NORWEGIAN ENVIRONMENT AGENCY

Norwegian Institute for Water Research

NILU

ENVIRONMENTAL MONITORING

M-375 | 2015

Environmental Contaminants in an Urban Fjord, 2014

COLOPHON

Executive institution

Norwegian Institute for Water Research (NIVA). NIVA Report no. 6884-2015

Project manager for the contractor

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Bård Nordbø

M-no	Year	Pages	Contract number
375	2015	110+Appendix	14028096 and 15078045

Publisher

The Norwegian Environment Agency

The project is funded by

The Norwegian Environment Agency

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Title - Norwegian and English

Miljøgifter i en urban fjord, 2014
Environmental Contaminants in an Urban Fjord, 2014

ISBN: 978-82-577-6619-1
Project number: 13239

Summary - sammendrag

This programme, "Environmental Contaminants in an Urban Fjord" has covered sampling and analysis of organisms in a marine food web of the Inner Oslofjord, in addition to samples of sediment, blue mussel and polychaetes at selected locations in the fjord. The programme also included inputs of pollutants via surface water (storm water). Results from other monitoring programmes such as "Contaminants in coastal areas" (MILKYS) and "Riverine inputs and direct discharges to Norwegian coastal waters" (RID), as well as results from other input measurements to the inner Oslofjord, and measurements of contaminants at Bekkelaget sewage treatment plant are referred and placed in context with the results of the present programme. A vast number of chemical parameters have been quantified, and the report serves as valuable documentation of the concentrations of these chemicals in different compartments of the Inner Oslofjord marine ecosystem. Furthermore, this report presents relationships between the contaminant concentrations and various biological variables.

4 emneord

Miljøgifter, urban, næringskjede, bioakkumulering

4 subject words

Contaminants, Urban areas, Food web, Bioaccumulation

Front page photo

Harald Bonaventura Borchgrevink

Foreword

The programme covers sampling and analysis of organisms in a marine food web of the Oslofjord in 2014 in addition to samples of sediment, blue mussel and polychaetes at selected locations in the fjord. The programme also includes inputs of pollutants via surface water (storm water). Results from other monitoring programmes such as "Contaminants in coastal areas" (MILKYS) and "Riverine inputs and direct discharges to Norwegian coastal waters" (RID), as well as results from other input measurements to the inner Oslofjord, and measurements of contaminants at Bekkelaget sewage treatment plant are referred and placed in context with the results of the present programme. 2014 represents the second year of the Urban Fjord programme, and it was *a priori* decided that the programme should have a similar design as in 2013, and that it thereafter may be modified following an evaluation.

The study was carried out by NIVA, with a majority of the chemical analyses performed by the Norwegian Institute for Air Research, NILU. Collection of herring gulls was done with assistance from the University of Oslo (Morten Helberg, Centre for Ecological and Evolutionary Synthesis).

Besides the authors of this report, several persons are acknowledged for their contribution in sample collection, sample preparation and analysis: Thomas Rundberget, Ingar Johansen, Sigurd Øxnevad, Norman Green, Alfhild Kringstad, Camilla With Fagerli, Katherine Langford, David Eidsvoll, Frøydis Meen Wærstad, Marthe Torunn Solhau Jenssen, Pawel Rostowski, Mikael Harju, Hilde Uggerud, Marit Vadset, Nick Warner, Inger-Christin Steen and Sven Hofgaard.

Oslo, august 2015

Anders Ruus
Forsker I, Marin Forurensning

Sammendrag

Dette programmet, "Miljøgifter i en Urban Fjord" har omfattet prøvetaking og analyse av organismer i en marin næringskjede i Indre Oslofjord, i tillegg til prøver av sediment, blåskjell og børstemark på utvalgte lokaliteter i fjorden i 2014. Programmet omfattet også undersøkelser av tilførsler av miljøgifter via overvann. Resultater fra andre overvåkingsprogrammer som "Miljøgifter i kystnære områder" (MILKYS) og "Elvetilførselsprogrammet" (RID), og resultater fra tilførselsundersøkelser, samt målinger av miljøgifter ved Bekkelaget kloakkrenseanlegg er omtalt og satt i sammenheng med resultatene fra den foreliggende undersøkelsen.

Målet med programmet var å undersøke tilførsler av miljøgifter som er tilstede i et tett befolket område og studere hvordan disse påvirker et fjordsystem. Denne undersøkelsen er ett skritt mot Miljødirektoratets generelle mål om å:

- Anslå graden av bioakkumulering av utvalgte miljøgifter på flere trofiske nivåer i marine næringskjeder.
- Koble eksponeringen av miljøgifter på marine organismer til toksiske effekter på ulike biologiske nivåer, inkludert hormonforstyrrende effekter og interaksjonseffekter ("cocktaileffekter").
- Identifisere kilder og sluk for miljøgifter i fjordsystemer ("skjebnen" til miljøgifter i en fjord), og utforme målrettede tiltak.

Intensjonen er videre at data skal brukes i internasjonale miljøgiftreguleringer, som REACH og Stockholmkonvensjonen. Dessuten skal programmet frembringe data som vil være til hjelp i å gjennomføre kravene i Vanndirektivet ("Vannforskriften") i forbindelse med statlig basisovervåking. 2014 er det andre året "Miljøgifter i en Urban Fjord" har vært gjennomført og det var på forhånd bestemt at det skulle gjennomføres i hovedsak som i 2013, hvor det deretter eventuelt blir modifisert, etter en evaluering.

Konsentrasjonene av et stort antall kjemiske parametere er kvantifisert i denne undersøkelsen, og rapporten fungerer som verdifull dokumentasjon av konsentrasjonene av disse kjemikaliene i ulike deler ("compartments") av det marine økosystemet i Indre Oslofjord. Videre presenterer denne rapporten sammenhenger mellom forurensnings-konsentrasjoner og forskjellige biologiske variabler. Generelt var konsentrasjonene av de ulike stoffene omtrent som tidligere observert. For flere av stoffene finnes det (ennå) ikke kvalitetsstandarder å relatere til, men for de stoffene hvor dette finnes kan det nevnes at det ble observert forhøyede konsentrasjoner av oktylfenol, TBT og enkelte metaller i sedimenter, samt forhøyede konsentrasjoner av enkelte metaller i blåskjell og overflatevann.

De relative isotopsignaturene blant artene i næringsnettet som ble prøvetatt er veldig like resultatene fra forrige prøvetakingskampanje i «Urban fjord»-programmet, noe som tyder på at de trofiske/økologiske interaksjonene (eller mangel på disse) vedvarer, og ikke var et resultat av tilfeldig prøvetaking innenfor en kort tidsramme. Videre underbygger resultatene konklusjonen fra forrige undersøkelse, nemlig at artene som er samlet inn ikke utgjør et representativt næringsnett (artene som er analysert representerer kanskje ikke viktige predator/bytte-forhold), og indikasjoner på biomagnifisering (eller mangel på dette) er ikke konklusive. I lys av de innledende "pilot"-kampanjene (2013 og 2014) i "Urban fjord"-

programmet, bør det legges vekt på å prøveta et mer representativt næringsnett. Det er også behov for et mer balansert design med tanke på antall enkeltprøver fra hver art i næringskjeden. Disse endringene er planlagt i videreføringen av dette overvåkingsprogrammet.

Variabilitet i fraksjonering av stabile isotoper blant enkeltindivider av gråmåke var høy (et spenn i $\delta^{15}N$ i blod tilsvarte mer enn ett trofisk nivå), og signifikante positive lineære sammenhenger mellom (log) konsentrasjoner og trofisk posisjon kunne observeres for flere stoffer med kjent bioakkumulerende/biomagnifiserende potensiale, slik som PCB, PBDE, PFAS (f.eks. PFOS) og metaller (spesielt Hg). En slik positiv sammenheng kunne også observeres for siloksan-forbindelsen 'D5', til tross for tidligere indikasjoner på at siloksaner raskt utåndes fra luftpustende organismer. Det var også et signifikant forhold mellom konsentrasjonene av D5 (så vel som for flere PCB-kongenere) og kroppsvekt av måker. Det må imidlertid bemerkes at regresjonene ofte trolig ble influert av noen få (store) individer med høy trofisk posisjon og høye konsentrasjoner.

Gråmåker er kjent for å vise forskjellig beiteatferd og vandringsmønster, noe som åpenbart kan påvirke resultatene fra undersøkelsen. Gråmåker migrerer delvis, en strategi som innebærer at noen individer blir i hekkeområdet hele året, mens andre migrerer. Andelen migrerende måker i utvalget i denne undersøkelsen er ukjent. Den generalistiske beiteadferden hos gråmåke ble reflektert i isotopsignaturene (se ovenfor). Gråmåke viste lav $\delta^{15}N$ (og innehar dermed en lav trofisk posisjon) og $\delta^{13}C$ sammenlignet med de andre artene, noe som indikerer viktige elementer i dietten som ikke er knyttet til næringsnettet som er prøvetatt.

Summary

This programme, "Environmental Contaminants in an Urban Fjord" has covered sampling and analysis of organisms in a marine food web of the Inner Oslofjord, in addition to samples of sediment, blue mussel and polychaetes at selected locations in the fjord, in 2014. The programme also included inputs of pollutants via surface water (storm water). Results from other monitoring programmes such as "Contaminants in coastal areas" (MILKYS) and "Riverine inputs and direct discharges to Norwegian coastal waters" (RID), as well as results from other input measurements to the inner Oslofjord, and measurements of contaminants at Bekkelaget sewage treatment plant are referred and placed in context with the results of the present programme.

The objective of the programme was to monitor the discharges of chemicals used in a densely populated area and to study how this contaminant input affects a fjord system. The present study represents one step towards the Norwegian Environment Agency's general aim to:

- Estimate the degree of bioaccumulation of selected contaminants at several trophic levels in marine food chains.
- Connect pollutant exposure of marine organisms to toxic effects at different biological levels, including endocrine disruption and contaminant interactions ("cocktail effects").
- Identify sources and sinks (i.e. the fate) of environmental contaminants in fjord systems and design targeted actions.

Furthermore, there is an intention that data will be used in international chemical regulation, such as REACH and the Stockholm Convention. The programme was also meant to provide data from governmental monitoring in Norway to comply with the requirements of Water Framework Directive (The Water Regulation/"Vannforskriften"). 2014 represents the second year of the Urban Fjord programme, and it was *a priori* decided that the programme should be similar to that carried out in 2013, which after it may be modified following an evaluation.

A large number of chemical parameters have been quantified, and the present report provides documentation of the concentrations of these chemicals in different compartments of the Inner Oslofjord marine ecosystem. Furthermore, the report presents relationships between the contaminant concentrations and various biological variables in the addressed organisms. In general, the concentrations of the different contaminants were in the same range as previously observed. For several of the compounds, no quality criteria to relate to (yet) exist. However, for compounds where such are available, the following can be mentioned: Elevated concentrations of octylphenol, TBT, and certain metals were observed in sediments. Elevated concentrations of certain metals were also observed in blue mussel and storm water.

The relative isotopic signatures among the species of the sampled food web are very similar to the results of the previous sampling campaign in the programme, suggesting that the trophic/ecological interactions (or lack of such) persist, and were not a random result of sampling within a short time frame. Furthermore, the results corroborate the conclusion from the previous campaign, namely that the species collected do not constitute a representative food web (species analysed may not represent important predator-prey relationships), and

that indications of biomagnification (or lack of such) using the trophic magnification approach are not conclusive. After the initial “pilot” campaigns (2013 and 2014) of the “Urban fjord”-programme, an effort should be made to sample a more representative food web. It is also a need for a more balanced design, in terms of the number of individual samples from each species in the food web. Such a re-design is planned for the continuation of this monitoring programme.

Interestingly, the variability in stable isotope fractionation among individual herring gulls was high (a span in $\delta^{15}N$ in blood ranging over >1 trophic level), and significant positive linear relationships between (log) concentrations and trophic position could be observed for several contaminants with known bioaccumulative/biomagnifying potential, such as PCBs, PBDEs, PFASs (e.g. PFOS), and metals (especially Hg). Furthermore, such a positive relationship could also be observed for the cyclic volatile methylsiloxane ‘D5’, despite earlier indications that siloxanes are rapidly exhaled from air breathing organisms. There was also a significant relationship between the concentrations of D5 (as well as for several PCB congeners) and body mass of the gulls. It must be noted however, that the regressions were probably often highly influenced by a few (large) individuals with high trophic position and high concentrations.

Herring gulls display different feeding behaviour and migration patterns, which obviously influence the results. The Herring gulls are partial migrants, a strategy were some individuals stay in the breeding region during the whole annual cycle while others migrate. The proportion of migrants in the sampled population is unknown. The generalistic feeding behaviour of herring gulls was reflected in the isotopic signatures (see above). Herring gull displayed low $\delta^{15}N$ (and thus inhabit a low trophic position) and $\delta^{13}C$ compared the other species, indicating important food items not related to the selected food web.

Content

Attachments:

1. Appendix (concentrations In individual samples; CAS-no.)

1. Introduction

"Environmental contaminants in an urban fjord" is a programme designed to monitor discharges of anthropogenic chemicals in a densely populated area and to study how this contaminant input affects a fjord system. The programme addresses inputs of pollutants from potential sources, measurements of contaminant concentrations in different marine species, assessment of bioaccumulation patterns within a food web and estimation of effect risks in organisms. The programme contributes to the Norwegian Environment Agency's ongoing monitoring activity in coastal areas and supplements two other monitoring programmes: "RID - Riverine inputs and direct discharges to Norwegian coastal waters" and "MILKYS - Environmental contaminants in coastal areas".

1.1 Objectives

The environmental monitoring activity in the present programme contributes to the Norwegian Environment Agency’s general aim to:

- Estimate the bioaccumulation of selected contaminants at several trophic levels in marine food chains.
- Connect pollutant exposure of marine organisms to toxic effects at different levels of biological organisation, including endocrine disruption and contaminant interactions ("cocktail effects").
- Identify sources and sinks of environmental contaminants in fjord systems ("the fate of the contaminants in a fjord") and designing targeted actions.

The programme will also provide data that will aid to implement the requirements of Water Framework Directive (The Water Regulation/“Vannforskriften”) regarding governmental basic monitoring as well as used in international chemical regulation. The present report (2014) represents the second year of the Urban Fjord project, and it was *a priori* decided that the programme should be similar to that conducted in 2013, which after it may be modified following an evaluation.

2. Material and Methods

2.1 Sample Collection

2.1.1 Food web of the Inner Oslofjord

Zooplankton, prawns, polychaetes and flatfish were collected as representatives of a food chain in the inner Oslo Fjord. The organisms were collected in an area between Lysakerfjorden and Midtmeie (southwest of Steilene; Figure 1), the autumn of 2014. Table 1 shows the sampling plan of the programme.

Krill (*Euphausiacea*) were collected as representatives of the zooplankton by Midtmeie, southwest of Steilene. A fry trawl was operated from RV Trygve Braarud for this purpose. Midtmeie is also the area where cod is collected in connection with the MILKYS-programme. Material for three pooled samples was collected.

Prawns (*Pandalus borealis*) were caught with benthic trawl from RV Trygve Braarud in the same area as zooplankton (krill), Midtmeie, southwest of Steilene. Material for three pooled samples (of 50 individuals; size: 71-110 mm) was collected.

Polychaetes were collected in the inner Oslofjord (near the sampling sites for other species; Figure 1) using a van Veen grab (0.15 m^2) from RV Trygve Braaarud. When possible (dependent on species and mechanical damage), the worms were held in a container of clean seawater for 6-8 hours prior to cryopreservation and analysis. This was done in order to allow the worms to purge any residual sediment from the gut. Material for three pooled samples was collected. The samples consisted of the species listed in Table 2.

Flounder (*Platichthys flesus*) were caught using gill nets in an area of the Lysakerfjord by Sven Hofgaard at Sollerud skole. 15 individuals were caught. Biometric data for the fish are given in Chapter 3.12.

Herring Gull (*Larus argentatus*) blood samples (from adult breeding individuals trapped at nest) and eggs (14 egg samples and 16 blood samples) were sampled by Morten Helberg (University of Oslo) and provided by the Norwegian Environment Agency. Biometric data for the birds are given in Chapter 3.12. The birds were captured at Bleikøykalven (59.89126 N, 10.74712 E) and at Søndre Skjælholmen (Nesodden municipality; 59.85317 N, 10.7281 E), while the eggs were collected at the island Søndre Skjælholmen. The blood samples were taken from adult birds trapped by walk-in trap placed at the nest, and the blood samples (~5 ml) were taken from a vein under the wing.

Storm water samples were collected at one occasion at four specific sampling points (Bryn Ring 3/E6, Breivoll/Alnabru terminal, Breivoll E6, downstream terminal and Hasle snow disposal site; Figure 1). The samples were collected from manholes by filling bottles directly in the storm water. Subsequently, the storm water samples were separated into a filtered fraction (hereafter referred to as “dissolved fraction”) and a particulate fraction by filtering (polyethylene (PE) frit, 20 µm porosity prior to analysis of per-and polyfluorinated substances (at NIVA) and Whatman Glass Microfilters GF, pore size 1.2 µm, prior to analysis of other chemical parameters (at NILU)).

2.1.2 Alna River

Mussels were collected near the mouth of Alna River by standard procedures (as in "Contaminants in coastal areas", MILKYS; handpicked, using rake, or snorkelling). A pooled sample of 60 shells in the size 30 to 40 mm (shell length) was prepared.

Sediment was collected at the mouth of Alna River by means of a van Veen grab (0.15 m^2) from RV Trygve Braarud. Three samples of the top layer (0-2 cm in grab samples with undisturbed surface) were prepared[1].

Polychaetes were collected at the mouth of Alna River, using the same approach as for the food chain of the Inner Oslofjord (above). One pooled sample was prepared. The samples consisted of the species listed in Table 2.

2.1.3 Bekkelaget

Mussels were collected at Bekkelaget by standard procedures (as in "Contaminants in coastal areas", MILKYS; handpicked, using rake, or snorkelling). A pooled sample of 60 shells in the size 30 to 40 mm (shell length) was prepared.

Sediment was collected at Bekkelaget by means of a van Veen grab (0.15 m^2) from RV Trygve Braarud. Three samples of the top layer (0-2 cm in grab samples with undisturbed surface) were prepared[1].

Polychaetes were collected at Bekkelaget, using the same approach as for the food chain of the Inner Oslofjord (above). One pooled sample was prepared. The samples consisted of the species listed in Table 2.

2.1.4 Frognerkilen

Mussels were collected in Frognerkilen using standard procedures (as in "Contaminants in coastal areas", MILKYS; handpicked, using rake, or snorkelling). A pooled sample of 60 shells in the size 40 to 50 mm (shell length) was prepared.

Sediment was collected in Frognerkilen by means of a grab van Veen grab (0.15 m^2) from RV Trygve Braarud. Three samples of the top layer (0-2 cm in grab samples with undisturbed surface) were prepared[1].

Polychaetes were collected in Frognerkilen, using the same approach as for the food chain of the Inner Oslofjord (above). One pooled sample was prepared. The samples consisted of the species listed in Table 2.

[1] According to the Norwegian Environment Agency guidelines for risk assessment of contaminated sediment (TA-2802/2011).

Table 1
Overview of samples collected for the "Urban Fjord" programme.

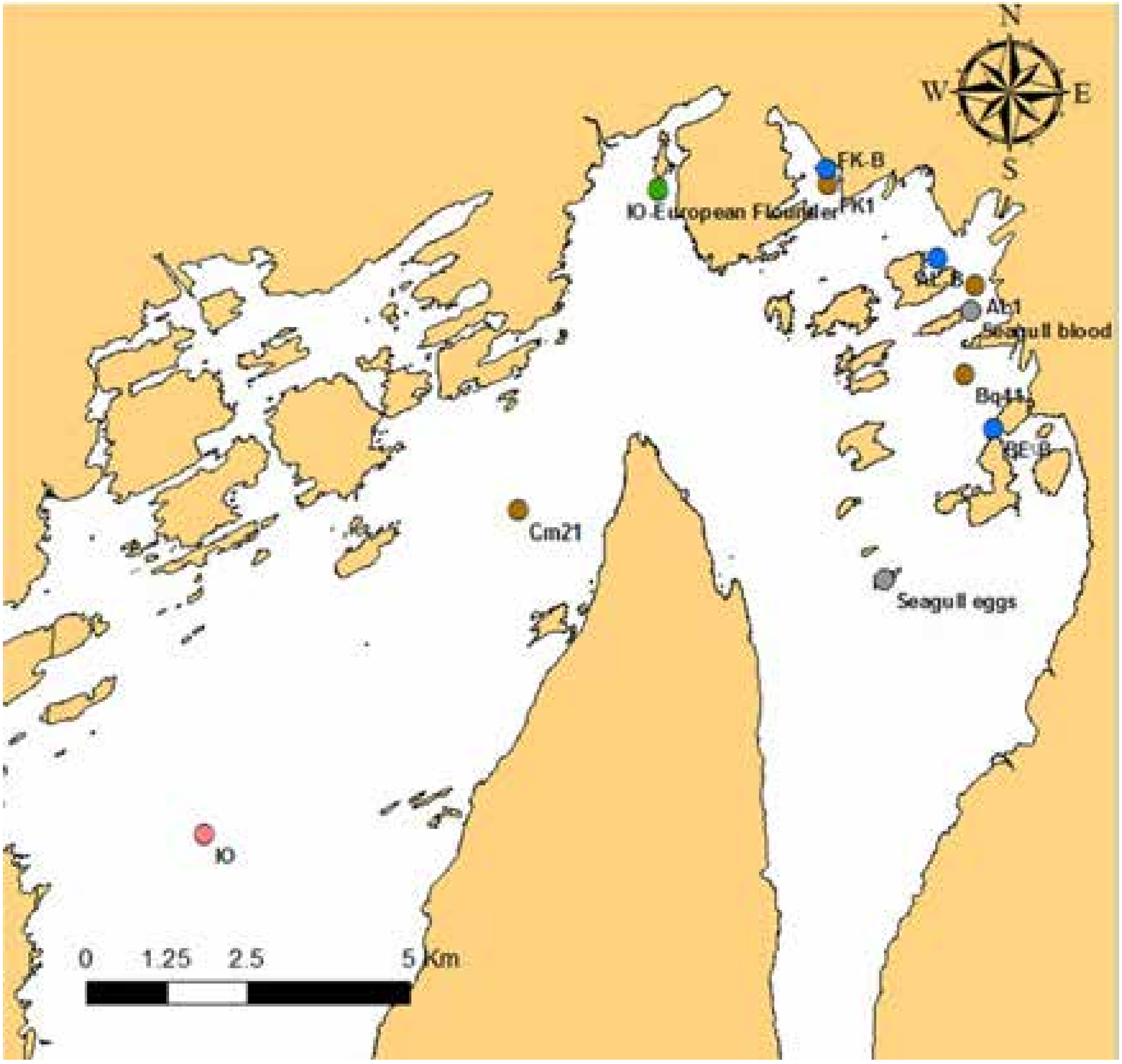
Species/matrix	Locality	Frequency	No. for analysis
Zooplankton	Food chain, Inner Oslofjord	Once per year	3 pooled samples
Prawns	Food chain, Inner Oslofjord	Once per year	3 pooled samples
Polychaetes	Food chain, Inner Oslofjord	Once per year	3 pooled samples
Flatfish	Food chain, Inner Oslofjord	Once per year	15 individuals
Inputs storm water	See Figure 1	Once per year*	4 samples (4 samples of dissolved fraction plus 4 of particulate fraction)
Alna blue mussel	Mouth of Alna River	Once per year	1 pooled sample
Alna sediment	Mouth of Alna River	Once per year	3 pooled samples
Alna polychaetes	Mouth of Alna River	Once per year	1 pooled sample
Bekkelaget blue mussel	Bekkelaget STP	Once per year	1 pooled sample
Bekkelaget sediment	Bekkelaget STP	Once per year	3 pooled samples
Bekkelaget polychaetes	Bekkelaget STP	Once per year	1 pooled sample
Frognerkilen blue mussel	Frognerkilen	Once per year	1 pooled sample
Frognerkilen sediment	Frognerkilen	Once per year	3 pooled samples
Frognerkilen polychaetes	Frognerkilen	Once per year	1 pooled sample

* Original plan was two localities, twice per year.

Table 2.
Species constituting polychaete samples (grams of each species).

	Frognerkilen (FK1)	Mouth of Alna River (AL1)	Bekkelaget (Bq41)	Inner Oslofjord (Cm21)		
				Rep. 1	Rep. 2	Rep. 3
S.inflatum		18.4				
P.crassa	44.0		80.8	26.05	30.4	33.6
Nephtys sp.	7.0	0.4				3.9
Glycera sp.	9.1	19.1	13.2			
Goniada sp.	15.3	3.4	3.9	1.6	0.76	
Lumbrineridae indet		3.1	25.0	10.1	7.9	21.6
Nereis sp.		3.1				
Misc. (undetermined)	7.8	5.6	11.5	14.5	22.18	17.84
Total (grams)	**83.2**	**53.1**	**134.4**	**52.25**	**61.24**	**76.94**

A.



B.

C.

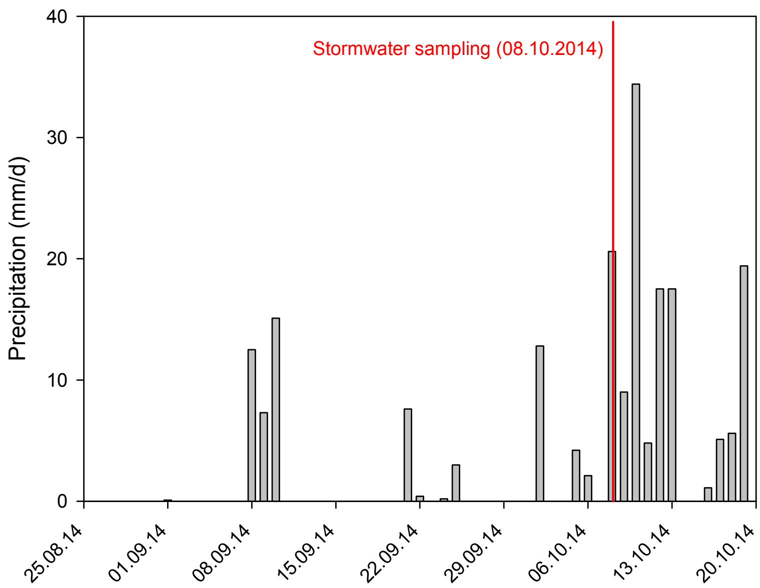


Figure 1. A.: (previous page) Map depicting stations for collection of blue mussel (blue dots) at Frognerkilen (FK-B), the mouth of Alna River (AL-B) and Bekkelaget (BE-B), collection of sediment and polychaetes (Brown dots) at Frognerkilen (FK1), the mouth of Alna River (AL1), Bekkelaget (Bq41) and Inner Oslofjord (Cm21; only polychaetes), collection of flounder (green dot) in the Inner Oslofjord (IO-European flounder), collection of Krill and prawns (pink dot) in the Inner Oslofjord (IO), as well as collection of herring gull eggs (Seagull eggs) and blood (Seagull blood), respectively (grey dots; Some blood samples also collected at site labelled "Seagull eggs"). B.: Map depicting sites for collection of storm water/surface water samples. C.: Overview of time of sampling of storm water/surface water in relation to rainfall (mm/d).

2.2 Chemical analysis and support parameters

Tables 3-6 provide a detailed overview of the compounds/parameters analysed in the different samples. Additional parameters (Table 7) were included in the programme. The samples were analysed at NIVA, NILU and Eurofins. Stable isotopes of carbon and nitrogen were analysed at IFE.

Table 3.
Overview: analyses in different matrices from the different localities (original programme).

Species/matrix	Locality	Analytes
Zooplankton	Food chain Inner Oslofjord	Metals, PCB7, PFAS, HBCDD, PBDE, Chloroparaffins, siloxanes, PFR, TBBPA
Prawns	Food chain Inner Oslofjord	Metals, PCB7, PFAS, HBCDD, PBDE, Chloroparaffins, siloxanes, PFR, TBBPA
Polychaetes	Food chain Inner Oslofjord	Metals, PCB7, PFAS, HBCDD, PBDE, Chloroparaffins, siloxanes, PFR, TBBPA
Flounder	Food chain Inner Oslofjord	Metals, PCB7, PFAS, HBCDD, PBDE, Chloroparaffins, siloxanes, PFR, TBBPA
Herring gull (blood)	Food chain Inner Oslofjord	Metals, PCB7, PFAS, HBCDD, PBDE, Chloroparaffins, siloxanes, PFR, TBBPA
Herring gull (egg)	Food chain Inner Oslofjord	Metals, PCB7, PFAS, HBCDD, PBDE, BPA, oktyl-/nonylphenol, Chloroparaffins, ΣDDT, siloxanes, PFR, TBBPA
Storm water *	See Figure 1	Metals, PCB7, PFAS, HBCDD, PBDE, BPA, oktyl-/nonylphenol, Chloroparaffins, siloxanes, PFR, TBBPA
Alna blue mussel	Mouth of Alna River	Metals, PCB7, PFAS, HBCDD, PBDE, BPA, oktyl-/nonylphenol, Chloroparaffins, siloxanes, PFR, TBBPA
Alna sediment	Mouth of Alna River	Metals, PCB7, PFAS, HBCDD, PBDE, BPA, oktyl-/nonylphenol, Chloroparaffins, siloxanes, PFR, TBBPA
Alna polychaetes	Mouth of Alna River	Metals, PCB7, PFAS, HBCDD, PBDE, BPA, oktyl-/nonylphenol, Chloroparaffins, siloxanes, PFR, TBBPA
Bekkelaget blue mussel	Bekkelaget STP	Metals, PCB7, PFAS, HBCDD, PBDE, BPA, oktyl-/nonylphenol, Chloroparaffins, siloxanes, PFR, TBBPA
Bekkelaget sediment	Bekkelaget STP	Metals, PCB7, PFAS, HBCDD, PBDE, BPA, oktyl-/nonylphenol, Chloroparaffins, siloxanes, PFR, TBBPA
Bekkelaget polychaetes	Bekkelaget STP	Metals, PCB7, PFAS, HBCDD, PBDE, BPA, oktyl-/nonylphenol, Chloroparaffins, siloxanes, PFR, TBBPA
Frognerkilen blue mussel	Frognerkilen	Metals, PCB7, PFAS, HBCDD, PBDE, BPA, oktyl-/nonylphenol, Chloroparaffins, antifouling agents, siloxanes, PFR, TBBPA
Frognerkilen sediment	Frognerkilen	Metals, PCB7, PFAS, HBCDD, PBDE, BPA, oktyl-/nonylphenol, Chloroparaffins, antifouling agents, siloxanes, PFR, TBBPA
Frognerkilen polychaetes	Frognerkilen	Metals, PCB7, PFAS, HBCDD, PBDE, BPA, oktyl-/nonylphenol, Chloroparaffins, antifouling agents, siloxanes, PFR, TBBPA

* Dissolved and particulate fractions.

Table 4.
Analytes included in the programme. (See the Appendix for CAS-no.)

Parameter	Single compounds	Comment
Metals	Hg, Pb, Cd, Ni, Cu, Cr, Ag, Zn, Fe, As	
PCB 7	PCB-28, -52, -101, -118, -138, -153 and -180	
PCB32 (minus those constituting PCB 7)	PCB-18, 31, 33, 37, 47, 66, 74, 99, 105, 114, 122, 123, 128, 141, 149, 156, 157, 167, 170, 183, 187, 189, 194, 206 and 209	
PFAS	PFBS, PFHxS, PFOS, br-PFOS, 6:2 FTS, ipPFNS, PFDS, PFDoS, PFOSA N-EtFOSE, N-MeFOSE, N-EtFOSA, N-MeFOSA, N-MeFOSEA, N-EtFOSEA, Perfluorinated carboxylic acids (6-14 C-atoms): PFBA, PFPA, PFHxA, PFHpA, PFOA, PFNA, PFDA, PFUnA, PFDoA, PFTrA, PFTA	
HBCDD	α-, β-, γ-HBCDD	
PBDE *	BDE-28, -47, -99, -100, -153, -154, -183, -196, -202, -206, -207 and -209	
Bisphenol A (BPA)		
Octyl-/nonylphenol		
Chloroparaffins	SCCP (C10-C13) and MCCP (C14-C17)	
Antifouling agents	Monobutyltin (MBT), dibutyltin (DBT), tributyltin (TBT) trifenyltinn (TPhT), irgarol, diuron, Zineb (i.e.. ETU as proxy for Zineb)	
ΣDDT	p,p'-DDT, p,p'-DDE, p,p'-DDD	Only eggs
Siloxanes	Octamethylcyclotetrasiloxane (D4), decamethylcyclopentasiloxane (D5), dodecamethylcyclohexasiloxane (D6)	
Phosphorus flame retardants (PFR)	tri-iso-butylphosphate (TIBP), tributylphosphate (TBP), tri(2-chloroethyl)phosphate (TCEP), tri(1-chloro-2-propyl)phosphate (TCPP), tri(1,3-dichloro-2-propyl)phosphate (TDCP), tri(2-butoxyethyl)phosphate (TBEP), triphenylphosphate (TPhP), 2-ethylhexyl-di-phenylphosphate (EHDPP), dibutylphenylphosphate (DBPhP), butyldiphenylphosphate (BdPhP), tris(2-ethylhexyl)phosphate (TEHP), tris-o-cresylphosphate (ToCrP), tricresylphosphate (TCrP)	
Tetrabromobisphenol A (TBBPA)		

* Additional congeners were analysed/quantified: BDE-49, -66, -71, -77, -85, -119 and -138).

Table 5.
Supportparameters included in the programme

Parameter	Specific single parameters	Comment
Stable isotopes	$\delta^{15}N$ and $\delta^{13}C$	In biological matrices
Eggshell thickness	Eggshell thickness	In egg
Lipid content (%) in biota		In biological matrices
Weight and length		Flounder
Assessment of stomach content		Flounder
Age		Flounder
Grain size distribution	Fraction <63 µm	Sediment
TOC		Sediment

Table 6.
Overview of additional parameters included in the programme. (See the Appendix for CAS-no.)

Locality	Matrix	Parameters	No. of samples
Food chain Inner Oslofjord	Zooplankton	BDE-126, TBPH/BEHTBP[1], EHTeBB/TBB[2]	3
Food chain Inner Oslofjord	Prawns	BDE-126, TBPH/BEHTBP[1], EHTeBB/TBB[2]	3
Food chain Inner Oslofjord	Polychaetes	BDE-126, TBPH/BEHTBP[1], EHTeBB/TBB[2]	3
Food chain Inner Oslofjord	Flounder	BDE-126, TBPH/BEHTBP[1], EHTeBB/TBB[2]	15
Food chain Inner Oslofjord	Herring gull (blood)	BDE-126, TBPH/BEHTBP[1], EHTeBB/TBB[2]	15
Food chain Inner Oslofjord	Herring gull (egg)	BDE-126, TBPH/BEHTBP[1], EHTeBB/TBB[2]	15
Inner Oslofjord	Storm water (dissolved fraction)	BDE-126, TBPH/BEHTBP[1], EHTeBB/TBB[2]	3
Inner Oslofjord	Storm water (particulate fraction)	BDE-126, TBPH/BEHTBP[1], EHTeBB/TBB[2]	3
Mouth of Alna River	Blue mussel	BDE-126, TBPH/BEHTBP[1], EHTeBB/TBB[2]	1
Mouth of Alna River	Sediment	BDE-126, TBPH/BEHTBP[1], EHTeBB/TBB[2]	3
Mouth of Alna River	Polychaetes	BDE-126, TBPH/BEHTBP[1], EHTeBB/TBB[2]	1
Bekkelaget STP	Blue mussel	BDE-126, TBPH/BEHTBP[1], EHTeBB/TBB[2]	1
Bekkelaget STP	Sediment	BDE-126, TBPH/BEHTBP[1], EHTeBB/TBB[2]	3
Bekkelaget STP	Polychaetes	BDE-126, TBPH/BEHTBP[1], EHTeBB/TBB[2]	1
Frognerkilen	Blue mussel	BDE-126, TBPH/BEHTBP[1], EHTeBB/TBB[2]	1
Frognerkilen	Sediment	BDE-126, TBPH/BEHTBP[1], EHTeBB/TBB[2]	3
Frognerkilen	Polychaetes	BDE-126, TBPH/BEHTBP[1], EHTeBB/TBB[2]	1

[1.] Bis(2-ethyl-1-hexyl)tetrabromophthalate (TBPH/BEHTBP) – Cas no 26040-51-7

[2.] 2-ethylhexyl-2,3,4,5-tetrabromobenzoate (EHTeBB/TBB) – Cas no 183658-27-7

2.2.1 Analysis of PCBs, PBDEs, HBCDD, DDT and S/MCCP

Polychlorinated biphenyls (PCBs), polybrominated diphenylethers (PBDEs), hexabromocyclododecane (HBCDD), DDT and short- and medium chained chloroparaffins (S/MCCP) were analysed by NILU.

Extraction

Prior to extraction, the samples were added a mixture of isotope labelled PCBs, PBDEs, HBCCD and DDT standards, for quantification purposes.

The water-, sediment-and biota-samples were extracted with organic solvents and concentrated under nitrogen flow, followed by a clean-up procedure using concentrated sulphuric acid and a silica column to remove lipids and other interferences prior to analysis.

Analysis

With the exception of HBCDD, all compounds were quantified on GC-HRMS (Waters Autospec), while an LC-ToF (Waters Premier) or LC-QToF (Agilent 6530/50) were utilised to quantify HBCDD.

Limits of Detection

The limits of detection (LoD) and quantification (LoQ) were calculated for each sample, using the accepted standard method; three times the signal/noise ratio (z/n) and 9 times z/n, respectively.

Quality assurance and accreditation

NILU's laboratories are accredited by Norwegian Accreditation for ISO/IEC 17025. NILU is accredited for the analysis of PCBs and DDT compounds. For the other compounds, the same quality assurance procedures (as for the accredited compounds) were applied.

2.2.2 Analysis of PFR

Phosphorus flame retardants (PFRs) were analysed by NILU.

Extraction

Prior to extraction, the samples were added a mixture of isotope labelled PFR standards, for quantification purposes.

The water-, sediment- and biota-samples were extracted with organic solvents and concentrated under nitrogen flow, followed by a clean-up procedure using a silica column to remove lipids and other interferences prior to analysis.

Analysis

PFR compounds were quantified on a LC-MS/MS (Thermo Finnigan TSQ Vantage).

Limits of Detection

The limits of detection (LoD) and quantification (LoQ) were calculated for each sample, using the accepted standard method; three times the signal/noise ratio (z/n) and 9 times z/n, respectively.

Quality assurance and accreditation
NILU's laboratories are accredited by Norwegian Accreditation for ISO/IEC 17025. NILU is not accredited for the analysis of PFRs, but the same quality assurance procedures (as for the accredited compounds) were applied for the analyses of these compounds.

2.2.3 Analysis of alkylphenols amd bisphenols
Alkylphenols and bisphenols (BPA and TBBPA) were analysed by NILU.

Extraction
Prior to extraction, the samples were added a mixture of isotope labelled phenols for quantification purposes.

The sediment- and biota-samples were extracted with organic solvents and concentrated under nitrogen flow, followed by a clean-up procedure using an SPE column to remove lipids and other interferences prior to analysis. Water samples were concentrated and purified on a SPE column. After elution from the SPE column, the water sample extracts were further concentrated under nitrogen.

Analysis
All samples were analysed by LC-QToF (Agilent 6550).

Limits of Detection
The limits of detection (LoD) and quantification (LoQ) were calculated for each sample, using the accepted standard method; three times the signal/noise ratio (z/n) and 9 times z/n, respectively.

Quality assurance and accreditation
NILU's laboratories are accredited by Norwegian Accreditation for ISO/IEC 17025. NILU is not accredited for the analysis of alkylphenols and bisphenols, but as far as possible, the documentation, sample preparation, analysis and calculation procedures were conducted according to the accredited methods.

2.2.4 Analysis of siloxanes
Siloxanes were analysed by NILU.

Extraction
Established methods based on liquid/liquid extraction (Warner et al. 2010; Warner et al. 2013) were used to extract and quantify siloxanes, in addition to headspace extraction techniques (Sparham et al. 2008) for analysing siloxanes in water and sediment samples.

Analysis

Analysis of siloxanes (D4, D5 and D6) was performed using gas chromatography with mass spectrometric detection (GC-MS).

NILU has extensive experience with analysis of siloxanes. The greatest risk in the analysis is background contamination, as these chemicals (D4, D5 and D6) are applied in e.g. skin care products. Using a state-of-the-art cleanroom, NILU may perform trace analysis of these compounds in matrices from pristine environments, such as the Arctic (Krogseth et al. 2013; Warner et al. 2013).

Limits of Detection

Limits of detection (Method detection limits, MDLs) and quantification (limits of quantification, LoQ) were used to evaluate the detection of analytes. The method used to calculate the MDL has been previously reported (Warner et al. 2013). LoQ was calculated as nine times the signal/noise ratio of the GC-MS instrument.

Quality assurance and accreditation

NILU's laboratories are accredited by Norwegian Accreditation for ISO/IEC 17025. NILU is not accredited for the analysis of siloxanes. However, to the extent possible, documentation, preparation, analysis and calculations were performed in accordance with accredited methods. NILU has previously participated in a laboratory intercalibration of siloxanes (McGoldrick et al. 2011) and has also worked closely with the industry.

Samples were analysed in groups with at least one additive standard sample and a blank control. The data from these were used to calculate the uncertainty for each sample group. To ensure repeatability, a random sample from each matrix was selected for duplicate analysis.

Field blanks were prepared for the collection of samples for siloxane analyses by packing 2 or 3 grams of XAD resin in filter bags of polypropylene/cellulose, which were thereafter cleaned by ultrasonic treatment in hexane for 30 min. Subsequently, used hexane was removed and substituted with clean hexane and the field blanks were sonicated once more for 30 min. After ultrasonic treatment, the field blanks were dried in a clean cabinet equipped with HEPA- and charcoal filter to prevent contamination from indoor air. After drying, the field blanks were put in sealed polypropylene containers and sent for sampling purposes. Several field-blanks were stored at NILU's laboratories and analysed to determine reference concentrations before sampling. The field blanks sent for sampling purposes were exposed and handled in the field during sampling and during preparation of samples. The results from the analysis of the field blanks are presented in Table 7. Reference blanks are the same as field blanks (XAD resin in filter bags of polypropylene/cellulose), but stored in cabinet at NILU-lab (not exposed in field or during preparation of samples).

Table 7.
Results of the analysis of siloxanes in (field and reference) blanks, consisting of XAD resin in filter bags of polypropylene/cellulose.

Description of sampling/purpose	D4 (ng/g)	D5 (ng/g)	D6 (ng/g)
Reference blank 1	94.99	7.85	3.66
Reference blank 2	110.09	9.04	3.91
Reference blank 3	89.58	8.12	3.74
Reference blank 4	158.46	9.75	3.88
Mean (reference blanks)	**113.28**	**8.69**	**3.80**
Standard deviation (reference blanks)	**31.34**	**0.87**	**0.12**
Field blank 1 (polychaetes)	26.48	5.85	3.08
Field blank 2 (polychaetes) *	356.54	100.28	53.32
Field blank 3 (krill)	25.61	6.19	3.20
Field blank 4 (mussels)	26.80	9.32	2.86
Field blank 5	26.62	6.12	3.11

* Low extraction recovery (< 10%) affecting results. Measured area was not significantly different from other field blanks for all cVMS indicating no field contamination has occurred

2.2.5 Analysis of PFAS

Per- and polyfluorinated substances (PFAS) were analysed by NIVA

Extraction

Biota: Biota samples were homogenized and 2 g aliquots taken. Internal standards were added and the samples were shaken and sonicated for 1 hour with MeCN (4 mL) and then centrifuged for 5 min at 3500 rpm. The solvent was decanted off and the procedure was repeated and the two extracts were combined. One ml of the extract was diluted with 0.5 mL 2.6 mM ammonium acetate (aq) and 75 uL acetic acid (cons.) before active coal was added. After mixing, the sample was finally centrifuged with a 0.2 um nylon Spin-X filter (Costar).

Water: Internal standards were added to the water sample (1 L) before extraction using a HLB solid phase extraction cartridge (Waters). The analytes were eluted of the HLB with MeOH. The MeOH extract was evaporated under nitrogen and resolved in 60+40 MeCN and 2.6 mM ammonium acetate (aq).

Particulate fraction: Particles were filtered from 1 L of water with a polyethylene frit (Supelco). The frit was sonicated in MeCN for 30 min. The MeCN extract was reduced under nitrogen and diluted (1+1) with 2.6 mM ammonium acetate (aq).

Analysis

UPLC-HighRes MS analysis: PFAS analytes were separated on a Acquity BEH C8 column (100 x 2 mm x 1.7 µm) with water (2.6 mM ammonium acetate) and MeCN mobile phases using a gradient elution programme over a period of 8 minutes with a flow rate of 0.5 ml/min. The MS parameters are shown in Table 8.

Limits of Detection

The limits of detection (LoD) and quantification (LoQ) were calculated for each sample, using the accepted standard method; three times the signal/noise ratio (z/n) and 9 times z/n, respectively.

Quality assurance and accreditation

NIVA's laboratory is accredited by Norwegian Accreditation for ISO/IEC 17025. NIVA is not accredited for these particular compounds, but to the extent possible, documentation, preparation, analysis and calculations are performed in accordance with accredited methods. NIVA has previously participated in intercalibrations, e.g. in 2013 organized by UNEP-coordinated Global Inter Laboratory Assessment 2012/2013 and the Ontario Ministry of the environment/AMPA (NCP) which included analysis of various biological matrices and sediment samples.

Samples were analysed in groups with at least one additive standard sample and a blank control. To ensure repeatability, a random sample from each matrix was selected for duplicate analysis.

Table 8.
Analytes, acronyms, formula and quantifier ions for the High resolution MS detection of PFAS.

PFAS	Acronyme	Molecular formula	Quantifier ion	
perfluoro-n-butanoic acid	PFBA	$C_4HF_7O_2$	168.985	[M-CO2]-
perfluoro-n-pentanoic acid	PFPA	$C_5HF_9O_2$	218.980	[M-CO2]-
perfluoro-n-hexanoic acid	PFHxA	$C_6HF_{11}O_2$	268.977	[M-CO2]-
perfluoro-n-heptanoic acid	PFHpA	$C_7HF_{13}O_2$	318.974	[M-CO2]-
perfluoro-n-octanoic acid	PFOA	$C_8HF_{15}O_2$	368.973	[M-CO2]-
perfluoro-n-nonanoic acid	PFNA	$C_9HF_{17}O_2$	418.969	[M-CO2]-
perfluoro-n-decanoic acid	PFDA	$C_{10}HF_{19}O_2$	468.967	[M-CO2]-
perfluoro-n-undecanoic acid	PFUnDA	$C_{11}HF_{21}O_2$	518.966	[M-CO2]-
perfluoro-n-dodecanoic acid	PFDoDA	$C_{12}HF_{23}O_2$	568.964	[M-CO2]-
perfluoro-n-tridecanoic acid	PFTrDA	$C_{13}HF_{25}O_2$	618.960	[M-CO2]-
perfluoro-n-tetradecanoic acid	PFTeDA	$C_{14}HF_{27}O_2$	712.940	[M-H]-
perfluoro-1-butanesulfonate	PFBS	$C_4F_9SO_3$	298.937	[M-H]-
perfluoro-1-hexanesulfonate	PFHxS	$C_6F_{13}SO_3$	398.933	[M-H]-
perfluoro-1-octanesulfonate	PFOS	$C_8F_{17}SO_3$	498.931	[M-H]-
perfluoro-1-decanesulfonate	PFDS	$C_{10}F_{21}SO_3$	598.925	[M-H]-
perfluoro-1-dodecansulfonate	PFDoDS	$C_{12}F_{25}SO_3$	698.920	[M-H]-
perfluoro-7-methyloctanesulfonate	ipPFNS	$C_9F_{19}SO_3$	548.928	[M-H]-
perfluoro-1-octanesulfonamide	PFOSA	$C_8H_2F_{17}NO_2S$	497.945	[M-H]-
N-methylperfluoro-1-octanesulfonamide	N-MeFOSA	$C_9H_4F_{17}NO_2S$	511.960	[M-H]-
N-ethylperfluoro-1-octanesulfonamide	N-EtFOSA	$C_{10}H_6F_{17}NO_2S$	525.969	[M-H]-
2-(N-methylperfluoro-1-octanesulfonamido)-ethanol	N-MeFOSE	$C_{11}H_8F_{17}NO_3S$	616.010	[M+CH3COO]-
2-(N-ethylperfluoro-1-octanesulfonamido)-ethanol	N-EtFOSE	$C_{12}H_{10}F_{17}NO_3S$	630.010	[M+CH3COO]-
1H,2H-perfluorooctane sulfonate (6:2)	6:2FTS	$C_8H_4F_{13}SO_3$	426.963	[M-H]-

2.2.6 Analysis of biocides

Diuron, irgarol and tinorganic compounds were analysed by Eurofins. Ethylene thiourea (ETU; hydrolysis product of Zineb) was analysed by NIVA.

Analysis of tinorganic compounds

Analyses of tinorganic compounds were done according to accredited methods. Samples were extracted followed by derivatisation with sodiumtetraethylborate. Internal standards were added prior to the extraction. After clean-up of the hexane phase a recovery standard was added and analysis was done by means of GC-AED.

Analysis of diuron and irgarol

The samples were extracted with organic solvent, before evaporation and reconstituted in methanol/water. Analysis was done by means of LC-MS/MS.

Analysis of Zineb

Zineb is biocide used in Norway in antifouling paints, however there is currently very little monitoring data for Zineb in the environment. In water, Zineb is rapidly (<96h) transformed to the metabolite ethylene thiourea (ETU; Thomas et al. 2002; Figure 2).

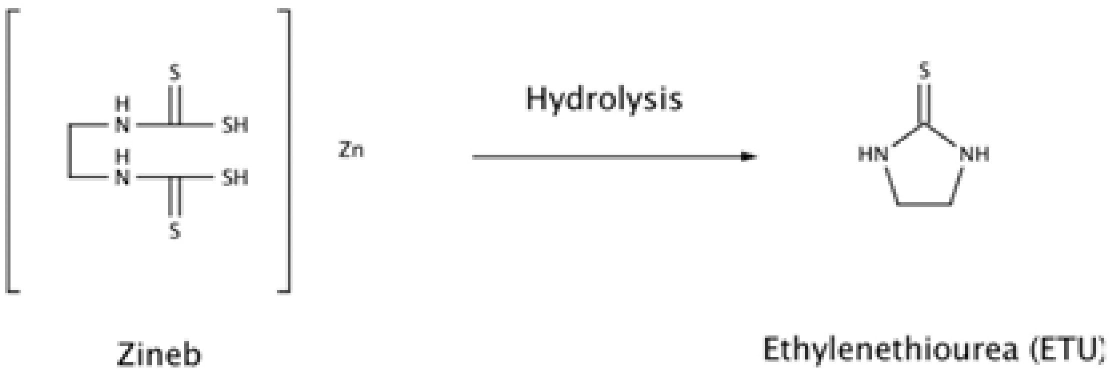


Figure 2. Hydrolysis of Zineb to Ethylene thiourea (ETU).

For this reason, published methods were used to analyze ethylene thiourea (ETU) as a substitute for Zineb in samples of mussels, polychaetes and sediment from Frognerkilen (USEPA Method 509). The analysis was carried out with GC-MS after extraction with dichloromethane and d_4-ETU as quantification standard (Langford et al. 2012).

Limits of Detection

The limits of detection (LoD) and quantification (LoQ) were calculated for each sample, using the accepted standard method; three times the signal/noise ratio (z/n) and 9 times z/n, respectively.

Quality assurance and accreditation
NIVA's laboratory is accredited by Norwegian Accreditation for ISO/IEC 17025 and NIVA used the same quality assurance routines for ETU as for accredited methods/compounds.

Samples were analysed in groups with at least one additive standard sample and a blank control. To ensure repeatability, a random sample from each matrix was selected for duplicate analysis.

2.2.7 Analysis of metals

Metal analyses were performed by NILU.

Sample Preparation
Sediment- and biota-samples were added supra pure acid and digested at high pressure and temperature in a microwave- based digestion unit (UltraClave). A minimum of two blanks were included with each digestion. Furthermore, reference material (traceable to NIST) was digested with the samples.

Water samples were preserved in original bottles with 1% (v/v) nitric acid.

Instrumental Analysis
The metals were determined using inductively coupled plasma mass spectrometer (ICP-MS). All samples, standards and blanks were added internal standard prior to analysis.

Limits of Detection
Detection limits (LoD) and Quantification limits (LoQ) were calculated from 3 times and 10 times the standard deviation of blanks, respectively.

2.2.8 Support parameters

Stable isotopes of nitrogen and carbon were analysed by IFE by combustion in an element analyser, reduction of NOx in Cu-oven, separation of N_2 and CO_2 on a GC-column and determination of $\delta^{13}C$ and $\delta^{15}N$ at IRMS (Isotope Ratio Mass Spectrometer).

Trophic level was calculated as follows (assuming a 3.8 increase per full trophic level; Hobson and Welch, 1992; and that blue mussel inhabit trophic level 2, filtrating algal particles on trophic level 1):

$$TL_{consumer} = 2 + (\delta^{15}N_{consumer} - \delta^{15}N_{blue\ mussel})/3.8$$

Captive-rearing studies on piscivorous birds indicate that the $\delta^{15}N$ isotopic fractionation factor between bird diet and tissue is less than that derived for the other trophic steps, most likely linked to the fact that birds produce uric acid (Mizutani et al. 1991). According to Mizutani et al (1991) an isotopic fractionation factor of +2.4 ‰ is appropriate. Thus, the following equation was used to calculate the trophic level of herring gulls:

$$TL_{herring\ gull} = 3 + (\delta^{15}N_{herring\ gull} - (\delta^{15}N_{blue\ mussel} + 2.4))/3.8$$

Eggshell thickness (herring gull eggs) was determined according to procedures described by Nygård (1983).

Lipid content in biological samples was determined gravimetrically during extraction for chemical analyses.

Weight and length of the fish (flounder) were determined before dissection. Assessment of gastric contents was done by recording the number of sufficiently undigested individuals of prey species to an appropriate taxonomic level.

The age of the flounder was read from otoliths. The age was read by counting the number of opaque zones (summer zones) and hyaline zones (winter zones).

Grain size distribution (fraction of particles <63 µm) in sediment was determined according to procedures described by Krumbein and Petttijohn (1938).

Total organic carbon content (TOC) in sediment was determined by catalytic combustion in an element analyser.

3. Results and Discussion

The results of the chemical analyses (and lipid content of biological samples) are given in the Appendix, where also analyses falling below LoD are indicated together with the values of the LoDs.

When results are below LoD (especially when this occurs in many samples), the value of the information is reduced, and there are challenges regarding presentations and statistical evaluation. For the purpose of calculating mean concentrations, we have assigned these samples/parameters a value of zero (it is noted below when this occurs). In regression models, we have omitted samples with non-detects from processing ("case-wise deletion").

3.1 Stable isotopes

The results of the stable isotope analysis are given in the Appendix.

Stable isotopes of carbon and nitrogen are useful indicators of food origin and trophic levels. $\delta^{13}C$ gives an indication of carbon source in the diet or a food web. For instance, it is in principle possible to detect differences in the importance of autochthonous (native marine) and allochthonous (watershed/origin on land) carbon sources in the food web, since the $\delta^{13}C$ signature of the land-based energy sources is lower (greater negative number). Also $\delta^{15}N$ (although to a lesser extent than $\delta^{13}C$) may be lower in allochthonous as compared to autochthonous organic matter (Helland et al. 2002), but more important, it increases in organisms with higher trophic level because of a greater retention of the heavier isotope (^{15}N). The relative increase of ^{15}N over ^{14}N ($\delta^{15}N$) is 3-5‰ per trophic level (Layman et al. 2012; Post 2002), and provides a continuous descriptor of trophic position. It is also the basis for Trophic Magnification Factors (TMFs) that give the factor of increase in concentrations of contaminants, and have recently been amended to Annex XIII of the European Community Regulation on chemicals and their safe use (REACH) for possible use in weight of evidence assessments of the bioaccumulative potential of chemicals as contaminants of concern.

In the present report, the stable isotope data have been reviewed partly to indicate any possibilities that there are different energy sources (food chain baselines) at the different localities in the inner Oslofjord that one should be aware of (assessed in polychaetes and blue mussel). Secondly, as organisms (here flounder and herring gull) grow, they may feed on larger prey organisms, thus an increase in trophic level is likely to occur. For compounds with bioaccumulative potential, a consequence may be higher tissue concentrations. Thirdly, trophic level is calculated from $\delta^{15}N$ for the organisms to assess possible biomagnification of the compounds/contaminants in question.

There were no large differences in $\delta^{13}C$ or $\delta^{15}N$ between mussels from the different localities in the inner Oslofjord (Figure 3), indicating a common or similar food chain baseline. The isotopic signatures among polychaetes from the different localities were also similar, except a lower $\delta^{15}N$ in the sample from Alna, compared to the other samples. As mentioned, an increase in $\delta^{15}N$ of 3 to 5 ‰ represents a step of one full trophic level. The variability in $\delta^{15}N$

signature in flounder spans a maximum of approximately one trophic level. Prawns had a relatively high $\delta^{15}N$ isotope ratio, possibly related to their scavenging behaviour.

There were no demonstrable relationships between $\delta^{13}C$ or $\delta^{15}N$ and the age, weight or length of flounder (not shown). Nor were there any demonstrable relationships between $\delta^{13}C$ or $\delta^{15}N$ and the body mass or wing length of herring gull (not shown).

When herring gull matrices (blood and eggs) are evaluated separately (Figure 3), it can be seen that the matrices show similar $\delta^{15}N$, with the exception of a few blood samples that showed higher $\delta^{15}N$. Herring gull would therefore be placed on approximately the same average trophic level regardless of matrix. However, the range for herring gull blood spans >1 trophic level and the $\delta^{13}C$ is higher in blood than eggs.

