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# Environmental Contaminants in an Urban Fjord, 2025



# Report

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Anders Ruus  
Project Manager/Lead Author

Morten Jartun  
Quality Assurer

Malcolm Reid  
Research Manager

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### Abstract

This report presents data from the last year of a 5-year period of the Urban Fjord programme. The programme started in 2013 and has since been altered/advanced. In 2025 the programme covers sampling and analyses of sediment, polychaetes, krill, shrimps, blue mussels, herring, cod, eider, and herring gull from the Inner Oslofjord. A total of ~230 single compounds/isomers were analysed, and frequent detection was found of specific PFAS compounds (e.g. PFOS) in most matrices, certain QACs in several matrices (ATAC-C22 in all matrices), specific benzothiazoles in eider blood, LCCPs in certain matrices, certain siloxanes in most matrices, metals in all matrices and PCBs in all matrices. Biomagnification was observed for 24 PCB congeners, LCCPs and D4 (siloxane; lipid wt. basis). Furthermore, biomagnification was observed for PFOSA, ATAC-C20 and ATAC-C22, as well as for the metals As and Hg (wet wt. basis).

**Keywords:** Contaminants, Urban Areas, Bioaccumulation, Inputs

**Emneord:** Miljøgifter, Urbane områder, Bioakkumulering, Tilførsler

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# Preface

This report presents data from the last year of a 5-year period of the Urban Fjord programme. The programme started in 2013 and has since been advanced. The content differs between years, and the 2025 programme covers sampling and analyses of sediment, polychaetes, krill, shrimps, blue mussels, herring, cod, eider and herring gull from the Inner Oslofjord.

This year's campaign was carried out by NIVA, with a large number of chemical analyses performed by the Norwegian Institute for Air Research, NILU. Bird samples (eider and herring gull) were sampled by Morten Helberg at Birdlife Norge.

Besides the authors of this report, several persons are acknowledged for their contribution in sample collection, sample preparation, data treatment and analysis: Ingar Johansen, Gunhild Borgersen, Pawel Rostowski, Mikael Harju, Hilde Uggerud, Marit Vadset, Inger-Christin Steen, Anders Borgen, Carsten Lome, Dag Hjermann.

This report represents an extended summary of the Urban Fjord 2025 campaign and has been quality assured by senior scientist Morten Jartun and research manager Malcolm Reid.

Oslo, June 2026

# Summary

The 2025 “Urban fjord” programme covers sampling and analyses of sediment, polychaetes, krill, shrimps, blue mussels, herring, cod, eider and herring gull from the Inner Oslofjord. A total of ~230 single compounds/isomers were analysed, and frequent detection was found of:

- Specific PFAS compounds (e.g. PFOS) in most matrices
- Certain QACs in several matrices (ATAC-C22 in all matrices)
- Specific benzothiazoles in eider blood
- LCCPs in certain matrices
- Certain siloxanes in most matrices
- Metals in all matrices
- PCBs in all matrices

Concentrations of PFAS were highest in cod (liver) and birds (eggs in particular). PFOS (including brPFOS) was a dominating PFAS. PFOSA constituted the highest proportion of the sum-PFAS concentration in cod, as well as in blue mussel, shrimp, and herring. UV-compounds were only analysed in sediment and birds. In herring gull and eider, UV-compounds were only detected in eggs and UV-327 was found in both species, as well as in sediment. UV-328 was a major UV-compound in sediment and herring gull eggs. Octocrylene was also an important UV-compound in sediment. The highest concentrations of quaternary ammonium compounds (QACs) were observed in sediment and polychaetes and DADMAC-C16 and DADMAC-C18 were dominating. In all other samples (biota), ATAC-C22 were dominating. Benzothiazoles were only analysed in sediment and birds. Benzothiazole (BT) was found in both blood and eggs of both bird species. Conspicuous amounts were found in blood of eider, with MBT displaying the highest concentration, and with OHBT also detected. The highest concentrations of dechloranes were found in sediment, cod liver and eggs of herring gull and eider, and dechlorane plus *syn* and *anti* were important constituents of sum-dechloranes. In cod liver, dechlorane 602 and dechlorane 603 constituted the highest proportions of the sum-dechloranes concentration. High proportions of dechlorane 602 were also observed in eggs of herring gull and eider. All classes of chlorinated paraffins (SCCPs, MCCPs and LCCPs) were found in sediment, with LCCPs showing the highest concentration. Among the biota samples, the highest concentrations of chlorinated paraffins were observed in cod liver and eggs of herring gull. LCCPs constituted the highest proportion of the sum-chlorinated paraffins concentrations. Phthalates were only analysed in sediment and DEHP and DINP constituted the highest proportions of the sum-phthalates concentration. OPFRs were only analysed in sediments and TCPP constituted the highest proportion of the sum-OPFRs concentration. Phenolic compounds were only analysed in sediment and bile of cod and 4,4-bisphenol A displayed the highest concentration in both matrices. Siloxanes were detected in all matrices and D5 was a major constituent of the sum-siloxanes concentrations. M3T(Ph) was a major constituent of sum-siloxanes in blood of herring gull and eider. Long (linear) siloxanes (L7 and L8) constituted ~20% of the sum-siloxanes concentration in sediment. Musks were only analysed in sediment, and Galaxolide and Tonalide (AHMT) were both detected.

Biomagnification (quantified by Trophic Magnification Factors, TMF) was observed for 24 PCB congeners, LCCPs and D4 (lipid wt. basis). Furthermore, biomagnification was observed for PFOSA, ATAC-C20 and ATAC-C22, as well as for the metals As and Hg (wet wt. basis). Certain PCBs have been shown to biomagnify in the Inner Oslofjord food web every year (since 2013) of the monitoring. Also, Hg and As have been shown to biomagnify most years. Biomagnification of PFOSA was also observed

2016-2018, while ATAC-C20 and -C22 were shown to biomagnify (only wet wt basis) in 2017, 2019 and 2023.

# Sammendrag

"Urban fjord"-programmet for 2025 har dekket prøvetaking og analyse av sediment, flerbørstemark, krill, reker, blåskjell, sild, torsk, ærfugl og gråmåke fra Indre Oslofjord. Totalt ble ~230 enkeltforbindelser/isomerer bestemt og hyppig deteksjon ble funnet av:

- Spesifikke PFAS-forbindelser (som PFOS) i de fleste prøvetyper
- Visse QAC-forbindelser i flere prøvetyper (ATAC-C22 i alle)
- Spesifikke benzotiazoler i blod av ærfugl
- LCCP i visse prøvetyper
- Visse siloksaner i de fleste prøvetyper
- Metaller i alle prøvetyper
- PCB-forbindelser i alle prøvetyper

Konsentrasjoner av PFAS var høyest i torsk (lever) og fugl (særlig egg). PFOS (inkludert brPFOS) var her en dominerende PFAS-forbindelse. PFOSA utgjorde den høyeste andelen av sum-PFAS-konsentrasjonen i torsk, samt i blåskjell, reke og sild. UV-stoffer ble kun analysert i sediment og prøver av fugl. I gråmåke og ærfugl ble UV-stoffer kun detektert i egg og UV-327 ble funnet i begge arter, samt i sediment. UV-328 var et dominerende UV-stoff i sediment og egg av gråmåke. Oktokrylen var også et viktig UV-stoff i sediment. De høyeste konsentrasjonene av kvaternære ammoniumforbindelser ble observert i sediment og flerbørstemark, og DADMAC-C16 og DADMAC-C18 var dominerende. I alle de øvrige prøvetypene (biota) var ATAC-C22 dominerende. Benzotiazoler ble kun analysert i sediment og fugl. Benzotiazol (BT) ble funnet i både blod og egg fra begge arter. Løyenfallende konsentrasjoner ble observert i blod fra ærfugl, med høyest konsentrasjon av MBT, men også OHBT var detektert. De høyeste konsentrasjonene av dekloraner ble funnet i sediment, lever av torsk, og egg av gråmåke og ærfugl, og dekloran pluss *syn* og *anti* utgjorde høye andeler av summen av dekloraner. I lever av torsk utgjorde dekloran 602 og dekloran 603 de høyeste andelene av sum-dekloran-konsentrasjonen. Høye andeler av dekloran 602 ble også observert i egg av gråmåke og ærfugl. Alle klasser av klorparafiner (SCCP, MCCP og LCCP) ble funnet i sediment, med høyest konsentrasjon av LCCP. Blant biota-prøvene ble de høyeste konsentrasjonene av klorparafiner funnet i lever av torsk og egg av gråmåke. LCCP utgjorde de høyeste andelene av sum-klorparafiner-konsentrasjonene. Ftalater ble kun analysert i sediment, og DEHP og DINP utgjorde de høyeste andelene av sum-ftalat-konsentrasjonen. Fosfororganiske flammehemmere (OPFR) ble kun analysert i sediment og TCPF utgjorde den høyeste andelen av sum-OPFR-konsentrasjonen. Fenoliske forbindelser ble kun analysert i sediment og galle fra torsk, og 4,4-bisfenol A viste høyest konsentrasjon i begge prøvetyper. Siloksaner ble detektert i alle prøvetyper og D5 utgjorde høye andeler av sum-siloksan-konsentrasjonene. M3T(Ph) var en dominerende forbindelse i blod fra gråmåke og ærfugl. Lange (lineære) siloksaner (L7 of L8) utgjorde ~20% av sum-siloksan-konsentrasjonen i sediment. Muskforbindelser ble kun analysert i sediment, og Galaxolide og Tonalide (AHMT) ble begge detektert.

Biomagnifisering (kvantifisert vha. trofiske magnifiseringsfaktorer, TMF) ble observert for 24 PCB-kongenere, LCCP og D4 (lipidvektsbasis). Videre ble biomagnifisering observert for PFOSA, ATAC-C20 og ATAC-C22, samt for metallene As og Hg (våttvektsbasis). Flere PCB-kongenere har vist biomagnifisering i næringsnettet i Indre Oslofjord i alle årene av overvåkingen (siden 2013). Også biomagnifisering av Hg og As er vist de fleste årene. Biomagnifisering av PFOSA ble observert i 2016-2018, mens ATAC-C20 og C-22 viste biomagnifisering (kun på våttvektsbasis) i 2017, 2019 og 2023.

# 1 Introduction

"Environmental contaminants in an urban fjord" is a programme designed to monitor discharges of anthropogenic chemicals in a densely populated area and to study how this contaminant input affects a fjord system. The programme addresses inputs of pollutants from potential sources, measurements of contaminant concentrations in different marine species, assessment of bioaccumulation patterns within a food web and estimation of effect risks in organisms.

This report presents data from the last year of a 5-year period of the Urban Fjord programme. The programme started in 2013 and has since been altered/advanced, and the content differs between years. The 2025 programme covers sampling and analyses of sediment, polychaetes, krill, shrimps, blue mussels, herring, cod, eider and herring gull from the Inner Oslofjord.

This year's campaign was carried out by NIVA, with a large number of chemical analyses performed by the Norwegian Institute for Air Research, NILU.

This report contains reused text from the previous reports from the "Urban fjord" programme, used in accordance with NIVA's guidelines for text reuse (e.g. Ruus et al. 2025 and Ruus et al. 2023).

## 2 Extended summary of Urban Fjord 2025

### 2.1 Samples and localities

An overview of the samples collected in the Urban Fjord programme 2025 is presented in Table 1. Localities for sample collection are shown in Figure 1.

**Table 1. Overview of samples collected for the “Urban Fjord” programme 2025.**

| Species/Sample                  | Matrix                               | Locality                                     | Station code               | No. for analysis              |
|---------------------------------|--------------------------------------|----------------------------------------------|----------------------------|-------------------------------|
| <b>Sediment</b>                 | Whole sediment                       | Bekkelaget<br>Alna River outlet<br>Ildjernet | Bq41<br>AL1<br>Cm21        | 3                             |
| <b>Blue mussel</b>              | Pooled samples,<br>soft body         | Steilene                                     | IO Blåskjell               | 3 pooled samples              |
| <b>Polychaetes</b>              | Pooled samples,<br>whole individuals | Bekkelaget<br>Alna River outlet<br>Ildjernet | Bq41<br>AL1<br>Cm21        | 3 pooled samples <sup>1</sup> |
| <b>Zooplankton<br/>(krill)</b>  | Pooled samples,<br>whole individuals | Midtmeie                                     | IO                         | 3 pooled samples              |
| <b>Shrimp</b>                   | Pooled samples,<br>soft tissue tails | Midtmeie                                     | IO                         | 3 pooled samples              |
| <b>Herring</b>                  | Muscle                               | Midtmeie                                     | IO                         | 3 pooled samples <sup>2</sup> |
| <b>Cod</b>                      | Muscle, liver, bile                  | Midtmeie                                     | IO                         | 3 pooled samples <sup>2</sup> |
| <b>Herring gull<br/>(blood)</b> | Blood                                | Søndre skjælholmen                           | Skjælholmene               | 3                             |
| <b>Herring gull<br/>(egg)</b>   | Egg                                  | Søndre skjælholmen                           | Skjælholmene               | 3                             |
| <b>Eider (blood)</b>            | Blood                                | Søndre skjælholmen<br>Husbergøya             | Skjælholmene<br>Husbergøya | 3                             |
| <b>Eider (egg)</b>              | Egg                                  | Søndre skjælholmen<br>Husbergøya             | Skjælholmene<br>Husbergøya | 3                             |

