MILJØ-
DIREKTORATET

Norsk institutt for vannforskning

Norges miljø- og biovitenskapelige universitet

MILJØOVERVÅKNING

M-1106 | 2018

Monitoring of environmental contaminants in freshwater ecosystems

Occurrence and biomagnification

KOLOFON

Utførende institusjon

NIVA – Norsk institutt for vannforskning og NMBU - Norges Miljø og Biovitenskaplige Universitet

Oppdragstakers prosjektansvarlig

Eirik Fjeld/Morten Jartun og Jan Ludvig Lyche

Kontaktperson i Miljødirektoratet

Eivind Farmen

M-nummer

1106

År

2018

Sidetall

136

Miljødirektoratets kontraktnummer

17078053 og 17078122

Utgiver

Miljødirektoratet

Prosjektet er finansiert av

Miljødirektoratet

Forfatter(e)

Morten Jartun, Eirik Fjeld, Kine Bæk, Katharina B. Løken, Thomas Rundberget, Merete Grung (NIVA), Martin Schlabach, Nicholas A. Warner (NILU), Ingar Johansen (IFE), Jan Ludvig Lyche, Vidar Berg (NMBU), Ole Jakob Nøstbakken (NIFES)

Tittel – norsk og engelsk

Monitoring of environmental contaminants in freshwater ecosystems
Overvåking av miljøgifter i ferskvann

Sammendrag – summary

Denne rapporten består av to deler, der del I omhandler forekomsten av en rekke nye miljøgifter i den pelagiske næringskjeden i Mjøsa. Del to av denne rapporten beskriver nivåene av vannforskriftens prioriterte stoffer målt i fisk fra 13 sjøer i Norge. Resultatene viser trofisk magnifisering av siloksan (D5), Hg og BDE-47, mens langkjedede PFASer dominerer i leverprøver fra fisk. Nivåene av PBDE, kvikksølv og oktylfenol overstiger vannforskriftens miljøkvalitetsstandarder (EQS) i fisk fra alle 13 innsjøer som inngår i dette overvåkingsprogrammet, og PCB overskrider EQS i 12 av de 13 innsjøene.

This report consists of two parts, where part I reports the main findings of the annual monitoring program focusing on emerging contaminants in the pelagic food web of Lake Mjøsa. Part II of the report presents concentrations of EU priority contaminants in fish from 13 Norwegian lakes. cVMS D5, Hg, and BDE-47 tend to show trophic biomagnification in Lake Mjøsa, and Long-chained PFASs are dominating the PFAS pattern in fish liver. The levels of PBDEs, mercury and octylphenol exceed the Environmental Quality Standards (EQS) limits in the EU Water Framework Directive's (WFD) in all 13 lakes and PCBs exceeded EQS in 12 of 13 lakes.

4 emneord

Innsjøer, næringsnett, siloksaner, miljøgifter

4 subject words

Lakes, food web, siloxanes, contaminants

Forsidefoto

Mjøsa, view from Minnesund below the E6 highway bridge. Photo: Morten Jartun.

Contents

1. Part I – contaminants in freshwater food webs

2. Abstract

2.1 Norsk sammendrag

Norsk institutt for vannforskning (NIVA) har på vegne av Miljødirektoratet studert innholdet av miljøgifter i det pelagiske næringsnettet i Mjøsa. I tillegg har vi sammenlignet med prøver fra Femunden og Eikedalsvatnet. Mjøsa er en innsjø med moderat antropogen påvirkning gjennom f.eks. tilførsler fra renseanlegg, urbane områder, veg, industri og landbruk. De to andre sjøene er i ubetydelig grad direkte berørt av menneskelig påvirkning. Overvåkingsprogrammet er inne i sitt første år, og varer fra 2017-2021, men er en videreføring av tidligere studier i store norske innsjøer. Denne rapporten omfatter en sammenstilling av forekomsten til en rekke miljøgifter på ulike trofiske nivåer i 2017, og vurderer potensialet for biomagnifisering til utvalgte miljøgifter, f.eks. kvikksølv (Hg), bromerte flammehemmere og siloksaner.

Kvikksølv (Hg), siloksaner (cVMS), bromerte flammehemmere (BFR), fosfororganiske flammehemmere (PFR), per- og polyfluorerte alkylsubstanser (PFAS), alkylfenoler og bisfenoler samt UV-stoffer ble bestemt i prøver av zooplankton, istidskrepsen *Mysis relicta*, lågåsild (*Coregonus albula*), krøkle (*Osmerus eperlanus*) og ørret (*Salmo trutta*) fra Mjøsa. Innholdet av disse miljøgiftene ble også bestemt i ørret fra Femunden og Eikedalsvatnet, samt i prøver av vann og sediment fra Mjøsa. For å estimere organismenes trofiske posisjon i næringsnettet og deres hovedkarbonkilder ble også innholdet av stabile nitrogen- ($\delta^{15}N$) og karbonisotoper ($\delta^{13}C$) bestemt i alle prøver.

Kvikksølv - Hg
I de tre sjøene ser vi en klar økning i konsentrasjon for Hg med trofisk nivå. I toppredatoren stor, fiskespisende ørret, varierte konsentrasjonene fra 0,06-1,48 µg/g våtvekt. Konsentrasjonene var høyest i Mjøsa, og lavest i Eikedalsvatnet. Konsentrasjonene av Hg i toppredatoren ørret overskrider EQS-konsentrasjonen (QS_{biota}, miljøkvalitetsstandard) på 20 µg/kg (0,020 µg/g) i samtlige (N=25) individer fra Mjøsa og Femunden. Omsetningsgrensen på 0,5 µg/g våtvekt overskrides i halvparten av ørretene fra Mjøsa, men kun i 1 av 13 fisk fra Femunden og Eikedalsvatnet. For Mjøsa ser det ut til at denne konsentrasjonen på 0,5 µg/g overskrides i ørret over ca. 55 cm. Innholdet av Hg i lågåsild og krøkle fra Mjøsa var vesentlig lavere enn i ørret med gjennomsnittskonsentrasjoner 0,08 – 0,22 µg/g våtvekt. Når det gjelder tidstrend for Hg, så har konsentrasjonen i biota vært relativt stabil i perioden 2006-2016, og konsentrasjonene i 2017 ligger på samme nivå som for 2016.

Siloksaner – cVMS
Innholdet av sykliske siloksaner, (cVMS: D4, D5 og D6), ble bestemt i alle prøver fra Mjøsa og Femunden. De høyeste konsentrasjonene ble påvist i fisk fra Mjøsa. Ørret fra Mjøsa hadde konsentrasjoner på 0,6 ng/g våtvekt (D4), 4,0-39,3 ng/g våtvekt (D5) og 0,5-2,2 ng/g våtvekt

(D6). Ørret fra Femunden hadde alle konsentrasjoner av siloksaner under deteksjonsgrensen (LOD: 0.3 – 0.96 ng/g, våtvekt) unntatt to prøver som lå like over LOD.

D5 dominerer i prøvene fra Mjøsa, og skyldes trolig lokale tilførsler, og 3 av 5 prøver av sediment overskrider EQS_{sed} på 0,44 µg/kg. Den ble ikke påvist i vannfase, og heller ingen av prøvene av stor ørret overskrider nasjonal EQS for biota (QS_{biota}=15217 µg/kg). Resultatene viser likevel at D5 biomagnifiserer i Mjøsas næringsnett med en trofisk magnifikasjonsfaktor (TMF) på 2,05. I trenddataene ser vi en liten reduksjon i 2017-nivåene fra perioden 2013-2016.

Bromerte flammehemmere
Gjennomsnittlig sum av ΣBDE-6, gitt i vannforskriften, varierte i stor ørret fra Mjøsa mellom 3,7 - 25,6 ng/g våtvekt og 92 - 6080 ng/g lipid. Samtlige prøver av muskel fra ørret i Mjøsa og Femunden overskrider EQS-konsentrasjonen på 0,0085 ng/g våtvekt. Ingen prøver av vann eller sediment overskred EQS-verdiene på henholdsvis 0.14 µg/L og 0.31 µg/kg d.w.

Tidligere høye konsentrasjoner av bromerte flammehemmere i Mjøsa har vært forårsaket av lokale industriutslipp på 1990-tallet og tidlige 2000-tallet. Nivåene i biota har etter dette gått kraftig ned, som vi ser av trenddata fra år 2000-2017. Likevel er nivåene fortsatt noe forhøyet sammenlignet med andre innsjøer i f.eks. Sverige.

Fosfororganiske flammehemmere
Konsentrasjonene av alle fosfororganiske flammehemmere i analyseprogrammet var under deteksjonsgrensen (LOD). Unntaket er TPP (trifenylfosfat), som ble detektert i samtlige prøver av lågåsild og krøkle i Mjøsa med en gjennomsnittlig konsentrasjon på 0,78 ng/g våtvekt. Ingen fosfororganiske flammehemmere er påvist i ørret, zooplankton eller Mysis fra Mjøsa, eller i ørret fra Femunden.

Per- og polyfluorerte alkylstoffer (PFAS)
PFAS ble bestemt i prøver av lever. PFAS ble detektert i over 50 % av prøvene for 10 av 38 ulike PFASer. For resten av PFAS-forbindelsene var alle prøver under deteksjonsgrensen. De langkjedede PFAS (C10-C15) dominerer prøvene i tillegg til PFOS og PFOSA. Gjennomsnittlig konsentrasjon av PFOS i ørretlever fra Mjøsa var 5,4 ng/g våtvekt. EQS for PFOS i biota er 9,1 ng/g, og 2 av 25 prøver av ørret fra Mjøsa og Femunden overskrider denne grensen. Begge disse individene ble fanget i Mjøsa. I Femunden dominerer også de langkjedede PFASene, bl.a. PFTrDA (C13) som hadde en gjennomsnittlig konsentrasjon på 23,6 ng/g våtvekt, langt høyere enn i Mjøsa. Noe av forklaringen på dette kan være at ørret i Femunden har sitt hovedinntak av næring fra terrestriske kilder, f.eks. overflateinsekter, mens ørret i Mjøsa hovedsakelig spiser fisk i den pelagiske sonen.

Alkylfenoler og bisfenoler
Det ble kun påvist enkelte alkylfenoler og bisfenoler i noen få prøver (5 av 54). Det ble detektert spor av bisfenol-A, bisfenol-F og bisfenol-P i prøver av krøkle og ørret fra Mjøsa, men i svært lave konsentrasjoner. Analysemetodene her er foreløpig ikke fullt standardisert og ringtestet på lik linje med klassiske miljøgifter som f.eks. PCB og PAH. Det gir bl.a. utslag i svært varierende deteksjonsgrenser for disse stoffene.

UV-stoffer
Av UV-stoffene som inngikk i analyseprogrammet, ble kun bensophenone-3 (Bp-3) detektert i 1 prøve av krøkle i Mjøsa. Konsentrasjonen i resten av prøvene lå under deteksjonsgrensen. I

tillegg ble innholdet av tre ekstra UV-stoffer bestemt (UV-327, -328 og -329), og av disse ble kun UV-328 detektert like over deteksjonsgrensen i 1 enkeltprøve.

Ekstra analyseparametere
I tillegg til analysene i hovedprogrammet, ble innholdet av ekstra utvalgte organiske miljøgifter bestemt i prøvene, som f.eks. ekstra PFASer, ekstra siloksaner, ekstra etoksylater og fenoliske forbindelser, dekloran, UV-stoffer og den kvaternære ammoniumforbindelsen behentrimonium.

Dekloran ble bestemt i prøver av vann, sediment og biota. Konsentrasjonen av disse stoffene var i hovedsak under deteksjonsgrensen, men enkeltstoffene D 602, D plus *syn* og – *anti* ble detektert i høye konsentrasjoner sammenlignet med resten av enkeltforbindelsene. Det er lite data for stoffene fra undersøkelser i Norge, men konsentrasjonene av disse enkeltstoffene var høye sammenlignet med studier fra bl.a. Canada.

Kvartærnære ammoniumforbindelser (Behentrimonium; ATAC C20 og C22) ble kun påvist i konsentrasjoner like over deteksjonsgrensen (LOD) i noen få enkeltprøver i Mjøsa. Resten av prøvene hadde konsentrasjoner under deteksjonsgrensen.

2.2 English summary

The Norwegian Institute for Water Research (NIVA) has, with the analytical help of the Norwegian Institute for Air Research (NILU), Eurofins, and Institute for Energy Technology (IFE), carried out a monitoring study of contaminants in the pelagic food web of Lakes Mjøsa, Femunden and Eikedalsvatnet. Samples of zooplankton, the planktonic opossum shrimp *Mysis relicta*, vendace (*Coregonus albula*), smelt (*Osmerus eperlanus*), and brown trout (*Salmo trutta*) were analyzed for a long range of contaminants, such as:

- Mercury (Hg)
- Cyclic volatile methylated siloxanes (cVMS)
- Brominated flame retardants (BFR)
- Phosphorous flame retardants (PFR)
- Per- and polyfluorinated alkyl substances (PFAS)
- Alkylphenols and bisphenols
- UV-chemicals

Levels of contaminants in different trophic levels were determined, and the trophic magnification factor (TMF) for selected compounds were determined using stable nitrogen and carbon isotopes.

Mercury - Hg
Hg was found to biomagnify throughout the food chain in Lake Mjøsa. Mean concentrations in large trout were in the range of 0,06 – 1,48 µg/g w.w. Highest concentrations were found in brown trout from Lake Mjøsa, and the lowest in Lake Eikedalsvatnet. The concentration of Hg in the top predator brown trout exceeded the EQS value (QS_{biota}, environmental quality standard) of 20 µg/kg (0.020 µg/g) in all (N = 25) individuals from Lakes Mjøsa and Femunden. Looking at the trends for Hg in biota, it seems the concentrations have stabilized in the period of 2006-2016, and concentrations from 2017 are on the same level as 2016.

Cyclic volatile methylated siloxanes – cVMS
Concentrations of cVMS (D4, D5, and D6) were determined in all biota samples from Lakes Mjøsa and Femunden. Highest concentrations were detected in fish from Mjøsa with mean values of 0.6-1.5 ng/g w.w., 19.7-29.4 ng/g w.w., and 1.2-1.8 ng/g w.w. for D4, D5, and D6, respectively. In Femunden, all compounds were below the limit of detection (LOD).

D5 dominates the samples from Lake Mjøsa, probably caused by local supply from e.g. waste water treatment plants. EQS values were not exceeded for any water (1.7 µg/L) or sediment samples (0,44 µg/kg d.w.). QS_{biota} was not exceeded in samples of brown trout either (QS_{biota}=15217 µg/kg). D5 also biomagnifies in the pelagic food web with a TMF of 2.05 with a 95 % confidence interval. There is a small reduction in the levels in 2017 compared to the period of 2013-2016.

Brominated flame retardants
Mean sum-BDE6 (BDE-28, -47, -99, -100, -153, and -154) ranged from 0.18-8.1 ng/g w.w. and 21-710 ng/g lipid for fish samples. Highest concentrations were found in brown trout from Lake Mjøsa, and the lowest in brown trout from Lake Eikedalsvatnet. ΣBDE-6 in Mysis was 0.71 ng/g w.w. and 15 ng/g lipid.

All samples of brown trout in Lakes Mjøsa and Femunden exceeded the QS_{biota} of 0.0085 µg/kg w.w. No samples of water or sediment exceeded their respective EQS values of 0.14 µg/L and 0.31 µg/kg d.w.

Previous high concentrations of BFRs in Lake Mjøsa have been caused by local industry discharges in the 1990s and early 2000. Afterwards, the concentrations have lowered to about 5 % of the levels from the peak period. Still, the levels found in biota in 2017 are somewhat higher than comparable lakes in e.g. Sweden.

Phosphorus flame retardants
Concentrations of all PFRs in the analytical program, except for TPP (triphenylphosphate), were below LOD for the individual compounds. TPP was detected in all samples of vendace and smelt in Lake Mjøsa, not in the brown trout, with a mean concentration of 0.78 ng/g w.w.

Per- og polyfluorinated alkyl substances (PFAS)
PFAS were determined in samples of liver, and 10 out of 38 PFASs were detected in more than 50 % of the total samples. The rest of the PFAS were below LOD. Long chained PFASs (C10-C15) dominate in the samples, in addition to PFOS and PFOSA. Mean PFOS concentration in brown trout liver was 5.4 ng/g w.w. EQS for PFOS in biota is 9,1 ng/g w.w. and 2 out of 25 samples of brown trout from Lakes Mjøsa and Femunden exceeded this value. Both individuals were caught in Mjøsa.

In Lake Femunden, PFTrDA dominates with a mean concentration of 23.6 ng/g w.w., far above the Mjøsa samples. Femunden has no obvious sources of PFAS, and long-range transport seem to be the overall best explanation for these observations.

Alkylphenols and bisphenols

Alkyl- and bisphenols were only detected slightly above LOD in a few samples of smelt and brown trout in Lake Mjøsa. The only compounds detected were bisphenol-A, bisphenol-F, and bisphenol-P in low concentrations.

UV-chemicals
Of the three UV-compounds in the main analytical program, only bensophenone-3 (Bp-3) was detected in 1 sample of smelt from Lake Mjøsa. The rest of the samples had concentrations below LOD. UV-328 was however detected in samples of zooplankton, but in concentrations only slightly above LOD.

Ekstra analyseparametere
In addition to the analyses in the main analytical program, the concentration of a list of specific organic contaminants were determined such as some extra PFAS, siloxanes, ethoxylates and phenolic substances, dechlorane, UV-chemicals and the quaternary ammonium substance behentrimonium.

Dechlorane were determined in samples of water, sediment, and biota. Concentrations were below LOD for most samples and substances. However, some detections were made for the substances D 602, D plus *syn* and – *anti*. The concentrations were quite high compared to the rest of the samples, but no feasible explanation exists for these findings.

Quaternary ammonium compounds (Behentrimonium; sum of ATAC C20 and -C22) were only detected in a few biota samples from Mjøsa slightly above LOD.

3. Introduction

On behalf of the Norwegian Environment Agency, the Norwegian Institute for Water Research (NIVA) is monitoring contaminants in an aquatic pelagic food web in Lake Mjøsa. The current monitoring program started in 2017, proceeding the sampling strategy from previous years. A wide range of environmental contaminants have been determined in samples of zooplankton, the planktonic opossum shrimp *Mysis relicta*, vendace (*Coregonus albula*), smelt (*Osmerus eperlanus*), and brown trout (*Salmo trutta*) in Lake Mjøsa, and brown trout from Lakes Femunden and Eikedalsvatnet. Lakes were selected based on previous annual monitoring of a large lake with several potential anthropogenic sources (Mjøsa) and two reference lakes (Femunden and Eikedalsvatnet). In addition to the biological samples, water and sediment samples from five stations in Lake Mjøsa were sampled and analyzed for the same range of contaminants.

Main goals for the monitoring program are

- Report the concentrations of selected contaminants in multiple trophic levels
- Estimate the bioaccumulation of contaminants in selected species
- Estimate the biomagnification factors for selected contaminants in the food web
- Evaluate the potential for harmful effects on different levels in the food chain
- Evaluate the historic trends and potential sources for selected contaminants

All goals are not likely to be thoroughly answered, considering the main efforts necessary to complete the survey. Seasonal sampling of all species is often challenging, especially for zooplankton and Mysis. In addition, the uncertainties and challenges regarding analytical methodology for several of the upcoming contaminants are considerable. The analythical methods are getting more precise and accurate, but for some contaminants such as some phenols and new PFASs, procedures, extraction chemicals, standards, and instruments are not yet fully implemented in global standardized tests. However, the contributing laboratories from the Norwegian Institute for Water Research (NIVA), the Norwegian Institute for Air Research (NILU), Eurofins, and the Institute for Energy Technology (IFE) are all experienced and have completed the annual analytical program with high quality.

In this report, levels of stable isotopes ($\delta^{15}N$, $\delta^{13}C$, and $\delta^{34}S$), Hg, cyclic volatile methylated siloxanes (cVMS), brominated flame retardants (BFR), phosphorous flame retardants (PFR), per- and polyfluorinated substances (PFAS), alkylphenols and bisphenols, and UV-chemicals in biota, water, and sediment are discussed. In addition to this main analytical program, an extensive selection of additional compounds was included, such as extra PFASs, extra siloxanes, extra bisphenols, dechloranes, and quaternary ammonium compounds (Behentrimonium).

4. Methods

4.1 Studied lakes – a short description

Studies of the concentration of environmental contaminants in a pelagic food web have previously been carried out in Lakes Mjøsa, Randsfjorden, and Femunden (Fjeld et al., 2014-2017) with some other lakes in specific years. For the main sampling program in 2017 biota was collected from Lakes Mjøsa and Femunden. In addition, three samples of brown trout were analyzed from Lake Eikedalsvatnet. Table 1 lists some main properties of the lakes within this survey, and the main sampling sites are indicated in Figure 1. Table 2 lists the main sampling stations.

Table 1
Information about the lakes in this survey. PE: population equivalents, estimated discharge from WWTP.

Info	Lake Mjøsa	Lake Femunden	Lake Eikedalsvatnet
Location (UTM33 EUREF89)	N: 6746114 E: 282000	N: 6898700 E: 338500	N: 6952286 E: 148740
Volume (km^3)	65	6	2
Surface area (km^2)	369	203	23
Max depth (m)	453	153	155
Catchment area	17 251	1 790	1093
PE	206000	~200	~ 0

The three lakes are large, deep fjord lakes, however different regarding possible environmental impact and the food webs they possess. Lake Mjøsa is the largest lake in Norway, holding over 20 different fish species. The well-defined pelagic food web in Lake Mjøsa has been studied for several years and starts in the lower trophic level with a population of zooplankton (Figure 2). The crustacean *Mysis relicta* is an important part of the pelagic food web, as it feeds on zooplankton, and is an important prey for smelt (*Osmerus eperlanus*). Smelt is, together with brown trout (*Salmo trutta*), considered a top-predator in Lake Mjøsa. In addition, vendace (*Coregonus albula*) is a part of this food web as a central planktivore species. The biodiversity of Lake Mjøsa is rich and puts the top-predator brown trout and smelt at a higher trophic level in this lake compared to similar lakes in Norway. Lake Mjøsa is located in the east-central part of Norway with several possible environmental impacts, such as runoff from major roads, industries, and urban areas (five cities located at the lake), and discharge from waste water treatment plants (WWTP), including three large ones and several of minor sizes, with a total of 200 000 population equivalents (PE). Agricultural runoff and input from major rivers are other fluxes to the lake.

Supplementary samples of brown trout were collected from Lake Femunden, which is the third largest lake in Norway. Its catchment area consists mostly of bare mountain and woods within a national park. The area is mostly rural except for small settlements and some tourist activities (e.g. hiking, fishing, hunting, skiing). To our knowledge, the main environmental impact must come from long-range transport. There is a small waste water facility close to the lake (PE: ~200), but it has infiltration to the ground and no direct discharges to the lake.

Lake Eikesdalsvatnet was chosen as a supplementary lake from a different part of the country (North-western Norway). It is a long (20 km) and narrow (1,7 km) lake of 23 km^2 surrounded by steep mountain sides in a strictly rural area.

Table 2
Sampling stations, with coordinates in UTM33.

Lake	Parameters	Stations	UTM33 (EUREF89)		Depth
			N	E	m
Mjøsa	Zooplankton Mysis	S of Helgøya	6735833	283365	Z: 0-10 M: 70-100
	Vendace Smelt	Around Helgøya	6738520	285438	30-50
			6737040	280445	
	Brown trout	N of Gjøvik	6749473	265847	50
	Water Sediment	S of Helgøya	6735833	283365	W: 0,2 S: 80
		Ringsakerfjorden	6757915	267370	W: 0,2 S: 40
		Furnesfjorden	6750616	279895	W: 0,2 S: 40
		Tangenvika	6720407	293986	W: 0,2 S: 100
		Minnesund	6706592	291955	W: 0,2 S: 30
Femunden	Brown trout		6898700	338500	
Eikedalsvatnet	Brown trout		6952286	148740	

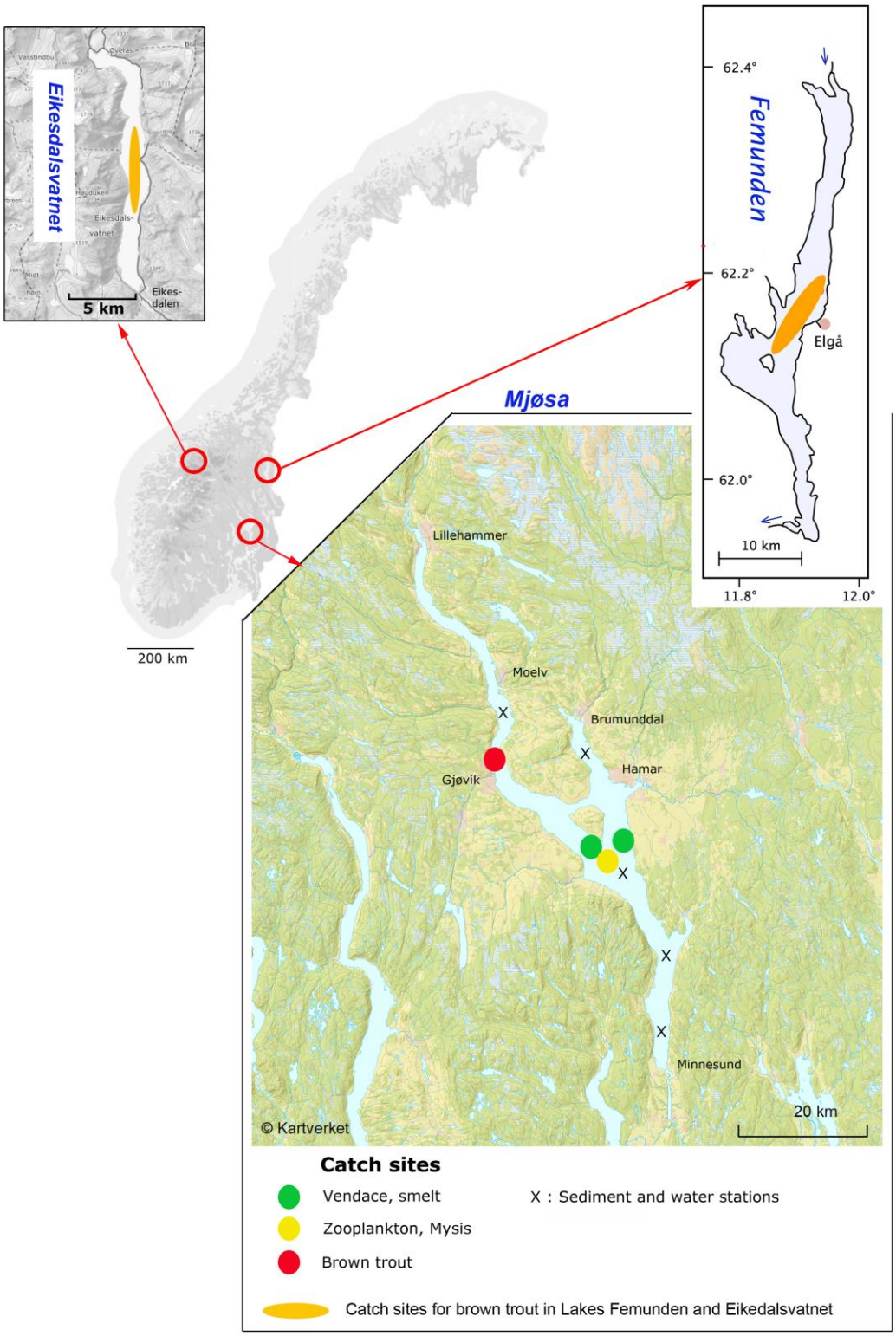

Figure 1. Map of Lakes Mjøsa, Femunden, and Eikesdalsvatnet with the main sampling areas for zooplankton, Mysis and fish in Lake Mjøsa. Locations for sediment and water sampling are also included in this figure.

The well-studied pelagic food web of Lake Mjøsa is shown in Figure 2.

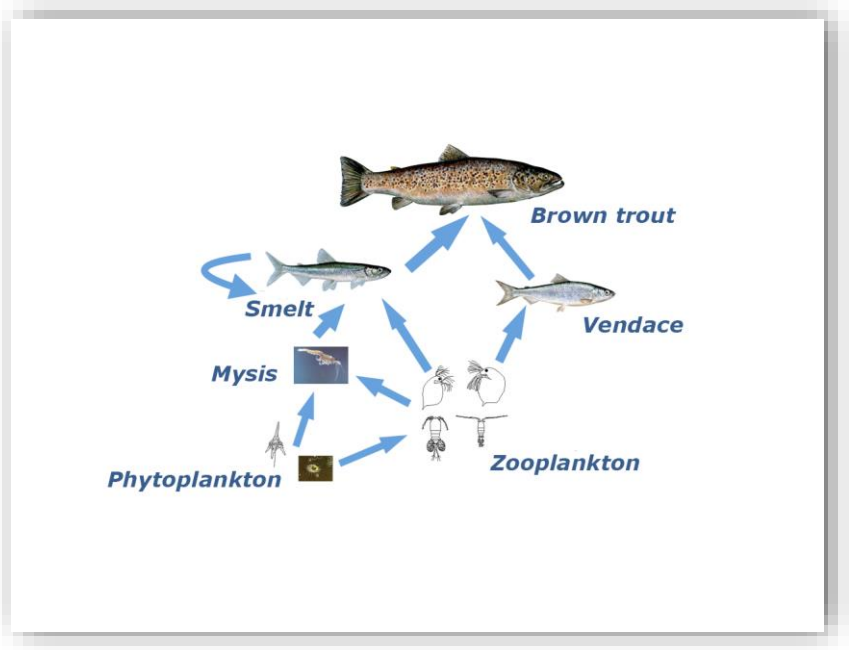

Figure 2. The pelagic food web of Lake Mjøsa.

4.2 Sampling of fish and zooplankton

All biological materials in the project were collected and processed according to the strict procedures of the Norwegian Environmental Specimen Bank for freshwater fish (Miljøprøvebanken, 2015). In this procedure several actions are mandatory to implement for the field personnel in order to avoid potential cross-contamination of the samples. One example is that all personnel must avoid using personal care products, or only use approved products one day prior to sampling. During capture, later handling and sampling it is vital that the fish must not come into contact with potentially contaminating surfaces or substances.

Zooplankton and the planktonic opossum shrimp Mysis from Lake Mjøsa were sampled in September when the zooplankton population was fully developed. Zooplankton was collected from the circulating surface water (epilimnion), whereas sampling of Mysis was carried out using vertical net tows at a depth of 70 to 100 meters. Mysis tend to migrate vertically to avoid predation. Collection area was in the main basin of the lake south of Helgøya (see Figure 1). Sample equipment included a nylon mesh net (mesh size 500 microns) equipped with a collecting cup with a sieve (both in brass). Clogging of nets by diatoms (algae) that may form jelly-like aggregates on the net is lowering the efficiency of zooplankton sampling, challenging the sampling procedure to provide 200 g of material. After sampling, Mysis were transferred to the same type of test glasses and tubes as the fish samples and stored frozen until analysis at -20 °C. All tools supposed to be in direct contact with the samples were cleaned with methanol and acetone (HPLC grade). At all times during field work, approved disposable gloves (nitrile rubber) were used.

Vendace and smelt were caught using bottom nets in the area south of Hamar and Helgøya. Both species tend to migrate vertically in the water column within a 24-hour period to avoid predation. During the night both species will prey on zooplankton and Mysis in the epilimnion, whereas they both undergo shoaling during daylight on depths of 30-50 m. In Lake Mjøsa, brown

trout were caught by local fishermen using bottom nets in an area north of Gjøvik (Figure 1). In Lake Femunden, brown trout were caught during the annual fishing for whitefish.

Sampling of fish in Lake Mjøsa and Lake Femunden were carried out in August and September 2017. After collection, individual fish were wrapped in clean aluminum foil, packed in clean polyethylene bags and kept cold (≈ 4°C) or frozen (-20°C) until dissection of samples. The fish were stored in boxes lined with rinsed aluminum foil. Traditional fish boxes in expanded polystyrene (EPS) were avoided because of the risk of contamination by flame retardants.

Brown trout from Lake Eikedalsvatnet was provided by a different monitoring program in Norway called ØKOSTOR. Muscle and liver samples were dissected from a total of 18 individuals, mixed into three composite samples according to size.

Dissections of fish samples were performed out in the open air in a non-urban environment to prevent contamination of siloxanes (cVMS) from indoor sources. All surfaces that could come into contact with fish were covered by aluminum foil, rinsed with methanol and acetone (HPLC grade). Fish length, weight, sex and maturation stage were recorded. All tools used for dissection were made of steel and cleaned according to the Environmental Specimen Bank procedures (dishwasher, rinsed in Milli-Q water, acetone, and methanol). For vendace and brown trout about 20 – 100 g of dorsal muscle filet was dissected out from each individual. Smelt had an individual weight ranging from 5 – 109 g. Pooled samples from an average of 4-5 individuals within a similar weight class, had to be processed to provide enough sample for analysis (a total of 20 – 25 g). Eight out of ten samples for smelt were pooled samples, the remaining two were large individuals (73 and 109 g). In addition, liver samples were dissected out of smelt, vendace, and brown trout for PFAS-analysis.

All samples were stored in glass beakers sealed with an aluminum foil under the lid. Glass and the aluminum foil were cleansed by heating up to 500°C. The samples were stored in sub-zero temperatures (-20°C) until analysis.

Sample of *Mysis relicta* from Lake Mjøsa (Photo: Morten Jartun)

4.3 Analytical methods

4.3.1 Stable isotopes of N ($\delta^{15}N$), C ($\delta^{13}C$), and S ($\delta^{34}S$)

The ratio between the stable nitrogen isotopes ^{14}N and ^{15}N ($\delta^{15}N$), the carbon isotopes ^{12}C and ^{13}C ($\delta^{13}C$), and the sulfur isotopes ^{32}S and ^{34}S were determined by IFE (Institute for Energy Technology), based on Vander Zanden and Rasmussen (2001). Analyses were performed according to standard protocols without removing lipids nor carbonates prior to analysis. Important steps of the method include combustion in an element analyzer, reduction of NO_x in a Cu-oven, separation of N_2 and CO_2 on a GC-column followed by determination of ^{15}N, ^{13}C, and ^{34}S on an Isotope Ratio Mass Spectrometer (IRMS).

4.3.2 Mercury, Hg

Mercury, Hg, was determined in all samples by Eurofins, according to NS-EN ISO 12846 (Norsk standard, 2012). After homogenization, 1 g of sample is weighed in a test tube, followed by extraction with nitric acid (HNO3). Blinds and control samples are treated the same way. Quantification was performed by a M-7500 Mercury analyzer (HydridGenerating-AtomicAbsorptionSpectrophotometry, HG-AAS). This is a cold-vapor technique.

4.3.3 Cyclic volatile methyl siloxanes (cVMS)

The samples were analyzed by NILU according to methods published by Krogseth et al. (2017). Field blanks for sample siloxanes were prepared using 2 – 3 grams of XAD-2 sorbent packed into a polypropylene/cellulose filter bag. Before use in the field, XAD-2 sorbent was cleaned by ultrasonicfication in hexane for 30 minutes. Hexane was removed and replaced with dichloromethane and XAD sorbent was sonicated again for 30 minutes. After sonification, XAD-2 sorbent was dried overnight in a clean cabinet equipped with a HEPA and carbon filter to prevent contamination of the XAD-2 sorbent from indoor air. XAD-2 sorbent was then packed into the previously described filter bags and placed in polypropylene tubes and sent to field personnel for sampling purposes.

Several field blanks prepared were kept at NILU's laboratories and analyzed to determine reference concentrations present in the field blanks prior to exposure within the field. Comparison of concentrations between reference levels and field blank levels was done to assess if contamination during sampling had occurred. Extraction of all sample material was done in a clean cabinet to prevent contamination from indoor air. All laboratory personnel involved in sample extraction avoid use of personal care products such as lotion or deodorant.

Samples were extracted using a mixture of 3:1 hexane:acetonitrile with ultrasonification for 15 min. Samples were subsequently shaken for 1 hour followed by centrifugation at 2500 rpm. A small aliquot of hexane supernatant was transferred to a GC vial followed by addition of tris(trimethylsiloxy)silane as a recovery standard.

Samples were analyzed by GC-MS equipped with DB-5MS column using large volume injection (10 µL). Instrumental conditions have been described by Krogseth et al. (2017). Method detection limits (MDLs) have been shown to be ideal for the analysis of siloxanes in

environmental samples as they account for the variation introduced to the analytical signal from the extracted matrix (Warner et al. 2013). Due to the different matrices investigated in this study, it was not possible logistically to determine MDL for all matrices. Therefore, limit of quantification (LOQ) described as the average plus 10 × standard deviation of the procedural blank signal was used as a conservative detection limit for reporting concentrations. Limits of detection (LOD) described as 3 × standard deviation of the procedural blank signal was also reported for comparison with LOQ.

Siloxanes (D4, D5 and D6) were determined in a clean-room facility using GC-MS.

4.3.4 Brominated flame retardants (BFR)

BFRs were determined by NILU, based on the methods by Bengtson Nash (2008). 4-5 g of biological material is weighed and homogenized with 50 g of dry sodium sulphate to fine grained powder, transferred to an elution column with isotope labelled PBDE congeners and eluted with cyclohexane/ethylacetate (1:1). The extract was concentrated and cleaned using a silica column, conc. H_2SO_4 was added followed by another clean-up on silica column down to 100 µL with addition of a recovery standard. PBDE-congeners were determined and quantified in 2 separate GC/HRMS-analyses. Proper identification and quantification were confirmed based on correct retention time, correct isotope ratio, a signal/noise ratio > 3:1, and a correct recovery of internal standard, in addition to accepted blind for the method.

4.3.5 Phosphorous flame retardants (PFR)

PFRs were determined by NILU. Prior to extraction, a mixture of isotope labelled PFR-standards were added to the sample for quantification. All samples, including biota, water, and sediment, were extracted using acetonitrile. The extracts were reduced under a stream of nitrogen followed by a clean-up using silica column to ensure good recovery. PFR-compounds were quantified using a Thermo TSQ Vantage UPLC/MS-MS, methods described in Evenset et al. (2018).

4.3.6 Per- and polyfluorinated substances (PFAS)

PFAS were determined by NIVA. Prior to extraction, a mixture of isotope labelled PFAS were added to the sample (~2 g), following the sequence of both extraction and preconcentration with acetonitrile. The analytical method is based on e.g. Verrault (2007) with some adaptions. Samples were extracted using acetonitrile and buffers for pH-control. Extracts were cleaned using solid phase extraction (SPE) and active carbon. PFAS were determined using a LC-qToF-MS.

4.3.7 Alkylphenols and bisphenols

Alkylphenols and bisphenols (octylphenol, nonylfenol, bisphenol A, S, F, AF, AP, B, E, FL, M and Z, TBBPA) were determined by NILU. Prior to extraction, isotope labelled phenols were added to the samples, following both extraction and preconcentration. Extraction was carried out using distilled methanol, ethyl acetate, and MTBE (methyl tert-butyl ether) securing good

recovery, and preconcentration under nitrogen followed by clean-up with SPE-column to remove lipids and other interferences. All samples were analyzed using a LC-qToF (Agilent 65/50). Limits of detection (LOD) and quantification (LOQ) were calculated for each sample using an accepted standard method which included an average of blank concentrations plus 3- and 10-times standard deviation for the blanks for LOD and LOQ respectively. Methods are also described in Ruus et al. (2016).

4.3.8 UV-chemicals

UV-chemicals (octocrylen, benzophenone and ethylhexylmethoxycinnamate) were determined by NIVA. The analytical methods are based on published works by e.g. Langford et al. (2015). A mixture of isotope labelled internal standards were added to homogenized biota samples, following both the extraction and preconcentration steps. Samples were extracted with organic solvents (isopropanol and cyclohexane), and the extracts were reduced to approximately 1 ml under a stream of nitrogen (35 °C) before further clean-up via Gel Permeation Chromatography (GPC). UV-chemicals were quantified using GC-MSD (Agilent) or APGC-Vion (Waters). LOD and LOQ were calculated for each sample using an accepted standard method of 3 x signal/noise ratio (s/n) and 9 times s/n respectively.

4.4 Calculating trophic magnification factors

Trophic magnification factor (TMF) is the factor of increase in concentration of a contaminant per integer trophic level (TL). The trophic level is traditionally estimated from stable N-isotope ratios ($\delta^{15}N$) using empirical data from analyses of $^{15}N/^{14}N$ in organisms. Dietary absorption of contaminants normally occurs faster than elimination, which causes TMFs to be > 1, indicating non-equilibrium between organisms in the food web and abiotic media such as the water. This will increase with increasing TL.

Calculating TL from $\delta^{15}N$-ratios preferably involves a baseline adjustment, which means that the $\delta^{15}N$-ratio for primary consumers are subtracted from the $\delta^{15}N$ in consumers of a higher trophic level:

$$TL=[(\delta^{15}N_C - \delta^{15}N_{pc})/\Delta^{15}N] + 2$$

Where TL is the trophic level of consumers, $\delta^{15}N_c$ *and* $\delta^{15}N_{pc}$ are the N-isotope ratio for consumers and primary consumers, respectively. $\Delta^{15}N$ is the enrichment factor of 3.4 ‰ per trophic level (Vander Zanden et al., 1997; Vander Zanden and Rasmussen, 1999).

When the natural logarithm of the of the concentration is plotted against the trophic level of the organisms, the relationship between the concentration of a contaminant (C_{LW}) and trophic level might be expressed with the following function:

$$ln\ C_{LW} = a + b \cdot TL$$

This is the natural exponential function, in which *b* is the gradient (slope) to the regression between the *ln*-transformed concentration (lipid weight) of a contaminant (C_{LW}) and the trophic level (TL) of this contaminant. If a baseline adjustment for primary consumers is not possible, a relative trophic level (TL_{rel}) for the different organisms may be calculated by dividing $\delta^{15}N_c$ with the N-enrichment factor $\Delta^{15}N$:

$$TL_{rel} = \frac{\delta 15Nc}{\Delta 15N}$$

where TL_{rel} is the relative trophic level, $\delta^{15}N_c$ is the measured ratio between stable N-isotopes and $\Delta^{15}N$ is the N-enrichment factor 3,4 ‰ (Vander Zanden et al., 1997; Vander Zanden and Rasmussen, 1999; Post, 2002). In this respect, a baseline adjustment for each lake and year to account for the difference in $\delta^{15}N$ between consumers and primary consumers will not be necessary. TL_{rel} may then be used to calculate the trophic distance between different organisms within a lake but will not be accurate for determining their absolute position or to compare trophic levels between lakes with a different $\delta^{15}N$.

$$ln\ C_{LW} = a + b \cdot TL_{rel}$$

TMF is now defined as:

$$TMF = e^{b}$$

A trophic magnification is determined when the regression coefficient *b* is significantly > 0. Trophic magnification factor (TMF), defined as e^b, will then consequently be > 1.

4.5 Introduction to the contaminants

4.5.1 Mercury, Hg

Hg in fish is mostly present as the toxic compound Methyl-Hg, which is a neurotoxin also for humans. Historically, the two main sources of elemental Hg are point source discharges and atmospheric deposition. Local sources such as the woodworking industry have been known to cause severe contamination of Lake Mjøsa in the past (Underdal, 1970; Sandlund et al., 1981). Because of this, Hg has been monitored in Lake Mjøsa for several years even though strict restrictions on the use of Hg exists in Norway. There is a general ban on the use of Hg in products, and regulations on discharges (Lovdata, 2017) for e.g. WWTP, waste facilities, and industry to limit the environmental impact of Hg.

4.5.2 Cyclic volatile methylated siloxanes (cVMS)

Cyclic volatile methyl siloxanes (cVMS), such as the most commonly used octamethylcyclotetrasiloxane (D4), decamethylcyclopentasiloxane (D5), and dodecamethylcyclohexasiloxane (D6), are used as ingredients in personal care products and are emitted to aquatic environments first through wastewater discharge. The European chemical agency (ECHA) categorize D4 as persistent, bioaccumulative, and toxic, whereas D5 is

categorized as very persistent and very bioaccumulative (ECHA, 2015). cVMS are mostly used in personal care products, detergents (Huse and Aas-Aune, 2009), and they exhibit unusual physical-chemical properties in the environment being both hydrophobic and volatile. Once in the water phase, they slowly undergo hydrolysis with acid- and bases, and/or are being adsorbed to particles. In Norway, there is a stated goal to stop all discharges of D4 and D5 within the year 2020. Biomagnifying properties have been demonstrated by e.g. Borgå et al. (2012a and b).

4.5.3 Brominated flame retardants (BFR)

Polybrominated diphenyl ethers (PBDE) are anthropogenic contaminants used as flame retardants in a range of products such as textiles and EE-products. These compounds are generally very stable and hydrophobic, and some exhibit hormone disrupting and neurotoxic properties (Stockholm convention, 2013). In Norway there is a ban against all use, import and production of PBDEs. Penta- and octa-BDE are banned globally according to the Stockholm convention, and deca-BDE has been nominated to the same regulation. In 2000, fish with extreme concentrations of PBDEs were found in Lake Mjøsa (Fjeld et al., 2001), caused by a local discharge. Levels of PBDEs are now coming down and are reduced to 1/5 of the initial concentrations 15-20 years ago.

4.5.4 Phosphorous flame retardants (PFR)

PFRs are often considered a substitute for BFRs after they were banned. Major uses include flame retardants such as chlorinated organophosphate esters tris-(chloroisopropyl) phosphate (TCPP), tris- (dichloroisopropyl) phosphate (TDCP) and tris-(chloroethyl) phosphate (TCEP), plasticizers such as tri-n-butylphosphate (TnBP), tri-isobutylphosphate (TiBP), triphenylphosphate (TPP), ethylhexyldiphenylphosphate (EHDPP) and tris-(butoxyethyl) phosphate (TBEP) (non-halogenated) and anti-foaming agents (Andresen, J.A., 2006; Van der Veen and de Boer, 2012; Wei et al., 2015). Levels of PFRs in environmental compartments have been reported in e.g. Evenset et al. (2009) and Regnery et al. (2011). Knowledge of the biological effects of PFRs are still limited.

4.5.5 Per- and polyfluorinated substances (PFAS)

These are substances with exceptional physical-chemical properties resulting in environmental persistency, toxicity, and biomagnification. Some of the substances are carcinogenic, have reproductive effects, and may alter the lipid metabolism in organisms. Two particular compounds, perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS), have so far driven the regulation because of their ubiquitous presence in environmental compartments, in addition to their bioaccumulative, and toxic potential for aquatic and mammal species (e.g. Lau et al., 2007). Most important sources in the environment are firefighting foam (aqueous film-forming foams, AFFF) and paper industry.

4.5.6 Alkylphenols and bisphenols

Bisphenol-A (BPA) is considered an environmental endocrine disruptor (EDC), and with the potential impact, some nations have banned the use of BPA in specific products such as food-packaging. However, the substitutes such as bisphenol-B, -S, and -F have been reported to

exhibit similar biological effects (Chen et al., 2016). The analogues are not yet regulated. Alkylphenols (APs) are a class of EDCs and are the degradation products of the non-ionic surfactants alkylphenol polyethoxylates (APEs), used as plasticizers in high density polyethylene (HDPE), polyethyleneterephthalate (PET) and polyvinylchloride (PVC) and in the manufacture of textiles, paper and agricultural chemical products (e.g. Salgueiro-González et al., 2015).

4.5.7 UV-chemicals

Organic UV-filters such as octocrylene (CAS: 6197-30-4), benzophenone-3 (CAS: 131-57-7), and ethylhexylmethoxyciannamate (CAS: 5466-77-3) are aromatic compounds adsorbing UV-radiation and are thus used in sunscreen and other personal care products. Other uses include additives as stabilizers in e.g. clothes, plastics, and paints, e.g. benzotriazole UV-stabilizers (e.g. UV-327, UV-328, and UV-329). UV-filters are ubiquitous in the environment, posing a potential for endocrine disruption and developmental toxicity (Vidal-Linan et al., 2018). They are most likely to enter aquatic environments through wastewater effluents and sludge (Langford et al., 2015). In the EU, there are regulations limiting the concentrations of these compounds in care products between 4-10 % (EC, 2009).

5. Results and discussion

5.1 Fish size, trophic level, lipid content

Crucial characteristics to understand the biomagnification of contaminants in aquatic biota are individual size, trophic level (N-isotopes: $\delta^{15}N$), sources of carbon in the food (C-isotopes: $\delta^{13}C$) and lipid content. Table 3 lists the mean values for mysis (*Mysis relicta*), vendace (*Coregonus albula*), smelt (*Osmerus eperlanus*) and brown trout (*Salmo trutta*) in Lake Mjøsa, and for brown trout in Lake Femunden in 2017. Data for three brown trout samples in Lake Eikesdalsvatnet are also shown.

Mean length and weight for fish samples are given in Table 3.

Values for $\delta^{15}N$ will tend to increase upwards in the food web as the lighter isotope (^{14}N) is excreted from the organisms in a higher rate than its heavier counterpart, the ^{15}N-isotope (Peterson and Fry, 1987). $\delta^{15}N$ is reported to increase with an average of 3,4 ‰ for each trophic level (Minagawa and Wada, 1984; Vander Zanden and Rasmussen, 1999). In Lake Mjøsa, the range of mean $\delta^{15}N$-values from zooplankton to brown trout vary between 7,9-15,0 ‰. The total gap from zooplankton to brown trout is 7,1 ‰ in total, which means ~2,0 trophic levels on average considering 3,4 ‰ increase per TL. Difference in trophic level between brown trout and smelt in Lake Mjøsa was quite low (0,3 ‰), which may be explained that the sample batch of smelt individuals contained some large, cannibalistic individuals up to 109 g, see Figure 3. There is a tendency in the data showing that $\delta^{15}N$ for smelt increases with length, also indicating that large smelt becomes cannibals.

$\delta^{13}C$ signature represents the ratio of ^{13}C to ^{12}C expressed as a deviation from the initial isotopic standard (France, 1995). The $\delta^{13}C$ pattern in the data is not related to trophic level but will represent feeding and main carbon sources (France and Peters, 1997). Pelagic food webs, such

as the one in Lake Mjøsa, tend to display lower, more negative, $\delta^{13}C$-values than other types of food web.

Table 3
Length (L), weight (w), lipid content, and stable N and C isotopes (δ15N, δ13C) for samples of fish (muscle) and Mysis from 2017 in Lake Mjøsa. The mean (x), standard deviation (SD) and no. of samples are also shown.

2017			Length, cm		Weight, g		$\delta^{15}N$, ‰		$\delta^{13}C$, ‰		Lipid, %	
	Species	n	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
Mjøsa	Mysis	3					11.8	0.0	-31.7	0.3	4.6	0.2
	Vendace	10	18.0	1.0	47	6	13.5	0.5	-29.9	0.5	3.8	1.0
	Smelt	10	16.5	4.8	36	34	14.7	0.6	-27.4	0.7	1.4	0.6
	Brown trout	15	65.3	7.6	3391	1180	15.0	0.3	-27.3	0.5	2.8	1.3
Femunden	Brown trout	10	39.6	3.7	712	204	10.2	1.0	-23.2	1.4	1.1	0.4
Eikesdalsvatnet	Brown trout	3	34.3	4.9	440	188	-	-	-	-	1.0	0.3

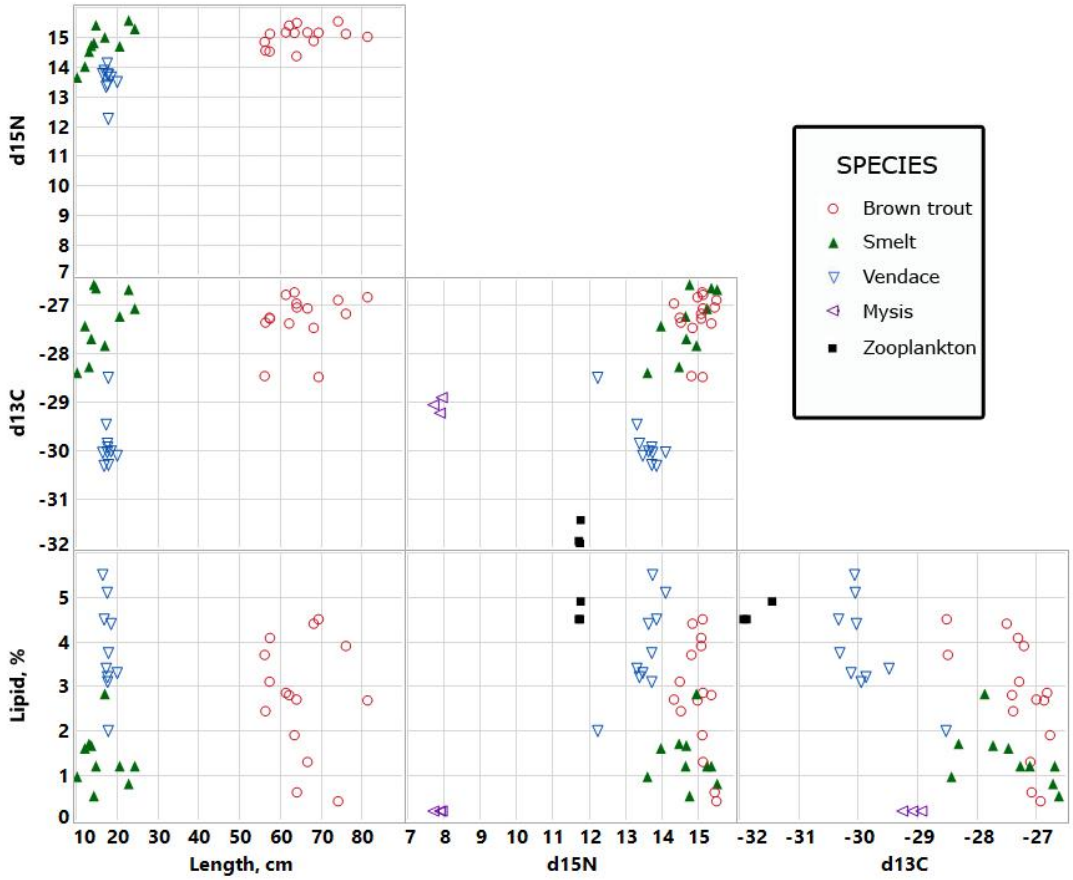

Figure 3. Scatter plot matrix showing variations between fish length, stabile N- and C-isotopes ($\delta^{15}N$, $\delta^{13}C$) and lipid content in samples from 2017 in Lake Mjøsa. Sample type for fish is muscle, and for zooplankton and Mysis whole body.

5.2 Environmental quality standards (EQS)

EQS (Environmental quality standard) is a specific concentration distinguishing between a "good" and a "poor" environmental condition in a water body. The concentration limit is determined based on risk assessments for human health and the environment, such as an aquatic ecosystem, and exist for a range of contaminants in water, sediment, and biota. For water, there are two different limits, the annual average (AA-EQS) and the maximum value (Mac-EQS), indicating a chronic and acute exposure to the contaminant, respectively.

To understand the environmental impact caused by contaminants over time, biota samples are preferred over abiotic samples. As an example, mercury (Hg) is a contaminant which tends to biomagnify in food chains, and a low EQS_{biota}-value for Hg may indicate high toxicity and a high bioaccumulation and biomagnifying factor (Direktoratsgruppen vanndirektivet, 2018). The EQS-value for Hg in freshwater biota is considered low (0.02 µg/g w.w.) but should, based on risk assessments, protect the most sensitive species within the ecosystem from adverse effects. There are several motives for protecting various organisms from exposure to contaminants, such as protecting top predators from secondary poisoning through the consumption of contaminated prey and prevent the risk of toxic effects in humans caused by consumption of contaminated fish.

Classification of water are based on unfiltered samples from representative locations within the lake. EQS are very low in water for several of the contaminants, making it challenging to obtain an acceptable sensitivity of the chemical analyses. Sediment classification limits exist mostly for marine sediments, but for some contaminants, EQSs also exist for freshwater sediments.

In freshwater, brown trout is one of the species that meet most of the criteria for EQS classification such as:

- reflecting changes of contaminant concentrations in the environment,
- ability of biomagnification throughout the study area,
- representative for the study area,
- rich population
- large enough size for tissue sampling

Several legacy POPs (persistent organic pollutants), such as PBDEs binds to sulfhydryl groups in proteins. The same is relevant for mercury (Hg). Fish muscle is thus the preferred sample tissue for these contaminants. In addition, bisphenol A, TBBPA (tetrabromobisphenol A), D5 (cyclic volatile methylated siloxane), octyl- and nonylphenol are determined in muscle. PFOS and PFOA are determined in liver.

5.2.1 Results compared to EQS

Table 4 lists the contaminants with EQS values in the monitoring program and the concentrations detected in water, sediment, and biota samples. QS_{biota} was considered for samples of brown trout muscle, except for PFOS and PFOA where the sample media was liver.

Table 4

EQS values from Norwegian water framework directive (WFD) (Direktoratsgruppen vanndirektivet, 2018) compared to results from Lakes Mjøsa and Femunden for the contaminants that fall under the WFD. Last column within each sample media lists the number of samples (N) above the EQS value. Values exceeding QS_{biota} are marked in bold and the difference between Lake Mjøsa (M) and Femunden (F) is shown.

	Water			Sediment			Biota		
Contaminant	Water AA-EQS	Water range	N > AA-EQS	$QS_{sediment}$ (freshwater)	Sediment range	N > $QS_{sediment}$	Biota QSbiota	Biota range (Brown trout)	N > QSbiota
	µg/L	µg/L	N	mg/kg	mg/kg	N	µg/kg w.w.	µg/kg w.w.	N
PBDEs (Mac-EQS)	0.14	< LOD (0.0004 - 0.007)	0/5	0.31	< LOD - 0.00015	0/5	0.0085	**M: 3.7 - 25.5** **F: 0.19 - 1.50**	**15/15** **10/10**
PFOS	0.00065	< LOD (0.0001) - 0.00013	0/5	0.023	< LOD (0.0001) - 0.00025	0/5	9.1	**M:** 1.5 - **11.4** F: 0.76 - 5.22	**2/15** 0/10
PFOA	9.1	< LOD (0.0005)	0/5	0.710	< LOD (0.0005)	0/5	91.3	< 0.5	0/25
Nonylphenol	0.3	< LOD (0.006)	0/5	n.e.	< LOD (0.002)	-	3000	< LOD (35)	0/25
Octylphenol	0.1	n.d.	0/5	n.e.	n.d.	-	0.004	n.d.	0/25
Bisphenol-A	1.5	< LOD (0.015) - 0.285	0/5	n.e.	< LOD (0.015)	-	n.e.	< LOD (25) - 41	-
D5	1.7	< LOD (0.00092)	0/5	0.44	< LOD - 0.00177	0/5	15217	0.48 - 39.3	0/25
Hg	0.047	n.d.	0/5	n.e.	n.d.	-	20	**M: 289 - 1480** **F: 56 - 739**	**15/15** **10/10**
TBBPA	0.254	< LOD (0.0005)	0/5	n.e.	< LOD (0.016)	-	n.e.	< LOD (9)	-

n.e.: non-existing

None of the water and sediment samples exceeded the EQS values for the contaminants discussed here. For biota, EQS were exceeded for PBDEs (sum of six BDEs) in all 25 samples of brown trout muscle. This was also the case in 2017 (Fjeld et al., 2016). The same pattern is found for Hg. EQS-values might seem low but are set to protect sensitive organisms and human health. 2 out of 25 samples had PFOS concentrations above the EQS value of 9.1 µg/kg w.w., both samples from Lake Mjøsa.

5.3 Mercury, Hg

In 2017, the mean concentrations of Hg in brown trout muscle from Lake Mjøsa and Lake Femunden were 0.63 and 0.35 µg/g w.w., respectively (table 5). In the planktivorous fish vendace, the mean concentration was 0.08 µg/g w.w., whereas the concentrations in zooplankton and Mysis the means were 0.01 and <0.005 µg/g w.w., respectively. In smelt, which mostly prey on Mysis and vendace, the mean Hg concentration was 0.22 µg/g w.w. Some of the smelt caught in this survey were large, most likely cannibalistic, individuals.

All samples of fish from the three lakes exceeded this value in 2017, as was also the case in 2016 (Fjeld et al., 2017).

Table 5
Hg concentrations (mean, SD, min, max) in µg/g w.w. in zooplankton, Mysis and fish from Lake Mjøsa, and brown trout from Lake Femunden. Including values for mean length and weight

	Sample	n	$\bar{x}$	SD	Min	Max	Length, cm ($\bar{x}$)	Weight, g ($\bar{x}$)
Mjøsa	Brown trout	15	0.63	0.340	0.29	1.48	65.3	3390
	Smelt	10	0.22	0.134	0.10	0.51	16.5	35.7
	Vendace	10	0.08	0.008	0.07	0.10	18.0	47
	Mysis	3	0.01	0.002	0.01	0.02		
	Zooplankton	3	0.00	0.000	0.00	0.00		
Femunden	Brown trout	10	0.35	0.186	0.06	0.74	39.6	712
Eikedalsvatnet	Brown trout	3	0.18	0.13	0.09	0.33	33.5	413

5.3.1 Trophic magnification of Hg and trends

The EQS-value of 20 µg/kg w.w. was exceeded in all samples of brown trout. Note that table 5 lists the detected concentrations in µg/g, whereas the EQS is in µg/kg. Data from 2013-2016 indicate that the concentrations of Hg in brown trout from Lake Mjøsa exceeded the Norwegian Food Safety Authority (Mattilsynet) guidelines for sale (0.5 µg/g) in more than 50 % of the samples. Data from 2017 show the same trend (table 5). Hg is still showing trophic magnification (TMF>1, also for 2017-data) in Lake Mjøsa (Figure 4, data from 2017). However, the mean concentration in 2017 seem to have stabilized on the same level as for 2016, indicating a total decreasing trend in concentrations in the top-predator brown trout since 2012 (Figure 5).

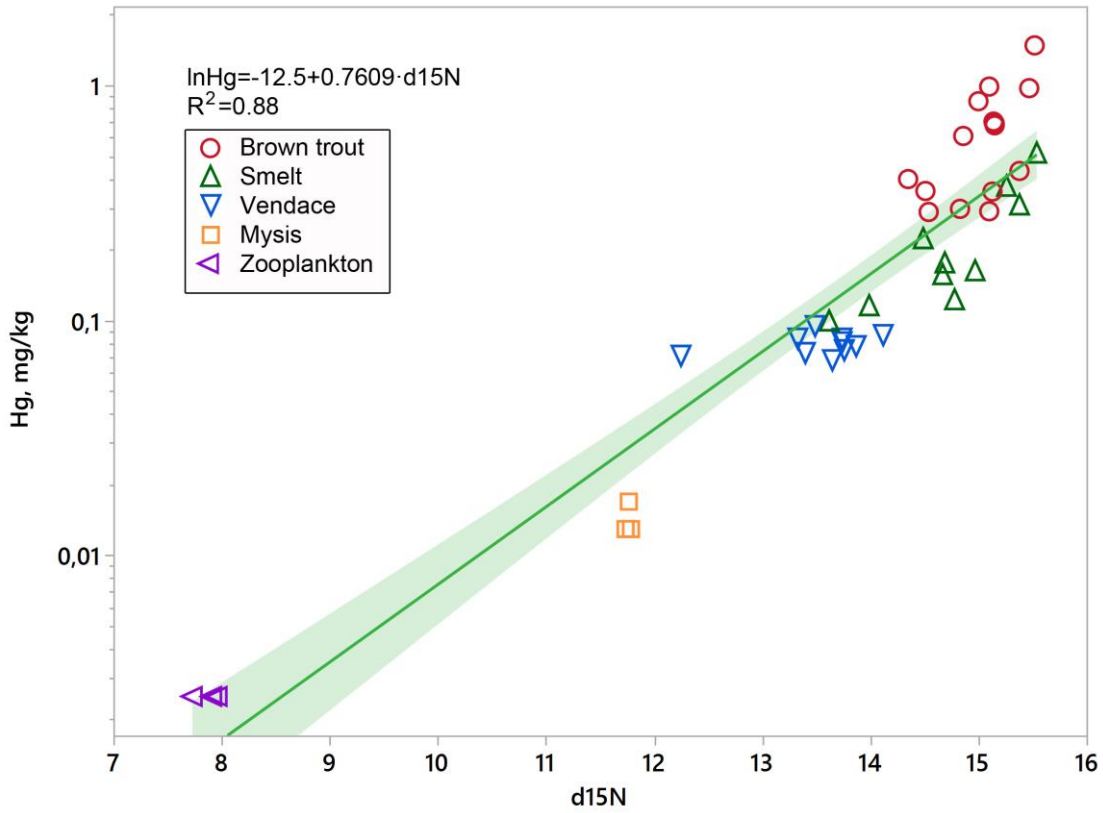

Figure 4. Hg-concentrations in fish, Mysis and zooplankton from Mjøsa for the year 2017 plotted against $\delta^{15}N$.

