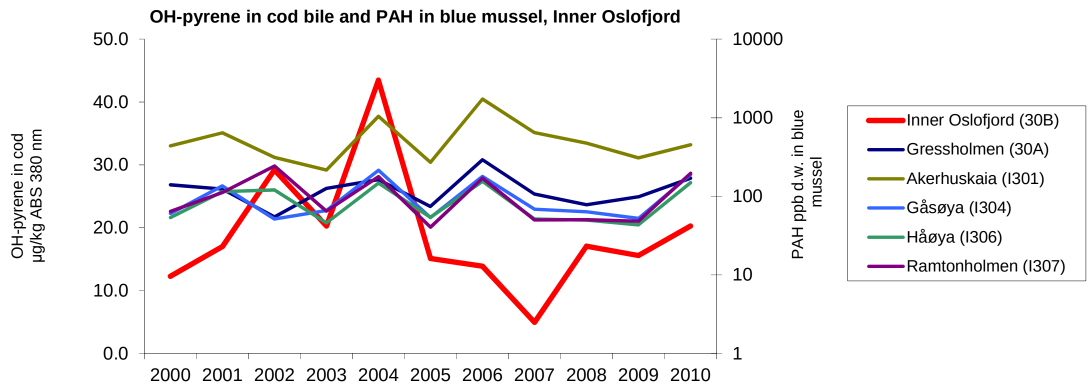

Figure 40. *Changes in median concentration of OH-pyrene (µg/kg ABS 380 nm) in bile from Atlantic cod collected from the Inner Oslofjord (st. 30B Inner Oslofjord; thick red line) and total PAH in blue mussel from the same area.* ***NB: concentrations of PAHs are on a log scale.***

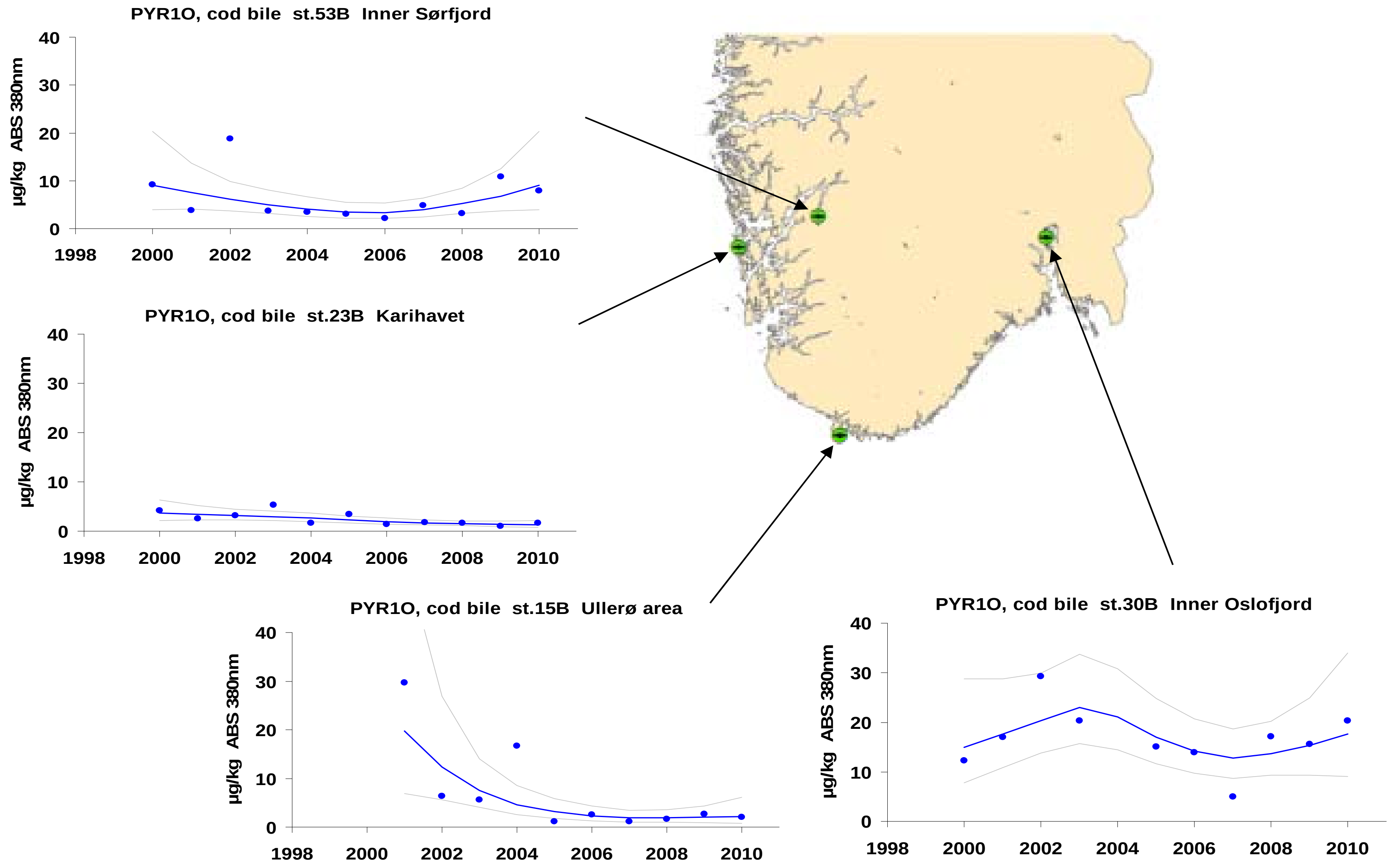

Figure 41. *Median concentration of OH-pyrene (µg/kg ABS 380 nm) in bile from Atlantic cod collected from southern Norway (cf. Appendix H and see otherwise key to detail in Figure 2). There is no limit to classify the result from 2010.*

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 enhance 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 does 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 42, Appendix H). For the years 1997-2006 and 2009-2010 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 3.3), the lower activities of ALA-D in cod from the Sørfjord compared to the reference station (basis for comparison prior to 2007 and in 2009-2010) indicate the contamination of lead in the Sørfjord. The highest concentrations of lead in cod liver are observed in the Inner Oslofjord and the Inner Sørfjord, with great individual variation at both sites (Figure 50).

In 2010, ALA-D levels in the blood of cod from the Inner Oslofjord (st. 30B) were intermediate of those observed in 2008 and 2009. ALA-D levels were also higher in the Inner Oslofjord than in the Inner Sørfjord (st. 53A). However, an upward trend was found in cod from Karihavet (st. 23B) for the period 2001-2010 but (Appendix H), indicating fluctuations in the enzyme activity at a similar level for the whole period.

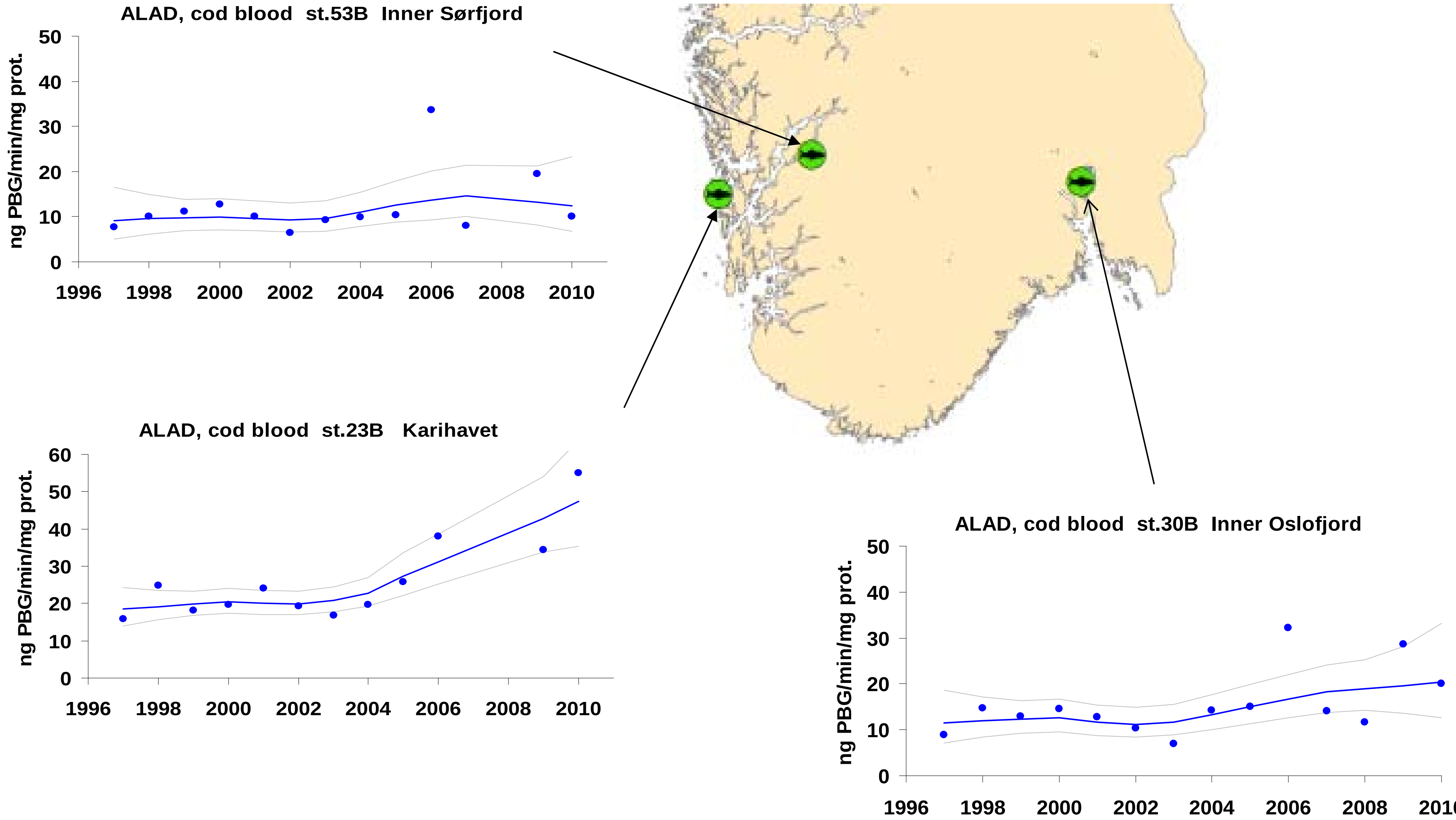

Figure 42. *Median activity of δ-aminolevulinic acid dehydrase (ALA-D, ng PBG/min/mg protein) in red blood cells from Atlantic cod collected from southern Norway (cf. Appendix H and see otherwise key to detail in Figure 2). There is no limit to classify the results from 2010. Note that lower activity means higher exposure and vice versa.*

EROD-activity and amount of CYP1A protein in liver

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). Since 2000, the median EROD-activity has been higher in the Inner Oslofjord compared to the reference station on the west coast (Karihavet, st. 23B). However, in the Inner Sørfjord EROD activities were not consistently higher than at the reference Karihavet. No significant downward trends for EROD in cod liver in the Inner Oslofjord, Inner Sørfjord (st. 53B) or Karihavet (st. 23B) could be seen for the period 1997-2010 or 2001-2010 (st. 30B).

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 H), 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 2010 was intermediate of those in 2008 and 2009. No significant trend could be observed (Figure 44). CYP1A protein levels were however higher in the Inner Oslofjord compared to the Inner Sørfjord (st. 53B) and Karihavet (st. 23B), as was observed for the EROD activities. An explanation could be that the exposure to PCBs is higher in the inner Oslofjord than in the Sørfjord and Karihavet (Figure 52). It was earlier observed, however, that EROD activities apparently were not significantly influenced by a substantial increase in cod liver PCB content (Ruus *et al.* 2006). An explanation (besides the adaptation hypothesis) may be that the inducing effect of specific contaminants may be inhibited by other contaminants present (e.g. dioxins or PAHs). The significant reduction in EROD activity for the period 1997-2008 was not supported in 2009 and 2010 where the activity was nearly 10 times higher than in 2008 (Figure 62, Appendix H). The variability in 2010 was however high though less so than in 2009.

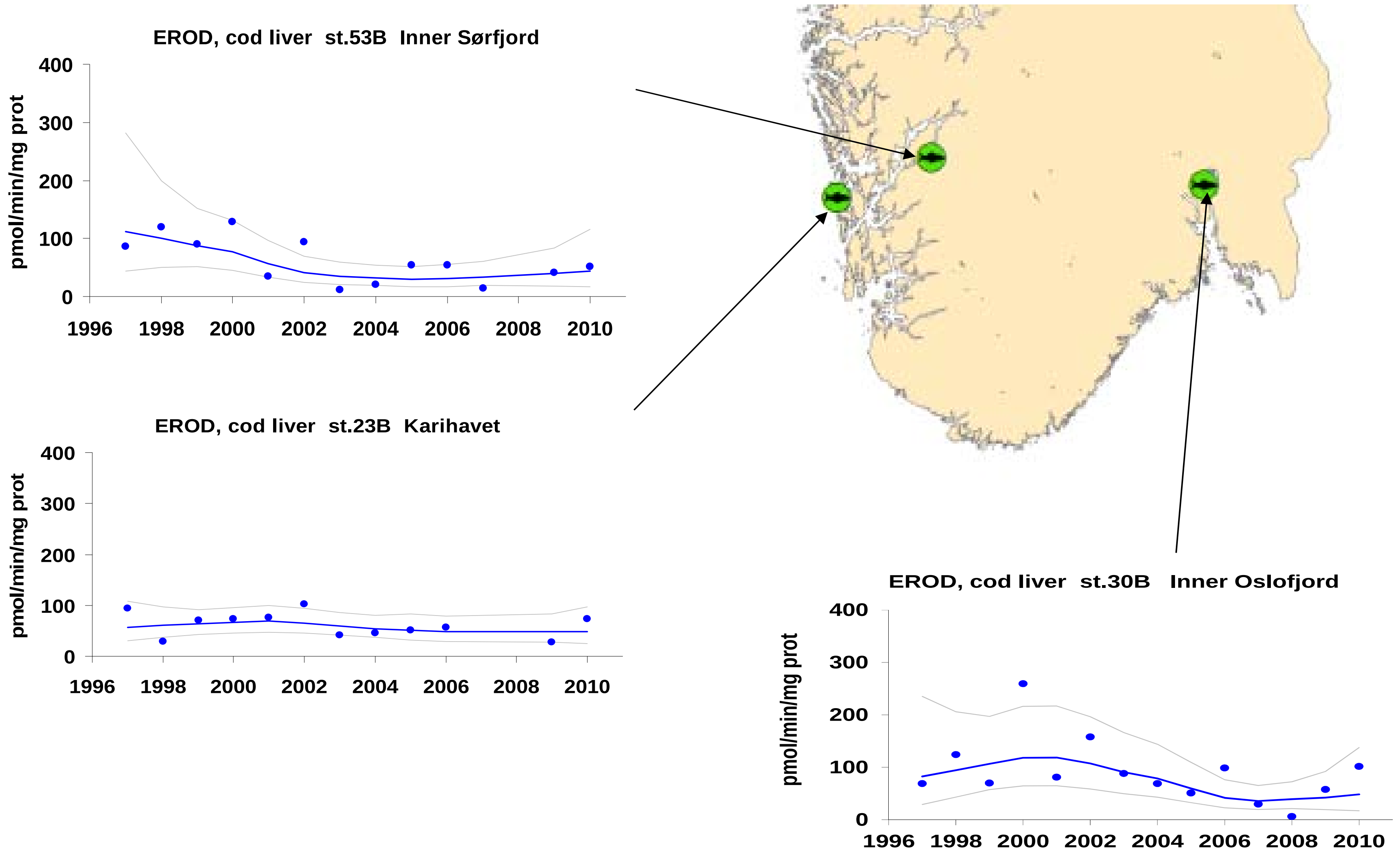

Figure 43. *Median activity of cytochrome P4501A (EROD-activity, pmol/min/mg protein) in liver from Atlantic cod collected from southern Norway (cf. Appendix H and see otherwise key to map and detail in Figure 2). There is no limit to classify the results from 2010.*

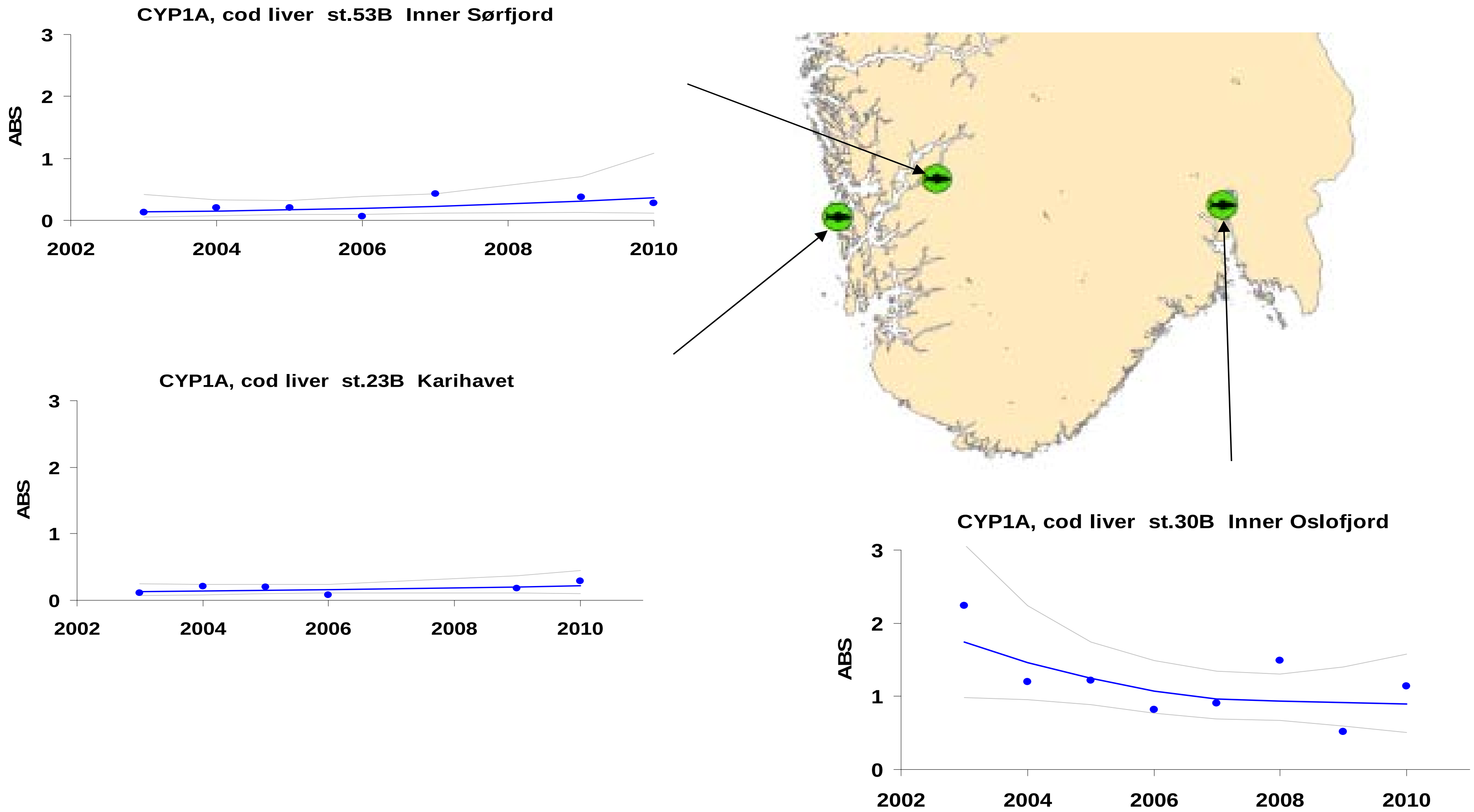

Figure 44. *Median activity of cytochrome CYP1A (relative amount of cytochrome P4501A-protein) in liver from Atlantic cod collected from southern Norway (cf. Appendix H and see otherwise key to map and detail in Figure 2). There is no limit to classify the results from 2010.*

5. Conclusions

The Norwegian contribution to OSPAR's Coordinated Environmental Monitoring Programme (CEMP) in 2010 included the monitoring of micropollutants (contaminants) in blue mussel (40 stations), dogwhelk (8 stations), common periwinkle (1 station), cod (11 stations) and flatfish (dab, flounder, plaice, megrim; 8 stations) along the coast of Norway from the Oslofjord and Hvaler region in the southeast to the Varangerfjord in the northeast. The stations are located both in areas with known or presumed point sources of contaminants, in areas of diffuse load of contamination like city areas, and in more remote areas exposed to presumed low and diffuse pollution. The mussel sites include supplementary stations for the Norwegian Index Programme. The results from 2010 supplied data to a total of 1039 time series of selected contaminants or biomarkers. Of these, 280 showed statistically significant trends of which 248 were downwards and 32 upwards. The dominance of downward trends indicates that contamination is decreasing. In 154 cases, concentrations were above what is expected in only diffusely contaminated areas.

Concentrations of contaminants in fish

Cod fillet from the Inner Oslofjord was moderately polluted by mercury, which had a significant upward trend for the period 1984-2010. Cod liver from the Inner Oslofjord had median concentrations of lead and cadmium higher than presumed high background, and there was a significant upward trend for cadmium in cod liver from the Inner Oslofjord for the same period. Cod liver from the Inner Oslofjord was markedly polluted with PCBs, but showed no significant trend. Cod fillet from the Inner Oslofjord was moderately polluted with PCBs, and here a significant upward trend was detected for the period 2001-2010.

Cod fillet from the Inner Sørfjord was moderately polluted by mercury. Cod liver from the Inner Sørfjord had concentrations of cadmium and lead that exceeded presumed high background levels. There was a significant upward trend for cadmium and a significant downward trend for lead in cod liver from the Inner Sørfjord for the monitoring period 1986-2010. Cod from Strandebarm in the Hardangerfjord had a significant downward trend for these metals. Cod from the Inner Sørfjord had a median concentration of lead in the liver that exceeded presumed high background level. Inhibition of ALA-D in cod has been frequently observed in the Sørfjord, also in 2010, as a result of the lead exposure.

Liver and fillet of cod from the Inner Sørfjord were moderately polluted by PCBs. Cod liver and fillet from the Inner Sørfjord and Strandebarm was moderately polluted by ppDDE. Cod from Strandebarm showed significant downward trends for ppDDE in both liver and fillet for the same period.

There were concentrations above presumed high background levels and an upward trend for the period 1986-2010 for mercury in flounder fillet from the Inner Sørfjord. Flounder from the Inner Sørfjord was moderately polluted with PCB in fillet and showed concentrations of PCB in liver that exceeded presumed high background level.

The concentration of sum PBDE and PFOS (the most abundant PFC) was highest in cod from the Inner Oslofjord. PFOS was low in the Sørfjord, Tromsø harbour and Trondheim harbour areas. PBDE was lowest in cod from Lofoten. BDE47 was the dominant PBDE in all samples.

Cod and blue mussel from the outer parts of western and northern Norway were in general insignificantly polluted.

Concentrations of contaminants in blue mussel

Blue mussel from the stations in the Grenlandsfjord area were extremely polluted by dioxins. The blue mussel have been severely to extremely polluted by dioxins for the whole monitoring period. There was a tendency towards an increase at the two stations Bjørkøya and Strømtangen, but there were no significant trends.

In 2010 the blue mussel from the Inner and Mid Sørfjord were moderately to markedly polluted by mercury. Blue mussel from the Mid part of the Sørfjord were markedly polluted with cadmium.

Mussel from Byrkenes were markedly polluted with lead. Significant downward trends have been observed for cadmium in blue mussel at all seven mussel stations in the in the Sørfjord and Hardangerfjord for time periods that spanned at least 20 years. Blue mussel from Kvalnes in the Mid part of the Sørfjord were severely polluted with ppDDE.

Biological effects
The median concentration of CYP1A protein levels was higher in the Inner Oslofjord compared to the Inner Sørfjord and Karihavet on the west coast, as was observed for the EROD activities. An explanation could be that the exposure to PCBs is higher in the Inner Oslofjord than in the Sørfjord and Karihavet. Since the year 2000, investigations have shown that EROD-activity in fish from the Inner Oslofjord is often higher than presumed cleaner stations. In 2010, the median concentration of OH-pyrene metabolites in bile from cod was higher in the Inner Oslofjord compared to samples from the Inner Sørfjord, the Bømlo-Sotra area and Lista. Changes in concentrations of PAHs measured in blue mussel from the Inner Oslofjord correlate moderately well with alterations in OH-pyrene concentrations in the bile of cod from the same area. Reduced activities of ALA-D were shown in the Inner Oslofjord and the Inner Sørfjord, as compared to the Bømlo-Sotra area. This reflects the higher exposure of lead in these areas.

Of the time series investigated for biological effects (imposex) of TBT in dogwhelk, seven stations showed significant downward trends. One station showed little effects and had no significant trend for the entire monitoring period. The effects from TBT were low (VDSI<2) at seven of eight stations investigated in 2010.

Blue mussel from two stations in the Ranfjord were markedly polluted by PAHs of which one station was extremely polluted by benzo[a]pyrene (B[a]P). One blue mussel station in the Kristiansandsfjord was markedly polluted with B[a]P.

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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)
- 2008 (Green *et al.* 2010a)
- 2009 (Green *et al.* 2010b)

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 62 of July-October 2010 and round 64 of January-May 2011, which apply to the 2010 samples. These QUASIMEME exercises included nearly all the contaminants as well as imposex analysed in this programme. In addition, NIVAs laboratory was accredited in 1993 by Norwegian Accreditation and is since 2001 accredited in accordance with NS-EN ISO/IEC 17025 (Test 009).

In addition to the QUASIMEME exercises, Standard Reference Materials (SRM) and in-house reference materials (HSD) are also analysed routinely with the CEMP samples. It should be noted that for biota the type of tissue used in the SRMs do not always match the target tissue for analysis. Uncertain values identified by the analytical laboratory or the reporting institute are flagged in the database. The results are also “screened” when submitted to the database at NIVA and ICES.

Accreditation

The laboratories at NIVA, which include the chemical, microbiological and 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. The chemical laboratory has satisfied the requirements in NS-EN ISO/IEC 17025 since 2001 and has the reference number Test 009.

Summary of quality control results

Standard Reference Materials (SRM) as well as in-house reference materials (HSD) were analysed regularly (Table 11). Fish protein (DORM-3) or dogfish liver (DOLT-4) was used as SRM for the control of the determination of metals. Fish fillet (2525) and mussel tissue (2977) was used as SRM for controls of PCBs and PAHs respectively. Fish fillet (2525) was also used at NILU for control and determination of dioxins. Cod filet (HSD #8), mussel tissue (HSD #9) and fat from tusk liver (HSD # 10) were used as in-house reference materials for the control of PCB determination. HSD # 9 was also used for the control of PAH determination.

The results for QUASIMEME-Round 62 (July-October 2010) and Round 64 (January-May 2011) apply to the 2010 samples. Overall, the results are very good and mostly within the uncertainty limits of deviation from the true value with only a few exceptions.

ROUND 62

- QTM087BT (no. 1) and QTM088BT (no. 2) for metals in biota
  The results were all very good with the exception of the results for lead (Pb in no.2), but the uncertainty in the true value here is relatively large.
- QOR104BT (no. 1) and QOR105BT (no. 2) for PCB in biota
  The true values of the Quasimeme samples were very low and close to the detection limits for the method. For some of the results for sample no. 2, the shellfish, the deviation from the true value were a few percent higher than the uncertainty limit.

ROUND 64

- QTM089BT (no.1) and QTM090BT (no. 2) for metals in biota
  All the results were good and within the uncertainty limits of the method with the exception of nickel (Ni in no. 1) which had a deviation from the true value of 33.7% whereas the uncertainty limit is 20%.
- QOR106BT (no.1) and QOR107BT (no.2) for PCB in biota
  The results were acceptable and within the uncertainty limits of the method with only a few exceptions. Notably, the deviation from the true value for CB105 was higher than the uncertainty limit but the true value was very low and close to the detection limit.
- QPH061BT (no. 1) and QPH062BT (no. 2) for PAH in biota
  The results were acceptable and within the uncertainty limits of the method with only a few exceptions.

Table 11. *Summary of the quality control of results for the 2010 biota samples analysed in 2010-2011. Summary of the quality control of results for the 2010 biota samples analysed in 2010-2011. The Standard Reference Materials (SRM) were DORM-3 * (fish protein) for blue mussel and fish fillet, DOLT-4* (dogfish liver) for fish liver, EDF2525 ** (fish fillet) for fish (cyprinid) and 2977*** (mussel tissue) for blue mussel. The in-house reference materials were HSD#8 (cod fillet), HSD#9 (mussel tissue) and HSD#10 (tusk liver). The SRMs and HSDs were analysed in series with the CEMP samples for the determination of metals (mg/kg d.w.), PAH (µg/kg d.w), PCB (µg/kg d.w) and BDE (µg/kg d.w). EDF2525 was analysed for dioxins (ng/kg) by NILU (Norwegian Institute for Air Research). Tissue types were: mussel soft body (SB), fish liver (LI) and fish fillet (MU). SRMs and HSDs 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-4	9.66 ± 0.62	17	23	10.67	0.553
Cd	**Cadmium**	LI	DOLT-4	24.3 ± 0.8	17	23	24.13	1,423
Cr	**Chromium**	LI	DOLT-4	1.4 ± 0.19	17	23	1.36	0.152
Cu	**Copper**	LI	DOLT-4	31.2 ±1.1	17	23	31.33	1.085
Ni	**Nickel**	LI	DOLT-4	0.97 ± 0.11	17	23	0.979	0.192
Pb	**Lead**	LI	DOLT-4	0.16	17	23	0.142	0.020
Zn	**Zinc**	LI	DOLT-4	116 ± 6	17	23	125.06	6.561
As	**Arsenic**	SB	DORM-3	6.88±0.30	24	44	8.09	0.70
Cd	**Cadmium**	SB	DORM-3	0.290 ± 0.020	24	44	0.316	0.018
Co	**Cobalt**	SB	DORM-3	Missing	24	44	0.259	0.010
Cr	**Chromium**	SB	DORM-3	1.89 ± 5.5	24	44	1.86	0.13
Cu	**Copper**	SB	DORM-3	15.5 ± 0.63	24	44	15.1	0.92
Hg	**Mercury**	SB	DORM-3	0.409 ± 0.027	37	37	0.401	0.02
Ni	**Nickel**	SB	DORM-3	1.28± 0.24	24	44	1.30	0.07
Pb	**Lead**	SB	DORM-3	0.395 ± 0.050	22	44	0.395	0.019
Zn	**Zinc**	SB	DORM-3	51.3 ± 3.1	22	44	52.9	2.23
BDE100	**2,2',4,4',6-Pentabromidiphenylether**	MU	SRM2525	1.72 ± 0.57	3	1	1.97	0.461
BDE154	**2,2',4,4',5,6'-Hexabromidiphenylether**	MU	SRM2525	2.55 ± 1.0	3	1	3.40	0.754
BDE28	**2,2,4'-Tribromodiphenylether**	MU	SRM2525	0.31 ± 0.20	3	1	0.52	0.09
BDE47	**2,2',4,4',-Tetrabromidiphenylether**	MU	SRM2525	9.08 ± 2.62	3	1	12.7	2.52
BDE49	**2,2',4,5'-Tetrabromidiphenylether**	MU	SRM2525	0.52 ± 0.27	3	1	0.57	0.18
BDE99	**2,2',4,4',5-Pentabromidiphenylether**	MU	SRM2525	2.28 ± 0.47	3	1	2.23	0.40
CB101	**PCB congener CB-101**	MU	SRM2525	82.7 ± 21,4	3	1	102,8	15.86
CB105	**PCB congener CB-105**	MU	SRM2525	50.1 ± 15.7	3	1	48.33	4.23
CB118	**PCB congener CB-118**	MU	SRM2525	122 ± 38	3	1	123.7	7.71
CB138	**PCB congener CB-138**	MU	SRM2525	178 ± 27.8	3	1	187	9.64
CB153	**PCB congener CB-153**	MU	SRM2525	226 ± 71.2	3	1	259.5	15.2
CB156	**PCB congener CB-156**	MU	SRM2525	13.1 ± 2.62	3	1	13.7	0.78
CB180	**PCB congener CB-180**	MU	SRM2525	108 ± 11.8	3	1	112.9	6.47
CB209	**PCB congener CB-209**	MU	SRM2525	3.5 ± 0.98	3	1	3.77	0.46
CB28	**PCB congener CB-28**	MU	SRM2525	7.1 ± 1.3	3	1	7.91	0.46
CB52	**PCB congener CB-52**	MU	SRM2525	27.1 ± 1.3	3	1	33.63	1.32
DDEPP	**4.4'-DDE**	MU	SRM2525	587 ± 140	3	1	615.1	30.2
DDTPP	**4.4'-DDT**	MU	SRM2525	9.1 ± 2.7	3	1	3.14	0.90
HCB	**Hexachlorobenzene**	MU	SRM2525	18.1 ± 15.3	3	1	16.67	1.34
HCHA	**α - hexachlorocyclohexane**	MU	SRM2525	1.4 ± 1.14	3	1	1.81	0.07
HCHG	**γ – hexachlorocyclohexane**	MU	SRM2525	0.83 ± 0.43	3	1	0.20	0.02
TDEPP	**4.4'-DDD**	MU	SRM2525	97.6 ± 33.2	3	1	99.83	11.40
CB101	**PCB congener CB-101**	MU	HSD#8	0.80 ± 0.12	8	23	0.76	0.11
CB105	**PCB congener CB-105**	MU	HSD#8	0.77 ± 0.10	8	21	0.73	0.06
CB118	**PCB congener CB-118**	MU	HSD#8	2.20 ± 0.29	9	23	2.12	0.20
CB138	**PCB congener CB-138**	MU	HSD#8	4.78 ± 0.62	9	23	4.67	0.40
CB153	**PCB congener CB-153**	MU	HSD#8	7.26 ± 0.94	9	23	7.51	0.71
CB156	**PCB congener CB-156**	MU	HSD#8	0.35 ± 0.05	9	23	0.31	0.03
CB180	**PCB congener CB-180**	MU	HSD#8	2.04 ± 0.26	9	23	2.11	0.18

Code	Contaminant	Tis-sue type	SRM type	SRM value confidence interval	N	W	Mean value	Standard deviation
CB209	**PCB congener CB-209**	MU	HSD#8	0.08 ± 0.02	8	21	0.07	0.01
CB52	**PCB congener CB-52**	MU	HSD#8	0.158 ± 0.02	9	23	0.15	0.02
DDEPP	**4.4'-DDE**	MU	HSD#8	1.05 ± 0.14	9	23	1.03	0.11
HCB	**Hexachlorobenzene**	MU	HSD#8	0.05 ± 0.01	8	21	0.05	0.01
CB101	**PCB congener CB-101**	SB	HSD#9	1.32 ± 0.20	11	40	1.31	0.17
CB105	**PCB congener CB-105**	SB	HSD#9	0.44 ± 0.07	11	40	0.42	0.05
CB118	**PCB congener CB-118**	SB	HSD#9	1.36 ± 0.20	11	40	1.32	0.11
CB138	**PCB congener CB-138**	SB	HSD#9	1.38 ± 0.21	11	40	1.39	0.21
CB153	**PCB congener CB-153**	SB	HSD#9	1.56 ± 0.23	11	40	1.55	0.14
CB156	**PCB congener CB-156**	SB	HSD#9	Missing	1	1	0.07	
CB180	**PCB congener CB-180**	SB	HSD#9	0.24 ± 0.04	11	40	0.23	0.03
CB28	**PCB congener CB-28**	SB	HSD#9	Missing	1	1	0.07	
CB52	**PCB congener CB-52**	SB	HSD#9	0.49 ± 0.07	11	40	0.50	0.07
DDEPP	**4.4'-DDE**	SB	HSD#9	0.32 ± 0.05	11	40	0.29	0.03
DDTPP	**4.4'-DDT**	SB	HSD#9	0.22 ± 0.04	5	9	0.234	0.05
HCB	**Hexachlorobenzene**	SB	HSD#9	0.06 ± 0.01	11	40	0.06	0.01
QCB	**Pentachlorobenzene**	SB	HSD#9	Missing	6	17	0.03	0.005
TDEPP	**4.4'-DDD**	SB	HSD#9	0.13 ± 0.02	11	40	0.14	0.01
CB101	**PCB congener CB-101**	LI	HSD#10	33.2 ± 13.3	16	27	60.1	16.7
CB105	**PCB congener CB-105**	LI	HSD#10	15.5 ± 6.20	16	27	19.4	4.49
CB118	**PCB congener CB-118**	LI	HSD#10	44.9 ± 18.0	16	27	55.8	9.42
CB138	**PCB congener CB-138**	LI	HSD#10	194 ± 77.7	16	27	214.6	26.3
CB153	**PCB congener CB-153**	LI	HSD#10	277 ± 110.6	16	27	337.2	49.2
CB156	**PCB congener CB-156**	LI	HSD#10	6.07 ± 2.42	14	27	8.19	2.09
CB180	**PCB congener CB-180**	LI	HSD#10	33.1 ± 13.2	16	27	43.9	7.87
CB209	**PCB congener CB-209**	LI	HSD#10	1.44 ± 0.58	16	27	2.18	0.85
CB28	**PCB congener CB-28**	LI	HSD#10	6.29 ± 2.52	16	27	7.25	1.10
CB31	**PCB congener CB-31**	LI	HSD#10	3.16 ± 1.26	16	27	3.66	0.59
CB52	**PCB congener CB-52**	LI	HSD#10	14.5 ± 5.81	16	27	17.8	3.85
DDEPP	**4.4'-DDE**	LI	HSD#10	209 ± 83.7	16	27	243.3	34.3
DDTPP	**4.4'-DDT**	LI	HSD#10	41.3 ± 16.5	16	27	45.8	10.3
HCB	**Hexachlorobenzene**	LI	HSD#10	15.8 ± 6.33	16	27	20.6	3.22
HCHA	**α - hexachlorocyclohexane**	LI	HSD#10	0.95 ± 0.38	16	27	1.74	0.69
OCS	**Octachlorostyrene**	LI	HSD#10	39.5 ± 15.8	15	27	9.56	15.5
QCB	**Pentachlorobenzene**	LI	HSD#10	2.90 ± 1.16	13	27	2.06	0.56
TDEPP	**4.4'-DDD**	LI	HSD#10	68.0 ± 27.2	16	27	87.2	12.9
ACNE	**Acenaphthene**	SB	SRM2977	4.9 ± 1.2	2	24	2.7	0.57
ACNLE	**Acenaphthylene**	SB	SRM2977	Missing				
ANT	**Anthracene**	SB	SRM2977	6.2 ± 1.4	2	24	3.55	0.21
BAP	**benzo[a]pyrene**	SB	SRM2977	5.3 ± 0.61	2	24	4.85	0.21
BBJF	**Benzo(b+j)flouranthene[1)]**	SB	SRM2977	Missing	2	24	19.5	0.71
BEP	**benzo[e]pyrene**	SB	SRM2977	13.29 ± 0.43	2	24	18.5	3.53
BGHIP	**benzo[ghi]perylene**	SB	SRM2977	9.45 ± 0.37	2	24	9.85	1.63
BKF	**benzo[k]fluoranthene**	SB	SRM2977	4.02 ± 0.75	2	24	6.00	0.99
BAA	**benzo[a]anthracene**	SB	SRM2977	20.19 ± 0.87	2	24	23	5.66
CHR	**Chrysene**	SB	SRM2977	42.2 ± 5.5	2	24	46.5	9.19
DBA3A	**Dibenz[a,h]anthracene**	SB	SRM2977	1.47 ± 0.33	2	24	1.75	0.21
FLE	**Fluorene**	SB	SRM2977	10.3 ± 0.13	2	24	8.7	0.71
FLU	**Fluoranthene**	SB	SRM2977	38.9 ± 0.63	2	24	35	8.48
ICDP	**indeno[1,2,3-cd]pyrene**	SB	SRM2977	4.76 ± 0.15	2	24	4.1	0.14
NAP	**Naphthalene**	SB	SRM2977	21.1 ± 1.4	2	24	7.2	0.28
PA	**Phenanthrene**	SB	SRM2977	36.2 ± 2.5	2	24	40.5	7.78
PER	**Perylene**	SB	SRM2977	3.69 ± 0.38	2	24	2.2	0.99
PYR	**Pyrene**	SB	SRM2977	77.4 ± 2.1	2	24	73	14.1
ACNE	**Acenaphthene**	SB	HSD#9	0.50 ± 0.20	13	40	0,56	0,07
ACNLE	**Acenaphthylene**	SB	HSD#9	Missing	1	1	0,66	
ANT	**Anthracene**	SB	HSD#9	2.40 ± 0.96	17	40	2,73	0,34
BAP	**benzo[a]pyrene**	SB	HSD#9	22.0 ± 8.80	17	40	19,7	1,44
BBJF	**Benzo(b+j)flouranthene[1)]**	SB	HSD#9	149 ± 60.0	17	40	132,3	16,0
BEP	**benzo[e]pyrene**	SB	HSD#9	41.0 ± 16.0	17	40	33,7	5,52
BGHIP	**benzo[ghi]perylene**	SB	HSD#9	21.0 ± 8.40	17	40	19,8	3,31
BKF	**benzo[k]fluoranthene**	SB	HSD#9	61.0 ± 25.0	17	40	53,5	5,83
BAA	**benzo[a]anthracene**	SB	HSD#9	25.0 ± 10.0	17	40	26,3	1,79
CHR	**Chrysene**	SB	HSD#9	39.0 ± 16.0	17	40	34,6	3,37
DBA3A	**Dibenz[a,h]anthracene**	SB	HSD#9	13.0 ± 5.20	17	40	12,7	2,46

Code	Contaminant	Tis-sue type	SRM type	SRM value confidence interval	N	W	Mean value	Standard deviation
FLE	**Fluorene**	SB	HSD#9	3.70 ± 1.50	17	40	3,46	0,52
FLU	**Fluoranthene**	SB	HSD#9	15.0 ± 6.00	17	40	15,3	1,80
ICDP	**indeno[1,2,3-cd]pyrene**	SB	HSD#9	29.0 ± 11.6	17	40	24,3	3,65
PA	**Phenanthrene**	SB	HSD#9	3.40 ± 1.36	17	40	4,35	0,52
PER	**Perylene**	SB	HSD#9	2.30 ± 0.92	17	40	2,41	0,41
PYR	**Pyrene**	SB	HSD#9	1.40 ± 0.56	17	40	1,76	0,57
CB126	**3,3',4,4',5-PeCB**	SB	EDF2525	647 ± 211	11	30	688	Missing
CB169	**3,3',4,4',5,5'-HxCB**	SB	EDF2525	55.8 ± 12.6	11	30	64,0	Missing
CB77	**3,3',4,4'-TeCB**	SB	EDF2525	1980 ± 659	11	30	2074	Missing
CB81	**3,4,4',5-TeCB**	SB	EDF2525	179 ± 35.1	11	30	179	Missing
CDD1N	**1,2,3,7,8-PeCDD**	SB	EDF2525	3.88 ± 1.22	11	30	4,45	Missing
CDD4X	**1,2,3,4,7,8-HxCDD**	SB	EDF2525	0.31 ± 0.14	11	30	0,34	Missing
CDD6X	**1,2,3,6,7,8-HxCDD**	SB	EDF2525	2.19 ± 0.76	11	30	2,06	Missing
CDD9X	**1,2,3,7,8,9-HxCDD**	SB	EDF2525	0.32 ± 0.11	11	30	0,35	Missing
CDDO	**OCDD**	SB	EDF2525	2.57 ± 2.59	11	30	2,14	Missing
CDF2N	**2,3,4,7,8-PeCDF**	SB	EDF2525	14.5 ± 2.41	11	30	16,8	Missing
CDF2T	**2,3,7,8-TCDF**	SB	EDF2525	24.5 ± 5.52	11	30	22,4	Missing
CDF4X	**2,3,4,6,7,8-HxCDF**	SB	EDF2525	1.09 ± 0.55	11	30	1,03	Missing
CDF6P	**1,2,3,4,6,7,8-HpCDF**	SB	EDF2525	0.59 ± 0.61	11	30	0,46	Missing
CDF6X	**1,2,3,6,7,8-HxCDF**	SB	EDF2525	1.65 ± 0.56	11	30	1,89	Missing
CDF9P	**1,2,3,4,7,8,9-HpCDF**	SB	EDF2525	0.08 ± 0.11	11	30	0,18	Missing
CDFDN	**1,2,3,7,8/1,2,3,4,8-PeCDF**	SB	EDF2525	4.88 ± 1.46	11	30	4,58	Missing
CDFDX	**1,2,3,4,7,8/1,2,3,4,7,9-HxCDF**	SB	EDF2525	5.8 ± 0.99	11	30	6,14	Missing
CDFO	**OCDF**	SB	EDF2525	0.78 ± 1	11	30	0,35	Missing
TCDD	**2,3,7,8-tetrachl-DiBpD (TCDD)**	SB	EDF2525	17.3 ± 2.58	11	30	22,0	Missing

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

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 (formulation basis =TBTIN*2.44)	*Tributyltinn* (formula basis =TBTIN*2.44)	O-MET
MBTIN	Monobutyltin	*Monobutyltinn*	O-MET
DBTIN	Dibutyltin	*dibutyltinn*	O-MET
TBTIN	Tributyltin (=TBT*0.40984)	*tributyltinn* (=TBT*0.40984)	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

Abbreviation[1]	English	*Norwegian*	Param. group
NAPD3 [2]	1,5-dimethylnaphthalene	*1,5-dimetylnaftalen*	PAH
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_Sn	*% BAP av PK_Sn*	
PKn_P	% PK_Sn of PAHΣΣ	*% PK_Sn av PAHΣΣ*	
PKnPP	% PK_Sn of P-Σn	*% PK_Sn 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*	
TCDDN	Sum of TCDD-toxicity equivalents after Nordic model, see **TEQ**	*Sum TCDD- toksitets ekvivalenter etter Nordisk modell, se **TEQ***	
TCDDI	Sum of TCDD-toxicity equivalents after international model, see **TEQ**	*Sum TCDD-toksitets ekvivalenter etter internasjonale modell, se **TEQ***	
PESTICIDES			
ALD	aldrin	*aldrin*	OC-DN
DIELD	dieldrin	*dieldrin*	OC-DN
ENDA	endrin	*endrin*	OC-DN
CCDAN	cis-chlordane (=α-chlordane)	*cis-klordan (=α-klordan)*	OC-DN
TCDAN	trans-chlordane (=γ-chlordane)	*trans-klordan (=γ-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

Abbreviation[1]	English	*Norwegian*	Param. group
DDD	dichlorodiphenyldichloroethane 1,1-dichloro-2,2-bis-(4-chlorophenyl)ethane	*diklordifenyldikloretan* *1,1-dikloro-2,2-bis-(4-klorofenyl)etan*	OC-DD
DDE	dichlorodiphenyldichloroethylene (principle metabolite of DDT) 1,1-dichloro-2,2-bis-(4-chlorophenyl)ethylene*	*diklordifenyldikloretylen (hovedmetabolitt av DDT)* *1,1-dikloro-2,2-bis-(4-klorofenyl)etylen*	OC-DD
DDT	dichlorodiphenyltrichloroethane 1,1,1-trichloro-2,2-bis-(4-chlorophenyl)ethane	*diklordifenyltrikloretan* *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 γ HCH = gamma hexachlorocyclohexane (γ BHC = gamma benzenehexachloride, outdated synonym)	*Lindan* *γ HCH = gamma heksaklorsykloheksan* *(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-196	2,2',3,3',4,4',5',6-octabromodiphenyl ether	*2,2',3,3',4,4',5',6-octabromdifenyleter*	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
BDE5S	Sum of BDE -85, -99, -100, -119	Sum av BDE -85, -99, -100, -119	OC-BB
BDESS	Sum of all BDEs	Sum av alle BDEer	OC-BB

Abbreviation[1]	English	*Norwegian*	Param. group
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
PFOS	perfluoroctanoic sulfonate	perfluoroktansulfonat	PFAS
PFOSA	perfluoroctanesulfonic acid	perfluoroktansulfon syre	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
Specific biological effects methods			
ALAD	δ-aminolevulinic acid dehydrase inhibition	*δ-aminolevulinsyre dehydrase*	BEM
CYP1A	cytochrome P450 1A-protein	*cytokrom P450 1A-protein*	BEM
EROD-activity	Cytochrome P4501A-activity (CYP1A/P4501A1, EROD)	*cytokrom P450 1A-aktivitet*	BEM
OH-pyrene	Pyrene metabolite	*pyren metabolitt*	BEM
VSDI	Vas Deferens Sequence Index		BEM
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 Klif 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: • 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] • non-ortho and mono-ortho substituted chlorobiphenyls after WHO model (Ahlborg *et al.* 1994) [3] or Safe (1994, cf. NILU pers. comm.)	*"Toxisitetsekvivalentfaktorer" for de giftigste forbindelsene innen følgende grupper.* • *polyklorerte dibenzo-p-dioksiner og dibenzofuraner (**PCDD/PCDF**). Ekvivalentberegning etter nordisk modell (Ahlborg 1989) [1] eller etter internasjonal modell (Int./EPA, cf. Van den Berg* et al. *1998) [2]* • *non-orto og mono-orto substituerte klorobifenyler etter WHO modell (Ahlborg* et al. *1994) [3] eller Safe (1994, cf. NILU pers. medd.)*
ppm	parts per million, mg/kg	*deler pr. milliondeler, mg/kg*
ppb	parts per billion, µg/kg	*deler pr. milliarddeler, µg/kg*
ppp	parts per trillion, ng/kg	*deler pr. tusen-milliarddeler, ng/kg*
d.w.	dry weight basis	*tørrvekt basis*
w.w.	wet weight or fresh weight basis	*våtvekt eller friskvekt basis*

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

[2]) 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
Classification of environmental quality

Table 12. *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							
Arsenic (As)	mg/kg	w.w. [2)]	10	30	70	140	>140
	mg/kg	d.w.	50	150	350	700	>700
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
Chromium (Cr)	mg/kg	w.w. [2)]	0.2	1	3	10	>10
	mg/kg	d.w.	1	5	15	50	>50
Lead (Pb)	mg/kg	w.w. [2)]	0.6	3	8	20	>20
	mg/kg	d.w.	3	15	40	100	>100
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
Nickel (Ni)	mg/kg	w.w. [2)]	1	5	10	20	>20
	mg/kg	d.w.	5	25	50	100	>100
Silver (Ag)	mg/kg	d.w.	0.3	1	2	5	>5
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
ΣPCB-7	µg/kg	w.w.	3 [5)]	15	40	100	>100
		d.w.[2)]	15 [2)]	75	200	500	>500
ΣDDT[11)]	µg/kg	w.w.	2	5	10	30	>30
		d.w.[2)]	10	25	50	150	>150
ΣHCH[12)]	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
ΣPAH[13)]	µg/kg	w.w.	50	200	2000	5000	>5000
		d.w.[2)]	250	1000	10000	25000	>25000
ΣKPAH	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
ΣPCB-7	µg/kg	w.w.	3 [6)]	20	50	150	>150
ΣDDT[11)]	µg/kg	w.w.	1	3	10	25	>25
ΣHCH[12]	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							
ΣPCB-7	µg/kg	w.w.	500	1500	4000	10000	>10000
ΣDDT[11)]	µg/kg	w.w.	200 [8)]	500	1500	3000	>3000
ΣHCH[12)]	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							
ΣPCB-7	µg/kg	w.w.	<5	20	50	150	>150
ΣDDT[11)]	µg/kg	w.w.	<2	4	15	40	>40
ΣHCH[12)]	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/t = µg/ton = g/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 15 to 10

[11]) Used in this investigation also for ppDDE

[12]) Used in this investigation also for γ-HCH (lindane)

[13]) The sum of tri- to hexacyclic PAH compounds named in EPA protocol 8310 minus naphthalene (dicyclic)-totalling 15 compounds, so that the Klif classification system can be applied

Table 13. *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, Green & Knutzen 2003), 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)] 0.0000002 [2)]		0.00001 [9)]							

[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
Overview of localities and sample count for biota
1981-2010

Nominal station positions are shown on maps in Appendix F

jmpco:CEMP area code (J99 = unclassified)
jmpst: station code
stnam: station name
nom_lon: Longitude (nominal)
nom_lat: Latitude (nominal)
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	Station_Name	Latitude	Longitude	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	2009	2010
01A	Sponvika	59,088	11,226	MYTI EDU	SB		3			3					3																		3	2	
01A	Sponvika	59,088	11,226	MYTI EDU	XX																													1	
02A	Fugleskjær	59,115	10,983	MYTI EDU	SB		3			3					3																		2	3	
03A	Tisler	58,98	10,958	MYTI EDU	SB		2			3					3																		3	3	
10A1	Skagodden	70,104	30,262	MYTI EDU	SB														3	3															
10A2	Skallneset	70,104	30,262	MYTI EDU	SB																4	3	3	3	3	3	3	3	3	3	3	3	3	3	3
10B	Varangerfjorden	69,933	29,667	BROS BRO	LI														1																
10B	Varangerfjorden	69,933	29,667	BROS BRO	MU														1																
10B	Varangerfjorden	69,933	29,667	GADU MOR	BI																				22	21									
10B	Varangerfjorden	69,933	29,667	GADU MOR	BL																				25	25									
10B	Varangerfjorden	69,933	29,667	GADU MOR	LI														21	25	25	23	25	25	25	25	25	25	25	25	10	25	25	25	25
10B	Varangerfjorden	69,933	29,667	GADU MOR	MU														25	30	30	27	30	30	30	30	30	30	30	30	12	30	30	30	30
10F	Skogerøy	69,917	29,85	PLEU PLA	LI																	5		4	3	5	5	4	4	5		4	2	3	4
10F	Skogerøy	69,917	29,85	PLEU PLA	MU																	5		4	3	5	5	4	4	5		4	2	2	4
10G3	Vardø	70,378	31,108	NUCE LAP	SB																										1				
10G4	Vadsø	70,075	29,715	NUCE LAP	SB																										1				
11A1	Sildkrokneset (south)	69,785	30,185	MYTI EDU	SB														3	3															
11A2	Sildkrokneset (north)	69,785	30,185	MYTI EDU	SB																4	3													
11G	Brashavn	69,899	29,744	NUCE LAP	SB																						1	1	2	1	1	1	1	1	1
11X	Brashavn	69,899	29,744	MYTI EDU	SB																	3	3	3	3	3	3	3	3	3	3	3	3	3	3
131G	Lastad	58,056	7,709	NUCE LAP	SB																					1	1	1	1	1	1	1	1	1	1
13A	Langøsund	57,998	7,577	MYTI EDU	SB										1	4																	4	3	
13BH	Kristiansand havn	58,135	7,988	GADU MOR	LI																													25	25
13BH	Kristiansand havn	58,135	7,988	GADU MOR	MU																													30	30
14A	Aavigen	58,033	7,216	MYTI EDU	SB										3	4																	3	3	
15A	Gåsøy (Ullerø)	58,048	6,895	MYTI EDU	SB										4	4		3	3	4	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3
15B	Ullerø area	58,05	6,717	GADU MOR	BI																	10	25	25		24	25	24	22	25	25	25	22	25	17
15B	Ullerø area	58,05	6,717	GADU MOR	BL																	24	25	25		23									
15B	Ullerø area	58,05	6,717	GADU MOR	LI										25	24	23	30	23	25	26	25	25	25	25	25	25	25	25	25	25	25	25	25	21
15B	Ullerø area	58,05	6,717	GADU MOR	MU										30	29	27	30	28	29	30	30	30	30	30	30	30	30	30	30	30	30	30	30	25
15C	Gåsøy (Ullerø)	57,988	7,244	PAND BOR	TM																												2		
15F	Ullerø area	58,05	6,717	LIMA LIM	LI											3		2	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
15F	Ullerø area	58,05	6,717	LIMA LIM	MU											3		2	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
15F	Ullerø area	58,05	6,717	MICR KIT	LI														1																
15F	Ullerø area	58,05	6,717	MICR KIT	MU														1																
15F	Ullerø area	58,05	6,717	PLEU PLA	LI												3	2																	
15F	Ullerø area	58,05	6,717	PLEU PLA	MU												3	2																	
15G	Gåsøy (Ullerø)	58,05	6,896	NUCE LAP	SB																					1	1	1	2	1	1	1	1	1	1
21D	Åkrafjord	59,8	6,183	BROS BRO	LI																			1		4									
21D	Åkrafjord	59,8	6,183	BROS BRO	MU																			1		4									
21D	Åkrafjord	59,8	6,183	CHIM MON	LI																			1		2									
21D	Åkrafjord	59,8	6,183	CHIM MON	MU																			1		2									
21D	Åkrafjord	59,8	6,183	MOLV MOL	LI																			1		4									
21D	Åkrafjord	59,8	6,183	MOLV MOL	MU																			1		4									
21F	Åkrafjord	59,75	6,117	LEPI WHI	LI																			5				5	5	5	3	5	5	5	4
21F	Åkrafjord	59,75	6,117	LEPI WHI	MU																			5				5	5	5	3	5	5	5	4
21F	Åkrafjord	59,75	6,117	LIMA LIM	LI																						5	5	5	5		5		3	
21F	Åkrafjord	59,75	6,117	LIMA LIM	MU																						5	5	5	5		5		3	
21F	Åkrafjord	59,75	6,117	PLAT FLE	LI																			3	5	5	5		1	5	5				
21F	Åkrafjord	59,75	6,117	PLAT FLE	MU																			3	5	5	5		1	5	5				
220G	Smørstakk	59,252	5,352	NUCE LAP	SB																	1	1	1					2						

jmpst	Station_Name	Latitude	Longitude	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	2009	2010
221A	Stangeland	59,277	5,328	MYTI EDU	SB																		2	3											
221G	Stangeland	59,27	5,33	NUCE LAP	SB																		1	1											
222A	Kopervik harbour	59,283	5,316	MYTI EDU	SB																				3										
224G	Heggjelen	59,416	5,232	NUCE LAP	SB																	1	1	1	1										
226G	Karmsund bridge (east)	59,378	5,298	NUCE LAP	SB																		1	1	1										
226H	Karmsund bridge (west)	59,378	5,292	NUCE LAP	SB																	1			1										
226X	Karmsund bridge (east)	59,378	5,298	MYTI EDU	SB																		1	3	3										
227A2	Høgevarde	59,326	5,318	MYTI EDU	SB																		2	3	3	3	3	3	1	2	2	1	1	1	3
227G1	Melandholmen/FLatskjær	59,337	5,312	NUCE LAP	SB																	1	1	1	1	1	1	1	1	1	1	1	1	1	1
22A	Espevær (west)	59,584	5,144	MYTI EDU	SB										3	3	3	3	3	3	5	3	3	3	3	3	3	3	3	3	3	3	3	3	3
22C	Bømlofjord	59,567	5,183	PAND BOR	TM										2																				
22F	Borøyfjorden	59,71	5,33	LIMA LIM	LI										5	5	4		5	2															
22F	Borøyfjorden	59,71	5,33	LIMA LIM	MU										5	5	4		5	2															
22F	Borøyfjorden	59,71	5,33	MICR KIT	LI													5																	
22F	Borøyfjorden	59,71	5,33	MICR KIT	MU													5																	
22F	Borøyfjorden	59,71	5,33	PLEU PLA	LI																5	5	5												
22F	Borøyfjorden	59,71	5,33	PLEU PLA	MU																5	5	5												
22G	Espevær (west)	59,584	5,144	NUCE LAP	SB																					1	1	1	2	1	1	1	1	1	1
23A	Austvik	59,87	5,108	MYTI EDU	SB										3	3													3	3					
23B	Karihavet area	59,9	5,133	GADU MOR	BI																	22	23	24	23	25	25	25	24	25	25	23	25	25	25
23B	Karihavet area	59,9	5,133	GADU MOR	BL																	25	25	25	24	25	25	25	25	25	25				
23B	Karihavet area	59,9	5,133	GADU MOR	LI										25	25	25	25	26	25	26	25	25	25	25	25	25	25	25	25	25	25	25	25	25
23B	Karihavet area	59,9	5,133	GADU MOR	MU										30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
23F	Karihavet area	59,9	5,133	MICR KIT	LI														1	4															
23F	Karihavet area	59,9	5,133	MICR KIT	MU														1	4															
23F	Karihavet area	59,9	5,133	PLAT FLE	LI														1																
23F	Karihavet area	59,9	5,133	PLAT FLE	MU														1																
23F	Karihavet area	59,9	5,133	PLEU PLA	LI														3																
23F	Karihavet area	59,9	5,133	PLEU PLA	MU														3																
24A	Vardøy	60,171	5,01	MYTI EDU	SB										3	3													3	3					
24G	Vardøy	60,171	5,01	NUCE LAP	SB																								1						
25A	Hinnøy	61,37	4,879	MYTI EDU	SB												3	3											3	3					
25G	Hinnøy	61,37	4,879	NUCE LAP	SB												1												1						
26A	Hamnen	61,876	5,222	MYTI EDU	SB												6	3											3	3					
26G	Hamnen	61,875	5,222	NUCE LAP	SB												1												1						
27A	Grinden	62,202	5,421	MYTI EDU	SB												2												3	3					
27G	Røydeskjær	62,183	5,74	NUCE LAP	SB												1												1						
27H	Storholmen	62,19	5,393	NUCE LAP	SB												1																		
28A	Eiksundet	62,252	5,864	MYTI EDU	SB												5	3											3	3					
28G	Grønevikholmen (Eiksundet)	62,247	5,883	NUCE LAP	SB												1												1						
28H	Øveråneset (Hareid)	62,362	6,078	NUCE LAP	SB												1																		
302	Ormøya	59,878	10,758	MYTI EDU	SB												2																		
303	Malmøya	59,863	10,766	MYTI EDU	SB												1																		
304	Gåsøya	59,851	10,589	MYTI EDU	SB												3																		
305	Lysaker	59,906	10,643	MYTI EDU	SB												2																		
306	Håøya	59,713	10,555	MYTI EDU	SB												3																		
30A	Gressholmen	59,882	10,712	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	3	3
30B	Oslo City area	59,799	10,56	GADU MOR	BI																		27	23	23	25	25	25	25	25	25	25	25	25	25
30B	Oslo City area	59,799	10,56	GADU MOR	BL																	10	30	25	25	25	25	25	25	25	25	25			
30B	Oslo City area	59,799	10,56	GADU MOR	LI				29	25	25	25	25	25	25	24	21	24	25	25	40	40	50	25	25	28	30	25	25	25	25	25	25	25	25
30B	Oslo City area	59,799	10,56	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	30	30
30C	Oslo City area	59,817	10,55	PAND BOR	TM				1								2																2		
30F	Oslo City area	59,783	10,567	PLEU PLA	LI												2		5	5															
30F	Oslo City area	59,783	10,567	PLEU PLA	MU												2		5	5															
30J	Spro	59,799	10,56	PAND BOR	TM															1															