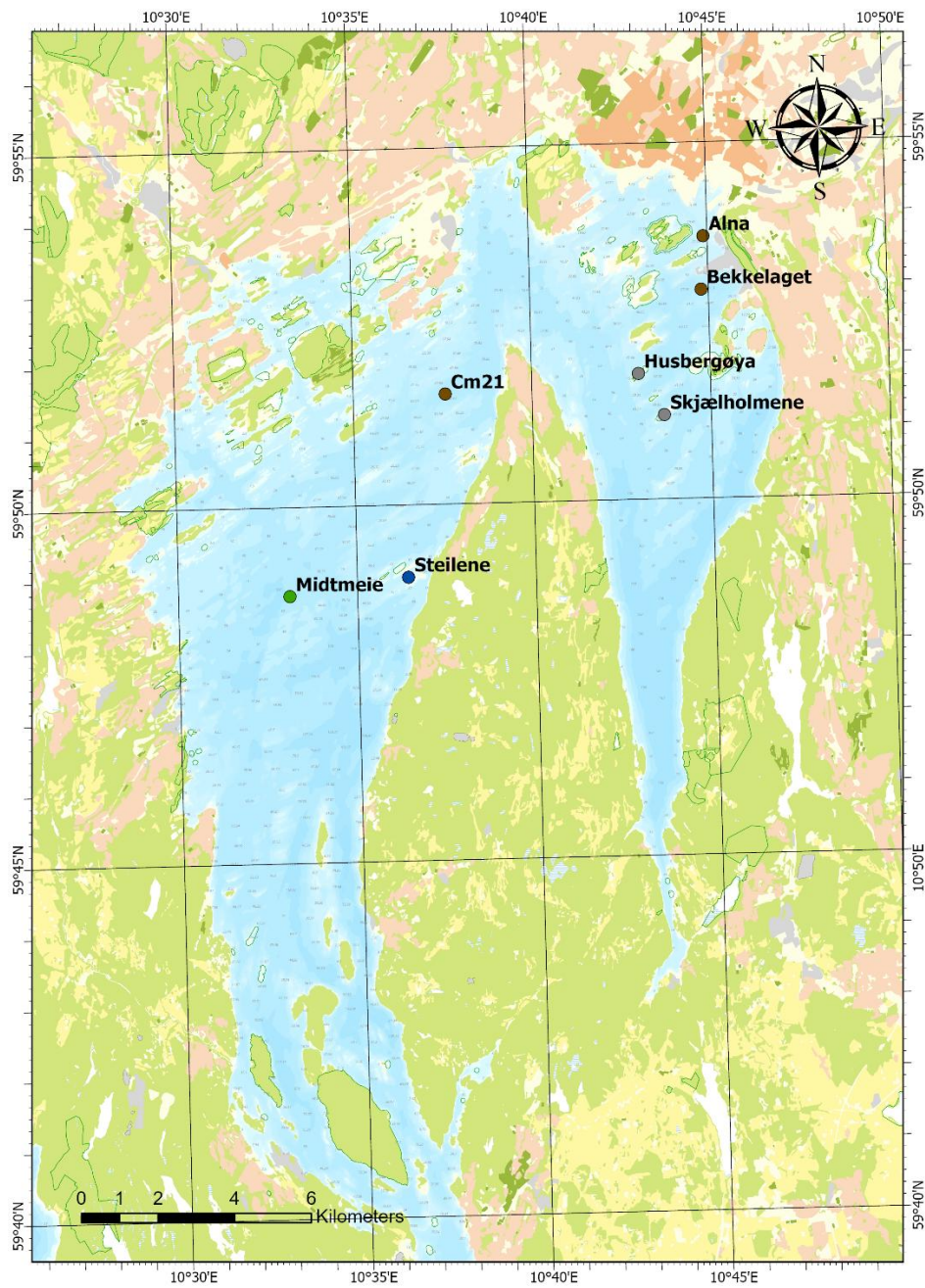
<sup>1</sup> For species constituting polychaete samples, see Table 2

<sup>2</sup> Each of 5 specimens (biometric data are given in Appendix, Chapter 4)

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

|                           | Bekkelaget<br>Bq41 | Alna River outlet<br>AL1 | Ildjernet<br>Cm21 |
|---------------------------|--------------------|--------------------------|-------------------|
| <i>Glycera</i>            | 60                 | 12*                      | 12                |
| <i>Polyphysia crassa</i>  | 9                  | 30                       | 151               |
| <i>Lumbrineridae</i>      | 12                 | 15                       | 13                |
| <i>Terebellidae</i>       | 13                 | 52                       | 15                |
| <i>Aphrodita aculeata</i> | 24                 | 35                       | 46                |
| <i>Misc.</i>              | 4                  | 4                        | 8                 |
| <i>Goniada maculata</i>   | 11                 |                          | 4                 |
| <i>Nephtys sp.</i>        |                    | 5                        |                   |
| <b>Total (grams)</b>      | <b>133</b>         | <b>148</b>               | <b>249</b>        |

\* Weight includes *Goniada maculata*.



**Figure 1. Map depicting stations for collection of sediment (brown), polychaetes (brown), blue mussel (blue), krill (green), shrimp (green), herring (green), cod (green), herring gull (grey; only Skjærlholmene) and eider (grey) in the Inner Oslofjord.**

## 2.2 Chemical analysis

Details of the chemical analytical methods are presented in Chapter 3. Table 3 shows an overview of the chemical analyses performed in the different samples, while Table 7 (in Appendix, Chapter 4) shows the specific analytes in the programme.

## 2.3 Assessment of biomagnification

The chemical analyses in this study were performed on pooled samples. However, analyses of stable isotopes ( $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$ ) were performed on individual muscle samples ( $n=15$ ) of cod and herring; see Appendix, Chapter 4). In the biomagnification assessment, the mean  $\delta^{15}\text{N}$  values of the individuals constituting the pooled samples of herring and cod were applied.

Biomagnification was assessed in the food web consisting of polychaeta, blue mussel, krill, shrimp, Herring (muscle) and cod (liver or muscle). The  $\delta^{13}\text{C}$  signature shows that herring gull is not a representative member of the Inner Oslofjord (see Appendix and previous reports; e.g. Grung et al. 2021). Furthermore, using the same food web as previously, in the calculations, is advantageous for comparative purposes.

When exploring correlations between contaminant concentrations and trophic position, concentrations of the following contaminants were expressed on a wet weight basis: Metals, PFASs and QACs. The concentrations of the following contaminants were expressed on a lipid weight basis: PCBs and other organochlorine compounds, chlorinated paraffins, siloxanes and dechloranes. Other contaminants were not analysed in sufficient number of matrices for biomagnification assessment. Cod was represented by the concentrations in liver or muscle.

Biomagnification potential was evaluated by comparing contaminant concentrations with trophic position, calculated from  $\delta^{15}\text{N}$  levels (assuming an enrichment,  $\Delta^{15}\text{N}$ , of 3.4 between each integer trophic level, and that the average  $\delta^{15}\text{N}$  of blue mussel represents trophic level 2). Trophic Magnification Factors (TMFs) were calculated from statistically significant relationships:

$$\text{Log}_{10}[\text{Contaminant}] = a + b(\text{Trophic position})$$

$$\text{as TMF} = 10^b.$$

**Table 3. Overview: Analyses in different matrices in 2025.**

|                            | Sediment | Polychaeta | Blue mussel | Krill | Shrimp | Herring | Cod <sup>1</sup> | Herring gull <sup>2</sup> | Eider <sup>2</sup> |
|----------------------------|----------|------------|-------------|-------|--------|---------|------------------|---------------------------|--------------------|
| Metals                     | X        | X          | X           | X     | X      | X       | X                | X                         | X                  |
| Siloxanes                  | X        | X          | X           | X     | X      | X       | X                | X                         | X                  |
| PCBs (and organochlorines) | X        | X          | X           | X     | X      | X       | X                | X                         | X                  |
| OPFRs                      | X        |            |             |       |        |         |                  |                           |                    |
| Phenolic comp.             | X        |            |             |       |        |         | X                |                           |                    |
| PFAS                       | X        | X          | X           | X     | X      | X       | X                | X                         | X                  |
| UV-chemicals               | X        |            |             |       |        |         |                  | X                         | X                  |
| Dechloranes                | X        | X          | X           | X     | X      | X       | X                | X                         | X                  |
| QAC                        | X        | X          | X           | X     | X      | X       | X                | X                         | X                  |
| Musk                       | X        |            |             |       |        |         |                  |                           |                    |
| Benzothiazoles             | X        |            |             |       |        |         |                  | X                         | X                  |
| Phthalates                 | X        |            |             |       |        |         |                  |                           |                    |
| Chlorinated paraffins      | X        | X          | X           | X     | X      | X       | X                | X                         | X                  |
| Stable isotopes of C and N |          | X          | X           | X     | X      | X       | X                | X                         | X                  |

<sup>1</sup> Liver and muscle (stable isotopes only in muscle). Phenolic compounds in bile.

<sup>2</sup> Blood and eggs.

## 2.4 Results and discussion

In this chapter, key findings are presented. All results are presented in electronic Appendices.

### 2.4.1. Stable isotopes

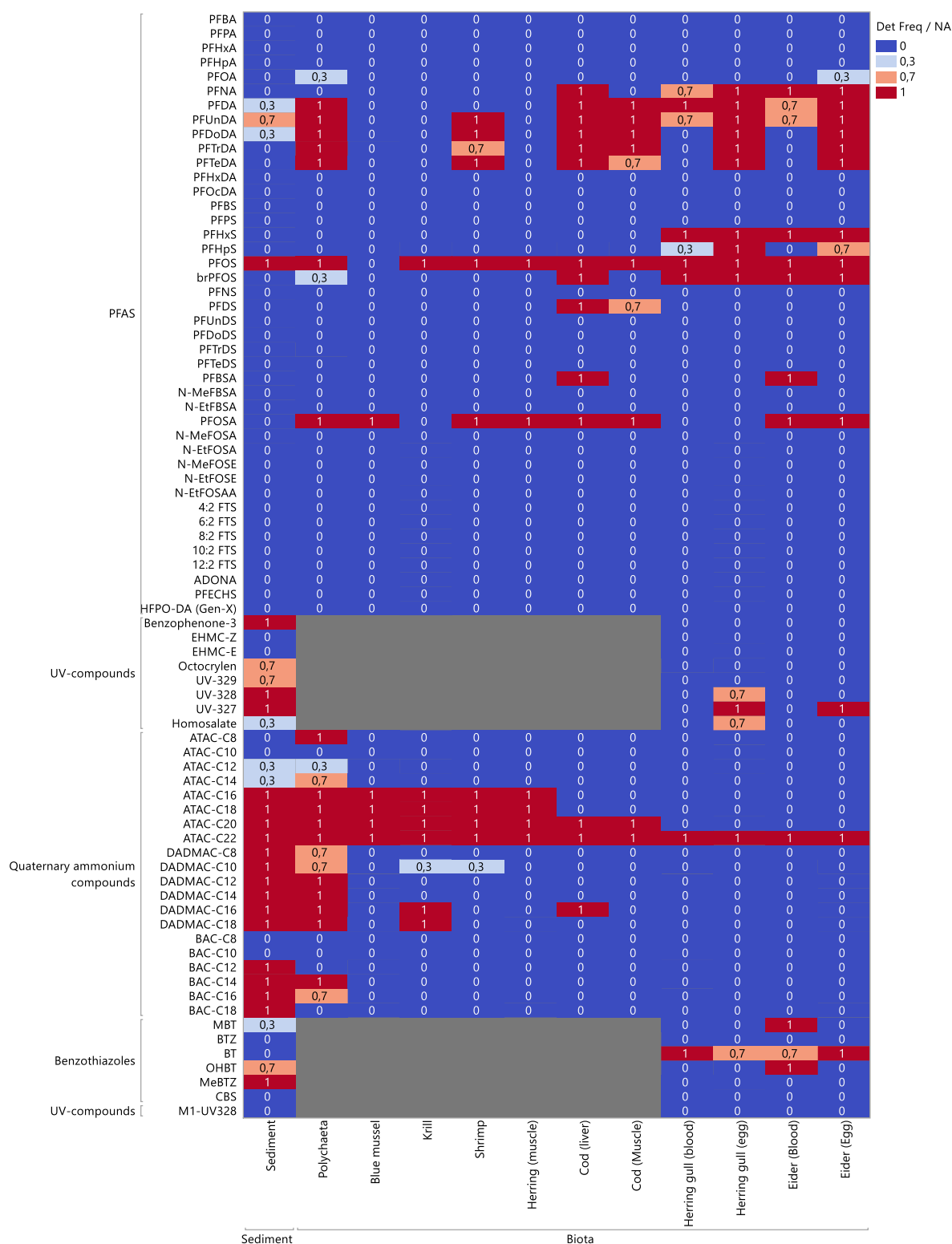
The results regarding the stable isotopes of C and N are given in the Appendix (Chapter 4).

### 2.4.2. Detection frequencies of contaminants

A total of ~230 single compounds/isomers were determined in this study. Figure 2 gives the detection frequency of the various compounds in the different samples. The figure shows frequent detection of specific PFAS compounds (e.g. PFOS) in most matrices, certain QACs in several matrices (ATAC-C22 in all matrices), specific benzothiazoles in eider blood, LCCPs in certain matrices, certain siloxanes in most matrices, metals in all matrices and PCBs in all matrices.

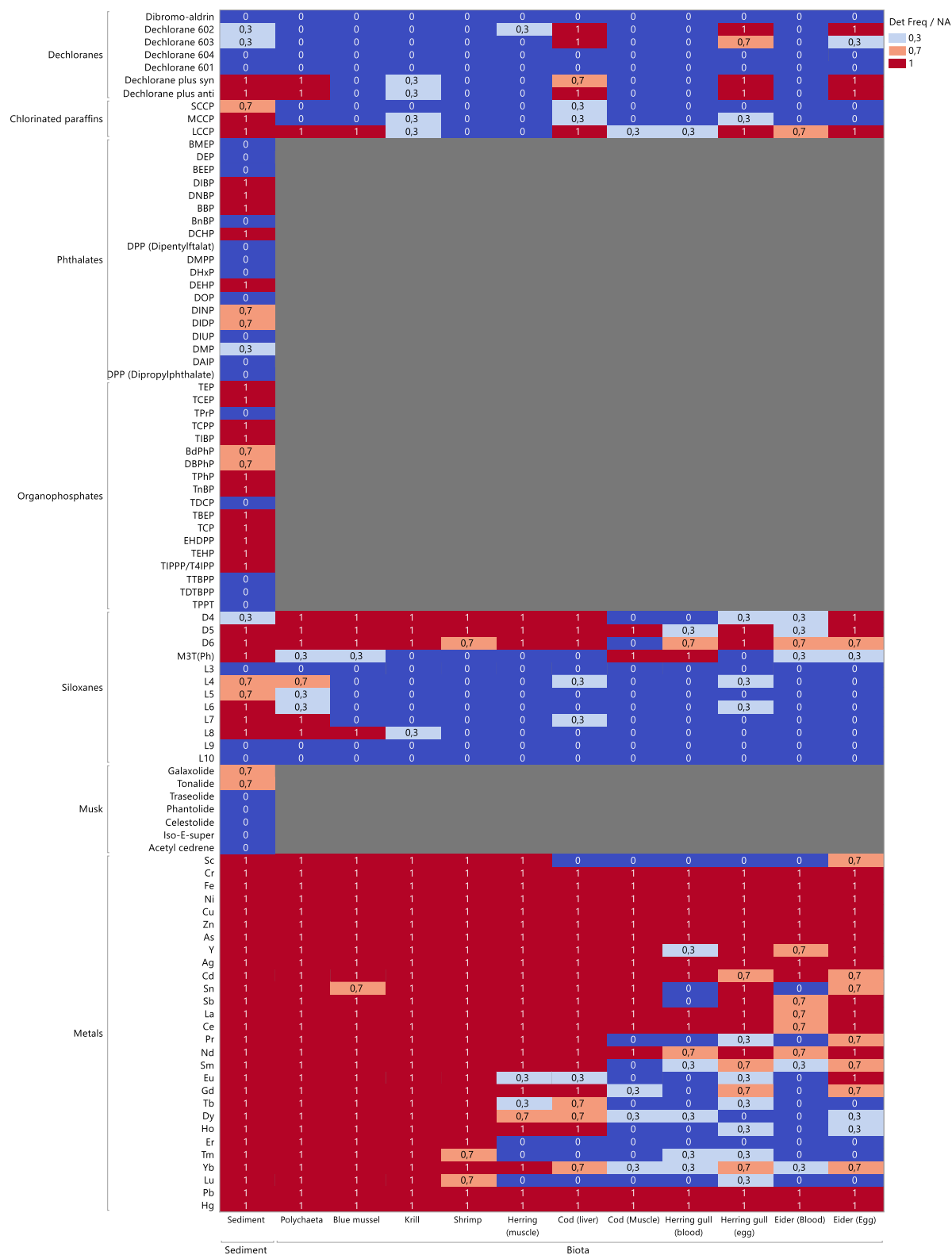
See Chapter 3.2.1 for an indication of analyses/analytes with the lowest/highest uncertainties.