Herring gull displayed low $\delta^{15}N$ and thus inhabit a low trophic position in the sampled food web. Furthermore Herring gull also displayed low $\delta^{13}C$ compared to the other species, indicating important food items not related to the selected food web. Herring gull is therefore omitted from the food web in terms of evaluations of biomagnification (except in specific comparative exercises). However, since the individual herring gulls (or eggs) display a range of $\delta^{15}N$ values, implicating different feeding behaviour placing individuals in different trophic positions, the bioaccumulative properties of the contaminants in question is also evaluated by analysing relationships between trophic level and contaminant concentrations in herring gull (in isolation). Similar analyses are performed for flounder. It should be noted that the trophic association of flounder (from Lysakerfjorden) to the invertebrates of the sampled food web is also questionable, given the low isotopic signature, relative to the invertebrates of the sampled food web.

The relative isotopic signatures among the species of the sampled food web (and between herring gull eggs and blood) are very similar to the results of the previous sampling campaign in the programme (Ruus et al. 2014), suggesting that the trophic/ecological interactions (or lack of such) persist, and were not a random result of sampling within a short time frame. Furthermore, the results corroborate the previous conclusion that the species collected do not constitute a representative food web, hence species analysed may not represent important predator-prey relationships, and that indications of biomagnification (or lack of such) using the trophic magnification approach are not conclusive. Therefore, regression slopes are not reported in the following. After the initial "pilot" campaigns (2013 and 2014) of the "Urban fjord"-programme, an effort should be made to sample a more representative food web (e.g. more species, including a fish with fairy known dietary preferences that correspond with collected prey species). There is also a need for a more balanced design, in terms of the number of individual samples from each species in the food web.

It should also be noted that samples were not treated to remove carbonates or lipid before stable isotope analysis. The C:N ratio was measured (Tables 57-60) and a C:N ratio of >3.5 implies the presence of lipids, which may somewhat confound $\delta^{13}C$ interpretation, since lipids are ^{13}C -depleted relative to proteins (Sweeting et al. 2006).

Cod is sampled annually in the Inner Oslofjord through the "Contaminants in coastal areas" (MILKYS) monitoring programme (Green et al. 2014). In this programme, samples of cod are analysed for various contaminants, as well as $\delta^{13}C$ and $\delta^{15}N$. Figure 3 shows that if cod (from MILKYS, sampled 2013) is included in the food web with the species of the present study

(2014), this species stand out as an apex predator (high ^{15}N) with similar $\delta^{13}C$ signature as flounder. In the following, cod from MILKYS (sampled 2013) is included in the food web for specific comparative exercises.

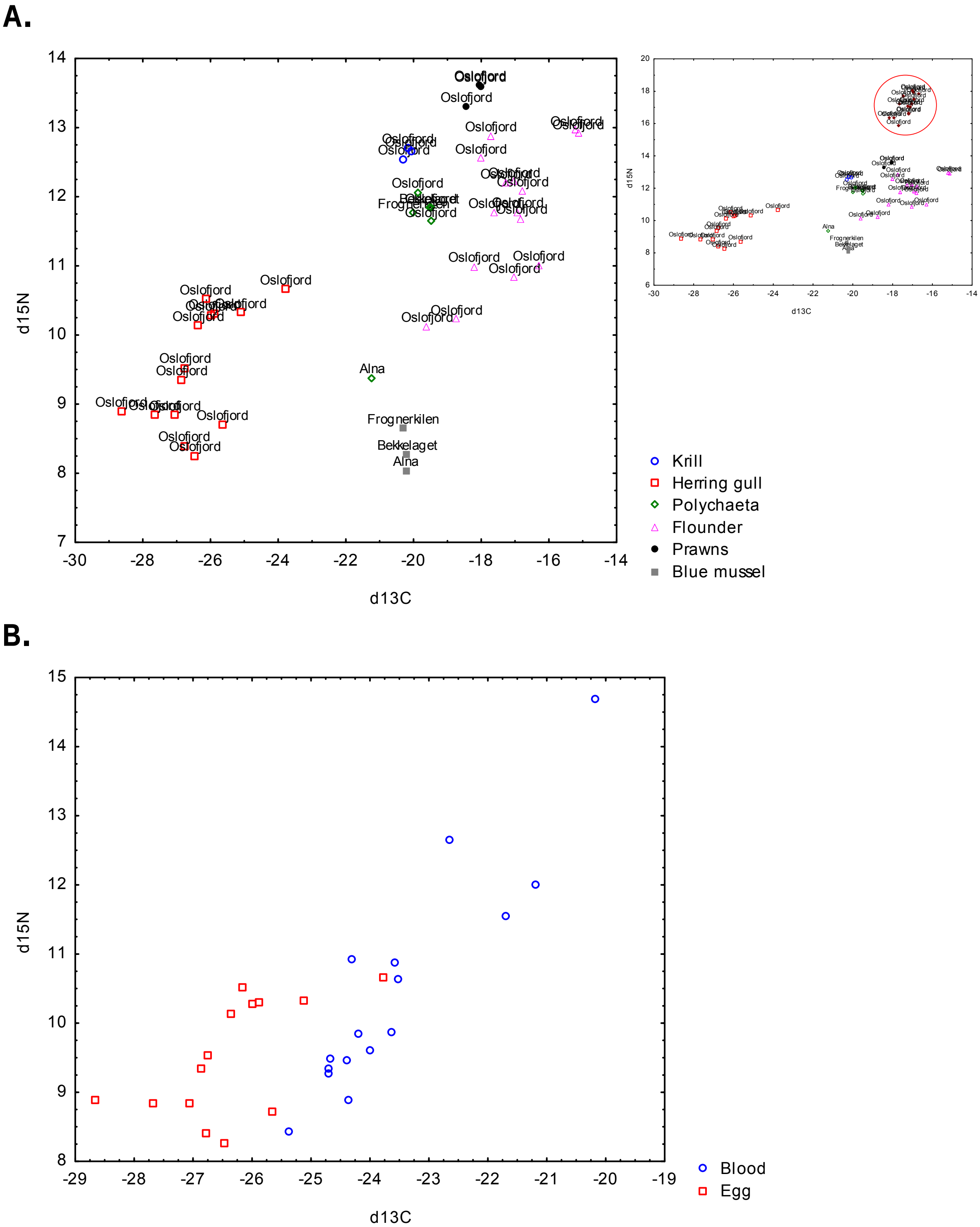


Figure 3. $\delta^{13}C$ plotted against $\delta^{15}N$ in organisms from the inner Oslofjord. (Herring gull = eggs; A.; Upper right figure shows how cod from the MILKYS-programme, sampled 2013 [noted with red circle] align with the samples of the present study), and $\delta^{13}C$ plotted against $\delta^{15}N$ in herring gull blood and eggs (B.).

3.2 Polychlorinated biphenyls (PCBs)

The results of the analyses of polychlorinated biphenyls (PCBs) are given in the Appendix.

Relation to quality standards

According to the Norwegian guidelines on classification of environmental quality in fjords and coastal waters – a revision of the classification of waters and sediments with respect to metals and organic contaminants (Bakke et al. 2007; Bakke et al. 2010), concentrations of ΣPCB_7 in sediments corresponded to “moderate condition” (Class III) at the mouth of Alna River and in Frognerkilen (all three replicates, both places), and “good” condition (Class II) at Bekkelaget (all three replicates).

According to the Norwegian classification of environmental quality in fjords and coastal waters (Molvær et al. 1997), concentrations of ΣPCB_7 in blue mussel corresponded to ”insignificantly polluted” (Class I) at the mouth of Alna River and borderline “insignificantly polluted”/“moderately polluted” (Class I to II) in Frognerkilen and at Bekkelaget).

There are yet no relevant quality standards for PCBs in water.

Diffuse inputs

Concentrations of PCBs determined in storm water are depicted in Figure 4. The compounds were detected in both the dissolved fraction and in the particulate fraction, as expected with higher concentrations in the particulate fraction. Given the hydrophobic properties of these compounds, they have a high affinity for the particulate phase and are usually associated with particles. There was a high variability in PCB-concentrations among the 4 samples/sites because of one sample/site with particularly higher concentrations than the other three (up to an order of magnitude for some compounds). In general, concentrations were lower than measured in 2013. However, no statistics were performed and there is no temporal resolution in the data; single sampling events both in 2013 and 2014).

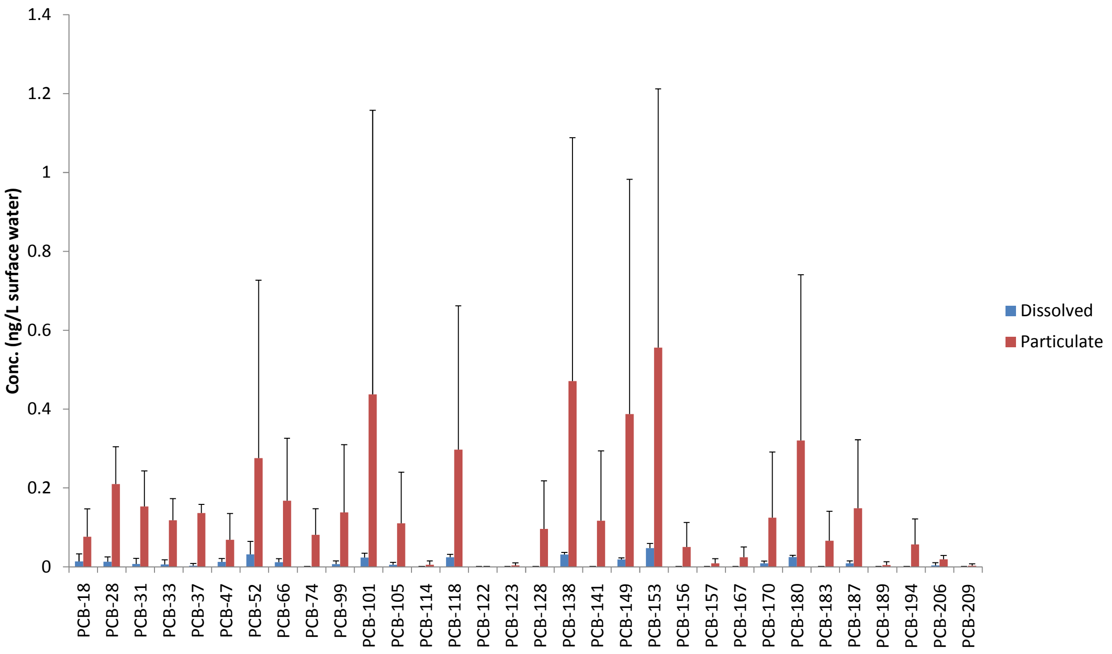


Figure 4. Concentrations of PCBs (ng/L of water) in storm water/surface water (mean and standard deviation; n=4).

Bekkelaget STP has reported that 0.189 kg of PCB ran into the plant, and 0.193 kg ran out of the plant in 2013. (BEVAS, 2014).

Contribution of particle-bound PCB inputs from Alna River in 2013 and 2014 is available through the programme "Riverine inputs and direct discharges to Norwegian coastal waters" (RID; Skarbøvik et al. 2014). Particle-bound and dissolved PCB concentrations and flux estimates from RID are also provided here (Tables 9-12).

Table 9.
Mean particulate-bound PCB concentrations (ng/g) measured in suspended particulate matter samples collected by continuous-flow centrifugation for 2013 and 2014.

	PCB-28 (ng/g)	PCB-52 (ng/g)	PCB-101 (ng/g)	PCB-118 (ng/g)	PCB-153 (ng/g)	PCB-138 (ng/g)	PCB-180 (ng/g)	ΣPCB_7 (ng/g)
Mean for 2013	2.2	2.8	2.9	1.7	4.3	4.1	2.8	21
%RSD	78	34	47	66	54	65	50	47
Mean for 2014	3.1*	4.3**	4.4	3.3	6.6	6.8	4.0	32
%RSD	-	-	44	30	30	45	24	-

*only one value above LoD (mean concentration calculated using LoDs when data were below LoD)
**two values below LoD (mean concentration calculated using LoDs when data were below LoD)

Table 10.
Mean dissolved PCB congener concentrations (ng/L) measured in the Alna River (outlet) in 2013 using silicone rubber

	PCB-28	PCB-52	PCB-101	PCB-118	PCB-153	PCB-138	PCB-180
Dissolved PCB-conc. ($C_{w,PCB}$)	0.015	0.008	0.005	0.003	0.003	0.004	< 0.001

Table 11.
Flux estimates for particle-bound PCBs (g/year) for 2013

	PCB-28	PCB-52	PCB-101	PCB-118	PCB-153	PCB-138	PCB-180	ΣPCB_7
Suspended total solids (STS)-based	0.74	1.14	0.92	0.52	1.33	1.24	0.92	6.80

Table 12.
Flux estimates for dissolved phase PCBs (g/year) for 2013

	PCB-28	PCB-52	PCB-101	PCB-118	PCB-153	PCB-138	PCB-180	ΣPCB_7
Passive sampling-based	0.614	0.338	0.200	0.105	0.126	0.146	0.041	1.57

Geographical aspects

There were apparent differences in concentrations (statistical evaluation not applicable due to limited number of samples) of PCBs in polychaetes and mussels from Frognerkilen, the mouth of Alna River and Bekkelaget (Figure 5). Similar to the results from 2013, concentrations in polychaetes were highest in Frognerkilen and lowest at Bekkelaget. Concentrations in blue mussel were generally lowest at the mouth of Alna River (as opposed to in 2013), despite an apparent increase in particle associated PCBs from the Alna River from 2013 to 2014 (Table 9). This indicates variable exposure of PCBs in surface water.

The lowest PCB concentrations in polychaetes from Bekkelaget likely reflect that the sediments at this location also contain the lowest mean PCB concentrations (Figure 6; no statistics performed). Likewise, the highest concentrations in polychaetes from Frognerkilen may reflect that the sediments at this location also contain the highest mean PCB concentrations in 2014 (Figure 6). The finding that PCB-concentrations were apparently highest in Frognerkilen and lowest at Bekkelaget is in accordance with the results from the previous year (2013).

It should be noted that the polychaete samples from the different locations consisted of different amounts of the various polychaete species (Table 2).

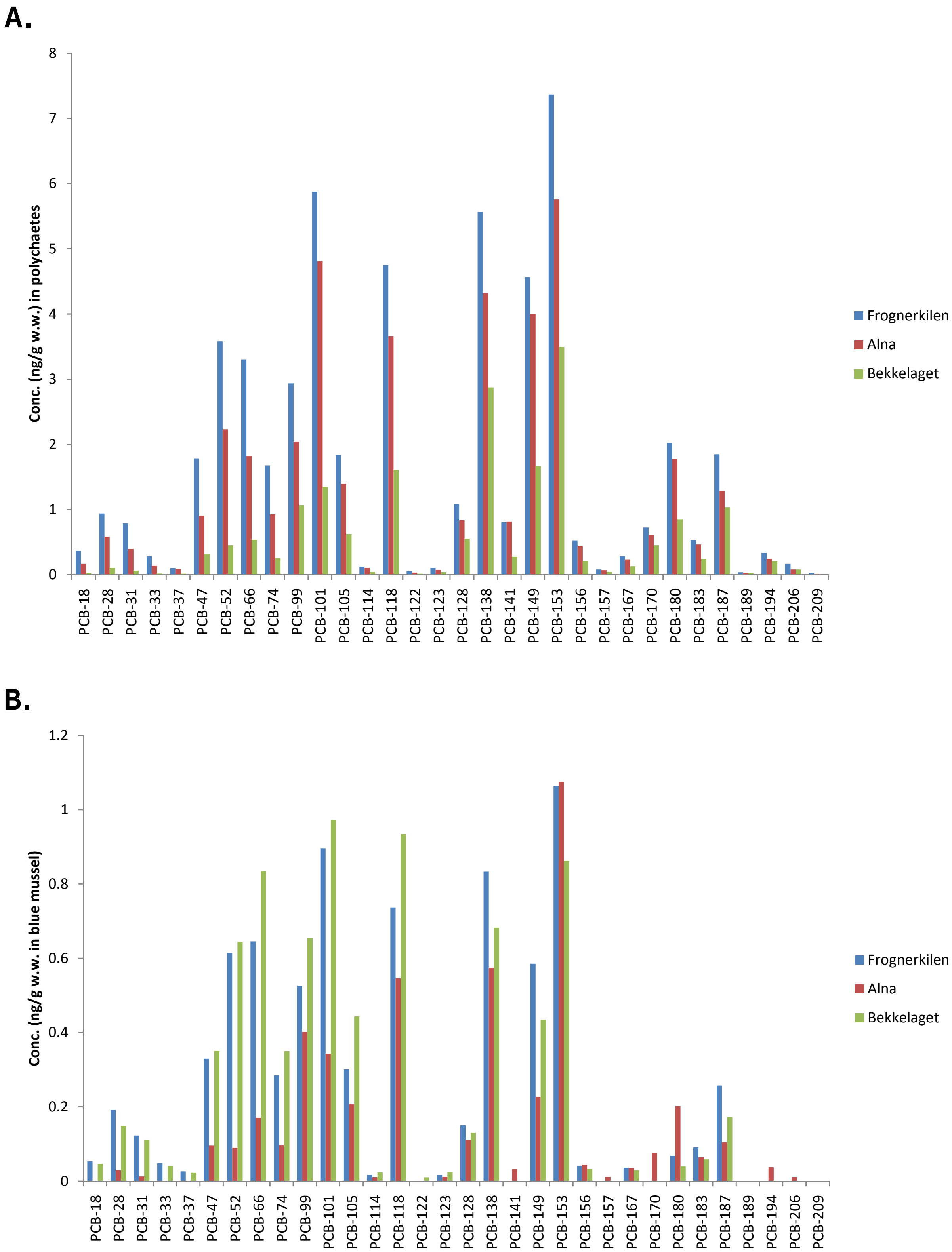


Figure 5. Concentrations of PCBs (ng/g wet wt.) in polychaetes (A.) and blue mussel (B.) from Frognerkilen, the mouth of Alna River and at Bekkelaget. One composite sample per station.

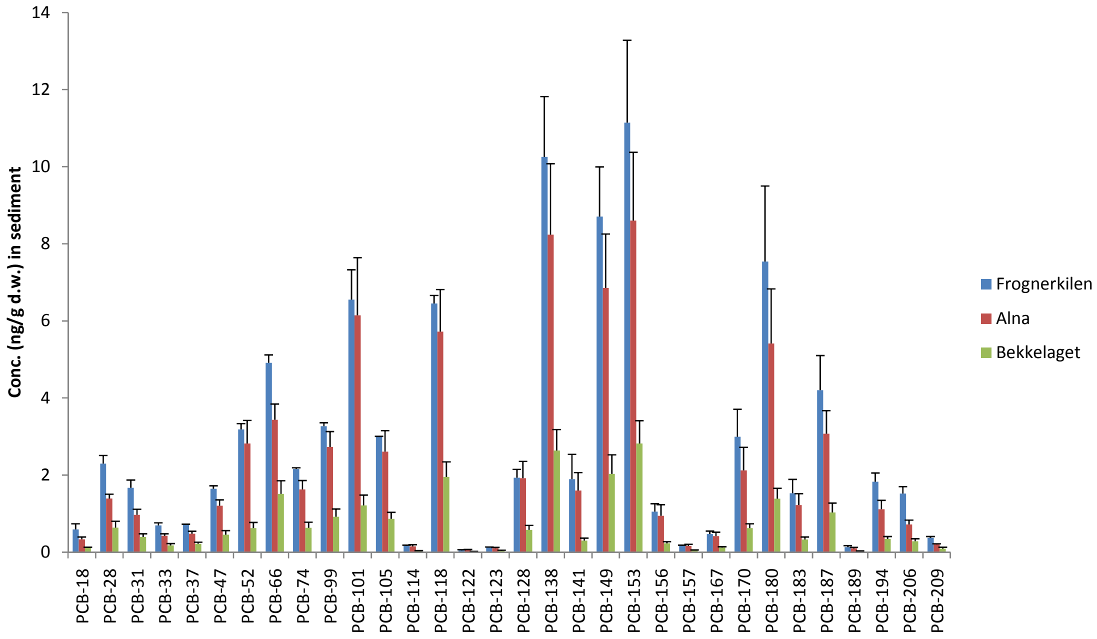


Figure 6. Concentrations of PCBs (ng/g dry wt.) in sediments from Frognerkilen, the mouth of Alna River and at Bekkelaget (mean and standard deviation; n=3).

Herring gull

PCBs were detected in eggs and blood of herring gull (Figure 7). The mean concentrations were apparently highest in eggs, as opposed to in 2013 when concentrations apparently were highest in blood (no statistics performed) however, the variability was high. Furthermore, several congeners were not detected.

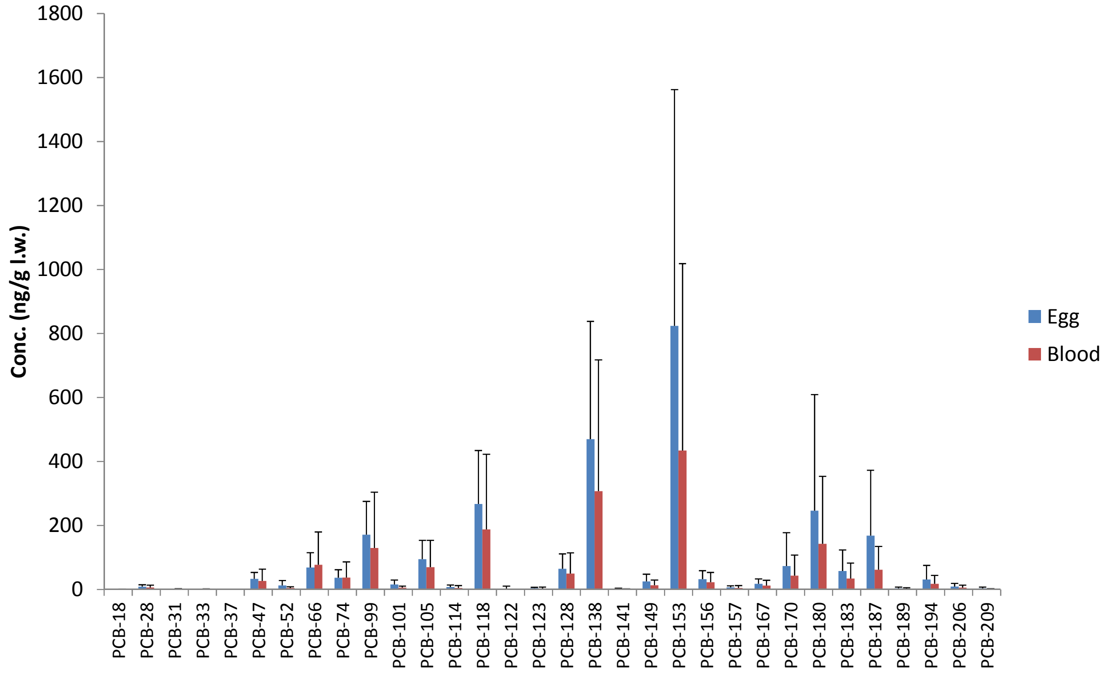


Figure 7. Concentrations of PCBs (ng/g lipid wt.) in herring gull (eggs and blood) from the Inner Oslofjord (mean and standard deviation; n=14 and 16, respectively; non-detects are assigned values of zero).

Food chain of the Inner Oslofjord

Evaluations of the concentrations of PCBs in the Inner Oslofjord food web were performed on a lipid weight basis.

PCBs are known to bioaccumulate and biomagnify through food chains (e.g. Ruus et al. 1999; 2002; Hallanger et al. 2011). As a result of these characteristics, PCBs are often used to "benchmark" biomagnifying properties, when such is evaluated for other contaminants in the same ecosystem (e.g. Borgå et al. 2012).

Several positive linear relationships (however, mostly with poor goodness-of-fit; R^2) were found between trophic position and (log) PCB-concentrations (PCB-18, -31, -52, -101, -149, -189 and -209; R^2=0.39, 0.15, 0.13, 0.17, 0.16, 0.20 and 0.13 respectively; p=0.0005, 0.02, 0.009, 0.01, 0.01 and 0.03 respectively; not shown), despite the low trophic position of the Herring gull (eggs). Relatively low lipid normalized PCB-concentrations in the egg samples (relative to the other species), contribute to these results. Furthermore, this is contradictory to the findings of the "Urban fjord"-campaign of 2013 (Ruus et al. 2014). As mentioned, the results of the stable isotope analysis corroborate the conclusion that (Ruus et al. 2014) the species collected do not constitute a representative food web (species analysed may not represent important predator-prey relationships), and that indications of biomagnification (or lack of such) using the trophic magnification approach are not conclusive (therefore regression slopes are not reported). When Herring gull was omitted from the analysis, several negative relationships could be observed (PCB-28, -31, -52, -101, -141 and -206; R^2=0.25, 0.29, 0.28, 0.31, 0.35, 0.20 respectively; p=0.01, 0.006, 0.007, 0.004, 0.002 and 0.03 respectively; not shown). When herring gull was represented by blood samples there were also several positive relationships observed between trophic position and (log) PCB-concentrations (PCB-99,-114, -128, -138, -149, -153, -156, -157, -167, -170, -180, -183, -187, -189 and -194; R^2=0.11, 0.11, 0.21, 0.15, 0.10, 0.16, 0.11, 0.15, 0.33, 0.11, 0.10, 0.13, 0.15, 0.27 and 0.10 respectively; p=0.03, 0.03, 0.003, 0.01, 0.04, 0.009, 0.04, 0.01, 0.02, 0.03. 0.04, 0.02, 0.01, 0.002 and 0.048; not shown). These regressions were likely highly influenced by the strong intra-species relationships between PCB-concentrations and trophic position for herring gull (see below). As mentioned, the range in $\delta^{15}N$ for herring gull blood among individuals corresponded to >1 trophic level.

PCBs have also been analysed in cod liver annually since 1990, through the "Contaminants in coastal areas" (MILKYS) monitoring programme (Green et al. 2014). In 2013, PCB-28, -52, -101, -118, -138, -153 and -180 were analysed in cod liver from the Inner Oslofjord. In addition, stable isotopes of carbon and nitrogen were analysed. If these cod samples are included in the food web and herring gull is excluded, significant biomagnification can be demonstrated for PCB-118, -138, -153 and -180 (R^2=0.13, 0.40, 0.43 and 0.36 respectively; p=0.02, 0.00002, 0.00001 and 0.00006 respectively), while a negative relationship could be observed for PCB-28 (R^2=0.28; p=0.0005). Figure 8 depicts the relationships for PCB-138 and -153.

Looking at flounder, isolated, (log) concentrations showed a significant positive linear relationship with trophic position for PCB-128, -206 and -209 (R^2=0.26, 0.47 and 0.28 respectively; p=0.049, 0.004, and 0.04 respectively). No positive relationships could be observed between PCB-concentrations and age, length or weight.

For herring gull in isolation, (log) concentrations in eggs showed no significant relationships with trophic position. In blood, however, with a span among individual birds in $\delta^{15}N$ ranging over >1 trophic level, a significant positive linear relationship between (log) concentrations and trophic position could be observed for most congeners ($p<0.05$). Figure 9 depicts this relationship for PCB-138 and -153. The concentrations of PCBs (in blood) did not show any significant relationships with wing length, but significant positive relationships with body mass for most congeners ($p<0.05$; not shown), much because of three large birds with higher PCB-concentrations than the other birds.

Cod from the Inner Oslofjord

PCBs have been analysed in cod liver annually since 1990, through the "Contaminants in coastal areas" (MILKYS) monitoring programme (Green et al. 2014). In 2013, these compounds were analysed in cod liver from 13 stations (including the Inner Oslofjord). The concentration of ΣPCB_7 in cod liver from the Inner Oslofjord was 3130 µg/kg wet wt. It was noted that historical data on entry of PCBs to the Inner Oslofjord is not available. Present entry of PCB to the fjord has however been calculated to be around 3.3 kg/year (Berge et al. 2013). Run-off from urban surfaces is the most important contributor (2.1 kg/year). It is also anticipated that sediments in the fjord store much of the historic inputs of PCB to the fjord. Parts of the Inner Oslofjord are densely populated and have a lot of urban activity. The high concentrations of PCB observed in cod liver are probably related to these activities, as well as reduced water exchange with the Outer fjord.

The median concentration of ΣPCB_7 measured in flounder from the Inner Oslofjord in 2014 (present study) were apparently lower (a factor of ~7) than the median concentration measured in cod (2013) (no statistics performed).

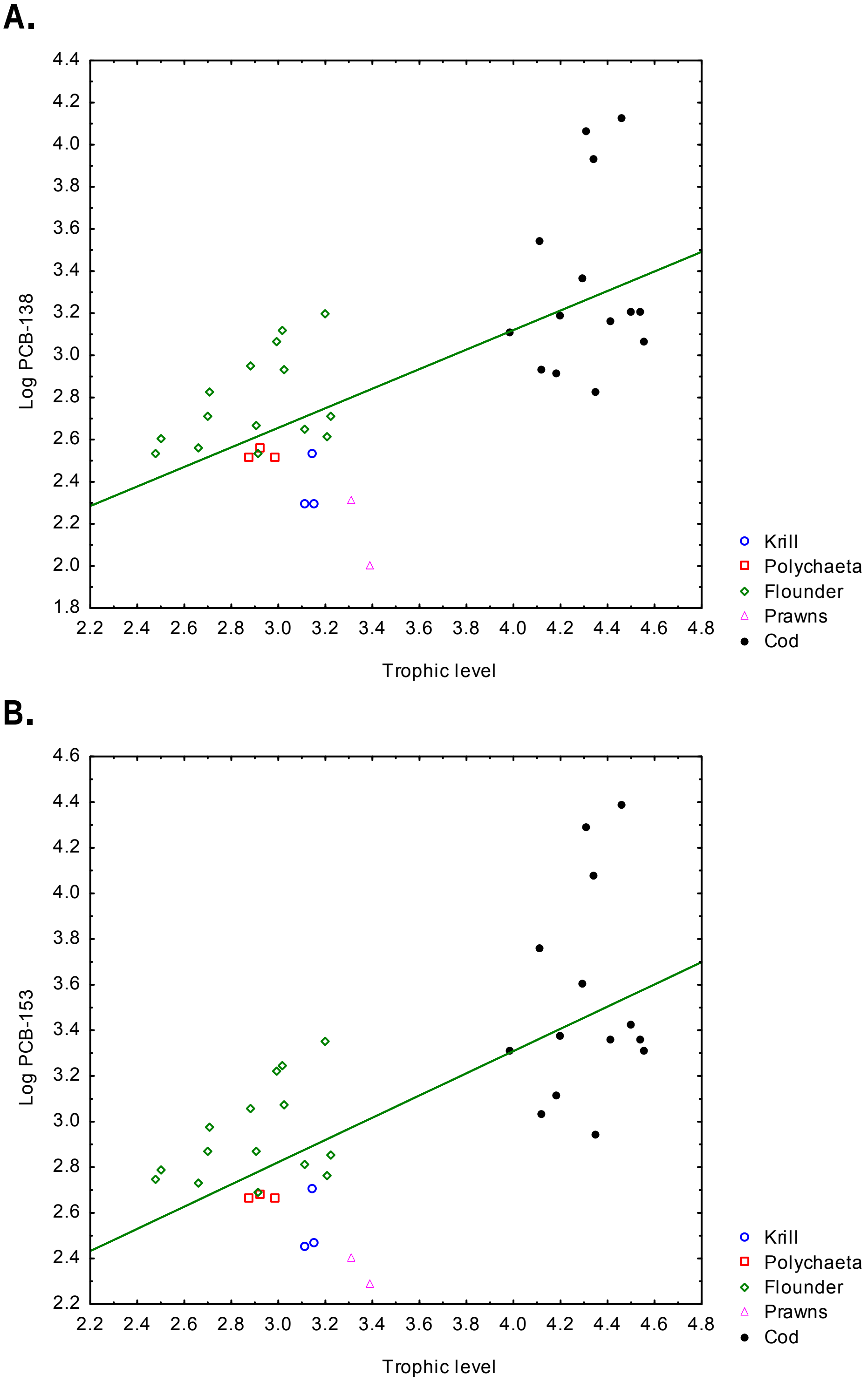
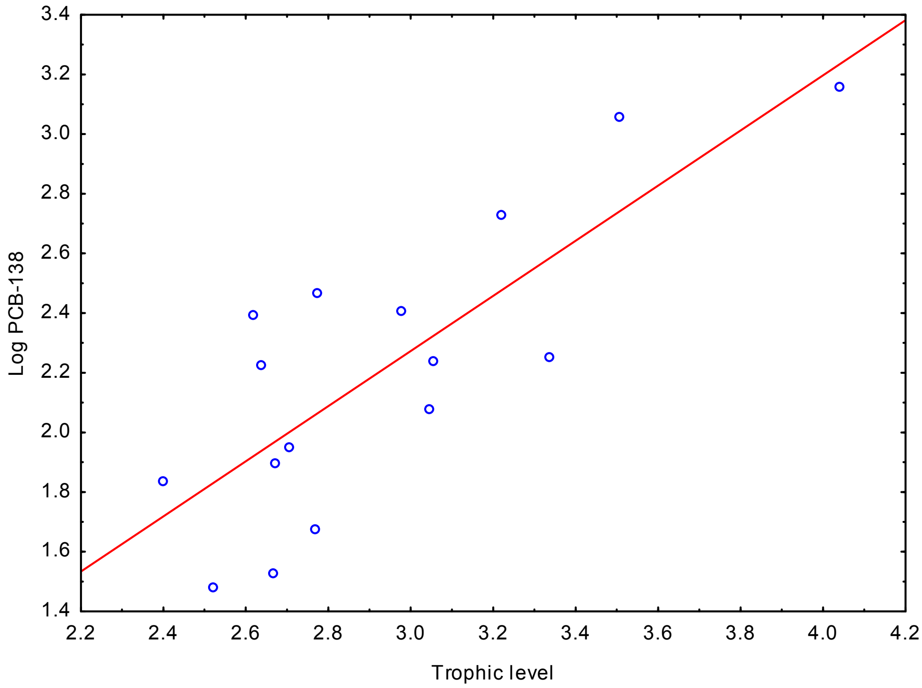


Figure 8. Trophic level against concentrations (ng/g lipid wt.; log-transformed) of PCB-138 (A.) and PCB-153 (B.) in organisms of the Inner Oslofjord. Only concentrations above the LoD are included. Concentrations in Cod from 2013 are included (Green et al. 2014). $R^2 = 0.40$ *and 0.43, respectively;* $p = 0.00002$ *and 0.00001, respectively.*

A.



B.

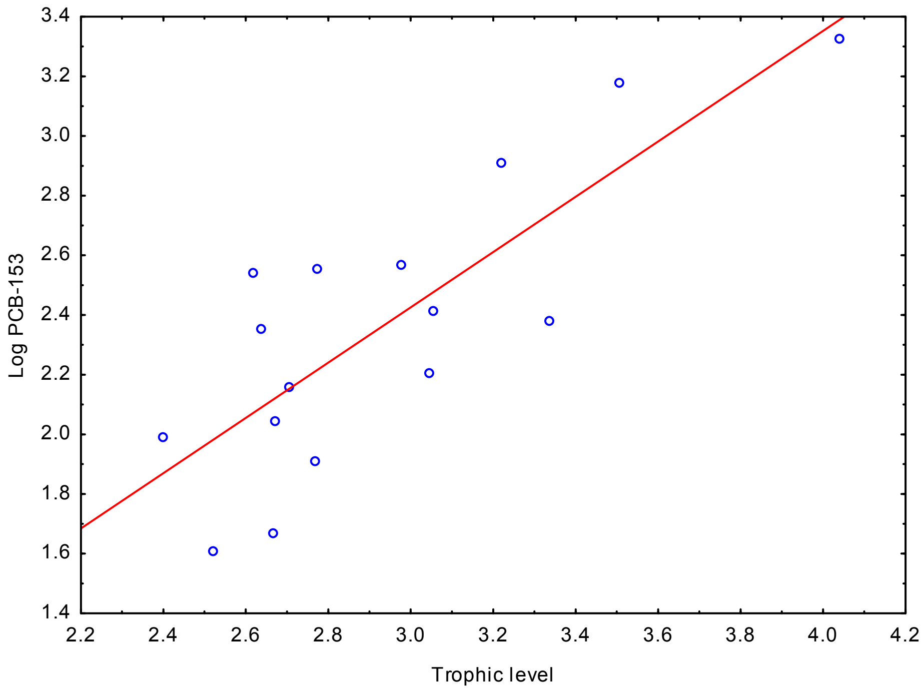


Figure 9. Trophic position against concentrations (ng/g lipid wt.; log-transformed) of PCB-138 (A.) and PCB-153 (B.) in Herring gull (blood) from the Inner Oslofjord. R^2 *= 0.63 and 0.65, respectively; p = 0.0002 and 0.0002, respectively.*

3.3 DDT and its compounds

DDT and its compounds (DDE and DDD) were analysed in eggs of herring gull and the results are reported in the Appendix. DDE and DDD are the major metabolites of DDT and are found as degradation products in the environment. In addition, hexacyclohexane (HCH) isomers were analysed in the eggs (also reported in the Appendix). p,p′-DDE constituted nearly all of the sum-DDT and the concentrations (mean ± standard deviation 45.5 ± 89.9 ng/g wet wt. p,p′-DDE) were in fact an order of magnitude lower than recently reported in herring gull eggs from remote colonies in Norway (Sklinna and Røst; Huber et al. 2015). The concentrations of p,p′-DDE in the herring gull eggs from the Inner Oslofjord were similar to those found in 2013 (mean ± standard deviation 55.4 ± 43.6 ng/g wet wt.; Ruus et al. 2014).

No significant relationship could be observed between (log) concentrations of DDT-compounds and the trophic position of the eggs.

DDT-compounds are known to induce a decrease in eggshell calcium (Bitman et al. 1969), thus affecting reproductive success in certain predatory birds (Ratcliffe, 1967). These issues are dealt with in chapter 3.13).

3.4 Brominated compounds

The results from the PBDE, HBCDD, and TBPH/BEHTBP and EHTeBB/TBB analyses are given in the Appendix. BDE-126 was included as an additional optional parameter.

3.4.1 Polybrominated diphenylethers

BDE-126 has been demonstrated to be a debromination product of BDE 209 (Wan et al. 2013) and is shown to induce weak Ah-receptor (AhR) mediated gene expression *in vitro* (H4IIE-luc recombinant rat hepatoma cells; Villeneuve et al. 2002). BDE-126 was detected in a few of the samples in this study, indicating its presence in this (urban) environment. BDE-126 was also detected in some samples in 2013 and then apparently in higher concentrations.

Relation to quality standards

According to “Vannforskriften” (Norwegian Law) the quality standards for PBDEs (sum of congeners 28, 47, 99, 100, 153 and 154) are 0.0005 µg/L (annual average for fresh water) and 0.0002 µg/L (annual average for costal water).

According to the Norwegian guidelines on classification of environmental quality in fjords and coastal waters – a revision of the classification of waters and sediments with respect to metals and organic contaminants (Bakke et al. 2007; Bakke et al. 2010), quality standards for PBDEs (more specifically BDE-99) in sediment are as presented in Table 13.

Table 13.
Quality standards (ng/g dry wt.) for BDE-99 in sediment according to the Norwegian guidelines on classification of environmental quality in fjords and coastal waters – a revision of the classification of waters and sediments with respect to metals and organic contaminants (Bakke et al. 2007; Bakke et al. 2010).

	Class I (Background)	Class II (Good)	Class III (Moderate)	Class IV (Poor)	Class V (Very Poor)
BDE-99	-	<62	62 – 7800	7800 - 16000	>16000

The mean concentration of BDE-99 measured in storm water/surface water (dissolved phase) did not exceed the quality standard. Neither did any of the (four) individual measurements. In sediments, all concentrations were well below the upper limit of good condition (class II).

Diffuse inputs

Concentrations of PBDEs determined in storm water are shown in Figure 10. BDE-209 displayed the highest concentrations (as in 2013; Ruus et al, 2014), and the variability was high. As expected, the higher brominated congeners were detected in the highest concentration in the particulate fraction (no statistics performed). One sample/site showed markedly higher concentrations of the higher brominated congeners, than the other samples/sites, hence the large variability. A larger number of congeners were detected in the dissolved fraction, than in the particulate fraction (Figure 10). These results may suggest that the dissolved fraction contain colloids or very small particles that are smaller than the pore size of the filters used (1.2 µm).

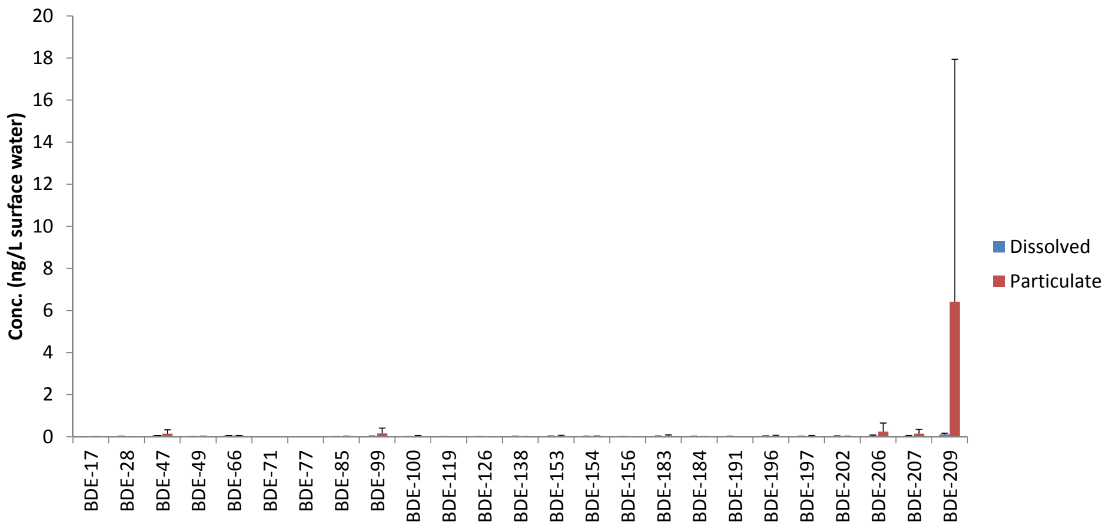


Figure 10. Concentrations of PBDEs (ng/L of water) in storm water/surface water. Mean and standard deviation; n=4; non-detects are assigned values of zero.

Amounts of PBDEs reported to enter/exit Bekkelaget STP in 2013 is presented in Table 14 (BEVAS, 2014).

Table 14.
Amounts (kg) of PBDEs reported to enter and exit Bekkelaget STP in 2013

Congener	In (kg)	Out (kg)
-47	0.197	0.0965
-99	0.197	0.0965
-100	0.197	0.0965
-183	0.197	0.0965
-209	1.11	0.258

Contribution of PBDE inputs from Alna River in 2013 and 2014 is available through the programme "Riverine inputs and direct discharges to Norwegian coastal waters" (RID; Skarbøvik et al. 2014). Particle-bound and dissolved concentrations of PBDEs in the River Alna as well as riverine fluxes are presented in Tables 15 to 18.

Table 15.
Particulate-bound PBDE concentrations (ng/g) measured in suspended particulate matter samples collected by continuous-flow centrifugation in 2013 and 2014 as part of the RID programme

	BDE-47 (ng/g)	BDE-99 (ng/g)	BDE-100 (ng/g)	BDE-153 (ng/g)	BDE-154 (ng/g)	BDE-183 (ng/g)	BDE-196 (ng/g)	BDE-209 (ng/g)
Mean for 2013	0.93	1.71	0.34*	1.14**	0.245*	< 0.4	< 0.6	25
%RSD	51	57	-	-	-	-	-	71
Mean for 2014	1.86	2.04	0.68**	0.43*	0.27**	< 0.7	< 0.5	49
%RSD	33	67	-	-	-	-	-	39

*two values above LoD (mean concentration calculated using LoDs when data were below LoD)
**one value below LoD (mean concentration calculated using LoDs when data were below LoD)

Table 16.
Dissolved PBDE congener concentrations (ng/L) measured in the Alna River (outlet) in 2013 using silicone passive samplers. Nd: Not determined

	BDE-47	BDE-99	BDE-100	BDE-153	BDE-154	BDE-183	BDE-196	BDE-209
$C_{W,PBDE}$	0.0018	0.0012	0.0002	0.00008	0.00008	< 0.0002	< 0.0002	0.00123

Table 17.
Estimates of particulate-bound PBDE fluxes (g/year) for the Alna River estimated from continuous flow centrifugation measurements in 2013 (RID programme)

	BDE-47	BDE-99	BDE-100	BDE-153	BDE-154	BDE-183	BDE-196	BDE-209
STS-based	0.30	0.54	0.04-0.11	0.36-0.41	0.03	< 0.16	< 0.19	8.6

Table 18.
Estimates of PBDE fluxes (mg/year) for the Alna River estimated from silicone passive sampler measurements in 2013

	BDE-47	BDE-99	BDE-100	BDE-153	BDE-154	BDE-183	BDE-196	BDE-209
Passive sampling-based	0.073	0.048	0.010	0.001-0.003	0.002-0.003	< 0.007	< 0.008	0.049

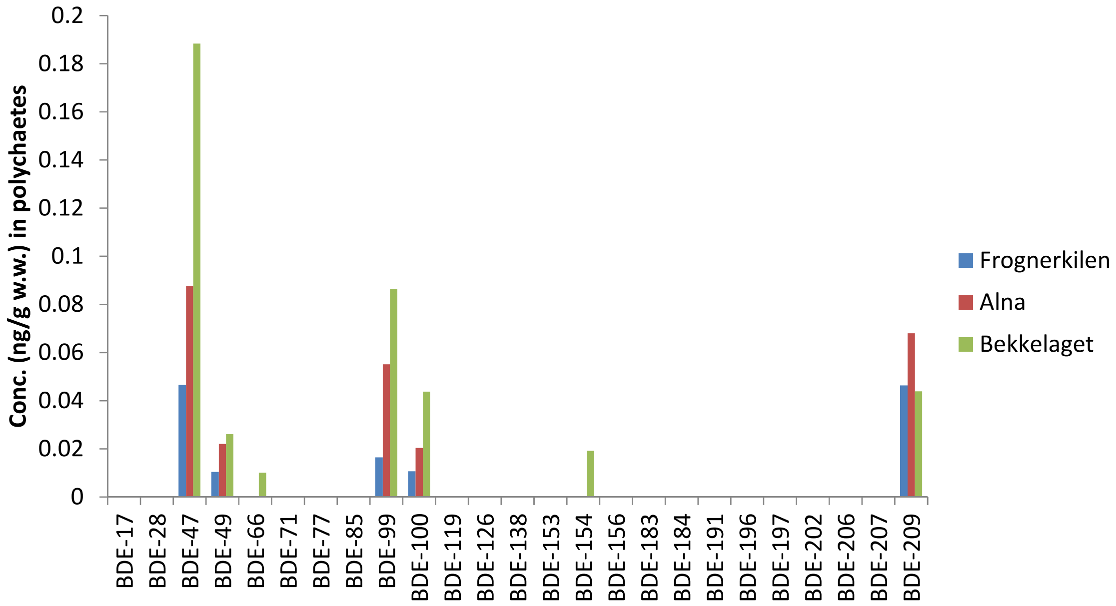
Geographical aspects

There were apparently some differences in concentrations of PBDEs in polychaetes from Frognerkilen, the mouth of Alna River and Bekkelaget (Figure 11; statistical evaluation not applicable due to limited number of samples). BDE-209 showed the highest concentration at the mouth of Alna River, while in general, concentrations of PBDEs were highest at Bekkelaget. This corresponds with the findings in 2013 (Ruus et al. 2014).

Regarding blue mussel, BDE-47 was the congener detected in the highest concentrations and there were small differences between sites (Figure 11).

In sediments, BDE-209 displayed the highest concentrations (Figure 12) and the concentration was highest at the mouth of Alna River, followed by Bekkelaget and Frognerkilen (no statistics performed). This corresponds with the findings in 2013 (Ruus et al. 2014).

A.



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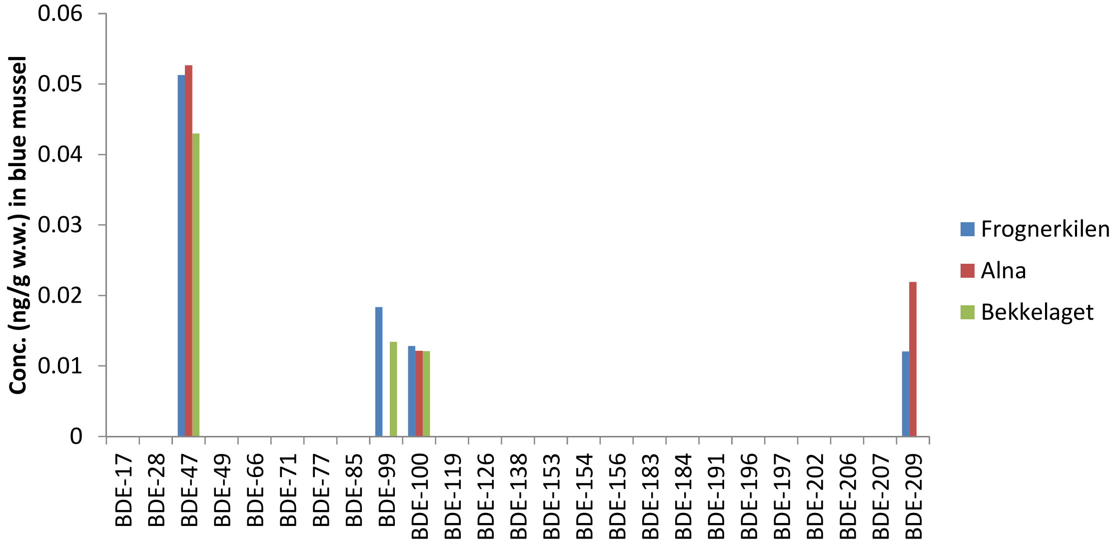


Figure 11. Concentrations of PBDEs (ng/g wet. wt.) in polychaetes (A.) and blue mussel (B.) from Frognerkilen, the mouth of Alna River and at Bekkelaget. One composite sample per station.

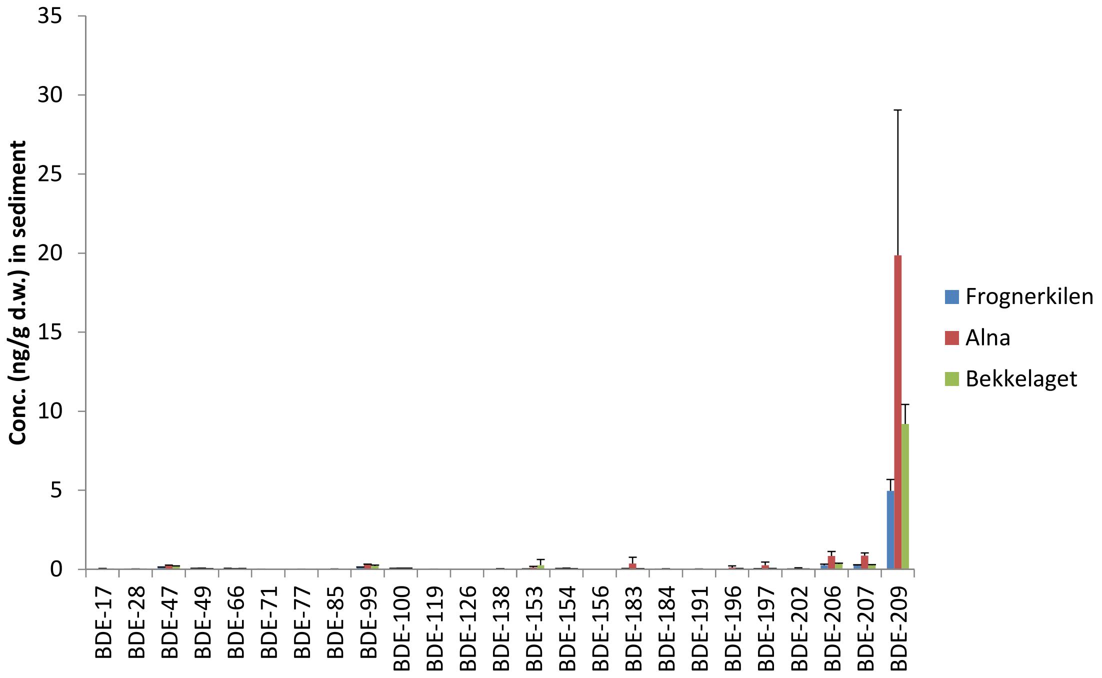


Figure 12. Concentrations of PBDEs (ng/g dry wt.) in sediments from Frognerkilen, the mouth of Alna River and at Bekkelaget (mean and standard deviation; n=3; non-detects are assigned values of zero).

Herring gull

PBDEs were detected in eggs and blood of herring gull (Figure 13). The mean concentrations were apparently highest in eggs (no statistics performed) however, the variability was high. This corresponds with the results for PCBs (see above) and is contrary to the finding in 2013, when the concentrations of PBDEs and PCBs were apparently highest in blood (Ruus et al. 2014). BDE-209 displayed the highest concentrations of the PBDE-congeners, however, the variability was high. In some eggs, this congener displayed concentrations that were several orders of magnitude higher than those recently observed in herring gull eggs from remote colonies in Norway (Huber et al. 2015), indicating urban influence. It can also be mentioned that according to Gentes et al. (2015), intraspecific forage strategies have a strong influence on the PBDE accumulation in gulls, and that foraging in waste management facilities particularly results in higher BDE-209 exposure.

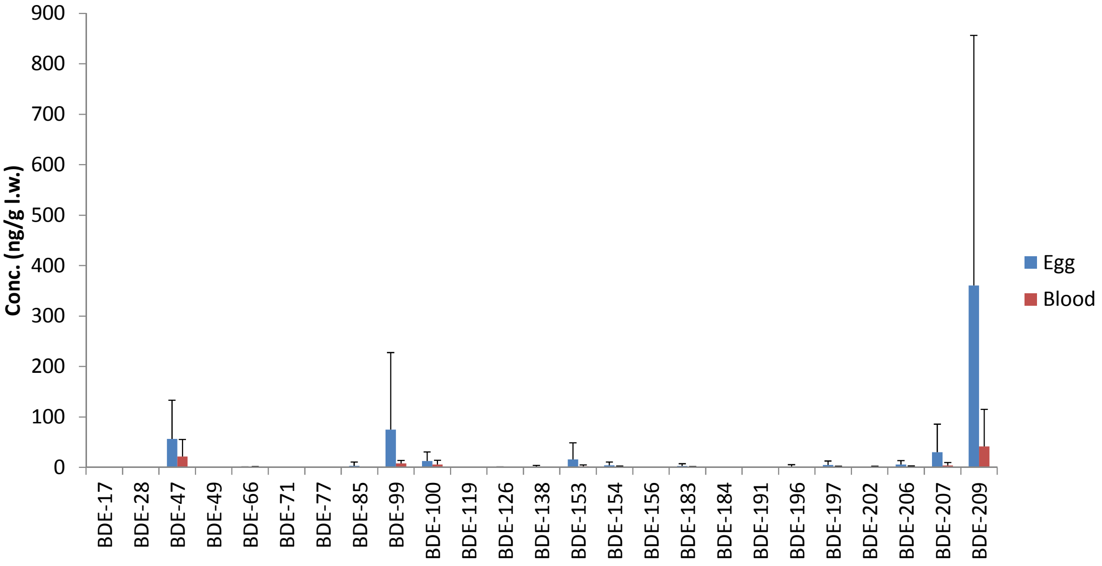


Figure 13. Concentrations of PBDEs (ng/g lipid wt.) in Herring gull (eggs and blood) from the Inner Oslofjord (mean and standard deviation; n=14 and 16, respectively; non-detects are assigned values of zero).

Food chain of the Inner Oslofjord

Evaluations of the concentrations of PBDEs in the Inner Oslofjord food web were done on a lipid weight basis. For several compounds concentrations were below the limit of detection in several samples/species.

There was no demonstrable biomagnification of PBDE congeners in the investigated food web in the Inner Oslofjord (herring gull excluded). Nor if herring gull (eggs) are included, no positive relationships between (log) BDE-concentrations and trophic position of the organisms can be observed, because of the low trophic position of the Herring gulls (see above). As for PCBs (see above), when herring gull was represented by blood samples, there were some positive relationships that could be observed between trophic position and (log) BDE-concentrations (BDE-47,-99 and -100; R^2=0.34, 0.13 and 0.22 respectively; p=0.00008, 0.03 and 0.003 respectively). Figure 14 shows the relationship for BDE-47. These regressions were likely highly influenced by the strong intra-species relationships between BDE-concentrations and trophic position for herring gull (see below). As mentioned, the range in $\delta^{15}N$ for herring gull blood among individuals corresponded to >1 trophic level.

Looking at flounder, isolated, (log) concentrations did not show significant linear relationships with trophic position. Nor were there any significant relationships between PBDE-concentrations and age, length or weight.

For herring gull in isolation, (log) concentrations in eggs showed no significant linear relationship with trophic position. In blood, with a span in $\delta^{15}N$ ranging over >1 trophic level among individual birds, the (log) concentrations showed significant linear relationships with trophic position for BDE-47, -99, -100 and -154 (R^2=0.80, 0.43, 0.77 and 0.35 respectively; p=0.00001, 0.005, 0.00001 and 0.02 respectively). Figure 15 depicts the relationship for BDE-47. The concentrations of PBDEs (in blood) did not show any significant relationships with wing length, but a couple of significant positive relationships with body mass (not shown), much because of two large birds with higher PBDE-concentrations that the other birds.