jmpst	Station_Name	Latitude	Longitude	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	2009	2010
30K	Storegrunn	59,799	10,56	PAND BOR	TM															1															
30X	West of Nesodden	59,808	10,6	GADU MOR	LI												22																		
30X	West of Nesodden	59,808	10,6	GADU MOR	MU												22																		
31A	Solbergstrand	59,619	10,65	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	3	3
31B	Solbergstrand	59,615	10,64	GADU MOR	LI	10	27																												
31B	Solbergstrand	59,615	10,64	GADU MOR	MU	10	27																												
31C	Solbergstrand	59,615	10,64	PAND BOR	TM				1																										
31F	Solbergstrand	59,615	10,64	PLAT FLE	LI	8																													
31F	Solbergstrand	59,615	10,64	PLAT FLE	MU	8																													
32A	Rødtangen	59,525	10,427	MYTI EDU	SB	1	3			3																									
33C	Sande	59,528	10,35	PAND BOR	TM						1																								
33F	Sande (east side)	59,528	10,35	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	5	5
33F	Sande (east side)	59,528	10,35	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	5	5
33X	Sande (west side)	59,528	10,34	PLAT FLE	LI										3																				
33X	Sande (west side)	59,528	10,34	PLAT FLE	MU										3																				
35A	Mølen	59,488	10,498	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	3	3
35C	Mølen-Moss	59,483	10,529	PAND BOR	TM		1						1		2																		2		
35C	Mølen-Moss	59,483	10,529	PAND BOR	XX								1																						
36A	Færder	59,027	10,526	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		
36B	Færder area	59,04	10,436	GADU MOR	BI																	21	25	25	23	25									
36B	Færder area	59,04	10,436	GADU MOR	BL																	20	25	25	23	25									
36B	Færder area	59,04	10,436	GADU MOR	LI	10	27	23	24	14	25	25	25	25	24	25	25	25	25	25	26	25	25	25	23	28	30	25	25	25	25	25	25	21	25
36B	Færder area	59,04	10,436	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	25	30
36C	Færder area	59,04	10,436	PAND BOR	TM																												2		
36F	Færder area	59,067	10,383	LIMA LIM	LI										5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
36F	Færder area	59,067	10,383	LIMA LIM	MU										5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
36G	Færder	59,027	10,526	NUCE LAP	SB																	1	1	1	1	1	1	1	2	1	1	1	1	1	1
41A	Fensneset (Grytøya)	68,935	16,641	MYTI EDU	SB														3	3	4	3									3	3			
41G	Harstad (Trondenes)	68,822	16,565	NUCE LAP	SB																				1						1				
41G1	Feneset	68,935	16,641	NUCE LAP	SB																										1				
42A	Tennskjær (Malangen)	69,478	18,302	MYTI EDU	SB														3	3											3	3			
42G	Finnsnes	69,226	17,975	NUCE LAP	SB																				1										
43A	Lyngneset (Langfjord)	70,1	20,546	MYTI EDU	SB														3	3		3									3	3			
43B	Kvænangen (Olderfjord)	70,226	21,397	GADU MOR	LI														25	25	25												20	21	
43B	Kvænangen (Olderfjord)	70,226	21,397	GADU MOR	MU														30	30	30												24	21	
43B1	Leisundet	70,226	21,397	GADU MOR	LI																										25	25			
43B1	Leisundet	70,226	21,397	GADU MOR	MU																										30	30			
43BH	Tromsø havn	69,653	18,974	GADU MOR	LI																													25	25
43BH	Tromsø havn	69,653	18,974	GADU MOR	MU																													30	30
43F	Kvænangen (Olderfjord)	70,224	21,397	LIMA LIM	LI																3														
43F	Kvænangen (Olderfjord)	70,224	21,397	LIMA LIM	MU																3														
43F	Kvænangen (Olderfjord)	70,224	21,397	MICR KIT	LI																1														
43F	Kvænangen (Olderfjord)	70,224	21,397	MICR KIT	MU																1														
43F1	Leisundet	70,224	21,397	PLEU PLA	LI																										4	5			
43F1	Leisundet	70,224	21,397	PLEU PLA	MU																										4	5			
43G	Skjervøy	70,036	20,996	NUCE LAP	SB																				1						1				
43G1	Lyngneset (Langfjord)	70,101	20,546	NUCE LAP	SB																										1				
44A	Elenheimsundet	70,516	22,246	MYTI EDU	SB														3	3	4	3									3	3			
44G	Alta	69,99	23,306	NUCE LAP	SB																				1										
44G1	Elenheimsundet	70,516	22,246	NUCE LAP	SB																										1				
45A	Sauhamneset	70,764	24,32	MYTI EDU	SB														3	3											3	3			
45B	Hammerfest area	70,767	24,108	GADU MOR	LI														24	25															
45B	Hammerfest area	70,767	24,108	GADU MOR	MU														29	30															
45B1	Revsbotn	70,767	24,108	GADU MOR	LI																										25	25			
45B1	Revsbotn	70,767	24,108	GADU MOR	MU																										30	30			

jmpst	Station_Name	Latitude	Longitude	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	2009	2010
45F	Hammerfest area	70,667	24,667	PLEU PLA	LI																										5	5			
45F	Hammerfest area	70,667	24,667	PLEU PLA	MU																										5	5			
45G	Sauhamneset	70,764	24,32	NUCE LAP	SB																				1						1				
46A	Smines (Altesula)	70,973	25,802	MYTI EDU	SB														3	3	5										3	3			
46H	Honningsvåg	70,985	25,966	MYTI EDU	SB																										3				
46H	Honningsvåg	70,985	25,966	NUCE LAP	SB																				1						1				
47A	Kifjordneset	70,881	27,37	MYTI EDU	SB														3	3											2	3			
47G	Kifjordneset	70,881	27,37	NUCE LAP	SB																				1						1				
48A	Trollfjorden (Tanafjord)	70,694	28,555	MYTI EDU	SB														3	3	3										3	3			
48G	Mehamn	71,042	27,839	NUCE LAP	SB																				1										
48G1	Trollfjorden (Tanafjord)	70,694	28,555	NUCE LAP	SB																										1				
49A	Nordfjorden (Syltefjord)	70,55	30,086	MYTI EDU	SB														3	3											3	3			
49G	Syltefjorden	70,55	30,086	NUCE LAP	SB																										1				
51A	Byrkjenes	60,084	6,55	MYTI EDU	SB							3	3							1	3	3	3	6	3	3	3	3	3	3	3	3	3	3	3
52A	Eitrheimsneset	60,097	6,533	MYTI EDU	SB									3	3	3	3	2	3	3	3	3	3	6	3	3	3	3	3	3	3	3	3	3	3
52E	Eitrheimsneset	60,097	6,537	ANGU ANG	MU																			5											
53B	Inner Sørfjord	60,167	6,567	GADU MOR	BI																	15	28	24	25	25	25	24	25	25	25	25	24	19	25
53B	Inner Sørfjord	60,167	6,567	GADU MOR	BL																	15	30	25	25	25	25	25	25	25	25	25			
53B	Inner Sørfjord	60,167	6,567	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	19	25
53B	Inner Sørfjord	60,167	6,567	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	23	30
53B	Inner Sørfjord	60,167	6,567	SALM TRU	LI										12																				
53B	Inner Sørfjord	60,167	6,567	SALM TRU	MU										12																				
53D	Digraneset	60,183	6,575	BROS BRO	LI																					4									
53D	Digraneset	60,183	6,575	BROS BRO	MU																					4									
53D	Digraneset	60,183	6,575	CHIM MON	LI																					2									
53D	Digraneset	60,183	6,575	CHIM MON	MU																					2									
53D	Digraneset	60,183	6,575	MOLV MOL	LI																					5							25		
53D	Digraneset	60,183	6,575	MOLV MOL	MU																					5							30		
53E	Inner Sørfjord	60,167	6,567	ANGU ANG	MU																			5											
53F	Inner Sørfjord	60,167	6,567	GLYP CYN	LI							3																							
53F	Inner Sørfjord	60,167	6,567	GLYP CYN	MU							3																							
53F	Inner Sørfjord	60,167	6,567	PLAT FLE	LI				22				1	30	5	5	5	5	4	4	11	15	11	5	2	5	5	5	5	5		5	5	2	4
53F	Inner Sørfjord	60,167	6,567	PLAT FLE	MU				22				1	30	5	5	5	5	4	4	11	15	11	5	2	5	5	5	5	5		5	5	2	4
56A	Kvalnes	60,22	6,602	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	3	3
56A1	Kvalnes (north)	60,225	6,604	MYTI EDU	SB																			3			2								
56A2	Kjeken	60,339	6,655	MYTI EDU	SB																			3			2								
56A3	Sekse	60,261	6,623	MYTI EDU	SB																						2								
56A4	Rosstadnes	60,287	6,624	MYTI EDU	SB																						2								
56A5	Lofthus (south)	60,322	6,652	MYTI EDU	SB																						2								
56D	Kvalnes	60,25	6,6	BROS BRO	LI																			3											
56D	Kvalnes	60,25	6,6	BROS BRO	MU																			3											
56D	Kvalnes	60,25	6,6	CHIM MON	LI																			1											
56D	Kvalnes	60,25	6,6	CHIM MON	MU																			1											
56D	Kvalnes	60,25	6,6	MOLV MOL	LI																			1											
56D	Kvalnes	60,25	6,6	MOLV MOL	MU																			1											
57A	Krossanes	60,387	6,689	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	3	3
57A1	Urdheim	60,372	6,678	MYTI EDU	SB																			3			2								
57A2	Ernes	60,353	6,662	MYTI EDU	SB																						2								
63A	Ranaskjær	60,421	6,405	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	3	3
65A	Vikingneset	60,242	6,153	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	3	3
67B	Strandebarm area	60,267	6,033	GADU MOR	BI																	25	24	25	15	25									
67B	Strandebarm area	60,267	6,033	GADU MOR	BL																	25	25	25	13	24									
67B	Strandebarm area	60,267	6,033	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	25	14
67B	Strandebarm area	60,267	6,033	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	30	17
67D	Strandebarm area	60,267	6,033	MOLV MOL	LI																												17		

jmpst	Station_Name	Latitude	Longitude	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	2009	2010
67D	Strandebarm area	60,267	6,033	MOLV MOL	MU																												21		
67E	Strandebarm area	60,267	6,033	ANGU ANG	MU																			5											
67F	Strandebarm area	60,267	6,033	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	5	3
67F	Strandebarm area	60,267	6,033	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	5	3
67F	Strandebarm area	60,267	6,033	LIMA LIM	LI																		5												
67F	Strandebarm area	60,267	6,033	LIMA LIM	MU																		5												
67F	Strandebarm area	60,267	6,033	PLAT FLE	LI																3		4	5	5	5	5	5	5	5	5	5	5	5	
67F	Strandebarm area	60,267	6,033	PLAT FLE	MU																3		4	5	5	5	5	5	5	5	5	5	5	5	
69A	Lille Terøy	59,982	5,752	MYTI EDU	SB												3	1	3	3	3	3	3	6	3	3	3	3	3	3	3	3	3	3	3
71A	Bjørkøya (Risøyodden)	59,023	9,754	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	3	4	3	3	3
71G	Fugløyskjær	58,981	9,808	LITT LIT	SB																												1	1	1
71G	Fugløyskjær	58,981	9,808	NUCE LAP	SB																					1	1	1	1		1	1		1	
73A	Lyngholmen	59,045	10,295	MYTI EDU	SB										3																		3	5	
74A	Langholmane	58,955	9,868	MYTI EDU	SB										3																		3		
74G	Langholmane	58,955	9,868	NUCE LAP	SB																													1	
76A	Risøy	58,731	9,272	MYTI EDU	SB										3	3	3	3			3	3	3	3	3	3	3	3	3	3	3	3	5	3	4
76G	Risøy	58,728	9,276	NUCE LAP	SB																					1	1	1	1	1	1	1	1	1	1
77A	Nordstrand	58,524	8,942	MYTI EDU	SB										3	3																	3	5	
77B	Borøy area	58,55	9,017	GADU MOR	LI										14	25																	25	25	
77B	Borøy area	58,55	9,017	GADU MOR	MU										17	30																	30	30	
77C	Borøy area	58,483	9,167	PAND BOR	TM										2																		2		
77F	Borøy area	58,55	9,017	LIMA LIM	LI											3																	5	5	
77F	Borøy area	58,55	9,017	LIMA LIM	MU																												5	5	
79A	Gjerdsvoldsøyen (east)	58,413	8,742	MYTI EDU	SB										3	3																	3	3	
80A	Østmarknes	63,457	10,45	MYTI EDU	SB				1	2																									
80BH	Trondheim	63,442	10,392	GADU MOR	LI																													21	4
80BH	Trondheim	63,442	10,392	GADU MOR	MU																													25	5
81A	Biologisk Stasjon	63,442	10,349	MYTI EDU	SB				1																										
82A	Flakk	63,45	10,206	MYTI EDU	SB				1	2	2	3	1	2		3	2	2		3	3								3	3					
82G	Flakk	63,451	10,202	NUCE LAP	SB												1												1						
83A	Frøsetskjær	63,428	10,107	MYTI EDU	SB				1																										
84A	Tråsåvika	63,346	9,957	MYTI EDU	SB				2	3	3	3	3	3		3	3	3		3	3								3	3					
84B	Tråsåvika	63,349	9,961	GADU MOR	LI				13	1	1	1	1																						
84B	Tråsåvika	63,349	9,961	GADU MOR	MU				13	10	1	1	1																						
84B	Tråsåvika	63,349	9,961	MELA AEG	LI						1	1	1																						
84B	Tråsåvika	63,349	9,961	MELA AEG	MU						1	1	1																						
84B	Tråsåvika	63,349	9,961	MERL MNG	LI							1	1																						
84B	Tråsåvika	63,349	9,961	MERL MNG	MU							1	1																						
84B	Tråsåvika	63,349	9,961	POLL POL	LI					1	1		1																						
84B	Tråsåvika	63,349	9,961	POLL POL	MU					16	1		1																						
84B	Tråsåvika	63,349	9,961	POLL VIR	LI								1																						
84B	Tråsåvika	63,349	9,961	POLL VIR	MU								1																						
84F	Tråsåvika	63,349	9,961	MICR KIT	LI								1																						
84F	Tråsåvika	63,349	9,961	MICR KIT	MU								1																						
84G	Tråsåvika	63,346	9,957	NUCE LAP	SB												1																		
85A	Geitstrand	63,364	9,928	MYTI EDU	SB				1																										
86A	Geitnes	63,443	9,978	MYTI EDU	SB				1																										
87A	Ingdalsbukt	63,462	9,907	MYTI EDU	SB				1	1	1	1	1	1		1	1	1		2	2								1	3					
87G	Ingdalsbukt	63,462	9,907	NUCE LAP	SB												1												1						
88A	Rødberg	63,487	10	MYTI EDU	SB				1	1																									
91A	Nerdvika	63,353	8,157	MYTI EDU	SB												3	3	3											3					
92A1	Krokholmen	64,054	10,03	MYTI EDU	SB												6	3	3	3	3	3													
92A2	Nygården	64,054	10,03	MYTI EDU	SB																									3					
92B	Stokken area	64,171	9,887	GADU MOR	LI													25	24	25	25								25	25			25	25	
92B	Stokken area	64,171	9,887	GADU MOR	MU													30	29	30	30								30	30			30	25	

jmpst	Station_Name	Latitude	Longitude	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	2009	2010
92F	Stokken area	64,171	9,887	LIMA LIM	LI															1															
92F	Stokken area	64,171	9,887	LIMA LIM	MU															1															
92F	Stokken area	64,171	9,887	PLEU PLA	LI															1										5					
92F	Stokken area	64,171	9,887	PLEU PLA	MU															1										5					
93A	Sætervik	64,395	10,483	MYTI EDU	SB												3	3											3	3					
93G	Sætervika (Stadsvikskjæret)	64,395	10,5	NUCE LAP	SB												1																		
94A	Landfast	65,644	12,006	MYTI EDU	SB												3	3											3	3					
94G	Steinskjær (Landfast)	65,641	11,998	NUCE LAP	SB												1												1						
95A	Sleipnesodden (south)	66,71	13,253	MYTI EDU	SB												3	3											3	3					
95G	Sleipnesodden (south)	66,707	13,238	NUCE LAP	SB												1												1						
96A	Breiviken	66,296	12,834	MYTI EDU	SB												6	3											3	3					
97A	Klokkholmen	67,665	14,743	MYTI EDU	SB												3	3											3	3					
97G	Varnesodden	67,801	14,75	NUCE LAP	SB												1												1						
97H	Småfloholmene	67,891	14,818	NUCE LAP	SB												1																		
98A1	Yitj-Skarvsundet	68,158	14,653	MYTI EDU	SB												3	3																	
98A2	Husvaagen area	68,258	14,664	MYTI EDU	SB																	3		3	3	3	3	3	3	3	3	3	3	3	3
98A3	Vatterfjord	68,258	14,664	MYTI EDU	SB																		3												
98B1	Bjørnerøya (east)	68,247	14,803	GADU MOR	LI												25	29	25	24	26	25	25	25			25	21	25	25	25	8	25	25	25
98B1	Bjørnerøya (east)	68,247	14,803	GADU MOR	MU												30	29	30	29	30	30	30	30			30	25	30	30	30	10	30	30	30
98B2	Austnesfjorden	68,247	14,803	GADU MOR	BI																				14	22									
98B2	Austnesfjorden	68,247	14,803	GADU MOR	BL																				5	25									
98B2	Austnesfjorden	68,247	14,803	GADU MOR	LI																				25	25									
98B2	Austnesfjorden	68,247	14,803	GADU MOR	MU																				30	30									
98F1	Bjørnerøya (east)	68,219	14,808	GLYP CYN	LI															1															
98F1	Bjørnerøya (east)	68,219	14,808	GLYP CYN	MU															1															
98F1	Bjørnerøya (east)	68,219	14,808	LIMA LIM	LI													4	1	1	5														
98F1	Bjørnerøya (east)	68,219	14,808	LIMA LIM	MU													4	1	1	5														
98F1	Bjørnerøya (east)	68,219	14,808	MICR KIT	LI														1	1															
98F1	Bjørnerøya (east)	68,219	14,808	MICR KIT	MU														1	1															
98F1	Bjørnerøya (east)	68,219	14,808	PLEU PLA	LI													3		5		4	5	1											
98F1	Bjørnerøya (east)	68,219	14,808	PLEU PLA	MU													3		5		4	5	1											
98F2	Husholmen	68,219	14,808	PLEU PLA	LI																				4	5	4	3	5	2	5	5	5	5	5
98F2	Husholmen	68,219	14,808	PLEU PLA	MU																				4	5	4	3	5	2	5	5	5	5	5
98G	Svolvær området	68,249	14,663	NUCE LAP	SB																					1	1	1	2	1	1	1	1	1	1
98X	Skrova harbour	68,165	14,659	MYTI EDU	SB														3	4	4														
99A	Brunvær	68,005	15,093	MYTI EDU	SB												6	3											3	3					
I001	Sponvikskansen	59,09	11,21	MYTI EDU	SB															3	3														
I011	Kråkenebbet	59,101	11,289	MYTI EDU	SB															3	3														
I021	Kjøkø (south)	59,13	10,952	MYTI EDU	SB															3	3	3	3		3	3	3								
I022	West Damholmen	59,102	11,045	MYTI EDU	SB															3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
I023	Singlekalven (south)	59,095	11,137	MYTI EDU	SB															3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
I024	Kirkøy (north west)	59,08	10,986	MYTI EDU	SB															3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
I080	Østmerknes	63,457	10,45	MYTI EDU	SB															3	3														
I131A	Lastad	58,056	7,709	MYTI EDU	SB															3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
I132	Svensholmen	58,125	7,989	MYTI EDU	SB																		3	3	3	3	3	3	3	3	3	3	4	3	3
I1321	Fiskåtangen	58,128	7,977	MYTI EDU	SB															4	4	3													
I133	Odderø (west)	58,132	8,002	MYTI EDU	SB															4	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3
I201	Ekkjegrunn (G1)	59,643	6,357	MYTI EDU	SB															3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
I205	Bølsnes (G5)	59,592	6,3	MYTI EDU	SB															3		3	3	3	3	3	3	3	3	3	3	3	3	3	3
I241	Nordnes	60,401	5,302	MYTI EDU	SB															3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
I242	Gravdalsneset	60,395	5,267	MYTI EDU	SB															3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
I243	Hegreneset	60,415	5,305	MYTI EDU	SB															3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
I301	Akershuskaia	59,905	10,736	MYTI EDU	SB												2			3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
I304	Gåsøya	59,851	10,589	MYTI EDU	SB															3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
I306	Håøya	59,713	10,555	MYTI EDU	SB															3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

jmpst	Station_Name	Latitude	Longitude	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	2009	2010
I307	Ramtonholmen	59,744	10,523	MYTI EDU	SB															3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
I711	Steinholmen	59,052	9,677	MYTI EDU	SB															3	4	3	3	3	3		3								
I712	Croftholmen	59,045	9,707	MYTI EDU	SB															3	4	3	3	3	3	3	3	3	3	3	3	3	3	4	3
I713	Strømtangen	59,05	9,692	MYTI EDU	SB																						3	3	3	3	3	3	3	3	3
I911	Horvika	62,735	8,523	MYTI EDU	SB															3	3														
I912	Honnhammer	62,853	8,162	MYTI EDU	SB															3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
I913	Fjøseid	62,81	8,275	MYTI EDU	SB																			3	3	3	3	3	3	3	3	3	3	3	3
I914	Flåøya (southeast)	62,756	8,445	MYTI EDU	SB																							3							
I915	Flåøya (northwest)	62,758	8,44	MYTI EDU	SB																							3	3	3	3	3	3	3	
I916	Sundalsfjord (Hydro kai)	62,684	8,552	MYTI EDU	SB																								3	3					
I962	Koksverktomta (B2)	66,326	14,14	MYTI EDU	SB															3	3	2	3												
I964	Toraneskaien (B4)	66,319	14,128	MYTI EDU	SB																						3	3	3	3	3	3	3	3	3
I965	Moholmen (B5)	66,312	14,126	MYTI EDU	SB																					3	3	3	3	3	3	3	4	3	3
I969	Bjørnbærviken (B9)	66,28	14,035	MYTI EDU	SB															3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
R096	Breiviken (Tomma)	66,294	12,841	MYTI EDU	SB															3	3														

Appendix F
Map of stations

Nominel station positions 1981-2010
(cf. Appendix G and Appendix J)

Appendix F (cont.) Map of stations

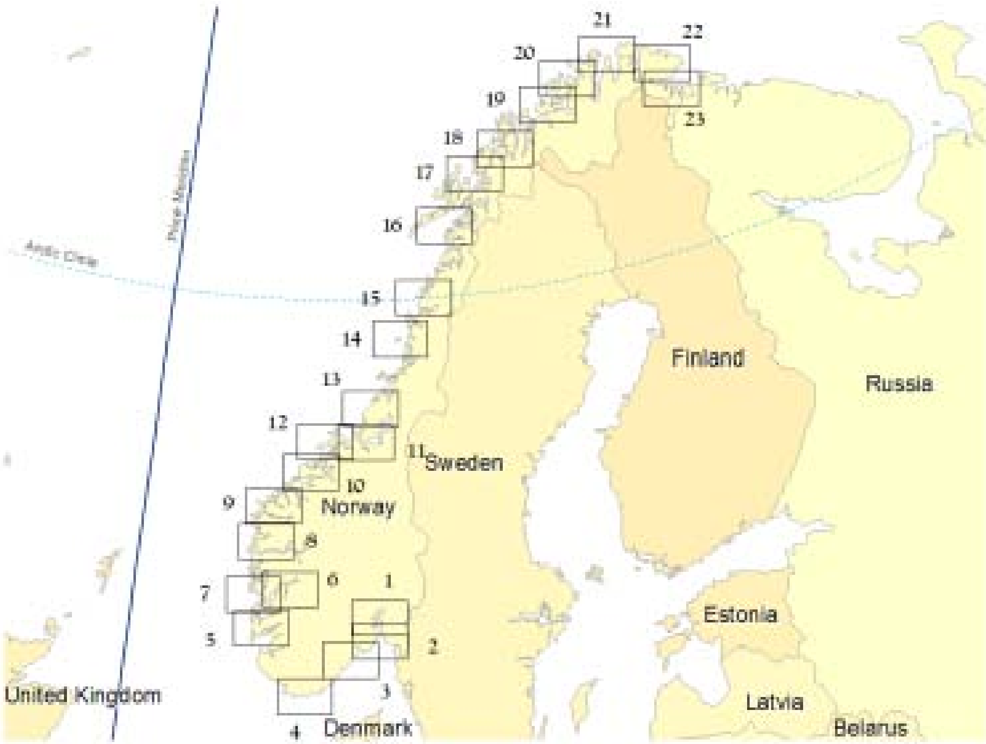
NOTES

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.

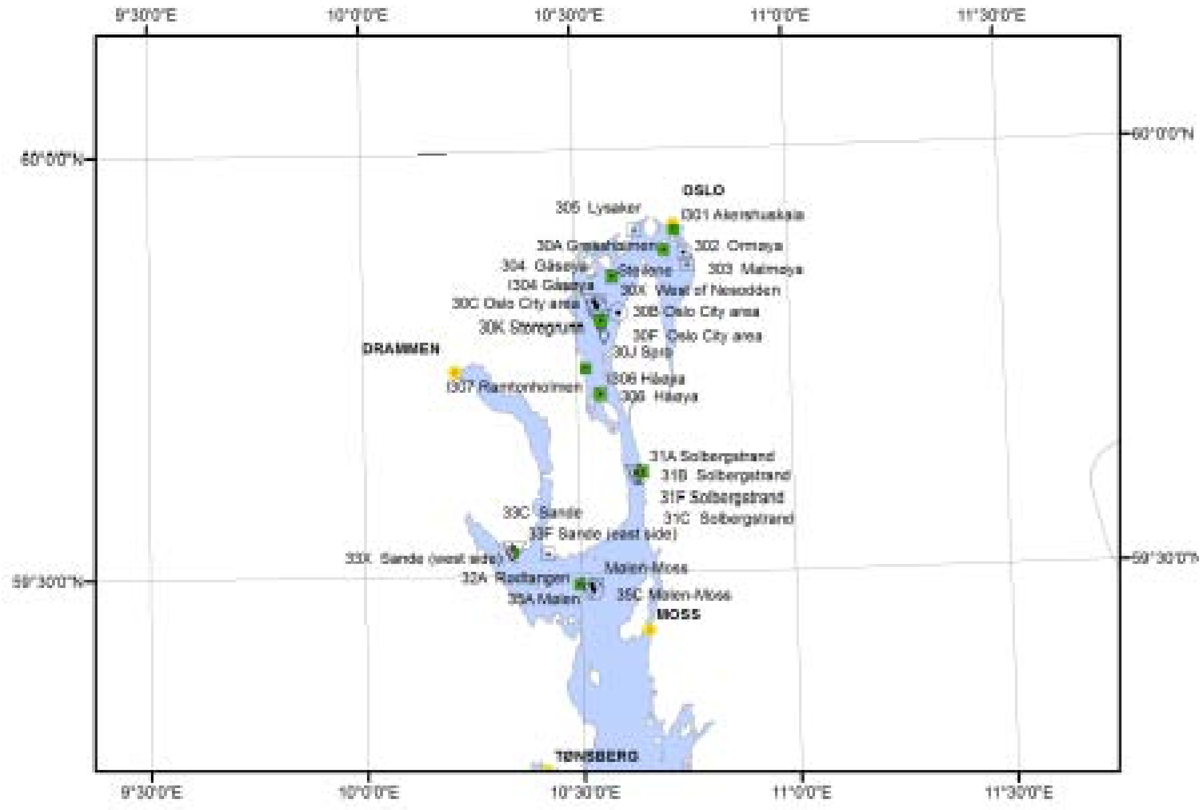
The following symbols and codes apply:

All years	2010	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	

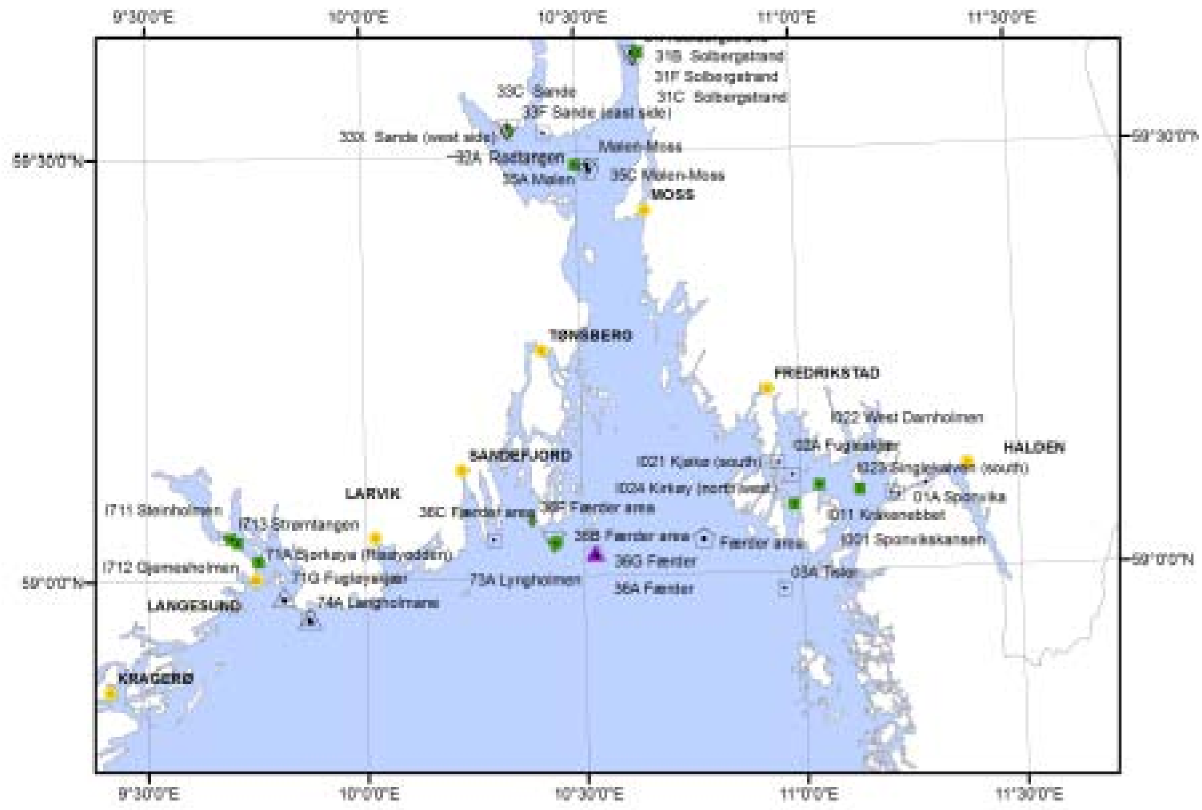
1) Supplementary station used in Klif blue mussel pollution (I) or reference (R) index (cf. Appendix J).



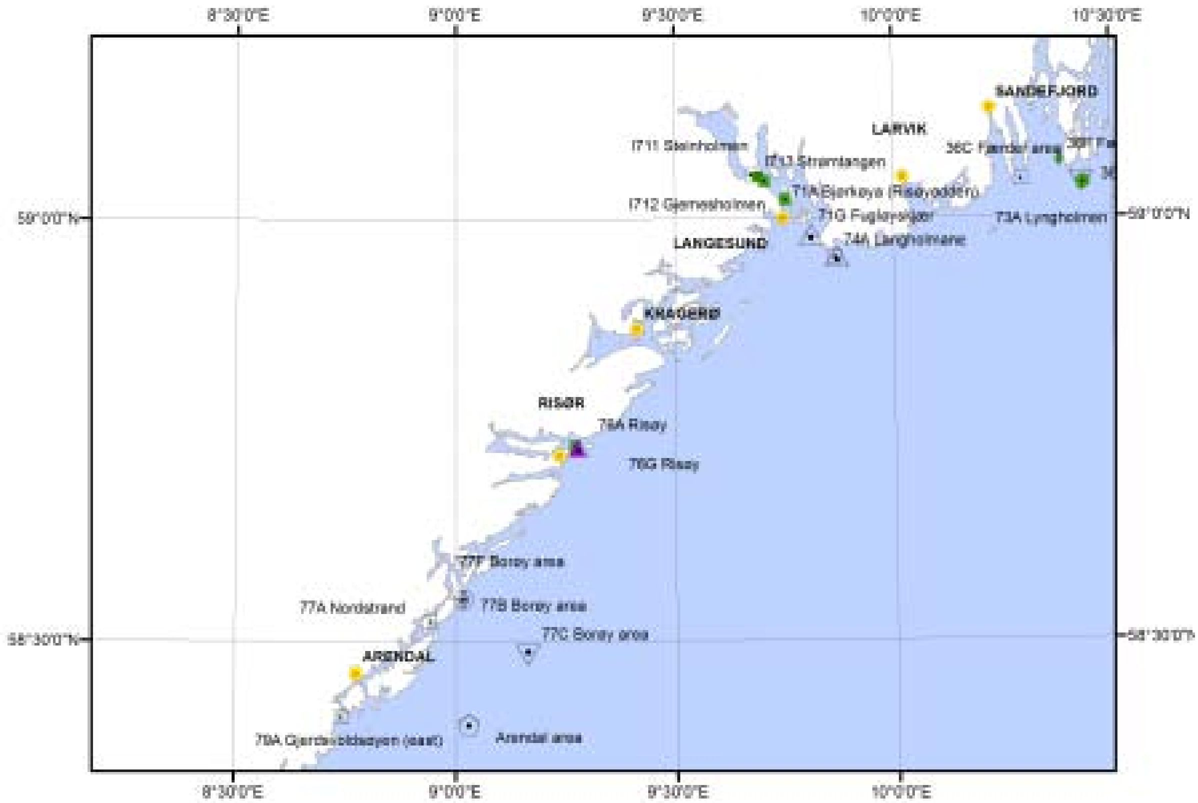
CEMP stations Norway. Numbers indicate map reference that follow.
Note: distance between two lines of latitude is 15 nautical miles (= 27.8 km).


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
30A Gressholmen
302 Ormøya
304 Gåsøya
303 Malmøya
I304 Gåsøya
30X West of Nesodden
30C Oslo City area
30B Oslo City area
30K Steilene
30F Oslo City area
DRAMMEN
I307 Ramtonholmen
306 Håøya
31A Solbergstrand
31B Solbergstrand
31F Solbergstrand
31C Solbergstrand
33C Sande
33F Sande (east side)
33X Sande (west side)
32A Rødtangen
Mølen-Moss
35A Mølen
35C Mølen-Moss
MOSS
TØNSBERG

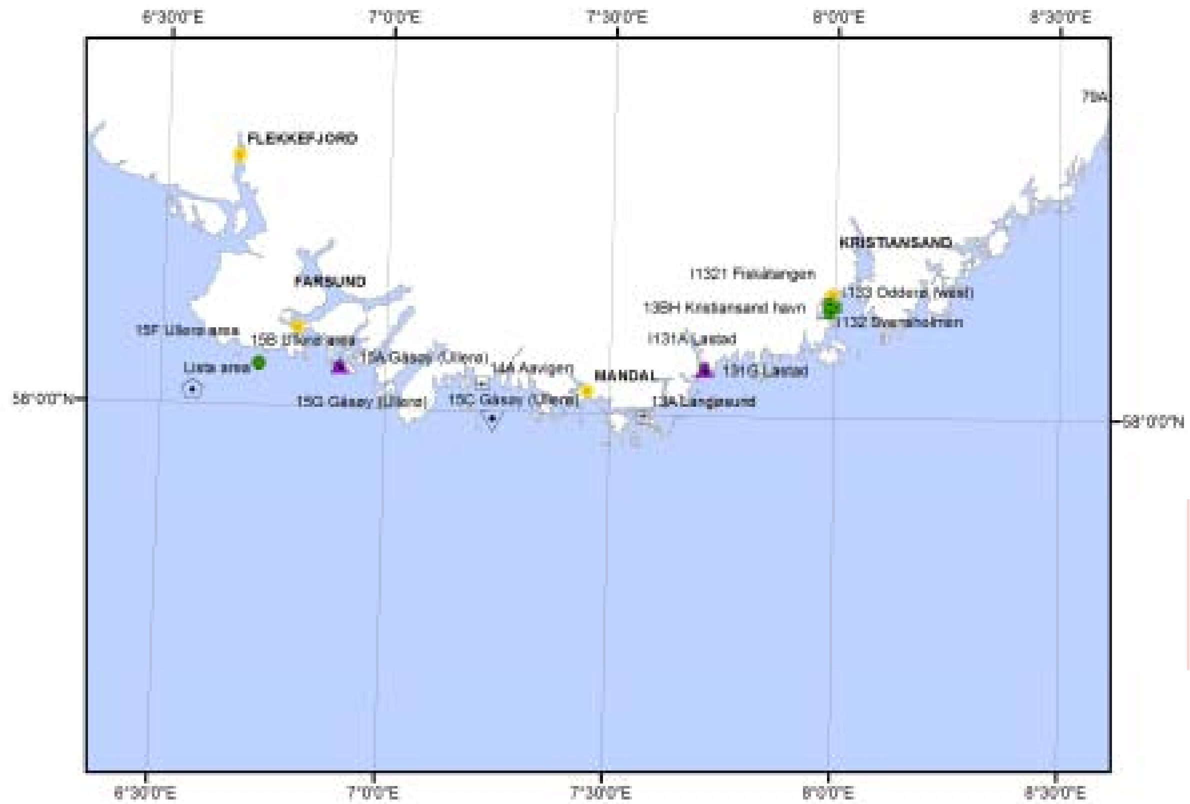
MAP 1


9°30'0"E
10°0'0"E
10°30'0"E
11°0'0"E
11°30'0"E
59°30'0"N
59°0'0"N
31B Solbergstrand
31F Solbergstrand
31C Solbergstrand
33C Sande
33F Sande (east side)
33X Sande (west side)
32A Rødtangen
Mølen-Moss
35A Mølen
35C Mølen-Moss
MOSS
TØNSBERG
FREDRIKSTAD
I022 West Damholmen
02A Fugleskjær
HALDEN
I021 Kjøkø (south)
I023 Singlekalven (south)
SANDEFJORD
I024 Kirkøy (north west)
01A Sponvika
LARVIK
I711 Steinholmen
I713 Strømtangen
36C Færder area
36F Færder area
I011 Krokenebbet
36B Færder area
Færder area
I001 Sponvikskansen
71A Bjørkøya (Risøyodden)
I712 Gjemesholmen
71G Fugløyskjær
36G Færder
73A Lyngholmen
36A Færder
03A Tisler
LANGESUND
74A Langholmene
KRAGERØ

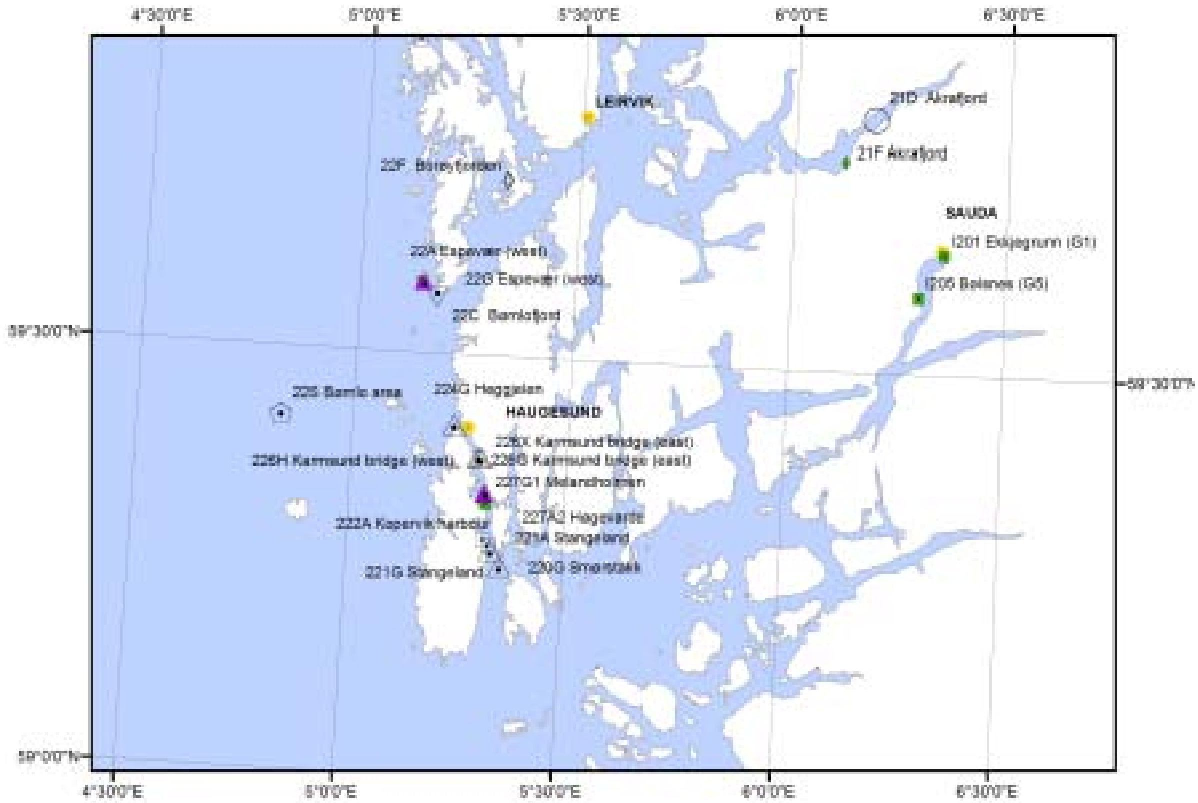
MAP 2


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
I711 Steinholmen
I712 Gjemesholmen
LANGESUND
73A Lyngholmen
KRAGERØ
RISØR
76A Risøy
76G Risøy
77F Borøy area
77A Nordstrand
77B Borøy area
77C Borøy area
ARENDAL
Arendal area

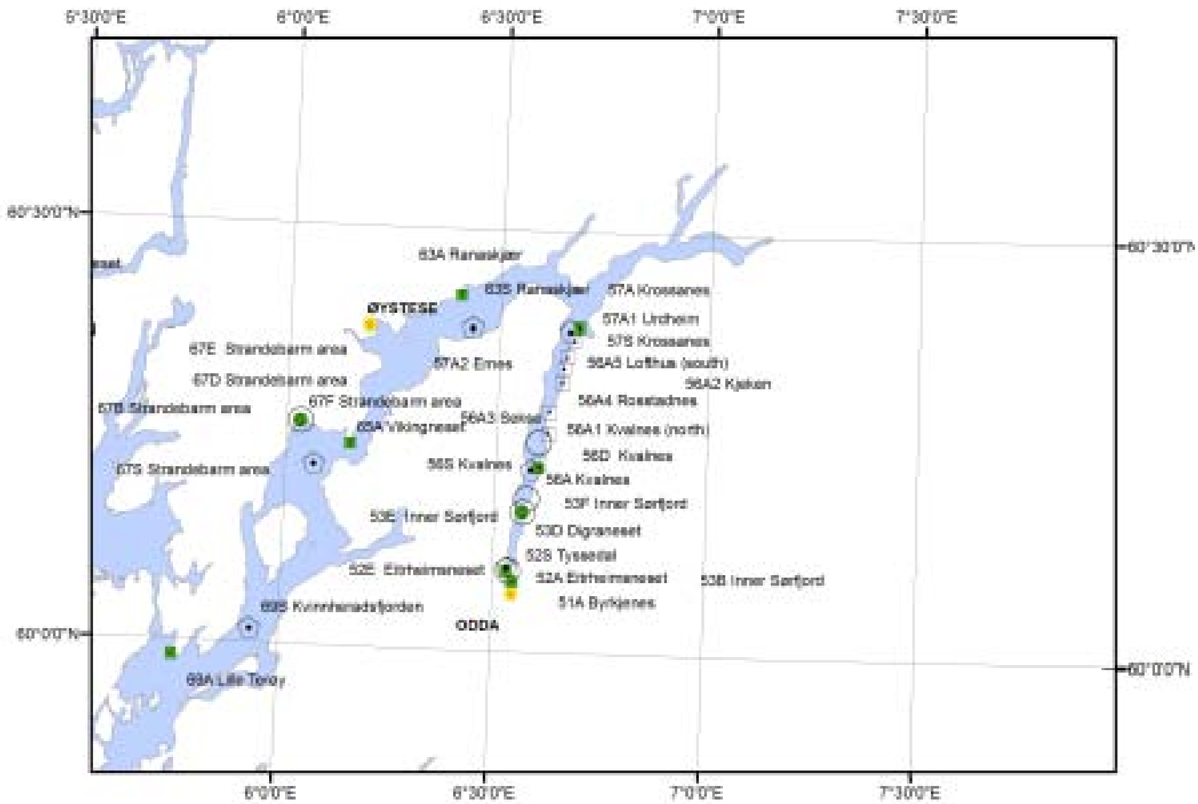
MAP 3


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
FARSUND
KRISTIANSAND
I1321 Fiskåtangen
I133 Odderø (west)
13BH Kristiansand havn
I132 Svensholmen
I131A Lastad
131G Lastad
MANDAL
13A Langøsund
14A Aavigen
15G Gåsøy (Ullerø)
15C Gåsøy (Ullerø)
15A Gåsøy (Ullerø)
Lista area

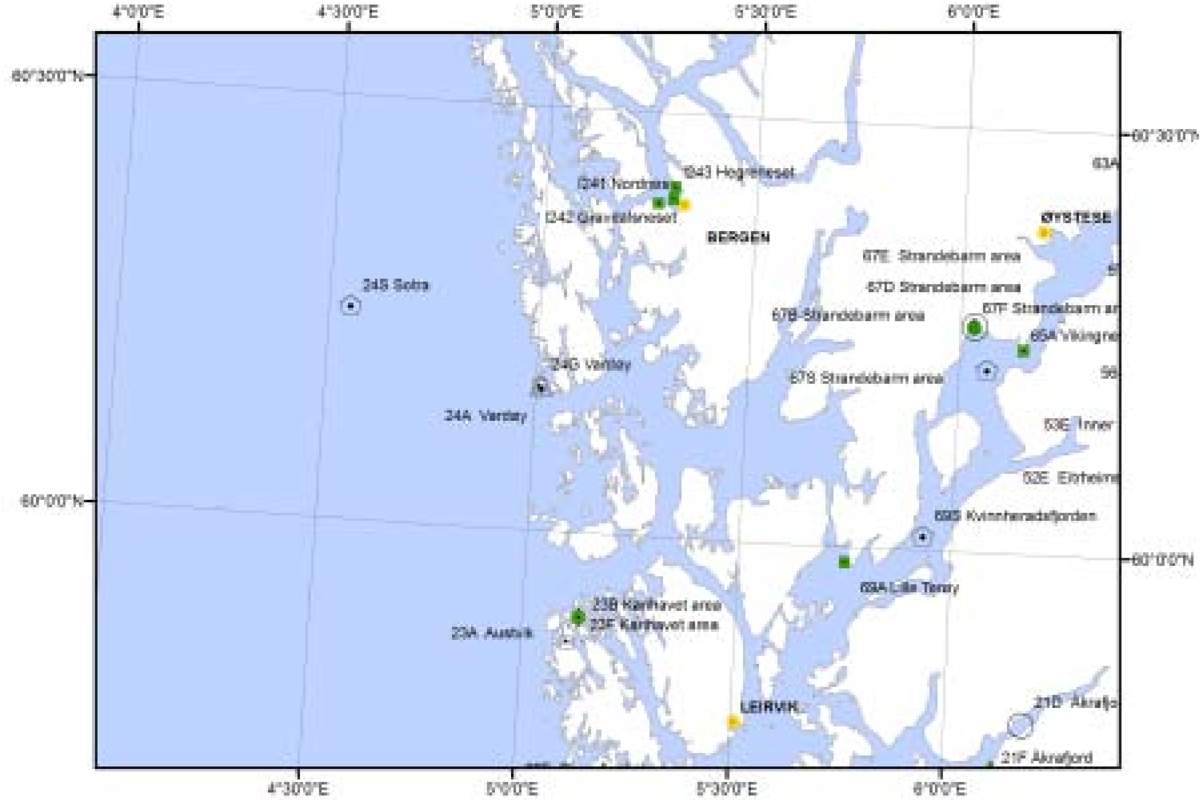
MAP 4



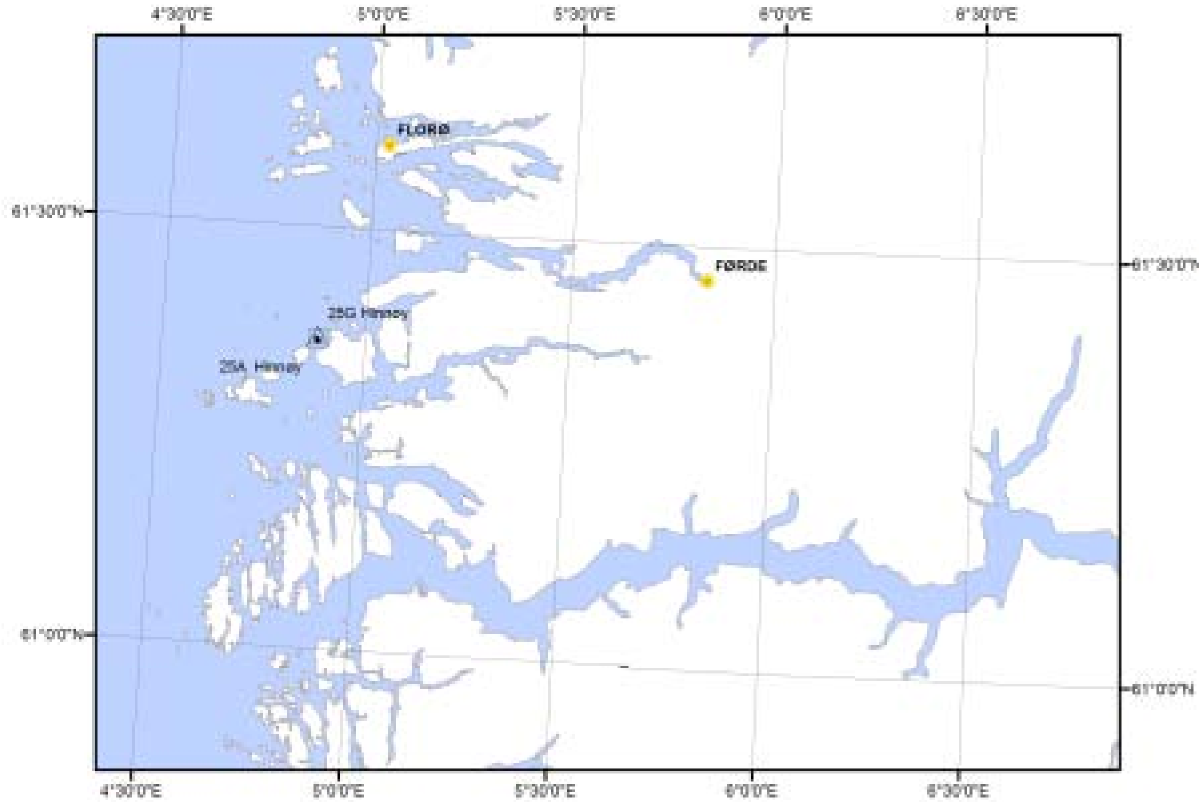
MAP 5



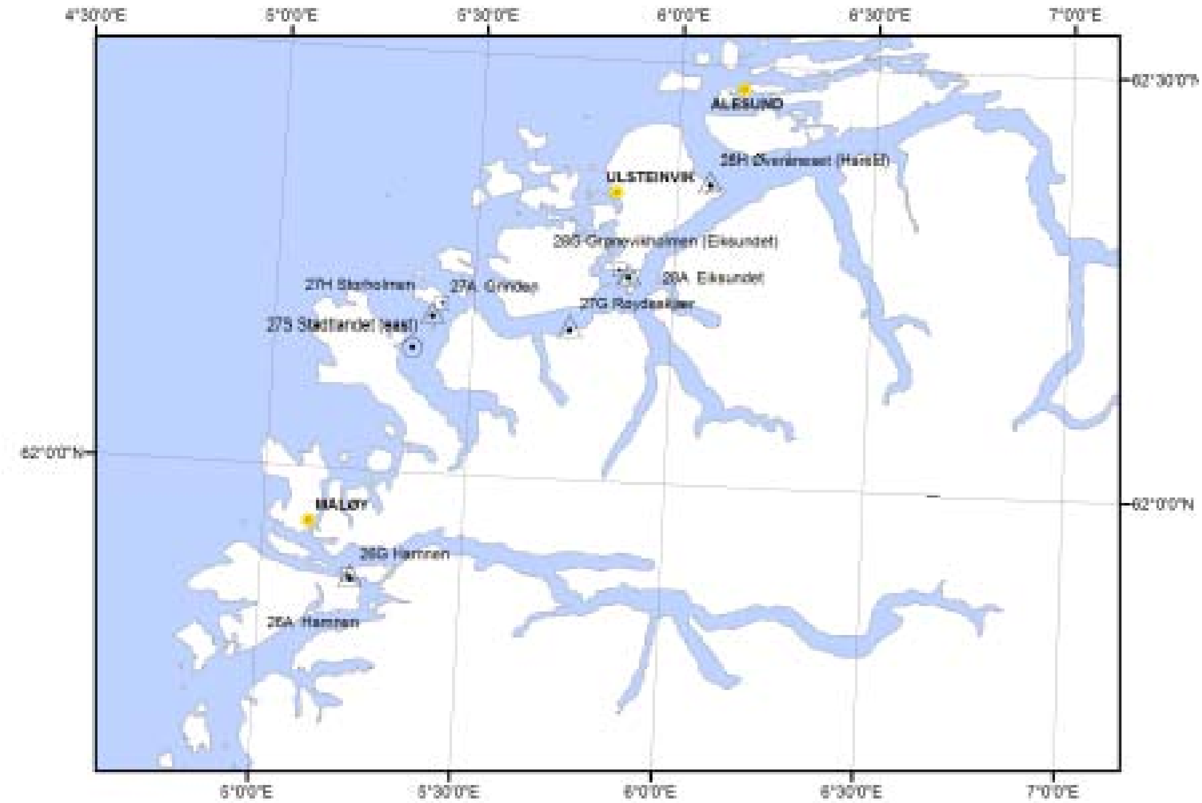
MAP 6


4°0'0"E
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
LEIRVIK
24S Sotra
24G Vardøy
24A Vardøy
23B Karihavet area
23F Karihavet area
23A Austvik
67E Strandebarm area
67D Strandebarm area
67B Strandebarm area
67S Strandebarm area
69S Kvinnheradsfjorden
69A Lille Terøy
21F Akrafjord

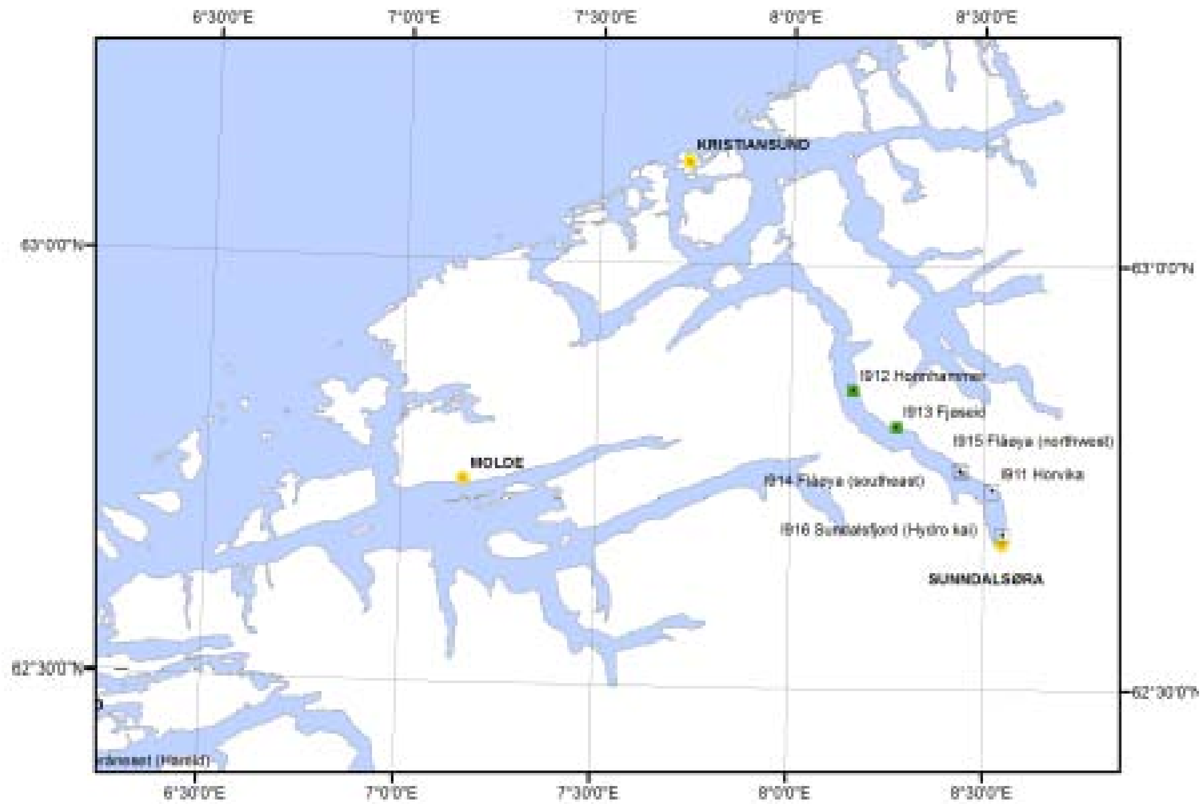
MAP 7


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
25G Hinnøy
25A Hinnøy

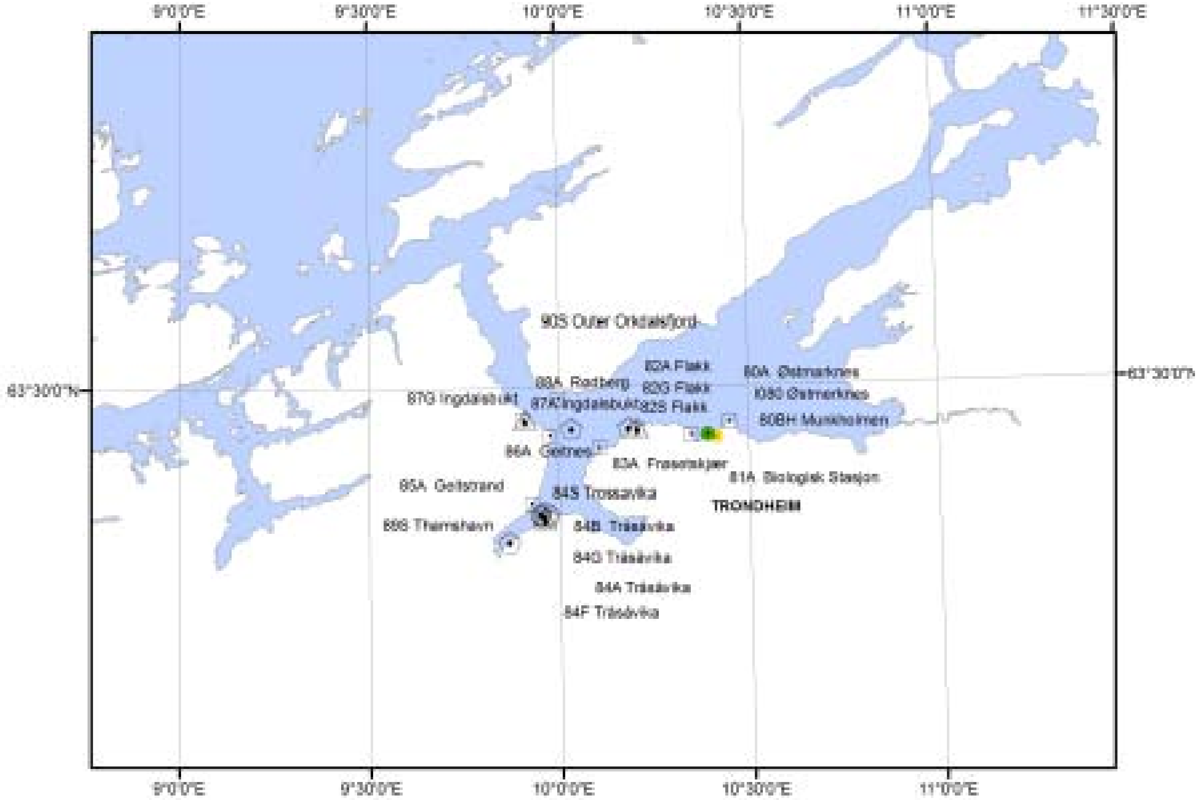
MAP 8


4°30'0"E
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
ULSTEINVIK
28A Eiksundet
27S Stadtlandet (east)
MÅLØY
26G Hamnen
26A Hamnen