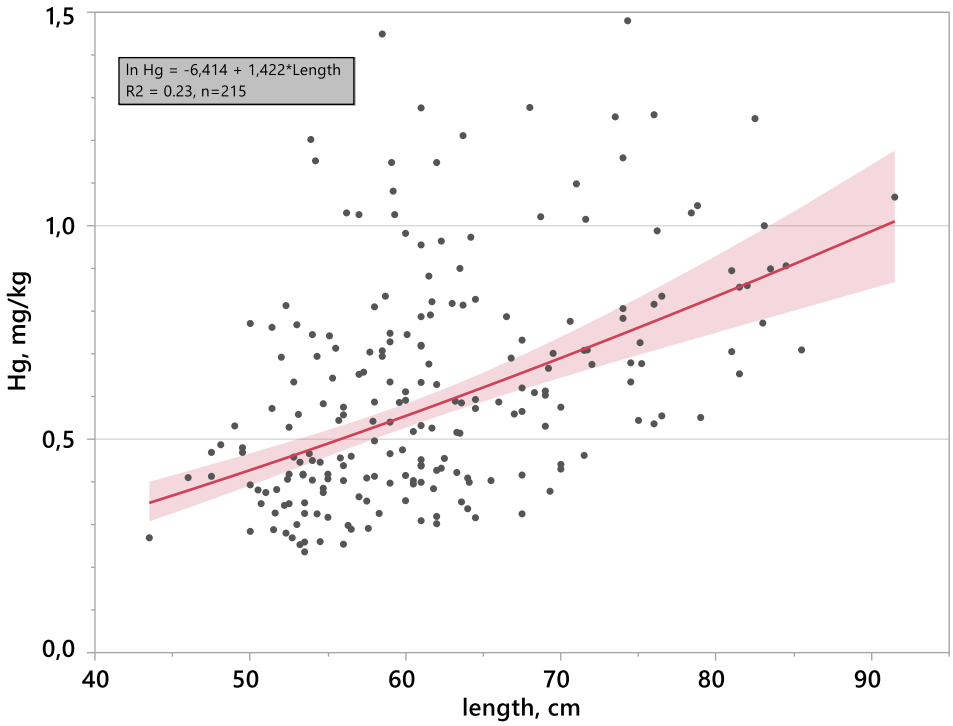

Figure 5. Spreadsheet showing Hg-concentrations and fish length for brown trout in Lake Mjøsa from 2006-2017 (n=215), with 95 % confidence interval. Raw data from 2013-2016 on other species than brown trout were unavailable.

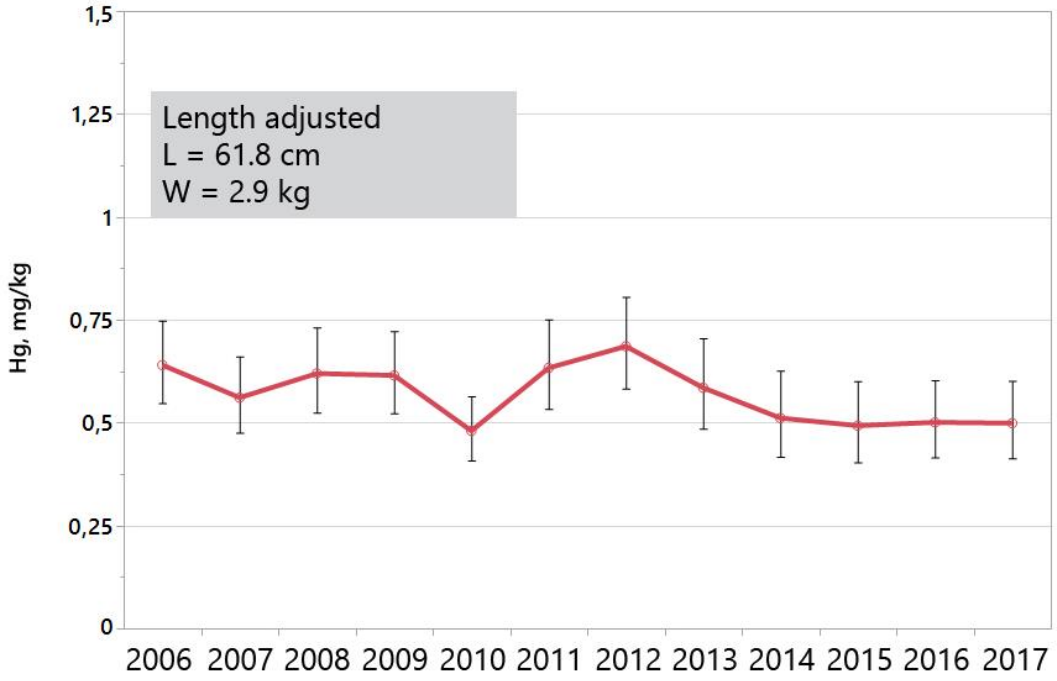

Figure 6. Annual mean Hg-concentrations adjusted for length with a 95 % confidence interval, from the years 2006-2017.

5.4 Cyclic volatile methylated siloxanes, cVMS

5.4.1 Levels of cVMS in 2017

Concentrations of siloxanes (D4, D5 and D6) were determined in biota (zooplankton, Mysis and fish muscle samples) from Lake Mjøsa and in fish muscle samples from brown trout in Lake Femunden. The limits of detection and quantification (LOD/Q) of the individual cVMS compounds varied between the different "batches" of samples analyzed. The total percentage of quantifiable analytical results for D4, D5 and D6 in biota from Lake Mjøsa were 0%, 100% and 98% respectively (Table 6). For Femunden, all analyses were below the method's detection or quantification limits (<LOD/Q) for D4 and D5. Two out of ten samples for D6 had quantifiable results. In the following, all concentrations below LOD/Q (< LOD/Q) are substituted by half the limits.

EQS-values for water, sediment, and biota were not exceeded for any of the samples.

Table 6
No of samples (N) analyzed for cVMS and the fraction of N (%) ≥ LOD.

Lake	Species	cVMS	N	LOD, ng/g ww	≥ LOD, %
Mjøsa	Zooplankton	D4	3	2.94	0
		D5	3	0.7	100
		D6	3	0.17	100
	Mysis	D4	3	2.94	0
		D5	3	0.7	100
		D6	3	0.17	100
	Vendace	D4	10	2.94	0
		D5	10	0.7	100
		D6	10	0.17	90
	Smelt	D4	10	2.94	0
		D5	10	0.7	100
		D6	10	0.17	100
	Brown trout	D4	15	1.21	0
		D5	15	0.7	100
		D6	15	0.7	100
	All	D4	41		0
		D5	41		100
		D6	41		98
Femunden	Brown trout	D4	10	0.96	0
		D5	10	0.96	0
		D6	10	0.30	20

The concentrations of cVMS were higher in Lake Mjøsa compared to Lake Femunden, and generally D5 was the dominant compound (Table 7, Figure 7). Environmental quality standard (EQS) value for D5 in biota is 15 000 ng/g w.w. (Miljødirektoratet, 2016) and no samples exceeded this value.

In Lake Mjøsa, the highest mean values of D5 were found in smelt (2829 ng/g lipid; 29.4 ng/g w.w.), while brown trout and vendace had lower levels of 877 and 581 ng/g lipid, respectively (17.6 and 29.7 ng/g w.w.). Lowest mean concentration of D5 was found in Mysis from Lake Mjøsa, with 458 ng/g lipid (10 ng/g w.w.). Smelts from Lake Mjøsa were at almost the same trophic level as brown trout in 2017, due to some cannibalistic individuals in the sample batch, which implies that their generally higher concentrations of cVMS cannot be explained directly by differences in trophic positions. Table 3 also indicates that the differences in $\delta^{13}C$ and $\delta^{15}N$ for brown trout and smelt in Lake Mjøsa are minimal. Similar results were also reported in 2015 and 2016 (Fjeld et al. 2016 and 2017), but we have no basis for speculating in possible explanations yet.

D4 was not detected in any of the biota samples, and thus statistical evaluation based on half the LOD is not discussed. Mean concentrations of D6 in the samples from Lake Mjøsa were 33-165 ng/g lipid (1.2-1.8 n/g w.w.), with the lowest levels in the samples of Mysis.

For Lake Femunden, all the analytical results of cVMS were below the quantification limits except for two values for D6, however in the lower concentration range. Hence, estimated means are very uncertain, as for the D4 results in Lake Mjøsa, and therefore we cannot give any more specific comments to these.

The higher concentrations of D5 found in Lake Mjøsa compared to Lake Femunden, are expected based on previous studies by e.g. Borgå et al. (2012b and 2013b) and Fjeld et al. (2015, 2016). These concentration differences most likely reflect the importance of local sources from the surrounding urban areas to Lake Mjøsa, which has a relatively large population connected to several waste water treatment plants (WWTP) with discharge to the lake. Lake Femunden, however, is a rural lake situated in a sparsely populated nature reserve with a catchment area mostly consisting of bare mountains and woodland areas. In this lake we can expect the influence of local sources of cVMS to be close to zero. Here, atmospheric deposition is therefore probably the main source for cVMS (Xu and Wania, 2013; Bohlin-Nizzetto et al., 2017).

Table 7

Average concentrations ($\bar{x}$), standard deviation (SD), min and max values for siloxanes (cVMS D4, D5, and D6) in samples of biota from Lake Mjøsa and Lake Femunden in 2017. Concentrations below the limit of detection have been replaced by half the limit. Orange color indicate that > 50 % of the samples are above LOD.

				Conc., ng/g w.w.				Conc., ng/g lipid			
Lake	Species	cVMS	N	$\bar{x}$	SD	Min	Max	$\bar{x}$	SD	Min	Max
Mjøsa	Zoopl.	D4	3	1.5	0	1.5	1.5	735	0	735	735
		D5	3	1.8	0.2	1.7	2.1	905	109	830	1030
		D6	3	1.0	0.3	0.8	1.3	475	152	380	650
	Mysis	D4	3	1.5	0.0	1.5	1.5	32	2	30	33
		D5	3	21.2	3.3	17.7	24.2	458	73	394	537
		D6	3	1.6	0.1	1.5	1.6	33	2	32	35
	Vendace	D4	10	1.5	0.0	1.5	1.5	42	13	27	74
		D5	10	23.6	16.7	0.8	58.4	581	360	38	1207
		D6	10	1.6	1.1	0.1	4.0	45	31	1	120
	Smelt	D4	10	1.5	0.0	1.5	1.5	130	64	52	277
		D5	10	29.4	19.7	6.3	63.7	2829	2484	393	7245
		D6	10	1.8	0.6	1.1	2.9	165	96	66	336
	Brown trout	D4	15	0.6	0.0	0.6	0.6	35	37	14	145
		D5	15	19.7	10.4	4.0	39.3	877	655	289	2976
		D6	15	1.2	0.5	0.5	2.2	63	68	21	302
Femunden	Brown trout	D4	10	0.5	0.0	0.5	0.5	53	26	28	114
		D5	10	0.5	0.0	0.5	0.5	53	26	28	114
		D6	10	0.3	0.5	0.2	1.8	38	68	9	231

Siloxanes were not determined in the samples from Lake Eikedalsvatnet.

Studies elsewhere have been reporting concentrations of D5 in the range of 1.4-14.4 ng/g w.w. in Swedish perch muscle (Kierkegaard et al., 2013) and 14-36 ng/g w.w. in Lake Erie, USA (McGoldrick et al., 2014). Concentrations of D5 have previously been reported in various fish species in Lake Mjøsa with concentrations ranging from 1.2-160 ng/g w.w. (Borgå et al., 2013a and b; Fjeld et al., 2017). Data from 2017, table 4, indicate the same trend, that the concentrations of especially D5 found in the pelagic food web of Lake Mjøsa are higher compared to other studies, with no obvious local source other than discharges from WWTP around the lake. However, the Swedish study by Kierkegaard et al. (2013) was also carried out in a lake with impact from WWTPs.

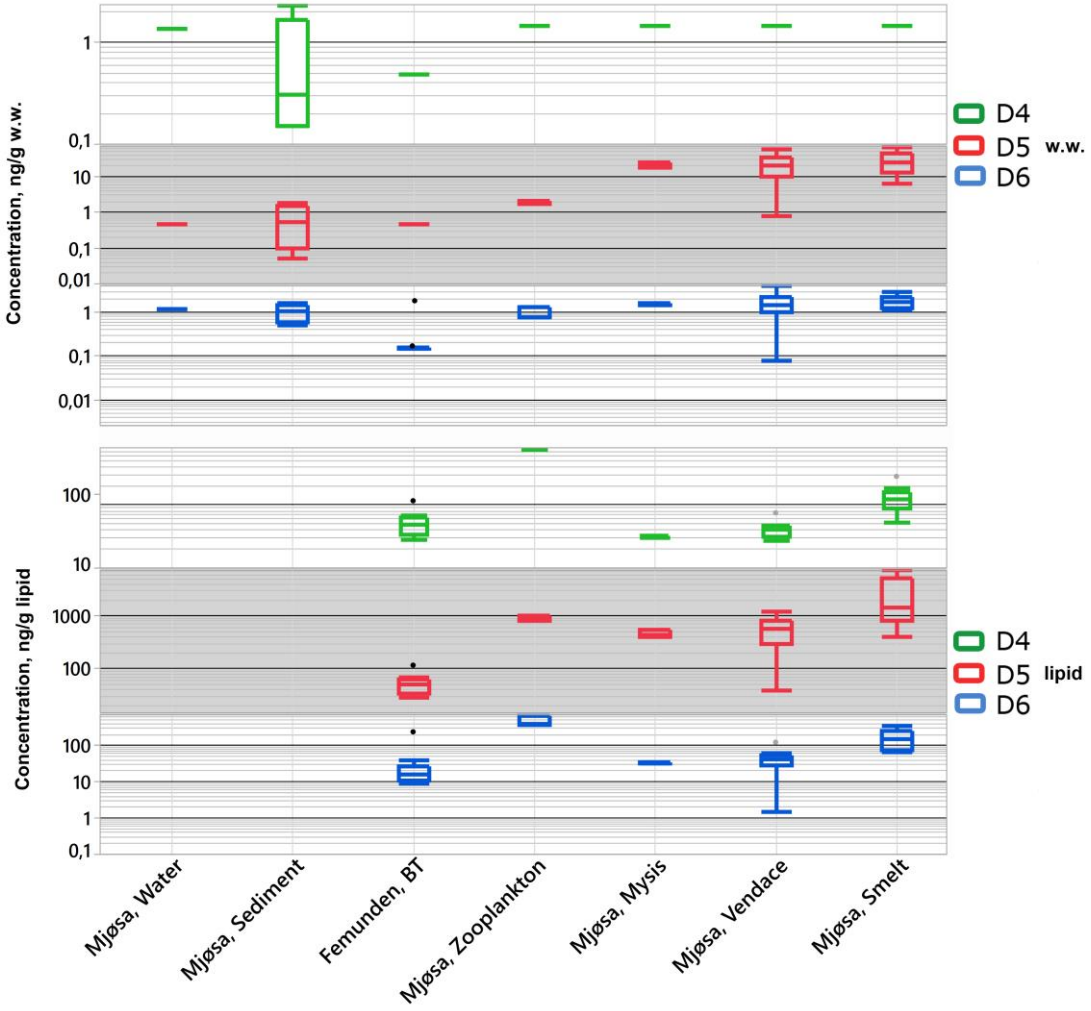

Figure 7. Box-plot of cVMS-concentrations in biota from Lake Mjøsa and Lake Femunden, sampled in 2017. Upper figure (wet weight), lower figure (lipid weight). Concentrations <LOD are substituted with half the limit. Figure also includes cVMS detected in water and sediment from Lake Mjøsa (option 6).

5.4.2 Trends and annual variation of cVMS in Lake Mjøsa

In previous monitoring reports from Lake Mjøsa, the concentration of cVMS compounds in the top predator brown trout have been discussed and compared (e.g. Fjeld et al., 2016 and 2017). Data from 2017 are included and compared with previous results in table 8 and figure 8, also displaying the percentage of the different cVMS that constitute the calculated total concentration of cVMS (ΣcVMS).

Table 8
Annual mean conc. of cVMS (D4, D5, and D6) in ng/g lipid ± SD in brown trout from Lake Mjøsa. Conc below LOD are substituted with half of the limits. Orange color indicate that > 50 % of the samples are above LOD.

			Concentration (mean ± SD), ng/g lipid				Percentage of cVMS		
Year	Lake	n	D4	D5	D6	ΣcVMS	D4	D5	D6
2010	Mjøsa	5	180±190	3800±3400	130±44	4100±3600	4 %	93 %	3 %
2012	Mjøsa	5	23±17	5600±2300	285±100	5900±2400	0 %	95 %	5 %
2013	Mjøsa	15	100±130	1700±2000	410±550	2200±2000	5 %	76 %	19 %
2014	Mjøsa	15	40±20	2500±1700	140±60	2700±1800	1 %	94 %	5 %
2015	Mjøsa	15	140±180	2800±2800	140±180	3100±3200	4 %	89 %	7 %
2016	Mjøsa	15	110±90	1300±590	160±70	1600±700	7 %	83 %	10 %
2017	Mjøsa	15	35±37	880±660	63±68	980±750	4 %	90 %	6 %

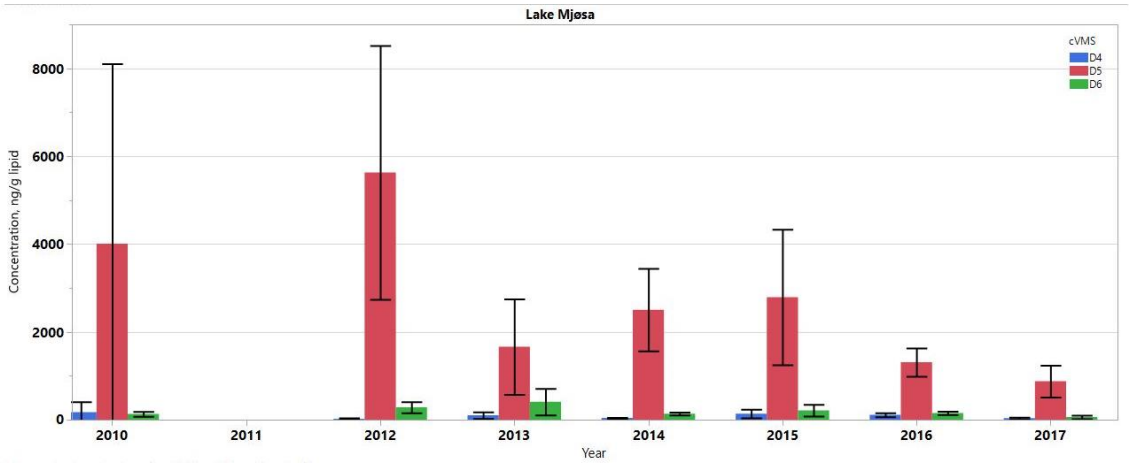

Figure 8. Annual mean concentrations with 95 % confidence intervals of cVMS in muscle from brown trout in Lake Mjøsa 2010-2017. Conc. below detection limit (LOD) are replaced by half the limit. Each error bar is constructed using a 95 % confidence interval of the mean.

Samples from 2010 and 2012 were analyzed by the University of Stockholm, samples from 2013-2017 at NILU. Replacing the LODs with half the limits introduces an uncertainty of the estimates for especially D4 and D6. D5 was thus the dominant compound in Lake Mjøsa. Concentrations from Lake Femunden were almost exclusively below the LOD and excluded from these statistical evaluations.

An analysis of variance (Anova) was performed on the ln-transformed data for D5 in brown trout muscle concentrations from 2010-2017 to determine possible differences among the mean values. A post-hoc test (Tukey-Kramer HSD) indicate that the mean concentrations in 2017 are significantly different from 2010, 2012, 2014, and 2015, see excerpt from the statistical test in Table 9. Comparisons shown in red are significantly different.

Table 9
Comparisons of mean concentrations of cVMS D5 in muscle samples of brown trout from Lake Mjøsa between 2010 and 2017 using JMP13 Anova, and a Tukey-Kramer test. p-values below 0.05 are significantly different.

Level	-Level	Difference	Std Err Dif	Lower CL	Upper CL	p-Value
2012	2017	1,9635	0,40225	0,7460	3,1810	0,0001*
2012	2013	1,6357	0,40225	0,4182	2,8532	0,0021*
2012	2016	1,4909	0,40225	0,2734	2,7083	0,0069*
2010	2017	1,4515	0,40225	0,2341	2,6690	0,0094*
2010	2013	1,1238	0,40225	-0,0936	2,3413	0,0898
2012	2014	1,0327	0,40225	-0,1847	2,2502	0,1505
2012	2015	0,9959	0,40225	-0,2215	2,2134	0,1825
2010	2016	0,9789	0,40225	-0,2385	2,1964	0,1988
2015	2017	0,9675	0,28444	0,1066	1,8284	0,0175*
2014	2017	0,9307	0,28444	0,0698	1,7916	0,0255*
2015	2013	0,6397	0,28444	-0,2211	1,5006	0,2821
2014	2013	0,6030	0,28444	-0,2578	1,4639	0,3515
2010	2014	0,5208	0,40225	-0,6966	1,7383	0,8523
2012	2010	0,5119	0,49266	-0,9791	2,0030	0,9432
2015	2016	0,4949	0,28444	-0,3659	1,3558	0,5918
2010	2015	0,4840	0,40225	-0,7334	1,7015	0,8908
2016	2017	0,4726	0,28444	-0,3882	1,3335	0,6432
2014	2016	0,4581	0,28444	-0,4027	1,3190	0,6759
2013	2017	0,3277	0,28444	-0,5331	1,1886	0,9094
2016	2013	0,1448	0,28444	-0,7160	1,0057	0,9987
2015	2014	0,0367	0,28444	-0,8241	0,8976	1,0000

D4, D5, and D6 concentrations were lower in 2017 for all matrixes compared to previous years. Discussion of the empirical inter-annual differences must be performed with caution as the variation might be explained with sources of uncertainty such as:

i) the substitution of LOD for half the limits, as the LOD/Q changes with analytical batches
ii) determination of cVMS in the period 2010-2017 have been carried out by two different laboratories with no intercalibration between the two, and
iii) analytical methods for cVMS are developing each year and are not yet fully established as routine as for the more classic contaminants such as PCBs and PAHs.

Given the rare physical-chemical properties of cVMS being both hydrophobic/lipophilic and volatile (Whelan et al., 2010; Xu et al., 2014), the major partitioning of these compounds will be to air and sludge after and during use in e.g. personal care products. Half-life estimates of D5 range from 9 (at 25°C) to 449 (at 9°C) days in freshwater systems (cited in Whelan et al., 2010). D5 may undergo acid- and base hydrolysis in addition to the affinity to e.g. organic

content, susceptible to sedimentation. As we see in the results from Lake Mjøsa in 2017, where water and sediment samples were included, the concentrations are well above LOD in sediments, and below LOD in the water phase (Figure 8).

5.4.3 Trophic magnification of D5 in Lake Mjøsa

Fjeld et al. (2015; 2016; 2017) have in previous studies combined chemical data for cVMS for several years of monitoring to perform a statistical analysis of trophic magnification (TMF) of D5 and D6. TMF has been demonstrated for D5 and D6 in the pelagic food web in both Lake Mjøsa and Lake Randsfjorden (Borgå et al., 2012b; 2013a and b; Fjeld et al., 2014-2017).

Values of $\delta^{15}N$ in primary consumers have been shown to vary between years, introducing a subsequent annual variation in the calculation of trophic levels of consumers higher in the food chain. Consequently, relative trophic levels (TL_{rel}) have been calculated instead, to avoid the uncertainty of baseline adjustments in the consumer $\delta^{15}N$, following the equation:

$$TL_{rel} = \frac{\delta 15Nc}{\Delta 15N}$$

where TL_{rel} is the relative trophic level, $\delta^{15}N_c$ is the measured ratio between stable N-isotopes and $\Delta^{15}N$ is the N-enrichment factor 3,4 ‰ (Post, 2002). With this approach, the annual $\delta^{15}N$ variations in zooplankton will not interfere with the estimation of higher trophic levels. TL_{rel} is consequently used to determine the trophic distance between the species within Lake Mjøsa but will not be able to calculate the absolute position in the food web or compare different lakes.

Fjeld et al. (2017) tested a statistical mixed linear model on the D5- and D6-data from Lakes Mjøsa and Randsfjorden, defining the variables “lake” and “TL_{rel}” as nominal and continuous, respectively, and the interaction between them as fixed effects. Full model analysis, including the random effect of “year”, was downscaled step-by-step until a viable, reduced model for D5 predictions was established. This working model indicated that D5 displayed the same trophic magnification in the two lakes. This model, including the data from 2017, are shown in Figure 9. Calculated value for TMF (D5 lipid) was 2.05, indicating a biomagnification for D5 through the food chain. TMF for D6 was 1.26.

Figure 9. cVMS-compound D5 (lipid normalized) and relative trophic levels (TL_{rel}) in zooplankton, Mysis, and fish from Lake Mjøsa from 2010 – 2017. Regressions of the ln-transformed concentrations on TL_{rel} are indicated with the 95 % confidence interval band. Concentrations below LOD have been replaced with half the limits.

5.5 Brominated flame retardants (BFR)

5.5.1 Concentrations of PBDE in 2017

PBDEs were determined in samples of zooplankton, Mysis, and in fish muscle from Lake Mjøsa. LOQ for the most common PBDE congeners were in the range of 0.001 – 0.007 ng/g w.w. In Table 10 the percentage of samples above LOQ is shown for the six main BDEs according to the Water framework directive (Miljødirektoratet, 2016).

Table 10
Share of samples where concentrations of BDE6 (according to the Water Framework Directive) exceeded the LOQ in samples of zooplankton, Mysis, and fish from Lake Mjøsa in 2017.

Lake	Species	N	BDE-28	BDE-47	BDE-99	BDE-100	BDE-153	BDE-154
Mjøsa	Brown trout	15	100 %	100 %	100 %	100 %	100 %	100 %
	Smelt	10	100 %	100 %	100 %	100 %	100 %	100 %
	Vendace	10	100 %	100 %	100 %	100 %	100 %	100 %
	Mysis	3	100 %	100 %	67 %	100 %	100 %	100 %
	Zooplankton	3	0 %	0 %	0 %	0 %	100 %	100 %
Femunden	Brown trout	10	90 %	100 %	80 %	100 %	100 %	100 %

Concentrations of PBDEs in the pelagic food web are reported as the sum of six congeners of tri-, tetra-, penta-, and hexa-BDEs (ΣBDE_6: BDE-28, BDE-47, BDE-99, BDE-100, BDE-153, and BDE-154) (Miljødirektoratet, 2016). Tables 11 and 12 show the mean value ($\bar{x}$) and standard

deviation (SD) for the six individual BDEs included in in all samples of zooplankton, Mysis, vendace, smelt, and brown trout on a wet weight and lipid weight basis, respectively.

Mean values of ΣBDE_6 varied from <LOQ in zooplankton to 8.1 ng/g w.w. (710 ng/g lipid) for brown trout in Lake Mjøsa. For Lake Femunden, the mean concentrations in brown trout were 0.49 and 52 ng/g for wet weight and lipid normalization, respectively. Compared with the environmental quality standard (EQS) for ΣBDE_6 in organisms of 0.0085 ng/g w.w., all samples exceeded this value. Of the individual BDEs, BDE-47 dominates the ΣBDE_6 congener pattern followed by penta-BDEs 99 and 100. For Lake Eikesdalsvatnet ΣBDE_6 mean concentrations in brown trout were 0.2 and 21.3 ng/g for wet weight and lipid normalization, respectively.

Brown trout from Lake Mjøsa (Photo: Morten Jartun)

Table 11

Mean (x) concentrations and standard deviation (SD) of six polybrominated diphenylethers (PBDE) and sum-BDE6 (according to the Water Framework Directive) in samples of zooplankton, Mysis, and fish from Lake Mjøsa and fish from Lake Femunden in 2017. Conc. in µg/g w.w. Conc. below LOQ are substituted with half the limit.

			BDE-28		BDE-47		BDE-99	
	Species	N	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
Mjøsa	Brown trout	15	0,021	0,010	4,4	3,1	1,4	1
	Smelt	10	0,008	0,003	1,3	0,56	0,087	0,041
	Vendace	10	0,009	0,002	0,99	0,25	0,6	0,15
	Mysis	3	0,005	0,001	0,37	0,027	0,18	0,017
	Zooplankton	3	0,001	0	0,024	0,003	0,014	0,001
Femunden	Brown trout	10	0,007	0,011	0,23	0,25	0,12	0,06
Eikedalsv.	Brown trout	3	0,002	0,0004	0,08	0,03	0,04	0,02

			BDE-100		BDE-153		BDE-154		ΣBDE6	
	Species	N	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
Mjøsa	Brown trout	15	1,4	1,2	0,28	0,23	0,64	0,5	8,1	6
	Smelt	10	0,33	0,15	0,047	0,021	0,14	0,059	1,9	0,81
	Vendace	10	0,34	0,074	0,058	0,013	0,12	0,027	2,1	0,51
	Mysis	3	0,084	0,003	0,01	0,005	0,03	0,004	0,71	0,029
	Zooplankton	3	0,003	0	0,002	0	0,002	0	-	-
Femunden	Brown trout	10	0,098	0,064	0,027	0,018	0,09	0,052	0,49	0,26
Eikedalsv.	Brown trout	3	0,03	0,02	0,01	0,005	0,02	0,01	0,18	0,09

Table 12
Mean (x) concentrations and standard deviation (SD) of six polybrominated diphenylethers (PBDE) and sum-BDE6 (according to the Water Framework Directive) in samples of zooplankton, Mysis, and fish from Lake Mjøsa and fish from Lake Femunden in 2017. Conc. in µg/g lipid. Conc. below LOQ are substituted with half the limit.

			BDE-28		BDE-47		BDE-99	
	Species	N	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
Mjøsa	Brown trout	15	1.14	1.4	370	770	120	270
	Smelt	10	0.66	0.30	110	66	6.5	1.7
	Vendace	10	0.24	0.053	26	5.7	16	3.3
	Mysis	3	0.11	0.010	8	0.65	3.9	0.41
	Zooplankton	3	0.66	0	12	1.6	7.1	0.4
Femunden	Brown trout	10	0.78	1.5	26	33	13	8.9
Eikedalsv.	Brown trout	3	0,25	0,10	9,4	6,7	4,6	2,5

			BDE-100		BDE-153		BDE-154		ΣBDE6	
	Species	N	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
Mjøsa	Brown trout	15	130	300	26	58	59	130	710	1530
	Smelt	10	28	18	4.0	2.7	11	7.5	160	95
	Vendace	10	9.2	1.8	1.6	0.31	3.2	0.58	57	12
	Mysis	3	1.8	0.13	0.21	0.11	0.65	0.094	15	1.5
	Zooplankton	3	1.5	0	1.1	0	0.90	0	-	-
Femunden	Brown trout	10	11	9.2	2.9	2.4	9.8	7.3	52	39
Eikedalsv.	Brown trout	3	3,4	3,0	1,2	0,9	2,5	2,3	21	14

Considering the extensive analytical program for brominated flame retardants (BFRs), including PBDEs and other compounds, the total content is dominated by BDE-47, BDE-99, BDE-100, BDE-153, BDE-154, and DBDPE (decabromodiphenylethane), see Figure 10. DBDPE is a flame retardant with a high degree of bromination, similar to the fully deca-brominated BDE-209, but for DBDPE, the two fully brominated benzene rings are linked with an ethane chain.

.

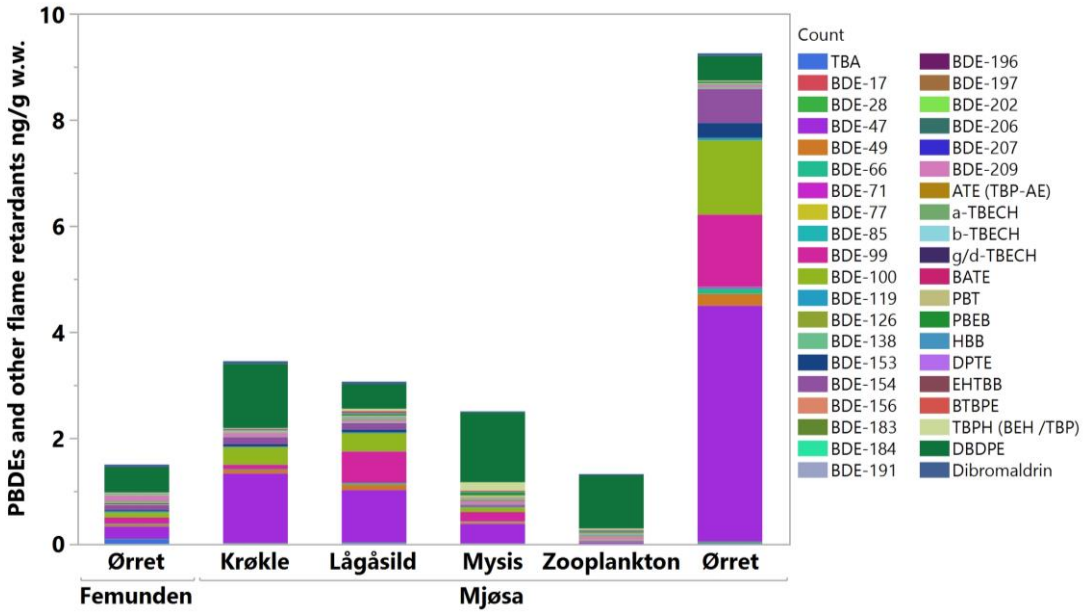

Figure 10. Display of all PBDEs and other brominated flame retardants in samples of zooplankton, Mysis, vendace, smelt, and brown trout from Lake Mjøsa, and brown trout from Lake Femunden. Concentrations are shown in ng/g w.w., and results below LOQ have been substituted with half the limit.

5.5.2 Time trends for PBDEs in Lake Mjøsa

PBDE levels in vendace, smelt, and brown trout have been monitored since the 1990s with continous data for brown trout from 2000. Mean concentrations in brown trout muscle for the most abundant PBDEs (47, 49/71, 99, 100, 153, and 154) are given in Figure 11 for w.w. basis and lipid normalization for the years 2000-2017. The high levels from 2000-2006 were a result of large continuous discharges from local textile industry to the lake. For brown trout, the highest levels were > 5000 ng/g lipid in 2006, compared to 710 ng/g lipid in 2017.

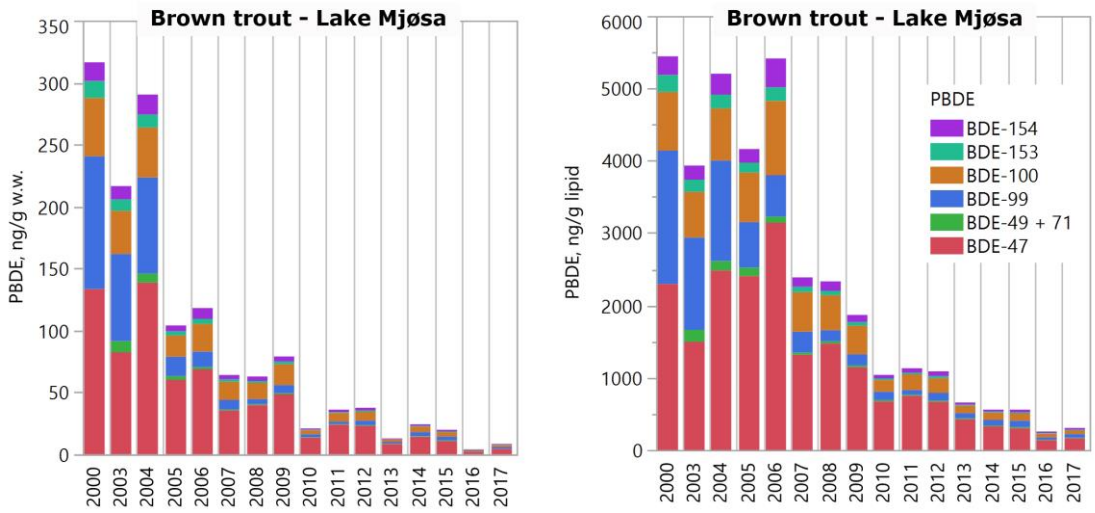

Figure 11. Mean concentrations of selected PBDEs in samples of brown trout muscle from Lake Mjøsa caught in the period 2000-2017. Concentrations are given in w.w. (left) and lipid normalization (right). Conc. below LOQ have been replaced by half the limit.

Looking at the data for ΣBDE_6, as mentioned in the Water Framework Directive, we only have consistent data since 2013. Mean concentrations for wet weight and lipid normalization are shown in Figure 12, indicating a descending trend for lipid normalization from 2013 to 2016, but with a slight increase in 2017. Levels of ΣBDE_6 w.w. in 2016 and 2017 are significantly different, with a p-value of 0.019. But looking at the lipid normalization, the difference between 2016 and 2017 data are not significant. We have no additional data to suggest any explanation for this, but the pattern of individual contribution from the specific congeners remains the same from 2016 to 2017.

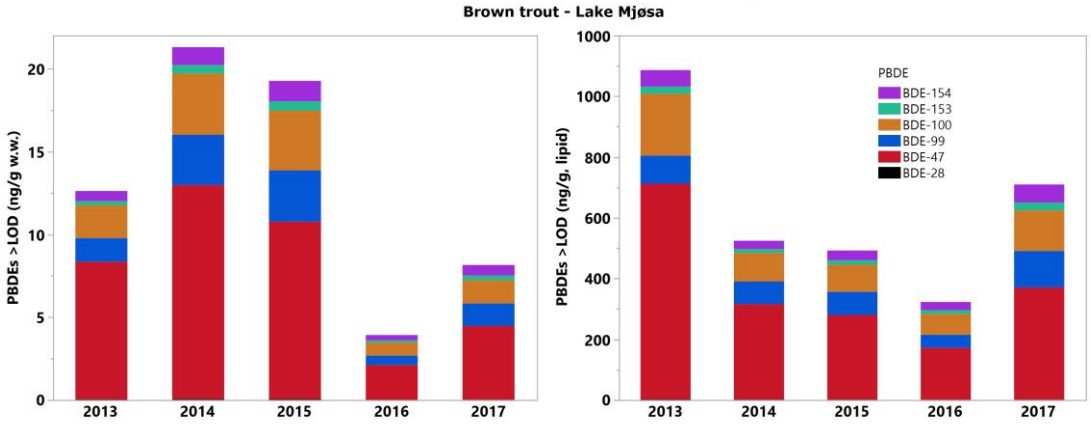

Figure 12. Mean concentrations for ΣBDE_6 in samples of brown trout from Lake Mjøsa caught in the years 2013-2017. Conc. given in ng/g w.w. (left) and lipid normalization (right). Conc. below LOQ have been replaced by half the limit.

For smelt in Lake Mjøsa and brown trout in Lake Femunden there are no significant differences between 2016 and 2017 (Figure 13). Concentrations of ΣBDE_6 in brown trout from Lake Mjøsa are 4 times higher than the concentrations found in smelt, and 10-15 times higher than in brown trout from Lake Femunden.

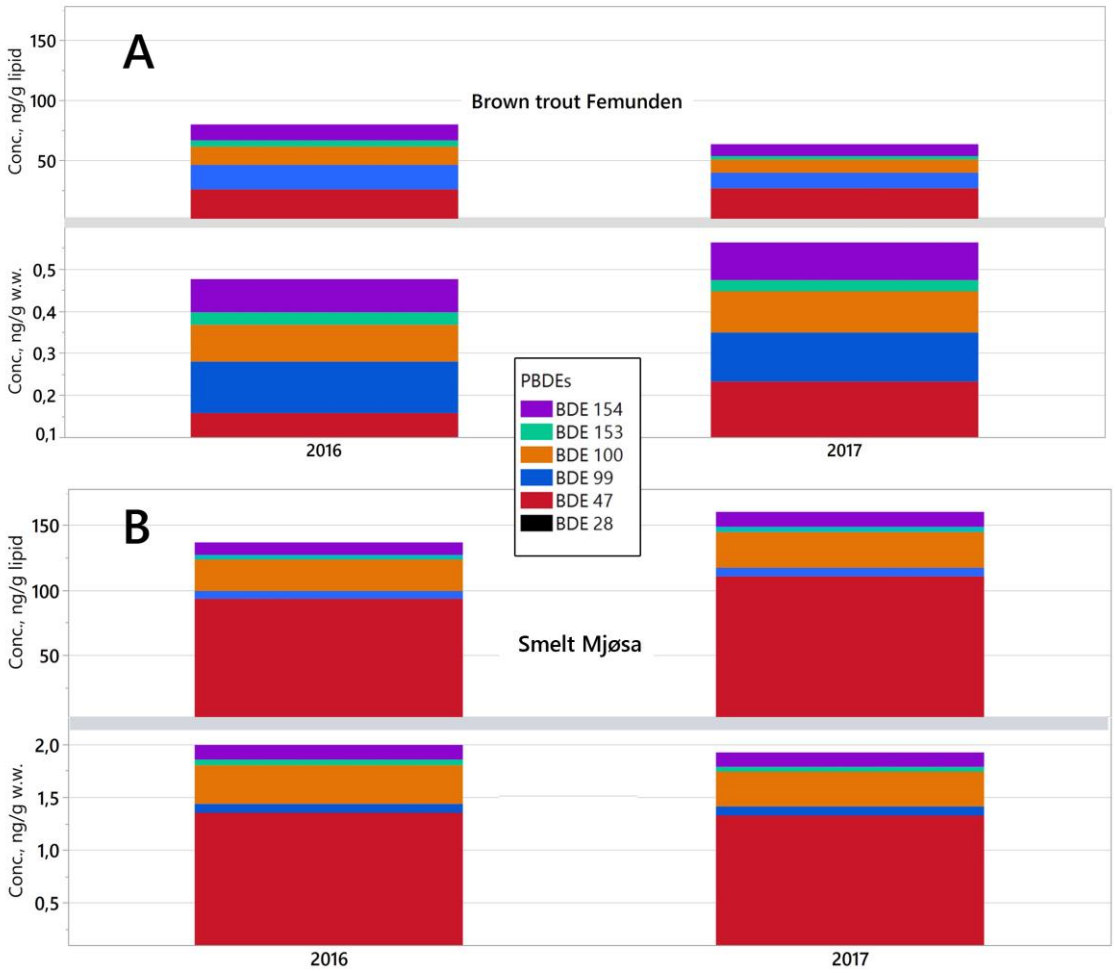

Figure 13. Mean concentrations for ΣBDE$_6$ in samples of brown trout from Lake Femunden (A) and smelt from Lake Mjøsa (B) caught in 2016 and 2017. Concentrations are given in ng/g w.w. (upper) and lipid normalization (lower) for each year. Concentrations below LOD have been replaced by half the limit.

5.6 Correlations between cVMS, Hg, BDE-47 and relative trophic level

Contaminants, such as siloxanes, mercury, and some brominated flame retardants (e.g. BDE-47), with similar physical-chemical properties, such as being lipophilic and bioaccumulative, can express a relatable accumulation pattern in food webs. Previously in Lake Mjøsa, the correlation between D5 and D6, PCB-153, BDE-47, Hg, and relative trophic level (TL_{rel}, based on $\delta^{15}N$) have been calculated based on $\log_e$-transformed lipid-normalized concentrations in samples from the pelagic food web. Fjeld et al. (2017) have shown good correlation with relative trophic level (TL_{rel}) for D5 and D6 with trophic magnification factors (TMFs) of about 3 and 2 in Lake Mjøsa, respectively. The data from 2016 indicated that PCB-153, BDE-47, and Hg also biomagnified in Lake Mjøsa. However, the TMFs calculated in 2017 were mainly based on fish and did not include samples of primary consumers (zooplankton).

Figure 14 displays the data from 2017. PCBs were not determined in this part of the study from 2017. D5 and D6 did not have a significant correlation with TL_{rel} ($p>0.05$), and this might be explained by very high concentrations of these two compounds on a lipid-basis in zooplankton. Lipid content in zooplankton was 0.2 % consequently resulting in much higher concentrations on a lipid-basis than for the other species in the study. This is illustrated in the top right corner of Figure 14 where the calculation of ln D6 vs. TL_{rel} is performed without the zooplankton concentrations, and the TMF for D6 changes from 0.6 (with zooplankton) to 2.8 (zooplankton removed from the model).

BDE-47 and Hg seem to correlate well with TL_{rel} with correlation coefficients of 0.71 and 0.69, and a TMF of 4.6 and 6.7, respectively. This means that BDE-47 and Hg are still biomagnifying in Lake Mjøsa, confirming the findings in previous years (e.g. Fjeld et al., 2016, 2017). D5 shows a weak to moderate correlation with BDE-47 and Hg ($r=0.43$ and 0.44, respectively), and a weak correlation with D6 considering the data from 2017. These correlation coefficients are somewhat weaker than showed e.g. in Fjeld et al. (2017). However, the correlation between BDE-47 and Hg stands strong ($r=0.96$), stating that these two compounds behave in the same way in the pelagic food web of Lake Mjøsa.

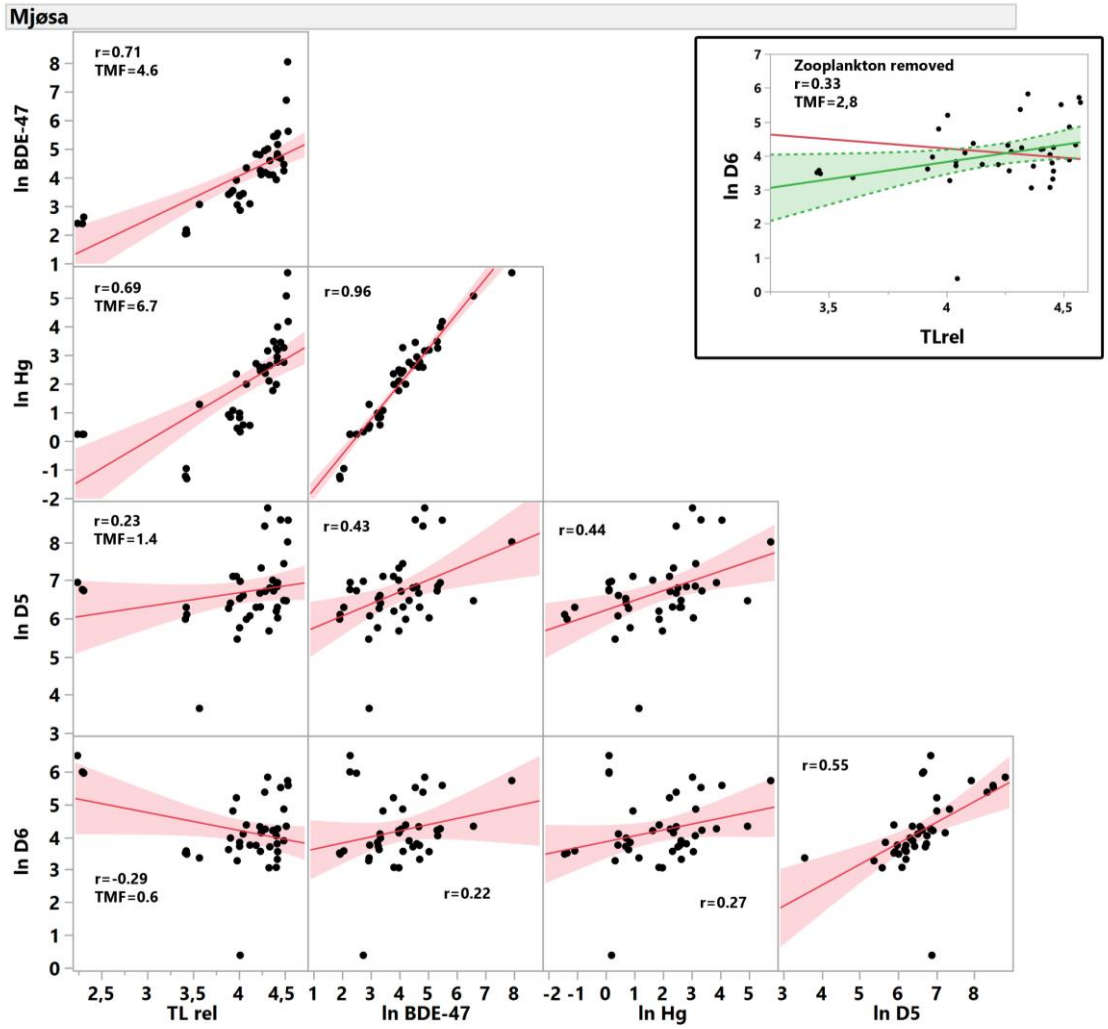

Figure 14. Scatter plots and regression lines between D5, D6, BDE-47, Hg, and relative trophic level (TL_{rel}) in fish (muscle), Mysis, and zooplankton from Lake Mjøsa, sampled in 2017. Concentrations are log_e(ln)-transformed on a lipid weight basis, ng/g lip. Conc. below LOQ are replaced by half the limit. r: correlation coefficient, TMF: trophic magnification factor.

5.7 Phosphorus flame retardants (PFR)

Levels of phosphorus flame retardants were determined in samples of vendace, smelt, and brown trout from Lake Mjøsa, and in brown trout from Lakes Femunden and Eikesdalsvatnet. In addition, water and sediment samples from Lake Mjøsa were analyzed.

For most compounds concentrations were below LOQ, see table 11. Some detections of PFRs were made in sediment and biota samples, discussed below.

Table 13
List of PFR compounds in the analytical program and the LOQ values in ng/g w.w.

PFR short	PFR name	LOQ range, biota	Detected
TEP	Triethyl phosphate	0.05 – 0.13	No
TCEP	Tris(2-chloroethyl)phosphate	0.1 – 0.2	No
TPrP	Tripropyl phosphate	0.01	No
TCPP	Tris(chloropropyl)phosphate	0.2 – 0.8	Yes
TiBP	Tri-isobutylphosphate	0.2 – 5.0	Yes
BdPhP		0.02 – 0.06	No
TPP	Triphenoxyphosphine oxide	0.01 – 0.14	Yes
DBPhP	Dibutylphenylphosphate	0.02 – 0.3	No
TnBP	Tri-n-butylphosphate	0.08 – 1.4	Yes
TCDPP	Tris(1,2-dichloro-2-propyl)-phosphate	0.2 – 0.4	No
TBEP	Tris-(butoxyethyl)-phosphate	0.3 - 0.7	Yes
TCP	Tricresylphosphate	0.02 - 0.2	Yes
EHDP	2-ethylhexyl-di-phenyl-phosphate	0.5 – 2.9	Yes
TXP	Trixylenyl phosphate	0.02 – 0.03	Yes
TIPPP	Triisopropylphosphate	0.02 – 0.03	No
TTBPP	Tris(tribromopentyl)-phosphate	0.02 – 0.03	No
TEHP	Tris(2-ethylhexyl)-phosphate	0.25 – 1.0	Yes

PFRs were detected in some single samples. Brown trout in Lake Mjøsa had very few detected concentrations of PFRs, but smelt and vendace had detectable concentrations of TCPP, TPP, and TCP, ranging up to 1.40, 5.61, and 0.09 ng/g w.w. respectively. TPP was the most abundant

PFR in the biota samples. Brown trout from Lake Femunden had detectable concentrations of TnBP and TBEP slightly above LOQ.

No PFRs were detected in water samples. In sediment samples TCPP (up to 8.8 ng/g d.w.), TiBP (1.7 ng/g d.w.), TPP (0.4 ng/g d.w.), TBEP (20 ng/g d.w.), TCP (1.8 ng/g d.w.), EHDP (1.2 ng/g d.w.), TXP (1.4 ng/g d.w.), and TEHP (1.8 ng/g d.w.) were detected.

In a study of White-tailed eagle nestlings PFRs were detected on feathers, but only a few detectable concentrations in plasma (Eulaers et al., 2014). Atmospheric deposition onto feathers were suggested to be the main explanation, in addition to possible low bioavailability and a relative high degree of biodegradation for these compounds (van der Veen and de Boer, 2012). Other studies have shown that PFRs may exist in higher concentrations than PBDEs in other media samples such as air, water, and sediment, also suggesting that PFRs are replacing other BFRs in various products (van der Veen and de Boer, 2012; Marklund et al., 2003.

5.8 Per- and polyfluorinated substances, PFAS

Levels of a total of 38 different PFASs were determined in samples of zooplankton, Mysis, vendace, smelt, and brown trout from Lake Mjøsa, and in brown trout from Lake Femunden and Eikesdalsvatnet. Liver was chosen as the main matrix for fish, succeeding the previous studies by Fjeld et al. (2016, 2017). PFASs have been shown to accumulate in blood and blood rich organs such as liver (Lau et al., 2007).

Detectable concentrations were found in over 50 % of the analytical results for 10 out of 38 compounds, listed in table 14. These were mostly long chained perfluorinated carboxylic acids (C8 – C15) in addition to PFOS (perfluorooctane sulfonate) and PFOSA (perfluorooctane sulfonamide). In addition to these compounds, PFBS and PFHpS were detected in samples of smelt. PFBS were in the range of 0.13 – 0.53 µg/kg w.w. and PFHpS in the range of 0.78-1.2 µg/kg w.w. In samples of zooplankton and Mysis, all samples were below LOD (0.1 – 0.5 ng/g w.w.). 2 out of 25 samples of brown trout muscle exceeded the QS_{biota} value for PFOS of 9.1 µg/kg w.w., and both individuals were caught in Lake Mjøsa.

Table 14 lists the main findings of PFASs in the different matrixes. Other compounds were found in concentrations below the LOQ of the given compound.

Table 14
Concentrations of PFASs with >50% total results above LOQ in samples of zooplankton and Mysis, in liver samples from vendace, smelt, and brown trout from Lake Mjøsa, and brown trout from Lake Femunden and Eikesdalsvatnet. Conc. given as mean (x) and standard deviation (SD) in ng/g w.w. in liver. Conc. below LOQ are substituted with half the limits.

Lake	Species	n	Stats.	PFOA	PFNA	PFDA	PFUnDA	PFDoDA	PFTrDA	PFTeDA	PFPeDA	PFOS	PFOSA
Mjøsa	Zooplankton	3	$\bar{x}$	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.1
			SD	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Mysis	3	$\bar{x}$	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.1
			SD	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Vendace	10	$\bar{x}$	0.3	0.3	0.3	0.7	0.6	1.0	0.2	0.2	1.1	0.1
			SD	0.0	0.2	0.0	0.2	0.3	0.2	0.0	0.0	1.0	0.0
	Smelt	10	$\bar{x}$	1.1	0.9	2.2	5.2	3.6	4.6	1.3	0.4	3.5	0.5
			SD	0.6	0.4	1.3	4.3	2.2	2.7	0.6	0.4	2.8	0.6
	Brown trout	15	$\bar{x}$	0.3	0.3	2.6	7.5	4.5	7.7	1.9	0.8	5.4	0.3
			SD	0.0	0.2	1.6	5.0	2.7	5.4	1.2	0.5	3.1	0.2
Femunden	Brown trout	10	$\bar{x}$	0.3	0.6	1.4	8.1	4.5	23.6	2.9	2.4	2.0	0.3
			SD	0.0	0.5	1.0	6.7	3.5	18.7	1.8	1.4	1.3	0.2
Eikesdalsvatnet	Brown trout	3	$\bar{x}$	0.3	0.3	0.7	1.7	1.4	2.0	0.9	-	1.6	0.1
			SD	0.0	0.0	0.0	0.3	0.1	0.4	0.1	-	0.1	0.0

Generally, the highest concentrations of PFAS were found in the higher trophic levels, meaning that concentrations in brown trout and smelt were significantly higher than in vendace, see Figure 15. The PFAS pattern in samples of fish liver in Lake Mjøsa is mainly dominated by PFTrDA (C13 perfluotridecanoic acid) with mean concentrations of 4.6 and 7.7 ng/g w.w. in smelt and brown trout respectively in Lake Mjøsa. PFOS-concentrations were 3.5 and 5.4 ng/g w.w. for smelt and brown trout in Lake Mjøsa, respectively. In Lake Femunden, PFTrDA also dominates the PFAS pattern, with a mean concentration of 23.6 ng/g w.w. in brown trout, significantly higher than in Lake Mjøsa, see Figure 16. Similar trends were found in 2016 for Lakes Mjøsa and Femunden (Fjeld et al., 2017). One suggested explanation for these differences in concentration between Lake Femunden and Mjøsa is that the brown trout in Lake Femunden feeds more on prey connected to a terrestrial food chain, such as insects on the water surface, compared to brown trout in Mjøsa which feeds mostly on fish from the pelagic food web, such as smelt.

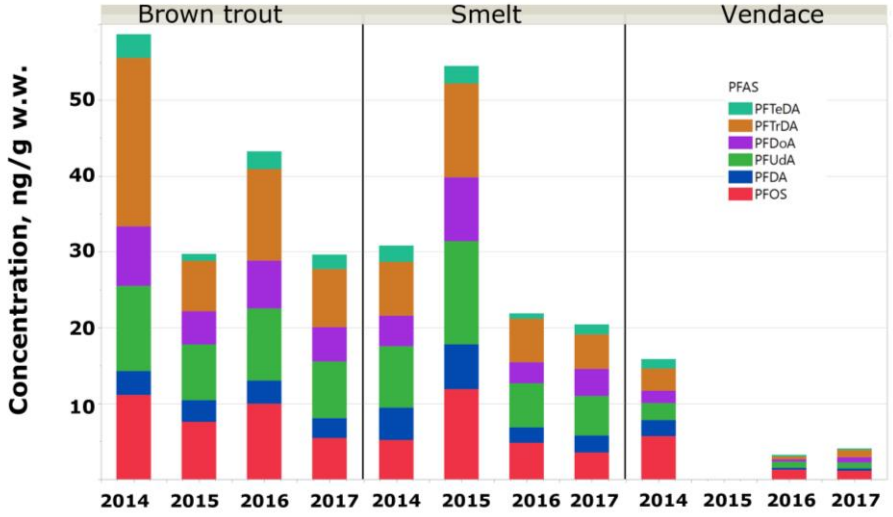

Figure 15. Mean concentrations (ng/g w.w.) of selected PFASs in samples of liver from brown trout, smelt, and vendace in Lake Mjøsa 2014-2018. Concentrations below LOQ have been replaced with half the value.

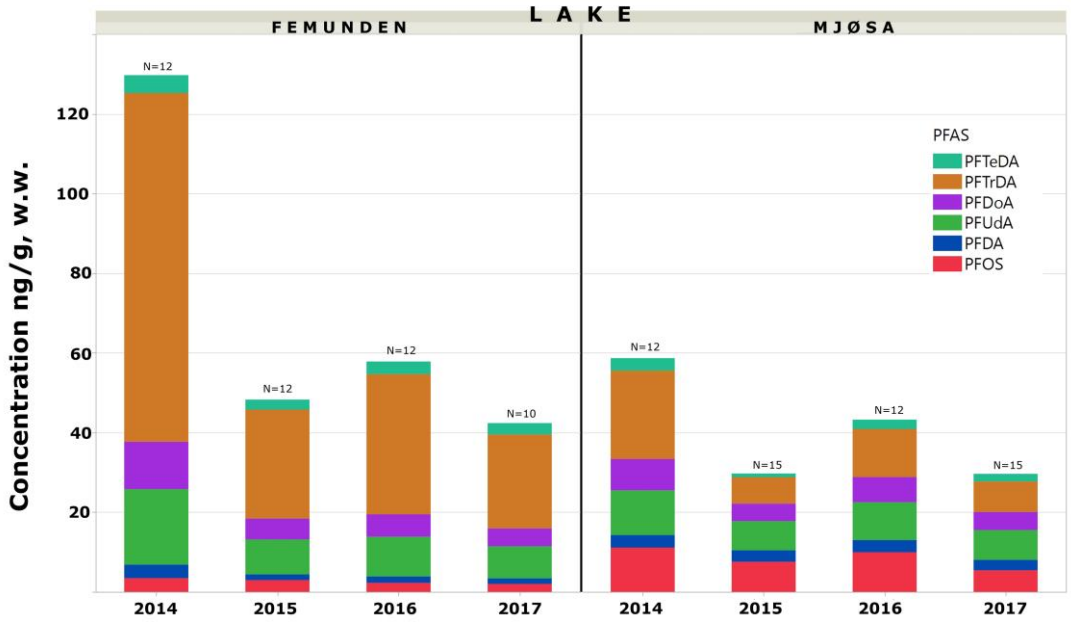

Figure 16. Mean concentrations (ng/g, w.w.) of selected PFASs in samples of liver from brown trout in Lakes Femunden and Mjøsa from 2014 – 2017. Concentrations below LOQ have been replaced with half the value.

PFAS concentrations in brown trout from Lake Eikesdalsvatnet are low compared to Lakes Mjøsa and Femunden, with detectable results for 6 out of 38 compounds. The pattern is dominated by PFTrDA, PFUnDA, and PFOS, similar to the other two lakes, with mean concentrations of 2.0, 1.7, and 1.6 ng/g w.w., respectively.

ΣPFAS(38) was calculated including all 38 compounds with half the detection limit for the results below LOQ. For smelt and brown trout in Lake Mjøsa the values range from 17 – 60 and 12 – 72 ng/g w.w., respectively, with mean values of 27 and 35 ng/g w.w. ΣPFAS(38) in smelt was dominated by two large individual samples probably indicating cannibalistic behavior. Mean ΣPFAS(38) from brown trout in Lakes Femunden and Eikesdalsvatnet was 49 and 13 ng/g w.w., respectively. Higher concentrations found in Lake Femunden is dominated by PFTrDA.

These concentrations found in Lakes Mjøsa, Femunden, and Eikesdalsvatnet are all very low compared to those found in samples of perch liver in Lake Tyrifjorden in 2017 (Slinde and Høisæter, 2017), were mean PFTrDA and PFOS concentrations were 104 and 807 ng/g w.w., respectively. PFAS in Lake Tyrifjorden have been studied before by Fjeld et al. (2015), and the recent studies by Slinde and Høisæter (2017) confirms the high concentrations of PFOS and other PFASs in samples of fish liver. Main sources of PFAS to the environment include the use of firefighting foam, especially from training facilities at airports, in addition to paper industry. Slinde and Høisæter (2017) points to old paper industry facilities as one of the main sources of PFAS to the Tyrifjorden catchment area. For Lakes Mjøsa, Femunden, and Eikesdalsvatnet, there are no known specific sources of PFAS, which is also reflected in the results here. Lake Mjøsa receives some sewage from waste water treatment plants in addition to urban stormwater runoff from 5 different small cities and main roads. Other than that, we have no indication of other direct sources other than possible closed down municipal firefighting areas. One must suspect that long-range transport may affect what we consider a reference baseline concentration, but all samples of water and sediment from Lake Mjøsa were below LOQ.

5.9 Alkylphenols and bisphenols

Alkylphenols and bisphenols were determined in all biota samples (zooplankton, Mysis and fish muscle), but only detected in a few individual samples. List of compounds is presented in table 15, indicating the few compounds with detections slightly above LOD.

Table 15
List of alkylphenols and bisphenols determined in samples of zooplankton, Mysis, and muscle from vendace, smelt, and brown trout from Lake Mjøsa and brown trout from Lakes Femunden and Eikesdalsvatnet (total N=54).

	Compounds below LOD in all samples (N=54)	Compounds with detections > LOD		
		Comp.	N above LOD	Species
Main analytical program	Bisphenol S, Bisphenol Z, 4-nonylphenol, 4-tert-octylphenol	Bisphenol A Bisphenol F Bisphenol P	(4/54 samples) (5/54 samples) (2/54 samples)	Smelt and brown trout
Extra analyses	Bisphenols: BP, B, AP, E, FL, and M. TMC, TBBPA, Dodecylphenol.			