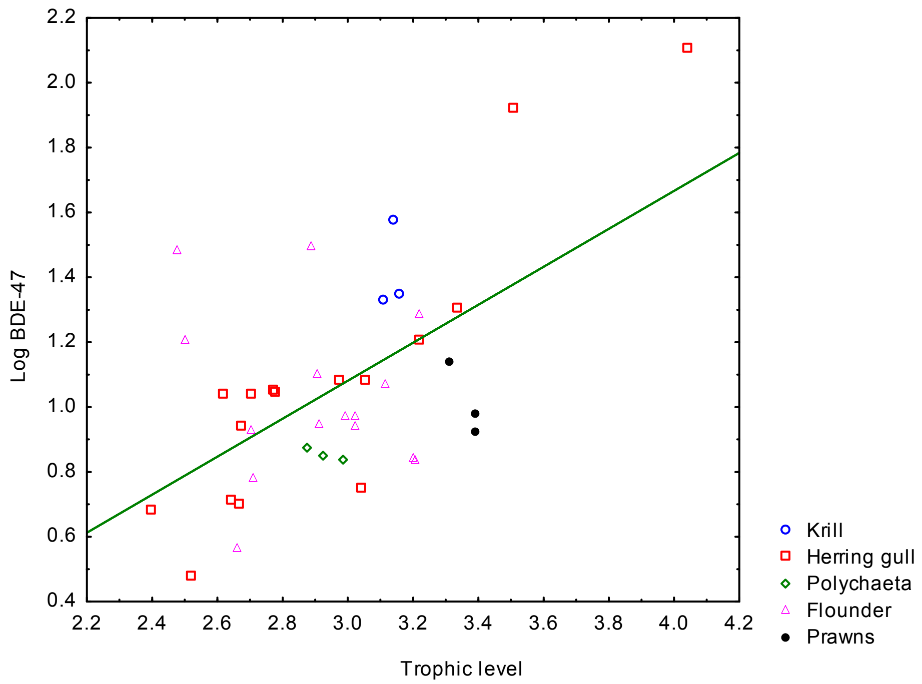


Figure 14. Trophic position against concentrations (ng/g lipid wt.; log-transformed) of BDE-47 in organisms of the Inner Oslofjord. Only concentrations above the LoD are included. Herring gull is represented by blood samples. R^2 *= 0.34; p = 0.00008.*

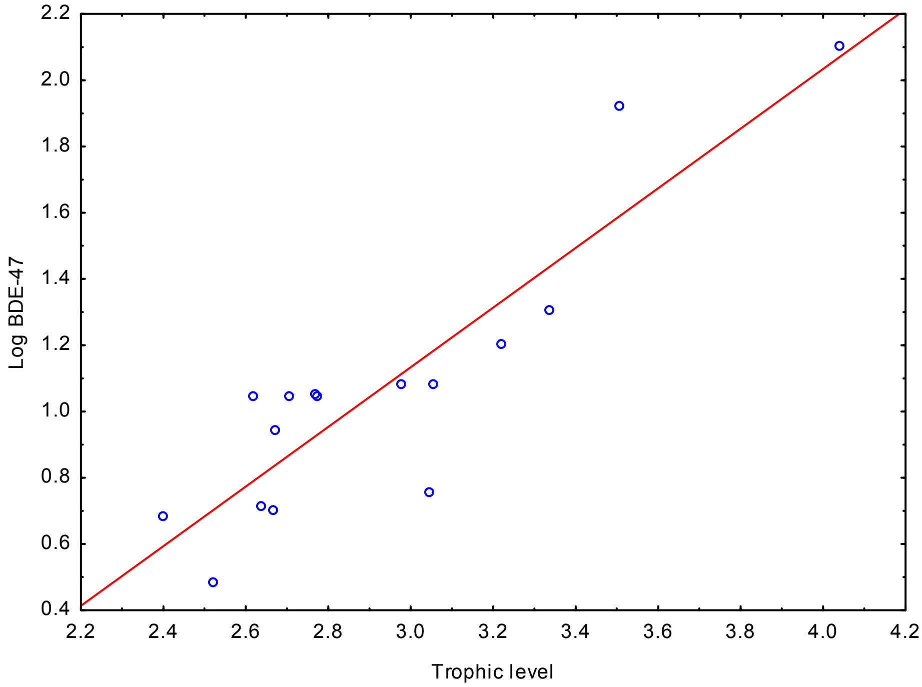


Figure 15. Trophic position against concentrations (ng/g lipid wt.; log-transformed) of BDE-47 in Herring gull (blood) from the Inner Oslofjord. R^2 = 0.80; p = 0.00001.

Cod from the Inner Oslofjord

PBDEs have also been analysed in cod liver annually since 2005, through the "Contaminants in coastal areas" (MILKYS) monitoring programme (Green et al. 2014). In 2013, these compounds were analysed in cod liver from 9 stations, including the Inner Oslofjord. The highest concentrations were found in the inner Oslofjord. The Inner Oslofjord is densely populated with much urban activities and the high concentrations of PBDEs observed in cod liver are probably related to these activities, as well as reduced water exchange with the Outer fjord.

The concentration of PBDEs measured in flounder from the Inner Oslofjord in 2014 reported in the present study were in general substantially lower (e.g. a factor of ~35 for BDE-47) than the median concentration measured in cod (2013; no statistics performed).

3.4.2 Hexabromocyclododecane (HBCDD)

Relation to quality standards

According to the Norwegian guidelines on classification of environmental quality in fjords and coastal waters – a revision of the classification of waters and sediments with respect to metals and organic contaminants (Bakke et al. 2007; Bakke et al. 2010), quality standards for HBCDD in water and sediment are as presented in Tables 19 and 20, respectively.

Table 19.
Quality standards (µg/L) for HBCDD in water according to the Norwegian guidelines on classification of environmental quality in fjords and coastal waters – a revision of the classification of waters and sediments with respect to metals and organic contaminants (Bakke et al. 2007; Bakke et al. 2010).

	Class I (Background)	Class II (Good)	Class III (Moderate)	Class IV (Poor)	Class V (Very Poor)
HBCDD	-	<0.31	0.31 – 1.1	1.1 – 2.2	>2.2

Table 20.
Quality standards (ng/g dry wt.) for HBCDD in sediment according to the Norwegian guidelines on classification of environmental quality in fjords and coastal waters – a revision of the classification of waters and sediments with respect to metals and organic contaminants (Bakke et al. 2007; Bakke et al. 2010).

	Class I (Background)	Class II (Good)	Class III (Moderate)	Class IV (Poor)	Class V (Very Poor)
HBCDD	<0.3	0.3-86	86 – 310	310 - 610	>610

The concentrations of HBCDD measured in storm water/surface water (dissolved phase) were well below the upper limit for good condition (class II). In sediments, concentrations of HBCDD corresponded to good condition (class II) at all stations.

Diffuse inputs

Concentrations of HBCDD determined in storm water are depicted in Figure 16. As expected, the compounds were detected in the highest concentrations in the particulate fraction. The variability was high.

Data from the RID programme (2013) showed that HBCDD (α, β, γ) was below limits of detection (5 ng/g for each isomer) in all four suspended particulate matter samples from the Alna River. This mean flux of particulate-bound HBCDD (sum of the three isomers) was below 10 g/year. HBCDD was found in suspended particulate matter samples from the RID programme in 2014. The mean concentration of α-HBCDD was 9.9 ng/g (mean of three samples). The β isomer of HBCDD was detected above LoD in two of four samples with a mean concentration of 3.5 ng/g. The γ isomer was not found above LoD in any of the 2014 samples of suspended particulate matter.

Bekkelaget STP has reported that 0.189 kg of HBCDD ran into the plant, and 0.193 kg ran out of the plant in 2013. (BEVAS, 2014).

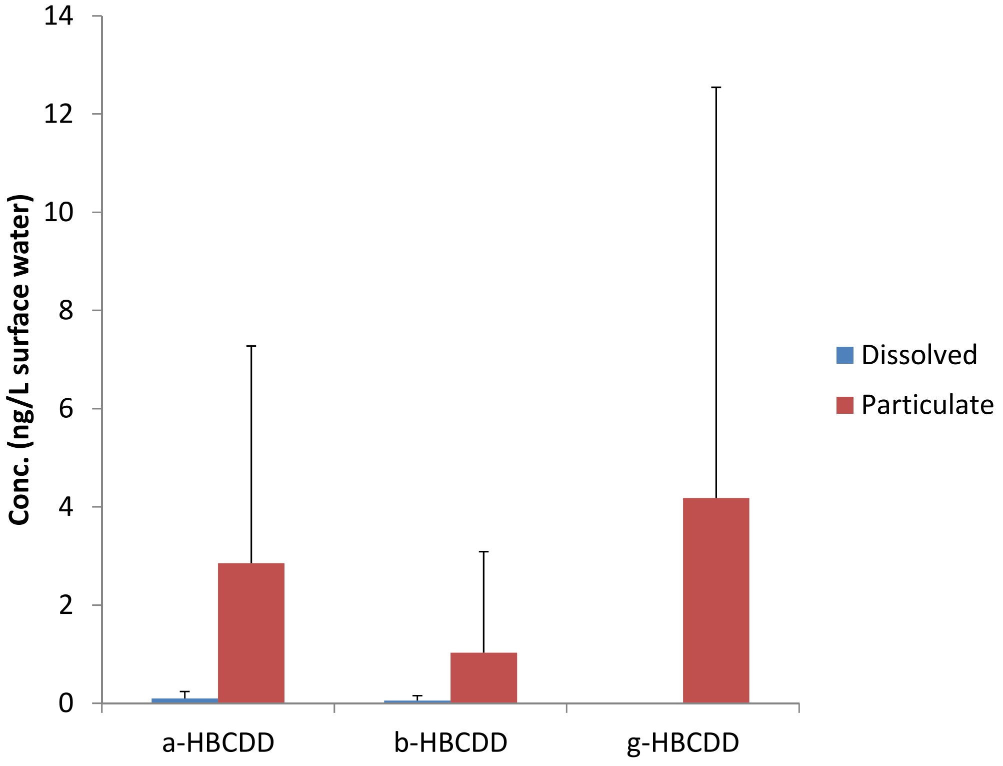


Figure 16. Concentrations of HBCDD (ng/L of water) in storm water/surface water (mean and standard deviation; n=4; non-detects are assigned values of zero).

Geographical aspects

It was mainly the stereoisomer α–HBCDD that was detected in polychaetes and blue mussel (Figure 17), and the lowest concentrations were found at Bekkelaget (both for polychaetes and blue mussel). This is in accordance with the findings in 2013 (Ruus et al. 2014). The concentrations were apparently highest at the mouth of Alna River. Also in sediments, the highest concentrations were found at the mouth of Alna River (Figure 18). These results correspond with results from RID 2014 where α-HBCDD was the stereoisomer detected in the highest concentrations in particulate matter from Alna River (see results above).

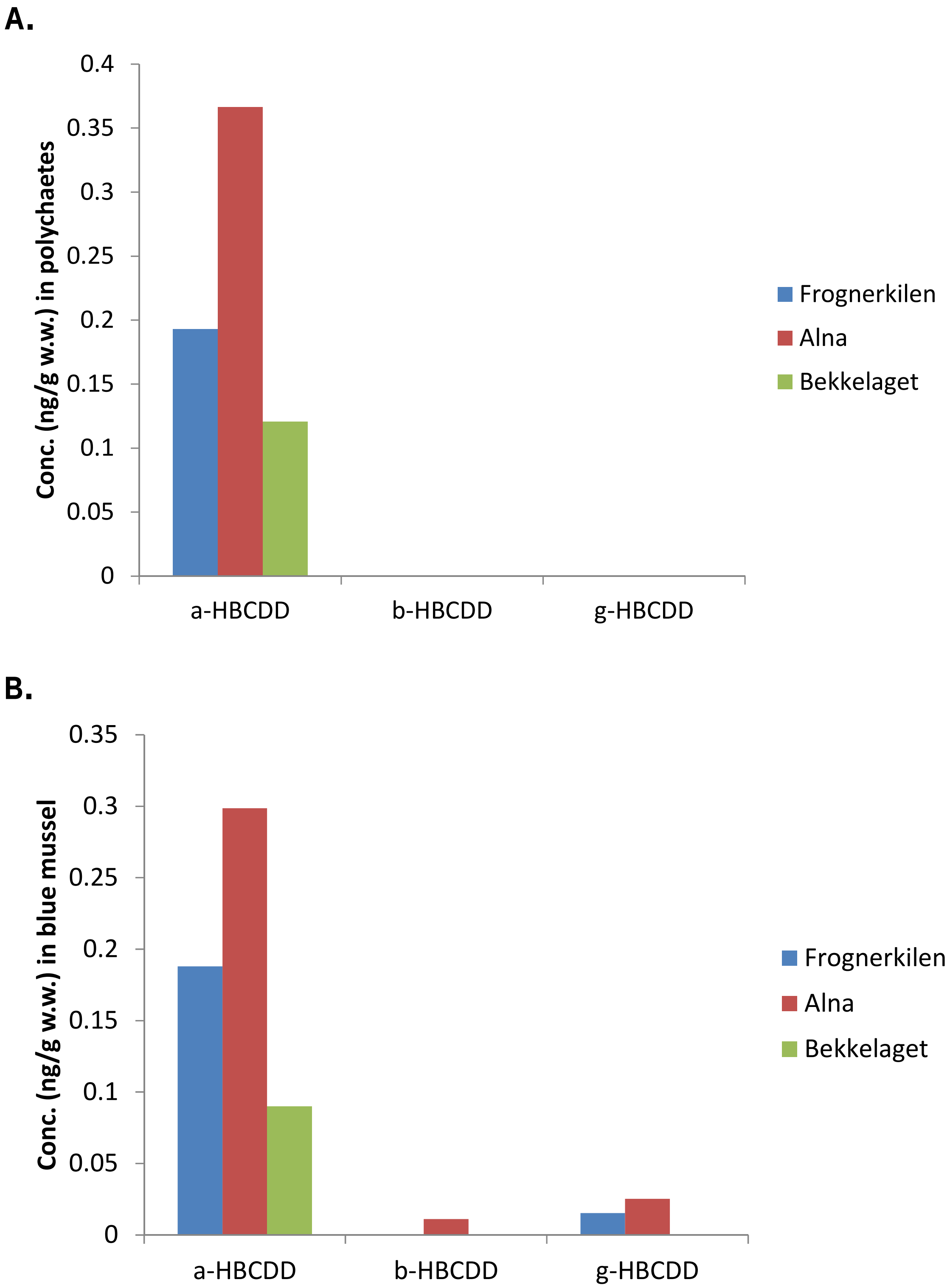


Figure 17. Concentrations of HBCDD stereoisomers (ng/g wet wt.) in polychaetes (A.) and blue mussel (B.) from Frognerkilen, the mouth of Alna River and at Bekkelaget. One composite sample per station.

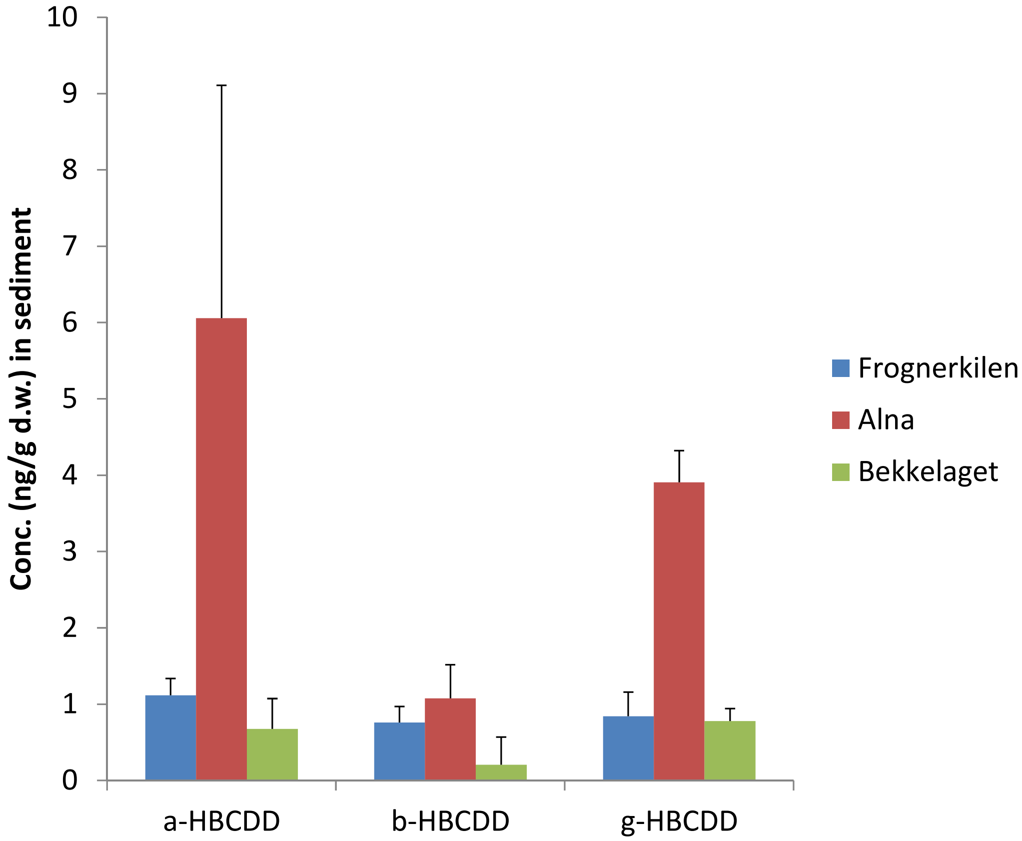


Figure 18. Concentrations of HBCDD stereoisomers (ng/g dry wt.) in sediments from Frognerkilen, the mouth of Alna River and at Bekkelaget (mean and standard deviation; n=3; non-detects are assigned values of zero).

Herring gull

As for polychaetes and blue mussel, the stereoisomer that was found in the highest concentrations in Herring gull (blood) was α–HBCDD (Figure 19). The various HBCDD isomers were not detected in all samples and the variability was high.

In a comprehensive study by Haukås (2009), it was suggested that selective uptake and biotransformation had more influence on the fate of HBCDD in the ecosystem than physicochemical partitioning in the environment. There were indications of biomagnification of the α–diastereomer, while β– and γ–HBCDD seemed to be eliminated at higher trophic levels (Haukås, 2009).

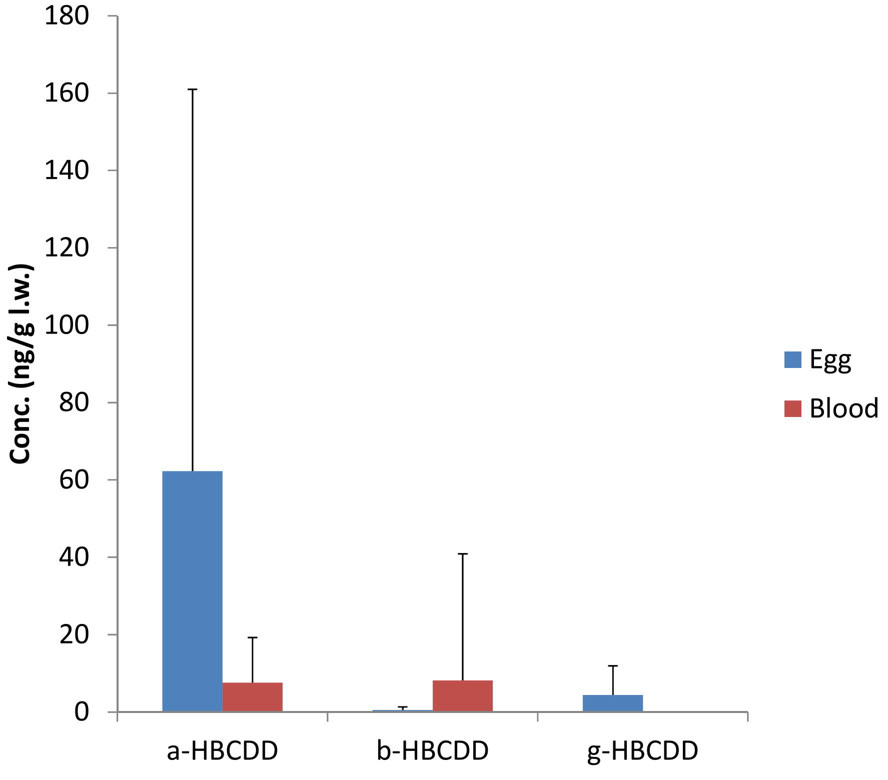


Figure 19. Concentrations of HBCDD stereoisomers (ng/g lipid wt.) in Herring gull (eggs and blood) from the Inner Oslofjord (mean and standard deviation; n=14 and 16, respectively; non-detects are assigned values of zero).

Food chain of the Inner Oslofjord

Evaluations of the concentrations of HBCDD in the Inner Oslofjord food web were performed on a lipid weight basis.

Biomagnification was not observed for HBCDD-diastereomers in the Inner Oslofjord food web, neither with nor without herring gull (blood or egg). However, if including cod from the MILKYS programme (2013) a significant positive relationship could be observed between trophic position and the (log) concentrations of α-HBCDD (herring gull excluded; R^2=0.52; p=0.00002, Figure 20). The β-isomer was then only detected in cod, while the γ-isomer was only detected in cod and a few flounders.

Looking at flounder, isolated, (log) concentrations did not show significant linear relationships with trophic position. Nor were there any significant relationships between HBCDD-concentrations and age, length or weight.

For herring gull in isolation, (log) concentrations in neither eggs nor blood showed significant linear relationships with trophic position. Nor were there any significant relationships with wing length or weight.

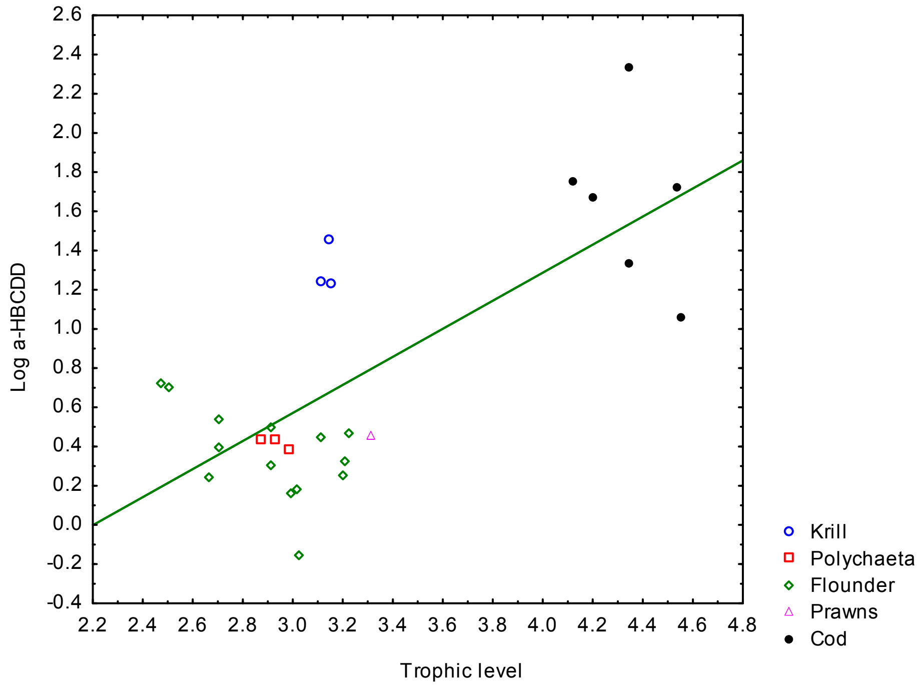


Figure 20. Trophic level against concentrations (ng/g lipid wt.; log-transformed) of α-HBCDD in organisms of the Inner Oslofjord. Only concentrations above the LoD are included. Concentrations in Cod from 2013 are included (Green et al. 2014). R^2 = 0.52; p = 0.00002.

Cod from the Inner Oslofjord

HBCDD has also been analysed in cod liver, through the "Contaminants in coastal areas" (MILKYS) monitoring programme (Green et al. 2014). In 2013, these compounds were analysed in cod liver from 11 stations along the Norwegian coast, with the highest concentrations found in the inner Oslofjord. It was concluded that parts of the Inner Oslofjord are densely populated with much urban activities and the high concentrations of HBCDD observed in cod liver are probably related to these activities, as well as reduced water exchange with the Outer fjord.

The concentration of HBCDD measured in flounder from the Inner Oslofjord in 2014 (present study) were generally substantially lower (a factor of ~50) than the median concentration measured in cod (2013; no statistics performed).

3.4.3 Bis(2-ethyl-1-hexyl)tetrabromophthalate (TBPH/BEHTBP) and 2-ethylhexyl-2,3,4,5-tetrabromobenzoate (EHTeBB/TBB)

Relation to quality standards

There are no relevant quality standards to relate to for TBPH/BEHTBP and EHTeBB/TBB.

Diffuse inputs

Concentrations of TBPH/BEHTBP and EHTeBB/TBB determined in storm water are shown in Figure 21. The concentrations of TBPH/BEHTBP were higher than the concentrations of EHTeBB/TBB (no statistics performed).

Bekkelaget STP did not report measurements of any discharge of TBPH/BEHTBP and EHTeBB/TBB in 2013.

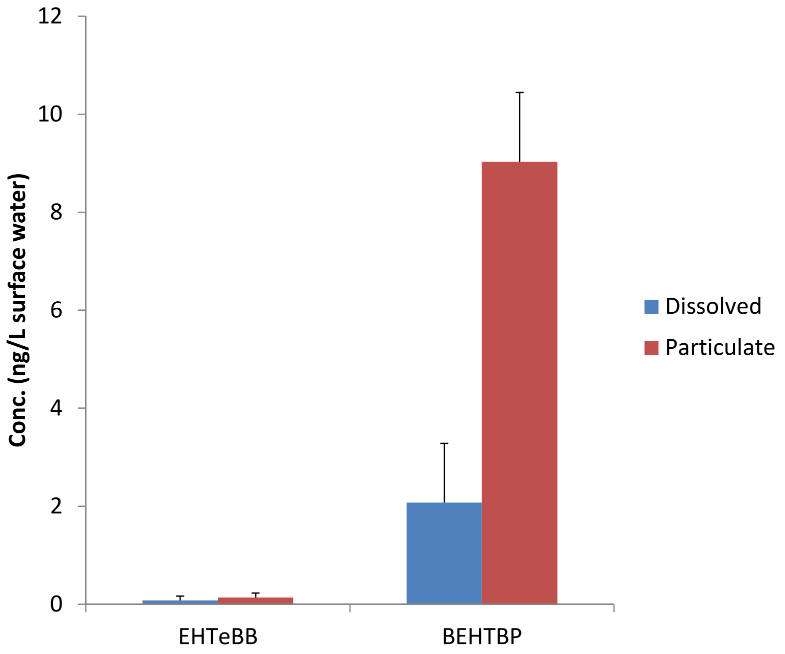


Figure 21. Concentrations of TBPH/BEHTBP and EHTeBB/TBB (ng/L of water) in storm water/surface water (mean and standard deviation; n=4; non-detects are assigned values of zero).

Geographical aspects

EHTeBB/TBB were not detected in polychaetes nor blue mussel at any of the locations. Concentrations of TBPH/BEHTBP were apparently highest at the mouth of Alna River (no statistics possible; Figure 22).

Also in sediments, EHTeBB/TBB was mostly not detected (Figure 23).

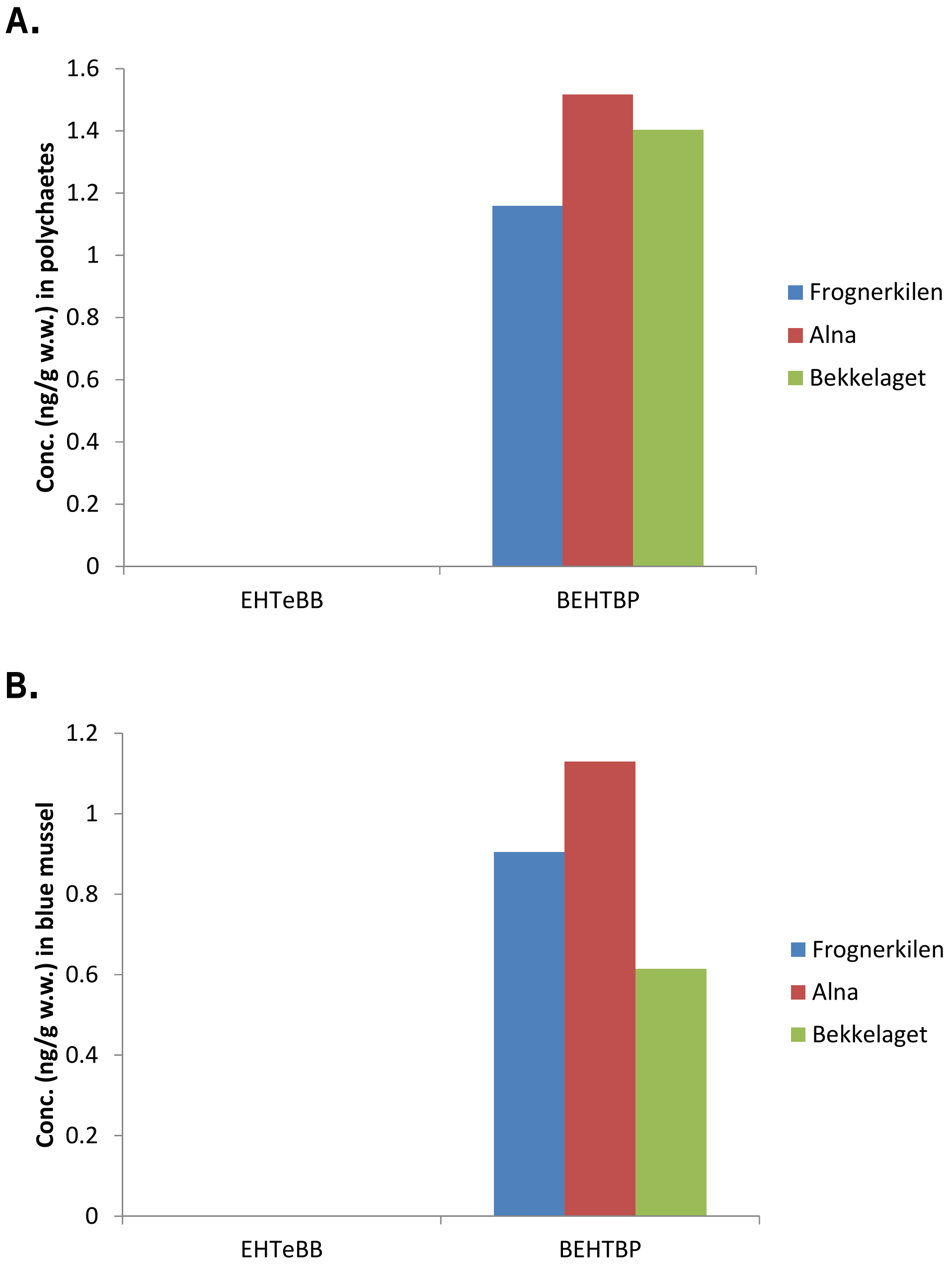


Figure 22. Concentrations of TBPH/BEHTBP and EHTeBB/TBB (ng/g wet wt.) in polychaetes (A.) and blue mussel (B.) from Frognerkilen, the mouth of Alna River and at Bekkelaget. One composite sample per station.

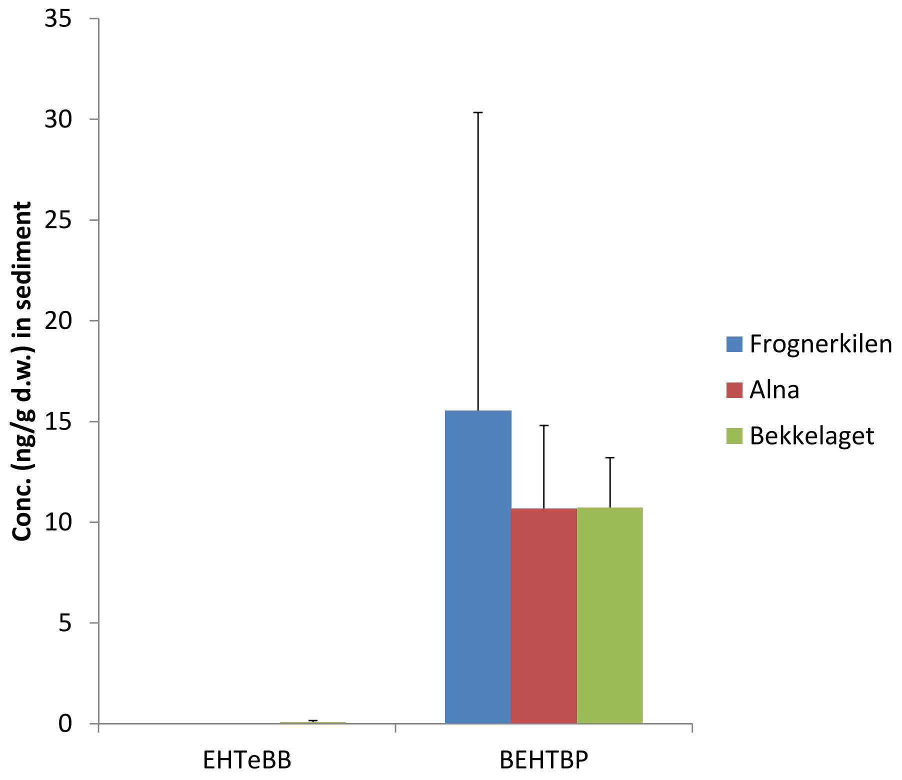


Figure 23. Concentrations of TBPH/BEHTBP and EHTeBB/TBB (ng/g dry wt.) in sediments from Frognerkilen, the mouth of Alna River and at Bekkelaget (mean and standard deviation; n=3; non-detects are assigned values of zero).

Herring gull

EHTeBB/TBB was only detected in two out of 16 herring gull blood samples, and not in eggs. TBPH/BEHTBP, on the other hand, was only detected in one blood sample, but in all 14 egg samples. The variability was high (Figure 24; no statistics performed).

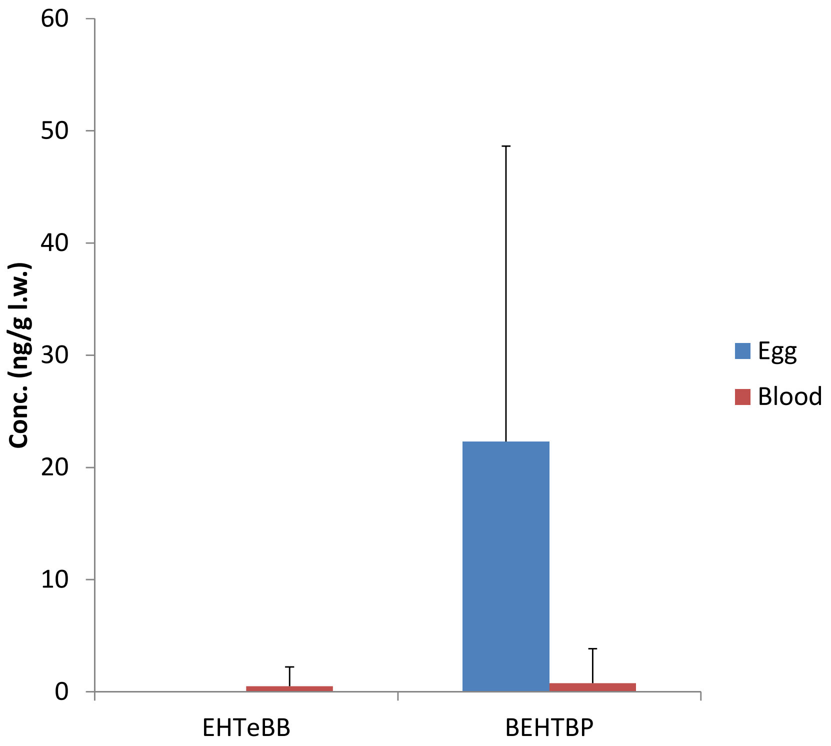


Figure 24. Concentrations of TBPH/BEHTBP and EHTeBB/TBB (ng/g lipid wt.) in Herring gull (eggs and blood) from the Inner Oslofjord (mean and standard deviation; n=14 and 16, respectively; non-detects are assigned values of zero).

Food chain of the Inner Oslofjord

Evaluations of the concentrations of TBPH/BEHTBP and EHTeBB/TBB in the Inner Oslofjord food web were done on a lipid weight basis.

EHTeBB/TBB was only detected in two gull blood samples, while TBPH/BEHTBP was detected in most samples, except in herring blood. No relationship between trophic position and (log) TBPH/BEHTBP concentration could be observed, when herring gull (eggs) was excluded. With herring gull included, there was a positive relationship between trophic position and TBPH/BEHTBP concentration (R^2=0.17; p=0.009; not shown), despite the low trophic position of the herring gull. As mentioned, the results of the stable isotope analysis corroborate the conclusion that (Ruus et al. 2014) the species collected do not constitute a representative food web, and that indications of biomagnification (or lack of such) using the trophic magnification approach are not conclusive.

For herring gull in isolation, no relationship between (log) TBPH/BEHTBP- or EHTeBB/TBB concentration and trophic position could be observed and these compounds were hardly detected in blood and only TBPH/BEHTBP was detected in eggs.

3.5 Short and medium chained chloroparaffins (S/MCCPs)

The results from the analysis of short and medium chained chloroparaffins (S/MCCPs) are given in the Appendix.

Relation to quality standards

According to “Vannforskriften” (Norwegian Law) the quality standards for SCCPs are 0.4 µg/L (annual average for fresh water or coastal water) and 1.4 µg/L (maximum value for fresh water or costal water).

According to the Norwegian guidelines on classification of environmental quality in fjords and coastal waters – a revision of the classification of waters and sediments with respect to metals and organic contaminants (Bakke et al. 2007; Bakke et al. 2010), quality standards for SCCPs and MCCPs in sediment are as presented in Table 21.

Table 21.
Quality standards (ng/g dry wt.) for SCCP and MCCP in sediment according to the Norwegian guidelines on classification of environmental quality in fjords and coastal waters – a revision of the classification of waters and sediments with respect to metals and organic contaminants (Bakke et al. 2007; Bakke et al. 2010).

	Class I (Background)	Class II (Good)	Class III (Moderate)	Class IV (Poor)	Class V (Very Poor)
SCCP	-	<1000	1000 – 2800	2800 - 5600	>5600
MCCP	-	<4600	4600 – 27000	27000 – 54000	>54000

The mean concentrations of S/MCCPs measured in storm water/surface water (dissolved phase) did not exceed the EQSs, but one sample/site showed a concentration of 454 ng/L of SCCP. In sediments, mean concentrations of S/MCCPs were below the upper limit for good condition (class II) at all stations (one sample in Frognerkilen, however, showed a SCCP concentration of 1004 ng/g dry wt.).

Diffuse inputs

SCCPs and MCCPs were detected in storm water (both water phase and particulate fraction). Apparently, the concentrations were highest in the particulate phase (no statistics performed), however, the variability was high (Figure 25).

Bekkelaget STP did not report measurements of discharge of S/MCCPs in 2013.

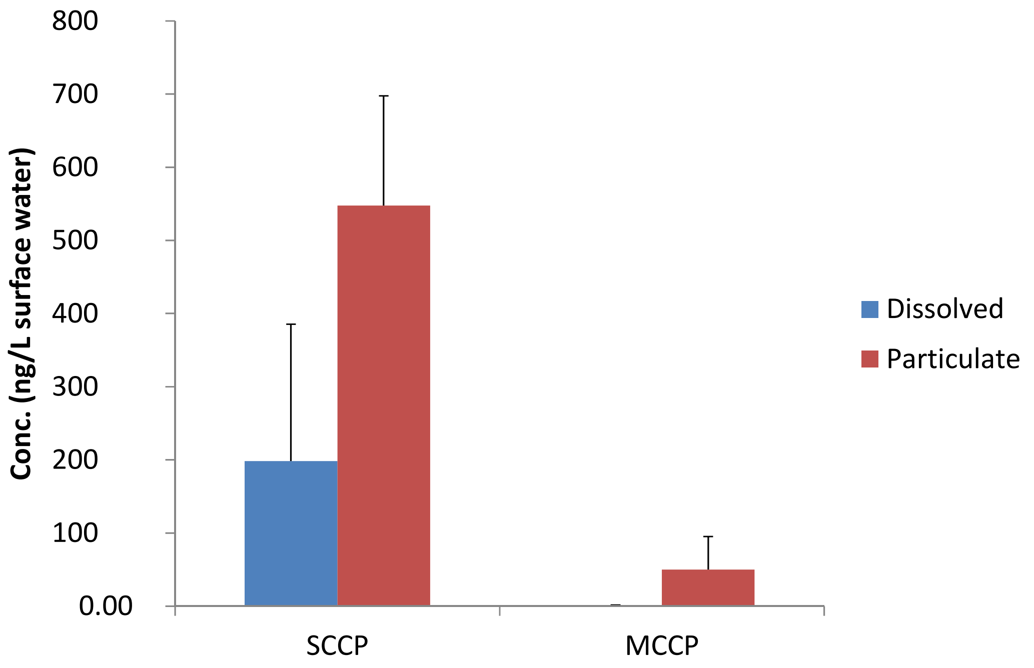


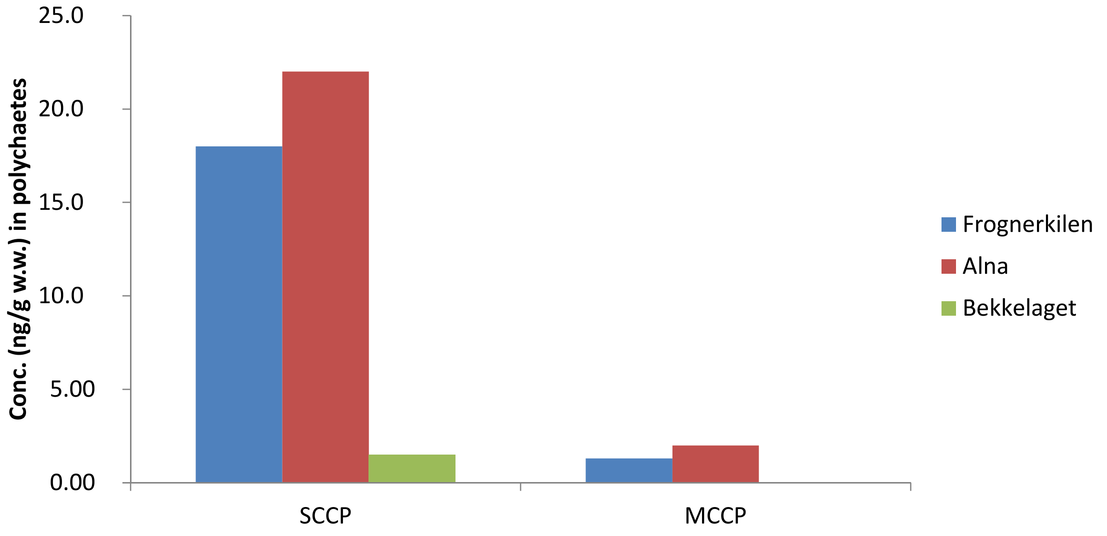
Figure 25. Concentrations of short and medium chained chloroparaffins (S/MCCPs; ng/L of water) in storm water/surface water (mean and standard deviation; n=4; non-detects are assigned values of zero).

Geographical aspects

SCCPs and MCCPs were analysed in polychaetes and blue mussel from Frognerkilen, the mouth of Alna River and at Bekkelaget (Figure 26). SCCPs were found in higher concentrations than MCCPs. SCCPs were not detected in blue mussels from the mouth of Alna River, and MCCPs were not detected in polychaetes at Bekkelaget. The highest concentrations in polychaetes were apparently found at the mouth of Alna River (no statistics possible), while the highest concentrations (of SCCPs) in blue mussel were apparently found in Frognerkilen.

In sediments, the highest concentrations of SCCPs (and MCCPs) were also found in Frognerkilen (no statistics performed; Figure 27), but the variability was high.

A.



B.

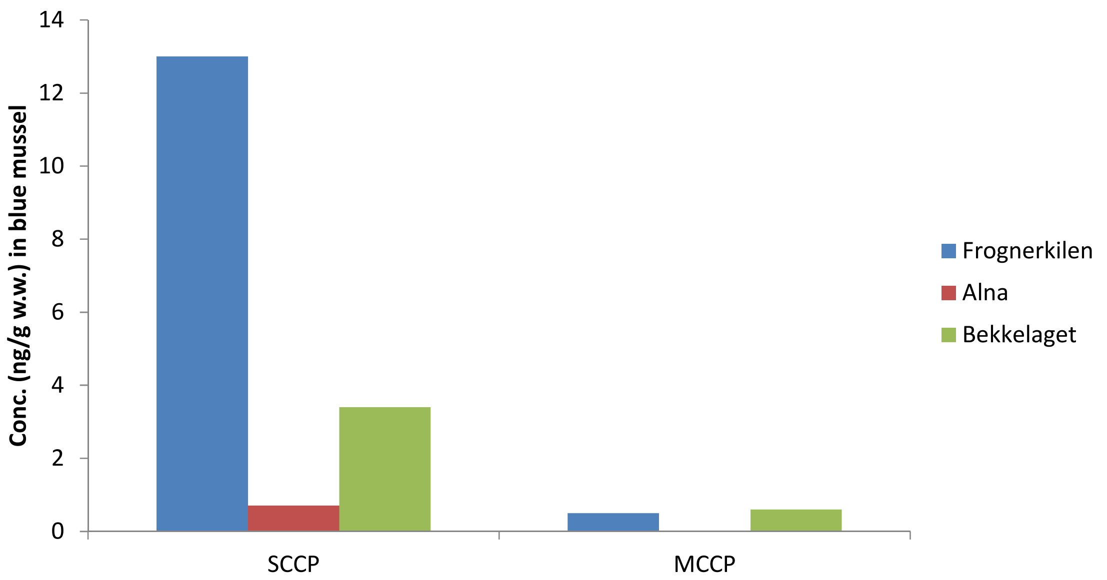


Figure 26. Concentrations of short and medium chained chloroparaffins (S/MCCPs; ng/g wet wt.) in polychaetes (A.) and blue mussel (B.) from Frognerkilen, the mouth of Alna River and at Bekkelaget. One composite sample per station.

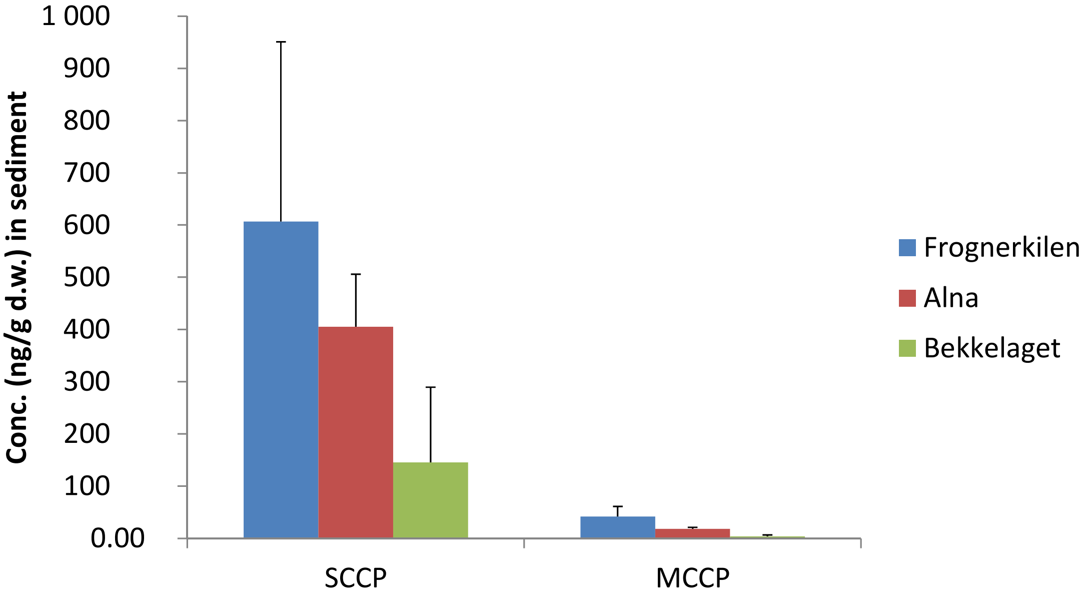


Figure 27. Concentrations of short and medium chained chloroparaffins (S/MCCPs; ng/g dry wt.) in sediments from Frognerkilen, the mouth of Alna River and at Bekkelaget (mean and standard deviation; n=3).

Herring gull

SCCPs and MCCPs were detected in eggs and blood of Herring gull (Figure 28). However, MCCPs were not detected in 6 of 16 blood samples. The variability was high (Figure 28). Concentrations were apparently higher in blood than in eggs (no statistics performed).

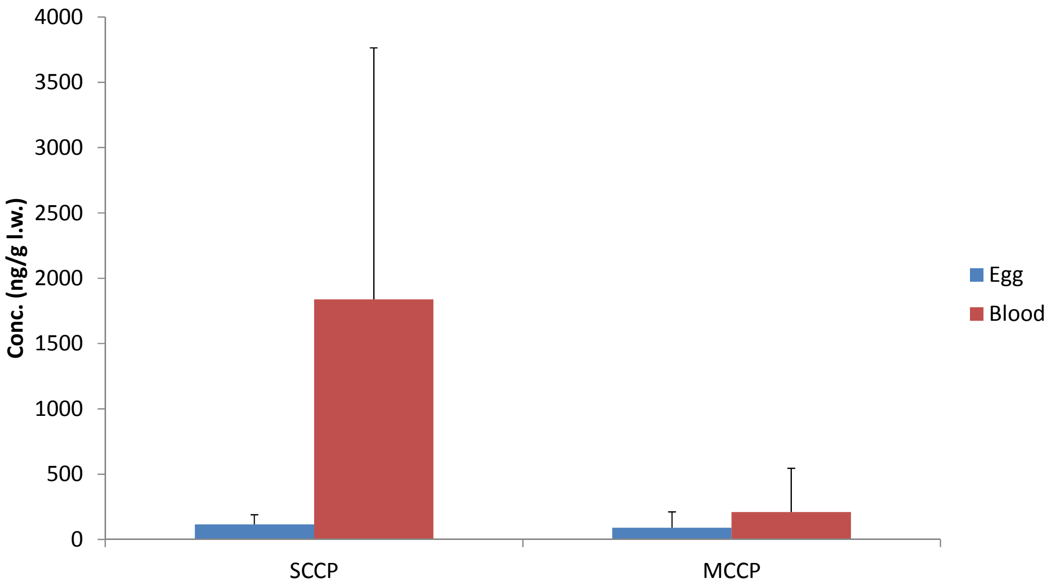


Figure 28. Concentrations of short and medium chained chloroparaffins (S/MCCPs; ng/g lipid wt.) in Herring gull (eggs and blood) from the Inner Oslofjord (mean and standard deviation; n=14 and 16, respectively; non-detects are assigned values of zero).

Food chain of the Inner Oslofjord

Evaluations of the concentrations of S/MCCPs in the Inner Oslofjord food web were done on a lipid weight basis.

No linear relationships could be demonstrated between trophic position and (log) S/MCCP concentrations (including or excluding herring gull; eggs).

For herring gull eggs isolated, no significant relationship could be observed between trophic level and the (log) concentrations of S/MCCPs. Also for herring gull blood, no relationship between (log) concentrations of S/MCCPs and trophic level could be demonstrated. Neither were there any relationships observed between concentrations of S/MCCPs and wing length or weight.

Looking at flounder, isolated, (log) concentrations did not show significant linear relationships with trophic level. Nor were there any significant relationships between S/MCCPs-concentrations and age, length or weight.

Cod from the Inner Oslofjord

SCCPs and MCCPs have also been analysed in cod liver through the "Contaminants in coastal areas" (MILKYS) monitoring programme (Green et al. 2014). These compounds were analysed in cod liver from 11 stations (including the Inner Oslofjord) in 2013. It was noted that concentrations observed in samples from urban areas are frequently higher than from other more sparsely populated areas. Among the stations studied, only cod from the inner Trondheimsfjord and Kristiansand Harbour displayed higher concentrations of MCCPs than cod from the inner Oslofjord.

The concentration of S/MCCPs measured in flounder from the Inner Oslofjord in 2014 (present study) were substantially lower, by a factor of 3 and 37, respectively, than the median concentration measured in cod (2013; no statistics performed).

3.6 Phosphorus flame retardants (PFRs)

The results from the analysis of PFRs are given in the Appendix.

Relation to quality standards

There are no relevant quality standards to relate to for any of the PFRs analysed in this study.

Diffuse inputs

Most of the PFRs were detected in some of the storm water samples (either water fraction or particulate fraction; Figure 29). The variability was very large for some compounds.

Bekkelaget STP did not report measurements of discharge of PFRs in 2013.

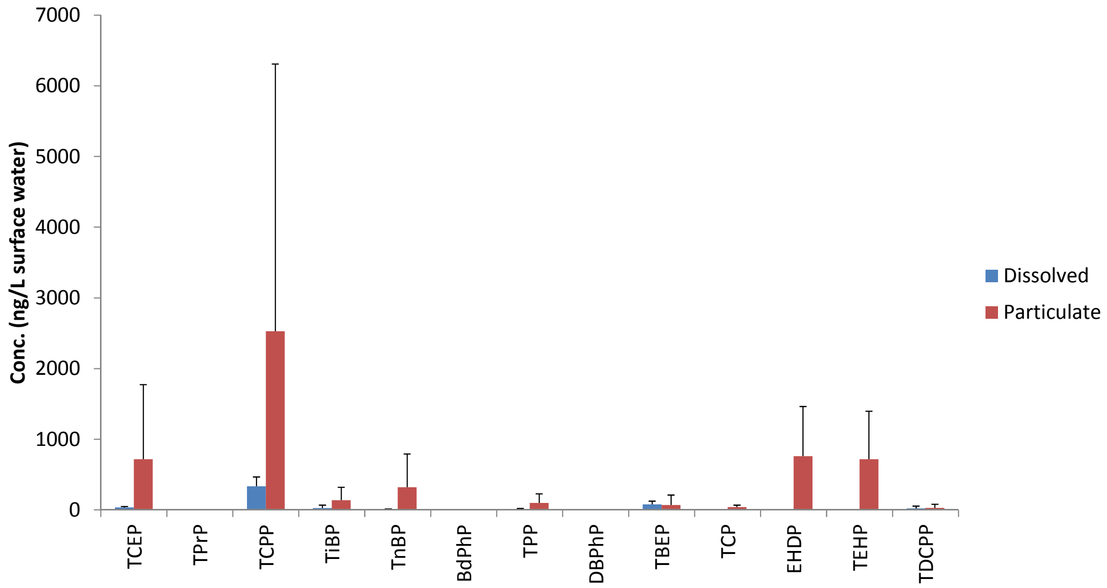


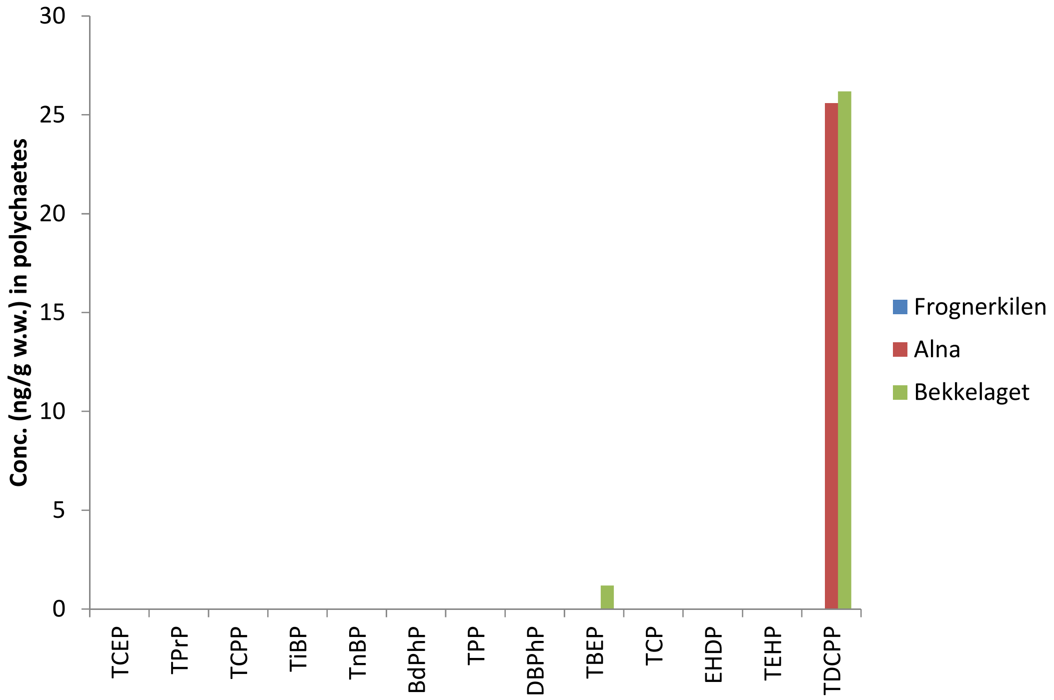
Figure 29. Concentrations of PFRs (ng/L of water) in storm water/surface water (mean and standard deviation; n=4; non-detects are assigned values of zero).

Geographical aspects

Of the phosphorus flame retardants, it was mainly TDCPP that was detected in polychaetes and blue mussel (Figure 30). This compound was detected at the mouth of Alna River in both organisms.

A larger number of PFR compounds were detected in sediments from Frognerkilen, the mouth of Alna River and Bekkelaget (Figure 31), than in polychaetes and blue mussel. Variability was high. In contrary to the organisms, TDCPP was not the dominating compound in sediments.

A.



B.

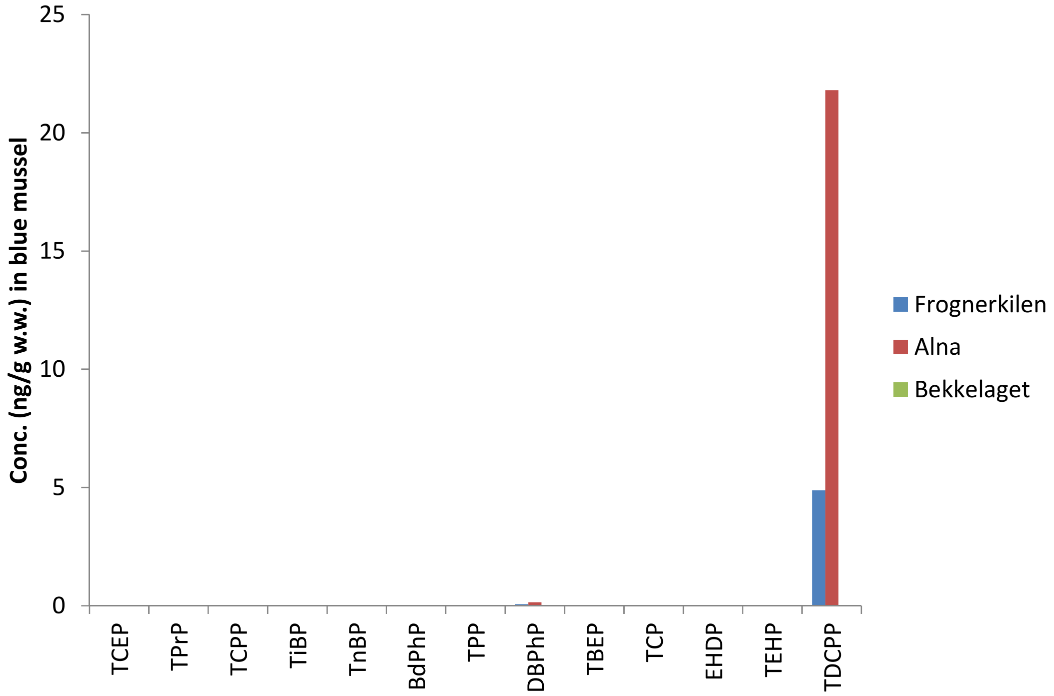


Figure 30. Concentrations of PFRs (ng/g wet wt.) in in polychaetes (A.) and blue mussel (B.) from Frognerkilen, the mouth of Alna River and at Bekkelaget. One composite sample per station.