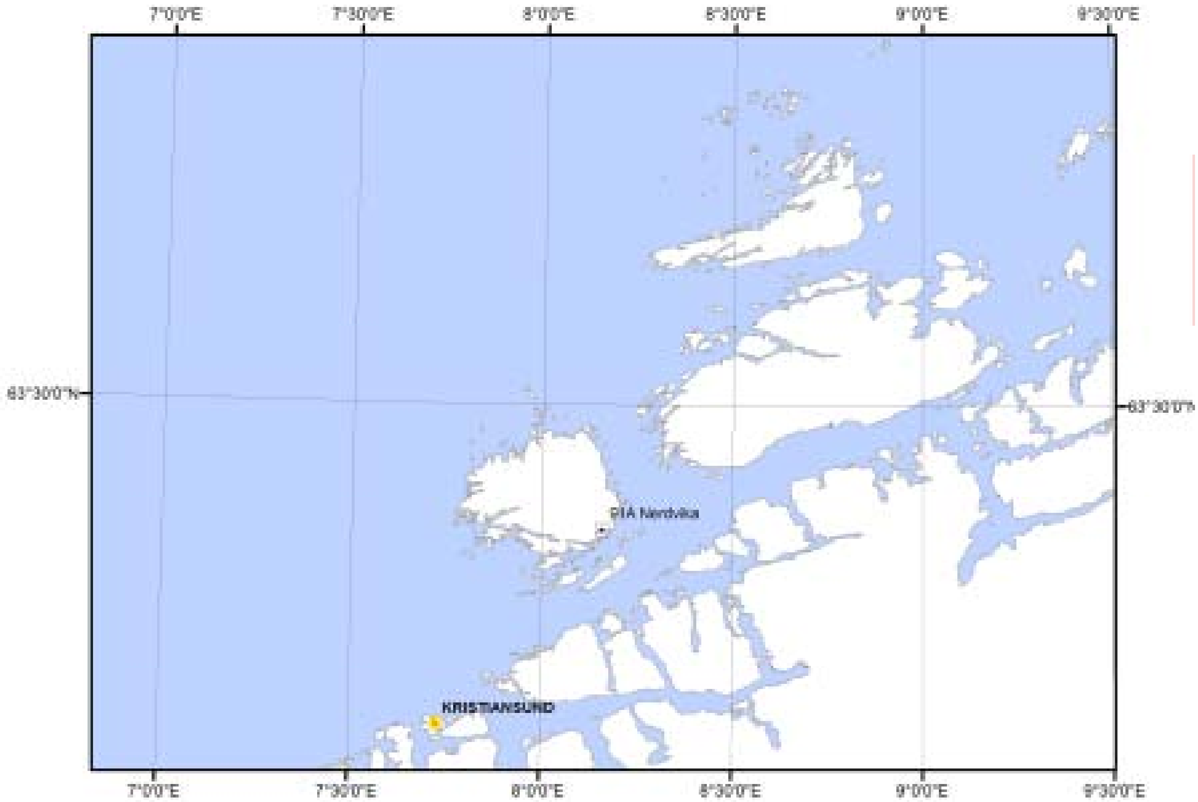
MAP 9


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
MOLDE
I913 Fjøseid
I915 Flåøya (northwest)
I911 Horvika
SUNNDALSØRA

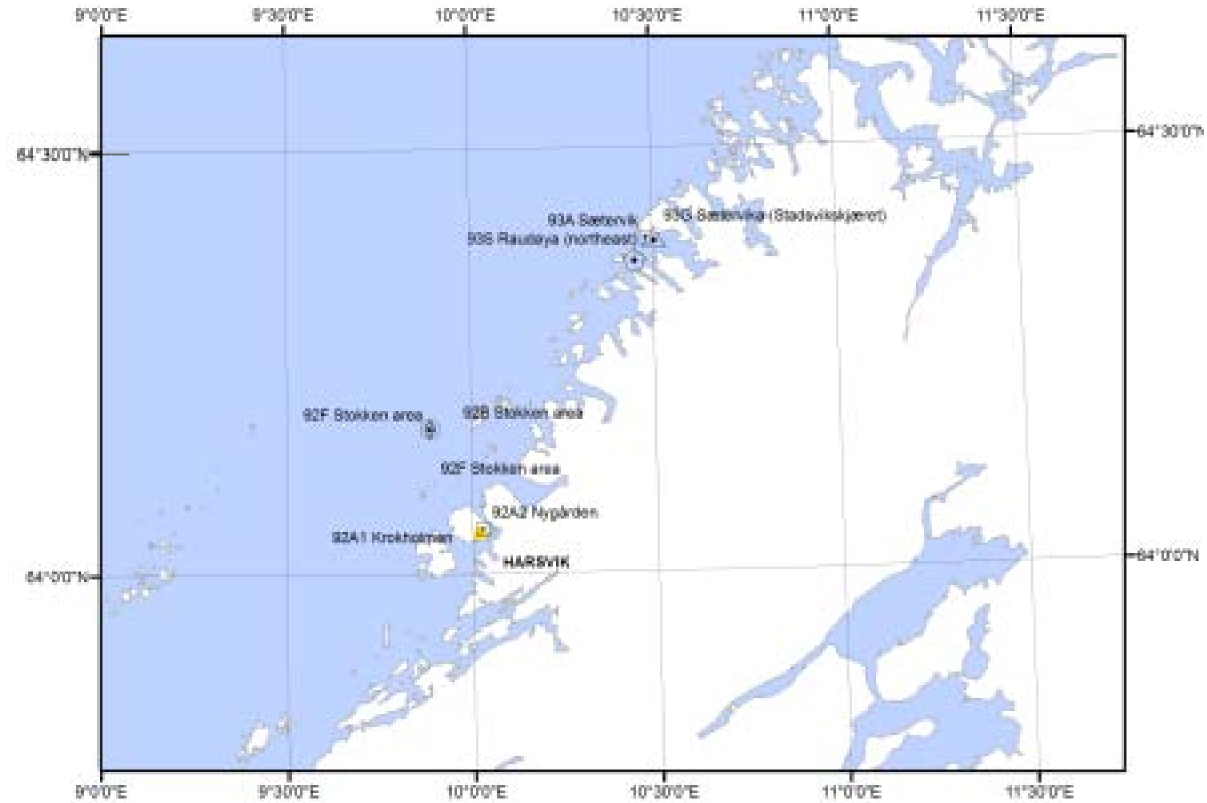
MAP 10


9°0'0"E
9°30'0"E
10°0'0"E
10°30'0"E
11°0'0"E
11°30'0"E
63°30'0"N
90S Outer Orkdalsfjord
82A Flakk
82G Flakk
82S Flakk
80A Østmarkneset
80BH Munkholmen
87G Ingdalsbukt
86A Geitnes
83A Fraserskjær
81A Biologisk Stasjon
85A Geitstrand
84S Trosavika
TRONDHEIM
88S Thamshavn
84B Trosavika
84G Trosavika
84A Trosavika
84F Trosavika

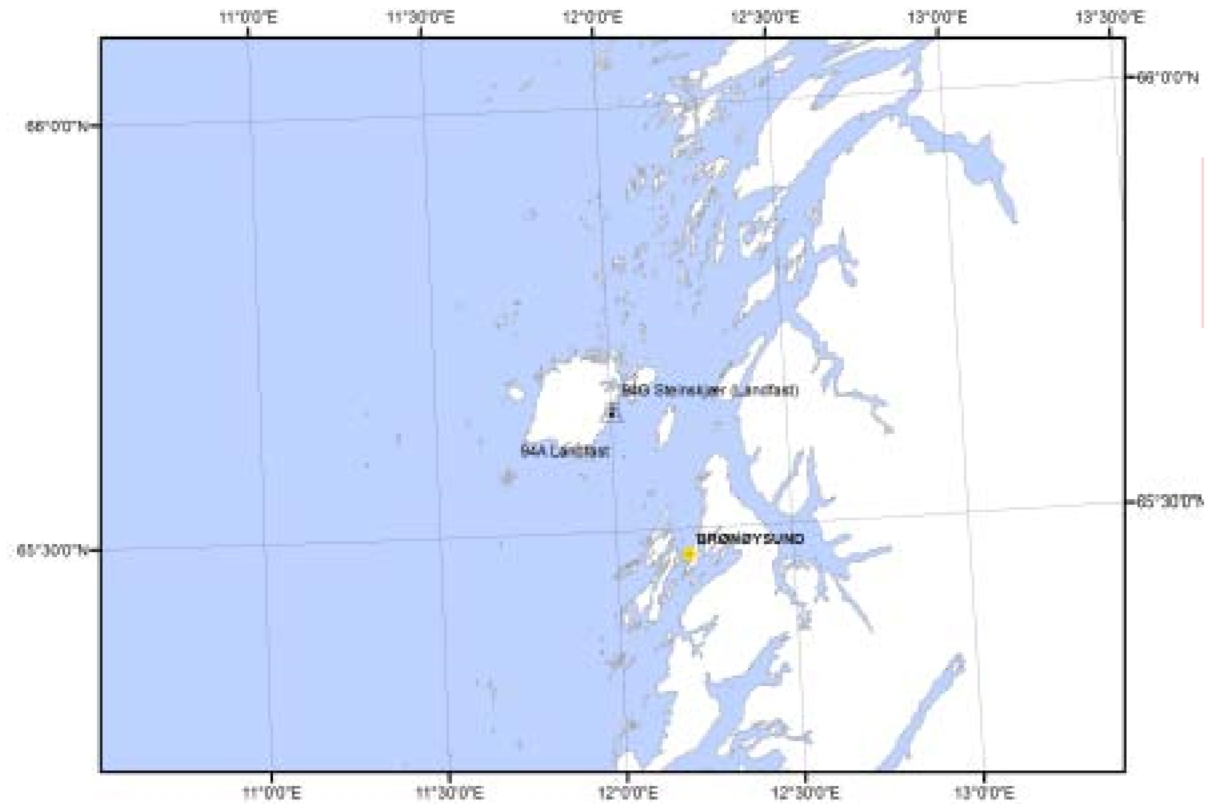
MAP 11


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
91A Nerdvika
KRISTIANSUND

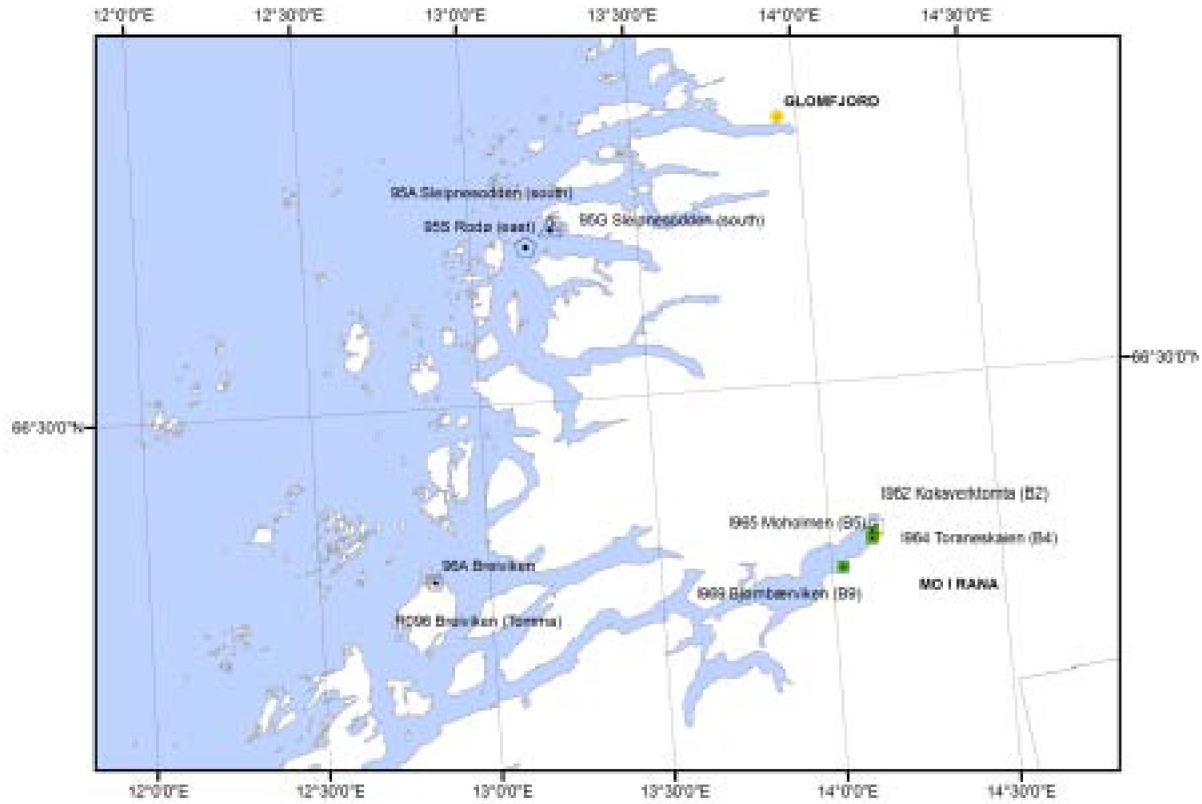
MAP 12


9°0'0"E
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
93A Sætervik
93G Sætervika (Stadsvikskjæret)
93S Raudøya (northeast)
92F Stokken area
92B Stokken area
92F Stokken area
92A2 Nygården
92A1 Krokholmen
HARSVIK

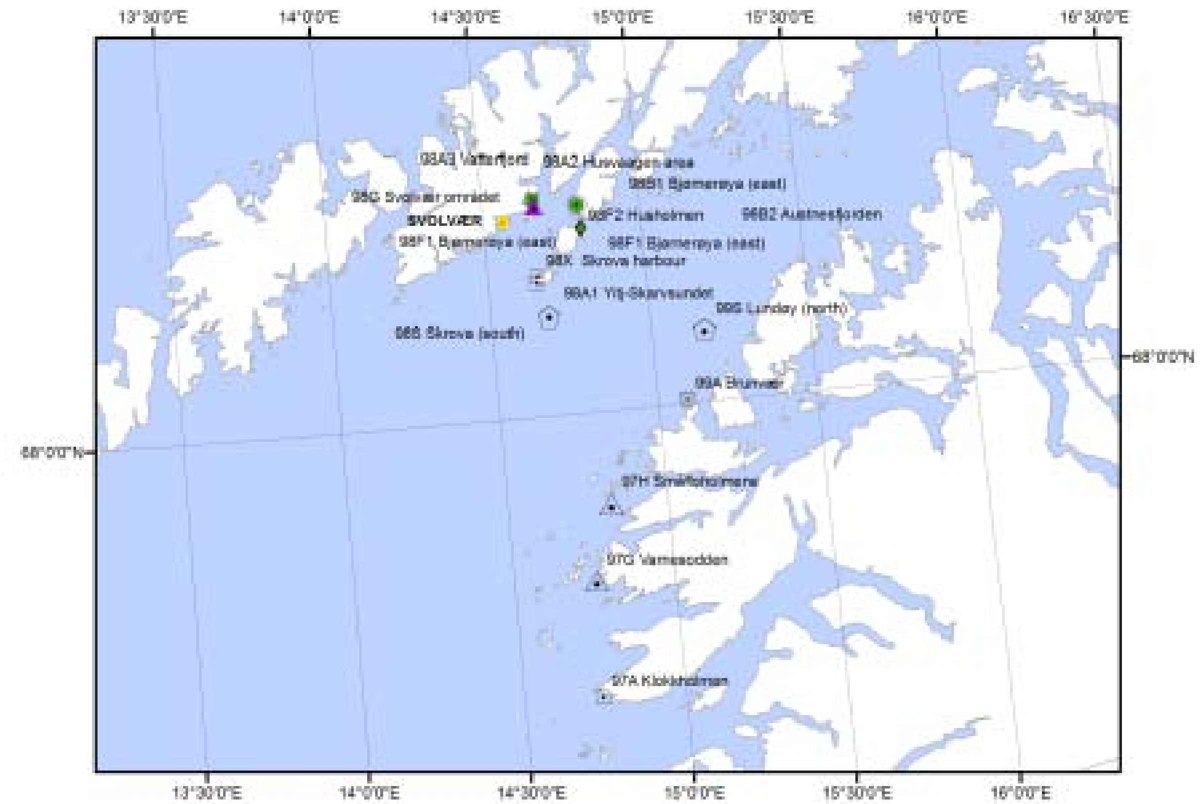
MAP 13


11°0'0"E
11°30'0"E
12°0'0"E
12°30'0"E
13°0'0"E
13°30'0"E
66°0'0"N
65°30'0"N
94G Steinskjær (Landfast)
94A Landfast
BRØNØYSUND

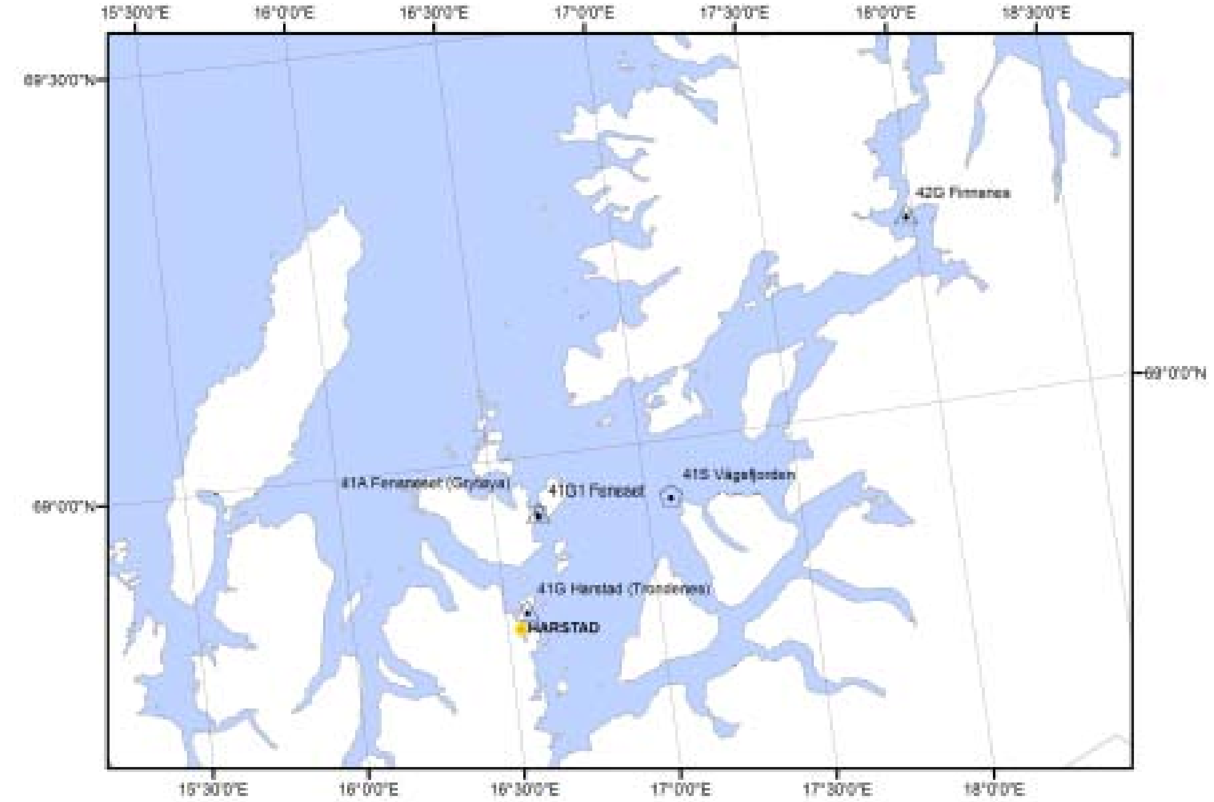
MAP 14


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
MO I RANA

MAP 15


13°30'0"E
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
SVOLVÆR
98K Skrova harbour

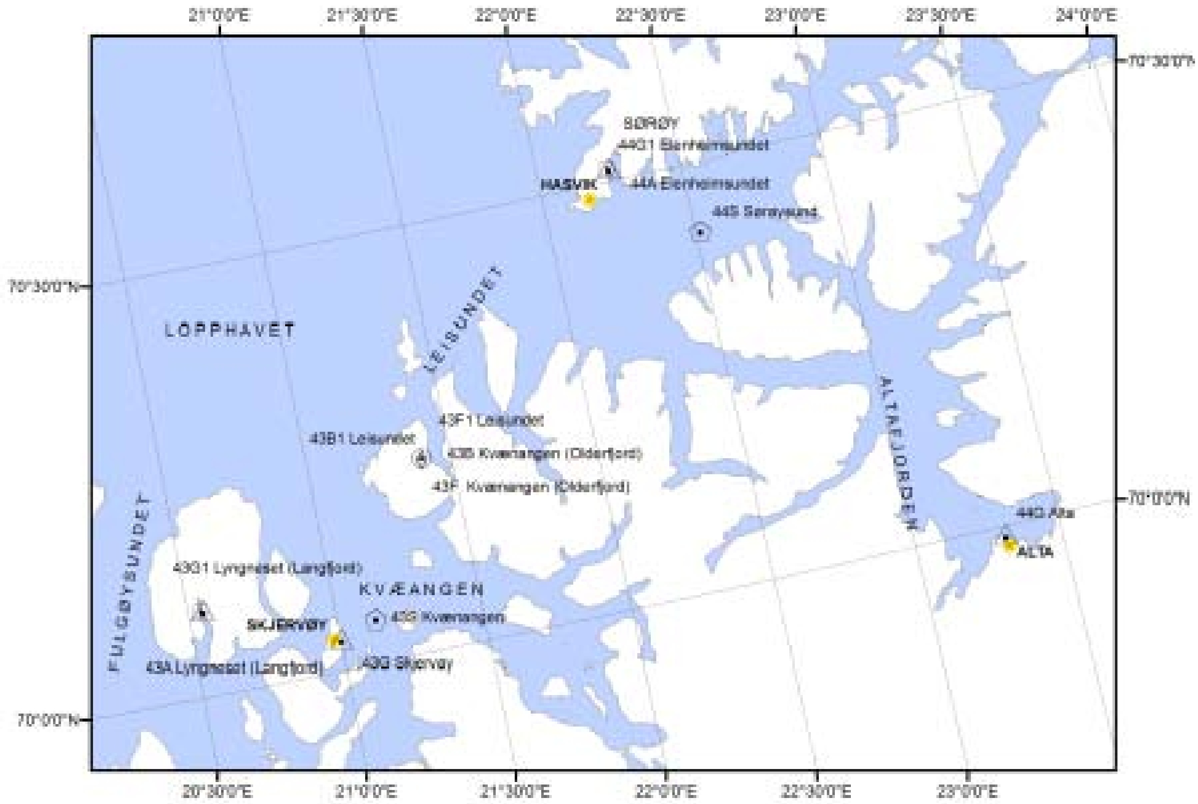
MAP 16


42G Finnsnes
41S Vågsfjorden
41G Harstad (Trondenes)
HARSTAD

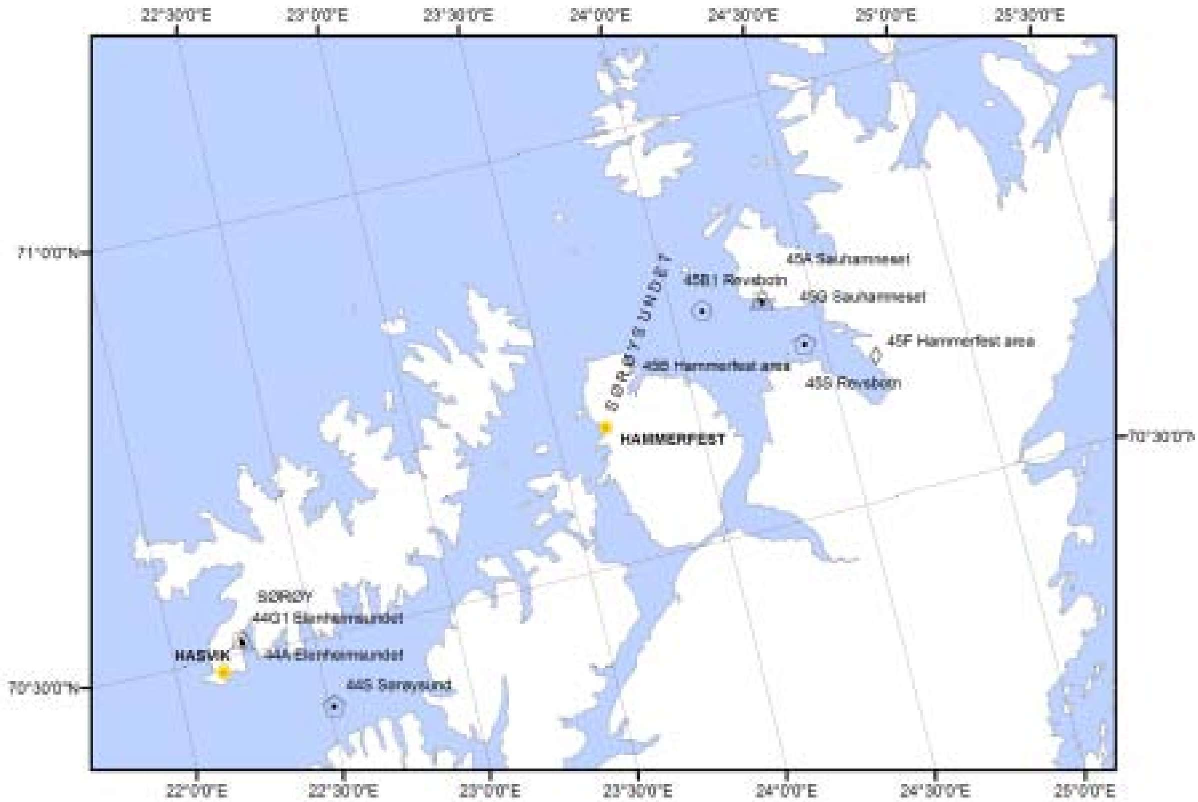
MAP 17


TROMSØ
KVALØY
MALANGEN
42G Finnsnes

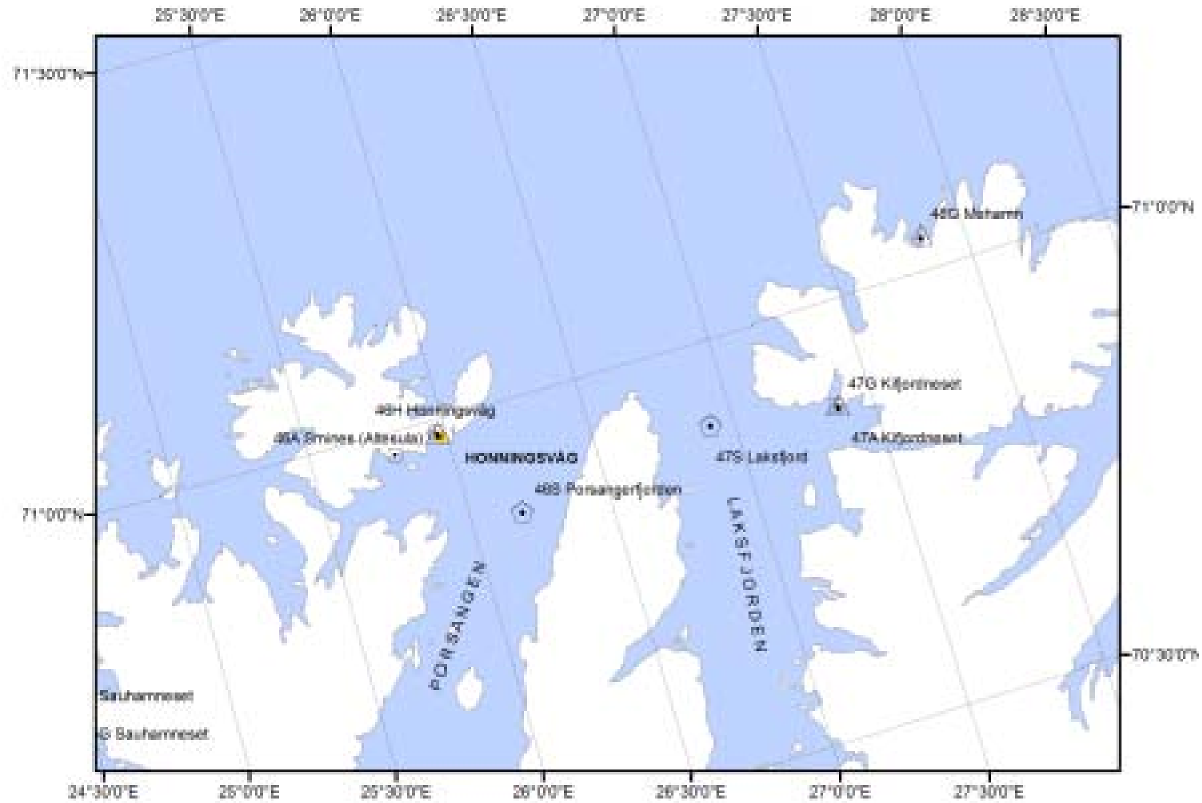
MAP 18


SØRØY
44G1 Eienheimsundet
HASVIK
44A Eienheimsundet
44S Sørøysund
LØPPHAVET
LEISUNDET
43F1 Leisundet
43B1 Leisundet
43B Kvænangen (Olderfjord)
43F Kvænangen (Olderfjord)
ALTAFJORDEN
44G Alta
ALTA
FUGLØYSUNDET
43G1 Lyngneset (Langfjord)
KVÆANGEN
43S Kvænangen
SKJERVØY
43A Lyngneset (Langfjord)
43G Skjervøy

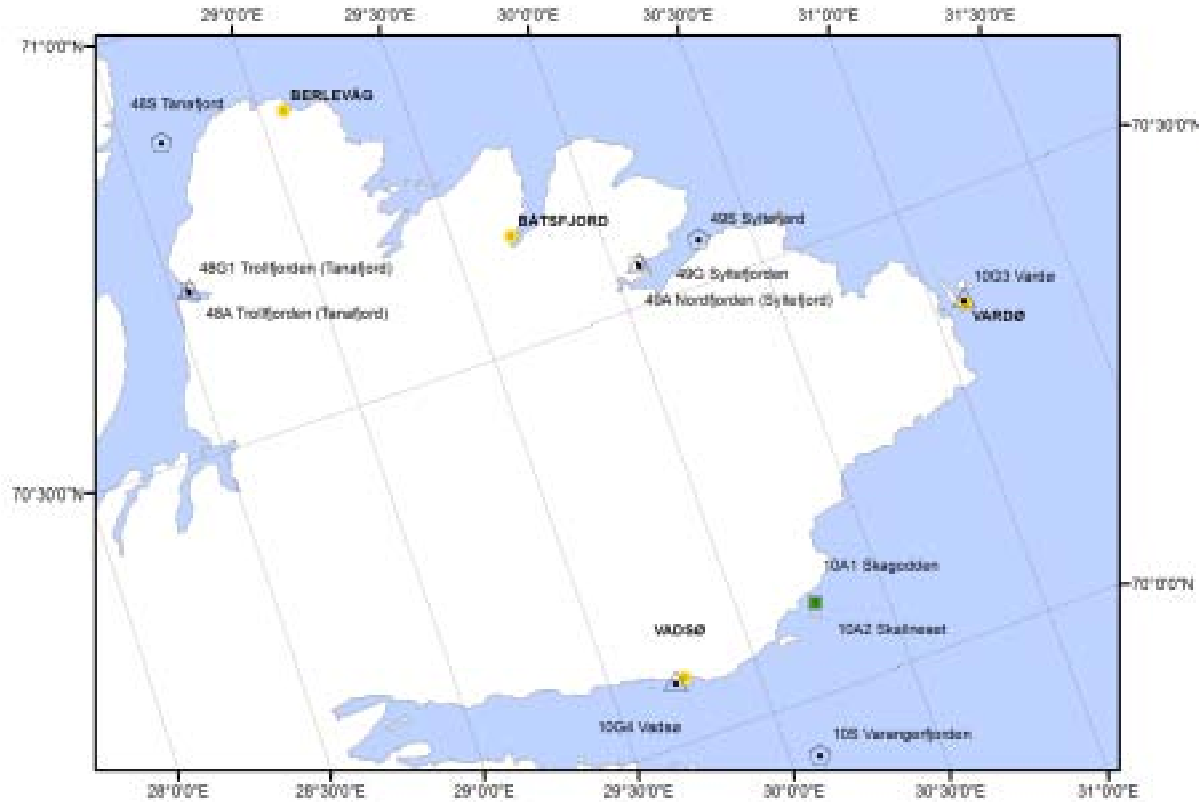
MAP 19


45A Sauhamneset
45B1 Revsbotn
45G Sauhamneset
SØRØYSUNDET
45F Hammerfest area
45B Hammerfest area
45S Revsbotn
HAMMERFEST
SØRØY
44G1 Eienheimsundet
HASVIK
44A Eienheimsundet
44S Sørøysund

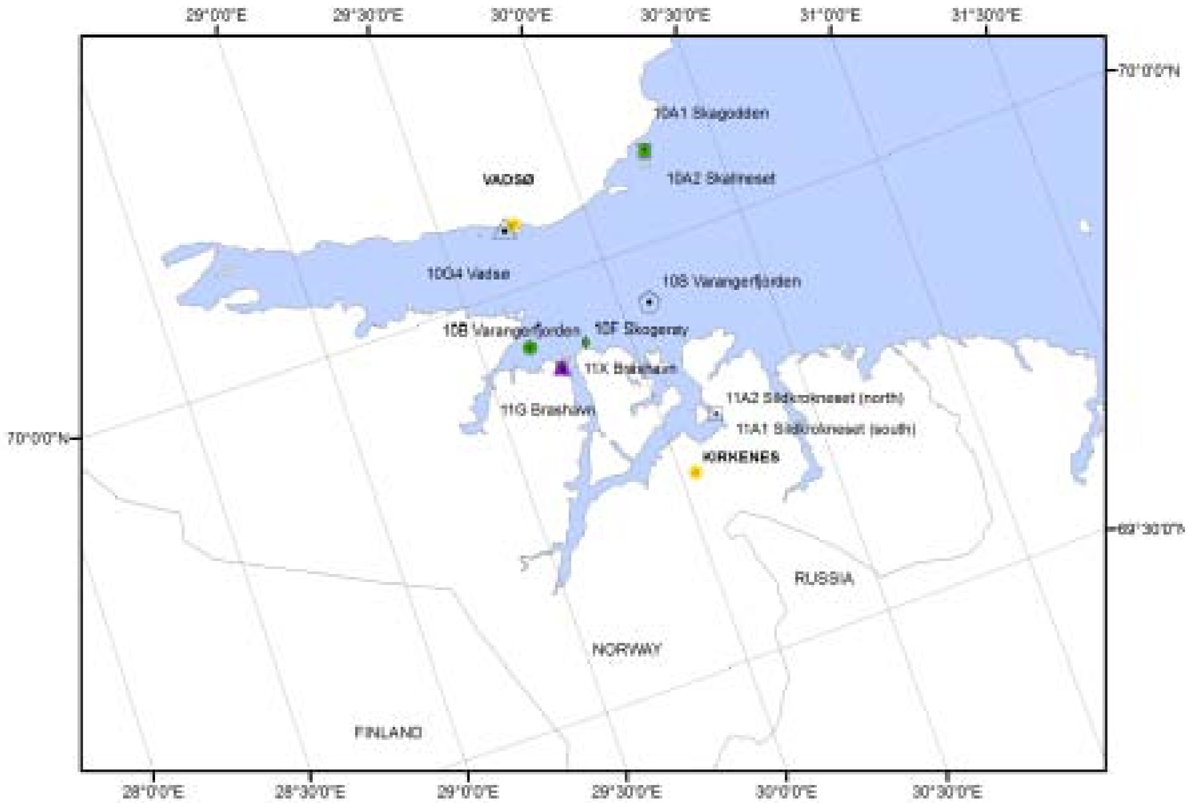
MAP 20


HONNINGSVÅG
47G Kifjordneset
47S Laksfjord
PORSANGEN
LAKSFJORDEN

MAP 21


BERLEVÅG
BÅTSFJORD
48G1 Trollfjorden (Tanafjord)
48A Trollfjorden (Tanafjord)
49G Syltefjorden
VARDØ
VADSØ
10A1 Skagodden
10A2 Skallneset
10S Varangerfjorden

MAP 22


10A1 Skagodden
10A2 Skallneset
VADSØ
10G4 Vadsø
10S Varangerfjorden
10B Varangerfjorden
10F Skogerøy
11X Brashavn
11G Brashavn
11A2 Sildkroneset (north)
11A1 Sildkroneset (south)
KIRKENES
RUSSIA
NORWAY
FINLAND

MAP 23

Appendix G
Overview of materials and analyses 2010

Nominal station positions are shown on maps in Appendix F

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-BI	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 retardants 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 G. Sampling and analyses for 2010 –biota.

jmpst	Station_Name	Longitude	Latitude	speci	tissu	No samples	<>	I-MET	O-BR	OC-CB	OC-CL	OC-DD	OC-DX	OC-HC	O-FL	O-MET	O-PAH
10B	Varangerfjorden	29.667	69.933	GADU MOR	LI	25		25		25	25	25		25			
10F	Skogerøy	29.85	69.917	PLEU PLA	LI	4		4		4	4	4		4			
13BH	Kristiansand havn	7.988	58.135	GADU MOR	LI	25	25	25	25	25	25	25		25	25		
15B	Ullerø area	6.717	58.05	GADU MOR	LI	21		21		21	21	21		21			
15F	Ullerø area	6.717	58.05	LIMA LIM	LI	5		5		5	5	5		5			
21F	Åkrafjord	6.117	59.75	LEPI WHI	LI	4		4		4	4	4		4			
23B	Karihavet area	5.133	59.9	GADU MOR	LI	25	25	25	25	25	25	25		25	25		
30B	Oslo City area	10.56	59.799	GADU MOR	LI	25	25	25	25	25	25	25		25	25		
33F	Sande (east side)	10.35	59.528	PLAT FLE	LI	5		5		5	5	5		5			
36B	Færder area	10.436	59.04	GADU MOR	LI	25	25	25	25	25	25	25		25	25		
36F	Færder area	10.383	59.067	LIMA LIM	LI	5		5		5	5	5		5			
43BH	Tromsø havn	18.974	69.653	GADU MOR	LI	25	25	25	25	25	25	25		25	25		
53B	Inner Sørfjord	6.567	60.167	GADU MOR	LI	25	25	25	25	25	25	25		25	25		
53F	Inner Sørfjord	6.567	60.167	PLAT FLE	LI	4		4		4	4	4		4			
67B	Strandebarm area	6.033	60.267	GADU MOR	LI	14		14		14	14	14		14			
67F	Strandebarm area	6.033	60.267	LEPI WHI	LI	3		3		3	3	3		3			
80BH	Trondheim	10.392	63.442	GADU MOR	LI	4	4	4	4	4	4	4		4	4		
98B1	Bjørnerøya (east)	14.803	68.247	GADU MOR	LI	25	25	25	25	25	25	25		25	25		
98F2	Husholmen	14.808	68.219	PLEU PLA	LI	5		5		5	5	5		5			
10B	Varangerfjorden	29.667	69.933	GADU MOR	MU	30		25		5	5	5		5			
10F	Skogerøy	29.85	69.917	PLEU PLA	MU	4		4		4	4	4		4			
13BH	Kristiansand havn	7.988	58.135	GADU MOR	MU	30		25		5	5	5		5			
15B	Ullerø area	6.717	58.05	GADU MOR	MU	25		21		4	4	4		4			
15F	Ullerø area	6.717	58.05	LIMA LIM	MU	5		5		5	5	5		5			
21F	Åkrafjord	6.117	59.75	LEPI WHI	MU	4		4		4	4	4		4			
23B	Karihavet area	5.133	59.9	GADU MOR	MU	30		25		5	5	5		5			
30B	Oslo City area	10.56	59.799	GADU MOR	MU	30		25		5	5	5		5			
33F	Sande (east side)	10.35	59.528	PLAT FLE	MU	5		5		5	5	5		5			
36B	Færder area	10.436	59.04	GADU MOR	MU	30		25		5	5	5		5			
36F	Færder area	10.383	59.067	LIMA LIM	MU	5		5		5	5	5		5			
43BH	Tromsø havn	18.974	69.653	GADU MOR	MU	30		25		5	5	5		5			
53B	Inner Sørfjord	6.567	60.167	GADU MOR	MU	30		25		5	5	5		5			
53F	Inner Sørfjord	6.567	60.167	PLAT FLE	MU	4		4		4	4	4		4			
67B	Strandebarm area	6.033	60.267	GADU MOR	MU	17		14		3	3	3		3			
67F	Strandebarm area	6.033	60.267	LEPI WHI	MU	3		3		3	3	3		3			
80BH	Trondheim	10.392	63.442	GADU MOR	MU	5		4		1	1	1		1			
98B1	Bjørnerøya (east)	14.803	68.247	GADU MOR	MU	30		25		5	5	5		5			
98F2	Husholmen	14.808	68.219	PLEU PLA	MU	5		5		5	5	5		5			
10A2	Skallneset	30.262	70.104	MYTI EDU	SB	3		3		3	3	3		3			
11G	Brashavn	29.744	69.899	NUCE LAP	SB	1	1									1	1
11X	Brashavn	29.744	69.899	MYTI EDU	SB	3	2	3		3	3	3		3		2	2
131G	Lastad	7.709	58.056	NUCE LAP	SB	1	1									1	1
15A	Gåsøy (Ullerø)	6.895	58.048	MYTI EDU	SB	3	2	3		3	3	3		3		2	2
15G	Gåsøy (Ullerø)	6.896	58.05	NUCE LAP	SB	1	1									1	1
227A2	Høgevarde	5.318	59.326	MYTI EDU	SB	3	2	3		3	3	3		3		2	2
227G1	Melandholmen/Flatskjær	5.312	59.337	NUCE LAP	SB	1	1									1	1
22A	Espevær (west)	5.144	59.584	MYTI EDU	SB	3	2	3		3	3	3		3		2	2
22G	Espevær (west)	5.144	59.584	NUCE LAP	SB	1	1									1	1
30A	Gressholmen	10.712	59.882	MYTI EDU	SB	3	2	3		3	3	3	2	3		2	3
31A	Solbergstrand	10.65	59.619	MYTI EDU	SB	3		3		3	3	3		3			
35A	Mølen	10.498	59.488	MYTI EDU	SB	3	3	3		3	3	3		3		1	1
36G	Færder	10.526	59.027	NUCE LAP	SB	1	1									1	1
51A	Byrkjenes	6.55	60.084	MYTI EDU	SB	3		3		3	3	3		3			
52A	Eitrheimsneset	6.533	60.097	MYTI EDU	SB	3		3		3	3	3		3			
56A	Kvalnes	6.602	60.22	MYTI EDU	SB	3		3		3	3	3		3			
57A	Krossanes	6.689	60.387	MYTI EDU	SB	3		3		3	3	3		3			
63A	Ranaskjær	6.405	60.421	MYTI EDU	SB	3		3		3	3	3		3			
65A	Vikingneset	6.153	60.242	MYTI EDU	SB	3		3		3	3	3		3			
69A	Lille Terøy	5.752	59.982	MYTI EDU	SB	3		3		3	3	3		3			
71A	Bjørkøya (Risøyodden)	9.754	59.023	MYTI EDU	SB	3	2	3		3	3	3	2	3		2	2
71G	Fugløyskjær	9.808	58.981	LITT LIT	SB	1	1									1	1
76A	Risøy	9.272	58.731	MYTI EDU	SB	4	2	4		4	4	4	2	4		2	2
76G	Risøy	9.276	58.728	NUCE LAP	SB	1	1									1	1
98A2	Husvaagen area	14.664	68.258	MYTI EDU	SB	3	2	3		3	3	3		3		2	2
98G	Svolvær området	14.663	68.249	NUCE LAP	SB	1	1									1	1
I022	West Damholmen	11.045	59.102	MYTI EDU	SB	3		3		3	3	3		3			
I023	Singlekalven (south)	11.137	59.095	MYTI EDU	SB	3		3		3	3	3		3			
I024	Kirkøy (north west)	10.986	59.08	MYTI EDU	SB	3		3		3	3	3		3			
I131A	Lastad	7.709	58.056	MYTI EDU	SB	3	2	3		3	3	3		3		2	3
I201	Ekkjegrunn (G1)	6.357	59.643	MYTI EDU	SB	3		3									3
I205	Bølsnes (G5)	6.3	59.592	MYTI EDU	SB	3		3									3

jmpst	Station_Name	Longitude	Latitude	speci	tissu	No samples	<>	I-MET	O-BR	OC-CB	OC-CL	OC-DD	OC-DX	OC-HC	O-FL	O-MET	O-PAH
I241	Nordnes	5.302	60.401	MYTI EDU	SB	3		3		3	3	3		3			
I242	Gravdalsneset	5.267	60.395	MYTI EDU	SB	3		3		3	3	3		3			
I243	Hegreneset	5.305	60.415	MYTI EDU	SB	3		3		3	3	3		3			
I301	Akershuskaia	10.736	59.905	MYTI EDU	SB	3	2	3		3	3	3		3		2	3
I304	Gåsøya	10.589	59.851	MYTI EDU	SB	3		3		3	3	3		3			3
I306	Håøya	10.555	59.713	MYTI EDU	SB	3		3		3	3	3		3			3
I307	Ramtonholmen	10.523	59.744	MYTI EDU	SB	3	2	3		3	3	3		3		2	3
I712	Croftholmen	9.707	59.045	MYTI EDU	SB	3		3		3	3	3	1	3			
I713	Strømtangen	9.692	59.05	MYTI EDU	SB	3		3		3	3	3	1	3			
I912	Honnhammer	8.162	62.853	MYTI EDU	SB	3											3
I913	Fjøseid	8.275	62.81	MYTI EDU	SB	3											3
I964	Toraneskaien (B4)	14.128	66.319	MYTI EDU	SB	3		3									3
I965	Moholmen (B5)	14.126	66.312	MYTI EDU	SB	3		3									3
I969	Bjørnbærviken (B9)	14.035	66.28	MYTI EDU	SB	3		3									3
I132	Svensholmen	7.989	58.125	MYTI EDU	SB	3	3	3		3	3	3	2	3		3	3
I133	Odderø (west)	8.002	58.132	MYTI EDU	SB	3	2	3		3	3	3	2	3		2	3

Appendix H
Temporal trend analyses of contaminants and biomarkers in biota 1981-2010

Median concentrations only shown for the period 2001-2010

Sorted by alphabetically by contaminant (and unit), species and area/station:

Code descriptions are given in Appendix C

Cadmium (Cd)
Mercury (Hg)
Lead (Pb)
Copper (Cu)
Zinc (Zn)
Silver (Ag)
Arsenic (As)
Nickel (Ni)
Sum PCB-7 or **CB_S7** (CB: 28+52+101+118+138+153+180)
DDEPP (ppDDE)
HCB
HCHG (gamma-hexachlorocyclohexane)
BAP (benzo[*a*]pyrene)
PK_Sn or PK_S (sum carcinogen PAHs, cf. Appendix B)
P-Σn or P_S (sum of PAHs, dicyclic "PAHs" not included, cf. Appendix B)
PFOS (perfluoroctanoic sulphonate**)**
TBT (Tributyltin)
TCDDN (Dioxin toxicity equivalents-Nordic model)
BDESS (Sum brominated flame retardants)
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***)**

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 upper limit to presumed "high background" ("m" missing background value)

TRD trend for all time series with 3 or more years data. Trend analyses were done for the entire period (Long) and for the last 10-year period (Short).

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"

Sm	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)
Pw	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.

Parameter	Unit	Station	Station Name	Species	Tissue	Basis	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	OC	Class	Trend	Sm	Power	First Year	No of Years	Trend	Sm	Power	First Year	No of Years
																				long	long	long	long	long	short	short	short	short	short
Ag	mg/kg	10B	Varangerfjorden	GADU MOR	LI	W										0,15	0,05	m					2009	2				2009	2
Ag	mg/kg	13BH	Kristiansand havn	GADU MOR	LI	W										2,11	0,31	m					2009	2				2009	2
Ag	mg/kg	15B	Ullerø area	GADU MOR	LI	W										0,33	0,17	m					2009	2				2009	2
Ag	mg/kg	23B	Karihavet area	GADU MOR	LI	W								0,47		3,77	0,49	m		-?	m	>25	1993	4	-?	m	>25	2007	3
Ag	mg/kg	30B	Oslo City area	GADU MOR	LI	W								5,51		10,7	10,1	m		-?	m	12	1993	4	-?	m	10	2007	3
Ag	mg/kg	36B	Færder area	GADU MOR	LI	W										0,61	1,04	m					2009	2				2009	2
Ag	mg/kg	43BH	Tromsø havn	GADU MOR	LI	W										0,19	0,34	m					2009	2				2009	2
Ag	mg/kg	53B	Inner Sørfjord	GADU MOR	LI	W										0,24	0,32	m					2009	2				2009	2
Ag	mg/kg	67B	Strandebarm area	GADU MOR	LI	W										0,12	0,25	m					2009	2				2009	2
Ag	mg/kg	80BH	Trondheim	GADU MOR	LI	W										0,19	0,15	m					2009	2				2009	2
Ag	mg/kg	98B1	Bjørnerøya (east)	GADU MOR	LI	W										0,07	0,28	m					2009	2				2009	2
Ag	mg/kg	21F	Åkrafjord	LEPI WHI	LI	W										0,08	0,14	m					2009	2				2009	2
Ag	mg/kg	67F	Strandebarm area	LEPI WHI	LI	W										0,06	0,07	m					2009	2				2009	2
Ag	mg/kg	15F	Ullerø area	LIMA LIM	LI	W										0,06	0,06	m					2009	2				2009	2
Ag	mg/kg	36F	Færder area	LIMA LIM	LI	W										0,03	0,05	m					2009	2				2009	2
Ag	mg/kg	10A2	Skallneset	MYTI EDU	SB	D									0,11	0,12	0,14	no	I	-?	m	<=5	2008	3	-?	m	<=5	2008	3
Ag	mg/kg	11X	Brashavn	MYTI EDU	SB	D										0,14	0,11	no	I				2009	2				2009	2
Ag	mg/kg	15A	Gåsøy (Ullerø)	MYTI EDU	SB	D										0,07	0,07	no	I				2009	2				2009	2
Ag	mg/kg	227A2	Høgevarde	MYTI EDU	SB	D										0,03	0,03	no	I				2009	2				2009	2
Ag	mg/kg	22A	Espevær (west)	MYTI EDU	SB	D									0,02	0,02	0,04	no	I	-?	m	7	2008	3	-?	m	7	2008	3
Ag	mg/kg	30A	Gressholmen	MYTI EDU	SB	D									0,06	0,16	0,07	no	I	-?	m	20	2008	3	-?	m	20	2008	3
Ag	mg/kg	31A	Solbergstrand	MYTI EDU	SB	D										0,06	0,06	no	I				2009	2				2009	2
Ag	mg/kg	35A	Mølen	MYTI EDU	SB	D										0,06	0,04	no	I				2009	2				2009	2
Ag	mg/kg	51A	Byrkjenes	MYTI EDU	SB	D										0,04	0,06	no	I				2009	2				2009	2
Ag	mg/kg	52A	Eitrheimsneset	MYTI EDU	SB	D									0,05	0,05	0,06	no	I	-?	m	6	2008	3	-?	m	6	2008	3
Ag	mg/kg	56A	Kvalnes	MYTI EDU	SB	D										0,04	0,05	no	I				2009	2				2009	2
Ag	mg/kg	57A	Krossanes	MYTI EDU	SB	D										0,03	0,08	no	I				2009	2				2009	2
Ag	mg/kg	63A	Ranaskjær	MYTI EDU	SB	D										0,03	0,03	no	I				2009	2				2009	2
Ag	mg/kg	65A	Vikingneset	MYTI EDU	SB	D										0,03	0,05	no	I				2009	2				2009	2
Ag	mg/kg	69A	Lille Terøy	MYTI EDU	SB	D										0,03	0,03	no	I				2009	2				2009	2
Ag	mg/kg	71A	Bjørkøya (Risøyodden)	MYTI EDU	SB	D									0,07	0,04	0,05	no	I	-?	m	12	2008	3	-?	m	12	2008	3
Ag	mg/kg	76A	Risøy	MYTI EDU	SB	D										0,03	0,04	no	I				2009	2				2009	2
Ag	mg/kg	98A2	Husvaagen area	MYTI EDU	SB	D									0,05	0,04	0,04	no	I	-?	m	<=5	2008	3	-?	m	<=5	2008	3
Ag	mg/kg	I022	West Damholmen	MYTI EDU	SB	D										0,05	0,05	no	I				2009	2				2009	2
Ag	mg/kg	I023	Singlekalven (south)	MYTI EDU	SB	D										0,04	0,03	no	I				2009	2				2009	2
Ag	mg/kg	I024	Kirkøy (north west)	MYTI EDU	SB	D										0,05	0,05	no	I				2009	2				2009	2
Ag	mg/kg	I131A	Lastad	MYTI EDU	SB	D										0,04	0,03	no	I				2009	2				2009	2
Ag	mg/kg	I132	Svensholmen	MYTI EDU	SB	D										0,06	0,14	no	I				2009	2				2009	2
Ag	mg/kg	I133	Odderø (west)	MYTI EDU	SB	D										0,04	0,15	no	I				2009	2				2009	2
Ag	mg/kg	I201	Ekkjegrunn (G1)	MYTI EDU	SB	D										0,03	0,04	no	I				2009	2				2009	2
Ag	mg/kg	I205	Bølsnes (G5)	MYTI EDU	SB	D										0,03	0,04	no	I				2009	2				2009	2
Ag	mg/kg	I241	Nordnes	MYTI EDU	SB	D										0,03	0,03	no	I				2009	2				2009	2
Ag	mg/kg	I242	Gravdalsneset	MYTI EDU	SB	D										0,04	0,03	no	I				2009	2				2009	2
Ag	mg/kg	I243	Hegreneset	MYTI EDU	SB	D										0,03	0,04	no	I				2009	2				2009	2
Ag	mg/kg	I301	Akershuskaia	MYTI EDU	SB	D										0,03	0,04	no	I				2009	2				2009	2
Ag	mg/kg	I304	Gåsøya	MYTI EDU	SB	D									0,03	0,04	0,04	no	I	-?	m	8	2008	3	-?	m	8	2008	3

Parameter	Unit	Station	Station Name	Species	Tissue	Basis	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	OC	Class	Trend	Sm	Power	First Year	No of Years	Trend	Sm	Power	First Year	No of Years
																				long	long	long	long	long	short	short	short	short	short
Ag	mg/kg	I306	Håøya	MYTI EDU	SB	D										0,03	0,04	no	I				2009	2				2009	2
Ag	mg/kg	I307	Ramtonholmen	MYTI EDU	SB	D									0,04	0,05	0,04	no	I	-?	m	11	2008	3	-?	m	11	2008	3
Ag	mg/kg	I712	Croftholmen	MYTI EDU	SB	D										0,04	0,04	no	I				2009	2				2009	2
Ag	mg/kg	I713	Strømtangen	MYTI EDU	SB	D										0,04	0,03	no	I				2009	2				2009	2
Ag	mg/kg	I964	Toraneskaien	MYTI EDU	SB	D										0,05	0,05	no	I				2009	2				2009	2
Ag	mg/kg	I965	Moholmen (B5)	MYTI EDU	SB	D										0,04	0,04	no	I				2009	2				2009	2
Ag	mg/kg	I969	Bjørnbærviken (B9)	MYTI EDU	SB	D										0,03	0,03	no	I				2009	2				2009	2
Ag	mg/kg	33F	Sande (east side)	PLAT FLE	LI	W										0,09	0,08	m					2009	2				2009	2
Ag	mg/kg	53F	Inner Sørfjord	PLAT FLE	LI	W										0,02	0,04	m					2009	2				2009	2
Ag	mg/kg	10F	Skogerøy	PLEU PLA	LI	W										0,18	0,19	m					2009	2				2009	2
Ag	mg/kg	98F2	Husholmen	PLEU PLA	LI	W										0,05	0,13	m					2009	2				2009	2
ALAD	ng/min/mg protein	23B	Karihavet area	GADU MOR	BL	W	19,8	24	19,4	16,8	19,7	25,8	38			34,4	55,1	m		U-	m	9	1997	12	U-	m	10	2001	8
ALAD	ng/min/mg protein	30B	Oslo City area	GADU MOR	BL	W	14,6	12,7	10,4	6,91	14,2	15	32,3	14,1	11,7	28,6	20,1	m		--	m	13	1997	14	--	m	15	2001	10
ALAD	ng/min/mg protein	53B	Inner Sørfjord	GADU MOR	BL	W	12,7	10	6,44	9,32	9,95	10,4	33,7	7,98		19,6	10	m		--	m	15	1997	13	--	m	17	2001	9
As	mg/kg	10B	Varangerfjorden	GADU MOR	LI	W										4,64	2,36	m					2009	2				2009	2
As	mg/kg	13BH	Kristiansand havn	GADU MOR	LI	W										5,1	6,15	m					2009	2				2009	2
As	mg/kg	15B	Ullerø area	GADU MOR	LI	W										4,69	4,06	m					2009	2				2009	2
As	mg/kg	23B	Karihavet area	GADU MOR	LI	W										48,5	6,45	m					2009	2				2009	2
As	mg/kg	30B	Oslo City area	GADU MOR	LI	W										43,5	30,9	m					2009	2				2009	2
As	mg/kg	36B	Færder area	GADU MOR	LI	W										4,18	8,22	m					2009	2				2009	2
As	mg/kg	43BH	Tromsø havn	GADU MOR	LI	W										6,17	7,11	m					2009	2				2009	2
As	mg/kg	53B	Inner Sørfjord	GADU MOR	LI	W										4,21	5,08	m					2009	2				2009	2
As	mg/kg	67B	Strandebarm area	GADU MOR	LI	W										3,05	5,72	m					2009	2				2009	2
As	mg/kg	80BH	Trondheim	GADU MOR	LI	W										2,4	3,67	m					2009	2				2009	2
As	mg/kg	98B1	Bjørnerøya (east)	GADU MOR	LI	W										3,49	5,03	m					2009	2				2009	2
As	mg/kg	21F	Åkrafjord	LEPI WHI	LI	W										9,91	14,9	m					2009	2				2009	2
As	mg/kg	67F	Strandebarm area	LEPI WHI	LI	W										3,52	5,64	m					2009	2				2009	2
As	mg/kg	15F	Ullerø area	LIMA LIM	LI	W										5,81	10,1	m					2009	2				2009	2
As	mg/kg	36F	Færder area	LIMA LIM	LI	W										9,61	19,3	m					2009	2				2009	2
As	mg/kg	10A2	Skallneset	MYTI EDU	SB	D									16,2	14,8	12,9	1.29	II	-?	m	<=5	2008	3	-?	m	<=5	2008	3
As	mg/kg	11X	Brashavn	MYTI EDU	SB	D										10,6	8,6	no	I				2009	2				2009	2
As	mg/kg	15A	Gåsøy (Ullerø)	MYTI EDU	SB	D										20,2	21,4	2.14	II				2009	2				2009	2
As	mg/kg	227A2	Høgevarde	MYTI EDU	SB	D										31,6	39,8	3.98	III				2009	2				2009	2
As	mg/kg	22A	Espevær (west)	MYTI EDU	SB	D									28,9	16,8	14,1	1.4	II	-?	m	8	2008	3	-?	m	8	2008	3
As	mg/kg	30A	Gressholmen	MYTI EDU	SB	D									9,25	13,4	16,7	1.67	II	-?	m	<=5	2008	3	-?	m	<=5	2008	3
As	mg/kg	31A	Solbergstrand	MYTI EDU	SB	D											14,1	1.41	II				2010	1				2010	1
As	mg/kg	35A	Mølen	MYTI EDU	SB	D	7,83	12,2	7,7	66,5	12,6	13,4	8,57	19,3	12,6	14,9	21	2.1	II	--	m	19	1996	15	--	m	19	2001	10
As	mg/kg	51A	Byrkjenes	MYTI EDU	SB	D										13,3	10,8	1.08	II				2009	2				2009	2
As	mg/kg	52A	Eitrheimsneset	MYTI EDU	SB	D									13,1	18,2	9,61	no	I	-?	m	14	2008	3	-?	m	14	2008	3
As	mg/kg	56A	Kvalnes	MYTI EDU	SB	D										25	15,4	1.54	II				2009	2				2009	2
As	mg/kg	57A	Krossanes	MYTI EDU	SB	D										19,1	13,3	1.33	II				2009	2				2009	2
As	mg/kg	63A	Ranaskjær	MYTI EDU	SB	D										21,5	18,3	1.83	II				2009	2				2009	2
As	mg/kg	65A	Vikingneset	MYTI EDU	SB	D										21,6	20,6	2.06	II				2009	2				2009	2
As	mg/kg	69A	Lille Terøy	MYTI EDU	SB	D										17,6	15,4	1.54	II				2009	2				2009	2
As	mg/kg	71A	Bjørkøya (Risøyodden)	MYTI EDU	SB	D									13,2	10,4	14,1	1.41	II	-?	m	10	2008	3	-?	m	10	2008	3
As	mg/kg	76A	Risøy	MYTI EDU	SB	D										23,6	30,3	3.03	III				2009	2				2009	2