For the analyses of alkylphenols and bisphenols, the LOD varies between the different species. The detected values are only slightly above LOD. As for bisphenol-A the LOD is 12 ng/g w.w. and 25 ng/g w.w. for smelt and brown trout in Lake Mjøsa, respectively, and the respective concentrations detected are 14-15 ng/g and 26-40 ng/g w.w. Bisphenol-F was detected in two samples of brown trout in Lake Mjøsa with concentrations of 45 and 61 ng/g w.w., and an LOD of 8 ng/g. In a previous screening study, bisphenols were frequently detected in perch (median concentration: 0.3 – 260 ng/g w.w.), whitefish (median range: 0.3 – 250 ng/g w.w.), and brown trout (0.2 – 60 ng/g w.w.). In that study the BPFs were dominating, and almost all measured bisphenols could be detected in freshwater biota samples (Thomas et al., 2014), somewhat contradicting the findings in Lakes Mjøsa and Femunden in 2017 where only 1 % of all biological samples had detectable concentrations of bisphenols and alkylphenols.

5.10UV-chemicals

Synthtetic ultraviolet light filtering (UV-filter) compounds are contaminants of emerging concern and have regulatory limitations for their concentrations in cosmetic products (EC, 2009). In the main analytical program for Lake Mjøsa and Femunden, three UV-filters have been determined by NIVA; octocrylene (OC, CAS: 6197-30-4), benzophenone-3 (BP-3, CAS: 131-57-7), and ethylhexylmethoxyciannamate (EHMC, CAS: 5466-77-3). In option 4 (extra analytical parameters) the benzotriazols UV-327, UV-328, and UV-329 were also determined, and will be discussed here.

Octocrylene and EHMC were not detected in any of the biota samples (muscle) in Lakes Mjøsa and Femunden, with LOQs ranging from 0.2 – 3 ng/g w.w. and 0.6 – 5 ng/g w.w., respectively. EHMC is a very lipophilic compound known to accumulate in the aquatic food chain (Christen et al., 2011). Benzophenone-3 (Bp-3) was detected in only one sample of smelt from Lake Mjøsa (1.7 ng/g w.w.) with LOQ ranging from 0.6 ng/g w.w. in vendace to 12 ng/g w.w. in samples of Mysis.

Of the three benzotriazole UV stabilizers (UV-327, -328, and -329) only UV-328 was detected in three zooplankton samples from Lake Mjøsa in a concentration range of 0.09-0.13 ng/g w.w. LOQs for the other species ranged from 0.15 – 5 ng/g.

UV-filters benzophenone-3 (BP3), ethylhexylmethoxycinnamate (EHMC), octocrylene (OC), and 2-(2Hbenzotriazol-2-yl)-4,6-bis(2-phenyl-2-propanyl)phenol (UV-234) have been studied in Norwegian environment by Thomas et al. (2014). These compounds were detected in treated wastewater and leachate. BP3, EHMC, OC, 2-(5-chloro-2H-benzotriazol-2-yl)- 4,6-bis(2-methyl-2-propanyl)phenol (UV- 327) and 2-(2H-benzotriazol-2-yl)-4-(2,4,4-trimethyl-2-pentanyl)phenol (UV-329) were detected in sludge. Organic UV-chemicals was also detected in sediments from the respective recipients, but only EHMC was found in Mjøsa sediments.

6. Analyses of abiotic samples – water and sediment

Water and lake sediments were sampled from 5 selected stations in Lake Mjøsa (see Figure 1). Stations were chosen in areas of little or no direct influence from known sources of contamination, representing to a large extent the reference baseline for Lake Mjøsa. The same analytical program was performed as for the biota samples in the main analytical program.

6.1 Sampling of water and sediments

Water samples were collected from depth 10-20 cm from the boat moving slightly forward directly into assigned bottles. Sediment samples were collected with a core sampler with a diameter of 5 cm. The corer was lowered slowly into the sediments using a wire on a winch, and slowly elevated to the surface. Upon sampling, the core was gently pushed out of the device and a slice of 0-2 cm was transferred to a glass jar. Each sediment sample consisted of 5 replicas of 0-2 cm.

6.2 Results

Results from the main analytical program include the determination of cVMS, brominated flame retardants (BFR), phosphorous flame retardants (PFR), PFAS, alkylphenols and bisphenols, and UV-chemicals. For cVMS, none of the compounds (D4, D5, D6) were detected in the water phase, but all were detected slightly above LOD in the sediment samples, shown in table 16. Over 95 % of the contaminants determined in sediments had concentrations below LOD, but there were some results, such as cVMS, PFOS, and BDE-100. None of the samples of water and sediment exceeded the EQS values listed in table 4.

Table 16
Concentrations of selected contaminants in samples of sediments from Lake Mjøsa (ng/g d.w.)

Location	D4	D5	D6	PFOS	BDE-100
Furnes-fjorden	< LOD (0.30)	1.8	1.7	0.3	< LOD (0.05)
Helgøya S	1.0	0.54	1.1	0.2	0.15
Ringsaker-fjorden	2.3	1.3	1.3	0.1	< LOD (0.05)
Tangenvika	0.3	0.2	0.7	< LOD (0.1)	-
Minnesund	0.2	< LOD (0.1)	0.5	< LOD (0.1)	-

7. Extra chemical analyses

Some of the extra chemical analyses have been included in the specific chapters for the main groups of contaminants, such as PFAS, BFRs, and Bisphenols and alkylphenols.

7.1 Dechloranes

Dechloranes are a group of highly chlorinated and lipophilic flame retardants. They are often superior to brominated flame retardants based on their thermal and photochemical stabilities (Feo et al., 2012). Table 15 lists the concentrations of different dechlorans in samples from Lakes Mjøsa, Femunden, and Eikesdalsvatnet.

Most abundant of the dechloranes are D 602 and Dechlorane plus *syn* and *anti*, which all stands out in rather high concentrations compared to the other compounds. Given the lipophilic properties of dechloranes, the concentrations in table 15 are given for both wet weight and lipid weight. Feo et al. (2012) reported levels of *syn*- and *anti*-dechlorane plus in fish and other animals in a review article. For smelt and trout in Canada, the concentrations were 7 and 100 pg/g lipid weight for *syn*-DP, respectively. Concentrations of *anti*-DP were 8 and 105 pg/g lipid weight. These are much lower than all the concentrations on lipid weight found in the same species in Lakes Mjøsa, Femunden, and Eikesdalsvatnet. We have no indication of possible sources for these compounds, but we will recommend further monitoring and a review of uncertainties for the analytical method.

There is no geographical distribution pattern for these compounds, as the concentrations in Lake Mjøsa are on the same level as Lake Eikesdalsvatnet.

Sediment sampling in Lake Mjøsa (Photo: David P. Eidsvoll)

Table 15

Mean concentrations of dechloranes in samples of biota (pg/g w.w.), water (pg/L), and sediments (pg/g d.w.) from Lakes Mjøsa, Femunden, and Eikesdalsvatnet.

Lake	Sample	D 601	D 602	D 602 pg/lipid	D 603	D 604	D plus syn	D plus syn pg/lipid	D plus anti	D plus anti pg/lipid
Mjøsa	Zoopl.	<10	0.3	200	<10	<20	28	14000	50	25000
	Mysis	<10	1.5	32	<10	<20	25	540	50	1100
	Vendace	<10	7.3	190	<5	<50	8.3	230	12	320
	Smelt	<10	4.2	350	<5	<50	6.8	660	9.6	940
	Brown trout	<10	20.7	1600	<5	<50	6.8	370	13	690
Femunden	Brown trout	<10	6.9	750	<5	<50	4.5	530	4.9	580
Eikesdals-vatnet	Brown trout	<10	6.6	770	<5	<50	17.8	1800	47	4800
Mjøsa	Water	<1000	<200		<500	<50000	800		2100	
	Sed	<50	<10		<25	<200	160		670	

7.2 Quaternary ammonium compounds

Alkyltrimethyl ammonium compounds (ATAC) was measured by NIVA. Behentrimonium is a mixture dominated by a homologue having 22 carbon atoms in its alkyl chain (ATAC-C22), and in this case, the results are presented as the sum of ATAC-C20 and -C22. ATACs in general, and behentrimonium specifically, are cationic surfactants used in a variety of applications such as personal hygiene products, detergents, and fabric softeners. Quaternary ammonium compounds are being considered emerging compounds.

Results from biological and abiotic samples in this study indicate low levels of behentrimonium, only one sample of vendace in Lake Mjøsa exhibit levels above LOD of 1 ng/g w.w. Concentration in this one sample was 4.1 ng/g w.w. In addition, there were some detections of ATAC-C22 in the samples of Mysis from Lake Mjøsa (4,0-5,3 ng/g w.w.), but we have no indication that this is anything other than analytical variation and uncertainties. No traces of these compounds were found in zooplankton or in any other trophic level caught on the same location. The samples of water and sediments were also below LOD for behentrimonium.

Lake Mjøsa, view from Oppistun Bjørke, Feiring. (Photo: Morten Jartun)

8. References

Andresen, J.A., 2006. Emission, fate and behaviour of phosphororganic flame retardants and plasticisers in the aquatic environment. Dr. thesis, Universität Duisburg-Essen, Campus Essen, Institut für Umweltanalytik und Angewandte Geochemie.

Bengtson Nash, S.M., Poulsen, A.H., Kawaguchi, S., Vetter, W. and Schlabach, M., 2008. Persistent organohalogen contaminant burdens in Antarctic krill (*Euphausia superba*) from the eastern Antarctic sector: A baseline study. Science of the Total Environment 407, 304-314.

Bohlin-Nizzetto, P., Aas, W. and Warner, N.A., 201. Monitoring of environmental contaminants in air and precipitation, annual report 2016. Norwegian Environment Agency, Report M757/2017. 104 pp.

Borgå, K., Kidd, K.A., Muir, D.C.G., Berglund, O., Conder, J.M., Gobas, F.A.P.C., Kucklick, J., Malm, O., and Powell, D.E., 2012a. Trophic magnification factors: Considerations of ecology, ecosystems, and study design. Integr. Environ. Assess. Manage., 8, 64–84.

Borgå, K., Fjeld, E., Kierkegaard, A., and McLachlan, M.S., 2012b. Food Web Accumulation of Cyclic Siloxanes in Lake Mjøsa, Norway. Environ Sci Technol 46, 6347–6354.

Borgå, K., Fjeld, E., Kierkegaard A., Løvik, J.E., Rognerud; S., Høgfeldt, A., Bæk, K., and McLachlan, M.S., 2013a. Siloxanes in freshwater food webs – a study of three lakes in Norway. Miljødirektoratet rapport M-81/2013. 36 pp.

Borgå, K., Fjeld, E., Kierkegaard, A., and McLachlan, M.S., 2013b. Consistency in trophic magnification factors of cyclic methyl siloxanes in pelagic freshwater food webs leading to brown trout. Environ Sci Technol 47(24), 14394–14402.

Chen, D., Kannan, K., Tan, H., Zheng, Z, Feng, Y.L., Wu, Y., and Widelka, M., 2016. Bisphenol analogues other than BPA: environmental occurrence, human exposure, and toxicity – a review. Environ. Sci. Technol., 50, 5438-5453.

Christen, V., Zucchi, S., and Fent, K., 2011. Effects of the UV-filter 2-ethyl-hexyl-4-trimethoxycinnamate (EHMC) on expression of genes involved in hormonal pathways in fathead minnows (*Pimephales promelas*) and link to vitellogenin induction and histology. Aquatic Toxicology 102 (3-4), 167-176.

Direktoratsgruppen vanndirektivet, 2018. Veileder 02:2018. Klassifisering av miljøtilstand i vann.

EC, 2009. Regulation (EC) No 1223/2009 of the European Parliament and of the Council of 30.nov 2009 on Cosmetic Products.

ECHA, 2015. Annex XV restriction report, Proposal for a restriction. https://echa.europa.eu/documents/10162/9a53a4d9-a641-4b7b-ad58-8fec6cf26229. [Accessed May 2018].

Eulaers, I., Jaspers, V.L.B., Halley, D.J., Lepoint, G., Nygård, T., Pinxten, R., Covaci, A. and Eens, M., 2014. Brominated and phosphorus flame retardants in Whit-tailed Eagle *Haliaeetus albicilla* nestlings: Bioaccumulation and associations with dietary proxies (d13C, d15N and d34S). Science of the Total Environment 478, 48-57.

Evenset, A., Leknes, H., Christensen, G.N., Warner, N., Remberger, M. and Gabrielsen, G.W., 2009. Screening of New Contaminants in Samples from Norwegian Arctic. NIVA Report 4351-1, SPFO-Report 1049/2009. TA-2510/2009. ISBN:978-82- 449-0065-2.

Evenset, A., Olsson, A., Harju, M. and Gabrielsen, G.W., 2018. Settlements on Svalbard as sources for emerging contaminants. Akvaplan-niva report no. 7874-1, 48 p.

Feo, M.L., Barón, E., Eljarrat, E. and Barceló, D., 2012. Dechlorane plus and related compounds in aquatic and terrestrial biota: a review. Analytical Bioanalytical Chemistry 404, 2625-2637.

Fjeld, E., Knutzen, J., Brevik, E.M., Schlabach, M., Skotvold, T., Borgen, A.R. and Wiborg, M.L., 2001. Halogenerte organiske miljøgifter og kvikksølv i norsk ferskvannsfisk 1995-1999. SFT rapport TA-1813/2001. 48 pp.

Fjeld, E., Bæk, K., Rognerud, S., Rundberget, J.T., Schalbach, M. and Warner, N.A., 2014. Miljøgifter i store norske innsjøer, 2013. Miljødirektoratet M-157/2014, 46 pp.

Fjeld, E., Bæk, K., Rognerud, S., Rundberget, J.T., Schalbach, M. and Warner, N.A., 2015. Miljøgifter i store norske innsjøer, 2014. Miljødirektoratet M-349/2015, 101 pp.

Fjeld, E., Bæk, K., Rognerud, S., Rundberget, J.T., Schalbach, M. and Warner, N.A., 2016. Miljøgifter I store norske innsjøer, 2015. Miljødirektoratet M-548/2016, 97 pp.

Fjeld, E., Bæk, K., Rundberget, J.T., Schlabach, M. and Warner, N.A., 2017. Miljøgifter i store norske innsjøer, 2016. Miljødirektoratet M-807/2017, 88 pp.

France, R.L., 1995. Differentiaton between littoral and pelagic food webs in lakes using stable carbon isotopes. Limnology and oceanography, 40 (7), 1310-1313.

France and Peters, 1997. Ecosystem differences in the trophic enrichment of C-13 in aquatic food webs. Can. J. Fish. Aquat. Sci., 54, 1255-1258.

Goksøyr, A. and Forlin, L., 1992. The cytochrome P-450 system in fish, aquatic tocicology and environmental monitoring. Aquatic Toxicology 22, 287-312.

Huse, A. og Aas-Aune, S. 2009. Kartlegging av siloksaner. Kartlegging av bruk i Norge i 2008. COWI. Klif. Rapport TA-2557/2009. 46 s.

Kierkegaard, A., Bignert, A. and McLachlan, M.S., 2013. Bioaccumulation of decamethylcyclopentasiloxane in perch in Swedish lakes. Chemosphere, 93: 789–793.

Krogseth, I.S., Undeman, E., Evenset, A., Christensen, G.N., Whelan, M.J., Breivik, K. and Warner, N.A., 2017. Elucidating the Behavior of Cyclic Volatile Methylsiloxanes in a Subarctic Freshwater Food Web: A Modeled and Measured Approach. Environmental Science & Technology 51 (21), 12489-12497.

Langford, K., Reid, M.J., Fjeld, E., Øxnevad, S. and Thomas, K.V., 2015. Environmental occurrence and risk of organic UV filters and stabilizers in multiple matrices in Norway. Environment International 80, 1-7.

Lau, C., Anitole, K., Hodes, C., Lai, D., Pfahles-Hutchens, A. and Seed, J., 2007. Perfluoroalkyl acids: a review of monitoring and toxicological findings. Toxicol. Sci. 99, 366-394.

Lovdata, 2017. Minamata convention on mercury. Id: 10-10-2013 nr 18 Multilateral. Effective as of August 2017. https://lovdata.no/dokument/TRAKTATEN/traktat/2013-10-10-18, [Accessed May 2018].

Marklund, A., Andersson, B. and Haglund, P., 2003. Screening of organophosphorus compounds and their distribution in various indoor environments. Chemosphere 53, 1137-1146.

McGoldrick, J., Chan, C., and Drouillard, K.G., Keir, M.J, Clark, M.G. and Backus, S.M., 2014. Concentrations and trophic magnification of cyclic siloxanes in aquatic biota from the Western Basin of Lake Erie, Canada. Environmental pollution 186, 41–148.

Miljødirektoratet, 2016. Grenseverdier for klassifisering av vann, sediment og biota – Environmental quality standards for water, sediment and biota. Report M-608/2016, 24 pp.

Miljøprøvebanken, 2015. Procedure 001: Collection and sampling of freshwater fish, ver.1.1. Can be downloaded from: https://mpbank.files.wordpress.com/2018/04/mpb-eng-procedure-1-freshwater-fish.pdf

Minagawa, M. and Wada, E., 1984. Stepwise enrichment of 15N along food chains: Further evidence and the relation between d15N and animal age. Geochim. Cosmochim. Acta 48: 1135– 1140.

Norsk Standard, 2012. Water quality - Determination of mercury - Method using atomic absorption spectrometry (AAS) with and without enrichment (ISO 12846:2012), 24 p.

Peterson, B.J. and Fry, B., 1987. Stable isotopes in ecosystem studies. Attn. Rev. Ecol. Syst. 18, 293-320.

Post, D.M., 2002. Using stable isotopes to estimate trophic position: models, methods, and assumptions. Ecology 83, 703-718.

Regnery, J., Püttmann, W., Merz, C. and Berthold, G., 2011. Occurrence and distribution of organophosphous flame retardants and plastizers in anthropogenically affected groundwater. J. Environ. Monit. 13, 347-354.

Ruus, A., Bæk, K., Petersen, K., Allan, I., Beylich, B., Schlabach, M., Warner, N. and Helberg, M., 2016. Environmental contaminants in an Urban Fjord. M-601, 84 p.

Salgueiro-González, N., Turnes-Carou, I., Besada, V., Muniategui-Lorenzo, S., López-Mahía, P. and Prada-Rodríguez, D., 2015. Occurrence, distribution and bioaccumulation of endocrine disrupting compounds in water, sediment and biota samples from a European river basin. Science of the Total Environment 529, 121-130.

Sandlund, O.D., Nashoug, O., Norheim, G., Høye, R. and Kjellberg, G., 1981. Kvikksølv i fisk og evertebrater i Mjøsa og noen sjøer i Mjøsområdet, 1979-80. DVF- Mjøsundersøkelsen. Rapport nr. 4. 54 pp. + appendices.

Slinde, G.A. and Høisæter, Å., 2017. Kildesporing av PFAS til Tyrifjorden. Miljødirektoratet M-863, 270 pp.

Stockholm Convention, 2013. The new POPs under the Stockholm Convention. Châtelaine. http://chm.pops.int/TheConvention/ThePOPs/TheNewPOPs/tabid/2511/Default.aspx [Accessed May 2018].

Sundt, R.C. and Bjorkblom, C., 2011. Effects of Produced Water on Reproductive Parameters in Prespawning Atlantic Cod (Gadus morhua). Journal of Toxicology and Environmental Health-Part a-Current Issues 74, 543-554.

Thomas, K.V., Schlabach, M., Langford, K., Fjeld, E., Øxnevad, S., Rundberget, T., Bæk, K., Rostkowski, P., and Harju, M., 2014. Screening programme 2013: New bisphenols, organic peroxides, fluorinated siloxanes, organic UV-filters and selected PBT substances. Miljødirektoratet M-176/2014, 101 pp.

Underdal, B. 1970. Undersøkelse av kvikksølvinnholdet i fisk fra Mjøsområdet. «Survey of Hg-content in fish from the Mjøsa area." Norges veterinærhøgskole, Institutt for næringsmiddelhygiene. Rapport. 18 pp.

Van der Veen, I. and de Boer, J., 2012. Phosphorus flame retardants: properties, production, environmental occurrence, toxicity and analysis. Chemosphere 88 (10), 1119-1153.

Vander Zanden, M.J., Cabana, G. and Rasmussen, J.B., 1997. Comparing the trophic position of littoral fish estimated using stable nitrogen isotopes (d15N) and dietary data. Can. J. Fish. Aquat. Sci., 54, 1142-1158.

Vander Zanden, M.J. and Rasmussen, J.B., 1999. Primary consumer d13C and d15N and the trophic position of aquatic consumers. Ecology 80(4), 1395-1404.

Vander Zanden, M.J. and Rasmussen, J.B., 2001. Variation in d15N and d13C trophic fractionation: implication for aquatic food web studies. Limnology and Oceanography 46, 2061–2066.

Verreault, J., Berger, U. and Gabrielsen, G.W., 2007. Trends of Perfluorinated Alkyl Substances in Herring Gull Eggs from Two Coastal Colonies in Northern Norway: 1983-2003. Environmental Science and Technology 41, 6671-6677.

Vidal-Linan, L., Villaverde-de-Saa, E., Rodil, R., Quintana, J.B. and Beiras, R., 2018. Bioaccumulation of UV filters in *Mytilus galloprovincialis* mussel. Chemosphere 190, 267-271.

Warner, N.A., Kozerski, G., Durham, J., Koerner, M., Gerhards, R., Campbell, R. and McNett, D.A., 2013. Positive vs. false detection: A comparison of analytical methods and performance for analysis of cyclic volatile methylsiloxanes (cVMS) in environmental samples from remote regions. Chemosphere 93, 749-756.

Warner, N.A., Nøst, T.H., Andrade, H. and Christensen, G., 2014. Allometric relationships to liver tissue concentrations of cyclic volatile methyl siloxanes in Atlantic cod. Environmental Pollution 190, 109-114.

Wei, G-L., Li, D-Q., Zhuo, M-N., Liao, Y-S., Xie, Z-Y., Guo, T-L., Li, J-J., Zhang, S-Y. and Liang, Z-Q., 2015. Organophosphorus flame retardants and plasticizers: sources, occurrence, toxicity and human exposure. Environmental Pollution, 196, 29-46.

Whelan, M.J., van Egmond, R., Gore, D. and Sanders, D., 2010. Dynamic multi-phase partitioning of decamethylcyclopentasiloxane (D5) in river water. Water Res. 44, 3679–3686.

Xu, S. and Wania, F., 2013. Chemical fate, latitudinal distriubution and long-range transport of cyclic volatiole methylsiloxanes in the global environment: a modeling assessment. Chemosphere 93, 835-843.

Xu, S., Kozerski, G. and Mackay, D., 2014. Critical review and interpretation of environmental data for volatile methylsiloxanes: partition properties. Environ. Sci. Technol., 48, 11748–11759.

Zanden, M.J.V. and Rasmussen, J.B., 2001. Variation in δ15N and δ13C trophic fractionation: Impliacations for aquatic food web studies. Limnology and oceanography, 46 (8), 2061-2066.

9. Part II - EU priority contaminants in Norwegian freshwater fish

[1]Jan Ludvig Lyche, [1]Vidar Berg, [2]Ole Jakob Nøstbakken,

[1]Department of Food Safety and Infection Biology, Faculty of Veterinary Medicine, Norwegian University of Life Sciences
[2]NIFES (Nasjonalt Institutt For Ernæring og Sjømatforsking), Havforskningsinstituttet, Bergen.

Summary

The levels of PBDEs, mercury and octylphenol exceed the Environmental Quality Standards (EQS) limits in the EU Water Framework Directive's (WFD) in all 13 lakes included in this monitoring program, and PCBs exceeded EQS in 12 of the 13 lakes. The EQS for PFOS was exceeded in one lake (Lake Øyeren) and the EQS for dioxin was exceeded in one lake (Lake Femsjøen). The EQSs are set lower than the European limit values (Minimum Residual Limit Levels (MRLs)) for foodstuffs and animal feed, to protect the entire ecosystem (ensuring protection for the most sensitive species). The results from the present survey, suggest that background levels of PBDEs, mercury and octylphenol in Norwegian lakes do not meet the environmental requirements in Europe. However, these results are comparable with results from different European countries, which may indicate an environmental problem for these contaminants across Europe.

Sammendrag

Nivåene av PBDE, kvikksølv og oktylfenol overstiger vannforskriftens miljøkvalitetsstandarder (EQS) i alle 13 innsjøer som inngår i dette overvåkingsprogrammet, og PCB overskrider EQS i 12 av de 13 innsjøene. EQS for PFOS ble overskredet i en innsjø (Øyeren) og EQS for dioksin ble overskredet i en innsjø (Femsjøen). EQSene er satt lavere enn de europeiske grenseverdiene (MRL) for matvarer og fôr, for å beskytte hele økosystemet (sikre beskyttelse for de mest følsomme artene). Resultatene fra den nåværende undersøkelsen antyder at bakgrunnsnivåene av PBDE, kvikksølv og oktylfenol i norske innsjøer ikke oppfyller miljøkravene i Europa. Imidlertid er disse resultatene sammenlignbare med resultater fra forskjellige europeiske land, noe som kan tyde på et miljøproblem for disse miljøgiftene i hele Europa.

9.1 Results and discussion

The map shows the localization of the lakes from which fish livers were analyzed for priority environmental contaminants.

9.1.1 Fish species, tissue, weight, length and fat percentage and stabile isotopes

The fish species and the tissues analyzed are shown in table 1. Mean weight, length, and fat percentage of the analyzed tissue are also given in Table 1. The species analyzed were trout from eight lakes, perch from two lakes, a mix of trout and char from one lake, a mix of white bream, burbot and pike from one lake and a mix of perch, pike and pike-perch (Zander) from one lake. The mean fish weight differed between lakes from a mean weight of 155 g in Lake Vangsvatnet to a mean weight of 1070 g in Lake Mingevannet.

Table 1. Overview over tissues and species analyzed and mean weight (g), length (cm) and fat percentage for the fish in each lake.

Lake	Species	Tissue	Mean Weight	Length (cm)	Fat %
Byglandsfjorden	Trout	Liver	246	27	3,0
Eikesdalsvatnet	Trout	Liver	413	34	3,5
Femsjøen	White bream, burbot, pike	Liver	919	46	12,
Hornindalsvatnet	Trout	Liver	267	31	3,7
Lundevatnet	Trout	Liver	210	24	5,0
Mingevannet	Perch, pike and pike-perch	Liver	1070	48	4,3
Selsvatnet	Trout	Liver	161	23	5,1
Smalfjordvannet	Trout	Liver/whole	373	29	2,1
Storvannet	Trout/Arctic char	Liver	329	32	3,8
Surtningen Vågå	Trout	Liver	279	30	3,5
Vangsvatnet	Trout	Liver	155	25	2,9
Ø Drengsrudvann	Perch	Liver	1027	40	3,6
Øyeren	Perch	Liver	312	28	3,8

The levels of stable isotopes (mean, min and max) are given in Table 2.

Table 2. Mean, min and max values of stable isotopes in fish liver.

Lake	Weight	d13CVPDB			d15NAIR		
	g	Mean	Min	Max	Mean	Min	Max
Byglandsfjorden	246	-24,89	-25,26	-24,56	8,68	7,25	11,51
Eikesdalsvatnet	413	-19,57	-22,79	-15,26	9,01	8,50	9,81
Femsjøen	919	-26,88	-27,18	-26,29	14,65	12,99	16,48
Hornindalsvatnet	267	-25,00	-25,40	-24,59	9,74	9,45	10,32
Lundevatnet	210	-26,21	-26,41	-26,10	8,26	7,84	8,67
Mingevannet	1070	-24,30	-24,98	-23,16	15,02	14,58	15,38
Selsvatnet	161	-25,57	-26,03	-25,13	9,96	9,78	10,10
Smalfjordvannet	373	-22,88	-23,64	-22,44	9,68	8,56	10,82
Storvannet (Gamvik)	329	-20,13	-20,87	-19,00	8,57	6,85	9,46
Surtningen Vågå	279	-29,25	-29,94	-28,58	11,05	10,79	11,42
Vangsvatnet	155	-27,61	-29,97	-26,25	9,06	8,12	9,59
Ø Drengsrudvann	1027	-32,91	-33,85	-32,07	9,53	9,26	9,96
Øyeren	312	-25,21	-25,82	-24,58	14,51	14,16	14,90

9.1.2 Organochlorine pesticides (OCP)

The wet weight (ng/g ww) concentrations of Hexachlorobenzene (HCB), Pentachlorobenzene (PeCB), Hexachlorocyclohexane (HCH), ∑Dichlorodiphenyltrichloroethane (DDT) and ∑Endosulfan in fish from the different lakes are shown in table 3 and the lipid weight (lw) concentrations of the respective chemicals are shown in table 4. The lipid weight (lW) concentrations are also shown in figure 1. The lipid weight concentrations of fat-soluble compounds were used to compare the total concentrations of OCP and other POPs between individuals and populations. The OCPs, which occurred at the highest concentrations (lw) in fish liver were ∑DDT and HCB. The highest levels of ∑DDT were found in fish liver from Lake Femsjøen (836 ng/g) followed by Lake Mingevannet (386 ng/g), Lake Øyeren (268 ng/g) and Lake Byglandsfjorden (197 ng/g). The lowest concentrations were found in Lake Selsvatnet (2 ng/g). Lake Surtningen Vågå (8 ng/g) and Lake Smalfjordvannet (10 ng/g). The relative high wet weight concentration of ∑DDT detected in Lake Femsjøen compared with the other lakes may partly be explained by the higher fat content in the liver of the fish from Lake Femsjøen. The concentration (lw) of HCB were highest in fish liver from Lake Femsjøen (17 ng/g) followed by Lake Eikesdalsvatnet (16 ng/g) and Lake Storevatn (13 ng/g). The lowest concentrations of HCB were detected in Lake Selsvatnet (2 ng/g) followed by Lake Lundevatnet (4 ng/g) and Lake Surtningen Vågå (5 ng/g). Interestingly, the three lakes with nitrogen isotope measurements suggesting the highest tropic position of the sampled fish were Lake Femsjøen, Lake Mingevannet and Lake Øyeren. These lakes all had high levels of DDTs.

EU has established European Quality Standards (WFD) for prioritized environmental contaminants and the EQSs are given in wet weight values. The EQSs are established to prevent the negative effects in the aquatic ecosystem (ensuring protection for the most sensitive species). The EU EQSs for OCPs were not exceeded in fish liver from any of the lakes.

Table 3: Mean wet weight (ng/g ww) concentrations of HCB, PeCB, Sum HCH (ZHCH), Sum DDT (∑DDT) and Sum Endosulfan (∑Endosulfan).

Lake	HCB ww	PeCB ww	∑HCH ww	∑DDT ww	∑Endosulfan ww
Byglandsfjorden	0,26	0,02	0,01	6,02	0,01
Eikesdalsvatnet	0,58	0,03	0,03	4,09	0,39
Femsjøen	3,40	0,16	0,27	150,88	1,73
Hornindalsvatnet	0,25	0,01	0,09	1,56	0,08
Lundevatnet	0,20	0,01	0,02	0,70	0,03
Mingevannet	0,43	0,03	0,05	17,43	0,08
Selsvatnet	0,12	0,02	0,00	0,11	0,00
Smalfjordvannet	0,18	0,01	0,02	0,23	0,02
Storvannet (Gamvik)	0,48	0,02	0,01	0,40	0,01
Surtningen Vågå	0,18	0,01	0,01	0,28	0,00
Vangsvatnet	0,32	0,01	0,00	1,45	0,09
Ø Drengsrudvann	0,22	0,02	0,02	3,33	0,04
Øyeren	0,33	0,02	0,04	9,80	0,28

Table 4: Mean lipid weight (ng/g lw) concentrations of HCB, PeCB, Sum HCH (ZHCH), Sum DDT (∑DDT) and Sum Endosulfan (∑Endosulfan).

Lake	HCB lw	PeCB lw	∑HCH lw	∑DDT lw	∑Endosulfan lw
Byglandsfjorden	8,84	0,52	0,48	197,34	0,49
Eikesdalsvatnet	15,76	0,84	0,86	100,63	9,60
Femsjøen	17,02	0,90	1,60	836,18	6,12
Hornindalsvatnet	6,63	0,36	2,54	39,20	2,22
Lundevatnet	4,11	0,24	0,43	14,00	0,61
Mingevannet	9,94	0,58	1,11	386,71	1,44
Selsvatnet	2,21	0,32	0,07	2,03	0,00
Smalfjordvannet	8,30	0,28	1,02	9,61	0,79
Storvannet (Gamvik)	12,87	0,59	0,37	10,64	0,43
Surtningen Vågå	5,20	0,35	0,31	8,15	0,00
Vangsvatnet	10,82	0,41	0,00	48,84	2,71
Ø Drengsrudvann	6,32	0,55	0,70	93,80	1,04
Øyeren	8,70	0,50	1,02	268,06	7,41

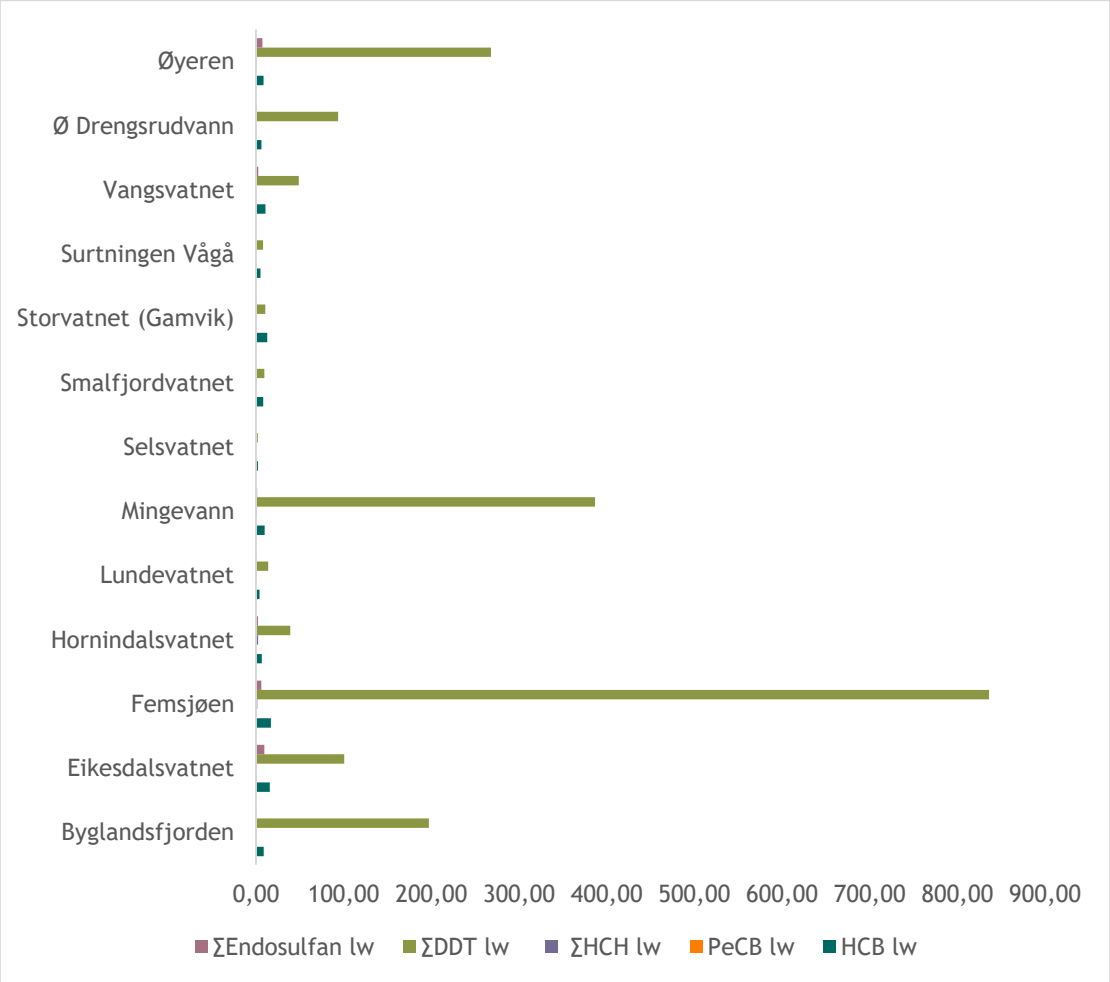

Figure 1: Mean lipid weight (ng/g lw) concentrations of HCB, PeCB, HCH, DDT and Endosulfan

9.1.3 PCBs and Brominated Flame Retardants (PBDEs and HBCDD)

The mean wet weight (ww) concentrations of Polychlorinated Biphenyls (PCBs), Polybrominated diphenyl ethers (PBDEs) and Hexabromocyclododecane (HBCD or HBCDD) in fish from the different lakes are given in table 5 and the lipid weight (lw) concentrations of the respective chemicals are given in table 6. The lipid weight concentrations are also shown in figure 2. The lipid weight concentrations of fat-soluble compounds are used to compare the levels of fat-soluble PCB and Brominated Flame Retardants between tissues, individuals and populations. The concentrations of PCBs, PBDEs and HBCDD were highest in the same lakes as DDT, which include Lake Femsjøen followed by Lake Mingevannet Lake Øyeren and Lake Byglandsfjorden. The lowest concentrations were found in Lake Selsvatnet, Lake Surtingne Vågå (8 ng/g) and Lake Smalfjordvannet (10 ng/g), which is the same lakes with the lowest concentrations of DDT. Because the concentration of POPs are increasing with age and the highest concentrations are typically detected in the biggest fish it can be speculated whether the higher concentration in Lake Femsjøen and Lake Mingevannet compared to the other lakes are related to fish weight. However, the fish weight Lake Øyeren (421 g) and Lake Byglandsfjorden (262 g) are comparable with or lower than lakes with lower contaminant concentrations, suggesting that these lakes may have been contaminated from other sources than long distance transport. Some of the variation in levels between lakes may be a result of differences in fish species sampled. One example is that the fish from Lake Byglandsfjorden are trout, and the fish from Lake Øyeren are perch. In Lake Femsjøen, burbot contributed to high levels of PCBs, PBDEs and HBCDD, and this species was not sampled in any other lake.

The concentrations of PBDEs exceeded the EQS in fish from all the lakes and the concentrations of PCBs exceeded the EQS in fish from 12 out of 13 lakes. Fish in Lake Selsvatnet had PCBs levels below the EQS and the nearby Lake Surtingen Vågå had PCBs levels close to the EQS. The same lakes that had high levels of DDTs in fish, also had the highest levels of PCBs, PBDEs and HBCDD.

Table 5: Mean wet weight (ng/g ww) concentrations of the sum of 7 PCBs (ΣPCB), thirteen PBDEs (ΣPBDE) and HBCDD

Lake	ΣPCB7 ww	ΣPBDEs ww	HBCDD ww
Byglandsfjorden	4,12	0,50	0,11
Eikesdalsvatnet	14,15	0,88	0,12
Femsjøen	195,76	18,95	11,89
Hornindalsvatnet	1,41	0,43	0,18
Lundevatnet	20,12	0,50	0,10
Mingevannet	41,03	6,63	0,53
Selsvatnet	0,43	0,07	0,12
Smalfjordvannet	1,19	0,16	0,12
Storvannet (Gamvik)	3,07	1,20	0,00
Surtningen Vågå	0,62	0,06	0,02
Vangsvatnet	2,37	0,56	0,12
Ø Drengsrudvann	7,42	0,92	0,13
Øyeren	22,34	4,45	1,21

Table 6: Mean lipid weight (ng/g lw) concentrations of the sum of 7 PCBs, thirteen PBDEs and HBCDD

Lake	∑PCB7 lw	∑PBDEs lw	HBCDD lw
Byglandsfjorden	141,97	17,01	3,89
Eikesdalsvatnet	346,48	22,12	2,92
Femsjøen	1177,47	147,81	49,78
Hornindalsvatnet	35,32	10,90	4,79
Lundevatnet	388,42	10,07	2,06
Mingevannet	897,71	145,77	11,68
Selsvatnet	8,28	1,37	2,42
Smalfjordvannet	49,11	6,82	5,96
Storvannett (Gamvik)	80,42	33,38	0,00
Surtningen Vågå	17,70	1,68	0,76
Vangsvatnet	81,37	18,47	4,40
Ø Drengsrudvann	209,79	25,84	3,72
Øyeren	615,91	122,78	33,89

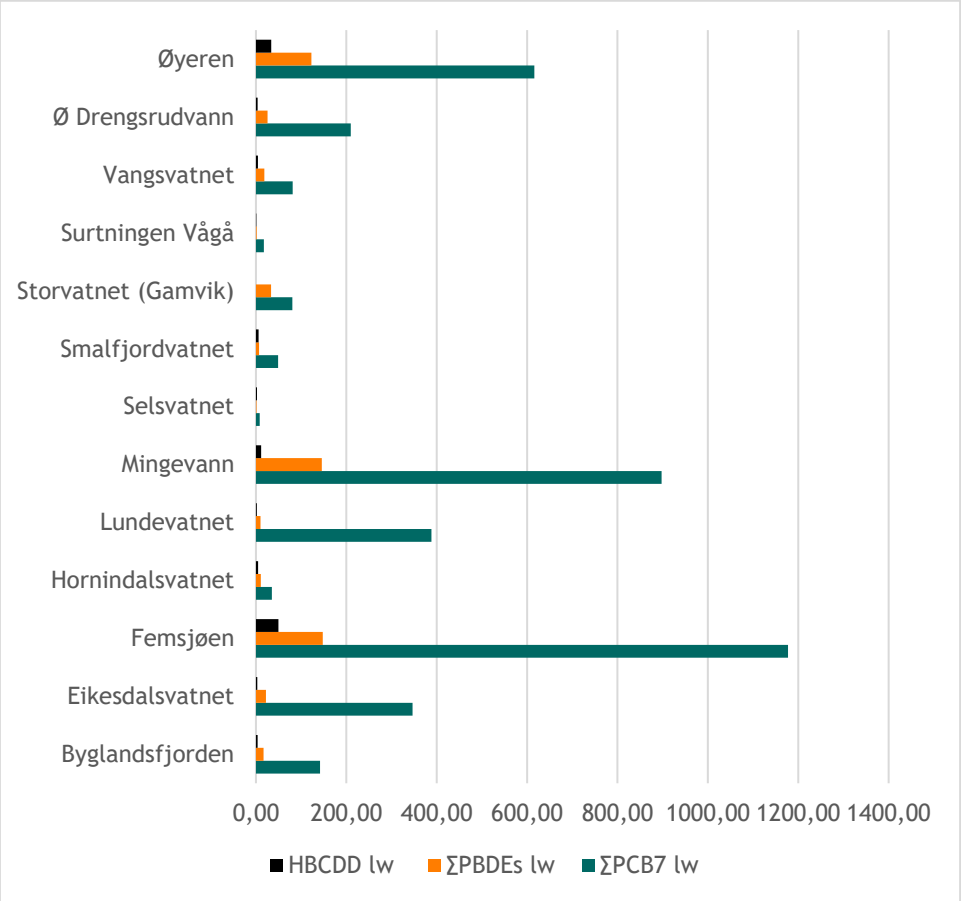

Figure 2: Mean lipid weight (ng/g lw) concentrations of the sum of 7 PCBs, thirteen PBDEs and HBCDD

9.1.4 Dioxins

The mean toxic equivalency (TEQ) values in pg/g wet weight (pg/g TEQ ww) dioxin-like PCBs (dl-PCBs), the sum of Polychlorinated dibenzodioxins (PCDDs) and Polychlorinated dibenzofurans (PCDFs) and the sum of PCDDs and PCDFs and dl-PCBs are given in table 7 and figure 3. The mean TEQ in lipid weight are given in table 8 and figure 4. Toxic equivalency factor (TEF) expresses the individual toxicity of each dioxin, dibenzofurans and dl-PCB, which may vary by orders of magnitude. The toxic equivalency (TEQ) is a single figure resulting from the product of the concentration and individual TEF values of each dioxin, dibenzofurans and dl-PCB and express the additive toxicity of a mixture of dioxins and dioxin-like compounds (van den Berg et al. 2006). The highest additive dioxin toxicity was detected in fish from Lake Femsjøen followed by Lake Mingevannet, Lake Storvannet (Gamvik) and Lake Eikesdalsvatnet. Fish from Lake Femsjøen had approximately 15 times higher additive toxicity (16.81 pg/g TEQ ww) in wet weight compared to the next highest (Lake Mingevannet; 1.26 pg/g TEQ ww), which may be explained by the 4 times higher mean fat content in the liver of fish from Lake Femsjøen. Burbot contributes most to the high toxicity of Lake Femsjøen, and this species was not sampled in any other lake

The EQS value for dioxin was only exceeded in Lake Femsjøen, whereas all the other lakes had values below the dioxin EQS for biota.

Table 7: Mean wet weight TEQ (pg/g TEQ ww) values of ∑dl-PCB, ∑PCDD+PCDF and ∑PCDD+PCDF+dl-PCB in fish from each lake.

Lake	∑dl-PCB (pg/g TEQ ww)	∑PCDD+PCDF (pg/g TEQ ww)	∑PCDD+PCDF+dl-PCB (pg/g TEQ ww)
Byglandsfjorden	0,20	0,11	0,31
Eikesdalsvatnet	0,63	0,01	0,63
Femsjøen	11,27	5,54	16,81
Hornindalsvatnet	0,28	0,30	0,58
Lundevatnet	0,42	0,19	0,61
Mingevannet	1,01	0,25	1,26
Selsvatnet	0,15	0,01	0,15
Smalfjordvannet	0,42	0,18	0,59
Storvannet (Gamvik)	0,51	0,49	1,01
Surtningen Vågå	0,08	0,08	0,16
Vangsvatnet	0,09	0,02	0,11
Ø Drengsrudvann	0,45	0,02	0,48
Øyeren	0,59	0,02	0,61

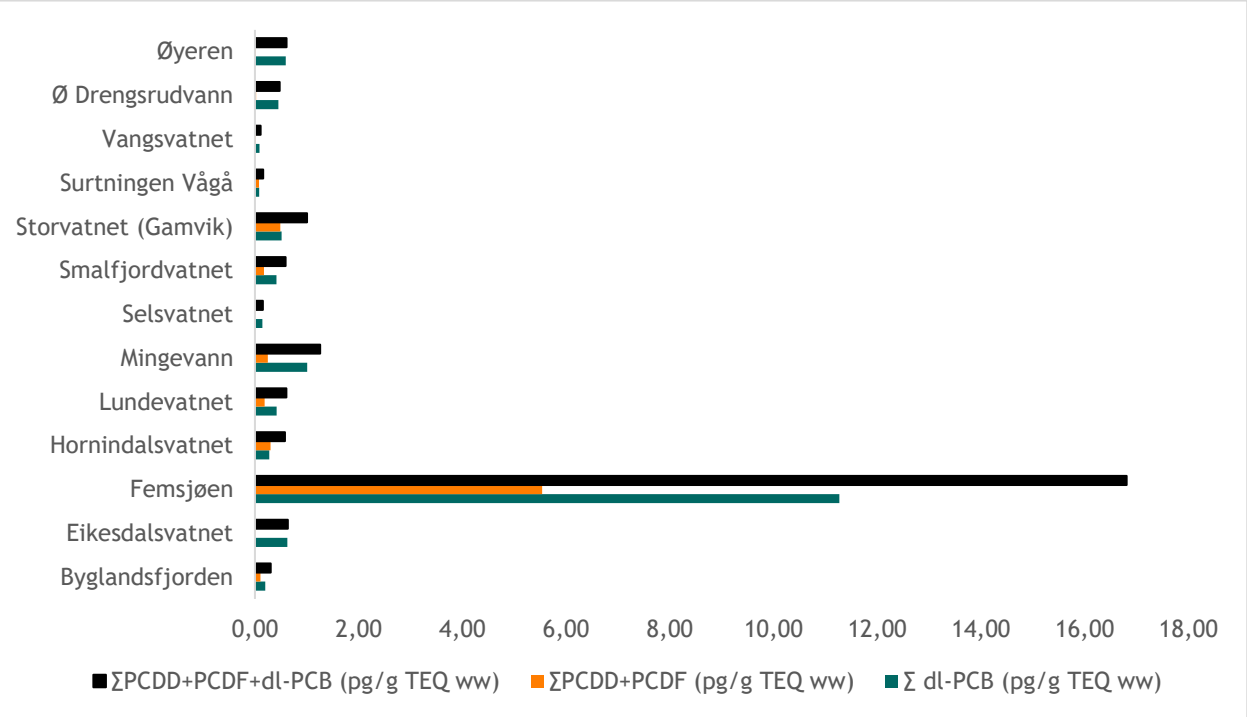

Figure 3: Mean wet weight TEQ (pg/g TEQ ww) values of ∑dl-PCB, ∑PCDD+PCDF and ∑PCDD+PCDF+dl-PCB in fish from each lake.

Table 8: Mean lipid weight TEQ (pg/g TEQ lw) values of ∑dl-PCB, ∑PCDD+PCDF and ∑PCDD+PCDF+dl-PCB in fish from each lake.

Lake	∑dl-PCB (pg/g TEQ lw)	∑PCDD+PCDF (pg/g TEQ lw)	∑PCDD+PCDF+dl-PCB (pg/g TEQ lw)
Byglandsfjorden	6,82	3,56	10,39
Eikesdalsvatnet	15,38	0,19	15,56
Femsjøen	65,78	32,28	98,07
Hornindalsvatnet	6,52	6,95	13,47
Lundevatnet	8,14	4,09	12,23
Mingevannet	23,40	5,48	28,88
Selsvatnet	2,74	0,15	2,88
Smalfjordvannet	17,31	6,87	24,18
Storvannet (Gamvik)	13,76	13,99	27,75
Surtningen Vågå	2,34	2,31	4,65
Vangsvatnet	3,52	0,66	4,19
Ø Drengsrudvann	12,66	0,64	13,31
Øyeren	16,19	0,33	16,51

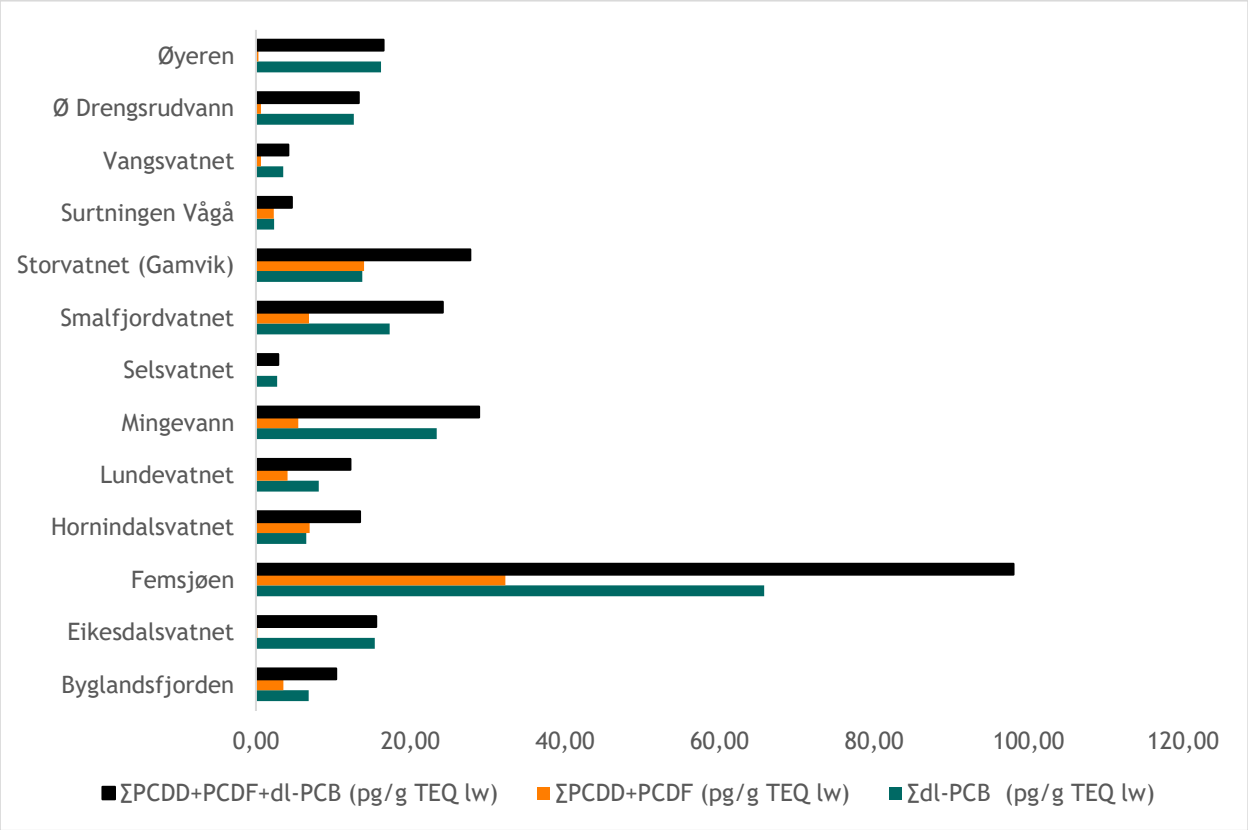

Figure 4: Mean lipid weight TEQ (pg/g TEQ lw) values of ∑dl-PCB, ∑PCDD+PCDF and ∑PCDD+PCDF+dl-PCB in fish from each lake.

9.1.5 Polyaromantic Hydrocarbons (PAH)

The mean wet weight concentrations of the polyaromatic hydrocarbons Naphthalene, Anthracene, Fluoranthene and Benzo[a]pyrene in fish from each lake are given in table 9 and figure 5. Among the four PAHs measured benzo[a]pyrene showed the highest levels in fish liver from the lakes. The highest level of benzo[a]pyrene was detected in Lake Lundevatnet (71 ng/g ww) followed by Lake Surtingen Vågå (22 ng/g ww), Lake Vangsvatnet and Lake Eikesdalsvatnet (8 ng/g ww).

The EQS for benzo[a]pyrene was exceeded in Lake Lundevatnet, Lake Surtingen Vågå, Lake Vangsvatnet, Lake Eikesdalsvatnet and Lake Øyeren.

Table 9: Mean wet weight concentrations (ng/g ww) of Naphthalene, Anthracene, Fluoranthene and Benzo[a]pyrene.

Lake	Naphthalene	Anthracene	Fluoranthene	Benzo[a]pyrene
Byglandsfjorden	0,80	0,02	0,16	1,84
Eikesdalsvatnet	0,73	0,15	0,10	8,13
Femsjøen	1,47	0,03	0,57	3,86
Hornindalsvatnet	0,87	0,03	0,16	2,82
Lundevatnet	0,86	0,04	0,19	70,77
Mingevannet	1,01	0,03	0,25	2,94
Selsvatnet	0,75	0,02	0,15	0,20
Smalfjordvannet	0,90	0,04	0,12	2,52
Storvannet (Gamvik)	1,25	0,03	0,16	2,93
Surtningen Vågå	1,20	0,02	0,15	22,15
Vangsvatnet	0,74	0,04	0,17	14,65
Ø Drengsrudvann	0,99	0,03	0,26	2,16
Øyeren	2,50	0,02	0,27	7,57

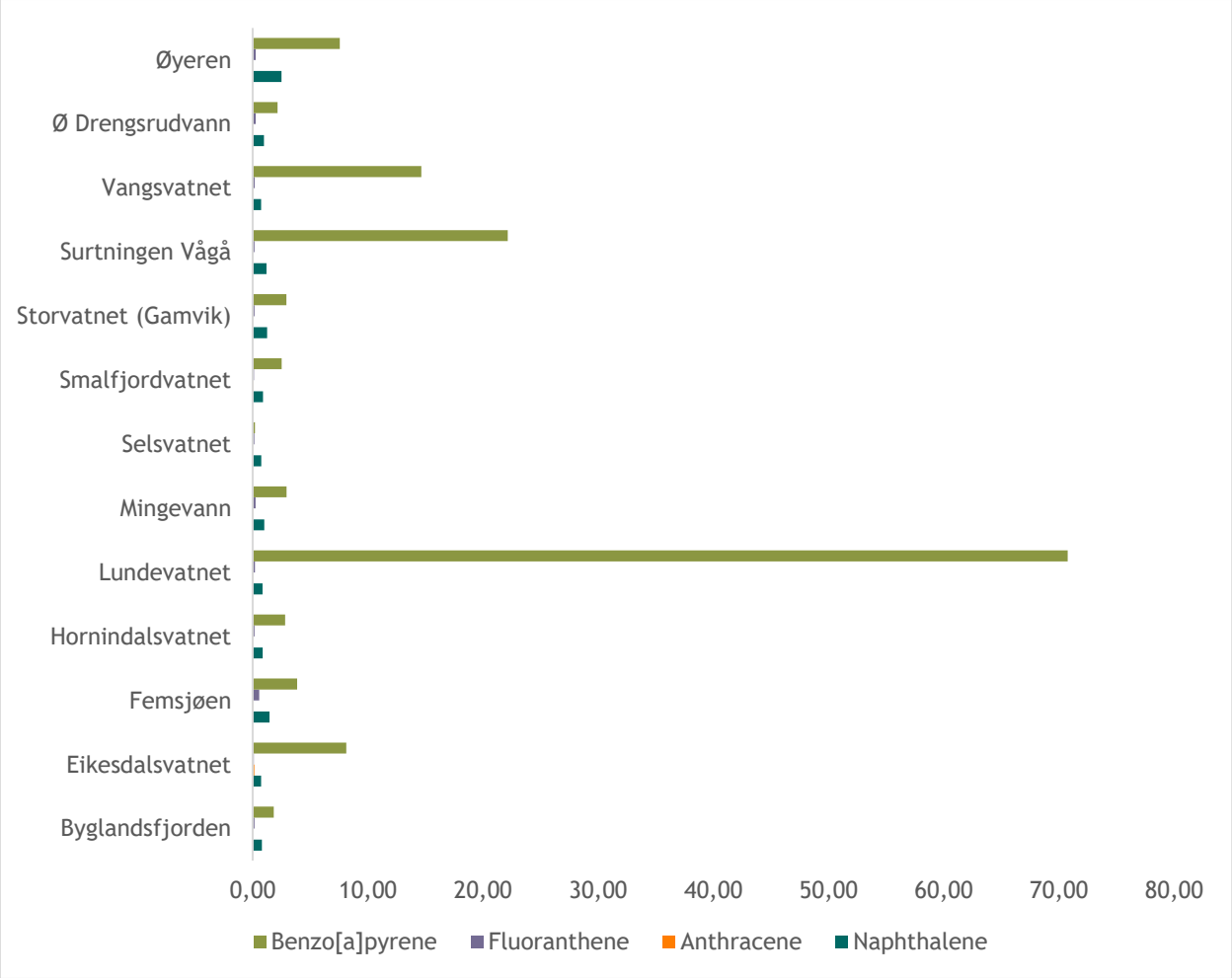

Figure 5: Mean wet weight concentrations (ng/g ww) of Naphthalene, Anthracene, Fluoranthene and Benzo[a]pyrene.

9.1.6 Perfluorinated Compounds (PFAS)

The mean wet weight (ww) concentrations of 15 different PFASs in fish from each lake are given in tables 10 and 11 and in figures 6 and 7. The mean ww concentrations of the sum of the 15 PFASs are given table 12 and figure 10. The highest concentrations of PFOS were detected In Lake Øyeren (12 ng/g ww) followed by Lake Mingevannet (7 ng/g), Lake Øvre (Ø) Drengsrudvann (6 ng/g ww) and Lake Lundevatnet (5 ng/g ww). The sum of PFAS (ΣPFAS) were highest in Lake Ø Drengsrudvann (34 ng/g ww) followed by Lake Lundevatnet (31 ng/g ww), Lake Øyeren (25 ng/g ww) and Lake Byglandsfjorden (19 ng/g ww). In five of the lakes, PFTrDA and/or PFUnDA were the dominating PFASs. The same trend was found in a previous study on PFAS levels in Lake Femunden, Lake Mjøsa and Lake Randsfjorden (Miljødirektoratet, 2017). Furthermore, statistical analysis showed that these PFASs are highly correlated, suggesting that they are spread from common sources.

EU has established EQS for PFOS and PFOA. In this survey, it was found that fish from Lake Øyeren had PFOS levels, which exceeded the EQS. However, fish from none of the lakes had PFOA levels which exceeded the EQS.

Table 10: Mean wet weight concentrations of (ng/g ww) 8 individual PFASs in fish from each lake.

Lake	PFNA	PFOS	PFOA	PFDA	PFTeDA	PFDoDA	PFUnDA	PFTrDA
Byglandsfjorden	0,52	3,98	0,00	1,25	1,34	1,75	3,44	3,39
Eikesdalsvatnet	0,07	1,58	0,64	0,41	0,74	1,20	1,58	3,16
Femsjøen	0,58	2,77	0,24	0,52	0,78	0,65	1,47	1,52
Hornindalsvatnet	0,40	1,85	0,00	0,48	0,97	1,06	2,18	3,36
Lundevatnet	0,55	5,38	0,48	2,18	2,76	3,55	3,82	6,89
Mingevannet	0,68	6,62	0,00	0,99	0,53	1,35	2,19	1,73
Selsvatnet	0,84	0,00	0,14	0,28	0,00	0,07	0,18	0,26
Smalfjordvannet	1,00	1,58	0,00	0,95	0,18	0,34	1,49	1,18
Storvannet (Gamvik)	1,00	4,16	0,39	1,12	0,16	0,58	1,49	1,24
Surtningen Vågå	1,65	0,63	0,00	1,32	0,32	0,33	1,37	0,97
Vangsvatnet	0,00	1,60	0,00	0,45	0,26	0,89	1,29	1,70
Ø Drengsrudvann	0,47	5,87	0,00	4,00	1,33	4,93	9,04	5,80
Øyeren	0,32	11,70	0,00	1,63	0,76	1,55	2,71	2,20

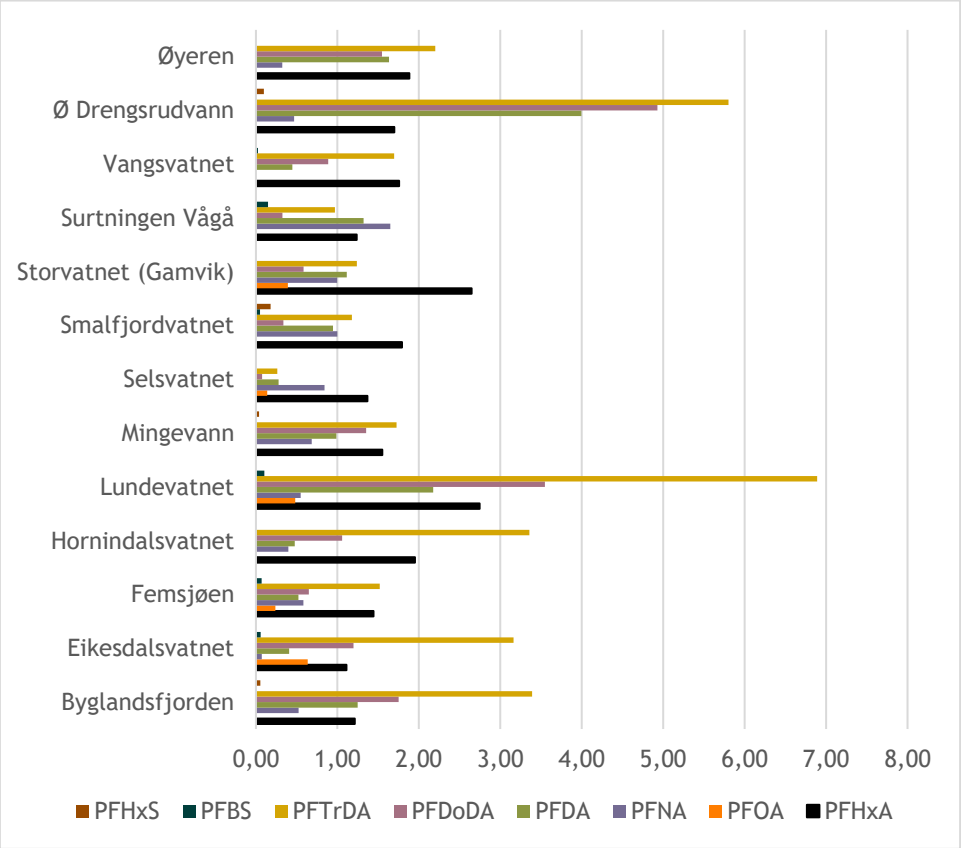

Figure 6: Mean wet weight concentrations (ng/g ww) of 8 individual PFAS in fish from each lake

Table 11: Mean wet weight concentrations (ng/g ww) of 7 individual PFASs in fish from each lake.