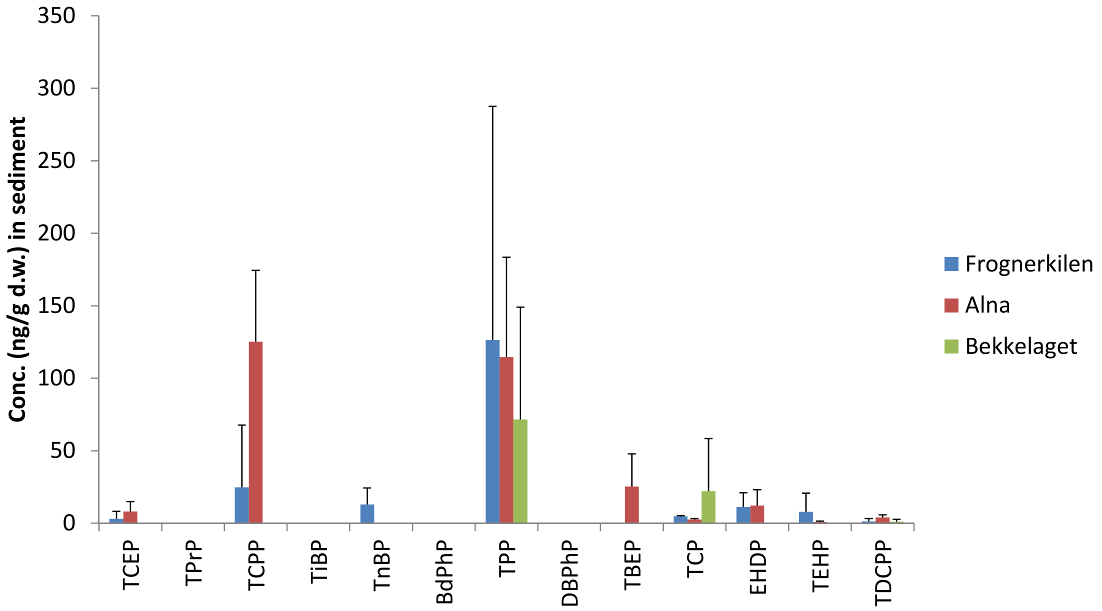


Figure 31. Concentrations of PFRs (ng/g dry wt.) in sediments from Frognerkilen, the mouth of Alna River and at Bekkelaget (mean and standard deviation; n=3; non-detects are assigned values of zero).

Herring gull

A few of the PFR compounds were detected in some samples of gull eggs and/or blood, and variability was high (Figure 32).

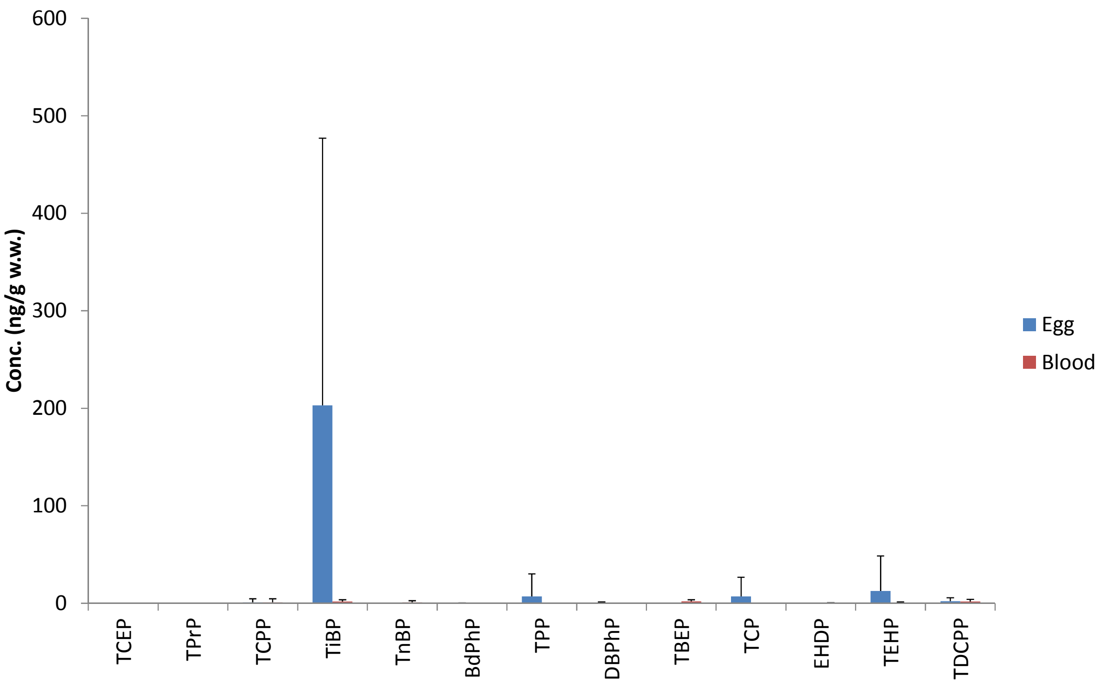


Figure 32. Concentrations of PFRs (ng/g wet wt.) in Herring gull (eggs and blood) from the Inner Oslofjord (mean and standard deviation; n=14 and 16, respectively; non-detects are assigned values of zero).

Food chain of the Inner Oslofjord

Evaluations of the concentrations of PFRs in the Inner Oslofjord food web were performed on a wet weight basis.

The PFR compounds were below the limit of detection in the majority of the samples. There were no demonstrable relationships between trophic level and (log) concentration of PFRs in the studied Inner Oslofjord food web (including or excluding herring gull; eggs).

Looking at flounder, isolated, (log) concentrations did not show significant linear relationships with trophic level. Nor were there any significant relationships between PFR-concentrations and age, length or weight.

For herring gull in isolation, in blood, the (log) PFR-concentrations did not show significant linear relationships with trophic position. Nor were there any significant relationships between PFR concentrations and wing length or weight. None of the PFRs were detected in more than half of the egg samples and the (log) PFR-concentrations did not show significant linear relationships with trophic position of the eggs.

Cod from the Inner Oslofjord

PFRs have also been analysed in cod liver, through the "Contaminants in coastal areas" (MILKYS) monitoring programme (Green et al. 2014). In 2013, these compounds were analysed in cod liver from 11 stations (including the Inner Oslofjord). Concentrations were low, mostly below the limit of detection. In flounder livers (2014; present study) median concentrations of all PFR compounds were also below limit of detection.

3.7 Alkylphenols and bisphenols

The results from the analyses of alkylphenols and bisphenols are given in the Appendix. Additional compounds (4,4'-sulfonylbisphenol or bisphenol S; 4,4'-methylenebisphenol or 4,4'-bisphenol F; 2,2'-methylenebisphenol or 2,2'-bisphenol F; 4,4'-[2,2,2-trifluoro-1-(trifluoromethyl)ethylidene]bisphenol or bisphenol AF; 4,4'-(diphenylmethylene)bisphenol or bisphenol BP) are presented only in the Appendix.

3.7.1 Alkylphenols

Alkylphenols refer here to octylphenol and nonylphenol.

Relation to quality standards

According to “Vannforskriften” (Norwegian Law) the quality standards for octylphenol are 0.1 µg/L (annual average for fresh water) and 0.01 µg/L (annual average for costal water). For nonylphenol the quality standards are 0.3 µg/L (annual average for fresh water or coastal water) and 2.0 µg/L (maximum value for fresh water or costal water).

According to the Norwegian guidelines on classification of environmental quality in fjords and coastal waters – a revision of the classification of waters and sediments with respect to metals and organic contaminants (Bakke et al. 2007; Bakke et al. 2010), quality standards for alkylphenols in sediment are as presented in Table 22.

Table 22.
Quality standards (ng/g dry wt.) for alkylphenols in sediment according to the Norwegian guidelines on classification of environmental quality in fjords and coastal waters – a revision of the classification of waters and sediments with respect to metals and organic contaminants (Bakke et al. 2007; Bakke et al. 2010).

Alkylphenol	Class I (Background)	Class II (Good)	Class III (Moderate)	Class IV (Poor)	Class V (Very Poor)
Octylphenol	-	<3.3	3.3 – 7.3	7.3 - 36	>36
Nonylphenol	-	<18	18 - 110	110 - 220	>220

The concentrations of octylphenol and nonylphenol in the storm water samples (dissolved phase) were well below EQS. With respect to octylphenol (considering 4-*tert*-octylphenol; CAS 140-66-9) in sediments, Frognerkilen, Bekkelaget and the mouth of Alna River all showed very poor condition (class V), considering 4-*tert*-octylphenol (CAS 140-66-9) in the one sample in which this component was detected from each site. With respect to only 4-octylphenol, the mean concentrations corresponded to background concentrations (class I). With respect to nonylphenol in sediments, all stations also showed moderate condition (class III).

Diffuse inputs

Both octylphenol and nonylphenol were present in the storm water samples, and both in the dissolved and particulate fractions.

Bekkelaget STP has reported that 0.189 kg of nonylphenol ran into the plant, and 0.193 kg ran out of the plant in 2013 (BEVAS, 2014).

Geographical aspects

Concentrations of alkylphenols in polychaetes, blue mussel and sediments, respectively, from Frognerkilen, the mouth of Alna River and Bekkelaget are presented in Tables 23, 24 and 25. The variability in sediment samples was high at all stations.

Table 23.
Concentrations of alkylphenols (ng/g wet wt.) in polychaetes from Frognerkilen, the mouth of Alna River and Bekkelaget.

	4-Octylphenol	4-*t*-Octylphenol	4-Nonylphenol
Frognerkilen	3.43	<1	80.2
Mouth of Alna River	1.57	216	24.5
Bekkelaget	0.54	<1	<0.3

Table 24.
Concentrations of alkylphenols (ng/g wet wt.) in blue mussel from Frognerkilen, the mouth of Alna River and Bekkelaget.

	4-Octylphenol	4-*t*-Octylphenol	4-Nonylphenol
Frognerkilen	1.29	<0.05	34.9
Mouth of Alna River	1.79	<0.05	107
Bekkelaget	1.47	124	<0.3

Table 25.
Concentrations of alkylphenols (ng/g dry wt.) in sediments from Frognerkilen, the mouth of Alna River and Bekkelaget (mean and standard deviation; n=3; non-detects are assigned values of zero).

	4-Octylphenol	4-*t*-Octylphenol	4-Nonylphenol
Frognerkilen	2.93 (3.07)	108 (186)	33.3 (18.4)
Mouth of Alna River	2.15 (2.53)	100 (173)	25.5 (16.2)
Bekkelaget	1.76 (1.75)	60 (103)	35.6 (24.6)

Herring gull

Alkylphenols were detected in eggs and blood of herring gull (Table 26). The mean concentrations were apparently highest in blood (no statistics performed), however the variability was high.

Table 26.
Concentrations of alkylphenols (ng/g wet wt.) in Herring gull (eggs and blood) from the Inner Oslofjord (mean and standard deviation; n=15; non-detects are assigned values of zero).

	4-Octylphenol	4-*t*-Octylphenol	4-Nonylphenol
Egg	0.20 (0.25)	11.9 (13.6)	15.0 (27.4)
Blood	1.67 (1.64)	74.3 (50.1)	92.8 (65.6)

Food chain of the Inner Oslofjord

Evaluations of the concentrations of alkylphenols in the Inner Oslofjord food web were performed on a wet weight basis.

There were no demonstrable relationships between trophic level and (log) alkylphenol concentrations in the studied Inner Oslofjord food web (Herring gull excluded).

Looking at flounder, isolated, (log) concentrations did not show significant linear relationships with trophic position. Nor were there any significant relationships between alkylphenol-concentrations and age, length nor body mass.

For herring gull in isolation, (log) concentrations of alkylphenols in eggs and blood did not show any relationship with trophic position. Neither were there any relationships between alkylphenol concentrations in blood and wing length nor body mass.

3.7.2 Bisphenol A (BPA)

Relation to quality standards

According to the Norwegian guidelines on classification of environmental quality in fjords and coastal waters – a revision of the classification of waters and sediments with respect to metals and organic contaminants (Bakke et al. 2007; Bakke et al. 2010), quality standards for bisphenol A in water and sediment are as presented in Tables 27 and 28, respectively.

Table 27.
Quality standards (µg/L) for bisphenol A in water according to the Norwegian guidelines on classification of environmental quality in fjords and coastal waters – a revision of the classification of waters and sediments with respect to metals and organic contaminants (Bakke et al. 2007; Bakke et al. 2010).

	Class I (Background)	Class II (Good)	Class III (Moderate)	Class IV (Poor)	Class V (Very Poor)
Bisphenol A	-	<1.6	1.6 – 11	11 - 110	>110

Table 28.
Quality standards (ng/g dry wt.) for bisphenol A in sediment according to the Norwegian guidelines on classification of environmental quality in fjords and coastal waters – a revision of the classification of waters and sediments with respect to metals and organic contaminants (Bakke et al. 2007; Bakke et al. 2010).

	Class I (Background)	Class II (Good)	Class III (Moderate)	Class IV (Poor)	Class V (Very Poor)
Bisphenol A	-	<11	11 – 79	79 - 790	>790

The concentrations of BPA in surface water (dissolved phase) corresponded to background concentrations. With respect to bisphenol A in sediments, mean concentrations corresponded to moderate condition (class III) at all stations.

Diffuse inputs

Bisphenol A was detected in both the dissolved and the particulate fraction of surface water. The variability was high among samples/sites. The mean concentration in the dissolved fraction was three orders of magnitude higher than in the particulate fraction.

Bekkelaget STP did not report measurements of discharge of bisphenol A in 2013.

Geographical aspects

Concentrations of bisphenol A in polychaetes, blue mussel and sediments, respectively, from Frognerkilen, the mouth of Alna River and Bekkelaget are presented in Tables 29, 30 and 31. There were no notable differences among stations, however, concentrations were apparently slightly lower at Bekkelaget, than in Frognerkilen and at the mouth of Alna River (polychaetes and sediments; no statistics performed).

Table 29.
Concentrations of bisphenol A (ng/g wet wt.) in polychaetes from Frognerkilen, the mouth of Alna River and Bekkelaget.

	Bisphenol A
Frognerkilen	9.92
Mouth of Alna River	8.70
Bekkelaget	6.73

Table 30.
Concentrations of bisphenol A (ng/g wet wt.) in blue mussel from Frognerkilen, the mouth of Alna River and Bekkelaget.

	Bisphenol A
Frognerkilen	<0.1
Mouth of Alna River	<0.1
Bekkelaget	<0.1

Table 31.
Concentrations of bisphenol A (ng/g dry wt.) in sediments from Frognerkilen, the mouth of Alna River and Bekkelaget (mean and standard deviation; n=3).

	Bisphenol A
Frognerkilen	26.6 (6.8)
Mouth of Alna River	36.8 (10.2)
Bekkelaget	14.4 (2.5)

Herring gull

Bisphenol A was measured in eggs and blood of herring gull (Table 32). Concentrations were higher in eggs than in blood (no statistics performed). Variability was very high in egg samples and BPA was not detected in 3 of 14 eggs.

Table 32.
Concentrations of bisphenol A (ng/g wet wt.) in Herring gull (eggs and blood) from the Inner Oslofjord (mean and standard deviation; n=14 and 16 for eggs and blood, respectively).

	Bisphenol A
Egg *	21.4 (55.0)
Blood	6.0 (0.8)

* Bisphenol A not detected (assigned a value of zero) in 3 of 14 samples.

Food chain of the Inner Oslofjord

Evaluations of the concentrations of bisphenol A in the Inner Oslofjord food web were performed on a wet weight basis.

There was a negative linear relationship between trophic level and (log) bisphenol A concentrations in the sampled Inner Oslofjord food web (Herring gull excluded; R^2=0.24; p=0.022; not shown). As mentioned, the results of the stable isotope analysis corroborate the conclusion that (Ruus et al. 2014) the species collected do not constitute a representative food web.

Looking at flounder, isolated, (log) concentrations of bisphenol A did not show significant linear relationships with trophic position. Nor were there any significant relationships between BPA concentrations and age, length nor body mass.

For herring gull in isolation, (log) concentrations of bisphenol A in eggs and blood did not show any relationship with trophic position. Neither were there any relationships between BPA concentrations in blood and wing length nor body mass.

3.7.3 Tetrabromobisphenol A (TBBPA)

Relation to quality standards

According to the Norwegian guidelines on classification of environmental quality in fjords and coastal waters – a revision of the classification of waters and sediments with respect to metals and organic contaminants (Bakke et al. 2007; Bakke et al. 2010), quality standards for TBBPA in water and sediment are as presented in Tables 33 and 34, respectively.

Table 33.
Quality standards (µg/L) for TBBPA in water according to the Norwegian guidelines on classification of environmental quality in fjords and coastal waters – a revision of the classification of waters and sediments with respect to metals and organic contaminants (Bakke et al. 2007; Bakke et al. 2010).

	Class I (Background)	Class II (Good)	Class III (Moderate)	Class IV (Poor)	Class V (Very Poor)
TBBPA	-	<0.052	0.052 – 0.9	0.9 - 9	>9

Table 34.
Quality standards (ng/g dry wt.) for TBBPA in sediment according to the Norwegian guidelines on classification of environmental quality in fjords and coastal waters – a revision of the classification of waters and sediments with respect to metals and organic contaminants (Bakke et al. 2007; Bakke et al. 2010).

	Class I (Background)	Class II (Good)	Class III (Moderate)	Class IV (Poor)	Class V (Very Poor)
TBBPA		<63	63 – 1100	1100 - 11000	>11000

TBBPA was not detected in the dissolved phase of the surface water. The mean concentration in the particulate phase was 0.10 ng/L (standard deviation: 0.06; not detected in one sample). With respect to TBBPA in sediments, concentrations at all stations corresponded to background concentrations (class I).

Diffuse inputs

As mentioned, TBBPA was not detected in the dissolved phase of the surface water. The mean concentration in the particulate phase was 0.10 ng/L (standard deviation: 0.06; not detected in one sample).

Bekkelaget STP has reported that 0.522 kg of TBBPA ran into the plant, and 1.257 kg ran out of the plant in 2013. (BEVAS, 2014).

Geographical aspects

Concentrations of TBBPA in polychaetes, blue mussel and sediments, respectively, from Frognerkilen, the mouth of Alna River and Bekkelaget are presented in Tables 35, 36 and 37. TBBPA was not detected in blue mussel. The TBBPA concentration in polychaetes was apparently highest at Bekkelaget (no statistics possible), but this could not be observed for sediments.

Table 35.
Concentrations of TBBPA (ng/g wet wt.) in polychaetes from Frognerkilen, the mouth of Alna River and Bekkelaget.

	TBBPA
Frognerkilen	<19.8
Mouth of Alna River	5.73
Bekkelaget	82.7

Table 36.
Concentrations of TBBPA (ng/g wet wt.) in blue mussel from Frognerkilen, the mouth of Alna River and Bekkelaget.

	TBBPA
Frognerkilen	<3
Mouth of Alna River	<3
Bekkelaget	<3

Table 37.
Concentrations of TBBPA (ng/g dry wt.) in sediments from Frognerkilen, the mouth of Alna River and Bekkelaget (mean and standard deviation; n=3).

	TBBPA
Frognerkilen	6.09 (4.36)
Mouth of Alna River	2.71 (0.21)
Bekkelaget	3.88 (1.58)

Herring gull

TBBPA could be detected in neither eggs, nor blood from herring gull.

Food chain of the Inner Oslofjord

Evaluations of the concentrations of TBBPA in the Inner Oslofjord food web were performed on a wet weight basis.

TBBPA was only detected in the polychaetes and in one out of 15 flounders.

3.8 Siloxanes

The results from the analysis of cyclic volatile methylsiloxanes are given in the Appendix.

Field blanks were prepared, and exposed and handled in the field during collection and preparation of samples. The results from the analysis of the field blanks are presented in chapter 2.2.4. The reason for elevated concentrations of D4 in reference blanks is unknown, however, concentrations in field blanks were below, or not different from reference blanks. No corrections have been made based on these results.

Relation to quality standards

There are no relevant quality standards to relate to the siloxanes D4, D5 and D6.

Diffuse inputs

Siloxanes could not be detected in the dissolved fraction of storm water. In the particulate fraction D6 could be detected inn all samples, while D5 was detected in one out of four sites/samples.

Bekkelaget STP did not report measurements of discharge of Siloxanes in 2013.

Geographical aspects

Siloxanes were detected in polychaetes and blue mussel from Frognerkilen, the mouth of Alna River and at Bekkelaget (Figure 33). D5 was found at the highest concentrations. In polychaetes, the highest concentrations (of all three compounds) were apparently found at Bekkelaget (as in 2013). In blue mussel, the highest concentration of D5 was apparently found in Frognerkilen.

Also in sediments D5 was found at the highest concentrations. Bekkelaget and the mouth of Alna River displayed the highest concentrations of this compound (Figure 34; no statistics performed).

High concentrations of D5 have previously been reported in sewage sludge (Andersen et al. 2012).

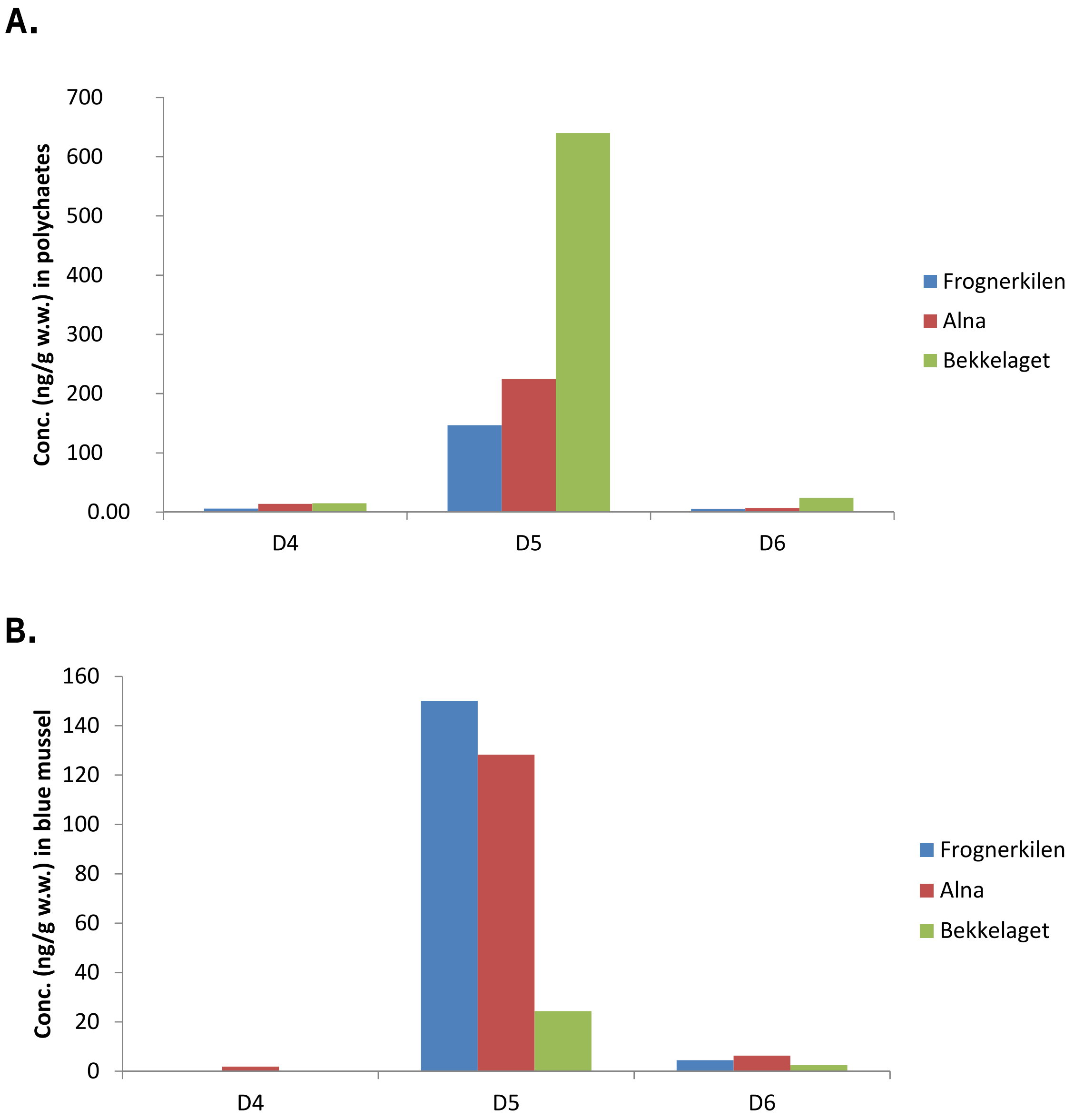


Figure 33. Concentrations of cyclic volatile methylsiloxanes (ng/g wet wt.) in polychaetes (A.) and blue mussel (B.) from Frognerkilen, the mouth of Alna River and at Bekkelaget. One composite sample per station.

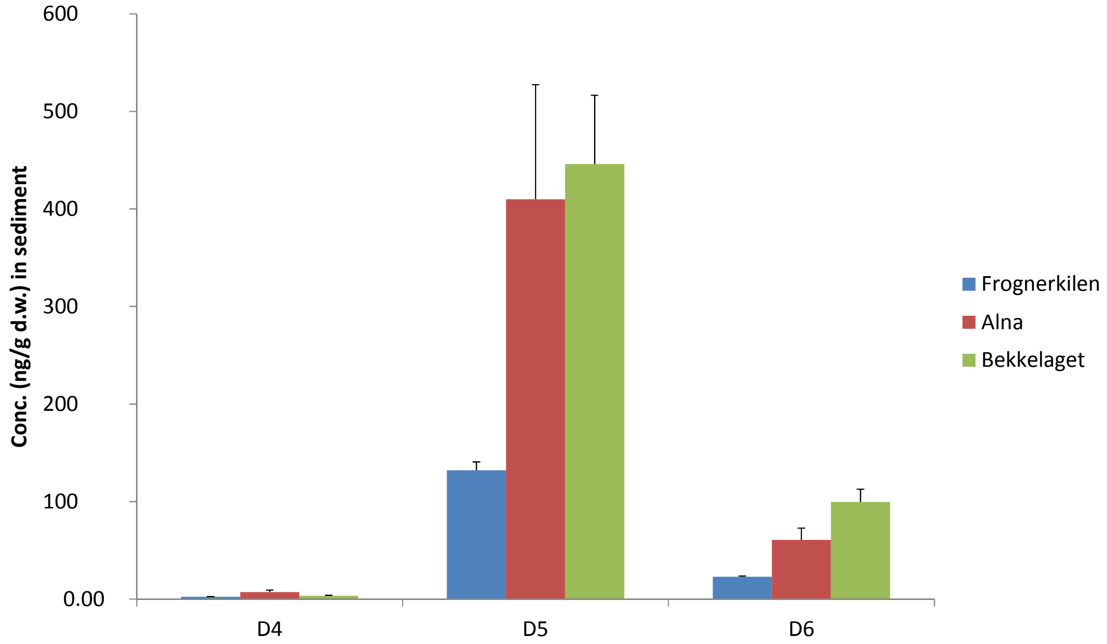


Figure 34. Concentrations of cyclic volatile methylsiloxanes (ng/g dry wt.) in sediments from Frognerkilen, the mouth of Alna River and at Bekkelaget (mean and standard deviation; n=3).

Herring gull

Siloxanes were detected in eggs and blood of Herring gull (Figure 35). D5 displayed the highest concentrations and the variability was high. In blood, D4 was only detected in 2 out of 16 samples.

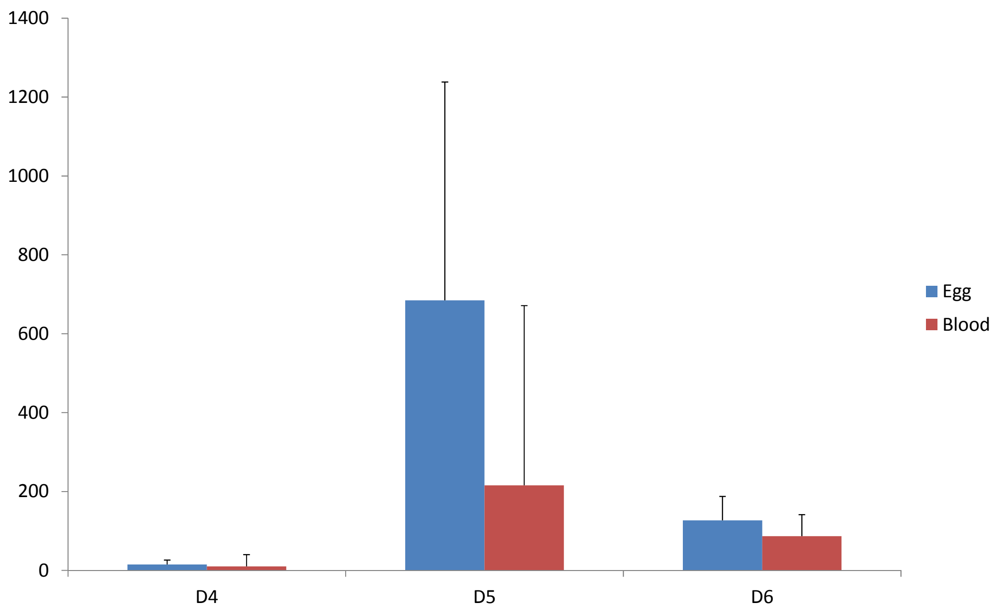


Figure 35. Concentrations of cyclic volatile methylsiloxanes (ng/g lipid wt.) in Herring gull (eggs and blood) from the Inner Oslofjord (mean and standard deviation; n=14 and 16, respectively; non-detects are assigned values of zero, relevant only for blood, where only D4 was not detected in 14 of 16 samples).

Food chain of the Inner Oslofjord

Evaluations of the concentrations of siloxanes in the Inner Oslofjord food web were performed on a lipid weight basis.

The (log) concentrations of D4, D5 and D6 showed positive relationships with trophic position when herring gull eggs were included in the food web (R^2=0.22, 0.18 and 0.26 respectively; p=0.003, 0.007 and 0.001 respectively; not shown), but not when Herring gull was represented by blood samples, nor when herring gull was excluded from the food web. This could be observed, despite the low trophic position of the Herring gull (eggs), as discussed for PCBs (above), for which similar behaviour was observed. As already mentioned, the results of the stable isotope analysis corroborate the conclusion that the species collected do not constitute a representative food web (Ruus et al. 2014), and that indications of biomagnification (or lack of such) using the trophic magnification approach are not conclusive.

For herring gull in isolation, (log) concentrations in eggs showed no significant relationships with trophic position. In blood (with a span in δ^{15}N ranging over >1 trophic level, among individual birds), however, a significant positive linear relationship between (log) concentrations and trophic position could be observed for D5 (R^2=0.37, p=0.01; Figure 36). Such positive relationship in herring gulls was also observed for several PCB-congeners (chapter 3.2). It must be noted however, that the regression is likely highly influenced by a couple of individuals with high trophic position and high D5 concentrations.

The concentrations of siloxanes (in blood) did not show any significant relationships with wing length, but a significant positive relationship with body mass for D5 (Figure 37 depicts the relationship between body mass and (log) concentration of D5). Again, this is similar to the observations for several PCB-congeners (chapter 3.2).

Looking at flounder, isolated, (Log) concentrations showed significant negative linear relationships with trophic position for D4 and D5 (R^2=0.34 and 0.27 respectively, p=0.02 and 0.04 respectively; not shown), but there were no relationships between concentrations and age, length, nor weight. However, it must be noted that the regressions are likely highly influenced by two of individuals with low trophic position and high D5 concentrations, relative to the other individuals.

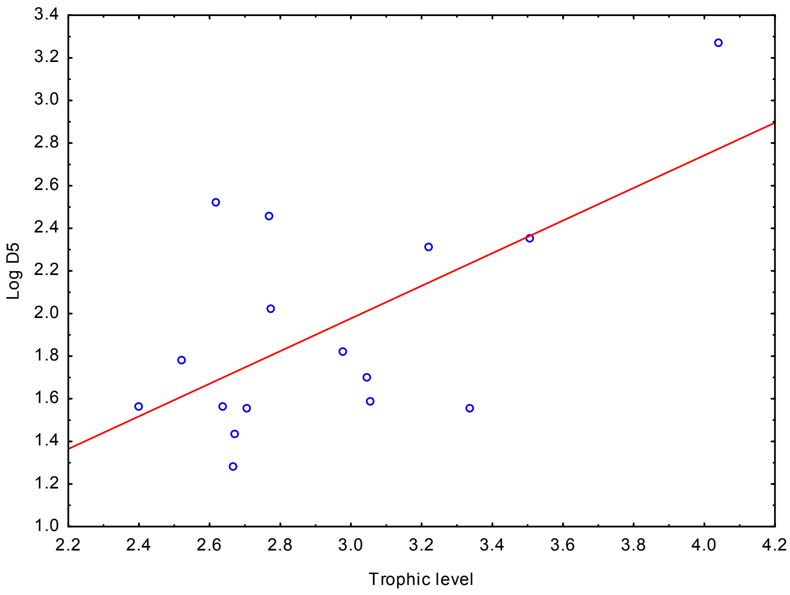


Figure 36. Trophic position against concentrations (ng/g lipid wt.; log-transformed) of D5 (decamethylcyclopentasiloxane) in Herring gull (blood) from the Inner Oslofjord (n=16; R^2=0.37, p=0.01).

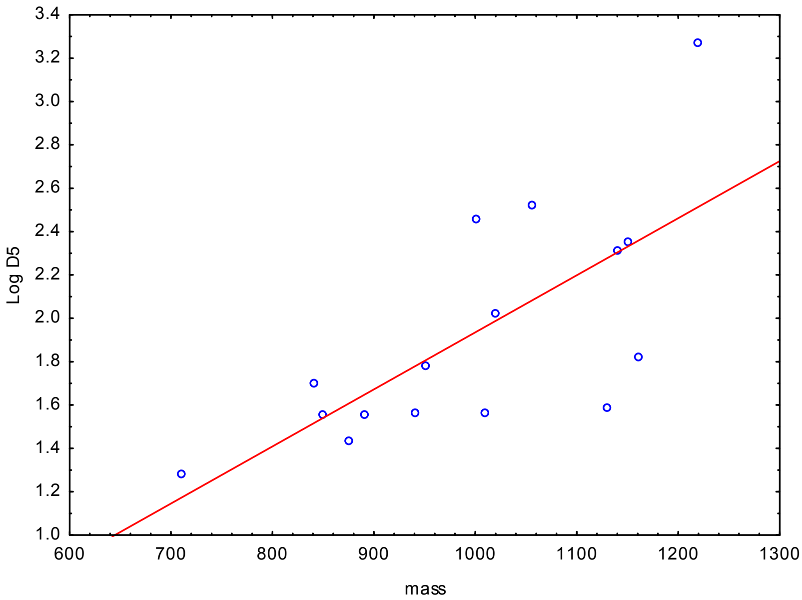


Figure 37. Body mass (g) against concentrations (ng/g lipid wt.; log-transformed) of D5 (decamethylcyclopentasiloxane) in herring gull (blood) from the inner Oslofjord (n=16; R^2=0.49, p=0.002).

3.9 Per- and polyfluorinated substances (PFAS)

The results from the PFAS analysis are given in the Appendix.

Relation to quality standards

According to the Norwegian guidelines on classification of environmental quality in fjords and coastal waters – a revision of the classification of waters and sediments with respect to metals and organic contaminants (Bakke et al. 2007; Bakke et al. 2010), quality standards for PFAS (more specifically PFOS) in water and sediment are as presented in Tables 38 and 39, respectively.

Table 38.
Quality standards (µg/L) for PFOS in water according to the Norwegian guidelines on classification of environmental quality in fjords and coastal waters – a revision of the classification of waters and sediments with respect to metals and organic contaminants (Bakke et al. 2007; Bakke et al. 2010).

	Class I (Background)	Class II (Good)	Class III (Moderate)	Class IV (Poor)	Class V (Very Poor)
PFOS	-	<25	25 – 72	72 - 360	>360

Table 39.
Quality standards (ng/g dry wt.) for PFOS in sediment according to the Norwegian guidelines on classification of environmental quality in fjords and coastal waters – a revision of the classification of waters and sediments with respect to metals and organic contaminants (Bakke et al. 2007; Bakke et al. 2010).

	Class I (Background)	Class II (Good)	Class III (Moderate)	Class IV (Poor)	Class V (Very Poor)
PFOS	<0.17	0.17 – 220	220 – 630	630 - 3100	>3100

In storm water/surface water samples, PFOS was only detected in the dissolved phase, and the concentrations were below the upper limit for background concentrations (class I).

PFOS were detected all sediment samples and the mean concentrations corresponded to borderline background (Class I) and good condition (class II) in Frognerkilen and at the mouth of Alna River (0.18 and 0.17 ng/g dry wt., respectively), and good condition (Class II) at Bekkelaget (0.57 ng/g dry wt.).

Diffuse inputs

Concentrations of PFASs determined in storm water are depicted in Figure 38. The compounds were only detected in the dissolved fraction.

Bekkelaget STP did not report measurements of discharge of PFASs in 2013.

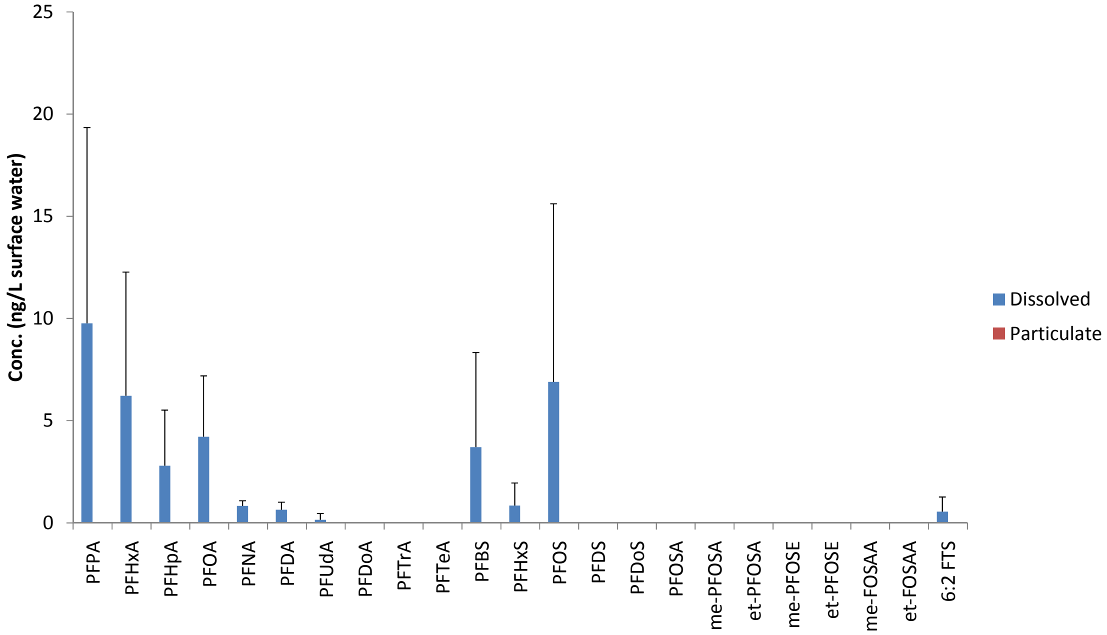


Figure 38. Concentrations of PFASs (ng/L of water) in storm water/surface water (mean and standard deviation; n=4; non-detects are assigned values of zero).

Contribution of PFAS inputs to the Inner Oslofjord from Alna River in 2013 and 2014 is available through the programme "Riverine inputs and direct discharges to Norwegian coastal waters" (RID; Skarbøvik et al. 2014). Mean particulate-bound PFOS and PFDS concentrations and calculated fluxes reported in Skarbøvik et al. (2014) are presented in Tables 40 and 41.

Table 40.
PFAS concentrations measured in the suspended particulate matter of the Alna River (ng/g), collected by continuous flow centrifugation measured through RID monitoring programme in 2013 and 2014

Analyte	PFOS	PFDS (ng/g)
Mean 2013	0.45	0.23
%RSD	150	68
Mean 2014	0.51*	0.21*,**
%RSD	53	-

*Mean of three sampling events
**One value below limits of detection (mean calculated using the LoD for this value)

Table 41.
Yearly fluxes of particle-bound PFOS and PFDS from the Alna River to the inner Oslofjord (g/year) for 2013.

PFOS	PFDS
0.17	0.09

Geographical aspects

There were differences in concentrations (statistical evaluation not applicable due to limited number of samples) of PFASs in polychaetes from Frognerkilen, the mouth of Alna River and Bekkelaget (Figure 39). As in 2013, concentrations were apparently highest at Bekkelaget.

Of all the PFASs, only PFOS and PFOSA were detected in blue mussel on all three stations. In addition, PFDoA was detected in blue mussel from the mouth of Alna River.

In sediments, only a few compounds were detected (however not always in all three replicates). The largest number of compounds, as well as the highest concentrations, were found at Bekkelaget (Figure 40).

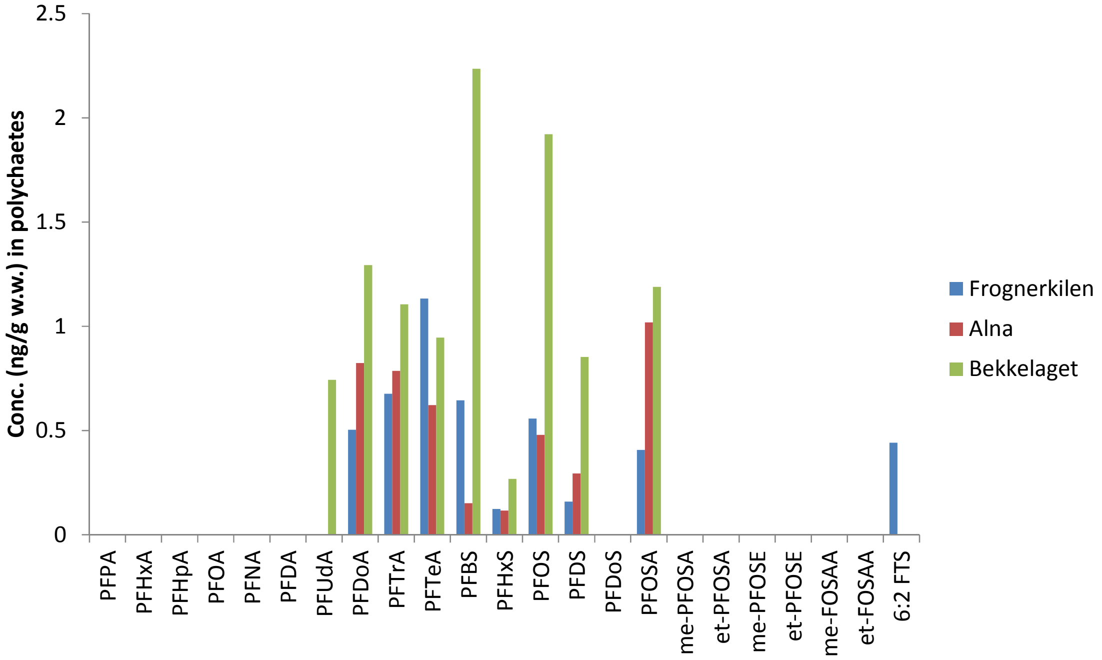


Figure 39. Concentrations of PFASs (ng/g wet wt.) in polychaetes from Frognerkilen, the mouth of Alna River and Bekkelaget. One composite sample per station.

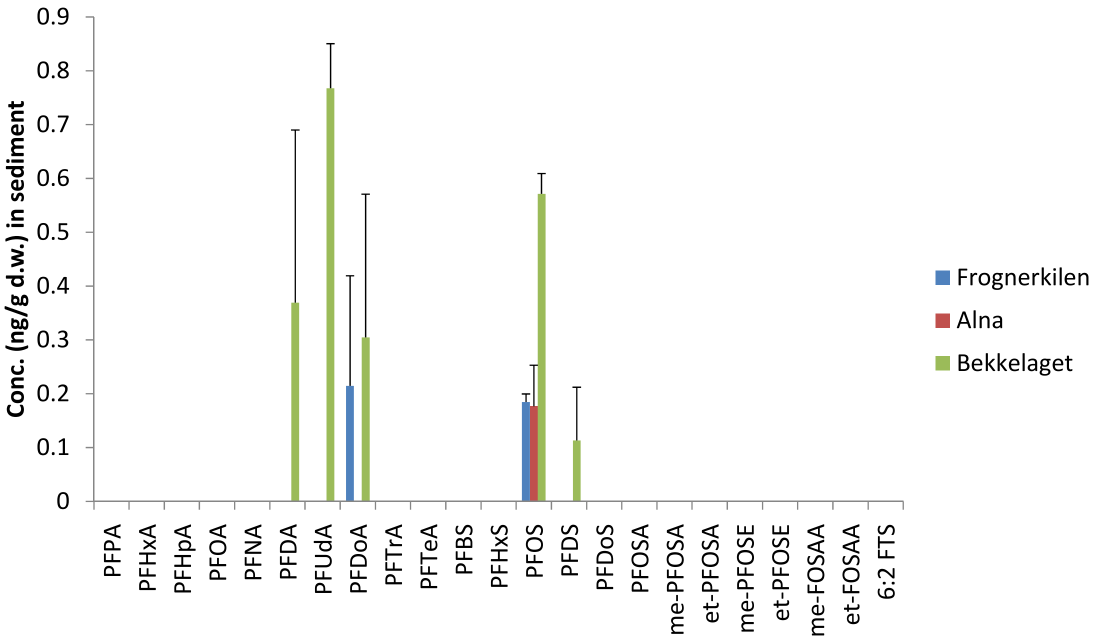


Figure 40. Concentrations of PFASs (ng/g wet wt.) in sediments from Frognerkilen, the mouth of Alna River and at Bekkelaget (mean and standard deviation; n=3; non-detects are assigned values of zero).

Herring gull

PFASs were detected in eggs and blood of herring gull (Figure 41). PFOS constituted the highest concentrations in both matrices. The variability was high, as the concentration range of e.g. PFOS in eggs spanned over almost three orders of magnitude.

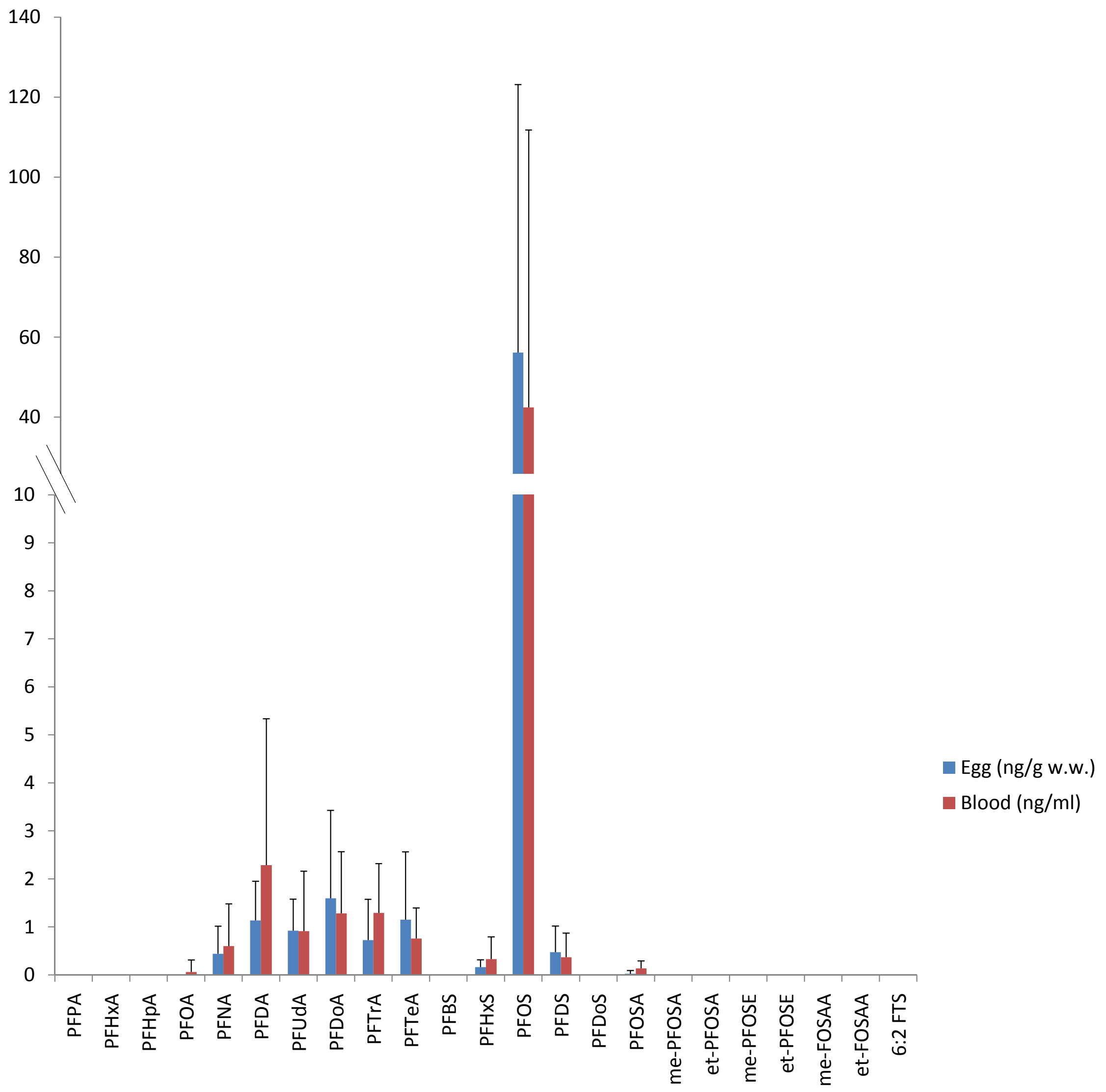


Figure 41. Concentrations of PFASs in eggs (ng/g. wet wt.) and blood (ng/ml) of Herring gull from the Inner Oslofjord (mean and standard deviation; n=14 and 16, respectively; non-detects are assigned values of zero). Note broken axis and different scales (top vs. bottom).

Food chain of the Inner Oslofjord

Evaluations of the concentrations of PFASs in the Inner Oslofjord food web were performed on a wet weight basis.

There were no demonstrable (significant) relationships between (log) PFAS-concentrations and trophic level in the sampled food web (Herring gull eggs included), except for a weak negative relationship for PFOS (R^2=0.10; p=0.048; not shown). As mentioned, the results of the stable isotope analysis corroborate the conclusion that the species collected do not constitute a representative food web (Ruus et al. 2014). With herring gull excluded, a positive relationship was observed for PFTeA (R^2=0.51; p=0.003; not shown), however, this compound was only detected in nine flounder samples, as well as polychaetes and prawns. Looking at flounder, isolated, (log) concentrations of PFTeA also showed a significant positive linear relationship with trophic position (R^2=0.51; p=0.029; not shown). No relationships could be observed between any of the PFAS-concentrations measured and age, length or weight.

Looking at Herring gull, isolated, (log) concentrations of PFASs did not show any relationships with trophic position in eggs.

In blood (with a span in $\delta^{15}N$ ranging over >1 trophic level, among individual birds), however, a significant positive linear relationship between (log) concentrations and trophic position could be observed for PFDA, PFUdA, PFTrA, PFHxS, PFOS, PFDS and PFOSA (R^2=0.56, 0.80, 0.48, 0.47, 0.56, 0.42 and 0.70 respectively; p=0.003, 0.001, 0.008, 0.009, 0.0008. 0.03 and 0.002 respectively). Figure 42 depicts this relationship for PFOS. The concentrations of some PFASs (in blood), such as PFOS, also showed significant positive relationships with wing length and/or body mass ($p<0.05$; not shown), much because of three large birds with higher PCB-concentrations that the other birds.

Cod from the Inner Oslofjord

Per- and polyfluorinated substances have also been analysed in cod liver annually since 2005, through the "Contaminants in coastal areas" (MILKYS) monitoring programme (Green et al. 2014). In 2013, these compounds were analysed in cod liver from eight stations (including the Inner Oslofjord).

The median concentration of perfluoroctonoic sulphonate (PFOS) was highest in the Inner Oslofjord (3.24 ng/g wet wt.).

Perfluorooctane sulphonamide (PFOSA) had a maximum median concentration of 7.16 ng/g wet wt. in the Inner Oslofjord.

The concentration of PFOSA was higher than PFOS in the Inner Oslofjord and Færder.

It was noted that parts of the Inner Oslofjord are densely populated with much urban activities including use of PFOSA in certain products. The high concentrations of PFOSA observed in cod are probably related to these activities, as well as reduced water exchange with the Outer fjord (Green et al. 2014).

Apparently, the median concentration of PFOS measured in flounder from the Inner Oslofjord in 2014 (present study) were higher than the median concentration measured in cod (2013; a factor of ~10), while the median concentration of PFOSA was somewhat lower (no statistics performed).

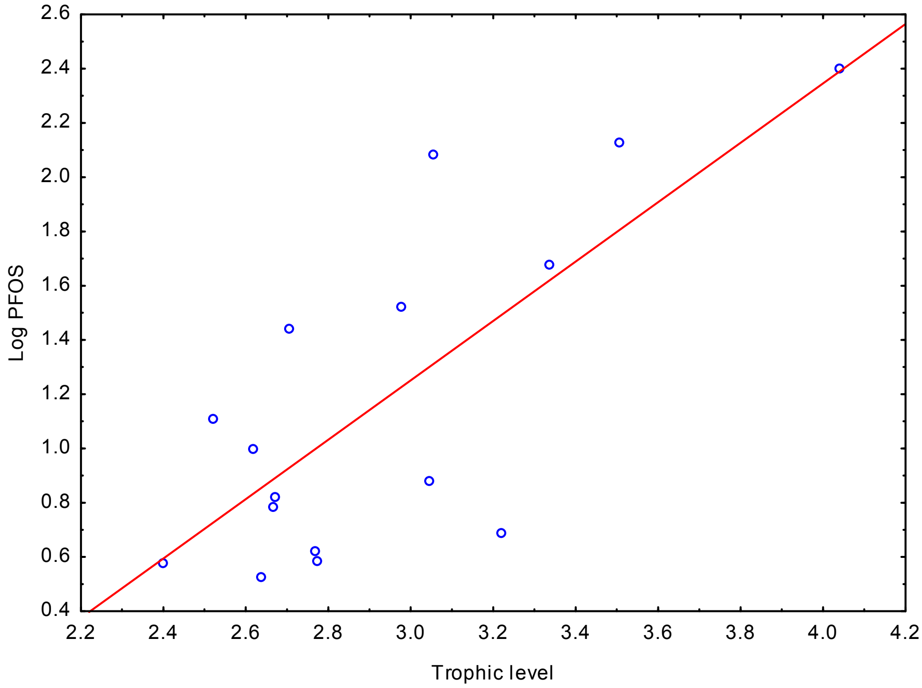


Figure 42. Trophic position against concentrations (ng/g wet wt.; log-transformed) of PFOS in Herring gull blood (R^2=0.56. p=0.0008).

3.10 Biocides

The results from the analyses of biocides are given in the Appendix. Regarding tinorganic compounds, additional compounds (tetrabutyltin, TetraBT; monooctyltin, MOT; dioctyltin, DOT; tricyclohexyltin, TCHT) are also presented there, which are not referred to below.

3.10.1 Tinorganic compounds

Relation to quality standards

According to “Vannforskriften” (Norwegian Law) the quality stardards for tributyltin (TBT) are 0.0002 µg/L (annual average for fresh water and coastal water) and 0.0015 µg/L (Maximum value for fresh water and costal water).

According to the Norwegian guidelines on classification of environmental quality in fjords and coastal waters – a revision of the classification of waters and sediments with respect to metals and organic contaminants (Bakke et al. 2007; Bakke et al. 2010), quality standards for TBT in sediment are as presented in Table 42.

According to the Norwegian classification of environmental quality in fjords and coastal waters (Molvær et al. 1997), quality standards for TBT in mussel are as presented in Table 43.

Table 42.
Quality standards (ng/g dry wt.) for TBT in sediment according to the Norwegian guidelines on classification of environmental quality in fjords and coastal waters – a revision of the classification of waters and sediments with respect to metals and organic contaminants (Bakke et al. 2007; Bakke et al. 2010).

	Class I (Background)	Class II (Good)	Class III (Moderate)	Class IV (Poor)	Class V (Very Poor)
TBT (effect based)	<1	<0.002	0.002 – 0.016	0.016 – 0.032	>0.032
TBT (management related)	<1	1 – 5	5 - 20	20 - 100	>100

Table 43.
Quality standards (µg/g dry wt.) for TBT in mussel according to the Norwegian classification of environmental quality in fjords and coastal waters (Molvær et al. 1997).

	Class I Insignificantly polluted	Class II Moderately polluted	Class III Markedly polluted	Class IV Strongly polluted	Class V Very strongly polluted
TBT	< 0.1	0.1 – 0.5	0.5 - 2	2 – 5	> 5

Tinorganic compounds were not measured in water within the current programme. In sediments from Frognerkilen, TBT concentrations corresponded to very poor environmental condition (class V). Lasting elevated levels of TBT in the sediments of most of the Inner Oslofjord are known (Berge et al. 2013).

There was not enough material to measure tinorganic compounds in the blue mussel sample from Frognerkilen since the method demands a high amount of soft tissue, and Diuron and Irgarol was prioritized in agreement with the Norwegian Environment Agency. The concentrations of tinorganic compounds in polychaetes from Frognerkilen are presented in Table 44. The concentrations in sediment from Frognerkilen are presented in Table 45.

Frognerkilen has for many decades been the site of many marinas/boat jetties, as well as a commercial harbour at Filipstad. It should be noted that Since 1990, use of tinorganic compounds in antifouling agents on boats less than 25 m long has been forbidden, from 2003 it has also been forbidden to apply TBT on ships >25 m. From 2008 all occurrence of antifouling agents containing tinorganic compounds has been banned.