Parameter	Unit	Station	Station Name	Species	Tissue	Basis	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	OC	Class	Trend long	Sm long	Power long	First Year long	No of Years long	Trend short	Sm short	Power short	First Year short	No of Years short
As	mg/kg	98A2	Husvaagen area	MYTI EDU	SB	D									15,7	15,7	19,5	1.95	II	-?	m	6	2008	3	-?	m	6	2008	3
As	mg/kg	I022	West Damholmen	MYTI EDU	SB	D										12,3	13	1.3	II				2009	2				2009	2
As	mg/kg	I023	Singlekalven (south)	MYTI EDU	SB	D										8,54	15,4	1.54	II				2009	2				2009	2
As	mg/kg	I024	Kirkøy (north west)	MYTI EDU	SB	D										12,9	14	1.4	II				2009	2				2009	2
As	mg/kg	I131A	Lastad	MYTI EDU	SB	D										14,8	21,2	2.12	II				2009	2				2009	2
As	mg/kg	I132	Svensholmen	MYTI EDU	SB	D										18,4	16,4	1.64	II				2009	2				2009	2
As	mg/kg	I133	Odderø (west)	MYTI EDU	SB	D										15,9	14,2	1.42	II				2009	2				2009	2
As	mg/kg	I201	Ekkjegrunn (G1)	MYTI EDU	SB	D										6,35	6,33	no	I				2009	2				2009	2
As	mg/kg	I205	Bølsnes (G5)	MYTI EDU	SB	D										8,38	7	no	I				2009	2				2009	2
As	mg/kg	I241	Nordnes	MYTI EDU	SB	D										12,4	12,3	1.23	II				2009	2				2009	2
As	mg/kg	I242	Gravdalsneset	MYTI EDU	SB	D										13,9	14,9	1.49	II				2009	2				2009	2
As	mg/kg	I243	Hegreneset	MYTI EDU	SB	D										11,5	13,5	1.35	II				2009	2				2009	2
As	mg/kg	I301	Akershuskaia	MYTI EDU	SB	D										10,3	12,2	1.22	II				2009	2				2009	2
As	mg/kg	I304	Gåsøya	MYTI EDU	SB	D									9,2	13,1	15,8	1.58	II	-?	m	6	2008	3	-?	m	6	2008	3
As	mg/kg	I306	Håøya	MYTI EDU	SB	D										14,7	16	1.6	II				2009	2				2009	2
As	mg/kg	I307	Ramtonholmen	MYTI EDU	SB	D									12,4	13,6	17,5	1.75	II	-?	m	<=5	2008	3	-?	m	<=5	2008	3
As	mg/kg	I712	Croftholmen	MYTI EDU	SB	D										12,3	13,7	1.37	II				2009	2				2009	2
As	mg/kg	I713	Strømtangen	MYTI EDU	SB	D										15,2	11,9	1.19	II				2009	2				2009	2
As	mg/kg	I964	Toraneskaien	MYTI EDU	SB	D						15,2	16,2	17,2	18,6		16,3	1.63	II	-?	m	6	2005	5	-?	m	6	2005	5
As	mg/kg	I965	Moholmen (B5)	MYTI EDU	SB	D						13	14,1	13,8	18,3		16,6	1.66	II	-?	m	7	2005	5	-?	m	7	2005	5
As	mg/kg	I969	Bjørnbærviken (B9)	MYTI EDU	SB	D						15,4	10,1	10,8	9,53	2E+06	13	1.3	II	--	m	>25	2005	6	--	m	>25	2005	6
As	mg/kg	33F	Sande (east side)	PLAT FLE	LI	W										15,7	1,47	m					2009	2				2009	2
As	mg/kg	53F	Inner Sørfjord	PLAT FLE	LI	W										9,56	2,07	m					2009	2				2009	2
As	mg/kg	10F	Skogerøy	PLEU PLA	LI	W										11,4	7,52	m					2009	2				2009	2
As	mg/kg	98F2	Husholmen	PLEU PLA	LI	W										3,75	4,44	m					2009	2				2009	2
B[a]P	µg/kg	30A	Gressholmen	MYTI EDU	SB	D	2,99	3,29	3,4	3,23	4,26	3,85	6,07	2,94	3,13	2,78	3,33	no	I	--	no	9	1992	16	--	no	10	2001	10
B[a]P	µg/kg	35A	Mølen	MYTI EDU	SB	D									5,33	2,27	3,13	no	I	-?	?	16	2008	3	-?	?	16	2008	3
B[a]P	µg/kg	I131A	Lastad	MYTI EDU	SB	D	2,4	3,27	2,79	3,73	8	3,4	3,85	3,33	3,33	3,85	3,33	no	I	--	no	11	1995	16	--	no	12	2001	10
B[a]P	µg/kg	I132	Svensholmen	MYTI EDU	SB	D	10,8	32,7	49,6	89,7	52,4	150	61,3	80	93,8	24,7	17,3	3.47	III	--	no	23	1998	13	DY	no	15	2001	10
B[a]P	µg/kg	I133	Odderø (west)	MYTI EDU	SB	D	8,47	19	23,7	39,3	135	67,3	50	22,3	123	112	6,67	1.33	II	--	no	23	1995	15	--	no	24	2001	10
B[a]P	µg/kg	I201	Ekkjegrunn (G1)	MYTI EDU	SB	D	47,4	31,7	188	7,23	3,79	8,55	5	6,08	5,2	5,41	3,53	no	I	D-	no	>25	1995	16	--	no	23	2001	10
B[a]P	µg/kg	I205	Bølsnes (G5)	MYTI EDU	SB	D	5,59	7,55	33	3,17	48,2	4,51	3,85	4,17	3,57	3,13	3,33	no	I	--	no	24	1995	15	--	no	24	2001	10
B[a]P	µg/kg	I301	Akershuskaia	MYTI EDU	SB	D	2,55	9,77	3,13	3,19	34,2	3,47	42,1	14,4	12	3,86	12,9	2.59	II	--	no	23	1992	17	--	no	25	2001	10
B[a]P	µg/kg	I304	Gåsøya	MYTI EDU	SB	D	2,94	3,76	3,85	3,07	5,33	4,39	3,85	2,94	3,33	3,57	6	1.2	II	--	1.1	9	1995	16	--	1.1	10	2001	10
B[a]P	µg/kg	I306	Håøya	MYTI EDU	SB	D	2,96	2,94	3,36	3,52	4,79	4,31	3,13	3,57	3,85	3,33	4,29	no	I	U-	no	7	1995	16	--	no	8	2001	10
B[a]P	µg/kg	I307	Ramtonholmen	MYTI EDU	SB	D	3,27	3,36	4,51	3,65	5,27	3,97	3,13	3,13	3,57	2,94	7,14	1.43	II	--	1.3	9	1995	16	--	1.3	11	2001	10
B[a]P	µg/kg	I912	Honnhammer	MYTI EDU	SB	D	135	4,17	20	3,97	1,46	3,65	3,33	3,38	9,29	2,78	2,92	no	I	--	no	24	1995	15	--	no	20	2001	10
B[a]P	µg/kg	I913	Fjøseid	MYTI EDU	SB	D	15,6	2,96	13,3	3,65	1,36	3,29	2,78	3,85	5,42	2,78	3,88	no	I	--	no	19	1999	12	--	no	18	2001	10
B[a]P	µg/kg	I964	Toraneskaien	MYTI EDU	SB	D			37,3	289	251	55,4	200	232	200	397	61,7	12.34	IV	--	22.1	23	2002	9	--	22.1	23	2002	9
B[a]P	µg/kg	I965	Moholmen (B5)	MYTI EDU	SB	D		233	30,8	43,6	87,7	19,3	58	115	66,5	233	35,4	7.09	III	--	19.4	23	2001	10	--	19.4	23	2001	10
B[a]P	µg/kg	I969	Bjørnbærviken (B9)	MYTI EDU	SB	D	17,1	23,5	3,68	46,7	34,7	7,27	24,2	23,9	25	14,9	8,33	1.67	II	--	1.1	20	1995	16	--	1.1	23	2001	10
Ba	mg/kg	35A	Mølen	MYTI EDU	SB	D	0,87	2,08	9,09	0,65	0,48	0,89	0,71	0,45	0,53	1,64	7,31	m		--	m	23	1996	12	--	m	23	2001	10
Cd	mg/kg	10B	Varangerfjorden	GADU MOR	LI	W	0,13	0,13	0,06	0,1	0,1	0,08	0,08	0,08	0,09	0,06	0,08	no	U	D-	no	10	1994	17	--	no	11	2001	10
Cd	mg/kg	13BH	Kristiansand havn	GADU MOR	LI	W										0,04	0,03	no	U				2009	2				2009	2
Cd	mg/kg	15B	Ullerø area	GADU MOR	LI	W	0,03	0,03	0,02	0,04	0,01	0,02	0,01	0,02	0,02	0,02	0,02	no	U	--	no	15	1990	21	--	no	16	2001	10
Cd	mg/kg	23B	Karihavet area	GADU MOR	LI	W	0,02	0,03	0,02	0,02	0,02	0,02	0,04	0,02	0,01	0,02	0,03	no	U	--	no	12	1990	21	--	no	13	2001	10

Parameter	Unit	Station	Station Name	Species	Tissue	Basis	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	OC	Class	Trend	Sm	Power	First Year	No of Years	Trend	Sm	Power	First Year	No of Years
																				long	long	long	long	long	short	short	short	short	short
Cd	mg/kg	30B	Oslo City area	GADU MOR	LI	W	0,08	0,11	0,11	0,11	0,1	0,07	0,12	0,19	0,17	0,16	0,18	no	U	U-	no	15	1984	27	U-	no	10	2001	10
Cd	mg/kg	36B	Færder area	GADU MOR	LI	W	0,04	0,03	0,03	0,01	0,01	0,03	0,03	0,03	0,03	0,03	0,04	no	U	DY	no	15	1981	30	--	no	16	2001	10
Cd	mg/kg	43BH	Tromsø havn	GADU MOR	LI	W										0,17	0,14	no	U				2009	2				2009	2
Cd	mg/kg	53B	Inner Sørfjord	GADU MOR	LI	W	0,83	0,57	0,43	0,25	0,37	0,41	0,2	0,28	0,49	0,2	0,16	no	U	UY	no	21	1986	23	--	no	14	2001	10
Cd	mg/kg	67B	Strandebarm area	GADU MOR	LI	W	0,06	0,03	0,02	0,01	0,02	0,03	0,01	0,02	0,01	0,01	0,01	no	U	D-	no	18	1987	24	--	no	14	2001	10
Cd	mg/kg	80BH	Trondheim	GADU MOR	LI	W										0,02	0,02	no	U				2009	2				2009	2
Cd	mg/kg	98B1	Bjørnerøya (east)	GADU MOR	LI	W			0,03	0,03	0,03	0,05	0,04	0,07	0,02	0,02	0,05	no	U	--	no	19	1992	17	--	no	15	2002	9
Cd	mg/kg	21F	Åkrafjord	LEPI WHI	LI	W				0,06	0,08	0,11	0,19	0,05	0,04	0,11	0,18	m		--	m	18	2003	8	--	m	18	2003	8
Cd	mg/kg	67F	Strandebarm area	LEPI WHI	LI	W	0,04	0,05	0,03	0,05	0,05	0,06	0,05	0,03	0,03	0,02	0,08	m		DY	m	15	1983	25	--	m	14	2001	10
Cd	mg/kg	15F	Ullerø area	LIMA LIM	LI	W		0,31	0,13	0,11	0,19	0,23	0,38	0,15	0,28	0,18	0,3	1.01	O	--	no	14	1993	17	--	no	15	2001	10
Cd	mg/kg	36F	Færder area	LIMA LIM	LI	W	0,14	0,23	0,13	0,14	0,19	0,14	0,13	0,21	0,14	0,15	0,18	no	U	--	no	11	1990	21	--	no	10	2001	10
Cd	mg/kg	10A2	Skallneset	MYTI EDU	SB	D	1,53	1,23	1,41	1,98	1,59	1,12	1,74	2,28	2,07	1,55	1,84	no	I	--	no	11	1996	15	--	no	10	2001	10
Cd	mg/kg	11X	Brashavn	MYTI EDU	SB	D	1,07	1,32	1,36	1,36	0,91	0,98	0,93	1,16	1,14	1,02	1,11	no	I	--	no	10	1997	14	--	no	7	2001	10
Cd	mg/kg	15A	Gåsøy (Ullerø)	MYTI EDU	SB	D	1,44	4,4	1,31	0,74	0,93	0,79	1,01	0,72	0,62	0,84	1,19	no	I	--	no	14	1990	20	D-	no	13	2001	10
Cd	mg/kg	227A2	Høgevarde	MYTI EDU	SB	D										0,85	1,03	no	I				2009	2				2009	2
Cd	mg/kg	22A	Espevær (west)	MYTI EDU	SB	D	2,69	2,01	0,98	1,04	1,18	0,91	0,84	1,24	1,02	0,87	0,71	no	I	--	no	12	1990	21	--	no	10	2001	10
Cd	mg/kg	30A	Gressholmen	MYTI EDU	SB	D	1,13	0,91	1,75	1,56	2,16	1,7	1,72	1,42	1,79	1,21	1,82	no	I	U-	no	10	1984	27	--	no	10	2001	10
Cd	mg/kg	31A	Solbergstrand	MYTI EDU	SB	D	1	1,76	1,14	1,33	1,4	1,28	1,11	1,16	1,21	1,16	1,06	no	I	UY	no	12	1983	28	--	no	7	2001	10
Cd	mg/kg	35A	Mølen	MYTI EDU	SB	D	1,33	1,53	1,16	1,06	1,23	1,33	0,86	0,86	1,01	0,73	0,99	no	I	UY	no	9	1983	28	--	no	9	2001	10
Cd	mg/kg	51A	Byrkjenes	MYTI EDU	SB	D	27,3	5,36	16,6	14,7	5,21	13,8	2,35	3,42	2,84	2,29	3,27	1.63	II	D-	no	20	1987	18	--	no	18	2001	10
Cd	mg/kg	52A	Eitrheimsneset	MYTI EDU	SB	D	10,5	5,59	5	7,38	5,37	7	2,88	4,41	2,22	2,25	4,06	2.03	II	D-	1.1	18	1989	22	--	1.1	13	2001	10
Cd	mg/kg	56A	Kvalnes	MYTI EDU	SB	D	24,4	14,5	13,4	11,4	6,18	11,7	8,4	5,29	6,21	4,89	6,09	3.04	III	D-	1.8	14	1987	24	D-	1.8	11	2001	10
Cd	mg/kg	57A	Krossanes	MYTI EDU	SB	D	10,3	8,19	6,96	6,32	3,12	5,94	6,21	2,34	2,43	1,83	2,76	1.38	II	D-	no	13	1987	24	D-	no	13	2001	10
Cd	mg/kg	63A	Ranaskjær	MYTI EDU	SB	D	5,97	6,73	5,38	5,69	1,3	4	3,98	3,07	1,81	2,04	2,59	1.3	II	D-	no	16	1987	24	--	no	15	2001	10
Cd	mg/kg	65A	Vikingneset	MYTI EDU	SB	D	3,85	4,5	3,74	3,4	1,31	3,42	3,98	1,87	1,47	1,43	2,05	1.02	II	D-	no	15	1987	24	--	no	14	2001	10
Cd	mg/kg	69A	Lille Terøy	MYTI EDU	SB	D	2,87	3,8	2,41	2,36	1,19	2,26	1,51	1,41	1,23	1,09	1,64	no	I	D-	no	12	1992	19	D-	no	11	2001	10
Cd	mg/kg	71A	Bjørkøya (Risøyodden)	MYTI EDU	SB	D	1,99	1,43	1,69	1,44	1,58	1,49	1,43	1,17	1,07	0,92	2,19	1.1	II	--	no	11	1983	28	--	no	10	2001	10
Cd	mg/kg	76A	Risøy	MYTI EDU	SB	D	0,82	1,82	1,45	1,05	1,01	0,83	0,82	1,03	0,95	1,01	1,69	no	I	UY	no	9	1990	19	DY	no	8	2001	10
Cd	mg/kg	98A2	Husvaagen area	MYTI EDU	SB	D	1,68	2,38	2,13	2,27	1,07	1,29	1,18	1,05	1,42	1,24	1,84	no	I	DY	no	10	1997	13	DY	no	9	2001	10
Cd	mg/kg	I022	West Damholmen	MYTI EDU	SB	D	1,33	1,7	2,69	1,61	1,25	1,42	1,74	2	2,37	1,65	2,06	1.03	II	--	1.1	10	1995	16	--	1.1	10	2001	10
Cd	mg/kg	I023	Singlekalven (south)	MYTI EDU	SB	D	0,95	0,87	1,55	1,48	1,03	1,39	1,79	1,15	1,29	0,98	1,95	no	I	--	no	11	1995	16	--	no	12	2001	10
Cd	mg/kg	I024	Kirkøy (north west)	MYTI EDU	SB	D	1,83	2,53	2,7	2,03	1,57	1,46	1,97	1,39	2,04	1,91	1,9	no	I	DY	1.1	9	1995	16	--	1.1	8	2001	10
Cd	mg/kg	I131A	Lastad	MYTI EDU	SB	D	1,98	2,48	1,13	0,86	1,34	0,97	0,83	0,79	1	1,51	0,95	no	I	--	no	11	1995	16	--	no	12	2001	10
Cd	mg/kg	I132	Svensholmen	MYTI EDU	SB	D										1,22	1,12	no	I				2009	2				2009	2
Cd	mg/kg	I133	Odderø (west)	MYTI EDU	SB	D										1,85	1,69	no	I				2009	2				2009	2
Cd	mg/kg	I201	Ekkjegrunn (G1)	MYTI EDU	SB	D	1,42	1,49	2,8	0,71	0,96	1,47	1,55	1,44	1,48	0,92	0,71	no	I	--	no	12	1995	16	--	no	14	2001	10
Cd	mg/kg	I205	Bølsnes (G5)	MYTI EDU	SB	D	1,99	1,42	2,43	1,25	1,02	2,02	1,91	1,28	2,41	1,14	0,98	no	I	--	no	13	1995	15	--	no	13	2001	10
Cd	mg/kg	I241	Nordnes	MYTI EDU	SB	D										1,33	0,85	no	I				2009	2				2009	2
Cd	mg/kg	I242	Gravdalsneset	MYTI EDU	SB	D										1,17	1,02	no	I				2009	2				2009	2
Cd	mg/kg	I243	Hegreneset	MYTI EDU	SB	D										1,24	1,14	no	I				2009	2				2009	2
Cd	mg/kg	I301	Akershuskaia	MYTI EDU	SB	D	0,72	0,9	0,89	1,15	1,32	1,04	1,49	1,18	1,45	1,23	1,25	no	I	U-	no	9	1992	17	--	no	8	2001	10
Cd	mg/kg	I304	Gåsøya	MYTI EDU	SB	D	0,92	1,16	1,3	1,37	1,1	1,34	1,35	0,89	1,11	1,16	1,38	no	I	--	no	9	1995	16	--	no	8	2001	10
Cd	mg/kg	I306	Håøya	MYTI EDU	SB	D	0,59	0,73	0,87	1,28	0,99	1,11	0,81	0,65	1,16	0,77	0,95	no	I	--	no	9	1995	16	--	no	10	2001	10
Cd	mg/kg	I307	Ramtonholmen	MYTI EDU	SB	D	0,72	0,9	1,46	1,44	1,14	1,26	0,93	0,88	1,33	0,82	1,32	no	I	U-	no	9	1995	16	--	no	10	2001	10
Cd	mg/kg	I712	Croftholmen	MYTI EDU	SB	D										1,44	1,61	no	I				2009	2				2009	2
Cd	mg/kg	I713	Strømtangen	MYTI EDU	SB	D										1,03	1,06	no	I				2009	2				2009	2

Parameter	Unit	Station	Station Name	Species	Tissue	Basis	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	OC	Class	Trend long	Sm long	Power long	First Year long	No of Years long	Trend short	Sm short	Power short	First Year short	No of Years short
Cd	mg/kg	I964	Toraneskaien	MYTI EDU	SB	D			1,57	0,65	0,92	2,15	2,11	2,04	2,06	1,55	1,74	no	I	--	no	14	2002	9	--	no	14	2002	9
Cd	mg/kg	I965	Moholmen (B5)	MYTI EDU	SB	D		2,02	2,15	0,81	1,9	1,8	1,78	2,08	2,92	1,75	1,69	no	I	--	no	13	2001	10	--	no	13	2001	10
Cd	mg/kg	I969	Bjørnbærviken (B9)	MYTI EDU	SB	D	0,83	0,76	0,8	0,56	0,62	1,19	0,43	0,46	0,56	0,5	0,58	no	I	--	no	12	1995	16	--	no	12	2001	10
Cd	mg/kg	33F	Sande (east side)	PLAT FLE	LI	W	0,07	0,09	0,06	0,06	0,03	0,03	0,07	0,04	0,07	0,06	0,05	no	U	D-	no	13	1983	27	--	no	13	2001	10
Cd	mg/kg	53F	Inner Sørfjord	PLAT FLE	LI	W	1,77	2,74	2,74	4,56	1,46	1,31		0,77	1,34	0,15	0,28	no	U	DY	no	20	1988	21	D-	no	18	2001	9
Cd	mg/kg	10F	Skogerøy	PLEU PLA	LI	W	0,25	0,3	0,2	0,32	0,31	0,27		0,63	0,41	0,62	0,48	2.4	O	--	3.3	13	1997	12	--	3.3	11	2001	9
Cd	mg/kg	98F2	Husholmen	PLEU PLA	LI	W	0,82	0,52	0,22	0,22	0,07	1,01	0,59	0,29	0,21	0,05	0,21	1.03	O	--	no	22	2000	11	--	no	23	2001	10
Co	mg/kg	10B	Varangerfjorden	GADU MOR	LI	W										0,02	0,02	m					2009	2				2009	2
Co	mg/kg	13BH	Kristiansand havn	GADU MOR	LI	W										0,08	0,05	m					2009	2				2009	2
Co	mg/kg	15B	Ullerø area	GADU MOR	LI	W										0,04	0,03	m					2009	2				2009	2
Co	mg/kg	23B	Karihavet area	GADU MOR	LI	W										0,29	0,04	m					2009	2				2009	2
Co	mg/kg	30B	Oslo City area	GADU MOR	LI	W										0,1	0,06	m					2009	2				2009	2
Co	mg/kg	36B	Færder area	GADU MOR	LI	W										0,05	0,06	m					2009	2				2009	2
Co	mg/kg	43BH	Tromsø havn	GADU MOR	LI	W										0,02	0,02	m					2009	2				2009	2
Co	mg/kg	53B	Inner Sørfjord	GADU MOR	LI	W										0,06	0,04	m					2009	2				2009	2
Co	mg/kg	67B	Strandebarm area	GADU MOR	LI	W										0,03	0,06	m					2009	2				2009	2
Co	mg/kg	80BH	Trondheim	GADU MOR	LI	W										0,03	0,03	m					2009	2				2009	2
Co	mg/kg	98B1	Bjørnerøya (east)	GADU MOR	LI	W										0,02	0,03	m					2009	2				2009	2
Co	mg/kg	21F	Åkrafjord	LEPI WHI	LI	W										0,08	0,1	m					2009	2				2009	2
Co	mg/kg	67F	Strandebarm area	LEPI WHI	LI	W										0,06	0,06	m					2009	2				2009	2
Co	mg/kg	15F	Ullerø area	LIMA LIM	LI	W										0,21	0,18	m					2009	2				2009	2
Co	mg/kg	36F	Færder area	LIMA LIM	LI	W										0,21	0,2	m					2009	2				2009	2
Co	mg/kg	10A2	Skallneset	MYTI EDU	SB	D										0,29	0,33	m					2009	2				2009	2
Co	mg/kg	11X	Brashavn	MYTI EDU	SB	D										0,3	0,2	m					2009	2				2009	2
Co	mg/kg	15A	Gåsøy (Ullerø)	MYTI EDU	SB	D										0,56	0,7	m					2009	2				2009	2
Co	mg/kg	227A2	Høgevarde	MYTI EDU	SB	D										0,62	0,56	m					2009	2				2009	2
Co	mg/kg	22A	Espevær (west)	MYTI EDU	SB	D										0,44	0,26	m					2009	2				2009	2
Co	mg/kg	30A	Gressholmen	MYTI EDU	SB	D										0,38	0,53	m					2009	2				2009	2
Co	mg/kg	31A	Solbergstrand	MYTI EDU	SB	D										0,41	0,43	m					2009	2				2009	2
Co	mg/kg	35A	Mølen	MYTI EDU	SB	D	0,39	0,66	0,21	0,38	0,3	0,39	0,27	0,35	0,25	0,26	0,41	m		--	m	12	1996	15	--	m	13	2001	10
Co	mg/kg	51A	Byrkjenes	MYTI EDU	SB	D										0,46	0,79	m					2009	2				2009	2
Co	mg/kg	52A	Eitrheimsneset	MYTI EDU	SB	D										0,35	0,42	m					2009	2				2009	2
Co	mg/kg	56A	Kvalnes	MYTI EDU	SB	D										0,55	0,75	m					2009	2				2009	2
Co	mg/kg	57A	Krossanes	MYTI EDU	SB	D										0,36	0,64	m					2009	2				2009	2
Co	mg/kg	63A	Ranaskjær	MYTI EDU	SB	D										0,47	0,63	m					2009	2				2009	2
Co	mg/kg	65A	Vikingneset	MYTI EDU	SB	D										0,4	0,5	m					2009	2				2009	2
Co	mg/kg	69A	Lille Terøy	MYTI EDU	SB	D										0,46	0,45	m					2009	2				2009	2
Co	mg/kg	71A	Bjørkøya (Risøyodden)	MYTI EDU	SB	D										0,35	0,39	m					2009	2				2009	2
Co	mg/kg	76A	Risøy	MYTI EDU	SB	D										0,56	0,54	m					2009	2				2009	2
Co	mg/kg	98A2	Husvaagen area	MYTI EDU	SB	D										0,35	0,32	m					2009	2				2009	2
Co	mg/kg	I022	West Damholmen	MYTI EDU	SB	D										0,89	1,08	m					2009	2				2009	2
Co	mg/kg	I023	Singlekalven (south)	MYTI EDU	SB	D										0,51	0,62	m					2009	2				2009	2
Co	mg/kg	I024	Kirkøy (north west)	MYTI EDU	SB	D										1,09	1,16	m					2009	2				2009	2
Co	mg/kg	I131A	Lastad	MYTI EDU	SB	D										0,63	0,5	m					2009	2				2009	2
Co	mg/kg	I132	Svensholmen	MYTI EDU	SB	D										1,01	1,21	m					2009	2				2009	2
Co	mg/kg	I133	Odderø (west)	MYTI EDU	SB	D										1,5	1,48	m					2009	2				2009	2

Parameter	Unit	Station	Station Name	Species	Tissue	Basis	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	OC	Class	Trend	Sm	Power	First Year	No of Years	Trend	Sm	Power	First Year	No of Years
																				long	long	long	long	long	short	short	short	short	short
Co	mg/kg	I201	Ekkjegrunn (G1)	MYTI EDU	SB	D										0,32	0,34	m					2009	2				2009	2
Co	mg/kg	I205	Bølsnes (G5)	MYTI EDU	SB	D										0,3	0,31	m					2009	2				2009	2
Co	mg/kg	I241	Nordnes	MYTI EDU	SB	D										0,47	0,3	m					2009	2				2009	2
Co	mg/kg	I242	Gravdalsneset	MYTI EDU	SB	D										0,46	0,41	m					2009	2				2009	2
Co	mg/kg	I243	Hegreneset	MYTI EDU	SB	D										0,36	0,44	m					2009	2				2009	2
Co	mg/kg	I301	Akershuskaia	MYTI EDU	SB	D										0,38	0,5	m					2009	2				2009	2
Co	mg/kg	I304	Gåsøya	MYTI EDU	SB	D										0,47	0,66	m					2009	2				2009	2
Co	mg/kg	I306	Håøya	MYTI EDU	SB	D										0,37	0,5	m					2009	2				2009	2
Co	mg/kg	I307	Ramtonholmen	MYTI EDU	SB	D										0,54	0,67	m					2009	2				2009	2
Co	mg/kg	I712	Croftholmen	MYTI EDU	SB	D										0,51	0,48	m					2009	2				2009	2
Co	mg/kg	I713	Strømtangen	MYTI EDU	SB	D										0,68	0,31	m					2009	2				2009	2
Co	mg/kg	I964	Toraneskaien	MYTI EDU	SB	D										1,12	0,98	m					2009	2				2009	2
Co	mg/kg	I965	Moholmen (B5)	MYTI EDU	SB	D										1,12	0,82	m					2009	2				2009	2
Co	mg/kg	I969	Bjørnbærviken (B9)	MYTI EDU	SB	D										0,35	0,35	m					2009	2				2009	2
Co	mg/kg	33F	Sande (east side)	PLAT FLE	LI	W										0,83	0,07	m					2009	2				2009	2
Co	mg/kg	53F	Inner Sørfjord	PLAT FLE	LI	W										0,19	0,1	m					2009	2				2009	2
Co	mg/kg	10F	Skogerøy	PLEU PLA	LI	W										0,27	0,28	m					2009	2				2009	2
Co	mg/kg	98F2	Husholmen	PLEU PLA	LI	W										0,07	0,24	m					2009	2				2009	2
Cr	mg/kg	10B	Varangerfjorden	GADU MOR	LI	W										0,2	0,2	m					2009	2				2009	2
Cr	mg/kg	13BH	Kristiansand havn	GADU MOR	LI	W										0,4	0,2	m					2009	2				2009	2
Cr	mg/kg	15B	Ullerø area	GADU MOR	LI	W									0,2	0,2	0,2	m		U?	m	?	2008	3	U?	m	?	2008	3
Cr	mg/kg	23B	Karihavet area	GADU MOR	LI	W								0,3	0,2	0,2	0,2	m		-?	m	9	1993	5	-?	m	8	2007	4
Cr	mg/kg	30B	Oslo City area	GADU MOR	LI	W								0,3	0,2	0,2	0,2	m		-?	m	9	1993	5	-?	m	8	2007	4
Cr	mg/kg	36B	Færder area	GADU MOR	LI	W									0,2	0,2	0,2	m		U?	m	?	2008	3	U?	m	?	2008	3
Cr	mg/kg	43BH	Tromsø havn	GADU MOR	LI	W										0,1	0,2	m					2009	2				2009	2
Cr	mg/kg	53B	Inner Sørfjord	GADU MOR	LI	W										0,2	0,2	m					2009	2				2009	2
Cr	mg/kg	67B	Strandebarm area	GADU MOR	LI	W										0,2	0,7	m					2009	2				2009	2
Cr	mg/kg	80BH	Trondheim	GADU MOR	LI	W										0,3	0,2	m					2009	2				2009	2
Cr	mg/kg	98B1	Bjørnerøya (east)	GADU MOR	LI	W									0,2	0,2	0,2	m		U?	m	?	2008	3	U?	m	?	2008	3
Cr	mg/kg	21F	Åkrafjord	LEPI WHI	LI	W										0,2	0,2	m					2009	2				2009	2
Cr	mg/kg	67F	Strandebarm area	LEPI WHI	LI	W										0,2	0,2	m					2009	2				2009	2
Cr	mg/kg	15F	Ullerø area	LIMA LIM	LI	W										0,2	0,2	m					2009	2				2009	2
Cr	mg/kg	36F	Færder area	LIMA LIM	LI	W										0,2	0,2	m					2009	2				2009	2
Cr	mg/kg	10A2	Skallneset	MYTI EDU	SB	D									2,77	1	1,18	no	I	-?	?	16	2008	3	-?	?	16	2008	3
Cr	mg/kg	11X	Brashavn	MYTI EDU	SB	D										0,67	0,48	no	I				2009	2				2009	2
Cr	mg/kg	15A	Gåsøy (Ullerø)	MYTI EDU	SB	D										0,47	0,63	no	I				2009	2				2009	2
Cr	mg/kg	227A2	Høgevarde	MYTI EDU	SB	D										1,33	2,14	no	I				2009	2				2009	2
Cr	mg/kg	22A	Espevær (west)	MYTI EDU	SB	D									0,71	0,57	0,5	no	I	-?	?	<=5	2008	3	-?	?	<=5	2008	3
Cr	mg/kg	30A	Gressholmen	MYTI EDU	SB	D									1,25	0,82	1,33	no	I	-?	?	13	2008	3	-?	?	13	2008	3
Cr	mg/kg	31A	Solbergstrand	MYTI EDU	SB	D										1,53	2,2	no	I				2009	2				2009	2
Cr	mg/kg	35A	Mølen	MYTI EDU	SB	D		10	0,92	0,87	1,83	1,07	0,71	0,4	1,58	0,96	1,25	no	I	--	no	21	1992	13	--	no	20	2001	10
Cr	mg/kg	51A	Byrkjenes	MYTI EDU	SB	D										1,5	3,31	1.1	II				2009	2				2009	2
Cr	mg/kg	52A	Eitrheimsneset	MYTI EDU	SB	D									0,47	0,41	1,25	no	I	-?	?	16	2008	3	-?	?	16	2008	3
Cr	mg/kg	56A	Kvalnes	MYTI EDU	SB	D										1,5	1,54	no	I				2009	2				2009	2
Cr	mg/kg	57A	Krossanes	MYTI EDU	SB	D										0,95	0,71	no	I				2009	2				2009	2
Cr	mg/kg	63A	Ranaskjær	MYTI EDU	SB	D										1,77	1,33	no	I				2009	2				2009	2

Parameter	Unit	Station	Station Name	Species	Tissue	Basis	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	OC	Class	Trend long	Sm long	Power long	First Year long	No of Years long	Trend short	Sm short	Power short	First Year short	No of Years short
Cr	mg/kg	65A	Vikingneset	MYTI EDU	SB	D										1	1,25	no	I				2009	2				2009	2
Cr	mg/kg	69A	Lille Terøy	MYTI EDU	SB	D										0,67	0,63	no	I				2009	2				2009	2
Cr	mg/kg	71A	Bjørkøya (Risøyodden)	MYTI EDU	SB	D									1,18	0,67	1,43	no	I	-?	?	17	2008	3	-?	?	17	2008	3
Cr	mg/kg	76A	Risøy	MYTI EDU	SB	D										0,82	1,33	no	I				2009	2				2009	2
Cr	mg/kg	98A2	Husvaagen area	MYTI EDU	SB	D									0,71	1,13	1,18	no	I	-?	?	9	2008	3	-?	?	9	2008	3
Cr	mg/kg	I022	West Damholmen	MYTI EDU	SB	D										2,2	5,83	1.94	II				2009	2				2009	2
Cr	mg/kg	I023	Singlekalven (south)	MYTI EDU	SB	D										2,08	3,53	1.18	II				2009	2				2009	2
Cr	mg/kg	I024	Kirkøy (north west)	MYTI EDU	SB	D										5,36	15,5	5.15	III				2009	2				2009	2
Cr	mg/kg	I131A	Lastad	MYTI EDU	SB	D										1,18	1,33	no	I				2009	2				2009	2
Cr	mg/kg	I132	Svensholmen	MYTI EDU	SB	D										2,06	2,5	no	I				2009	2				2009	2
Cr	mg/kg	I133	Odderø (west)	MYTI EDU	SB	D										3,02	2,83	no	I				2009	2				2009	2
Cr	mg/kg	I201	Ekkjegrunn (G1)	MYTI EDU	SB	D										0,82	1,33	no	I				2009	2				2009	2
Cr	mg/kg	I205	Bølsnes (G5)	MYTI EDU	SB	D										1,2	1,33	no	I				2009	2				2009	2
Cr	mg/kg	I241	Nordnes	MYTI EDU	SB	D										1,73	1,58	no	I				2009	2				2009	2
Cr	mg/kg	I242	Gravdalsneset	MYTI EDU	SB	D										1,64	1,86	no	I				2009	2				2009	2
Cr	mg/kg	I243	Hegreneset	MYTI EDU	SB	D										1,9	1,33	no	I				2009	2				2009	2
Cr	mg/kg	I301	Akershuskaia	MYTI EDU	SB	D										1,4	2,12	no	I				2009	2				2009	2
Cr	mg/kg	I304	Gåsøya	MYTI EDU	SB	D									0,8	1,07	1,54	no	I	U?	?	<=5	2008	3	U?	?	<=5	2008	3
Cr	mg/kg	I306	Håøya	MYTI EDU	SB	D										0,93	0,71	no	I				2009	2				2009	2
Cr	mg/kg	I307	Ramtonholmen	MYTI EDU	SB	D									2,5	1,24	1,43	no	I	-?	?	13	2008	3	-?	?	13	2008	3
Cr	mg/kg	I712	Croftholmen	MYTI EDU	SB	D										3,52	2,83	no	I				2009	2				2009	2
Cr	mg/kg	I713	Strømtangen	MYTI EDU	SB	D										1,69	0,63	no	I				2009	2				2009	2
Cr	mg/kg	I964	Toraneskaien	MYTI EDU	SB	D										47,3	21,9	7.29	III				2009	2				2009	2
Cr	mg/kg	I965	Moholmen (B5)	MYTI EDU	SB	D										36,7	20,5	6.82	III				2009	2				2009	2
Cr	mg/kg	I969	Bjørnbærviken (B9)	MYTI EDU	SB	D										2,3	1,41	no	I				2009	2				2009	2
Cr	mg/kg	33F	Sande (east side)	PLAT FLE	LI	W										0,2	0,2	m					2009	2				2009	2
Cr	mg/kg	53F	Inner Sørfjord	PLAT FLE	LI	W										0,2	0,2	m					2009	2				2009	2
Cr	mg/kg	10F	Skogerøy	PLEU PLA	LI	W										0,2	0,2	m					2009	2				2009	2
Cr	mg/kg	98F2	Husholmen	PLEU PLA	LI	W										0,2	0,2	m					2009	2				2009	2
Cu	mg/kg	10B	Varangerfjorden	GADU MOR	LI	W	3,04	3,71	3,43	4,18	4,45	4,26	4,06	2,52	2,75	3,66	2,14	no	U	DY	no	9	1994	17	--	no	9	2001	10
Cu	mg/kg	13BH	Kristiansand havn	GADU MOR	LI	W										7,44	4,03	no	U				2009	2				2009	2
Cu	mg/kg	15B	Ullerø area	GADU MOR	LI	W	5,74	8,38	3,47	5,75	2,04	2,42	1,98	2,61	3,15	5,04	2,39	no	U	--	no	16	1990	21	--	no	13	2001	10
Cu	mg/kg	23B	Karihavet area	GADU MOR	LI	W	8,28	8,53	8,73	9,97	6,2	9,01	13,5	7,83	2,41	7,46	7,47	no	U	--	no	13	1990	21	--	no	16	2001	10
Cu	mg/kg	30B	Oslo City area	GADU MOR	LI	W	5,84	8,84	7,09	5,51	4,9	7,12	7,38	4,92	8,61	6,54	8,07	no	U	--	no	14	1986	25	--	no	10	2001	10
Cu	mg/kg	36B	Færder area	GADU MOR	LI	W	9,58	9,99	7,55	4,58	4,21	7,72	8,51	8,1	6,85	6,14	6,83	no	U	D-	no	11	1986	25	--	no	11	2001	10
Cu	mg/kg	43BH	Tromsø havn	GADU MOR	LI	W										3,59	6,13	no	U				2009	2				2009	2
Cu	mg/kg	53B	Inner Sørfjord	GADU MOR	LI	W	8,68	10,5	13,7	11,2	10,4	14,2	7,85	12	8,02	7,94	7,45	no	U	UY	no	11	1986	23	--	no	9	2001	10
Cu	mg/kg	67B	Strandebarm area	GADU MOR	LI	W	10,4	7,47	7,89	4,37	5,86	4,69	4,68	5,99	6,65	7,8	7,73	no	U	--	no	12	1987	24	--	no	8	2001	10
Cu	mg/kg	80BH	Trondheim	GADU MOR	LI	W										4,45	3,74	no	U				2009	2				2009	2
Cu	mg/kg	98B1	Bjørnerøya (east)	GADU MOR	LI	W			4,91	3,85	3,58	8,65	7,86	5,38	4,34	1,94	3,73	no	U	--	no	14	1992	17	--	no	14	2002	9
Cu	mg/kg	21F	Åkrafjord	LEPI WHI	LI	W				9,31	7,81	8,82	14,4	6,48	6,09	11,8	15,6	m		--	m	13	2003	8	--	m	13	2003	8
Cu	mg/kg	67F	Strandebarm area	LEPI WHI	LI	W	9,16	13	9,57	9,27	4,28	7,85	5,78	8,43	4,73	7,46	5,55	m		D-	m	10	1987	24	--	m	11	2001	10
Cu	mg/kg	15F	Ullerø area	LIMA LIM	LI	W		7,23	8,3	5,11	8,14	5,1	7,46	4,48	4,98	9,82	5,19	no	U	--	no	15	1991	18	--	no	12	2001	10
Cu	mg/kg	36F	Færder area	LIMA LIM	LI	W	6,45	8,9	3,93	8,09	9,57	4,9	6,99	5,27	5,01	7,23	9,31	no	U	--	no	12	1990	21	--	no	13	2001	10
Cu	mg/kg	10A2	Skallneset	MYTI EDU	SB	D	6,17	5,43	6,4	7,42	6,95	6,79	8	6,26	6,41	6,24	7,18	no	I	--	no	7	1996	15	--	no	7	2001	10
Cu	mg/kg	11X	Brashavn	MYTI EDU	SB	D	5,27	5,46	6,51	7,07	6,55	6,1	8,61	5,91	5,82	5,91	5,33	no	I	--	no	7	1997	14	--	no	7	2001	10

Parameter	Unit	Station	Station Name	Species	Tissue	Basis	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	OC	Class	Trend	Sm	Power	First Year	No of Years	Trend	Sm	Power	First Year	No of Years
																				long	long	long	long	long	short	short	short	short	short
Cu	mg/kg	15A	Gåsøy (Ullerø)	MYTI EDU	SB	D	7,62	9,47	5,68	8,07	6,47	6,81	6,81	7,59	5,9	6,24	7,44	no	I	--	no	8	1990	20	--	no	8	2001	10
Cu	mg/kg	227A2	Høgevarde	MYTI EDU	SB	D										6,93	7,13	no	I				2009	2				2009	2
Cu	mg/kg	22A	Espevær (west)	MYTI EDU	SB	D	8,54	5,27	5,86	7,81	14,9	6,82	8,72	145	9,82	6,39	5,5	no	I	--	no	19	1990	21	--	no	24	2001	10
Cu	mg/kg	30A	Gressholmen	MYTI EDU	SB	D	6,5	5,81	6,29	7,68	8,55	9,31	8,2	7,35	7,44	8,44	8,27	no	I	--	no	9	1984	26	UY	no	6	2001	10
Cu	mg/kg	31A	Solbergstrand	MYTI EDU	SB	D	5,54	5,82	5,47	6,31	6,73	6,86	8,4	6,38	5,87	6,23	29,5	2.95	II	--	2.3	12	1983	26	--	2.3	14	2001	10
Cu	mg/kg	35A	Mølen	MYTI EDU	SB	D	5,49	6,19	6,51	7,38	8,31	7,94	6,55	5,57	6,58	6,48	8,25	no	I	--	no	9	1983	27	--	no	7	2001	10
Cu	mg/kg	51A	Byrkjenes	MYTI EDU	SB	D										4,86	5,2	no	I	--	no	8	1987	8				2009	2
Cu	mg/kg	52A	Eitrheimsneset	MYTI EDU	SB	D	6,97	5,88	7,45	9,2	6,21	7,47	5,56	8,11	5,27	6,94	5,88	no	I	--	no	16	1989	22	--	no	9	2001	10
Cu	mg/kg	56A	Kvalnes	MYTI EDU	SB	D	8,72	5,77	6	9,1	5,36	8	7,47	5,61	7	6,56	7,17	no	I	--	no	9	1987	24	--	no	9	2001	10
Cu	mg/kg	57A	Krossanes	MYTI EDU	SB	D	5,13	5,81	7,21	5,98	3,26	6,88	8,29	4,33	5,22	4,75	5,94	no	I	--	no	10	1987	24	--	no	12	2001	10
Cu	mg/kg	63A	Ranaskjær	MYTI EDU	SB	D	5,69	5,46	6,67	7,95	2,39	6,27	7	5,57	4,11	5,82	5,93	no	I	--	no	12	1987	24	--	no	14	2001	10
Cu	mg/kg	65A	Vikingneset	MYTI EDU	SB	D	5,27	5,93	6,54	7,71	2,81	6,94	6,77	4,62	6,75	5,37	7,06	no	I	--	no	12	1987	24	--	no	13	2001	10
Cu	mg/kg	69A	Lille Terøy	MYTI EDU	SB	D	8,51	6,82	5,81	12,6	3,06	5,84	5,55	6,06	6,39	5,61	6,69	no	I	--	no	12	1992	19	--	no	14	2001	10
Cu	mg/kg	71A	Bjørkøya (Risøyodden)	MYTI EDU	SB	D	8,81	7,53	7,12	11,2	8,81	8,93	10,1	8,13	7,72	6,22	7,43	no	I	--	no	8	1983	26	--	no	8	2001	10
Cu	mg/kg	76A	Risøy	MYTI EDU	SB	D	6,93	7,67	6,39	9,76	7,99	7,77	7	6,29	6,86	6,77	8,39	no	I	--	no	9	1990	19	--	no	8	2001	10
Cu	mg/kg	98A2	Husvaagen area	MYTI EDU	SB	D	6,84	6,11	6,58	7,23	8,34	7,13	8,2	5,94	7,12	6,68	6,07	no	I	--	no	7	1997	13	--	no	7	2001	10
Cu	mg/kg	I022	West Damholmen	MYTI EDU	SB	D										7,7	9,64	no	I	-?	?	8	1995	5				2009	2
Cu	mg/kg	I023	Singlekalven (south)	MYTI EDU	SB	D										6,77	8,07	no	I	-?	?	9	1995	5				2009	2
Cu	mg/kg	I024	Kirkøy (north west)	MYTI EDU	SB	D										10,1	10,2	1.02	II	-?	?	6	1995	5				2009	2
Cu	mg/kg	I131A	Lastad	MYTI EDU	SB	D										8,23	7,69	no	I	-?	?	6	1995	5				2009	2
Cu	mg/kg	I132	Svensholmen	MYTI EDU	SB	D										12,2	10,5	1.05	II				2009	2				2009	2
Cu	mg/kg	I133	Odderø (west)	MYTI EDU	SB	D										11	9,62	no	I				2009	2				2009	2
Cu	mg/kg	I201	Ekkjegrunn (G1)	MYTI EDU	SB	D										4,41	4,67	no	I				2009	2				2009	2
Cu	mg/kg	I205	Bølsnes (G5)	MYTI EDU	SB	D										3,93	4,53	no	I				2009	2				2009	2
Cu	mg/kg	I241	Nordnes	MYTI EDU	SB	D										8,4	7,06	no	I				2009	2				2009	2
Cu	mg/kg	I242	Gravdalsneset	MYTI EDU	SB	D										7,14	7,13	no	I				2009	2				2009	2
Cu	mg/kg	I243	Hegreneset	MYTI EDU	SB	D										7,21	7,5	no	I				2009	2				2009	2
Cu	mg/kg	I301	Akershuskaia	MYTI EDU	SB	D										7,53	9,29	no	I	--	no	9	1992	6				2009	2
Cu	mg/kg	I304	Gåsøya	MYTI EDU	SB	D										6,57	7	no	I	-?	?	8	1995	5				2009	2
Cu	mg/kg	I306	Håøya	MYTI EDU	SB	D										5,73	6,14	no	I	-?	?	8	1995	5				2009	2
Cu	mg/kg	I307	Ramtonholmen	MYTI EDU	SB	D										6,47	6,5	no	I	-?	?	<=5	1995	5				2009	2
Cu	mg/kg	I712	Croftholmen	MYTI EDU	SB	D										5,62	6,39	no	I				2009	2				2009	2
Cu	mg/kg	I713	Strømtangen	MYTI EDU	SB	D										6,85	7,19	no	I				2009	2				2009	2
Cu	mg/kg	I964	Toraneskaien	MYTI EDU	SB	D								10,2		11,2	11,4	1.14	II	-?	?	<=5	2007	3	-?	?	<=5	2007	3
Cu	mg/kg	I965	Moholmen (B5)	MYTI EDU	SB	D								7		10,2	7,87	no	I	-?	?	10	2007	3	-?	?	10	2007	3
Cu	mg/kg	I969	Bjørnbærviken (B9)	MYTI EDU	SB	D								6,33		5,45	6,85	no	I	-?	?	8	2007	3	-?	?	8	2007	3
Cu	mg/kg	33F	Sande (east side)	PLAT FLE	LI	W	14	12,3	12	16,6	13,4	14,3	15,7	8,41	11,9	15	16,2	1.62	O	D-	no	10	1986	25	--	no	10	2001	10
Cu	mg/kg	53F	Inner Sørfjord	PLAT FLE	LI	W	5,52	16	14,3	22,8	7,28	6,82		10	16,8	11,6	10,2	1.02	O	--	no	15	1988	21	--	no	14	2001	9
Cu	mg/kg	10F	Skogerøy	PLEU PLA	LI	W	1,83	2,21	1,64	4,45	3,52	2,54		3,92	2,89	4,22	6,02	no	U	U-	no	12	1997	12	--	no	12	2001	9
Cu	mg/kg	98F2	Husholmen	PLEU PLA	LI	W	3,4	4,02	2,24	4,72	1,67	2,58	2,49	2,25	3,59	2,15	4,57	no	U	--	no	13	2000	11	--	no	13	2001	10
CYP1A	ABS	23B	Karihavet area	GADU MOR	LI	W				0,11	0,21	0,2	0,08			0,18	0,29	m		--	m	15	2003	6	--	m	15	2003	6
CYP1A	ABS	30B	Oslo City area	GADU MOR	LI	W				2,24	1,2	1,22	0,82	0,9	1,49	0,51	1,14	m		--	m	14	2003	8	--	m	14	2003	8
CYP1A	ABS	53B	Inner Sørfjord	GADU MOR	LI	W				0,13	0,21	0,2	0,07	0,43		0,38	0,28	m		--	m	19	2003	7	--	m	19	2003	7
EROD	pmol/min/mg protein	23B	Karihavet area	GADU MOR	LI	W	73,5	76,5	103	41,9	45,9	50,8	57,2			27,8	72,9	m		--	m	15	1997	12	--	m	14	2001	8
EROD	pmol/min/mg protein	30B	Oslo City area	GADU MOR	LI	W	260	81,2	158	88,3	69	50,9	98,7	29,7	6,12	57,8	102	m		--	m	21	1997	14	--	m	23	2001	10
EROD	pmol/min/mg protein	53B	Inner Sørfjord	GADU MOR	LI	W	128	34,7	93,9	11,7	20	53,9	54,2	14,3		41,4	51,4	m		--	m	19	1997	13	--	m	22	2001	9

Parameter	Unit	Station	Station Name	Species	Tissue	Basis	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	OC	Class	Trend	Sm	Power	First Year	No of Years	Trend	Sm	Power	First Year	No of Years
																				long	long	long	long	long	short	short	short	short	short
HCB	µg/kg	10B	Varangerfjorden	GADU MOR	MU	W	0,09	0,11	0,13	0,09	0,09	0,1	0,09	0,09	0,08	0,1	0,1	no	I	--	no	12	1994	17	--	no	7	2001	10
HCB	µg/kg	10B	Varangerfjorden	GADU MOR	LI	W	9	9,9	11	9,43	5,1	7,7	6,8	8,5	4,3	7,9	8,3	no	I	D-	no	12	1994	17	--	no	11	2001	10
HCB	µg/kg	13BH	Kristiansand havn	GADU MOR	LI	W										110	48	2.4	II				2009	2				2009	2
HCB	µg/kg	13BH	Kristiansand havn	GADU MOR	MU	W										1,4	0,66	3.3	III				2009	2				2009	2
HCB	µg/kg	15B	Ullerø area	GADU MOR	LI	W	6,2	6,6	8,2	6,4	9,7	9,1	13	9,9	6,2	6	8,8	no	I	--	no	12	1990	21	--	no	10	2001	10
HCB	µg/kg	15B	Ullerø area	GADU MOR	MU	W	0,1	0,04	0,06	0,07	0,05	0,06	0,07	0,06	0,06	0,05	0,08	no	I	D-	no	10	1990	21	--	no	9	2001	10
HCB	µg/kg	23B	Karihavet area	GADU MOR	LI	W	7,6	9,25	4,7	7,9	5,8	6,9	5,5	8,5	4,3	5,1	5,9	no	I	--	no	11	1990	21	--	no	11	2001	10
HCB	µg/kg	23B	Karihavet area	GADU MOR	MU	W	0,06	0,06	0,04	0,05	0,03	0,07	0,08	0,05	0,04	0,17	0,06	no	I	--	no	13	1990	21	--	no	16	2001	10
HCB	µg/kg	30B	Oslo City area	GADU MOR	MU	W	0,06	0,05	0,06	0,05	0,06	0,06	0,05	0,04	0,05	0,06	0,04	no	I	D-	no	10	1990	21	--	no	8	2001	10
HCB	µg/kg	30B	Oslo City area	GADU MOR	LI	W	9,1	8,9	6,7	6	8,9	6,3	5,5	7,9	6,2	3,7	5,2	no	I	DY	no	12	1984	27	--	no	10	2001	10
HCB	µg/kg	36B	Færder area	GADU MOR	LI	W	5,4	4,6	3,1	3,3	4	3,3	3,5	3,7	4,1	2,8	3,8	no	I	DY	no	12	1983	28	--	no	8	2001	10
HCB	µg/kg	36B	Færder area	GADU MOR	MU	W	0,04	0,05	0,03	0,03	0,03	0,04	0,04	0,03	0,04	0,05	0,06	no	I	DY	no	10	1983	22	--	no	9	2001	10
HCB	µg/kg	43BH	Tromsø havn	GADU MOR	MU	W										0,08	0,08	no	I				2009	2				2009	2
HCB	µg/kg	43BH	Tromsø havn	GADU MOR	LI	W										7,7	8,4	no	I				2009	2				2009	2
HCB	µg/kg	53B	Inner Sørfjord	GADU MOR	LI	W	12	2,1	3	2,25	2,6	1,3	3,9	6,3	0,5	4,2	4,6	no	I	D-	no	19	1988	22	--	no	22	2001	10
HCB	µg/kg	53B	Inner Sørfjord	GADU MOR	MU	W	0,09	0,04	0,05	0,08	0,03	0,04	0,03	0,04	0,03	0,04	0,05	no	I	--	no	15	1990	20	--	no	12	2001	10
HCB	µg/kg	67B	Strandebarm area	GADU MOR	LI	W	5,63	4,9	4,6	5,1	5,3	7,7	5,3	8	3,7	4	5,14	no	I	DY	no	11	1988	23	--	no	10	2001	10
HCB	µg/kg	67B	Strandebarm area	GADU MOR	MU	W	0,05	0,04	0,05	0,05	0,04	0,07	0,04	0,05	0,05	0,05	0,05	no	I	DY	no	9	1990	21	--	no	9	2001	10
HCB	µg/kg	80BH	Trondheim	GADU MOR	LI	W										22	13,5	no	I				2009	2				2009	2
HCB	µg/kg	80BH	Trondheim	GADU MOR	MU	W										0,16	0,1	no	I				2009	2				2009	2
HCB	µg/kg	98B1	Bjørnerøya (east)	GADU MOR	MU	W			0,07	0,09	0,08	0,11	0,08	0,1	0,07	0,05	0,08	no	I	D-	no	11	1992	17	--	no	10	2002	9
HCB	µg/kg	98B1	Bjørnerøya (east)	GADU MOR	LI	W			10	13	11	10	13	12,5	7,4	4,1	6,3	no	I	D-	no	12	1992	17	--	no	11	2002	9
HCB	µg/kg	21F	Åkrafjord	LEPI WHI	MU	W				0,04	0,03	0,07	0,06	0,03	0,04	0,04	0,04	m		--	m	13	2003	8	--	m	13	2003	8
HCB	µg/kg	21F	Åkrafjord	LEPI WHI	LI	W				4,8	1	2,9	4,2	3,2	2,7	4,4	2,48	m		--	m	17	2003	8	--	m	17	2003	8
HCB	µg/kg	67F	Strandebarm area	LEPI WHI	MU	W	0,05	0,03	0,04	0,04	0,04	0,04	0,03	0,03	0,05	0,06	0,03	m		--	m	13	1990	21	--	m	11	2001	10
HCB	µg/kg	67F	Strandebarm area	LEPI WHI	LI	W	4,8	3,4	3,8	3,9	3,45	2	2,2	2,3	2	1,9	2,2	m		DY	m	11	1988	23	D-	m	8	2001	10
HCB	µg/kg	15F	Ullerø area	LIMA LIM	LI	W		5,9	2,5	4,3	3,1	4	2,6	3,7	2,5	3,3	2,4	no	U	--	no	11	1991	18	--	no	11	2001	10
HCB	µg/kg	15F	Ullerø area	LIMA LIM	MU	W		0,15	0,04	0,09	0,03	0,09	0,05	0,06	0,07	0,06	0,08	no	U	--	no	14	1991	18	--	no	15	2001	10
HCB	µg/kg	36F	Færder area	LIMA LIM	MU	W	0,05	0,06	0,06	0,05	0,03	0,03	0,04	0,04	0,04	0,07	0,04	no	U	DY	no	9	1990	21	--	no	10	2001	10
HCB	µg/kg	36F	Færder area	LIMA LIM	LI	W	3	2,6	2	2,5	1,8	1,6	2,2	1,5	1,6	1,4	1,4	no	U	D-	no	12	1990	21	D-	no	8	2001	10
HCB	µg/kg	10A2	Skallneset	MYTI EDU	SB	D	0,28	0,29	0,31	0,28	0,28	0,26	0,19	0,23	0,18	0,35	0,24	no	I	--	no	9	1996	14	--	no	10	2001	10
HCB	µg/kg	11X	Brashavn	MYTI EDU	SB	D	0,24	0,25	0,24		0,28	0,38	0,17	0,57	0,18	0,91	0,48	no	I	--	1.6	15	1997	13	--	1.6	17	2001	9
HCB	µg/kg	15A	Gåsøy (Ullerø)	MYTI EDU	SB	D	0,18	0,25	0,3	0,33	0,29	0,31	0,17	0,35	0,22	0,18	0,18	no	I	--	no	11	1990	19	--	no	11	2001	10
HCB	µg/kg	227A2	Høgevarde	MYTI EDU	SB	D										0,27	0,33	no	I				2009	2				2009	2
HCB	µg/kg	22A	Espevær (west)	MYTI EDU	SB	D	0,2	0,3	0,24	0,33	0,22	0,18	0,17	0,2	0,2	0,21	0,24	no	I	D-	no	11	1990	21	--	no	8	2001	10
HCB	µg/kg	30A	Gressholmen	MYTI EDU	SB	D	0,36	0,23	0,34	0,32	0,24	0,19	0,25	0,35	0,25	0,22	0,2	no	I	DY	no	12	1984	26	--	no	10	2001	10
HCB	µg/kg	31A	Solbergstrand	MYTI EDU	SB	D	0,23	0,27	0,32	0,33	0,22	0,21	0,42	0,5	0,2	0,94	0,21	no	I	DY	no	16	1983	27	--	no	17	2001	10
HCB	µg/kg	35A	Mølen	MYTI EDU	SB	D	0,36	0,3	0,29	0,27	0,31	0,53	0,35	0,38	0,33	0,26	0,19	no	I	DY	no	15	1983	28	DY	no	9	2001	10
HCB	µg/kg	51A	Byrkjenes	MYTI EDU	SB	D	0,39	0,2	0,48	0,4	0,49	0,58	0,5	0,77	0,47	0,58	0,46	no	I	--	no	11	1995	16	U-	no	10	2001	10
HCB	µg/kg	52A	Eitrheimsneset	MYTI EDU	SB	D	0,2	0,38	0,32		0,46	0,31	0,5	0,67	0,47	0,17	0,31	no	I	--	no	14	1989	20	--	no	14	2001	9
HCB	µg/kg	56A	Kvalnes	MYTI EDU	SB	D	0,18	0,34	0,3	0,45	0,53	0,33	0,6	0,72	0,29	0,27	0,39	no	I	--	no	15	1988	23	--	no	13	2001	10
HCB	µg/kg	57A	Krossanes	MYTI EDU	SB	D	0,26	0,36	0,25	0,4	0,24	0,53	0,54	0,7	0,28	0,75	0,36	no	I	--	no	13	1989	21	--	no	14	2001	10
HCB	µg/kg	63A	Ranaskjær	MYTI EDU	SB	D	0,23	0,32	0,33	0,35	0,15	0,53	0,24	0,88	0,26	0,63	0,33	no	I	--	no	14	1989	21	--	no	17	2001	10
HCB	µg/kg	65A	Vikingneset	MYTI EDU	SB	D	0,15	0,27	0,26	0,29	0,18	0,56	0,19	1,1	0,2	0,95	0,31	no	I	--	no	16	1988	23	--	no	19	2001	10
HCB	µg/kg	69A	Lille Terøy	MYTI EDU	SB	D	0,21	0,33	0,31	0,27	0,25	0,37	0,16	1,3	0,17	0,67	0,31	no	I	--	no	17	1992	19	--	no	20	2001	10
HCB	µg/kg	71A	Bjørkøya (Risøyodden)	MYTI EDU	SB	D	1,85	2,42	0,81	0,33	0,61	4,47	1,27	1,33	1,21	1,38	0,93	1.86	II	D-	1.1	>25	1983	28	--	1.1	21	2001	10