**A.**

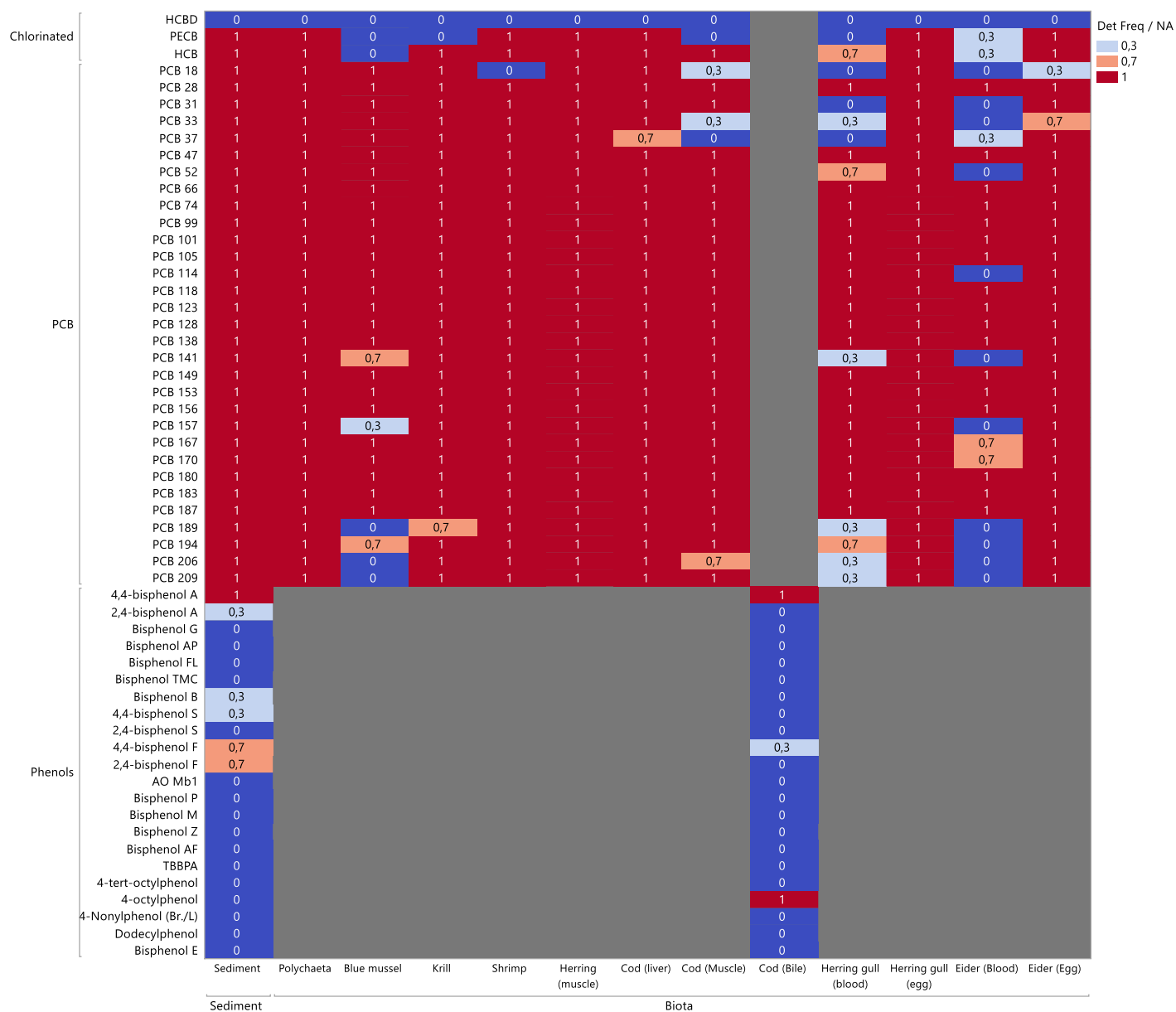


**Figure 2. Detection frequency (as fraction; %/100) of all compounds in the different species/matrices in this study. A: PFAS, UV-compounds, quaternary ammonium compounds, and benzothiazoles; B: Chlorinated compounds, phthalates, OPFRs, siloxanes, musks and metals; C: More chlorinated compounds and phenolic compounds.**

B.



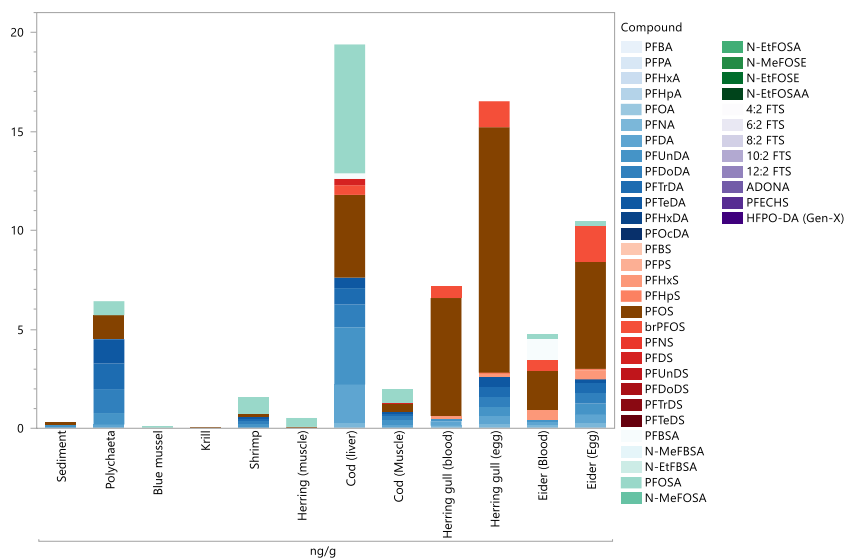
C.



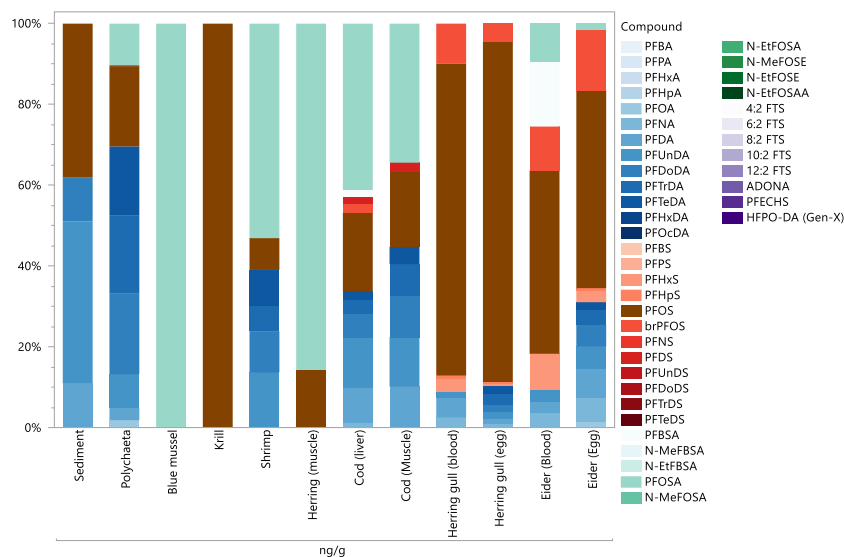
### 2.4.3. PFAS

Concentrations of PFAS were highest in cod (liver) and birds (eggs in particular; Figure 3). PFOS (including brPFOS) was a dominating PFAS. PFOSA constituted the highest proportion of the sum-PFAS concentration in cod, as well as in blue mussel, shrimp, and herring.

A.



B.

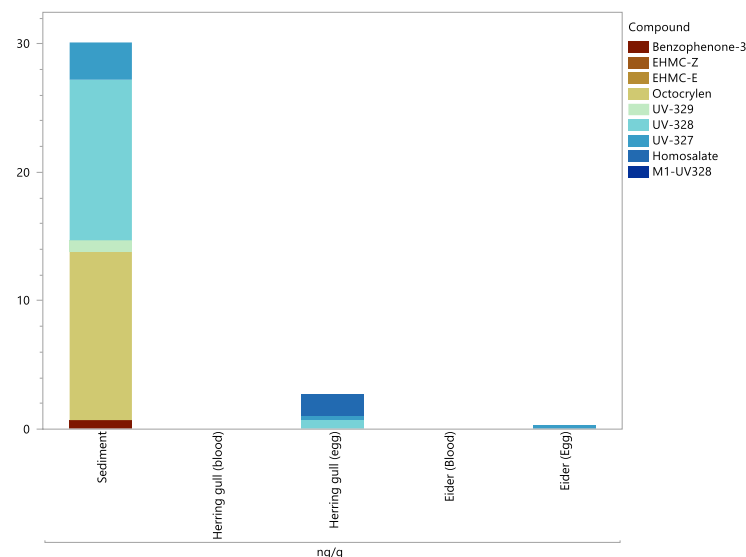


**Figure 3. Concentrations (median; ng/g wet wt. in biota, ng/g dry wt. in sediment) of PFAS compounds in all matrices (A) and their contribution (%) to the sum-PFAS concentration (B). Non-detected compounds are assigned a value of zero (0). TFA, PFPrA, PMeS, PFETs and PFPrS were not determined.**

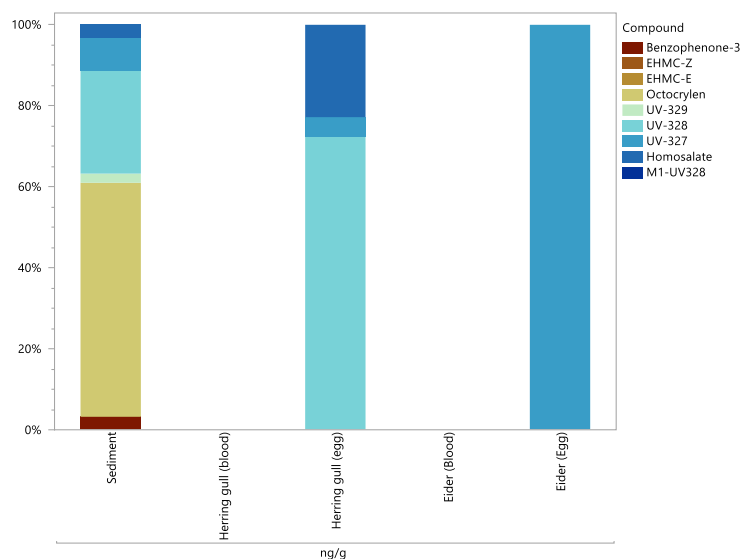
#### 2.4.4. UV-compounds

UV-compounds were analysed in sediment and birds. In herring gull and eider, UV-compounds were only detected in eggs and UV-327 was found in both species, as well as in sediment (Figure 4). UV-328 was a major UV-compound in sediment and herring gull eggs. Octocrylene was also an important UV-compound in sediment.

**A.**



**B.**

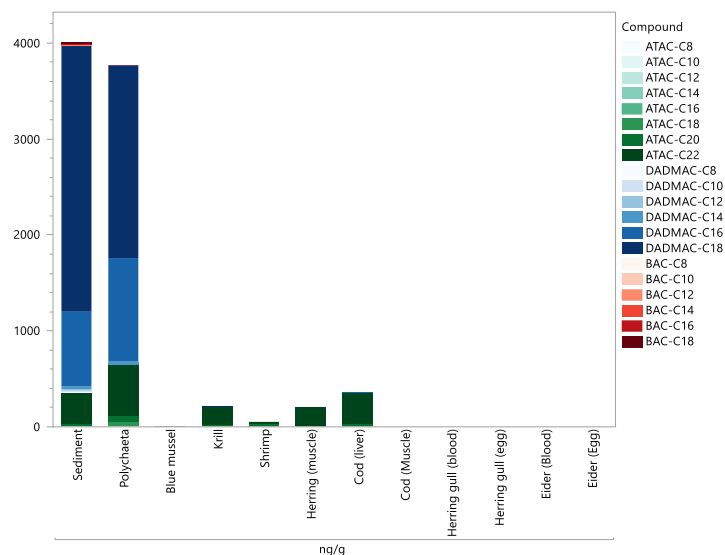


**Figure 4. Concentrations (median; ng/g wet wt. in biota, ng/g dry wt. in sediment) of UV-compounds in sediment, herring gull (blood and egg) and eider (blood and egg) (A) and their contribution (%) to the sum-UV-compounds concentration (B). Non-detected compounds are assigned a value of zero (0).**

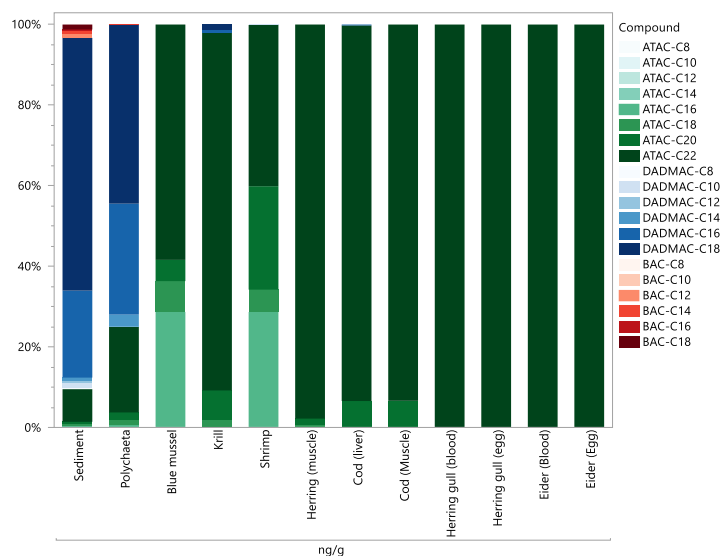
### 2.4.5. Quaternary ammonium compounds

The highest concentrations of quaternary ammonium compounds (QACs) were observed in sediment and polychaetes and the dialkyldimethyl ammonium compounds DADMAC-C16 and DADMAC-C18 were most dominating. In all other samples (biota), the alkyltrimethyl ammonium compound ATAC-C22 constituted the highest proportion of the sum-QAC concentrations (Figure 5).