Table 44.
Concentrations (ng/g wet wt.) of tinorganic compounds in polychaetes and blue mussel from Frognerkilen (inner Oslofjord).

Compound	Polychaetes
MBT	12.0
DBT	25.5
TBT	80.2
TPhT	3.23

Table 45.
Concentrations (ng/g dry wt.) of tinorganic compounds in sediment from Frognerkilen (inner Oslofjord; mean and standard deviation; n=3).

Compound	Sediment
MBT	28.7 (2.47)
DBT	67.2 (9.25)
TBT	186.7 (15.3)
TPhT	3.89 (1.14)

3.10.2 Diuron

Diuron was measured in sediment samples from Frognerkilen (n=3). However, all measurements were below the limit of detection (<0.05 µg/g dry wt). Diuron was also measured in polychaetes from Frognerkilen, however, the concentration was below the limit of detection (<0.005 µg/g wet wt).

3.10.3 Irgarol

Irgarol was measured in sediment samples from Frognerkilen (n=3). However, all measurements were below the limit of detection (<0.05 µg/g dry wt). Irgarol was also measured in polychaetes from Frognerkilen, however, the concentration was below the limit of detection (<0.01 µg/g wet wt).

3.10.4 Ethylene thiourea

Ethylene thiourea (ETU) is a metabolite of Zineb (biocide used in Norway in antifouling paints), and was measured in sediment samples from Frognerkilen (n=3). However, all measurements were below the limit of detection (<10 to <15 ng/g dry wt, dependent on sample). ETU was also measured in polychaetes and blue mussel from Frognerkilen, however, the concentrations were below the limit of detection (<20 ng/g wet wt). The limit of detection was higher than desired, because of low recoveries (a QA/QS measure).

3.11 Metals

The results of the metal analyses are given in the Appendix.

Relation to quality standards

According to "Vannforskriften" (Norwegian Law) the quality stardards for metals in question in water are presented in Table 46. "Vannforskriften" also gives an EQS for mercury (and mercury compounds) in organisms such as fish, molluscs, crustaceans and other organisms in freshwater and coastal water of 20 ng/g wet wt. Quality standards for some of the other metals not handled by "Vannforskriften" are given in the Norwegian guidelines on classification of environmental quality in fjords and coastal waters – a revision of the classification of waters and sediments with respect to metals and organic contaminants (Table 47; Bakke et al. 2007; Bakke et al. 2010).

According to the Norwegian guidelines on classification of environmental quality in fjords and coastal waters – a revision of the classification of waters and sediments with respect to metals and organic contaminants (Bakke et al. 2007; Bakke et al. 2010), quality standards for the relevant metals in sediment are as presented in Table 48. According to the Norwegian classification of environmental quality in fjords and coastal waters (Molvær et al. 1997), quality standards for the relevant metals (except Hg, since EQS is given in "Vannforskriften") in mussel are as presented in Table 49.

Table 46.
Environmental Quality Standards for metals according to "Vannforskriften" (Norwegian law; µg/L).

Metal	CAS.no.	AA-EQS fresh water	AA-EQS coastal water	MAC-EQS fresh water	MAC-EQS coastal water
Cadmium (and compounds)	7440-43-9	≤0.08 (class 1) 0.08 (class 2) 0.09 (class 3) 0.15 (class 4) 0.25 (class 5)	0.2	≤0.45 (class 1) 0.45 (class 2) 0.6 (class 3) 0.9 (class 4) 1.5 (class 5)	≤0.45 (class 1) 0.45 (class 2) 0.6 (class 3) 0.9 (class 4) 1.5 (class 5)
Lead (and compounds)	7439-92-1	7.2	7.2	Na	Na
Mercury (and compounds)	7439-97-6	0.05	0.05	0.07	0.07
Nickel(and compounds)	7440-02-0	20	20	Na	Na

Table 47.
Quality standards (µg/L) for metals in water according to the Norwegian guidelines on classification of environmental quality in fjords and coastal waters – a revision of the classification of waters and sediments with respect to metals and organic contaminants (Bakke et al. 2007; Bakke et al. 2010).

PAH compound	Class I (Background)	Class II (Good)	Class III (Moderate)	Class IV (Poor)	Class V (Very Poor)
Arsenic (As)	<2	2 - 4.8	4.8 – 8.5	8.5 - 85	>85
Copper (Cu)	<0.3	0.3 -0.64	0.64 -0.8	0.8 -7.7	>7.7
Chrome (Cr)	<0.2	0.2 - 3.4	3.4 - 36	36 - 360	>360
Zinc (Zn)	<1.5	1.5 - 2.9	2.9 - 6	6 - 60	>60

Table 48.
Quality standards (µg/g dry wt.) for metals in sediment according to the Norwegian guidelines on classification of environmental quality in fjords and coastal waters – a revision of the classification of waters and sediments with respect to metals and organic contaminants (Bakke et al. 2007; Bakke et al. 2010).

PAH compound	Class I (Background)	Class II (Good)	Class III (Moderate)	Class IV (Poor)	Class V (Very Poor)
Arsenic (As)	<20	20 - 52	52 - 76	76 - 580	>580
Lead (Pb)	<30	30 - 83	83 - 100	100 - 720	>720
Cadmium (Cd)	<0.25	0.25 - 2.6	2.6 - 15	15 - 140	>140
Copper (Cu)	<35	35 - 51	51 - 55	55 - 220	>220
Chrome (Cr)	<70	70 - 560	560 - 5900	5900 - 59000	>59000
Mercury (Hg)	<0.15	0.15 - 0.63	0.63 - 0.86	0.86 - 1,6	>1.6
Nickel (Ni)	<30	30 - 46	46 - 120	120 - 840	>840
Zinc (Zn)	<150	150 - 360	360 - 590	590 - 4500	>4500

Table 49.
Quality standards (µg/g dry wt.) for metals in mussel according to the Norwegian classification of environmental quality in fjords and coastal waters (Molvær et al. 1997).

Metal	Class I Insignificantly polluted	Class II Moderately polluted	Class III Markedly polluted	Class IV Strongly polluted	Class V Very strongly polluted
Arsenic (As)	<10	10 - 30	30 - 100	100 - 200	>200
Lead (Pb)	<3	3 - 15	15 - 40	40 - 100	>100
Cadmium (Cd)	<2	2 - 5	5 - 20	20 - 40	>40
Copper (Cu)	<10	10 - 30	30 - 100	100 - 200	>200
Chrome (Cr)	<3	3 - 10	10 - 30	30 - 60	>60
Nickel (Ni)	<5	5 - 20	20 - 50	50 - 100	>100
Zinc (Zn)	<200	200 - 400	400 - 1000	1000 - 2500	>2500
Silver (Ag)	<0.3	0.3 – 1	1 - 2	2 - 5	>5

The mean concentrations of metals measured in surface water (dissolved phase) did not exceed the AA-EQS (for Cd, Pb, Hg or Ni), according to "Vannforskriften" (cadmium corresponded to class I-IV in fresh water, dependent on sample/site). According to the Norwegian guidelines on classification of environmental quality in fjords and coastal waters – a revision of the classification of waters and sediments with respect to metals and organic contaminants (Bakke et al. 2007; Bakke et al. 2010), the concentrations of metals corresponded to background concentration (class I; As) to poor environmental condition (class IV; Cu and Zn).

In sediments the metal concentrations corresponded to background concentrations (class I; Pb), background concentrations to good environmental condition (class I – II; Cd), dependent on station, good environmental condition (class II; Cr), good to moderate environmental condition (class II – III; As), dependent on station, moderate environmental condition (class III; Ni), poor environmental condition (class IV; Cu and Zn), and good to very poor environmental condition (class II – V; Hg), dependent on station. Hg concentrations were highest in Frognerkilen and lowest at Bekkelaget (see below).

Concentrations of mercury (Hg) in mussel did not exceed the EQS given by "Vannforskriften" at any of the three stations. The quality standards for the other metals in mussel (Table 49) are expressed as µg/g dry wt. Total dry matter was not measured in blue mussel within the programme. However, environmental monitoring along the Norwegian coast (Green et al. 2013) has shown that the total dry matter in blue mussel is on average 16.7% (±0.2%; based on analysis of >2000 samples). Thus, the concentration of metals in blue mussel corresponded to background concentrations (class I; AS, Cd, Zn, Ag), background concentrations to moderately polluted (class I - II; Cu), moderately to markedly polluted (class II - III; Ni), markedly polluted (class III; Pb) and markedly to strongly polluted (calss III - IV; Cr).

Diffuse inputs

The concentrations of metals measured in surface water (dissolved phase and particulate phase, respectively) are presented in Table 50.

Table 50..
Concentrations (µg/L; ng/L for Hg) of metals in surface water (dissolved phase and particulate phase, respectively; Mean and standard deviation; n=4).

Metal	Dissolved	Particulate
Hg (ng/L)	2.94 (1.47)	0.01 (0.01)
Cr (µg/L)	0.89 (0.67)	3.83 (2.97)
Fe (µg/L)	123.9 (91)	1500 (1001)
Ni (µg/L)	3.25 (1.66)	2.18 (1.44)
Cu (µg/L)	8.84 (3.19)	5.79 (3.01)
Zn (µg/L)	23.3 (10.4)	23.5 (17.1)
As (µg/L)	0.62 (0.22)	0.39 (0.33)
Ag (µg/L)	0.005 (0.003)	0.02 (0.02)
Cd (µg/L)	0.12 (0.08)	0.02 (0.01)
Pb (µg/L)	0.33 (0.22)	2.15 (2.62)

Geographical aspects

The concentrations of metals in polychaetes and blue mussel, respectively, from Frognerkilen, the mouth of Alna River, and Bekkelaget are presented in Tables 51 and 52. The concentrations in sediment from the same stations are presented in Table 53. There were no notable differences between stations.

Table 51.
Concentrations (µg/g wet wt.) of metals in polychaetes from Frognerkilen, the mouth of Alna River, and Bekkelaget (Inner Oslofjord).

Metal	Frognerkilen	Alna	Bekkelaget
Hg	0.05	0.01	0.03
Cr	8.83	2.66	5.65
Fe	655.9	401.4	1065
Ni	5.51	1.88	3.31
Cu	16.53	6.36	19.12
Zn	23.42	35.49	16.62
As	2.51	3.06	3.94
Ag	0.78	0.23	1.09
Cd	0.14	0.16	0.31
Pb	20.49	7.72	13.23

Table 52.
Concentrations (µg/g wet wt.) of metals in blue mussel from Frognerkilen, the mouth of Alna River, and Bekkelaget (Inner Oslofjord).

Metal	Frognerkilen	Alna	Bekkelaget
Hg	0.01	0.01	0.01
Cr	8.21	2.86	8.13
Fe	89.5	46.6	53.0
Ni	4.75	1.71	4.94
Cu	1.97	1.61	1.28
Zn	23.39	22.21	19.20
As	1.06	0.97	0.91
Ag	0.004	0.003	0.002
Cd	0.15	0.16	0.14
Pb	4.80	4.77	3.72

Table 53.
Concentrations (µg/g dry wt.) of metals in sediments from Frognerkilen, the mouth of Alna River, and Bekkelaget (inner Oslofjord; mean and standard deviation; n=3).

Metal	Frognerkilen	Alna	Bekkelaget
Hg	4.85 (4.55)	0.97 (0.03)	0.45 (0.14)
Cr	117 (11.8)	118 (6.95)	111 (7.04)
Fe	53224 (3327)	46988 (5794)	59125 (2919)
Ni	49.1 (3.29)	51.0 (3.92)	51.5 (1.31)
Cu	162 (20.5)	178 (25.3)	81.9 (11.1)
Zn	342 (24.0)	413 (27.3)	237 (15.8)
As	41.6 (3.30)	25.7 (7.93)	53.0 (3.40)
Ag	6.02 (3.50)	3.64 (0.45)	1.58 (0.13)
Cd	0.40 (0.03)	1.27 (0.35)	0.16 (0.03)
Pb	3.57 (0.82)	2.66 (0.12)	1.66 (0.27)

Herring gull

Metals were detected in eggs and blood of herring gull (Table 54). High concentrations of iron in blood are obviously related to the function of iron in the haemoglobin oxygen-transport metalloprotein.

Table 54.
Concentrations (µg/g wet wt.) of metals in herring gull (eggs and blood, respectively; mean and standard deviation; n=15; non-detects are assigned values of zero (only relevant for blood)).

Metal	Eggs	Blood
Hg	0.049 (0.066)	0.153 (0.119)
Cr *	1.125 (0.694)	0.0006 (0.0006)
Fe	31.56 (8.569)	542.7 (77.51)
Ni *	0.702 (0.415)	0.0015 (0.0030)
Cu	0.761 (0.113)	0.471 (0.068)
Zn	13.42 (4.221)	5.627 (0.665)
As	0.043 (0.024)	0.273 (0.324)
Ag	0.0005 (0.0003)	0.0003 (0.0004)
Cd	0.0003 (0.0001)	0.0008 (0.0003)
Pb	0.140 (0.091)	0.750 (0.477)

* For Cr and Ni concentrations were below limit of detection (here assigned a value of zero) in 7 and 12 blood samples, respectively.

Food chain of the Inner Oslofjord

Evaluations of the concentrations of metals in the Inner Oslofjord food web were done on a wet weight basis. In flounder, metals were quantified in liver, except for mercury, which was analysed in muscle tissue.

Arsenic (As) was the only element displaying a significant positive linear relationship between trophic level and (log) concentrations in the sampled Inner Oslofjord food web (herring gull excluded; not shown; R^2 = 0.38; p = 0.001). As already mentioned, the results of the stable isotope analysis corroborate the conclusion that (Ruus et al. 2014) the species collected do not constitute a representative food web. For several metals, there was a tendency that concentrations were highest in the invertebrates (see the Appendix).

Looking at flounder, isolated, there were no significant relationships between (log) concentrations and trophic position. Nor were there any significant relationships between concentrations and age, length, nor body mass, except for a negative relationship between length and the concentration of Ag (not shown; R^2 = 0.36; p = 0.017).

For herring gull eggs in isolation, there were no significant relationships between (log) concentrations and trophic position. For Herring gull blood (with a span in δ^{15}N ranging over >1 trophic level, among individual birds), however, a significant positive linear relationship between (log) concentrations and trophic position could be observed for As, Hg and Cu (R^2 = 0.28, 0.85 and 0.28 respectively; p = 0.032, 0.000001 and 0.031 respectively). Figure 43 depicts this relationship for Hg. Concentrations of silver (Ag) displayed a positive relationship with the wing length and body mass of the gulls (not shown).

The biomagnifying properties of mercury are well known (e.g. Jaeger et al. 2009). Regarding arsenic, it is known that marine animals naturally contain considerable levels, and in higher concentrations compared to freshwater and terrestrial animals (Amlund, 2005 and references therein). The toxicity of As is strongly dependent on the chemical form, and a wide range of arsenicals are found in marine organisms (Amlund, 2005 and references therein). In general, inorganic arsenic is more toxic than organic arsenicals and in marine organisms organic arsenic compounds, mainly arsenobetaine, are the dominating forms (Amlund, 2005 and references therein).

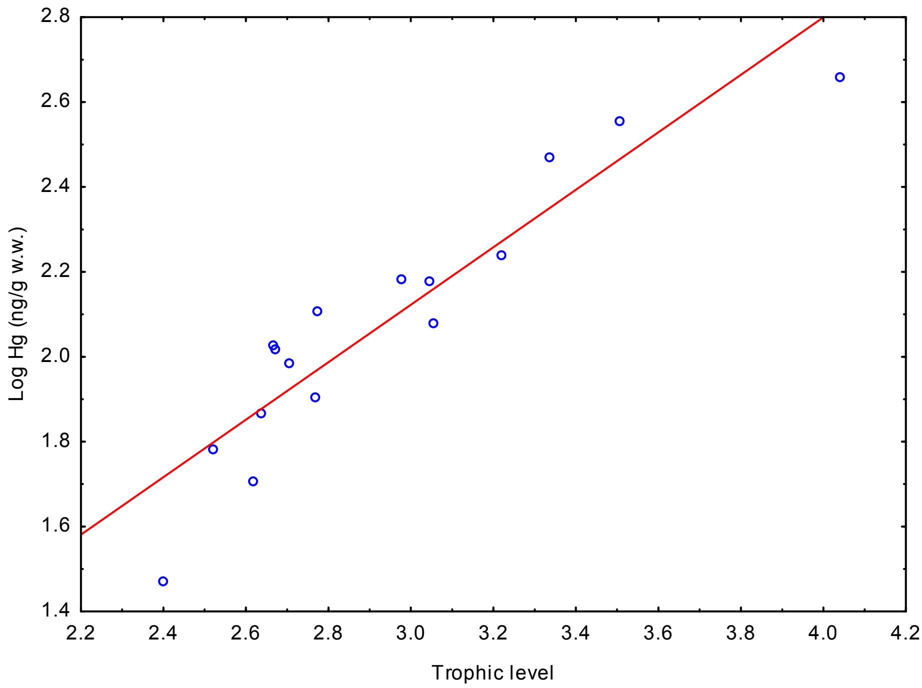


Figure 43. Trophic position against concentration (ng/g wet wt.; log-transformed) of mercury in the blood of herring gull (R^2 = 0.28; p = 0.007).

Cod from the Inner Oslofjord

Metals have also been analysed in cod liver annually since 1990, through the "Contaminants in coastal areas" (MILKYS) monitoring programme (Green et al. 2014). In 2013, metals were analysed in cod liver (Hg in cod muscle) from 13 (Hg at 14) stations (including the Inner Oslofjord). The median concentrations of Hg, As, and Ag were apparently higher than in flounder of the present study (no statistics performed).

3.12 Support Parameters

Miscellaneous support parameters were measured for the different matrixes/samples/organisms. Some of these were included in different statistical analyses referred to above. The measurements of these support parameters are presented in Tables 55-60. The lipid content of all biological samples is given in the Appendix.

An overview of the stomach content of the flounder from the Inner Oslofjord is presented in Table 61. It is shown that worms (including polychaetes) are important food items. *Polyphysia crassa*, which is an important species in the polychaete samples analysed within this study (see chapter 2.1), is conformed in flounder stomachs.

Table 55.
Support parameters measured for sediments from Forgnerkilen, the mouth of Alna River, and Bekkelaget.

Area	Sample sub no.	TDM (%)	<63 µm (% dry wt.)	TOC (µg/mg dry wt.)
Frognerkilen	1	32.5	62	37.9
Frognerkilen	2	32.4	58	38.0
Frognerkilen	3	34.8	55	36.2
Alna	1	40.4	78	37.7
Alna	2	39.4	76	37.8
Alna	3	33.1	72	38.0
Bekkelaget	1	26.2	82	26.5
Bekkelaget	2	27.4	84	26.6
Bekkelaget	3	27.9	77	30.4

Table 56.
Support parameters measured for storm water samples (dissolved phase).

Sample sub no.	Sample area details	SDM (mg/L)	NPOC/DC (mg C/L)
1	Breivoll E6, Downstream Term. (Aln 136x).	78.3	13.3
2	Bryn Ring3/E6 (Aln 125x).	12.2	3.6
3	Breivoll/Alnabru Teminal (Aln 138x).	9.8	8.9
4	Hasle, Snow disposal site (Hov 122z)	40.7	12.3

Table 57.
Support parameters measured for Herring gull eggs from the Inner Oslofjord.

Sample no.	$\delta^{13}C$	$\delta^{15}N$	W% C:N	Trophic level	Eggshell thickness (mm)
1	-26.76	9.53	6.17	2.69	0.40
2	-25.89	10.31	6.20	2.89	0.45
3	-26.86	9.35	6.51	2.64	0.38
4	-26.79	8.40	6.41	2.39	0.36
5	-23.79	10.66	3.33	2.98	0.41
6	-25.66	8.71	5.77	2.47	0.37
7	-25.12	10.32	5.96	2.89	0.38
8	-26.47	8.26	6.12	2.35	0.36
9	-28.65	8.90	6.93	2.52	0.35
10	-27.06	8.84	5.73	2.50	0.36
11	-26.16	10.52	5.82	2.95	0.37
12	-27.67	8.85	6.66	2.51	0.36
13	-25.99	10.29	6.16	2.89	0.40
14	-26.37	10.14	6.10	2.85	0.41

Table 58.
Support parameters measured for Herring gull blood from the Inner Oslofjord.

Sample no.	δ^{13}C	δ^{15}N	W% C:N	Trophic level	Wing (mm)	Head (mm)	Bill (mm)	Billh (mm)	Weight (g)
1	-23.52	10.63	2.52	2.97	472	132.6	n.a.	n.a.	1160
2	-22.65	12.65	2.79	3.51	446	132.1	n.a.	n.a.	1150
3	-23.58	10.89	2.58	3.04	419	111.5	n.a.	n.a.	840
4	-21.70	11.55	2.52	3.22	458	126.1	n.a.	n.a.	1140
5	-24.69	9.26	2.57	2.62	436	124.9	n.a.	n.a.	1055
6	-24.69	9.35	2.49	2.64	416	120.0	n.a.	n.a.	940
7	-23.99	9.60	2.42	2.70	440	114.0	n.a.	n.a.	850
8	-24.32	10.93	2.47	3.05	450	128.5	n.a.	n.a.	1130
9	-24.38	9.46	2.43	2.67	413	111.7	n.a.	n.a.	710
10	-25.38	8.44	2.49	2.40	423	130.6	n.a.	n.a.	1010
11	-21.18	12.00	2.41	3.33	434	113.8	n.a.	n.a.	890
12	-23.63	9.86	2.45	2.77	437	119.7	n.a.	n.a.	1020
13	-24.20	9.85	2.46	2.77	444	112.8	n.a.	n.a.	1000
14	-24.36	8.89	2.44	2.52	440	119.5	n.a.	n.a.	950
15	-24.66	9.48	2.43	2.67	422	117.9	n.a.	n.a.	875
16	-20.18	14.68	2.41	4.04	454	130.6	n.a.	n.a.	1220

Table 59.
Support parameters measured for Flounder from the Inner Oslofjord.

Sample no.	$\delta^{13}C$	$\delta^{15}N$	W% C:N	Trophic level	Age (yr)	Length (cm)	Weight (g)	Sex
1	-17.03	12.22	2.64	3.02	7	39	615	F
2	-17.72	12.88	2.78	3.20	7	40	695	F
3	-17.03	10.83	2.91	2.66	6	33	495	F
4	-16.31	11.01	2.46	2.71	6	36	629	F
5	-16.93	11.78	2.90	2.91	7	40	538	M
6	-16.78	12.08	2.64	2.99	6	36.5	649	F
7	-18.74	10.23	2.71	2.50	5	35	540	F
8	-15.20	12.96	2.80	3.22	6	37	670	F
9	-17.27	12.20	2.65	3.02	7	37.5	627	F
10	-16.81	11.69	2.65	2.89	6	37	581	F
11	-18.02	12.56	2.66	3.11	5	36.5	732	F
12	-18.22	10.99	2.70	2.70	6	37	769	F
13	-17.62	11.78	2.76	2.91	6	36.5	604	F
14	-15.14	12.91	2.72	3.21	4	36.5	603	F
15	-19.61	10.13	2.65	2.47	7	38.5	583	F

Table 60.
Support parameters measured for Krill, polychaeta, prawns and blue mussel.

Species	Area	Sample sub no.	δ^{13}C	δ^{15}N	W% C:N	Trophic level
Krill	Oslofjord	1	-20.29	12.54	3.32	3.11
Krill	Oslofjord	2	-20.18	12.71	3.31	3.15
Krill	Oslofjord	3	-20.09	12.66	3.28	3.14
Polychaeta	Frognerkilen		-20.00	11.77	3.44	2.91
Polychaeta	Alna		-21.23	9.38	3.72	2.28
Polychaeta	Bekkelaget		-19.54	11.84	3.75	2.92
Polychaeta	Oslofjord	1	-19.49	11.84	3.72	2.92
Polychaeta	Oslofjord	2	-19.50	11.64	3.71	2.87
Polychaeta	Oslofjord	3	-19.89	12.07	3.47	2.99
Prawns	Oslofjord	1	-18.45	13.31	2.90	3.31
Prawns	Oslofjord	2	-18.03	13.60	2.81	3.39
Prawns	Oslofjord	3	-18.04	13.62	2.77	3.39
Blue mussel	Frognerkilen		-20.24	8.04	4.06	1.93
Blue mussel	Alna		-20.32	8.65	3.91	2.09
Blue mussel	Bekkelaget		-20.19	8.28	4.21	1.99

Table 61.
Overview of stomach content in Flounder from the inner Oslofjord.

			Stomach content:					
Fish no.	**Degree of fullness (%)**	**Degree of digestion (%)**	**Polychaeta**	**Bivalvia**	**Gastropoda**	**Nematoda**	**Priapulidae**	**Undetermined pulp/lumps**
1	20	100						some pulp
2	70	80	2				1	pulp
3	50	70	1					some pulp
4	50	80	1				1	some pulp
5	70	30					3 (*Priapulus caudatus*)	
6	90	40	10 (3 *Polyphysia crassa*)					
7	90	40	1	55 (*Ennucula tenuis*)	1			
8	50	80					1	some pulp
9	30	80	3 (1 *P. crassa*)					some pulp
10	90	70	1 (*P. crassa*)	7 (*E. tenuis*)		10	1 (*P. caudata*)	some pulp
11	80	60		12 (2 E. tenuis)				some pulp
12	80	80	2					some pulp
13	60	70	1	11 (*E. tenuis*)				
14	40	80		2				some pulp
15	40	90		3				fragments of shells (bivalves)

3.13 Eggshell thickness

Separate linear regressions were run between contaminant concentration and eggshell thickness for all compounds analysed in eggs of Herring gull from the Inner Oslofjord (there were too many variables relative to the number of samples for more complex regression models). It should be noted that co-variation among several chemical parameters is expected since many are homologues/congeners of the same group of chemicals.

There were no significant negative relationships found between the concentrations of the different compounds and eggshell thickness, in contrary to in 2013, where a negative relationship was observed between concentrations of BPA and β-HCH, and eggshell thickness.

It is known that DDT-compounds induce a decrease in eggshell calcium (Bitman et al. 1969), thus affecting reproductive success in certain predatory birds (Ratcliffe, 1967). A negative relationship between concentrations of DDT compounds and thickness of herring gull eggs has been shown in times when concentrations were higher (Hickey and Anderson, 1968), however apparently it has been difficult to relate this to decreased reproductive success (Hickey and Anderson, 1968; Weseloh et al. 1994).

A significant positive relationship was found between the eggshell thickness and the trophic position of the eggs (determined from the fraction of stable nitrogen isotopes, $\delta^{15}N$; Figure 44; R^2 = 0.4, p = 0.0063). This suggests that the shell thickness of eggs in the present study was not affected negatively by compounds that increase in concentration with higher trophic position.

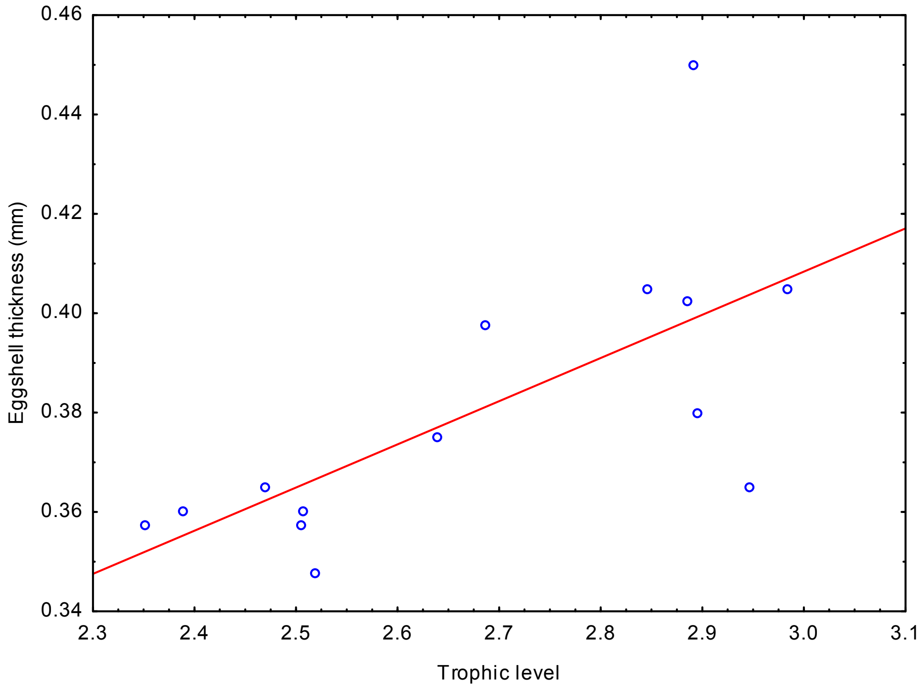


Figure 44. Trophic position against eggshell thickness (mm) of herring gull eggs from the Inner Oslofjord (R^2 = 0.4, p = 0.0063).

3.14 Concluding remarks

"Environmental contaminants in an urban fjord" is a programme designed to monitor the discharges of chemicals present in a densely populated area and to study how this affects a fjord system. The programme has included sampling and analysis of organisms in a marine food web of the Inner Oslofjord in addition to samples of sediment, blue mussel and polychaetes at selected locations in the fjord. A large number of chemical parameters have been quantified (see chapter 2.2), and the report serves as valuable documentation of the concentrations of these chemicals in different compartments of the Inner Oslofjord marine ecosystem. Furthermore, this report presents relationships (or lack of such) between the contaminant concentrations and various biological variables.

The relative isotopic signatures among the species of the sampled food web are very similar to the results of the previous sampling campaign in the programme (Ruus et al. 2014), suggesting that the trophic/ecological interactions (or lack of such) persist, and were not a random result of sampling within a short time frame. Furthermore, the results corroborate the conclusion that (Ruus et al. 2014) the species collected do not constitute a representative food web, hence species analysed may not represent important predator-prey relationships, and that indications of biomagnification (or lack of such) using the trophic magnification approach are not conclusive. After the initial "pilot" campaigns (2013 and 2014) of the "Urban fjord"-programme, an effort should be made to sample a more representative food web (e.g. more species, including a fish with fairy known dietary preferences that correspond with collected prey species). It is also a need for a more balanced design, in terms of the number of individual samples from each species in the food web and the programme will be re-designed for the years 2015-2016. Cod will replace flounder and herring and blue mussels (from central Inner Oslofjord) will be collected in addition to the species already in the programme. In addition, measures will be taken to obtain a more balanced design.

Interestingly, the variability in stable isotope fractionation among individual herring gulls was high (a span in $\delta^{15}N$ in blood ranging over >1 trophic level), and significant positive linear relationship between (log) concentrations and trophic position could be observed for several contaminants with known bioaccumulative/biomagnifying potential, such as PCBs, PBDEs, PFASs (e.g. PFOS), and metals (especially Hg). Furthermore, such a positive relationship could also be observed for the cyclic volatile methylsiloxane 'D5', despite earlier indications that siloxanes are rapidly exhaled from air breathing organisms (Andersen et al. 2001). There was also a significant relationship between the concentrations of D5, as well as for several PCB congeners and body mass of the gulls. It must be noted however, that the regression was most likely highly influenced by a few (large) individuals with high trophic position and high concentrations.

In 2013 (Ruus et al. 2014), a significant positive relationship was observed between trophic level and the (log) concentration of D5 in herring gull eggs. Such a relationship was not observed in 2014, but together with the above mentioned observed relationships in herring gull blood, the results are of interest, since there have previously been some divergences in reports of the bioaccumulative/biomagnifying properties of siloxanes (Borgå et al. 2012 and references therein).

Herring gulls display different feeding behaviour and migration patterns, which obviously influence on the results. The Herring gulls are partial migrants, a strategy were some individuals stay in the breeding region in the whole annual cycle while others migrate (Bakken et al. 2003). The proportion of migrants in the sampled population is unknown. However, all individuals were ringed with colour rings with a unique alpha-numeric code, which enables individuals to be identified at distance. All 16 adult birds were only observed near Oslo, and the longest distance travelled was 56 kilometers. As a curiosity it can be mentioned that one individual, with metal band 4268763 and colour band J7732, was first caught and ringed at Blindern, Oslo, January 22nd, 2014. Then it was caught at nest at Søndre Skjælholmen May 24th the same year. This particular bird was observed in Oslo in 9 of 12 months, and is most likely sedentary. The generalistic feeding behaviour of herring gulls was reflected in the isotopic signatures (see above). Herring gull displayed low $\delta^{15}N$ and $\delta^{13}C$ compared the other species. Therefore Herring gull is assigned a low trophic position, and the results indicate that important food items are not related to the selected food web.

In the first report of the Urban fjord programme (Ruus et al. 2014), a significant negative relationship was found between the concentration of bisphenol A (BPA) and eggshell thickness of herring gull eggs. These results could not be reproduced in 2014, and questions the causality in that relationship. BPA is known for its oestrogen-like effects (Chapin et al. 2008) and oestrogens are potential regulators of genes associated with calcium regulation. There is some evidence of effects of BPA on the expression of calcium transport genes in mammals (Kim et al. 2013), but to our knowledge, no effects on avian eggshells are known. Determined from the fraction of stable nitrogen isotopes, $\delta^{15}N$, a significant positive relationship was found between the eggshell thickness and the trophic position of the eggs, suggesting that the shell thickness of eggs in the present study was not affected negatively by compounds that increase in concentration with higher trophic position.

Some persistent legacy contaminants continue to be an environmental issue, as e.g. concentrations of TBT in Frognerkilen are elevated and correspond to very poor environmental condition. Frognerkilen has for many decades been the site of many marinas/boat jetties, as well as a commercial harbour at Filipstad. It should be noted that Since 1990, use of tinorganic compounds in antifouling agents on boats less than 25 m long has been forbidden, from 2003 it has also been forbidden to apply TBT on ships >25 m. From 2008 all occurrence of antifouling agents containing tinorganic compounds has been banned.

For comparison of the contamination levels of gulls in the present study, the following can be noted: It has previously been shown that the liver concentration of e.g. PCB-153 in herring gulls caught in the Outer Oslofjord (in 1998) ranged from 560 to 6603 ng/g lipid wt. (Ruus et al. 2002). This was approximately the same range as found in eggs and blood in the present study from the Inner Oslofjord (141 – 3086 ng/g lipid wt. and 41 – 2134 ng/g lipid wt., respectively). In 2013, the concentration ranges measured in herring gull in the "Urban fjord" programme were 468 – 4201 ng/g lipid wt. and 199 – 10226 ng/g lipid wt., for eggs and blood, respectively. Furthermore, it has been shown that liver concentrations of PBDEs (sum of BDE-28, -47, -99, -100, -153, -154, -183 and -209) in the same herring gulls caught in the Outer Oslofjord (in 1998) ranged from 135 to 985 ng/g lipid wt. (Sørmo et al. 2011). This was also approximately the same range as found in eggs and blood in the present study from the Inner Oslofjord (17 – 2363 ng/g lipid wt. and 16 – 301 ng/g lipid wt., respectively). In 2013, the concentration ranges measured in herring gull in the "Urban fjord" programme were 44 – 309 ng/g lipid wt. and 104 – 1703 ng/g lipid wt., for eggs and blood, respectively. The results do not suggest noteworthy changes in concentrations in gulls collected in the Inner Oslofjord from previous year and the concentrations were similar to those found in herring gulls collected in the Outer Oslofjord ~15 years earlier. It is also an interesting observation that PBDEs (e.g. BDE-209) in herring gull eggs from the present study displayed concentrations that were several orders of magnitude higher than those recently observed in herring gull eggs from remote colonies in Norway (Huber et al. 2015), indicating urban influence. On the other hand, concentrations of p,p′-DDE in herring gull eggs of the present study were in fact an order of magnitude lower than recently reported in herring gull eggs from remote colonies in Norway (Sklinna and Røst; Huber et al. 2015). This may suggest accumulation of higher concentrations of persistent legacy contaminants associated diffuse pollution (not urban activities) in gulls feeding more exclusively on items of the marine food web.

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Appendix

NILU-no.	NIVA-no.	Compartment	Compartment spec.	Area	Species	Tissue
14/2383	2069-1	Organism	Plankton	Oslofjord	Krill	Pooled wb
14/2384	2069-2	Organism	Plankton	Oslofjord	Krill	Pooled wb
14/2385	2069-3	Organism	Plankton	Oslofjord	Krill	Pooled wb
14/2682	1845-1	Organism	Bird egg	Oslofjord	Herring gull	Egg
14/2683	1845-2	Organism	Bird egg	Oslofjord	Herring gull	Egg
14/2684	1845-3	Organism	Bird egg	Oslofjord	Herring gull	Egg
14/2685	1845-4	Organism	Bird egg	Oslofjord	Herring gull	Egg
14/2686	1845-5	Organism	Bird egg	Oslofjord	Herring gull	Egg
14/2687	1845-6	Organism	Bird egg	Oslofjord	Herring gull	Egg
14/2688	1845-7	Organism	Bird egg	Oslofjord	Herring gull	Egg
14/2689	1845-8	Organism	Bird egg	Oslofjord	Herring gull	Egg
14/2690	1845-10	Organism	Bird egg	Oslofjord	Herring gull	Egg
14/2691	1845-11	Organism	Bird egg	Oslofjord	Herring gull	Egg
14/2692	1845-12	Organism	Bird egg	Oslofjord	Herring gull	Egg
14/2693	1845-13	Organism	Bird egg	Oslofjord	Herring gull	Egg
14/2694	1845-14	Organism	Bird egg	Oslofjord	Herring gull	Egg
14/2695	1845-15	Organism	Bird egg	Oslofjord	Herring gull	Egg
14/2380	2072-4	Organism	Polychaetes	Oslofjord	Polychaetes	Pooled wb
14/2381	2072-5	Organism	Polychaetes	Oslofjord	Polychaetes	Pooled wb
14/2382	2072-6	Organism	Polychaetes	Oslofjord	Polychaetes	Pooled wb
14/2696	14-2307-1	Organism	Fish	Oslofjord	Flounder	Liver (muscle for Hg)
14/2697	14-2307-2	Organism	Fish	Oslofjord	Flounder	Liver (muscle for Hg)
14/2698	14-2307-3	Organism	Fish	Oslofjord	Flounder	Liver (muscle for Hg)
14/2699	14-2307-4	Organism	Fish	Oslofjord	Flounder	Liver (muscle for Hg)
14/2700	14-2307-5	Organism	Fish	Oslofjord	Flounder	Liver (muscle for Hg)
14/2701	14-2307-6	Organism	Fish	Oslofjord	Flounder	Liver (muscle for Hg)
14/2702	14-2307-7	Organism	Fish	Oslofjord	Flounder	Liver (muscle for Hg)
14/2703	14-2307-8	Organism	Fish	Oslofjord	Flounder	Liver (muscle for Hg)
14/2704	14-2307-9	Organism	Fish	Oslofjord	Flounder	Liver (muscle for Hg)
14/2705	14-2307-10	Organism	Fish	Oslofjord	Flounder	Liver (muscle for Hg)
14/2706	14-2307-11	Organism	Fish	Oslofjord	Flounder	Liver (muscle for Hg)
14/2707	14-2307-12	Organism	Fish	Oslofjord	Flounder	Liver (muscle for Hg)
14/2708	14-2307-13	Organism	Fish	Oslofjord	Flounder	Liver (muscle for Hg)
14/2709	14-2307-14	Organism	Fish	Oslofjord	Flounder	Liver (muscle for Hg)
14/2710	14-2307-15	Organism	Fish	Oslofjord	Flounder	Liver (muscle for Hg)
14/2371	2070-1	Organism	Prawns	Oslofjord	Prawns	Pooled tail soft tissue
14/2372	2070-2	Organism	Prawns	Oslofjord	Prawns	Pooled tail soft tissue
14/2373	2070-3	Organism	Prawns	Oslofjord	Prawns	Pooled tail soft tissue
14/2377	2072-1	Organism	Polychaetes	Frognerkilen	Polychaetes	Pooled wb
14/2378	2072-2	Organism	Polychaetes	Alna	Polychaetes	Pooled wb
14/2379	2072-3	Organism	Polychaetes	Bekkelaget	Polychaetes	Pooled wb
14/2375	2071-2	Organism	Mussel	Frognerkilen	Mussel	Pooled soft tissue
14/2374	2071-1	Organism	Mussel	Alna	Mussel	Pooled soft tissue
14/2376	2071-3	Organism	Mussel	Bekkelaget	Mussel	Pooled soft tissue

Compartment spec.	Area	Lipid%	PeCB ng/g (w.w.)	HCB ng/g (w.w.)	PCB-18 ng/g (w.w.)	PCB-28 ng/g (w.w.)	PCB-31 ng/g (w.w.)
Plankton	Oslofjord	0.8	0.01	0.19	0.03	0.15	0.13
Plankton	Oslofjord	0.8	0.01	0.20	0.04	0.15	0.14
Plankton	Oslofjord	0.5	0.01	0.22	0.04	0.17	0.16
Bird egg	Oslofjord	8.4	0.11	2.07	0.02	0.47	0.03
Bird egg	Oslofjord	8.25	0.20	2.61	<0.01	0.89	0.03
Bird egg	Oslofjord	10.1	0.49	13.4	0.02	1.94	0.09
Bird egg	Oslofjord	10.67	0.11	2.13	<0.01	0.22	<0.01
Bird egg	Oslofjord	1.33	<0.01	0.07	<0.01	0.03	<0.01
Bird egg	Oslofjord	8.52	0.16	1.97	0.01	1.10	0.02
Bird egg	Oslofjord	9.2	0.19	2.59	<0.01	0.70	0.02
Bird egg	Oslofjord	9.84	0.17	3.03	0.02	1.24	0.01
Bird egg	Oslofjord	9.32	0.21	5.11	<0.01	0.18	0.02
Bird egg	Oslofjord	8.75	0.08	2.05	0.07	0.35	0.02
Bird egg	Oslofjord	8.29	0.28	4.82	<0.01	1.89	0.02
Bird egg	Oslofjord	8.22	0.11	3.89	<0.01	0.30	0.01
Bird egg	Oslofjord	9.61	0.31	5.10	<0.01	0.64	0.01
Bird egg	Oslofjord	9.65	0.07	1.11	<0.01	0.42	<0.01
Polychaetes	Oslofjord	0.76	0.02	0.11	0.04	0.18	0.07
Polychaetes	Oslofjord	0.8	0.02	0.12	0.08	0.31	0.19
Polychaetes	Oslofjord	0.74	0.01	0.10	0.04	0.15	0.06
Fish	Oslofjord	18.28	0.37	4.35	1.00	14.1	5.08
Fish	Oslofjord	6.7	0.23	2.59	0.50	11.3	2.19
Fish	Oslofjord	20.96	0.69	4.44	2.29	17.8	10.3
Fish	Oslofjord	19.9	0.56	4.01	1.55	30.0	12.0
Fish	Oslofjord	22	0.45	4.13	1.28	11.8	6.30
Fish	Oslofjord	10.1	0.31	2.34	0.74	12.9	3.87
Fish	Oslofjord	26.76	0.92	7.19	1.95	39.0	21.2
Fish	Oslofjord	12.46	0.45	3.58	0.96	14.1	6.45
Fish	Oslofjord	8.26	<0.789	1.83	0.78	11.4	4.28
Fish	Oslofjord	1.12	0.02	0.26	0.05	1.61	0.65
Fish	Oslofjord	11.32	0.23	1.94	2.02	10.3	6.43
Fish	Oslofjord	34.7	1.20	11.9	2.68	24.7	11.1
Fish	Oslofjord	12.84	0.27	2.16	1.23	5.86	2.96
Fish	Oslofjord	16.54	0.55	3.78	1.31	7.25	3.85
Fish	Oslofjord	9.86	1.20	12.1	0.47	6.49	4.11
Prawns	Oslofjord	0.56	0.04	0.03	0.09	0.28	0.20
Prawns	Oslofjord	0.57	<0.01	0.05	<0.01	0.03	0.01
Prawns	Oslofjord	0.51	<0.01	0.04	<0.01	0.03	0.01
Polychaetes	Frognerkilen	0.65	0.02	0.11	0.36	0.94	0.79
Polychaetes	Alna	0.86	0.06	0.28	0.17	0.58	0.40
Polychaetes	Bekkelaget	0.6	<0.01	0.08	0.03	0.10	0.06
Mussel	Frognerkilen	0.75	<0.01	0.02	0.05	0.19	0.12
Mussel	Alna	0.9	0.01	0.05	<0.01	0.03	0.01
Mussel	Bekkelaget	0.65	<0.01	0.02	0.05	0.15	0.11

Compartment spec.	Area	PCB-33 ng/g (w.w.)	PCB-37 ng/g (w.w.)	PCB-47 ng/g (w.w.)	PCB-52 ng/g (w.w.)	PCB-66 ng/g (w.w.)	PCB-74 ng/g (w.w.)
Plankton	Oslofjord	0.03	0.02	0.46	0.74	0.71	0.35
Plankton	Oslofjord	0.03	0.02	0.46	0.76	0.73	0.37
Plankton	Oslofjord	0.04	0.02	0.52	0.84	0.82	0.41
Bird egg	Oslofjord	<0.01	<0.01	2.80	0.34	4.33	2.46
Bird egg	Oslofjord	<0.01	<0.01	3.94	0.42	7.44	4.24
Bird egg	Oslofjord	<0.01	<0.01	5.76	2.90	9.73	6.10
Bird egg	Oslofjord	<0.01	<0.01	1.03	0.39	1.61	1.00
Bird egg	Oslofjord	<0.01	<0.01	0.15	0.03	0.37	0.16
Bird egg	Oslofjord	<0.01	<0.01	4.26	0.29	11.2	5.01
Bird egg	Oslofjord	<0.01	<0.01	3.31	5.50	4.88	2.54
Bird egg	Oslofjord	<0.01	<0.01	6.24	0.90	15.3	7.70
Bird egg	Oslofjord	<0.01	<0.01	0.27	0.55	0.64	0.34
Bird egg	Oslofjord	<0.01	<0.01	1.46	1.60	3.05	1.66
Bird egg	Oslofjord	<0.01	<0.01	4.90	1.00	10.7	6.14
Bird egg	Oslofjord	<0.01	<0.01	0.93	0.30	2.01	1.10
Bird egg	Oslofjord	<0.01	<0.01	2.90	1.15	5.35	3.39
Bird egg	Oslofjord	<0.01	<0.01	3.13	1.05	8.24	4.21
Polychaetes	Oslofjord	0.03	0.01	0.41	0.60	0.49	0.25
Polychaetes	Oslofjord	0.09	0.03	0.72	1.30	0.97	0.52
Polychaetes	Oslofjord	0.02	0.01	0.37	0.50	0.43	0.23
Fish	Oslofjord	0.58	0.27	32.3	25.6	111	60.4
Fish	Oslofjord	0.36	0.14	15.0	9.95	83.3	47.1
Fish	Oslofjord	1.10	0.36	32.6	54.8	74.1	36.4
Fish	Oslofjord	0.81	0.39	49.9	46.4	172	88.2
Fish	Oslofjord	0.67	0.23	22.6	29.6	55.3	29.7
Fish	Oslofjord	0.43	0.40	23.8	18.8	98.5	54.1
Fish	Oslofjord	1.32	1.22	40.6	64.3	114	68.7
Fish	Oslofjord	0.71	0.26	20.4	27.0	67.3	33.7
Fish	Oslofjord	0.74	0.28	21.1	16.8	80.7	45.1
Fish	Oslofjord	0.03	<0.01	3.28	2.78	10.7	5.54
Fish	Oslofjord	1.08	0.31	22.8	35.1	48.8	26.8
Fish	Oslofjord	1.46	0.38	39.4	55.4	96.1	51.2
Fish	Oslofjord	0.67	<0.049	13.8	17.3	24.6	13.4
Fish	Oslofjord	0.64	<0.058	15.8	23.5	31.2	14.9
Fish	Oslofjord	0.39	<0.055	8.18	19.0	21.0	11.3
Prawns	Oslofjord	0.07	0.05	0.55	1.07	1.28	0.56
Prawns	Oslofjord	<0.01	<0.01	0.10	0.10	0.17	0.10
Prawns	Oslofjord	<0.01	<0.01	0.09	0.10	0.17	0.09
Polychaetes	Frognerkilen	0.29	0.10	1.79	3.58	3.30	1.68
Polychaetes	Alna	0.14	0.09	0.90	2.23	1.82	0.93
Polychaetes	Bekkelaget	0.02	0.02	0.31	0.45	0.54	0.25
Mussel	Frognerkilen	0.05	0.03	0.33	0.61	0.65	0.28
Mussel	Alna	<0.01	<0.01	0.10	0.09	0.17	0.10
Mussel	Bekkelaget	0.04	0.02	0.35	0.64	0.83	0.35

Compartment spec.	Area	PCB-99 ng/g (w.w.)	PCB-101 ng/g (w.w.)	PCB-105 ng/g (w.w.)	PCB-114 ng/g (w.w.)	PCB-118 ng/g (w.w.)	PCB-122 ng/g (w.w.)
Plankton	Oslofjord	1.08	1.52	0.48	0.03	1.27	0.02
Plankton	Oslofjord	1.11	1.62	0.51	0.03	1.30	0.02
Plankton	Oslofjord	1.18	1.70	0.55	0.04	1.43	0.02
Bird egg	Oslofjord	14.5	0.29	8.15	0.63	22.3	<0.01
Bird egg	Oslofjord	19.3	0.52	10.9	0.75	28.4	<0.01
Bird egg	Oslofjord	36.5	3.27	17.0	2.41	58.9	<0.01
Bird egg	Oslofjord	7.22	0.65	3.02	0.33	10.8	<0.01
Bird egg	Oslofjord	0.67	0.06	0.42	0.03	1.02	<0.01
Bird egg	Oslofjord	18.2	0.23	10.9	0.75	28.0	<0.01
Bird egg	Oslofjord	17.7	4.12	7.36	0.67	25.6	<0.01
Bird egg	Oslofjord	29.5	1.91	16.7	1.19	46.0	<0.01
Bird egg	Oslofjord	2.52	0.68	1.28	0.15	4.17	<0.01
Bird egg	Oslofjord	6.92	3.17	3.89	0.29	10.9	<0.01
Bird egg	Oslofjord	23.8	1.06	16.5	1.17	40.7	2.52
Bird egg	Oslofjord	4.78	0.45	2.95	0.24	8.21	<0.01
Bird egg	Oslofjord	18.0	2.11	8.33	0.78	26.2	<0.01
Bird egg	Oslofjord	16.2	1.59	10.5	0.70	25.7	<0.01
Polychaetes	Oslofjord	1.25	1.36	0.51	0.03	1.28	0.01
Polychaetes	Oslofjord	1.39	1.75	0.55	0.03	1.55	0.02
Polychaetes	Oslofjord	1.18	1.22	0.46	0.03	1.19	0.01
Fish	Oslofjord	104	54.2	54.8	3.36	170	<0.01
Fish	Oslofjord	74.8	19.1	40.5	2.64	132	0.05
Fish	Oslofjord	67.7	84.9	38.1	2.94	103	0.46
Fish	Oslofjord	110	80.8	55.6	3.62	155	0.19
Fish	Oslofjord	57.5	53.0	28.3	1.74	75.0	0.29
Fish	Oslofjord	83.5	34.6	43.5	2.61	142	0.07
Fish	Oslofjord	101	112	48.7	3.46	143	0.47
Fish	Oslofjord	44.6	48.0	25.2	1.74	65.3	0.17
Fish	Oslofjord	72.8	32.1	38.6	2.51	126	0.11
Fish	Oslofjord	8.00	5.82	4.47	0.28	10.5	<0.01
Fish	Oslofjord	50.8	51.4	22.3	1.52	56.4	0.34
Fish	Oslofjord	119	119	63.4	4.69	194	<4.198
Fish	Oslofjord	42.2	38.2	19.0	0.96	52.3	0.16
Fish	Oslofjord	38.6	45.3	22.9	1.55	64.0	<0.091
Fish	Oslofjord	25.3	38.2	13.0	1.03	38.5	<0.102
Prawns	Oslofjord	0.92	1.55	0.63	0.04	1.38	0.02
Prawns	Oslofjord	0.40	0.38	0.20	0.01	0.56	<0.01
Prawns	Oslofjord	0.36	0.33	0.18	<0.01	0.48	<0.01
Polychaetes	Frognerkilen	2.93	5.88	1.84	0.12	4.75	0.05
Polychaetes	Alna	2.04	4.81	1.39	0.10	3.66	0.03
Polychaetes	Bekkelaget	1.07	1.35	0.62	0.04	1.61	0.01
Mussel	Frognerkilen	0.53	0.90	0.30	0.02	0.74	<0.01
Mussel	Alna	0.40	0.34	0.21	0.01	0.55	<0.01
Mussel	Bekkelaget	0.66	0.97	0.44	0.02	0.93	0.01

Compartment spec.	Area	PCB-123 ng/g (w.w.)	PCB-128 ng/g (w.w.)	PCB-138 ng/g (w.w.)	PCB-141 ng/g (w.w.)	PCB-149 ng/g (w.w.)	PCB-153 ng/g (w.w.)
Plankton	Oslofjord	0.03	0.31	1.57	0.12	1.80	2.29
Plankton	Oslofjord	0.03	0.31	1.59	0.13	1.84	2.34
Plankton	Oslofjord	0.04	0.33	1.71	0.14	1.97	2.54
Bird egg	Oslofjord	0.35	6.07	41.0	0.07	0.79	63.9
Bird egg	Oslofjord	0.46	6.51	44.1	0.11	1.93	76.4
Bird egg	Oslofjord	0.72	18.9	155	0.43	6.00	312
Bird egg	Oslofjord	0.14	3.31	25.7	0.09	1.14	48.2
Bird egg	Oslofjord	0.02	0.18	1.30	0.01	0.07	1.87
Bird egg	Oslofjord	0.56	5.38	35.7	0.07	1.06	57.2
Bird egg	Oslofjord	0.34	6.93	51.8	0.40	7.80	95.3
Bird egg	Oslofjord	0.84	9.31	62.9	0.22	2.93	91.7
Bird egg	Oslofjord	0.06	1.20	9.99	0.19	1.34	18.7
Bird egg	Oslofjord	0.19	2.45	17.6	0.43	2.62	28.6
Bird egg	Oslofjord	0.66	9.57	63.2	0.25	2.65	109
Bird egg	Oslofjord	0.13	1.85	13.9	0.06	0.87	23.2
Bird egg	Oslofjord	0.41	5.73	46.8	0.29	1.93	85.8
Bird egg	Oslofjord	0.44	4.70	32.1	0.17	1.12	50.3
Polychaetes	Oslofjord	0.04	0.52	2.74	0.12	1.69	3.64
Polychaetes	Oslofjord	0.04	0.47	2.61	0.13	1.75	3.68
Polychaetes	Oslofjord	0.03	0.49	2.42	0.11	1.49	3.42
Fish	Oslofjord	3.60	19.4	155	8.21	15.9	218
Fish	Oslofjord	2.90	12.5	107	3.54	4.19	151
Fish	Oslofjord	2.62	12.2	77.0	9.99	21.5	114
Fish	Oslofjord	3.43	18.2	132	12.0	12.2	187
Fish	Oslofjord	1.85	12.2	74.8	6.54	12.2	107
Fish	Oslofjord	2.89	13.6	118	6.25	7.96	167
Fish	Oslofjord	2.99	16.9	107	12.4	24.0	165
Fish	Oslofjord	1.54	9.75	63.5	5.71	8.18	88.1
Fish	Oslofjord	2.60	13.6	107	4.53	7.46	146
Fish	Oslofjord	0.26	1.33	9.93	0.69	0.92	12.7
Fish	Oslofjord	1.40	7.49	50.4	3.59	21.3	73.1
Fish	Oslofjord	<4.276	22.5	178	17.3	19.7	256
Fish	Oslofjord	1.36	8.89	59.9	3.63	11.9	95.3
Fish	Oslofjord	1.48	11.1	67.8	6.45	10.7	96.8
Fish	Oslofjord	0.86	4.30	34.0	5.40	14.7	55.3
Prawns	Oslofjord	0.04	0.24	1.15	0.02	0.85	1.42
Prawns	Oslofjord	0.01	0.12	0.58	0.03	0.22	1.11
Prawns	Oslofjord	0.01	0.11	0.51	0.03	0.22	0.99
Polychaetes	Frognerkilen	0.10	1.09	5.56	0.81	4.56	7.37
Polychaetes	Alna	0.07	0.84	4.32	0.81	4.00	5.76
Polychaetes	Bekkelaget	0.04	0.55	2.87	0.28	1.67	3.50
Mussel	Frognerkilen	0.02	0.15	0.83	<0.01	0.59	1.06
Mussel	Alna	0.01	0.11	0.57	0.03	0.23	1.08
Mussel	Bekkelaget	0.02	0.13	0.68	<0.01	0.43	0.86