Parameter	Unit	Station	Station Name	Species	Tissue	Basis	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	OC	Class	Trend long	Sm long	Power long	First Year long	No of Years long	Trend short	Sm short	Power short	First Year short	No of Years short
HCB	µg/kg	76A	Risøy	MYTI EDU	SB	D	0,22	0,24	0,3	0,31	0,97	0,29	0,19	0,24	0,35	0,18	0,2	no	I	--	no	14	1990	19	--	no	16	2001	10
HCB	µg/kg	98A2	Husvaagen area	MYTI EDU	SB	D	0,29	0,29	0,31	0,36	0,43	0,29	0,17	0,4	0,18	0,38	0,29	no	I	--	no	12	1997	13	--	no	13	2001	10
HCB	µg/kg	I022	West Damholmen	MYTI EDU	SB	D	0,46	0,54	0,55	0,38	0,51	0,48	0,69	0,67	0,55	0,5	0,36	no	I	--	no	12	1995	16	--	no	9	2001	10
HCB	µg/kg	I023	Singlekalven (south)	MYTI EDU	SB	D	0,35	0,34	0,42	0,39	0,45	0,54	0,55	0,62	0,54	0,42	0,29	no	I	--	no	10	1995	16	UY	no	8	2001	10
HCB	µg/kg	I024	Kirkøy (north west)	MYTI EDU	SB	D	0,56	0,54	0,5	0,39	0,4	0,53	0,62	0,31	0,64	0,5	0,27	no	I	--	no	12	1995	16	--	no	12	2001	10
HCB	µg/kg	I131A	Lastad	MYTI EDU	SB	D	0,29	0,33	0,29	0,37	1,4	0,72	0,64	0,63	0,64	0,77	0,2	no	I	--	no	15	1995	16	--	no	16	2001	10
HCB	µg/kg	I132	Svensholmen	MYTI EDU	SB	D	4,73	3,11	2,36	1,57	1,94	6,42	4,93	0,63	3,55	0,67	8,57	17.14	IV	--	6.7	25	1998	13	--	6.7	24	2001	10
HCB	µg/kg	I133	Odderø (west)	MYTI EDU	SB	D	6,18	2,3	1,62	2,45	3,76	7,18	4,09	0,62	4,31	1,87	7,69	15.38	IV	D-	10.9	23	1995	16	--	10.9	21	2001	10
HCB	µg/kg	I241	Nordnes	MYTI EDU	SB	D	0,62	0,29	0,55	0,3	1,14	1,33	1,55	1,65	0,69	0,56	0,47	no	I	UY	no	13	1995	16	UY	no	14	2001	10
HCB	µg/kg	I242	Gravdalsneset	MYTI EDU	SB	D	0,55	0,24	0,5	0,46	0,59	0,86	1,07	0,78	0,57	0,77	0,47	no	I	DY	no	11	1995	16	UY	no	10	2001	10
HCB	µg/kg	I243	Hegreneset	MYTI EDU	SB	D	0,67	0,26	0,44	0,34	0,61	0,92	1,19	0,89	0,5	0,53	0,43	no	I	--	no	13	1995	16	UY	no	11	2001	10
HCB	µg/kg	I301	Akershuskaia	MYTI EDU	SB	D	0,51	0,68	0,42	0,32	0,97	0,74	0,36	0,67	1,36	0,53	1,06	2.12	II	--	2.5	16	1992	17	--	2.5	16	2001	10
HCB	µg/kg	I304	Gåsøya	MYTI EDU	SB	D	0,29	0,53	0,39	0,31	0,5	0,44	0,29	0,33	0,73	0,36	0,31	no	I	--	no	13	1995	15	--	no	13	2001	10
HCB	µg/kg	I306	Håøya	MYTI EDU	SB	D	0,3	0,29	0,34	0,35	0,46	0,43	0,44	0,36	0,46	0,36	0,29	no	I	--	no	12	1995	15	--	no	7	2001	10
HCB	µg/kg	I307	Ramtonholmen	MYTI EDU	SB	D	0,33	0,34	0,45	0,37	0,36	0,24	0,5	0,47	0,57	0,44	0,27	no	I	--	no	14	1995	15	--	no	11	2001	10
HCB	µg/kg	I712	Croftholmen	MYTI EDU	SB	D	3,31	1,78	2,75	3,27	2,9	6,72	2,09	1,64	2,77	1,43	1,54	3.08	III	D-	1.2	16	1995	16	--	1.2	14	2001	10
HCB	µg/kg	I713	Strømtangen	MYTI EDU	SB	D			3,49	2,65	4,17	11,1	3,56	2,44	2,83	2,83	2,53	5.06	III	--	2.4	15	2002	9	--	2.4	15	2002	9
HCB	µg/kg	33F	Sande (east side)	PLAT FLE	LI	W	1,6	1,6	1,6	1,9	1,2	1,3	1,8	1,7	1,5	1,8	1,2	no	U	DY	no	22	1983	27	--	no	9	2001	10
HCB	µg/kg	33F	Sande (east side)	PLAT FLE	MU	W	0,04	0,04	0,05	0,06	0,03	0,03	0,04	0,04	0,04	0,05	0,03	no	I	DY	no	12	1983	22	--	no	11	2001	10
HCB	µg/kg	53F	Inner Sørfjord	PLAT FLE	LI	W	2,39	2	2,9	1,4	1	1,2		1,6	1,1	1,32	2,5	no	U	DY	no	13	1988	21	--	no	12	2001	9
HCB	µg/kg	53F	Inner Sørfjord	PLAT FLE	MU	W	0,09	0,06	0,05	0,13	0,03	0,07		0,04	0,08	0,05	0,09	no	I	DY	no	14	1990	19	--	no	16	2001	9
HCB	µg/kg	10F	Skogerøy	PLEU PLA	MU	W	0,49	0,15	0,43	0,07	0,04	0,07		0,06	0,07	0,07	0,05	no	U	D-	no	17	1997	12	--	no	18	2001	9
HCB	µg/kg	10F	Skogerøy	PLEU PLA	LI	W	6,4	2,4	1,6	2,15	1,99	2,9		1,35	1,59	1,7	0,76	no	U	D-	no	14	1997	12	--	no	12	2001	9
HCB	µg/kg	98F2	Husholmen	PLEU PLA	MU	W	0,07	0,04	0,05	0,04	0,03	0,07	0,04	0,04	0,04	0,03	0,05	no	U	--	no	11	2000	11	--	no	11	2001	10
HCB	µg/kg	98F2	Husholmen	PLEU PLA	LI	W	1,3	1,8	0,96	0,68	1,2	1,09	0,45	0,43	0,48	0,61	0,6	no	U	D-	no	13	2000	11	--	no	13	2001	10
HCHG	µg/kg	10B	Varangerfjorden	GADU MOR	MU	W	0,04	0,06	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	no	I	--	no	15	1994	17	--	no	<=5	2001	10
HCHG	µg/kg	10B	Varangerfjorden	GADU MOR	LI	W	3	2,85	1,6	2	1	1	2	0,6	1	0,5	1	no	I	D-	no	14	1994	17	--	no	14	2001	10
HCHG	µg/kg	13BH	Kristiansand havn	GADU MOR	MU	W										0,05	0,05	no	I				2009	2				2009	2
HCHG	µg/kg	13BH	Kristiansand havn	GADU MOR	LI	W										1	1	no	I				2009	2				2009	2
HCHG	µg/kg	15B	Ullerø area	GADU MOR	LI	W	3,4	2,7	1,7	1	1,5	1,5	2	1	0,8	1	2	no	I	D-	no	15	1990	21	--	no	14	2001	10
HCHG	µg/kg	15B	Ullerø area	GADU MOR	MU	W	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	no	I	--	no	10	1990	20	--	no	<=5	2001	10
HCHG	µg/kg	23B	Karihavet area	GADU MOR	MU	W	0,03	0,06	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	no	I	--	no	11	1990	21	--	no	<=5	2001	10
HCHG	µg/kg	23B	Karihavet area	GADU MOR	LI	W	5	2,88	2,6	3	2	1,5	1	2	1	0,5	1	no	I	D-	no	13	1990	21	D-	no	13	2001	10
HCHG	µg/kg	30B	Oslo City area	GADU MOR	MU	W	0,05	0,04	0,05	0,1	0,05	0,05	0,05	0,05	0,05	0,05	0,05	no	I	--	no	11	1990	20	--	no	11	2001	10
HCHG	µg/kg	30B	Oslo City area	GADU MOR	LI	W	4	2,8	2	1,5	2	2	1	0,47	0,56	0,6	1	no	I	D-	no	20	1986	25	D-	no	13	2001	10
HCHG	µg/kg	36B	Færder area	GADU MOR	LI	W	6,4	2,8	1,5	2	1,3	0,92	1	0,6	0,8	0,5	1	no	I	D-	no	16	1986	25	D-	no	11	2001	10
HCHG	µg/kg	36B	Færder area	GADU MOR	MU	W	0,03	0,06	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	no	I	D-	no	11	1990	21	--	no	<=5	2001	10
HCHG	µg/kg	43BH	Tromsø havn	GADU MOR	MU	W										0,05	0,05	no	I				2009	2				2009	2
HCHG	µg/kg	43BH	Tromsø havn	GADU MOR	LI	W										1	1	no	I				2009	2				2009	2
HCHG	µg/kg	53B	Inner Sørfjord	GADU MOR	LI	W	3,1	1,1	0,64	1	1	1	0,77	0,5	0,2	1	1	no	I	DY	no	16	1988	22	--	no	16	2001	10
HCHG	µg/kg	53B	Inner Sørfjord	GADU MOR	MU	W	0,05	0,04	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	no	I	--	no	15	1990	20	--	no	<=5	2001	10
HCHG	µg/kg	67B	Strandebarm area	GADU MOR	LI	W	4	2,6	2,3	3	2	1,5	2	1	1	1	1	no	I	DY	no	13	1988	23	D-	no	10	2001	10
HCHG	µg/kg	67B	Strandebarm area	GADU MOR	MU	W	0,04	0,04	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	no	I	D-	no	13	1990	20	--	no	<=5	2001	10
HCHG	µg/kg	80BH	Trondheim	GADU MOR	MU	W										0,05	0,1	no	I				2009	2				2009	2
HCHG	µg/kg	80BH	Trondheim	GADU MOR	LI	W										1	1	no	I				2009	2				2009	2
HCHG	µg/kg	98B1	Bjørnerøya (east)	GADU MOR	MU	W			0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	no	I	--	no	12	1992	17	--	no	<=5	2002	9

Parameter	Unit	Station	Station Name	Species	Tissue	Basis	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	OC	Class	Trend	Sm	Power	First Year	No of Years	Trend	Sm	Power	First Year	No of Years
																				long	long	long	long	long	short	short	short	short	short
HCHG	µg/kg	98B1	Bjørnerøya (east)	GADU MOR	LI	W			2,2	3	3	1,5	2	1	1	2	1	no	I	D-	no	14	1992	16	--	no	13	2002	9
HCHG	µg/kg	21F	Åkrafjord	LEPI WHI	LI	W				1,2	1,41	0,4	1	0,5	0,5	1	0,71	m		--	m	15	2003	8	--	m	15	2003	8
HCHG	µg/kg	21F	Åkrafjord	LEPI WHI	MU	W				0,05	0,05	0,05	0,05	0,05	0,06	0,05	0,05	m		--	m	6	2003	8	--	m	6	2003	8
HCHG	µg/kg	67F	Strandebarm area	LEPI WHI	LI	W	2,8	1,4	1,1	1,2	2	0,44	0,5	0,5	0,3	0,5	1	m		DY	m	17	1988	23	--	m	15	2001	10
HCHG	µg/kg	67F	Strandebarm area	LEPI WHI	MU	W	0,04	0,06	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	m		--	m	12	1990	21	--	m	<=5	2001	10
HCHG	µg/kg	15F	Ullerø area	LIMA LIM	MU	W		0,06	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,1	no	U	D-	no	14	1991	18	--	no	9	2001	10
HCHG	µg/kg	15F	Ullerø area	LIMA LIM	LI	W		2,6	1	1	1	1	1	0,5	0,5	1	0,5	no	U	DY	no	12	1991	18	--	no	13	2001	10
HCHG	µg/kg	36F	Færder area	LIMA LIM	MU	W	0,07	0,06	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	no	U	DY	no	12	1990	21	--	no	<=5	2001	10
HCHG	µg/kg	36F	Færder area	LIMA LIM	LI	W	4	1,8	1,6	2	1	1	0,5	0,6	0,5	0,5	0,5	no	U	D-	no	15	1990	21	D-	no	10	2001	10
HCHG	µg/kg	10A2	Skallneset	MYTI EDU	SB	D	0,5	0,87	0,61	0,55	0,27	0,26	0,31	0,23	0,29	0,29	0,29	no	I	DY	no	11	1996	14	DY	no	9	2001	10
HCHG	µg/kg	11X	Brashavn	MYTI EDU	SB	D	0,73	0,76	0,47	0,47	0,27	0,24	0,28	0,24	0,28	0,24	0,24	no	I	D-	no	12	1997	14	DY	no	8	2001	10
HCHG	µg/kg	15A	Gåsøy (Ullerø)	MYTI EDU	SB	D	0,6	0,76	0,59	0,66	0,34	0,29	0,28	0,29	0,26	0,29	0,29	no	I	D-	no	15	1990	19	DY	no	8	2001	10
HCHG	µg/kg	227A2	Høgevarde	MYTI EDU	SB	D										0,33	0,67	no	I				2009	2				2009	2
HCHG	µg/kg	22A	Espevær (west)	MYTI EDU	SB	D	1,06	0,89	0,48	0,66	0,37	0,29	0,28	0,33	0,31	0,24	0,48	no	I	D-	no	13	1990	21	D-	no	11	2001	10
HCHG	µg/kg	30A	Gressholmen	MYTI EDU	SB	D	0,84	0,68	0,68	0,65	0,4	0,31	0,33	0,29	0,31	0,28	0,33	no	I	D-	no	21	1986	24	DY	no	8	2001	10
HCHG	µg/kg	31A	Solbergstrand	MYTI EDU	SB	D	0,69	0,77	0,75	0,65	0,36	0,34	0,26	0,31	0,33	0,31	0,31	no	I	D-	no	21	1986	24	DY	no	8	2001	10
HCHG	µg/kg	35A	Mølen	MYTI EDU	SB	D	1,3	0,69	0,58	0,52	0,31	0,33	0,24	0,25	0,26	0,23	0,31	no	I	D-	no	22	1986	24	DY	no	8	2001	10
HCHG	µg/kg	51A	Byrkjenes	MYTI EDU	SB	D	0,92	0,35	0,79	0,81	0,35	0,56	0,31	0,42	0,33	0,71	0,67	no	I	D-	no	14	1995	16	--	no	14	2001	10
HCHG	µg/kg	52A	Eitrheimsneset	MYTI EDU	SB	D	1	1,13	0,5	0,67	0,33	0,31	0,31	0,31	1,07	0,28	0,59	no	I	D-	no	24	1989	21	--	no	16	2001	10
HCHG	µg/kg	56A	Kvalnes	MYTI EDU	SB	D	0,73	1,01	0,6	0,75	0,33	0,42	0,36	0,31	0,36	0,33	0,77	no	I	DY	no	22	1989	22	DY	no	11	2001	10
HCHG	µg/kg	57A	Krossanes	MYTI EDU	SB	D	0,73	0,94	0,51	0,59	0,24	0,33	0,36	0,22	0,28	0,25	0,71	no	I	DY	no	18	1989	21	--	no	13	2001	10
HCHG	µg/kg	63A	Ranaskjær	MYTI EDU	SB	D	0,77	0,96	0,66	0,79	0,17	0,36	0,31	0,36	0,26	0,31	0,67	no	I	DY	no	17	1989	21	--	no	15	2001	10
HCHG	µg/kg	65A	Vikingneset	MYTI EDU	SB	D	0,82	0,82	0,52	0,59	0,13	0,33	0,31	0,24	0,25	0,25	0,63	no	I	DY	no	21	1989	22	--	no	15	2001	10
HCHG	µg/kg	69A	Lille Terøy	MYTI EDU	SB	D	0,89	0,99	0,57	0,53	0,15	0,32	0,26	0,29	0,28	0,28	0,63	no	I	D-	no	16	1992	19	DY	no	13	2001	10
HCHG	µg/kg	71A	Bjørkøya (Risøyodden)	MYTI EDU	SB	D	0,94	0,93	479	0,64	0,39	0,36	0,33	0,33	0,28	0,24	0,36	no	I	D-	no	>25	1986	24	--	no	>25	2001	10
HCHG	µg/kg	76A	Risøy	MYTI EDU	SB	D	0,94	0,73	1,19	0,62	0,34	0,29	0,31	0,29	0,33	0,29	0,33	no	I	D-	no	13	1990	19	D-	no	11	2001	10
HCHG	µg/kg	98A2	Husvaagen area	MYTI EDU	SB	D	0,58	0,87	0,63	0,73	0,26	0,29	0,28	0,33	0,29	0,28	0,59	no	I	D-	no	12	1997	13	DY	no	12	2001	10
HCHG	µg/kg	I022	West Damholmen	MYTI EDU	SB	D	0,87	1,17	1,1	0,76	0,46	0,47	0,39	0,42	0,46	1	0,46	no	I	D-	no	12	1995	16	DY	no	12	2001	10
HCHG	µg/kg	I023	Singlekalven (south)	MYTI EDU	SB	D	1,22	1,03	0,83	0,79	0,43	0,43	0,39	0,39	0,39	0,77	0,33	no	I	D-	no	12	1995	16	D-	no	11	2001	10
HCHG	µg/kg	I024	Kirkøy (north west)	MYTI EDU	SB	D	0,93	0,89	0,99	0,78	0,51	0,49	0,58	0,42	0,46	1	0,46	no	I	D-	no	11	1995	16	--	no	12	2001	10
HCHG	µg/kg	I131A	Lastad	MYTI EDU	SB	D	1,06	0,65	0,56	0,73	0,33	0,34	0,39	0,33	0,33	0,39	0,33	no	I	D-	no	12	1995	16	D-	no	9	2001	10
HCHG	µg/kg	I132	Svensholmen	MYTI EDU	SB	D	0,85	0,68	0,76	0,69	0,49	2,33	0,33	0,33	0,32	0,33	0,33	no	I	D-	no	17	1998	13	--	no	17	2001	10
HCHG	µg/kg	I133	Odderø (west)	MYTI EDU	SB	D	1,01	0,79	0,79	0,85	0,43	0,46	0,52	0,39	0,39	0,4	0,39	no	I	D-	no	11	1995	16	D-	no	9	2001	10
HCHG	µg/kg	I241	Nordnes	MYTI EDU	SB	D	0,88	0,32	0,67	0,6	0,44	0,58	0,39	0,31	0,31	0,28	0,28	no	I	D-	no	12	1995	16	--	no	10	2001	10
HCHG	µg/kg	I242	Gravdalsneset	MYTI EDU	SB	D	0,85	0,36	0,61	0,7	0,41	0,36	0,36	0,29	0,36	0,36	0,33	no	I	D-	no	11	1995	16	--	no	10	2001	10
HCHG	µg/kg	I243	Hegreneset	MYTI EDU	SB	D	0,92	0,37	0,59	0,64	0,38	0,92	0,31	0,29	0,39	0,26	0,33	no	I	D-	no	13	1995	16	--	no	13	2001	10
HCHG	µg/kg	I301	Akershuskaia	MYTI EDU	SB	D	1,07	0,83	0,63	0,64	0,44	0,35	0,36	0,28	0,33	0,67	0,29	no	I	DY	no	12	1992	17	--	no	11	2001	10
HCHG	µg/kg	I304	Gåsøya	MYTI EDU	SB	D	0,94	0,75	0,77	0,61	0,39	0,44	0,39	0,29	0,33	0,71	0,39	no	I	D-	no	13	1995	15	--	no	11	2001	10
HCHG	µg/kg	I306	Håøya	MYTI EDU	SB	D	0,89	0,75	0,67	0,7	0,39	0,43	0,31	0,64	0,39	0,67	0,36	no	I	D-	no	15	1995	15	--	no	12	2001	10
HCHG	µg/kg	I307	Ramtonholmen	MYTI EDU	SB	D	0,85	0,87	0,9	0,73	0,42	0,4	0,33	0,31	0,36	0,59	0,36	no	I	D-	no	12	1995	15	DY	no	10	2001	10
HCHG	µg/kg	I712	Croftholmen	MYTI EDU	SB	D	0,85	0,99	0,81	0,68	0,46	0,4	0,46	0,31	0,36	0,35	0,42	no	I	DY	no	9	1995	16	DY	no	7	2001	10
HCHG	µg/kg	I713	Strømtangen	MYTI EDU	SB	D			0,74	0,79	0,44	0,35	0,69	0,28	0,39	0,39	0,31	no	I	--	no	12	2002	9	--	no	12	2002	9
HCHG	µg/kg	33F	Sande (east side)	PLAT FLE	MU	W	0,06	0,06	0,05	0,05	0,05	0,08	0,05	0,05	0,05	0,05	0,05	no	I	D-	no	13	1990	21	--	no	9	2001	10
HCHG	µg/kg	33F	Sande (east side)	PLAT FLE	LI	W	1,9	1,4	1,2	1,1	1	1	1	0,5	0,5	1	1	no	U	DY	no	24	1986	25	--	no	11	2001	10
HCHG	µg/kg	53F	Inner Sørfjord	PLAT FLE	LI	W	0,94	0,86	1	0,5	1	0,21		0,5	0,5	0,71	1	no	U	DY	no	17	1988	21	--	no	16	2001	9
HCHG	µg/kg	53F	Inner Sørfjord	PLAT FLE	MU	W	0,05	0,06	0,05	0,05	0,05	0,05		0,05	0,05	0,05	0,05	no	I	D-	no	10	1990	19	--	no	<=5	2001	9

Parameter	Unit	Station	Station Name	Species	Tissue	Basis	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	OC	Class	Trend long	Sm long	Power long	First Year long	No of Years long	Trend short	Sm short	Power short	First Year short	No of Years short
HCHG	µg/kg	10F	Skogerøy	PLEU PLA	MU	W	0,07	0,06	0,05	0,05	0,05	0,05		0,05	0,1	0,05	0,1	no	U	--	no	10	1997	12	--	no	11	2001	9
HCHG	µg/kg	10F	Skogerøy	PLEU PLA	LI	W	1,3	0,6	1,2	0,5	0,5	1		0,3	0,22	0,2	0,2	no	U	D-	no	14	1997	12	D-	no	14	2001	9
HCHG	µg/kg	98F2	Husholmen	PLEU PLA	MU	W	0,06	0,06	0,05	0,05	0,05	0,05	0,05	0,05	0,1	0,05	0,1	no	U	--	no	10	2000	11	--	no	11	2001	10
HCHG	µg/kg	98F2	Husholmen	PLEU PLA	LI	W	0,71	0,67	0,22	0,22	1	0,2	0,2	0,1	0,6	0,1	0,2	no	U	--	no	21	2000	11	--	no	22	2001	10
Hg	mg/kg	10B	Varangerfjorden	GADU MOR	MU	W	0,01	0,01	0,01	0,02	0,02	0,02	0,02	0,02	0,01	0,03	0,02	no	I	DY	no	11	1994	17	--	no	11	2001	10
Hg	mg/kg	13BH	Kristiansand havn	GADU MOR	MU	W										0,07	0,03	no	I				2009	2				2009	2
Hg	mg/kg	15B	Ullerø area	GADU MOR	MU	W	0,05	0,07	0,04	0,04	0,02	0,04	0,03	0,04	0,05	0,05	0,05	no	I	--	no	13	1990	21	UY	no	9	2001	10
Hg	mg/kg	23B	Karihavet area	GADU MOR	MU	W	0,09	0,09	0,09	0,07	0,1	0,08	0,1	0,11	0,11	0,06	0,07	no	I	UY	no	9	1990	21	--	no	10	2001	10
Hg	mg/kg	30B	Oslo City area	GADU MOR	MU	W	0,22	0,26	0,15	0,16	0,13	0,15	0,23	0,17	0,26	0,26	0,22	2.2	II	U-	3.0	11	1984	27	--	3.0	10	2001	10
Hg	mg/kg	36B	Færder area	GADU MOR	MU	W	0,07	0,08	0,08	0,04	0,05	0,09	0,09	0,08	0,11	0,09	0,11	1.1	II	--	1.2	11	1981	30	--	1.2	11	2001	10
Hg	mg/kg	43BH	Tromsø havn	GADU MOR	MU	W										0,03	0,03	no	I				2009	2				2009	2
Hg	mg/kg	53B	Inner Sørfjord	GADU MOR	MU	W	0,33	0,51	0,28	0,11	0,18	0,18	0,13	0,22	0,18	0,19	0,22	2.22	II	--	2.6	14	1986	23	--	2.6	12	2001	10
Hg	mg/kg	67B	Strandebarm area	GADU MOR	MU	W	0,09	0,07	0,06	0,04	0,04	0,06	0,05	0,06	0,04	0,07	0,06	no	I	D-	no	10	1987	24	--	no	10	2001	10
Hg	mg/kg	80BH	Trondheim	GADU MOR	MU	W										0,06	0,04	no	I				2009	2				2009	2
Hg	mg/kg	98B1	Bjørnerøya (east)	GADU MOR	MU	W			0,05	0,06	0,12	0,06	0,07	0,09	0,03	0,03	0,03	no	I	--	no	13	1992	17	--	no	14	2002	9
Hg	mg/kg	21F	Åkrafjord	LEPI WHI	MU	W				0,12	0,19	0,19	0,22	0,2	0,13	0,17	0,14	m		--	m	9	2003	8	--	m	9	2003	8
Hg	mg/kg	67F	Strandebarm area	LEPI WHI	MU	W	0,11	0,11	0,12	0,13	0,2	0,1	0,11	0,09	0,1	0,09	0,18	m		D-	m	15	1983	25	--	m	11	2001	10
Hg	mg/kg	15F	Ullerø area	LIMA LIM	MU	W		0,06	0,07	0,05	0,08	0,12	0,07	0,08	0,13	0,07	0,04	no	U	--	no	12	1991	18	--	no	13	2001	10
Hg	mg/kg	36F	Færder area	LIMA LIM	MU	W	0,07	0,05	0,07	0,06	0,07	0,12	0,1	0,11	0,05	0,12	0,11	1.1	O	--	1.0	11	1990	21	--	1.0	11	2001	10
Hg	mg/kg	10A2	Skallneset	MYTI EDU	SB	D	0,05	0,05	0,05	0,06	0,05	0,04	0,04	0,04	0,04	0,04	0,04	no	I	D-	no	6	1996	15	D-	no	6	2001	10
Hg	mg/kg	11X	Brashavn	MYTI EDU	SB	D	0,07	0,07	0,04	0,04	0,04	0,04	0,04	0,04	0,05	0,04	0,04	no	I	--	no	10	1997	14	--	no	8	2001	10
Hg	mg/kg	15A	Gåsøy (Ullerø)	MYTI EDU	SB	D	0,16	0,04	0,05	0,06	0,1	0,08	0,06	0,05	0,05	0,08	0,08	no	I	--	no	14	1990	20	--	no	10	2001	10
Hg	mg/kg	227A2	Høgevarde	MYTI EDU	SB	D										0,2	0,18	no	I				2009	2				2009	2
Hg	mg/kg	22A	Espevær (west)	MYTI EDU	SB	D	0,03	0,06	0,05	0,13	0,16	0,13	0,11	0,13	0,12	0,06	0,06	no	I	UY	no	12	1990	21	UY	no	12	2001	10
Hg	mg/kg	30A	Gressholmen	MYTI EDU	SB	D	0,06	0,06	0,1	0,07	0,15	0,11	0,1	0,08	0,11	0,08	0,1	no	I	--	no	12	1984	27	--	no	11	2001	10
Hg	mg/kg	31A	Solbergstrand	MYTI EDU	SB	D	0,05	0,05	0,06	0,06	0,09	0,11	0,18	0,16	0,09	0,09	0,1	no	I	UY	no	13	1983	28	UY	no	10	2001	10
Hg	mg/kg	35A	Mølen	MYTI EDU	SB	D	0,03	0,05	0,06	0,06	0,09	0,12	0,05	0,05	0,07	0,06	0,07	no	I	--	no	14	1983	28	--	no	12	2001	10
Hg	mg/kg	51A	Byrkjenes	MYTI EDU	SB	D	3,86	0,77	1,45	1,47	0,3	0,61	0,23	0,29	0,26	0,26	0,36	1.8	II	--	1.5	20	1987	18	D-	1.5	16	2001	10
Hg	mg/kg	52A	Eitrheimsneset	MYTI EDU	SB	D	0,34	0,3	0,26	0,2	0,23	0,16	0,14	0,24	0,14	0,13	0,16	no	I	D-	no	17	1989	22	--	no	10	2001	10
Hg	mg/kg	56A	Kvalnes	MYTI EDU	SB	D	0,98	0,61	0,6	0,35	0,24	0,36	0,34	0,29	0,31	0,31	0,35	1.73	II	D-	1.7	13	1987	24	D-	1.7	9	2001	10
Hg	mg/kg	57A	Krossanes	MYTI EDU	SB	D	0,45	0,35	0,28	0,19	0,12	0,23	0,23	0,14	0,13	0,15	0,19	no	I	DY	no	12	1987	24	--	no	12	2001	10
Hg	mg/kg	63A	Ranaskjær	MYTI EDU	SB	D	0,3	0,37	0,29	0,21	0,07	0,18	0,19	0,19	0,12	0,15	0,19	no	I	--	no	14	1987	24	--	no	14	2001	10
Hg	mg/kg	65A	Vikingneset	MYTI EDU	SB	D	0,16	0,19	0,13	0,14	0,06	0,13	0,16	0,11	0,09	0,11	0,14	no	I	--	no	13	1987	24	--	no	12	2001	10
Hg	mg/kg	69A	Lille Terøy	MYTI EDU	SB	D	0,11	0,15	0,11	0,1	0,06	0,1	0,08	0,09	0,08	0,1	0,1	no	I	--	no	13	1992	19	--	no	9	2001	10
Hg	mg/kg	71A	Bjørkøya (Risøyodden)	MYTI EDU	SB	D	0,13	0,12	0,15	0,15	0,19	0,18	0,18	0,13	0,12	0,12	0,24	1.21	II	--	no	11	1983	28	--	no	10	2001	10
Hg	mg/kg	76A	Risøy	MYTI EDU	SB	D	0,03	0,06	0,06	0,08	0,1	0,08	0,06	0,08	0,09	0,1	0,13	no	I	U-	no	12	1990	19	--	no	9	2001	10
Hg	mg/kg	98A2	Husvaagen area	MYTI EDU	SB	D	0,11	0,11	0,12	0,14	0,08	0,08	0,09	0,08	0,08	0,07	0,09	no	I	--	no	11	1997	13	--	no	8	2001	10
Hg	mg/kg	I022	West Damholmen	MYTI EDU	SB	D	0,18	0,24	0,29	0,2	0,16	0,24	0,22	0,24	0,26	0,28	0,24	1.18	II	--	1.4	11	1995	16	--	1.4	9	2001	10
Hg	mg/kg	I023	Singlekalven (south)	MYTI EDU	SB	D	0,09	0,1	0,15	0,14	0,13	0,16	0,18	0,14	0,13	0,13	0,21	1.07	II	--	no	12	1995	16	--	no	9	2001	10
Hg	mg/kg	I024	Kirkøy (north west)	MYTI EDU	SB	D	0,12	0,3	0,24	0,23	0,21	0,29	0,28	0,23	0,25	0,24	0,29	1.45	II	--	1.4	14	1995	16	--	1.4	8	2001	10
Hg	mg/kg	I131A	Lastad	MYTI EDU	SB	D	0,03	0,08	0,05	0,07	0,1	0,06	0,08	0,05	0,07	0,12	0,07	no	I	--	no	14	1995	16	--	no	12	2001	10
Hg	mg/kg	I132	Svensholmen	MYTI EDU	SB	D										0,14	0,15	no	I				2009	2				2009	2
Hg	mg/kg	I133	Odderø (west)	MYTI EDU	SB	D										0,18	0,19	no	I				2009	2				2009	2
Hg	mg/kg	I201	Ekkjegrunn (G1)	MYTI EDU	SB	D	0,16	0,17	0,31	0,1	0,13	0,29	0,22	0,29	0,25	0,13	0,1	no	I	--	no	13	1998	13	--	no	14	2001	10
Hg	mg/kg	I205	Bølsnes (G5)	MYTI EDU	SB	D	0,21	0,17	0,22	0,15	0,14	0,31	0,29	0,27	0,31	0,18	0,13	no	I	--	no	11	1998	13	--	no	11	2001	10
Hg	mg/kg	I241	Nordnes	MYTI EDU	SB	D										0,18	0,11	no	I				2009	2				2009	2

Parameter	Unit	Station	Station Name	Species	Tissue	Basis	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	OC	Class	Trend	Sm	Power	First Year	No of Years	Trend	Sm	Power	First Year	No of Years
																				long	long	long	long	long	short	short	short	short	short
Hg	mg/kg	I242	Gravdalsneset	MYTI EDU	SB	D										0,13	0,15	no	I				2009	2				2009	2
Hg	mg/kg	I243	Hegreneset	MYTI EDU	SB	D										0,12	0,13	no	I				2009	2				2009	2
Hg	mg/kg	I301	Akershuskaia	MYTI EDU	SB	D	0,04	0,07	0,05	0,07	0,11	0,13	0,09	0,08	0,09	0,07	0,18	no	I	U-	no	11	1992	17	--	no	12	2001	10
Hg	mg/kg	I304	Gåsøya	MYTI EDU	SB	D	0,03	0,05	0,05	0,05	0,06	0,07	0,06	0,05	0,05	0,06	0,08	no	I	--	no	10	1995	16	--	no	9	2001	10
Hg	mg/kg	I306	Håøya	MYTI EDU	SB	D	0,04	0,04	0,04	0,05	0,07	0,07	0,05	0,05	0,07	0,05	0,07	no	I	--	no	10	1995	16	--	no	9	2001	10
Hg	mg/kg	I307	Ramtonholmen	MYTI EDU	SB	D	0,03	0,05	0,05	0,06	0,09	0,1	0,04	0,04	0,07	0,05	0,08	no	I	--	no	12	1995	16	--	no	12	2001	10
Hg	mg/kg	I712	Croftholmen	MYTI EDU	SB	D	0,21	0,22	0,21	0,15	0,18	0,18	0,22	0,16	0,23	0,2	0,26	1.31	II	--	1.4	8	1998	13	--	1.4	8	2001	10
Hg	mg/kg	I713	Strømtangen	MYTI EDU	SB	D			0,11	0,18	0,16	0,11	0,16	0,12	0,19	0,13	0,14	no	I	--	no	10	2002	9	--	no	10	2002	9
Hg	mg/kg	I964	Toraneskaien	MYTI EDU	SB	D			0,14	0,06	0,05	0,16	0,17	0,16	0,16	0,12	0,09	no	I	--	no	15	2002	9	--	no	15	2002	9
Hg	mg/kg	I965	Moholmen (B5)	MYTI EDU	SB	D			0,2	0,09	0,17	0,12	0,11	0,12	0,15	0,09	0,08	no	I	--	no	12	2002	9	--	no	12	2002	9
Hg	mg/kg	I969	Bjørnbærviken (B9)	MYTI EDU	SB	D			0,06	0,04	0,04	0,1	0,04	0,07	0,05	0,04	0,03	no	I	--	no	13	2002	9	--	no	13	2002	9
Hg	mg/kg	33F	Sande (east side)	PLAT FLE	MU	W	0,05	0,05	0,04	0,04	0,04	0,05	0,03	0,07	0,04	0,05	0,05	no	U	DY	no	13	1983	26	--	no	10	2001	10
Hg	mg/kg	53F	Inner Sørfjord	PLAT FLE	MU	W	0,26	0,34	0,63	0,5	0,33	0,85		0,23	0,22	0,07	0,36	3.6	O	U-	no	17	1988	21	--	no	19	2001	9
Hg	mg/kg	10F	Skogerøy	PLEU PLA	MU	W	0,03	0,02	0,02	0,02	0,03	0,02		0,04	0,03	0,02	0,02	no	U	--	no	11	1997	12	--	no	11	2001	9
Hg	mg/kg	98F2	Husholmen	PLEU PLA	MU	W	0,12	0,07	0,03	0,04	0,02	0,07	0,05	0,04	0,02	0,02	0,02	no	U	--	no	16	2000	11	--	no	16	2001	10
KPAH	µg/kg	30A	Gressholmen	MYTI EDU	SB	D	16,5	38,3	11,6	17,6	45,7	14,2	45,1	18,2	14,7	11,1	25,9	no	I	--	no	16	1992	16	--	no	18	2001	10
KPAH	µg/kg	35A	Mølen	MYTI EDU	SB	D									20,6	5,68	7,81	no	I	-?	?	19	2008	3	-?	?	19	2008	3
KPAH	µg/kg	I131A	Lastad	MYTI EDU	SB	D	26,9	28	15,5	26,6	127	20,1	9,62	8,33	13,1	9,62	8,33	no	I	--	no	18	1995	16	--	no	20	2001	10
KPAH	µg/kg	I132	Svensholmen	MYTI EDU	SB	D	243	389	783	1261	570	813	401	405	484	162	124	2.49	II	--	no	19	1998	13	D-	no	14	2001	10
KPAH	µg/kg	I133	Odderø (west)	MYTI EDU	SB	D	150	339	476	580	1198	451	345	197	599	568	77,8	1.56	II	--	no	20	1995	15	--	no	20	2001	10
KPAH	µg/kg	I201	Ekkjegrunn (G1)	MYTI EDU	SB	D	903	638	413	189	111	212	119	149	78,5	52,6	38,3	no	I	D-	no	21	1995	16	D-	no	12	2001	10
KPAH	µg/kg	I205	Bølsnes (G5)	MYTI EDU	SB	D	187	189	1648	97,5	808	98,2	57,2	56,3	34,5	27,9	13,3	no	I	D-	no	24	1995	15	D-	no	24	2001	10
KPAH	µg/kg	I301	Akershuskaia	MYTI EDU	SB	D	32,4	112	43,7	38,4	313	40,9	269	109	75,7	35,9	85,6	1.71	II	--	no	21	1992	17	--	no	22	2001	10
KPAH	µg/kg	I304	Gåsøya	MYTI EDU	SB	D	7,62	21,4	9,62	8,01	69,9	15,5	27,7	10,1	10,5	8,93	42,4	no	I	--	no	20	1995	16	--	no	21	2001	10
KPAH	µg/kg	I306	Håøya	MYTI EDU	SB	D	7,4	28,2	12,1	8,8	52,7	12,6	18,2	10,1	11,9	8,93	32,5	no	I	--	no	18	1995	16	--	no	19	2001	10
KPAH	µg/kg	I307	Ramtonholmen	MYTI EDU	SB	D	11,6	27,2	29,3	9,69	74	13,6	16,8	9,65	11,4	7,35	51,8	1.04	II	--	no	19	1995	16	--	no	21	2001	10
KPAH	µg/kg	I912	Honnhammer	MYTI EDU	SB	D	1565	58,9	412	27,9	10,6	9,12	8,33	30,1	36,3	8,94	7,31	no	I	D-	no	25	1995	15	--	no	25	2001	10
KPAH	µg/kg	I913	Fjøseid	MYTI EDU	SB	D	604	76,7	405	28,8	20,9	8,22	8,67	14,3	20,6	11,6	9,69	no	I	D-	no	22	1999	12	D-	no	21	2001	10
KPAH	µg/kg	I964	Toraneskaien	MYTI EDU	SB	D			368	2372	2094	501	915	1073	993	1606	396	7.92	III	--	10.5	21	2002	9	--	10.5	21	2002	9
KPAH	µg/kg	I965	Moholmen (B5)	MYTI EDU	SB	D		1332	431	468	854	181	357	612	404	990	233	4.66	III	--	9.0	19	2001	10	--	9.0	19	2001	10
KPAH	µg/kg	I969	Bjørnbærviken (B9)	MYTI EDU	SB	D	192	169	39,7	625	361	73,6	188	170	188	90	56,5	1.13	II	--	no	20	1995	16	--	no	23	2001	10
Mo	mg/kg	35A	Mølen	MYTI EDU	SB	D						0,84	0,6	0,7	0,58	0,76	0,69	m		--	m	8	2005	6	--	m	8	2005	6
Ni	mg/kg	10B	Varangerfjorden	GADU MOR	LI	W										0,11	0,05	m					2009	2				2009	2
Ni	mg/kg	13BH	Kristiansand havn	GADU MOR	LI	W										0,39	0,18	m					2009	2				2009	2
Ni	mg/kg	15B	Ullerø area	GADU MOR	LI	W										0,06	0,05	m					2009	2				2009	2
Ni	mg/kg	23B	Karihavet area	GADU MOR	LI	W								0,05		0,5	0,09	m		-?	?	>25	1993	4	-?	?	>25	2007	3
Ni	mg/kg	30B	Oslo City area	GADU MOR	LI	W								0,06		0,17	0,13	m		-?	?	16	1993	4	-?	?	15	2007	3
Ni	mg/kg	36B	Færder area	GADU MOR	LI	W										0,07	0,12	m					2009	2				2009	2
Ni	mg/kg	43BH	Tromsø havn	GADU MOR	LI	W										0,06	0,04	m					2009	2				2009	2
Ni	mg/kg	53B	Inner Sørfjord	GADU MOR	LI	W										0,15	0,07	m					2009	2				2009	2
Ni	mg/kg	67B	Strandebarm area	GADU MOR	LI	W										0,04	0,5	m					2009	2				2009	2
Ni	mg/kg	80BH	Trondheim	GADU MOR	LI	W										0,1	0,06	m					2009	2				2009	2
Ni	mg/kg	98B1	Bjørnerøya (east)	GADU MOR	LI	W										0,03	0,05	m					2009	2				2009	2
Ni	mg/kg	21F	Åkrafjord	LEPI WHI	LI	W										0,02	0,02	m					2009	2				2009	2
Ni	mg/kg	67F	Strandebarm area	LEPI WHI	LI	W										0,02	0,04	m					2009	2				2009	2
Ni	mg/kg	15F	Ullerø area	LIMA LIM	LI	W										0,11	0,07	m					2009	2				2009	2

Parameter	Unit	Station	Station Name	Species	Tissue	Basis	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	OC	Class	Trend long	Sm long	Power long	First Year long	No of Years long	Trend short	Sm short	Power short	First Year short	No of Years short
Ni	mg/kg	36F	Færder area	LIMA LIM	LI	W										0,09	0,07	m					2009	2				2009	2
Ni	mg/kg	10A2	Skallneset	MYTI EDU	SB	D									1,88	1,29	1,77	no	I	-?	?	11	2008	3	-?	?	11	2008	3
Ni	mg/kg	11X	Brashavn	MYTI EDU	SB	D										1,14	0,95	no	I				2009	2				2009	2
Ni	mg/kg	15A	Gåsøy (Ullerø)	MYTI EDU	SB	D										1,29	1,31	no	I				2009	2				2009	2
Ni	mg/kg	227A2	Høgevarde	MYTI EDU	SB	D										2,53	2,56	no	I				2009	2				2009	2
Ni	mg/kg	22A	Espevær (west)	MYTI EDU	SB	D									1,06	1	0,6	no	I	-?	?	9	2008	3	-?	?	9	2008	3
Ni	mg/kg	30A	Gressholmen	MYTI EDU	SB	D									0,81	1	1,53	no	I	-?	?	6	2008	3	-?	?	6	2008	3
Ni	mg/kg	31A	Solbergstrand	MYTI EDU	SB	D										1,67	2,01	no	I	-?	?	7	1983	3				2009	2
Ni	mg/kg	35A	Mølen	MYTI EDU	SB	D	0,87	5,87	1,03	0,83	2,04	1,15	0,62	0,5	0,79	1,13	1,69	no	I	--	no	19	1983	15	--	no	17	2001	10
Ni	mg/kg	51A	Byrkjenes	MYTI EDU	SB	D										1,29	2,54	no	I				2009	2				2009	2
Ni	mg/kg	52A	Eitrheimsneset	MYTI EDU	SB	D									0,47	0,94	1,31	no	I	-?	?	8	2008	3	-?	?	8	2008	3
Ni	mg/kg	56A	Kvalnes	MYTI EDU	SB	D										1,38	1,62	no	I				2009	2				2009	2
Ni	mg/kg	57A	Krossanes	MYTI EDU	SB	D										1	1,07	no	I				2009	2				2009	2
Ni	mg/kg	63A	Ranaskjær	MYTI EDU	SB	D										1,53	1,67	no	I				2009	2				2009	2
Ni	mg/kg	65A	Vikingneset	MYTI EDU	SB	D										1,25	1,75	no	I				2009	2				2009	2
Ni	mg/kg	69A	Lille Terøy	MYTI EDU	SB	D										1	1,13	no	I				2009	2				2009	2
Ni	mg/kg	71A	Bjørkøya (Risøyodden)	MYTI EDU	SB	D									1	0,86	1,29	no	I	-?	?	10	1983	4	-?	?	10	2008	3
Ni	mg/kg	76A	Risøy	MYTI EDU	SB	D										1,8	1,9	no	I				2009	2				2009	2
Ni	mg/kg	98A2	Husvaagen area	MYTI EDU	SB	D									0,77	1,19	1	no	I	-?	?	11	2008	3	-?	?	11	2008	3
Ni	mg/kg	I022	West Damholmen	MYTI EDU	SB	D										2,5	4	no	I				2009	2				2009	2
Ni	mg/kg	I023	Singlekalven (south)	MYTI EDU	SB	D										2,25	2,8	no	I				2009	2				2009	2
Ni	mg/kg	I024	Kirkøy (north west)	MYTI EDU	SB	D										5,2	11,6	2.33	II				2009	2				2009	2
Ni	mg/kg	I131A	Lastad	MYTI EDU	SB	D										1,69	1	no	I				2009	2				2009	2
Ni	mg/kg	I132	Svensholmen	MYTI EDU	SB	D										6,63	5,93	1.19	II				2009	2				2009	2
Ni	mg/kg	I133	Odderø (west)	MYTI EDU	SB	D										5,18	4,67	no	I				2009	2				2009	2
Ni	mg/kg	I201	Ekkjegrunn (G1)	MYTI EDU	SB	D										0,71	1,47	no	I				2009	2				2009	2
Ni	mg/kg	I205	Bølsnes (G5)	MYTI EDU	SB	D										0,73	1,27	no	I				2009	2				2009	2
Ni	mg/kg	I241	Nordnes	MYTI EDU	SB	D										1,4	1,11	no	I				2009	2				2009	2
Ni	mg/kg	I242	Gravdalsneset	MYTI EDU	SB	D										1,21	1,36	no	I				2009	2				2009	2
Ni	mg/kg	I243	Hegreneset	MYTI EDU	SB	D										1,4	1,2	no	I				2009	2				2009	2
Ni	mg/kg	I301	Akershuskaia	MYTI EDU	SB	D										1,13	1,88	no	I				2009	2				2009	2
Ni	mg/kg	I304	Gåsøya	MYTI EDU	SB	D									0,8	1,36	1,71	no	I	-?	?	7	2008	3	-?	?	7	2008	3
Ni	mg/kg	I306	Håøya	MYTI EDU	SB	D										1,4	1,43	no	I				2009	2				2009	2
Ni	mg/kg	I307	Ramtonholmen	MYTI EDU	SB	D									1,21	1,53	2	no	I	U?	?	<=5	2008	3	U?	?	<=5	2008	3
Ni	mg/kg	I712	Croftholmen	MYTI EDU	SB	D										2,72	2,17	no	I				2009	2				2009	2
Ni	mg/kg	I713	Strømtangen	MYTI EDU	SB	D										2,08	0,77	no	I				2009	2				2009	2
Ni	mg/kg	I964	Toraneskaien	MYTI EDU	SB	D										28,3	14,5	2.89	II				2009	2				2009	2
Ni	mg/kg	I965	Moholmen (B5)	MYTI EDU	SB	D										22,6	13,2	2.65	II				2009	2				2009	2
Ni	mg/kg	I969	Bjørnbærviken (B9)	MYTI EDU	SB	D										1,75	1,17	no	I				2009	2				2009	2
Ni	mg/kg	33F	Sande (east side)	PLAT FLE	LI	W										0,44	0,04	m					2009	2				2009	2
Ni	mg/kg	53F	Inner Sørfjord	PLAT FLE	LI	W										0,06	0,04	m					2009	2				2009	2
Ni	mg/kg	10F	Skogerøy	PLEU PLA	LI	W										0,1	0,14	m					2009	2				2009	2
Ni	mg/kg	98F2	Husholmen	PLEU PLA	LI	W										0,05	0,15	m					2009	2				2009	2
OCS	µg/kg	10B	Varangerfjorden	GADU MOR	LI	W	2,4	0,98	1,2	1,6	0,78	1	2	1	1	1	1	m		D-	m	13	1994	17	--	m	12	2001	10
OCS	µg/kg	10B	Varangerfjorden	GADU MOR	MU	W	0,04	0,03	0,03	0,03	0,05	0,05	0,05	0,05	0,05	0,05	0,05	m		--	m	14	1994	17	U-	m	7	2001	10
OCS	µg/kg	13BH	Kristiansand havn	GADU MOR	MU	W										0,46	0,21	m					2009	2				2009	2

Parameter	Unit	Station	Station Name	Species	Tissue	Basis	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	OC	Class	Trend long	Sm long	Power long	First Year long	No of Years long	Trend short	Sm short	Power short	First Year short	No of Years short
OCS	µg/kg	13BH	Kristiansand havn	GADU MOR	LI	W										70	13	m					2009	2				2009	2
OCS	µg/kg	15B	Ullerø area	GADU MOR	MU	W	0,05	0,02	0,03	0,03	0,05	0,05	0,05	0,05	0,05	0,05	0,05	m		--	m	13	1990	21	UY	m	7	2001	10
OCS	µg/kg	15B	Ullerø area	GADU MOR	LI	W	1,6	1,1	1,1	0,99	0,81	1,4	2	1,5	0,8	1	2	m		D-	m	17	1990	21	--	m	13	2001	10
OCS	µg/kg	23B	Karihavet area	GADU MOR	LI	W	1	1	1,5	1,5	1	1	1	2	1	0,5	1	m		D-	m	12	1990	21	--	m	14	2001	10
OCS	µg/kg	23B	Karihavet area	GADU MOR	MU	W	0,02	0,03	0,03	0,03	0,03	0,05	0,05	0,05	0,05	0,05	0,05	m		DY	m	12	1990	21	U-	m	7	2001	10
OCS	µg/kg	30B	Oslo City area	GADU MOR	MU	W	0,03	0,03	0,03	0,05	0,03	0,05	0,05	0,05	0,05	0,05	0,05	m		--	m	12	1990	21	--	m	9	2001	10
OCS	µg/kg	30B	Oslo City area	GADU MOR	LI	W	6,1	6,1	4,8	4,6	4,4	4,7	3,7	3,1	4,1	2,6	2	m		DY	m	14	1990	21	D-	m	8	2001	10
OCS	µg/kg	36B	Færder area	GADU MOR	MU	W	0,02	0,03	0,03	0,03	0,03	0,05	0,05	0,05	0,05	0,05	0,05	m		DY	m	11	1990	21	U-	m	7	2001	10
OCS	µg/kg	36B	Færder area	GADU MOR	LI	W	1,7	1,3	0,73	3	2,4	1,6	1,2	0,66	0,8	0,88	1	m		D-	m	12	1990	21	--	m	15	2001	10
OCS	µg/kg	43BH	Tromsø havn	GADU MOR	LI	W										1	1	m					2009	2				2009	2
OCS	µg/kg	43BH	Tromsø havn	GADU MOR	MU	W										0,05	0,05	m					2009	2				2009	2
OCS	µg/kg	53B	Inner Sørfjord	GADU MOR	LI	W	2	0,78	0,5	0,5	1	1	0,5	0,92	0,26	1	1	m		D-	m	16	1990	20	--	m	16	2001	10
OCS	µg/kg	53B	Inner Sørfjord	GADU MOR	MU	W	0,02	0,02	0,04	0,03	0,05	0,05	0,05	0,05	0,05	0,05	0,05	m		--	m	14	1990	20	UY	m	8	2001	10
OCS	µg/kg	67B	Strandebarm area	GADU MOR	LI	W	1	1	1,25	1,5	1	0,8	1	1	1	1	1	m		DY	m	9	1990	21	--	m	9	2001	10
OCS	µg/kg	67B	Strandebarm area	GADU MOR	MU	W	0,01	0,02	0,03	0,03	0,05	0,05	0,05	0,05	0,05	0,05	0,05	m		DY	m	13	1990	21	UY	m	7	2001	10
OCS	µg/kg	80BH	Trondheim	GADU MOR	LI	W										1	1	m					2009	2				2009	2
OCS	µg/kg	98B1	Bjørnerøya (east)	GADU MOR	LI	W			1	1,5	1,5	1,5	2	1,05	1	2	1	m		--	m	14	1992	17	--	m	12	2002	9
OCS	µg/kg	98B1	Bjørnerøya (east)	GADU MOR	MU	W			0,03	0,03	0,03	0,05	0,05	0,05	0,05	0,05	0,05	m		--	m	15	1992	17	U-	m	7	2002	9
OCS	µg/kg	21F	Åkrafjord	LEPI WHI	MU	W				0,03	0,03	0,05	0,05	0,05	0,05	0,05	0,05	m		U-	m	7	2003	8	U-	m	7	2003	8
OCS	µg/kg	21F	Åkrafjord	LEPI WHI	LI	W				0,6	0,71	0,3	1	0,5	0,5	1	0,71	m		--	m	15	2003	8	--	m	15	2003	8
OCS	µg/kg	67F	Strandebarm area	LEPI WHI	LI	W	1	0,3	0,5	0,6	1	0,4	0,5	0,5		0,5	1	m		D-	m	16	1990	20	--	m	13	2001	9
OCS	µg/kg	67F	Strandebarm area	LEPI WHI	MU	W	0,04	0,03	0,03	0,03	0,03	0,05	0,05	0,05	0,05	0,05	0,05	m		DY	m	12	1990	21	U-	m	7	2001	10
OCS	µg/kg	15F	Ullerø area	LIMA LIM	LI	W		0,63	0,5	0,5	0,5	1	1	0,5		1	0,5	m		--	m	15	1991	17	--	m	13	2001	9
OCS	µg/kg	36F	Færder area	LIMA LIM	LI	W	1	0,6	0,8	1	0,71	1	0,5	0,6	9,4	0,5	0,5	m		--	m	21	1990	21	--	m	25	2001	10
OCS	µg/kg	36F	Færder area	LIMA LIM	MU	W	0,02	0,03	0,03	0,03	0,03	0,05	0,05	0,05	0,05	0,05	0,05	m		DY	m	11	1990	21	U-	m	7	2001	10
OCS	µg/kg	10A2	Skallneset	MYTI EDU	SB	D	0,28	0,58	0,31	0,28	0,27	0,26	0,31	0,23	0,29	0,29	0,29	m		--	m	10	1996	14	--	m	9	2001	10
OCS	µg/kg	11X	Brashavn	MYTI EDU	SB	D	0,24	0,51	0,24	0,23	0,27	0,24	0,28	0,24	0,28	0,24	0,24	m		--	m	11	1997	14	--	m	9	2001	10
OCS	µg/kg	15A	Gåsøy (Ullerø)	MYTI EDU	SB	D	0,18	0,51	0,25	0,33	0,34	0,29	0,28		0,26	0,29	0,29	m		--	m	11	1993	17	--	m	9	2001	9
OCS	µg/kg	227A2	Høgevarde	MYTI EDU	SB	D										0,33	0,67	m					2009	2				2009	2
OCS	µg/kg	22A	Espevær (west)	MYTI EDU	SB	D	0,12	0,6	0,24	0,33	0,37	0,29	0,28		0,31	0,24	0,48	m		--	m	14	1992	18	--	m	12	2001	9
OCS	µg/kg	30A	Gressholmen	MYTI EDU	SB	D	0,24	0,45	0,34	0,32	0,4	0,31	0,33	0,29	0,31	0,28	0,33	m		DY	m	9	1992	19	--	m	7	2001	10
OCS	µg/kg	31A	Solbergstrand	MYTI EDU	SB	D	0,23	0,51	0,32	0,33	0,36	0,34	0,26	0,31	0,33	0,31	0,79	m		UY	m	11	1992	19	--	m	11	2001	10
OCS	µg/kg	35A	Mølen	MYTI EDU	SB	D	0,17	0,43	0,29	0,26	0,31	0,33	0,24	0,25	0,26	0,22	0,31	m		DY	m	11	1992	19	--	m	9	2001	10
OCS	µg/kg	51A	Byrkjenes	MYTI EDU	SB	D	0,74	0,17	0,39	0,4	0,35	0,56	0,31	0,42	0,33	0,71	13,3	m		U-	m	19	1995	16	U-	m	21	2001	10
OCS	µg/kg	52A	Eitrheimsneset	MYTI EDU	SB	D	0,2	0,75	0,22	0,34	0,33	0,31	0,31	0,31	0,33	0,28	0,63	m		--	m	14	1992	19	--	m	13	2001	10
OCS	µg/kg	56A	Kvalnes	MYTI EDU	SB	D	0,18	0,67	0,3	0,37	0,33	0,42	0,36	0,31	0,33	0,33	0,77	m		--	m	14	1992	19	--	m	12	2001	10
OCS	µg/kg	57A	Krossanes	MYTI EDU	SB	D	0,16	0,63	0,25	0,3	0,24	0,33	0,36	0,22	0,28	0,25	0,71	m		--	m	14	1992	19	--	m	13	2001	10
OCS	µg/kg	63A	Ranaskjær	MYTI EDU	SB	D	0,17	0,64	0,33	0,39	0,17	0,36	0,31	0,36	0,26	0,31	0,67	m		--	m	13	1992	19	--	m	13	2001	10
OCS	µg/kg	65A	Vikingneset	MYTI EDU	SB	D	0,15	0,54	0,24	0,29	0,13	0,28	0,31	0,24	0,25	0,25	0,63	m		--	m	14	1992	19	--	m	14	2001	10
OCS	µg/kg	69A	Lille Terøy	MYTI EDU	SB	D	0,13	0,66	0,26	0,27	0,15	0,26	0,26	0,29	0,28	0,28	0,63	m		--	m	14	1992	19	--	m	12	2001	10
OCS	µg/kg	71A	Bjørkøya (Risøyodden)	MYTI EDU	SB	D	0,26	0,62		0,32	0,39	0,36	0,33		0,28	0,24	0,36	m		--	m	12	1992	17	--	m	9	2001	8
OCS	µg/kg	76A	Risøy	MYTI EDU	SB	D	0,12	0,49	0,25	0,31	0,34	0,29	0,31		0,33	0,29	0,33	m		--	m	12	1992	16	--	m	9	2001	9
OCS	µg/kg	98A2	Husvaagen area	MYTI EDU	SB	D	0,29	0,58	0,31	0,36	0,26	0,29	0,28	0,33	0,29	0,28	0,59	m		--	m	11	1997	13	--	m	10	2001	10
OCS	µg/kg	I022	West Damholmen	MYTI EDU	SB	D	0,76	0,78	0,55	0,38	0,45	0,47	0,39	0,42	0,46	1	0,46	m		--	m	11	1995	16	--	m	12	2001	10
OCS	µg/kg	I023	Singlekalven (south)	MYTI EDU	SB	D	0,56	0,69	0,42	0,39	0,43	0,43	0,39	0,39	0,39	0,77	0,33	m		--	m	11	1995	16	--	m	11	2001	10
OCS	µg/kg	I024	Kirkøy (north west)	MYTI EDU	SB	D	0,6	0,45	0,5	0,39	0,47	0,49	0,42	0,42	0,46	1	0,46	m		--	m	11	1995	16	--	m	11	2001	10

Parameter	Unit	Station	Station Name	Species	Tissue	Basis	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	OC	Class	Trend long	Sm long	Power long	First Year long	No of Years long	Trend short	Sm short	Power short	First Year short	No of Years short
OCS	µg/kg	I131A	Lastad	MYTI EDU	SB	D	0,48	0,33	0,28	0,37	0,33	0,34	0,39	0,33	0,33	0,42	0,33	m		--	m	10	1995	16	--	m	7	2001	10
OCS	µg/kg	I132	Svensholmen	MYTI EDU	SB	D	0,48	0,34	0,38	0,35	0,49	0,42	0,33	0,33	0,32	0,33	0,33	m		--	m	9	1998	13	--	m	7	2001	10
OCS	µg/kg	I133	Odderø (west)	MYTI EDU	SB	D	0,43	0,4	0,4	0,42	0,43	0,46	0,52	0,39	0,39	0,4	0,39	m		U-	m	8	1995	16	--	m	6	2001	10
OCS	µg/kg	I241	Nordnes	MYTI EDU	SB	D	0,56	0,16	0,28	0,28	0,26	0,42	0,29	0,31	0,31	0,28	0,28	m		--	m	12	1995	16	--	m	9	2001	10
OCS	µg/kg	I242	Gravdalsneset	MYTI EDU	SB	D	0,55	0,17	0,29	0,35	0,25	0,36	0,36	0,29	0,36	0,36	0,33	m		--	m	12	1995	16	--	m	9	2001	10
OCS	µg/kg	I243	Hegreneset	MYTI EDU	SB	D	0,45	0,19	0,28	0,47	0,31	0,53	0,31	0,29	0,39		0,33	m		--	m	12	1995	15	--	m	11	2001	9
OCS	µg/kg	I301	Akershuskaia	MYTI EDU	SB	D	0,51	0,38	0,31	0,35	0,44	0,35	0,36	0,28	0,33	0,67	0,29	m		--	m	13	1992	17	--	m	11	2001	10
OCS	µg/kg	I304	Gåsøya	MYTI EDU	SB	D	0,59	0,38	0,39	0,31	0,39	0,44	0,39	0,29	0,33	0,71	0,39	m		--	m	12	1995	15	--	m	11	2001	10
OCS	µg/kg	I306	Håøya	MYTI EDU	SB	D	0,59	0,29	0,34	0,35	0,39	0,43	0,31	0,36	0,39	0,67	0,36	m		--	m	12	1995	15	--	m	10	2001	10
OCS	µg/kg	I307	Ramtonholmen	MYTI EDU	SB	D	0,65	0,34	0,45	0,37	0,42	0,4	0,31	0,31	0,36	0,59	0,36	m		--	m	12	1995	15	--	m	10	2001	10
OCS	µg/kg	I712	Croftholmen	MYTI EDU	SB	D	0,62	0,5	0,41	0,34	0,46	0,4	0,46	0,31	0,36	0,35	0,42	m		--	m	11	1995	16	--	m	8	2001	10
OCS	µg/kg	I713	Strømtangen	MYTI EDU	SB	D			0,37	0,39	0,44	0,35	0,69	0,28	0,39	0,39	0,31	m		--	m	11	2002	9	--	m	11	2002	9
OCS	µg/kg	33F	Sande (east side)	PLAT FLE	LI	W	1	0,4	0,6	0,5	0,5	1	1	0,5		1	1	m		--	m	19	1990	20	--	m	12	2001	9
OCS	µg/kg	33F	Sande (east side)	PLAT FLE	MU	W	0,04	0,03	0,03	0,03	0,03	0,05	0,05	0,05	0,05	0,05	0,05	m		--	m	13	1990	21	U-	m	7	2001	10
OCS	µg/kg	53F	Inner Sørfjord	PLAT FLE	MU	W	0,05	0,03	0,03	0,03	0,03	0,05		0,05	0,1	0,05	0,05	m		DY	m	14	1990	19	--	m	11	2001	9
OCS	µg/kg	53F	Inner Sørfjord	PLAT FLE	LI	W	0,22	0,3	0,5	0,3	0,5	0,54		0,5	0,5	0,71	1	m		DY	m	15	1990	19	U-	m	10	2001	9
OCS	µg/kg	10F	Skogerøy	PLEU PLA	LI	W	1	0,3	0,6	0,3	0,3	1		0,3	0,2	0,2	0,2	m		--	m	17	1997	12	--	m	16	2001	9
OCS	µg/kg	98F2	Husholmen	PLEU PLA	LI	W	0,6	0,3	0,1	0,1	0,5	0,2	0,2	0,1	0,4	0,1	0,2	m		--	m	20	2000	11	--	m	20	2001	10
PAH-16	µg/kg	30A	Gressholmen	MYTI EDU	SB	D	140	124	54,9	126	163	74,6	292	107	78,4	98,9	170	no	I	--	no	15	1992	16	--	no	17	2001	10
PAH-16	µg/kg	35A	Mølen	MYTI EDU	SB	D									103	38,3	57	no	I	-?	?	17	2008	3	-?	?	17	2008	3
PAH-16	µg/kg	I131A	Lastad	MYTI EDU	SB	D	181	91,8	95	133	344	109	80,6	70	98,9	43,8	49,3	no	I	D-	no	14	1995	16	--	no	15	2001	10
PAH-16	µg/kg	I132	Svensholmen	MYTI EDU	SB	D	1266	1003	1749	2053	1062	2803	1763	1382	1397	513	430	1.72	II	--	no	17	1998	13	DY	no	13	2001	10
PAH-16	µg/kg	I133	Odderø (west)	MYTI EDU	SB	D	908	863	1117	1070	2531	1408	1320	709	3217	1627	316	1.26	II	--	no	18	1995	15	--	no	19	2001	10
PAH-16	µg/kg	I201	Ekkjegrunn (G1)	MYTI EDU	SB	D	2303	1131	1442	579	381	569	303	358	196	137	88,7	no	I	D-	no	19	1995	16	D-	no	12	2001	10
PAH-16	µg/kg	I205	Bølsnes (G5)	MYTI EDU	SB	D	603	457	2383	384	2174	309	221	204	124	101	53,9	no	I	D-	no	20	1995	15	D-	no	21	2001	10
PAH-16	µg/kg	I301	Akershuskaia	MYTI EDU	SB	D	438	645	312	216	1044	271	1726	647	553	308	453	1.81	II	--	no	18	1992	17	--	no	19	2001	10
PAH-16	µg/kg	I304	Gåsøya	MYTI EDU	SB	D	60,4	136	51,5	66,1	215	53,6	179	68,8	63,7	52,5	189	no	I	--	no	18	1995	16	--	no	19	2001	10
PAH-16	µg/kg	I306	Håøya	MYTI EDU	SB	D	53,8	115	121	45,9	147	53,9	155	51,5	49,9	43,5	149	no	I	--	no	17	1995	16	--	no	18	2001	10
PAH-16	µg/kg	I307	Ramtonholmen	MYTI EDU	SB	D	64,4	112	244	64,8	178	40,6	170	50,3	50,5	48,3	197	no	I	--	no	19	1995	16	--	no	20	2001	10
PAH-16	µg/kg	I912	Honnhammer	MYTI EDU	SB	D	5987	735	1965	164	42,3	32,9	42,9	305	185	61,7	57,2	no	I	DY	no	23	1995	15	--	no	24	2001	10
PAH-16	µg/kg	I913	Fjøseid	MYTI EDU	SB	D	2198	578	1995	128	98,1	55,1	75,7	103	84,9	73,6	48	no	I	D-	no	21	1999	12	D-	no	20	2001	10
PAH-16	µg/kg	I964	Toraneskaien	MYTI EDU	SB	D			643	6267	7961	1009	2593	2987	2503	3513	1336	5.35	III	--	6.8	23	2002	9	--	6.8	23	2002	9
PAH-16	µg/kg	I965	Moholmen (B5)	MYTI EDU	SB	D		2768	720	1318	2929	587	1495	2615	1431	2583	1056	4.22	III	--	6.4	19	2001	10	--	6.4	19	2001	10
PAH-16	µg/kg	I969	Bjørnbærviken (B9)	MYTI EDU	SB	D	988	675	136	2338	1537	283	660	832	744	641	609	2.44	II	--	2.8	21	1995	16	--	2.8	23	2001	10
Pb	mg/kg	10B	Varangerfjorden	GADU MOR	LI	W	0,04	0,03	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	no	U	DY	no	9	1994	17	--	no	7	2001	10
Pb	mg/kg	13BH	Kristiansand havn	GADU MOR	LI	W										0,04	0,02	no	U				2009	2				2009	2
Pb	mg/kg	15B	Ullerø area	GADU MOR	LI	W	0,04	0,03	0,01	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	no	U	DY	no	12	1990	21	--	no	12	2001	10
Pb	mg/kg	23B	Karihavet area	GADU MOR	LI	W	0,03	0,03	0,01	0,02	0,02	0,02	0,04	0,02	0,02	0,02	0,02	no	U	D-	no	14	1990	21	--	no	16	2001	10
Pb	mg/kg	30B	Oslo City area	GADU MOR	LI	W	0,24	0,22	0,51	0,24	0,17	0,14	0,1	0,29	0,3	0,13	0,13	1.3	O	--	1.4	16	1986	25	--	1.4	16	2001	10
Pb	mg/kg	36B	Færder area	GADU MOR	LI	W	0,04	0,03	0,01	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	no	U	DY	no	14	1986	25	--	no	15	2001	10
Pb	mg/kg	43BH	Tromsø havn	GADU MOR	LI	W										0,02	0,02	no	U				2009	2				2009	2
Pb	mg/kg	53B	Inner Sørfjord	GADU MOR	LI	W	0,13	0,13	0,14	0,04	0,09	0,08	0,05	0,1	0,16	0,17	0,12	1.2	O	DY	2.3	16	1986	23	--	2.3	15	2001	10
Pb	mg/kg	67B	Strandebarm area	GADU MOR	LI	W	0,04	0,03	0,02	0,02	0,02	0,01	0,02	0,02	0,02	0,02	0,02	no	U	D-	no	15	1987	24	--	no	13	2001	10
Pb	mg/kg	80BH	Trondheim	GADU MOR	LI	W										0,03	0,02	no	U				2009	2				2009	2
Pb	mg/kg	98B1	Bjørnerøya (east)	GADU MOR	LI	W			0,01	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	no	U	DY	no	9	1992	17	--	no	9	2002	9
Pb	mg/kg	21F	Åkrafjord	LEPI WHI	LI	W				0,02	0,02	0,02	0,03	0,02	0,02	0,02	0,02	m		--	m	8	2003	8	--	m	8	2003	8