**A.**



**B.**



**Figure 5. Concentrations (median; ng/g wet wt. in biota, ng/g dry wt. in sediment) of quaternary ammonium compounds in all matrices (A) and their contribution (%) to the sum- QAC concentration (B). Non-detected compounds are assigned a value of zero (0).**

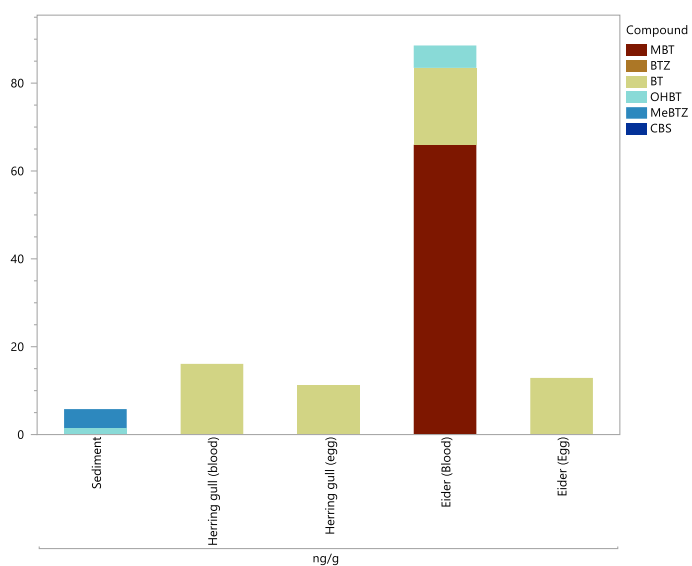
#### **2.4.6. Benzothiazoles**

Benzothiazoles were analysed and detected in sediment and birds. Benzothiazole (BT) was found in both blood and eggs of both bird species. Conspicuous amounts were found in blood of eider, with mercaptobenzothiazole (MBT) displaying the highest concentrations (63, 66 and 101 ng/g wet wt.), and with 2(3H)-Benzothiazolone (OHBT) also detected (4.8, 5.1 and 9.1 ng/g wet wt.; Figure 6). Ask et al. (2025) detected benzothiazoles in blood of eider from the Baltic and this was, to their knowledge, the first report of OHBT in birds. They found an OHBT-concentration of 1.57 ng/g (wet wt.; early breeders, early incubation) and an MBT-concentration of 3.15 ng/g (wet wt.; late breeders, late incubation). MBT is used primarily as a vulcanization accelerator and preservative in the manufacturing of rubber, such as tyre production. It is shown that Inner Oslofjord sediments contain high amounts of tyre wear particles (TWP; Alling et al. 2025).

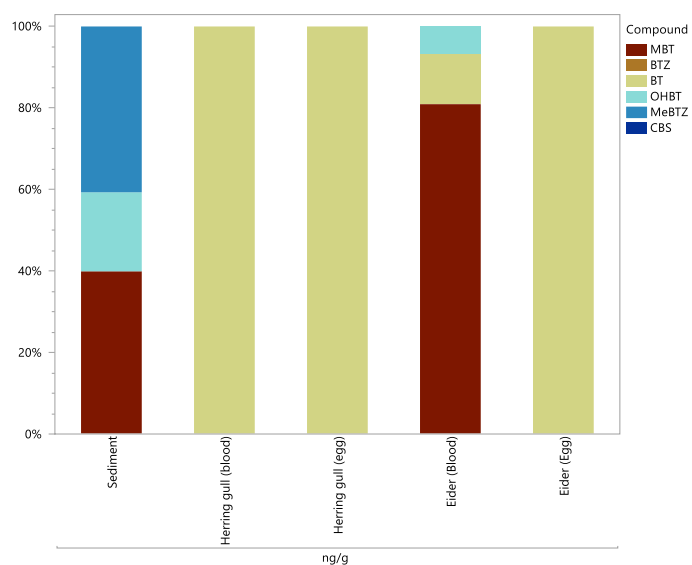
#### **2.4.7. Organochlorines and PCBs**

PCBs were detected in all matrices analysed. Highest concentrations were found in the lipid rich matrices cod liver and bird eggs, which could also be observed for PeCB and HCB (see electronic Appendix).

**A.**



**B.**

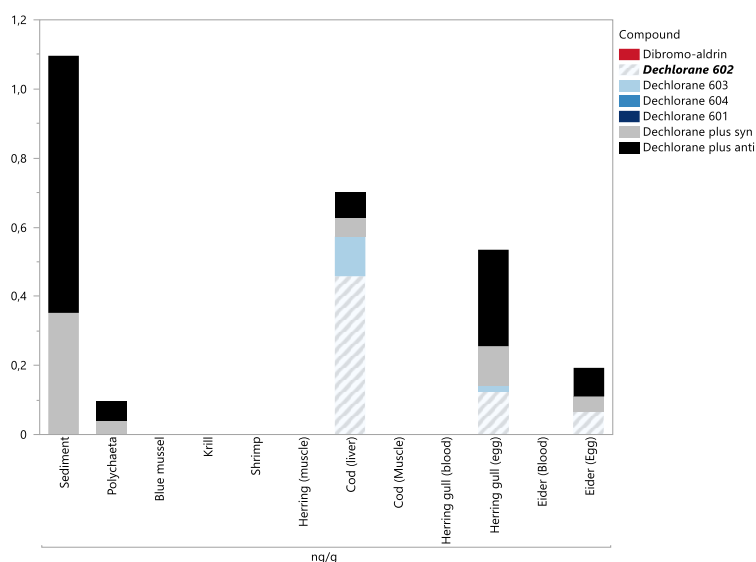


**Figure 6. Concentrations (median; ng/g wet wt. in biota, ng/g dry wt. in sediment) of benzothiazoles in sediment, herring gull (blood and egg) and eider (blood and egg) (A) and their contribution (%) to the sum-benzothiazoles concentration (B). Non-detected compounds are assigned a value of zero (0).**

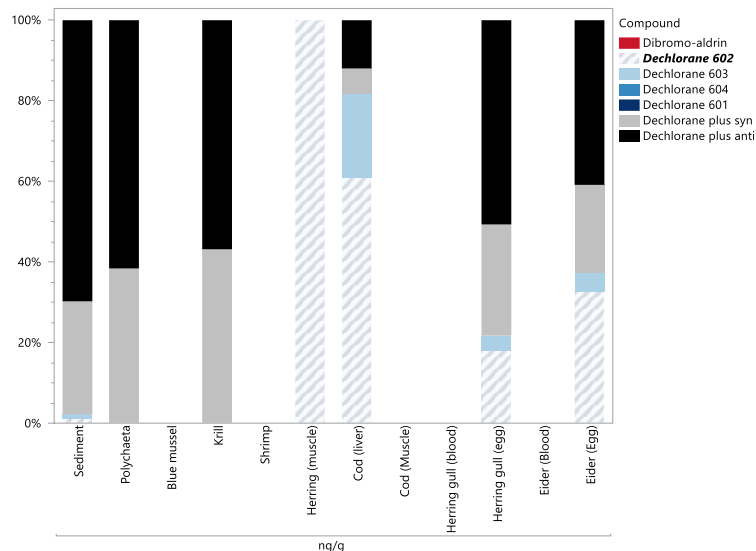
### 2.4.8. Dechloranes

The highest concentrations of dechloranes were observed in sediment, cod liver and eggs of herring gull and eider, and dechlorane plus *syn* and *anti* were important constituents of sum-dechloranes (Figure 7). In cod liver, dechlorane 602 and dechlorane 603 constituted the highest proportions of the sum-dechloranes concentration. High proportions of dechlorane 602 were also observed in eggs of herring gull and eider.

**A.**



**B.**

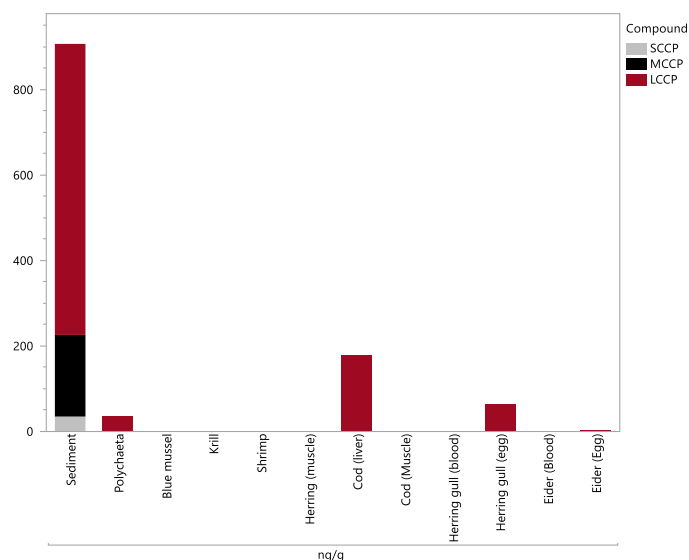


**Figure 7. Concentrations (median; ng/g wet wt. in biota, ng/g dry wt. in sediment) of dechloranes in all matrices (A) and their contribution (%) to the sum-dechloranes concentration (B). Non-detected compounds are assigned a value of zero (0).**

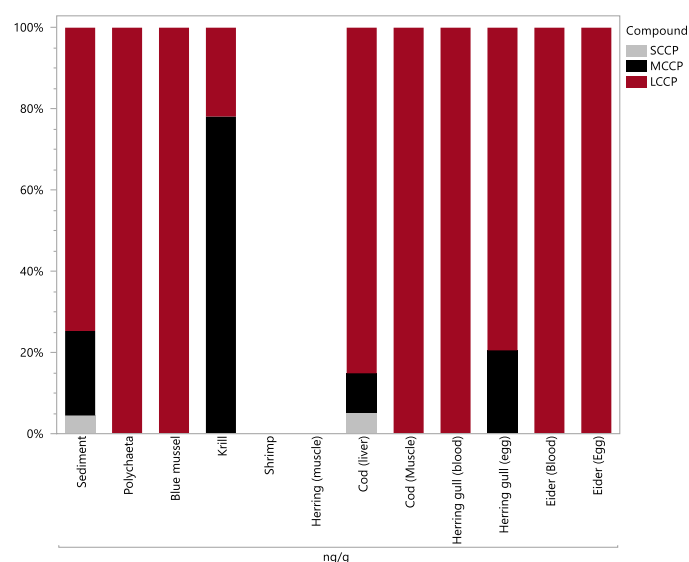
### 2.4.9. Chlorinated paraffins

SCCPs, MCCPs and LCCPs were found in sediment, with LCCPs showing the highest concentrations (Figure 8). Among the biota samples, the highest concentrations of chlorinated paraffins were observed in cod liver and eggs of herring gull. In these matrices also, LCCPs constituted the highest proportions of the sum-chlorinated paraffins concentrations. As previously mentioned (Ruus et al 2025), high proportions of LCCPs have earlier been found in birds and other biota samples (Yuan et al. 2019, Yuan et al. 2021, Yuan et al. 2022).

**A.**



**B.**

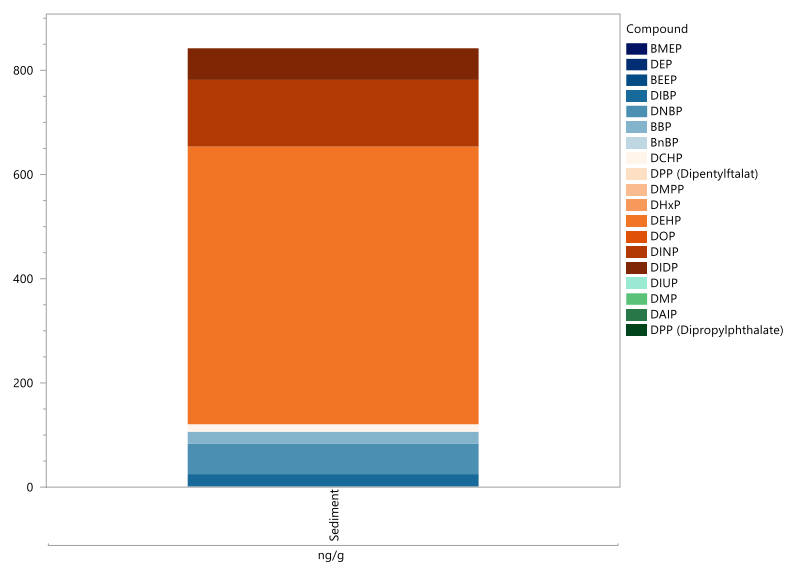


**Figure 8. Concentrations (median; ng/g wet wt. in biota, ng/g dry wt. in sediment) of chlorinated paraffins in all matrices (A) and their contribution (%) to the sum-chlorinated paraffins concentration (B). Non-detected compounds are assigned a value of zero (0).**

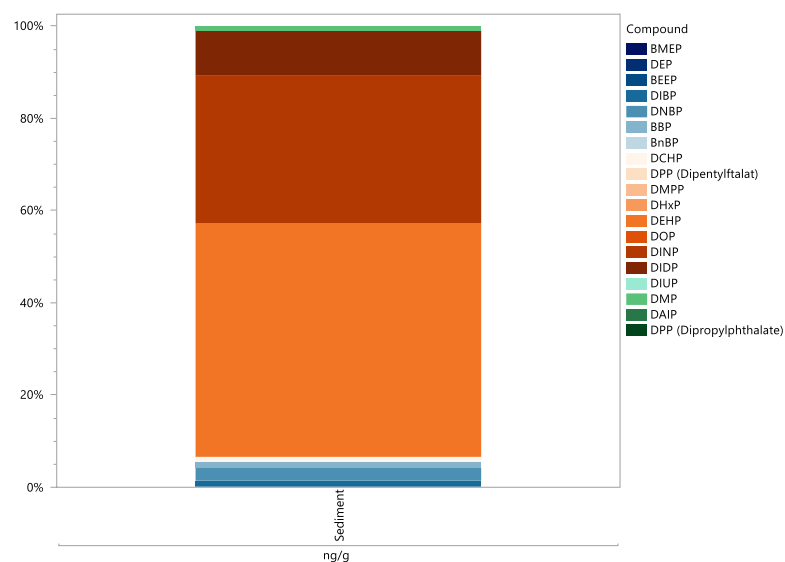
#### 2.4.10. Phthalates

Phthalates were detected in sediments (the only matrix where they were analysed; Figure 9). DEHP and DINP constituted the highest proportions of the sum-phthalates concentrations.