Lake	PFBS	PFHxS	FOSA	N-MeFOSE	N-EtFOSE*	PFHpA	PFHxA
Byglandsfjorden	0,00	0,05	0,17	1,26	0,00	0,65	1,21
Eikesdalsvatnet	0,06	0,00	0,23	1,13	1,84	0,47	1,11
Femsjøen	0,07	0,00	0,58	1,05	1,16	1,13	1,44
Hornindalsvatnet	0,00	0,00	0,02	0,12	0,00	1,23	1,95
Lundevatnet	0,10	0,00	0,30	1,33	0,00	1,31	2,75
Mingevannet	0,00	0,04	0,39	0,36	0,00	0,79	1,55
Selsvatnet	0,00	0,00	0,00	3,78	0,00	0,95	1,37
Smalfjordvannet	0,05	0,18	0,00	1,61	0,00	1,37	1,79
Storvannet (Gamvik)	0,00	0,00	0,18	2,80	0,22	1,41	2,65
Surtningen Vågå	0,15	0,00	0,14	4,78	0,00	0,82	1,24
Vangsvatnet	0,02	0,00	0,08	1,41	0,22	0,70	1,76
Ø Drengsrudvann	0,00	0,10	0,04	0,67	0,00	0,00	1,70
Øyeren	0,00	0,00	0,16	0,25	1,10	0,43	1,88

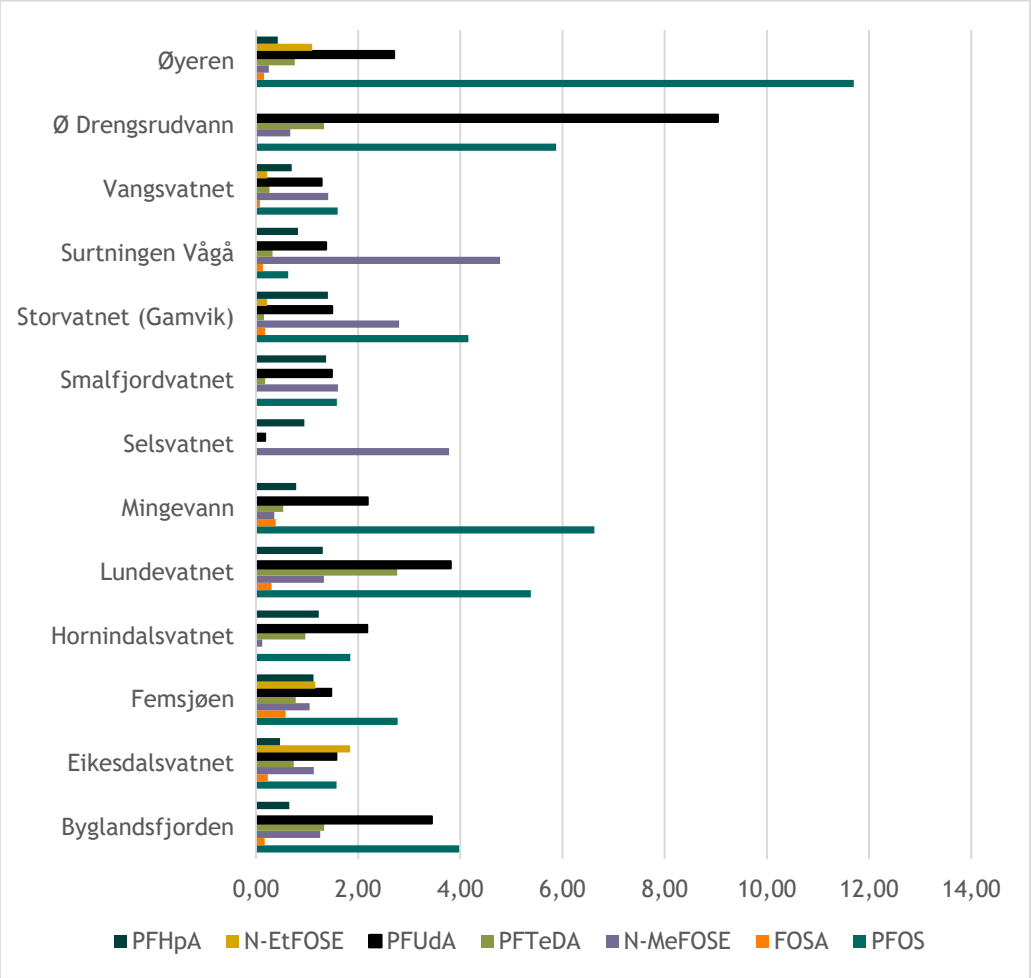

Figure 7: Mean wet weight concentrations (ng/g ww) of 7 individual PFAS in fish from each lake

Table 12: Mean wet weight concentrations (ng/g ww) of the sum of 15 PFASs in fish from each lake.

Lake	ΣPFAS
Byglandsfjorden	19,02
Eikesdalsvatnet	14,56
Femsjøen	13,98
Hornindalsvatnet	13,20
Lundevatnet	31,40
Mingevannet	17,22
Selsvatnet	7,87
Smalfjordvannet	11,72
Storvannet (Gamvik)	17,34
Surtningen Vågå	13,61
Vangsvatnet	9,95
Ø Drengsrudvann	34,26
Øyeren	24,70

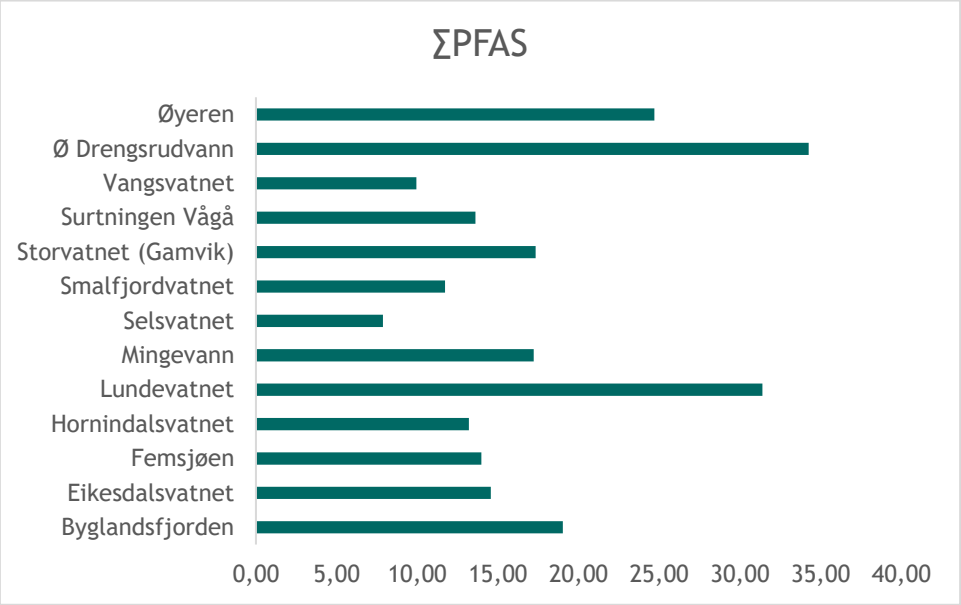

Figure 8: Mean wet weight (ng/g ww) concentrations of the sum of 15 PFASs in fish from each lake.

9.1.7 Phenols and Organotin Compounds

The mean wet weight concentrations of the phenols, 4-tert-oktylfenol, p-nonylfenol and the organotins, Dibutyltin (DBT) and Tributyltin (TBT) in fish from each lake are given in table 13 and figure 9. The concentrations of the organotins Monobutyltin (MBT), Triphenyltin (TPT), Diphenyltin (DPT) and Monophenyltin (MPT) were under the detection limit. The highest level of 4-tert-oktylfenol was detected in Lake Smalfjordvannet (0.22 ng/g ww) followed by Lake Femsjøen (0.18 ng/g ww) and Lake Selsvatnet (0.15 ng/g ww). The highest level of p-nonylfenol was detected in Lake Ø Drengsrudvann (15 ng/g ww) followed by Lake Femsjøen (11 ng/g ww) and Lake Storvannet (Gamvik) (9 ng/g ww).

The EQS for 4-tert-oktylfenol was exceeded in fish livers from all the lakes, whereas the levels of p-nonylfenol were below the EQS in all lakes.

The highest levels of dibutyltin was detected in Lake Storvannet (Gamvik) (5.61 ng/g ww) followed by Lake Femsjøen (4.52 ng/g ww) and Lake Lundevatnet (1.39 ng/g ww). The highest levels of tributyltin were detected in Lake Øyeren (1.95 ng/g ww) followed by Lake Mingevannet (1.77 ng/g ww) and Ø Drengsrudvann (1.26 ng/g ww).

The levels of tributyltin did not exceed the EQS for this contaminant in any of the lakes.

Table 13: Mean wet weight concentrations (ng/g ww) of 4-tert-oktylfenol, p-nonylfenol and the organotins, Dibutyltin (DBT) and Tributyltin (TBT) in fish from each lake.

Lake	4-tert-oktylfenol	p-nonylfenol	Dibutyltin (DBT)	Tributyltin (TBT)
Byglandsfjorden	0,15	2,35	0,43	0,13
Eikesdalsvatnet	0,05	0,00	0,40	0,60
Femsjøen	0,18	11,10	4,52	0,41
Hornindalsvatnet	0,14	0,00	0,63	0,00
Lundevatnet	0,10	7,43	1,39	0,78
Mingevannet	0,08	2,47	0,17	1,77
Selsvatnet	0,15	3,58	0,55	0,95
Smalfjordvannet	0,22	5,76	0,25	0,00
Storvannet (Gamvik)	0,11	9,12	5,61	0,39
Surtningen Vågå	0,09	3,24	0,89	0,11
Vangsvatnet	0,16	3,12	1,16	0,30
Ø Drengsrudvann	0,21	14,84	0,73	1,26
Øyeren	0,16	6,32	0,54	1,95

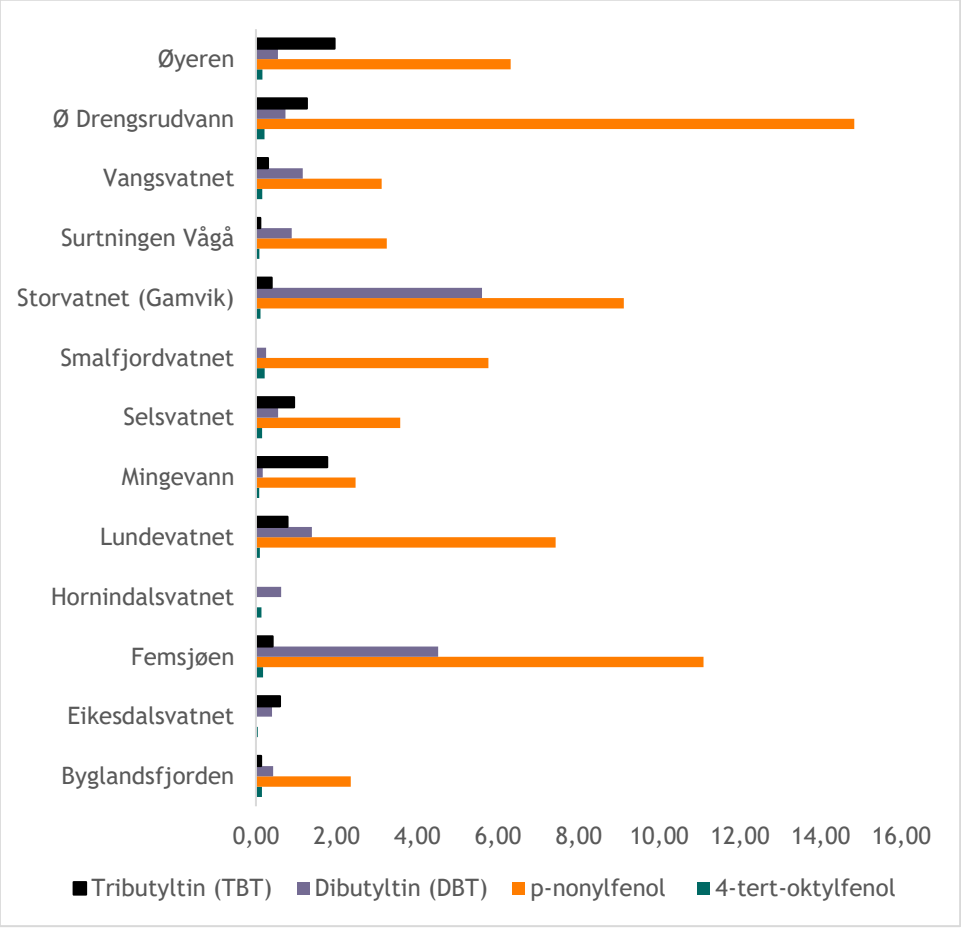

Figure 9: Mean wet weight concentrations (ng/g) of 4-tert-oktylfenol, p-nonylfenol and the organotins, Dibutyltin (DBT) and Tributyltin (TBT) in fish from each lake.

9.1.8 Siloxane, Triclosan, Dicofol and Short-Chain (SCCPs) and Medium-Chain (MCCPs) Chlorinated Paraffins

The mean wet weight concentrations of Siloxane, Triclosan, Dicofol and Short-Chain (SCCPs) and Medium-Chain (MCCPs) Chlorinated Paraffins in fish from each lake are given in table 14 and figure 10.

The highest level of siloxane (D5) was detected in Lake Femsjøen (50 ng/g ww) followed by Lake Storvannet (Gamvik)(29 ng/g ww), Lake Lundevatnet (22 ng/g ww) and lake Hornindalsvatnet (20 ng/g ww).

The levels of D5 were lower than EQS in fish from all the lakes.

The highest level of triclosan was detected in Lake Storvannet (Gamvik) (6.56 ng/g ww) followed by Lake Øyeren (5.11 ng/g ww), Lake Femsjøen (3.72 ng/g ww) and Ludevatnet (2.30 ng/g ww).

The levels of triclosan did not exceed the EQSs for this contaminant.

The highest level of dicofol was detected in Lake Storvannet (Gamvik) (7.47 ng/g ww) followed by Vangsvatnet (4.56 ng/g ww) and Eikesdalsvatnet (4.01 ng/g ww).

The levels of dicofol did not exceed the EQSs for this contaminant.

The highest level of Short-Chain Chlorinated Paraffins (SCCPs) was detected in Lake Femsjøen (12.76 ng/g ww) followed by Lake Ø Drengerudsvan (10.13 ng/g ww), Lake Eikesdalsvatnet (8.61 ng/g ww) and Lake Øyeren 7.21 ng/g ww). The highest level of Mediumt-Chain Chlorinated Paraffins (MCCPs) was detected in Lake Femsjøen (51.50 ng/g ww) followed by Lake Byglandsfjorden (23.87 ng/g ww), Lake Storvannet(Gamvik) (22.97 ng/g ww), Lake Selvatnet (22.67 ng/g ww).

The levels of SCCPs and MCCPs did not exceed the EQSs for these contaminants.

Table 14: Mean wet weight concentrations (ng/g) of D5, TCS, Dicofol, SCCPs and MCCPs

Lake	Siloxane(D5)	Triclosan (TCS)	Dicofol	SCCPs (C10-13)	MCCPs (C14-17)
Byglandsfjorden	13,62	0,80	1,94	4,68	23,87
Eikesdalsvatnet	14,39	1,84	4,01	8,61	19,41
Femsjøen	50,48	3,72	3,77	12,76	51,50
Hornindalsvatnet	19,81	1,66	0,88	4,19	8,24
Lundevatnet	21,76	2,30	2,54	3,21	9,01
Mingevannet	16,87	0,51	1,35	4,74	18,52
Selsvatnet	8,26	0,83	1,69	5,16	22,67
Smalfjordvannet	16,60	2,05	2,25	2,39	17,35
Storvannet (Gamvik)	29,01	6,56	7,47	5,79	22,97
Surtningen Vågå	16,79	1,81	0,76	5,05	10,60
Vangsvatnet	14,83	0,71	4,56	5,60	13,97
Ø Drengsrudvann	6,53	2,13	1,65	10,13	20,15
Øyeren	19,08	5,11	3,96	7,21	15,53

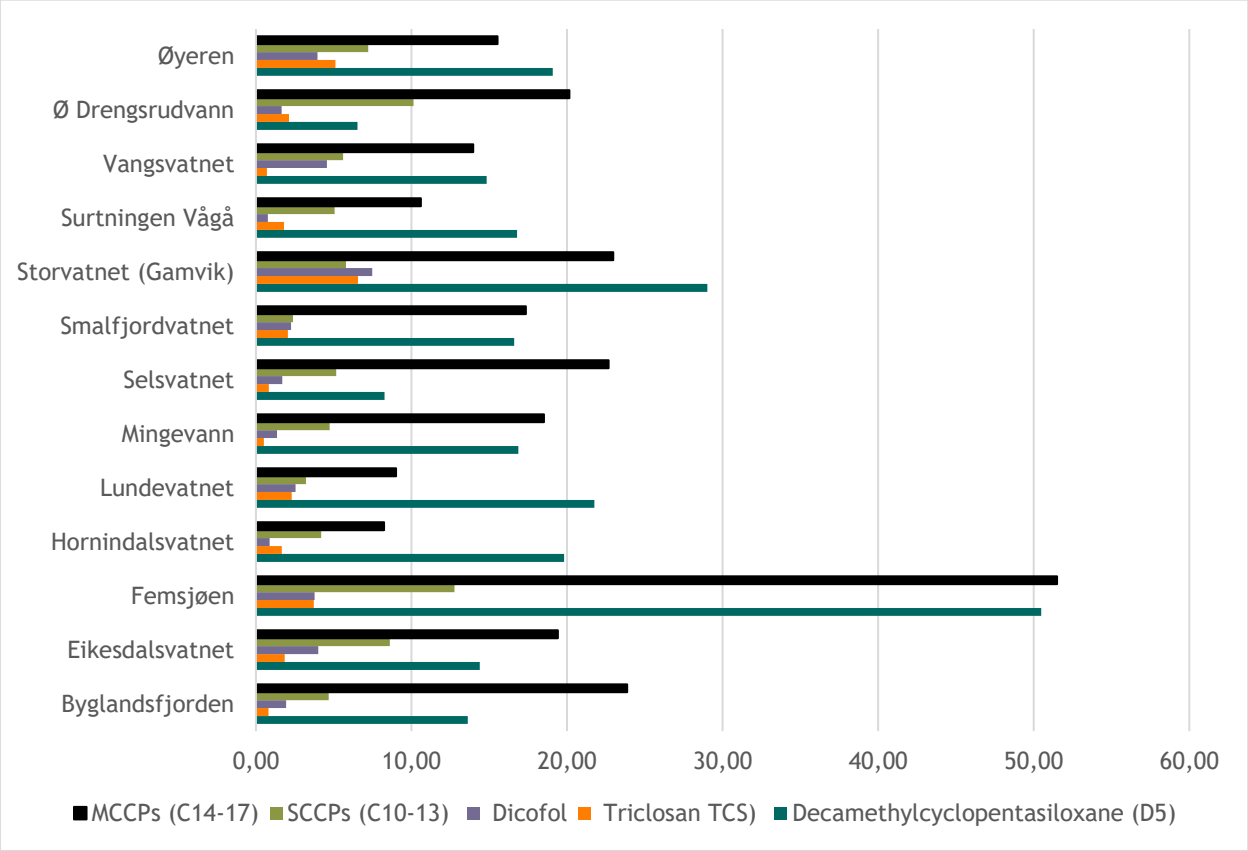

Figure 10: Mean wet weight concentrations (ng/g) of D5, TCS, Dicofol, SCCPs and MCCPs

9.1.9 Hexachlorobutadien (HCBD), Trichlorobenzene (TCBs), Pentachlorophenol (PCP) and TCEP (tris(2-kloretyl)fosfat)

The mean wet weight concentrations of Hexachlorobutadien (HCBD), Trichlorobenzene (TCBs), Pentachlorophenol (PCP) and TCEP (tris(2-kloretyl)fosfat) in fish from each lake are given in table 15 and figure 11.

The highest level of HCBD was detected in Lake Storvannet (Gamvik) (0.15 ng/g ww) followed by Lake Femsjøen (0.11 ng/g ww) and Lake Vangsvatnet (0.07 ng/g ww).

The highest level of TCBs was detected in Lake Femsjøen (0.10 ng/g ww) followed by Lake Storvannet (Gamvik) (0.07 ng/g ww) and Lake Lundevatnet (0.02 ng/g ww).

The highest level of PCP was detected in Lake Byglandsfjorden (2.65 ng/g ww) followed by Lake Surtingen Vågå (2.09 ng/g ww) and Lake Smalfjordvannet (1.46 ng/g ww).

The highest level of TCEP was detected in Lake Øyeren (2.58 ng/g ww) followed by Lake Femsjøen (1.94 ng/g ww) and lake Storvannet (Gamvik) (1.88 ng/g ww).

The levels of HCBD, TCBs, PCP and TCEP in fish were lower than the EQSs for these contaminants in all the lakes.

Table 15: Mean wet weight concentration (ng/g) of HCBD, TCBs, PCP and TCEP in fish from each lake.

Lake	HCBD	TCBs	PCP	TCEP
Byglandsfjorden	0,05	0,00	2,65	0,72
Eikesdalsvatnet	0,04	0,00	0,37	0,49
Femsjøen	0,11	0,10	0,29	1,94
Hornindalsvatnet	0,06	0,00	0,28	0,67
Lundevatnet	0,06	0,02	0,20	1,71
Mingevannet	0,06	0,00	1,24	0,94
Selsvatnet	0,04	0,00	1,12	1,01
Smalfjordvannet	0,05	0,00	1,46	1,14
Storvannet (Gamvik)	0,15	0,07	0,27	1,88
Surtningen Vågå	0,05	0,03	2,09	0,65
Vangsvatnet	0,07	0,04	0,24	1,46
Ø Drengsrudvann	0,05	0,00	0,99	0,85
Øyeren	0,08	0,13	0,35	2,58

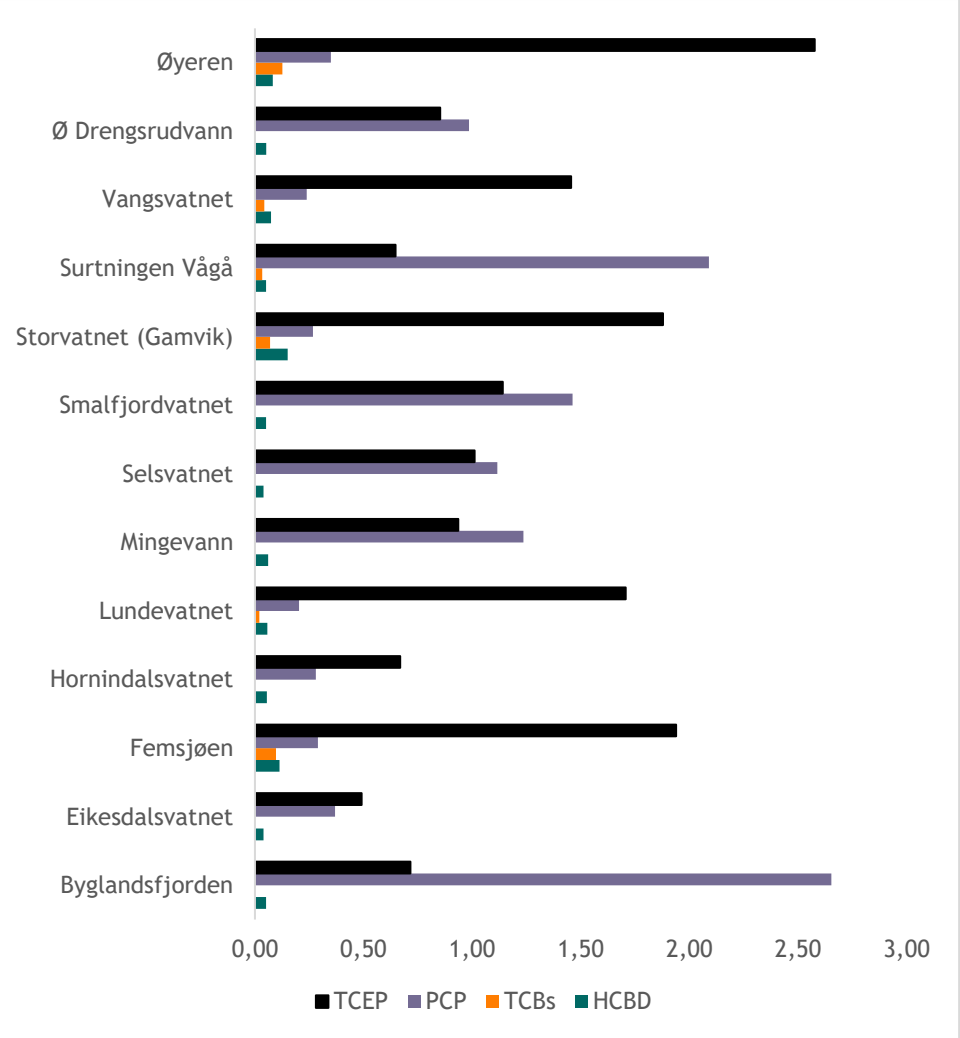

Figure 11: Mean wet weight concentration (ng/g) of HCBD, TCBs, PCP and TCEP in fish from each lake.

9.1.10 Bis (2-etylheksyl) phthalate wet weight (DEHP)

The mean wet weight concentrations of Bis (2-etylheksyl) phthalate (DEHP) in fish from each lake are given in table 16 and figure 12 and the lipid weight concentrations of DEHP are given in table 17 and figure 13.

The highest level of DEHP was detected in Lake Øyeren (1900 ng/g ww) followed by Lake Smalfjordvannet (653 ng/g ww), Lake Femsjøen (531 ng/g ww) and Lake Vangsvatnet (385 ng/g ww).

The levels of DEHP in fish were lower than the EQSs for these contaminants in all the lakes.

Table 16: Mean wet weight (ww) and lipid weight (lw) concentrations (ng/g) of DEHP in fish from each lake.

Lake	DEHP ww	DEHP lw
Byglandsfjorden	187	6501
Eikesdalsvatnet	368	11402
Femsjøen	530	7174
Hornindalsvatnet	192	5130
Lundevatnet	379	7938
Mingevannet	217	5165
Selsvatnet)	355	6671
Smalfjordvannet	652	36802
Storvannet (Gamvik)	144	3879
Surtningen Vågå	224	6554
Vangsvatnet	385	13642
Ø Drengsrudvann	222	6243
Øyeren	1899	56053

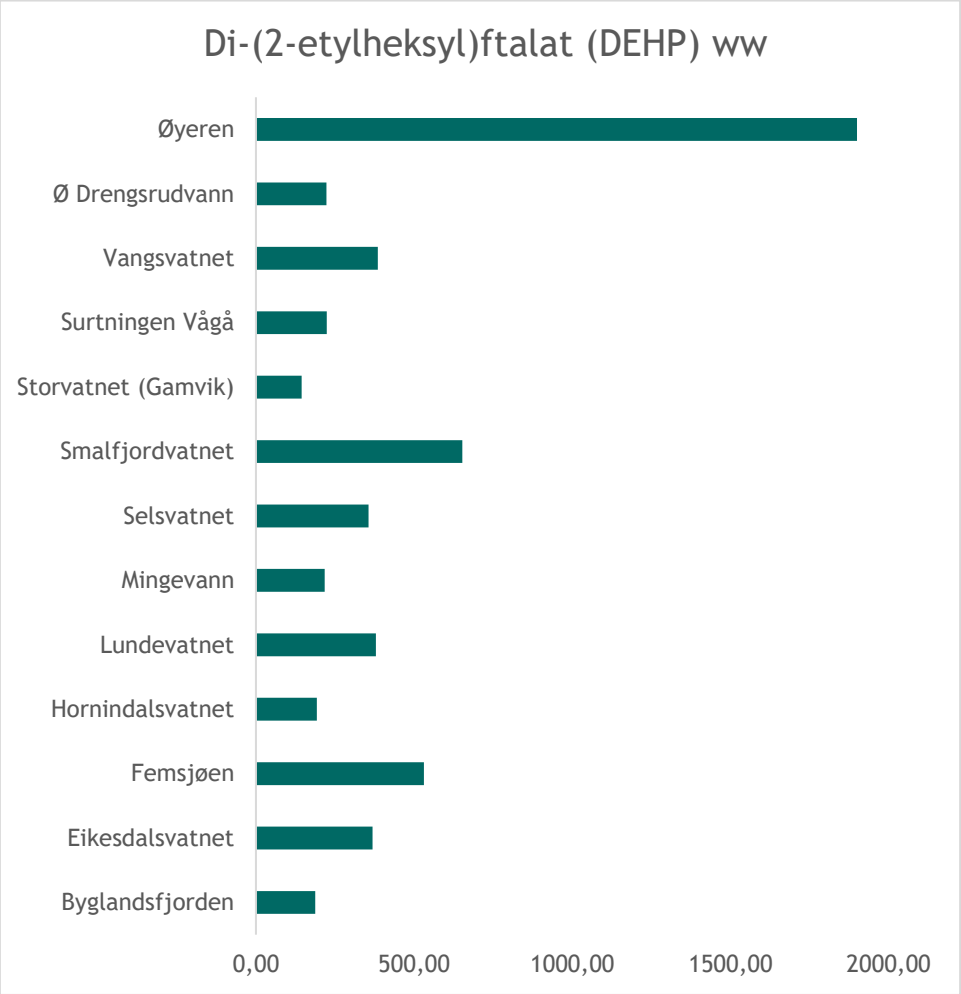

Figure 12: Mean wet weight (ww) concentrations (ng/g) of DEHP in fish from each lake.

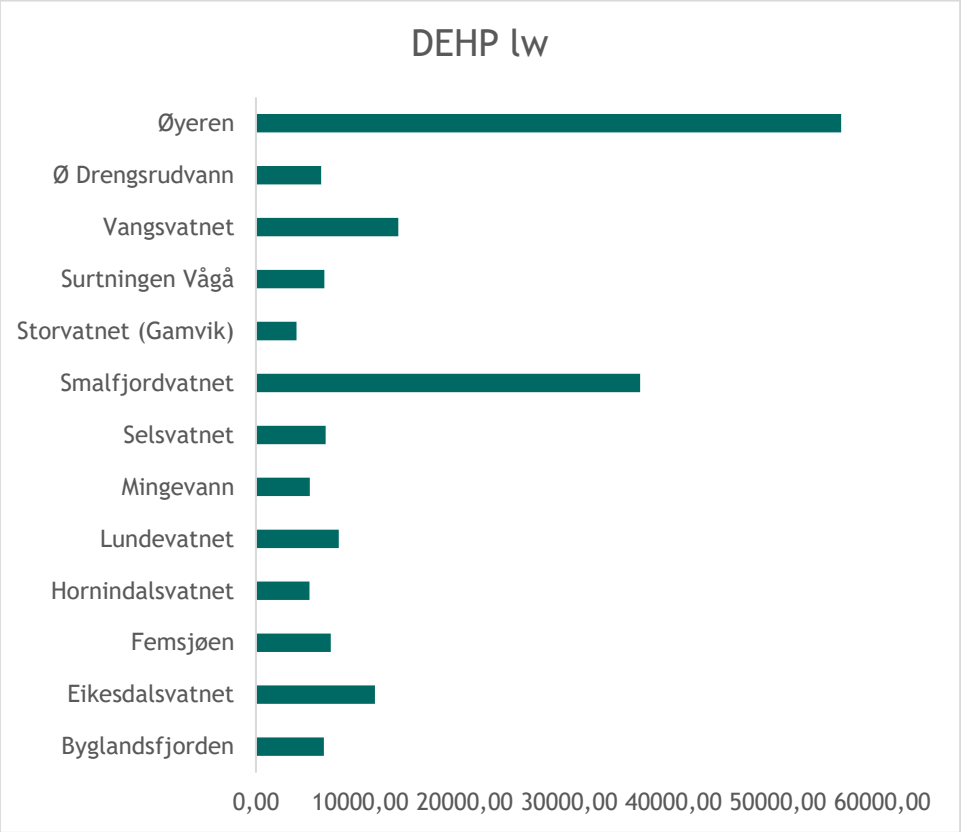

Figure 13: Mean lipid weight (lw) concentrations (ng/g) of DEHP in fish from each lake.

9.1.11 Metals

The mean wet weight concentrations of Magnesium (Mg), Iron (Fe), Copper (Cu), Zinc (Zn) and Selenium (Se) in fish liver from each lake are given in table 17 and figure 14. The mean wet weight concentrations of Aluminium (Al), Silver (Ag) and Molybdenum (Mo) are given in table 18 and figure 15 and the mean wet weight concentrations of Vanadium (V), Cobalt (Co), Arsenic (As), Cadmium (Cd), Mercury (Hg), Hg muscle are given in table 19 and figure 16.

The levels of Hg in muscle was highest in Lake Ø Drengerudsvann (1070 µg/kg ww) followed by Lake Femsjøen (817 µg/kg ww), Lake Øyeren (763 µg/kg ww) and Lake Mingevannet (430 µg/kg ww).

The levels of Cd in liver was highest in Lake Lundevatnet (3067 µg/kg ww) followed by Lake Byglandsfjorden (1090 µg/kg ww), Lake Hornindalsvatnet (530 µg/kg ww) and Lake Vangsvatnet (530 µg/kg ww).

The levels of Hg in fish muscle exceeded the EQS in all the lakes.

EU has not established an EQS for Cd in biota. However, relatively high levels of Cd detected in fish liver from Lake Lundevatnet and Lake Byglandsfjorden as well as Lake Hornindalsvatnet and Lake Vangsvatnet.

Table 17: Mean wet weight concentration (µg/g) of Mg, Fe, Cu, Zn and Se in fish liver from each lake

Lake	Mg	Fe	Cu	Zn	Se
Byglandsfjorden	156,67	183,33	97,00	35,67	6,53
Eikesdalsvatnet	173,33	118,33	157,67	36,33	14,00
Femsjøen	153,33	164,67	8,47	34,33	1,17
Hornindalsvatnet	143,33	243,33	110,00	31,67	8,83
Lundevatnet	153,33	196,67	87,00	35,33	10,43
Mingevannet	196,67	49,00	1,73	24,67	0,88
Selsvatnet	260,00	38,67	17,03	43,00	2,65
Smalfjordvannet	243,33	93,00	25,33	53,00	6,30
Storvannet (Gamvik)	210,00	166,00	55,67	56,33	17,40
Surtningen Vågå	203,33	133,33	45,00	40,00	4,67
Vangsvatnet	200,00	390,00	35,93	31,33	3,57
Ø Drengsrudvann	183,33	81,33	1,47	24,00	0,92
Øyeren	196,67	91,67	2,13	27,00	1,03

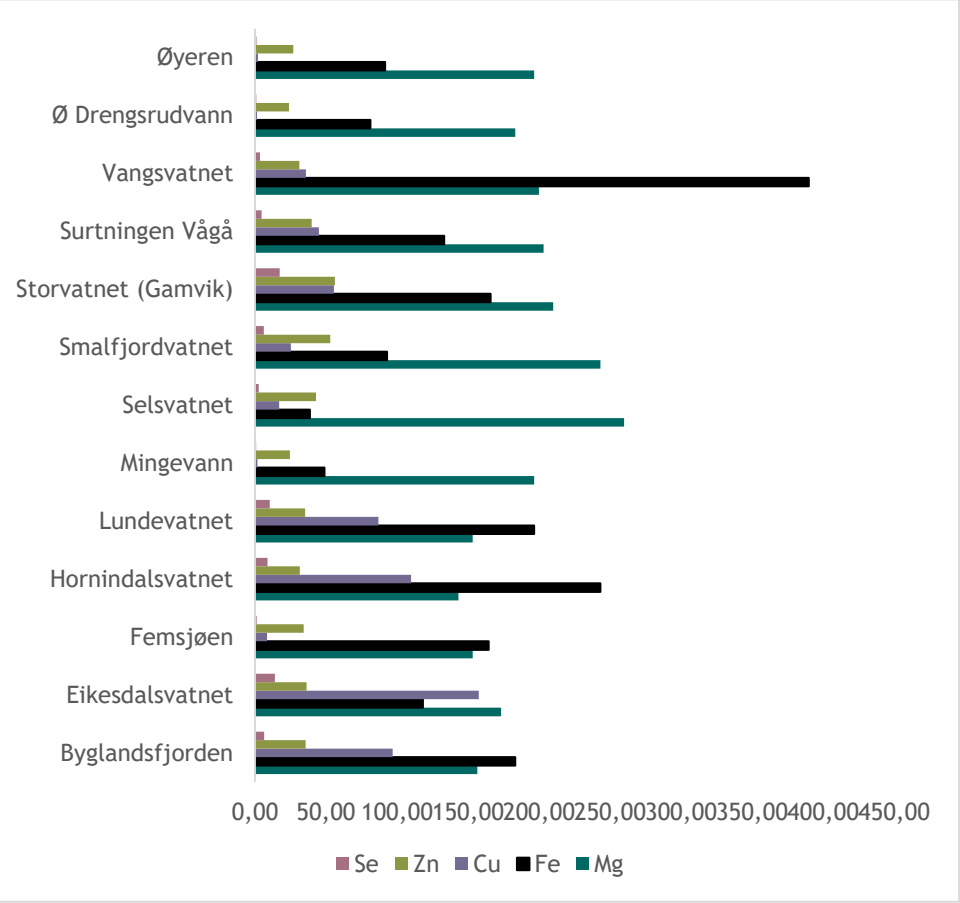

Figure 14: Mean wet weight concentration (µg/g) of Mg, Fe, Cu, Zn and Se in fish liver from each lake.

Table 18: Mean wet weight concentration (µg/g) of Al, Ag and Mo in fish liver from each lake.

Lake	Al	Ag	Mo
Byglandsfjorden	14,53	2,20	0,11
Eikesdalsvatnet	2,83	2,33	0,20
Femsjøen	5,20	0,08	0,16
Hornindalsvatnet	1,83	0,82	0,12
Lundevatnet	8,80	2,50	0,15
Mingevannet	1,19	0,01	0,10
Selsvatnet	2,41	0,05	0,16
Smalfjordvannet	0,88	0,50	0,17
Storvannet (Gamvik)	1,07	1,64	0,20
Surtningen Vågå	1,05	0,58	0,15
Vangsvatnet	8,50	1,06	0,17
Ø Drengsrudvann	0,73	0,00	0,12
Øyeren	3,53	0,00	0,13

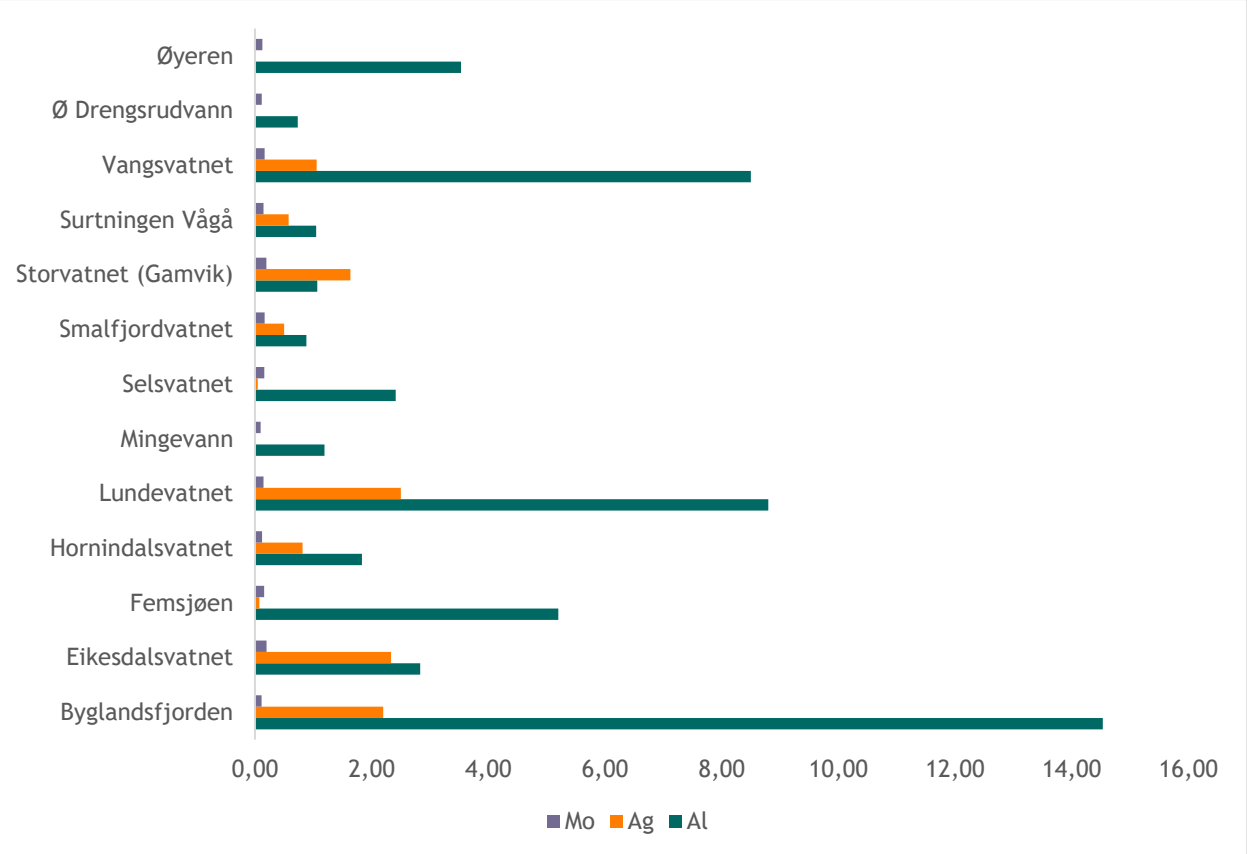

Figure 15: Mean wet weight concentration (µg/g) of Al, Ag and Mo in fish liver from each lake.

Table 19: Mean wet weight concentration (µg/g) of V, Co, As, Cd, Hg in liver and Hg muscle in fish from each lake.

Lake	V	Co	As	Cd	Hg	Hg muscle
Byglandsfjorden	0,031	0,090	0,028	1,090	0,160	0,133
Eikesdalsvatnet	0,033	0,094	0,057	0,117	0,220	0,181
Femsjøen	0,071	0,080	0,154	0,513	0,713	0,817
Hornindalsvatnet	0,012	0,057	0,009	0,530	0,153	0,127
Lundevatnet	0,060	0,046	0,015	3,067	0,127	0,131
Mingevannet	0,010	0,068	0,072	0,209	0,177	0,430
Selsvatnet	0,012	0,016	0,011	0,001	0,067	0,063
Smalfjordvannet	0,008	0,061	0,038	0,034	0,197	0,163
Storvannet (Gamvik)	0,017	0,064	0,106	0,139	0,240	0,157
Surtningen Vågå	0,030	0,032	0,051	0,041	0,120	0,116
Vangsvatnet (Gamvik)	0,034	0,120	0,023	0,530	0,131	0,113
Ø Drengsrudvann	0,000	0,163	0,069	0,092	0,813	1,070
Øyeren	0,019	0,180	0,070	0,440	0,307	0,763

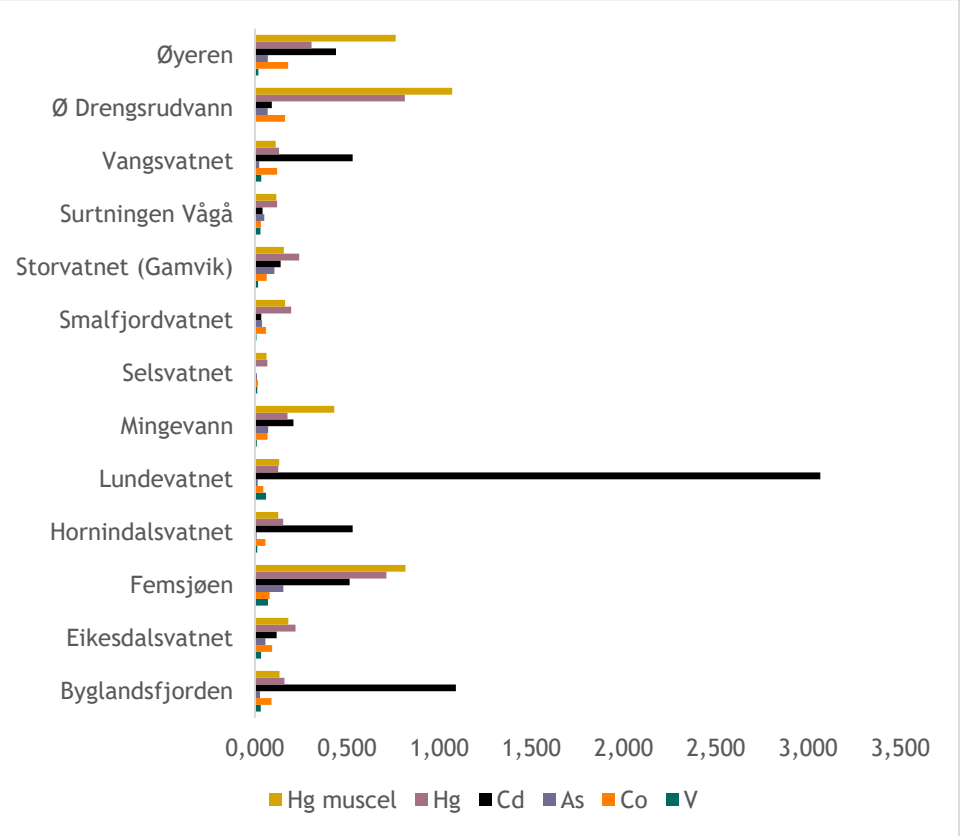

Figure 16: Mean wet weight concentration (µg/g) of V, Co, As, Cd, Hg in liver and Hg muscle in fish from each lake

9.1.12 Levels of environmental contaminants in fish compared to environmental quality standards (EQS)

Table 20- 32: Levels of individual chemical and groups of pollutants given in µg / kg wet weight and environmental quality standards (EQS) for these chemicals given in µg / kg wet weight. Red numbers indicate exceedance of EQS.

Table 20: Lake Byglandsfjorden

Chemical(s)	CAS-nr.[1]	EQS (µg/kg	**Byglandsfjorden**
Anthracene	120-12-7	2400	0.02
Short-Chain (SCCPs) Chlorinated Paraffins	85535-84-8	6000	4.68
Medium-Chain Chlorinated Paraffins (MCCPs)	85535-26-1	170	23.87
Bis (2-etylheksyl) phthalate (DEHP)	117-81-7	2900	187
Decmethylcyclosiloxane (D5)	541-02-6	15217	13.62
Endosulfan	115-29-7	370	0.01
Hexachlorobutadien (HCBD)	87-68-3	55	0.05
HCB	A 118-74-1	10	8.8
Naphthalene	91-20-3	2400	0.80
Pentachlorophenol (PCP)	87-86-5	180	2.65
Benzo[a]pyrene	50-32-8	5	1.84
Tributyltin (TBT)	36643-28-4	150	0.13
Trichlorobenzene (TCBs)	12002-48-1	490	0.00
Tris(2-chloroethyl) phosphate (TCEP)	115-96-8	7304	0.72
Diflubenzuron	35367-38-5	730	0.00
Teflubenzuron	83121-18.0	609	0.00
Triphenyltin	892-20-6	152	0.00
PCB7	1336-36-3	0.6	4.12
Dioxins and dioxin-like PCBs		0,0065 TEQ	0.0003
PBDE	A 32534-81-9	0.0085	0.5000
HBCDD	134237-51-7	167	0.11
PFOA	3825-261	91.3	0.00
PFOS	1763-21-1	9.1	3.98
p-nonylfenol	A 84852-15-3	3000	2,35
4-tert- oktylfenol	140-66-9	0.004	0.150
Kvikksølv	A 7439-97-6	20	133
Triclosan	3380-34-5	15217	0.80
Dicofol	115-32-2	33	1.94

Table 21: Lake Eikesdalsvatnet

Chemical(s)	CAS-nr.[1]	EQS (µg/kg	**Eikesdalsvatnet**
Anthracene	120-12-7	2400	0.73
Short-Chain (SCCPs) Chlorinated Paraffins	85535-84-8	6000	8.61
Medium-Chain Chlorinated Paraffins (MCCPs)	85535-26-1	170	19.41
Bis (2-etylheksyl) phthalate (DEHP)	117-81-7	2900	369
Decmethylcyclosiloxane (D5)	541-02-6	15217	14.39
Endosulfan	115-29-7	370	0.39
Hexachlorobutadien (HCBD)	87-68-3	55	0.04
HCB	A 118-74-1	10	15,8
Naphthalene	91-20-3	2400	0.73
Pentachlorophenol (PCP)	87-86-5	180	0.37
Benzo[a]pyrene	50-32-8	5	8.13
Tributyltin (TBT)	36643-28-4	150	0.60
Trichlorobenzene (TCBs)	12002-48-1	490	0.00
Tris(2-chloroethyl) phosphate (TCEP)	115-96-8	7304	0.49
Diflubenzuron	35367-38-5	730	0.00
Teflubenzuron	83121-18.0	609	0.00
Triphenyltin	892-20-6	152	0.00
PCB7	1336-36-3	0.6	14.15
Dioxins and dioxin-like PCBs		0,0065 TEQ	0.0006
PBDE	A 32534-81-9	0.0085	0.8800
HBCDD	134237-51-7	167	0.12
PFOA	3825-261	91.3	0.64
PFOS	1763-21-1	9.1	1.58
p-nonylfenol	A 84852-15-3	3000	0.00
4-tert- oktylfenol	140-66-9	0.004	0.050
Kvikksølv	A 7439-97-6	20	181
Triclosan	3380-34-5	15217	1.84
Dicofol	115-32-2	33	4.01

Table 22: Lake Femsjøen

Chemical(s)	CAS-nr.[1]	EQS (µg/kg	**Femsjøen**
Anthracene	120-12-7	2400	1.47
Short-Chain (SCCPs) Chlorinated Paraffins	85535-84-8	6000	12.76
Medium-Chain Chlorinated Paraffins (MCCPs)	85535-26-1	170	51.59
Bis (2-etylheksyl) phthalate (DEHP)	117-81-7	2900	531
Decmethylcyclosiloxane (D5)	541-02-6	15217	50.48
Endosulfan	115-29-7	370	1.73
Hexachlorobutadien (HCBD)	87-68-3	55	0.11
HCB	A 118-74-1	10	17
Naphthalene	91-20-3	2400	1.47
Pentachlorophenol (PCP)	87-86-5	180	0.29
Benzo[a]pyrene	50-32-8	5	3.86
Tributyltin (TBT)	36643-28-4	150	0.41
Trichlorobenzene (TCBs)	12002-48-1	490	0.10
Tris(2-chloroethyl) phosphate (TCEP)	115-96-8	7304	1.94
Diflubenzuron	35367-38-5	730	0.00
Teflubenzuron	83121-18.0	609	0.00
Triphenyltin	892-20-6	152	0.00
PCB7	1336-36-3	0.6	195.76
Dioxins and dioxin-like PCBs		0,0065 TEQ	0.0168
PBDE	A 32534-81-9	0.0085	18.9500
HBCDD	134237-51-7	167	11.89
PFOA	3825-261	91.3	0.24
PFOS	1763-21-1	9.1	2.77
p-nonylfenol	A 84852-15-3	3000	11.10
4-tert- oktylfenol	140-66-9	0.004	0.180
Kvikksølv	A 7439-97-6	20	817
Triclosan	3380-34-5	15217	3.77
Dicofol	115-32-2	33	12.76

Table 23: Lake Hornindalsvannet

Chemical(s)	CAS-nr.[1]	EQS (µg/kg	**Hornindalsvatnet**
Anthracene	120-12-7	2400	0.87
Short-Chain (SCCPs) Chlorinated Paraffins	85535-84-8	6000	4.19
Medium-Chain Chlorinated Paraffins (MCCPs)	85535-26-1	170	8.24
Bis (2-etylheksyl) phthalate (DEHP)	117-81-7	2900	192
Decmethylcyclosiloxane (D5)	541-02-6	15217	19.81
Endosulfan	115-29-7	370	0.08
Hexachlorobutadien (HCBD)	87-68-3	55	0.06
HCB	A 118-74-1	10	6.6
Naphthalene	91-20-3	2400	0.87
Pentachlorophenol (PCP)	87-86-5	180	0.28
Benzo[a]pyrene	50-32-8	5	2.82
Tributyltin (TBT)	36643-28-4	150	0.00
Trichlorobenzene (TCBs)	12002-48-1	490	0.00
Tris(2-chloroethyl) phosphate (TCEP)	115-96-8	7304	0.67
Diflubenzuron	35367-38-5	730	0.00
Teflubenzuron	83121-18.0	609	0.00
Triphenyltin	892-20-6	152	0.00
PCB7	1336-36-3	0.6	1.41
Dioxins and dioxin-like PCBs		0,0065 TEQ	0.0006
PBDE	A 32534-81-9	0.0085	0.4300
HBCDD	134237-51-7	167	0.18
PFOA	3825-261	91.3	0.00
PFOS	1763-21-1	9.1	1.85
p-nonylfenol	A 84852-15-3	3000	0.00
4-tert- oktylfenol	140-66-9	0.004	0.140
Kvikksølv	A 7439-97-6	20	127
Triclosan	3380-34-5	15217	0.88
Dicofol	115-32-2	33	4.19

Table 24: Lake Lundevatnet

Chemical(s)	CAS-nr.[1]	EQS (µg/kg	**Lundevatnet**
Anthracene	120-12-7	2400	0.86
Short-Chain (SCCPs) Chlorinated Paraffins	85535-84-8	6000	3.21
Medium-Chain Chlorinated Paraffins (MCCPs)	85535-26-1	170	9.01
Bis (2-etylheksyl) phthalate (DEHP)	117-81-7	2900	379
Decmethylcyclosiloxane (D5)	541-02-6	15217	21.76
Endosulfan	115-29-7	370	0.03
Hexachlorobutadien (HCBD)	87-68-3	55	0.04
HCB	A 118-74-1	10	4.1
Naphthalene	91-20-3	2400	0.86
Pentachlorophenol (PCP)	87-86-5	180	0.20
Benzo[a]pyrene	50-32-8	5	70.77
Tributyltin (TBT)	36643-28-4	150	0.78
Trichlorobenzene (TCBs)	12002-48-1	490	0.02
Tris(2-chloroethyl) phosphate (TCEP)	115-96-8	7304	1.71
Diflubenzuron	35367-38-5	730	0.00
Teflubenzuron	83121-18.0	609	0.00
Triphenyltin	892-20-6	152	0.00
PCB7	1336-36-3	0.6	20.12
Dioxins and dioxin-like PCBs		0,0065 TEQ	0.0006
PBDE	A 32534-81-9	0.0085	0.5000
HBCDD	134237-51-7	167	0.10
PFOA	3825-261	91.3	0.48
PFOS	1763-21-1	9.1	5.38
p-nonylfenol	A 84852-15-3	3000	7.43
4-tert- oktylfenol	140-66-9	0.004	0.100
Kvikksølv	A 7439-97-6	20	131
Triclosan	3380-34-5	15217	2.54
Dicofol	115-32-2	33	3.21

Table 25: Lake Mingevannet

Chemical(s)	CAS-nr.[1]	EQS (µg/kg	**Mingevannet**
Anthracene	120-12-7	2400	1.01
Short-Chain (SCCPs) Chlorinated Paraffins	85535-84-8	6000	4.74
Medium-Chain Chlorinated Paraffins (MCCPs)	85535-26-1	170	18.52
Bis (2-etylheksyl) phthalate (DEHP)	117-81-7	2900	217
Decmethylcyclosiloxane (D5)	541-02-6	15217	16.87
Endosulfan	115-29-7	370	0.08
Hexachlorobutadien (HCBD)	87-68-3	55	0.06
HCB	A 118-74-1	10	9.9
Naphthalene	91-20-3	2400	1.01
Pentachlorophenol (PCP)	87-86-5	180	1.24
Benzo[a]pyrene	50-32-8	5	2.94
Tributyltin (TBT)	36643-28-4	150	1.77
Trichlorobenzene (TCBs)	12002-48-1	490	0.00
Tris(2-chloroethyl) phosphate (TCEP)	115-96-8	7304	0.94
Diflubenzuron	35367-38-5	730	0.00
Teflubenzuron	83121-18.0	609	0.00
Triphenyltin	892-20-6	152	0.00
PCB7	1336-36-3	0.6	41.03
Dioxins and dioxin-like PCBs		0,0065 TEQ	0.0012
PBDE	A 32534-81-9	0.0085	6.6300
HBCDD	134237-51-7	167	0.53
PFOA	3825-261	91.3	0.00
PFOS	1763-21-1	9.1	6.62
p-nonylfenol	A 84852-15-3	3000	2.47
4-tert- oktylfenol	140-66-9	0.004	0.080
Kvikksølv	A 7439-97-6	20	430
Triclosan	3380-34-5	15217	0.51
Dicofol	115-32-2	33	4.74

Table 26: Lake Selsvatnet

Chemical(s)	CAS-nr.[1]	EQS (µg/kg	**Selsvatnet**
Anthracene	120-12-7	2400	0.75
Short-Chain (SCCPs) Chlorinated Paraffins	85535-84-8	6000	5.16
Medium-Chain Chlorinated Paraffins (MCCPs)	85535-26-1	170	22.67
Bis (2-etylheksyl) phthalate (DEHP)	117-81-7	2900	356
Decmethylcyclosiloxane (D5)	541-02-6	15217	8.26
Endosulfan	115-29-7	370	0.00
Hexachlorobutadien (HCBD)	87-68-3	55	0.04
HCB	A 118-74-1	10	2.2
Naphthalene	91-20-3	2400	0.75
Pentachlorophenol (PCP)	87-86-5	180	1.12
Benzo[a]pyrene	50-32-8	5	0.20
Tributyltin (TBT)	36643-28-4	150	0.95
Trichlorobenzene (TCBs)	12002-48-1	490	0.00
Tris(2-chloroethyl) phosphate (TCEP)	115-96-8	7304	1.01
Diflubenzuron	35367-38-5	730	0.00
Teflubenzuron	83121-18.0	609	0.00
Triphenyltin	892-20-6	152	0.00
PCB7	1336-36-3	0.6	0.43
Dioxins and dioxin-like PCBs		0,0065 TEQ	0.0002
PBDE	A 32534-81-9	0.0085	0.0700
HBCDD	134237-51-7	167	0.12
PFOA	3825-261	91.3	0.14
PFOS	1763-21-1	9.1	0.00
p-nonylfenol	A 84852-15-3	3000	3.58
4-tert- oktylfenol	140-66-9	0.004	0.150
Kvikksølv	A 7439-97-6	20	63
Triclosan	3380-34-5	15217	0.83
Dicofol	115-32-2	33	5.16

Table 27: Lake Smalfjordvannet

Chemical(s)	CAS-nr.[1]	EQS (µg/kg	**Smalfjorvannet**
Anthracene	120-12-7	2400	0.90
Short-Chain (SCCPs) Chlorinated Paraffins	85535-84-8	6000	2.39
Medium-Chain Chlorinated Paraffins (MCCPs)	85535-26-1	170	17.35
Bis (2-etylheksyl) phthalate (DEHP)	117-81-7	2900	653
Decmethylcyclosiloxane (D5)	541-02-6	15217	16.60
Endosulfan	115-29-7	370	0.79
Hexachlorobutadien (HCBD)	87-68-3	55	0.05
HCB	A 118-74-1	10	8.3
Naphthalene	91-20-3	2400	0.90
Pentachlorophenol (PCP)	87-86-5	180	1.46
Benzo[a]pyrene	50-32-8	5	2.52
Tributyltin (TBT)	36643-28-4	150	0.00
Trichlorobenzene (TCBs)	12002-48-1	490	0.00
Tris(2-chloroethyl) phosphate (TCEP)	115-96-8	7304	1.14
Diflubenzuron	35367-38-5	730	0.00
Teflubenzuron	83121-18.0	609	0.00
Triphenyltin	892-20-6	152	0.00
PCB7	1336-36-3	0.6	1.19
Dioxins and dioxin-like PCBs		0,0065 TEQ	0.0006
PBDE	A 32534-81-9	0.0085	0.1600
HBCDD	134237-51-7	167	0.12
PFOA	3825-261	91.3	0.00
PFOS	1763-21-1	9.1	1.58
p-nonylfenol	A 84852-15-3	3000	5.76
4-tert- oktylfenol	140-66-9	0.004	0.220
Kvikksølv	A 7439-97-6	20	163
Triclosan	3380-34-5	15217	2.05
Dicofol	115-32-2	33	2.25

Table 28: Lake Storvannet (Gamvik)

Chemical(s)	CAS-nr.[1]	EQS (µg/kg	**Storvannet**
Anthracene	120-12-7	2400	1.25
Short-Chain (SCCPs) Chlorinated Paraffins	85535-84-8	6000	5.79
Medium-Chain Chlorinated Paraffins (MCCPs)	85535-26-1	170	22.97
Bis (2-etylheksyl) phthalate (DEHP)	117-81-7	2900	145
Decmethylcyclosiloxane (D5)	541-02-6	15217	29.01
Endosulfan	115-29-7	370	0.43
Hexachlorobutadien (HCBD)	87-68-3	55	0.15
HCB	A 118-74-1	10	12.9
Naphthalene	91-20-3	2400	1.25
Pentachlorophenol (PCP)	87-86-5	180	0.27
Benzo[a]pyrene	50-32-8	5	2.93
Tributyltin (TBT)	36643-28-4	150	0.39
Trichlorobenzene (TCBs)	12002-48-1	490	0.07
Tris(2-chloroethyl) phosphate (TCEP)	115-96-8	7304	1.88
Diflubenzuron	35367-38-5	730	0.00
Teflubenzuron	83121-18.0	609	0.00
Triphenyltin	892-20-6	152	0.00
PCB7	1336-36-3	0.6	3.07
Dioxins and dioxin-like PCBs		0,0065 TEQ	0.0010
PBDE	A 32534-81-9	0.0085	1.2000
HBCDD	134237-51-7	167	0.00
PFOA	3825-261	91.3	0.39
PFOS	1763-21-1	9.1	4.16
p-nonylfenol	A 84852-15-3	3000	9.12
4-tert- oktylfenol	140-66-9	0.004	0.110
Kvikksølv	A 7439-97-6	20	157
Triclosan	3380-34-5	15217	6.56
Dicofol	115-32-2	33	7.47

Table 29: Lake Surtningen Vågå

Chemical(s)	CAS-nr.[1]	EQS (µg/kg	**Surtningen Vågå**
Anthracene	120-12-7	2400	1.20
Short-Chain (SCCPs) Chlorinated Paraffins	85535-84-8	6000	5.05
Medium-Chain Chlorinated Paraffins (MCCPs)	85535-26-1	170	10.60
Bis (2-etylheksyl) phthalate (DEHP)	117-81-7	2900	224
Decmethylcyclosiloxane (D5)	541-02-6	15217	16.79
Endosulfan	115-29-7	370	0.00
Hexachlorobutadien (HCBD)	87-68-3	55	0.05
HCB	A 118-74-1	10	5.2
Naphthalene	91-20-3	2400	0.74
Pentachlorophenol (PCP)	87-86-5	180	2.09
Benzo[a]pyrene	50-32-8	5	22.15
Tributyltin (TBT)	36643-28-4	150	0.11
Trichlorobenzene (TCBs)	12002-48-1	490	0.03
Tris(2-chloroethyl) phosphate (TCEP)	115-96-8	7304	0.65
Diflubenzuron	35367-38-5	730	0.00
Teflubenzuron	83121-18.0	609	0.00
Triphenyltin	892-20-6	152	0.00
PCB7	1336-36-3	0.6	0.62
Dioxins and dioxin-like PCBs		0,0065 TEQ	0.0002
PBDE	A 32534-81-9	0.0085	0.0200
HBCDD	134237-51-7	167	0.02
PFOA	3825-261	91.3	0.00
PFOS	1763-21-1	9.1	0.63
p-nonylfenol	A 84852-15-3	3000	3.24
4-tert- oktylfenol	140-66-9	0.004	0.090
Kvikksølv	A 7439-97-6	20	116
Triclosan	3380-34-5	15217	1.81
Dicofol	115-32-2	33	0.76

Table 30: Lake vangsvatnet

Chemical(s)	CAS-nr.[1]	EQS (µg/kg	**Vangsvatnet**
Anthracene	120-12-7	2400	0.74
Short-Chain (SCCPs) Chlorinated Paraffins	85535-84-8	6000	5.60
Medium-Chain Chlorinated Paraffins (MCCPs)	85535-26-1	170	13.97
Bis (2-etylheksyl) phthalate (DEHP)	117-81-7	2900	385
Decmethylcyclosiloxane (D5)	541-02-6	15217	14.33
Endosulfan	115-29-7	370	2.71
Hexachlorobutadien (HCBD)	87-68-3	55	0.07
HCB	A 118-74-1	10	10.8
Naphthalene	91-20-3	2400	0.74
Pentachlorophenol (PCP)	87-86-5	180	0.24
Benzo[a]pyrene	50-32-8	5	14.65
Tributyltin (TBT)	36643-28-4	150	0.30
Trichlorobenzene (TCBs)	12002-48-1	490	0.04
Tris(2-chloroethyl) phosphate (TCEP)	115-96-8	7304	1.46
Diflubenzuron	35367-38-5	730	0.00
Teflubenzuron	83121-18.0	609	0.00
Triphenyltin	892-20-6	152	0.00
PCB7	1336-36-3	0.6	2.37
Dioxins and dioxin-like PCBs		0,0065 TEQ	0.0001
PBDE	A 32534-81-9	0.0085	0.5600
HBCDD	134237-51-7	167	0.12
PFOA	3825-261	91.3	0.00
PFOS	1763-21-1	9.1	1.60
p-nonylfenol	A 84852-15-3	3000	3.12
4-tert- oktylfenol	140-66-9	0.004	0.160
Kvikksølv	A 7439-97-6	20	113
Triclosan	3380-34-5	15217	2.13
Dicofol	115-32-2	33	1.65

Table 31: Lake Ø Drensrudvann

Chemical(s)	CAS-nr.[1]	EQS (µg/kg	**Ø Drensrudvann**
Anthracene	120-12-7	2400	0.99
Short-Chain (SCCPs) Chlorinated Paraffins	85535-84-8	6000	10.13
Medium-Chain Chlorinated Paraffins (MCCPs)	85535-26-1	170	20.15
Bis (2-etylheksyl) phthalate (DEHP)	117-81-7	2900	223
Decmethylcyclosiloxane (D5)	541-02-6	15217	6.53
Endosulfan	115-29-7	370	1.04
Hexachlorobutadien (HCBD)	87-68-3	55	0.05
HCB	A 118-74-1	10	6.3
Naphthalene	91-20-3	2400	0.99
Pentachlorophenol (PCP)	87-86-5	180	0.99
Benzo[a]pyrene	50-32-8	5	2.16
Tributyltin (TBT)	36643-28-4	150	1.26
Trichlorobenzene (TCBs)	12002-48-1	490	0.00
Tris(2-chloroethyl) phosphate (TCEP)	115-96-8	7304	0.85
Diflubenzuron	35367-38-5	730	0.00
Teflubenzuron	83121-18.0	609	0.00
Triphenyltin	892-20-6	152	0.00
PCB7	1336-36-3	0.6	7.42
Dioxins and dioxin-like PCBs		0,0065 TEQ	0.0005
PBDE	A 32534-81-9	0.0085	0.9200
HBCDD	134237-51-7	167	0.13
PFOA	3825-261	91.3	0.00
PFOS	1763-21-1	9.1	5.87
p-nonylfenol	A 84852-15-3	3000	14.82
4-tert- oktylfenol	140-66-9	0.004	0.210
Kvikksølv	A 7439-97-6	20	1070
Triclosan	3380-34-5	15217	2.13
Dicofol	115-32-2	33	1.65

Table 32: Lake Øyeren

Chemical(s)	CAS-nr.[1]	EQS (µg/kg	**Øyeren**
Anthracene	120-12-7	2400	2.50
Short-Chain (SCCPs) Chlorinated Paraffins	85535-84-8	6000	7.21
Medium-Chain Chlorinated Paraffins (MCCPs)	85535-26-1	170	15.53
Bis (2-etylheksyl) phthalate (DEHP)	117-81-7	2900	1900
Decmethylcyclosiloxane (D5)	541-02-6	15217	19.08
Endosulfan	115-29-7	370	7.41
Hexachlorobutadien (HCBD)	87-68-3	55	0.08
HCB	A 118-74-1	10	7.4
Naphthalene	91-20-3	2400	2.50
Pentachlorophenol (PCP)	87-86-5	180	0.35
Benzo[a]pyrene	50-32-8	5	7.57
Tributyltin (TBT)	36643-28-4	150	1.95
Trichlorobenzene (TCBs)	12002-48-1	490	0.13
Tris(2-chloroethyl) phosphate (TCEP)	115-96-8	7304	2.58
Diflubenzuron	35367-38-5	730	0.00
Teflubenzuron	83121-18.0	609	0.00
Triphenyltin	892-20-6	152	0.00
PCB7	1336-36-3	0.6	22.34
Dioxins and dioxin-like PCBs		0,0065 TEQ	0.0006
PBDE	A 32534-81-9	0.0085	4.4600
HBCDD	134237-51-7	167	1.21
PFOA	3825-261	91.3	0.00
PFOS	1763-21-1	9.1	11.70
p-nonylfenol	A 84852-15-3	3000	6.32
4-tert- octylphenol	140-66-9	0.004	0.160
Kvikksølv	A 7439-97-6	20	763
Triclosan	3380-34-5	15217	5.11
Dicofol	115-32-2	33	3.96

9.2 Discussion

The levels of environmental pollutants measured in the 13 Norwegian lakes, were compared with environmental quality standards (EQS) set by EU (table 20-32). The EQS for PBDEs were exceeded in all the lakes and levels of PCB exceeded EQS in all lakes with the exception of Lake Selsvatnet. In a German study published in 2018, PBDE also exceeded the EQS in all fish (Fliedner et al., 2018). The German fish contained levels which were about four times higher than in Norwegian fish. In the same study, they analyzed fish from River Danube in the vicinity of industrial activity, which may explain the higher levels than in what we have found. Studies from Germany (Fliedner et al., 2018), Italy (Squadrone et al., 2013) and Spain (Bordajandi et al., 2003; Vives et al., 2005) show that the levels of PCB also exceed EUs environmental quality standards in these countries. The German study, published in 2018 and therefore most comparable with the Norwegian study, found levels that exceeded environmental quality standard PCB in all measured fish.