Compartment spec.	Area	PCB-156 ng/g (w.w.)	PCB-157 ng/g (w.w.)	PCB-167 ng/g (w.w.)	PCB-170 ng/g (w.w.)	PCB-180 ng/g (w.w.)	PCB-183 ng/g (w.w.)
Plankton	Oslofjord	0.08	0.02	0.07	0.13	0.46	0.14
Plankton	Oslofjord	0.08	0.02	0.07	0.13	0.46	0.14
Plankton	Oslofjord	0.09	0.02	0.07	0.15	0.50	0.15
Bird egg	Oslofjord	2.46	0.56	1.35	3.05	9.35	3.56
Bird egg	Oslofjord	2.99	0.67	1.58	5.42	19.2	5.42
Bird egg	Oslofjord	10.9	1.93	6.50	42.4	147	27.4
Bird egg	Oslofjord	1.70	0.37	0.90	3.74	13.3	3.12
Bird egg	Oslofjord	0.08	0.02	0.04	0.12	0.35	0.11
Bird egg	Oslofjord	2.51	0.55	1.52	3.89	12.3	3.38
Bird egg	Oslofjord	3.64	0.71	2.20	7.27	22.4	5.36
Bird egg	Oslofjord	3.40	0.82	2.14	4.10	11.5	3.63
Bird egg	Oslofjord	0.75	0.13	0.41	1.84	6.71	1.36
Bird egg	Oslofjord	1.14	0.26	0.73	2.21	7.34	1.92
Bird egg	Oslofjord	4.97	1.02	2.24	10.5	35.8	8.67
Bird egg	Oslofjord	1.08	0.21	0.50	2.01	6.63	1.58
Bird egg	Oslofjord	3.28	0.70	1.84	5.50	19.6	5.44
Bird egg	Oslofjord	2.24	0.48	1.05	3.80	12.1	3.31
Polychaetes	Oslofjord	0.12	0.04	0.11	0.31	0.61	0.26
Polychaetes	Oslofjord	0.13	0.04	0.11	0.31	0.66	0.24
Polychaetes	Oslofjord	0.12	0.04	0.10	0.32	0.59	0.23
Fish	Oslofjord	13.9	2.39	9.09	16.3	65.8	21.0
Fish	Oslofjord	10.4	1.79	6.53	13.4	47.1	13.5
Fish	Oslofjord	7.04	1.24	4.19	10.6	39.6	8.65
Fish	Oslofjord	11.5	2.02	7.12	12.8	65.1	19.6
Fish	Oslofjord	5.46	1.18	3.50	8.87	28.0	7.48
Fish	Oslofjord	11.2	1.88	7.19	10.2	48.8	16.7
Fish	Oslofjord	10.4	1.95	5.96	14.1	45.8	17.3
Fish	Oslofjord	5.47	1.05	3.16	8.11	26.9	8.02
Fish	Oslofjord	9.83	1.72	6.26	13.5	44.9	12.5
Fish	Oslofjord	0.70	0.13	0.39	0.86	3.45	1.11
Fish	Oslofjord	3.50	0.78	2.08	6.78	19.6	4.36
Fish	Oslofjord	15.9	2.83	10.0	22.6	85.3	20.2
Fish	Oslofjord	3.74	0.93	2.78	8.21	21.0	7.24
Fish	Oslofjord	5.58	1.24	3.75	10.6	33.2	9.38
Fish	Oslofjord	3.15	0.52	2.00	5.18	20.0	3.90
Prawns	Oslofjord	0.07	0.02	0.05	0.02	0.14	0.11
Prawns	Oslofjord	0.05	0.01	0.03	0.08	0.21	0.07
Prawns	Oslofjord	0.04	0.01	0.03	0.08	0.19	0.05
Polychaetes	Frognerkilen	0.52	0.08	0.28	0.72	2.02	0.53
Polychaetes	Alna	0.44	0.07	0.23	0.61	1.77	0.46
Polychaetes	Bekkelaget	0.22	0.04	0.13	0.45	0.84	0.24
Mussel	Frognerkilen	0.04	<0.01	0.04	<0.01	0.07	0.09
Mussel	Alna	0.04	0.01	0.03	0.08	0.20	0.06
Mussel	Bekkelaget	0.03	<0.01	0.03	<0.01	0.04	0.06

Compartment spec.	Area	PCB-187 ng/g (w.w.)	PCB-189 ng/g (w.w.)	PCB-194 ng/g (w.w.)	PCB-206 ng/g (w.w.)	PCB-209 ng/g (w.w.)	TBA ng/g (w.w.)
Plankton	Oslofjord	0.94	<0.01	0.05	0.03	0.02	<0.01
Plankton	Oslofjord	0.98	<0.01	0.05	0.03	0.02	<0.01
Plankton	Oslofjord	0.98	<0.01	0.05	0.03	0.02	<0.01
Bird egg	Oslofjord	11.0	0.19	1.07	0.30	0.09	<0.01
Bird egg	Oslofjord	13.9	0.32	2.57	1.14	0.41	<0.01
Bird egg	Oslofjord	85.0	1.65	17.4	3.33	1.31	<0.01
Bird egg	Oslofjord	8.44	0.24	1.79	0.78	0.89	<0.01
Bird egg	Oslofjord	0.32	<0.01	0.03	0.02	<0.01	<0.01
Bird egg	Oslofjord	10.7	0.21	1.61	0.47	0.10	0.01
Bird egg	Oslofjord	14.3	0.39	2.67	1.00	0.45	<0.01
Bird egg	Oslofjord	16.7	0.23	1.35	0.31	0.11	<0.01
Bird egg	Oslofjord	5.70	0.10	0.97	0.47	0.51	<0.01
Bird egg	Oslofjord	4.87	0.13	1.08	0.49	0.18	<0.01
Bird egg	Oslofjord	21.7	0.52	5.83	2.25	0.35	<0.01
Bird egg	Oslofjord	4.89	0.09	0.60	0.15	0.07	<0.01
Bird egg	Oslofjord	15.5	0.32	2.16	0.63	0.35	0.04
Bird egg	Oslofjord	5.86	0.20	1.50	0.42	0.08	<0.01
Polychaetes	Oslofjord	1.30	0.02	0.22	0.13	0.05	<0.01
Polychaetes	Oslofjord	1.22	0.02	0.22	0.14	0.05	<0.01
Polychaetes	Oslofjord	1.33	0.02	0.25	0.17	0.06	<0.01
Fish	Oslofjord	15.8	0.86	14.2	5.61	2.11	0.24
Fish	Oslofjord	2.41	0.69	9.09	3.63	1.69	0.30
Fish	Oslofjord	12.6	0.59	5.98	4.34	1.83	0.37
Fish	Oslofjord	9.19	0.92	16.4	5.91	2.33	0.15
Fish	Oslofjord	12.4	0.51	7.75	4.39	1.92	0.50
Fish	Oslofjord	5.23	0.73	13.9	3.34	2.16	0.18
Fish	Oslofjord	22.6	0.85	13.2	7.10	3.66	0.42
Fish	Oslofjord	7.28	0.46	7.32	4.41	2.00	0.12
Fish	Oslofjord	4.33	0.67	8.71	3.60	1.49	0.19
Fish	Oslofjord	1.43	0.04	0.87	0.37	0.14	0.03
Fish	Oslofjord	13.3	0.31	5.62	3.66	1.22	0.40
Fish	Oslofjord	16.6	1.20	13.3	9.77	4.14	0.72
Fish	Oslofjord	9.95	0.46	4.67	4.65	1.91	0.38
Fish	Oslofjord	7.66	0.56	6.68	7.36	3.76	0.21
Fish	Oslofjord	9.56	0.24	3.32	2.48	1.22	0.16
Prawns	Oslofjord	0.31	<0.01	<0.01	<0.01	<0.01	0.04
Prawns	Oslofjord	0.09	<0.01	0.04	0.01	<0.01	<0.01
Prawns	Oslofjord	0.09	<0.01	0.03	0.01	<0.01	<0.011
Polychaetes	Frognerkilen	1.85	0.04	0.33	0.17	0.02	0.01
Polychaetes	Alna	1.28	0.03	0.24	0.08	0.01	<0.01
Polychaetes	Bekkelaget	1.03	0.02	0.21	0.08	<0.01	<0.01
Mussel	Frognerkilen	0.26	<0.01	<0.01	<0.01	<0.01	0.03
Mussel	Alna	0.11	<0.01	0.04	0.01	<0.01	<0.01
Mussel	Bekkelaget	0.17	<0.01	<0.01	<0.01	<0.01	0.02

Compartment spec.	Area	BDE-17 ng/g (w.w.)	BDE-28 ng/g (w.w.)	BDE-47 ng/g (w.w.)	BDE-49 ng/g (w.w.)	BDE-66 ng/g (w.w.)	BDE-71 ng/g (w.w.)
Plankton	Oslofjord	<0.01	<0.01	0.17	0.01	0.01	<0.01
Plankton	Oslofjord	<0.01	<0.01	0.18	0.01	0.01	<0.01
Plankton	Oslofjord	<0.01	<0.01	0.19	0.02	0.01	<0.01
Bird egg	Oslofjord	<0.01	<0.01	5.10	<0.01	0.02	<0.01
Bird egg	Oslofjord	<0.01	<0.01	1.62	<0.01	<0.01	<0.01
Bird egg	Oslofjord	<0.01	0.04	7.15	0.07	0.01	0.12
Bird egg	Oslofjord	<0.01	<0.01	1.52	0.03	<0.01	<0.01
Bird egg	Oslofjord	<0.01	<0.01	0.11	<0.01	<0.01	<0.01
Bird egg	Oslofjord	<0.01	0.01	10.3	<0.01	0.04	<0.01
Bird egg	Oslofjord	<0.01	<0.01	4.59	0.02	0.03	<0.01
Bird egg	Oslofjord	<0.01	0.01	3.25	0.01	0.02	<0.01
Bird egg	Oslofjord	<0.01	<0.01	0.49	<0.01	<0.01	<0.01
Bird egg	Oslofjord	<0.01	<0.01	2.12	0.01	0.02	<0.01
Bird egg	Oslofjord	<0.01	0.01	24.7	0.02	0.30	<0.01
Bird egg	Oslofjord	<0.01	<0.01	1.25	<0.01	0.02	<0.01
Bird egg	Oslofjord	<0.01	0.03	5.95	<0.04	<0.055	<0.041
Bird egg	Oslofjord	<0.01	<0.01	1.30	<0.01	0.01	<0.01
Polychaetes	Oslofjord	<0.01	<0.01	0.05	0.01	<0.01	<0.01
Polychaetes	Oslofjord	<0.01	<0.01	0.06	0.01	<0.01	<0.01
Polychaetes	Oslofjord	<0.01	<0.01	0.05	0.01	<0.01	<0.01
Fish	Oslofjord	<0.01	0.05	1.59	0.12	0.04	<0.013
Fish	Oslofjord	<0.01	0.02	0.47	<0.013	<0.014	<0.012
Fish	Oslofjord	<0.01	0.03	0.77	0.06	0.02	<0.01
Fish	Oslofjord	<0.01	0.05	1.21	0.03	0.03	<0.01
Fish	Oslofjord	<0.01	0.06	1.96	0.12	<0.01	<0.01
Fish	Oslofjord	<0.01	0.03	0.95	0.02	0.01	<0.013
Fish	Oslofjord	<0.01	0.11	4.32	0.17	<0.01	<0.01
Fish	Oslofjord	<0.01	0.05	2.40	0.06	0.06	<0.01
Fish	Oslofjord	<0.01	0.03	0.78	0.05	0.02	0.01
Fish	Oslofjord	<0.01	0.01	0.35	<0.01	0.02	<0.01
Fish	Oslofjord	<0.01	0.04	1.33	0.18	0.04	<0.01
Fish	Oslofjord	<0.01	0.09	2.96	0.11	<0.01	<0.01
Fish	Oslofjord	<0.01	0.04	1.62	0.07	<0.01	<0.01
Fish	Oslofjord	<0.01	0.03	1.13	0.05	0.02	<0.01
Fish	Oslofjord	0.05	0.07	3.02	0.44	0.05	<0.01
Prawns	Oslofjord	<0.01	<0.01	0.08	<0.01	<0.01	<0.01
Prawns	Oslofjord	<0.01	<0.01	0.05	<0.01	<0.01	<0.01
Prawns	Oslofjord	<0.01	<0.01	0.04	<0.01	<0.01	<0.01
Polychaetes	Frognerkilen	<0.01	<0.01	0.05	0.01	<0.01	<0.01
Polychaetes	Alna	<0.01	<0.01	0.09	0.02	<0.01	<0.01
Polychaetes	Bekkelaget	<0.01	<0.01	0.19	0.03	0.01	<0.01
Mussel	Frognerkilen	<0.01	<0.01	0.05	<0.01	<0.01	<0.01
Mussel	Alna	<0.01	<0.01	0.05	<0.01	<0.01	<0.01
Mussel	Bekkelaget	<0.01	<0.01	0.04	<0.01	<0.01	<0.01

Compartment spec.	Area	BDE-77 ng/g (w.w.)	BDE-85 ng/g (w.w.)	BDE-99 ng/g (w.w.)	BDE-100 ng/g (w.w.)	BDE-119 ng/g (w.w.)	BDE-126 ng/g (w.w.)
Plankton	Oslofjord	<0.01	<0.01	0.13	0.04	<0.01	<0.01
Plankton	Oslofjord	<0.01	<0.01	0.14	0.03	<0.01	<0.01
Plankton	Oslofjord	<0.01	<0.01	0.14	0.04	<0.01	<0.01
Bird egg	Oslofjord	<0.01	0.20	5.19	0.99	<0.01	<0.01
Bird egg	Oslofjord	<0.01	0.02	0.58	0.41	<0.013	<0.011
Bird egg	Oslofjord	<0.01	<0.01	1.92	1.91	0.03	<0.01
Bird egg	Oslofjord	<0.01	<0.01	0.52	0.50	<0.01	<0.01
Bird egg	Oslofjord	<0.01	<0.01	0.11	0.03	<0.01	<0.01
Bird egg	Oslofjord	<0.01	1.03	18.4	2.47	<0.01	0.36
Bird egg	Oslofjord	<0.01	0.30	6.29	1.00	<0.01	<0.01
Bird egg	Oslofjord	<0.01	0.08	2.24	0.89	<0.01	0.06
Bird egg	Oslofjord	<0.01	0.01	0.36	0.15	<0.01	<0.01
Bird egg	Oslofjord	<0.01	<0.035	2.72	0.57	<0.029	<0.026
Bird egg	Oslofjord	0.02	2.22	47.2	5.78	<0.01	<0.01
Bird egg	Oslofjord	<0.01	0.05	1.45	0.29	<0.01	<0.01
Bird egg	Oslofjord	<0.034	<0.156	1.10	0.54	<0.129	<0.118
Bird egg	Oslofjord	<0.01	0.03	0.80	0.31	<0.01	<0.01
Polychaetes	Oslofjord	<0.01	<0.01	0.02	0.02	<0.01	<0.01
Polychaetes	Oslofjord	<0.01	<0.01	0.03	0.02	<0.01	<0.01
Polychaetes	Oslofjord	<0.01	<0.01	0.02	0.01	<0.01	<0.01
Fish	Oslofjord	<0.012	<0.025	0.30	0.07	<0.018	<0.021
Fish	Oslofjord	<0.01	<0.056	<0.041	<0.029	<0.047	<0.042
Fish	Oslofjord	<0.01	<0.02	0.12	0.06	<0.017	<0.015
Fish	Oslofjord	<0.018	<0.04	0.12	0.07	<0.029	<0.033
Fish	Oslofjord	<0.01	<0.011	0.23	0.10	<0.01	<0.01
Fish	Oslofjord	<0.012	<0.046	0.05	0.03	<0.033	<0.038
Fish	Oslofjord	<0.01	<0.026	0.57	0.27	<0.022	<0.02
Fish	Oslofjord	<0.01	<0.031	0.15	0.18	<0.026	<0.023
Fish	Oslofjord	<0.01	<0.027	0.07	0.03	<0.02	<0.022
Fish	Oslofjord	<0.01	<0.01	0.03	0.03	<0.01	<0.01
Fish	Oslofjord	<0.01	<0.01	0.30	0.12	<0.01	<0.01
Fish	Oslofjord	<0.01	<0.034	0.25	0.16	<0.028	<0.025
Fish	Oslofjord	<0.01	<0.01	0.16	0.07	<0.01	<0.01
Fish	Oslofjord	<0.01	<0.031	0.09	0.08	<0.026	<0.023
Fish	Oslofjord	<0.01	<0.067	0.26	0.34	<0.055	<0.049
Prawns	Oslofjord	<0.01	<0.01	0.04	0.02	<0.01	<0.01
Prawns	Oslofjord	<0.01	<0.01	<0.01	0.01	<0.01	<0.01
Prawns	Oslofjord	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Polychaetes	Frognerkilen	<0.01	<0.01	0.02	0.01	<0.01	<0.01
Polychaetes	Alna	<0.01	<0.01	0.06	0.02	<0.01	<0.01
Polychaetes	Bekkelaget	<0.01	<0.01	0.09	0.04	<0.01	<0.01
Mussel	Frognerkilen	<0.01	<0.01	0.02	0.01	<0.01	<0.01
Mussel	Alna	<0.01	<0.01	<0.01	0.01	<0.01	<0.01
Mussel	Bekkelaget	<0.01	<0.01	0.01	0.01	<0.01	<0.01

Compartment spec.	Area	BDE-138 ng/g (w.w.)	BDE-153 ng/g (w.w.)	BDE-154 ng/g (w.w.)	BDE-156 ng/g (w.w.)	BDE-183 ng/g (w.w.)	BDE-184 ng/g (w.w.)
Plankton	Oslofjord	<0.01	0.02	0.02	<0.01	<0.01	<0.01
Plankton	Oslofjord	<0.01	0.02	0.02	<0.01	<0.01	<0.01
Plankton	Oslofjord	<0.01	0.02	0.02	<0.01	<0.01	<0.01
Bird egg	Oslofjord	0.05	0.55	0.18	<0.01	0.11	<0.01
Bird egg	Oslofjord	0.01	0.18	0.12	<0.01	0.08	<0.01
Bird egg	Oslofjord	0.02	1.03	0.74	<0.01	0.16	<0.01
Bird egg	Oslofjord	<0.01	0.26	0.18	<0.01	0.08	<0.01
Bird egg	Oslofjord	<0.01	0.02	<0.01	<0.01	<0.01	<0.01
Bird egg	Oslofjord	0.25	3.16	0.79	<0.01	0.54	<0.01
Bird egg	Oslofjord	0.10	1.16	0.32	<0.01	0.17	<0.01
Bird egg	Oslofjord	0.04	0.41	0.16	<0.01	0.18	<0.01
Bird egg	Oslofjord	0.01	0.18	0.05	<0.01	0.09	<0.01
Bird egg	Oslofjord	0.06	0.61	0.21	<0.01	0.19	<0.01
Bird egg	Oslofjord	0.87	10.4	2.09	<0.01	1.45	0.01
Bird egg	Oslofjord	0.03	0.35	0.08	<0.01	0.14	<0.01
Bird egg	Oslofjord	0.03	0.53	0.22	<0.01	0.24	<0.01
Bird egg	Oslofjord	<0.01	0.13	0.07	<0.01	0.03	<0.01
Polychaetes	Oslofjord	<0.01	<0.01	0.01	<0.01	<0.01	<0.01
Polychaetes	Oslofjord	<0.01	<0.01	0.01	<0.01	<0.01	<0.01
Polychaetes	Oslofjord	<0.01	<0.01	0.01	<0.01	<0.01	<0.01
Fish	Oslofjord	<0.038	0.07	0.01	<0.071	<0.012	<0.01
Fish	Oslofjord	<0.022	<0.016	<0.01	<0.037	<0.01	<0.01
Fish	Oslofjord	<0.01	0.03	<0.01	<0.013	<0.01	<0.01
Fish	Oslofjord	<0.031	0.06	<0.01	<0.057	0.01	0.01
Fish	Oslofjord	<0.01	0.07	0.02	<0.013	<0.01	0.01
Fish	Oslofjord	<0.018	0.02	<0.01	<0.033	<0.01	<0.01
Fish	Oslofjord	<0.01	0.14	0.03	<0.012	<0.01	0.02
Fish	Oslofjord	<0.01	0.10	0.02	<0.015	<0.01	0.01
Fish	Oslofjord	0.02	0.04	0.01	<0.031	<0.01	0.01
Fish	Oslofjord	<0.011	<0.01	<0.01	<0.018	<0.01	<0.01
Fish	Oslofjord	<0.01	0.06	0.07	<0.011	<0.01	<0.01
Fish	Oslofjord	<0.01	0.09	<0.01	<0.013	<0.01	0.01
Fish	Oslofjord	<0.01	0.06	0.02	<0.01	<0.01	<0.01
Fish	Oslofjord	<0.01	0.04	0.01	<0.01	<0.01	<0.01
Fish	Oslofjord	<0.01	0.07	0.07	<0.01	<0.01	<0.01
Prawns	Oslofjord	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Prawns	Oslofjord	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Prawns	Oslofjord	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Polychaetes	Frognerkilen	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Polychaetes	Alna	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Polychaetes	Bekkelaget	<0.01	<0.01	0.02	<0.01	<0.01	<0.01
Mussel	Frognerkilen	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Mussel	Alna	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Mussel	Bekkelaget	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Compartment spec.	Area	BDE-191 ng/g (w.w.)	BDE-196 ng/g (w.w.)	BDE-197 ng/g (w.w.)	BDE-202 ng/g (w.w.)	BDE-206 ng/g (w.w.)	BDE-207 ng/g (w.w.)
Plankton	Oslofjord	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Plankton	Oslofjord	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Plankton	Oslofjord	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bird egg	Oslofjord	<0.01	0.18	0.32	0.03	0.96	4.04
Bird egg	Oslofjord	<0.01	0.05	0.08	0.05	0.02	0.13
Bird egg	Oslofjord	<0.01	0.11	0.34	0.11	0.04	0.44
Bird egg	Oslofjord	<0.01	0.05	0.13	0.03	0.05	0.24
Bird egg	Oslofjord	<0.01	<0.01	<0.01	<0.01	<0.01	0.02
Bird egg	Oslofjord	<0.01	0.45	0.98	0.04	1.67	7.52
Bird egg	Oslofjord	<0.01	0.16	0.47	0.03	0.19	2.06
Bird egg	Oslofjord	<0.01	0.14	0.22	0.03	2.13	2.81
Bird egg	Oslofjord	<0.01	0.03	0.07	0.01	0.01	0.04
Bird egg	Oslofjord	<0.01	0.11	0.19	0.02	0.49	0.92
Bird egg	Oslofjord	<0.01	1.08	2.56	0.08	1.26	16.8
Bird egg	Oslofjord	<0.01	0.08	0.16	0.02	0.22	0.68
Bird egg	Oslofjord	<0.01	0.14	0.37	0.05	0.04	0.40
Bird egg	Oslofjord	<0.01	0.04	0.05	0.01	0.21	0.30
Polychaetes	Oslofjord	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Polychaetes	Oslofjord	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Polychaetes	Oslofjord	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fish	Oslofjord	<0.024	<0.02	<0.014	0.03	<0.014	<0.01
Fish	Oslofjord	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fish	Oslofjord	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fish	Oslofjord	<0.02	<0.035	<0.025	<0.026	0.03	0.04
Fish	Oslofjord	<0.01	<0.01	<0.01	0.02	<0.01	<0.01
Fish	Oslofjord	<0.011	<0.018	<0.013	<0.014	<0.018	<0.013
Fish	Oslofjord	<0.01	<0.01	<0.01	0.02	<0.01	<0.01
Fish	Oslofjord	<0.01	<0.01	<0.01	0.01	<0.01	<0.01
Fish	Oslofjord	0.01	<0.013	<0.01	0.02	0.03	0.03
Fish	Oslofjord	<0.01	<0.011	<0.01	<0.01	<0.01	<0.01
Fish	Oslofjord	<0.01	<0.01	<0.01	0.04	<0.01	<0.01
Fish	Oslofjord	<0.01	<0.01	<0.01	0.02	<0.01	<0.01
Fish	Oslofjord	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fish	Oslofjord	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fish	Oslofjord	<0.01	<0.01	<0.01	0.04	<0.01	<0.01
Prawns	Oslofjord	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Prawns	Oslofjord	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Prawns	Oslofjord	<0.01	<0.016	<0.013	<0.014	<0.01	<0.01
Polychaetes	Frognerkilen	<0.01	<0.011	<0.01	<0.01	<0.01	<0.01
Polychaetes	Alna	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Polychaetes	Bekkelaget	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Mussel	Frognerkilen	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Mussel	Alna	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Mussel	Bekkelaget	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Compartment spec.	Area	BDE-209 ng/g (w.w.)	EHTeBB ng/g (w.w.)	BEHTBP ng/g (w.w.)	a-HBCD ng/g (w.w.)	b-HBCD ng/g (w.w.)	g-HBCD ng/g (w.w.)
Plankton	Oslofjord	0.05	<0.004	0.14	0.14	<0.01	<0.01
Plankton	Oslofjord	0.04	<0.004	0.12	0.14	<0.01	<0.01
Plankton	Oslofjord	0.02	<0.015	0.25	0.14	<0.01	<0.01
Bird egg	Oslofjord	61.9	<0.024	2.82	3.12	0.05	0.07
Bird egg	Oslofjord	0.78	<0.022	3.78	0.43	0.02	<0.01
Bird egg	Oslofjord	1.60	<0.033	2.07	1.02	<0.01	<0.01
Bird egg	Oslofjord	2.07	<0.024	1.65	0.35	<0.01	0.11
Bird egg	Oslofjord	0.20	<0.007	1.37	0.12	<0.01	<0.01
Bird egg	Oslofjord	88.7	<0.024	2.47	25.9	0.24	1.31
Bird egg	Oslofjord	12.3	<0.016	1.25	1.68	<0.01	0.05
Bird egg	Oslofjord	127	<0.019	1.09	10.7	0.03	0.29
Bird egg	Oslofjord	0.26	<0.011	0.37	1.67	0.15	0.27
Bird egg	Oslofjord	25.8	<0.012	0.76	1.11	0.03	0.36
Bird egg	Oslofjord	104	<0.01	0.33	22.3	<0.111	2.21
Bird egg	Oslofjord	10.6	<0.009	0.49	1.68	<0.01	<0.01
Bird egg	Oslofjord	1.55	<0.014	1.02	3.85	0.04	0.43
Bird egg	Oslofjord	8.46	<0.008	0.69	1.67	0.05	0.24
Polychaetes	Oslofjord	0.04	<0.009	0.25	0.02	<0.01	<0.01
Polychaetes	Oslofjord	0.09	<0.011	0.78	0.02	<0.01	<0.01
Polychaetes	Oslofjord	0.06	<0.006	1.05	0.02	<0.01	<0.01
Fish	Oslofjord	0.12	<0.611	10.6	0.13	<0.017	<0.01
Fish	Oslofjord	<0.034	<0.81	3.99	0.12	<0.013	<0.01
Fish	Oslofjord	0.05	<0.097	8.37	0.36	<0.028	<0.02
Fish	Oslofjord	0.16	<0.117	13.0	0.69	<0.02	0.02
Fish	Oslofjord	0.08	<0.051	7.55	0.44	<0.012	0.01
Fish	Oslofjord	0.16	<0.768	11.2	0.15	<0.013	<0.01
Fish	Oslofjord	0.06	<0.097	8.89	1.36	<0.024	0.05
Fish	Oslofjord	0.04	<0.335	9.34	0.36	<0.012	<0.01
Fish	Oslofjord	0.14	<0.933	18.1	0.13	<0.013	<0.01
Fish	Oslofjord	0.13	<0.092	13.5	<0.011	<0.011	<0.01
Fish	Oslofjord	0.06	<0.049	1.96	0.32	<0.021	<0.015
Fish	Oslofjord	0.04	<0.081	11.6	0.86	<0.018	0.02
Fish	Oslofjord	0.08	<0.028	3.26	0.40	<0.013	<0.01
Fish	Oslofjord	0.05	<0.06	2.64	0.35	<0.015	<0.01
Fish	Oslofjord	0.03	<0.056	<0.354	0.52	<0.01	0.01
Prawns	Oslofjord	<0.01	<0.007	0.34	0.02	<0.01	<0.01
Prawns	Oslofjord	<0.01	<0.003	0.94	<0.01	<0.01	<0.01
Prawns	Oslofjord	<0.026	<0.014	0.65	<0.01	<0.01	<0.01
Polychaetes	Frognerkilen	0.05	<0.015	1.16	0.19	<0.01	<0.01
Polychaetes	Alna	0.07	<0.011	1.52	0.37	<0.01	<0.01
Polychaetes	Bekkelaget	0.04	<0.008	1.40	0.12	<0.01	<0.01
Mussel	Frognerkilen	0.01	<0.009	0.91	0.19	<0.01	0.02
Mussel	Alna	0.02	<0.007	1.13	0.30	0.01	0.03
Mussel	Bekkelaget	<0.012	<0.012	0.61	0.09	<0.01	<0.01

Compartment spec.	Area	a-HCH ng/g (w.w.)	b-HCH ng/g (w.w.)	g-HCH ng/g (w.w.)	o,p'-DDE ng/g (w.w.)	p,p'-DDE ng/g (w.w.)
Plankton	Oslofjord					
Plankton	Oslofjord					
Plankton	Oslofjord					
Bird egg	Oslofjord	<0.01	0.23	0.04	<0.01	20.6
Bird egg	Oslofjord	<0.01	0.44	<0.01	<0.01	26.3
Bird egg	Oslofjord	<0.01	0.95	<0.01	0.18	355
Bird egg	Oslofjord	<0.01	0.07	<0.01	<0.01	27.1
Bird egg	Oslofjord	<0.01	0.02	<0.01	<0.01	1.03
Bird egg	Oslofjord	<0.01	0.25	0.04	<0.01	16.5
Bird egg	Oslofjord	<0.01	0.53	0.02	0.02	29.3
Bird egg	Oslofjord	<0.01	0.27	0.03	<0.01	20.5
Bird egg	Oslofjord	<0.01	0.09	<0.01	<0.01	15.6
Bird egg	Oslofjord	0.01	0.12	0.05	0.01	10.0
Bird egg	Oslofjord	<0.01	0.47	0.03	<0.01	40.3
Bird egg	Oslofjord	<0.01	0.17	0.02	<0.01	12.8
Bird egg	Oslofjord	0.01	0.61	<0.01	<0.01	50.4
Bird egg	Oslofjord	<0.01	0.19	1.57	<0.01	11.5
Polychaetes	Oslofjord					
Polychaetes	Oslofjord					
Polychaetes	Oslofjord					
Fish	Oslofjord	0.12	0.19	0.12	0.48	55.3
Fish	Oslofjord	0.06	0.09	0.07	0.17	34.3
Fish	Oslofjord	0.15	0.25	0.16	0.35	35.3
Fish	Oslofjord	0.14	0.23	0.13	0.54	53.2
Fish	Oslofjord	0.14	0.25	0.14	0.25	33.6
Fish	Oslofjord	0.08	0.15	0.07	0.30	41.6
Fish	Oslofjord	0.18	0.36	0.15	0.71	52.1
Fish	Oslofjord	0.11	0.17	0.08	0.29	28.6
Fish	Oslofjord	0.07	0.11	<0.013	0.29	35.4
Fish	Oslofjord	<0.026	<0.028	<0.029	0.06	7.73
Fish	Oslofjord	0.11	0.18	0.11	0.31	21.6
Fish	Oslofjord	0.24	0.42	0.21	0.76	74.2
Fish	Oslofjord	0.10	0.18	0.10	0.29	27.0
Fish	Oslofjord	0.13	0.22	0.12	0.36	18.8
Fish	Oslofjord	0.08	0.14	0.07	0.10	18.5
Prawns	Oslofjord	<0.01	<0.01	<0.01	0.01	0.33
Prawns	Oslofjord	<0.01	<0.01	<0.01	<0.01	0.08
Prawns	Oslofjord	<0.01	<0.01	<0.01	<0.01	0.18
Polychaetes	Frognerkilen	<0.01	<0.01	<0.01	0.07	1.90
Polychaetes	Alna	<0.01	0.02	<0.01	0.03	1.09
Polychaetes	Bekkelaget					
Mussel	Frognerkilen	<0.01	<0.01	<0.01	<0.01	0.27
Mussel	Alna	<0.01	<0.01	<0.01	<0.01	0.08
Mussel	Bekkelaget	<0.01	<0.01	<0.01	<0.01	0.20

Compartment spec.	Area	o,p'-DDD ng/g (w.w.)	p,p'-DDD ng/g (w.w.)	o,p'-DDT ng/g (w.w.)	p,p'-DDT ng/g (w.w.)	TCEP ng/g (w.w.)
Plankton	Oslofjord					<7.8
Plankton	Oslofjord					<7.8
Plankton	Oslofjord					<7.8
Bird egg	Oslofjord	<0.01	0.08	0.06	0.42	<49.8
Bird egg	Oslofjord	<0.01	0.14	<0.01	1.41	<20.4
Bird egg	Oslofjord	<0.01	0.20	0.04	0.41	<20.4
Bird egg	Oslofjord	<0.01	0.08	<0.01	0.07	<20.4
Bird egg	Oslofjord	<0.01	0.02	<0.01	0.02	<20.4
Bird egg	Oslofjord	<0.01	0.05	0.07	0.62	<20.4
Bird egg	Oslofjord	<0.01	0.12	0.01	0.24	<20.4
Bird egg	Oslofjord	0.02	0.21	0.04	0.44	<20.4
Bird egg	Oslofjord	<0.01	0.12	0.01	0.08	<20.4
Bird egg	Oslofjord	0.04	0.34	0.09	1.12	<20.4
Bird egg	Oslofjord	<0.01	0.09	0.02	0.41	<20.4
Bird egg	Oslofjord	<0.01	0.06	0.02	0.16	<20.4
Bird egg	Oslofjord	<0.01	0.10	0.06	0.36	<20.4
Bird egg	Oslofjord	<0.01	0.05	0.02	0.24	<49.8
Polychaetes	Oslofjord					<7.8
Polychaetes	Oslofjord					<7.8
Polychaetes	Oslofjord					<7.8
Fish	Oslofjord	1.21	12.1	0.12	1.39	<11.3
Fish	Oslofjord	0.44	5.33	<0.037	0.30	<11.3
Fish	Oslofjord	1.51	20.6	0.07	1.22	<33.3
Fish	Oslofjord	1.60	28.5	0.04	0.63	<33.3
Fish	Oslofjord	1.31	18.7	0.04	0.54	<11.3
Fish	Oslofjord	0.79	9.28	<0.023	0.17	<11.3
Fish	Oslofjord	5.43	106	0.06	0.47	<11.3
Fish	Oslofjord	1.33	13.3	0.05	0.33	<11.3
Fish	Oslofjord	0.85	7.69	<0.028	0.12	<11.3
Fish	Oslofjord	0.16	2.20	<0.029	0.23	<11.3
Fish	Oslofjord	1.34	14.8	0.04	0.21	<11.3
Fish	Oslofjord	3.32	39.7	0.10	1.50	<11.3
Fish	Oslofjord	1.35	10.9	0.03	0.28	<11.3
Fish	Oslofjord	1.58	14.1	0.03	0.20	<11.3
Fish	Oslofjord	0.97	9.30	0.07	0.66	<11.3
Prawns	Oslofjord	0.11	0.29	0.02	0.08	<23.3
Prawns	Oslofjord	<0.01	<0.01	<0.01	<0.01	<7.8
Prawns	Oslofjord	<0.01	<0.01	<0.01	<0.01	<7.8
Polychaetes	Frognerkilen	1.56	6.19	<0.01	0.08	<7.8
Polychaetes	Alna	0.46	1.68	<0.01	0.02	<7.8
Polychaetes	Bekkelaget					<7.8
Mussel	Frognerkilen	0.07	0.25	0.01	0.04	<7.8
Mussel	Alna	<0.01	<0.01	<0.01	<0.01	<7.8
Mussel	Bekkelaget	0.03	0.09	0.01	0.04	<7.8

Compartment spec.	Area	TPrP ng/g (w.w.)	TCPP ng/g (w.w.)	TiBP ng/g (w.w.)	TnBP ng/g (w.w.)	BdPhP ng/g (w.w.)	TPP ng/g (w.w.)
Plankton	Oslofjord	<0.3	<13	<281	<15.3	<0.1	<4.3
Plankton	Oslofjord	<0.3	<13	<281	<15.3	<0.1	<4.3
Plankton	Oslofjord	<0.3	<13	<281	<15.3	<0.1	<4.3
Bird egg	Oslofjord	<0.3	<4.8	<203	<32.3	<0.3	<4.9
Bird egg	Oslofjord	<0.3	<4.8	<203	<32.3	<0.1	<4.9
Bird egg	Oslofjord	<0.3	<4.8	<203	<32.3	<0.1	<4.9
Bird egg	Oslofjord	<0.3	<4.8	296	<32.3	<0.1	<4.9
Bird egg	Oslofjord	<0.3	<4.8	<203	<32.3	<0.3	<4.9
Bird egg	Oslofjord	<0.3	<4.8	<203	<32.3	<0.3	<4.9
Bird egg	Oslofjord	<0.3	<4.8	<106	<32.3	<0.1	<4.9
Bird egg	Oslofjord	<0.3	<4.8	<203	<32.3	<0.3	<4.9
Bird egg	Oslofjord	<0.3	<4.8	363	<32.3	<0.3	<4.9
Bird egg	Oslofjord	<0.3	<4.8	<106	<32.3	<0.1	<4.9
Bird egg	Oslofjord	<0.3	<4.8	394	<32.3	0.58	<11.5
Bird egg	Oslofjord	<0.3	<4.8	325	<32.3	0.34	86.3
Bird egg	Oslofjord	<0.3	<4.8	728	<32.3	<0.1	12.5
Bird egg	Oslofjord	<0.3	13.4	737	<32.3	1.04	<11.5
Polychaetes	Oslofjord	<0.3	<13	<281	<15.3	<0.1	<4.3
Polychaetes	Oslofjord	<0.3	<13	<281	<15.3	<0.1	<4.3
Polychaetes	Oslofjord	<0.3	<13	<281	<15.3	<0.1	<4.3
Fish	Oslofjord	<0.4	<11.2	<378	<26.2	<0.14	<0.14
Fish	Oslofjord	<0.4	<11.2	<378	<26.2	<0.14	<0.14
Fish	Oslofjord	<0.4	<11.2	<378	<26.2	<0.14	<0.14
Fish	Oslofjord	<0.4	<11.2	<378	<26.2	<0.14	<0.14
Fish	Oslofjord	<0.4	<11.2	<378	<26.2	<0.14	<0.14
Fish	Oslofjord	<0.4	<11.2	<378	<26.2	<0.14	<0.14
Fish	Oslofjord	<0.4	<11.2	<378	<26.2	<0.14	<0.14
Fish	Oslofjord	<0.4	<11.2	<378	<26.2	<0.14	<0.14
Fish	Oslofjord	<0.4	<11.2	<378	<26.2	<0.14	<0.14
Fish	Oslofjord	<0.4	<11.2	<378	<61.8	<0.14	<0.14
Fish	Oslofjord	<0.4	<11.2	<378	<26.2	<0.14	<0.14
Fish	Oslofjord	<0.4	<11.2	<378	<26.2	<0.14	<0.14
Fish	Oslofjord	<0.4	<11.2	<378	<26.2	<0.14	<0.14
Fish	Oslofjord	<0.4	<25.3	<378	<26.2	<0.14	<0.14
Fish	Oslofjord	<0.4	<11.2	<378	<26.2	<0.14	<0.14
Prawns	Oslofjord	<0.3	<13	<625	<15.3	<0.1	<4.3
Prawns	Oslofjord	<0.3	<13	<281	<15.3	<0.1	<4.3
Prawns	Oslofjord	<0.3	<13	<281	<15.3	<0.1	<4.3
Polychaetes	Frognerkilen	<0.3	<13	<281	<15.3	<0.1	<4.3
Polychaetes	Alna	<0.3	<13	<281	<15.3	<0.1	<4.3
Polychaetes	Bekkelaget	<0.3	<13	<281	<15.3	<0.1	<4.3
Mussel	Frognerkilen	<0.3	<13	<281	<15.3	<0.1	<4.3
Mussel	Alna	<0.3	<13	<281	<15.3	<0.1	<4.3
Mussel	Bekkelaget	<0.3	<13	<281	<15.3	<0.1	<4.3

Compartment spec.	Area	DBPhP ng/g (w.w.)	TBEP ng/g (w.w.)	TCP ng/g (w.w.)	EHDP ng/g (w.w.)	TEHP ng/g (w.w.)	TDCPP ng/g (w.w.)
Plankton	Oslofjord	<0.03	<1.1	<22.7	<0.05	<16.8	<1.5
Plankton	Oslofjord	<0.03	<0.6	<22.7	<0.05	<16.8	<1.5
Plankton	Oslofjord	<0.03	<1.1	<22.7	<0.05	<16.8	<1.5
Bird egg	Oslofjord	0.32	<2.4	<14.3	<0.05	<26.7	<1.5
Bird egg	Oslofjord	0.92	<1.2	<30.8	<0.2	<26.7	<3.2
Bird egg	Oslofjord	<0.2	<1.2	<14.3	<0.05	<26.7	<1.5
Bird egg	Oslofjord	<0.2	<1.2	<14.3	<0.05	<26.7	<3.2
Bird egg	Oslofjord	<0.06	<1.2	<14.3	<0.05	<26.7	<1.5
Bird egg	Oslofjord	0.33	<1.2	<14.3	<0.05	<26.7	<3.2
Bird egg	Oslofjord	<0.06	<1.2	<14.3	<0.05	<26.7	<1.5
Bird egg	Oslofjord	<0.2	<1.2	<14.3	<0.05	<26.7	<1.5
Bird egg	Oslofjord	0.26	<1.2	<14.3	<0.05	<26.7	3.66
Bird egg	Oslofjord	<0.06	<1.2	<14.3	<0.05	<26.7	<1.5
Bird egg	Oslofjord	<0.06	<1.2	<30.8	<0.05	<26.7	5.87
Bird egg	Oslofjord	2.65	<1.2	<30.8	<0.2	128	6.65
Bird egg	Oslofjord	2.27	<1.2	31.2	<0.05	50.2	7.29
Bird egg	Oslofjord	0.58	<1.2	68.5	<0.05	<57.6	8.03
Polychaetes	Oslofjord	<0.03	<0.6	<22.7	<0.05	<16.8	11.1
Polychaetes	Oslofjord	<0.03	1.40	<22.7	<0.05	<16.8	<1.5
Polychaetes	Oslofjord	<0.03	<1.1	<22.7	<0.05	<16.8	<1.5
Fish	Oslofjord	<6.5	<1.3	<39.6	<0.1	<54.6	15.3
Fish	Oslofjord	<6.5	<1.3	<39.6	<0.1	<23.6	<5.7
Fish	Oslofjord	<6.5	1.68	<39.6	<0.1	<23.6	8.99
Fish	Oslofjord	<6.5	<1.3	<39.6	<0.1	<54.6	40.4
Fish	Oslofjord	<6.5	<0.7	<39.6	<0.1	<23.6	7.54
Fish	Oslofjord	<6.5	<1.3	<39.6	<0.1	<23.6	13.7
Fish	Oslofjord	<6.5	<1.3	<39.6	<0.1	<23.6	15.7
Fish	Oslofjord	<6.5	<0.7	<39.6	<0.1	<23.6	<2.5
Fish	Oslofjord	<6.5	<1.3	<39.6	<0.1	<23.6	<2.5
Fish	Oslofjord	17.8	1.36	<39.6	<0.1	<23.6	<2.5
Fish	Oslofjord	<6.5	<0.7	<39.6	<0.1	<23.6	<2.5
Fish	Oslofjord	<16	<1.3	<39.6	<0.1	<23.6	<2.5
Fish	Oslofjord	<6.5	<1.3	<39.6	<0.1	<23.6	<2.5
Fish	Oslofjord	<6.5	<0.7	<39.6	<0.1	<23.6	<2.5
Fish	Oslofjord	<6.5	<0.7	<39.6	<0.1	<23.6	<2.5
Prawns	Oslofjord	<0.03	<0.6	<60.7	<0.05	<16.8	4.31
Prawns	Oslofjord	<0.03	<0.6	<22.7	<0.05	<16.8	<3.2
Prawns	Oslofjord	<0.03	<0.6	<22.7	<0.05	<16.8	<3.2
Polychaetes	Frognerkilen	<0.03	<0.6	<22.7	<0.05	<16.8	<3.2
Polychaetes	Alna	<0.03	<1.1	<22.7	<0.05	<16.8	25.6
Polychaetes	Bekkelaget	<0.03	1.19	<22.7	<0.05	<16.8	26.2
Mussel	Frognerkilen	0.07	<0.6	<22.7	<0.05	<16.8	4.88
Mussel	Alna	0.15	<0.6	<22.7	<0.05	<16.8	21.8
Mussel	Bekkelaget	<0.03	<0.6	<22.7	<0.05	<16.8	<1.5

Compartment spec.	Area	Cr µg/g (w.w.)	Fe µg/g (w.w.)	Ni µg/g (w.w.)	Cu µg/g (w.w.)	Zn µg/g (w.w.)	As µg/g (w.w.)
Plankton	Oslofjord	8.56	44.8	5.55	14.0	10.3	5.74
Plankton	Oslofjord	6.86	36.1	4.25	16.0	11.6	6.25
Plankton	Oslofjord	8.56	46.4	5.44	16.0	12.7	6.17
Bird egg	Oslofjord	3.12	45.3	1.87	0.79	18.9	0.02
Bird egg	Oslofjord	1.58	34.2	0.97	0.83	13.0	0.04
Bird egg	Oslofjord	0.86	31.9	0.53	0.74	14.3	0.04
Bird egg	Oslofjord	1.05	29.5	0.64	0.82	17.9	0.04
Bird egg	Oslofjord	1.19	7.21	0.71	0.46	0.84	0.02
Bird egg	Oslofjord	1.31	36.9	0.82	0.83	11.5	0.02
Bird egg	Oslofjord	1.04	29.1	0.66	0.74	12.9	0.05
Bird egg	Oslofjord	1.30	37.4	0.87	0.75	14.1	0.04
Bird egg	Oslofjord	0.80	37.4	0.53	0.72	14.2	0.01
Bird egg	Oslofjord	0.17	27.6	0.11	0.93	12.8	0.09
Bird egg	Oslofjord	0.54	26.5	0.33	0.66	12.0	0.05
Bird egg	Oslofjord	1.23	34.5	0.81	0.75	16.9	0.02
Bird egg	Oslofjord	0.39	30.4	0.26	0.75	13.8	0.05
Bird egg	Oslofjord	1.18	34.1	0.72	0.89	14.8	0.09
Polychaetes	Oslofjord	5.23	1 128	3.28	28.4	18.9	6.19
Polychaetes	Oslofjord	8.41	1 538	4.69	34.1	20.3	4.74
Polychaetes	Oslofjord	19.3	1 916	11.3	40.7	30.7	8.24
Fish	Oslofjord	1.01	106	0.57	10.6	32.7	3.22
Fish	Oslofjord	0.33	103	0.27	25.6	55.2	3.74
Fish	Oslofjord	0.23	135	0.17	19.4	52.5	2.01
Fish	Oslofjord	0.31	196	0.19	18.4	61.3	1.91
Fish	Oslofjord	0.03	65.1	0.04	16.0	38.9	2.74
Fish	Oslofjord	0.17	149	0.18	22.3	56.6	3.15
Fish	Oslofjord	0.12	70.2	0.09	22.4	44.5	2.69
Fish	Oslofjord	0.04	174	0.05	11.0	53.3	1.74
Fish	Oslofjord	0.08	216	0.09	21.6	43.6	2.77
Fish	Oslofjord	0.58	288	0.35	8.21	28.4	2.72
Fish	Oslofjord	0.05	164	0.04	12.6	52.0	1.48
Fish	Oslofjord	0.02	89.0	0.06	22.4	62.3	2.23
Fish	Oslofjord	0.13	135	0.09	16.6	44.6	2.19
Fish	Oslofjord	0.12	144	0.08	23.3	61.8	2.23
Fish	Oslofjord	0.06	1 290	0.09	12.4	48.5	1.80
Prawns	Oslofjord	3.21	19.3	2.08	6.53	12.5	25.9
Prawns	Oslofjord	1.60	13.1	0.96	6.78	13.4	29.2
Prawns	Oslofjord	0.61	7.41	0.35	7.05	12.3	26.7
Polychaetes	Frognerkilen	8.83	656	5.52	16.5	23.4	2.51
Polychaetes	Alna	2.66	401	1.88	6.36	35.5	3.06
Polychaetes	Bekkelaget	5.65	1 066	3.31	19.1	16.6	3.94
Mussel	Frognerkilen	2.86	46.6	1.71	1.62	22.2	0.97
Mussel	Alna	8.21	89.5	4.74	1.97	23.4	1.06
Mussel	Bekkelaget	8.13	53.0	4.94	1.28	19.2	0.91

Compartment spec.	Area	Ag µg/g (w.w.)	Cd µg/g (w.w.)	Hg ng/g (w.w.)	Pb µg/g (w.w.)	SCCP ng/g (w.w.)	MCCP ng/g (w.w.)
Plankton	Oslofjord	0.06	0.01	13.4	0.16	10	0.6
Plankton	Oslofjord	0.06	0.01	14.9	0.14	10	0.1
Plankton	Oslofjord	0.07	0.01	15.7	0.17	2.3	<0.1
Bird egg	Oslofjord	0.00	0.00	27.7	0.30	17.3	35.4
Bird egg	Oslofjord	0.00	0.00	41.3	0.12	5	7.5
Bird egg	Oslofjord	0.00	0.00	273	0.07	7.2	0.9
Bird egg	Oslofjord	0.00	0.00	23.0	0.06	9.4	28.9
Bird egg	Oslofjord	0.00	0.00	61.3	0.03	1.9	0.3
Bird egg	Oslofjord	0.00	0.00	31.8	0.09	19.5	5.2
Bird egg	Oslofjord	0.00	0.00	49.2	0.26	3.7	1.3
Bird egg	Oslofjord	0.00	0.00	31.6	0.05	2	2.5
Bird egg	Oslofjord	0.00	0.00	25.8	0.10	10.6	0.8
Bird egg	Oslofjord	0.00	0.00	22.5	0.20	13.4	2.3
Bird egg	Oslofjord	0.00	0.00	27.1	0.30	16.3	5.5
Bird egg	Oslofjord	0.00	0.00	10.9	0.12	4.4	5.6
Bird egg	Oslofjord	0.00	0.00	34.8	0.12	20.5	17.3
Bird egg	Oslofjord	0.00	0.00	27.1	0.13	2.2	0.8
Polychaetes	Oslofjord	0.94	0.29	69.9	24.7	0.3	<0.1
Polychaetes	Oslofjord	0.96	0.33	78.1	29.6	0.4	<0.1
Polychaetes	Oslofjord	0.71	0.40	92.9	38.6	0.3	0.4
Fish	Oslofjord	0.02	1.15	86.9	2.58	10.7	2
Fish	Oslofjord	0.07	3.20	89.9	3.42	7.8	0.6
Fish	Oslofjord	0.15	0.10	103	1.22	20.2	16.9
Fish	Oslofjord	0.08	0.16	56.8	1.79	22	2.2
Fish	Oslofjord	0.07	0.09	33.8	1.38	14.4	2.8
Fish	Oslofjord	0.10	1.17	63.2	3.63	7.4	3.7
Fish	Oslofjord	0.17	0.19	36.2	2.92	34.9	11.4
Fish	Oslofjord	0.13	0.09	104	4.39	11.9	4.5
Fish	Oslofjord	0.10	1.61	75.9	3.69	4.9	2.7
Fish	Oslofjord	0.03	0.14	81.3	2.01	6.2	7.4
Fish	Oslofjord	0.03	0.04	60.1	2.16	12.1	4.1
Fish	Oslofjord	0.09	0.30	23.9	1.99	48.1	8.7
Fish	Oslofjord	0.07	0.09	73.6	2.76	7.9	11.7
Fish	Oslofjord	0.14	0.13	57.5	6.55	8.3	4.4
Fish	Oslofjord	0.05	0.21	102	4.14	12.2	8.3
Prawns	Oslofjord	0.30	0.01	113	0.12	51	1.6
Prawns	Oslofjord	0.31	0.01	131	0.15	0.2	0.1
Prawns	Oslofjord	0.30	0.01	103	0.10	<0.2	0.2
Polychaetes	Frognerkilen	0.78	0.14	46.0	20.5	18	1.3
Polychaetes	Alna	0.23	0.16	9.44	7.72	22	2
Polychaetes	Bekkelaget	1.09	0.31	26.4	13.2	1.5	<0.1
Mussel	Frognerkilen	0.00	0.16	13.2	4.77	13	0.5
Mussel	Alna	0.00	0.15	14.2	4.80	0.7	<0.1
Mussel	Bekkelaget	0.00	0.14	11.2	3.72	3.4	0.6

Compartment spec.	Area	D4 ng/g (w.w.)	D5 ng/g (w.w.)	D6 ng/g (w.w.)	BPA ng/g (w.w.)	TBBPA ng/g (w.w.)	44-BPF ng/g (w.w.)
Plankton	Oslofjord	7.89	293	5.27	<0.1	<0.5	0.32
Plankton	Oslofjord	9.80	360	5.97	19.0	<0.5	2.76
Plankton	Oslofjord	8.34	297	4.86	40.3	<0.5	9.39
Bird egg	Oslofjord	1.06	46.1	12.9	4.72	<0.5	1.10
Bird egg	Oslofjord	0.93	109	14.6	86.6	<5	<0.3
Bird egg	Oslofjord	1.08	104	13.8	195	<5	<0.5
Bird egg	Oslofjord	0.79	15.2	7.12	1.46	<5	0.00
Bird egg	Oslofjord	0.62	1.35	2.47	1.52	<5	0.35
Bird egg	Oslofjord	1.44	40.4	16.3	<0.4	<5	<0.4
Bird egg	Oslofjord	0.67	38.8	6.19	<0.4	<5	5.01
Bird egg	Oslofjord	2.98	163	10.4	<0.3	<5	<0.3
Bird egg	Oslofjord	0.75	5.15	3.89	1.46	<5	0.31
Bird egg	Oslofjord	1.70	127	15.5	1.58	<0.9	0.64
Bird egg	Oslofjord	1.39	92.9	19.1	1.48	<0.1	1.18
Bird egg	Oslofjord	0.89	24.5	7.01	2.03	<0.11	0.97
Bird egg	Oslofjord	0.98	85.4	10.5	1.53	<0.12	1.41
Bird egg	Oslofjord	0.60	6.62	4.25	1.55	<0.13	2.56
Polychaetes	Oslofjord	3.81	125	7.35	6.80	82.9	0.70
Polychaetes	Oslofjord	3.88	124	7.54	6.61	672	0.61
Polychaetes	Oslofjord	5.00	162	8.98	6.24	221	1.40
Fish	Oslofjord	37.2	919	18.1	25.0	<326.39	37.4
Fish	Oslofjord	18.5	618	13.4	5.80	<70	<1.6
Fish	Oslofjord	79.2	1 928	45.6	44.0	<0.58	<4
Fish	Oslofjord	42.7	1 169	19.9	369	<0.71	<2.06
Fish	Oslofjord	59.5	1 467	32.6	11.6	<37	7.16
Fish	Oslofjord	20.2	581	16.5	2.81	<37	202
Fish	Oslofjord	235	3 632	90.6	<0.56	<7	2.12
Fish	Oslofjord	58.7	1 085	23.6	17.8	<8.1	9.69
Fish	Oslofjord	15.8	601	9.64	23.0	<6.06	16.9
Fish	Oslofjord	13.2	176	7.75	27.0	<12.22	10.8
Fish	Oslofjord	24.6	534	17.1	11.7	610	9.12
Fish	Oslofjord	104	2 318	53.5	8.69	<5.9	<2.2
Fish	Oslofjord	36.3	1 635	53.6	15.7	<15.2	8.03
Fish	Oslofjord	34.4	1 063	39.3	38.0	<0.53	<4
Fish	Oslofjord	247	2 375	26.0	<1.31	<9.33	<1.7
Prawns	Oslofjord	3.06	33.3	4.48	3.62	<3	<0.1
Prawns	Oslofjord	3.10	30.0	4.18	2.51	<3	<0.1
Prawns	Oslofjord	3.10	30.4	4.57	2.62	<3	0.12
Polychaetes	Frognerkilen	5.93	147	5.65	9.92	<19.8	0.63
Polychaetes	Alna	14.0	225	6.94	8.70	5.73	7.28
Polychaetes	Bekkelaget	15.0	640	23.9	6.73	82.7	0.44
Mussel	Frognerkilen	<1.8	150	4.53	<0.1	<3	12.1
Mussel	Alna	1.91	128	6.38	<0.1	<3	<0.1
Mussel	Bekkelaget	<1.5	24.4	2.53	<0.1	<3	<0.1

Compartment spec.	Area	22-BPF ng/g (w.w.)	BPAF ng/g (w.w.)	BPBP ng/g (w.w.)	BPS ng/g (w.w.)	4-NP ng/g (w.w.)	4-OP ng/g (w.w.)
Plankton	Oslofjord	0.30	<0.2	5.63	<0.55	131	1.25
Plankton	Oslofjord	0.36	<0.2	<0.5	<0.55	140	1.77
Plankton	Oslofjord	4.71	<0.2	1.96	<0.55	339	0.98
Bird egg	Oslofjord	0.29	<0.1	3.91	<0.55	103	0.05
Bird egg	Oslofjord	7.11	<0.1	5.56	18.8	29.2	<0.05
Bird egg	Oslofjord	19.4	<0.1	9.02	248	0.42	0.85
Bird egg	Oslofjord	0.00	<0.1	<0.5	<0.55	5.22	<0.05
Bird egg	Oslofjord	0.00	<0.1	<0.5	<0.55	6.49	0.36
Bird egg	Oslofjord	4.92	<0.1	22.5	23.6	1.00	0.53
Bird egg	Oslofjord	10.8	<0.1	<0.5	16.8	3.56	<0.05
Bird egg	Oslofjord	<0.1	1.16	17.7	16.3	4.98	0.02
Bird egg	Oslofjord	<0.1	<0.1	<0.5	<0.55	5.21	0.27
Bird egg	Oslofjord	<0.1	<0.1	<0.5	<0.55	2.46	0.33
Bird egg	Oslofjord	0.03	<0.1	1.16	<0.55	5.20	0.02
Bird egg	Oslofjord	0.15	<0.1	<0.5	<0.55	6.20	<0.05
Bird egg	Oslofjord	0.38	<0.1	<0.5	<0.55	2.31	0.25
Bird egg	Oslofjord	0.66	<0.1	0.81	<0.55	35.0	0.18
Polychaetes	Oslofjord	0.17	<0.2	<0.5	<0.55	34.1	<0.05
Polychaetes	Oslofjord	<0.1	<0.2	<0.5	<0.55	168	5.95
Polychaetes	Oslofjord	0.12	<0.2	0.95	<0.55	91.8	0.74
Fish	Oslofjord	2.34	<0.2	1.00	<0.55	46.0	0.87
Fish	Oslofjord	<0.6	1.38	58.4	<0.55	0.66	<0.054
Fish	Oslofjord	<5	<0.2	<2	<0.55	0.32	<0.062
Fish	Oslofjord	<0.98	<0.2	<1.34	<0.55	2.70	<0.119
Fish	Oslofjord	0.38	<0.2	<0.16	<0.55	1.57	7.11
Fish	Oslofjord	14.8	<0.2	<0.15	<0.55	2.45	1.83
Fish	Oslofjord	0.75	<0.2	<0.47	<0.56	<0.3	<0.15
Fish	Oslofjord	<0.6	<0.2	<1.3	<0.57	0.36	<0.05
Fish	Oslofjord	<0.36	<0.2	<0.5	<0.55	<0.3	1.40
Fish	Oslofjord	<0.06	<0.2	<0.08	<0.55	3.89	0.99
Fish	Oslofjord	<0.2	<0.2	<0.3	<0.58	<0.3	<0.051
Fish	Oslofjord	<0.8	<0.2	<1.6	<0.59	<0.3	<0.052
Fish	Oslofjord	0.22	1.45	<0.4	<0.6	<0.3	<0.053
Fish	Oslofjord	<5	<0.2	<3	<0.55	0.35	<0.199
Fish	Oslofjord	<0.81	<0.2	<1.1	<0.55	<0.3	<0.15
Prawns	Oslofjord	0.25	<0.2	0.60	<0.55	290	2.47
Prawns	Oslofjord	0.05	<0.2	1.75	<0.55	517	1.86
Prawns	Oslofjord	0.03	<0.2	<0.5	<0.55	542	2.53
Polychaetes	Frognerkilen	0.06	<0.2	<0.5	<0.55	80.2	3.43
Polychaetes	Alna	1.20	<0.2	<0.5	<0.55	24.5	1.57
Polychaetes	Bekkelaget	0.11	<0.2	<0.5	<0.55	<0.3	0.54
Mussel	Frognerkilen	5.14	<0.2	7.76	<0.55	34.9	1.29
Mussel	Alna	<0.1	<0.2	16.8	<0.55	107	1.79
Mussel	Bekkelaget	<0.1	<0.2	4.99	<0.55	<0.3	1.47