**A.**



**B.**

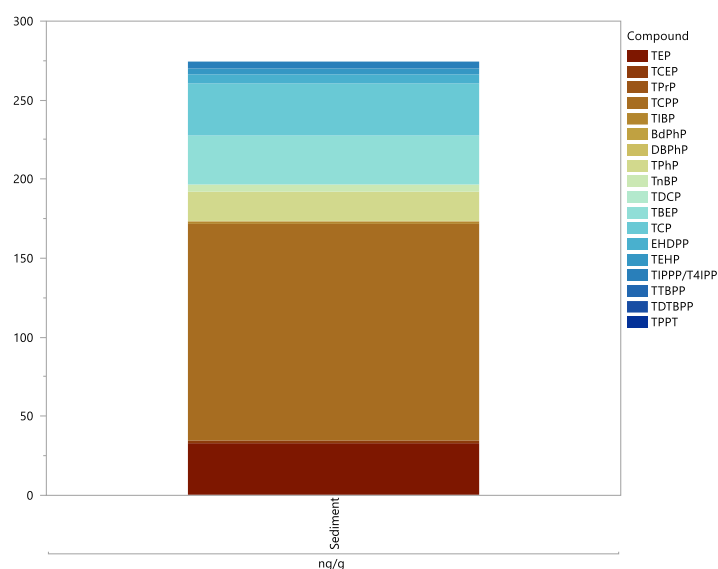


**Figure 9. Concentrations (median; ng/g dry wt.) of phthalates in sediment (A) and their contribution (%) to the sum-phthalates concentration (B). Non-detected compounds are assigned a value of zero (0).**

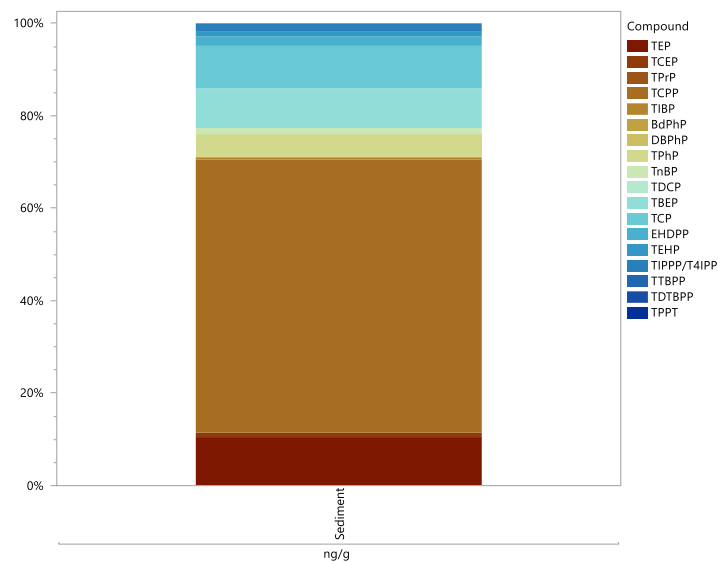
### 2.4.11. OPFRs

OPFRs were detected in sediments (the only matrix where they were analysed; Figure 10). TCPF constituted the highest proportion of the sum-OPFRs concentration.

**A.**



**B.**

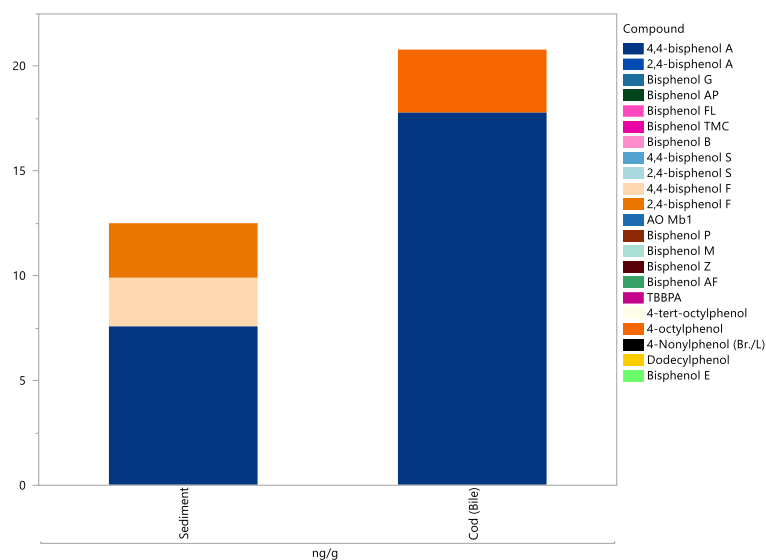


**Figure 10. Concentrations (median; ng/g dry wt.) of OPFRs in sediment (A) and their contribution (%) to the sum-OPFRs concentration (B). Non-detected compounds are assigned a value of zero (0).**

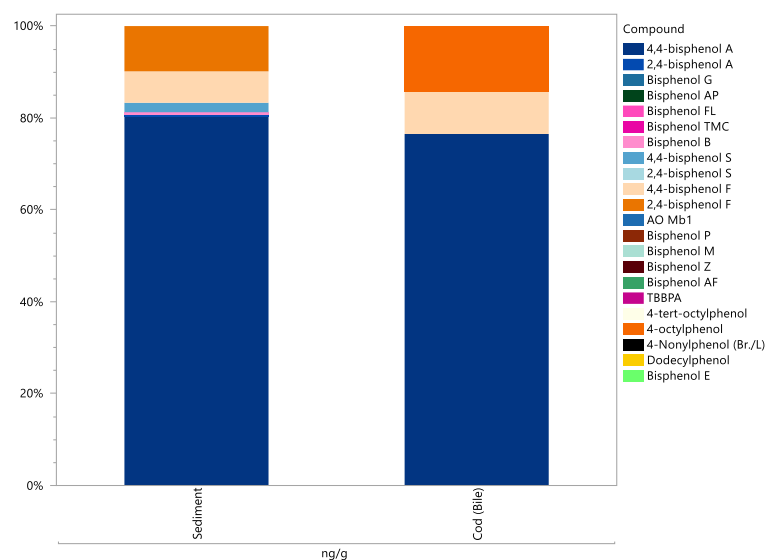
### 2.4.12. Phenolic compounds

Phenolic compounds were detected in sediments and bile of cod (the two matrices where they were analysed; Figure 11). 4,4-bisphenol A displayed the highest concentration in both matrices.

**A.**



**B.**



**Figure 11. Concentrations (median; ng/g wet wt. in biota, ng/g dry wt. in sediment) of phenolic compounds in sediment and bile of cod (A) and their contribution (%) to the sum-phenolic compounds concentration (B). Non-detected compounds are assigned a value of zero (0).**

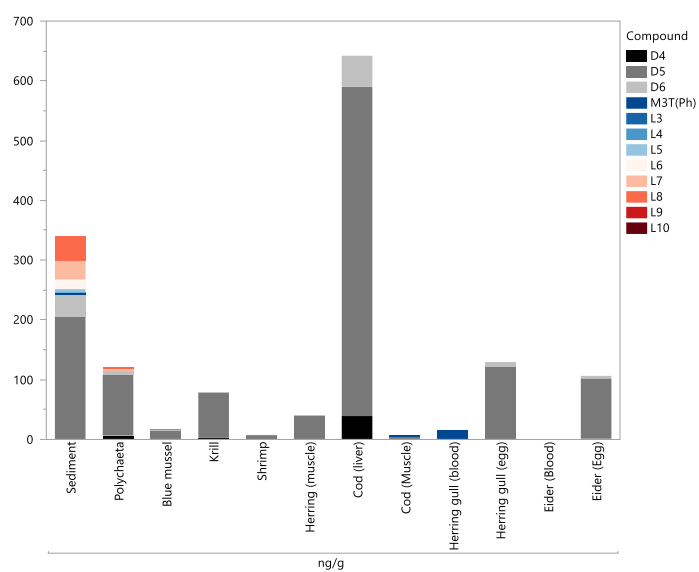
#### **2.4.13. Siloxanes**

Siloxanes were detected in all matrices (Figure 12) and the highest concentrations were observed in cod liver. D5 was a major constituent of the sum-siloxanes concentrations. M3T(Ph) was a major constituent of sum-siloxanes in blood of herring gull and eider. Long (linear) siloxanes (L7 and L8) constituted ~20% of the sum-siloxanes concentration in sediments. As previously mentioned (Ruus et al. 2025), Wang et al. (2021) studied the occurrence and distribution of cyclic and linear siloxanes in a South Korean river, with a focus on crucian carp (*Carassius carassius*). While a high bioaccumulative property of D5 was suggested, no bioaccumulation potentials were observed for linear siloxanes (L3-L17).

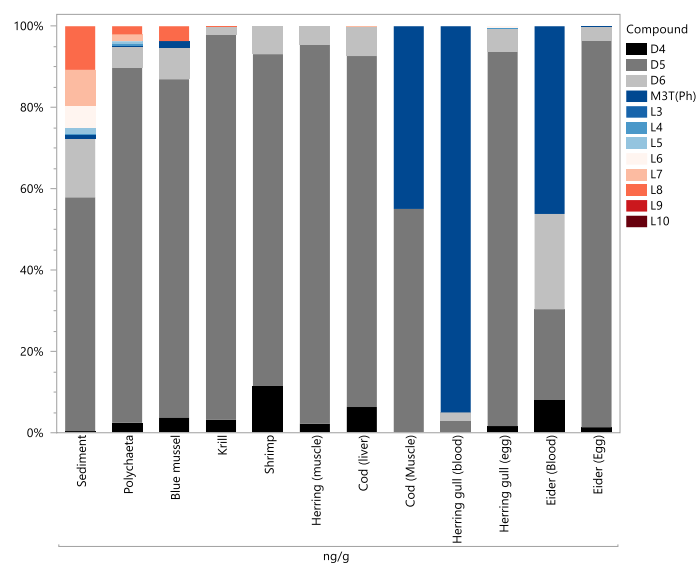
#### **2.4.14. Musks**

Musks were only analysed in sediment. Galaxolide and Tonalide (AHMT) were both detected in two of three samples (Figure 2) and Galaxolide appeared in the highest concentrations.

**A.**



**B.**



**Figure 12. Concentrations (median; ng/g wet wt. in biota, ng/g dry wt. in sediment) of siloxanes in all matrices (A) and their contribution (%) to the sum-siloxanes concentration (B). Non-detected compounds are assigned a value of zero (0).**

#### 2.4.15. Metals

Iron (Fe) is the dominating metal in sediment and in haemoglobin rich matrices, such as blood of herring gull and eider (see electronic Appendix). In these matrices, concentrations are much higher than for the other metals, thus iron is omitted from graphical display in Figure 13. The essential metals zinc (Zn) and copper (Cu) also constituted high proportions of the sum of metals in all matrices. As previously (Ruus et al. 2025), arsenic (As) constituted conspicuous proportions of sum-metals in several matrices. It is known that a significant proportion of arsenic in marine organisms is organic As species (such as arsenobetaine), which are much less toxic than inorganic As (Amlund 2005).

Rare earth metals (Sc, Y and lanthanides) were found mainly in sediment (Figure 13). As previously pointed out (Ruus et al. 2023), the homogenizing effects of sedimentary processes should result in nearly constant distributions of rare earth elements (REE) in sedimentary rocks, and the pattern should reflect upper continental crust abundances (Taylor and McLennan, 1985). Furthermore, The REE distribution in modern sedimentary environments is similar to that of the post-Archean shales (such as the Post Archean Australian Shale, PAAS; Taylor and McLennan, 1985).

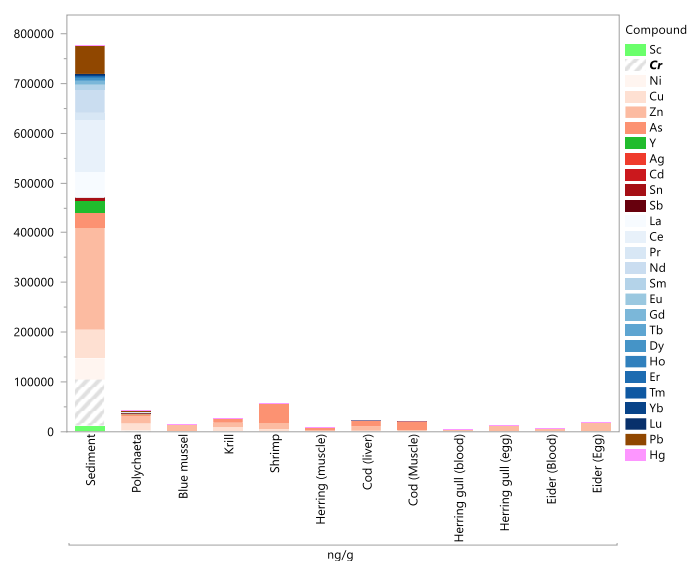
In sediments from station Cm21, post Archean Australian Shale (PAAS)-normalized ratios (Taylor and McLennan, 1985) of light rare earth elements (LREE), middle REE (MREE) and heavy REE (HREE) were (on average) 1.41, 1.43 and 0.92, while “continental crust”-normalized ratios (from McLennan, 2001) of LREE, MREE and HREE were (on average) 1.77, 1.77 and 1.16 (Figure 14).