The EQS for mercury were exceeded in all lakes. The same trend was found in a study analyzing mercury levels in fish from all over Europe every year from 2007 to 2013 (Nguetseng et al., 2015). With the exception of one lake, the Hg levels in fish exceeded the EQS in all lakes and the highest level measured was 251 µg/kg (wet weight), which is over 12 times the standard (Nguetseng et al., 2015). Three of the Norwegian lakes had higher values in muscle than the highest level measured in the European survey. These lakes are Lake Ø Drengerudsvann (which had the highest level of 813 µg/kg (wet weight)) followed by Lake Femsjøen and Lake Øyeren.

EU has not established EQSs for cadmium in biota. However, the relatively high levels of Cd detected in Lake Lundevatnet and Lake Byglandsfjorden as well as Lake Hornindalsvatnet and, Lake Vangsvatnet suggest that these lakes may have been contaminated from potential point sources.

The levels of octylphenol exceeded EQS in all the Norwegian lakes. The scientific data on levels of octylphenol in fish are scarce. However, an Environmental Risk Evaluation on 4-tert-Octylphenol reported levels between 0.2 µg/kg and 5.5 µg/kg ww in German freshwater fish collected between 1992 and 1997, which is higher than in the Norwegian lakes (0.05 – 0.22 µg/kg) (UKEA, 2006).

For the perfluorinated compounds (PFAS), EU has established EQS for PFOS and PFOA. In this survey, it was found that fish from Lake Øyeren had PFOS levels which exceeded the EQS. However, fish from none of the lakes had PFOA levels which exceeded the EQS. The mean PFOS level (3,67 ng/g ww) in the Norwegian lakes was lower than the levels measured in two fish species in Germany (123 ng/g ww and 295 ng/g ww (Becker et a, 2010)).

The EQS value for dioxin was only exceeded in Lake Femsjøen, whereas all the other lakes had values below the dioxin EQS for biota. In a German survey EQS for dioxin was exceeded in fish from about 40% of the sampling locations, suggesting that the dioxin contamination is lower in Norwegian freshwaters compared to German waters (Fliedner et al, 2016).

The fact that the levels of PBDE, mercury and octylphenol exceed EU EQS in all 13 lakes and PCBs in 12 of 13 lakes suggests that levels of these substances in Norwegian lakes do not meet the environmental requirements in Europe. However, these results are comparable with results from different European countries which may indicate an environmental problem across Europe. In order to protect the aquatic ecosystem (ensuring protection for the most sensitive species), the EU's EQSs are set lower than the European limit values (Minimum Residual Limit Levels (MRLs)) for foodstuffs and animal feed.

9.3 References

Becker AM, Gerstmann S, Frank H. 2010. Perfluorooctanoic acid and perfluorooctane sulfonate in two fish species collected from the Roter Main River, Bayreuth, Germany. Bull Environ Contam Toxicol. 84:132-135.

Bogdal, C., Alsberg, T., Diefenbacher, P., MacLeod, M., Berger, U. (2015) Fast quantification of chlorinated paraffins in environmental samples by direct injection high-resolution mass spectrometry with pattern deconvolution. Analytical Chemistry, 2015, 87, 2852-2860.

Bordajandi, L.R., Go´mez, G., Ferna´ndez, M.A., Abad, E., Rivera, J., Gonza´les, M.J., 2003. Study on PCBs, PCDD/Fs, organochlorine pesticides, heavy metals and arsenic content in freshwater fish species from the River Turia (Spain). Chemosphere 53, 163–171.

Fliedner A, Lohmann N, Rüdel H, Teubner D, Wellmitz J, Koschorreck J. 2016. Current levels and trends of selected EU Water Framework Directive priority substances in freshwater fish from the German environmental specimen bank. Environ Pollut. 216:866-876.

Fliedner A, Rüdel H, Lohmann N, Buchmeier G, Koschorreck J. 2918. Biota monitoring under the Water Framework Directive: On tissue choice and fish species selection. Environ Pollut. 235:129-140.

Ma, X., Zhang, H., Wang, Z., Yao, Z., Chen, J., Chen, J. Bioaccumulation and Trophic Transfer of Short Chain Chlorinated Paraffins in a Marine Food Web from Liaodong Bay, North China. Environmental Science and Technology, 2014, 48, 5964-5971.

Miljødirektoratet rapport. NIVA. 2017. Miljøgifter i store norske innsjøer, 2016. Rapport 7184-2017; Prosjekt O-13223; ISBN 978-82-577-6919-2

Norwegian Pollution Control Authority. Screening of selected priority substances of the Water Framework Directive in marine samples 2004 – 2008. SPFO-report: 1060/ 2009, TA-2564/ 2009 ISBN 978-82-577-5611-6.

Nguetseng R, Fliedner A, Knopf B, Lebreton B, Quack M, Rüdel H. 2015. Retrospective monitoring of mercury in fish from selected European freshwater and estuary sites. Chemosphere. 34:427-434.

Squadrone S, Favaro L, Prearo M, Vivaldi B, Brizio P, Abete MC. 2013. NDL-PCBs in muscle of the European catfish (Silurus glanis): an alert from Italian rivers. Chemosphere. 2013 93:521-525.

UKEA, UK Environmental Agency. 2006. Environmental Risk Evaluation Report: 4-tert-Octylphenol.
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/290844/scho0405biyz-e-e.pdf

van den Berg M, Birnbaum LS, Denison M, De Vito M, Farland W, Feeley F, Fiedler H, Hakansson H, Hanberg A, Haws L, Rose M, Safe S, Schrenk D, Tohyama C, Tritscher A, Tuomisto J, Tysklind M, Walker N, Peterson RE. 2006. The 2005 World Health Organization reevaluation of human and mammalian toxic equivalency factors for dioxins and dioxin-like compounds, Toxicol. Sci. 93:223–241.

Vives, I., Grimalt, J.O., Ventura, M., Catalan, J., Rosseland, B.O., 2005. Age dependence of the accumulation of organochlorine pollutants in brown trout (Salmo trutta) from a remote high mountain lake (Redo´, Pyrenees). Environ. Pollut. 133, 343–350.

Xie, Z., Ebinghaus, R., Flöser, G., Caba, A., Ruck, W. Occurrence and distribution of triclosan in the German Bight (North Sea). Environmental Pollution, 2008, 156, 1190-1195.

Xie, Z., Ebinghaus, R., Temme, C., Lohmann, R., Caba, A., Wolfgang, R. Occurrence and Air−Sea Exchange of Phthalates in the Arctic. Environmental Science and Technology, 2007, 41, 4555-4560.

Yuan, B., Bogdal, C., Berger, U., MacLeod, M., Gebbink, W., Alsberg, T., de Wit, C. Quantifying short-chain chlorinated paraffin congener groups. Environmental Science and Technology, 2017, 51, 10633–10641.

9.4 Materials and Methods

9.4.1 Collection of fish

Fish were sampled by the Norwegian Institute for Nature Research (NINA) as part of an assignment for ecosystem monitoring. Frozen fish were brought to the Norwegian School of Veterinary Science at the Norwegian University of Life Sciences (NMBU), where pooled samples was prepared. A project number was assigned to each sample (appendix 1). Most samples were

prepared from pooled livers, but two samples were prepared from whole fish due to small specimens. From whole fish samples, liver slices for metal analyses were collected prior to homogenization.

9.4.2 Choice of species, tissue and sample category

In the present report, the sampling program included fish caught during summer and autumn 2017 from 13 lakes. Pooled samples were prepared by pooling 15 specimens from each lake into 3 samples, in total 39 samples. Due to small specimens, samples from one lake (Selsvatnet) were prepared from whole fish. In most lakes, trout (*Salmo trutta*) was sampled, but sampling also included arctic char (*Salvelinus alpinus* (3 samples)), pike (*Esox lucius* (2 samples)), burbot (*Lota lota* (1 sample)) and silver bream (*Blicca bjoerkna,* 1 sample). 1.1.3

A rough overview of the available fish was first presented to Miljødirektoratet for final choice of specimens for each sample. Individual data for fish used to prepare each sample is shown in appendix 1 including location, length, weight and species, and whether the sample was prepared from liver or whole fish. The individual fish were assigned a letter to show how the pooled samples had been made. For each lake, all individual fish with the same letter were pooled into one sample.

9.4.3 Analyses at the Institute for Energy Technology (IFE)

1.1.3.1 Isotope analyses
Pooled muscle samples were used for measurements of Isotopes, δ 13C and δ 15N. Approximately 1.5 mg sample was placed in a Sn- capsule for combustion with access to O_2 and Cr_2O_3 1700 ºC in a Eurovector EA3028 element instrument. The reduction of NOx to N_2 took place in a Cu heater at 650 ºC. H_2O was removed in a chemical $Mg(ClO_4)_2$ trap before separation of N_2 and CO_2 in a 2 m Poraplot Q GC column. N_2 and CO_2 were injected directly on-line to a Horizon Isotope Ratio Mass Spectrometer (IRMS) from Nu-Instruments, for δ 15 N and δ 13 C determination.

9.4.4 Analyses at the Norwegian University of Life Sciences (NMBU)

1.4.4.1 Metal analyses
The following metals were analysed in liver samples at the Metal Laboratory at the Norwegian University of Life Sciences (NMBU) : Li, Al, V, Cr, Fe, Co, Ni, Cu, Zn, As, Se, Mo, Ag, Cd, Hg and Pb. Hg was also analysed in muscle. The samples were weighed, with approximately 250 mg (liver) or 500 mg (muscle) in ultra pure teflon tubes. Then 5 mL HNO3 (Ultrapure, subboiled) was added, and HCl to prevent loss of Hg. Internal standards consisting of Sc, Ge, Rh, In and Bi were added. Then the samples were decomposed at 260 ºC for at least 20 min in an UltraClave from Milestone. For each series, at least one certified reference material (CRM) was analysed, with at least 3 blanks. After decomposing, the samples were diluted to 50.0 mL using distilled water in centrifuge tubes from Sarstedt. Glass and filters are avoided to reduce contamination. The samples were then analysed on Agilent 8800 QQQ ICP-MS against standards for each element.

1.4.4.2 Analyses of organic chemicals at NMBU
The extraction of chemicals from the fish samples were performed using one method for fluorinated components, and another method for the rest of the components. Most of the analyzed chemicals were extracted using nonpolar solvents in the laboratory's multimethod (MT 2.2). For the fluorinated components, a different method (M-MT.2.7) was applied.

1.4.4.3 Analyses of fluorinated chemicals

Perfluorinated sulfonates and derivatives (PFAS), and Perfluorinated carboxylic acids were extracted and quantified. The following perfluorinated sulfonates and derivatives were analyzed (CAS nr): PFBS (375-73-5), PFHxS (355-46-4), PFOS (1763-23-1), PFOSA (754-91-6), N-EtFOSA (4151-50-2), N-MeFOSA (31506-32-8) N-Et-FOSE (1691-99-2), N-MeFOSE (24448-09-7), N-Et-FOSEA (423-82-5), N-MeFOSEA (25268-77-3). The following perfluorinated carboxylic acids (6 – 14 C-atoms) were analyzed: PFHxA (307-24-4), PFHpA (375-85-9), PFOA (335-67-1), PFNA (375-95-1), PFDA (335-76-2), PFUnDA (2058-94-8), PFDoDA (307-55-1), PFTrDA (72629-94-8), PFTeDA (376-06-7). The two groups were analyzed using the same method (M-MT.2.7). Because of the possible adhesion to glass for these chemicals, all extraction equipment are made of plastic. A 0.5 g sample was weighed in a 15 mL centrifuge tube with internal standards (^{13}C) added. After adding 5 mL methanol, samples were homogenized using an Ultra-Turrax®, IKA homogenizer. The samples were then shaken, using an IKA Vibrax VXR®, 2000 rpm, 30 min, and centrifuged at 3000 rpm for 10 min. The upper phase was transferred to a new tube, and a new extraction with 3 mL methanol was performed. After evaporation to 2 mL on a TurboVap®, under a flow of N_2, 0.3 g Envi-Carb® was added. This compound is actively using carbon for lipid removal from the samples. The tubes were shaken, centrifuged and the upper phase transferred to a new tube. The precipitate was extracted again, and the sample reduced to 1 mL before analysis on a LC/MS/MS system. This consists of Agilent triple quad 6460 LC/MS/MS1100 series (Auto sampler, quaternary pump, degasser), and API 3000 LC/MS/MS system equipped with Supelco, Discovery C18 column, 15 cm x 2,1 mm, 5 µm with pre column; Supelco, superguard Discovey 18, 2 cm x 2,1 mm, 5 µm. Mobil phases A: 2 mM ammonium acetate in methanol. B: 2 mM ammonium acetate in water.

1.4.4.4 Analyses of other organic chemicals

The laboratory's multimethod (M-MT.2.2.) was used for extraction. First around 3 gram fish sample (liver or whole fish) was weighed. Internal standards for PCBs HCB, DDTs and phenols are added: PCB-29, -112 and -207 (Ultra Scientific, RI, USA). For brominated compounds: BDE-77, -119 and -181 and $^{13}C_{12}$-BDE-209 (Cambridge Isotope Laboratories, Inc., MA, USA). Cyclohexane (CHX), acetone and distilled water (20:15:10 mL) were added, before further homogenization with an Ultra-Turrax®, IKA homogenizers and an ultra sonicator. After centrifuging (3000 rpm, 10 min), the organic upper phase was transferred to a Zymark® evaporation unit, and the water phase extracted a second time with CHX and acetone (10:5 mL). After evaporation, the upper phase was volume adjusted to 5 mL. One mL of this extract was used for gravimetric lipid determination.

1.4.4.5 Analyses of phenols

The following phenols were analysed: 4-nonylphenol (84852-15-3) and 4-tert-oktylphenol (140-66-9). 2mL lipid extract was cleaned using gel permeation chromatography, Bio-Beads S-X3, 200-400 mesh (Bio-Rad Laboratories, Inc., CA, USA) with mobile phase 1:1 Chx/ethyl acetate on a «Freestyle Robotic System, Type Basic, 740 mm Working Area and GPC-module". After pentafluorobenzoyl chloride derivatization and evaporation to 0,5 mL, 1 mL 1M NaHCO3 and 0,5 mL 1 M NaOH were added and the samples were shaken. Then 1 mL CHX and 50 µL 10% pentafluorobenzoyl chloride were added, and the samples were shaken and kept hot (60 °C for 30 min). After cooling, 4 mL 1 M NaOH was added and the samples kept cool overnight. Room temperature samples were extracted with 2 x 2 mL CHX and the volume reduced to 150µL under a gentle stream of N_2. Phenols were then quantified on a HRGC–LRMS (Agilent 6890 Series; Agilent Technologies), with an auto sampler (Agilent 7683 Series; Agilent Technologies) and coupled to a MS detector (Agilent 5973Network; Agilent Technologies). Component separation and identification were done using a DB-5 MS column (30 m, 0.25 mm i.d., 0.25 µm film thickness; J&W Scientific). Carrier gas was Helium and reagent gas Methane 5.5. The temperature program was: start 90 °C; 20 °C/min to 140 °C; 5 °C/min increase to 260 °C; 25 °C/min to 310 °C (hold 2 min); total run time 31,50 min.

1.4.4.6 Analyses of HCB, PCB, DDTs, PBDE and HBCDD

The extracts were cleaned using ≥ 97.5% H_2SO_4 (Fluka Analytical®). Then the extracts were up-concentrated to 0,25 mL under a flow of N_2. The following OCs were analysed: HCB, PCB 7 (PCB 28, -52, -101, -118, -138, -153 and -180), DDTs (*p,p'*-DDE, *o,p'*-DDD, *p,p'*-DDD, *o,p'*-DDT and *p,p'*-DDT). Separation and detection of PCB, HCB and DDTs were done on a «high resolution gas chromatograph" (HRGC) (Agilent 6890 Series gas chromatography system; Agilent Technologies, PA, USA) equipped with an auto sampler (Agilent 7683 Series; Agilent Technologies), coupled to a MS detector (Agilent 5975C Agilent Technologies) run in a negative chemical ionization (NCI) condition with selected ion monitoring (SIM). The components were separated using a DB-5 MS column (J&W Scientific, Agilent Technologies) (60 m, 0.25 mm i.d., 0.25 µm film thickness). The temperature program was: 90 °C (2 min hold); 25 °C/min increase to 180 °C (2 min hold); 1.5 °C/min increase to 220 °C (2 min hold); and 3 °C/min increase to 275 °C (12 min hold) and 25 °C/min increase to 300 °C (4 min hold). Total run time was 71,6 min. Carrier gas helium, make up gas nitrogen. The following brominated diphenyl ethers (PBDE) were quantified: BDE-28, -47, -99, -100, -153, -154, -183, -196, -202, -206, -207 and -209, and also HBCDD (α-HBCDD, ß-HBCDD, γ-HBCDD). BDE -28, -47, -99, -100, -153, -154, -183, and HBCDD (sum) were quantified on a HRGC–LRMS (Agilent 6890 Series; Agilent Technologies), with an auto sampler (Agilent 7683 Series; Agilent Technologies) connected to a MS detector (Agilent 5973 Network; Agilent Technologies). Separation and identification of the components were done using a DB-5 MS column (30 m, 0.25 mm i.d., 0.25 µm film thickness; J&W Scientific). The temperature program was: start 90 °C; 25 °C/min increase to 180 °C; 2,5 °C/min increase to 220 °C (hold 1 min); 20 °C/min increase to 320 °C (hold 5 min); total run time 31,60 min. Carrier gas helium, makeup gas nitrogen. For detection of BDE 196, -202, -206, -207 and -209, the extracts (10 µL) were injected on a GC–MS (Agilent 6890 Series/5973Network) configured with a programmed temperature evaporation (PTV) injector (Agilent Technologies). For separation and identification a DB-5-MS column (10 m, 0.25 mm i.d., 0.10 µm film thickness; J&W Scientific, Agilent Technologies) was used. The temperature program was: start 80 °C (hold 2 min); 30 °C/min increase to 315 °C (hold 6 min); total run time 15.83 min. Carrier gas helium, makeup gas nitrogen. For PBDE and HBCDD detection, negative chemical ionizing (NCI) in selected ion monitoring (SIM) (with m/z 79/81. BDE-209 m/z 484/486 and $^{13}C_{12}$-BDE-209 at m/z 495/497) was used.

1.4.4.7 Quality assurance

The laboratory is accredited by the Norwegian Accreditation for testing the analyzed chemicals in biological material according to the requirements of the NS-EN ISO/IEC 17025 (TEST 137). Every analytical series included three procedural blanks (solvents), one blind (non-spiked brown trout (*Salmo trutta*)), two spiked samples of brown trout for recoveries and the laboratory's own reference materials (LRMs) of blubber of harp seal (*Pagophilus groenlandicus*). The lowest levels of detection (LODs) for individual compounds were defined as three times the noise level. The quality control parameters were within the accepted ranges for the method. In addition to the laboratory's own blubber RLM, analytical quality is successfully approved by routinely analyzing relevant Certified Reference Materials (CRM). One of them was mackerel oil (CRM 350). Further, the laboratory participates in relevant inter calibration tests such as the 2011 MOE Inter laboratory study for the Northern Contaminants Program (NCP) III — phase 6 on lake trout (*Salvelinus namaycush*) and brown trout organized by the Ontario Ministry of the Environment, Laboratory Services Branch.

9.4.5 Analyses at Institute of Environmental Science and Health, Geesthacht, Germany (MINJIE)

1.4.5.1 Chemicals and materials

The analyses were performed at Institute of Environmental Science and Health, Geestacht, Germany. The native standards, including short-chain chlorinated paraffin (SCCPs, C10-13) and medium-chain chlorinated paraffins (MCCPs, C14-17), decamethylcyclopentasiloxane (D5), polycyclic aromatic hydrocarbon mixtures (naphthalene, anthracene, fluoranthene and benzo(a)pyrene), hexachlorobutadiene (HCBD), trichlorobenzene isomers (135-TCB, 124-TCB, 123-TCB), dicofol, diethylhexyl phthalate (DEHP), *tris*(2-chloroethyl) phosphate (TCEP),

triclosan (TCS), pentachlorophenol (PCP), tributyltin, and triphenyltin isomers, were purchased from LGC Standards (Wesel, Germany) and Sigma Aldrich Germany, respectively. D5-$^{13}C_{10}$, DEP-d4, DnBP-d4, Naphthalene d8, Anthracene d10, Fluoranthene d10 and TCEP-d12 were supplied from Cambridge Isotope Laboratories, Inc. USA. The standards including tributyltin chloride (TBT, 90%), dibutyltin dichloride (DBT, 97%), monobutyltin trichloride (MBT, 97%), tetrabutyltin (TeBT, 96%) and triphenyltin were purchased from Acros Organics (New Jersey, USA). TeBT was used as an internal standard. Organic solvents e.g., acetone, *n*-hexane and dichloromethane (DCM) were for residual analysis. Neutral silica gel (0.1-0.2 mm, Macherey-Nagel, Düren, Germany) and anhydrous sodium sulfate (Merck purity 99%, Darmstadt, Germany) were baked at 450°C for 12 h. Silica gel was deactivated with 10% (w:w) of Millipore water. The organic solvents e.g., acetone, n-hexane and dichloromethane (DCM) were of residual analysis grade, and redistilled using glass system. Laboratory glassware was baked at 250 °C for 12 h, and then rinsed with acetone and n-hexane.

1.4.5.2 Sample extraction and fractionation

The fish liver samples (0.5 – 2.0 g) were homogenized with 10 g anhydrous sodium sulfate and packed in 50 mL centrifuge glass vial. 10 ng of Naphthalene d8, Anthracene d10, Fluoranthene d10, benzo(a)pyrene d12, DEP-d4, DnBP-d4 and 20 ng of TCEP-d15 were added as internal standards. The samples were then extracted with 20 mL n-hexane/DCM (1:1v:v) by 30-min sonication for three times. After centrifugation, the clear extracts were combined and concentrated down to 2 mL. The samples were equally split into part A and B for analysis of different substances. Part A was purified using a GPC column with SX-3 Bio-Beads (40 g), eluted with a mixture of n-hexane/DCM (3:7) at 5 mL/min. The fraction 1 containing SCCP and MCCP was further cleaned on a column packed with 20 g of acidified silica gel, and eluded with 150 mL n-hexane/DCM (1:1). The elute was concentrated to dryness with nitrogen. The sample volume was redefined with addition of 50 µL of isooctane. 10 ng ^{13}C labeled chloroparaffin (1,5,5,6,6,10-$C_{10}Cl_5$) and 20 ng Dechlorane 603 were spiked as internal standards (Ma et al., 2014). Fraction 2 was concentrated down to 150 µL and spiked with 20 ng of D5-$^{13}C_{10}$ as injection standards. Fraction 2 was used for the analysis of TCEP, DEHP, dicofol, TCS and PCP. Part B was cleaned on a neutral silica gel column (2.5 g, 10 % water deactivated) topped on 3 g anhydrous granulated sodium sulfate. The extract was purified by eluting with 20 mL hexane (fraction 1) and 20 mL acetone/DCM (1:1$_{V/V}$) (fraction 2), respectively. Fraction 1 was concentrated down to 150 µL and spiked with 20 ng D5-$^{13}C_{10}$ as injection standard. Fraction 1 was used for the determination of D4, D5, HCBD, 135-TCB, 124-TCB, 123-TCB, naphthalene, anthracene, fluoranthene, benzo(a)pyrene and HCB.

1.4.5.3 Extraction for tributyltins (TBT) and triphenyltin (TPhT)

About 1 g fish liver sample was used to measure organotin concentrations. After it was mixed with appropriate amount of internal standard TeBT, 10 mL of THF–HCl (11:1, v/v) solution was added and then extracted with 25 mL 0.01% (m/v) tropolone–hexane solution under vigorous shaking for 40 min. The supernatant was transferred to a flask and the residue was extracted again in the same way with another 10 mL of hexane for 10 min. The combined extract was concentrated to about 2–3 mL and subjected to Grignard propylation. The analytes were purified using a chromatography column packed with anhydrous Na2SO4 (2 g), silica gel (2 g) and Florisil (2 g) in turn from the top. The elution was conducted with 10 mL of hexane, and concentrated down to 200 µL under a gentle stream of pure nitrogen.

1.4.5.4 Instrumental analysis of SCCP, MCCP, PAH, DEHP, TCEP, TCS, PCP,

Method 1 was applied for the determination of D4, D5, HCBD, 135-TCB, 124-TCB, 123-TCB, naphthalene, anthracene, fluoranthene, benzo(a)pyrene and HCB using GC-MS-EI. The samples were analyzed with an Agilent 6890N gas chromatography coupled to an Agilent 5975 mass spectrometer (GC-MS) (Agilent Technologies, Avondale, PA, USA), operating in electron impact and selective ion monitoring modes (SIM), and a HP-5MS capillary column (30 m × 250 µm i.d.; 0.25 µm film thickness, J&W Scientific) for chromatographic separation. The transfer line and the ion source temperature were maintained at 280 and 230 °C, respectively. The column temperature program was initiated at 60 ºC for 2.0 min, increased to 120 °C at a rate of 10

ºC/min held for 10 min. The oven temperature was further ramped at 2 °C/min to 240 °C and then ramped at 30°C/min to 300°C and kept for 10 min. The flow rate of the carrier gas helium was kept constant at 1.3 mL min^{-1}.The flow rate of the carrier gas helium was kept constant at 1.3 mL min^{-1}. The extracts (1.0 μL) were injected onto GC-MS in splitless mode with an inlet temperature of 280 °C. Quantitation was performed using the internal calibration method based on 5-point calibration curve for individual substances. The response factors were derived from the calibration curves (7-points) made for response ratio between targets compounds and internal standards.

Method 2 was applied for the determination of TCEP, dicofol, DEHP, DEP, DiBP and DnBP using GC-MS-EI. The samples were analyzed with an Agilent 6890N gas chromatography coupled to an Agilent 5975 mass spectrometer (GC-MS) (Agilent Technologies, Avondale, PA, USA), operating in electron impact and selective ion monitoring modes (SIM), and a HP-5MS capillary column (30 m × 250 μm i.d.; 0.25 μm film thickness, J&W Scientific) for chromatographic separation. The transfer line and the ion source temperature were maintained at 280 and 230 °C, respectively. The column temperature program was initiated at 60 ºC for 2.0 min, increased to 120 °C at a rate of 10 ºC/min held for 10 min. The oven temperature was further ramped at 2 °C/min to 240 °C and then ramped at 30°C/min to 300°C and kept for 10 min. The flow rate of the carrier gas helium was kept constant at 1.3 mL min^{-1}. The extracts (1.0 μL) were injected onto GC-MS in splitless mode with an inlet temperature of 280 °C. Quantitation was performed using the internal calibration method based on 5-point calibration curve for individual substances. The response factors were derived from the calibration curves (7-points) made for response ratio between targets compounds and internal standards (Xie et al., 2007).

Method 3 was applied for the determination of PCP and TCS using GC-MS-EI. The samples were analyzed with an Agilent 6890N gas chromatography coupled to an Agilent 5975 mass spectrometer (GC-MS) (Agilent Technologies, Avondale, PA, USA), operating in electron impact and selective ion monitoring modes (SIM), and a HP-5MS capillary column (30 m × 250 μm i.d.; 0.25 μm film thickness, J&W Scientific) for chromatographic separation. The column temperature program was initiated at 60 ºC for 2.0 min, increased to 120 °C at a rate of 10 ºC/min held for 10 min. The oven temperature was further ramped at 2 °C/min to 240 °C and then ramped at 30°C/min to 300°C and kept for 10 min. The flow rate of the carrier gas helium was kept constant at 1.3 mL min^{-1}. The flow rate of the carrier gas helium was kept constant at 1.3 mL min^{-1}. Before the injection, a derivatization step was carried out following the method reported by xie et al. (2018). Briefly, 50 µL of BSTFA+1% TMS was added for derivatization and 5 ng octylphenol 13C6 (OP-$_{13}C^6$) was spiked as internal standard for quantitation. The reaction was carried out for 60 min at 60°C. The samples (1.0 μL) were injected onto GC-MS in splitless mode with an inlet temperature of 280 °C. Quantitation was performed using the internal calibration method based on 5-point calibration curve for individual substances. The response factors were derived from the calibration curves (7-points) made for response ratio between targets compounds and internal standards OP-13C6.
Method 4 was applied for the determination of SCCP, MCCP and LCCP using APCI-QTOF-MS. SCCP, MCCP and LCCP have been analyzed with the direct injection full scan method (scan range m/z 250 – 1000) using quadrupole time-of-flight high-resolution mass spectrometry (APCI-QTOF-MS) (QTOF Premier, Waters, Manchester, UK), which has developed by Bogdal et al. (2015) and Yuan et al. (2017). The observed resolution was 9,000 to 10,000 FWHM. All the chemicals and extracts were analyzed in cyclohexane to be consistent with the solvent of the chain length standards. 10 ng 13C labeled chloroparaffin (1,5,5,6,6,10-C10Cl5) and 20 ng Dechlorane 603 were spiked as internal standards.

Method 5 was applied for the determination of tributyltin (TBT), dibutyltin (DBT) and monobutyltin (MBT), triphenyltin (TPT), diphenyltin (DPT) and monophenyltin (MPT) using GC-FPD. The samples were analyzed with an Agilent 7890 gas chromatography coupled to a flame photometric detector equipped with Sn-filter (650 nm) (GC-FPD). Organotin compounds were based-line separated with a HP-5 fused-silica capillary column (30m× 0.32 mm×0.25 µm). The oven temperature program conditions were 80 °C held for 1 min, ramped at 5 °C/min to 190 °C then ramped at 10°C/min to 240°C held for 10min. The temperatures of the detector and the injector were kept at 250 °C. High pure nitrogen severed as carrier gas and kept at 2

mL/min, and the flow rate of hydrogen and air were 120 and 100 mL/min, respectively.

1.4.5.5 Quality assurance

In this report, the concentrations of the target compounds in fish liver samples are defined as the masses of the analytes divided by the masses of fish liver, and normally expressed as ng/g. As fish liver with a more stable water content the concentration is normally given on a wet weight base (g/g w.w.). Quantification was performed by the internal standard method. Three procedural blanks were performed to check the interference and cross-contamination. The method detection limits (MDLs) were calculated by the means of three procedure blanks plus 3 times of the standard diversions. The recoveries of the sample preparation were determined by spiking target compounds to the matrixes. The analytical method adopted for TBT, DBT, MBT, TPT, DPT and MPT have been certified with international laboratory inter calibration. The recoveries for TBTs were achieved by analyzing certified reference materials. As the analytical methods adopted for other compounds have not been certified through laboratory inter calibration exercises, the measurement uncertainty were estimated roughly between 10 and 50 % (TA-2564/ 2009). The concentrations reported in this work were not subtracted from procedure blanks.

9.4.6 Analyses at Institute of Marine Research (IMR)

1.4.6.1 Diflubenzuron and teflubenzuron

The analytes were extracted with acetone. Solid phase extraction was used for sample clean up. The samples were analysed and quantified by LC-MS/MS as described in (Samuelsen et al. 2014). The method is accredited as a screening method in liver.

1.4.6.2 Dioxins, dl-PCBs

This method is an adaptation to modern clean-up equipment of the US-EPAs (Environmental Protection Agency) methods No. 1613 and 1668. Separation and quantification were performed by high resolution gas chromatography/high resolution mass spectrometry (HRGC/HRMS). The method determines all of the 29 compounds on the WHO list: 17 PCDD / PCDF congeners, four non-ortho substituted PCBs: PCB -77, 81, 126 and 169 and eight mono-ortho substituted PCBs: PCB-105, 114, 118, 123, 156, 157, 167 and 189. The method has been further described in Berntssen et al. (2010). The PCBs included in PCB-6, PCBs no. 28, 52, 101, 138, 153 and 180, are analysed by GC-MS/MS. The method is accredited for the analysis of fish liver.

1.4.6.3 Poly-aromatic hydrocarbons (PAH)

Samples were freeze-dried and mixed with hydromatrix (Agilent, Santa Clara Cal. USA) and internal standard (US EPA 16 PAH Cocktail (13C, 99 %), CIL ES-4087) were added, before the PAH are extracted using dichloromethane : cyclohexane (1:3) with use of Accelerated Solvent Extractor (ASE) at 100ºC and 1500 psi. Fat is partly removed on-line using silica gel. The extracts are evaporated on a TurboVap®, and purified further on SPE columns (Envichrom). The solvent is changed to isooctane and the samples concentrated to 50 µL before addition of recovery standard (3-Fluorchrysene, Chiron 1317.18-100-T). The samples were subsequently analysed by GCMSMS. A calibration curve is included in each series for quantification. The method determines 16 PAHs, and is accredited for most of these as specified in table 1.

1.4.6.4 Quality assurance

The laboratory routines and the analytical methods at Institute of Marine Research (IMR) are accredited in accordance with the standard ISO 17025. A summary of the analytical methods, their limit of quantification (LOQ) and accreditation status are shown in table 1. The LOD is the lowest level at which the method is able to detect the substance, while the LOQ is the lowest level for a reliable quantitative measurement. For all methods, a quality control sample (QC) with a known composition and concentration of target analyte, is included in each series. The methods are regularly verified by participation in inter laboratory proficiency tests, and by analysing certified reference material (CRM), where such exist.

9.5 Fish data and analytical results

Fish data for each sample is shown in table 33. Individual length and weight for specimens included in each sample are shown in table 34. Analytical results for individual samples are shown in table 35.

Table 33. Mean weight, length and lipid % in fish samples (project number 1 – 39 2017)

Project	Species	Lake	Tissue	Fish	Fish	Lipid
Number				weight (g)	length (cm)	%
1	Trout	Liver	Eikesdalsvatnet	276	30	3,52
2	Trout	Liver	Eikesdalsvatnet	400	34	2,63
3	Trout	Liver	Eikesdalsvatnet	647	40	4,27
4	Perch	Liver	Ø Drengsrudvann	729	37	3,30
5	Perch	Liver	Ø Drengsrudvann	1099	42	3,74
6	Perch	Liver	Ø Drengsrudvann	1405	46	3,62
7	Perch	Liver	Øyeren	184	25	4,66
8	Perch	Liver	Øyeren	397	32	3,35
9	Perch	Liver	Øyeren	682	36	3,47
10	Arctic char	Liver	Storvannet	334	33	3,34
11	Trout	Liver	Storvannet	246	28	4,03
12	Trout	Liver	Storvannet	454	34	3,91
13	Pike	Liver	Femsjøen	1621	64	4,59
14	White bream	Liver	Femsjøen	547	33	3,42
15	Burbot	Liver	Femsjøen	836	51	30,2
16	Pike	Liver	Mingevannet	1444	63	4,36
17	Perch	Liver	Mingevannet	456	31	3,13
18	Pikeperch	Liver	Mingevannet	1387	53	5,27
19	Trout	Liver	Surtningen Vågå	343	32	3,39
20	Trout	Liver	Surtningen Vågå	289	30	3,28
21	Trout	Liver	Surtningen Vågå	236	29	3,76
22	Trout	Liver	Byglandsfjorden	323	31	2,81
23	Trout	Liver	Byglandsfjorden	259	28	3,23
24	Trout	Liver	Byglandsfjorden	204	25	2,87
25	Trout	Whole fish	Selsvatnet	84	19	5,82
26	Trout	Whole fish	Selsvatnet	133	22	5,66
27	Trout	Whole fish	Selsvatnet	332	30	3,70
28	Arctic char	Liver	Smalfjordvatnet	427	35	2,76
29	Trout	Liver	Smalfjordvatnet	274	29	1,50
30	Trout	Liver	Smalfjordvatnet	494	25	2,10
31	Trout	Liver	Lundevatnet	263	30	4,27
32	Trout	Liver	Lundevatnet	225	28	5,45
33	Trout	Liver	Lundevatnet	169	26	5,28
34	Trout	Liver	Vangsvatnet	127	24	1,96
35	Trout	Liver	Vangsvatnet	211	27	3,51
36	Arctic char	Liver	Vangsvatnet	156	26	3,21
37	Trout	Liver	Hornindalsvatnet	225	29	2,54
38	Trout	Liver	Hornindalsvatnet	260	31	4,18
39	Trout	Liver	Hornindalsvatnet	339	34	4,35

Table 34. Individual length and weight for specimens included in each sample (project number 1-39). For each lake, all individual fish with the same letter are pooled.

Number	pooled	Species	Lake	Date of	Tissue	weight (g)	Length (cm)
Number	pooled			capture			
1	a	Trout	Eikesdalsvatnet	22 08 17	Liver	254	29
	a	Trout	Eikesdalsvatnet	22 08 17	Liver	255	29
	a	Trout	Eikesdalsvatnet	22 08 17	Liver	260	28,5
	a	Trout	Eikesdalsvatnet	22 08 17	Liver	269	30
	a	Trout	Eikesdalsvatnet	22 08 17	Liver	278	29,5
	a	Trout	Eikesdalsvatnet	22 08 17	Liver	285	29,5
	a	Trout	Eikesdalsvatnet	22 08 17	Liver	283	30
	a	Trout	Eikesdalsvatnet	22 08 17	Liver	320	32
2	b	Trout	Eikesdalsvatnet	22 08 17	Liver	337	32,5
	b	Trout	Eikesdalsvatnet	22 08 17	Liver	404	34
	b	Trout	Eikesdalsvatnet	22 08 17	Liver	393	33
	b	Trout	Eikesdalsvatnet	22 08 17	Liver	410	34,5
	b	Trout	Eikesdalsvatnet	22 08 17	Liver	454	35
3	c	Trout	Eikesdalsvatnet	22 08 17	Liver	566	37
	c	Trout	Eikesdalsvatnet	22 08 17	Liver	569	37,5
	c	Trout	Eikesdalsvatnet	22 08 17	Liver	636	38
	c	Trout	Eikesdalsvatnet	22 08 17	Liver	659	43
	c	Trout	Eikesdalsvatnet	22 08 17	Liver	803	42
4	a	Perch	Ø Drengsrudvann	21 09 17	Liver	524	33
	a	Perch	Ø Drengsrudvann	21 09 17	Liver	738	37
	a	Perch	Ø Drengsrudvann	21 09 17	Liver	925	41
5	b	Perch	Ø Drengsrudvann	21 09 17	Liver	979	40
	b	Perch	Ø Drengsrudvann	21 09 17	Liver	1218	43
6	c	Perch	Ø Drengsrudvann	21 09 17	Liver	1199	45
	c	Perch	Ø Drengsrudvann	21 09 17	Liver	1611	47
7	a	Perch	Øyeren	31 08 17	Liver	124	22
	a	Perch	Øyeren	31 08 17	Liver	136	22
	a	Perch	Øyeren	31 08 17	Liver	138	23
	a	Perch	Øyeren	31 08 17	Liver	152	24
	a	Perch	Øyeren	31 08 17	Liver	159	25
	a	Perch	Øyeren	31 08 17	Liver	173	25
	a	Perch	Øyeren	31 08 17	Liver	173	25
	a	Perch	Øyeren	31 08 17	Liver	197	25
	a	Perch	Øyeren	31 08 17	Liver	183	25
	a	Perch	Øyeren	31 08 17	Liver	213	27
	a	Perch	Øyeren	31 08 17	Liver	291	28
	a	Perch	Øyeren	31 08 17	Liver	271	29
8	b	Perch	Øyeren	31 08 17	Liver	268	29
	b	Perch	Øyeren	31 08 17	Liver	326	30
	b	Perch	Øyeren	31 08 17	Liver	387	31
	b	Perch	Øyeren	31 08 17	Liver	455	34
	b	Perch	Øyeren	31 08 17	Liver	550	35
9	c	Perch	Øyeren	31 08 17	Liver	593	34
	c	Perch	Øyeren	31 08 17	Liver	772	36
	c	Perch	Øyeren	31 08 17	Liver	680	38
10	a	Arctic char	Storvannet	07 08 17	Liver	240	31

	a	Arctic char	Storvannet	07 08 17	Liver	243	30
	a	Arctic char	Storvannet	07 08 17	Liver	343	34,5
	a	Arctic char	Storvannet	07 08 17	Liver	223	29
	a	Arctic char	Storvannet	07 08 17	Liver	415	34
	a	Arctic char	Storvannet	07 08 17	Liver	409	36
	a	Arctic char	Storvannet	07 08 17	Liver	464	39
11	b	Trout	Storvannet	07 08 17	Liver	236	27
	b	Trout	Storvannet	07 08 17	Liver	246	28
	b	Trout	Storvannet	07 08 17	Liver	197	26,5
	b	Trout	Storvannet	07 08 17	Liver	220	26
	b	Trout	Storvannet	07 08 17	Liver	331	30
12	c	Trout	Storvannet	07 08 17	Liver	388	32,5
	c	Trout	Storvannet	07 08 17	Liver	345	32
	c	Trout	Storvannet	07 08 17	Liver	630	37
13	a	Pike	Femsjøen	16 11 17	Liver	2214	61
	a	Pike	Femsjøen	16 11 17	Liver	1372	62
	a	Pike	Femsjøen	16 11 17	Liver	1276	70
14	b	White bream	Femsjøen	16 11 17	Liver	797	39
	b	White bream	Femsjøen	16 11 17	Liver	696	37
	b	White bream	Femsjøen	16 11 17	Liver	504	31
	b	White bream	Femsjøen	16 11 17	Liver	393	30
	b	White bream	Femsjøen	16 11 17	Liver	345	28
15	c	Burbot	Femsjøen	16 11 17	Liver	849	55
	c	Burbot	Femsjøen	16 11 17	Liver	835	50
	c	Burbot	Femsjøen	16 11 17	Liver	825	48
16	a	Pike	Mingevannet	19 11 17	Liver	1443	62
	a	Pike	Mingevannet	19 11 17	Liver	1220	60
	a	Pike	Mingevannet	19 11 17	Liver	1664	67
	a	Pike	Mingevannet	19 11 17	Liver	1450	62
17	b	Perch	Mingevannet	19 11 17	Liver	589	32
	b	Perch	Mingevannet	19 11 17	Liver	497	33
	b	Perch	Mingevannet	19 11 17	Liver	441	30
	b	Perch	Mingevannet	19 11 17	Liver	409	29
	b	Perch	Mingevannet	19 11 17	Liver	345	29
18	c	Pikeperch	Mingevannet	19 11 17	Liver	1758	59
	c	Pikeperch	Mingevannet	19 11 17	Liver	1483	51
	c	Pikeperch	Mingevannet	19 11 17	Liver	1146	50
	c	Pikeperch	Mingevannet	19 11 17	Liver	1393	53
	c	Pikeperch	Mingevannet	19 11 17	Liver	1155	51
19	a	Trout	Surtningen Vågå	15 08 17	Liver	400	34
	a	Trout	Surtningen Vågå	15 08 17	Liver	340	32
	a	Trout	Surtningen Vågå	15 08 17	Liver	320	32
	a	Trout	Surtningen Vågå	15 08 17	Liver	311	31
20	b	Trout	Surtningen Vågå	15 08 17	Liver	305	31
	b	Trout	Surtningen Vågå	15 08 17	Liver	303	31
	b	Trout	Surtningen Vågå	15 08 17	Liver	286	30
	b	Trout	Surtningen Vågå	15 08 17	Liver	292	30
	b	Trout	Surtningen Vågå	15 08 17	Liver	260	30
21	c	Trout	Surtningen Vågå	15 08 17	Liver	260	30
	c	Trout	Surtningen Vågå	15 08 17	Liver	242	29
	c	Trout	Surtningen Vågå	15 08 17	Liver	250	30
	c	Trout	Surtningen Vågå	15 08 17	Liver	240	30
	c	Trout	Surtningen Vågå	15 08 17	Liver	236	28
	c	Trout	Surtningen Vågå	15 08 17	Liver	215	27
	c	Trout	Surtningen Vågå	15 08 17	Liver	207	26

22	a	Trout	Byglandsfjorden	15 09 17	Liver	420	35
	a	Trout	Byglandsfjorden	15 09 17	Liver	325	32
	a	Trout	Byglandsfjorden	15 09 17	Liver	290	31
	a	Trout	Byglandsfjorden	15 09 17	Liver	300	30
	a	Trout	Byglandsfjorden	15 09 17	Liver	280	29
23	b	Trout	Byglandsfjorden	15 09 17	Liver	270	31
	b	Trout	Byglandsfjorden	15 09 17	Liver	265	28
	b	Trout	Byglandsfjorden	15 09 17	Liver	260	28
	b	Trout	Byglandsfjorden	15 09 17	Liver	255	28
	b	Trout	Byglandsfjorden	15 09 17	Liver	260	27
	b	Trout	Byglandsfjorden	15 09 17	Liver	260	27
	b	Trout	Byglandsfjorden	15 09 17	Liver	240	26
24	c	Trout	Byglandsfjorden	15 09 17	Liver	233	25
	c	Trout	Byglandsfjorden	15 09 17	Liver	233	25
	c	Trout	Byglandsfjorden	15 09 17	Liver	218	24
	c	Trout	Byglandsfjorden	15 09 17	Liver	220	24
	c	Trout	Byglandsfjorden	15 09 17	Liver	216	26
	c	Trout	Byglandsfjorden	15 09 17	Liver	198	27
	c	Trout	Byglandsfjorden	15 09 17	Liver	200	26
	c	Trout	Byglandsfjorden	15 09 17	Liver	200	26
	c	Trout	Byglandsfjorden	15 09 17	Liver	180	25
	c	Trout	Byglandsfjorden	15 09 17	Liver	175	25
	c	Trout	Byglandsfjorden	15 09 17	Liver	169	24
25	a	Trout	Selsvatnet	20 07 17	Whole fish	49	16
	a	Trout	Selsvatnet	20 07 17	Whole fish	67	17
	a	Trout	Selsvatnet	20 07 17	Whole fish	77	18
	a	Trout	Selsvatnet	20 07 17	Whole fish	80	20
	a	Trout	Selsvatnet	20 07 17	Whole fish	96	20
	a	Trout	Selsvatnet	20 07 17	Whole fish	103	20
	b	Trout	Selsvatnet	20 07 17	Whole fish	117	22
26	b	Trout	Selsvatnet	20 07 17	Whole fish	169	24
	b	Trout	Selsvatnet	20 07 17	Whole fish	144	23
	b	Trout	Selsvatnet	20 07 17	Whole fish	133	22
	b	Trout	Selsvatnet	20 07 17	Whole fish	132	22
	b	Trout	Selsvatnet	20 07 17	Whole fish	119	21
	b	Trout	Selsvatnet	20 07 17	Whole fish	116	21
27	c	Trout	Selsvatnet	20 07 17	Whole fish	175	24
	c	Trout	Selsvatnet	20 07 17	Whole fish	168	24
	c	Trout	Selsvatnet	20 07 17	Whole fish	400	34
	c	Trout	Selsvatnet	20 07 17	Whole fish	585	36
28	a	Arctic char	Smalfjordvannet	08 08 17	Liver	680	42
	a	Arctic char	Smalfjordvannet	08 08 17	Liver	391	35
	a	Arctic char	Smalfjordvannet	08 08 17	Liver	356	32
	a	Arctic char	Smalfjordvannet	08 08 17	Liver	281	29
29	b	Trout	Smalfjordvannet	08 08 17	Liver	326	31
	b	Trout	Smalfjordvannet	08 08 17	Liver	320	32
	b	Trout	Smalfjordvannet	08 08 17	Liver	304	31
	b	Trout	Smalfjordvannet	08 08 17	Liver	269	29
	b	Trout	Smalfjordvannet	08 08 17	Liver	257	29
	b	Trout	Smalfjordvannet	08 08 17	Liver	232	27
	b	Trout	Smalfjordvannet	08 08 17	Liver	212	25
30	c	Trout	Smalfjordvannet	08 08 17	Liver	362	28
	c	Trout	Smalfjordvannet	08 08 17	Liver	455	25
	c	Trout	Smalfjordvannet	08 08 17	Liver	393	24
	c	Trout	Smalfjordvannet	08 08 17	Liver	766	21

31	a	Trout	Lundevatnet	15 08 17	Liver	307	32
	a	Trout	Lundevatnet	15 08 17	Liver	272	30
	a	Trout	Lundevatnet	15 08 17	Liver	259	30
	a	Trout	Lundevatnet	15 08 17	Liver	215	27
32	b	Trout	Lundevatnet	15 08 17	Liver	253	29
	b	Trout	Lundevatnet	15 08 17	Liver	243	28
	b	Trout	Lundevatnet	15 08 17	Liver	215	28
	b	Trout	Lundevatnet	15 08 17	Liver	214	27
	b	Trout	Lundevatnet	15 08 17	Liver	200	28
33	c	Trout	Lundevatnet	15 08 17	Liver	146	25
	c	Trout	Lundevatnet	15 08 17	Liver	159	26
	c	Trout	Lundevatnet	15 08 17	Liver	160	25
	c	Trout	Lundevatnet	15 08 17	Liver	171	26
	c	Trout	Lundevatnet	15 08 17	Liver	182	25
	c	Trout	Lundevatnet	15 08 17	Liver	182	27
	c	Trout	Lundevatnet	15 08 17	Liver	183	26
34	a	Trout	Vangsvatnet	21 08 17	Liver	152	24
	a	Trout	Vangsvatnet	21 08 17	Liver	124	24
	a	Trout	Vangsvatnet	21 08 17	Liver	147	25
	a	Trout	Vangsvatnet	21 08 17	Liver	160	26
	a	Trout	Vangsvatnet	21 08 17	Liver	167	26
	a	Trout	Vangsvatnet	21 08 17	Liver	111	23
	a	Trout	Vangsvatnet	21 08 17	Liver	120	24
	a	Trout	Vangsvatnet	21 08 17	Liver	110	23
	a	Trout	Vangsvatnet	21 08 17	Liver	90	21
	a	Trout	Vangsvatnet	21 08 17	Liver	86	19
35	b	Trout	Vangsvatnet	21 08 17	Liver	215	27
	b	Trout	Vangsvatnet	21 08 17	Liver	182	26
	b	Trout	Vangsvatnet	21 08 17	Liver	210	27
	b	Trout	Vangsvatnet	21 08 17	Liver	220	28
	c	Trout	Vangsvatnet	21 08 17	Liver	227	29
36	c	Arctic char	Vangsvatnet	21 08 17	Liver	110	22
	c	Arctic char	Vangsvatnet	21 08 17	Liver	129	23
	c	Arctic char	Vangsvatnet	21 08 17	Liver	184	27
	c	Arctic char	Vangsvatnet	21 08 17	Liver	192	28
	c	Arctic char	Vangsvatnet	21 08 17	Liver	185	28
	c	Arctic char	Vangsvatnet	21 08 17	Liver	144	25
	c	Arctic char	Vangsvatnet	21 08 17	Liver	140	24
	c	Arctic char	Vangsvatnet	21 08 17	Liver	148	26
	c	Arctic char	Vangsvatnet	21 08 17	Liver	140	26
	c	Arctic char	Vangsvatnet	21 08 17	Liver	135	24
	c	Arctic char	Vangsvatnet	21 08 17	Liver	178	26
	c	Arctic char	Vangsvatnet	21 08 17	Liver	175	28
	c	Arctic char	Vangsvatnet	21 08 17	Liver	140	25
	c	Arctic char	Vangsvatnet	21 08 17	Liver	186	27
37	a	Trout	Hornindalsvatnet	19 11 17	Liver	210	29
	a	Trout	Hornindalsvatnet	19 11 17	Liver	254	30
	a	Trout	Hornindalsvatnet	19 11 17	Liver	259	31
	a	Trout	Hornindalsvatnet	19 11 17	Liver	204	28
	a	Trout	Hornindalsvatnet	19 11 17	Liver	212	29
	a	Trout	Hornindalsvatnet	19 11 17	Liver	210	28
38	b	Trout	Hornindalsvatnet	19 11 17	Liver	254	30
	b	Trout	Hornindalsvatnet	19 11 17	Liver	274	31
	b	Trout	Hornindalsvatnet	19 11 17	Liver	246	30
	b	Trout	Hornindalsvatnet	19 11 17	Liver	255	31

	b	Trout	Hornindalsvatnet	19 11 17	Liver	272	31
39	c	Trout	Hornindalsvatnet	19 11 17	Liver	330	34
	c	Trout	Hornindalsvatnet	19 11 17	Liver	388	35
	c	Trout	Hornindalsvatnet	19 11 17	Liver	283	31
	c	Trout	Hornindalsvatnet	19 11 17	Liver	354	34

Table 35 Analytical results. Levels are given in ng/g wet weight unless otherwise indicated in table

Project		Speciec		HCB	PeCB	∑ HCH	∑ DDT	∑ DDT	∑ Endosulfan
							wet w.	lip. W.	
number	Det. lim.			0,005	0,005				
	Lake		Lipid %						
1	Eikedalsvannet	Trout	3,52	0,506	0,027	0,031	1,236	35,1	0,025
2	Eikedalsvannet	Trout	2,63	0,282	0,019	0,028	0,573	21,8	0,000
3	Eikedalsvannet	Trout	4,27	0,947	0,045	0,026	10,462	245	0,183
4	Ø Drengsrudvann	Perch	3,30	0,203	0,016	0,027	3,000	90,8	0,000
5	Ø Drengsrudvann	Perch	3,74	0,249	0,023	0,026	3,273	87,6	0,117
6	Ø Drengsrudvann	Perch	3,62	0,223	0,020	0,021	3,723	103	0,000
7	Øyern	Perch	4,66	0,384	0,022	0,039	6,288	135	0,092
8	Øyern	Perch	3,35	0,293	0,017	0,033	3,796	113	0,176
9	Øyern	Perch	3,47	0,317	0,018	0,043	19,322	556	0,123
10	Storvatn	Arctic char	3,34	0,446	0,024	0,014	0,363	10,9	0,043
11	Storvatn	Trout	4,03	0,536	0,021	0,012	0,617	15,3	0,000
12	Storvatn	Trout	3,91	0,468	0,021	0,010	0,225	5,8	0,000
13	Femsjøen	Pike	4,59	0,595	0,032	0,059	48,486	1056	0,063
14	Femsjøen	White bream	3,42	0,243	0,020	0,038	4,484	131	0,000
15	Femsjøen	Burbot	30,24	9,37	0,425	0,722	399,678	1322	1,069
16	Mingevannet	Pike	4,36	0,640	0,035	0,059	31,651	726	0,000
17	Mingevannet	Perch	3,13	0,210	0,012	0,032	3,283	105	0,000
18	Mingevannet	Pikeperch	5,27	0,444	0,029	0,051	17,363	329	0,227
19	Surtningen Vågå	Trout	3,39	0,160	0,010	0,032	0,291	8,6	0,000
20	Surtningen Vågå	Trout	3,28	0,159	0,012	0,000	0,241	7,4	0,000
21	Surtningen Vågå	Trout	3,76	0,227	0,014	0,000	0,320	8,5	0,000
22	Byglandsfjord	Trout	2,81	0,241	0,015	0,013	3,141	112	0,000
23	Byglandsfjord	Trout	3,23	0,272	0,017	0,031	10,406	322	0,000
24	Byglandsfjord	Trout	2,87	0,272	0,014	0,000	4,523	158	0,042
25	Selsvatnet	Trout	5,82	0,131	0,020	0,012	0,148	2,5	0,000
26	Selsvatnet	Trout	5,66	0,156	0,023	0,000	0,114	2,0	0,000
27	Selsvatnet	Trout	3,70	0,060	0,008	0,000	0,057	1,5	0,000
28	Smalfjordvatn	Arctic char	2,76	0,287	0,012	0,020	0,508	18,4	0,065
29	Smalfjordvatn	Trout	1,50	0,098	n.d.	0,024	0,077	5,1	0,000
30	Smalfjordvatn	Trout	2,10	0,168	0,008	0,016	0,111	5,3	0,000
31	Lundevatnet	Trout	4,27	0,179	0,011	0,017	0,610	14,3	0,000
32	Lundevatnet	Trout	5,45	0,206	0,013	0,012	0,584	10,7	0,000
33	Lundevatnet	Trout	5,28	0,230	0,013	0,035	0,896	17,0	0,097
34	Vangsvatnet	Trout	1,96	0,148	0,006	0,000	0,717	36,7	0,000
35	Vangsvatnet	Trout	3,51	0,252	0,010	0,000	1,143	32,5	0,000
36	Vangsvatnet	Arctic char	3,21	0,568	0,020	0,000	2,480	77,3	0,261
37	Hornindalsvatne	Trout	2,54	0,154	0,009	0,082	0,473	18,6	0,074
38	Hornindalsvatne	Trout	4,18	0,303	0,012	0,085	2,396	57,4	0,000
39	Hornindalsvatne	Trout	4,35	0,286	0,018	0,103	1,810	41,6	0,162