Compartment spec.	Area	4t-OP ng/g (w.w.)	PFPA ng/g (w.w.)	PFHxA ng/g (w.w.)	PFHpA ng/g (w.w.)	PFOA ng/g (w.w.)	PFNA ng/g (w.w.)
Plankton	Oslofjord	<1	<1	<0.5	<0.5	<0.5	<0.5
Plankton	Oslofjord	<1	<1	<0.5	<0.5	<0.5	<0.5
Plankton	Oslofjord	<1	<1	<0.5	<0.5	<0.5	<0.5
Bird egg	Oslofjord	4.00	<1	<0.5	<0.5	<0.5	<0.5
Bird egg	Oslofjord	6.62	<1	<0.5	<0.5	<0.5	1.63
Bird egg	Oslofjord	28.0	<1	<0.5	<0.5	<0.5	0.90
Bird egg	Oslofjord	<0.5	<1	<0.5	<0.5	<0.5	<0.5
Bird egg	Oslofjord	1.00	<1	<0.5	<0.5	<0.5	<0.5
Bird egg	Oslofjord	50.0	<1	<0.5	<0.5	<0.5	<0.5
Bird egg	Oslofjord	9.00	<1	<0.5	<0.5	<0.5	0.68
Bird egg	Oslofjord	8.00	<1	<0.5	<0.5	<0.5	<0.5
Bird egg	Oslofjord	2.99	<1	<0.5	<0.5	<0.5	<0.5
Bird egg	Oslofjord	17.5	<1	<0.5	<0.5	<0.5	<0.5
Bird egg	Oslofjord	3.16	<1	<0.5	<0.5	<0.5	1.15
Bird egg	Oslofjord	5.93	<1	<0.5	<0.5	<0.5	0.65
Bird egg	Oslofjord	21.5	<1	<0.5	<0.5	<0.5	1.17
Bird egg	Oslofjord	8.51	<1	<0.5	<0.5	<0.5	<0.5
Polychaetes	Oslofjord	144	<1	<0.5	<0.5	<0.5	<0.5
Polychaetes	Oslofjord	<1	<1	<0.5	<0.5	<0.5	<0.5
Polychaetes	Oslofjord	<1	<1	<0.5	<0.5	<0.5	<0.5
Fish	Oslofjord	<50	<1	<0.5	<0.5	<0.5	<0.5
Fish	Oslofjord	<0.1	<1	<0.5	<0.5	<0.5	<0.5
Fish	Oslofjord	<11.91	<1	<0.5	<0.5	<0.5	<0.5
Fish	Oslofjord	<23.02	<1	<0.5	<0.5	<0.5	<0.5
Fish	Oslofjord	<33.07	<1	<0.5	<0.5	<0.5	<0.5
Fish	Oslofjord	63.3	<1	<0.5	<0.5	<0.5	<0.5
Fish	Oslofjord	<50	<1	<0.5	<0.5	<0.5	<0.5
Fish	Oslofjord	<0.1	<1	<0.5	<0.5	<0.5	<0.5
Fish	Oslofjord	<50	<1	<0.5	<0.5	<0.5	<0.5
Fish	Oslofjord	<50	<1	<0.5	<0.5	<0.5	<0.5
Fish	Oslofjord	<0.1	<1	<0.5	<0.5	<0.5	<0.5
Fish	Oslofjord	0.12	<1	<0.5	<0.5	<0.5	<0.5
Fish	Oslofjord	<0.1	<1	<0.5	<0.5	<0.5	<0.5
Fish	Oslofjord	<38.37	<1	<0.5	<0.5	<0.5	<0.5
Fish	Oslofjord	<50	<1	<0.5	<0.5	<0.5	<0.5
Prawns	Oslofjord	<0.5	<1	<0.5	<0.5	<0.5	<0.5
Prawns	Oslofjord	<0.05	<1	<0.5	<0.5	<0.5	<0.5
Prawns	Oslofjord	<0.05	<1	<0.5	<0.5	<0.5	<0.5
Polychaetes	Frognerkilen	<1	<1	<0.5	<0.5	<0.5	<0.5
Polychaetes	Alna	216	<1	<0.5	<0.5	<0.5	<0.5
Polychaetes	Bekkelaget	<1	<1	<0.5	<0.5	<0.5	<0.5
Mussel	Frognerkilen	<0.05	<1	<0.5	<0.5	<0.5	<0.5
Mussel	Alna	<0.05	<1	<0.5	<0.5	<0.5	<0.5
Mussel	Bekkelaget	124	<1	<0.5	<0.5	<0.5	<0.5

Compartment spec.	Area	PFDA ng/g (w.w.)	PFUdA ng/g (w.w.)	PFDoA ng/g (w.w.)	PFTrA ng/g (w.w.)	PFTeA ng/g (w.w.)	PFBS ng/g (w.w.)
Plankton	Oslofjord	<0.5	<0.5	0.42	0.53	<0.4	<0.1
Plankton	Oslofjord	<0.5	0.51	0.51	0.43	<0.4	<0.1
Plankton	Oslofjord	<0.5	0.49	0.48	0.51	<0.4	<0.1
Bird egg	Oslofjord	0.52	<0.5	0.51	<0.4	<0.4	<0.1
Bird egg	Oslofjord	2.94	1.79	2.03	1.95	1.35	<0.1
Bird egg	Oslofjord	1.31	1.53	7.19	2.96	5.73	<0.1
Bird egg	Oslofjord	<0.5	<0.5	<0.4	<0.4	0.58	<0.1
Bird egg	Oslofjord	<0.5	<0.5	<0.4	<0.4	<0.4	<0.1
Bird egg	Oslofjord	0.92	0.56	0.64	<0.4	0.41	<0.1
Bird egg	Oslofjord	2.00	0.68	1.25	0.57	1.00	<0.1
Bird egg	Oslofjord	0.99	1.40	1.51	0.47	0.75	<0.1
Bird egg	Oslofjord	1.08	0.96	2.56	0.87	1.80	<0.1
Bird egg	Oslofjord	1.43	1.19	1.84	0.88	1.11	<0.1
Bird egg	Oslofjord	1.55	0.93	1.50	0.59	0.62	<0.1
Bird egg	Oslofjord	0.67	0.57	0.92	0.87	0.93	<0.1
Bird egg	Oslofjord	1.99	2.01	2.39	1.02	1.37	<0.1
Bird egg	Oslofjord	0.50	1.30	<0.4	<0.4	0.43	<0.1
Polychaetes	Oslofjord	0.59	1.07	1.80	1.79	0.70	1.17
Polychaetes	Oslofjord	0.62	1.07	1.25	1.16	0.81	1.19
Polychaetes	Oslofjord	0.56	1.30	0.75	1.07	0.71	0.87
Fish	Oslofjord	0.78	0.86	1.77	0.94	0.54	0.82
Fish	Oslofjord	1.50	1.12	2.65	1.98	0.85	1.47
Fish	Oslofjord	2.11	1.18	2.12	1.02	0.39	2.28
Fish	Oslofjord	1.68	2.85	2.86	1.48	0.57	0.71
Fish	Oslofjord	0.85	1.07	1.18	0.60	<0.4	0.51
Fish	Oslofjord	1.33	1.51	4.02	2.11	1.38	1.21
Fish	Oslofjord	0.96	1.17	1.40	0.80	0.43	0.57
Fish	Oslofjord	1.28	0.77	1.32	0.50	<0.4	0.16
Fish	Oslofjord	0.98	1.56	5.15	2.84	1.15	2.22
Fish	Oslofjord	5.60	2.54	3.06	1.31	0.57	0.20
Fish	Oslofjord	1.86	1.44	1.74	0.70	<0.4	<0.1
Fish	Oslofjord	0.62	0.60	1.54	0.98	0.39	0.72
Fish	Oslofjord	1.09	1.11	1.36	0.64	<0.4	1.62
Fish	Oslofjord	1.43	0.83	1.43	0.68	<0.4	1.02
Fish	Oslofjord	1.26	1.17	1.40	0.63	<0.4	<0.1
Prawns	Oslofjord	1.36	1.73	1.77	2.66	1.02	<0.1
Prawns	Oslofjord	1.03	2.22	1.52	1.65	1.10	<0.1
Prawns	Oslofjord	0.95	1.58	1.73	2.24	0.80	<0.1
Polychaetes	Frognerkilen	<0.5	<0.5	0.50	0.68	1.13	0.65
Polychaetes	Alna	<0.5	<0.5	0.82	0.79	0.62	0.15
Polychaetes	Bekkelaget	<0.5	0.74	1.29	1.11	0.95	2.24
Mussel	Frognerkilen	<0.5	<0.5	<0.4	<0.4	<0.4	<0.1
Mussel	Alna	<0.5	<0.5	0.48	<0.4	<0.4	<0.1
Mussel	Bekkelaget	<0.5	<0.5	<0.4	<0.4	<0.4	<0.1

Compartment spec.	Area	PFHxS ng/g (w.w.)	PFOS ng/g (w.w.)	PFDS ng/g (w.w.)	PFDoS ng/g (w.w.)	PFOSA ng/g (w.w.)	me-PFOSA ng/g (w.w.)
Plankton	Oslofjord	<0.1	0.21	<0.1	<0.2	1.45	<0.3
Plankton	Oslofjord	<0.1	0.25	<0.1	<0.2	1.67	<0.3
Plankton	Oslofjord	<0.1	0.23	<0.1	<0.2	1.40	<0.3
Bird egg	Oslofjord	<0.1	2.45	<0.2	<0.2	<0.1	<0.3
Bird egg	Oslofjord	0.52	124	1.13	<0.2	<0.1	<0.3
Bird egg	Oslofjord	0.17	211	1.69	<0.2	0.20	<0.3
Bird egg	Oslofjord	<0.1	3.16	<0.2	<0.2	<0.1	<0.3
Bird egg	Oslofjord	0.08	0.28	<0.2	<0.2	<0.1	<0.3
Bird egg	Oslofjord	0.16	12.7	<0.2	<0.2	<0.1	<0.3
Bird egg	Oslofjord	0.26	24.3	0.39	<0.2	<0.1	<0.3
Bird egg	Oslofjord	0.18	26.2	0.43	<0.2	<0.1	<0.3
Bird egg	Oslofjord	0.17	88.9	0.47	<0.2	<0.1	<0.3
Bird egg	Oslofjord	0.15	158	1.35	<0.2	<0.1	<0.3
Bird egg	Oslofjord	0.26	38.3	0.42	<0.2	<0.1	<0.3
Bird egg	Oslofjord	<0.1	8.61	<0.2	<0.2	<0.1	<0.3
Bird egg	Oslofjord	0.35	81.5	0.52	<0.2	0.16	<0.3
Bird egg	Oslofjord	<0.1	6.68	0.24	<0.2	<0.1	<0.3
Polychaetes	Oslofjord	0.24	2.02	0.90	<0.2	1.11	<0.3
Polychaetes	Oslofjord	0.13	1.59	0.75	<0.2	1.41	<0.3
Polychaetes	Oslofjord	0.19	2.08	0.72	<0.2	0.95	<0.3
Fish	Oslofjord	0.22	34.4	0.75	<0.2	1.82	<0.3
Fish	Oslofjord	0.42	83.1	2.48	<0.2	6.99	<0.3
Fish	Oslofjord	0.43	68.4	0.92	<0.2	4.20	<0.3
Fish	Oslofjord	0.35	49.0	0.88	<0.2	5.18	<0.3
Fish	Oslofjord	0.15	25.7	0.71	<0.2	2.17	<0.3
Fish	Oslofjord	0.42	90.9	4.09	<0.2	7.01	<0.3
Fish	Oslofjord	0.24	29.9	1.12	<0.2	1.56	<0.3
Fish	Oslofjord	0.16	24.8	0.45	<0.2	7.29	<0.3
Fish	Oslofjord	0.49	92.2	3.87	<0.2	9.87	<0.3
Fish	Oslofjord	0.40	34.1	0.62	<0.2	1.35	<0.3
Fish	Oslofjord	0.20	11.8	0.35	<0.2	1.12	<0.3
Fish	Oslofjord	0.15	34.1	1.05	<0.2	2.70	<0.3
Fish	Oslofjord	0.25	11.1	0.32	<0.2	5.89	<0.3
Fish	Oslofjord	0.24	20.4	0.62	<0.2	3.43	<0.3
Fish	Oslofjord	0.27	35.6	0.46	<0.2	6.20	<0.3
Prawns	Oslofjord	<0.1	5.73	0.39	<0.2	0.86	<0.3
Prawns	Oslofjord	<0.1	4.56	0.38	<0.2	0.82	<0.3
Prawns	Oslofjord	<0.1	4.72	0.37	<0.2	0.80	<0.3
Polychaetes	Frognerkilen	0.12	0.56	0.16	<0.2	0.41	<0.3
Polychaetes	Alna	0.12	0.48	0.30	<0.2	1.02	<0.3
Polychaetes	Bekkelaget	0.27	1.92	0.85	<0.2	1.19	<0.3
Mussel	Frognerkilen	<0.1	0.16	<0.1	<0.2	0.37	<0.3
Mussel	Alna	<0.1	0.16	<0.1	<0.2	0.36	<0.3
Mussel	Bekkelaget	<0.1	0.12	<0.1	<0.2	0.24	<0.3

Compartment spec.	Area	et-PFOSA ng/g (w.w.)	me-PFOSE ng/g (w.w.)	et-PFOSE ng/g (w.w.)	me-FOSAA ng/g (w.w.)	et-FOSAA ng/g (w.w.)	6:2 FTS ng/g (w.w.)
Plankton	Oslofjord	<0.3	<5	<5	<0.3	<0.3	<0.3
Plankton	Oslofjord	<0.3	<5	<5	<0.3	<0.3	<0.3
Plankton	Oslofjord	<0.3	<5	<5	<0.3	<0.3	<0.3
Bird egg	Oslofjord	<0.3	<5	<5	<0.3	<0.3	<0.3
Bird egg	Oslofjord	<0.3	<5	<5	<0.3	<0.3	<0.3
Bird egg	Oslofjord	<0.3	<5	<5	<0.3	<0.3	<0.3
Bird egg	Oslofjord	<0.3	<5	<5	<0.3	<0.3	<0.3
Bird egg	Oslofjord	<0.3	<5	<5	<0.3	<0.3	<0.3
Bird egg	Oslofjord	<0.3	<5	<5	<0.3	<0.3	<0.3
Bird egg	Oslofjord	<0.3	<5	<5	<0.3	<0.3	<0.3
Bird egg	Oslofjord	<0.3	<5	<5	<0.3	<0.3	<0.3
Bird egg	Oslofjord	<0.3	<5	<5	<0.3	<0.3	<0.3
Bird egg	Oslofjord	<0.3	<5	<5	<0.3	<0.3	<0.3
Bird egg	Oslofjord	<0.3	<5	<5	<0.3	<0.3	<0.3
Bird egg	Oslofjord	<0.3	<5	<5	<0.3	<0.3	<0.3
Bird egg	Oslofjord	<0.3	<5	<5	<0.3	<0.3	<0.3
Bird egg	Oslofjord	<0.3	<5	<5	<0.3	<0.3	<0.3
Polychaetes	Oslofjord	<0.3	<5	<5	<0.3	<0.3	0.39
Polychaetes	Oslofjord	<0.3	<5	<5	<0.3	<0.3	<0.3
Polychaetes	Oslofjord	<0.3	<5	<5	<0.3	<0.3	0.44
Fish	Oslofjord	<0.3	<5	<5	<0.3	0.33	<0.3
Fish	Oslofjord	<0.3	<5	<5	<0.3	0.41	<0.3
Fish	Oslofjord	<0.3	<5	<5	<0.3	1.54	<0.3
Fish	Oslofjord	<0.3	<5	<5	<0.3	0.60	<0.3
Fish	Oslofjord	<0.3	<5	<5	<0.3	0.57	<0.3
Fish	Oslofjord	<0.3	<5	<5	<0.3	0.96	<0.3
Fish	Oslofjord	<0.3	<5	<5	<0.3	0.34	<0.3
Fish	Oslofjord	<0.3	<5	<5	<0.3	0.32	<0.3
Fish	Oslofjord	<0.3	<5	<5	<0.3	0.46	<0.3
Fish	Oslofjord	<0.3	<5	<5	<0.3	0.53	<0.3
Fish	Oslofjord	<0.3	<5	<5	<0.3	0.36	<0.3
Fish	Oslofjord	<0.3	<5	<5	<0.3	0.42	<0.3
Fish	Oslofjord	<0.3	<5	<5	<0.3	0.35	<0.3
Fish	Oslofjord	<0.3	<5	<5	<0.3	0.38	<0.3
Fish	Oslofjord	<0.3	<5	<5	<0.3	0.84	<0.3
Prawns	Oslofjord	<0.3	<5	<5	0.33	0.75	<0.3
Prawns	Oslofjord	<0.3	<5	<5	0.33	0.47	<0.3
Prawns	Oslofjord	<0.3	<5	<5	0.33	0.53	<0.3
Polychaetes	Frognerkilen	<0.3	<5	<5	<0.3	<0.3	0.44
Polychaetes	Alna	<0.3	<5	<5	<0.3	<0.3	<0.3
Polychaetes	Bekkelaget	<0.3	<5	<5	<0.3	<0.3	<0.3
Mussel	Frognerkilen	<0.3	<5	<5	<0.3	<0.3	<0.3
Mussel	Alna	<0.3	<5	<5	<0.3	<0.3	<0.3
Mussel	Bekkelaget	<0.3	<5	<5	<0.3	<0.3	<0.3

Compartment spec.	Area	MBT ng/g (w.w.)	DBT ng/g (w.w.)	TBT ng/g (w.w.)	TetraBT ng/g (w.w.)	MOT ng/g (w.w.)
Plankton	Oslofjord					
Plankton	Oslofjord					
Plankton	Oslofjord					
Bird egg	Oslofjord					
Bird egg	Oslofjord					
Bird egg	Oslofjord					
Bird egg	Oslofjord					
Bird egg	Oslofjord					
Bird egg	Oslofjord					
Bird egg	Oslofjord					
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Bird egg	Oslofjord					
Bird egg	Oslofjord					
Bird egg	Oslofjord					
Bird egg	Oslofjord					
Bird egg	Oslofjord					
Polychaetes	Oslofjord					
Polychaetes	Oslofjord					
Polychaetes	Oslofjord					
Fish	Oslofjord					
Fish	Oslofjord					
Fish	Oslofjord					
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Fish	Oslofjord					
Fish	Oslofjord					
Fish	Oslofjord					
Fish	Oslofjord					
Fish	Oslofjord					
Fish	Oslofjord					
Prawns	Oslofjord					
Prawns	Oslofjord					
Prawns	Oslofjord					
Polychaetes	Frognerkilen	12.0	25.5	80.2	< 0.823	< 0.823
Polychaetes	Alna					
Polychaetes	Bekkelaget					
Mussel	Frognerkilen					
Mussel	Alna					
Mussel	Bekkelaget					

Compartment spec.	Area	DOT ng/g (w.w.)	TPhT ng/g (w.w.)	TCHT ng/g (w.w.)	Diuron µg/g (w.w.)	Irgarol µg/g (w.w.)	ETU ng/g (w.w.)
Plankton	Oslofjord						
Plankton	Oslofjord						
Plankton	Oslofjord						
Bird egg	Oslofjord						
Bird egg	Oslofjord						
Bird egg	Oslofjord						
Bird egg	Oslofjord						
Bird egg	Oslofjord						
Bird egg	Oslofjord						
Bird egg	Oslofjord						
Bird egg	Oslofjord						
Bird egg	Oslofjord						
Bird egg	Oslofjord						
Bird egg	Oslofjord						
Bird egg	Oslofjord						
Bird egg	Oslofjord						
Bird egg	Oslofjord						
Polychaetes	Oslofjord						
Polychaetes	Oslofjord						
Polychaetes	Oslofjord						
Fish	Oslofjord						
Fish	Oslofjord						
Fish	Oslofjord						
Fish	Oslofjord						
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Fish	Oslofjord						
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Fish	Oslofjord						
Fish	Oslofjord						
Fish	Oslofjord						
Fish	Oslofjord						
Fish	Oslofjord						
Fish	Oslofjord						
Prawns	Oslofjord						
Prawns	Oslofjord						
Prawns	Oslofjord						
Polychaetes	Frognerkilen	< 0.823	3.23	< 1.65	<0.005	<0.01	<20
Polychaetes	Alna						
Polychaetes	Bekkelaget						
Mussel	Frognerkilen				<0.005	<0.01	<20
Mussel	Alna						
Mussel	Bekkelaget						

NILU-no.	NIVA-no.	Compartment	Compartment spec.	Area	Species	Tissue
14/2634	1395-1	Organism	Bird blood	Oslofjord	Herring gull	Blood
14/2635	1395-2	Organism	Bird blood	Oslofjord	Herring gull	Blood
14/2636	1395-3	Organism	Bird blood	Oslofjord	Herring gull	Blood
14/2637	1395-4	Organism	Bird blood	Oslofjord	Herring gull	Blood
14/2638	1395-5	Organism	Bird blood	Oslofjord	Herring gull	Blood
14/2639	1395-6	Organism	Bird blood	Oslofjord	Herring gull	Blood
14/2640	1395-7	Organism	Bird blood	Oslofjord	Herring gull	Blood
14/2641	1395-8	Organism	Bird blood	Oslofjord	Herring gull	Blood
14/2642	1395-9	Organism	Bird blood	Oslofjord	Herring gull	Blood
14/2643	1395-10	Organism	Bird blood	Oslofjord	Herring gull	Blood
14/2644	1395-11	Organism	Bird blood	Oslofjord	Herring gull	Blood
14/2645	1395-12	Organism	Bird blood	Oslofjord	Herring gull	Blood
14/2646	1395-13	Organism	Bird blood	Oslofjord	Herring gull	Blood
14/2647	1395-14	Organism	Bird blood	Oslofjord	Herring gull	Blood
14/2648	1395-15	Organism	Bird blood	Oslofjord	Herring gull	Blood
14/2649	1395-16	Organism	Bird blood	Oslofjord	Herring gull	Blood

Compartment spec.	Area	Lipid%	PeCB ng/g (w.w.)	HCB ng/g (w.w.)	PCB-18 ng/g (w.w.)	PCB-28 ng/g (w.w.)	PCB-31 ng/g (w.w.)
Bird blood	Oslofjord	3.58	0.06	0.36	<0.01	0.09	<0.01
Bird blood	Oslofjord	2.41	0.07	1.04	<0.01	0.46	0.01
Bird blood	Oslofjord	3.65	0.04	0.46	<0.01	0.06	<0.01
Bird blood	Oslofjord	2.45	0.05	0.23	<0.01	0.11	0.01
Bird blood	Oslofjord	2.04	0.03	0.20	<0.01	0.06	0.01
Bird blood	Oslofjord	3.55	0.05	0.29	<0.01	0.05	<0.01
Bird blood	Oslofjord	3.1	0.05	0.58	0.06	0.18	0.12
Bird blood	Oslofjord	4.46	0.12	1.15	0.04	0.27	0.08
Bird blood	Oslofjord	6.29	0.04	0.23	0.05	0.17	0.11
Bird blood	Oslofjord	3.56	0.05	0.31	<0.01	0.04	<0.01
Bird blood	Oslofjord	4.61	0.06	0.39	0.05	0.30	0.10
Bird blood	Oslofjord	2.39	0.04	0.22	<0.01	0.21	0.01
Bird blood	Oslofjord	0.9	0.03	0.15	<0.01	0.02	<0.01
Bird blood	Oslofjord	4.34	0.04	0.23	<0.01	0.03	<0.01
Bird blood	Oslofjord	3.53	0.05	0.35	0.04	0.18	0.10
Bird blood	Oslofjord	3.99	0.15	3.01	0.05	1.13	0.13

Compartment spec.	Area	PCB-33 ng/g (w.w.)	PCB-37 ng/g (w.w.)	PCB-47 ng/g (w.w.)	PCB-52 ng/g (w.w.)	PCB-66 ng/g (w.w.)	PCB-74 ng/g (w.w.)
Bird blood	Oslofjord	<0.01	<0.01	0.49	0.14	1.33	0.67
Bird blood	Oslofjord	<0.01	<0.01	2.69	0.20	7.37	3.48
Bird blood	Oslofjord	<0.01	<0.01	0.32	0.04	0.76	0.40
Bird blood	Oslofjord	<0.01	<0.01	0.73	0.14	2.71	1.03
Bird blood	Oslofjord	<0.01	<0.01	0.25	0.20	0.81	0.36
Bird blood	Oslofjord	<0.01	<0.01	0.35	0.11	1.03	0.52
Bird blood	Oslofjord	0.09	0.02	0.19	0.07	0.35	0.18
Bird blood	Oslofjord	0.06	0.02	0.48	0.16	1.68	1.10
Bird blood	Oslofjord	0.08	0.02	0.16	0.04	0.34	0.18
Bird blood	Oslofjord	<0.01	<0.01	0.30	0.03	0.83	0.42
Bird blood	Oslofjord	0.07	0.02	1.20	0.05	2.53	1.30
Bird blood	Oslofjord	<0.01	<0.01	1.32	0.33	5.29	2.44
Bird blood	Oslofjord	<0.01	<0.01	0.03	0.03	0.07	0.04
Bird blood	Oslofjord	<0.01	<0.01	0.11	0.02	0.23	0.12
Bird blood	Oslofjord	0.07	0.02	0.37	0.13	0.88	0.42
Bird blood	Oslofjord	0.08	0.02	4.73	0.47	11.8	6.02

Compartment spec.	Area	PCB-99 ng/g (w.w.)	PCB-101 ng/g (w.w.)	PCB-105 ng/g (w.w.)	PCB-114 ng/g (w.w.)	PCB-118 ng/g (w.w.)	PCB-122 ng/g (w.w.)
Bird blood	Oslofjord	3.04	0.31	1.78	0.12	4.87	<0.01
Bird blood	Oslofjord	12.5	0.14	6.73	0.48	18.5	<0.01
Bird blood	Oslofjord	1.54	0.06	0.99	0.07	2.42	<0.01
Bird blood	Oslofjord	4.59	0.25	2.17	0.16	6.59	<0.01
Bird blood	Oslofjord	1.56	0.36	0.94	0.07	2.57	<0.01
Bird blood	Oslofjord	2.07	0.14	1.76	0.13	4.02	<0.01
Bird blood	Oslofjord	0.97	0.05	0.40	0.04	1.31	<0.01
Bird blood	Oslofjord	2.35	0.13	1.82	0.13	4.83	<0.01
Bird blood	Oslofjord	0.79	0.03	0.44	0.03	1.14	<0.01
Bird blood	Oslofjord	1.35	0.04	0.87	0.06	2.11	<0.01
Bird blood	Oslofjord	4.99	0.08	2.23	0.16	5.90	<0.01
Bird blood	Oslofjord	5.19	0.27	3.85	0.24	8.09	<0.01
Bird blood	Oslofjord	0.13	0.04	0.07	<0.01	0.20	<0.01
Bird blood	Oslofjord	0.45	0.02	0.24	0.01	0.73	<0.01
Bird blood	Oslofjord	1.55	0.07	0.91	0.04	2.22	<0.01
Bird blood	Oslofjord	23.0	0.39	9.63	0.90	28.9	<0.01

Compartment spec.	Area	PCB-123 ng/g (w.w.)	PCB-128 ng/g (w.w.)	PCB-138 ng/g (w.w.)	PCB-141 ng/g (w.w.)	PCB-149 ng/g (w.w.)	PCB-153 ng/g (w.w.)
Bird blood	Oslofjord	0.08	1.44	9.07	0.05	0.27	13.3
Bird blood	Oslofjord	0.33	4.61	27.4	0.04	1.11	36.4
Bird blood	Oslofjord	0.04	0.76	4.40	0.02	0.18	5.87
Bird blood	Oslofjord	0.13	1.89	13.2	0.02	0.42	19.9
Bird blood	Oslofjord	0.04	0.74	5.08	0.05	0.34	7.09
Bird blood	Oslofjord	0.06	1.01	5.98	0.02	0.19	7.97
Bird blood	Oslofjord	0.02	0.42	2.75	0.02	0.22	4.49
Bird blood	Oslofjord	0.07	1.36	7.71	0.03	0.24	11.6
Bird blood	Oslofjord	0.02	0.36	2.12	0.01	0.08	2.96
Bird blood	Oslofjord	0.04	0.42	2.44	0.01	0.08	3.48
Bird blood	Oslofjord	0.10	1.40	8.23	0.04	0.58	11.1
Bird blood	Oslofjord	0.16	1.33	7.04	0.02	0.41	8.55
Bird blood	Oslofjord	<0.01	0.07	0.43	<0.01	0.06	0.73
Bird blood	Oslofjord	0.01	0.20	1.30	<0.01	0.07	1.76
Bird blood	Oslofjord	0.04	0.47	2.80	0.02	0.21	3.93
Bird blood	Oslofjord	0.50	8.90	57.9	0.08	2.25	85.2

Compartment spec.	Area	PCB-156 ng/g (w.w.)	PCB-157 ng/g (w.w.)	PCB-167 ng/g (w.w.)	PCB-170 ng/g (w.w.)	PCB-180 ng/g (w.w.)	PCB-183 ng/g (w.w.)
Bird blood	Oslofjord	0.66	0.14	0.41	1.27	4.39	1.21
Bird blood	Oslofjord	2.10	0.47	1.14	3.68	11.8	2.91
Bird blood	Oslofjord	0.31	0.07	0.16	0.47	1.49	0.45
Bird blood	Oslofjord	1.01	0.21	0.72	2.00	6.62	1.57
Bird blood	Oslofjord	0.38	0.08	0.20	0.77	2.70	0.59
Bird blood	Oslofjord	0.63	0.12	0.25	1.11	3.39	0.73
Bird blood	Oslofjord	0.19	0.04	0.12	0.39	1.22	0.28
Bird blood	Oslofjord	0.53	0.12	0.31	1.06	3.35	0.85
Bird blood	Oslofjord	0.13	0.03	0.07	0.17	0.53	0.17
Bird blood	Oslofjord	0.17	0.05	0.08	0.27	0.85	0.21
Bird blood	Oslofjord	0.50	0.13	0.25	0.88	2.77	0.68
Bird blood	Oslofjord	0.52	0.12	0.25	0.57	1.70	0.48
Bird blood	Oslofjord	0.03	<0.01	0.02	0.07	0.22	0.05
Bird blood	Oslofjord	0.07	0.02	0.04	0.13	0.34	0.10
Bird blood	Oslofjord	0.20	0.05	0.11	0.33	0.96	0.25
Bird blood	Oslofjord	4.17	0.99	2.15	9.49	31.4	7.06

Compartment spec.	Area	PCB-187 ng/g (w.w.)	PCB-189 ng/g (w.w.)	PCB-194 ng/g (w.w.)	PCB-206 ng/g (w.w.)	PCB-209 ng/g (w.w.)	TBA ng/g (w.w.)
Bird blood	Oslofjord	1.91	0.07	0.65	0.25	0.06	<0.036
Bird blood	Oslofjord	4.63	0.19	1.35	0.39	0.06	<0.01
Bird blood	Oslofjord	1.07	0.03	0.18	0.06	0.01	<0.01
Bird blood	Oslofjord	2.28	0.11	0.86	0.22	0.03	<0.01
Bird blood	Oslofjord	1.04	0.04	0.35	0.08	0.02	<0.01
Bird blood	Oslofjord	1.33	0.05	0.41	0.12	0.02	<0.01
Bird blood	Oslofjord	0.76	0.02	0.15	0.05	0.02	<0.01
Bird blood	Oslofjord	2.58	0.06	0.40	0.14	0.07	<0.01
Bird blood	Oslofjord	0.56	0.01	0.06	0.02	0.01	<0.01
Bird blood	Oslofjord	0.56	0.02	0.09	0.03	0.02	<0.01
Bird blood	Oslofjord	2.04	0.04	0.34	0.11	0.03	<0.011
Bird blood	Oslofjord	1.33	0.03	0.17	0.05	0.02	<0.01
Bird blood	Oslofjord	0.20	<0.01	0.03	0.01	<0.01	<0.011
Bird blood	Oslofjord	0.38	<0.01	0.04	<0.01	<0.01	<0.015
Bird blood	Oslofjord	0.59	0.02	0.11	0.04	<0.01	<0.022
Bird blood	Oslofjord	11.1	0.51	4.00	1.23	0.25	<0.024

Compartment spec.	Area	BDE-17 ng/g (w.w.)	BDE-28 ng/g (w.w.)	BDE-47 ng/g (w.w.)	BDE-49 ng/g (w.w.)	BDE-66 ng/g (w.w.)	BDE-71 ng/g (w.w.)
Bird blood	Oslofjord	0.01	0.02	0.43	0.01	0.03	<0.01
Bird blood	Oslofjord	<0.01	0.01	2.01	0.01	0.02	<0.01
Bird blood	Oslofjord	<0.01	<0.01	0.21	<0.01	0.02	<0.01
Bird blood	Oslofjord	<0.01	<0.01	0.39	0.01	0.01	<0.01
Bird blood	Oslofjord	0.02	0.02	0.23	0.02	0.04	0.02
Bird blood	Oslofjord	0.02	0.01	0.18	0.02	0.04	0.01
Bird blood	Oslofjord	0.02	0.02	0.34	0.02	0.03	0.01
Bird blood	Oslofjord	<0.01	<0.01	0.54	<0.01	0.02	<0.01
Bird blood	Oslofjord	<0.01	<0.01	0.32	<0.01	0.02	<0.01
Bird blood	Oslofjord	<0.01	<0.01	0.17	<0.01	0.03	<0.01
Bird blood	Oslofjord	<0.01	<0.01	0.94	<0.01	0.03	<0.01
Bird blood	Oslofjord	<0.01	<0.01	0.27	<0.01	0.03	<0.01
Bird blood	Oslofjord	<0.01	<0.01	0.10	<0.01	0.03	<0.01
Bird blood	Oslofjord	<0.01	<0.01	0.13	<0.01	0.02	<0.01
Bird blood	Oslofjord	<0.013	<0.01	0.31	<0.01	0.03	<0.01
Bird blood	Oslofjord	0.04	0.05	5.09	0.08	0.03	<0.011

Compartment spec.	Area	BDE-77 ng/g (w.w.)	BDE-85 ng/g (w.w.)	BDE-99 ng/g (w.w.)	BDE-100 ng/g (w.w.)	BDE-119 ng/g (w.w.)	BDE-126 ng/g (w.w.)
Bird blood	Oslofjord	0.01	0.01	0.23	0.14	0.01	0.01
Bird blood	Oslofjord	<0.01	<0.01	0.27	0.50	<0.01	<0.01
Bird blood	Oslofjord	<0.01	<0.01	0.19	0.08	<0.01	<0.01
Bird blood	Oslofjord	<0.01	<0.01	0.17	0.16	<0.01	<0.01
Bird blood	Oslofjord	0.01	0.02	0.13	0.10	0.02	0.01
Bird blood	Oslofjord	<0.01	<0.01	0.09	0.07	0.01	<0.01
Bird blood	Oslofjord	0.01	0.04	0.47	0.12	0.02	0.01
Bird blood	Oslofjord	<0.01	<0.01	0.50	0.18	<0.01	<0.01
Bird blood	Oslofjord	<0.01	0.01	0.29	0.07	<0.01	<0.01
Bird blood	Oslofjord	<0.01	<0.01	0.09	0.05	<0.01	<0.01
Bird blood	Oslofjord	<0.01	0.02	0.93	0.25	<0.012	<0.011
Bird blood	Oslofjord	<0.01	<0.01	0.07	0.07	<0.01	<0.01
Bird blood	Oslofjord	<0.01	<0.01	0.12	0.03	<0.01	<0.01
Bird blood	Oslofjord	<0.01	<0.01	0.08	0.04	<0.01	<0.01
Bird blood	Oslofjord	<0.01	<0.01	0.19	0.08	<0.01	<0.01
Bird blood	Oslofjord	<0.01	<0.013	0.66	1.26	0.04	<0.01

Compartment spec.	Area	BDE-138 ng/g (w.w.)	BDE-153 ng/g (w.w.)	BDE-154 ng/g (w.w.)	BDE-156 ng/g (w.w.)	BDE-183 ng/g (w.w.)	BDE-184 ng/g (w.w.)
Bird blood	Oslofjord	<0.038	0.10	0.06	<0.065	0.04	0.02
Bird blood	Oslofjord	<0.013	0.04	0.05	<0.023	<0.01	<0.01
Bird blood	Oslofjord	<0.011	0.03	0.02	<0.02	<0.01	<0.01
Bird blood	Oslofjord	<0.011	0.07	0.02	<0.019	0.01	<0.01
Bird blood	Oslofjord	0.04	0.08	0.05	0.02	0.04	0.02
Bird blood	Oslofjord	0.02	0.05	0.03	<0.025	0.03	0.02
Bird blood	Oslofjord	0.05	0.12	0.07	<0.031	0.06	0.04
Bird blood	Oslofjord	<0.023	0.16	0.04	<0.043	0.03	<0.011
Bird blood	Oslofjord	<0.017	0.04	0.01	<0.031	<0.01	<0.01
Bird blood	Oslofjord	<0.024	0.04	0.01	<0.045	0.02	<0.01
Bird blood	Oslofjord	<0.03	0.46	0.07	<0.054	0.15	<0.017
Bird blood	Oslofjord	<0.026	<0.01	0.01	<0.048	0.01	<0.01
Bird blood	Oslofjord	<0.021	0.04	0.02	<0.039	0.02	<0.01
Bird blood	Oslofjord	<0.018	0.02	<0.01	<0.031	0.02	<0.01
Bird blood	Oslofjord	<0.03	0.03	0.02	<0.051	<0.018	<0.013
Bird blood	Oslofjord	<0.032	0.18	0.22	<0.054	0.01	0.02

Compartment spec.	Area	BDE-191 ng/g (w.w.)	BDE-196 ng/g (w.w.)	BDE-197 ng/g (w.w.)	BDE-202 ng/g (w.w.)	BDE-206 ng/g (w.w.)	BDE-207 ng/g (w.w.)
Bird blood	Oslofjord	<0.027	<0.055	<0.049	<0.059	0.10	0.07
Bird blood	Oslofjord	<0.013	<0.019	0.02	<0.012	<0.032	<0.029
Bird blood	Oslofjord	<0.014	<0.022	<0.015	<0.014	<0.035	<0.031
Bird blood	Oslofjord	<0.016	<0.039	0.04	<0.025	<0.026	0.05
Bird blood	Oslofjord	0.03	<0.044	0.07	0.06	0.12	0.14
Bird blood	Oslofjord	<0.024	<0.048	<0.033	0.06	0.09	0.11
Bird blood	Oslofjord	0.03	<0.057	0.11	0.10	0.18	0.53
Bird blood	Oslofjord	<0.029	<0.053	0.09	<0.04	<0.061	0.18
Bird blood	Oslofjord	<0.015	<0.042	<0.03	<0.031	<0.038	0.08
Bird blood	Oslofjord	<0.026	<0.059	<0.042	<0.043	<0.051	<0.038
Bird blood	Oslofjord	<0.046	<0.078	0.16	<0.058	<0.082	0.36
Bird blood	Oslofjord	<0.027	<0.055	<0.04	<0.041	<0.067	<0.051
Bird blood	Oslofjord	<0.023	<0.079	<0.057	0.05	<0.047	0.17
Bird blood	Oslofjord	<0.023	<0.048	<0.043	<0.051	<0.059	0.09
Bird blood	Oslofjord	<0.03	<0.043	<0.038	<0.046	<0.05	<0.032
Bird blood	Oslofjord	<0.029	<0.041	<0.037	<0.044	<0.084	<0.054

Compartment spec.	Area	BDE-209 ng/g (w.w.)	EHTeBB ng/g (w.w.)	BEHTBP ng/g (w.w.)	a-HBCD ng/g (w.w.)	b-HBCD ng/g (w.w.)	g-HBCD ng/g (w.w.)
Bird blood	Oslofjord	<0.196	<0.096	<0.193	<0.551	<0.964	<0.537
Bird blood	Oslofjord	0.21	<0.072	<0.152	0.39	<6.087	<0.519
Bird blood	Oslofjord	0.56	<0.096	<0.219	<0.495	<0.978	<0.445
Bird blood	Oslofjord	0.19	<0.123	<0.256	<0.352	<2.858	<0.356
Bird blood	Oslofjord	0.41	<0.147	<0.32	<0.42	<3.08	<0.511
Bird blood	Oslofjord	0.24	<0.103	<0.192	<0.337	<4.104	<0.521
Bird blood	Oslofjord	4.91	<0.109	<0.242	0.23	<1.149	<0.128
Bird blood	Oslofjord	1.42	<0.175	<0.292	0.32	<2.131	<0.127
Bird blood	Oslofjord	0.74	<0.144	<0.301	0.29	<1.052	<0.131
Bird blood	Oslofjord	0.19	<0.226	<0.379	<0.105	<1.378	<0.126
Bird blood	Oslofjord	4.88	0.32	<0.44	0.18	<1.511	<0.161
Bird blood	Oslofjord	<0.218	<0.089	<0.127	0.13	3.13	<0.116
Bird blood	Oslofjord	2.37	<0.064	<0.151	0.34	<1.002	<0.093
Bird blood	Oslofjord	0.85	0.04	<0.139	0.11	<0.762	<0.124
Bird blood	Oslofjord	0.42	<0.101	<0.206	0.15	<1.221	<0.163
Bird blood	Oslofjord	0.18	<0.126	0.49	1.28	<2.375	<0.133

Compartment spec.	Area	a-HCH ng/g (w.w.)	b-HCH ng/g (w.w.)	g-HCH ng/g (w.w.)	o,p'-DDE ng/g (w.w.)	p,p'-DDE ng/g (w.w.)
Bird blood	Oslofjord	<0.026	<0.054	<0.029	<0.034	3.71
Bird blood	Oslofjord	<0.023	<0.052	<0.027	<0.035	10.5
Bird blood	Oslofjord	<0.026	<0.055	<0.029	<0.039	1.14
Bird blood	Oslofjord	<0.036	<0.067	<0.039	<0.056	3.33
Bird blood	Oslofjord	<0.031	<0.062	<0.036	<0.048	2.08
Bird blood	Oslofjord	<0.039	<0.076	<0.042	<0.054	3.13
Bird blood	Oslofjord	<0.023	<0.044	<0.024	<0.03	1.42
Bird blood	Oslofjord	<0.024	0.21	<0.026	<0.034	7.05
Bird blood	Oslofjord	<0.02	<0.04	<0.023	<0.026	1.12
Bird blood	Oslofjord	<0.031	<0.061	<0.032	<0.035	1.40
Bird blood	Oslofjord	<0.029	<0.068	<0.033	<0.046	3.45
Bird blood	Oslofjord	<0.026	<0.052	<0.03	<0.038	1.49
Bird blood	Oslofjord	<0.023	<0.049	<0.026	<0.038	0.39
Bird blood	Oslofjord	<0.02	<0.043	<0.023	<0.036	0.50
Bird blood	Oslofjord	<0.035	<0.074	<0.039	<0.05	1.27
Bird blood	Oslofjord	<0.029	0.19	<0.033	<0.055	40.8

Compartment spec.	Area	o,p'-DDD ng/g (w.w.)	p,p'-DDD ng/g (w.w.)	o,p'-DDT ng/g (w.w.)	p,p'-DDT ng/g (w.w.)	TCEP ng/g (w.w.)
Bird blood	Oslofjord	<0.029	<0.03	<0.047	<0.057	<4.4
Bird blood	Oslofjord	<0.025	<0.027	<0.045	<0.057	<4.4
Bird blood	Oslofjord	<0.031	<0.034	<0.063	<0.079	<4.4
Bird blood	Oslofjord	<0.039	<0.043	<0.074	<0.093	<4.4
Bird blood	Oslofjord	<0.042	<0.046	<0.076	<0.095	<4.4
Bird blood	Oslofjord	<0.045	<0.05	<0.085	<0.107	<4.4
Bird blood	Oslofjord	<0.026	<0.027	<0.041	<0.05	<4.4
Bird blood	Oslofjord	<0.025	<0.025	<0.039	<0.047	<4.4
Bird blood	Oslofjord	<0.02	<0.021	<0.031	<0.038	<4.4
Bird blood	Oslofjord	<0.03	<0.031	<0.048	<0.058	<4.4
Bird blood	Oslofjord	<0.037	<0.038	<0.059	<0.071	<4.4
Bird blood	Oslofjord	<0.03	<0.031	<0.051	<0.062	<4.4
Bird blood	Oslofjord	<0.031	<0.032	<0.053	<0.064	<4.4
Bird blood	Oslofjord	<0.026	<0.027	<0.046	<0.056	<4.4
Bird blood	Oslofjord	<0.035	<0.035	<0.064	<0.078	<4.4
Bird blood	Oslofjord	<0.044	0.09	<0.079	<0.096	<4.4

Compartment spec.	Area	TPrP ng/g (w.w.)	TCPP ng/g (w.w.)	TiBP ng/g (w.w.)	TnBP ng/g (w.w.)	BdPhP ng/g (w.w.)	TPP ng/g (w.w.)
Bird blood	Oslofjord	<0.01	<10.9	4.55	1.79	<0.01	<0.5
Bird blood	Oslofjord	<0.01	<10.9	4.22	3.34	<0.01	<0.5
Bird blood	Oslofjord	<0.01	<10.9	3.02	2.28	<0.01	<0.5
Bird blood	Oslofjord	<0.01	<10.9	2.19	1.98	<0.01	<0.5
Bird blood	Oslofjord	<0.01	<10.9	<1.5	<1.5	<0.01	<0.5
Bird blood	Oslofjord	<0.01	<10.9	4.73	4.52	<0.01	<0.5
Bird blood	Oslofjord	<0.01	14.8	<0.5	<0.5	<0.01	<0.5
Bird blood	Oslofjord	<0.01	<10.9	4.24	2.52	<0.01	<0.5
Bird blood	Oslofjord	<0.01	<10.9	<1.5	<1.5	<0.01	<0.5
Bird blood	Oslofjord	<0.01	<10.9	1.72	<1.5	<0.01	<0.5
Bird blood	Oslofjord	<0.01	<10.9	<1.5	<1.5	<0.01	<0.5
Bird blood	Oslofjord	<0.01	<10.9	<1.5	<0.5	<0.01	<0.5
Bird blood	Oslofjord	<0.01	<10.9	2.87	<1.5	<0.01	<1.5
Bird blood	Oslofjord	<0.01	<10.9	<1.5	<1.5	<0.01	<0.5
Bird blood	Oslofjord	<0.01	<10.9	<0.5	<0.5	<0.01	<0.5
Bird blood	Oslofjord	<0.01	<10.9	<0.5	<0.5	<0.01	<0.5

Compartment spec.	Area	DBPhP ng/g (w.w.)	TBEP ng/g (w.w.)	TCP ng/g (w.w.)	EHDP ng/g (w.w.)	TEHP ng/g (w.w.)	TDCPP ng/g (w.w.)
Bird blood	Oslofjord	<0.01	0.90	<0.01	<1.5	<1.5	2.04
Bird blood	Oslofjord	<0.01	4.78	<0.01	<1.5	<1.5	6.39
Bird blood	Oslofjord	<0.01	2.19	<0.01	<1.5	<1.5	<1
Bird blood	Oslofjord	<0.01	3.45	<0.01	<1.5	1.66	<1
Bird blood	Oslofjord	<0.01	2.61	<0.01	<1.5	<1.5	<1
Bird blood	Oslofjord	<0.01	3.97	<0.01	1.78	3.08	4.48
Bird blood	Oslofjord	<0.01	<0.3	<0.01	<0.5	<0.5	3.16
Bird blood	Oslofjord	<0.01	4.67	<0.01	<1.5	2.22	1.73
Bird blood	Oslofjord	<0.01	1.49	<0.01	<1.5	<1.5	1.05
Bird blood	Oslofjord	<0.01	1.00	<0.01	<1.5	<1.5	<1
Bird blood	Oslofjord	<0.01	2.21	<0.01	<1.5	<1.5	<1
Bird blood	Oslofjord	<0.01	1.85	<0.01	<1.5	<1.5	<1
Bird blood	Oslofjord	<0.01	0.90	<0.01	<1.5	<1.5	6.24
Bird blood	Oslofjord	<0.01	1.27	<0.01	<1.5	<1.5	2.88
Bird blood	Oslofjord	<0.01	<0.3	<0.01	<0.5	<0.5	<0.7
Bird blood	Oslofjord	<0.01	<0.3	<0.01	<0.5	<0.5	<0.7

Compartment spec.	Area	Cr µg/g (w.w.)	Fe µg/g (w.w.)	Ni µg/g (w.w.)	Cu µg/g (w.w.)	Zn µg/g (w.w.)	As µg/g (w.w.)
Bird blood	Oslofjord	<0.001	478	0.01	0.38	4.76	0.25
Bird blood	Oslofjord	<0.001	479	0.00	0.47	4.83	0.24
Bird blood	Oslofjord	<0.001	516	<0.002	0.51	5.45	0.72
Bird blood	Oslofjord	<0.001	449	<0.002	0.44	5.13	0.33
Bird blood	Oslofjord	<0.001	431	<0.002	0.41	4.97	0.10
Bird blood	Oslofjord	0.00	495	0.00	0.50	5.41	0.05
Bird blood	Oslofjord	0.00	646	<0.002	0.45	6.34	0.06
Bird blood	Oslofjord	0.00	560	<0.001	0.42	5.28	0.19
Bird blood	Oslofjord	0.00	601	<0.001	0.49	5.92	0.12
Bird blood	Oslofjord	0.00	469	<0.001	0.38	5.36	0.50
Bird blood	Oslofjord	0.00	633	<0.001	0.55	6.31	0.10
Bird blood	Oslofjord	0.00	525	<0.001	0.45	6.08	0.16
Bird blood	Oslofjord	0.00	543	<0.001	0.41	5.68	0.05
Bird blood	Oslofjord	0.00	551	<0.001	0.50	6.00	0.20
Bird blood	Oslofjord	<0.001	607	<0.001	0.53	7.28	0.04
Bird blood	Oslofjord	<0.002	700	0.01	0.64	5.24	1.28

Compartment spec.	Area	Ag µg/g (w.w.)	Cd µg/g (w.w.)	Hg ng/g (w.w.)	Pb µg/g (w.w.)	SCCP ng/g (w.w.)	MCCP ng/g (w.w.)
Bird blood	Oslofjord	0.00	0.00	152	0.38	104	<0.4
Bird blood	Oslofjord	0.00	0.00	361	0.41	40.1	3
Bird blood	Oslofjord	0.00	0.00	151	2.14	23.6	36.5
Bird blood	Oslofjord	0.00	0.00	174	0.39	46.7	7.6
Bird blood	Oslofjord	0.00	0.00	51.1	0.35	22.3	21.1
Bird blood	Oslofjord	0.00	0.00	73.4	0.97	30.8	5.7
Bird blood	Oslofjord	0.00	0.00	96.4	0.97	15.5	1.2
Bird blood	Oslofjord	0.00	0.00	120	0.89	25.2	<0.7
Bird blood	Oslofjord	0.00	0.00	107	1.03	16.4	0.4
Bird blood	Oslofjord	0.00	0.00	29.7	0.62	263	<0.4
Bird blood	Oslofjord	0.00	0.00	296	0.93	178	15.6
Bird blood	Oslofjord	0.00	0.00	129	0.59	87.1	5.2
Bird blood	Oslofjord	0.00	0.00	80.1	1.05	26.4	1.1
Bird blood	Oslofjord	0.00	0.00	60.5	0.42	14.1	<0.7
Bird blood	Oslofjord	0.00	0.00	104	0.79	15.2	<0.4
Bird blood	Oslofjord	0.00	0.00	457	0.06	17	<0.6

Compartment spec.	Area	D4 ng/g (w.w.)	D5 ng/g (w.w.)	D6 ng/g (w.w.)	BPA ng/g (w.w.)	TBBPA ng/g (w.w.)	44-BPF ng/g (w.w.)
Bird blood	Oslofjord	<2.1	2.40	3.50	7.35	<0.5	0.73
Bird blood	Oslofjord	<1.5	5.46	4.28	5.10	<0.5	0.55
Bird blood	Oslofjord	<2.1	1.83	4.04	5.15	<70.7	1.17
Bird blood	Oslofjord	2.55	5.06	1.59	5.73	<29.9	0.82
Bird blood	Oslofjord	<2.1	6.86	2.14	5.20	<0.5	0.42
Bird blood	Oslofjord	2.20	1.30	2.79	6.64	<0.5	1.01
Bird blood	Oslofjord	<1.5	1.11	1.17	6.01	<0.5	0.95
Bird blood	Oslofjord	<2.1	1.72	1.72	5.59	<0.5	1.31
Bird blood	Oslofjord	<2.1	1.20	1.08	5.92	<0.5	1.62
Bird blood	Oslofjord	<2.1	1.31	4.77	7.73	<0.5	0.50
Bird blood	Oslofjord	<2.1	1.65	1.62	6.96	<0.5	0.25
Bird blood	Oslofjord	<2.1	2.54	1.60	5.19	<0.5	0.95
Bird blood	Oslofjord	<2.1	2.59	1.93	6.10	<0.5	2.02
Bird blood	Oslofjord	<2.1	2.64	4.93	5.69	<0.5	1.85
Bird blood	Oslofjord	<2.1	0.97	1.34	5.71	<0.5	1.43
Bird blood	Oslofjord	<2.1	75.0	2.28	6.05	<0.5	1.75

Compartment spec.	Area	22-BPF ng/g (w.w.)	BPAF ng/g (w.w.)	BPBP ng/g (w.w.)	BPS ng/g (w.w.)	4-NP ng/g (w.w.)	4-OP ng/g (w.w.)
Bird blood	Oslofjord	0.15	<0.2	<0.5	<0.55	43.0	3.49
Bird blood	Oslofjord	0.18	<0.2	<0.5	<0.55	131	0.10
Bird blood	Oslofjord	0.00	<0.2	<0.5	<0.55	105	1.87
Bird blood	Oslofjord	0.13	<0.2	<0.5	<0.55	96.1	2.72
Bird blood	Oslofjord	0.03	<0.2	<0.5	<0.55	208	1.13
Bird blood	Oslofjord	0.10	<0.2	0.97	<0.55	20.3	3.90
Bird blood	Oslofjord	<0.1	<0.2	<0.5	<0.55	151	0.11
Bird blood	Oslofjord	<0.1	<0.2	<0.5	<0.55	184	0.16
Bird blood	Oslofjord	0.11	<0.2	<0.5	<0.55	18.1	0.21
Bird blood	Oslofjord	0.04	<0.2	<0.5	<0.55	56.3	4.82
Bird blood	Oslofjord	0.06	<0.2	<0.5	<0.55	0.20	2.47
Bird blood	Oslofjord	0.04	<0.2	<0.5	<0.55	147	1.87
Bird blood	Oslofjord	<0.1	<0.2	<0.5	<0.55	<0.5	0.17
Bird blood	Oslofjord	0.15	<0.2	<0.5	<0.55	43.8	0.11
Bird blood	Oslofjord	0.03	<0.2	<0.5	<0.55	144	0.11
Bird blood	Oslofjord	<0.1	<0.2	0.55	<0.55	43.3	3.60

Compartment spec.	Area	4t-OP ng/g (w.w.)	PFPA ng/ml	PFHxA ng/ml	PFHpA ng/ml	PFOA ng/ml	PFNA ng/ml
Bird blood	Oslofjord	154	<1	<0.5	<0.5	<0.5	1.58
Bird blood	Oslofjord	18.0	<1	<0.5	<0.5	<0.5	1.10
Bird blood	Oslofjord	39.0	<1	<0.5	<0.5	1.00	<0.5
Bird blood	Oslofjord	85.0	<1	<0.5	<0.5	<0.5	<0.5
Bird blood	Oslofjord	17.0	<1	<0.5	<0.5	<0.5	<0.5
Bird blood	Oslofjord	33.0	<1	<0.5	<0.5	<0.5	0.70
Bird blood	Oslofjord	28.0	<1	<0.5	<0.5	<0.5	0.67
Bird blood	Oslofjord	31.0	<1	<0.5	<0.5	<0.5	2.96
Bird blood	Oslofjord	143	<1	<0.5	<0.5	<0.5	<0.5
Bird blood	Oslofjord	176	<1	<0.5	<0.5	<0.5	<0.5
Bird blood	Oslofjord	74.0	<1	<0.5	<0.5	<0.5	0.83
Bird blood	Oslofjord	72.0	<1	<0.5	<0.5	<0.5	<0.5
Bird blood	Oslofjord	109	<1	<0.5	<0.5	<0.5	<0.5
Bird blood	Oslofjord	86.0	<1	<0.5	<0.5	<0.5	<0.5
Bird blood	Oslofjord	39.0	<1	<0.5	<0.5	<0.5	<0.5
Bird blood	Oslofjord	84.0	<1	<0.5	<0.5	<0.5	1.82

Compartment spec.	Area	PFDA ng/ml	PFUdA ng/ml	PFDoA ng/ml	PFTrA ng/ml	PFTeA ng/ml	PFBS ng/ml
Bird blood	Oslofjord	4.05	0.91	1.30	2.73	0.87	<0.1
Bird blood	Oslofjord	11.5	2.88	4.16	2.62	1.44	<0.1
Bird blood	Oslofjord	<0.5	<0.5	1.17	1.66	0.90	<0.1
Bird blood	Oslofjord	1.64	1.17	1.15	1.17	1.44	<0.1
Bird blood	Oslofjord	1.10	0.75	<0.4	<0.4	<0.4	<0.1
Bird blood	Oslofjord	0.63	<0.5	<0.4	0.87	<0.4	<0.1
Bird blood	Oslofjord	0.85	0.78	2.94	1.21	1.97	<0.1
Bird blood	Oslofjord	4.97	1.83	2.53	2.39	1.29	<0.1
Bird blood	Oslofjord	1.53	<0.5	0.93	0.87	0.70	<0.1
Bird blood	Oslofjord	<0.5	<0.5	<0.4	<0.4	<0.4	<0.1
Bird blood	Oslofjord	1.34	1.04	0.98	0.84	0.59	<0.1
Bird blood	Oslofjord	1.13	<0.5	<0.4	1.11	0.61	<0.1
Bird blood	Oslofjord	0.94	<0.5	1.00	1.07	<0.4	<0.1
Bird blood	Oslofjord	0.80	0.77	1.10	0.74	0.91	<0.1
Bird blood	Oslofjord	<0.5	<0.5	<0.4	<0.4	<0.4	<0.1
Bird blood	Oslofjord	6.11	4.47	3.21	3.44	1.43	<0.1

Compartment spec.	Area	PFHxS ng/ml	PFOS ng/ml	PFDS ng/ml	PFDoS ng/ml	PFOSA ng/ml	me-PFOSA ng/ml
Bird blood	Oslofjord	0.28	33.4	0.35	<0.2	0.18	<0.3
Bird blood	Oslofjord	0.34	134	0.88	<0.2	0.18	<0.3
Bird blood	Oslofjord	0.24	7.58	0.22	<0.2	<0.1	<0.3
Bird blood	Oslofjord	<0.1	4.88	0.22	<0.2	0.20	<0.3
Bird blood	Oslofjord	0.18	10.0	<0.2	<0.2	0.15	<0.3
Bird blood	Oslofjord	0.17	3.36	0.24	<0.2	0.15	<0.3
Bird blood	Oslofjord	0.26	27.6	0.27	<0.2	<0.1	<0.3
Bird blood	Oslofjord	1.60	121	0.57	<0.2	0.19	<0.3
Bird blood	Oslofjord	<0.1	6.09	<0.2	<0.2	<0.1	<0.3
Bird blood	Oslofjord	<0.1	3.75	<0.2	<0.2	<0.1	<0.3
Bird blood	Oslofjord	0.22	47.4	0.22	<0.2	<0.1	<0.3
Bird blood	Oslofjord	0.14	3.83	<0.2	<0.2	0.18	<0.3
Bird blood	Oslofjord	0.15	4.21	0.69	<0.2	0.15	<0.3
Bird blood	Oslofjord	0.17	12.9	0.27	<0.2	0.18	<0.3
Bird blood	Oslofjord	0.16	6.59	<0.2	<0.2	<0.1	<0.3
Bird blood	Oslofjord	1.38	252	1.97	<0.2	0.62	<0.3

Compartment spec.	Area	et-PFOSA ng/ml	me-PFOSE ng/ml	et-PFOSE ng/ml	me-FOSAA ng/ml	et-FOSAA ng/ml	6:2 FTS ng/ml
Bird blood	Oslofjord	<0.3	<5	<5	<0.3	<0.3	<0.3
Bird blood	Oslofjord	<0.3	<5	<5	<0.3	<0.3	<0.3
Bird blood	Oslofjord	<0.3	<5	<5	<0.3	<0.3	<0.3
Bird blood	Oslofjord	<0.3	<5	<5	<0.3	<0.3	<0.3
Bird blood	Oslofjord	<0.3	<5	<5	<0.3	<0.3	<0.3
Bird blood	Oslofjord	<0.3	<5	<5	<0.3	<0.3	<0.3
Bird blood	Oslofjord	<0.3	<5	<5	<0.3	<0.3	<0.3
Bird blood	Oslofjord	<0.3	<5	<5	<0.3	<0.3	<0.3
Bird blood	Oslofjord	<0.3	<5	<5	<0.3	<0.3	<0.3
Bird blood	Oslofjord	<0.3	<5	<5	<0.3	<0.3	<0.3
Bird blood	Oslofjord	<0.3	<5	<5	<0.3	<0.3	<0.3
Bird blood	Oslofjord	<0.3	<5	<5	<0.3	<0.3	<0.3
Bird blood	Oslofjord	<0.3	<5	<5	<0.3	<0.3	<0.3
Bird blood	Oslofjord	<0.3	<5	<5	<0.3	<0.3	<0.3
Bird blood	Oslofjord	<0.3	<5	<5	<0.3	<0.3	<0.3
Bird blood	Oslofjord	<0.3	<5	<5	<0.3	<0.3	<0.3

NILU-no.	NIVA-no.	Compartment	Compartment spec.	Area
14/2653	2312-2 HLB	Storm water	Water	Bryn Ring3/E6
14/2655	2312-3 HLB	Storm water	Water	Breivoll/Alnabru Tem.
14/2654	2312-1 HLB	Storm water	Water	Breivoll E6, Downstr. Term.
14/2656	2312-4 HLB	Storm water	Water	Hasle, snow dep.
14/2657	2312-2 filter	Storm water	Particles	Bryn Ring3/E6
14/2659	2312-3 filter	Storm water	Particles	Breivoll/Alnabru Tem.
14/2658	2312-1 filter	Storm water	Particles	Breivoll E6, Downstr. Term.
14/2660	2312-4 filter	Storm water	Particles	Hasle, snow dep.