Parameter	Unit	Station	Station Name	Species	Tissue	Basis	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	OC	Class	Trend	Sm	Power	First Year	No of Years	Trend	Sm	Power	First Year	No of Years
																				long	long	long	long	long	short	short	short	short	short
Pb	mg/kg	67F	Strandebarm area	LEPI WHI	LI	W	0,03	0,04	0,03	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	m		D-	m	11	1987	24	DY	m	7	2001	10
Pb	mg/kg	15F	Ullerø area	LIMA LIM	LI	W		0,05	0,02	0,02	0,03	0,03	0,04	0,02	0,03	0,02	0,02	no	U	D-	no	12	1991	18	--	no	12	2001	10
Pb	mg/kg	36F	Færder area	LIMA LIM	LI	W	0,06	0,04	0,05	0,03	0,05	0,05	0,05	0,05	0,06	0,04	0,06	no	U	DY	no	14	1990	21	--	no	10	2001	10
Pb	mg/kg	10A2	Skallneset	MYTI EDU	SB	D	1,44	1,39	1,8	1,65	1,02	0,67	0,99	1,63	1,06	0,82	0,83	no	I	--	no	12	1996	15	--	no	12	2001	10
Pb	mg/kg	11X	Brashavn	MYTI EDU	SB	D	1,09	2,32	0,74	0,28	0,37	0,32	0,54	0,33	0,39	0,3	0,24	no	I	--	no	17	1997	14	D-	no	14	2001	10
Pb	mg/kg	15A	Gåsøy (Ullerø)	MYTI EDU	SB	D	2,2	0,96	0,71	0,76	0,86	1,66	0,78	1,06	0,55	0,94	1,12	no	I	--	no	13	1990	20	--	no	13	2001	10
Pb	mg/kg	227A2	Høgevarde	MYTI EDU	SB	D										3,53	2,19	no	I				2009	2				2009	2
Pb	mg/kg	22A	Espevær (west)	MYTI EDU	SB	D	1,3	1,21	0,88	1,46	1,79	1,88	1,31	2,6	2,29	0,74	0,57	no	I	--	no	12	1990	21	--	no	14	2001	10
Pb	mg/kg	30A	Gressholmen	MYTI EDU	SB	D	1,74	1,76	2,25	2,58	3,74	3,38	4,12	3,06	3,87	2,54	3,33	1.11	II	--	no	18	1985	26	UY	no	8	2001	10
Pb	mg/kg	31A	Solbergstrand	MYTI EDU	SB	D	0,63	0,51	1,43	0,81	0,78	0,87	0,86	0,65	0,67	0,78	1,34	no	I	D-	no	12	1983	27	--	no	12	2001	10
Pb	mg/kg	35A	Mølen	MYTI EDU	SB	D	0,52	0,87	0,57	0,57	0,81	1,21	0,81	0,57	1,11	1	0,94	no	I	DY	no	12	1983	27	--	no	12	2001	10
Pb	mg/kg	51A	Byrkjenes	MYTI EDU	SB	D	91,7	32,4	98,4	108	42,2	77,5	17,6	29,8	23,4	21,2	31	10.33	III	--	7.0	17	1987	18	--	7.0	17	2001	10
Pb	mg/kg	52A	Eitrheimsneset	MYTI EDU	SB	D	11	21,8	21,8	16,9	16,3	9,27	8,44	15,8	9,86	5,5	8,5	2.83	II	D-	1.7	20	1989	22	D-	1.7	12	2001	10
Pb	mg/kg	56A	Kvalnes	MYTI EDU	SB	D	28,5	30,5	42,9	27,8	24,7	32	28,9	21,4	19,6	15	26,2	8.74	III	--	5.4	17	1987	24	--	5.4	10	2001	10
Pb	mg/kg	57A	Krossanes	MYTI EDU	SB	D	10,3	11,9	9,59	7,02	5,79	11,3	10,4	4,57	4,78	4,28	8,29	2.76	II	D-	1.5	14	1987	24	--	1.5	13	2001	10
Pb	mg/kg	63A	Ranaskjær	MYTI EDU	SB	D	4,52	7,05	6,57	6,3	1,92	4,53	5,36	4,05	2,63	3,19	4,13	1.38	II	D-	no	18	1987	24	--	no	14	2001	10
Pb	mg/kg	65A	Vikingneset	MYTI EDU	SB	D	2,45	2,84	3,05	2,82	1,25	3	4,01	1,56	1,75	3,1	6,44	2.15	II	D-	2.0	13	1987	24	--	2.0	16	2001	10
Pb	mg/kg	69A	Lille Terøy	MYTI EDU	SB	D	2,27	3,91	2,76	2,53	0,96	1,74	2,01	1,65	1,84	1,2	1,06	no	I	D-	no	12	1992	19	D-	no	12	2001	10
Pb	mg/kg	71A	Bjørkøya (Risøyodden)	MYTI EDU	SB	D	0,77	1,46	0,92	0,92	0,87	0,96	0,98	0,8	1	0,81	1,4	no	I	D-	no	12	1983	27	--	no	9	2001	10
Pb	mg/kg	76A	Risøy	MYTI EDU	SB	D	0,6	0,83	0,77	0,94	1,48	0,78	1,19	1,06	1,77	1,35	1,5	no	I	--	no	13	1990	19	--	no	10	2001	10
Pb	mg/kg	98A2	Husvaagen area	MYTI EDU	SB	D	1,49	1,34	0,89	1,16	1,09	0,54	0,67	0,7	0,71	0,83	0,71	no	I	D-	no	9	1997	13	--	no	10	2001	10
Pb	mg/kg	I022	West Damholmen	MYTI EDU	SB	D	1,05	0,95	1,27	1,36	3,51	1,26	1,34	1,67	1,55	1,5	1,5	no	I	--	no	13	1995	16	--	no	13	2001	10
Pb	mg/kg	I023	Singlekalven (south)	MYTI EDU	SB	D	0,64	0,62	0,75	1,28	2,34	0,9	1,05	0,85	0,77	0,77	1	no	I	--	no	13	1995	16	--	no	12	2001	10
Pb	mg/kg	I024	Kirkøy (north west)	MYTI EDU	SB	D	0,62	1,33	1,1	1,73	2,68	1,06	1,18	0,92	1,46	1,4	1,46	no	I	--	no	13	1995	16	--	no	12	2001	10
Pb	mg/kg	I131A	Lastad	MYTI EDU	SB	D										1,54	1,13	no	I				2009	2				2009	2
Pb	mg/kg	I132	Svensholmen	MYTI EDU	SB	D										3,83	3,87	1.29	II				2009	2				2009	2
Pb	mg/kg	I133	Odderø (west)	MYTI EDU	SB	D										12,8	23,8	7.95	III				2009	2				2009	2
Pb	mg/kg	I201	Ekkjegrunn (G1)	MYTI EDU	SB	D	6,41	3,78	8,21	1,87	3,33	4,31	3,41	4,75	4,44	1,88	1,67	no	I	--	no	13	1995	16	--	no	15	2001	10
Pb	mg/kg	I205	Bølsnes (G5)	MYTI EDU	SB	D	7,09	6,15	9,27	3,4	2,76	6,3	5,26	3,33	7,29	2,8	2,13	no	I	--	no	14	1995	15	--	no	15	2001	10
Pb	mg/kg	I241	Nordnes	MYTI EDU	SB	D										18,7	5,65	1.88	II				2009	2				2009	2
Pb	mg/kg	I242	Gravdalsneset	MYTI EDU	SB	D										5,21	4,4	1.47	II				2009	2				2009	2
Pb	mg/kg	I243	Hegreneset	MYTI EDU	SB	D										8,89	9,8	3.27	II				2009	2				2009	2
Pb	mg/kg	I301	Akershuskaia	MYTI EDU	SB	D	1,32	3,16	1,98	1,77	3,07	2,15	5,38	2,94	2,63	2	2,47	no	I	--	no	13	1992	14	--	no	13	2001	10
Pb	mg/kg	I304	Gåsøya	MYTI EDU	SB	D	0,77	1,88	1,3	1,16	1,73	1,95	2,16	1,59	1,47	1,5	2,21	no	I	--	no	12	1998	13	--	no	10	2001	10
Pb	mg/kg	I306	Håøya	MYTI EDU	SB	D	0,54	1,03	0,66	0,7	1,08	1,09	0,94	0,87	1,15	0,71	1,14	no	I	--	no	11	1998	13	--	no	10	2001	10
Pb	mg/kg	I307	Ramtonholmen	MYTI EDU	SB	D	0,51	1,01	1,26	1,01	1,07	1,39	1,04	0,88	1,21	0,88	1,43	no	I	--	no	11	1998	13	--	no	9	2001	10
Pb	mg/kg	I712	Croftholmen	MYTI EDU	SB	D										3,29	4,75	1.58	II				2009	2				2009	2
Pb	mg/kg	I713	Strømtangen	MYTI EDU	SB	D										1,83	1,19	no	I				2009	2				2009	2
Pb	mg/kg	I964	Toraneskaien	MYTI EDU	SB	D			8,75	3,49	6,57	13	13,3	13,7	15,4	10,7	8,75	2.92	II	--	2.5	14	2002	9	--	2.5	14	2002	9
Pb	mg/kg	I965	Moholmen (B5)	MYTI EDU	SB	D		20	12,7	6,45	13,1	12,5	13,7	16,6	29,4	18,4	13,9	4.64	II	--	6.5	13	2001	10	--	6.5	13	2001	10
Pb	mg/kg	I969	Bjørnbærviken (B9)	MYTI EDU	SB	D	3	2,57	2,58	1,85	1,59	3,92	2,11	1,94	1,93	2,13	1,62	no	I	--	no	12	1995	16	--	no	12	2001	10
Pb	mg/kg	33F	Sande (east side)	PLAT FLE	LI	W	0,04	0,03	0,03	0,03	0,02	0,03	0,04	0,02	0,03	0,03	0,02	no	U	DY	no	15	1986	25	--	no	11	2001	10
Pb	mg/kg	53F	Inner Sørfjord	PLAT FLE	LI	W	0,36	0,57	1,29	0,73	0,44	1,35		0,56	0,7	0,05	0,44	1.46	O	--	no	23	1988	21	--	no	24	2001	9
Pb	mg/kg	10F	Skogerøy	PLEU PLA	LI	W	0,08	0,05	0,06	0,05	0,05	0,03		0,04	0,06	0,03	0,02	no	U	D-	no	11	1997	12	--	no	11	2001	9
Pb	mg/kg	98F2	Husholmen	PLEU PLA	LI	W	0,1	0,04	0,07	0,04	0,02	0,2	0,15	0,06	0,02	0,02	0,06	no	U	--	no	22	2000	11	--	no	23	2001	10
PBDE	µg/kg	13BH	Kristiansand havn	GADU MOR	LI	W										19,8	13	m					2009	2				2009	2

Parameter	Unit	Station	Station Name	Species	Tissue	Basis	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	OC	Class	Trend long	Sm long	Power long	First Year long	No of Years long	Trend short	Sm short	Power short	First Year short	No of Years short
PBDE	µg/kg	23B	Karihavet area	GADU MOR	LI	W						9,06	8,22	8,41	11,4	9,52	8,81	m		D-	m	8	1993	8	--	m	7	2005	6
PBDE	µg/kg	30B	Oslo City area	GADU MOR	LI	W		65,9				84,6	91,4	106	98,2	98,9	86,8	m		--	m	6	1993	8	--	m	6	2001	7
PBDE	µg/kg	36B	Færder area	GADU MOR	LI	W		13,6						7,51	11,5	2,95	8,79	m		--	m	16	1996	6	-?	m	17	2001	5
PBDE	µg/kg	43BH	Tromsø havn	GADU MOR	LI	W										36,1	35,9	m					2009	2				2009	2
PBDE	µg/kg	53B	Inner Sørfjord	GADU MOR	LI	W						29,2	14,4	50,5	31,2	33,2	64,9	m		--	m	15	2005	6	--	m	15	2005	6
PBDE	µg/kg	80BH	Trondheim	GADU MOR	LI	W										38,7	14,9	m					2009	2				2009	2
PBDE	µg/kg	98B1	Bjørnerøya (east)	GADU MOR	LI	W							8,73		6,91	2,7	6,14	m		--	m	14	1994	6	-?	m	16	2006	4
PCB-7	µg/kg	10B	Varangerfjorden	GADU MOR	LI	W	99,4	109	149	146	127	104	96,6	108	82,4	131	77,8	no	I	DY	no	11	1994	17	--	no	9	2001	10
PCB-7	µg/kg	10B	Varangerfjorden	GADU MOR	MU	W	0,5	0,55	0,64	0,56	1,15	0,54	0,61	0,59	0,5	0,71	0,39	no	I	--	no	15	1994	17	--	no	11	2001	10
PCB-7	µg/kg	13BH	Kristiansand havn	GADU MOR	LI	W										1168	541	1.08	II				2009	2				2009	2
PCB-7	µg/kg	13BH	Kristiansand havn	GADU MOR	MU	W										6,06	7,86	2.62	II				2009	2				2009	2
PCB-7	µg/kg	15B	Ullerø area	GADU MOR	MU	W	1,42	1,88	0,66	1,23	0,2	0,68	0,58	0,48	0,58	0,48	0,49	no	I	D-	no	15	1990	21	--	no	16	2001	10
PCB-7	µg/kg	15B	Ullerø area	GADU MOR	LI	W	153	377	244	213	154	186	131	166	135	121	148	no	I	D-	no	11	1990	21	D-	no	8	2001	10
PCB-7	µg/kg	23B	Karihavet area	GADU MOR	MU	W	0,45	0,62	0,38	0,5	0,33	0,7	1,01	0,53	0,52	0,45	0,74	no	I	--	no	16	1990	21	--	no	13	2001	10
PCB-7	µg/kg	23B	Karihavet area	GADU MOR	LI	W	207	167	113	114	202	210	141	153	75,7	78,1	122	no	I	D-	no	11	1990	21	--	no	12	2001	10
PCB-7	µg/kg	30B	Oslo City area	GADU MOR	MU	W	6,06	9,4	10,3	9,31	7,91	9,01	11,9	10,6	16,6	21,2	14,9	4.96	II	--	8.2	17	1990	21	U-	8.2	9	2001	10
PCB-7	µg/kg	30B	Oslo City area	GADU MOR	LI	W	2076	2445	2232	1995	2617	4157	3545	2046	2718	3603	3092	6.18	III	--	6.3	13	1990	21	--	6.3	11	2001	10
PCB-7	µg/kg	36B	Færder area	GADU MOR	MU	W	2,26	2,19	1,9	2,52	2,88	2,71	9,34	0,63	1,36	2,53	1,78	no	I	--	no	21	1990	21	--	no	20	2001	10
PCB-7	µg/kg	36B	Færder area	GADU MOR	LI	W	482	288	269	425	527	523	586	210	261	181	284	no	I	DY	no	13	1990	21	--	no	12	2001	10
PCB-7	µg/kg	43BH	Tromsø havn	GADU MOR	LI	W										290	324	no	I				2009	2				2009	2
PCB-7	µg/kg	43BH	Tromsø havn	GADU MOR	MU	W										1,32	1,08	no	I				2009	2				2009	2
PCB-7	µg/kg	53B	Inner Sørfjord	GADU MOR	MU	W	36,3	1,08	23,6	4,84	3,22	2,2	1,12	5,72	6,02	4,45	8,92	2.97	II	--	4.7	>25	1990	20	--	4.7	24	2001	10
PCB-7	µg/kg	53B	Inner Sørfjord	GADU MOR	LI	W	1524	842	956	317	463	317	340	742	136	474	768	1.54	II	--	1.4	20	1990	20	--	1.4	18	2001	10
PCB-7	µg/kg	67B	Strandebarm area	GADU MOR	LI	W	148	225	145	92,6	97,2	134	56,1	107	77,1	89,3	158	no	I	D-	no	13	1990	21	--	no	12	2001	10
PCB-7	µg/kg	67B	Strandebarm area	GADU MOR	MU	W	1,18	9,98	0,61	0,35	0,57	0,87	0,24	0,26	0,56	0,43	0,46	no	I	--	no	22	1990	21	--	no	22	2001	10
PCB-7	µg/kg	80BH	Trondheim	GADU MOR	MU	W										4,46	2,84	no	I				2009	2				2009	2
PCB-7	µg/kg	80BH	Trondheim	GADU MOR	LI	W										1253	613	1.23	II				2009	2				2009	2
PCB-7	µg/kg	98B1	Bjørnerøya (east)	GADU MOR	LI	W			56,3	110	183	67,2	102	132	43,6	14,9	42,4	no	I	D-	no	17	1992	17	--	no	18	2002	9
PCB-7	µg/kg	98B1	Bjørnerøya (east)	GADU MOR	MU	W			0,24	0,39	0,32	0,44	0,39	0,31	0,25	0,18	0,3	no	I	--	no	17	1992	17	--	no	10	2002	9
PCB-7	µg/kg	21F	Åkrafjord	LEPI WHI	LI	W				101	65,6	101	112	87,6	59,7	65,9	63	m		--	m	10	2003	8	--	m	10	2003	8
PCB-7	µg/kg	21F	Åkrafjord	LEPI WHI	MU	W				0,45	0,35	1,11	0,93	0,86	0,63	0,59	0,58	m		--	m	13	2003	8	--	m	13	2003	8
PCB-7	µg/kg	67F	Strandebarm area	LEPI WHI	MU	W	0,82	0,62	0,37	0,43	0,46	0,61	0,43	0,22	0,64	0,52	0,48	m		--	m	15	1990	21	--	m	13	2001	10
PCB-7	µg/kg	67F	Strandebarm area	LEPI WHI	LI	W	83,9	63,8	60,9	85,2	73,3	58	52,5	50,4	40,4	27,3	63,2	m		D-	m	10	1990	21	--	m	11	2001	10
PCB-7	µg/kg	15F	Ullerø area	LIMA LIM	LI	W		106	51,2	49,8	66,8	105	47,1	55,5	74,9	47,7	28,3	no	U	--	no	12	1991	18	--	no	13	2001	10
PCB-7	µg/kg	15F	Ullerø area	LIMA LIM	MU	W		1,5	0,67	0,94	0,31	1,25	0,7	0,58	0,98	0,66	0,73	no	U	--	no	16	1991	18	--	no	15	2001	10
PCB-7	µg/kg	36F	Færder area	LIMA LIM	LI	W	838	527	297	272	538	511	620	650	721	313	172	no	U	--	no	13	1990	21	--	no	13	2001	10
PCB-7	µg/kg	36F	Færder area	LIMA LIM	MU	W	8,38	7,73	6,56	3,73	4,34	4,47	7,18	10,4	12,1	10,1	3,77	no	U	--	1.0	13	1990	21	--	1.0	14	2001	10
PCB-7	µg/kg	10A2	Skallneset	MYTI EDU	SB	D	4,33	3,04	2,13	2,58	1,29	2,29	4,59	1,89	1,65	2,06	2,5	no	I	D-	no	13	1996	14	--	no	14	2001	10
PCB-7	µg/kg	11X	Brashavn	MYTI EDU	SB	D	2,79	3,1	1,93	1,93	1,29	3,02	2,11	1,91	2,25	1,74	2,4	no	I	D-	no	11	1997	14	--	no	11	2001	10
PCB-7	µg/kg	15A	Gåsøy (Ullerø)	MYTI EDU	SB	D	2,56	4,19	3,15	2,73	2,74	3,34	2,56	4,38	4,18	4,5	3,75	no	I	--	no	12	1990	19	--	no	9	2001	10
PCB-7	µg/kg	227A2	Høgevarde	MYTI EDU	SB	D										25,6	17,8	1.19	II				2009	2				2009	2
PCB-7	µg/kg	22A	Espevær (west)	MYTI EDU	SB	D	5,14	4,69	3,24	8,5	5,51	8,74	5,77	6,43	8,68	4,04	4,65	no	I	--	no	13	1990	21	--	no	12	2001	10
PCB-7	µg/kg	30A	Gressholmen	MYTI EDU	SB	D	49,9	29,6	33,9	43,4	18,4	67,9	28,8	47,7	49,4	38,3	28,1	1.88	II	DY	1.7	13	1987	24	--	1.7	14	2001	10
PCB-7	µg/kg	31A	Solbergstrand	MYTI EDU	SB	D	6,5	8,87	8,97	7,58	3,85	13,8	9,3	5,32	11,5	11	116	7.75	III	DY	5.4	17	1987	24	--	5.4	19	2001	10
PCB-7	µg/kg	35A	Mølen	MYTI EDU	SB	D	5,52	7,32	6,97	8,2	6,06	12,3	4,91	5,86	9,45	6,96	5,63	no	I	D-	no	12	1987	24	--	no	12	2001	10
PCB-7	µg/kg	51A	Byrkjenes	MYTI EDU	SB	D	12	28	16,9	16	10,6	14,5	11,2	11,2	9,89	9,93	8,73	no	I	--	no	11	1995	16	D-	no	8	2001	10

Parameter	Unit	Station	Station Name	Species	Tissue	Basis	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	OC	Class	Trend long	Sm long	Power long	First Year long	No of Years long	Trend short	Sm short	Power short	First Year short	No of Years short
PCB-7	µg/kg	52A	Eitrheimsneset	MYTI EDU	SB	D	7,19	74,2	12,5	12	10,3	9,97	11,1	15,4	10,7	6,78	6,28	no	I	--	no	17	1989	21	D-	no	15	2001	10
PCB-7	µg/kg	56A	Kvalnes	MYTI EDU	SB	D	5,98	216	13	13,1	6,73	9,33	6,04	9,53	6,5	5,81	4,83	no	I	--	no	21	1988	23	D-	no	19	2001	10
PCB-7	µg/kg	57A	Krossanes	MYTI EDU	SB	D	3,89	55,9	5,89	6,16	2,9	7,47	4,28	3,74	4,65	4,88	4,75	no	I	--	no	18	1989	21	--	no	18	2001	10
PCB-7	µg/kg	63A	Ranaskjær	MYTI EDU	SB	D	4,09	13,8	3,54	6,2	1,25	5,3	4,09	5,07	3,25	6,5	2,8	no	I	--	no	16	1989	21	--	no	18	2001	10
PCB-7	µg/kg	65A	Vikingneset	MYTI EDU	SB	D	3	8,31	2,73	3,73	1,24	4,75	3,28	3,91	2,68	2,79	2,65	no	I	D-	no	16	1988	23	--	no	15	2001	10
PCB-7	µg/kg	69A	Lille Terøy	MYTI EDU	SB	D	2,53	5,7	3,18	4,01	1,27	4,03	1,75	2,18	1,28	2,27	2,78	no	I	--	no	15	1992	19	--	no	15	2001	10
PCB-7	µg/kg	71A	Bjørkøya (Risøyodden)	MYTI EDU	SB	D	8,52	12,7	7,55	9,74	4,32	14,3	9,33	9,3	10,5	9,71	7,54	no	I	D-	no	13	1987	24	--	no	13	2001	10
PCB-7	µg/kg	76A	Risøy	MYTI EDU	SB	D	6,34	6,78	5,12	5,06	5,49	3,27	4,59	4,68	5,91	5,24	5,36	no	I	DY	no	11	1990	19	--	no	8	2001	10
PCB-7	µg/kg	98A2	Husvaagen area	MYTI EDU	SB	D	3,54	4,56	3,23	3,62	1,85	2,72	3,27	2,7	1,09	3,25	3,59	no	I	--	no	14	1997	13	--	no	14	2001	10
PCB-7	µg/kg	I022	West Damholmen	MYTI EDU	SB	D	19,2	22,4	20,8	15,2	16,5	11	11,1	5,79	6,77	8,8	8,25	no	I	D-	no	10	1995	16	D-	no	9	2001	10
PCB-7	µg/kg	I023	Singlekalven (south)	MYTI EDU	SB	D	10,8	17,4	15,9	12,3	12,6	9,73	8,91	4,39	5,04	9,62	7,14	no	I	D-	no	11	1995	16	D-	no	11	2001	10
PCB-7	µg/kg	I024	Kirkøy (north west)	MYTI EDU	SB	D	16,8	17,7	26	15	15,6	11,3	10,6	3,54	5,55	8,36	6,55	no	I	D-	no	12	1995	16	D-	no	13	2001	10
PCB-7	µg/kg	I131A	Lastad	MYTI EDU	SB	D	10,1	14	29,4	8,13	4,68	9,65	4,65	3,53	12,3	6,72	4,84	no	I	--	no	16	1995	16	--	no	17	2001	10
PCB-7	µg/kg	I132	Svensholmen	MYTI EDU	SB	D	10,2	15,8	11,8	13,3	7,96	11,5	10,9	6,19	5,92	29,1	13	no	I	--	1.4	15	1998	13	--	1.4	15	2001	10
PCB-7	µg/kg	I133	Odderø (west)	MYTI EDU	SB	D	10,4	11,7	9,24	9,23	9,53	10	9,68	9,58	6,42	16,7	8,83	no	I	D-	no	11	1995	16	--	no	11	2001	10
PCB-7	µg/kg	I241	Nordnes	MYTI EDU	SB	D	55,5	36,3	96,4	125	118	61,8	48,5	46,4	55	51,5	30,8	2.05	II	--	1.6	13	1995	16	--	1.6	14	2001	10
PCB-7	µg/kg	I242	Gravdalsneset	MYTI EDU	SB	D	36,6	26,2	44,6	81,9	55,9	36,8	31,7	29,4	34,5	35,1	30,4	2.02	II	--	2.0	13	1995	16	--	2.0	12	2001	10
PCB-7	µg/kg	I243	Hegreneset	MYTI EDU	SB	D	47,9	29,3	52,5	326	288	217	75,2	48,9	63	35,9	36,3	2.42	II	DY	no	17	1995	16	DY	no	18	2001	10
PCB-7	µg/kg	I301	Akershuskaia	MYTI EDU	SB	D	58,7	64,6	62,6	70,4	57,9	84,7	75,4	63,2	96,6	45,9	39,2	2.62	II	D-	1.4	11	1992	17	--	1.4	10	2001	10
PCB-7	µg/kg	I304	Gåsøya	MYTI EDU	SB	D	19,9	25	24,4	27,5	30	21,4	23,5	23,9	33,6	17,7	15,2	1.01	II	--	no	11	1995	15	--	no	10	2001	10
PCB-7	µg/kg	I306	Håøya	MYTI EDU	SB	D	21,8	17,2	15,7	15,4	17,9	12,9	17,6	20,7	12,7	12,3	12	no	I	--	no	12	1995	15	--	no	9	2001	10
PCB-7	µg/kg	I307	Ramtonholmen	MYTI EDU	SB	D	20,3	16,9	17,5	15,4	13	11,3	18,1	15,5	16,5	16,5	13	no	I	D-	no	10	1995	15	--	no	8	2001	10
PCB-7	µg/kg	I712	Croftholmen	MYTI EDU	SB	D	13,9	12,5	10,9	16,9	16,7	16,2	14,2	11,4	19,4	9,47	10,1	no	I	D-	no	10	1995	16	--	no	10	2001	10
PCB-7	µg/kg	I713	Strømtangen	MYTI EDU	SB	D			12,5	15	16,9	18,1	15,7	12,8	13,7	13,1	16,3	1.08	II	--	no	7	2002	9	--	no	7	2002	9
PCB-7	µg/kg	33F	Sande (east side)	PLAT FLE	LI	W	90,7	126	53	60,1	62,8	63,4	68,9	67,3	72,8	74,6	79	no	U	--	no	12	1990	21	--	no	10	2001	10
PCB-7	µg/kg	33F	Sande (east side)	PLAT FLE	MU	W	1,14	1,76	1,53	1,25	0,68	0,48	0,81	0,68	1,38	1,28	1,31	no	I	--	no	16	1990	21	DY	no	11	2001	10
PCB-7	µg/kg	53F	Inner Sørfjord	PLAT FLE	MU	W	3	2,67	2,02	1,13	1,96	6,73		1,76	2,19	0,59	6,3	1.26	II	DY	no	21	1990	19	--	no	23	2001	9
PCB-7	µg/kg	53F	Inner Sørfjord	PLAT FLE	LI	W	95,8	95,1	158	165	108	363		119	80,7	19,4	338	3.38	O	--	no	21	1990	19	--	no	24	2001	9
PCB-7	µg/kg	10F	Skogerøy	PLEU PLA	LI	W	45	24,9	86,2	16,6	22,3	25,7		14,9	23,8	10,5	6,36	no	U	D-	no	16	1997	12	--	no	17	2001	9
PCB-7	µg/kg	10F	Skogerøy	PLEU PLA	MU	W	1,78	1,22	1	0,46	0,18	0,44		0,53	0,99	0,33	0,66	no	U	D-	no	16	1997	12	--	no	16	2001	9
PCB-7	µg/kg	98F2	Husholmen	PLEU PLA	LI	W	40,8	25,5	10,3	10,5	8,4	24,1	13,8	5,53	3,49	2,56	3,55	no	U	D-	no	16	2000	11	D-	no	16	2001	10
PCB-7	µg/kg	98F2	Husholmen	PLEU PLA	MU	W	1,54	0,6	0,29	0,25	0,18	0,86	0,74	0,29	0,23	0,18	0,63	no	U	--	no	19	2000	11	--	no	19	2001	10
PFOS	µg/kg	13BH	Kristiansand havn	GADU MOR	LI	W										9	6,9	no					2009	2				2009	2
PFOS	µg/kg	23B	Karihavet area	GADU MOR	LI	W						5,48	16,5	3	6,9	8,9	4	no		--	m	20	1993	7	--	m	19	2005	6
PFOS	µg/kg	30B	Oslo City area	GADU MOR	LI	W						38	49	11	42	48	16	no		--	m	21	1993	7	--	m	19	2005	6
PFOS	µg/kg	36B	Færder area	GADU MOR	LI	W								34	180	29	8,94	no		-?	m	>25	2007	4	-?	m	>25	2007	4
PFOS	µg/kg	43BH	Tromsø havn	GADU MOR	LI	W										6,3	3,3	no					2009	2				2009	2
PFOS	µg/kg	53B	Inner Sørfjord	GADU MOR	LI	W						6,48	10	2	10	3,2	2,4	no		--	m	19	2005	6	--	m	19	2005	6
PFOS	µg/kg	80BH	Trondheim	GADU MOR	LI	W										4,3	3,1	no					2009	2				2009	2
PFOS	µg/kg	98B1	Bjørnerøya (east)	GADU MOR	LI	W							3		2	6,8	16	no		-?	m	20	2006	4	-?	m	20	2006	4
ppDDE	µg/kg	10B	Varangerfjorden	GADU MOR	LI	W	32	38,5	54	51,5	50	37	34	35	30	51	30	no	I	D-	no	12	1994	17	--	no	10	2001	10
ppDDE	µg/kg	10B	Varangerfjorden	GADU MOR	MU	W	0,15	0,18	0,23	0,18	0,41	0,17	0,18	0,26	0,19	0,27	0,11	no	I	--	no	16	1994	17	--	no	13	2001	10
ppDDE	µg/kg	13BH	Kristiansand havn	GADU MOR	MU	W										0,31	0,24	no	I				2009	2				2009	2
ppDDE	µg/kg	13BH	Kristiansand havn	GADU MOR	LI	W										58	21	no	I				2009	2				2009	2
ppDDE	µg/kg	15B	Ullerø area	GADU MOR	MU	W	0,31	0,19	0,22	0,39	0,07	0,21	0,18	0,15	0,15	0,12	0,14	no	I	D-	no	14	1990	21	--	no	16	2001	10
ppDDE	µg/kg	15B	Ullerø area	GADU MOR	LI	W	46	60	78	74	50	58	51	55	48	37	62	no	I	--	no	13	1990	21	--	no	9	2001	10

Parameter	Unit	Station	Station Name	Species	Tissue	Basis	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	OC	Class	Trend long	Sm long	Power long	First Year long	No of Years long	Trend short	Sm short	Power short	First Year short	No of Years short
ppDDE	µg/kg	23B	Karihavet area	GADU MOR	MU	W	0,12	0,16	0,1	0,13	0,08	0,17	0,29	0,15	0,07	0,09	0,18	no	I	--	no	17	1990	21	--	no	16	2001	10
ppDDE	µg/kg	23B	Karihavet area	GADU MOR	LI	W	59	52,9	24	37	52	46	33	40	21,4	26	28	no	I	D-	no	11	1990	21	--	no	12	2001	10
ppDDE	µg/kg	30B	Oslo City area	GADU MOR	LI	W	160	180	180	240	210	260	190	130	180	150	200	1	I	D-	no	14	1984	27	--	no	9	2001	10
ppDDE	µg/kg	30B	Oslo City area	GADU MOR	MU	W	0,44	0,67	0,73	0,7	0,66	0,73	0,65	0,58	0,82	1,1	0,88	no	I	--	1.2	16	1990	21	--	1.2	8	2001	10
ppDDE	µg/kg	36B	Færder area	GADU MOR	MU	W	0,17	0,24	0,22	0,21	0,26	0,41	0,38	0,08	0,22	0,22	0,29	no	I	DY	no	18	1983	22	--	no	16	2001	10
ppDDE	µg/kg	36B	Færder area	GADU MOR	LI	W	47	46	39	32	34	40	59	26	34	26	50	no	I	D-	no	15	1982	29	--	no	12	2001	10
ppDDE	µg/kg	43BH	Tromsø havn	GADU MOR	MU	W										0,14	0,09	no	I				2009	2				2009	2
ppDDE	µg/kg	43BH	Tromsø havn	GADU MOR	LI	W										33	31	no	I				2009	2				2009	2
ppDDE	µg/kg	53B	Inner Sørfjord	GADU MOR	MU	W	2,5	0,6	1,79	2,4	1,9	4,2	0,63	1,9	1,8	1,3	2,1	2.1	II	--	1.9	25	1990	20	--	1.9	18	2001	10
ppDDE	µg/kg	53B	Inner Sørfjord	GADU MOR	LI	W	380	260	200	145	300	199	220	360	87	268	420	2.1	II	--	1.8	21	1988	22	--	1.8	16	2001	10
ppDDE	µg/kg	67B	Strandebarm area	GADU MOR	LI	W	177	140	110	89	74	110	34	130	96,5	100	284	1.42	II	D-	1.6	18	1988	23	--	1.6	15	2001	10
ppDDE	µg/kg	67B	Strandebarm area	GADU MOR	MU	W	1,1	1,8	0,44	0,24	0,31	0,66	0,12	0,34	0,55	0,47	1,1	1.1	II	D-	1.4	21	1990	21	--	1.4	19	2001	10
ppDDE	µg/kg	80BH	Trondheim	GADU MOR	LI	W										60	36,3	no	I				2009	2				2009	2
ppDDE	µg/kg	80BH	Trondheim	GADU MOR	MU	W										0,21	0,15	no	I				2009	2				2009	2
ppDDE	µg/kg	98B1	Bjørnerøya (east)	GADU MOR	LI	W			29	64	73	22	37	52,2	17	5,6	18	no	I	D-	no	18	1992	17	--	no	19	2002	9
ppDDE	µg/kg	98B1	Bjørnerøya (east)	GADU MOR	MU	W			0,09	0,12	0,21	0,14	0,09	0,15	0,05	0,05	0,08	no	I	--	no	20	1992	17	--	no	14	2002	9
ppDDE	µg/kg	21F	Åkrafjord	LEPI WHI	LI	W				44	27,9	48	45	36	38	43	32,4	m		--	m	10	2003	8	--	m	10	2003	8
ppDDE	µg/kg	21F	Åkrafjord	LEPI WHI	MU	W				0,27	0,15	0,6	0,38	0,46	0,43	0,35	0,27	m		--	m	14	2003	8	--	m	14	2003	8
ppDDE	µg/kg	67F	Strandebarm area	LEPI WHI	MU	W	1,1	0,54	0,39	0,59	0,48	0,57	0,37	0,28	0,76	0,66	0,33	m		D-	m	16	1990	21	--	m	13	2001	10
ppDDE	µg/kg	67F	Strandebarm area	LEPI WHI	LI	W	130	58	64	73	71,1	55	61,6	48	61	46	65	m		DY	m	10	1988	23	--	m	8	2001	10
ppDDE	µg/kg	15F	Ullerø area	LIMA LIM	MU	W		0,55	0,18	0,28	0,1	0,46	0,24	0,16	0,35	0,23	0,2	no	U	--	no	17	1991	18	--	no	17	2001	10
ppDDE	µg/kg	15F	Ullerø area	LIMA LIM	LI	W		41	15	17	23	26	15	16	22	16	11	no	U	--	no	14	1991	18	--	no	13	2001	10
ppDDE	µg/kg	36F	Færder area	LIMA LIM	LI	W	45	27	31	36	17	21	35	19	22	18	14	no	U	--	no	13	1990	21	--	no	11	2001	10
ppDDE	µg/kg	36F	Færder area	LIMA LIM	MU	W	0,52	0,51	0,61	0,53	0,13	0,31	0,38	0,46	0,35	0,41	0,32	no	U	D-	no	14	1990	21	--	no	14	2001	10
ppDDE	µg/kg	10A2	Skallneset	MYTI EDU	SB	D	0,61	0,87	0,61	0,58	0,27	0,47	0,59	0,32	0,41	0,35	0,88	no	I	--	no	15	1996	14	--	no	13	2001	10
ppDDE	µg/kg	11X	Brashavn	MYTI EDU	SB	D	0,77	0,76	0,47	0,47	0,32	0,52	0,39	0,29	1,17	0,45	0,45	no	I	--	no	13	1997	14	--	no	15	2001	10
ppDDE	µg/kg	15A	Gåsøy (Ullerø)	MYTI EDU	SB	D	0,54	0,62	0,85	0,67	0,86	0,69	0,72	0,71	1,17	0,77	0,56	no	I	--	no	16	1993	18	--	no	10	2001	10
ppDDE	µg/kg	227A2	Høgevarde	MYTI EDU	SB	D										0,93	0,73	no	I				2009	2				2009	2
ppDDE	µg/kg	22A	Espevær (west)	MYTI EDU	SB	D	1,49	0,91	0,73	1,46	0,86	1,65	4,78	0,93	0,94	0,9	0,8	no	I	--	no	18	1992	19	--	no	17	2001	10
ppDDE	µg/kg	30A	Gressholmen	MYTI EDU	SB	D	3,47	1,99	1,97	2,08	1,22	2,56	1,77	3,29	3	2,11	1,6	no	I	D-	no	13	1992	19	--	no	11	2001	10
ppDDE	µg/kg	31A	Solbergstrand	MYTI EDU	SB	D	1,19	2,1	1,8	1,01	1,25	3,17	6,32	3,94	3,47	2,94	2,5	no	I	--	no	18	1992	19	--	no	15	2001	10
ppDDE	µg/kg	35A	Mølen	MYTI EDU	SB	D	1,61	3,29	2,17	1,8	2,94	5,47	2,4	2,86	3,95	3,13	2,63	no	I	--	no	17	1992	19	--	no	13	2001	10
ppDDE	µg/kg	51A	Byrkjenes	MYTI EDU	SB	D	16,9	5,48	9,52	10	10,5	14,7	7,5	11,7	13,3	12,9	7,54	no	I	--	no	15	1995	16	--	no	11	2001	10
ppDDE	µg/kg	52A	Eitrheimsneset	MYTI EDU	SB	D	11,9	6,47	6,82	8,86	10,5	12,5	4,71	12,2	12,7	6,11	5,06	no	I	D-	no	13	1992	19	--	no	14	2001	10
ppDDE	µg/kg	56A	Kvalnes	MYTI EDU	SB	D	26,2	60,6	40	55,1	49,3	550	186	117	180	44	62,5	6.25	IV	--	no	18	1992	19	--	no	20	2001	10
ppDDE	µg/kg	57A	Krossanes	MYTI EDU	SB	D	27,5	24,7	14,7	27,8	16,6	53,3	12,1	23	26,7	25,5	10	1	I	--	no	16	1992	19	--	no	17	2001	10
ppDDE	µg/kg	63A	Ranaskjær	MYTI EDU	SB	D	10,2	7,09	4,76	11,3	3,82	14	5,67	13,6	12,1	7,5	3,2	no	I	--	no	15	1992	19	--	no	17	2001	10
ppDDE	µg/kg	65A	Vikingneset	MYTI EDU	SB	D	6,76	5,44	3,61	6,47	2,55	8,33	3,63	6,67	7	5,5	1,65	no	I	--	no	14	1992	19	--	no	16	2001	10
ppDDE	µg/kg	69A	Lille Terøy	MYTI EDU	SB	D	2,7	2,25	1,61	2,62	0,91	3	0,85	3,29	0,78	2,12	1,06	no	I	--	no	20	1992	19	--	no	18	2001	10
ppDDE	µg/kg	71A	Bjørkøya (Risøyodden)	MYTI EDU	SB	D	2,26	3,58	1,1	1,67	0,76	1,8	2,17	1,8	1,56	1,71	1,53	no	I	--	no	14	1992	19	--	no	14	2001	10
ppDDE	µg/kg	76A	Risøy	MYTI EDU	SB	D	0,78	0,83	0,75	0,62	1,1	0,61	1,38	0,59	0,82	0,73	0,93	no	I	--	no	15	1992	17	--	no	12	2001	10
ppDDE	µg/kg	98A2	Husvaagen area	MYTI EDU	SB	D	0,58	1,31	0,63	0,73	0,42	0,78	0,87	0,5	0,44	0,61	0,59	no	I	--	no	13	1997	13	--	no	12	2001	10
ppDDE	µg/kg	I022	West Damholmen	MYTI EDU	SB	D	4,92	3,73	4,51	2,54	2,7	1,43	1,31	0,75	1,09	1,4	1,58	no	I	DY	no	14	1995	16	DY	no	11	2001	10
ppDDE	µg/kg	I023	Singlekalven (south)	MYTI EDU	SB	D	2,39	2,91	3,31	1,42	1,29	1,47	1,46	0,92	1	1,77	1,81	no	I	D-	no	13	1995	16	D-	no	11	2001	10
ppDDE	µg/kg	I024	Kirkøy (north west)	MYTI EDU	SB	D	4,94	2,52	5,15	2,4	2,32	1,7	1,33	0,62	1,09	1,2	1,36	no	I	DY	no	13	1995	16	D-	no	13	2001	10
ppDDE	µg/kg	I131A	Lastad	MYTI EDU	SB	D	1,11	0,92	1,11	0,94	1,37	2,39	0,85	0,73	2,07	1,46	0,75	no	I	--	no	15	1995	16	--	no	15	2001	10

Parameter	Unit	Station	Station Name	Species	Tissue	Basis	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	OC	Class	Trend	Sm	Power	First Year	No of Years	Trend	Sm	Power	First Year	No of Years
																				long	long	long	long	long	short	short	short	short	short
ppDDE	µg/kg	I132	Svensholmen	MYTI EDU	SB	D	1,19	1,15	1,26	1,17	0,92	1,83	1,13	0,5	0,55	1,87	1,14	no	I	--	no	14	1998	13	--	no	15	2001	10
ppDDE	µg/kg	I133	Odderø (west)	MYTI EDU	SB	D	1,16	1,11	1,03	0,93	0,94	1,55	1,35	0,64	0,69	2	0,69	no	I	--	no	15	1995	16	--	no	15	2001	10
ppDDE	µg/kg	I241	Nordnes	MYTI EDU	SB	D	4,45	2,93	4,4	4,37	5,49	6,17	3	3,88	11,9	5,56	3,65	no	I	--	no	15	1995	16	--	no	15	2001	10
ppDDE	µg/kg	I242	Gravdalsneset	MYTI EDU	SB	D	3,52	2,22	2,88	3,38	4,41	2,57	1,93	3,06	2,43	2,71	1,6	no	I	--	no	17	1995	16	--	no	11	2001	10
ppDDE	µg/kg	I243	Hegreneset	MYTI EDU	SB	D	4,01	1,99	3,32	3,88	6,41	19,5	5,88	4,41	6,23	3,16	3,2	no	I	--	no	16	1995	16	--	no	15	2001	10
ppDDE	µg/kg	I301	Akershuskaia	MYTI EDU	SB	D	5,58	4,51	5,06	3,54	4,47	5,17	3,57	4,06	6,53	3	2,82	no	I	--	no	14	1992	17	--	no	11	2001	10
ppDDE	µg/kg	I304	Gåsøya	MYTI EDU	SB	D	1,95	2,71	2,62	1,73	2,71	1,43	1,85	3,17	3,07	1,93	1,62	no	I	--	no	15	1995	15	--	no	12	2001	10
ppDDE	µg/kg	I306	Håøya	MYTI EDU	SB	D	2,37	1,88	1,92	1,12	1,74	1,09	2,47	1,86	2,46	1,71	1,64	no	I	--	no	17	1995	15	--	no	11	2001	10
ppDDE	µg/kg	I307	Ramtonholmen	MYTI EDU	SB	D	2,12	4,13	2,28	1,1	1,35	0,87	2,5	2,31	2,07	2,31	1,71	no	I	--	no	14	1995	15	--	no	13	2001	10
ppDDE	µg/kg	I712	Croftholmen	MYTI EDU	SB	D	3,46	2,48	1,6	2,65	2,94	1,36	2,36	1,75	2,39	1,05	2,02	no	I	--	no	13	1995	16	--	no	13	2001	10
ppDDE	µg/kg	I713	Strømtangen	MYTI EDU	SB	D			1,61	2,26	2,96	0,68	2,19	2,17	1,69	1,62	2,88	no	I	--	no	16	2002	9	--	no	16	2002	9
ppDDE	µg/kg	33F	Sande (east side)	PLAT FLE	MU	W	0,3	0,56	0,43	0,53	0,25	0,16	0,25	0,22	0,29	0,39	0,19	no	I	DY	no	17	1983	22	--	no	12	2001	10
ppDDE	µg/kg	33F	Sande (east side)	PLAT FLE	LI	W	27	27	17	22	19	16	20	16	18	24	15	no	U	--	no	22	1983	27	--	no	9	2001	10
ppDDE	µg/kg	53F	Inner Sørfjord	PLAT FLE	MU	W	0,61	0,88	0,66	0,81	0,57	1,3		0,67	0,73	0,27	0,37	no	I	D-	no	15	1990	19	--	no	13	2001	9
ppDDE	µg/kg	53F	Inner Sørfjord	PLAT FLE	LI	W	17,6	39	42	40	29	45		51	30	9,44	19,2	no	U	DY	no	16	1988	21	--	no	14	2001	9
ppDDE	µg/kg	10F	Skogerøy	PLEU PLA	MU	W	1,1	0,3	0,4	0,13	0,07	0,18		0,2	0,14	0,11	0,1	no	U	D-	no	16	1997	12	--	no	15	2001	9
ppDDE	µg/kg	10F	Skogerøy	PLEU PLA	LI	W	28	8,9	19	4,74	5,79	10		3,9	5,02	3,7	1,85	no	U	D-	no	16	1997	12	--	no	16	2001	9
ppDDE	µg/kg	98F2	Husholmen	PLEU PLA	LI	W	10,8	8	5,1	3,6	2,8	9,19	4,6	1,7	1,2	1,2	1,8	no	U	D-	no	16	2000	11	--	no	17	2001	10
ppDDE	µg/kg	98F2	Husholmen	PLEU PLA	MU	W	0,47	0,24	0,14	0,09	0,05	0,43	0,34	0,08	0,05	0,05	0,11	no	U	--	no	21	2000	11	--	no	22	2001	10
PYR1O	µg/kg/ABS 380 nm	15B	Ullerø area	GADU MOR	BI	W		29,7	6,32	5,66	16,7	1,1	2,61	1,14	1,7	2,69	2,07	m		DY	m	21	1998	12	D-	m	21	2001	10
PYR1O	µg/kg/ABS 380 nm	23B	Karihavet area	GADU MOR	BI	W	4,15	2,55	3,1	5,32	1,62	3,46	1,34	1,72	1,67	1,02	1,59	m		D-	m	14	1998	13	--	m	14	2001	10
PYR1O	µg/kg/ABS 380 nm	30B	Oslo City area	GADU MOR	BI	W	12,3	17	29,2	20,3	43,5	15,1	13,9	4,95	17,1	15,6	20,3	m		D-	m	19	1998	13	--	m	16	2001	10
PYR1O	µg/kg/ABS 380 nm	53B	Inner Sørfjord	GADU MOR	BI	W	9,23	3,81	18,8	3,65	3,39	3,04	2,18	4,84	3,19	10,9	7,96	m		DY	m	19	1998	13	--	m	18	2001	10
TBT	mg/kg	71G	Fugløyskjær	LITT LIT	SB	D									0,02	0,02	0,02	m		-?	m	14	2008	3	-?	m	14	2008	3
TBT	mg/kg	11X	Brashavn	MYTI EDU	SB	D			0,04	0,02	0	0	0	0	0	0	0	no	I	D-	no	17	2002	9	D-	no	17	2002	9
TBT	mg/kg	15A	Gåsøy (Ullerø)	MYTI EDU	SB	D		0,1	0,08	0,06	0,02	0,02	0,01	0,01	0,01	0,01	0,01	no	I	DY	no	13	2001	10	DY	no	13	2001	10
TBT	mg/kg	227A2	Høgevarde	MYTI EDU	SB	D	0,38	0,42	0,67	0,71	0,31	0,28	0,13	0,19	0,14	0,11	0,11	1.07	II	D-	no	13	1998	13	D-	no	12	2001	10
TBT	mg/kg	22A	Espevær (west)	MYTI EDU	SB	D		0,17	0,14	0,59	0,29	0,25	0,1	0,3	0,1	0,05	0,01	no	I	D-	no	19	2001	10	D-	no	19	2001	10
TBT	mg/kg	30A	Gressholmen	MYTI EDU	SB	D	0,94	0,8	1,81	1,08	0,72	0,28	0,36	0,54	0,46	0,19	0,18	1.81	II	D-	no	14	1997	14	D-	no	15	2001	10
TBT	mg/kg	35A	Mølen	MYTI EDU	SB	D									0,1	0,03	0,04	no	I	-?	?	16	2008	3	-?	?	16	2008	3
TBT	mg/kg	71A	Bjørkøya (Risøyodden)	MYTI EDU	SB	D		0,43	0,7	0,38	0,12	0,14	0,06	0,09	0,08	0,04	0,03	no	I	D-	no	14	1997	11	D-	no	14	2001	10
TBT	mg/kg	76A	Risøy	MYTI EDU	SB	D		0,05	0,09	0,11	0,03	0,03	0,02	0,01	0,03	0,02	0,01	no	I	D-	no	15	1997	11	D-	no	15	2001	10
TBT	mg/kg	98A2	Husvaagen area	MYTI EDU	SB	D		0,11	0,11	0,11	0,05	0,03	0,02	0,03	0,02	0,02	0,02	no	I	D-	no	12	2001	10	D-	no	12	2001	10
TBT	mg/kg	I131A	Lastad	MYTI EDU	SB	D		0,49	0,12		0,06						0,03	no	I	-?	?	20	2001	4	-?	?	20	2001	4
TBT	mg/kg	I132	Svensholmen	MYTI EDU	SB	D			0,47		0,46	0,13	0,21	0,08	0,18	0,21	0,09	no	I	--	no	17	2002	8	--	no	17	2002	8
TBT	mg/kg	I133	Odderø (west)	MYTI EDU	SB	D				1	0,23	0,22	0,29	0,12	0,25	0,21	0,11	1.1	II	--	no	16	2003	8	--	no	16	2003	8
TBT	mg/kg	I301	Akershuskaia	MYTI EDU	SB	D			2,59	2,11	2,83	2,94	1,27	1,42	0,56	0,36	0,18	1.75	II	DY	no	11	2002	9	DY	no	11	2002	9
TBT	mg/kg	I307	Ramtonholmen	MYTI EDU	SB	D											0,08	no	I				2010	1				2010	1
TBT	mg/kg	11G	Brashavn	NUCE LAP	SB	D			0,01	0,03	0,01	0,02	0,01	0,01	0	0	0	m		D-	m	17	2002	9	D-	m	17	2002	9
TBT	mg/kg	131G	Lastad	NUCE LAP	SB	D		0,03	0,06	0,08	0,05	0,02		0,01	0,02	0,01	0	m		D-	m	17	2001	9	D-	m	17	2001	9
TBT	mg/kg	15G	Gåsøy (Ullerø)	NUCE LAP	SB	D		0,07	0,09	0,07	0,03	0,02	0,01	0,01	0,01	0,01	0	m		D-	m	15	2001	10	D-	m	15	2001	10
TBT	mg/kg	227G1	Melandholmen/Flatskjær	NUCE LAP	SB	W	0,14	0,05	0,18	0,37	0,1	0,08	0,03	0,05	0,07	0,01	0,01	m		D-	m	20	1997	27	--	m	21	1997	33
TBT	mg/kg	22G	Espevær (west)	NUCE LAP	SB	D		0,07	0,1	0,32	0,2	0,13	0,03	0,06	0,06	0,01	0,01	m		D-	m	20	2001	10	D-	m	20	2001	10
TBT	mg/kg	36G	Færder	NUCE LAP	SB	D	0,1	0,05	0,16	0,09	0,04	0,03	0,01	0,03	0,04	0,01	0,01	m		D-	m	19	1997	14	--	m	21	2001	10
TBT	mg/kg	76G	Risøy	NUCE LAP	SB	D		0,04	0,2	0,11	0,07	0,05	0,02	0,03	0,01	0,01	0,01	m		D-	m	17	2001	10	D-	m	17	2001	10
TBT	mg/kg	98G	Svolvær området	NUCE LAP	SB	D		0,03	0,06	0,06	0,05	0,04	0,01	0,03	0,02	0	0,01	m		D-	m	19	2001	10	D-	m	19	2001	10