Project		Speciec		PCB-28	PCB-52	PCB-101	PCB-118	PCB-138	PCB-153	PCB-180	∑PCB7	∑PCB7
											wet w	lip w
number	Det. lim.			0,010	0,500	0,013	0,006	0,006	0,006	0,006		
	Lake		Lipid %									
1	Eikedalsvannet	Trout	3,52	0,015	n.d.	0,263	0,430	0,987	1,54	0,642	3,87	110
2	Eikedalsvannet	Trout	2,63	0,017	n.d.	0,130	0,172	0,465	0,721	0,306	1,81	69
3	Eikedalsvannet	Trout	4,27	0,043	n.d.	2,16	2,95	9,36	15,3	6,96	36,8	861
4	Ø Drengsrudvann	Perch	3,30	0,125	n.d.	0,860	1,10	1,50	2,40	1,52	7,50	227
5	Ø Drengsrudvann	Perch	3,74	0,126	n.d.	0,888	1,01	1,25	1,96	1,08	6,32	169
6	Ø Drengsrudvann	Perch	3,62	0,101	n.d.	1,12	1,23	1,75	2,62	1,61	8,43	233
7	Øyern	Perch	4,66	0,050	n.d.	1,42	1,14	2,98	4,38	2,13	12,1	259
8	Øyern	Perch	3,35	0,065	n.d.	0,864	0,620	1,59	2,40	1,32	6,85	204
9	Øyern	Perch	3,47	0,133	n.d.	4,83	3,82	11,2	18,0	10,1	48,1	1384
10	Storvatn	Arctic char	3,34	0,021	n.d.	0,125	0,231	0,560	0,852	0,386	2,17	65
11	Storvatn	Trout	4,03	n.d.	n.d.	0,255	0,463	1,20	1,83	0,993	4,74	117
12	Storvatn	Trout	3,91	0,015	n.d.	0,136	0,227	0,574	0,893	0,448	2,29	59
13	Femsjøen	Pike	4,59	0,116	n.d.	5,55	6,30	18,4	30,5	16,5	77,4	1685
14	Femsjøen	White bream	3,42	0,066	n.d.	0,559	0,615	1,61	2,31	1,08	6,23	182
15	Femsjøen	Burbot	30,24	1,46	2,69	24,5	41,6	139	205	89,0	504	1665
16	Mingevannet	Pike	4,36	0,189	n.d.	5,48	4,66	14,5	28,0	17,1	69,9	1603
17	Mingevannet	Perch	3,13	0,074	n.d.	0,634	0,480	1,50	2,37	1,21	6,26	200
18	Mingevannet	Pikeperch	5,27	0,111	n.d.	3,82	2,61	11,0	16,8	12,6	46,9	890
19	Surtningen Vågå	Trout	3,39	n.d.	n.d.	0,089	0,075	0,126	0,219	0,082	0,59	17
20	Surtningen Vågå	Trout	3,28	n.d.	n.d.	0,063	0,056	0,117	0,200	0,083	0,52	16
21	Surtningen Vågå	Trout	3,76	n.d.	n.d.	0,105	0,092	0,165	0,267	0,117	0,75	20
22	Byglandsfjord	Trout	2,81	n.d.	n.d.	0,183	0,593	1,74	3,08	1,14	6,74	240
23	Byglandsfjord	Trout	3,23	0,123	n.d.	0,263	0,241	0,530	0,861	0,510	2,53	78
24	Byglandsfjord	Trout	2,87	n.d.	n.d.	0,224	0,258	0,731	1,12	0,753	3,09	108
25	Selsvatnet	Trout	5,82	n.d.	n.d.	0,076	0,050	0,124	0,197	0,053	0,50	9
26	Selsvatnet	Trout	5,66	n.d.	n.d.	0,112	0,050	0,129	0,211	0,056	0,56	10
27	Selsvatnet	Trout	3,70	n.d.	n.d.	0,047	0,026	0,056	0,085	0,023	0,24	6
28	Smalfjordvatn	Arctic char	2,76	0,043	n.d.	0,223	0,303	0,629	0,994	0,372	2,56	93
29	Smalfjordvatn	Trout	1,50	n.d.	n.d.	0,040	0,038	0,076	0,129	0,049	0,33	22
30	Smalfjordvatn	Trout	2,10	0,034	n.d.	0,059	0,075	0,139	0,274	0,099	0,68	32
31	Lundevatnet	Trout	4,27	0,030	n.d.	0,434	0,397	0,985	1,96	1,27	5,08	119
32	Lundevatnet	Trout	5,45	0,071	n.d.	0,219	0,187	0,539	1,01	0,696	2,72	50
33	Lundevatnet	Trout	5,28	0,045	n.d.	9,51	10,2	15,0	13,3	4,57	52,6	996
34	Vangsvatnet	Trout	1,96	0,076	n.d.	0,204	0,179	0,297	0,356	0,209	1,32	67
35	Vangsvatnet	Trout	3,51	0,077	n.d.	0,140	0,152	0,359	0,494	0,267	1,49	42
36	Vangsvatnet	Arctic char	3,21	0,053	n.d.	0,327	0,436	1,12	1,41	0,962	4,31	134
37	Hornindalsvatnet	Trout	2,54	0,045	n.d.	0,049	0,037	0,086	0,123	0,053	0,39	16
38	Hornindalsvatnet	Trout	4,18	n.d.	n.d.	0,213	0,175	0,564	0,877	0,419	2,25	54
39	Hornindalsvatnet	Trout	4,35	0,049	n.d.	0,164	0,127	0,404	0,568	0,283	1,59	37

Project		Speciec		BDE-28	BDE-47	BDE-99	BDE-100	BDE-153	BDE-154	∑PentaBDE	∑PentaBDE	HBCDD
										wet w	lip w	
number	Det. lim.			0,005	0,010	0,012	0,006	0,012	0,005			0,061
	Lake		Lipid %									
1	Eikedalsvannet	Trout	3,52	n.d.	0,094	0,056	0,048	0,015	0,031	0,244	6,921	n.d.
2	Eikedalsvannet	Trout	2,63	n.d.	0,093	0,072	0,033	n.d.	0,018	0,217	8,235	n.d.
3	Eikedalsvannet	Trout	4,27	n.d.	0,907	0,348	0,492	0,130	0,310	2,186	51,194	0,375
4	Ø Drengsrudvann	Perch	3,30	0,017	0,549	0,049	0,122	0,036	0,100	0,873	26,417	0,128
5	Ø Drengsrudvann	Perch	3,74	0,023	0,553	0,016	0,100	0,024	0,073	0,790	21,140	0,086
6	Ø Drengsrudvann	Perch	3,62	0,027	0,742	0,024	0,130	0,043	0,116	1,083	29,960	0,180
7	Øyern	Perch	4,66	0,009	1,11	0,704	0,321	0,087	0,122	2,350	50,384	0,452
8	Øyern	Perch	3,35	n.d.	0,711	0,385	0,187	0,062	0,090	1,434	42,770	0,182
9	Øyern	Perch	3,47	0,033	4,50	1,75	1,65	0,654	0,980	9,559	275,171	3,01
10	Storvatn	Arctic char	3,34	n.d.	1,21	0,55	0,16	n.d.	0,017	1,931	57,865	n.d.
11	Storvatn	Trout	4,03	n.d.	0,50	0,41	0,12	0,012	0,048	1,095	27,147	n.d.
12	Storvatn	Trout	3,91	n.d.	0,25	0,21	0,06	n.d.	0,017	0,527	13,475	n.d.
13	Femsjøen	Pike	4,59	0,044	4,25	2,15	1,80	0,582	1,54	10,365	225,682	1,34
14	Femsjøen	White bream	3,42	0,022	0,716	1,34	0,166	0,031	0,086	2,359	69,083	0,255
15	Femsjøen	Burbot	30,24	0,094	11,2	16,9	6,96	2,44	4,97	42,559	140,725	34,1
16	Mingevannet	Pike	4,36	0,050	5,17	2,05	1,72	0,600	0,786	10,379	238,027	0,892
17	Mingevannet	Perch	3,13	0,008	0,533	0,154	0,144	0,064	0,064	0,966	30,915	0,115
18	Mingevannet	Pikeperch	5,27	0,029	4,77	0,697	1,21	0,242	0,559	7,504	142,297	0,574
19	Surtningen Vågå	Trout	3,39	n.d.	0,027	0,013	0,018	n.d.	n.d.	0,059	1,730	n.d.
20	Surtningen Vågå	Trout	3,28	n.d.	0,022	0,014	0,015	n.d.	n.d.	0,051	1,560	0,075
21	Surtningen Vågå	Trout	3,76	n.d.	0,029	n.d.	0,007	n.d.	0,009	0,044	1,181	n.d.
22	Byglandsfjord	Trout	2,81	n.d.	0,154	0,160	0,091	0,055	0,043	0,502	17,889	0,086
23	Byglandsfjord	Trout	3,23	n.d.	0,156	0,227	0,060	0,038	0,036	0,516	15,985	0,092
24	Byglandsfjord	Trout	2,87	n.d.	0,117	0,153	0,069	0,044	0,040	0,423	14,771	0,165
25	Selsvatnet	Trout	5,82	n.d.	0,028	0,030	0,020	n.d.	0,012	0,090	1,545	0,175
26	Selsvatnet	Trout	5,66	n.d.	0,034	0,020	0,010	n.d.	0,008	0,072	1,281	0,110
27	Selsvatnet	Trout	3,70	n.d.	0,016	0,012	0,010	n.d.	0,010	0,047	1,283	0,085
28	Smalfjordvatn	Arctic char	2,76	n.d.	0,047	0,022	0,043	0,016	0,024	0,152	5,508	0,122
29	Smalfjordvatn	Trout	1,50	n.d.	n.d.	n.d.	0,016	n.d.	0,018	0,034	2,237	0,129
30	Smalfjordvatn	Trout	2,10	n.d.	0,014	n.d.	0,020	n.d.	0,016	0,050	2,369	0,103
31	Lundevatnet	Trout	4,27	n.d.	0,130	0,210	0,047	0,030	0,033	0,451	10,556	0,080
32	Lundevatnet	Trout	5,45	n.d.	0,085	0,161	0,032	0,032	0,029	0,339	6,210	0,119
33	Lundevatnet	Trout	5,28	n.d.	0,137	0,326	0,077	0,062	0,060	0,662	12,552	0,112
34	Vangsvatnet	Trout	1,96	n.d.	0,066	0,095	0,027	0,011	0,016	0,215	10,988	0,103
35	Vangsvatnet	Trout	3,51	n.d.	0,111	0,169	0,026	0,014	0,026	0,347	9,871	0,173
36	Vangsvatnet	Arctic char	3,21	n.d.	0,368	0,450	0,112	0,063	0,067	1,059	32,995	0,096
37	Hornindalsvatnet	Trout	2,54	n.d.	0,037	0,052	0,013	n.d.	0,024	0,125	4,925	0,123
38	Hornindalsvatnet	Trout	4,18	n.d.	0,185	0,309	0,087	0,039	0,057	0,678	16,232	0,142
39	Hornindalsvatnet	Trout	4,35	n.d.	0,145	0,220	0,057	0,030	0,036	0,487	11,187	0,267

Project		Speciec		∑Heptaklor	∑Endosulfan	Oktyl	Nonyl	Diflu	Teflu	Pentachloro
						fenol	fenol	benzuron	benzuron	phenol (PCP)
number	Det. lim.					0,015	7,0	3	3	0,14
	Lake		Lipid %							
1	Eikedalsvannet	Trout	3,52	0,00	0,00	n.d.	n.d.	<3	<3	0,14
2	Eikedalsvannet	Trout	2,63	6,05	110,91	0,136	n.d.	<3	<3	0,11
3	Eikedalsvannet	Trout	4,27	2,84	70,80	n.d.	n.d.	<3	<3	0,86
4	Ø Drengsrudvann	Perch	3,30	58,99	863,74	0,118	n.d.	<3	<3	0,35
5	Ø Drengsrudvann	Perch	3,74	11,43	231,08	0,276	8,94	<3	<3	0,76
6	Ø Drengsrudvann	Perch	3,62	9,36	174,04	0,242	35,6	<3	<3	1,84
7	Øyern	Perch	4,66	12,66	239,24	0,299	8,14	<3	<3	0,52
8	Øyern	Perch	3,35	18,60	266,24	0,053	n.d.	<3	<3	0,25
9	Øyern	Perch	3,47	10,56	212,24	0,132	10,8	<3	<3	0,29
10	Storvatn	Arctic char	3,34	76,23	1393,27	0,081	9,49	<3	<3	0,19
11	Storvatn	Trout	4,03	3,41	75,18	n.d.	9,42	<3	<3	0,24
12	Storvatn	Trout	3,91	7,56	128,46	0,261	8,46	<3	<3	0,37
13	Femsjøen	Pike	4,59	3,63	70,63	0,211	n.d.	<3	<3	0,37
14	Femsjøen	White bream	3,42	124,34	1697,54	0,163	8,74	<3	<3	0,05
15	Femsjøen	Burbot	30,24	9,62	196,43	0,156	24,6	<3	<3	0,45
16	Mingevannet	Pike	4,36	797,92	1680,45	0,022	n.d.	<3	<3	2,93
17	Mingevannet	Perch	3,13	114,96	1618,95	0,228	7,41	<3	<3	0,57
18	Mingevannet	Pikeperch	5,27	9,84	217,27	n.d.	n.d.	<3	<3	0,21
19	Surtningen Vågå	Trout	3,39	76,33	907,90	0,201	n.d.	<3	<3	1,56
20	Surtningen Vågå	Trout	3,28	0,89	36,39	n.d.	n.d.	<3	<3	3,63
21	Surtningen Vågå	Trout	3,76	0,80	35,85	0,055	9,73	<3	<3	1,08
22	Byglandsfjord	Trout	2,81	1,13	40,86	0,060	n.d.	<3	<3	4,03
23	Byglandsfjord	Trout	3,23	10,97	261,94	0,177	7,05	<3	<3	0,52
24	Byglandsfjord	Trout	2,87	3,90	101,31	0,210	n.d.	<3	<3	3,42
25	Selsvatnet	Trout	5,82	4,96	131,65	0,148	n.d.	<3	<3	0,86
26	Selsvatnet	Trout	5,66	0,75	33,60	0,049	n.d.	<3	<3	1,59
27	Selsvatnet	Trout	3,70	0,82	35,86	0,264	10,7	<3	<3	0,89
28	Smalfjordvatn	Arctic char	2,76	0,34	33,38	0,304	7,47	<3	<3	1,46
29	Smalfjordvatn	Trout	1,50	3,93	121,00	0,076	n.d.	<3	<3	1,54
30	Smalfjordvatn	Trout	2,10	0,51	50,97	0,272	9,82	<3	<3	1,38
31	Lundevatnet	Trout	4,27	1,05	62,36	0,141	8,18	<3	<3	0,27
32	Lundevatnet	Trout	5,45	8,31	149,98	0,120	14,1	<3	<3	0,08
33	Lundevatnet	Trout	5,28	4,43	81,96	0,026	n.d.	<3	<3	0,26
34	Vangsvatnet	Trout	1,96	70,43	1029,32	0,153	n.d.	<3	<3	0,20
35	Vangsvatnet	Trout	3,51	1,89	101,50	0,165	9,35	<3	<3	0,14
36	Vangsvatnet	Arctic char	3,21	2,25	77,33	0,153	n.d.	<3	<3	0,37
37	Hornindalsvatnet	Trout	2,54	6,68	170,27	0,128	n.d.	<3	<3	0,37
38	Hornindalsvatnet	Trout	4,18	0,57	52,51	0,125	n.d.	<3	<3	0,28
39	Hornindalsvatnet	Trout	4,35	3,54	91,82	0,159	n.d.	<3	<3	0,20

Project		Speciec		PFBA*	PFBS*	PFHxS*	**PFOS***	FOSA*	N-MeFOSA*	N-EtFOSA*	N-MeFOSE*	N-EtFOSE*
number	Det. lim.			0,185	0,060	0,110	0,200	0,050	0,500	1,00	0,280	0,450
	Lake		Lipid %									
1	Eikedalsvannet	Trout	3,52	n.d.	0,175	n.d.	1,59	0,428	n.d.	1,03	1,35	1,85
2	Eikedalsvannet	Trout	2,63	n.d.	n.d.	n.d.	1,36	0,077	n.d.	n.d.	2,04	0,542
3	Eikedalsvannet	Trout	4,27	n.d.	n.d.	n.d.	1,78	0,194	n.d.	n.d.	n.d.	3,13
4	Ø Drengsrudvann	Perch	3,30	n.d.	n.d.	n.d.	6,39	n.d.	n.d.	n.d.	1,71	n.d.
5	Ø Drengsrudvann	Perch	3,74	n.d.	n.d.	0,290	5,43	0,058	0,930	n.d.	n.d.	n.d.
6	Ø Drengsrudvann	Perch	3,62	n.d.	n.d.	n.d.	5,81	0,053	n.d.	n.d.	0,309	n.d.
7	Øyern	Perch	4,66	n.d.	n.d.	n.d.	12,5	0,268	n.d.	n.d.	n.d.	3,30
8	Øyern	Perch	3,35	n.d.	n.d.	n.d.	10,2	0,208	n.d.	n.d.	n.d.	n.d.
9	Øyern	Perch	3,47	n.d.	n.d.	n.d.	12,5	n.d.	n.d.	n.d.	0,757	n.d.
10	Storvatn	Arctic char	3,34	n.d.	n.d.	n.d.	3,33	n.d.	n.d.	n.d.	2,00	n.d.
11	Storvatn	Trout	4,03	n.d.	n.d.	n.d.	6,04	0,167	n.d.	n.d.	3,61	0,655
12	Storvatn	Trout	3,91	n.d.	n.d.	n.d.	3,10	0,375	n.d.	n.d.	2,80	n.d.
13	Femsjøen	Pike	4,59	n.d.	0,138	n.d.	4,07	0,647	n.d.	n.d.	1,33	n.d.
14	Femsjøen	White bream	3,42	n.d.	0,071	n.d.	2,47	n.d.	n.d.	n.d.	1,83	1,35
15	Femsjøen	Burbot	30,24	n.d.	n.d.	n.d.	1,78	1,10	n.d.	n.d.	n.d.	2,13
16	Mingevannet	Pike	4,36	n.d.	n.d.	0,116	5,10	0,611	n.d.	n.d.	0,641	n.d.
17	Mingevannet	Perch	3,13	n.d.	n.d.	n.d.	7,13	n.d.	n.d.	n.d.	0,440	n.d.
18	Mingevannet	Pikeperch	5,27	n.d.	n.d.	n.d.	7,63	0,549	n.d.	n.d.	n.d.	n.d.
19	Surtningen Vågå	Trout	3,39	n.d.	n.d.	n.d.	0,771	0,180	n.d.	n.d.	6,63	n.d.
20	Surtningen Vågå	Trout	3,28	n.d.	0,183	n.d.	0,640	0,057	n.d.	n.d.	1,98	n.d.
21	Surtningen Vågå	Trout	3,76	n.d.	0,261	n.d.	0,479	0,172	n.d.	n.d.	5,73	n.d.
22	Byglandsfjord	Trout	2,81	n.d.	n.d.	n.d.	5,65	0,091	n.d.	n.d.	1,27	n.d.
23	Byglandsfjord	Trout	3,23	n.d.	n.d.	0,161	3,02	0,186	n.d.	n.d.	0,785	n.d.
24	Byglandsfjord	Trout	2,87	n.d.	n.d.	n.d.	3,26	0,235	n.d.	n.d.	1,72	n.d.
25	Selsvatnet	Trout	5,82	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	2,72	n.d.
26	Selsvatnet	Trout	5,66	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	2,73	n.d.
27	Selsvatnet	Trout	3,70	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	5,88	n.d.
28	Smalfjordvatn	Arctic char	2,76	n.d.	0,153	n.d.	n.d.	n.d.	n.d.	n.d.	0,466	n.d.
29	Smalfjordvatn	Trout	1,50	n.d.	n.d.	0,260	2,74	n.d.	n.d.	n.d.	2,63	n.d.
30	Smalfjordvatn	Trout	2,10	n.d.	n.d.	0,278	2,01	n.d.	n.d.	n.d.	1,72	n.d.
31	Lundevatnet	Trout	4,27	n.d.	0,243	n.d.	3,88	0,384	n.d.	n.d.	n.d.	n.d.
32	Lundevatnet	Trout	5,45	n.d.	0,067	n.d.	5,21	0,143	n.d.	n.d.	2,12	n.d.
33	Lundevatnet	Trout	5,28	n.d.	n.d.	n.d.	7,05	0,386	n.d.	n.d.	1,87	n.d.
34	Vangsvatnet	Trout	1,96	n.d.	n.d.	n.d.	2,12	0,243	n.d.	n.d.	3,70	0,667
35	Vangsvatnet	Trout	3,51	n.d.	0,071	n.d.	1,26	n.d.	n.d.	n.d.	n.d.	n.d.
36	Vangsvatnet	Arctic char	3,21	n.d.	n.d.	n.d.	1,42	n.d.	n.d.	n.d.	0,540	n.d.
37	Hornindalsvatnet	Trout	2,54	n.d.	n.d.	n.d.	1,77	n.d.	n.d.	n.d.	n.d.	n.d.
38	Hornindalsvatnet	Trout	4,18	n.d.	n.d.	n.d.	2,47	0,073	n.d.	n.d.	n.d.	n.d.
39	Hornindalsvatnet	Trout	4,35	n.d.	n.d.	n.d.	1,30	n.d.	n.d.	n.d.	0,371	n.d.

Project		Speciec		PFHxA*	PFHpA*	**PFOA***	PFNA*	PFDA*	PFUdA*	PFDoDA*	PFTrDA*	PFTeDA*
number	Det. lim.			0,420	0,360	0,350	0,170	0,080	0,240	0,140	0,075	0,130
	Lake		Lipid %									
1	Eikedalsvannet	Trout	3,52	1,36	0,762	n.d.	0,215	0,318	1,76	1,31	3,90	0,886
2	Eikedalsvannet	Trout	2,63	1,27	n.d.	n.d.	n.d.	n.d.	0,823	0,634	1,76	0,396
3	Eikedalsvannet	Trout	4,27	0,706	0,657	1,91	n.d.	0,905	2,14	1,65	3,83	0,944
4	Ø Drengsrudvann	Perch	3,30	0,573	n.d.	n.d.	0,240	2,54	6,28	3,07	3,36	0,742
5	Ø Drengsrudvann	Perch	3,74	2,15	n.d.	n.d.	0,841	4,28	10,17	6,15	6,62	0,611
6	Ø Drengsrudvann	Perch	3,62	2,37	n.d.	n.d.	0,326	5,17	10,67	5,56	7,43	2,65
7	Øyern	Perch	4,66	1,49	0,884	n.d.	0,432	1,51	2,99	1,68	2,49	1,35
8	Øyern	Perch	3,35	1,79	n.d.	n.d.	0,319	1,49	2,58	1,32	2,13	0,306
9	Øyern	Perch	3,47	2,37	0,400	n.d.	0,220	1,90	2,55	1,63	1,99	0,627
10	Storvatn	Arctic char	3,34	1,70	1,09	1,17	0,944	0,103	0,289	0,192	0,351	n.d.
11	Storvatn	Trout	4,03	3,86	1,37	n.d.	1,47	1,72	2,22	1,13	1,94	0,180
12	Storvatn	Trout	3,91	2,38	1,76	n.d.	0,573	1,53	1,97	0,429	1,43	0,139
13	Femsjøen	Pike	4,59	1,67	1,99	n.d.	0,468	0,833	2,78	0,966	2,84	1,45
14	Femsjøen	White bream	3,42	1,41	0,819	0,718	0,514	0,246	0,643	0,569	0,544	0,347
15	Femsjøen	Burbot	30,24	1,24	0,571	n.d.	0,768	0,487	1,00	0,416	1,18	0,539
16	Mingevannet	Pike	4,36	2,09	0,559	n.d.	0,236	0,418	1,89	1,13	1,53	0,223
17	Mingevannet	Perch	3,13	1,14	0,482	n.d.	1,13	1,26	3,06	1,40	1,68	0,842
18	Mingevannet	Pikeperch	5,27	1,43	1,32	n.d.	0,689	1,28	1,61	1,53	1,98	0,537
19	Surtningen Vågå	Trout	3,39	1,12	1,33	n.d.	2,35	1,70	1,72	0,401	1,08	0,312
20	Surtningen Vågå	Trout	3,28	1,26	0,500	n.d.	1,66	0,906	1,39	0,162	0,586	n.d.
21	Surtningen Vågå	Trout	3,76	1,33	0,633	n.d.	0,943	1,36	1,01	0,42	1,25	0,337
22	Byglandsfjord	Trout	2,81	1,28	0,898	n.d.	0,294	1,83	5,91	2,49	5,32	2,23
23	Byglandsfjord	Trout	3,23	1,43	0,553	n.d.	0,763	0,834	2,12	1,38	2,91	0,849
24	Byglandsfjord	Trout	2,87	0,924	0,512	n.d.	0,512	1,08	2,30	1,38	1,94	0,936
25	Selsvatnet	Trout	5,82	0,936	1,03	n.d.	0,701	0,518	n.d.	n.d.	n.d.	n.d.
26	Selsvatnet	Trout	5,66	2,03	0,957	0,413	0,821	0,317	n.d.	n.d.	0,163	n.d.
27	Selsvatnet	Trout	3,70	1,14	0,860	n.d.	1,00	n.d.	0,540	0,225	0,623	n.d.
28	Smalfjordvatn	Arctic char	2,76	2,26	1,48	n.d.	n.d.	0,526	n.d.	n.d.	0,321	n.d.
29	Smalfjordvatn	Trout	1,50	1,59	1,24	n.d.	1,59	1,23	2,77	0,562	1,50	0,541
30	Smalfjordvatn	Trout	2,10	1,54	1,40	n.d.	1,40	1,09	1,69	0,451	1,71	n.d.
31	Lundevatnet	Trout	4,27	2,43	1,51	1,45	1,02	1,32	4,51	4,47	8,92	3,92
32	Lundevatnet	Trout	5,45	3,27	1,15	n.d.	0,421	2,92	2,75	1,56	3,74	0,946
33	Lundevatnet	Trout	5,28	2,54	1,26	n.d.	0,208	2,29	4,19	4,61	8,02	3,43
34	Vangsvatnet	Trout	1,96	2,66	0,772	n.d.	n.d.	0,520	1,41	1,15	2,01	0,181
35	Vangsvatnet	Trout	3,51	0,593	0,840	n.d.	n.d.	0,629	1,16	0,79	1,46	n.d.
36	Vangsvatnet	Arctic char	3,21	2,02	0,486	n.d.	n.d.	0,195	n.d.	0,732	1,62	0,611
37	Hornindalsvatnet	Trout	2,54	2,68	1,28	n.d.	0,468	0,466	1,89	1,56	4,49	1,43
38	Hornindalsvatnet	Trout	4,18	1,22	1,19	n.d.	0,416	0,471	1,93	0,792	2,81	0,788
39	Hornindalsvatnet	Trout	4,35	1,96	n.d.	n.d.	0,310	0,492	2,71	0,825	2,77	0,681

Project		Speciec		Benz(a)	Naphthalene	Anthracene	Fluor	Benzo[a]	Decamethylcyclo	Hexachloro	Trichloro
				anthracen			anthene	pyrene	pentasiloxane (D5)	butadiene	benzenes (TCBs)
number	Det. lim.			0,31	0,85	0,04	0,09	0,26	2,88	0,08	0,06
	Lake		Lipid %								
1	Eikedalsvannet	Trout	3,52	< .4	0,70	0,01	0,09	21,22	12,25	0,03	nd
2	Eikedalsvannet	Trout	2,63	< .69	0,52	0,01	0,09	0,52	18,03	0,04	nd
3	Eikedalsvannet	Trout	4,27	< .37	0,98	0,43	0,12	2,66	12,89	0,05	nd
4	Ø Drengsrudvann	Perch	3,30	< .68	0,93	0,03	0,22	3,23	5,90	0,05	nd
5	Ø Drengsrudvann	Perch	3,74	< .67	0,84	0,03	0,21	2,50	4,85	0,05	nd
6	Ø Drengsrudvann	Perch	3,62	< .36	1,19	0,05	0,36	0,75	8,84	0,06	nd
7	Øyern	Perch	4,66	< .36	5,36	0,03	0,26	8,50	25,66	0,12	0,18
8	Øyern	Perch	3,35	< .5	1,10	0,02	0,26	10,79	22,00	0,07	0,20
9	Øyern	Perch	3,47	< .52	1,05	0,02	0,28	3,42	9,59	0,05	nd
10	Storvatn	Arctic char	3,34	< .6	1,18	0,02	0,17	0,70	26,38	0,12	nd
11	Storvatn	Trout	4,03	< .66	1,29	0,01	0,13	5,57	26,32	0,17	nd
12	Storvatn	Trout	3,91	< .53	1,29	0,05	0,19	2,54	34,35	0,15	0,21
13	Femsjøen	Pike	4,59	< .56	0,87	0,02	0,37	0,37	30,58	0,07	0,09
14	Femsjøen	White bream	3,42	< .4	1,77	0,03	0,85	0,55	14,95	0,09	nd
15	Femsjøen	Burbot	30,24	< .41	1,76	0,05	0,48	10,65	105,92	0,18	0,20
16	Mingevannet	Pike	4,36	< .47	1,08	0,04	0,37	0,32	24,14	0,06	nd
17	Mingevannet	Perch	3,13	< .45	1,00	0,02	0,19	1,14	8,18	0,04	nd
18	Mingevannet	Pikeperch	5,27	< .48	0,96	0,03	0,20	7,37	18,28	0,09	nd
19	Surtningen Vågå	Trout	3,39	< .48	1,77	0,03	0,14	8,84	19,56	0,04	0,10
20	Surtningen Vågå	Trout	3,28	< .42	0,96	0,02	0,20	2,53	10,80	0,04	nd
21	Surtningen Vågå	Trout	3,76	< .34	0,87	0,01	0,12	55,09	20,00	0,08	nd
22	Byglandsfjord	Trout	2,81	< .53	1,00	0,02	0,15	3,30	18,70	0,04	nd
23	Byglandsfjord	Trout	3,23	< .57	0,73	0,02	0,18	0,91	15,45	0,04	nd
24	Byglandsfjord	Trout	2,87	< .33	0,66	0,02	0,14	1,31	6,72	0,07	nd
25	Selsvatnet	Trout	5,82	< .31	0,74	0,02	0,18	0,20	6,05	0,03	nd
26	Selsvatnet	Trout	5,66	< .45	0,82	0,02	0,17	0,19	8,59	0,06	nd
27	Selsvatnet	Trout	3,70	< .56	0,69	0,01	0,10	0,20	10,15	0,03	nd
28	Smalfjordvatn	Arctic char	2,76	< .19	0,96	0,04	0,13	0,29	27,79	0,05	nd
29	Smalfjordvatn	Trout	1,50	< .5	0,83	0,03	0,09	4,68	10,93	0,05	nd
30	Smalfjordvatn	Trout	2,10	< .4	0,92	0,06	0,15	2,57	11,09	0,05	nd
31	Lundevatnet	Trout	4,27	< .49	1,02	0,07	0,27	91,93	22,04	0,05	0,06
32	Lundevatnet	Trout	5,45	< .6	0,76	0,01	0,15	20,68	33,41	0,05	nd
33	Lundevatnet	Trout	5,28	< .36	0,81	0,04	0,16	99,69	9,83	0,06	nd
34	Vangsvatnet	Trout	1,96	< .45	0,85	0,04	0,16	25,18	5,79	0,07	nd
35	Vangsvatnet	Trout	3,51	< .41	0,66	0,03	0,14	16,97	10,67	0,07	0,06
36	Vangsvatnet	Arctic char	3,21	< .48	0,70	0,04	0,22	1,79	28,03	0,08	0,07
37	Hornindalsvatnet	Trout	2,54	< .56	0,83	0,04	0,16	2,78	23,71	0,05	nd
38	Hornindalsvatnet	Trout	4,18	< .35	0,73	0,02	0,18	4,98	18,15	0,07	nd
39	Hornindalsvatnet	Trout	4,35	< .43	1,06	0,02	0,15	0,70	17,57	0,05	nd

Project		Speciec		Triclosan	Dicofol	(tris(2- kloretyl)	Di-(2-etylheksyl)	SCCPs	MCCPs
				TCS		fosfat (TCEP)	ftalat (DEHP)	(C10-13)	(C14-17)
number	Det. lim.			0,06	0,11	0,80	29	2,4	2,6
	Lake		Lipid %						
1	Eikedalsvannet	Trout	3,52	0,29	5,1	0,15	449	9,8	5,4
2	Eikedalsvannet	Trout	2,63	1,37	4,5	1,19	416	10,1	34,5
3	Eikedalsvannet	Trout	4,27	3,87	2,5	0,14	241	5,9	18,4
4	Ø Drengsrudvann	Perch	3,30	0,28	0,2	0,54	145	11,7	11,7
5	Ø Drengsrudvann	Perch	3,74	5,83	0,0	1,81	144	8,4	39,8
6	Ø Drengsrudvann	Perch	3,62	0,28	4,8	0,22	380	10,4	9,0
7	Øyern	Perch	4,66	10,82	9,8	0,24	202	7,5	27,2
8	Øyern	Perch	3,35	3,72	2,0	1,35	5418	7,2	9,2
9	Øyern	Perch	3,47	0,80	0,0	6,14	80	7,0	10,1
10	Storvatn	Arctic char	3,34	13,67	5,3	2,54	142	2,5	4,7
11	Storvatn	Trout	4,03	5,62	12,8	1,30	101	8,6	36,9
12	Storvatn	Trout	3,91	0,40	4,3	1,79	190	6,3	27,4
13	Femsjøen	Pike	4,59	0,84	0,9	0,92	198	6,2	28,0
14	Femsjøen	White bream	3,42	4,99	2,3	1,03	485	10,7	71,2
15	Femsjøen	Burbot	30,24	5,34	8,1	3,87	909	21,4	55,3
16	Mingevannet	Pike	4,36	0,85	1,3	0,90	173	7,2	21,0
17	Mingevannet	Perch	3,13	0,65	2,3	1,36	187	2,0	16,8
18	Mingevannet	Pikeperch	5,27	0,04	0,5	0,55	292	5,0	17,7
19	Surtningen Vågå	Trout	3,39	0,73	1,2	0,78	284	2,4	13,4
20	Surtningen Vågå	Trout	3,28	1,32	0,2	0,76	247	3,6	7,1
21	Surtningen Vågå	Trout	3,76	3,38	0,9	0,41	141	9,2	11,4
22	Byglandsfjord	Trout	2,81	1,07	2,1	1,07	299	4,8	40,2
23	Byglandsfjord	Trout	3,23	0,33	2,4	0,76	84	2,6	10,0
24	Byglandsfjord	Trout	2,87	1,01	1,3	0,31	179	6,6	21,3
25	Selsvatnet	Trout	5,82	2,32	1,5	1,59	232	1,9	9,1
26	Selsvatnet	Trout	5,66	0,06	3,0	0,95	700	7,7	25,5
27	Selsvatnet	Trout	3,70	0,12	0,5	0,50	135	5,9	33,4
28	Smalfjordvatn	Arctic char	2,76	5,45	0,9	1,05	409	3,4	29,2
29	Smalfjordvatn	Trout	1,50	0,10	3,2	1,42	1158	2,0	13,4
30	Smalfjordvatn	Trout	2,10	0,61	2,6	0,95	391	1,7	9,4
31	Lundevatnet	Trout	4,27	2,85	3,0	2,22	523	2,3	12,8
32	Lundevatnet	Trout	5,45	3,52	1,6	1,41	157	3,4	6,3
33	Lundevatnet	Trout	5,28	0,54	3,1	1,49	458	4,0	7,9
34	Vangsvatnet	Trout	1,96	0,14	7,7	0,97	324	11,8	21,8
35	Vangsvatnet	Trout	3,51	1,63	4,6	2,46	584	2,2	11,8
36	Vangsvatnet	Arctic char	3,21	0,35	1,4	0,93	248	2,8	8,3
37	Hornindalsvatnet	Trout	2,54	2,94	1,2	0,57	119	8,7	11,0
38	Hornindalsvatnet	Trout	4,18	1,69	0,9	0,73	177	1,9	6,6
39	Hornindalsvatnet	Trout	4,35	0,36	0,5	0,70	280	2,0	7,1

Project		Speciec		Tributyltin	Dibutyltin	Monobutyltin	Triphenyltin	Diphenyltin	Monophenyltin
				TBT	DBT	MBT	TPT	DPT	(MPT)
number	Det. lim.			0,06	0,04	0,03	0,05	0,07	0,18
	Lake		Lipid %						
1	Eikedalsvannet	Trout	3,52	0,93	nd	nd	nd	nd	nd
2	Eikedalsvannet	Trout	2,63	0,38	0,39	nd	nd	nd	nd
3	Eikedalsvannet	Trout	4,27	0,48	0,41	nd	nd	nd	nd
4	Ø Drengsrudvann	Perch	3,30	1,58	0,65	nd	nd	nd	nd
5	Ø Drengsrudvann	Perch	3,74	1,15	0,75	nd	nd	nd	nd
6	Ø Drengsrudvann	Perch	3,62	1,06	0,80	nd	nd	nd	nd
7	Øyern	Perch	4,66	1,51	0,68	nd	nd	nd	nd
8	Øyern	Perch	3,35	2,43	nd	nd	nd	nd	nd
9	Øyern	Perch	3,47	1,91	0,96	nd	nd	nd	nd
10	Storvatn	Arctic char	3,34	0,38	0,42	nd	nd	nd	nd
11	Storvatn	Trout	4,03	0,47	15,94	nd	nd	nd	nd
12	Storvatn	Trout	3,91	0,33	0,46	nd	nd	nd	nd
13	Femsjøen	Pike	4,59	0,49	12,47	nd	nd	nd	nd
14	Femsjøen	White bream	3,42	0,75	1,09	nd	nd	nd	7,0
15	Femsjøen	Burbot	30,24	nd	nd	nd	nd	nd	nd
16	Mingevannet	Pike	4,36	4,46	nd	nd	nd	nd	nd
17	Mingevannet	Perch	3,13	0,45	0,27	nd	nd	nd	nd
18	Mingevannet	Pikeperch	5,27	0,40	0,25	nd	nd	nd	nd
19	Surtningen Vågå	Trout	3,39	nd	0,63	nd	nd	nd	nd
20	Surtningen Vågå	Trout	3,28	nd	1,49	nd	nd	nd	nd
21	Surtningen Vågå	Trout	3,76	0,33	0,54	nd	nd	nd	nd
22	Byglandsfjord	Trout	2,81	nd	nd	nd	nd	nd	nd
23	Byglandsfjord	Trout	3,23	0,20	0,47	nd	nd	nd	nd
24	Byglandsfjord	Trout	2,87	0,19	0,81	nd	nd	nd	nd
25	Selsvatnet	Trout	5,82	0,64	nd	nd	nd	nd	nd
26	Selsvatnet	Trout	5,66	0,86	0,34	nd	nd	nd	nd
27	Selsvatnet	Trout	3,70	1,34	1,31	nd	nd	nd	nd
28	Smalfjordvatn	Arctic char	2,76	nd	nd	nd	nd	nd	nd
29	Smalfjordvatn	Trout	1,50	nd	0,42	nd	nd	nd	nd
30	Smalfjordvatn	Trout	2,10	nd	0,33	nd	nd	nd	nd
31	Lundevatnet	Trout	4,27	0,98	1,74	nd	nd	nd	nd
32	Lundevatnet	Trout	5,45	1,37	1,29	nd	nd	nd	nd
33	Lundevatnet	Trout	5,28	nd	1,13	nd	nd	nd	nd
34	Vangsvatnet	Trout	1,96	nd	1,23	nd	nd	nd	nd
35	Vangsvatnet	Trout	3,51	nd	0,64	nd	nd	nd	nd
36	Vangsvatnet	Arctic char	3,21	0,90	1,60	nd	nd	nd	nd
37	Hornindalsvatnet	Trout	2,54	nd	0,47	nd	nd	nd	nd
38	Hornindalsvatnet	Trout	4,18	nd	0,68	nd	nd	nd	nd
39	Hornindalsvatnet	Trout	4,35	nd	0,73	nd	nd	nd	nd

Project		Speciec		Sum TEQ (pg/g ww)	Sum(p g/g ww)	Sum (pg/g ww)TEQ	Sum (pg/g ww) TEQ	$d^{13}C_{VPDB}$	$d^{15}N_{AIR}$
				moPCB+noPCB	PCDD+PCDF	PCDD+PCDF	PCDD+PCDF +dl PCBs		
number	Det. lim.								
	Lake		Lipid %						
1	Eikedalsvannet	Trout	3,52	0,1825	0,0	0,0	0,1825	-22,79	8,71
2	Eikedalsvannet	Trout	2,63	0,0877	0,0	0,0	0,0877	-15,26	8,50
3	Eikedalsvannet	Trout	4,27	1,6060	0,2385	0,0238	1,6299	-20,67	9,81
4	Ø Drengsrudvann	Perch	3,30	0,3413	0,0	0,0	0,3413	-32,07	9,26
5	Ø Drengsrudvann	Perch	3,74	0,4577	0,3418	0,0342	0,4918	-32,81	9,37
6	Ø Drengsrudvann	Perch	3,62	0,5572	0,3671	0,0367	0,5939	-33,85	9,96
7	Øyern	Perch	4,66	0,4109	0,2391	0,0458	0,4567	-25,82	14,16
8	Øyern	Perch	3,35	0,2037	0,00	0,00	0,2037	-25,22	14,90
9	Øyern	Perch	3,47	1,1698	0,00	0,00	1,1698	-24,58	14,47
10	Storvatn	Arctic char	3,34	0,5156	23,5482	1,0535	1,5691	-20,87	6,85
11	Storvatn	Trout	4,03	0,6223	3,6845	0,3749	0,9972	-19,00	9,46
12	Storvatn	Trout	3,91	0,4068	0,4320	0,0432	0,4500	-20,53	9,38
13	Femsjøen	Pike	4,59	3,6719	8,5520	1,7662	5,4381	-26,29	14,49
14	Femsjøen	White bream	3,42	0,6826	2,0544	0,3577	1,0402	-27,18	12,99
15	Femsjøen	Burbot	30,24	29,4599	85,4881	14,4942	43,9541	-27,17	16,48
16	Mingevannet	Pike	4,36	2,3252	3,6450	0,5810	2,9062	-24,98	14,58
17	Mingevannet	Perch	3,13	0,2742	0,0	0,0	0,2742	-23,16	15,08
18	Mingevannet	Pikeperch	5,27	0,4268	0,4034	0,1651	0,5919	-24,77	15,38
19	Surtningen Vågå	Trout	3,39	0,0710	0,3390	0,0633	0,1344	-28,58	10,79
20	Surtningen Vågå	Trout	3,28	0,0908	0,8891	0,1470	0,2378	-29,94	11,42
21	Surtningen Vågå	Trout	3,76	0,0812	0,2175	0,0217	0,1030	-29,22	10,93
22	Byglandsfjord	Trout	2,81	0,2716	0,2097	0,0210	0,2925	-24,56	7,25
23	Byglandsfjord	Trout	3,23	0,1546	1,1550	0,1046	0,2592	-24,85	11,51
24	Byglandsfjord	Trout	2,87	0,1724	1,8021	0,1921	0,3645	-25,26	7,29
25	Selsvatnet	Trout	5,82	0,0479	0,3472	0,0035	0,0513	-26,03	10,10
26	Selsvatnet	Trout	5,66	0,3301	0,1705	0,0170	0,3472	-25,13	9,78
27	Selsvatnet	Trout	3,70	0,0575	0,9302	0,0028	0,0604	-25,57	9,99
28	Smalfjordvatn	Arctic char	2,76	0,8575	2,4661	0,4545	1,3120	-23,64	8,56
29	Smalfjordvatn	Trout	1,50	0,1205	0,3859	0,0386	0,1591	-22,55	9,66
30	Smalfjordvatn	Trout	2,10	0,2694	0,3283	0,0328	0,3023	-22,44	10,82
31	Lundevatnet	Trout	4,27	0,1318	0,8576	0,3786	0,5104	-26,10	8,67
32	Lundevatnet	Trout	5,45	0,0074	0,8734	0,0595	0,0668	-26,12	8,28
33	Lundevatnet	Trout	5,28	1,1189	0,6809	0,1221	1,2410	-26,41	7,84
34	Vangsvatnet	Trout	1,96	0,1119	0,5440	0,0054	0,1173	-26,25	9,59
35	Vangsvatnet	Trout	3,51	0,0042	1,4443	0,0004	0,0046	-26,60	9,48
36	Vangsvatnet	Arctic char	3,21	0,1519	0,5446	0,0545	0,2063	-29,97	8,12
37	Hornindalsvatnet	Trout	2,54	0,0290	0,00	0,00	0,0290	-25,01	9,45
38	Hornindalsvatnet	Trout	4,18	0,0164	0,1896	0,0057	0,0221	-24,59	10,32
39	Hornindalsvatnet	Trout	4,35	0,7852	2,5406	0,9012	1,6864	-25,40	9,45

Project		Speciec	Li	Mg	Al	V	Cr	Fe	Co	Ni	Cu
number	Det. lim.		Mg/kg	Mg/kg	Mg/kg	Mg/kg	Mg/kg	Mg/kg	Mg/kg	Mg/kg	Mg/kg
	Lake										
1	Eikedalsvanne	Trout	<0,001	190	4,0	0,037	<LOD	110	0,058	<0,06	73
2	Eikedalsvanne	Trout	<0,001	160	3,4	0,051	<LOD	160	0,18	<0,06	290
3	Eikedalsvanne	Trout	<0,001	170	1,1	0,012	<LOD	85	0,043	<LOD	110
4	Ø Drengsrudv	Perch	0,004	180	1,1	<0,005	<LOD	72	0,16	<LOD	1,5
5	Ø Drengsrudv	Perch	0,004	180	0,35	<0,005	<LOD	91	0,12	<LOD	1,3
6	Ø Drengsrudv	Perch	0,004	190	0,75	<0,005	<LOD	81	0,21	<LOD	1,6
7	Øyern	Perch	0,006	220	2,5	0,016	<LOD	82	0,23	<LOD	2,2
8	Øyern	Perch	0,006	200	4,8	0,028	<LOD	97	0,15	<LOD	2,2
9	Øyern	Perch	0,007	170	3,3	0,013	<LOD	96	0,16	<LOD	2,0
10	Storvatn	Arctic char	<0,001	230	2,2	0,017	<0,05	360	0,14	<0,06	45
11	Storvatn	Trout	<LOD	190	0,44	<0,005	<LOD	73	0,026	<LOD	60
12	Storvatn	Trout	<LOD	210	0,57	<0,004	<LOD	65	0,025	<LOD	62
13	Femsjøen	Pike	<0,001	180	1,9	0,064	<LOD	94	0,024	<LOD	4,6
14	Femsjøen	White bream	0,002	180	11	0,11	<LOD	260	0,035	<0,05	12
15	Femsjøen	Burbot	<0,001	100	2,7	0,039	<LOD	140	0,18	<LOD	8,8
16	Mingevannet	Pike	<0,001	190	0,68	0,016	<LOD	49	0,024	<LOD	3,1
17	Mingevannet	Perch	0,003	220	1,8	0,010	<LOD	46	0,10	<LOD	1,1
18	Mingevannet	Pikeperch	0,004	180	1,1	0,005	<LOD	52	0,081	<LOD	0,99
19	Surtningen Vå	Trout	0,002	190	1,6	0,028	<0,04	150	0,035	0,067	69
20	Surtningen Vå	Trout	0,002	210	1,2	0,043	<LOD	130	0,034	<0,05	25
21	Surtningen Vå	Trout	0,002	210	0,35	0,019	<LOD	120	0,028	<0,06	41
22	Byglandsfjord	Trout	0,003	140	27	0,026	<LOD	150	0,086	<0,06	110
23	Byglandsfjord	Trout	0,002	180	9,4	0,036	<LOD	190	0,10	<0,05	91
24	Byglandsfjord	Trout	0,003	150	7,2	0,032	0,037	210	0,084	<0,05	90
25	Selsvatnet	Trout	0,010	300	1,2	0,006	<LOD	10	0,008	<LOD	1,4
26	Selsvatnet	Trout	0,013	310	5,6	0,011	<0,05	13	0,012	<LOD	1,7
27	Selsvatnet	Trout	0,004	170	0,44	0,020	<LOD	93	0,029	<LOD	48
28	Smalfjordvatn	Arctic char	0,002	340	1,4	0,008	<LOD	140	0,13	<LOD	13
29	Smalfjordvatn	Trout	0,001	180	0,56	<0,005	<LOD	77	0,026	<LOD	45
30	Smalfjordvatn	Trout	<0,001	210	0,69	<0,005	<LOD	62	0,026	<LOD	18
31	Lundevatnet	Trout	<0,001	150	11	0,083	<LOD	250	0,044	<LOD	96
32	Lundevatnet	Trout	<0,001	160	6,3	0,034	<LOD	170	0,039	<0,05	99
33	Lundevatnet	Trout	<0,001	150	9,1	0,064	<LOD	170	0,054	<LOD	66
34	Vangsvatnet	Trout	0,003	190	9,2	0,014	<LOD	150	0,12	0,084	42
35	Vangsvatnet	Trout	0,002	180	4,3	0,008	<LOD	160	0,11	<0,06	57
36	Vangsvatnet	Arctic char	0,002	230	12	0,081	<LOD	860	0,13	<LOD	8,8
37	Hornindalsvat	Trout	<0,001	150	1,7	0,010	<LOD	220	0,061	<0,05	70
38	Hornindalsvat	Trout	<0,001	140	1,6	0,010	<LOD	220	0,063	<0,06	120
39	Hornindalsvat	Trout	<0,001	140	2,2	0,018	<LOD	290	0,046	<0,05	140

Project		Speciec	Zn	As	Se	Mo	Ag	Cd	Hg	Hg muskel	Pb
number	Det. lim.		Mg/kg	Mg/kg	Mg/kg	Mg/kg	Mg/kg	Mg/kg	Mg/kg	Mg/kg	Mg/kg
	Lake										
1	Eikedalsvannet	Trout	35	0,041	11	0,21	1,8	0,16	0,18	0,16	0,013
2	Eikedalsvannet	Trout	43	0,073	13	0,19	2,5	0,11	0,16	0,082	0,011
3	Eikedalsvannet	Trout	31	0,056	18	0,20	2,7	0,082	0,32	0,30	0,0037
4	Ø Drengsrudvann	Perch	24	0,031	0,88	0,12	0,002	0,16	0,32	0,54	0,0084
5	Ø Drengsrudvann	Perch	23	0,065	0,89	0,098	<LOD	0,055	0,52	0,77	0,0015
6	Ø Drengsrudvann	Perch	25	0,11	1,0	0,13	<0,001	0,061	1,6	1,9	0,0012
7	Øyern	Perch	27	0,11	1,0	0,13	0,002	0,48	0,15	0,35	0,0035
8	Øyern	Perch	25	0,072	1,1	0,13	0,003	0,51	0,52	1,1	0,0038
9	Øyern	Perch	29	0,029	1,0	0,12	<0,001	0,33	0,25	0,84	0,0044
10	Storvatn	Arctic char	44	0,13	5,2	0,20	0,61	0,23	0,18	0,16	0,026
11	Storvatn	Trout	68	0,089	23	0,21	2,4	0,10	0,30	0,14	0,0029
12	Storvatn	Trout	57	0,098	24	0,18	1,9	0,087	0,24	0,17	0,0039
13	Femsjøen	Pike	54	0,058	1,7	0,14	0,062	0,17	1,2	1,0	0,0045
14	Femsjøen	White brea	28	0,064	1,3	0,16	0,11	0,91	0,12	0,35	0,046
15	Femsjøen	Burbot	21	0,34	0,51	0,17	0,056	0,46	0,82	1,1	0,0038
16	Mingevannet	Pike	39	0,040	1,1	0,11	0,028	0,096	0,16	0,34	0,0019
17	Mingevannet	Perch	22	0,13	0,80	0,10	<0,001	0,38	0,17	0,45	0,0037
18	Mingevannet	Pikeperch	13	0,045	0,74	0,079	<0,001	0,15	0,20	0,50	0,0018
19	Surtningen Vågå	Trout	36	0,067	6,3	0,14	0,64	0,035	0,091	0,099	0,023
20	Surtningen Vågå	Trout	34	0,043	2,5	0,13	0,43	0,050	0,14	0,13	0,017
21	Surtningen Vågå	Trout	50	0,043	5,2	0,17	0,66	0,039	0,13	0,12	0,018
22	Byglandsfjord	Trout	35	0,013	8,5	0,10	2,0	0,77	0,21	0,18	0,089
23	Byglandsfjord	Trout	39	0,023	5,3	0,12	2,2	1,3	0,13	0,10	0,14
24	Byglandsfjord	Trout	33	0,047	5,8	0,12	2,4	1,2	0,14	0,12	0,12
25	Selsvatnet	Trout	45	0,011	0,58	<0,01	0,003	0,0008	0,044	0,050	0,036
26	Selsvatnet	Trout	43	0,014	0,58	<0,01	0,004	<LOD	0,059	0,071	0,037
27	Selsvatnet	Trout	41	0,007	6,8	0,16	0,14	0,0011	0,098	0,068	0,0058
28	Smalfjordvatn	Arctic char	47	0,040	2,4	0,15	0,063	0,044	0,29	0,23	0,005
29	Smalfjordvatn	Trout	57	0,042	11	0,18	0,84	0,028	0,14	0,11	0,0018
30	Smalfjordvatn	Trout	55	0,033	5,5	0,17	0,60	0,031	0,16	0,15	0,003
31	Lundevatnet	Trout	34	0,013	12	0,15	3,0	4,1	0,15	0,14	0,38
32	Lundevatnet	Trout	40	0,017	12	0,15	2,6	2,7	0,090	0,094	0,38
33	Lundevatnet	Trout	32	0,015	7,3	0,14	1,9	2,4	0,14	0,16	0,34
34	Vangsvatnet	Trout	37	0,028	4,0	0,17	1,7	0,42	0,056	0,055	0,020
35	Vangsvatnet	Trout	31	0,027	4,3	0,16	1,4	0,59	0,077	0,083	0,021
36	Vangsvatnet	Arctic char	26	0,014	2,4	0,17	0,070	0,58	0,26	0,20	0,028
37	Hornindalsvatnet	Trout	37	0,012	6,2	0,12	0,61	0,54	0,11	0,10	0,020
38	Hornindalsvatnet	Trout	29	0,007	8,3	0,12	0,84	0,37	0,15	0,10	0,023
39	Hornindalsvatnet	Trout	29	0,007	12	0,13	1,0	0,68	0,20	0,18	0,019

10. Attachments

Raw data from “Monitoring of environmental contaminants in freshwater ecosystems – Part I”. First column on each page indicates the target organism or sample media. Units are for most contaminants reported as ng/g w.w. in biota, except Hg which is in µg/g.

Sample type	Lake	NILU ID	N fish in comp.sample	L, cm	SD L, cm	Wght, g	SD W, g	d13CVPDB	d15NAIR	W% C	W% N	C/N	d32SVCDT	W% S	Hg, mg/kg	LIMS ID
Brown trout	Mjøsa	17/1385	1	81,5		6190		-26,86	15	49,67	13,98	3,55	3,55	1,1	0.856	2017-9834
Brown trout	Mjøsa	17/1386	1	76,2		5630		-27,2	15,1	50,22	13,6	3,69	3,52	1,1	0.988	2017-9835
Brown trout	Mjøsa	17/1387	1	68,3		4020		-27,49	14,86	48,9	13,47	3,63	3,45	1,1	0.609	2017-9836
Brown trout	Mjøsa	17/1388	1	56,3		2130		-28,48	14,83	50,39	12,25	4,11	3,46	1,1	0.298	2017-9837
Brown trout	Mjøsa	17/1389	1	64,2		2580		-27,07	15,47	46,82	14,45	3,24	2,95	1,2	0.973	2017-9838
Brown trout	Mjøsa	17/1390	1	74,3		3560		-26,92	15,52	48,75	15,22	3,2	2,43	1,1	1,48	2017-9839
Brown trout	Mjøsa	17/1391	1	57,6		2560		-27,3	15,1	49,4	13,42	3,68	2,74	1,1	0.291	2017-9840
Brown trout	Mjøsa	17/1392	1	61,5		3040		-26,81	15,15	47,34	14,33	3,3	3,24	1,1	0.676	2017-9841
Brown trout	Mjøsa	17/1393	1	56,5		2300		-27,38	14,54	50,16	13,51	3,71	3,72	1,1	0.289	2017-9842
Brown trout	Mjøsa	17/1394	1	64,1		2980		-26,99	14,35	47,94	13,7	3,5	3,39	1	0.399	2017-9843
Brown trout	Mjøsa	17/1395	1	66,8		3200		-27,09	15,15	49,3	14,35	3,44	3,08	1,2	0.69	2017-9844
Brown trout	Mjøsa	17/1396	1	63,6		3040		-26,76	15,13	51,08	14,34	3,56	2,86	1,2	0.353	2017-9845
Brown trout	Mjøsa	17/1397	1	62,3		3020		-27,4	15,38	52,04	13,54	3,84	3,48	1	0.432	2017-9846
Brown trout	Mjøsa	17/1398	1	57,5		2440		-27,28	14,51	50,2	13,5	3,72	3,24	1,1	0.355	2017-9847
Brown trout	Mjøsa	17/1399	1	69,5		4170		-28,5	15,14	46,8	11,11	4,21	3,34	0,9	0.701	2017-9848
Smelt	Mjøsa	17/1365	4	14,475	0,763	19,7	4,834	-26,61	14,78	53,56	15,8	3,39	3,17	1,4	0.122	2017-9814
Smelt	Mjøsa	17/1366	8	10,375	0,381	5,4	0,580	-28,42	13,62	53,88	15,39	3,5	3,44	1,4	0.099	2017-9815
Smelt	Mjøsa	17/1367	1	24,5		109		-27,1	15,26	50,14	14,32	3,5	3,79	1,1	0.371	2017-9816
Smelt	Mjøsa	17/1368	1	23		72,6		-26,71	15,54	52,39	15,59	3,36	3,37	1,3	0.514	2017-9817
Smelt	Mjøsa	17/1369	5	12,28	0,661	10,3	0,853	-27,46	13,99	52,81	15,8	3,34	3,41	1,4	0.115	2017-9818
Smelt	Mjøsa	17/1370	5	13,84	0,764	14,9	3,900	-27,72	14,69	53,47	15,28	3,5	3,4	1,3	0.175	2017-9819
Smelt	Mjøsa	17/1371	6	13,3	0,865	12,8	2,452	-28,3	14,49	54,51	14,77	3,69	3,27	1,3	0.222	2017-9820
Smelt	Mjøsa	17/1372	2	17,15	0,212	34,4	5,374	-27,86	14,97	54,82	14,14	3,88	3,12	1,1	0.162	2017-9821
Smelt	Mjøsa	17/1373	4	14,975	1,642	19,7	5,570	-26,68	15,38	52,93	15,04	3,52	3,54	1,3	0.309	2017-9822
Smelt	Mjøsa	17/1374	2	20,8	1,697	58	9,899	-27,26	14,67	51,58	14,98	3,44	3,02	1,3	0.156	2017-9823
Vendace	Mjøsa	17/1375	2	17,75	0,212	45	0	-30,04	14,12	53,7	13,32	4,03	3,79	1,2	0.087	2017-9794
Vendace	Mjøsa	17/1376	2	18,05	0,071	45	2,828	-30,3	13,74	55,91	13,42	4,17	3,33	1,2	0.084	2017-9795
Vendace	Mjøsa	17/1377	2	17,85	0,919	43,5	4,950	-29,94	13,74	54,08	13,9	3,89	3,64	1,1	0.081	2017-9796
Vendace	Mjøsa	17/1378	1	18		49		-28,51	12,25	54,2	15,38	3,52	3,65	1,3	0.071	2017-9797
Vendace	Mjøsa	17/1379	1	20,2		59		-30,11	13,49	55,34	13,83	4	3,53	1,2	0.095	2017-9798
Vendace	Mjøsa	17/1380	1	17,8		51		-29,86	13,4	57,08	13,99	4,08	3,57	1,3	0.073	2017-9799
Vendace	Mjøsa	17/1381	2	17,5	0	43	0	-29,47	13,33	56,78	14,05	4,04	3,41	1,2	0.084	2017-9800
Vendace	Mjøsa	17/1382	2	16,65	0,071	41	1,414	-30,05	13,76	57,44	13,51	4,25	3,6	1,2	0.075	2017-9801
Vendace	Mjøsa	17/1383	2	17	0,707	41,5	2,121	-30,32	13,87	54,12	12,47	4,34	3,14	1	0.078	2017-9802
Vendace	Mjøsa	17/1384	1	18,7		52		-30,02	13,65	55,85	12,82	4,36	3,28	1,1	0.068	2017-9803
Brown trout	Femunden	17/1400	1	42,5		848		-23,98	10,8	48,55	13,37	3,63	7,18	1,1	0.739	2017-9864
Brown trout	Femunden	17/1401	1	44,6		1007		-21,53	9,97	47,79	14,58	3,28	6,97	1,1	0.451	2017-9865
Brown trout	Femunden	17/1402	1	36,6		485		-24,25	11,18	50,5	13,53	3,73	6,54	1,1	0.442	2017-9866
Brown trout	Femunden	17/1403	1	39,4		639		-24,43	10,95	47,53	13,82	3,44	6,86	1,1	0.308	2017-9867
Brown trout	Femunden	17/1404	1	44,3		1072		-24,86	11,01	47,33	14,11	3,35	6,22	1,1	0.48	2017-9868
Brown trout	Femunden	17/1405	1	36,2		517		-23,95	10,32	46,88	14,42	3,25	6,35	1,2	0.323	2017-9869
Brown trout	Femunden	17/1406	1	38,6		685		-22,32	10,14	48,35	13,73	3,52	6,75	1,1	0.274	2017-9870
Brown trout	Femunden	17/1407	1	40		674		-20,95	7,98	46,13	14,67	3,14	6,65	1,1	0.056	2017-9871
Brown trout	Femunden	17/1408	1	41		688		-21,88	8,96	45,92	13,61	3,37	7,36	1	0.186	2017-9872
Brown trout	Femunden	17/1409	1	33,1		504		-23,81	10,65	46,48	13,77	3,38	6,82	1	0.282	2017-9873
Zoopl, epilimnion	Mjøsa	17/1359						-28,92	7,96	46,78	9,83	4,76	3,29	0,8	<0.005	2017-10829
Zoopl, epilimnion	Mjøsa	17/1360						-29,07	7,73	46,66	9,66	4,83	2,95	0,8	<0.005	2017-10830
Zoopl, epilimnion	Mjøsa	17/1361						-29,24	7,91	46,19	9,62	4,8	2,89	0,7	<0.005	2017-10831
Mysis	Mjøsa	17/1362						-31,92	11,76	55,07	8,14	6,77	3,28	0,8	0.017	2017-10832
Mysis	Mjøsa	17/1363						-31,44	11,78	54,61	9,18	5,95	3,12	0,9	0.013	2017-10833
Mysis	Mjøsa	17/1364						-31,87	11,73	55,24	8,33	6,64	3,87	0,8	0.013	2017-10834
Water	Mjøsa	17/1709														
Water	Mjøsa	17/1710														
Water	Mjøsa	17/1711														
Water	Mjøsa	17/1712														
Water	Mjøsa	17/1713														
Sediment	Mjøsa	17/1714														
Sediment	Mjøsa	17/1715														
Sediment	Mjøsa	17/1716														
Sediment	Mjøsa	17/1717														
Sediment	Mjøsa	17/1718														
Brown trout, muskel	Eikedalsvatnet	17/2925	5	29,6875	1,067	275,5	21,706									2017-12146
Brown trout, muskel	Eikedalsvatnet	17/2926	5	33,8	1,037	399,6	41,980									2017-12147
Brown trout, muskel	Eikedalsvatnet	17/2927	8	39,5	2,784	646,6	96,495									2017-12148
Brown trout, lever	Eikedalsvatnet															
Brown trout, lever	Eikedalsvatnet															
Brown trout, lever	Eikedalsvatnet															