NILU-no.	NIVA-no.	Compartment	Compartment spec.	Area
14/2788	14-2100-1	Sediment	Sediment	Alna
14/2789	14-2100-2	Sediment	Sediment	Alna
14/2790	14-2100-3	Sediment	Sediment	Alna
14/2791	14-2100-4	Sediment	Sediment	Bekkelaget
14/2792	14-2100-5	Sediment	Sediment	Bekkelaget
14/2793	14-2100-6	Sediment	Sediment	Bekkelaget
14/2794	14-2100-7	Sediment	Sediment	Frognerkilen
14/2795	14-2100-8	Sediment	Sediment	Frognerkilen
14/2796	14-2100-9	Sediment	Sediment	Frognerkilen

Compartment spec.	Area	PeCB ng/L	HCB ng/L	PCB-18 ng/L	PCB-28 ng/L	PCB-31 ng/L
Water	Bryn Ring3/E6	0.05	0.05	<0.01	0.01	<0.01
Water	Breivoll/Alnabru Tem.	0.05	0.08	0.01	0.01	<0.01
Water	Breivoll E6, Downstr. Term.	0.11	0.05	0.04	0.03	0.03
Water	Hasle, snow dep.	0.08	0.04	<0.01	<0.01	<0.01
Particles	Bryn Ring3/E6	0.08	0.18	0.04	0.16	0.10
Particles	Breivoll/Alnabru Tem.	0.07	0.24	0.05	0.17	0.10
Particles	Breivoll E6, Downstr. Term.	0.19	0.28	0.18	0.35	0.29
Particles	Hasle, snow dep.	0.05	0.14	0.04	0.17	0.11

Compartment spec.	Area	PeCB ng/g (d.w.)	HCB ng/g (d.w.)	PCB-18 ng/g (d.w.)	PCB-28 ng/g (d.w.)	PCB-31 ng/g (d.w.)
Sediment	Alna	0.37	1.00	0.39	1.47	1.07
Sediment	Alna	0.36	1.06	0.36	1.44	1.03
Sediment	Alna	0.27	0.77	0.27	1.26	0.79
Sediment	Bekkelaget	0.11	0.24	0.10	0.61	0.37
Sediment	Bekkelaget	0.11	0.22	0.10	0.49	0.33
Sediment	Bekkelaget	0.14	0.28	0.14	0.82	0.49
Sediment	Frognerkilen	0.38	0.70	0.76	2.52	1.90
Sediment	Frognerkilen	0.21	0.56	0.48	2.11	1.51
Sediment	Frognerkilen	0.26	0.60	0.53	2.27	1.61

Compartment spec.	Area	PCB-33 ng/L	PCB-37 ng/L	PCB-47 ng/L	PCB-52 ng/L	PCB-66 ng/L
Water	Bryn Ring3/E6	<0.01	<0.01	0.01	0.02	0.01
Water	Breivoll/Alnabru Tem.	<0.01	<0.01	<0.01	0.01	<0.01
Water	Breivoll E6, Downstr. Term.	0.02	0.01	0.02	0.08	0.02
Water	Hasle, snow dep.	<0.01	<0.01	0.02	0.02	0.01
Particles	Bryn Ring3/E6	0.09	0.12	0.04	0.06	0.09
Particles	Breivoll/Alnabru Tem.	0.09	0.13	0.04	0.05	0.09
Particles	Breivoll E6, Downstr. Term.	0.20	0.17	0.17	0.95	0.41
Particles	Hasle, snow dep.	0.09	0.13	0.03	0.04	0.09

Compartment spec.	Area	PCB-33 ng/g (d.w.)	PCB-37 ng/g (d.w.)	PCB-47 ng/g (d.w.)	PCB-52 ng/g (d.w.)	PCB-66 ng/g (d.w.)
Sediment	Alna	0.46	0.50	1.25	3.15	3.42
Sediment	Alna	0.46	0.53	1.33	3.18	3.85
Sediment	Alna	0.37	0.41	1.04	2.14	3.03
Sediment	Bekkelaget	0.16	0.20	0.42	0.58	1.38
Sediment	Bekkelaget	0.15	0.18	0.37	0.51	1.26
Sediment	Bekkelaget	0.23	0.27	0.58	0.79	1.90
Sediment	Frognerkilen	0.76	0.73	1.73	3.36	4.68
Sediment	Frognerkilen	0.64	0.72	1.60	3.07	4.99
Sediment	Frognerkilen	0.70	0.72	1.60	3.14	5.07

Compartment spec.	Area	PCB-74 ng/L	PCB-99 ng/L	PCB-101 ng/L	PCB-105 ng/L	PCB-114 ng/L
Water	Bryn Ring3/E6	<0.01	<0.01	0.02	<0.01	<0.01
Water	Breivoll/Alnabru Tem.	<0.01	<0.01	0.01	<0.01	<0.01
Water	Breivoll E6, Downstr. Term.	<0.01	0.01	0.04	0.01	<0.01
Water	Hasle, snow dep.	<0.01	0.01	0.02	0.01	<0.01
Particles	Bryn Ring3/E6	0.05	0.06	0.10	0.06	<0.01
Particles	Breivoll/Alnabru Tem.	0.05	0.04	0.06	0.04	<0.01
Particles	Breivoll E6, Downstr. Term.	0.18	0.40	1.52	0.30	0.02
Particles	Hasle, snow dep.	0.05	0.05	0.07	0.04	<0.01

Compartment spec.	Area	PCB-74 ng/g (d.w.)	PCB-99 ng/g (d.w.)	PCB-101 ng/g (d.w.)	PCB-105 ng/g (d.w.)	PCB-114 ng/g (d.w.)
Sediment	Alna	1.61	2.97	7.07	2.92	0.18
Sediment	Alna	1.87	2.95	6.95	2.93	0.18
Sediment	Alna	1.40	2.26	4.43	1.99	0.11
Sediment	Bekkelaget	0.58	0.85	1.11	0.80	0.03
Sediment	Bekkelaget	0.52	0.77	1.02	0.75	0.03
Sediment	Bekkelaget	0.80	1.15	1.52	1.05	0.04
Sediment	Frognerkilen	2.18	3.37	6.23	3.00	0.15
Sediment	Frognerkilen	2.18	3.20	7.44	3.00	0.16
Sediment	Frognerkilen	2.12	3.25	6.00	3.00	0.18

Compartment spec.	Area	PCB-118 ng/L	PCB-122 ng/L	PCB-123 ng/L	PCB-128 ng/L	PCB-138 ng/L
Water	Bryn Ring3/E6	0.03	<0.01	<0.01	<0.01	0.03
Water	Breivoll/Alnabru Tem.	0.01	<0.01	<0.01	<0.01	0.02
Water	Breivoll E6, Downstr. Term.	0.03	<0.01	<0.01	<0.01	0.03
Water	Hasle, snow dep.	0.03	<0.01	<0.01	<0.01	0.04
Particles	Bryn Ring3/E6	0.14	<0.01	<0.01	0.04	0.19
Particles	Breivoll/Alnabru Tem.	0.10	<0.01	<0.01	0.03	0.13
Particles	Breivoll E6, Downstr. Term.	0.84	<0.01	0.01	0.28	1.40
Particles	Hasle, snow dep.	0.11	<0.01	<0.01	0.03	0.17

Compartment spec.	Area	PCB-118 ng/g (d.w.)	PCB-122 ng/g (d.w.)	PCB-123 ng/g (d.w.)	PCB-128 ng/g (d.w.)	PCB-138 ng/g (d.w.)
Sediment	Alna	6.46	0.07	0.12	2.15	9.21
Sediment	Alna	6.23	0.07	0.12	2.19	9.38
Sediment	Alna	4.46	0.05	0.09	1.41	6.11
Sediment	Bekkelaget	1.76	0.02	0.04	0.53	2.38
Sediment	Bekkelaget	1.69	0.02	0.04	0.50	2.28
Sediment	Bekkelaget	2.41	0.02	0.05	0.71	3.26
Sediment	Frognerkilen	6.23	0.06	0.13	1.77	9.91
Sediment	Frognerkilen	6.65	0.06	0.13	2.18	12.0
Sediment	Frognerkilen	6.47	0.05	0.14	1.84	8.89

Compartment spec.	Area	PCB-141 ng/L	PCB-149 ng/L	PCB-153 ng/L	PCB-156 ng/L	PCB-157 ng/L
Water	Bryn Ring3/E6	<0.01	0.02	0.05	<0.01	<0.01
Water	Breivoll/Alnabru Tem.	<0.01	0.01	0.03	<0.01	<0.01
Water	Breivoll E6, Downstr. Term.	<0.01	0.02	0.05	<0.01	<0.01
Water	Hasle, snow dep.	<0.01	0.02	0.06	<0.01	<0.01
Particles	Bryn Ring3/E6	0.03	0.11	0.24	0.02	<0.01
Particles	Breivoll/Alnabru Tem.	0.02	0.07	0.20	0.02	<0.01
Particles	Breivoll E6, Downstr. Term.	0.38	1.28	1.54	0.14	0.03
Particles	Hasle, snow dep.	0.03	0.09	0.24	0.02	0.01

Compartment spec.	Area	PCB-141 ng/g (d.w.)	PCB-149 ng/g (d.w.)	PCB-153 ng/g (d.w.)	PCB-156 ng/g (d.w.)	PCB-157 ng/g (d.w.)
Sediment	Alna	1.75	7.50	9.50	1.05	0.18
Sediment	Alna	1.98	7.81	9.74	1.16	0.20
Sediment	Alna	1.07	5.25	6.56	0.61	0.12
Sediment	Bekkelaget	0.25	1.82	2.52	0.20	0.05
Sediment	Bekkelaget	0.29	1.68	2.43	0.21	0.05
Sediment	Bekkelaget	0.37	2.60	3.50	0.28	0.06
Sediment	Frognerkilen	1.55	7.98	9.72	0.93	0.16
Sediment	Frognerkilen	2.64	10.2	13.6	1.29	0.19
Sediment	Frognerkilen	1.50	7.95	10.1	0.92	0.16

Compartment spec.	Area	PCB-167 ng/L	PCB-170 ng/L	PCB-180 ng/L	PCB-183 ng/L	PCB-187 ng/L
Water	Bryn Ring3/E6	<0.01	0.01	0.02	<0.01	0.01
Water	Breivoll/Alnabru Tem.	<0.01	<0.01	0.02	<0.01	<0.01
Water	Breivoll E6, Downstr. Term.	<0.01	0.01	0.03	<0.01	0.01
Water	Hasle, snow dep.	<0.01	0.01	0.03	<0.01	0.01
Particles	Bryn Ring3/E6	0.01	0.04	0.11	0.03	0.06
Particles	Breivoll/Alnabru Tem.	0.01	0.04	0.10	0.03	0.06
Particles	Breivoll E6, Downstr. Term.	0.06	0.37	0.95	0.18	0.41
Particles	Hasle, snow dep.	0.01	0.04	0.12	0.03	0.07

Compartment spec.	Area	PCB-167 ng/g (d.w.)	PCB-170 ng/g (d.w.)	PCB-180 ng/g (d.w.)	PCB-183 ng/g (d.w.)	PCB-187 ng/g (d.w.)
Sediment	Alna	0.46	2.44	6.04	1.41	3.42
Sediment	Alna	0.49	2.50	6.42	1.38	3.42
Sediment	Alna	0.30	1.43	3.79	0.89	2.38
Sediment	Bekkelaget	0.11	0.55	1.21	0.30	0.93
Sediment	Bekkelaget	0.11	0.56	1.26	0.28	0.86
Sediment	Bekkelaget	0.15	0.75	1.70	0.41	1.31
Sediment	Frognerkilen	0.43	2.44	6.55	1.31	3.94
Sediment	Frognerkilen	0.56	3.80	9.80	1.94	5.21
Sediment	Frognerkilen	0.44	2.73	6.27	1.34	3.46

Compartment spec.	Area	PCB-189 ng/L	PCB-194 ng/L	PCB-206 ng/L	PCB-209 ng/L	TBA ng/L
Water	Bryn Ring3/E6	<0.01	<0.01	<0.01	<0.01	0.10
Water	Breivoll/Alnabru Tem.	<0.01	<0.01	0.01	<0.01	0.02
Water	Breivoll E6, Downstr. Term.	<0.01	<0.01	<0.01	<0.01	0.04
Water	Hasle, snow dep.	<0.01	<0.01	<0.01	<0.01	0.08
Particles	Bryn Ring3/E6	<0.01	0.02	0.01	<0.01	<0.01
Particles	Breivoll/Alnabru Tem.	<0.01	0.02	0.01	0.01	<0.01
Particles	Breivoll E6, Downstr. Term.	0.02	0.15	0.03	<0.01	0.04
Particles	Hasle, snow dep.	<0.01	0.03	0.02	<0.01	0.01

Compartment spec.	Area	PCB-189 ng/g (d.w.)	PCB-194 ng/g (d.w.)	PCB-206 ng/g (d.w.)	PCB-209 ng/g (d.w.)	TBA ng/g (d.w.)
Sediment	Alna	0.11	1.25	0.83	0.22	0.02
Sediment	Alna	0.12	1.25	0.73	0.18	0.03
Sediment	Alna	0.07	0.85	0.60	0.20	0.03
Sediment	Bekkelaget	0.02	0.31	0.25	0.09	0.02
Sediment	Bekkelaget	0.03	0.30	0.23	0.07	0.01
Sediment	Bekkelaget	0.04	0.42	0.36	0.14	0.02
Sediment	Frognerkilen	0.11	1.89	1.38	0.34	0.05
Sediment	Frognerkilen	0.18	2.02	1.72	0.37	0.03
Sediment	Frognerkilen	0.10	1.58	1.46	0.41	0.04

Compartment spec.	Area	BDE-17 ng/L	BDE-28 ng/L	BDE-47 ng/L	BDE-49 ng/L	BDE-66 ng/L
Water	Bryn Ring3/E6	<0.01	<0.01	0.05	<0.01	0.05
Water	Breivoll/Alnabru Tem.	0.01	0.01	0.05	<0.01	0.06
Water	Breivoll E6, Downstr. Term.	<0.01	<0.01	0.07	<0.01	0.06
Water	Hasle, snow dep.	0.02	0.02	0.06	0.01	0.07
Particles	Bryn Ring3/E6	<0.01	<0.01	0.06	<0.01	0.05
Particles	Breivoll/Alnabru Tem.	0.01	0.01	0.06	0.01	0.06
Particles	Breivoll E6, Downstr. Term.	<0.01	0.01	0.42	0.02	0.07
Particles	Hasle, snow dep.	<0.01	<0.01	0.05	<0.01	0.05

Compartment spec.	Area	BDE-17 ng/g (d.w.)	BDE-28 ng/g (d.w.)	BDE-47 ng/g (d.w.)	BDE-49 ng/g (d.w.)	BDE-66 ng/g (d.w.)
Sediment	Alna	0.05	0.02	0.25	0.07	0.02
Sediment	Alna	0.04	0.02	0.27	0.08	0.03
Sediment	Alna	0.03	0.02	0.24	0.05	0.02
Sediment	Bekkelaget	0.01	0.01	0.17	0.03	0.01
Sediment	Bekkelaget	<0.01	<0.01	0.21	0.03	0.04
Sediment	Bekkelaget	<0.01	<0.01	0.21	0.03	0.04
Sediment	Frognerkilen	<0.01	<0.01	0.11	0.02	0.04
Sediment	Frognerkilen	0.01	0.01	0.14	0.02	0.06
Sediment	Frognerkilen	0.01	<0.01	0.13	0.07	0.07

Compartment spec.	Area	BDE-71 ng/L	BDE-77 ng/L	BDE-85 ng/L	BDE-99 ng/L	BDE-100 ng/L
Water	Bryn Ring3/E6	<0.01	<0.01	<0.01	0.02	<0.01
Water	Breivoll/Alnabru Tem.	<0.01	<0.01	<0.01	0.02	0.01
Water	Breivoll E6, Downstr. Term.	<0.01	<0.01	<0.01	0.02	<0.01
Water	Hasle, snow dep.	<0.01	<0.01	0.01	0.02	0.01
Particles	Bryn Ring3/E6	<0.01	<0.01	<0.01	0.05	<0.01
Particles	Breivoll/Alnabru Tem.	<0.01	<0.01	<0.01	0.03	0.01
Particles	Breivoll E6, Downstr. Term.	<0.01	<0.01	0.02	0.54	0.08
Particles	Hasle, snow dep.	<0.01	<0.01	<0.01	0.03	<0.01

Compartment spec.	Area	BDE-71 ng/g (d.w.)	BDE-77 ng/g (d.w.)	BDE-85 ng/g (d.w.)	BDE-99 ng/g (d.w.)	BDE-100 ng/g (d.w.)
Sediment	Alna	0.01	<0.01	0.02	0.31	0.07
Sediment	Alna	0.02	0.01	0.02	0.33	0.08
Sediment	Alna	0.01	<0.01	0.02	0.29	0.07
Sediment	Bekkelaget	<0.01	<0.01	<0.01	0.16	0.05
Sediment	Bekkelaget	<0.01	<0.01	<0.01	0.22	0.06
Sediment	Bekkelaget	<0.01	<0.01	<0.01	0.27	0.06
Sediment	Frognerkilen	<0.01	<0.01	<0.01	0.10	0.03
Sediment	Frognerkilen	<0.01	<0.01	<0.01	0.15	0.04
Sediment	Frognerkilen	0.01	<0.01	<0.092	0.13	0.06

Compartment spec.	Area	BDE-119 ng/L	BDE-126 ng/L	BDE-138 ng/L	BDE-153 ng/L	BDE-154 ng/L
Water	Bryn Ring3/E6	<0.01	<0.01	<0.01	<0.01	<0.01
Water	Breivoll/Alnabru Tem.	<0.01	<0.01	<0.01	0.01	0.01
Water	Breivoll E6, Downstr. Term.	<0.01	<0.01	<0.014	<0.011	<0.01
Water	Hasle, snow dep.	0.01	0.01	0.02	0.03	0.02
Particles	Bryn Ring3/E6	<0.01	<0.01	<0.026	<0.02	<0.012
Particles	Breivoll/Alnabru Tem.	<0.01	<0.01	0.01	0.02	0.01
Particles	Breivoll E6, Downstr. Term.	<0.01	<0.01	<0.012	0.09	0.04
Particles	Hasle, snow dep.	<0.01	<0.01	<0.013	<0.01	<0.01

Compartment spec.	Area	BDE-119 ng/g (d.w.)	BDE-126 ng/g (d.w.)	BDE-138 ng/g (d.w.)	BDE-153 ng/g (d.w.)	BDE-154 ng/g (d.w.)
Sediment	Alna	<0.01	<0.01	0.02	0.08	0.06
Sediment	Alna	0.01	<0.01	0.03	0.08	0.08
Sediment	Alna	<0.01	<0.01	0.02	0.21	0.07
Sediment	Bekkelaget	<0.01	<0.01	<0.026	0.05	0.04
Sediment	Bekkelaget	<0.01	<0.01	<0.017	0.04	0.04
Sediment	Bekkelaget	<0.01	<0.01	<0.016	0.69	0.03
Sediment	Frognerkilen	<0.01	<0.01	<0.023	0.03	0.03
Sediment	Frognerkilen	<0.01	<0.01	<0.039	0.04	0.06
Sediment	Frognerkilen	<0.079	<0.066	<0.04	0.03	0.03

Compartment spec.	Area	BDE-156 ng/L	BDE-183 ng/L	BDE-184 ng/L	BDE-191 ng/L	BDE-196 ng/L
Water	Bryn Ring3/E6	0.01	<0.01	<0.01	<0.01	<0.01
Water	Breivoll/Alnabru Tem.	<0.023	0.02	0.01	0.01	<0.023
Water	Breivoll E6, Downstr. Term.	<0.025	<0.01	<0.01	<0.012	<0.02
Water	Hasle, snow dep.	<0.038	0.03	0.03	0.02	0.05
Particles	Bryn Ring3/E6	<0.047	0.02	<0.01	<0.018	<0.038
Particles	Breivoll/Alnabru Tem.	<0.035	0.02	0.01	<0.015	<0.029
Particles	Breivoll E6, Downstr. Term.	<0.021	0.11	<0.01	<0.014	0.09
Particles	Hasle, snow dep.	<0.023	0.01	<0.01	<0.01	<0.019

Compartment spec.	Area	BDE-156 ng/g (d.w.)	BDE-183 ng/g (d.w.)	BDE-184 ng/g (d.w.)	BDE-191 ng/g (d.w.)	BDE-196 ng/g (d.w.)
Sediment	Alna	<0.031	0.14	0.03	0.02	<0.048
Sediment	Alna	<0.033	0.15	0.03	<0.019	0.06
Sediment	Alna	<0.017	0.83	0.02	<0.011	0.19
Sediment	Bekkelaget	<0.043	0.03	0.01	<0.013	0.04
Sediment	Bekkelaget	<0.029	0.05	0.01	<0.01	0.06
Sediment	Bekkelaget	<0.027	0.04	<0.01	<0.01	0.04
Sediment	Frognerkilen	<0.038	0.02	<0.01	<0.015	<0.023
Sediment	Frognerkilen	<0.066	0.05	0.01	<0.019	<0.035
Sediment	Frognerkilen	<0.067	0.04	<0.01	<0.025	<0.031

Compartment spec.	Area	BDE-197 ng/L	BDE-202 ng/L	BDE-206 ng/L	BDE-207 ng/L	BDE-209 ng/L
Water	Bryn Ring3/E6	<0.01	0.01	0.03	0.03	0.11
Water	Breivoll/Alnabru Tem.	<0.016	<0.016	0.04	0.03	0.12
Water	Breivoll E6, Downstr. Term.	<0.014	<0.014	<0.019	<0.016	0.06
Water	Hasle, snow dep.	0.03	0.05	0.09	0.07	0.17
Particles	Bryn Ring3/E6	<0.027	<0.027	<0.048	0.04	0.94
Particles	Breivoll/Alnabru Tem.	0.02	0.03	0.09	0.05	0.53
Particles	Breivoll E6, Downstr. Term.	0.08	<0.025	0.86	0.46	23.7
Particles	Hasle, snow dep.	<0.014	<0.013	<0.026	0.03	0.49

Compartment spec.	Area	BDE-197 ng/g (d.w.)	BDE-202 ng/g (d.w.)	BDE-206 ng/g (d.w.)	BDE-207 ng/g (d.w.)	BDE-209 ng/g (d.w.)
Sediment	Alna	0.15	0.08	1.05	1.04	27.3
Sediment	Alna	0.14	0.08	0.97	0.85	22.7
Sediment	Alna	0.50	0.04	0.52	0.72	9.58
Sediment	Bekkelaget	0.03	0.02	0.38	0.29	8.27
Sediment	Bekkelaget	0.05	0.02	0.31	0.29	8.71
Sediment	Bekkelaget	0.05	0.01	0.38	0.24	10.6
Sediment	Frognerkilen	0.04	0.02	0.22	0.22	4.20
Sediment	Frognerkilen	0.04	<0.028	0.24	0.26	5.07
Sediment	Frognerkilen	0.04	0.02	0.33	0.28	5.63

Compartment spec.	Area	EHTeBB ng/L	BEHTBP ng/L	a-HBCD ng/L	b-HBCD ng/L	g-HBCD ng/L
Water	Bryn Ring3/E6	0.15	3.41	0.09	<0.149	<0.085
Water	Breivoll/Alnabru Tem.	<0.132	0.79	0.30	0.21	<0.114
Water	Breivoll E6, Downstr. Term.	0.16	1.36	<0.053	<0.17	<0.081
Water	Hasle, snow dep.	<0.205	2.73	<0.072	<0.18	<0.116
Particles	Bryn Ring3/E6	0.18	7.01	0.37	<0.772	<0.439
Particles	Breivoll/Alnabru Tem.	<0.153	9.97	1.66	<0.431	<0.277
Particles	Breivoll E6, Downstr. Term.	0.15	9.08	9.39	4.12	16.7
Particles	Hasle, snow dep.	0.21	10.1	<0.238	<0.585	<0.312

Compartment spec.	Area	EHTeBB ng/g (d.w.)	BEHTBP ng/g (d.w.)	a-HBCD ng/g (d.w.)	b-HBCD ng/g (d.w.)	g-HBCD ng/g (d.w.)
Sediment	Alna	<0.111	15.1	4.26	0.70	4.35
Sediment	Alna	<0.084	10.0	4.34	0.98	3.53
Sediment	Alna	<0.083	6.92	9.58	1.56	3.84
Sediment	Bekkelaget	0.10	9.39	0.51	0.63	0.84
Sediment	Bekkelaget	0.14	9.21	0.39	<0.479	0.90
Sediment	Bekkelaget	<0.071	13.6	1.13	<0.355	0.59
Sediment	Frognerkilen	<0.333	32.6	1.31	0.52	0.63
Sediment	Frognerkilen	<0.116	6.09	1.16	0.92	1.21
Sediment	Frognerkilen	<0.275	7.96	0.88	0.84	0.68

Compartment spec.	Area	TCEP ng/L	TPrP ng/L	TCPP ng/L	TiBP ng/L	TnBP ng/L
Water	Bryn Ring3/E6	53.7	<0.003	357	<13.3	11.5
Water	Breivoll/Alnabru Tem.	37.1	<0.003	153	17.6	<4.9
Water	Breivoll E6, Downstr. Term.	21.1	<0.003	364	85.1	10.4
Water	Hasle, snow dep.	27.7	<0.003	467	<13.3	7.13
Particles	Bryn Ring3/E6	523	<1.4	<1862	127	235
Particles	Breivoll/Alnabru Tem.	2 263	<6	8 073	401	1 010
Particles	Breivoll E6, Downstr. Term.	78.9	<0.2	1 773	7.86	14.0
Particles	Hasle, snow dep.	<57	<0.2	266	9.94	29.0

Compartment spec.	Area	TCEP ng/g (d.w.)	TPrP ng/g (d.w.)	TCPP ng/g (d.w.)	TiBP ng/g (d.w.)	TnBP ng/g (d.w.)
Sediment	Alna	12.4	<0.08	128	<20.2	<17.9
Sediment	Alna	11.6	<0.08	173	<17.2	<17.9
Sediment	Alna	<7.5	<0.08	74.8	<17.2	<17.9
Sediment	Bekkelaget	<7.5	<0.08	<71.3	<20.2	<17.9
Sediment	Bekkelaget	<7.5	<0.08	<71.3	<17.2	<17.9
Sediment	Bekkelaget	<7.5	<0.08	<71.3	<17.2	<17.9
Sediment	Frognerkilen	<6.4	<0.08	<71.3	<17.2	<17.9
Sediment	Frognerkilen	<7.5	<0.08	<51.1	<17.2	20.2
Sediment	Frognerkilen	9.08	<0.08	74.3	<17.2	18.8

Compartment spec.	Area	BdPhP ng/L	TPP ng/L	DBPhP ng/L	TBEP ng/L	TCP ng/L
Water	Bryn Ring3/E6	<0.003	19.6	<0.003	123	0.30
Water	Breivoll/Alnabru Tem.	<0.003	20.2	<0.003	40.0	0.17
Water	Breivoll E6, Downstr. Term.	<0.003	6.16	<0.003	34.7	0.37
Water	Hasle, snow dep.	<0.003	<2.3	<0.003	110	0.10
Particles	Bryn Ring3/E6	<3.5	285	<3.5	<1155	67.3
Particles	Breivoll/Alnabru Tem.	<14.5	<841	<14.5	<4785	53.6
Particles	Breivoll E6, Downstr. Term.	<0.5	52.3	<0.5	<165	36.6
Particles	Hasle, snow dep.	<0.5	66.9	<0.5	278	5.75

Compartment spec.	Area	BdPhP ng/g (d.w.)	TPP ng/g (d.w.)	DBPhP ng/g (d.w.)	TBEP ng/g (d.w.)	TCP ng/g (d.w.)
Sediment	Alna	<0.04	187	<0.2	32.7	2.94
Sediment	Alna	<0.04	50.5	<0.2	43.2	2.98
Sediment	Alna	<0.04	106	<0.06	<31.3	1.81
Sediment	Bekkelaget	<0.04	60.9	<0.06	<25.3	1.14
Sediment	Bekkelaget	<0.04	154	<0.06	<25.3	1.19
Sediment	Bekkelaget	<0.04	<4.3	<0.2	<25.3	64.1
Sediment	Frognerkilen	<0.04	<4.3	<0.06	<25.3	5.10
Sediment	Frognerkilen	<0.04	71.6	<0.06	<25.3	4.79
Sediment	Frognerkilen	<0.04	308	<0.2	<25.3	4.22

Compartment spec.	Area	EHDP ng/L	TEHP ng/L	TDCPP ng/L	Cr µg/L	Fe µg/L
Water	Bryn Ring3/E6	2.42	1.70	67.1	1.85	229
Water	Breivoll/Alnabru Tem.	3.30	<0.36	18.2	0.29	119
Water	Breivoll E6, Downstr. Term.	4.40	0.53	5.78	0.69	140
Water	Hasle, snow dep.	3.30	0.41	<1.6	0.74	7.83
Particles	Bryn Ring3/E6	733	1 601	106	1.74	632
Particles	Breivoll/Alnabru Tem.	1 761	900	<354	0.84	1 009
Particles	Breivoll E6, Downstr. Term.	256	171	11.7	6.13	2 916
Particles	Hasle, snow dep.	292	191	<12.2	6.62	1 445

Compartment spec.	Area	EHDP ng/g (d.w.)	TEHP ng/g (d.w.)	TDCPP ng/g (d.w.)	Cr µg/g (d.w.)	Fe µg/g (d.w.)
Sediment	Alna	16.0	<0.3	6.12	110	40 887
Sediment	Alna	20.7	1.43	2.57	122	47 660
Sediment	Alna	<10.9	1.02	3.36	121	52 418
Sediment	Bekkelaget	<7.3	<0.3	<2.1	105	56 331
Sediment	Bekkelaget	<7.3	<0.3	2.99	118	62 155
Sediment	Bekkelaget	<7.3	<0.3	<1.5	109	58 890
Sediment	Frognerkilen	<7.3	22.6	<1.5	131	57 024
Sediment	Frognerkilen	15.4	0.99	<2.1	109	50 760
Sediment	Frognerkilen	18.2	<0.3	3.57	112	51 949

Compartment spec.	Area	Ni µg/L	Cu µg/L	Zn µg/L	As µg/L	Ag µg/L
Water	Bryn Ring3/E6	2.36	8.83	26.1	0.73	0.01
Water	Breivoll/Alnabru Tem.	1.35	2.69	11.9	0.31	0.01
Water	Breivoll E6, Downstr. Term.	4.57	8.32	36.2	0.84	0.00
Water	Hasle, snow dep.	4.72	3.51	18.9	0.62	0.00
Particles	Bryn Ring3/E6	1.05	4.82	12.7	0.14	0.01
Particles	Breivoll/Alnabru Tem.	0.83	2.30	14.2	0.25	0.01
Particles	Breivoll E6, Downstr. Term.	3.30	9.45	48.9	0.87	0.06
Particles	Hasle, snow dep.	3.54	6.59	18.1	0.30	0.01

Compartment spec.	Area	Ni µg/g (d.w.)	Cu µg/g (d.w.)	Zn µg/g (d.w.)	As µg/g (d.w.)	Ag µg/g (d.w.)
Sediment	Alna	46.7	184	413	19.0	3.51
Sediment	Alna	52.2	200	440	23.6	4.15
Sediment	Alna	54.2	151	386	34.4	3.28
Sediment	Bekkelaget	50.9	70.4	223	49.1	1.47
Sediment	Bekkelaget	53.0	82.6	235	54.5	1.55
Sediment	Bekkelaget	50.7	92.6	254	55.4	1.73
Sediment	Frognerkilen	52.8	185	368	45.4	10.1
Sediment	Frognerkilen	46.4	150	321	39.6	3.92
Sediment	Frognerkilen	48.2	149	338	39.7	4.09

Compartment spec.	Area	Cd µg/L	Hg ng/L	Pb µg/L	SCCP ng/L	MCCP ng/L
Water	Bryn Ring3/E6	0.04	4.65	0.45	76.8	1.1
Water	Breivoll/Alnabru Tem.	0.23	2.03	0.20	221	1.4
Water	Breivoll E6, Downstr. Term.	0.13	3.63	0.57	41	1.2
Water	Hasle, snow dep.	0.09	1.44	0.08	454	<0.3
Particles	Bryn Ring3/E6	0.01	0.01	0.86	721	13.6
Particles	Breivoll/Alnabru Tem.	0.04	0.00	0.52	420	13.7
Particles	Breivoll E6, Downstr. Term.	0.01	0.03	6.06	425	106
Particles	Hasle, snow dep.	0.02	0.00	1.15	625	67.2

Compartment spec.	Area	Cd µg/g (d.w.)	Hg ng/g (d.w.)	Pb µg/g (d.w.)	SCCP ng/g (d.w.)	MCCP ng/g (d.w.)
Sediment	Alna	1.49	993	2.77	299	21.8
Sediment	Alna	1.46	939	2.53	499	16.7
Sediment	Alna	0.87	979	2.67	417	15.5
Sediment	Bekkelaget	0.18	439	1.74	48.3	2.2
Sediment	Bekkelaget	0.12	322	1.36	77.1	2.4
Sediment	Bekkelaget	0.18	595	1.89	311	7.1
Sediment	Frognerkilen	0.44	2 245	4.52	401	40.3
Sediment	Frognerkilen	0.39	2 205	3.04	1004	62
Sediment	Frognerkilen	0.37	10 110	3.16	415	23.1

Compartment spec.	Area	D4 ng/L	D5 ng/L	D6 ng/L	BPA ng/L	TBBPA ng/L
Water	Bryn Ring3/E6	<12.1	<11.5	<8.7	191	<0.5
Water	Breivoll/Alnabru Tem.	<12.1	<7.7	<8.7	104	<0.5
Water	Breivoll E6, Downstr. Term.	<12.1	<7.7	<8.7	1 390	<0.5
Water	Hasle, snow dep.	<12.1	<11.5	<8.7	245	<0.5
Particles	Bryn Ring3/E6	<8.4	<12	2 718	19.0	2.59
Particles	Breivoll/Alnabru Tem.	<8.4	<5.3	3 568	26.6	<0.5
Particles	Breivoll E6, Downstr. Term.	<8.4	<12	198	62.0	2.49
Particles	Hasle, snow dep.	<8.4	235	309	28.6	0.53

Compartment spec.	Area	D4 ng/g (d.w.)	D5 ng/g (d.w.)	D6 ng/g (d.w.)	BPA ng/g (d.w.)	TBBPA ng/g (d.w.)
Sediment	Alna	8.53	482	67.7	46.2	2.47
Sediment	Alna	8.18	473	67.6	38.5	2.86
Sediment	Alna	4.96	274	46.7	25.9	2.81
Sediment	Bekkelaget	3.88	398	88.3	15.3	3.99
Sediment	Bekkelaget	3.58	527	114	11.5	5.40
Sediment	Bekkelaget	3.06	413	96.6	16.4	2.25
Sediment	Frognerkilen	2.59	141	23.8	34.4	3.01
Sediment	Frognerkilen	2.59	132	22.7	23.3	4.17
Sediment	Frognerkilen	2.14	123	22.2	22.0	11.1

Compartment spec.	Area	44-BPF ng/L	22-BPF ng/L	BPAF ng/L	BPBP ng/L	BPS ng/L
Water	Bryn Ring3/E6	13.9	6.83	<0.2	38.7	47.4
Water	Breivoll/Alnabru Tem.	2.63	4.04	<0.1	46.1	3.17
Water	Breivoll E6, Downstr. Term.	13.3	48.6	<0.1	13 938	547
Water	Hasle, snow dep.	14.9	36.0	<0.1	27.1	32.6
Particles	Bryn Ring3/E6	4.84	0.57	<0.1	11.3	<0.55
Particles	Breivoll/Alnabru Tem.	4.10	0.63	<0.1	3.18	<0.55
Particles	Breivoll E6, Downstr. Term.	4.10	1.05	<0.1	0.72	<0.55
Particles	Hasle, snow dep.	20.7	1.90	<0.1	2.08	<0.55

Compartment spec.	Area	44-BPF ng/g (d.w.)	22-BPF ng/g (d.w.)	BPAF ng/g (d.w.)	BPBP ng/g (d.w.)	BPS ng/g (d.w.)
Sediment	Alna	2.85	0.46	<0.2	<0.5	<0.55
Sediment	Alna	4.49	0.72	<0.2	1.10	<0.55
Sediment	Alna	2.58	0.54	<0.2	0.93	<0.55
Sediment	Bekkelaget	0.53	<0.81	<0.2	2.50	<0.55
Sediment	Bekkelaget	0.61	<0.81	<0.2	<0.5	<0.55
Sediment	Bekkelaget	0.41	<0.81	<0.2	1.23	<0.55
Sediment	Frognerkilen	1.89	<0.81	<0.2	0.47	<0.55
Sediment	Frognerkilen	1.80	0.89	<0.2	1.74	<0.55
Sediment	Frognerkilen	0.26	0.16	<0.2	0.61	<0.55

Compartment spec.	Area	4-NP ng/L	4-OP ng/L	4t-OP ng/L	PFPA ng/L	PFHxA ng/L
Water	Bryn Ring3/E6	40.0	0.08	39.5	6.72	3.28
Water	Breivoll/Alnabru Tem.	62.9	0.06	27.1	5.19	3.37
Water	Breivoll E6, Downstr. Term.	54.3	0.06	34.1	24.0	15.3
Water	Hasle, snow dep.	27.5	0.07	33.0	3.19	2.91
Particles	Bryn Ring3/E6	4.26	0.71	51.9	<1	<0.5
Particles	Breivoll/Alnabru Tem.	33.1	0.39	31.6	<1	<0.5
Particles	Breivoll E6, Downstr. Term.	54.3	0.40	30.0	<1	<0.5
Particles	Hasle, snow dep.	45.9	0.28	27.8	<1	<0.5

Compartment spec.	Area	4-NP ng/g (d.w.)	4-OP ng/g (d.w.)	4t-OP ng/g (d.w.)	PFPA ng/g (d.w.)	PFHxA ng/g (d.w.)
Sediment	Alna	19.5	0.08	<1	<1	<0.5
Sediment	Alna	13.2	4.98	299	<1	<0.5
Sediment	Alna	43.8	1.41	<1	<1	<0.5
Sediment	Bekkelaget	23.3	0.07	<1	<1	<0.5
Sediment	Bekkelaget	63.8	1.65	<1	<1	<0.5
Sediment	Bekkelaget	19.5	3.57	179	<1	<0.5
Sediment	Frognerkilen	20.2	6.49	323	<1	<0.5
Sediment	Frognerkilen	25.4	1.14	<1	<1	<0.5
Sediment	Frognerkilen	54.3	1.17	<1	<1	<0.5

Compartment spec.	Area	PFHpA ng/L	PFOA ng/L	PFNA ng/L	PFDA ng/L	PFUdA ng/L
Water	Bryn Ring3/E6	1.69	2.69	0.84	0.54	<0.4
Water	Breivoll/Alnabru Tem.	1.78	3.83	0.82	0.38	0.60
Water	Breivoll E6, Downstr. Term.	6.83	8.52	1.14	1.19	<0.4
Water	Hasle, snow dep.	0.87	1.82	0.53	0.46	<0.4
Particles	Bryn Ring3/E6	<0.5	<0.5	<0.5	<0.5	<0.5
Particles	Breivoll/Alnabru Tem.	<0.5	<0.5	<0.5	<0.5	<0.5
Particles	Breivoll E6, Downstr. Term.	<0.5	<0.5	<0.5	<0.5	<0.5
Particles	Hasle, snow dep.	<0.5	<0.5	<0.5	<0.5	<0.5

Compartment spec.	Area	PFHpA ng/g (d.w.)	PFOA ng/g (d.w.)	PFNA ng/g (d.w.)	PFDA ng/g (d.w.)	PFUdA ng/g (d.w.)
Sediment	Alna	<0.5	<0.5	<0.5	<0.5	<0.5
Sediment	Alna	<0.5	<0.5	<0.5	<0.5	<0.5
Sediment	Alna	<0.5	<0.5	<0.5	<0.5	<0.5
Sediment	Bekkelaget	<0.5	<0.5	<0.5	0.58	0.73
Sediment	Bekkelaget	<0.5	<0.5	<0.5	<0.5	0.71
Sediment	Bekkelaget	<0.5	<0.5	<0.5	0.53	0.86
Sediment	Frognerkilen	<0.5	<0.5	<0.5	<0.5	<0.5
Sediment	Frognerkilen	<0.5	<0.5	<0.5	<0.5	<0.5
Sediment	Frognerkilen	<0.5	<0.5	<0.5	<0.5	<0.5

Compartment spec.	Area	PFDoA ng/L	PFTrA ng/L	PFTeA ng/L	PFBS ng/L	PFHxS ng/L
Water	Bryn Ring3/E6	<0.4	<0.4	<0.4	1.68	0.20
Water	Breivoll/Alnabru Tem.	<0.4	<0.4	<0.4	0.88	0.55
Water	Breivoll E6, Downstr. Term.	<0.4	<0.4	<0.4	10.6	2.48
Water	Hasle, snow dep.	<0.4	<0.4	<0.4	1.58	0.12
Particles	Bryn Ring3/E6	<0.4	<0.4	<0.4	<0.1	<0.1
Particles	Breivoll/Alnabru Tem.	<0.4	<0.4	<0.4	<0.1	<0.1
Particles	Breivoll E6, Downstr. Term.	<0.4	<0.4	<0.4	<0.1	<0.1
Particles	Hasle, snow dep.	<0.4	<0.4	<0.4	<0.1	<0.1

Compartment spec.	Area	PFDoA ng/g (d.w.)	PFTrA ng/g (d.w.)	PFTeA ng/g (d.w.)	PFBS ng/g (d.w.)	PFHxS ng/g (d.w.)
Sediment	Alna	<0.4	<0.4	<0.4	<0.1	<0.1
Sediment	Alna	<0.4	<0.4	<0.4	<0.1	<0.1
Sediment	Alna	<0.4	<0.4	<0.4	<0.1	<0.1
Sediment	Bekkelaget	<0.4	<0.4	<0.4	<0.1	<0.1
Sediment	Bekkelaget	0.42	<0.4	<0.4	<0.1	<0.1
Sediment	Bekkelaget	0.49	<0.4	<0.4	<0.1	<0.1
Sediment	Frognerkilen	0.24	<0.4	<0.4	<0.1	<0.1
Sediment	Frognerkilen	0.41	<0.4	<0.4	<0.1	<0.1
Sediment	Frognerkilen	<0.4	<0.4	<0.4	<0.1	<0.1

Compartment spec.	Area	PFOS ng/L	PFDS ng/L	PFDoS ng/L	PFOSA ng/L	me-PFOSA ng/L
Water	Bryn Ring3/E6	3.41	<0.2	<0.2	<0.1	<0.3
Water	Breivoll/Alnabru Tem.	3.64	<0.2	<0.2	<0.1	<0.3
Water	Breivoll E6, Downstr. Term.	19.8	<0.2	<0.2	<0.1	<0.3
Water	Hasle, snow dep.	0.72	<0.2	<0.2	<0.1	<0.3
Particles	Bryn Ring3/E6	<0.1	<0.2	<0.2	<0.1	<0.3
Particles	Breivoll/Alnabru Tem.	<0.1	<0.2	<0.2	<0.1	<0.3
Particles	Breivoll E6, Downstr. Term.	<0.1	<0.2	<0.2	<0.1	<0.3
Particles	Hasle, snow dep.	<0.1	<0.2	<0.2	<0.1	<0.3

Compartment spec.	Area	PFOS ng/g (d.w.)	PFDS ng/g (d.w.)	PFDoS ng/g (d.w.)	PFOSA ng/g (d.w.)	me-PFOSA ng/g (d.w.)
Sediment	Alna	0.13	<0.2	<0.2	<0.1	<0.3
Sediment	Alna	0.13	<0.2	<0.2	<0.1	<0.3
Sediment	Alna	0.27	<0.2	<0.2	<0.1	<0.3
Sediment	Bekkelaget	0.56	0.16	<0.2	<0.1	<0.3
Sediment	Bekkelaget	0.54	<0.2	<0.2	<0.1	<0.3
Sediment	Bekkelaget	0.61	0.18	<0.2	<0.1	<0.3
Sediment	Frognerkilen	0.17	<0.2	<0.2	<0.1	<0.3
Sediment	Frognerkilen	0.19	<0.2	<0.2	<0.1	<0.3
Sediment	Frognerkilen	0.20	<0.2	<0.2	<0.1	<0.3

Compartment spec.	Area	et-PFOSA ng/L	me-PFOSE ng/L	et-PFOSE ng/L	me-FOSAA ng/L	et-FOSAA ng/L
Water	Bryn Ring3/E6	<0.3	<5	<5	<0.3	<0.3
Water	Breivoll/Alnabru Tem.	<0.3	<5	<5	<0.3	<0.3
Water	Breivoll E6, Downstr. Term.	<0.3	<5	<5	<0.3	<0.3
Water	Hasle, snow dep.	<0.3	<5	<5	<0.3	<0.3
Particles	Bryn Ring3/E6	<0.3	<5	<5	<0.3	<0.3
Particles	Breivoll/Alnabru Tem.	<0.3	<5	<5	<0.3	<0.3
Particles	Breivoll E6, Downstr. Term.	<0.3	<5	<5	<0.3	<0.3
Particles	Hasle, snow dep.	<0.3	<5	<5	<0.3	<0.3

Compartment spec.	Area	et-PFOSA ng/g (d.w.)	me-PFOSE ng/g (d.w.)	et-PFOSE ng/g (d.w.)	me-FOSAA ng/g (d.w.)	et-FOSAA ng/g (d.w.)
Sediment	Alna	<0.3	<5	<5	<0.3	<0.3
Sediment	Alna	<0.3	<5	<5	<0.3	<0.3
Sediment	Alna	<0.3	<5	<5	<0.3	<0.3
Sediment	Bekkelaget	<0.3	<5	<5	<0.3	<0.3
Sediment	Bekkelaget	<0.3	<5	<5	<0.3	<0.3
Sediment	Bekkelaget	<0.3	<5	<5	<0.3	<0.3
Sediment	Frognerkilen	<0.3	<5	<5	<0.3	<0.3
Sediment	Frognerkilen	<0.3	<5	<5	<0.3	<0.3
Sediment	Frognerkilen	<0.3	<5	<5	<0.3	<0.3

Compartment spec.	Area	6:2 FTS ng/L
Water	Bryn Ring3/E6	1.50
Water	Breivoll/Alnabru Tem.	<0.3
Water	Breivoll E6, Downstr. Term.	0.70
Water	Hasle, snow dep.	<0.3
Particles	Bryn Ring3/E6	<0.3
Particles	Breivoll/Alnabru Tem.	<0.3
Particles	Breivoll E6, Downstr. Term.	<0.3
Particles	Hasle, snow dep.	<0.3

Compartment spec.	Area	6:2 FTS ng/g (d.w.)	MBT ng/g (d.w.)	DBT ng/g (d.w.)	TBT ng/g (d.w.)
Sediment	Alna	<0.3			
Sediment	Alna	<0.3			
Sediment	Alna	<0.3			
Sediment	Bekkelaget	<0.3			
Sediment	Bekkelaget	<0.3			
Sediment	Bekkelaget	<0.3			
Sediment	Frognerkilen	<0.3	31.3	74.8	175
Sediment	Frognerkilen	<0.3	26.4	56.9	181
Sediment	Frognerkilen	<0.3	28.3	69.9	204

Compartment spec.	Area	
Water	Bryn Ring3/E6	
Water	Breivoll/Alnabru Tem.	
Water	Breivoll E6, Downstr. Term.	
Water	Hasle, snow dep.	
Particles	Bryn Ring3/E6	
Particles	Breivoll/Alnabru Tem.	
Particles	Breivoll E6, Downstr. Term.	
Particles	Hasle, snow dep.	

Compartment spec.	Area	TetraBT ng/g (d.w.)	MOT ng/g (d.w.)	DOT ng/g (d.w.)	TPhT ng/g (d.w.)
Sediment	Alna				
Sediment	Alna				
Sediment	Alna				
Sediment	Bekkelaget				
Sediment	Bekkelaget				
Sediment	Bekkelaget				
Sediment	Frognerkilen	< 1.28	< 1.28	< 1.31	3.74
Sediment	Frognerkilen	< 1.17	< 1.17	< 1.17	2.84
Sediment	Frognerkilen	4.44	< 1.10	< 1.10	5.10

Compartment spec.	Area	
Water	Bryn Ring3/E6	
Water	Breivoll/Alnabru Tem.	
Water	Breivoll E6, Downstr. Term.	
Water	Hasle, snow dep.	
Particles	Bryn Ring3/E6	
Particles	Breivoll/Alnabru Tem.	
Particles	Breivoll E6, Downstr. Term.	
Particles	Hasle, snow dep.	

Compartment spec.	Area	TCHT ng/g (d.w.)	Diuron µg/g (d.w.)	Irgarol µg/g (d.w.)	ETU ng/g (d.w.)
Sediment	Alna				
Sediment	Alna				
Sediment	Alna				
Sediment	Bekkelaget				
Sediment	Bekkelaget				
Sediment	Bekkelaget				
Sediment	Frognerkilen	< 2.56	<0.05	<0.05	<10
Sediment	Frognerkilen	< 2.34	<0.05	<0.05	<15
Sediment	Frognerkilen	< 2.19	<0.05	<0.05	<10

Compound	CAS
Mercury (Hg)	7439-9-76
Lead (Pb)	7439-92-1
Cadmium (Cd)	7440-43-9
Nickel (Ni)	7440-02-0
PCB 28	7012-37-5
PCB 52	35693-99-3
PCB 101	37680-73-2
PCB 118	31508-00-6
PCB 138	35065-28-2
PCB 153	35065-27-1
PCB 180	35065-29-3
PFBS	29420-49-3
PFHxS	82382-12-5
PFOS	4021-47-0
(P)FOSA	754-91-6
N-Et-FOSA	4151-50-2
N-Et-FOSE	1691-99-2
N-Me-FOSA	31506-32-8
N-Me-FOSE	24448-09-7
N-Me-FOSEA	25268-77-3
α-HBCDD	134237-50-6
β-HBCDD	134237-51-7
γ-HBCDD	134237-52-8
BDE 28	
BDE 47	5436-43-1
BDE 99	60348-60-9
BDE 100	189084-64- 8
BDE 126	366791-32-4
BDE 153	68631-49-2
BDE 154	207122-15-4
BDE 183	207122-16-5
BDE 196	32536-52-0
BDE 202	
BDE 206	
BDE 207	
BDE 209	1163-19-5
Bisfenol A	80-05-7
Oktylfenol	27193-28-8 (1806-26-4, 67632-66-0, 140-66-9)
(4-)nonylfenol	104-40-5 (25154-52-3, 84852-15-3)
TBBPA	79-94-7
SCCP (C10-C13)	85535-84-8
MCCP (C14-C17)	85535-85-9
Monobutyltinn (MBT)	2406-65-7 (78763-54-9)
Dibutyltinn (BDT)	1002-53-5
Tributyltinn (TBT)	688-73-3
Trifenyltinn (TPhT)	668-34-8
Irgarol	28159-98-0
Diouron	330-54-1
ETU (Zineb nedbrytningsprodukt)	96-45-7
p-p`-DDT	50-29-3
p-p`-DDE	82413-20-5
p-p`-DDD	72-54-8

Compound	CAS
Tri-iso-butylfosfat (TIBT)	126-71-6
Tributylfosfat (TBP)	126-73-8
Tri(2-kloretyl)fosfat (TCEP)	115-96-8
Tri(1-klor-2-propyl)fosfat (TCPP)	13674-84-5
Tri(1,3-diklor-2-propyl)fosfat (TDCP)	13674-87-8
Tri(2-butoksyetyl)fosfat (TBEP)	78-51-3
Trifenylfosfat (TPhP)	115-86-6
2-etylheksyl-di-fenylfosfat (EHDPP)	1241-94-7
Dibutylfenylfosfat (DBPhP)	2528-36-1
Butyldifenylfosfat (BdPhP)	2752-95-6
Tris(2-etylheksyl)fosfat (TEHP)	78-42-2
Tris-o-kresylfosfat (ToCrP)	78-30-8
Trikresylfosfat (TCrP)	1330-78-5
TBPH/BEHTBP	26040-51-7
EHTeBB/TBB	183658-27-7

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The Norwegian Environment Agency is working for a clean and diverse environment. Our primary tasks are to reduce greenhouse gas emissions, manage Norwegian nature, and prevent pollution.

We are a government agency under the Ministry of Climate and Environment and have 700 employees at our two offices in Trondheim and Oslo and at the Norwegian Nature Inspectorate's more than sixty local offices.

We implement and give advice on the development of climate and environmental policy. We are professionally independent. This means that we act independently in the individual cases that we decide and when we communicate knowledge and information or give advice.

Our principal functions include collating and communicating environmental information, exercising regulatory authority, supervising and guiding regional and local government level, giving professional and technical advice, and participating in international environmental activities.