Parameter	Unit	Station	Station Name	Species	Tissue	Basis	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	OC	Class	Trend long	Sm long	Power long	First Year long	No of Years long	Trend short	Sm short	Power short	First Year short	No of Years short
TCDDN	ng/kg	30A	Gressholmen	MYTI EDU	SB	W			0,09	0,1	0,11	0,17	0,11	0,14	0,11	0,11	0,1	no	I	DY	m	8	1996	10	--	m	8	2002	9
TCDDN	ng/kg	71A	Bjørkøya (Risøyodden)	MYTI EDU	SB	W			2,35	2,35	2	2,55	2,76	2,2	4,62	3,05	3,76	18.81	V	DY	m	10	1996	10	--	m	10	2002	9
TCDDN	ng/kg	76A	Risøy	MYTI EDU	SB	W			0,03	0,08	0,1	0,12	0,11	0,1	0,12	0,08	0,1	no	I	UY	m	11	2002	9	UY	m	11	2002	9
TCDDN	ng/kg	I132	Svensholmen	MYTI EDU	SB	W			0,25	0,47	0,17	1,48	0,3	0,37	0,59	0,43	0,33	1.64	II	--	m	19	2002	9	--	m	19	2002	9
TCDDN	ng/kg	I133	Odderø (west)	MYTI EDU	SB	W			0,26	0,14	0,37	0,25	0,23	0,2	0,18	0,64	0,99	4.96	III	--	m	15	1995	11	--	m	15	2002	9
TCDDN	ng/kg	I712	Croftholmen	MYTI EDU	SB	W			4,15	4,17	3,26	1,47	3,24	4,02	5,75	5,92	4,57	22.83	V	--	m	13	1996	10	--	m	13	2002	9
TCDDN	ng/kg	I713	Strømtangen	MYTI EDU	SB	W			3,59	4,16	2,78	4,6	1,39	6,14	3,61	3,85	4,55	22.73	V	--	m	15	2002	9	--	m	15	2002	9
V	mg/kg	35A	Mølen	MYTI EDU	SB	D	2,39	6,71	0,46	10,8	0,66	0,56	2,14	6,35	1,21	2,6	7,38	m		--	m	>25	1996	15	--	m	>25	2001	10
VDSI		11G	Brashavn	NUCE LAP	WO	W			0,03	0	0,29	0	0	0,03	0	0	0	m		--	m	7	2002	9	--	m	7	2002	9
VDSI		131G	Lastad	NUCE LAP	WO	W		3,89	3,77	3,47	3,63	1,86	1,08	0,12	0	0	0	m		D-	m	15	2001	10	D-	m	15	2001	10
VDSI		15G	Gåsøy (Ullerø)	NUCE LAP	WO	W		3,69	3,86	3,42	3,44	1,28	0,13	0	0,13	0	0	m		D-	m	18	2001	10	D-	m	18	2001	10
VDSI		227G1	Melandholmen/Flatskjær	NUCE LAP	WO	W	4,5	4,3	4,5	4,13	3,92	3,65	3,66	3,52	3,67	2,32	0,64	m		DY	m	15	1991	15	DY	m	16	2001	10
VDSI		22G	Espevær (west)	NUCE LAP	WO	W		4	4	3,95	4	4	2,96	2,41	1,41	1,58	0,13	m		DY	m	13	2001	10	DY	m	13	2001	10
VDSI		36G	Færder	NUCE LAP	WO	W	4	3,96	4	3,96	3,65	0,96	0,13	0,58	0,24	0,22	0	m		DY	m	17	1991	16	D-	m	20	2001	10
VDSI		76G	Risøy	NUCE LAP	WO	W		3,41	3,03	3,5	3,28	0,64	0,78	0,07	0,13	0	0	m		D-	m	19	2001	10	D-	m	19	2001	10
VDSI		98G	Svolvær området	NUCE LAP	WO	W		3,5	3,76	3,8	4	3,43	2,97	2,96	1,88	3,03	1,12	m		D-	m	16	2001	10	D-	m	16	2001	10
Zn	mg/kg	10B	Varangerfjorden	GADU MOR	LI	W	19,5	21,6	18,1	19,8	19,9	17,7	18,8	18,2	19,8	13,9	13	no	U	D-	no	8	1994	17	D-	no	7	2001	10
Zn	mg/kg	13BH	Kristiansand havn	GADU MOR	LI	W										29,6	26	no	U				2009	2				2009	2
Zn	mg/kg	15B	Ullerø area	GADU MOR	LI	W	26,7	31,9	22,7	31,3	17,4	13,9	11,5	18,1	19,7	20,4	14,2	no	U	DY	no	10	1990	21	--	no	11	2001	10
Zn	mg/kg	23B	Karihavet area	GADU MOR	LI	W	24,8	28	25,2	25,8	26	24,7	33,7	26,4	17,9	25,5	25,9	no	U	--	no	8	1990	21	--	no	9	2001	10
Zn	mg/kg	30B	Oslo City area	GADU MOR	LI	W	23,1	31,4	28,8	25,1	20,9	25,7	29,3	25	30,7	30,6	27,4	no	U	--	1.0	13	1986	25	--	1.0	7	2001	10
Zn	mg/kg	36B	Færder area	GADU MOR	LI	W	28,6	27,1	32,2	21,6	18,3	24,5	31,3	26,2	23,1	27,2	25,7	no	U	DY	no	9	1986	25	--	no	9	2001	10
Zn	mg/kg	43BH	Tromsø havn	GADU MOR	LI	W										23,8	21,3	no	U				2009	2				2009	2
Zn	mg/kg	53B	Inner Sørfjord	GADU MOR	LI	W	43,4	30,7	38,7	32,8	37,5	37,8	27,7	34,8	44,8	28,7	25	no	U	--	no	11	1986	23	--	no	9	2001	10
Zn	mg/kg	67B	Strandebarm area	GADU MOR	LI	W	30,3	30,4	23,5	16,5	21,6	19,9	12,9	19,6	20,3	21,3	22,5	no	U	--	no	10	1987	24	--	no	9	2001	10
Zn	mg/kg	80BH	Trondheim	GADU MOR	LI	W										23	18,6	no	U				2009	2				2009	2
Zn	mg/kg	98B1	Bjørnerøya (east)	GADU MOR	LI	W			15	17	16	22,7	18,4	22,3	14,8	13	19	no	U	--	no	9	1992	17	--	no	9	2002	9
Zn	mg/kg	21F	Åkrafjord	LEPI WHI	LI	W				90,9	88,9	64,1	98,1	57,3	78	86,2	75	m		--	m	9	2003	8	--	m	9	2003	8
Zn	mg/kg	67F	Strandebarm area	LEPI WHI	LI	W	84,2	112	81,9	98,1	72,5	70,3	61	63,3	44,3	38,6	93,4	m		--	m	10	1987	24	--	m	11	2001	10
Zn	mg/kg	15F	Ullerø area	LIMA LIM	LI	W		36	29,7	27,5	34,8	24,2	37,7	28,4	28,8	38,8	28,7	no	U	--	no	9	1991	18	--	no	9	2001	10
Zn	mg/kg	36F	Færder area	LIMA LIM	LI	W	29,1	37,3	20,9	25	34,5	26,4	25	25,8	23,1	27,1	30,2	no	U	--	no	8	1990	21	--	no	9	2001	10
Zn	mg/kg	10A2	Skallneset	MYTI EDU	SB	D	125	114	134	100	149	87,4	87,5	100	108	111	99,4	no	I	--	no	8	1996	15	--	no	9	2001	10
Zn	mg/kg	11X	Brashavn	MYTI EDU	SB	D	101	121	89,6	72,4	78,2	80,5	85,6	59,5	85	73	60	no	I	--	no	9	1997	14	--	no	8	2001	10
Zn	mg/kg	15A	Gåsøy (Ullerø)	MYTI EDU	SB	D	127	83,3	110	101	114	103	112	102	92,6	107	111	no	I	--	no	11	1990	20	--	no	6	2001	10
Zn	mg/kg	227A2	Høgevarde	MYTI EDU	SB	D										139	125	no	I				2009	2				2009	2
Zn	mg/kg	22A	Espevær (west)	MYTI EDU	SB	D	72,1	117	90,3	134	142	121	88,8	147	118	103	92,5	no	I	--	no	10	1990	21	--	no	9	2001	10
Zn	mg/kg	30A	Gressholmen	MYTI EDU	SB	D	93,4	92,3	116	123	141	118	125	106	134	117	121	no	I	--	no	9	1984	27	--	no	7	2001	10
Zn	mg/kg	31A	Solbergstrand	MYTI EDU	SB	D	84	83,1	92,9	127	128	116	108	100	104	110	124	no	I	--	no	10	1983	28	--	no	7	2001	10
Zn	mg/kg	35A	Mølen	MYTI EDU	SB	D	66,1	72,3	84,6	106	131	118	80,5	83,5	92,6	80,4	121	no	I	UY	no	9	1983	28	--	no	9	2001	10
Zn	mg/kg	51A	Byrkjenes	MYTI EDU	SB	D										83,3	93,3	no	I	--	no	13	1987	8				2009	2
Zn	mg/kg	52A	Eitrheimsneset	MYTI EDU	SB	D	134	180	90,6	137	106	104	90,6	106	95	94,1	81,2	no	I	D-	no	11	1989	22	--	no	9	2001	10
Zn	mg/kg	56A	Kvalnes	MYTI EDU	SB	D	225	158	146	151	178	171	140	99,3	125	101	107	no	I	D-	no	12	1987	24	D-	no	8	2001	10
Zn	mg/kg	57A	Krossanes	MYTI EDU	SB	D	167	124	108	98,8	84,4	112	105	63,8	78,9	67	92,1	no	I	D-	no	11	1987	24	--	no	9	2001	10
Zn	mg/kg	63A	Ranaskjær	MYTI EDU	SB	D	115	127	106	119	54,6	110	113	98,2	77,9	82,5	112	no	I	D-	no	12	1987	24	--	no	11	2001	10
Zn	mg/kg	65A	Vikingneset	MYTI EDU	SB	D	154	155	145	151	69,6	139	147	94,8	128	92,9	119	no	I	D-	no	12	1987	24	--	no	11	2001	10
Zn	mg/kg	69A	Lille Terøy	MYTI EDU	SB	D	133	190	136	177	84	123	92,5	106	114	98	108	no	I	DY	no	9	1992	19	--	no	9	2001	10

Parameter	Unit	Station	Station Name	Species	Tissue	Basis	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	OC	Class	Trend long	Sm long	Power long	First Year long	No of Years long	Trend short	Sm short	Power short	First Year short	No of Years short
Zn	mg/kg	71A	Bjørkøya (Risøyodden)	MYTI EDU	SB	D	99,4	97,9	134	121	117	105	95,3	85,6	104	86,1	95	no	I	DY	no	9	1983	28	--	no	7	2001	10
Zn	mg/kg	76A	Risøy	MYTI EDU	SB	D	83,1	116	123	127	128	107	92,6	121	116	114	104	no	I	--	no	9	1990	19	--	no	7	2001	10
Zn	mg/kg	98A2	Husvaagen area	MYTI EDU	SB	D	96	100	84,5	87	88	91,7	81,7	97,9	108	92,6	105	no	I	--	no	6	1997	13	--	no	6	2001	10
Zn	mg/kg	I022	West Damholmen	MYTI EDU	SB	D										171	153	no	I	-?	?	9	1995	5				2009	2
Zn	mg/kg	I023	Singlekalven (south)	MYTI EDU	SB	D										105	124	no	I	-?	?	9	1995	5				2009	2
Zn	mg/kg	I024	Kirkøy (north west)	MYTI EDU	SB	D										181	132	no	I	-?	?	12	1995	5				2009	2
Zn	mg/kg	I131A	Lastad	MYTI EDU	SB	D										124	95,3	no	I	-?	?	7	1995	5				2009	2
Zn	mg/kg	I132	Svensholmen	MYTI EDU	SB	D										102	119	no	I				2009	2				2009	2
Zn	mg/kg	I133	Odderø (west)	MYTI EDU	SB	D										152	158	no	I				2009	2				2009	2
Zn	mg/kg	I201	Ekkjegrunn (G1)	MYTI EDU	SB	D										118	110	no	I				2009	2				2009	2
Zn	mg/kg	I205	Bølsnes (G5)	MYTI EDU	SB	D										107	107	no	I				2009	2				2009	2
Zn	mg/kg	I241	Nordnes	MYTI EDU	SB	D										134	131	no	I	-?	?	7	1995	5				2009	2
Zn	mg/kg	I242	Gravdalsneset	MYTI EDU	SB	D										176	123	no	I	-?	?	9	1995	5				2009	2
Zn	mg/kg	I243	Hegreneset	MYTI EDU	SB	D										130	174	no	I	-?	?	9	1995	5				2009	2
Zn	mg/kg	I301	Akershuskaia	MYTI EDU	SB	D										145	126	no	I	--	no	9	1992	6				2009	2
Zn	mg/kg	I304	Gåsøya	MYTI EDU	SB	D										130	152	no	I	-?	?	10	1995	5				2009	2
Zn	mg/kg	I306	Håøya	MYTI EDU	SB	D										94,7	98,6	no	I	-?	?	7	1995	5				2009	2
Zn	mg/kg	I307	Ramtonholmen	MYTI EDU	SB	D										95,9	109	no	I	-?	?	7	1995	5				2009	2
Zn	mg/kg	I712	Croftholmen	MYTI EDU	SB	D										118	136	no	I				2009	2				2009	2
Zn	mg/kg	I713	Strømtangen	MYTI EDU	SB	D										96,2	86,3	no	I				2009	2				2009	2
Zn	mg/kg	I964	Toraneskaien	MYTI EDU	SB	D						346	243	309	359	233	234	1.17	II	--	1.0	9	2005	6	--	1.0	9	2005	6
Zn	mg/kg	I965	Moholmen (B5)	MYTI EDU	SB	D						200	237	240	304	378	317	1.59	II	Um	2.4	7	2005	6	Um	2.4	7	2005	6
Zn	mg/kg	I969	Bjørnbærviken (B9)	MYTI EDU	SB	D						112	113	134	131	90,9	76,4	no	I	--	no	8	1995	9	--	no	9	2005	6
Zn	mg/kg	33F	Sande (east side)	PLAT FLE	LI	W	46,6	45,6	40,8	44,9	41,6	37,7	41,1	39,1	47	45,2	46,6	no	U	D-	no	8	1986	25	--	no	<=5	2001	10
Zn	mg/kg	53F	Inner Sørfjord	PLAT FLE	LI	W	33	64,4	43,6	57,3	30,3	31		51	42,2	38,1	39	no	U	--	no	10	1988	21	--	no	10	2001	9
Zn	mg/kg	10F	Skogerøy	PLEU PLA	LI	W	30,8	44,9	33,1	38,2	37,5	38,6		42,1	30,1	38,6	40,5	no	U	--	no	8	1997	12	--	no	8	2001	9
Zn	mg/kg	98F2	Husholmen	PLEU PLA	LI	W	45,8	42,4	25,2	38,8	25,7	30,7	25,8	24,6	29,4	25,3	33	no	U	--	no	9	2000	11	--	no	9	2001	10

Appendix I
Geographical distribution of contaminants and biomarkers in biota 2008-2010

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

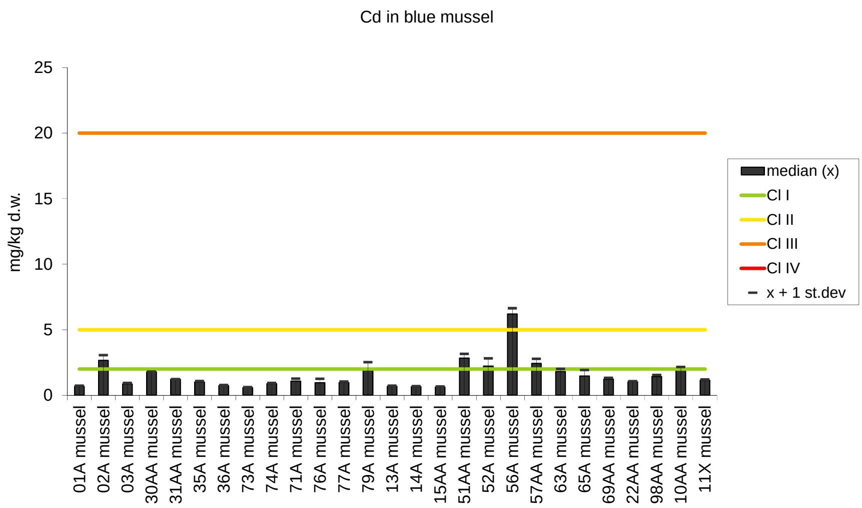
MYTI EDU-Blue Mussel (*Mytilus edulis*)
GADU MOR-Atlantic cod (*Gadus morhua*)
PLAT FLE-Flounder (*Platichthys flesus*)
LIMA LIM-Dab (*Limanda limanda*)
PLEU PLA-Plaice (*Pleuronectes platessa*)
MICR KIT-Lemon sole (*Microstomus kitt*)
LEPI WHI-Megrim (*Lepidorhombus whiff-iagonis*)

Station positions are shown on maps in Appendix F

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

Appendix I
Geographical distribution of contaminants and biomarkers in biota 2008-2010
(cont.)

A



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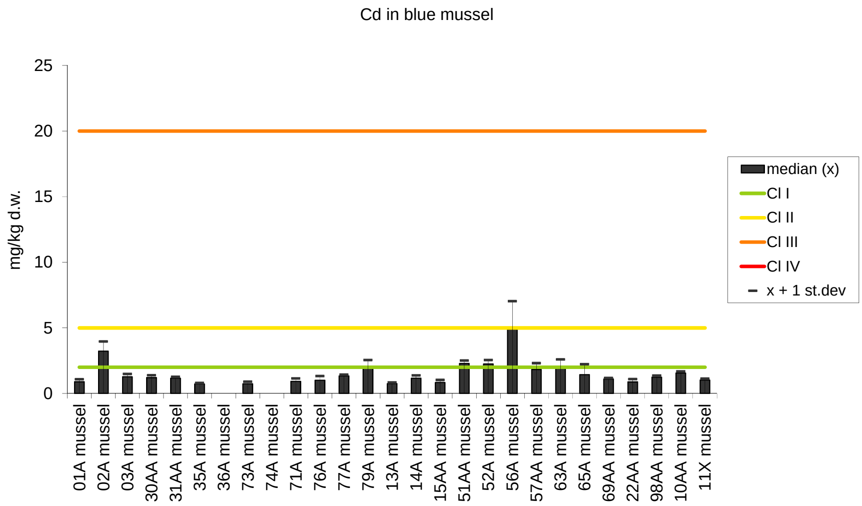

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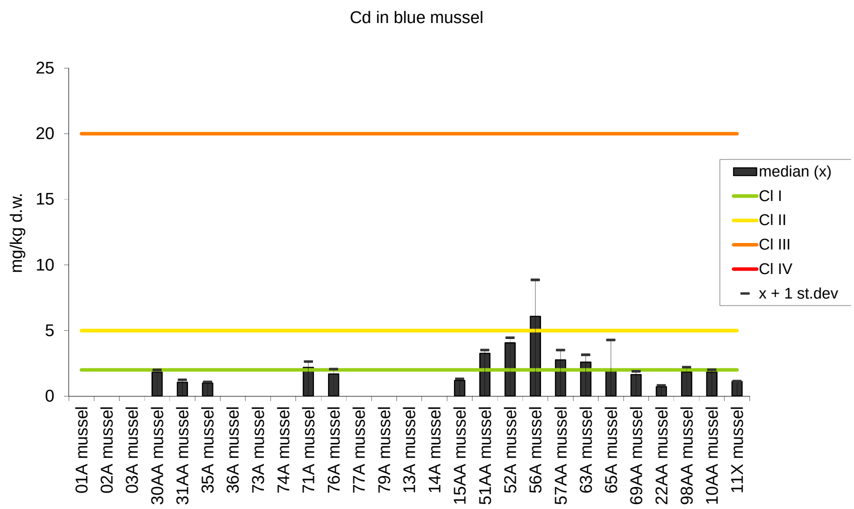
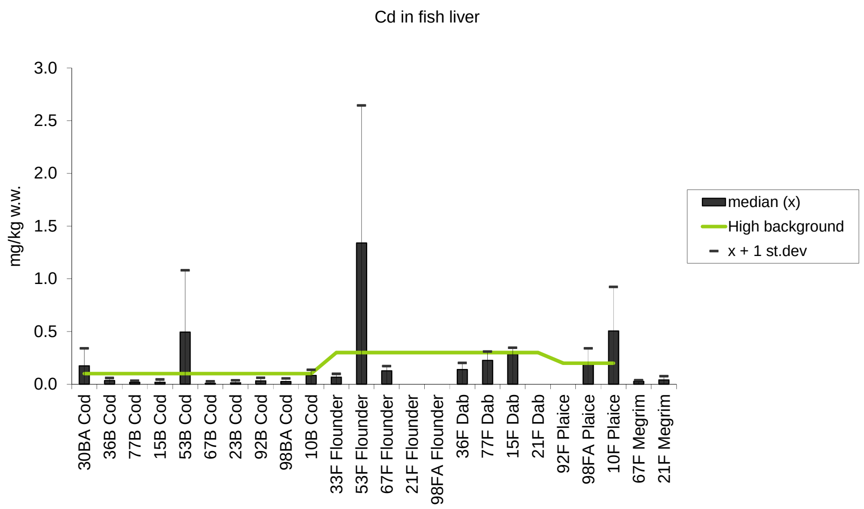
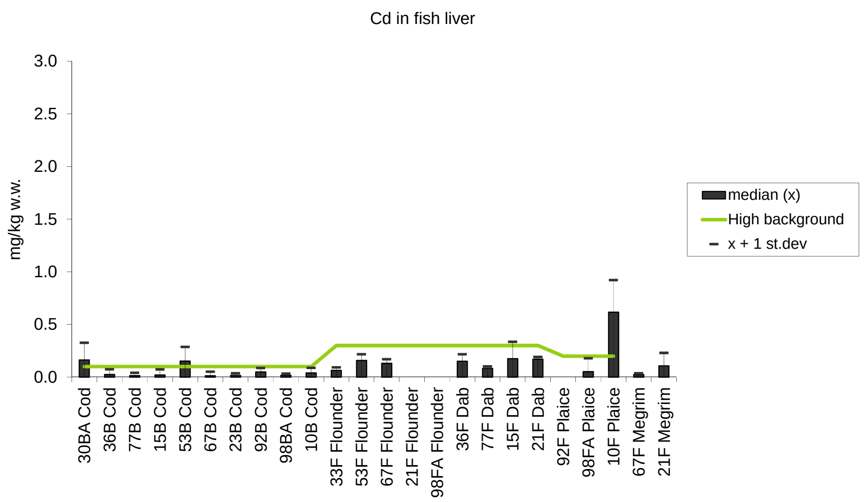


Figure 45. *Median, standard deviation and upper limit to Klif Classes or provisional "high background" concentration for cadmium in blue mussel 2008 (**A**), 2008 (**B**) and 2009 (**C**), ppm (mg/kg) dry weight (see maps in Appendix F).*

A



B



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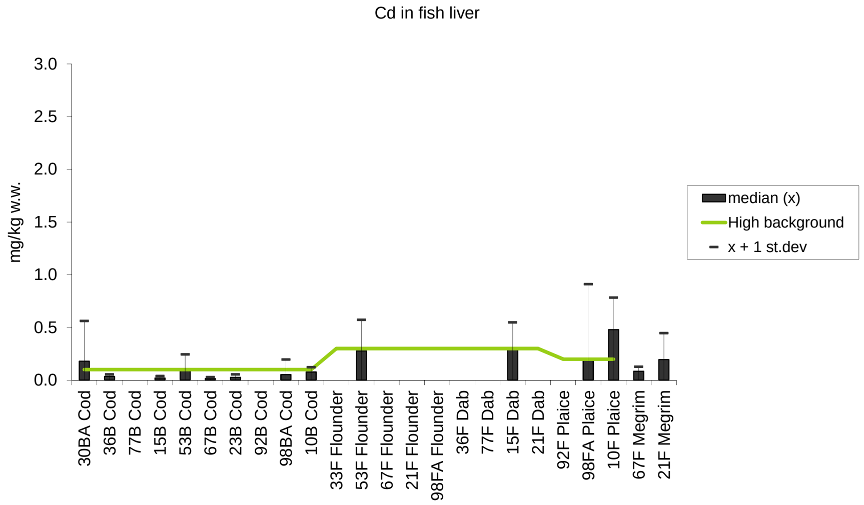
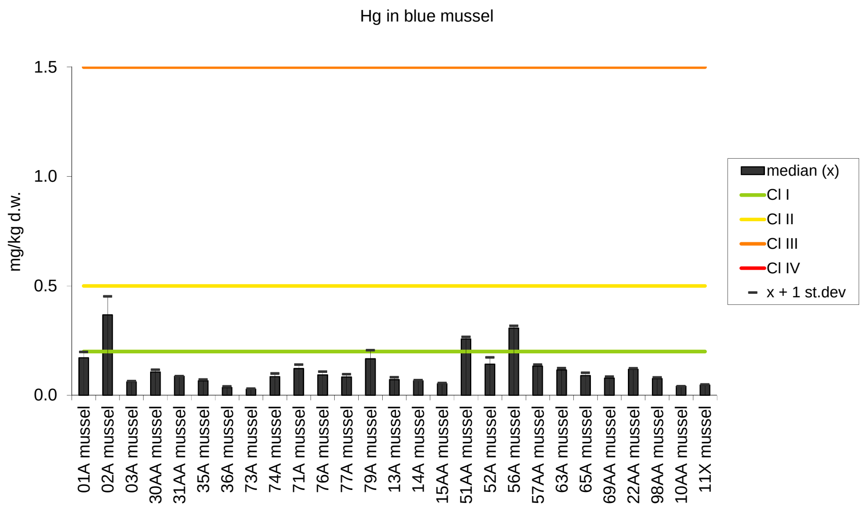
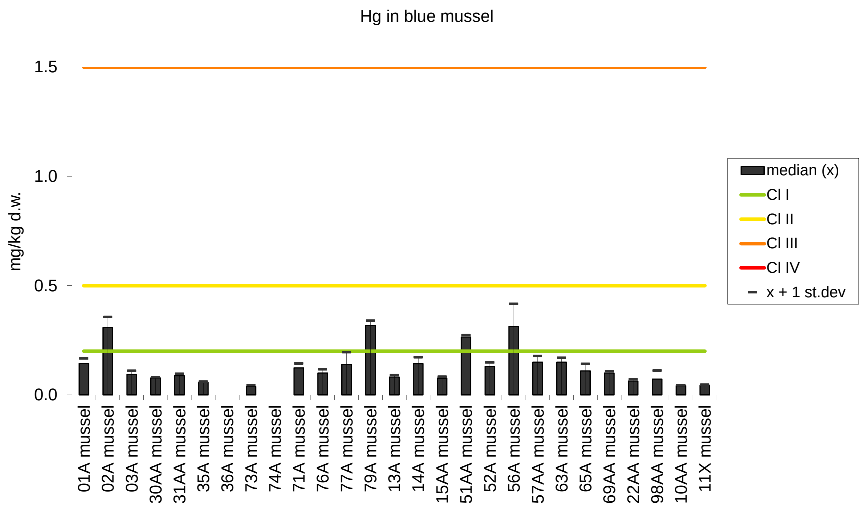


Figure 46. *Median, standard deviation and upper limit to Klif Classes or provisional "high background" concentration for cadmium in fish liver 2008* ***(A),*** *2009 (**B**) and 2010 (**C**), ppm (mg/kg) wet weight. "Cl.-B" indicates that only upper limit to Klif Classes or provisional high background concentration is indicated for all fish, (see maps in Appendix F).*

A



B



C

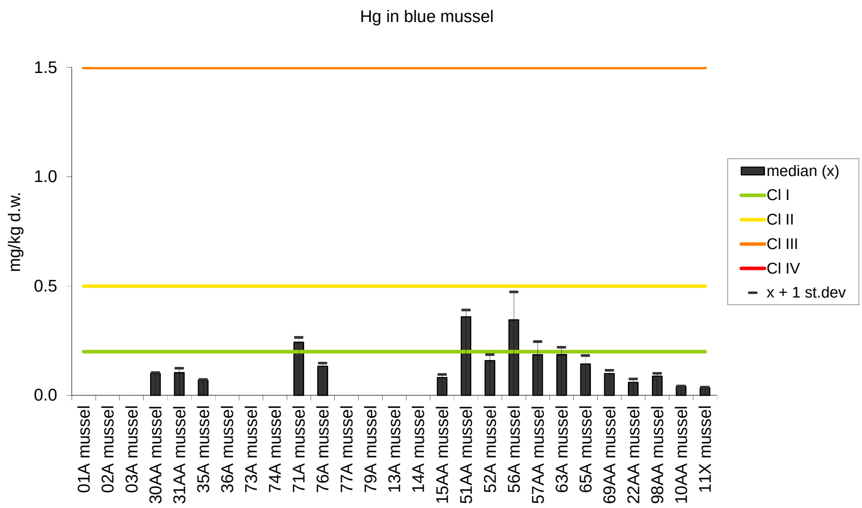


Figure 47. *Median, standard deviation and upper limit to Klif Classes or provisional "high background" concentration for mercury in blue mussel 2008 (**A**), 2009 (**B**) and 2010 (**C**), ppm (mg/kg) dry weight (see maps in Appendix F).*

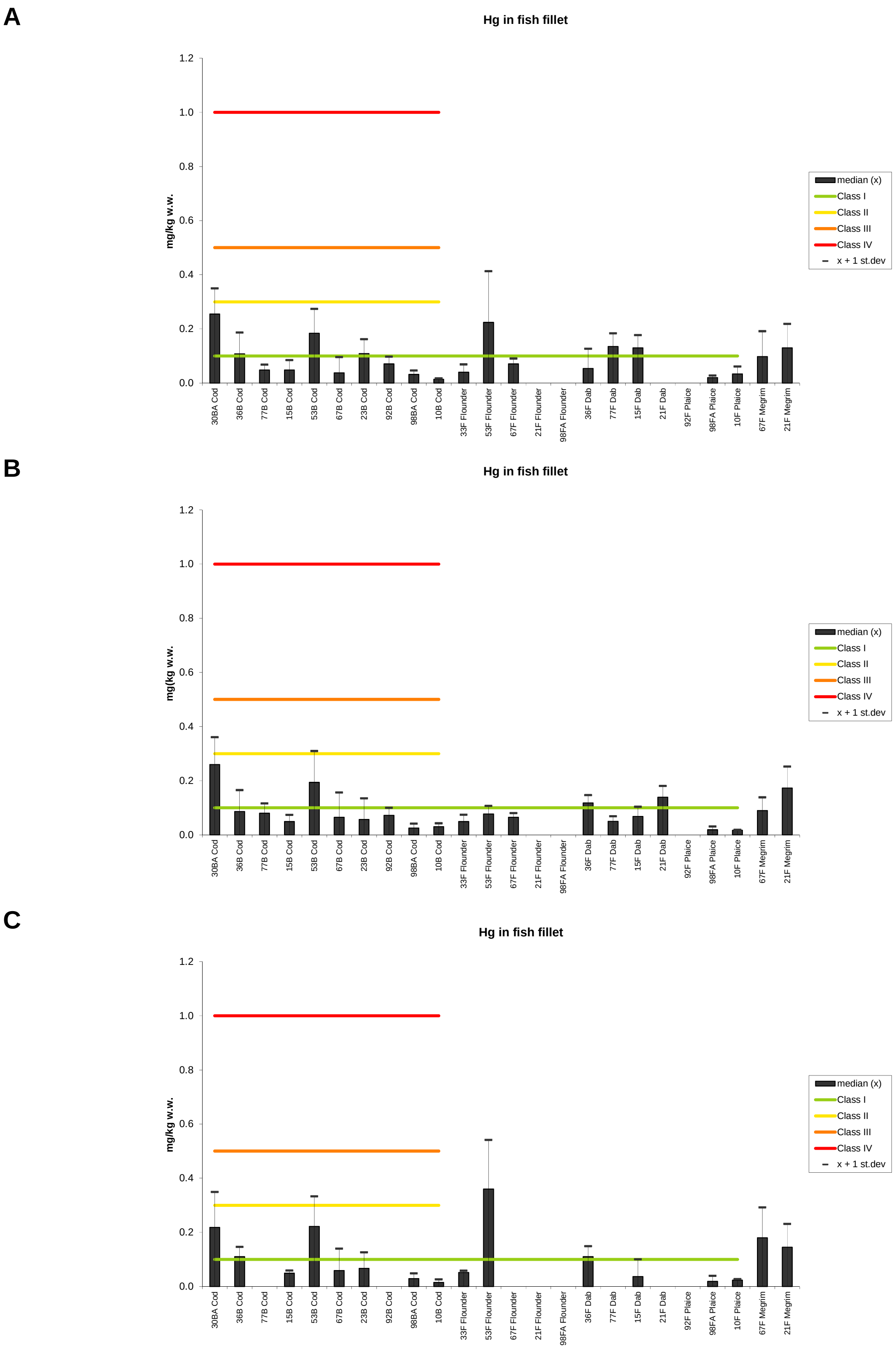
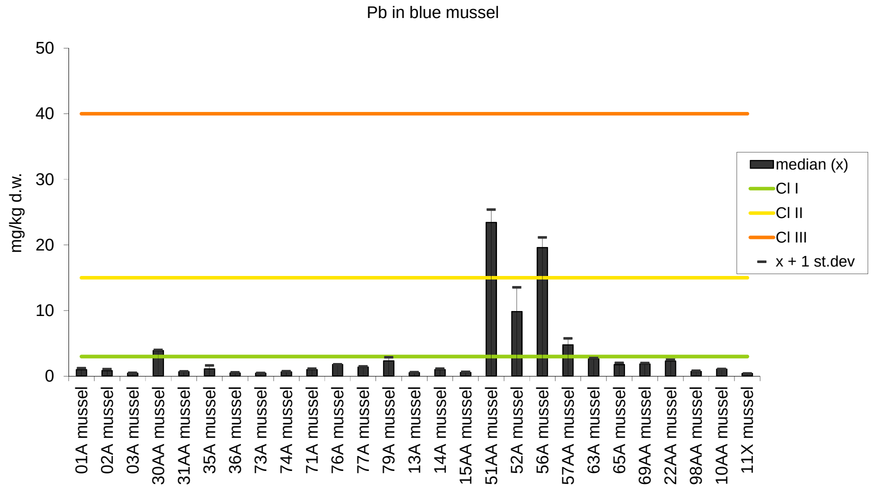
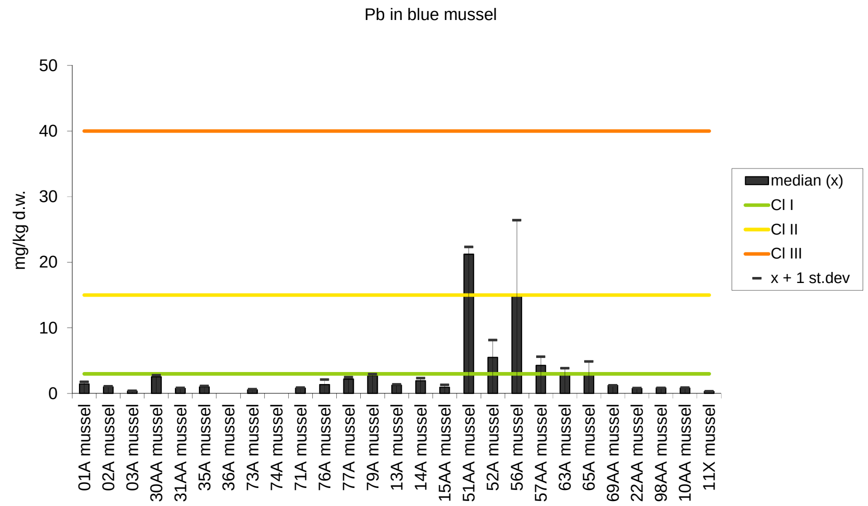


Figure 48. *Median, standard deviation and upper limit to Klif Classes or provisional "high background" concentration for mercury in fish fillet 2008 (**A**), 2009 (**B**) and 2010 (**C**), ppm (mg/kg) wet weight, "Cl.-B" indicates that only upper limit to Klif Classes or provisional high background concentration is indicated for flatfish, (see maps in Appendix F).*

A



B



C

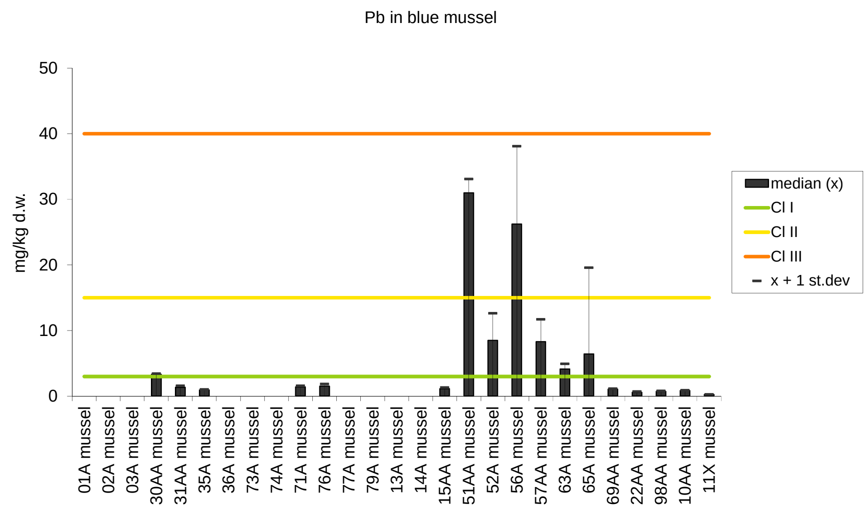
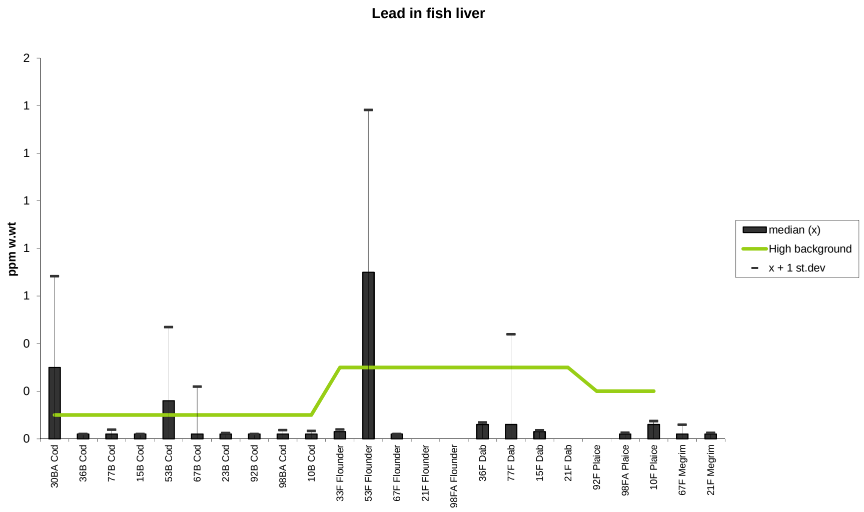
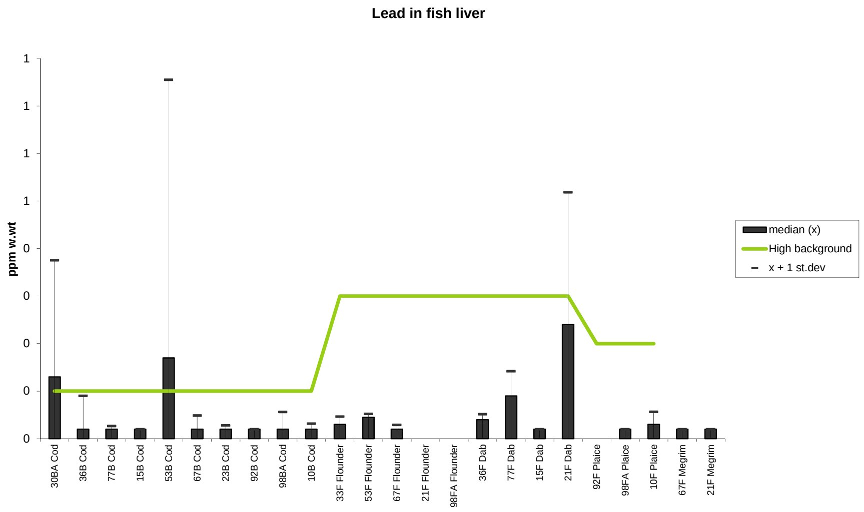


Figure 49. *Median, standard deviation and upper limit to Klif Classes or provisional "high background" concentration for lead in blue mussel 2008 (**A**), 2009 (**B**) and 2010 (**C**), ppm (mg/kg) dry weight (see maps in Appendix F).*

A



B



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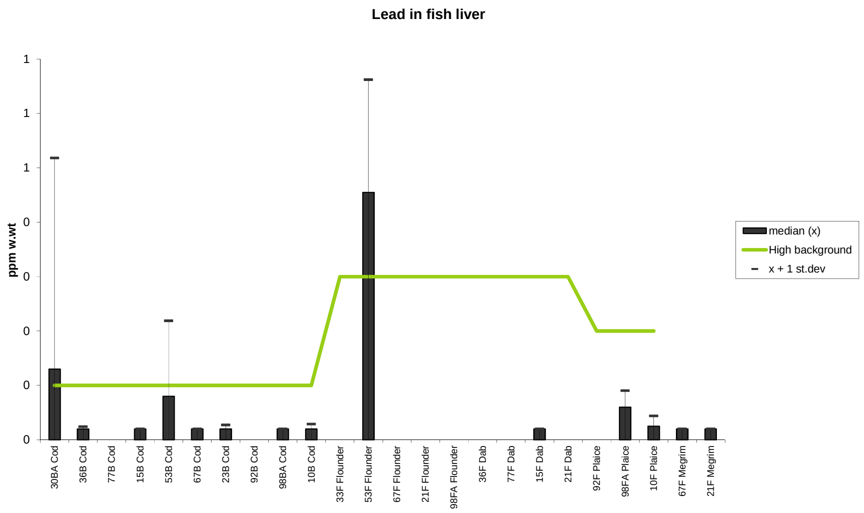
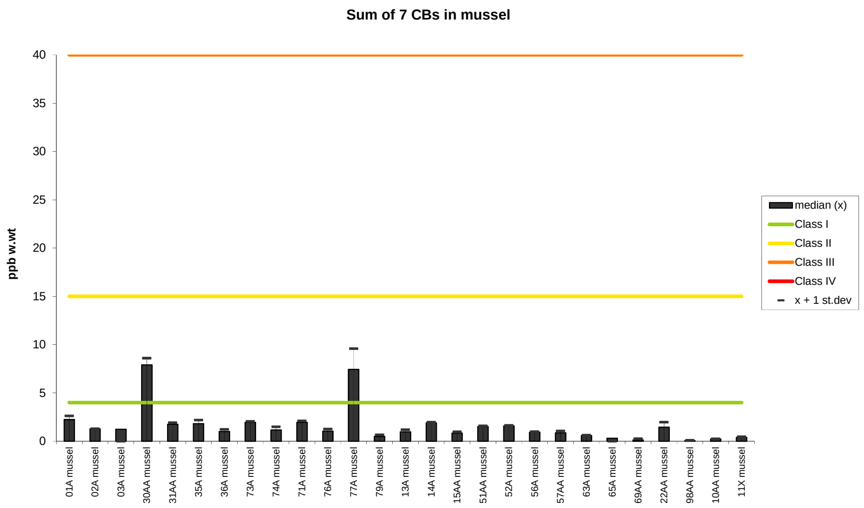
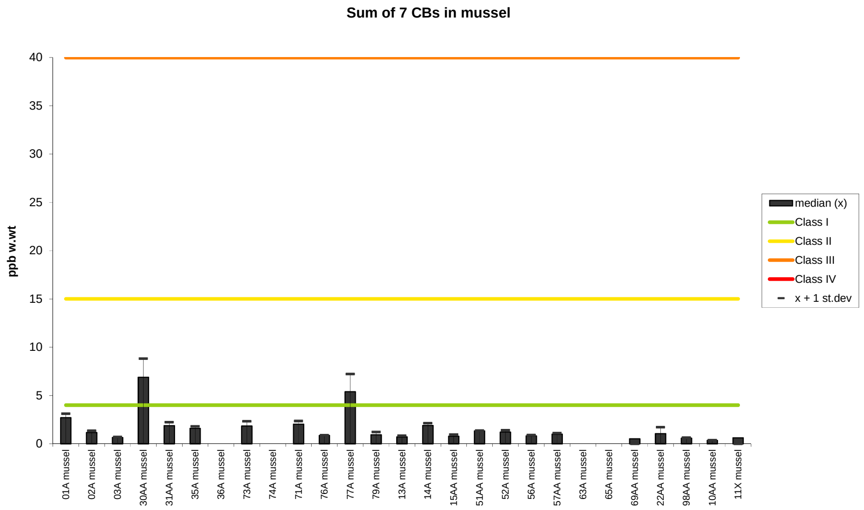


Figure 50. *Median, standard deviation and upper limit to Klif Classes or provisional "high background" concentration for lead in fish liver 2008 (**A**), 2009 (**B**) and 2010 (**C**), ppm (mg/kg) wet weight, "Cl.-B" indicates that only upper limit to Klif Classes or provisional high background concentration is indicated for all fish, (see maps in Appendix F).*

A



B



C

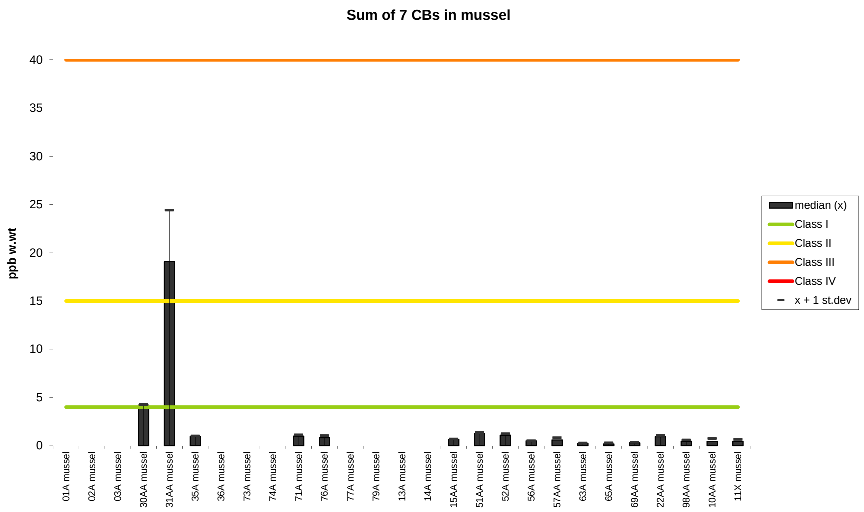
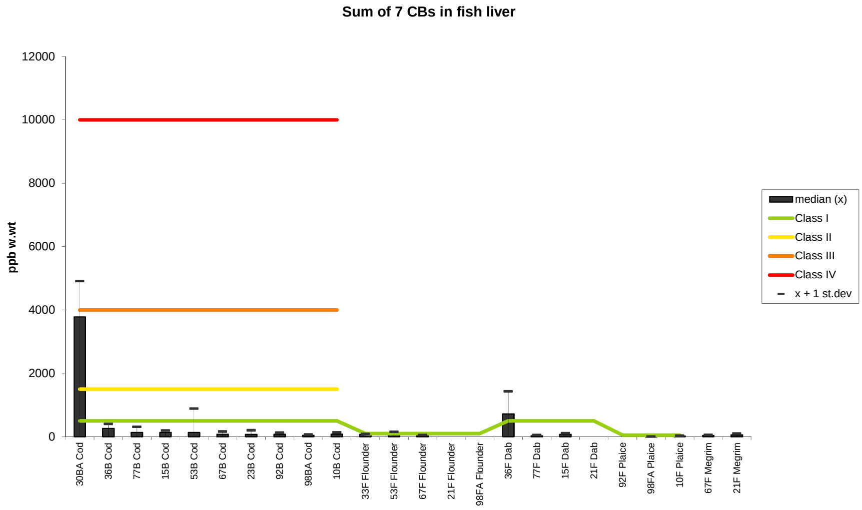
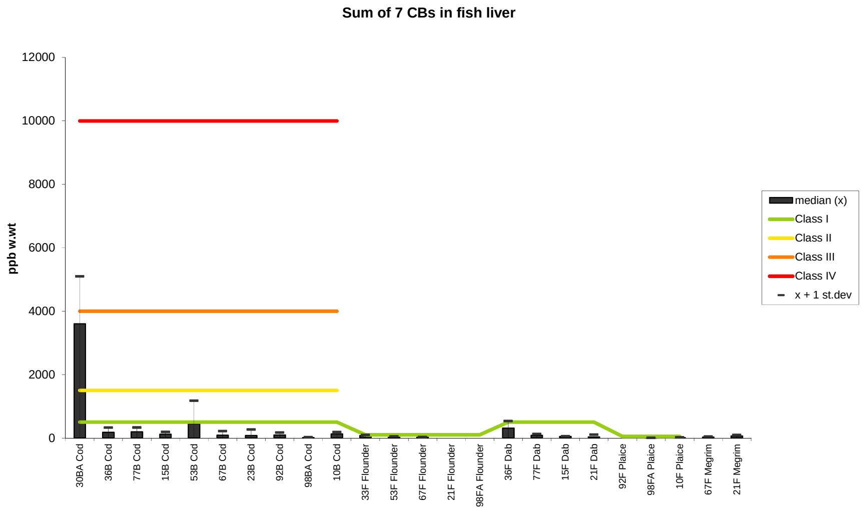


Figure 51. *Median, standard deviation and upper limit to Klif Classes or provisional "high background" concentration for sum of 7 PCBs (CB-28, -52, 101, -118, -138, -153 and -180) in blue mussel 2008 (**A**), 2009 (**B**) and 2010 (**C**), ppb (µg/kg) wet weight (see maps in Appendix F).*

A



B



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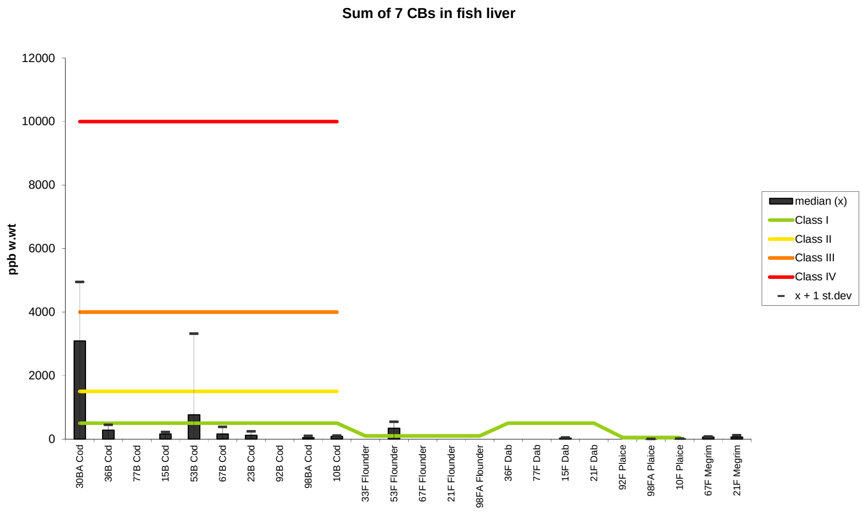
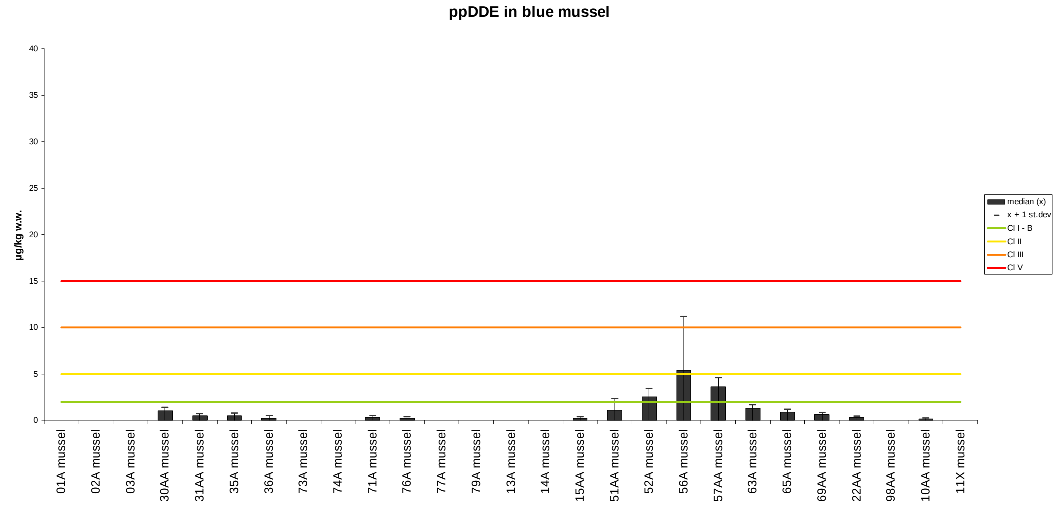
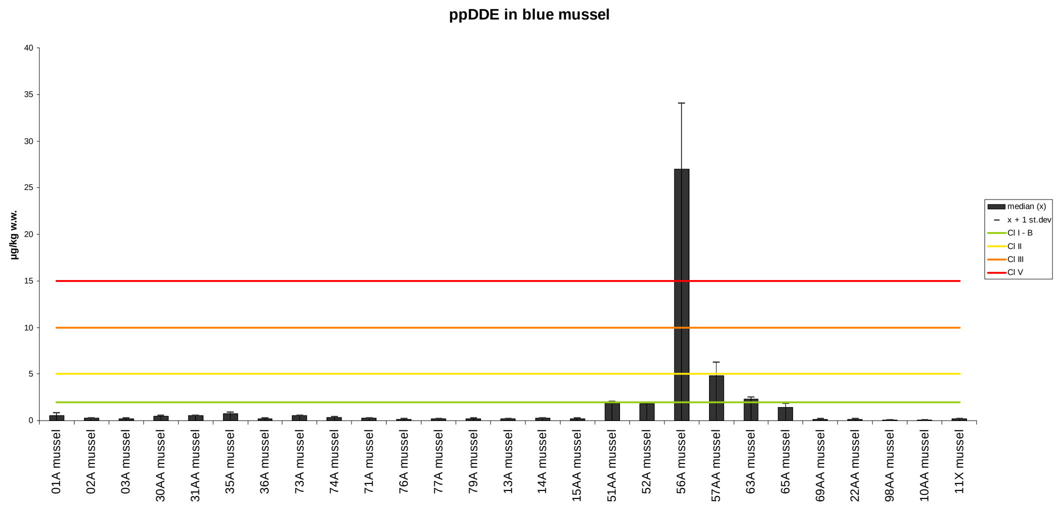


Figure 52. *Median, standard deviation and upper limit to Klif Classes or provisional "high background" concentration for sum of 7 PCBs (CB-28, -52, 101, -118, -138, -153 and -180) in fish liver 2008 (**A**), 2009 (**B**) and 2010 (**C**), ppb (µg/kg) wet weight, "Cl. I-B" indicates that only upper limit to Klif Classes or provisional high background concentration is indicated for flatfish, (see maps in Appendix F).*

A



B



C

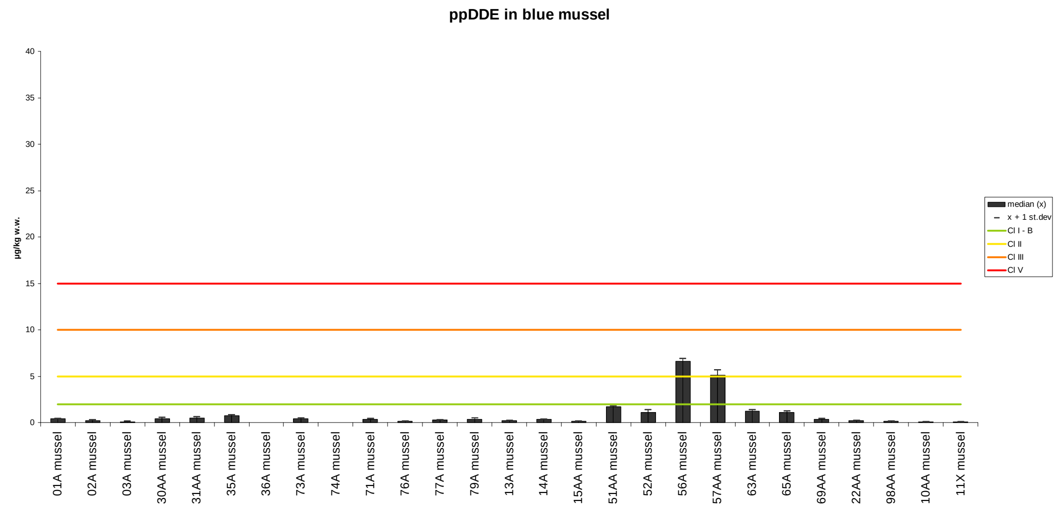
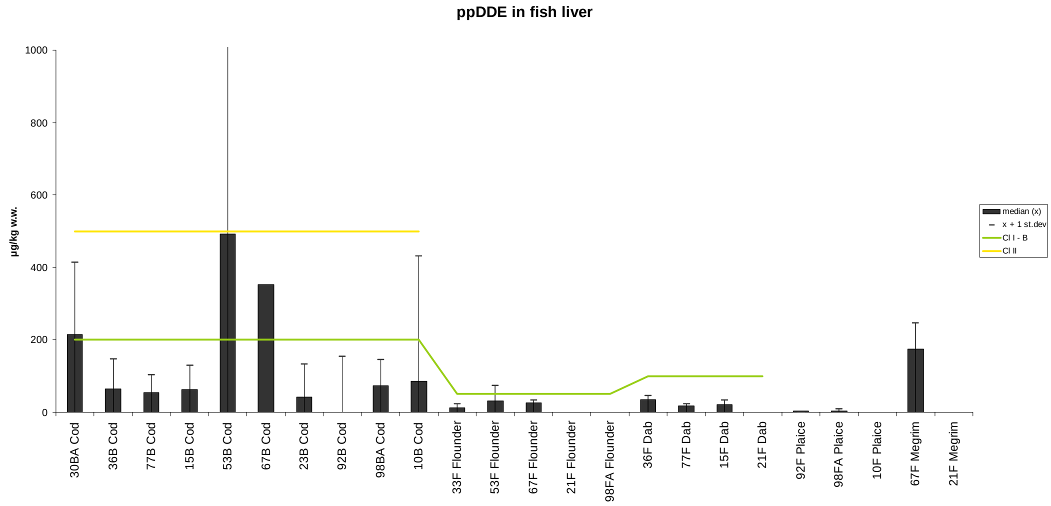
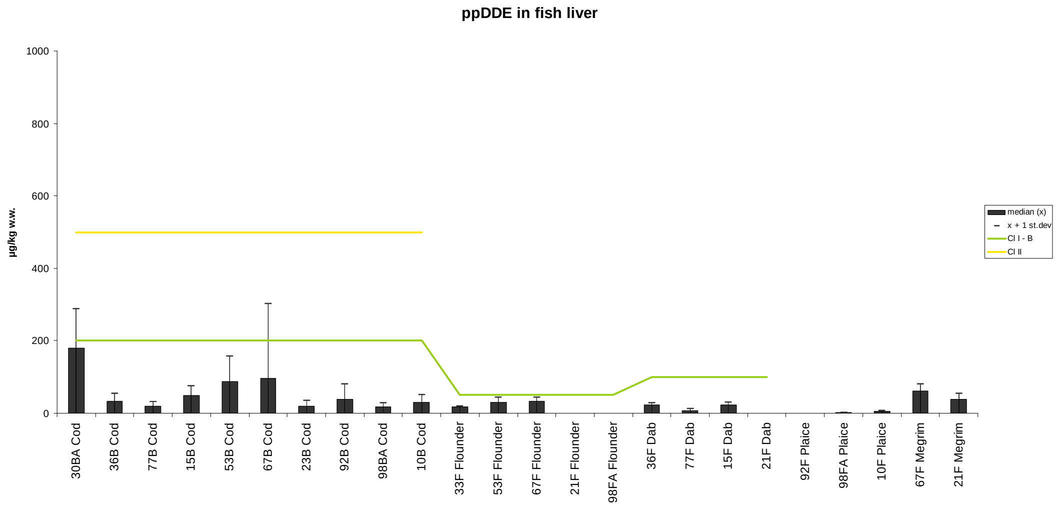


Figure 53. *Median, standard deviation and upper limit to Klif Classes or provisional "high background" concentration for ppDDE (DDEPP) in blue mussel 2008 (**A**), 2009 (**B**) and 2010 (**C**), ppb (µg/kg) wet weight (see maps in Appendix F). (See also footnote in Table 13).* ***Note: Class limits for ΣDDT used.***

A



B



C

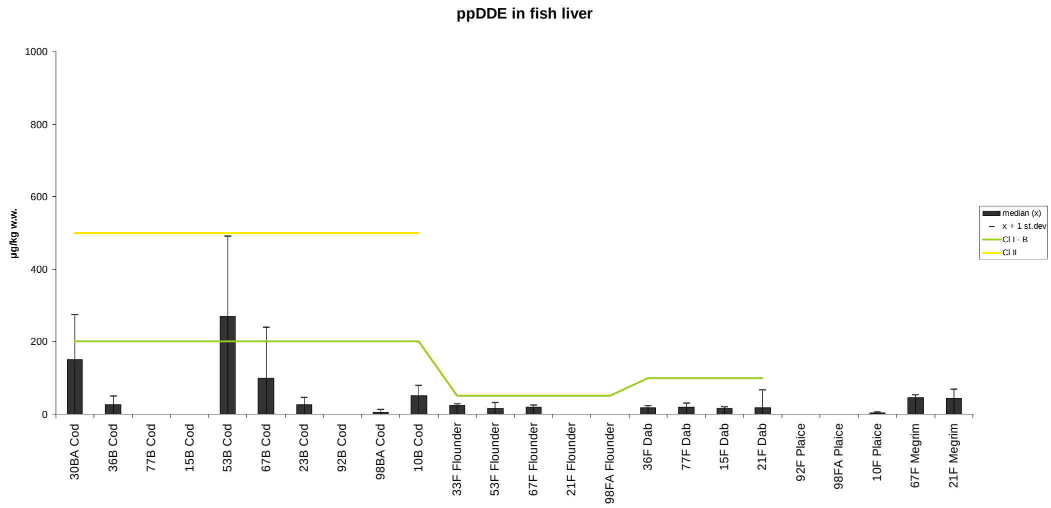


Figure 54. *Median, standard deviation and upper limit to Klif Classes or provisional "high background" concentration for ppDDE (DDEPP) in fish liver 2008 (**A**), 2009 (**B**) and 2010 (**C**), ppb (µg/kg) wet weight, "Cl.-B" indicates that only upper limit to Klif Classes or provisional high background concentration is indicated for flatfish, (see maps in Appendix F). (See also footnote in Table 13).* ***Note: Class limits for ΣDDT used.***

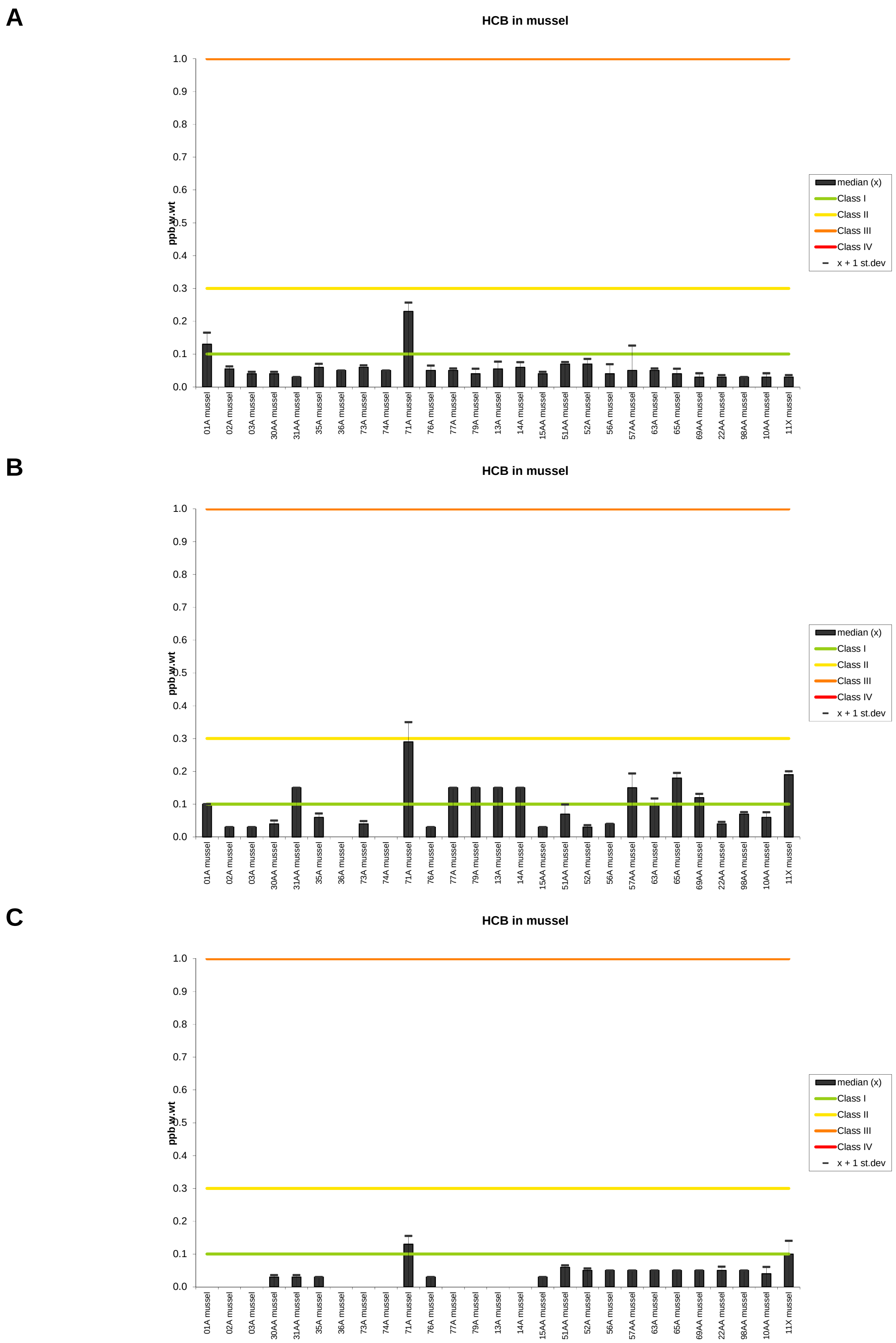
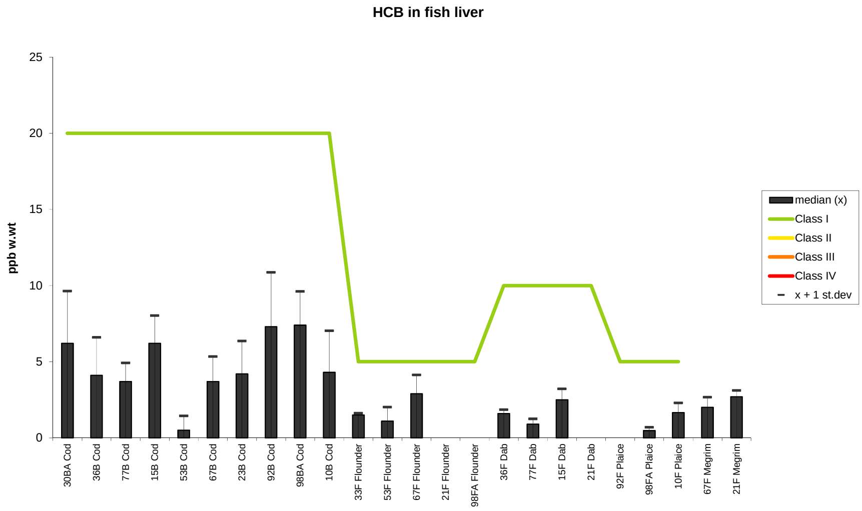
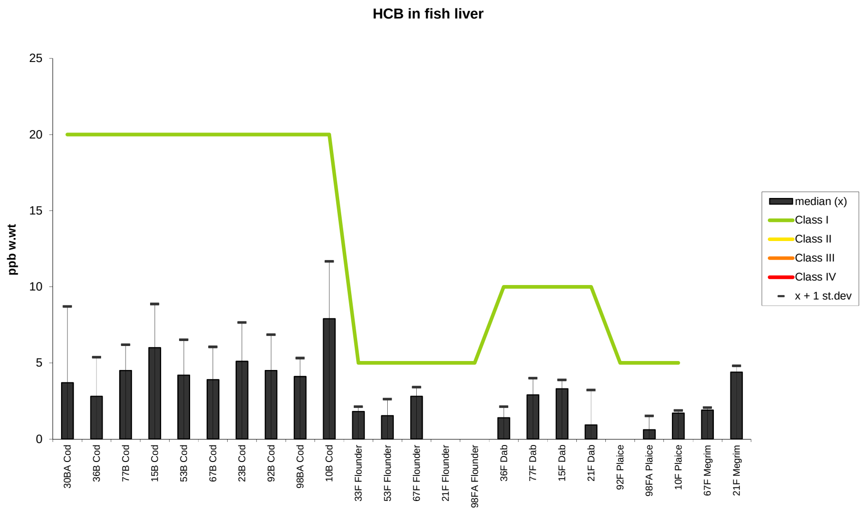