In sediments from station Bq41, post Archean Australian Shale (PAAS)-normalized ratios (Taylor and McLennan, 1985) of LREE, MREE and HREE were (on average) 1.35, 1.40 and 0.87, while “continental crust”-normalized ratios (from McLennan, 2001) of LREE, MREE and HREE were (on average) 1.69, 1.73 and 1.11 (Figure 14).

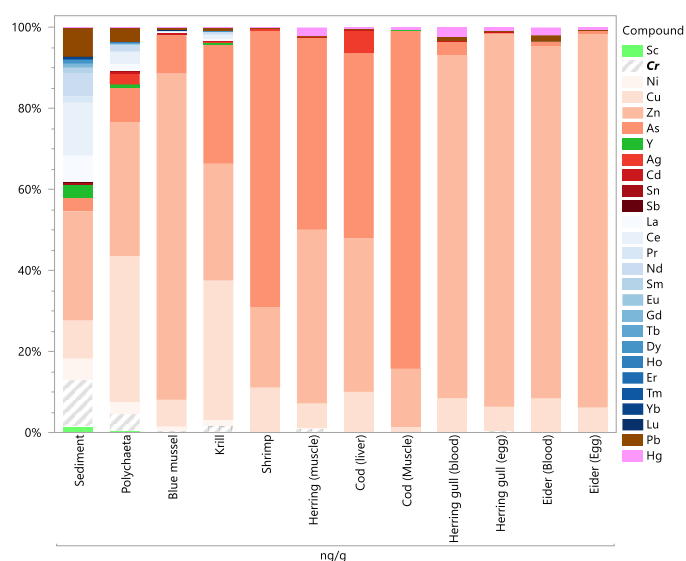
In sediments from station Al1, post Archean Australian Shale (PAAS)-normalized ratios (Taylor and McLennan, 1985) of LREE, MREE and HREE were (on average) 1.43, 1.47 and 0.92, while “continental crust”-normalized ratios (from McLennan, 2001) of LREE, MREE and HREE were (on average) 1.78, 1.82 and 1.16 (Figure 14).

As such, enrichment is shown, most in MREE, with gadolinium (Gd) showing high ratios, suggesting anthropogenic influence (Olmez et al. 1991; Migaszewski and Galuszka, 2015). As previously mentioned (Ruus et al. 2023), Gd complexes have e.g. been used as contrast agents in magnetic resonance imaging (MRI; Migaszewski and Galuszka, 2015).

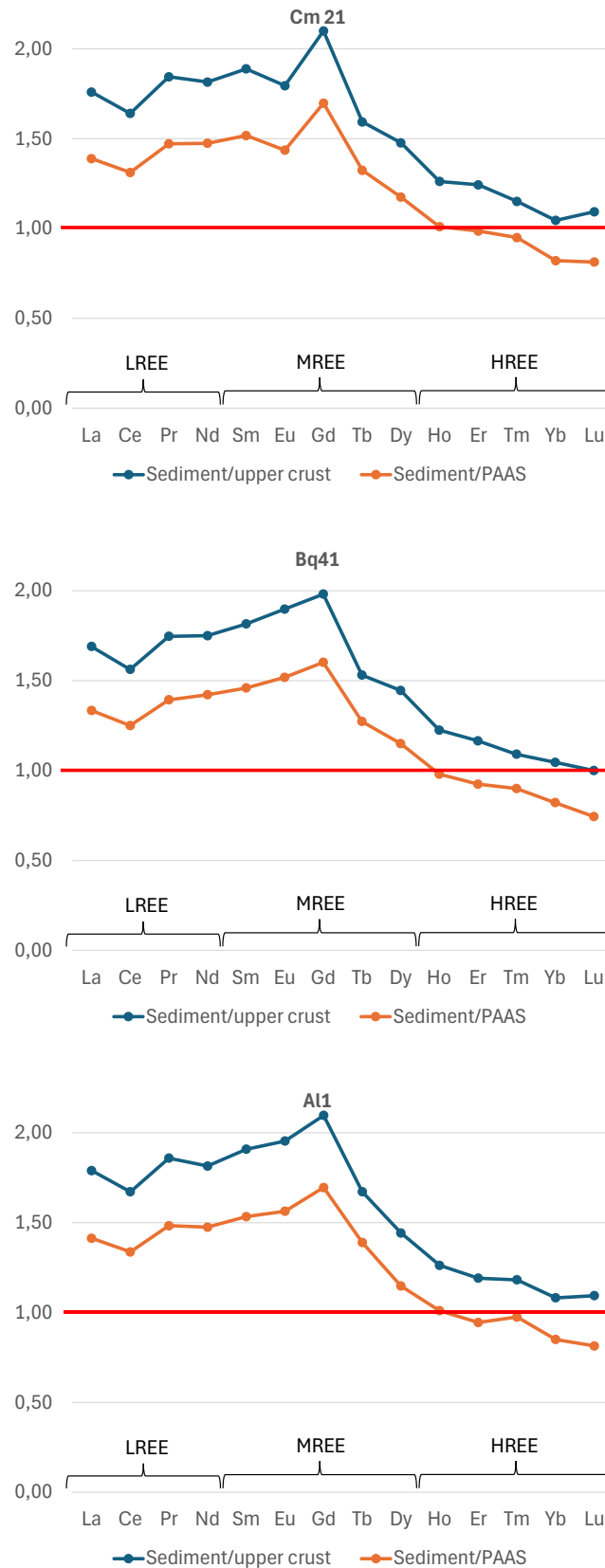
**A.**



**B.**



**Figure 13. Concentrations (median; ng/g wet wt. in biota, ng/g dry wt. in sediment) of metals in all matrices (A) and their contribution (%) to the sum-metals concentration (B). Non-detected compounds are assigned a value of zero (0). Note that iron (Fe) has been omitted from the figure because of much higher concentrations than the other metals.**



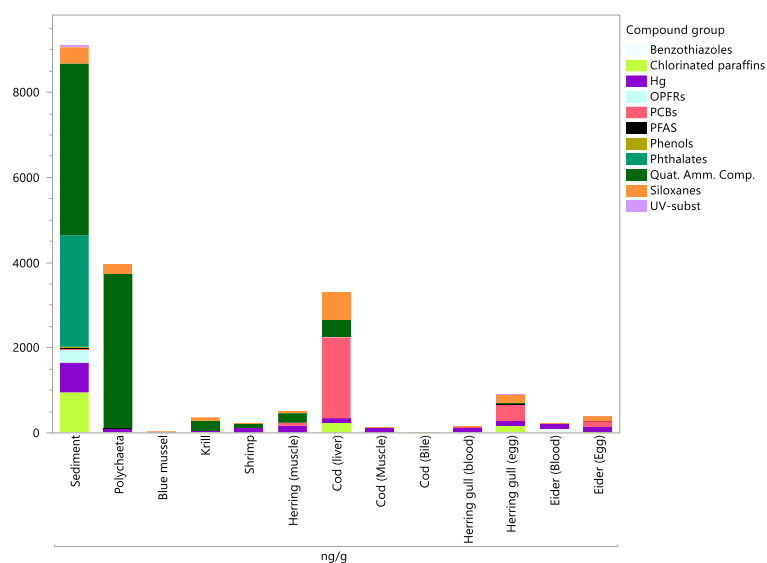
**Figure 14. Ratio of lanthanide content in Inner Oslofjord sediments (top: Cm21; middle: Bq41; bottom: Al1) to lanthanide content in Post Archean Australian Shale (PAAS; Taylor and McLennan, 1985) and continental crust (McLennan, 2001).**

#### **2.4.16. Comparisons of the different contaminant groups**

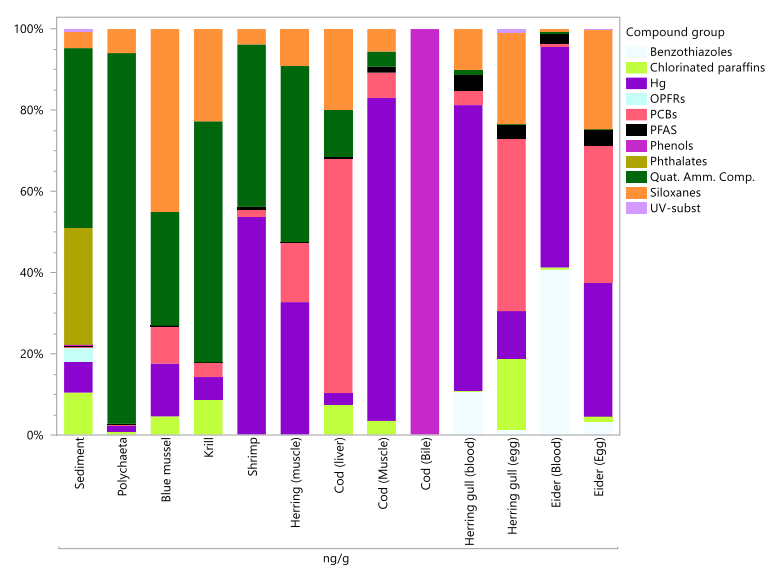
Figure 15 shows concentrations of selected compounds/compound groups in all matrices, and their contribution (in %) to the sum concentration of all these compounds/compound groups. In terms of sources and sinks of contaminants in the Oslo Urban fjord system, it is of interest to give a general impression of the dominating contaminants/groups of contaminants in the different matrices analysed.

Phthalates and QACs were dominating contaminants in sediment, followed by chlorinated paraffins, Hg and siloxanes. Hg constituted high proportions of the sum of all selected contaminants in most matrices, and especially in fish muscle (herring and cod), shrimp and blood of herring gull and eider. Siloxanes and QACs also constituted large proportions of the sum of all selected contaminants in biota. PCBs constituted large proportions of the sum of all selected contaminants especially in lipid rich tissues, such as cod liver and bird eggs. Chlorinated paraffins also constituted notable proportions of the sum of all selected contaminants in several of the matrices. PFAS constituted larger proportions of the sum of all selected contaminants in blood and eggs of herring gull and eider, than in any of the other matrices. Interestingly, benzothiazoles were among the compound groups constituting the largest proportions of the sum of all selected contaminants in blood of herring gull and especially Eider (see also Chapter 2.4.6).

**A.**



**B.**



**Figure 15. Concentrations (means; ng/g wet wt. in biota, ng/g dry wt. in sediment) of selected compounds/compound groups in all matrices (A) and their contribution (%) to the sum concentration of all these compounds/compound groups (B). Non-detected compounds are assigned a value of zero (0). Note: OPFRs, phthalates and musks were only analysed in sediment; Phenolic compounds were only analysed in sediment and cod bile; Benzothiazoles and UV-compounds were only analysed in sediment and birds (blood and egg of herring gull and eider). No other compounds than phenols were analysed in cod bile.**

#### 2.4.17. Relation to Environmental Quality Standards (EQS)

In Table 4 and Table 5, concentrations are compared to environmental quality standards (EQS). Concentrations are means and according to Miljødirektoratet (2026, May 13<sup>th</sup>), ½ LoQ is applied when one or more (but not all) values are below LoQ. For sums of analogues, non-detected analogues are assigned a value of zero (0).

**Table 4. Concentrations of contaminants (mean; mg/kg dry wt.) in sediment from the inner Oslofjord (mean, n=3), and the respective Norwegian quality standards (EQS; Miljødirektoratet 2026, May 13<sup>th</sup>). Red numbers indicate concentrations exceeding the quality standard.**

| River basin specific compounds               | EQS<br>(mg/kg dry wt.) | Sediment conc.<br>(mg/kg dry wt.) |
|----------------------------------------------|------------------------|-----------------------------------|
| Bisphenol A *                                | 0.0011                 | 0.0227                            |
| Dodecylphenol                                | 0.0044                 | <0.0002                           |
| Decamethylcyclopentasiloxane (D5)            | 0.044                  | 0.220                             |
| Medium chained chlorinated paraffins (MCCPs) | 4.6                    | 0.20                              |
| Copper (Cu)                                  | 84                     | 75                                |
| PCB7                                         | 0.0041                 | 0.0200                            |
| PFOA                                         | 0.071                  | <0.0002                           |
| Zinc (Zn)                                    | 139                    | 215                               |
| TBBPA                                        | 0.11                   | <0.002                            |
| Arsenic (As)                                 | 18                     | 26                                |
| Chromium (Cr)                                | 620                    | 91.3                              |
| TCEP                                         | 0.072                  | 0.003                             |
| Triclosan                                    | 0.009                  | n.a.                              |
| <b>EU priority substances</b>                |                        |                                   |
| Cadmium (Cd)                                 | 2.5                    | 0.28                              |
| Lead (Pb)                                    | 150                    | 57                                |
| Nickel (Ni)                                  | 42                     | 42.5                              |
| Mercury (Hg)                                 | 0.52                   | 0.70                              |
| Brominated diphenyl ethers *                 | 0.062                  | n.a.                              |
| Hexachlorobenzene                            | 0.017                  | 0.0003                            |
| C10-13 chloroalkanes **                      | 0.8                    | 0.05                              |
| Pentachlorobenzene                           | 0.4                    | 0.0004                            |
| Nonylphenol (4-)                             | 0.016                  | <0.045 ***                        |
| Octylphenol (4-tert-)                        | 0.0003                 | <0.0013 ***                       |
| PFOS *                                       | 0.00023                | 0.00013                           |
| DEHP                                         | 10                     | 1.33                              |

\* Bisphenol A is sum of 4,4'- and 2,4'-; BDEs are Sum of BDE-28, -47, -99, -100, -153 and -154; PFOS is sum of PFOS and brPFOS.

\*\* Short chained chlorinated paraffins (SCCPs)

\*\*\* Too high limit of detection to evaluate. However, single congeners exceeded EQS, if red.