Sample type	Lake	C_ID	Sample type:	Lipid, %	POPs Concentration units:	TBA	BDE-17	BDE-28	BDE-47	BDE-49
Brown trout	Mjøsa	ØM-M-1	Muscle	2,68	ng/g WW	0,0222	0,0023	0,0334	6,08	0,288
Brown trout	Mjøsa	ØM-M-2	Muscle	3,9	ng/g WW	0,0273	0,00279	0,0439	9,02	0,479
Brown trout	Mjøsa	ØM-M-3	Muscle	4,4	ng/g WW	0,0407	0,00221	0,0238	4,29	0,318
Brown trout	Mjøsa	ØM-M-4	Muscle	3,7	ng/g WW	0,0257	0,00174	0,0144	2,21	0,132
Brown trout	Mjøsa	ØM-M-5	Muscle	0,62	ng/g WW	0,00526	0,00165	0,012	4,99	0,226
Brown trout	Mjøsa	ØM-M-6	Muscle	0,42	ng/g WW	0,00275	0,00106	0,0255	12,9	0,442
Brown trout	Mjøsa	ØM-M-7	Muscle	4,08	ng/g WW	0,0186	0,00161	0,0146	2,05	0,142
Brown trout	Mjøsa	ØM-M-8	Muscle	2,85	ng/g WW	0,0202	0,00242	0,0215	4,89	0,228
Brown trout	Mjøsa	ØM-M-9	Muscle	2,44	ng/g WW	0,0179	0,00106	0,00985	1,46	0,0849
Brown trout	Mjøsa	ØM-M-10	Muscle	2,7	ng/g WW	0,0251	0,00227	0,0207	3,31	0,198
Brown trout	Mjøsa	ØM-M-11	Muscle	1,3	ng/g WW	0,0121	0,00175	0,016	3,29	0,169
Brown trout	Mjøsa	ØM-M-12	Muscle	1,9	ng/g WW	0,00959	0,00132	0,0135	2,12	0,134
Brown trout	Mjøsa	ØM-M-13	Muscle	2,8	ng/g WW	0,0153	0,00305	0,0158	2,39	0,137
Brown trout	Mjøsa	ØM-M-14	Muscle	3,1	ng/g WW	0,0197	0,00287	0,0121	2,14	0,108
Brown trout	Mjøsa	ØM-M-15	Muscle	4,5	ng/g WW	0,0319	0,0329	0,0306	5,55	0,306
Smelt	Mjøsa	KM-M-1	Muscle	0,53	ng/g WW	0,00261	0,00113	0,0053	0,779	0,04
Smelt	Mjøsa	KM-M-2	Muscle	0,96	ng/g WW	0,00383	-0,000995	0,0033	0,474	0,0257
Smelt	Mjøsa	KM-M-3	Muscle	1,2	ng/g WW	0,00407	-0,000995	0,00741	1,27	0,0621
Smelt	Mjøsa	KM-M-4	Muscle	0,8	ng/g WW	0,00257	0,00145	0,0101	2,17	0,0717
Smelt	Mjøsa	KM-M-5	Muscle	1,6	ng/g WW	0,00609	0,00159	0,00762	1,21	0,0638
Smelt	Mjøsa	KM-M-6	Muscle	1,66	ng/g WW	0,0044	0,00178	0,00734	1,07	0,0548
Smelt	Mjøsa	KM-M-7	Muscle	1,7	ng/g WW	0,00727	0,00255	0,0123	2,03	0,0841
Smelt	Mjøsa	KM-M-8	Muscle	2,82	ng/g WW	0,0108	0,00177	0,0112	1,67	0,0956
Smelt	Mjøsa	KM-M-9	Muscle	1,2	ng/g WW	0,00434	0,00654	0,00621	0,819	0,0474
Smelt	Mjøsa	KM-M-10	Muscle	1,2	ng/g WW	0,00479	0,00259	0,0101	1,66	0,0919
Vendace	Mjøsa	LM-M-1	Muscle	5,1	ng/g WW	0,0189	0,00339	0,00975	1,1	0,117
Vendace	Mjøsa	LM-M-2	Muscle	3,75	ng/g WW	0,0164	0,00275	0,00969	1,09	0,108
Vendace	Mjøsa	LM-M-3	Muscle	3,1	ng/g WW	0,0138	-0,000995	0,00752	0,879	0,089
Vendace	Mjøsa	LM-M-4	Muscle	2	ng/g WW	0,0103	0,00151	0,00378	0,423	0,0557
Vendace	Mjøsa	LM-M-5	Muscle	3,3	ng/g WW	0,0126	-0,000995	0,00984	1,13	0,119
Vendace	Mjøsa	LM-M-6	Muscle	3,21	ng/g WW	0,0179	0,00276	0,0102	1,01	0,0805
Vendace	Mjøsa	LM-M-7	Muscle	3,4	ng/g WW	0,0132	0,00138	0,00934	1,02	0,103
Vendace	Mjøsa	LM-M-8	Muscle	5,5	ng/g WW	0,0218	0,00196	0,00913	0,949	0,0954
Vendace	Mjøsa	LM-M-9	Muscle	4,5	ng/g WW	0,0187	0,00291	0,0119	1,39	0,146
Vendace	Mjøsa	LM-M-10	Muscle	4,4	ng/g WW	0,0175	-0,000995	0,00811	0,916	0,0814
Brown trout	Femunden	ØF-M-1	Muscle	0,84	ng/g WW	0,00663	-0,000796	0,00145	0,0673	0,00944
Brown trout	Femunden	ØF-M-2	Muscle	1,3	ng/g WW	0,00791	0,0016	0,0025	0,131	0,0171
Brown trout	Femunden	ØF-M-3	Muscle	0,42	ng/g WW	0,0146	0,00082	0,00233	0,139	0,018
Brown trout	Femunden	ØF-M-4	Muscle	1,14	ng/g WW	0,00561	0,000891	0,00215	0,15	0,0216
Brown trout	Femunden	ØF-M-5	Muscle	1,4	ng/g WW	0,0123	0,00116	0,00316	0,156	0,0233
Brown trout	Femunden	ØF-M-6	Muscle	0,85	ng/g WW	0,0202	0,00258	0,007	0,375	0,053
Brown trout	Femunden	ØF-M-7	Muscle	1,5	ng/g WW	0,00957	0,001	0,00238	0,143	0,0226
Brown trout	Femunden	ØF-M-8	Muscle	0,78	ng/g WW	0,811	-0,0133	0,0383	0,89	0,169
Brown trout	Femunden	ØF-M-9	Muscle	1,7	ng/g WW	0,0187	-0,00356	0,00464	0,136	0,0164
Brown trout	Femunden	ØF-M-10	Muscle	0,7	ng/g WW	0,0108	-0,00473	-0,00452	0,0679	0,00627
Zoopl, epilimnion	Mjøsa	ZM-1-H-A	Zooplankton	0,2	ng/g WW	-0,00499	-0,00199	-0,00263	0,0272	-0,00209
Zoopl, epilimnion	Mjøsa	ZM-2-H-A	Zooplankton	0,2	ng/g WW	-0,00499	-0,00199	-0,00263	0,0218	-0,00209
Zoopl, epilimnion	Mjøsa	ZM-3-H-A	Zooplankton	0,2	ng/g WW	-0,00499	-0,00199	-0,00263	0,0216	0,00214
Mysis	Mjøsa	MM-1-H-A	Mysis	4,5	ng/g WW	-0,00499	-0,00199	0,0045	0,393	0,0309
Mysis	Mjøsa	MM-2-H-A	Mysis	4,9	ng/g WW	0,00631	-0,00199	0,00484	0,376	0,0267
Mysis	Mjøsa	MM-3-H-A	Mysis	4,5	ng/g WW	-0,00499	-0,00199	0,00522	0,34	0,0235
Water	Mjøsa		Water		ng/L	-0,328000009	-0,261000007	-0,395999998	-7,369999886	-6,869999886
Water	Mjøsa		Water		ng/L	-0,328000009	-0,261000007	-0,395999998	-7,369999886	-6,869999886
Water	Mjøsa		Water		ng/L	-0,328000009	-0,261000007	-0,395999998	-7,369999886	-6,869999886
Water	Mjøsa		Water		ng/L	-0,328000009	-0,261000007	-0,395999998	-7,369999886	-6,869999886
Water	Mjøsa		Water		ng/L	-0,328000009	-0,261000007	-0,395999998	-7,369999886	-6,869999886
Sediment	Mjøsa		Sediment		ng/g DW	-0,016100001	-0,0128	-0,019400001	-0,361000001	-0,337000012
Sediment	Mjøsa		Sediment		ng/g DW	-0,015900001	-0,0127	-0,019200001	-0,35800001	-0,333999991
Sediment	Mjøsa		Sediment		ng/g DW	-0,0164	-0,013	-0,0198	-0,368000001	-0,344000012
Sediment	Mjøsa		Sediment		ng/g DW					
Sediment	Mjøsa		Sediment		ng/g DW					
Brown trout, muskel	Eikedalsvatnet	Bl.prøve 2017-12146	Muscle	1,4	ng/g WW	0,0154	-0,00133	0,00187	0,0518	0,00748
Brown trout, muskel	Eikedalsvatnet	Bl.prøve 2017-12147	Muscle	0,95	ng/g WW	0,0176	0,00151	0,00266	0,0747	0,00683
Brown trout, muskel	Eikedalsvatnet	Bl.prøve 2017-12148	Muscle	0,74	ng/g WW	0,015	-0,00133	0,00248	0,124	0,0155
Brown trout, lever	Eikedalsvatnet		Liver							
Brown trout, lever	Eikedalsvatnet		Liver							
Brown trout, lever	Eikedalsvatnet		Liver							

Sample type	Lake	BDE-66	BDE-71	BDE-77	BDE-85	BDE-99	BDE-100	BDE-119	BDE-126	BDE-138
Brown trout	Mjøsa	0,144	-0,000657	-0,000406	0,00726	1,6	1,7	0,0369	-0,000676	-0,00199
Brown trout	Mjøsa	0,208	-0,000603	0,0048	-0,00158	2,64	2,64	0,0773	-0,00107	-0,00199
Brown trout	Mjøsa	0,102	-0,000603	0,00306	0,0123	1,64	1,26	0,0383	-0,000654	-0,00199
Brown trout	Mjøsa	0,0498	-0,00101	0,00187	0,00301	0,667	0,549	0,0207	0,00204	-0,00199
Brown trout	Mjøsa	0,0964	-0,000606	-0,000384	0,0168	1,5	1,91	0,0506	0,0115	-0,00199
Brown trout	Mjøsa	0,285	-0,000603	0,00136	0,0336	4,48	5,05	0,136	0,0228	-0,00199
Brown trout	Mjøsa	0,0466	-0,000603	0,00183	0,00507	0,773	0,543	0,0202	0,00344	-0,00199
Brown trout	Mjøsa	0,097	-0,000603	0,00244	0,0125	1,24	1,38	0,0422	0,0085	-0,00199
Brown trout	Mjøsa	0,0303	-0,000603	-0,000384	0,00342	0,401	0,374	0,0131	0,00232	-0,00199
Brown trout	Mjøsa	0,0688	-0,000669	0,002	0,00771	1	0,882	0,0291	0,0052	-0,00199
Brown trout	Mjøsa	0,0884	-0,00309	-0,00174	-0,00302	1,15	1,2	0,0392	-0,00197	-0,00451
Brown trout	Mjøsa	0,0506	-0,00221	-0,00125	-0,00247	0,663	0,667	0,0262	-0,00161	-0,00398
Brown trout	Mjøsa	0,051	-0,00121	-0,000684	-0,00188	0,629	0,678	0,023	-0,00122	-0,00247
Brown trout	Mjøsa	0,051	-0,00276	-0,00156	-0,00132	0,502	0,616	0,0202	-0,000862	-0,00239
Brown trout	Mjøsa	0,129	0,312	0,00473	-0,00363	1,51	1,57	0,047	-0,00237	-0,00327
Smelt	Mjøsa	-0,0102	-0,000753	-0,00048	-0,0025	0,0544	0,179	-0,00228	-0,00162	-0,00249
Smelt	Mjøsa	-0,0102	-0,000753	-0,00048	-0,0018	0,0417	0,11	0,00419	-0,00117	-0,00249
Smelt	Mjøsa	0,0116	-0,000753	-0,00048	-0,0028	0,0601	0,309	0,00723	-0,00182	-0,00249
Smelt	Mjøsa	0,017	-0,000753	-0,00048	-0,00291	0,0555	0,58	-0,00265	-0,00189	-0,00249
Smelt	Mjøsa	-0,0102	-0,000753	-0,00048	-0,00312	0,0892	0,29	0,00999	-0,00203	-0,00249
Smelt	Mjøsa	0,0126	-0,000753	-0,00048	-0,00329	0,0939	0,255	0,00993	-0,00214	-0,00249
Smelt	Mjøsa	0,0206	-0,000753	-0,00048	-0,0039	0,134	0,53	0,0168	-0,00253	-0,00249
Smelt	Mjøsa	0,0201	-0,000753	-0,00048	-0,00482	0,176	0,372	0,0201	-0,00313	-0,00249
Smelt	Mjøsa	-0,0102	-0,000753	-0,00048	-0,00375	0,074	0,228	0,00353	-0,00246	-0,00249
Smelt	Mjøsa	-0,0102	-0,000753	-0,00048	-0,0035	0,0867	0,422	0,0126	-0,0023	-0,00249
Vendace	Mjøsa	0,0259	-0,000798	0,00109	-0,00496	0,647	0,363	0,0148	-0,00366	-0,00249
Vendace	Mjøsa	0,0321	-0,000753	0,00197	-0,00306	0,704	0,349	0,0142	-0,00226	-0,00249
Vendace	Mjøsa	0,0245	-0,000753	0,000966	-0,00594	0,506	0,311	0,0124	-0,00439	-0,00249
Vendace	Mjøsa	0,0122	-0,000753	0,000619	-0,00422	0,259	0,168	0,00646	-0,00312	-0,00249
Vendace	Mjøsa	0,0278	-0,000753	0,00143	-0,00273	0,654	0,389	0,0148	-0,00202	-0,00249
Vendace	Mjøsa	0,0287	-0,000753	0,00117	-0,00537	0,59	0,341	0,0093	-0,00397	-0,00309
Vendace	Mjøsa	0,0285	-0,000753	0,00154	-0,00293	0,613	0,353	0,00921	-0,00217	-0,00249
Vendace	Mjøsa	0,0254	-0,000753	0,000921	-0,0117	0,566	0,326	0,013	-0,00864	-0,00249
Vendace	Mjøsa	0,0376	-0,000753	0,00191	-0,0026	0,843	0,463	0,0135	-0,00192	-0,00249
Vendace	Mjøsa	0,026	-0,000753	0,00147	-0,00549	0,578	0,35	0,0101	-0,00406	-0,00249
Brown trout	Femunden	-0,00815	-0,000603	-0,000384	-0,000933	0,0462	0,0317	0,00592	-0,000654	-0,00199
Brown trout	Femunden	-0,0136	-0,001	-0,00064	-0,00155	0,104	0,0764	0,0121	-0,00109	-0,00332
Brown trout	Femunden	-0,00815	-0,000603	-0,000384	-0,000933	0,104	0,0736	0,011	-0,000654	-0,00199
Brown trout	Femunden	0,00855	-0,000603	-0,000384	0,00255	0,136	0,104	0,016	0,0017	-0,00199
Brown trout	Femunden	0,00873	-0,000603	-0,000384	0,00201	0,117	0,0816	0,0137	0,00133	-0,00199
Brown trout	Femunden	0,0212	-0,000603	-0,000384	-0,000933	0,255	0,171	0,0294	0,00314	-0,00199
Brown trout	Femunden	-0,00815	-0,000603	-0,000384	0,00261	0,111	0,0711	0,0127	0,00174	-0,00199
Brown trout	Femunden	-0,136000007	-0,01	-0,0064	-0,0155	0,157	0,248	0,0344	-0,0109	-0,033199999
Brown trout	Femunden	0,00928	-0,00448	-0,00352	-0,00489	0,0862	0,0764	0,00738	-0,00362	-0,0113
Brown trout	Femunden	-0,00815	-0,00432	-0,0034	-0,00464	0,0477	0,0468	-0,00368	-0,00343	-0,0218
Zoopl, epilimnion	Mjøsa	-0,020400001	-0,00151	-0,00096	-0,00233	0,0142	-0,00594	-0,00199	-0,00163	-0,00497
Zoopl, epilimnion	Mjøsa	-0,020400001	-0,00151	-0,00096	-0,00233	0,0149	-0,00594	-0,00199	-0,00163	-0,00497
Zoopl, epilimnion	Mjøsa	-0,020400001	-0,00151	-0,00096	-0,00233	0,0133	-0,00594	-0,00199	-0,00163	-0,00497
Mysis	Mjøsa	-0,020400001	-0,00151	-0,00096	-0,00233	0,197	0,0879	-0,00199	-0,00163	-0,00497
Mysis	Mjøsa	-0,020400001	-0,00213	-0,0014	-0,00315	0,183	0,0833	-0,00265	-0,00219	-0,00497
Mysis	Mjøsa	-0,020400001	-0,00351	-0,0023	-0,00387	0,163	0,0818	-0,00327	-0,00269	-0,00855
Water	Mjøsa	-2,109999895	-7	-0,128000006	-0,177000001	-4	-1,049999952	-0,518999994	-0,118000001	-0,280000001
Water	Mjøsa	-2,109999895	-7	-0,128000006	-0,177000001	-4	-1,049999952	-0,518999994	-0,118000001	-0,280000001
Water	Mjøsa	-2,109999895	-7	-0,128000006	-0,177000001	-4	-1,049999952	-0,518999994	-0,118000001	-0,280000001
Water	Mjøsa	-2,109999895	-7	-0,128000006	-0,177000001	-4	-1,049999952	-0,518999994	-0,118000001	-0,280000001
Water	Mjøsa	-2,109999895	-7	-0,128000006	-0,177000001	-4	-1,049999952	-0,518999994	-0,118000001	-0,280000001
Sediment	Mjøsa	-0,103	-0,342999995	-0,0063	-0,00867	-0,195999995	-0,051600002	-0,0254	-0,00576	-0,0137
Sediment	Mjøsa	-0,101999998	-0,340000004	-0,00624	-0,00859	-0,194000006	0,148	-0,0252	-0,00571	-0,023399999
Sediment	Mjøsa	-0,105999999	-0,349999994	-0,00642	-0,00884	-0,200000003	-0,0526	-0,025900001	-0,00588	-0,014
Sediment	Mjøsa									
Sediment	Mjøsa									
Brown trout, muskel	Eikedalsvatnet	-0,0136	-0,001	-0,00064	-0,00155	0,0259	0,0158	0,00179	-0,00109	-0,00332
Brown trout, muskel	Eikedalsvatnet	-0,0136	-0,001	-0,00064	-0,00155	0,0647	0,0212	-0,00132	-0,00109	-0,00332
Brown trout, muskel	Eikedalsvatnet	-0,0136	-0,001	-0,00064	-0,00155	0,0374	0,0501	0,00358	-0,00109	-0,00332
Brown trout, lever	Eikedalsvatnet									
Brown trout, lever	Eikedalsvatnet									
Brown trout, lever	Eikedalsvatnet									

Sample type	Lake	BDE-153	BDE-154	BDE-156	BDE-183	BDE-184	BDE-191	BDE-196	BDE-197	BDE-202
Brown trout	Mjøsa	0,332	0,712	-0,00314	0,00266	0,00546	-0,00191	-0,00276	-0,00229	0,00679
Brown trout	Mjøsa	0,53	1,12	-0,00314	0,00704	0,0114	-0,00191	-0,00276	0,00274	-0,00271
Brown trout	Mjøsa	0,296	0,68	-0,00314	0,0158	0,00954	-0,00191	-0,00276	-0,00229	0,0115
Brown trout	Mjøsa	0,124	0,282	-0,00314	0,00507	0,00415	-0,00194	-0,00276	-0,00229	0,00517
Brown trout	Mjøsa	0,401	0,94	-0,00314	0,00149	0,0117	-0,00191	-0,00276	0,00345	0,016
Brown trout	Mjøsa	0,958	2,14	-0,00314	0,00793	0,0295	-0,00191	-0,00276	0,00434	0,0221
Brown trout	Mjøsa	0,124	0,277	-0,00314	0,00688	0,00548	-0,00191	-0,00276	-0,00229	0,00423
Brown trout	Mjøsa	0,293	0,706	-0,00314	0,00592	0,00742	-0,00191	-0,00276	-0,00229	0,0124
Brown trout	Mjøsa	0,084	0,21	-0,00314	0,00359	0,0024	-0,00191	-0,00276	-0,00229	-0,00271
Brown trout	Mjøsa	0,195	0,465	-0,00314	0,00678	0,00581	-0,00191	-0,00276	-0,00229	-0,00271
Brown trout	Mjøsa	0,239	0,539	-0,00634	-0,00236	0,0108	-0,00348	-0,00314	-0,00261	-0,004
Brown trout	Mjøsa	0,121	0,287	-0,0056	-0,00278	0,00369	-0,0041	-0,00285	-0,00236	-0,00363
Brown trout	Mjøsa	0,124	0,303	-0,00348	-0,00195	-0,00163	-0,00288	-0,00276	-0,00229	-0,00271
Brown trout	Mjøsa	0,115	0,269	-0,00337	-0,00141	-0,00118	-0,00208	-0,00276	-0,00229	-0,00271
Brown trout	Mjøsa	0,279	0,679	-0,00461	0,00884	0,00941	-0,0024	-0,00276	-0,00229	-0,00271
Smelt	Mjøsa	0,0318	0,0818	-0,00392	-0,00159	-0,00117	-0,00239	-0,00345	-0,00287	-0,00339
Smelt	Mjøsa	0,0194	0,0505	-0,00392	-0,00159	-0,00117	-0,00239	-0,00345	-0,00287	-0,00339
Smelt	Mjøsa	0,0507	0,137	-0,00392	-0,00159	-0,00117	-0,00239	-0,00345	-0,00287	-0,00339
Smelt	Mjøsa	0,0841	0,246	-0,00392	-0,00159	-0,00117	-0,00239	-0,00345	-0,00287	-0,00339
Smelt	Mjøsa	0,0353	0,124	-0,00392	-0,00159	0,00139	-0,00239	-0,00345	-0,00287	-0,00339
Smelt	Mjøsa	0,0313	0,11	-0,00392	-0,00159	-0,00117	-0,00239	-0,00345	-0,00287	-0,00339
Smelt	Mjøsa	0,0546	0,2	-0,00392	-0,00159	-0,00117	-0,00239	-0,00345	-0,00287	-0,00339
Smelt	Mjøsa	0,0668	0,172	-0,00392	0,00224	-0,00117	-0,00239	-0,00345	-0,00287	-0,00339
Smelt	Mjøsa	0,0273	0,0844	-0,00392	0,00161	-0,00117	-0,00239	-0,00345	-0,00287	-0,00339
Smelt	Mjøsa	0,0667	0,15	-0,00392	-0,00159	-0,00117	-0,00239	-0,00345	-0,00287	-0,00339
Vendace	Mjøsa	0,0611	0,139	-0,00392	0,00839	0,00506	-0,00239	-0,00345	-0,00287	-0,00339
Vendace	Mjøsa	0,0663	0,118	-0,00392	0,00696	0,00345	-0,00239	-0,00345	-0,00287	-0,00339
Vendace	Mjøsa	0,054	0,115	-0,00392	0,0031	0,0032	-0,00443	-0,00345	-0,00287	-0,00346
Vendace	Mjøsa	0,0292	0,0567	-0,00392	-0,00159	-0,00117	-0,00263	-0,00389	-0,00299	-0,00411
Vendace	Mjøsa	0,0631	0,13	-0,00392	0,00982	0,00457	-0,00239	-0,00345	-0,00287	-0,00344
Vendace	Mjøsa	0,0533	0,118	-0,00527	0,00736	0,00449	-0,00697	-0,00376	-0,00289	-0,00398
Vendace	Mjøsa	0,0623	0,128	-0,00392	0,00439	0,00396	-0,00271	-0,00363	-0,00287	-0,00384
Vendace	Mjøsa	0,0561	0,119	-0,00394	0,00412	0,00468	-0,00484	-0,0037	-0,00287	-0,00391
Vendace	Mjøsa	0,082	0,162	-0,00392	0,00677	0,00492	-0,00239	-0,00345	-0,00287	0,0038
Vendace	Mjøsa	0,0568	0,125	-0,00392	0,00414	0,00415	-0,00451	-0,00459	-0,00353	-0,00485
Brown trout	Femunden	0,0123	0,0336	-0,00314	0,00162	0,00203	-0,00191	-0,00481	-0,00436	-0,0063
Brown trout	Femunden	0,0254	0,073	-0,00523	-0,00211	0,00467	-0,00318	-0,0046	-0,00382	-0,00452
Brown trout	Femunden	0,0252	0,0697	-0,00314	0,00264	0,00258	-0,00191	-0,00499	-0,00452	-0,00654
Brown trout	Femunden	0,0383	0,105	-0,00314	0,00353	0,00549	-0,00191	-0,00546	-0,00495	-0,00715
Brown trout	Femunden	0,0301	0,0864	-0,00314	0,0038	0,00482	-0,00191	-0,00794	-0,00719	-0,0104
Brown trout	Femunden	0,0713	0,197	-0,00314	0,00866	0,0128	-0,00191	-0,00896	-0,00812	-0,0117
Brown trout	Femunden	0,0282	0,0791	-0,00314	0,00375	0,00444	-0,00191	-0,00358	-0,00325	-0,00469
Brown trout	Femunden	-0,029300001	0,157	-0,052299999	-0,0211	-0,0156	-0,031800002	-0,177000001	-0,160999998	-0,231999993
Brown trout	Femunden	0,0136	0,0634	-0,019200001	-0,0105	-0,00851	-0,019200001	-0,034400001	-0,0261	-0,034899998
Brown trout	Femunden	-0,0167	0,031	-0,037099998	-0,0118	-0,00956	-0,021500001	-0,0348	-0,0264	-0,035300002
Zoopl, epilimnion	Mjøsa	-0,0044	-0,00361	-0,00784	-0,00317	-0,00235	-0,00477	-0,0069	-0,00573	-0,00678
Zoopl, epilimnion	Mjøsa	-0,0044	-0,00361	-0,00784	-0,00317	-0,00235	-0,00477	-0,0069	-0,00573	-0,00678
Zoopl, epilimnion	Mjøsa	-0,0044	-0,00361	-0,00784	-0,00317	-0,00235	-0,00477	-0,0069	-0,00573	-0,00678
Mysis	Mjøsa	0,013	0,0339	-0,00784	-0,00317	-0,00235	-0,00477	-0,0069	-0,00573	-0,00678
Mysis	Mjøsa	0,0126	0,0284	-0,00784	-0,00317	-0,00247	-0,00477	-0,0069	-0,00573	-0,00678
Mysis	Mjøsa	-0,00747	0,0271	-0,0125	-0,00372	-0,00303	-0,00549	-0,0069	-0,00573	-0,00678
Water	Mjøsa	-0,31400001	-0,204999998	-0,425000012	-0,214000002	-0,193000004	-0,293000013	-0,579999983	-0,463999987	-0,637000024
Water	Mjøsa	-0,31400001	-0,204999998	-0,425000012	-0,214000002	-0,193000004	-0,293000013	-0,579999983	-0,463999987	-0,637000024
Water	Mjøsa	-0,31400001	-0,204999998	-0,425000012	-0,214000002	-0,193000004	-0,293000013	-0,579999983	-0,463999987	-0,637000024
Water	Mjøsa	-0,31400001	-0,204999998	-0,425000012	-0,214000002	-0,193000004	-0,293000013	-0,579999983	-0,463999987	-0,637000024
Water	Mjøsa	-0,31400001	-0,204999998	-0,425000012	-0,214000002	-0,193000004	-0,293000013	-0,579999983	-0,463999987	-0,637000024
Sediment	Mjøsa	-0,0154	-0,01	-0,0208	-0,0105	-0,00945	-0,0144	-0,0284	-0,0228	-0,031199999
Sediment	Mjøsa	0,0308	0,0529	-0,039799999	0,0265	-0,0164	-0,036899999	-0,0469	-0,035599999	-0,047499999
Sediment	Mjøsa	-0,015699999	-0,0102	-0,021299999	-0,0107	-0,00964	-0,0147	-0,028999999	-0,0232	-0,0319
Sediment	Mjøsa									
Sediment	Mjøsa									
Brown trout, muskel	Eikedalsvatnet	0,00752	0,0146	-0,00523	-0,00211	-0,00156	-0,00318	-0,0046	-0,00382	-0,00452
Brown trout, muskel	Eikedalsvatnet	0,00724	0,0124	-0,00523	-0,00211	-0,00156	-0,00318	-0,0046	-0,00382	-0,00452
Brown trout, muskel	Eikedalsvatnet	0,0164	0,0381	-0,00523	-0,00211	-0,00156	-0,00318	-0,0046	-0,00382	-0,00452
Brown trout, lever	Eikedalsvatnet									
Brown trout, lever	Eikedalsvatnet									
Brown trout, lever	Eikedalsvatnet									

Sample type	Lake	BDE-206	BDE-207	BDE-209	ATE (TBP-AE)	a-TBECH	b-TBECH	g/d-TBECH	BATE	PBT
Brown trout	Mjøsa	0,00539	0,00237	0,0278	-0,00753	-0,0186	-0,0133	-0,00477	-0,00246	-0,016000001
Brown trout	Mjøsa	-0,00317	-0,00234	0,0391	-0,00753	-0,0186	-0,0133	-0,00477	-0,00246	-0,016000001
Brown trout	Mjøsa	-0,00317	-0,00234	0,036	-0,00753	-0,0186	-0,0133	-0,00477	-0,00246	-0,016000001
Brown trout	Mjøsa	0,00586	-0,00234	0,0801	-0,00753	-0,0186	-0,0133	-0,00477	-0,00246	-0,016000001
Brown trout	Mjøsa	0,00895	0,00253	0,127	-0,00753	-0,0186	-0,0133	-0,00477	-0,00246	-0,016000001
Brown trout	Mjøsa	-0,00317	-0,00234	-0,024800001	-0,00753	-0,0186	-0,0133	-0,00477	-0,00246	-0,016000001
Brown trout	Mjøsa	-0,00317	-0,00234	0,0361	-0,00753	-0,0186	-0,0133	-0,00477	-0,00246	-0,016000001
Brown trout	Mjøsa	-0,00317	-0,00234	0,055	-0,00753	-0,0186	-0,0133	-0,00477	-0,00246	-0,016000001
Brown trout	Mjøsa	-0,00317	-0,00234	0,0281	-0,00753	-0,0186	-0,0133	-0,00477	-0,00246	-0,016000001
Brown trout	Mjøsa	-0,00317	-0,00234	-0,024800001	-0,00753	-0,0186	-0,0133	-0,00477	-0,00246	-0,016000001
Brown trout	Mjøsa	-0,00317	-0,00243	0,032	-0,00753	-0,0186	-0,0133	-0,00477	-0,00246	-0,016000001
Brown trout	Mjøsa	-0,00317	-0,00234	-0,024800001	-0,00753	-0,0186	-0,0133	-0,00477	0,00298	-0,016000001
Brown trout	Mjøsa	-0,00317	-0,00234	-0,024800001	-0,00753	-0,0186	-0,0133	-0,00477	-0,00246	-0,016000001
Brown trout	Mjøsa	-0,00317	-0,00234	-0,024800001	-0,00753	-0,0186	-0,0133	-0,00477	-0,00246	-0,016000001
Brown trout	Mjøsa	-0,00317	-0,00234	0,0325	-0,0427	-0,073200002	-0,052999999	-0,0221	-0,00511	-0,294999987
Smelt	Mjøsa	0,00599	-0,00293	0,121	-0,00941	-0,0233	-0,0167	-0,00596	-0,00308	-0,02
Smelt	Mjøsa	-0,00397	-0,00293	-0,030999999	-0,00941	-0,0233	-0,0167	-0,00596	-0,00308	-0,02
Smelt	Mjøsa	-0,00397	-0,00293	-0,030999999	-0,00941	-0,0233	-0,0167	-0,00596	-0,00308	-0,02
Smelt	Mjøsa	0,0207	0,00788	0,392	-0,00941	-0,0233	-0,0167	-0,00596	-0,00308	-0,02
Smelt	Mjøsa	-0,00397	-0,00293	-0,030999999	-0,00941	-0,0233	-0,0167	-0,00596	-0,00308	-0,02
Smelt	Mjøsa	-0,00397	-0,00293	-0,030999999	-0,00941	-0,0233	-0,0167	-0,00596	-0,00308	-0,02
Smelt	Mjøsa	-0,00397	-0,00293	-0,030999999	-0,00941	-0,0233	-0,0167	-0,00596	-0,00308	-0,02
Smelt	Mjøsa	-0,00397	-0,00293	-0,030999999	-0,00941	-0,0233	-0,0167	-0,00596	-0,00308	-0,02
Smelt	Mjøsa	-0,00397	-0,00293	-0,030999999	-0,00941	-0,0233	-0,0167	-0,00596	-0,00308	-0,02
Smelt	Mjøsa	-0,00397	-0,00293	-0,030999999	-0,00941	-0,0233	-0,0167	-0,00596	-0,00308	-0,02
Vendace	Mjøsa	0,00571	-0,00293	0,0529	-0,00941	-0,0273	-0,0199	-0,00914	-0,00308	-0,02
Vendace	Mjøsa	-0,00397	-0,00293	-0,030999999	-0,00941	-0,0233	-0,0167	-0,00596	-0,00308	-0,02
Vendace	Mjøsa	-0,00397	-0,00293	-0,030999999	-0,00941	-0,024800001	-0,018100001	-0,0083	-0,00308	-0,021500001
Vendace	Mjøsa	-0,00397	-0,0035	0,045	-0,00941	-0,0233	-0,0167	-0,0066	-0,00308	-0,020199999
Vendace	Mjøsa	-0,00397	-0,00293	-0,030999999	-0,00941	-0,0233	-0,0167	-0,00612	-0,00308	-0,02
Vendace	Mjøsa	0,0101	-0,00337	0,0905	-0,0317	-0,0999	-0,074100003	-0,0297	-0,0133	-0,100000001
Vendace	Mjøsa	-0,00397	-0,00333	-0,030999999	-0,0173	-0,047899999	-0,035500001	-0,0142	-0,00923	-0,0559
Vendace	Mjøsa	-0,00415	0,00441	0,0348	-0,036800001	-0,0999	-0,074100003	-0,0297	-0,015699999	-0,123999998
Vendace	Mjøsa	-0,00397	-0,00293	-0,030999999	-0,00941	0,0361	-0,025599999	-0,0102	-0,00403	-0,0275
Vendace	Mjøsa	-0,00397	-0,0036	-0,030999999	-0,033599999	-0,076899998	-0,057	-0,0228	-0,00885	-0,120999999
Brown trout	Femunden	-0,00317	-0,00234	0,125	-0,00753	-0,0186	-0,0133	-0,00477	-0,00246	-0,016000001
Brown trout	Femunden	-0,00529	-0,0039	0,0448	-0,00753	-0,0186	-0,0133	-0,00477	-0,00246	-0,016000001
Brown trout	Femunden	0,00973	0,00498	0,127	-0,00753	-0,0186	-0,0133	-0,00477	-0,00246	-0,016000001
Brown trout	Femunden	-0,00317	-0,00234	-0,024800001	-0,00753	-0,0186	-0,0133	-0,00477	-0,00246	-0,016000001
Brown trout	Femunden	-0,00317	-0,00234	-0,024800001	-0,00753	-0,0186	-0,0133	-0,00477	-0,00246	-0,016000001
Brown trout	Femunden	0,0138	0,00546	0,22	-0,00753	-0,0186	-0,0133	-0,00477	-0,00246	-0,016000001
Brown trout	Femunden	-0,00317	-0,00234	-0,024800001	-0,00753	-0,0186	-0,0133	-0,00477	-0,00246	-0,016000001
Brown trout	Femunden	-0,052900001	-0,039000001	-0,412999988	-0,00753	-0,0186	-0,0133	-0,00477	-0,00246	-0,016000001
Brown trout	Femunden	-0,042399999	-0,039000001	-0,164000005	-0,00753	-0,0186	-0,0133	-0,00477	-0,00246	-0,016000001
Brown trout	Femunden	-0,036899999	-0,034000002	-0,264999986	-0,00753	-0,0186	-0,0133	-0,00477	-0,00246	-0,016000001
Zoopl, epilimnion	Mjøsa	-0,00793	-0,00585	-0,061999999	-0,0188	-0,046500001	-0,033399999	-0,0119	-0,00615	-0,039900001
Zoopl, epilimnion	Mjøsa	-0,00793	-0,00585	-0,061999999	-0,0188	-0,046500001	-0,033399999	-0,0119	-0,00615	-0,039900001
Zoopl, epilimnion	Mjøsa	0,00932	0,00702	0,08	-0,0188	-0,046500001	-0,033399999	-0,0119	-0,00615	-0,039900001
Mysis	Mjøsa	-0,00793	-0,00585	-0,061999999	-0,0188	-0,046500001	-0,033399999	-0,0119	-0,00615	-0,039900001
Mysis	Mjøsa	-0,00793	-0,00585	0,0883	-0,0188	-0,046500001	-0,033399999	-0,0119	-0,00615	-0,039900001
Mysis	Mjøsa	-0,00793	-0,00585	-0,061999999	-0,0188	-0,046500001	-0,033399999	-0,0119	-0,00816	-0,234999999
Water	Mjøsa	-2,210000038	-0,935000002	-10,30000019	-0,699999988	-3,089999914	-2,359999895	-1,169999957	-0,382999986	-2,329999924
Water	Mjøsa	-2,210000038	-0,935000002	-10,30000019	-0,699999988	-3,089999914	-2,359999895	-1,169999957	-0,382999986	-2,329999924
Water	Mjøsa	-2,210000038	-0,935000002	-10,30000019	-0,699999988	-3,089999914	-2,359999895	-1,169999957	-0,382999986	-2,329999924
Water	Mjøsa	-2,210000038	-0,935000002	-10,30000019	-0,699999988	-3,089999914	-2,359999895	-1,169999957	-0,382999986	-2,329999924
Water	Mjøsa	-2,210000038	-0,935000002	-10,30000019	-0,699999988	-3,089999914	-2,359999895	-1,169999957	-0,382999986	-2,329999924
Sediment	Mjøsa	-0,108000003	-0,0458	-0,505999982	-0,020300001	-0,875999987	-0,0469	-0,00979	-0,00599	-0,0228
Sediment	Mjøsa	-0,107000001	0,1	1,27	-0,020099999	-0,867999971	-0,046399999	-0,00969	-0,00593	-0,022500001
Sediment	Mjøsa	-0,111000001	-0,046700001	-0,515999973	-0,0207	-0,893999994	-0,047800001	-0,00998	-0,00611	-0,0232
Sediment	Mjøsa									
Sediment	Mjøsa									
Brown trout, muskel	Eikedalsvatnet	0,0133	0,00845	0,0721	-0,00689	-0,298000008	-0,015900001	-0,00333	-0,00204	-0,00774
Brown trout, muskel	Eikedalsvatnet	0,0156	0,00679	0,103	-0,00689	-0,298000008	-0,015900001	-0,00333	-0,00204	-0,00774
Brown trout, muskel	Eikedalsvatnet	-0,00529	-0,0039	-0,041299999	-0,00689	-0,298000008	-0,015900001	-0,00333	-0,00204	-0,00774
Brown trout, lever	Eikedalsvatnet									
Brown trout, lever	Eikedalsvatnet									
Brown trout, lever	Eikedalsvatnet									

Sample type	Lake	PBEB	HBB	DPTE	EHTBB	BTBPE	TBPH (BEH /TBP)	DBDPE	Dibromaldrin	Dechlorane 602
Brown trout	Mjøsa	-0,0166	-0,00929	-0,00252	-0,00577	-0,00965	-0,0186	1,9	<0.1	0.0193
Brown trout	Mjøsa	-0,0166	-0,00929	-0,00252	-0,00577	-0,00965	-0,0186	0,554	<0.1	0.0281
Brown trout	Mjøsa	-0,0166	-0,00929	-0,00252	-0,00577	-0,00965	-0,0186	-0,527999997	<0.1	0.0248
Brown trout	Mjøsa	-0,0166	-0,00929	-0,00252	-0,00577	-0,00965	-0,0186	0,845	<0.1	0.0104
Brown trout	Mjøsa	-0,0166	-0,00929	-0,00252	-0,00577	-0,00965	-0,0186	-0,527999997	<0.1	0.0326
Brown trout	Mjøsa	-0,0166	-0,00929	-0,00252	-0,00577	-0,00965	-0,0186	-0,527999997	<0.1	0.0463
Brown trout	Mjøsa	-0,0166	-0,00929	-0,00252	-0,00577	-0,00965	-0,0186	-0,527999997	<0.1	0.0116
Brown trout	Mjøsa	-0,0166	-0,00929	-0,00252	-0,00577	-0,00965	-0,0186	-0,527999997	<0.1	0.0214
Brown trout	Mjøsa	-0,0166	-0,00929	-0,00252	-0,00577	-0,00965	-0,0186	0,753	<0.1	0.0082
Brown trout	Mjøsa	-0,0166	-0,00929	-0,00252	-0,00676	-0,00965	-0,0186	-0,527999997	<0.1	0.0172
Brown trout	Mjøsa	-0,017000001	-0,00929	-0,00271	-0,0086	-0,00965	-0,0186	-0,527999997		
Brown trout	Mjøsa	-0,0166	-0,00929	-0,00252	-0,00966	-0,00965	-0,0186	-0,527999997		
Brown trout	Mjøsa	-0,0166	-0,00929	-0,00252	-0,0106	-0,00965	-0,0186	-0,527999997		
Brown trout	Mjøsa	-0,0166	-0,00929	-0,00252	-0,014	-0,00965	-0,0186	-0,527999997		
Brown trout	Mjøsa	-0,428000003	-0,00929	-0,027899999	-0,025800001	-0,00965	-0,0792	-0,527999997		
Smelt	Mjøsa	-0,0208	-0,0116	-0,00315	-0,0109	-0,0121	-0,0232	0,836	<0.1	0.0035
Smelt	Mjøsa	-0,0208	-0,0116	-0,00315	-0,020199999	-0,0121	-0,0232	-0,660000026	<0.1	0.002
Smelt	Mjøsa	-0,0208	-0,0116	-0,00315	-0,0131	-0,0121	-0,0232	-0,660000026	<0.1	0.0048
Smelt	Mjøsa	-0,0208	-0,0116	-0,00315	-0,022600001	-0,0121	-0,0232	6,49	<0.1	0.0051
Smelt	Mjøsa	-0,0208	-0,0116	-0,00315	-0,0473	-0,0121	-0,0232	-0,660000026	<0.1	0.0038
Smelt	Mjøsa	-0,0208	-0,0116	-0,00315	-0,0239	-0,0121	-0,0232	0,889	<0.1	0.0032
Smelt	Mjøsa	-0,0208	-0,0116	-0,00315	-0,070100002	-0,0121	-0,0255	1,92	<0.1	0.0045
Smelt	Mjøsa	-0,0208	-0,0116	-0,00315	-0,038199998	-0,0121	-0,0232	-0,660000026	<0.1	0.0063
Smelt	Mjøsa	-0,0208	-0,0116	-0,00315	-0,032600001	-0,0121	-0,0232	-0,660000026	<0.1	0.003
Smelt	Mjøsa	-0,0208	-0,0116	-0,00315	-0,070600003	-0,0121	-0,0232	-0,660000026	<0.1	0.0055
Vendace	Mjøsa	-0,0208	-0,0116	-0,00566	-0,0277	0,118	-0,044500001	0,911	<0.1	0.0099
Vendace	Mjøsa	-0,0208	0,0137	-0,00383	-0,019200001	0,0179	-0,033199999	-0,660000026	<0.1	0.0084
Vendace	Mjøsa	-0,0208	-0,0116	-0,0046	-0,0276	-0,0121	-0,0528	-0,660000026	<0.1	0.0074
Vendace	Mjøsa	-0,0208	0,0133	-0,00773	-0,0145	0,0161	-0,0449	1,08	<0.1	0.0028
Vendace	Mjøsa	-0,0219	-0,0116	-0,00315	-0,016899999	0,0156	-0,035599999	-0,660000026	<0.1	0.009
Vendace	Mjøsa	-0,138999999	0,0227	-0,019300001	-0,0471	0,0297	-0,158000007	-0,660000026	<0.1	0.0059
Vendace	Mjøsa	-0,046399999	0,0117	-0,00941	-0,035	0,0197	-0,091300003	-0,660000026	<0.1	0.0072
Vendace	Mjøsa	-0,130999997	0,0127	-0,0209	-0,050000001	-0,0121	-0,153999999	-0,660000026	<0.1	0.0076
Vendace	Mjøsa	-0,035300002	0,0162	-0,00404	-0,019099999	-0,0121	-0,064499997	-0,660000026	<0.1	0.0089
Vendace	Mjøsa	-0,127000004	0,0502	-0,0144	-0,037500001	-0,0121	-0,127000004	-0,660000026	<0.1	0.0063
Brown trout	Femunden	-0,0166	-0,00929	-0,00252	-0,0077	-0,00965	-0,0307	-0,527999997	<0.1	0.014
Brown trout	Femunden	-0,0166	-0,00929	-0,00252	-0,00577	-0,00965	-0,0186	-0,527999997	<0.1	0.0056
Brown trout	Femunden	-0,0166	-0,00929	-0,00252	-0,00577	-0,00965	-0,0186	0,927	<0.1	0.0074
Brown trout	Femunden	-0,0166	-0,00929	-0,00252	-0,00577	-0,00965	-0,0186	-0,527999997	<0.1	0.0069
Brown trout	Femunden	-0,0166	-0,00929	-0,00252	-0,00577	-0,00965	-0,0186	0,618	<0.1	0.0136
Brown trout	Femunden	-0,0166	-0,00929	-0,00252	-0,00577	-0,00965	-0,0186	0,881	<0.1	0.0079
Brown trout	Femunden	-0,0166	-0,00929	-0,00252	-0,00577	-0,00965	-0,0186	-0,527999997	<0.1	0.0049
Brown trout	Femunden	-0,0166	-0,00929	-0,00252	-0,00577	-0,00965	-0,0186	-0,527999997	<0.1	<0.002
Brown trout	Femunden	-0,0166	-0,00929	-0,00252	-0,00577	-0,00965	-0,0186	-0,527999997	<0.1	0.0053
Brown trout	Femunden	-0,0166	-0,00929	-0,00252	-0,00577	-0,00965	-0,0186	0,764	<0.1	0.0026
Zoopl, epilimnion	Mjøsa	-0,041499998	-0,0232	-0,0063	-0,0144	-0,0241	-0,046500001	1,68	<0.05	0.0008
Zoopl, epilimnion	Mjøsa	-0,041499998	-0,0232	-0,0063	-0,0144	-0,0241	-0,046500001	-1,320000052	<0.05	0.0004
Zoopl, epilimnion	Mjøsa	-0,041499998	-0,0232	-0,0063	-0,0144	-0,0241	-0,0469	-1,320000052	<0.05	0
Mysis	Mjøsa	-0,041499998	-0,0232	-0,0063	-0,0144	-0,0241	-0,169	-1,320000052	<0.05	0.0013
Mysis	Mjøsa	-0,041499998	-0,0232	-0,0063	-0,0144	-0,0241	-0,194000006	2,62	<0.05	0.0014
Mysis	Mjøsa	-0,231999993	-0,0232	-0,00854	-0,0184	-0,0252	-0,582000017	-1,320000052	<0.05	0.0017
Water	Mjøsa	-2,140000105	-4,420000076	-0,568000019	-2,059999943	-1,870000005	-5,590000153	-260	<10	<0.2
Water	Mjøsa	-1,700000048	-4,420000076	-0,568000019	-2,059999943	-1,870000005	-5,590000153	-260	<10	<0.2
Water	Mjøsa	-1,700000048	-4,420000076	-0,568000019	-2,059999943	-1,870000005	-5,590000153	-260	<10	<0.2
Water	Mjøsa	-1,700000048	-4,420000076	-0,568000019	-2,059999943	-1,870000005	-5,590000153	690	<10	<0.2
Water	Mjøsa	-1,700000048	-4,420000076	-0,568000019	-2,059999943	-1,870000005	-5,590000153	-260	<10	<0.2
Sediment	Mjøsa	-0,0254	-0,019099999	-0,00153	-0,00419	-0,0195	-0,0133	-7,869999886	<0.5	<0.01
Sediment	Mjøsa	-0,0252	-0,0189	-0,00462	-0,031300001	0,055	-0,144999996	-7,789999962	<0.5	0.0328
Sediment	Mjøsa	-0,025900001	-0,0195	-0,00127	0,0113	-0,0199	-0,00917	-8,029999733	<0.5	<0.01
Sediment	Mjøsa								<0.8	<0.02
Sediment	Mjøsa								<0.8	<0.02
Brown trout, muskel	Eikedalsvatnet	-0,00865	0,00785	-0,000497	0,00969	-0,00662	0,417	6,77	<0.1	0.0055
Brown trout, muskel	Eikedalsvatnet	-0,00865	0,00875	-0,000599	-0,00434	-0,00662	-0,0101	5,82	<0.1	<0.002
Brown trout, muskel	Eikedalsvatnet	-0,00865	0,0183	-0,0006	-0,00291	-0,00662	-0,00797	-2,680000067	<0.1	0.0134
Brown trout, lever	Eikedalsvatnet									
Brown trout, lever	Eikedalsvatnet									
Brown trout, lever	Eikedalsvatnet									

Sample type	Lake	Dechlorane 603	Dechlorane 604	Dechlorane plus syn	Dechlorane 601	Dechlorane plus anti	D4	D5	D6	M3T(Ph
Brown trout	Mjøsa	<0.005	<0.05	0.0065	<0.01	0.0112	< LOD (1.21)	22.1	1.78	0.761
Brown trout	Mjøsa	<0.005	<0.05	0.0055	<0.01	0.0085	< LOD (1.21)	36.4	2.19	0.955
Brown trout	Mjøsa	<0.005	<0.05	0.0052	<0.01	0.0069	< LOD (1.21)	39.3	1.76	0.298
Brown trout	Mjøsa	<0.005	<0.05	<0.005	<0.01	<0.005	< LOD (1.21)	10.7	0.780	0.713
Brown trout	Mjøsa	<0.005	<0.05	0.0042	<0.01	0.0063	< LOD (1.21)	3.95	0.465	< LOD (0.96)
Brown trout	Mjøsa	<0.005	<0.05	0.0068	<0.01	0.011	< LOD (1.21)	12.5	1.27	0.239
Brown trout	Mjøsa	<0.005	<0.05	0.0089	<0.01	0.0219	< LOD (1.21)	19.8	0.871	0.603
Brown trout	Mjøsa	<0.005	<0.05	0.0085	<0.01	0.0174	< LOD (1.21)	11.6	0.984	0.713
Brown trout	Mjøsa	<0.005	<0.05	0.0054	<0.01	0.013	< LOD (1.21)	36.7	1.50	0.480
Brown trout	Mjøsa	<0.005	<0.05	0.0065	<0.01	0.0141	< LOD (1.21)	14.5	1.13	< LOD (0.96)
Brown trout	Mjøsa						< LOD (1.21)	13.3	0.904	0.730
Brown trout	Mjøsa						< LOD (1.21)	17.5	0.836	0.267
Brown trout	Mjøsa						< LOD (1.21)	18.0	1.35	0.426
Brown trout	Mjøsa						< LOD (1.21)	16.8	1.08	0.650
Brown trout	Mjøsa						< LOD (1.21)	24.2	1.23	< LOD (0.96)
Smelt	Mjøsa	<0.005	<0.05	0.0084	<0.01	0.0116	< LOD (2.94)	38.40	1.78	0.33
Smelt	Mjøsa	<0.005	<0.05	0.0069	<0.01	0.0097	< LOD (2.94)	11.57	1.72	< LOD (0.10)
Smelt	Mjøsa	<0.005	<0.05	0.0067	<0.01	0.0076	< LOD (2.94)	63.70	2.94	0.47
Smelt	Mjøsa	<0.005	<0.05	0.0114	<0.01	0.0191	< LOD (2.94)	42.08	2.09	0.32
Smelt	Mjøsa	<0.005	<0.05	0.0065	<0.01	0.0083	< LOD (2.94)	6.28	1.25	0.11
Smelt	Mjøsa	<0.005	<0.05	0.0062	<0.01	0.0072	< LOD (2.94)	13.54	1.14	< LOD (0.10)
Smelt	Mjøsa	<0.005	<0.05	0.0065	<0.01	0.0087	< LOD (2.94)	13.24	1.26	0.14
Smelt	Mjøsa	<0.005	<0.05	0.0044	<0.01	0.0068	< LOD (2.94)	30.81	1.85	0.29
Smelt	Mjøsa	<0.005	<0.05	0.0052	<0.01	0.0082	< LOD (2.94)	20.21	1.52	< LOD (0.10)
Smelt	Mjøsa	<0.005	<0.05	0.0062	<0.01	0.0094	< LOD (2.94)	54.06	2.55	0.44
Vendace	Mjøsa	<0.005	<0.05	0.0112	<0.01	0.0156	< LOD (2.94)	21.89	2.15	0.40
Vendace	Mjøsa	<0.005	<0.05	0.0103	<0.01	0.0168	< LOD (2.94)	25.34	1.52	< LOD (0.10)
Vendace	Mjøsa	<0.005	<0.05	0.0048	<0.01	0.0056	< LOD (2.94)	9.74	1.42	< LOD (0.10)
Vendace	Mjøsa	<0.005	<0.05	0.0073	<0.01	0.0091	< LOD (2.94)	0.76	0.57	< LOD (0.10)
Vendace	Mjøsa	<0.005	<0.05	0.0083	<0.01	0.0102	< LOD (2.94)	39.82	3.95	0.73
Vendace	Mjøsa	<0.005	<0.05	0.0087	<0.01	0.0108	< LOD (2.94)	19.23	1.68	0.24
Vendace	Mjøsa	<0.005	<0.05	0.0071	<0.01	0.0103	< LOD (2.94)	17.74	1.25	0.39
Vendace	Mjøsa	<0.005	<0.05	0.0074	<0.01	0.0088	< LOD (2.94)	58.36	< LOD (0.17)	0.88
Vendace	Mjøsa	<0.005	<0.05	0.0075	<0.01	0.0128	< LOD (2.94)	32.96	2.67	0.51
Vendace	Mjøsa	<0.005	<0.05	0.0108	<0.01	0.0194	< LOD (2.94)	10.26	1.15	0.29
Brown trout	Femunden	<0.005	<0.05	0.0045	<0.01	0.0082	< LOD (0.96)	< LOD (0.96)	< LOD (0.30)	< LOD (0.96)
Brown trout	Femunden	<0.005	<0.05	0.0045	<0.01	0.0043	< LOD (0.96)	< LOD (0.96)	< LOD (0.30)	< LOD (0.96)
Brown trout	Femunden	<0.005	<0.05	0.0056	<0.01	0.0067	< LOD (0.96)	< LOD (0.96)	0.167	< LOD (0.96)
Brown trout	Femunden	<0.005	<0.05	<0.005	<0.01	<0.005	< LOD (0.96)	< LOD (0.96)	< LOD (0.30)	< LOD (0.96)
Brown trout	Femunden	<0.005	<0.05	0.0045	<0.01	0.0064	< LOD (0.96)	< LOD (0.96)	< LOD (0.30)	< LOD (0.96)
Brown trout	Femunden	<0.005	<0.05	0.0118	<0.01	0.006	< LOD (0.96)	< LOD (0.96)	< LOD (0.30)	< LOD (0.96)
Brown trout	Femunden	<0.005	<0.05	<0.005	<0.01	<0.005	< LOD (0.96)	< LOD (0.96)	< LOD (0.30)	< LOD (0.96)
Brown trout	Femunden	<0.005	<0.05	0.0026	<0.01	0.0044	< LOD (0.96)	< LOD (0.96)	1.80	< LOD (0.96)
Brown trout	Femunden	<0.005	<0.05	0.0033	<0.01	0.0047	< LOD (0.96)	< LOD (0.96)	< LOD (0.30)	< LOD (0.96)
Brown trout	Femunden	<0.005	<0.05	0.0031	<0.01	0.0034	< LOD (0.96)	< LOD (0.96)	< LOD (0.30)	< LOD (0.96)
Zoopl, epilimnion	Mjøsa	<0.01	<0.02	0.0364	<0.01	0.0586	< LOD (2.94)	1.66	0.76	< LOD (0.10)
Zoopl, epilimnion	Mjøsa	<0.01	<0.02	0.0229	<0.01	0.0441	< LOD (2.94)	2.06	1.30	< LOD (0.10)
Zoopl, epilimnion	Mjøsa	<0.01	<0.02	0.0234	<0.01	0.0484	< LOD (2.94)	1.71	0.79	< LOD (0.10)
Mysis	Mjøsa	<0.01	<0.02	0.0228	<0.01	0.0438	< LOD (2.94)	24.15	1.59	< LOD (0.10)
Mysis	Mjøsa	<0.01	<0.02	0.0225	<0.01	0.0424	< LOD (2.94)	21.79	1.57	< LOD (0.10)
Mysis	Mjøsa	<0.01	<0.02	0.0297	<0.01	0.0628	< LOD (2.94)	17.71	1.49	< LOD (0.10)
Water	Mjøsa	<0.5	<50	0.7834	<1	2.2624	< LOD (2.72)	< LOD (0.92)	< LOD (2.34)	
Water	Mjøsa	<0.5	<50	0.669	<1	1.8184	< LOD (2.72)	< LOD (0.92)	< LOD (2.34)	
Water	Mjøsa	<0.5	<50	0.61	<1	1.582	< LOD (2.72)	< LOD (0.92)	< LOD (2.34)	
Water	Mjøsa	<0.5	<50	1.0335	<1	2.5813	< LOD (2.72)	< LOD (0.92)	< LOD (2.34)	
Water	Mjøsa	<0.5	<50	0.9279	<1	2.5602	< LOD (2.72)	< LOD (0.92)	< LOD (2.34)	
Sediment	Mjøsa	<0.025	<0.2	0.0668	<0.05	0.4445	< LOD (0.30)	1.77	1.67	< LOD (0.10)
Sediment	Mjøsa	0.0191	<0.2	0.1961	<0.05	1.2656	1.00	0.54	1.05	< LOD (0.10)
Sediment	Mjøsa	<0.025	<0.2	0.0623	<0.05	0.1453	2.31	1.31	1.28	< LOD (0.10)
Sediment	Mjøsa	<0.05	<0.5	0.2146	<0.1	0.7552	0.31	0.15	0.67	0.15
Sediment	Mjøsa	<0.05	<0.5	0.2533	<0.1	0.7221	0.15	< LOD (0.10)	0.51	< LOD (0.10)
Brown trout, muskel	Eikedalsvatnet	<0.005	<0.05	0.0185	<0.01	0.0586				
Brown trout, muskel	Eikedalsvatnet	<0.005	<0.05	0.0173	<0.01	0.0356				
Brown trout, muskel	Eikedalsvatnet	<0.005	<0.05	0.0174	<0.01	0.0472				
Brown trout, lever	Eikedalsvatnet									
Brown trout, lever	Eikedalsvatnet									
Brown trout, lever	Eikedalsvatnet									

Sample type	Lake	L3	L4	L5	TEP	TCEP	TPrP	TCPP	TiBP	BdPhP	DBPhP	TPP
Brown trout	Mjøsa	< LOD (0.10)	< LOD (0.10)	< LOD (0.10)	< 0.13	< 0.10	< 0.01	< 0.33	< 1.8	< 0.01	< 0.01	0.06
Brown trout	Mjøsa	< LOD (0.10)	< LOD (0.10)	< LOD (0.10)	< 0.13	< 0.10	< 0.01	< 0.33	< 1.8	< 0.01	< 0.01	0.05 (<LOQ)
Brown trout	Mjøsa	< LOD (0.10)	< LOD (0.10)	< LOD (0.10)	< 0.13	< 0.10	< 0.01	< 0.33	< 1.8	< 0.01	< 0.01	< 0.02
Brown trout	Mjøsa	< LOD (0.10)	< LOD (0.10)	< LOD (0.10)	0.20 (<LOQ)	< 0.10	< 0.01	< 0.33	< 1.8	< 0.01	< 0.01	< 0.02
Brown trout	Mjøsa	< LOD (0.10)	< LOD (0.10)	< LOD (0.10)	< 0.13	< 0.10	< 0.01	< 0.33	< 1.8	< 0.01	< 0.01	< 0.02
Brown trout	Mjøsa				< 0.13	< 0.10	< 0.01	< 0.33	< 1.8	< 0.01	< 0.01	< 0.02
Brown trout	Mjøsa				< 0.13	< 0.10	< 0.01	< 0.33	< 1.8	< 0.01	< 0.01	< 0.02
Brown trout	Mjøsa				< 0.13	< 0.10	< 0.01	< 0.33	< 1.8	< 0.01	< 0.01	< 0.02
Brown trout	Mjøsa				< 0.13	< 0.10	< 0.01	< 0.33	< 1.8	< 0.01	< 0.01	< 0.02
Brown trout	Mjøsa				< 0.13	< 0.10	< 0.01	< 0.33	< 1.8	< 0.01	< 0.01	< 0.02
Brown trout	Mjøsa				< 0.13	< 0.10	< 0.01	< 0.33	< 1.8	< 0.01	< 0.01	< 0.02
Brown trout	Mjøsa				< 0.13	< 0.10	< 0.01	< 0.33	< 1.8	< 0.01	< 0.01	< 0.02
Brown trout	Mjøsa				< 0.13	< 0.10	< 0.01	< 0.33	< 1.8	< 0.01	< 0.01	< 0.02
Brown trout	Mjøsa				< 0.05	< 0.20	< 0.01	0.24	0.17 (<LOQ)	< 0.01	< 0.01	< 0.05
Brown trout	Mjøsa				< 0.05	< 0.20	< 0.01	0.16 (<LOQ)	< 0.14	< 0.01	< 0.01	< 0.05
Smelt	Mjøsa	< LOD (0.10)	< LOD (0.10)	< LOD (0.10)	< 0.13	0.13 (<LOQ)	< 0.01	0.64 (<LOQ)	< 1.8	< 0.01	< 0.01	0.32
Smelt	Mjøsa	< LOD (0.10)	< LOD (0.10)	< LOD (0.10)	< 0.13	< 0.10	< 0.01	0.46 (<LOQ)	< 1.8	< 0.01	< 0.01	0.85
Smelt	Mjøsa	< LOD (0.10)	< LOD (0.10)	< LOD (0.10)	< 0.13	< 0.10	< 0.01	< 0.33	< 1.8	< 0.01	< 0.01	0.04
Smelt	Mjøsa	< LOD (0.10)	< LOD (0.10)	< LOD (0.10)	< 0.13	< 0.10	< 0.01	< 0.33	< 1.8	< 0.01	< 0.01	0.17
Smelt	Mjøsa				< 0.13	0.19 (<LOQ)	< 0.01	1.40	< 1.8	< 0.01	< 0.01	5.61
Smelt	Mjøsa				0.20 (<LOQ)	0.17 (<LOQ)	< 0.01	1.01	< 1.8	< 0.01	< 0.01	2.32
Smelt	Mjøsa				< 0.13	0.17 (<LOQ)	< 0.01	(<LOQ)0912927215569	< 1.8	< 0.01	< 0.01	2.77
Smelt	Mjøsa				< 0.13	< 0.10	< 0.01	0.46 (<LOQ)	< 1.8	< 0.01	< 0.01	0.12
Smelt	Mjøsa				< 0.13	< 0.10	< 0.01	< 0.33	< 1.8	< 0.01	< 0.01	0.18
Smelt	Mjøsa				< 0.13	< 0.10	< 0.01	0.41 (<LOQ)	< 1.8	< 0.01	< 0.01	0.27
Vendace	Mjøsa	< LOD (0.10)	< LOD (0.10)	< LOD (0.10)	< 0.13	< 0.10	< 0.01	0.47 (<LOQ)	< 1.8	< 0.01	< 0.01	0.21
Vendace	Mjøsa	< LOD (0.10)	< LOD (0.10)	< LOD (0.10)	< 0.13	< 0.10	< 0.01	< 0.33	< 1.8	< 0.01	< 0.01	0.24
Vendace	Mjøsa	< LOD (0.10)	< LOD (0.10)	< LOD (0.10)	< 0.13	< 0.10	< 0.01	< 0.33	< 1.8	< 0.01	< 0.01	0.11
Vendace	Mjøsa	< LOD (0.10)	< LOD (0.10)	< LOD (0.10)	0.26 (<LOQ)	< 0.10	< 0.01	0.74 (<LOQ)	< 1.8	< 0.01	< 0.01	0.69
Vendace	Mjøsa				< 0.13	< 0.10	< 0.01	0.48 (<LOQ)	< 1.8	< 0.01	< 0.01	0.67
Vendace	Mjøsa				< 0.13	< 0.10	< 0.01	0.58 (<LOQ)	< 1.8	< 0.01	< 0.01	0.16
Vendace	Mjøsa				< 0.13	< 0.10	< 0.01	< 0.33	< 1.8	< 0.01	< 0.01	0.14
Vendace	Mjøsa				< 0.13	< 0.10	< 0.01	6 (<LOQ)57886447290041	< 1.8	< 0.01	< 0.01	0.45
Vendace	Mjøsa				< 0.13	< 0.10	< 0.01	< 0.33	< 1.8	< 0.01	< 0.01	0.17
Vendace	Mjøsa				< 0.13	< 0.10	< 0.01	0.36 (<LOQ)	< 1.8	< 0.01	< 0.01	0.11
Brown trout	Femunden	< LOD (0.10)	< LOD (0.10)	< LOD (0.10)	< 0.05	< 0.20	< 0.01	< 0.14	< 0.14	< 0.01	< 0.01	< 0.05
Brown trout	Femunden	< LOD (0.10)	< LOD (0.10)	< LOD (0.10)	< 0.05	< 0.20	< 0.01	< 0.14	< 0.14	< 0.01	< 0.01	< 0.05
Brown trout	Femunden	< LOD (0.10)	< LOD (0.10)	< LOD (0.10)	< 0.05	< 0.20	< 0.01	0.18(<LOQ)	< 0.14	< 0.01	< 0.01	< 0.05
Brown trout	Femunden	< LOD (0.10)	< LOD (0.10)	< LOD (0.10)	< 0.05	< 0.20	< 0.01	0.22	< 0.14	< 0.01	< 0.01	< 0.05
Brown trout	Femunden	< LOD (0.10)	< LOD (0.10)	< LOD (0.10)	< 0.05	< 0.20	< 0.01	0.17(<LOQ)	< 0.14	< 0.01	< 0.01	< 0.05
Brown trout	Femunden				< 0.05	< 0.20	< 0.01	< 0.14	< 0.14	< 0.01	< 0.01	< 0.05
Brown trout	Femunden				< 0.05	< 0.20	< 0.01	< 0.14	< 0.14	< 0.01	< 0.01	< 0.05
Brown trout	Femunden				< 0.05	< 0.20	< 0.01	< 0.14	< 0.14	< 0.01	< 0.01	< 0.05
Brown trout	Femunden				< 0.05	< 0.20	< 0.01	< 0.14	< 0.14	< 0.01	< 0.01	< 0.05
Brown trout	Femunden				< 0.05	< 0.20	< 0.01	< 0.14	< 0.14	< 0.01	< 0.01	< 0.05
Zoopl, epilimnion	Mjøsa	< LOD (0.10)	< LOD (0.10)	< LOD (0.10)								
Zoopl, epilimnion	Mjøsa	< LOD (0.10)	< LOD (0.10)	< LOD (0.10)								
Zoopl, epilimnion	Mjøsa	< LOD (0.10)	< LOD (0.10)	< LOD (0.10)								
Mysis	Mjøsa	< LOD (0.10)	< LOD (0.10)	< LOD (0.10)								
Mysis	Mjøsa	< LOD (0.10)	< LOD (0.10)	< LOD (0.10)								
Mysis	Mjøsa	< LOD (0.10)	< LOD (0.10)	< LOD (0.10)								
Water	Mjøsa				< 5.5	< 3.8	< 0.2	< 23.6	< 3.3	< 0.03	< 0.05	< 3.0
Water	Mjøsa				< 5.5	< 3.8	< 0.2	< 23.6	< 3.3	< 0.03	< 0.05	< 3.0
Water	Mjøsa				< 5.5	< 3.8	< 0.2	< 23.6	< 3.3	< 0.03	< 0.05	< 3.0
Water	Mjøsa				0.73 (<LOQ)	< 0.03	< 0.02	8.84	1.72	< 0.01	< 0.02	0.39
Water	Mjøsa				0.57 (<LOQ)	< 0.03	< 0.02	5.37	1.21	< 0.01	< 0.02	0.37
Sediment	Mjøsa				0.65 (<LOQ)	< 0.03	< 0.02	1.18 (<LOQ)	0.92	< 0.01	< 0.02	< 0.07
Sediment	Mjøsa				< 0.22	< 0.03	< 0.02	1.04 (<LOQ)	< 0.23	< 0.01	< 0.02	< 0.07
Sediment	Mjøsa				< 0.22	< 0.03	< 0.02	1.47 (<LOQ)	0.40 (<LOQ)	< 0.01	< 0.02	< 0.07
Sediment	Mjøsa				< 5.5	< 3.8	< 0.2	< 23.6	< 3.3	< 0.03	< 0.05	< 3.0
Sediment	Mjøsa				< 5.5	< 3.8	< 0.2	< 23.6	< 3.3	< 0.03	< 0.05	< 3.0
Brown trout, muskel	Eikedalsvatnet											
Brown trout, muskel	Eikedalsvatnet											
Brown trout, muskel	Eikedalsvatnet											
Brown trout, lever	Eikedalsvatnet											
Brown trout, lever	Eikedalsvatnet											
Brown trout, lever	Eikedalsvatnet											