Figure 55. *Median, standard deviation and upper limit to Klif Classes or provisional "high background" concentration for HCB in blue mussel 2008 (**A**), 2009 (**B**) and 2010 (**C**), ppb (µg/kg) wet weight (see maps in Appendix F).*

A



B



C

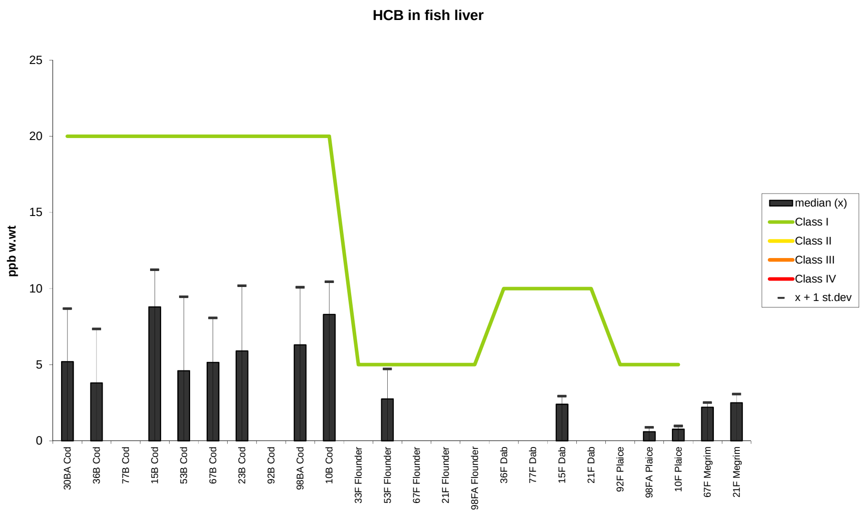
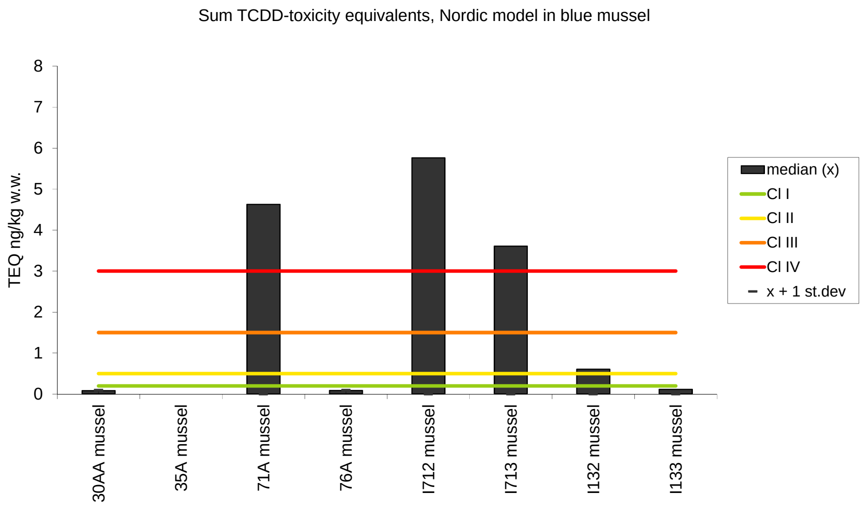
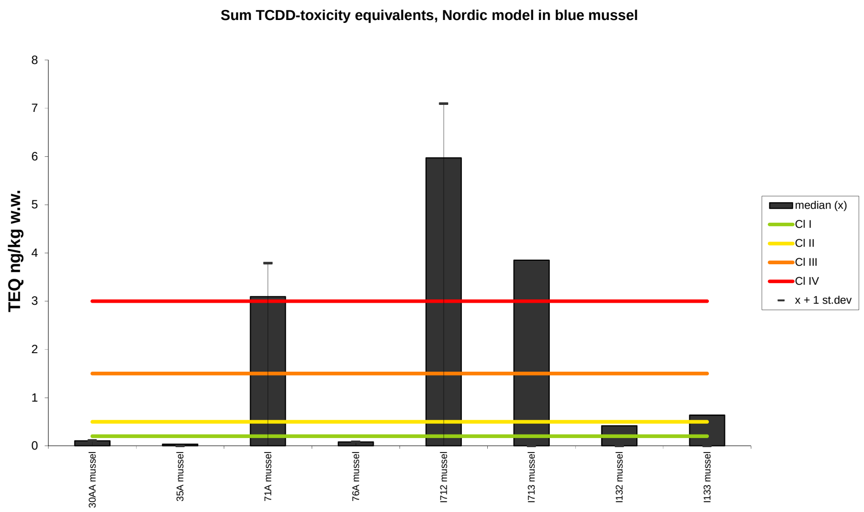


Figure 56. *Median, standard deviation and upper limit to Klif Classes or provisional "high background" concentration for HCB in fish liver 2008 (**A**), 2009 (**B**) and 2010 (**C**), ppb (μg/kg) wet weight, "Cl.-B" indicates that only upper limit to Klif Classes or provisional high background concentration is indicated for all fish, (see maps in Appendix F).*

A



B



C

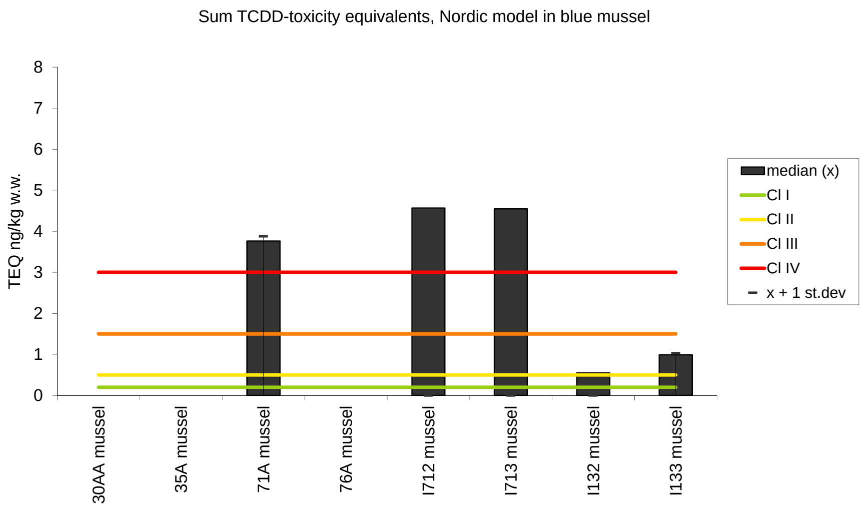


Figure 57. *Median, standard deviation and upper limit to Klif Classes or provisional "high background" concentration for dioxin TCDD-toxicity equivalents after nordic model (TCDDN) in blue mussel 2008 (**A**), 2009 (**B**) and 2010 (**C**), ppp (ng/kg) wet weight (see maps in Appendix F). NB: TCDDN is a sum of specific dioxin compounds of which may include compounds of uncertain quantification.*

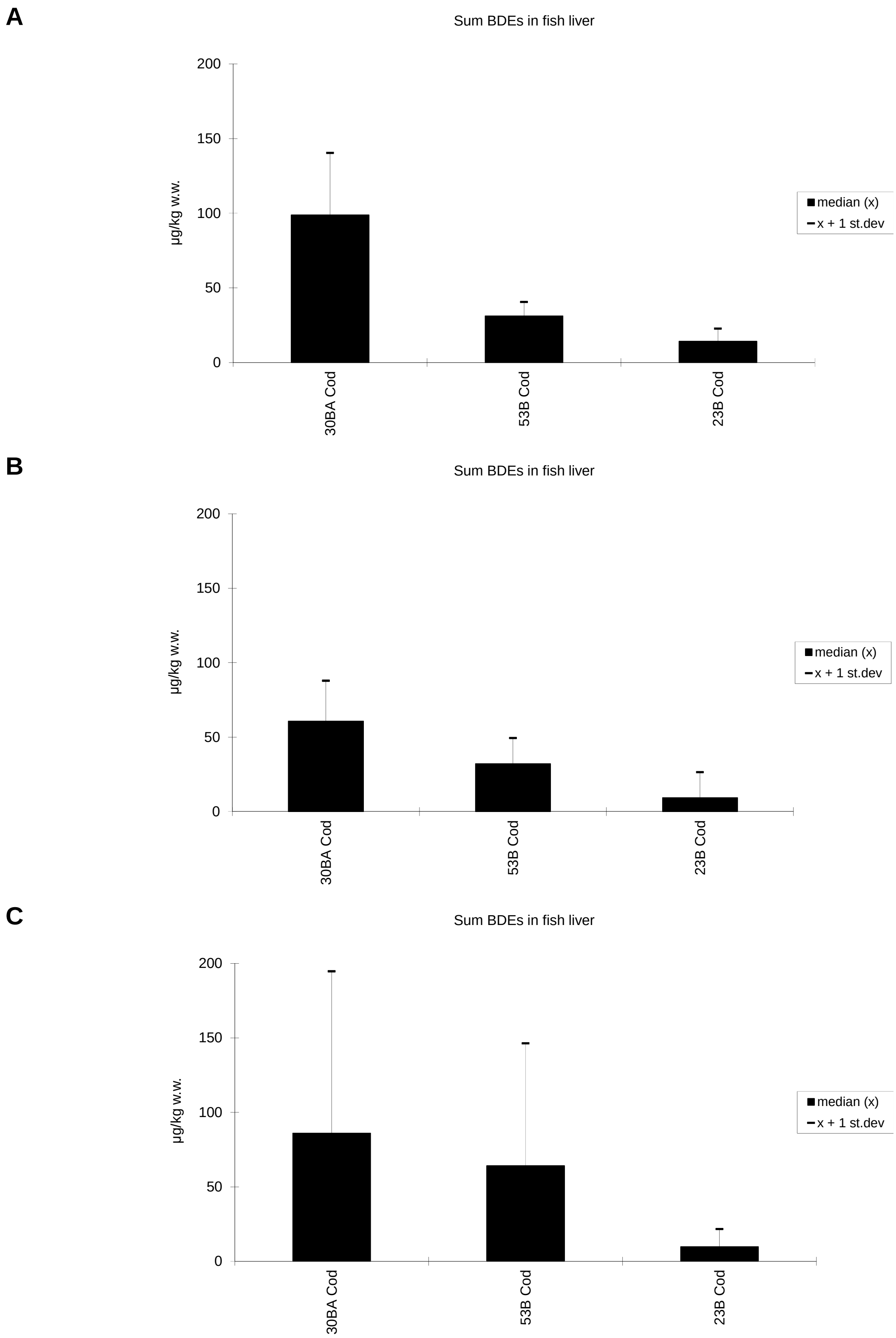
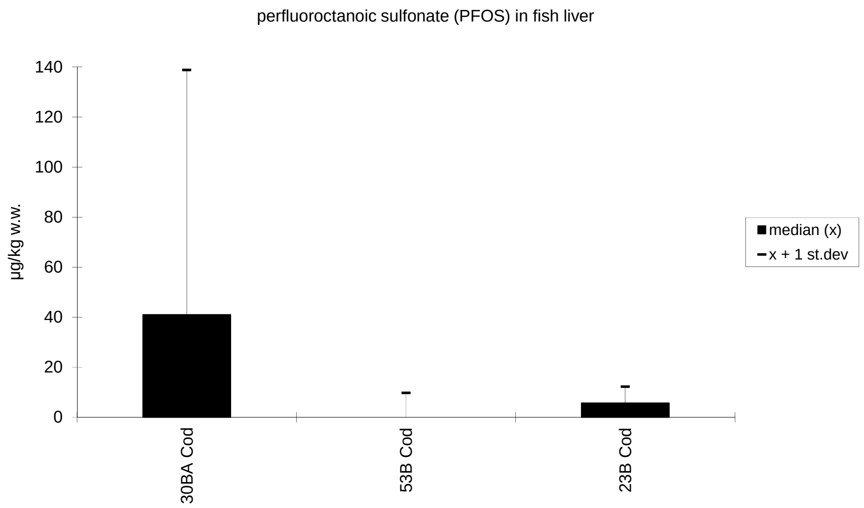
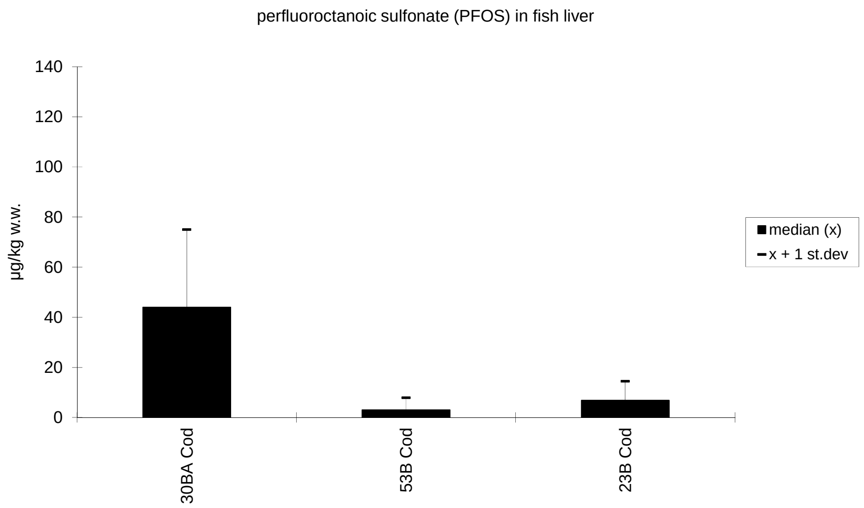


Figure 58. *Median concentration for brominated flame retardant in cod liver 2008 (**A**), 2009 (**B**) and 2010 (**C**) ppb (µg/kg) wet weight for three CEMP stations (Inner Oslofjord-st. 30B, Inner Sørfjord-st. 53B and Karihavet-st. 23B) (see maps in Appendix F), and from two other investigations (see text).*

A



B



C

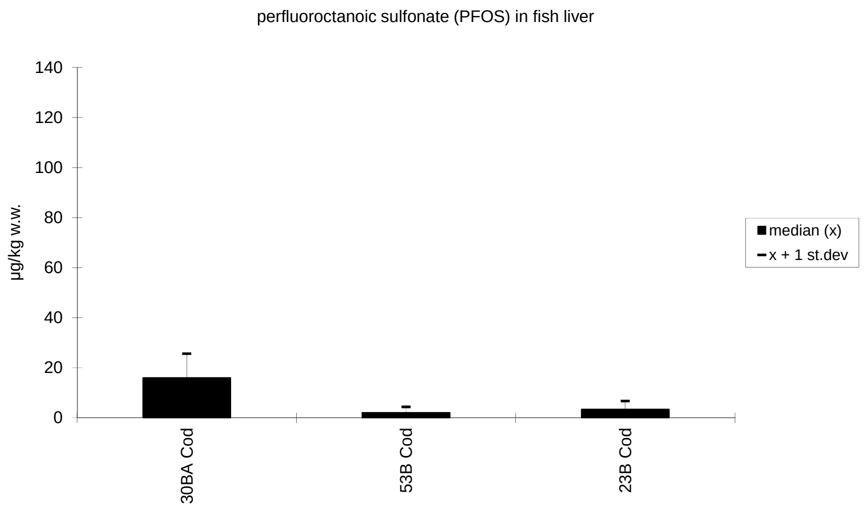


Figure 59. *Median concentration for perfluoroctanoic sulfonate (PFOS) in cod liver 2008 (**A**), 2009 (**B**) and 2010 (**C**) ppb (µg/kg) wet weight for three CEMP stations (Inner Oslofjord-st. 30B, Inner Sørfjord-st. 53B and Karihavet-st. 23B) (see maps in Appendix F), and from two other investigations (see text).*

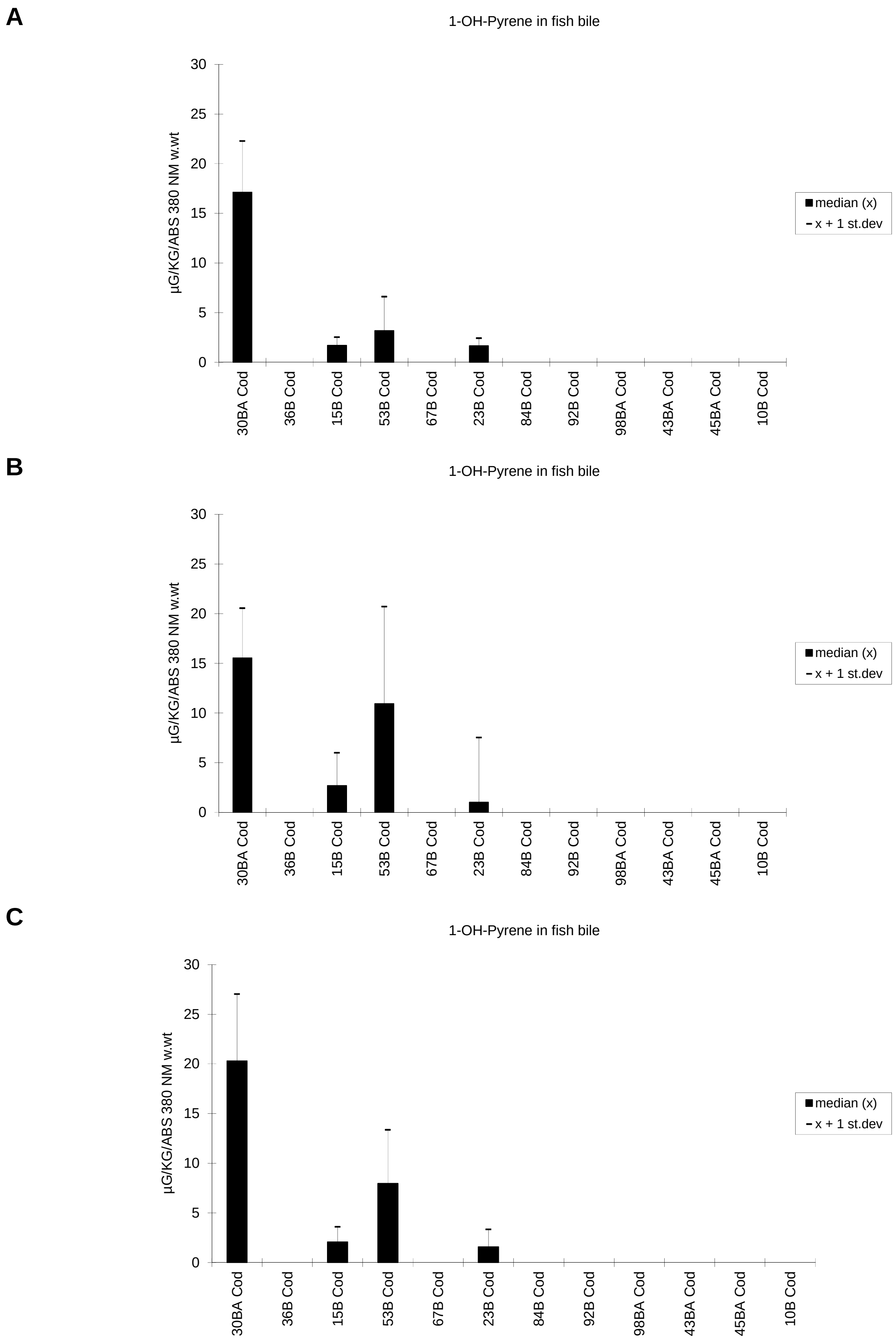
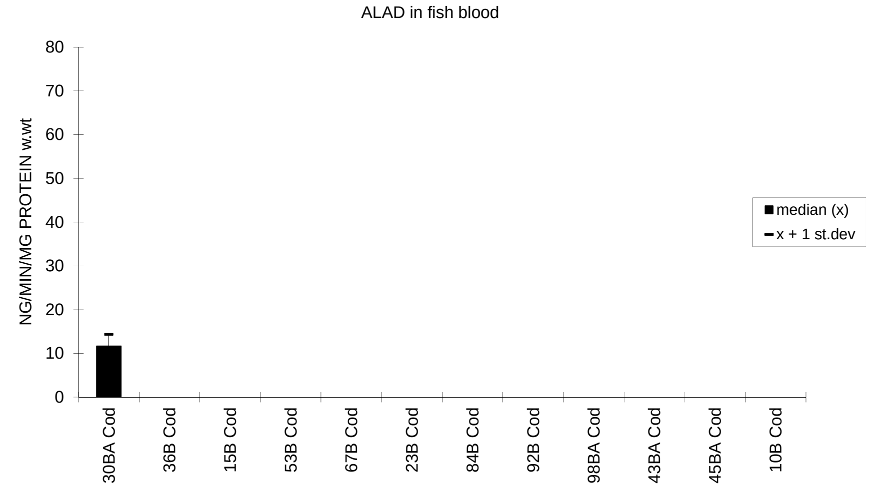
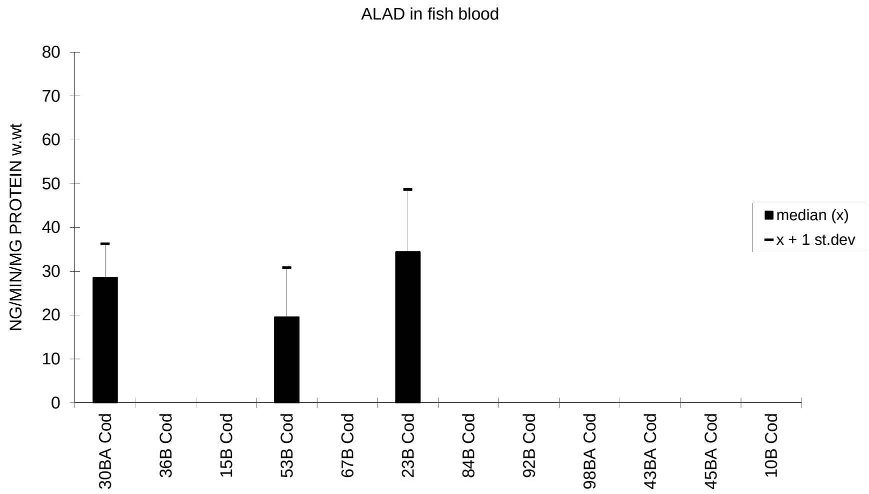


Figure 60. *Median and standard deviation concentration for OH-pyrene (Pyrene metabolite) in fish bile 2008 (**A**), 2009 (**B**) and 2010 (**C**), μg/kg/ABS (absorbance) 380 nm (see maps in Appendix F).*

A



B



C

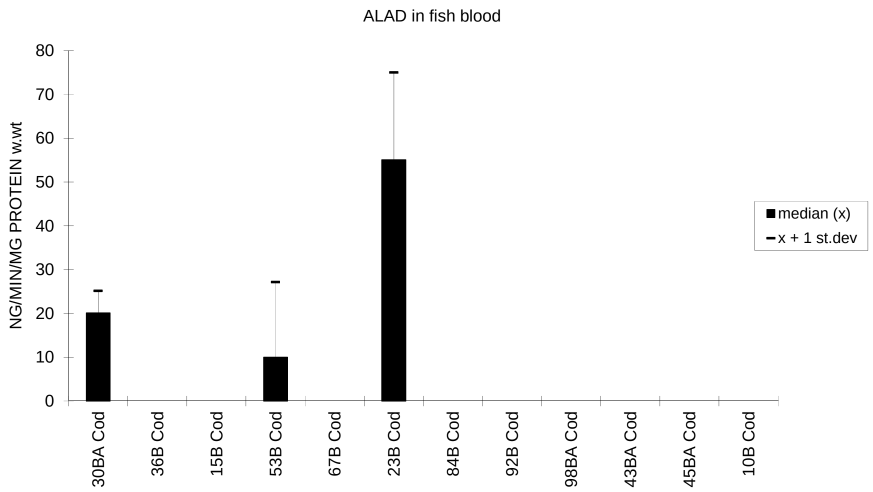
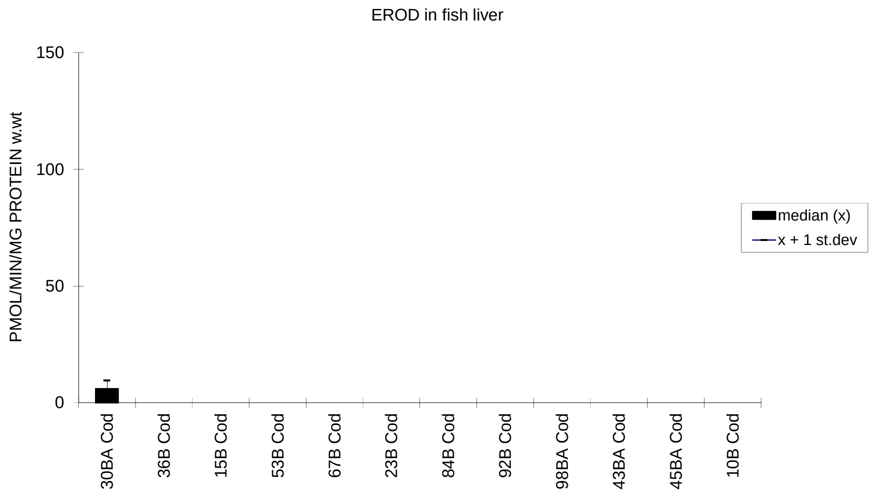
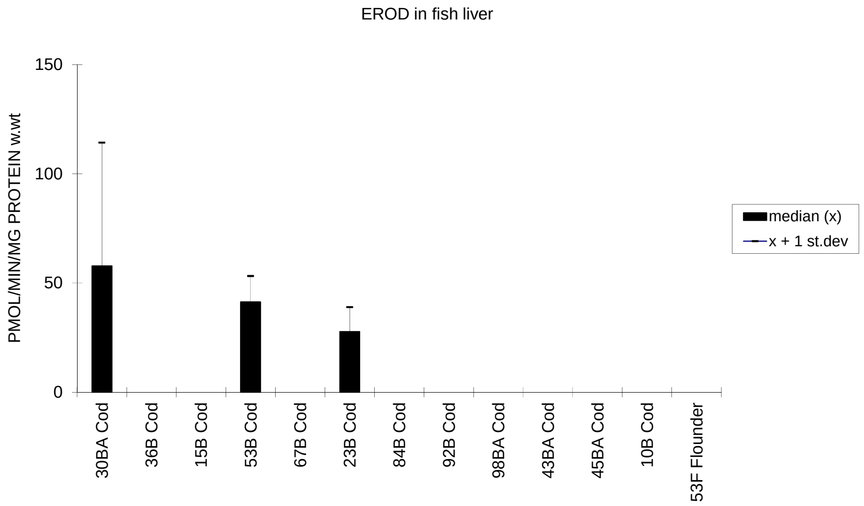


Figure 61. *Median and standard deviation activity for ALA-D (δ-amino levulinic acid dehydrase inhibition) in fish blood 2008 (**A**), 2009 (**B**) and 2010 (**C**), ng PBG (porphobilinogen)/min/mg protein (see maps in Appendix F).*

A



B



C

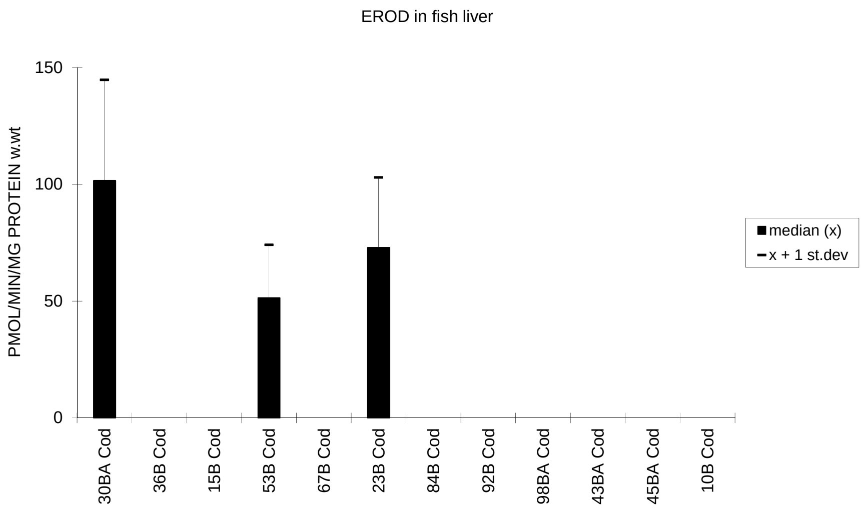
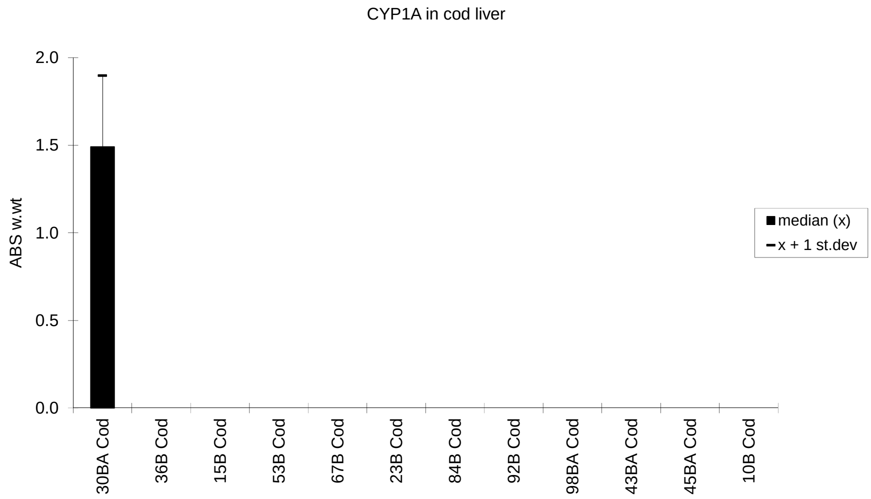
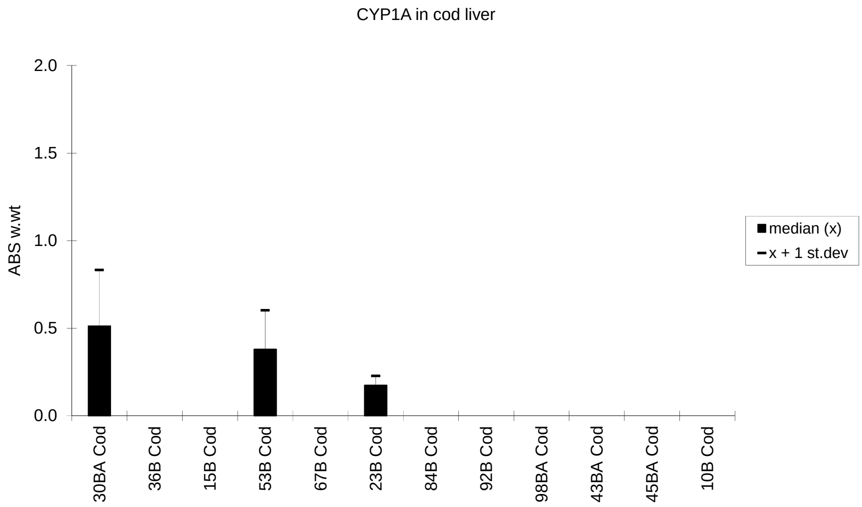


Figure 62. *Median and standard deviation activity for EROD (Cytochrome P4501A-activity) in fish liver 2008 (**A**), 2009 (**B**) and 2010 (**C**), pmol/min/mg protein (see maps in Appendix F).*

A



B



C

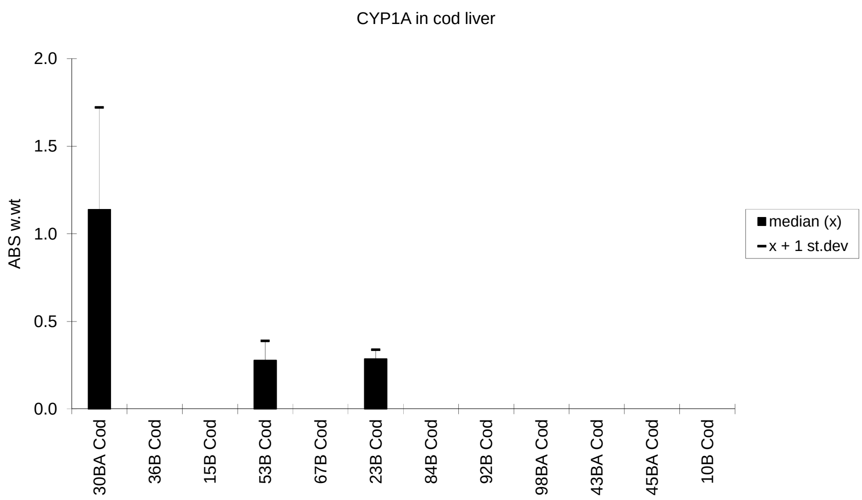


Figure 63. *Median and standard deviation activity for CYP1A (relative amount of Cytochrome P4501A-protein) in fish liver 2008 (**A**), 2009 (**B**) and 2010 (**C**), pmol/min/mg protein (see maps in Appendix F).*

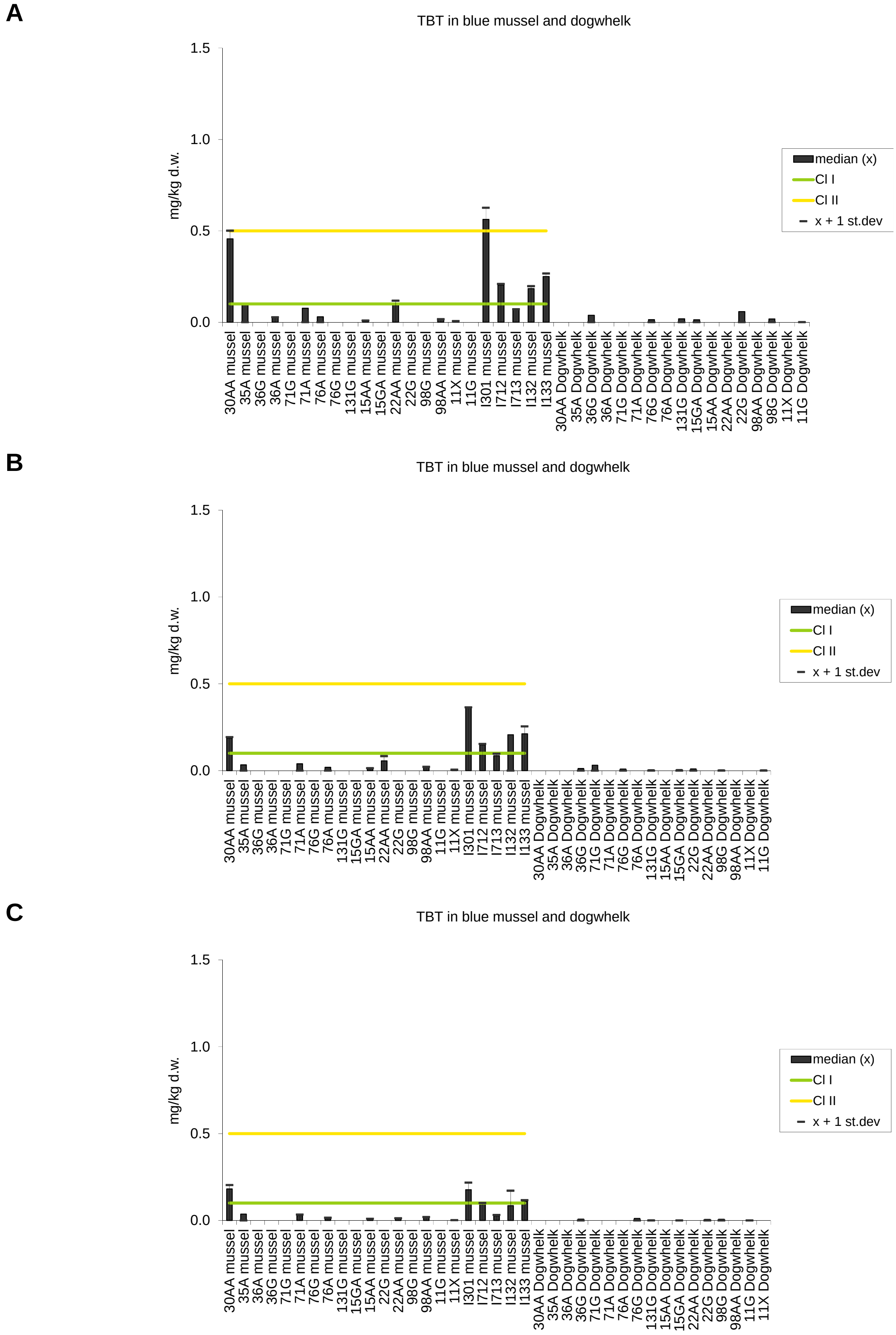


Figure 64. *Median, standard deviation and upper limit to Klif Classes or provisional "high background" concentration for tributyltin (TBT-concentration on a formulation basis) in blue mussel and dogwhelk 2008 (**A**), 2009 (**B**) and 2010 (**C**), ppm (2.44* mg Sn/kg) dry weight (see maps in Appendix F).*|

A

B

C

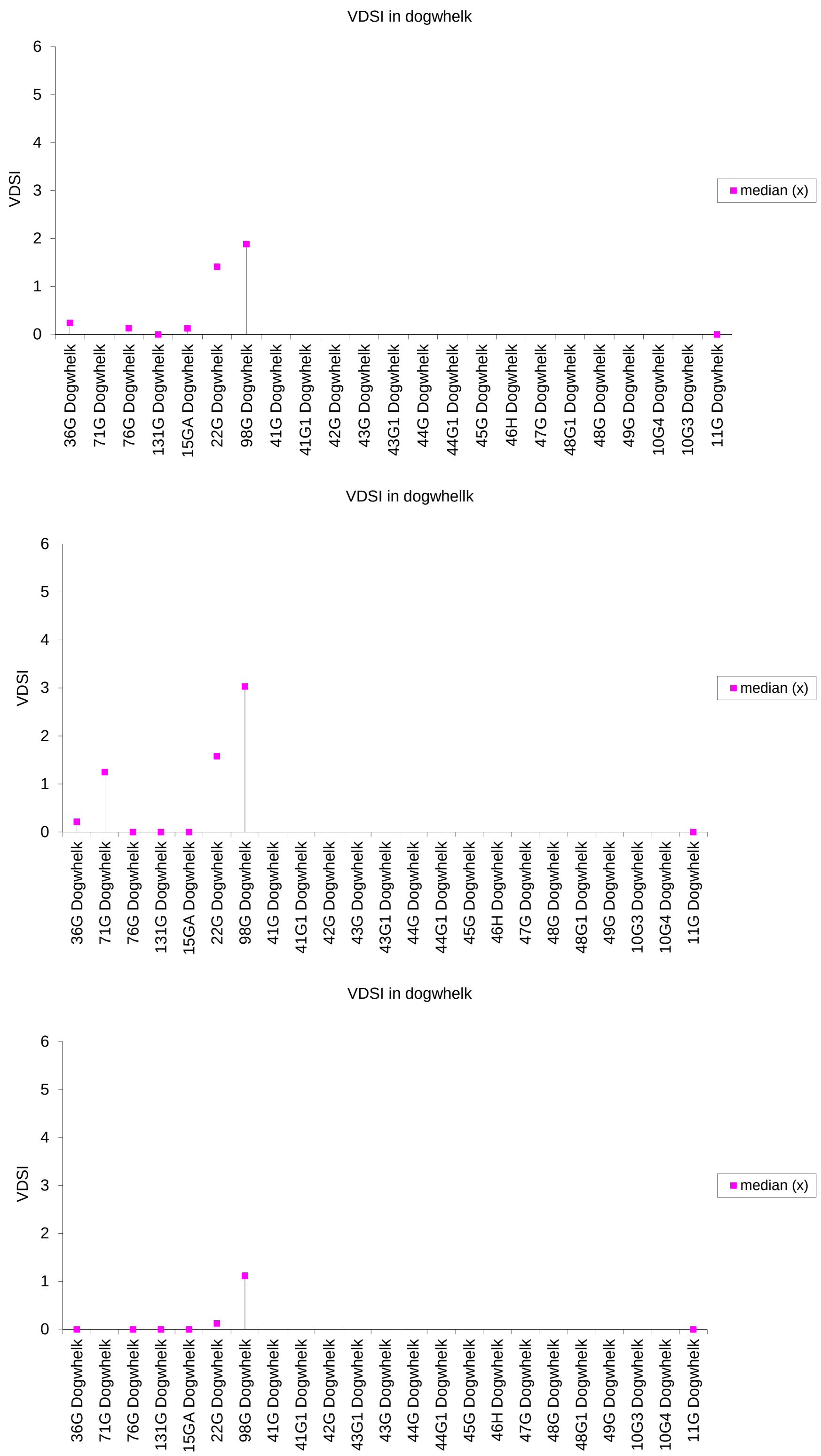


Figure 65. *Average VDSI in dogwhelk 2007 (**A**), 2009 (**B**) and 2010 (**C**) (see maps in Appendix F).*

Appendix J
Results from INDEX determinations 1995-2010

Introduction

The blue mussel pollution and reference indices are two indices used to evaluate levels of certain hazardous substances in blue mussel from a selection of fjord areas in Norway (Figure 66). The pollution index is based on 26 stations from nine fjord areas regarded as polluted. The reference index is based on results from 8 stations remote from point sources of pollution in five fjord areas.

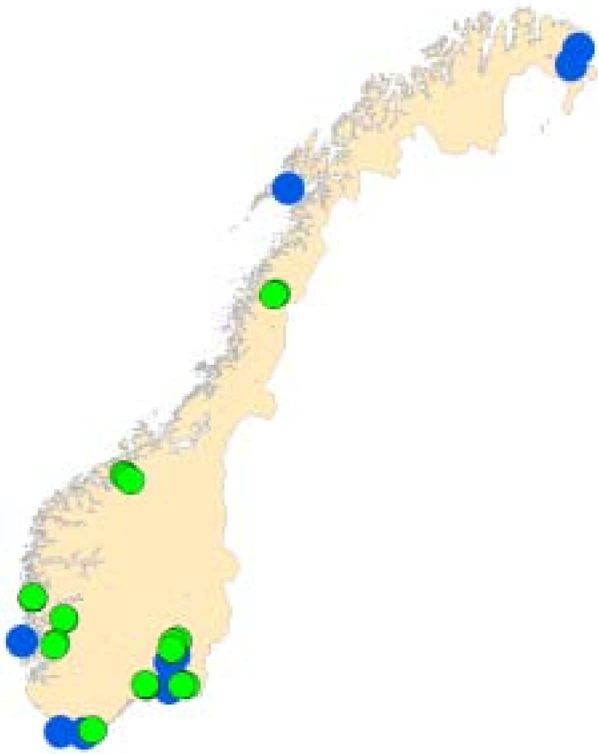


Figure 66. *Blue mussel Index stations sampled in 2010; pollution (green circles), reference (blue circles).*

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 a class according to the highest classification registered, e.g. if one station within an area is classified as Class IV, the area is would designated with Maximum Environmental Class (Max.E.C.) of IV, provided that this is the highest classification found for all the stations in that area. A Max.E.C. of 1 means that all stations within an area are insignificantly polluted (Class I in Klif's classification system). There is one Max. E.C. determined for each fjord or fjord area and the average of these is the index. An index of 5 would mean that all the fjords or fjord areas have a Max.E.C. of V or "extremely" in Klif's classification system.

The indices have been used since 1995 based on contaminant concentrations in blue mussel from 14-19 areas (cf. Green *et al.* 2004a). An assessment of their application suggested that the pollution index needed mainly two improvements (Green & Knutzen 2001): 1) more stations to avoid the consequences of insufficient sample size and 2) inclusion of more relevant contaminant analyses with respect to the pollution load expected and in relation to the Klif classification system for environmental quality (Molvær *et al.* 1997). Klif provided funds to improve the index in 2002. Three additional stations have since been established: one in the Frierfjord area (I713 Strømtangen, about 800 m east of I711 Steinsholmen), one in the inner Ranfjord (I964 Toraneskaien, about 500 m north of I965 Moholmen) and one in the Sunndalsfjord area (I915 Flåøya, northwest, about halfway between I913 and the inner most part of the fjord). Dioxin and TBT analyses were added to the programme 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 A). These changes affect the outcome of the index and comparison to previous years should be cautioned. For results up to and including 2001 Klif has presented only the results 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. 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 (CBΣ7) is now a distinct parameter for classification. The sum of all PAHs excluding the dicyclic PAHs (PAH_Σ) was compared to the system's "sum-PAH". Previously this was the calculation of sum-PAH that included the dicyclic PAHs. As analytical methods improved through the years additional PAHs could be quantified, and included the C1-, C2-, and C3-dibenzpthiophenes, and C1-, C2-, C3- alkylated 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), PAH_Σ was re-calculated, also for previous years, using only the 15 non-dicyclic PAH listed in the EPA protocol 8310[1]. 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 PAH_Σ 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. One likely change will be the lowering of limits to the 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). There was also lack of sufficient samples for the Reference Index at st. 35A Solbergstrand 2010 and the sampling was moved a short distance to a very small boat harbour. The results for PCBs and OCS at this station were deemed abnormally high for unknown reasons and not representative. Hence, these data were removed

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 was 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.

The Index scale varies from 1 to 5. Index 1 means that all areas or fjords are insignificantly polluted (Class I in Klif's classification system), Index 5 means that at least one sample from each area or fjord is extremely polluted or Class V in Klif's system. A value between 3 and 4 would be between "markedley" and "severely" (Class III and IV) in the Klif system. A value between 2 and 3 would be

[1] Acenaphthene, acenaphthylene, anthracene, benzo[*a*]anthracene, benzo[*a*]pyrene, benzo[b]fluoranthene, benzo[ghi]perlyene, benzo[*k*]fluoranthene, chrysene, dibenzo[*a,h*]anthracene, fluoranthene, indeno[*1,2,3-cd*]pyrene, phenanthrene and pyrene. NB. for NIVA's PAH_Σ, 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.

between “moderately” and “markedly” (Class II and III). A value between 1 and 2 would be between “insignificantly” and “moderately” (Class I and II).

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 2010 was 2.6, 0.2 lower than in 2009 (Table 14, Appendix M4, Green *et al.* 2010b). A value between 2 and 3 would be termed by the Klif system as “markedley” and between 3 and 4 "severely".

Only 5 fjords/areas were monitored for the Reference Index for 1998-2010 compared to 7 for 1997 and 8 for 1995-1996 (Table 2, Annex). However, only four of these provided a common basis (cf., Table 15). 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 2010 was 1.0, 0.2 lower than in 2009 (Table 2, Annex). This was the first time that the best (lowest) score was found since the index was started in 1995. Four of the fjords/areas included the TBT analyses. The index decreased one class for the Mid and Outer Oslofjord area because of lower concentration of HCB. An index value between 0 and 1 would be termed by the Klif system as iInsignificantly”.

Table 14. Maximum environmental classification for fjords selected for Pollution Index. (See text).

Index Area [1]	**1995**	**1996**	**1997** [2]	**1998**	**1999**	**2000**	**2001**	**2002**	**2002 new** [7]	**2003**	**2003 new** [7]	**2004 new** [7]	**2005 new** [7]	**2006 new** [7]	**2007 new** [7]	**2008 new** [7]	**2009 new** [7]	**2010 new** [7]
Hvaler/Singlefjord	2	2	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Iddefjord	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Inner Oslofjord	3	3	4	2	3	2	2	2	4	2	4	4	4	3	3	3	2	2
Frierfjord, Grenlandsfjords	3	4	3	3	3	3	3	5 [6]	5	3 [6]	5	5	5	5	5	5	5	5
Inner Kristiansandsfjord	5	5	5	5	5	4	3	3	3	4	4	4	4	3	4	4	4	4
Saudafjord	4	5	5	3	4	3	3	4	4	2	2	3	2	2	2	2	1	1
Sørfjord	5	4	3	3	4	4	3	4	4	5	5	4	4	3	3	3	3	3
Byfjorden, Bergen [3]	3	3	3	2	2	2	2	3	3	4	4	3	3	3	2	2	2	2
Sunndalsfjord	3	3	3 [4]	2	3	4	2	3	3	1 [6]	1	1	1	1	2	2	1	1
Orkdalsfjord	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Inner Ranfjord	5	3	3 [5]	4	2	2	3	3 [6]	3	3 [8]	5	5	3	4	4	4	5	3
AVERAGE (Pollution INDEX)	**3.7**	**3.6**	**3.4**	**3.0**	**3.1**	**2.9**	**2.7**	**3.2**	**3.4**	**2.9**	**3.6**	**3.4**	**3.1**	**2.9**	**3.0**	**3.0**	**2.8**	**2.6**

[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 Kristiansandsfjord.

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

Table 15. Maximum environmental classification for fjords selected for Reference Index. (See text).

Index Area	1995	1996	1997	1998	1999	2000	2001	2002	2002 new [5]	2003	2003 new [5]	2004 new [5]	2005 new [5]	2006 new [5]	2007 new [5]	2008 new [5]	2009 new [5]	2010 new [5]
Mid and Outer Oslofjord [1]	2	2	2	1	1	1	2	1	1	1	2	1	1	2	1	2	2	1
Lista	1	1	1	1	2	2	2	2	2	1	1	2	2	1	1	1	1	1
Bømlo-Sotra	1	1	1	1	1	2	2	1	2	1	3	2	2	2	2	2	1	1
Outer Ranfjord, Helgeland [2]	(1)	(1)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lofoten [3]	(2)	(2)	(1)	(2)	(2)	(1)	(2)	(2)	2	(2)	2	1	1	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	1	2	2	1	1
AVERAGE (Reference INDEX)	**1.3**	**1.5**	**1.3**	**1.3**	**1.3**	**1.5**	**1.8**	**1.3**	**1.6**	**1.2**	**1.8**	**1.4**	**1.4**	**1.4**	**1.4**	**1.6** [6]	**1.2**	**1.0**

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

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

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

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

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

[6] 1.4 reported earlier.

Appendix J1
INDEX-Sampling and analyses for 1995-2010

Appendix J1. 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 J2. See Walday *et al.* (1995) for discussion of selection of stations and analyses.

	st.	STATION	INDEX	+	A	B	C	D	E	F	G	H	I	J	K	CM
		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	Croftholmen	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	Fiskåtangen	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 J1

		STATION	**INDEX**						**---------------- ANALYSIS CODE**											**--------------------CM**
	st.							+	A	B	C	D	E	F	G	H	I	J	K	
		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 J2
INDEX-Key to analysis codes and sample counts

(Used in Appendix J1)

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

	Analysis code										
Contaminant	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**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 J3
INDEX-Klif Environmental quality classes

(Molvær *et al.* 1997)

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

*) See also **Appendix 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_S	W	U	<50	50-200	200-2000	2000-5000	>5000
BAP	W	U	<1	1-3	3-10	10-30	>30
DDTSS	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
HCHSS	W	U	<1	1-3	3-10	10-30	>30
CBSSe	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 J4
INDEX-Summary table “Pollution index” 2009-2010

Pollution index 2009-new (with supplementary analyses and stations)

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

Average of Max E.C is 2,8

Index areaname (Pollution area) 2009	n	N	Pb ppm d.wt	F ppm d.wt	Cd ppm d.wt	Cu ppm d.wt	Cr ppm d.wt	Hg ppm d.wt	Ni ppm d.wt	Zn ppm d.wt	Ag ppm d.wt	PAH_S ppb w.wt	BAP ppb w.wt	DDTSS ppb w.wt	HCB ppb w.wt	HCHSS ppb w.wt	CBSSe ppb w.wt	TCDDN ppp w.wt	TBT ppm d.wt	Max E.C I:V
Hvaler/Singlefjorden	3	4	1,50	i	1,91	i	i	0,28	i	i	i	i	i	<0,62	<0,05	<0,10	<1,40	i	i	II
Iddefjord	0	2	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	miss
Inner Oslofjord	5	5	i	i	1,23	i	i	0,08	i	i	i	<46,26	0,54	1,53	0,08	<0,10	6,90	<0,11	0,36	II
Frierfjorden	3	4	i	i	i	i	i	i	i	i	i	i	i	<0,58	0,34	<0,05	2,04	5,97	0,15	V
Inner Kristiansandsfjord	2	3	i	i	i	i	i	i	i	i	i	<191,00	13,00	<0,58	0,20	<0,05	3,81	<0,64	0,21	IV
Saudafjord	2	2	2,80	i	1,14	i	i	i	i	i	i	<22,83	0,83	i	i	i	i	i	i	I
Sørfjord	2	2	21,21	i	2,29	i	i	0,26	i	i	i	i	i	2,94	0,07	<0,10	<1,34	i	i	III
Byfjorden	3	3	i	i	i	i	i	i	i	i	i	i	i	1,79	<0,10	<0,05	8,31	i	i	II
Sunndalsfjord	3	4	i	i	i	i	i	i	i	i	i	<16,84	0,71	i	i	i	i	i	i	I
Orkdalsfjord area	0	3	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	miss
Inner Ranfjord	3	4	18,38	i	1,74	i	i	i	i	i	i	<363,50	41,00	i	i	i	i	i	i	V

Pollution index 2010-new (with supplementary analyses and stations)

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

Average of Max E.C is 2,6

Index areaname (Pollution area) **2010**	n	N	Pb ppm d.wt	F ppm d.wt	Cd ppm d.wt	Cu ppm d.wt	Cr ppm d.wt	Hg ppm d.wt	Ni ppm d.wt	Zn ppm d.wt	Ag ppm d.wt	∑PAH ppb w.wt	BAP ppb w.wt	∑DDT ppb w.wt	HCB ppb w.wt	∑HCH ppb w.wt	∑PCB ppb w.wt	TCDDN ppp w.wt	TBT ppm d.wt	Max E.C I:V
Hvaler/Singlefjorden	3	4	1,50	i	2,06	i	i	0,29	i	i	i	i	i	<0,48	0,04	<0,05	<1,12	i	i	II
Iddefjord	0	2	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	miss
Inner Oslofjord	5	5	i	i	1,82	i	i	0,18	i	i	i	<77,20	2,20	1,33	0,18	<0,05	6,67	s	0,18	II
Frierfjorden	3	4	i	i	i	i	i	i	i	i	i	i	i	0,86	0,43	<0,05	2,60	4,57	0,03	V
Inner Kristiansandsfjord	2	3	i	i	i	i	i	i	i	i	i	<60,16	2,60	0,51	1,20	<0,05	<1,82	0,99	0,11	IV
Saudafjord	2	2	2,13	i	0,98	i	i	i	i	i	i	<12,29	0,53	i	i	i	i	i	i	I
Sørfjord	2	2	31,00	i	4,06	i	i	0,36	i	i	i	i	i	3,44	0,06	<0,10	<1,26	i	i	III
Byfjorden	3	3	i	i	i	i	i	i	i	i	i	i	i	1,86	0,08	<0,05	5,45	i	i	II
Sunndalsfjord	2	4	i	i	i	i	i	i	i	i	i	<7,94	<0,50	i	i	i	i	i	i	I
Orkdalsfjord area	0	3	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	miss
Inner Ranfjord	3	4	13,93	i	1,74	i	i	i	i	i	i	<163,29	7,90	i	i	i	i	i	i	III

Appendix J5
INDEX-Summary table “Reference Index”
2009-2010

Reference index 2009-new (with supplementary analyses and stations)

Max(median). Statistics for alle areas: (n = Index-station measured, N = Station programmed for index, i = not included in index)

Average of Max E.C is 1,0

Index areaname	n	N	Pb	F	Cd	Cu	Cr	Hg	Ni	Zn	Ag	PAH_S	BAP	DDTSS	HCB	HCHSS	CBSSe	TCDDN	TBT	Max
(Reference area)			ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppb	ppb	ppb	ppb	ppb	ppb	ppp	ppm	E.C
2009			d.wt	d.wt	d.wt	d.wt	d.wt	d.wt	d.wt	d.wt	d.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	d.wt	I:V
Mid and outer Oslofjord	1	2	1,00		0,73		0,96	0,06	1,13		0,06	<6,67	<0,50	1,10	0,06	<0,05	1,60	<0,04	0,03	I
Lista area	2	3	1,54		1,51		1,18	0,12	1,69		0,06	<4,72	<0,50	<0,55	<0,10	<0,05	<1,11		0,01	I
Bømlo-Sotra area	1	1	0,74		0,87		0,57	0,06	1,00		<0,02			<1,02	0,04	<0,05	<1,06		0,06	I
Outer Ranfjord, Helgeland area	0	2																		miss
Lofoten area	1	3	0,83		1,24		1,13	0,07	1,19		0,04			<0,31	0,07	<0,05	<0,58		0,02	I
Finnsnes- Skjervøy area	0	1																		miss
Hammerfest-Honningsvåg area	0	2																		miss
Varanger peninsula area	1	5	0,82		1,55		1,00	0,04	1,29		0,12			<0,26	0,06	<0,05	<0,35			I

Reference index 2010-new (with supplementary analyses and stations)

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

Average of Max E.C is 1,0

Index areaname (Reference area) 2010	n	N	Pb ppm d.wt	F ppm d.wt	Cd ppm d.wt	Cu ppm d.wt	Cr ppm d.wt	Hg ppm d.wt	Ni ppm d.wt	Zn ppm d.wt	Ag ppm d.wt	PAH_S ppb w.wt	BAP ppb w.wt	DDTSS ppb w.wt	HCB ppb w.wt	HCHSS ppb w.wt	CBSSe ppb w.wt	TCDDN ppp w.wt	TBT ppm d.wt	Max E.C I:V
Mid and outer Oslofjord	1	2	0,94		0,99		1,25	0,07	1,69		0,04	<7,37	<0,50	0,80	0,03	<0,05	<0,95		0,04	I
Lista area	2	3	1,13		1,19		1,33	0,08	1,31		0,07	<5,64	<0,50	<0,32	<0,03	<0,05	<0,80		0,03	I
Bømlo-Sotra area	1	1	0,57		0,71		<0,50	0,06	0,60		0,04			<0,56	<0,05	<0,10	<0,93		0,01	I
Outer Ranfjord, Helgeland area	0	2																		miss
Lofoten area	1	3	0,71		1,84		1,18	0,09	1,00		0,04			<0,40	0,05	<0,10	<0,46		0,02	I
Finnsnes- Skjervøy area	0	1																		miss
Hammerfest-Honningsvåg area	0	2																		miss
Varanger peninsula area	1	5	0,83		1,84		1,18	0,04	1,76		0,14			<0,35	0,04	<0,05	<0,45			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 - 2010.
Levels, trends and effects.
Long-term monitoring of environmental quality in Norwegian coastal waters.

Summary
The Norwegian contribution to OSPAR's Coordinated Environmental Monitoring Programme (CEMP) in 2010 included the monitoring of micropollutants (contaminants) in blue mussel (38 stations), dogwhelk (8 stations), common periwinkle (1 station), cod (11 stations) and flatfish (dab, flounder, plaice, megrim; 8 stations) along the coast of Norway from the Oslofjord and Hvaler region in the southeast to the Varangerfjord in the northeast. The stations are located both in areas with known or presumed point sources of contaminants, in areas of diffuse load of contamination like city areas, and in more remote areas exposed to presumed low and diffuse pollution. The mussel sites include supplementary stations for the Norwegian Index Programme. The results from 2010 supplied data to a total of 1039 time series of selected contaminants or biomarkers. Of these, 280 showed statistically significant trends of which 248 were downwards and 32 upwards. The dominance of downward trends indicates that contamination is decreasing. In 154 cases, concentrations were above what is expected in only diffusely contaminated areas.

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SFPO-nr 1111/2011

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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