**Table 5. Concentrations of contaminants (mean; µg/kg wet wt.) in blue mussel, herring (muscle) and cod (muscle and liver) from the Inner Oslofjord, and the respective Norwegian quality standards for biota (Miljødirektoratet 2026, May 13<sup>th</sup>). Red numbers indicate concentrations exceeding the quality standard.**

| River basin specific compounds               | EQS (µg/kg) | Blue mussel conc. (µg/kg) | Herring conc. (µg/kg) | Cod muscle conc. (µg/kg) | Cod liver conc. (µg/kg) |
|----------------------------------------------|-------------|---------------------------|-----------------------|--------------------------|-------------------------|
| Decamethylcyclopentasiloxane (D5)            | 15000       | 14.4                      | 43.2                  | 4.1                      | 568                     |
| Medium chained chlorinated paraffins (MCCPs) | 170         | <25                       | <25                   | <25                      | 40.3                    |
| PCB7                                         | 0.6         | 2.0                       | 42.8                  | 5.3                      | 1243                    |
| PFOA                                         | 91          | <0.2                      | <0.2                  | <0.2                     | <0.2                    |
| TCEP                                         | 7300        | n.a.                      | n.a.                  | n.a.                     | n.a.                    |
| Triclosan                                    | 15000       | n.a.                      | n.a.                  | n.a.                     | n.a.                    |
| <b>EU priority substances</b>                |             |                           |                       |                          |                         |
| Mercury (Hg)                                 | 20          | 5                         | 167                   | 107                      | 97                      |
| Brominated diphenyl ethers *                 | 0.0085      | n.a.                      | n.a.                  | n.a.                     | n.a.                    |
| Hexachlorobenzene                            | 10          | <0.03                     | 0.33                  | 0.04                     | 3.95                    |
| C10-13 chloroalkanes **                      | 6000        | <16                       | <16                   | <21                      | 23                      |
| Pentachlorobenzene                           | 50          | <0.01                     | 0.060                 | <0.01                    | 0.502                   |
| Nonylphenol (4-)                             | 3000        | n.a.                      | n.a.                  | n.a.                     | n.a.                    |
| Octylphenol (4-tert-)                        | 0.004       | n.a.                      | n.a.                  | n.a.                     | n.a.                    |
| PFOS *                                       | 9.1         | <0.1                      | 0.07                  | 0.36                     | 4.66                    |
| DEHP                                         | 2900        | n.a.                      | n.a.                  | n.a.                     | n.a.                    |

\* BDEs are Sum of BDE-28, -47, -99, -100, -153 and -154; PFOS is sum of PFOS and brPFOS.

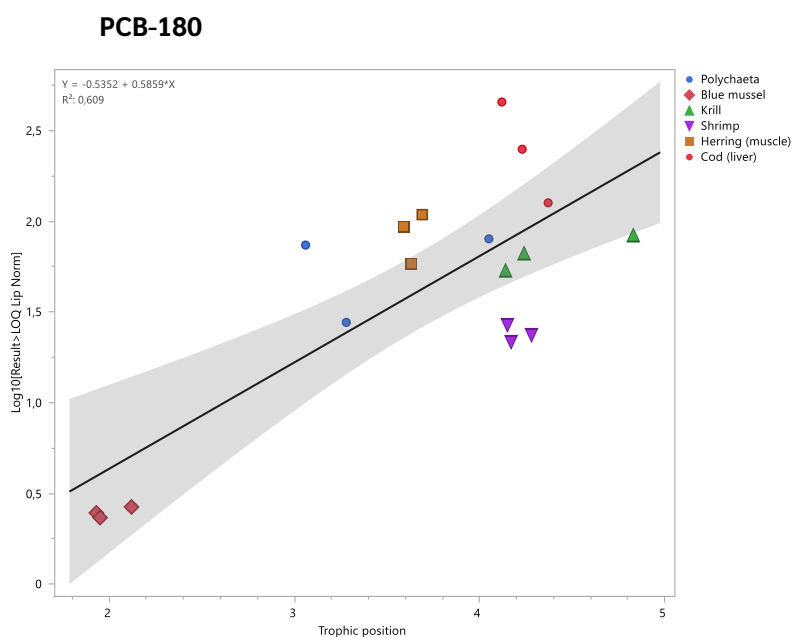
\*\* Short chained chlorinated paraffins (SCCPs)

\*\*\* Too high limit of detection to evaluate. However, single congeners exceeded EQS, if red.

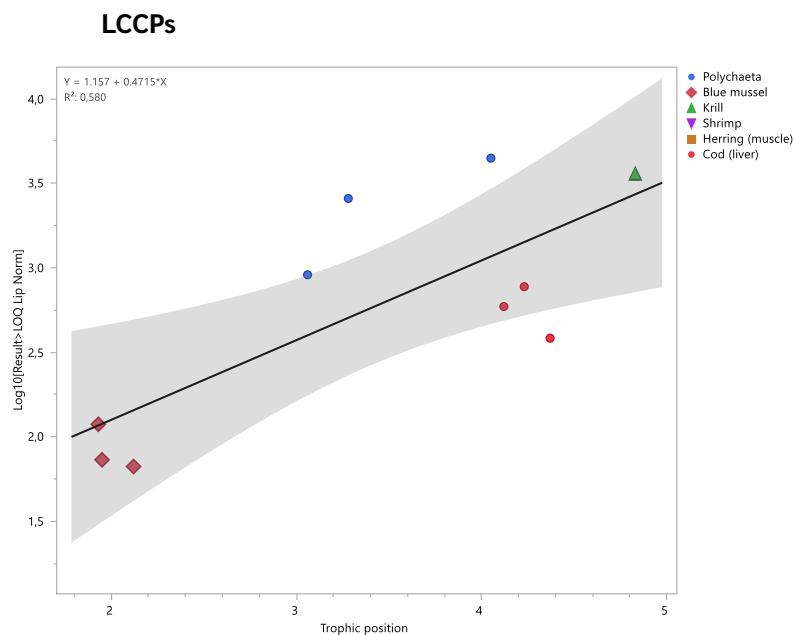
#### 2.4.18. Biomagnification of environmental contaminants in the Inner Oslofjord food web

Biomagnification (expressed by trophic magnification factors; TMFs) was evaluated in the selected inner Oslofjord food web. Statistically significant biomagnification was observed for 24 PCB congeners (lipid wt. basis), both when cod was represented by liver sample and muscle sample. Figure 16 depicts the significant regression for PCB-180 when cod is represented by liver sample. Furthermore, LCCPs and D4 showed statistically significant biomagnification (lipid wt. basis; both when cod was represented by liver sample and muscle sample), however LCCPs were only detected in blue mussel, polychaetes, krill (one sample) and cod, while D4 was not detected in cod muscle. Figure 17 and Figure 18 depict the significant regressions for LCCPs and D4, respectively, when cod is represented by liver sample.

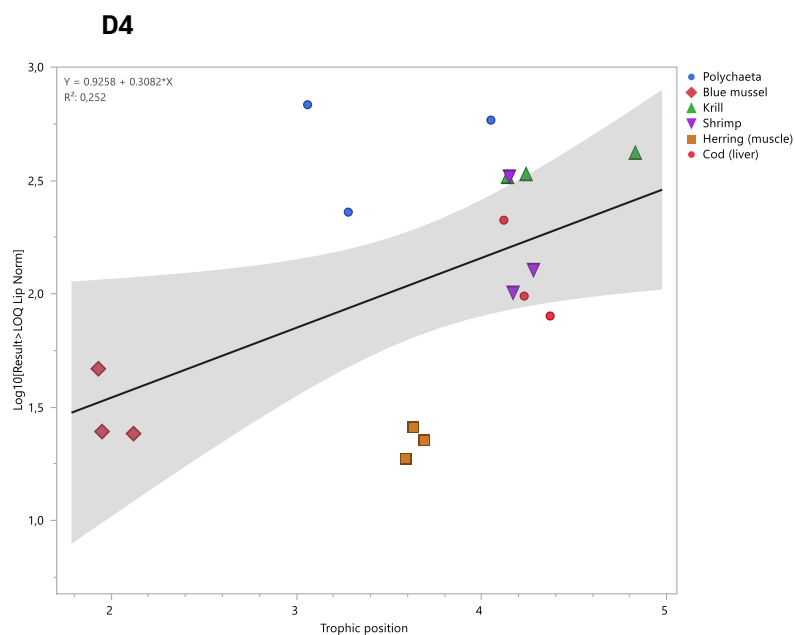
PFOSA displayed significant biomagnification (wet wt. basis), both when cod was represented by liver sample and muscle sample. The TMF was highest when cod was represented by liver sample (Figure 19). ATAC-C20 (Figure 20) and ATAC-C22 also displayed significant biomagnification (wet wt. basis), when cod was represented by liver sample. Furthermore, As and Hg showed statistically significant biomagnification (wet wt. basis; both when cod was represented by liver sample and muscle sample). Figure 21 and Figure 22 depict the significant regressions for As and Hg, respectively, when cod is represented by muscle sample.



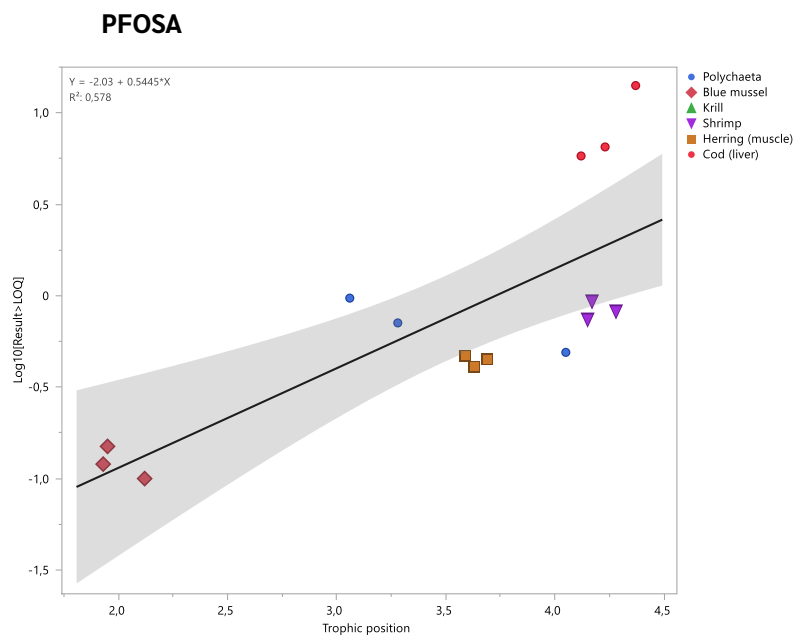
**Figure 16. Trophic position against concentrations (ng/g lipid wt.; log<sub>10</sub>-transformed) of PCB-180 in the studied Inner Oslofjord food web. The confidence region (95%) of the fitted line is indicated with grey shading. TMF=3.85; p=0.0001. Cod is represented by liver sample.**



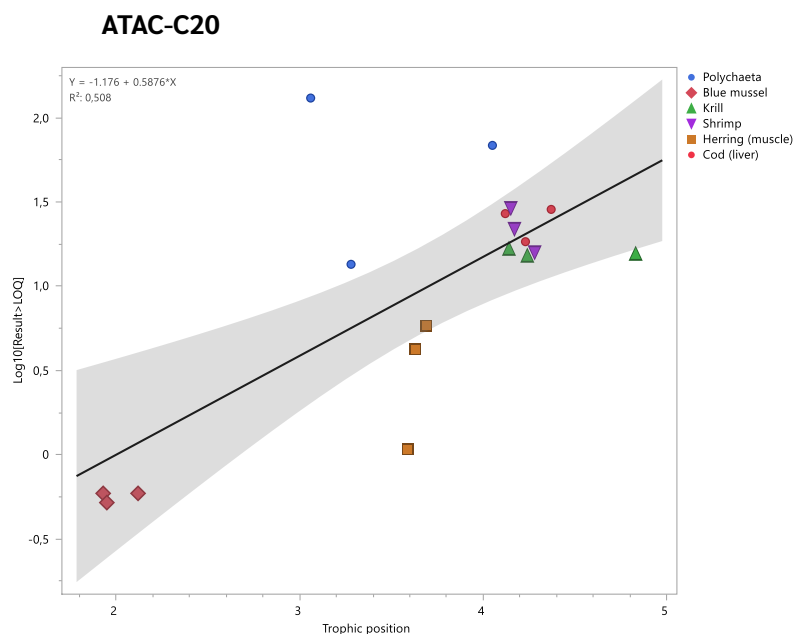
**Figure 17.** Trophic position against concentrations (ng/g lipid wt.;  $\log_{10}$ -transformed) of LCCPs in the studied Inner Oslofjord food web. The confidence region (95%) of the fitted line is indicated with grey shading. TMF=2.96;  $p=0.0105$ . LCCPs were not detected in shrimp or herring. Cod is represented by liver sample.



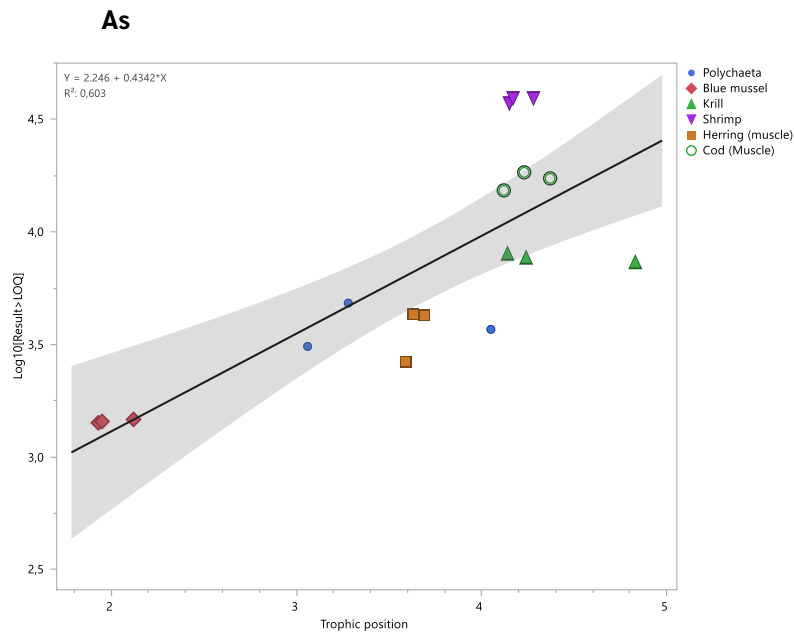
**Figure 18.** Trophic position against concentrations (ng/g lipid wt.;  $\log_{10}$ -transformed) of D4 in the studied Inner Oslofjord food web. The confidence region (95%) of the fitted line is indicated with grey shading. TMF=2.03;  $p=0.0339$ . Cod is represented by liver sample.