Sample type	Lake	TnBP	TDCPP	TBEP	TCP	EHDP	TXP	TIPPP	TTBPP	TEHP	Lims UV	BP3	EHMC	OC	UV-328
Brown trout	Mjøsa	< 0.52	< 0.17	< 0.27	< 0.01	0.41 (<LOQ)	< 0.01	< 0.01	< 0.01	< 0.35	2017-09834	<1	<4	<2	<0.4
Brown trout	Mjøsa	< 0.52	< 0.17	< 0.27	< 0.01	< 0.20	< 0.01	< 0.01	< 0.01	< 0.35	2017-09835	<1	<3	<2	<0.4
Brown trout	Mjøsa	< 0.52	< 0.17	< 0.27	< 0.01	< 0.20	< 0.01	< 0.01	< 0.01	< 0.35	2017-09836	<2	<8	<2	<1
Brown trout	Mjøsa	< 0.52	< 0.17	< 0.27	< 0.01	< 0.20	< 0.01	< 0.01	< 0.01	< 0.35	2017-09837	<1	<3	<2	<0.6
Brown trout	Mjøsa	< 0.52	< 0.17	< 0.27	< 0.01	< 0.20	< 0.01	< 0.01	< 0.01	< 0.35	2017-09838	<1	<4	<2	<0.4
Brown trout	Mjøsa	< 0.52	< 0.17	< 0.27	< 0.01	< 0.20	< 0.01	< 0.01	< 0.01	< 0.35	2017-09839	<2	<4	<2	<0.4
Brown trout	Mjøsa	< 0.52	< 0.17	< 0.27	< 0.01	< 0.20	< 0.01	< 0.01	< 0.01	< 0.35	2017-09840	<1	<3	<2	<0.6
Brown trout	Mjøsa	< 0.52	< 0.17	< 0.27	< 0.01	< 0.20	< 0.01	< 0.01	< 0.01	< 0.35	2017-09841	<2	<4	<2	<0.6
Brown trout	Mjøsa	< 0.52	< 0.17	< 0.27	< 0.01	< 0.20	< 0.01	< 0.01	< 0.01	< 0.35	2017-09842	<2	<4	<2	<0.6
Brown trout	Mjøsa	< 0.52	< 0.17	< 0.27	< 0.01	< 0.20	< 0.01	< 0.01	< 0.01	< 0.35	2017-09843	<2	<4	<2	<0.8
Brown trout	Mjøsa	< 0.52	< 0.17	< 0.27	< 0.01	< 0.20	< 0.01	< 0.01	< 0.01	< 0.35	2017-09844	<2	<4	<2	<0.4
Brown trout	Mjøsa	< 0.52	< 0.17	< 0.27	< 0.01	< 0.20	< 0.01	< 0.01	< 0.01	< 0.35	2017-09845	<2	<4	<2	<0.6
Brown trout	Mjøsa	< 0.52	< 0.17	< 0.27	< 0.01	< 0.20	< 0.01	< 0.01	< 0.01	< 0.35	2017-09846	<2	<4	<2	<0.6
Brown trout	Mjøsa	0.11	< 0.10	0.37	< 0.10	< 0.90	< 0.02	< 0.01	< 0.01	< 0.12	2017-09847	<2	<6	<2	<0.6
Brown trout	Mjøsa	0.09	< 0.10	< 0.20	< 0.10	< 0.90	< 0.02	< 0.01	< 0.01	< 0.12	2017-09848	<2	<6	<2	<0.8
Smelt	Mjøsa	< 0.52	< 0.17	0.72	< 0.01	< 0.20	< 0.01	< 0.01	< 0.01	< 0.35	2017-09814	<0,6	<3	<2	<0,4
Smelt	Mjøsa	< 0.52	< 0.17	< 0.27	0.05	0.25 (<LOQ)	< 0.01	< 0.01	< 0.01	< 0.35	2017-09815	<0,8	<3	<2	<0,4
Smelt	Mjøsa	< 0.52	< 0.17	< 0.27	< 0.01	< 0.20	< 0.01	< 0.01	< 0.01	< 0.35	2017-09816	1,66	<3	<2	<0,4
Smelt	Mjøsa	< 0.52	< 0.17	0.32 (<LOQ)	< 0.01	< 0.20	< 0.01	< 0.01	< 0.01	< 0.35	2017-09817	<0,6	<3	<2	<0,4
Smelt	Mjøsa	< 0.52	0.29 (<LOQ)	< 0.27	0.05	< 0.20	< 0.01	< 0.01	< 0.01	< 0.35	2017-09818	<0,8	<4	<2	<0,4
Smelt	Mjøsa	< 0.52	0.34 (<LOQ)	0.33 (<LOQ)	0.03	< 0.20	< 0.01	< 0.01	< 0.01	< 0.35	2017-09819	<0,8	<4	<2	<0,4
Smelt	Mjøsa	< 0.52	0.19 (<LOQ)	< 0.27	0.09	< 0.20	< 0.01	< 0.01	< 0.01	< 0.35	2017-09820	<0,8	<4	<2	<0,4
Smelt	Mjøsa	< 0.52	< 0.17	0.31 (<LOQ)	< 0.01	0.32 (<LOQ)	< 0.01	< 0.01	< 0.01	< 0.35	2017-09821	<0,8	<4	<2	<0,4
Smelt	Mjøsa	< 0.52	< 0.17	< 0.27	< 0.01	< 0.20	< 0.01	< 0.01	< 0.01	< 0.35	2017-09822	<0,8	<4	<2	<0,4
Smelt	Mjøsa	< 0.52	< 0.17	< 0.27	< 0.01	< 0.20	< 0.01	< 0.01	< 0.01	< 0.35	2017-09823	<0,8	<3	<2	<0,4
Vendace	Mjøsa	< 0.52	0.30 (<LOQ)	< 0.27	0.03	< 0.20	< 0.01	< 0.01	< 0.01	< 0.35	2017-09794	<2	<5	<3	<1
Vendace	Mjøsa	< 0.52	< 0.17	< 0.27	< 0.01	< 0.20	< 0.01	< 0.01	< 0.01	< 0.35	2017-09795	<1,5	<5	<2	<0,6
Vendace	Mjøsa	< 0.52	< 0.17	< 0.27	0.05	< 0.20	< 0.01	< 0.01	< 0.01	< 0.35	2017-09796	<0,6	<3	<2	0,51
Vendace	Mjøsa	< 0.52	0.22 (<LOQ)	< 0.27	0.03	< 0.20	< 0.01	< 0.01	< 0.01	< 0.35	2017-09797	<0,6	<3	<2	<0,4
Vendace	Mjøsa	< 0.52	0.30 (<LOQ)	< 0.27	0.03	< 0.20	< 0.01	< 0.01	< 0.01	< 0.35	2017-09798	<1,5	<5	<2	<0,6
Vendace	Mjøsa	< 0.52	< 0.17	< 0.27	0.03	< 0.20	< 0.01	< 0.01	< 0.01	< 0.35	2017-09799	<0,8	<4	<2	0,51
Vendace	Mjøsa	< 0.52	< 0.17	< 0.27	0.03	< 0.20	< 0.01	< 0.01	< 0.01	< 0.35	2017-09800	<1	<4	<2	<0,4
Vendace	Mjøsa	< 0.52	0.23 (<LOQ)	0.55 (<LOQ)	< 0.01	< 0.20	< 0.01	< 0.01	< 0.01	< 0.35	2017-09801	<1	<4	<2	<0,4
Vendace	Mjøsa	< 0.52	< 0.17	< 0.27	0.04	< 0.20	< 0.01	< 0.01	< 0.01	< 0.35	2017-09802	<1	<4	<2	0,54
Vendace	Mjøsa	< 0.52	< 0.17	< 0.27	0.03	< 0.20	< 0.01	< 0.01	< 0.01	< 0.35	2017-09803	<0,6	<3	<2	<0,4
Brown trout	Femunden	< 0.06	< 0.10	< 0.20	< 0.10	< 0.90	< 0.02	< 0.01	< 0.01	< 0.12	2017-09864	<3	<5	<3	<0,6
Brown trout	Femunden	< 0.06	< 0.10	0.23 (<LOQ)	< 0.10	< 0.90	< 0.02	< 0.01	< 0.01	< 0.12	2017-09865	<3	<5	<2	<0,6
Brown trout	Femunden	0.10	< 0.10	0.22 (<LOQ)	< 0.10	< 0.90	< 0.02	< 0.01	< 0.01	< 0.12	2017-09866	<3	<5	<2	<0,6
Brown trout	Femunden	0.09	0.18 (<LOQ)	0.45	< 0.10	< 0.90	< 0.02	< 0.01	< 0.01	0.15 (<LOQ)	2017-09867	<3	<5	<2	<0,6
Brown trout	Femunden	0.08 (<LOQ)	< 0.10	0.22 (<LOQ)	< 0.10	< 0.90	< 0.02	< 0.01	< 0.01	< 0.12	2017-09868	<3	<5	<2	<0,6
Brown trout	Femunden	< 0.06	< 0.10	1.86	< 0.10	< 0.90	< 0.02	< 0.01	< 0.01	0.15 (<LOQ)	2017-09869	<3	<5	<2	<0,6
Brown trout	Femunden	< 0.06	< 0.10	< 0.20	< 0.10	< 0.90	< 0.02	< 0.01	< 0.01	< 0.12	2017-09870	<3	<5	<2	<0,6
Brown trout	Femunden	< 0.06	< 0.10	0.63	< 0.10	< 0.90	< 0.02	< 0.01	< 0.01	< 0.12	2017-09871	<3	<5	<2	<0,6
Brown trout	Femunden	< 0.06	< 0.10	0.24 (<LOQ)	< 0.10	< 0.90	< 0.02	< 0.01	< 0.01	< 0.12	2017-09872	<3	<5	<2	<0,6
Brown trout	Femunden	< 0.06	< 0.10	< 0.20	< 0.10	< 0.90	< 0.02	< 0.01	< 0.01	< 0.12	2017-09873	<3	<5	<2	<0,6
Zoopl, epilimnion	Mjøsa										2017-10829	<2	0.12	<0,2	<0,6
Zoopl, epilimnion	Mjøsa										2017-10830	<2	0.09	<0,2	<0,6
Zoopl, epilimnion	Mjøsa										2017-10831	<2	0.13	<0,2	<1
Mysis	Mjøsa										2017-10832	<12	<0,15	<0,5	<2
Mysis	Mjøsa										2017-10833	<12	<0,15	<0,3	<2
Mysis	Mjøsa										2017-10834	<5	<0,15	<0,4	<2
Water	Mjøsa	< 1.6	< 7.9	< 15.5	< 0.10	< 0.38	< 0.14	< 0.03	< 0.04	< 0.10	2017-07263	<1	<2	65	<0,05
Water	Mjøsa	< 1.6	< 7.9	< 15.5	< 0.10	< 0.38	< 0.14	< 0.03	< 0.04	< 0.10	2017-07264	<1	<2	12	<0,05
Water	Mjøsa	< 1.6	< 7.9	< 15.5	< 0.10	< 0.38	< 0.14	< 0.03	< 0.04	< 0.10	2017-07265	<1	<2	75	<0,05
Water	Mjøsa	1.15	< 0.11	5.23 (<LOQ)	1.76	1.18	1.40	< 0.01	< 0.02	1.75	2017-10656	<0,1	<0,5	<1	<0,1
Water	Mjøsa	0.78 (<LOQ)	< 0.11	20.7	0.88	< 0.07	0.75	< 0.01	< 0.02	< 0.46	2017-10657	<0,1	<0,5	<1	<0,1
Sediment	Mjøsa	< 0.25	< 0.11	< 1.90	0.34	< 0.07	< 0.06	< 0.01	< 0.02	< 0.46	2017-07268	<0,3	<2	<10	<0,5
Sediment	Mjøsa	< 0.25	< 0.11	< 1.90	< 0.03	< 0.07	< 0.06	< 0.01	< 0.02	< 0.46	2017-07269	<0,3	<2	<10	<0,5
Sediment	Mjøsa	< 0.25	< 0.11	< 1.90	< 0.03	< 0.07	< 0.06	< 0.01	< 0.02	< 0.46	2017-07270	<3	<2	<10	<0,5
Sediment	Mjøsa	< 1.6	< 7.9	< 15.5	< 0.10	< 0.38	< 0.14	< 0.03	< 0.04	< 0.10	2017-11888	<0,3	<2	<10	<0,5
Sediment	Mjøsa	< 1.6	< 7.9	< 15.5	< 0.10	< 0.38	< 0.14	< 0.03	< 0.04	< 0.10	2017-11889	<3	2,835626667	<10	<0,5
Brown trout, muskel	Eikedalsvatnet										NR-2017-12146	<0,9	<6	<3	<0,15
Brown trout, muskel	Eikedalsvatnet										NR-2017-12147	<1	<6	<3	<0,15
Brown trout, muskel	Eikedalsvatnet										NR-2017-12148	<1	<7	<3	<0,15
Brown trout, lever	Eikedalsvatnet														
Brown trout, lever	Eikedalsvatnet														
Brown trout, lever	Eikedalsvatnet														

Sample type	Lake	UV-327	UV-329	Prøve ID PFAS	Prøve	PFPA	PFHxA	PFHpA	PFOA	PFNA	PFDA	PFUdA	PFDoA	PFTrDA	PFTeDA	PFPeDA	PFHxDA	PFBS	PFPS
Brown trout	Mjøsa	<0.4	<0.6	2017-09849	Liver	<0.5	<0.5	<0.5	<0.5	<0.5	3.52	10.9	6.51	14.1	2.97	1.18	<0.5	<0.1	<0.1
Brown trout	Mjøsa	<0.8	<0.6	2017-09850	Liver	<0.5	<0.5	<0.5	<0.5	<0.5	1.16	1.83	1.07	1.45	0.45	<0.4	<0.5	<0.1	<0.1
Brown trout	Mjøsa	<1	<1	2017-09851	Liver	<0.5	<0.5	<0.5	<0.5	<0.5	2.60	7.97	5.38	7.87	2.15	1.08	<0.5	<0.1	<0.1
Brown trout	Mjøsa	<0.8	<0.4	2017-09852	Liver	<0.5	<0.5	<0.5	<0.5	<0.5	3.21	9.92	5.79	8.83	2.52	0.99	<0.5	<0.1	<0.1
Brown trout	Mjøsa	<0.8	<0.6	2017-09853	Liver	<0.5	<0.5	<0.5	<0.5	<0.5	1.98	4.96	3.29	5.23	1.60	0.79	<0.5	<0.1	<0.1
Brown trout	Mjøsa	<0.8	<1	2017-09854	Liver	<0.5	<0.5	<0.5	<0.5	<0.5	0.33	0.87	0.97	1.55	0.63	0.43	<0.5	<0.1	<0.1
Brown trout	Mjøsa	<0.8	<0.6	2017-09855	Liver	<0.5	<0.5	<0.5	<0.5	<0.5	1.76	5.34	3.36	5.05	1.36	0.52	<0.5	<0.1	<0.1
Brown trout	Mjøsa	<0.8	<0.8	2017-09856	Liver	<0.5	<0.5	<0.5	<0.5	<0.5	2.84	9.50	5.26	9.35	2.06	0.76	<0.5	<0.1	<0.1
Brown trout	Mjøsa	<0.8	<0.6	2017-09857	Liver	<0.5	<0.5	<0.5	<0.5	0.69	6.55	16.8	8.62	13.7	3.51	1.54	<0.5	<0.1	<0.1
Brown trout	Mjøsa	<1	<0.6	2017-09858	Liver	<0.5	<0.5	<0.5	<0.5	0.68	4.85	15.6	9.83	19.8	4.76	1.81	<0.5	<0.1	<0.1
Brown trout	Mjøsa	<0.8	<0.6	2017-09859	Liver	<0.5	<0.5	<0.5	<0.5	0.54	3.64	11.9	6.71	11.3	2.49	1.05	<0.5	<0.1	<0.1
Brown trout	Mjøsa	<0.8	<0.6	2017-09860	Liver	<0.5	<0.5	<0.5	<0.5	<0.5	2.65	7.73	4.96	8.62	1.91	0.91	<0.5	<0.1	<0.1
Brown trout	Mjøsa	<0.6	<0.6	2017-09861	Liver	<0.5	<0.5	<0.5	<0.5	<0.5	0.98	1.93	1.34	1.66	0.46	<0.4	<0.5	<0.1	<0.1
Brown trout	Mjøsa	<1	<1	2017-09862	Liver	<0.5	<0.5	<0.5	<0.5	<0.5	1.85	4.51	3.23	4.30	1.23	0.74	<0.5	<0.1	<0.1
Brown trout	Mjøsa	<1.4	<0.8	2017-09863	Liver	<0.5	<0.5	<0.5	<0.5	<0.5	1.38	2.36	1.58	2.12	0.49	<0.4	<0.5	<0.1	<0.1
Smelt	Mjøsa	<0,4	<0,4	2017-09824	Liver	<0.5	<0.5	<0.5	1.59	0.94	1.29	2.61	2.31	3.19	0.76	<0.4	<0.5	<0.1	<0.1
Smelt	Mjøsa	<0,5	<0,4	2017-09825	Liver	<0.5	<0.5	<0.5	0.85	1.32	1.74	3.22	2.69	3.21	1.38	<0.4	<0.5	<0.1	<0.1
Smelt	Mjøsa	<0,4	<0,4	2017-09826	Liver	<0.5	<0.5	<0.5	1.07	1.41	4.28	11.2	6.65	8.84	2.26	1.30	<0.5	<0.1	<0.1
Smelt	Mjøsa	<0,4	<0,4	2017-09827	Liver	<0.5	<0.5	<0.5	1.03	1.27	4.96	14.9	8.42	10.3	2.33	1.10	<0.5	0.13	<0.1
Smelt	Mjøsa	<0,5	<0,4	2017-09828	Liver	<0.5	<0.5	<0.5	1.16	0.96	1.47	2.97	2.28	3.04	1.02	<0.4	<0.5	0.53	<0.1
Smelt	Mjøsa	<0,5	<0,4	2017-09829	Liver	<0.5	<0.5	<0.5	0.76	0.64	1.45	3.16	2.44	3.12	1.06	<0.4	<0.5	<0.1	<0.1
Smelt	Mjøsa	<0,5	<0,4	2017-09830	Liver	<0.5	<0.5	<0.5	1.19	0.89	1.58	2.75	2.06	2.76	0.67	<0.4	<0.5	<0.1	<0.1
Smelt	Mjøsa	<0,5	<0,4	2017-09831	Liver	<0.5	<0.5	<0.5	2.62	0.86	2.19	3.90	3.05	4.25	1.40	<0.4	<0.5	<0.1	<0.1
Smelt	Mjøsa	<0,5	<0,4	2017-09832	Liver	<0.5	<0.5	<0.5	0.71	0.67	1.35	3.04	2.48	3.35	1.02	<0.4	<0.5	<0.1	<0.1
Smelt	Mjøsa	<0,5	<0,4	2017-09833	Liver	<0.5	<0.5	<0.5	<0.5	0.59	2.16	4.31	3.30	3.52	1.20	<0.4	<0.5	<0.1	<0.1
Vendace	Mjøsa	<1	<0,8	2017-09804	Liver	<0.5	<0.5	<0.5	<0.5	0.91	<0.5	0.59	0.52	0.60	<0.4	<0.4	<0.5	<0.1	<0.1
Vendace	Mjøsa	<0,8	<0,5	2017-09805	Liver	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.47	0.52	0.81	<0.4	<0.4	<0.5	<0.1	<0.1
Vendace	Mjøsa	<0,3	<0,3	2017-09806	Liver	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.84	0.75	0.97	<0.4	<0.4	<0.5	<0.1	<0.1
Vendace	Mjøsa	<0,4	<0,4	2017-09807	Liver	<0.5	<0.5	<0.5	<0.5	<0.5	0.51	1.08	0.87	1.04	<0.4	<0.4	<0.5	<0.1	<0.1
Vendace	Mjøsa	<0,8	<0,5	2017-09808	Liver	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.61	0.55	0.84	<0.4	<0.4	<0.5	<0.1	<0.1
Vendace	Mjøsa	<0,4	<0,4	2017-09809	Liver	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.76	0.55	0.88	<0.4	<0.4	<0.5	<0.1	<0.1
Vendace	Mjøsa	<0,5	<0,5	2017-09810	Liver	<0.5	<0.5	<0.5	<0.5	0.50	0.59	1.04	0.91	1.15	<0.4	<0.4	<0.5	<0.1	<0.1
Vendace	Mjøsa	<0,4	<0,5	2017-09811	Liver	<0.5	<0.5	<0.5	<0.5	0.55	<0.5	0.79	0.95	1.43	<0.4	<0.4	<0.5	<0.1	<0.1
Vendace	Mjøsa	<0,5	<0,4	2017-09812	Liver	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.81	0.73	1.22	<0.4	<0.4	<0.5	<0.1	<0.1
Vendace	Mjøsa	<0,4	<0,4	2017-09813	Liver	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.67	0.63	0.79	<0.4	<0.4	<0.5	<0.1	<0.1
Brown trout	Femunden	<1	<1,6	2017-09874	Liver	<0.5	<0.5	<0.5	<0.5	0.90	1.54	9.56	6.04	33.3	4.38	4.05	<0.5	<0.1	<0.1
Brown trout	Femunden	<1	<1,6	2017-09875	Liver	<0.5	<0.5	<0.5	<0.5	<0.5	0.64	2.57	1.45	7.58	1.35	1.27	<0.5	<0.1	<0.1
Brown trout	Femunden	<1	<1,6	2017-09876	Liver	<0.5	<0.5	<0.5	<0.5	0.63	1.31	6.22	3.82	19.1	2.42	1.97	<0.5	<0.1	<0.1
Brown trout	Femunden	<1	<1,6	2017-09877	Liver	<0.5	<0.5	<0.5	<0.5	<0.5	1.30	9.78	5.76	30.0	3.52	3.27	<0.5	<0.1	<0.1
Brown trout	Femunden	<1	<1,6	2017-09878	Liver	<0.5	<0.5	<0.5	<0.5	0.50	1.44	9.50	5.63	35.0	3.74	2.99	<0.5	<0.1	<0.1
Brown trout	Femunden	<1	<1,6	2017-09879	Liver	<0.5	<0.5	<0.5	<0.5	1.56	3.66	25.2	13.0	66.5	6.80	4.98	<0.5	<0.1	<0.1
Brown trout	Femunden	<1	<1,6	2017-09880	Liver	<0.5	<0.5	<0.5	<0.5	1.41	2.05	8.10	3.45	14.0	1.90	1.29	<0.5	<0.1	<0.1
Brown trout	Femunden	<1	<1,6	2017-09881	Liver	<0.5	<0.5	<0.5	<0.5	<0.5	0.71	2.67	1.27	4.41	0.81	0.68	<0.5	<0.1	<0.1
Brown trout	Femunden	<1	<1,6	2017-09882	Liver	<0.5	<0.5	<0.5	<0.5	<0.5	0.50	2.08	1.18	7.04	1.14	0.86	<0.5	<0.1	<0.1
Brown trout	Femunden	<1	<1,6	2017-09883	Liver	<0.5	<0.5	<0.5	<0.5	<0.5	0.97	4.88	3.15	18.9	2.55	2.31	<0.5	<0.1	<0.1
Zoopl, epilimnion	Mjøsa	<0,2	<1	2017-10829	ZM-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.4	<0.4	<0.4	<0.4	<0.4	<0.5	<0.1	<0.1
Zoopl, epilimnion	Mjøsa	<0,2	<1	2017-10830	ZM-2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.4	<0.4	<0.4	<0.4	<0.4	<0.5	<0.1	<0.1
Zoopl, epilimnion	Mjøsa	<0,2	<2	2017-10831	ZM-3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.4	<0.4	<0.4	<0.4	<0.4	<0.5	<0.1	<0.1
Mysis	Mjøsa	<0,3	<2	2017-10832	MM-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.4	<0.4	<0.4	<0.4	<0.4	<0.5	<0.1	<0.1
Mysis	Mjøsa	<0,4	<2	2017-10833	MM-2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.4	<0.4	<0.4	<0.4	<0.4	<0.5	<0.1	<0.1
Mysis	Mjøsa	<0,3	<2	2017-10834	MM-3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.4	<0.4	<0.4	<0.4	<0.4	<0.5	<0.1	<0.1
Water	Mjøsa	<0,05	<0,1	2017-07263	M 1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.4	<0.4	<0.4	<0.4	<0.4	<0.5	<0.1	<0.1
Water	Mjøsa	<0,05	<0,05	2017-07264	M 2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.4	<0.4	<0.4	<0.4	<0.4	<0.5	<0.1	<0.1
Water	Mjøsa	<0,05	<0,05	2017-07265	M 3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.4	<0.4	<0.4	<0.4	<0.4	<0.5	<0.1	<0.1
Water	Mjøsa	<0,1	<0,1	2017-10656	M 4	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.4	<0.4	<0.4	<0.4	<0.4	<0.5	<0.1	<0.1
Water	Mjøsa	<0,1	<0,1	2017-10657	M 5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.4	<0.4	<0.4	<0.4	<0.4	<0.5	<0.1	<0.1
Sediment	Mjøsa	<0,5	<0,5	2017-07268	M ST-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.4	<0.4	<0.4	<0.4	<0.4	<0.5	<0.1	<0.1
Sediment	Mjøsa	<0,5	<0,5	2017-07269	M ST-2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.4	<0.4	<0.4	<0.4	<0.4	<0.5	<0.1	<0.1
Sediment	Mjøsa	<0,5	<0,5	2017-07270	M ST-3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.4	<0.4	<0.4	<0.4	<0.4	<0.5	<0.1	<0.1
Sediment	Mjøsa	<0,5	<0,5	2017-11888	M ST-4	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.4	<0.4	<0.4	<0.4	<0.4	<0.5	<0.1	<0.1
Sediment	Mjøsa	<0,5	<0,5	2017-11889	M ST-5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.4	<0.4	<0.4	<0.4	<0.4	<0.5	<0.1	<0.1
Brown trout, muskel	Eikedalsvatnet	<0,3	<0,4																
Brown trout, muskel	Eikedalsvatnet	<0,3	<0,3																
Brown trout, muskel	Eikedalsvatnet	<0,3	<0,2																
Brown trout, lever	Eikedalsvatnet			2017-12149	Liver	<0.5	<0.5	<0.5	<0.5	<0.5	0,65	1,38	1,29	1,55	0,87			<0.1	<0.1
Brown trout, lever	Eikedalsvatnet			2017-12150	Liver	<0.5	<0.5	<0.5	<0.5	<0.5	0,71	1,69	1,31	2,20	0,81			<0.1	<0.1
Brown trout, lever	Eikedalsvatnet			2017-12151	Liver	<0.5	<0.5	<0.5	<0.5	<0.5	0,74	1,91	1,52	2,33	1,00			<0.1	<0.1

Sample type	Lake	PFHxS	PFHpS	PFOS	8Cl-PFOS	PFNS	PFDS	PFDoS	PFOSA	meFOSA	etFOSA	meFOSE	etFOSE	4:2 FTS	6:2 FTS	8:2 FTS	4:2 F53B	6:2 F53B
Brown trout	Mjøsa	<0.1	<0.1	8.20	<0.2	<0.1	<0.1	<0.2	0.22	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Brown trout	Mjøsa	<0.1	<0.1	1.84	<0.2	<0.1	<0.1	<0.2	0.17	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Brown trout	Mjøsa	<0.1	<0.1	6.68	<0.2	<0.1	<0.1	<0.2	0.31	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Brown trout	Mjøsa	<0.1	<0.1	6.46	<0.2	<0.1	<0.1	<0.2	0.45	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Brown trout	Mjøsa	<0.1	<0.1	4.03	<0.2	<0.1	<0.1	<0.2	0.37	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Brown trout	Mjøsa	<0.1	<0.1	1.51	<0.2	<0.1	<0.1	<0.2	0.15	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Brown trout	Mjøsa	<0.1	<0.1	3.13	<0.2	<0.1	<0.1	<0.2	0.22	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Brown trout	Mjøsa	<0.1	<0.1	6.41	<0.2	<0.1	<0.1	<0.2	0.55	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Brown trout	Mjøsa	<0.1	<0.1	11.4	<0.2	<0.1	<0.1	<0.2	0.27	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Brown trout	Mjøsa	<0.1	<0.1	10.5	<0.2	<0.1	<0.1	<0.2	0.81	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Brown trout	Mjøsa	<0.1	<0.1	6.90	<0.2	<0.1	<0.1	<0.2	0.40	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Brown trout	Mjøsa	<0.1	<0.1	6.28	<0.2	<0.1	<0.1	<0.2	0.24	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Brown trout	Mjøsa	<0.1	<0.1	1.77	<0.2	<0.1	<0.1	<0.2	0.14	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Brown trout	Mjøsa	<0.1	<0.1	3.92	<0.2	<0.1	<0.1	<0.2	0.30	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Brown trout	Mjøsa	<0.1	<0.1	2.48	<0.2	<0.1	<0.1	<0.2	0.34	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Smelt	Mjøsa	<0.1	<0.1	1.55	<0.2	<0.1	<0.1	<0.2	0.20	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Smelt	Mjøsa	<0.1	<0.1	2.02	<0.2	0.20	<0.1	<0.2	0.30	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Smelt	Mjøsa	<0.1	<0.1	8.13	<0.2	<0.1	<0.1	<0.2	0.90	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Smelt	Mjøsa	<0.1	0.78	8.92	<0.2	<0.1	<0.1	<0.2	2.04	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Smelt	Mjøsa	<0.1	<0.1	1.62	<0.2	<0.1	<0.1	<0.2	0.36	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Smelt	Mjøsa	<0.1	<0.1	1.75	<0.2	<0.1	<0.1	<0.2	0.34	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Smelt	Mjøsa	<0.1	<0.1	1.33	<0.2	<0.1	<0.1	<0.2	0.31	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Smelt	Mjøsa	<0.1	1.18	3.26	<0.2	<0.1	<0.1	<0.2	0.31	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Smelt	Mjøsa	<0.1	<0.1	2.41	<0.2	<0.1	<0.1	<0.2	0.33	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Smelt	Mjøsa	<0.1	<0.1	4.26	<0.2	<0.1	<0.1	<0.2	0.36	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Vendace	Mjøsa	<0.1	<0.1	0.35	<0.2	<0.1	<0.1	<0.2	<0.1	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Vendace	Mjøsa	<0.1	<0.1	0.53	<0.2	<0.1	<0.1	<0.2	<0.1	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Vendace	Mjøsa	<0.1	<0.1	0.56	<0.2	<0.1	<0.1	<0.2	<0.1	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Vendace	Mjøsa	<0.1	<0.1	3.75	<0.2	<0.1	<0.1	<0.2	<0.1	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Vendace	Mjøsa	<0.1	<0.1	1.04	<0.2	<0.1	<0.1	<0.2	<0.1	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Vendace	Mjøsa	<0.1	<0.1	0.90	<0.2	<0.1	<0.1	<0.2	<0.1	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Vendace	Mjøsa	<0.1	<0.1	1.30	<0.2	<0.1	<0.1	<0.2	<0.1	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Vendace	Mjøsa	<0.1	<0.1	0.99	<0.2	<0.1	<0.1	<0.2	<0.1	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Vendace	Mjøsa	<0.1	<0.1	1.01	<0.2	<0.1	<0.1	<0.2	<0.1	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Vendace	Mjøsa	<0.1	<0.1	0.79	<0.2	<0.1	<0.1	<0.2	<0.1	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Brown trout	Femunden	<0.1	<0.1	2.22	<0.2	<0.1	<0.1	<0.2	0.25	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Brown trout	Femunden	<0.1	<0.1	1.00	<0.2	<0.1	<0.1	<0.2	0.17	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Brown trout	Femunden	<0.1	<0.1	1.75	<0.2	<0.1	<0.1	<0.2	0.45	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Brown trout	Femunden	<0.1	<0.1	1.86	<0.2	<0.1	<0.1	<0.2	0.52	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Brown trout	Femunden	<0.1	<0.1	1.94	<0.2	<0.1	<0.1	<0.2	0.65	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Brown trout	Femunden	<0.1	<0.1	5.22	<0.2	<0.1	<0.1	<0.2	0.63	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Brown trout	Femunden	<0.1	<0.1	2.64	<0.2	<0.1	<0.1	<0.2	0.24	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Brown trout	Femunden	<0.1	<0.1	0.85	<0.2	<0.1	<0.1	<0.2	<0.1	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Brown trout	Femunden	<0.1	<0.1	0.76	<0.2	<0.1	<0.1	<0.2	0.12	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Brown trout	Femunden	<0.1	<0.1	1.62	<0.2	<0.1	<0.1	<0.2	0.27	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Zoopl, epilimnion	Mjøsa	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.2	<0.1	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Zoopl, epilimnion	Mjøsa	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.2	<0.1	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Zoopl, epilimnion	Mjøsa	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.2	<0.1	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Mysis	Mjøsa	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.2	<0.1	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Mysis	Mjøsa	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.2	<0.1	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Mysis	Mjøsa	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.2	<0.1	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Water	Mjøsa	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Water	Mjøsa	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Water	Mjøsa	<0.1	<0.1	0.10	<0.2	<0.1	<0.1	<0.1	<0.1	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Water	Mjøsa	<0.1	<0.1	0.13	<0.2	<0.1	<0.1	<0.1	<0.1	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Water	Mjøsa	<0.1	<0.1	0.10	<0.2	<0.1	<0.1	<0.1	<0.1	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Sediment	Mjøsa	<0.1	<0.1	0.25	<0.2	<0.1	<0.1	<0.2	<0.1	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Sediment	Mjøsa	<0.1	<0.1	0.17	<0.2	<0.1	<0.1	<0.2	<0.1	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Sediment	Mjøsa	<0.1	<0.1	0.12	<0.2	<0.1	<0.1	<0.2	<0.1	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Sediment	Mjøsa	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.2	<0.1	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Sediment	Mjøsa	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.2	<0.1	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Brown trout, muskel	Eikedalsvatnet																	
Brown trout, muskel	Eikedalsvatnet																	
Brown trout, muskel	Eikedalsvatnet																	
Brown trout, lever	Eikedalsvatnet	<0.1	<0.1	1,58	<0.2	<0.1	0,16	<0.2	<0.1	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Brown trout, lever	Eikedalsvatnet	<0.1	<0.1	1,47	<0.2	<0.1	<0.1	<0.2	<0.1	<0.3	<0.3	<5	<5	<0.3	<0.3	<0.3	<0.3	<0.3
Brown trout, lever	Eikedalsvatnet	<0.1	<0.1	1,70	<0.2	<0.1	<0.1	<0.2	<0.1	<0.3	<0.3	<5	<5	<0.3	<0.3	0,66	<0.3	<0.3

Sample type	Lake	me-FOSAA	et-FOSAA	F53	7:3 FTCA	PFBSA	mePFBSA	etPFBSA	ATAC-C20*	ATAC-C22*	Bisf-FL	Bisf-BP	Bisf-TMC	Bisf-P	Bisf-M	Bisf-Z	Bisf-AP	Bisf-S
Brown trout	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2	<1	<1	< 1,0	< 1,0	< 3,0	< 2,0	< 1,5	< 4,0	< 0,7	< 15,0
Brown trout	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2	<1	<1	< 1,0	< 1,0	< 3,0	< 2,0	< 1,5	< 4,0	< 0,7	< 15,0
Brown trout	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2	<1	<1	< 1,0	< 1,0	< 3,0	< 2,0	< 1,5	< 4,0	< 0,7	< 15,0
Brown trout	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2	<1	<1	< 1,0	< 1,0	< 3,0	< 2,0	< 1,5	< 4,0	< 0,7	< 15,0
Brown trout	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2	<1	<1	< 1,0	< 1,0	< 3,0	7,58	< 1,5	< 4,0	< 0,7	< 15,0
Brown trout	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2			< 1,0	< 1,0	< 3,0	< 2,0	< 1,5	< 4,0	< 0,7	< 15,0
Brown trout	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2			< 1,0	< 1,0	< 3,0	< 2,0	< 1,5	< 4,0	< 0,7	< 15,0
Brown trout	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2			< 1,0	< 1,0	< 3,0	< 2,0	< 1,5	< 4,0	< 0,7	< 15,0
Brown trout	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2			< 1,0	< 1,0	< 3,0	< 2,0	< 1,5	< 4,0	< 0,7	< 15,0
Brown trout	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2			< 1,0	< 1,0	< 3,0	2,17	< 1,5	< 4,0	< 0,7	< 15,0
Brown trout	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2			< 1,0	< 1,0	< 3,0	< 2,0	< 1,5	< 4,0	< 0,7	< 15,0
Brown trout	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2			< 1,0	< 1,0	< 3,0	< 2,0	< 1,5	< 4,0	< 0,7	< 15,0
Brown trout	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2			< 1,0	< 1,0	< 3,0	< 2,0	< 1,5	< 4,0	< 0,7	< 15,0
Brown trout	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2			< 1,0	< 1,0	< 3,0	< 2,0	< 1,5	< 4,0	< 0,7	< 15,0
Brown trout	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2			< 1,0	< 1,0	< 3,0	< 2,0	< 1,5	< 4,0	< 0,7	< 15,0
Smelt	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2	<1	<1	< 0,5	< 0,5	< 5,0	< 1,5	< 0,6	< 3,5	< 0,5	< 2,0
Smelt	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2	<1	<1	< 0,5	< 0,5	< 5,0	< 1,5	< 0,6	< 3,5	< 0,5	< 2,0
Smelt	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2	<1	<1	< 0,5	< 0,5	< 5,0	< 1,5	< 0,6	< 3,5	< 0,5	< 2,0
Smelt	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2	<1	<1	< 0,5	< 0,5	< 5,0	< 1,5	< 0,6	< 3,5	< 0,5	< 2,0
Smelt	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2			< 0,5	< 0,5	< 5,0	< 1,5	< 0,6	< 3,5	< 0,5	< 2,0
Smelt	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2			< 0,5	< 0,5	< 5,0	< 1,5	< 0,6	< 3,5	< 0,5	< 2,0
Smelt	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2			< 0,5	< 0,5	< 5,0	< 1,5	< 0,6	< 3,5	< 0,5	< 2,0
Smelt	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2			< 0,5	< 0,5	< 5,0	< 1,5	< 0,6	< 3,5	< 0,5	< 2,0
Smelt	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2			< 0,5	< 0,5	< 5,0	< 1,5	< 0,6	< 3,5	< 0,5	< 2,0
Smelt	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2			< 0,5	< 0,5	< 5,0	< 1,5	< 0,6	< 3,5	< 0,5	< 2,0
Vendace	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2	<1	<1	< 1,0	< 1,0	< 4,0	< 1,5	< 1,5	< 2,0	< 0,5	< 7,0
Vendace	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2	<1	<1	< 1,0	< 1,0	< 4,0	< 1,5	< 1,5	< 2,0	< 0,5	< 7,0
Vendace	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2	<1	<1	< 1,0	< 1,0	< 4,0	< 1,5	< 1,5	< 2,0	< 0,5	< 7,0
Vendace	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2	2,2	1,9	< 1,0	< 1,0	< 4,0	< 1,5	< 1,5	< 2,0	< 0,5	< 7,0
Vendace	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2			< 1,0	< 1,0	< 4,0	< 1,5	< 1,5	< 2,0	< 0,5	< 7,0
Vendace	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2			< 1,0	< 1,0	< 4,0	< 1,5	< 1,5	< 2,0	< 0,5	< 7,0
Vendace	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2			< 1,0	< 1,0	< 4,0	< 1,5	< 1,5	< 2,0	< 0,5	< 7,0
Vendace	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2			< 1,0	< 1,0	< 4,0	< 1,5	< 1,5	< 2,0	< 0,5	< 7,0
Vendace	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2			< 1,0	< 1,0	< 4,0	< 1,5	< 1,5	< 2,0	< 0,5	< 7,0
Vendace	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2			< 1,0	< 1,0	< 4,0	< 1,5	< 1,5	< 2,0	< 0,5	< 7,0
Brown trout	Femunden	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2	<1	<1	< 1,0	< 1,0	< 3,0	< 2,0	< 1,5	< 4,0	< 0,7	< 15,0
Brown trout	Femunden	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2	<1	<1	< 1,0	< 1,0	< 3,0	< 2,0	< 1,5	< 4,0	< 0,7	< 15,0
Brown trout	Femunden	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2	<1	<1	< 1,0	< 1,0	< 3,0	< 2,0	< 1,5	< 4,0	< 0,7	< 15,0
Brown trout	Femunden	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2	<1	<1	< 1,0	< 1,0	< 3,0	< 2,0	< 1,5	< 4,0	< 0,7	< 15,0
Brown trout	Femunden	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2	<1	<1	< 1,0	< 1,0	< 3,0	< 2,0	< 1,5	< 4,0	< 0,7	< 15,0
Brown trout	Femunden	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2			< 1,0	< 1,0	< 3,0	< 2,0	< 1,5	< 4,0	< 0,7	< 15,0
Brown trout	Femunden	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2			< 1,0	< 1,0	< 3,0	< 2,0	< 1,5	< 4,0	< 0,7	< 15,0
Brown trout	Femunden	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2			< 1,0	< 1,0	< 3,0	< 2,0	< 1,5	< 4,0	< 0,7	< 15,0
Brown trout	Femunden	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2			< 1,0	< 1,0	< 3,0	< 2,0	< 1,5	< 4,0	< 0,7	< 15,0
Brown trout	Femunden	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2			< 1,0	< 1,0	< 3,0	< 2,0	< 1,5	< 4,0	< 0,7	< 15,0
Zoopl, epilimnion	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2	<1	<1	< 1,0	< 0,5	< 8,0	< 2,0	< 1,5	< 6,5	< 0,5	< 8,5
Zoopl, epilimnion	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2	<1	<1	< 1,0	< 0,5	< 8,0	< 2,0	< 1,5	< 6,5	< 0,5	< 8,5
Zoopl, epilimnion	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2	<1	<1	< 1,0	< 0,5	< 8,0	< 2,0	< 1,5	< 6,5	< 0,5	< 8,5
Mysis	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2	<1	5,3	< 1,0	< 0,5	< 8,0	< 2,0	< 1,5	< 6,5	< 0,5	< 8,5
Mysis	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2	<1	4,8	< 1,0	< 0,5	< 8,0	< 2,0	< 1,5	< 6,5	< 0,5	< 8,5
Mysis	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2	<1	4,0	< 1,0	< 0,5	< 8,0	< 2,0	< 1,5	< 6,5	< 0,5	< 8,5
Water	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2	<10	<10								
Water	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2	<10	<10	< 3,0	< 4,0	< 37,0	< 3,0	< 2,0	< 26,0	< 3,0	< 5,0
Water	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2	<10	<10	< 3,0	< 4,0	< 37,0	< 3,0	< 2,0	< 26,0	< 3,0	< 5,0
Water	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2			< 3,0	< 4,0	< 37,0	< 3,0	< 2,0	< 26,0	< 3,0	< 5,0
Water	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2			< 3,0	< 4,0	< 37,0	< 3,0	< 2,0	< 26,0	< 3,0	< 5,0
Sediment	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2	<1	<1	< 1,0	< 1,5	< 11,0	< 2,5	< 1,0	< 1,0	< 0,5	< 3,5
Sediment	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2	<1	<1	< 1,0	< 1,5	< 11,0	< 2,5	< 1,0	< 1,0	< 0,5	< 3,5
Sediment	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2	<1	<1	< 1,0	< 1,5	< 11,0	< 2,5	< 1,0	< 1,0	< 0,5	< 3,5
Sediment	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2			< 1,0	< 1,5	< 11,0	< 2,5	< 1,0	< 1,0	< 0,5	< 3,5
Sediment	Mjøsa	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2			< 1,0	< 1,5	< 11,0	< 2,5	< 1,0	< 1,0	< 0,5	4,1
Brown trout, muskel	Eikedalsvatnet										< 1,0	< 1,0	< 3,0	< 2,0	< 1,0	< 4,0	< 1,0	< 2,0
Brown trout, muskel	Eikedalsvatnet										< 1,0	< 1,0	< 3,0	< 2,0	< 1,0	< 4,0	< 1,0	< 2,0
Brown trout, muskel	Eikedalsvatnet										< 1,0	< 1,0	< 3,0	< 2,0	< 1,0	< 4,0	< 1,0	< 2,0
Brown trout, lever	Eikedalsvatnet	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2										
Brown trout, lever	Eikedalsvatnet	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2										
Brown trout, lever	Eikedalsvatnet	<0.3	<0.3	<0.3	<0.5	<0.2	<0.2	<0.2										

Sample type	**Lake**	Bisf-F	Bisf-E	Bisf- A	Bisf-B	4-tert-octylphenol	4-nonylphenol	Dodekylphenol	TBBPA	MB1/AO	NILU ID	4-Nonylfenolethoxylate
Brown trout	Mjøsa	< 8,0	< 20,0	40,6	< 1,5	ND	< 35,0	< 70,0	< 9,0	< 0,7	2017-9834	6
Brown trout	Mjøsa	< 8,0	< 20,0	< 25,0	< 1,5	ND	< 35,0	< 70,0	< 9,0	< 0,7	2017-9835	25
Brown trout	Mjøsa	< 8,0	< 20,0	< 25,0	< 1,5	ND	< 35,0	< 70,0	< 9,0	< 0,7	2017-9836	45
Brown trout	Mjøsa	< 8,0	< 20,0	< 25,0	< 1,5	ND	< 35,0	< 70,0	< 9,0	< 0,7	2017-9837	50
Brown trout	Mjøsa	61,0	< 20,0	< 25,0	< 1,5	ND	< 35,0	< 70,0	< 9,0	< 0,7	2017-9838	<0.6
Brown trout	Mjøsa	< 8,0	< 20,0	< 25,0	< 1,5	ND	< 35,0	< 70,0	< 9,0	< 0,7		
Brown trout	Mjøsa	< 8,0	< 20,0	< 25,0	< 1,5	ND	< 35,0	< 70,0	< 9,0	< 0,7		
Brown trout	Mjøsa	45,6	< 20,0	< 25,0	< 1,5	ND	< 35,0	< 70,0	< 9,0	< 0,7		
Brown trout	Mjøsa	< 8,0	< 20,0	< 25,0	< 1,5	ND	< 35,0	< 70,0	< 9,0	< 0,7		
Brown trout	Mjøsa	< 8,0	< 20,0	< 25,0	< 1,5	ND	< 35,0	< 70,0	< 9,0	< 0,7		
Brown trout	Mjøsa	< 8,0	< 20,0	< 25,0	< 1,5	ND	< 35,0	< 70,0	< 9,0	< 0,7		
Brown trout	Mjøsa	< 8,0	< 20,0	< 25,0	< 1,5	ND	< 35,0	< 70,0	< 9,0	< 0,7		
Brown trout	Mjøsa	< 8,0	< 23,2	< 25,0	< 1,6	ND	< 35,0	< 70,0	< 9,0	< 0,7		
Brown trout	Mjøsa	< 8,0	< 20,0	< 25,0	< 1,5	ND	< 35,0	< 70,0	< 9,0	< 0,7		
Brown trout	Mjøsa	< 8,0	< 20,0	< 25,0	< 1,9	ND	< 35,0	< 70,0	< 9,0	< 0,7		
Smelt	Mjøsa	< 4,0	< 15,0	< 12,0	< 1,5	ND	< 1,5	< 3,0	< 3,0	< 0,5	2017-9814	320
Smelt	Mjøsa	< 4,0	< 15,0	14,2	< 1,5	ND	< 1,5	< 3,0	< 3,0	< 0,5	2017-9815	
Smelt	Mjøsa	< 4,0	< 15,0	15,7	< 1,5	ND	< 1,5	< 3,0	< 3,0	< 0,5	2017-9816	40
Smelt	Mjøsa	< 4,0	< 15,0	< 12,0	< 1,5	ND	< 1,5	< 3,0	< 3,0	< 0,5	2017-9817	25
Smelt	Mjøsa	< 4,0	< 15,0	< 12,0	< 1,5	ND	< 1,5	< 3,0	< 3,0	< 0,5		
Smelt	Mjøsa	< 4,0	< 15,0	< 12,0	< 1,5	ND	< 1,5	< 3,0	< 3,0	< 0,5		
Smelt	Mjøsa	< 4,0	< 15,0	< 12,0	< 1,5	ND	< 1,5	< 3,0	< 3,0	< 0,5		
Smelt	Mjøsa	< 4,0	< 15,0	< 12,0	< 1,5	ND	< 1,5	< 3,0	< 3,0	< 0,5		
Smelt	Mjøsa	< 4,0	< 15,0	< 12,0	< 1,5	ND	< 1,5	< 3,0	< 3,0	< 0,5		
Smelt	Mjøsa	< 4,0	< 15,0	< 12,0	< 1,5	ND	< 1,5	< 3,0	< 3,0	< 0,5		
Vendace	Mjøsa	< 6,0	< 60,0	< 60,0	< 2,0	ND	< 3,0	< 3,5	< 1,0	< 1,0	2017-9794	140
Vendace	Mjøsa	< 6,0	< 60,0	< 60,0	< 2,0	ND	< 3,0	< 3,5	< 1,0	< 1,0	2017-9795	55
Vendace	Mjøsa	< 6,0	< 60,0	< 60,0	< 2,0	ND	< 3,0	< 3,5	< 1,0	< 1,0	2017-9796	660
Vendace	Mjøsa	< 6,0	< 60,0	< 60,0	< 2,0	ND	< 3,0	< 3,5	< 1,0	< 1,0	2017-9797	85
Vendace	Mjøsa	< 6,0	< 60,0	< 60,0	< 2,0	ND	< 3,0	< 3,5	< 1,0	< 1,0		
Vendace	Mjøsa	< 6,0	< 60,0	< 60,0	< 2,0	ND	< 3,0	< 3,5	< 1,0	< 1,0		
Vendace	Mjøsa	< 6,0	< 60,0	< 60,0	< 2,0	ND	< 3,0	< 3,5	< 1,0	< 1,0		
Vendace	Mjøsa	< 6,0	< 60,0	< 60,0	< 2,0	ND	< 3,0	< 3,5	< 1,0	< 1,0		
Vendace	Mjøsa	< 6,0	< 60,0	< 60,0	< 2,0	ND	< 3,0	< 3,5	< 1,0	< 1,0		
Vendace	Mjøsa	< 6,0	< 60,0	< 60,0	< 2,0	ND	< 3,0	< 3,5	< 1,0	< 1,0		
Brown trout	Femunden	< 8,0	< 20,0	< 25,0	< 1,5	ND	< 35,0	< 70,0	< 9,0	< 0,7	2017-9864	<0.6
Brown trout	Femunden	< 8,0	< 20,0	< 25,0	< 1,5	ND	< 35,0	< 70,0	< 9,0	< 0,7	2017-9865	<0.6
Brown trout	Femunden	< 8,0	< 20,0	< 25,0	< 1,5	ND	< 35,0	< 70,0	< 9,0	< 0,7	2017-9866	6
Brown trout	Femunden	< 8,0	< 20,0	26,6	< 1,5	ND	< 35,0	< 70,0	< 9,0	< 0,7	2017-9867	30
Brown trout	Femunden	13,6	< 20,0	< 25,0	< 1,5	ND	< 35,0	< 70,0	< 9,0	< 0,7		
Brown trout	Femunden	< 8,0	< 20,0	< 25,0	< 1,5	ND	< 35,0	< 70,0	< 9,0	< 0,7		
Brown trout	Femunden	11,7	< 20,0	< 25,0	< 1,5	ND	< 35,0	< 70,0	< 9,0	< 0,7		
Brown trout	Femunden	< 8,0	< 20,0	< 25,0	< 1,5	ND	< 35,0	< 70,0	< 9,0	< 0,7		
Brown trout	Femunden	< 8,0	< 20,0	< 25,0	< 1,5	ND	< 35,0	< 70,0	< 9,0	< 0,7		
Brown trout	Femunden	< 8,0	< 20,0	< 25,0	< 1,5	ND	< 35,0	< 70,0	< 9,0	< 0,7		
Zoopl, epilimnion	Mjøsa	< 17,0	< 23,0	< 30,0	< 1,5	ND	< 4,0	< 5,0	< 4,0	< 0,7	2017-10829	<30
Zoopl, epilimnion	Mjøsa	< 17,0	< 23,0	< 30,0	< 1,5	ND	< 4,0	< 5,0	< 4,0	< 0,7	2017-10830	<35
Zoopl, epilimnion	Mjøsa	< 17,0	< 23,0	< 30,0	< 1,5	ND	< 4,0	< 5,0	< 4,0	< 0,7	2017-10831	<35
Mysis	Mjøsa	< 17,0	< 23,0	< 30,0	< 1,5	ND	< 4,0	< 5,0	< 4,0	< 0,7	2017-10832	315
Mysis	Mjøsa	< 17,0	< 23,0	< 30,0	< 1,5	ND	< 4,0	< 5,0	< 4,0	< 0,7	2017-10833	135
Mysis	Mjøsa	< 17,0	< 23,0	< 30,0	< 1,5	ND	< 4,0	< 5,0	< 4,0	< 0,7	2017-10834	120
Water	Mjøsa											
Water	Mjøsa	< 26,0	< 110,0	284,8	< 7,0	ND	< 6,0	< 350,0	< 5,0	< 1,0		
Water	Mjøsa	< 26,0	< 110,0	2228	< 7,0	ND	< 6,0	< 350,0	< 5,0	< 1,0		
Water	Mjøsa	< 26,0	< 110,0	22,0	< 7,0	ND	< 6,0	< 350,0	< 5,0	< 1,0		
Water	Mjøsa	< 26,0	< 110,0	< 15,0	< 7,0	ND	< 6,0	< 350,0	< 5,0	< 1,0		
Sediment	Mjøsa	< 190,0	< 65,0	< 15,0	< 3,0	ND	< 2,0	< 2,0	< 16,0	< 2,0	2017-7268	50
Sediment	Mjøsa	< 190,0	< 65,0	< 15,0	< 3,0	ND	< 2,0	< 2,0	< 16,0	< 2,0	2017-7269	60
Sediment	Mjøsa	< 190,0	< 65,0	< 15,0	< 3,0	ND	< 2,0	< 2,0	< 16,0	< 2,0	2017-7270	<6
Sediment	Mjøsa	< 190,0	< 65,0	< 15,0	< 3,0	ND	< 2,0	< 2,0	< 16,0	< 2,0	2017-11888	15
Sediment	Mjøsa	< 190,0	< 65,0	< 15,0	< 3,0	ND	< 2,0	< 2,0	< 16,0	< 2,0	2017-11889	25
Brown trout, muskel	Eikedalsvatnet	< 15,0	< 25,0	< 22,0	< 2,0	ND	< 45,0	< 80,0	< 5,0	< 1,0		
Brown trout, muskel	Eikedalsvatnet	40,3	< 25,0	< 22,0	< 2,0	ND	< 45,0	< 80,0	< 5,0	< 1,0		
Brown trout, muskel	Eikedalsvatnet	< 15,0	< 25,0	< 22,0	< 2,0	ND	< 45,0	< 80,0	< 5,0	< 1,0		
Brown trout, lever	Eikedalsvatnet											
Brown trout, lever	Eikedalsvatnet											
Brown trout, lever	Eikedalsvatnet											

Sample type	Lake	4-Octylphenolethoxulate	2,4,6-trimethyl-2,4,6-tris(3,3,3-trifluoropropyl)-cyclotrisiloxane (D4F) (CAS: 429-67-4)	2,4,6,8-tetramethyl- 2,4,6,8-tetrakis(3,3,3-trifluoropropyl)-cyclotetrasiloxane (D3F) (CAS: 2374-14-3)	Tris(trimethylsiloxy) Phenylsilane (siloxane), M3T(Ph) (CAS 2116-84-9)
Brown trout	Mjøsa	<7	<0.2	<0.5	<0.4
Brown trout	Mjøsa	<7	<0.2	<0.5	<0.4
Brown trout	Mjøsa	<8	<0.2	<0.5	<0.4
Brown trout	Mjøsa	<8	<0.2	<0.5	<0.4
Brown trout	Mjøsa	210	<0.16	<0.43	<0.37
Brown trout	Mjøsa				
Brown trout	Mjøsa				
Brown trout	Mjøsa				
Brown trout	Mjøsa				
Brown trout	Mjøsa				
Brown trout	Mjøsa				
Brown trout	Mjøsa				
Brown trout	Mjøsa				
Brown trout	Mjøsa				
Brown trout	Mjøsa				
Smelt	Mjøsa	<7	<0.2	<0.5	<0.4
Smelt	Mjøsa				
Smelt	Mjøsa	<8	<0.2	<0.5	<0.4
Smelt	Mjøsa	<7	<0.2	<0.5	<0.4
Smelt	Mjøsa				
Smelt	Mjøsa				
Smelt	Mjøsa				
Smelt	Mjøsa				
Smelt	Mjøsa				
Smelt	Mjøsa				
Vendace	Mjøsa	28	<0.1	<0.5	0,9
Vendace	Mjøsa	<7	<0.2	<0.5	<0.4
Vendace	Mjøsa	<7	<0.2	<0.5	1,8
Vendace	Mjøsa	<7	<0.2	<0.4	<0.4
Vendace	Mjøsa				
Vendace	Mjøsa				
Vendace	Mjøsa				
Vendace	Mjøsa				
Vendace	Mjøsa				
Vendace	Mjøsa				
Brown trout	Femunden	290	<0.2	<0.4	<0.4
Brown trout	Femunden	185	<0.2	<0.5	<0.4
Brown trout	Femunden	40	<0.2	<0.4	<0.4
Brown trout	Femunden	<8	<0.2	<0.5	<0.4
Brown trout	Femunden				
Brown trout	Femunden				
Brown trout	Femunden				
Brown trout	Femunden				
Brown trout	Femunden				
Brown trout	Femunden				
Zoopl, epilimnion	Mjøsa	750	<7	<20	<17
Zoopl, epilimnion	Mjøsa	620	<9	<25	<21
Zoopl, epilimnion	Mjøsa	1200	<9	<25	<20
Mysis	Mjøsa	<65	<2	<4	<4
Mysis	Mjøsa	<55	<1	<4	3,6
Mysis	Mjøsa	<55	<1	<4	35
Water	Mjøsa				
Water	Mjøsa				
Water	Mjøsa				
Water	Mjøsa				
Water	Mjøsa				
Sediment	Mjøsa	<35	<0.8	<2	<2
Sediment	Mjøsa	<65	<2	<4	<4
Sediment	Mjøsa	78	<2	<4	<4
Sediment	Mjøsa	<10	<0.3	<0.8	<0.7
Sediment	Mjøsa	<15	<0.4	<1	<0.8
Brown trout, muskel	Eikedalsvatnet				
Brown trout, muskel	Eikedalsvatnet				
Brown trout, muskel	Eikedalsvatnet				
Brown trout, lever	Eikedalsvatnet				
Brown trout, lever	Eikedalsvatnet				
Brown trout, lever	Eikedalsvatnet				

Miljødirektoratet
Telefon: 03400/73 58 05 00 | Faks: 73 58 05 01
E-post: post@miljodir.no
Nett: www.miljødirektoratet.no
Post: Postboks 5672 Torgarden, 7485 Trondheim
Besøksadresse Trondheim: Brattørkaia 15, 7010 Trondheim
Besøksadresse Oslo: Grensesvingen 7, 0661 Oslo

Miljødirektoratet jobber for et rent og rikt miljø. Våre hovedoppgaver er å redusere klimagassutslipp, forvalte norsk natur og hindre forurensning.

Vi er et statlig forvaltningsorgan underlagt Klima- og miljødepartementet og har mer enn 700 ansatte ved våre to kontorer i Trondheim og Oslo, og ved Statens naturoppsyn (SNO) sine mer enn 60 lokalkontor.

Vi gjennomfører og gir råd om utvikling av klima- og miljøpolitikken. Vi er faglig uavhengig. Det innebærer at vi opptrer selvstendig i enkeltsaker vi avgjør, når vi formidler kunnskap eller gir råd. Samtidig er vi underlagt politisk styring.
Våre viktigste funksjoner er at vi skaffer og formidler miljøinformasjon, utøver og iverksetter forvaltningsmyndighet, styrer og veileder regionalt og kommunalt nivå, gir faglige råd og deltar i internasjonalt miljøarbeid.