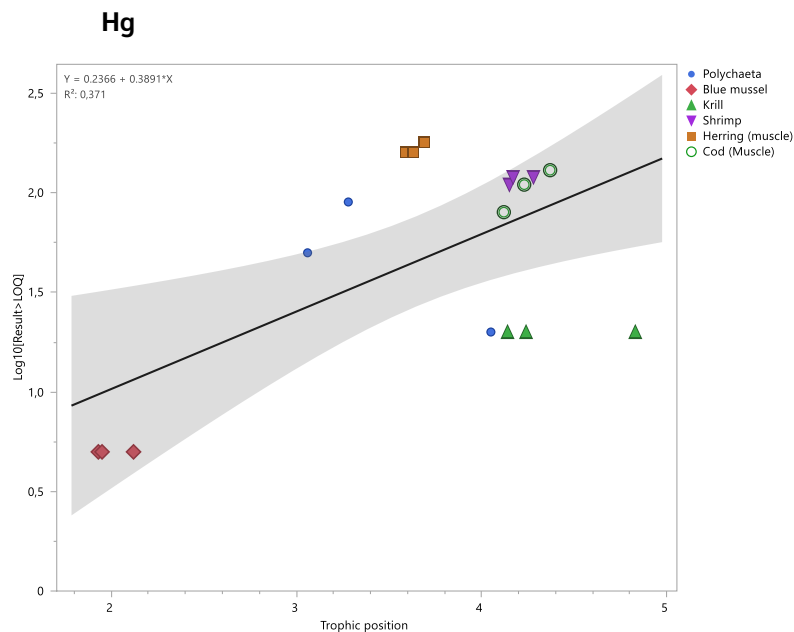
**Figure 19.** Trophic position against concentrations (ng/g wet wt.; log<sub>10</sub>-transformed) of PFOSA in the studied Inner Oslofjord food web. The confidence region (95%) of the fitted line is indicated with grey shading. TMF=3.50; p=0.001. PFOSA was not detected in krill. Cod is represented by liver sample.



**Figure 20.** Trophic position against concentrations (ng/g wet wt.; log<sub>10</sub>-transformed) of ATAC-C20 in the studied Inner Oslofjord food web. The confidence region (95%) of the fitted line is indicated with grey shading. TMF=3.87; p=0.0009. Cod is represented by liver sample.



**Figure 21.** Trophic position against concentrations (ng/g wet wt.; log<sub>10</sub>-transformed) of As in the studied Inner Oslofjord food web. The confidence region (95%) of the fitted line is indicated with grey shading. TMF=2.54; p=0.0003. Cod is represented by muscle sample.



**Figure 22.** Trophic position against concentrations (ng/g wet wt.; log<sub>10</sub>-transformed) of Hg in the studied Inner Oslofjord food web. The confidence region (95%) of the fitted line is indicated with grey shading. TMF=2.37; p=0.0097. Cod is represented by muscle sample.

## 3 Material and Methods Appendix

### 3.1 Sampling and matrices

#### 3.1.1. Sediment

Sediment was collected at station Bekkelaget (Bq41), Alna River outlet (Al1) and Ildjernet (Cm21; Figure 1) by means of a van Veen grab (0.15 m<sup>2</sup>) from Research Vessel Trygve Braarud on June 11<sup>th</sup>, 2025. Four grabs of the top layer (0-2 cm in grab samples with undisturbed surface) were prepared for one sample.

#### 3.1.2. Polychaeta

Polychaetes were collected at stations Bq41, Al1 and Cm21 (Figure 1) using a van Veen grab (0.15 m<sup>2</sup>) from RV Trygve Braarud. Polychaetes were collected at the same time as the sediments. The samples consisted of the species listed in Table 2.

#### 3.1.3. Krill

Krill (*Euphausiacea*) were collected at Midtmeie, southwest of Steilene (Figure 1) August 12<sup>th</sup>, 2025, as representatives of the zooplankton. A fry trawl was operated from RV Trygve Braarud for this purpose. Material for three pooled samples was collected.

#### 3.1.4. Shrimp

Shrimp (*Pandalus borealis*) were caught with benthic trawl from RV Trygve Braarud, in the same area as zooplankton (krill); Midtmeie, southwest of Steilene (Figure 1), August 11<sup>th</sup>, 2025.

#### 3.1.5. Blue mussel

Mussels (*Mytilus edulis*) were collected at Steilene (Figure 1), on August 4<sup>th</sup>, 2025, by standard procedures (handpicked, using rake, or snorkelling; as done in the project "Contaminants in coastal waters", MILKYS; Schøyen et al. 2025). The method for collecting and preparing blue mussels was based on the National Standard for mussel collection (NS 9434:2017).

#### 3.1.6. Herring

Herring (*Clupea harengus*) were caught with trawl from RV Trygve Braarud at Midtmeie, southwest of Steilene (Figure 1) on August 11<sup>th</sup>, 2025. Biometric data for the fish are given in Appendix (Chapter 4). 15 specimens were pooled into 3 pooled samples (5 individuals in each) for chemical analyses. Stable isotopes of carbon and nitrogen were performed on individual muscle samples (n=15).

#### 3.1.7. Cod

Cod (*Gadus morhua*) were also caught with trawl from RV Trygve Braarud at Midtmeie, southwest of Steilene (Figure 1), on August 11<sup>th</sup>, 2025. Biometric data for the fish are given in Appendix (Chapter 4). 15 specimens were pooled into 3 pooled samples (5 individuals in each) for chemical analyses. Stable isotopes of carbon and nitrogen were performed on individual muscle samples (n=15).

#### 3.1.8. Eider

Eider (*Somateria mollissima*) blood samples (from adult individuals trapped at nest) and eggs (3 of each) were sampled at Søndre Skjælholmen and Husbergøya (Figure 1), May 13<sup>th</sup> to 14<sup>th</sup>, 2025. Biometric data for the birds are given in Appendix, Chapter 4. Adult birds were trapped by walk-in

trap placed at the nest. Blood samples (~5 ml) were taken from a vein under the wing. Preferably, adult female and egg were sampled from the same nest.

#### **3.1.9. Herring gull**

Herring gull (*Larus argentatus*) blood samples (from adult individuals trapped at nest) and eggs (3 of each) were sampled at Søndre Skjælholmen (Figure 1), June 3<sup>rd</sup>, 2025. Biometric data for the birds are given in Appendix, Chapter 4. Adult birds were trapped by walk-in trap placed at the nest. Blood samples (~5 ml) were taken from a vein under the wing. Preferably, adult female and egg were sampled from the same nest.

## 3.2 Analytical procedures

### 3.2.1. QA/QC

In Table 6 there is a short method description, including LoQ and an assessment and categorization of the uncertainty for every individual compound analysed. The uncertainty is divided in three groups from 1-3.

Group 1 includes the compounds with the highest certainty. For the compounds in this group the method is well established, not only at NIVA/NILU, but also internationally. That means the quality of this analysis has been proven with intercalibration studies and quality parameters are good. Most of these analyses are accredited according to ISO 17025.

Group 2 includes the compounds with medium certainty. The internal control parameters in the lab are good, the method is fit for purpose, but the quality cannot, or have not, been proven within intercalibration studies. This group also includes parameters that have been tested in intercalibration studies, but the results within the studies show that the uncertainty of this analysis still is high (typically more than 50%).

Group 3 includes the compounds with the highest uncertainty. This could be due to not satisfying recovery data, method not fit for purpose, high variability in blanks, or other.

**Table 6. Method information**

**Uncertainty categories:**

- 1. Results from analysis of control samples (spikes and blanks etc) are accurate and precise. The laboratory has participated in and has passed ring-tests and proficiency tests for this analysis. Results are considered to be very reliable.**
- 2. Results from analysis of control samples (spikes and blanks etc) are accurate and precise. The laboratory has not participated in proficiency tests for this analysis, or ring-tests included too few participants to be reliable. Results are considered to be reliable.**
- 3. Results from analysis of control samples (spikes and blanks etc) are variable and precision is not acceptable. Results of these analyses are considered to be least reliable.**

**UV-compounds**

| Parameter group | Name parameter                      | CAS Number  | Blank subtraction and determination of LOQ                                                                                                                         | LOQ range ng/g | Method                                                                                                                  | Uncertainty category |
|-----------------|-------------------------------------|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-------------------------------------------------------------------------------------------------------------------------|----------------------|
| UV compounds    | Benzophenone-3                      | 131-57-7    | Minimum three blanks per batch. Blank-subtraction and LOQ based on average signal of blanks +10*std. Octocrylene and homosalate have the highest levels in blanks. | 0.1-0.5        | Internal Standard (IS) added. Samples then extracted twice, followed by clean-up via GPC and/or PSA. GC-MS/MS detection | 2                    |
|                 | Ethylhexylmethoxycinnamate (EHMZ-Z) | 177352-99-7 |                                                                                                                                                                    | 0.2-1.6        |                                                                                                                         | 2                    |
|                 | Ethylhexylmethoxycinnamate (EHMZ-E) | 5466-77-3   |                                                                                                                                                                    | 4-20           |                                                                                                                         | 2                    |
|                 | Octocrylene                         | 6197-30-4   |                                                                                                                                                                    | 5-30           |                                                                                                                         | 2                    |
|                 | UV-327                              | 3864-99-1   |                                                                                                                                                                    | 0.1-1.5        |                                                                                                                         | 2                    |
|                 | UV-328                              | 25973-55-1  |                                                                                                                                                                    | 0.5            |                                                                                                                         | 2                    |
|                 | UV-329                              | 3147-75-9   |                                                                                                                                                                    | 0.5-1.5        |                                                                                                                         | 2                    |
|                 | Homosalate                          | 118-56-9    |                                                                                                                                                                    | 1.5-15         |                                                                                                                         | 2                    |

Comment to UV-compounds: Highest LoQ in bird blood due to limited sample volume.

Table 6 cont. Method information. PFAS

| Parameter group | Name parameter | CAS Number               | Blank subtraction and determination of LOQ              | LOQ range, ng/g                       | Method                                                                                                                                   | Uncertainty category |
|-----------------|----------------|--------------------------|---------------------------------------------------------|---------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| PFAS            | PFSA           |                          |                                                         |                                       |                                                                                                                                          |                      |
|                 | PFBA           | 375-22-4                 | One blank per batch. LOQ based on 10 x signal-to-noise  | 0.3                                   | Internal standard is added, and solid samples are extracted twice. Water samples are concentrated on an SPE column. LC-QTOF-MS detection | 2                    |
|                 | PFPA           | 2706-90-3                |                                                         | 0.2                                   |                                                                                                                                          | 2                    |
|                 | PFHxA          | 307-24-4                 |                                                         | 0.2                                   |                                                                                                                                          | 1                    |
|                 | PFHpA          | 375-85-9                 |                                                         | 0.2                                   |                                                                                                                                          | 2                    |
|                 | PFOA           | 335-67-1                 |                                                         | 0.2                                   |                                                                                                                                          | 1                    |
|                 | PFNA           | 375-95-1                 |                                                         | 0.1                                   |                                                                                                                                          | 1                    |
|                 | PFDA           | 335-76-2                 |                                                         | 0.1                                   |                                                                                                                                          | 1                    |
|                 | PFUnDA         | 2058-94-8                |                                                         | 0.1                                   |                                                                                                                                          | 1                    |
|                 | PFDODA         | 307-55-1                 |                                                         | 0.1                                   |                                                                                                                                          | 1                    |
|                 | PFTTrDA        | 72629-94-8               |                                                         | 0.1                                   |                                                                                                                                          | 1                    |
|                 | PFTeDA         | 376-06-7                 |                                                         | 0.1                                   |                                                                                                                                          | 1                    |
|                 | PFHxDA         | 67905-19-5               |                                                         | 0.2                                   |                                                                                                                                          | 2                    |
|                 | PFOcDA         | 16517-11-6               |                                                         | 0.2                                   |                                                                                                                                          | 2                    |
|                 | PFSA           |                          |                                                         |                                       |                                                                                                                                          |                      |
|                 | PFBS           | 375-73-5                 | One blank per batch. LOQ based on 10 x signal-to-noise. | 0.1                                   | Internal standard is added, and solid samples are extracted twice. Water samples are concentrated on an SPE column. LC-QTOF-MS detection | 1                    |
|                 | PFPS           | 2706-91-4                |                                                         | 0.1                                   |                                                                                                                                          | 2                    |
|                 | PFHxS          | 355-46-4                 |                                                         | 0.05                                  |                                                                                                                                          | 1                    |
|                 | PFHpS          | 375-92-8                 |                                                         | 0.05                                  |                                                                                                                                          | 1                    |
|                 | PFOS           | 2795-39-3                |                                                         | 0.05                                  |                                                                                                                                          | 1                    |
|                 | brPFOS         | 1763-23-1                |                                                         | 0.05                                  |                                                                                                                                          | 2                    |
|                 | PFNS           | 474511-07-4              |                                                         | 0.05                                  |                                                                                                                                          | 2                    |
|                 | PFDS           | 335-77-3                 |                                                         | 0.05                                  |                                                                                                                                          | 1                    |
|                 | PFUnDS         | 441296-91-9              |                                                         | 0.1                                   |                                                                                                                                          | 2                    |
|                 | PFDODS         | 79780-39-5               |                                                         | 0.1                                   |                                                                                                                                          | 2                    |
|                 | PFTTrDS        | 791563-89-8              |                                                         | 0.1                                   |                                                                                                                                          | 2                    |
|                 | PFTeDS         | 1379460-39-5             |                                                         | 0.2                                   |                                                                                                                                          | 3                    |
|                 | nPFAS          |                          |                                                         |                                       |                                                                                                                                          |                      |
|                 | PFBSA          | 30334-69-1               | One blank per batch. LOQ based on 10 x signal-to-noise. | 0.2                                   | Internal standard is added, and solid samples are extracted twice. Water samples are concentrated on an SPE column. LC-QTOF-MS detection | 2                    |
|                 | N-MeFBSA       | 68298-12-4               |                                                         | 0.2                                   |                                                                                                                                          | 2                    |
|                 | N-EtFBSA       | 40630-67-9               |                                                         | 0.2                                   |                                                                                                                                          | 2                    |
|                 | PFOSA          | 754-91-6                 |                                                         | 0.1                                   |                                                                                                                                          | 1                    |
|                 | N-MeFOSA       | 31506-32-8               |                                                         | 0.1                                   |                                                                                                                                          | 2                    |
| N-EtFOSA        | 4151-50-2      | 0.1                      |                                                         | 2                                     |                                                                                                                                          |                      |
| N-MeFOSE        | 24448-09-7     | 1.0                      |                                                         | 2                                     |                                                                                                                                          |                      |
| N-EtFOSE        | 1691-99-2      | 1.0                      |                                                         | 2                                     |                                                                                                                                          |                      |
| N-EtFOSAA       | 2991-50-6      | 0.1                      |                                                         | 2                                     |                                                                                                                                          |                      |
| newPFAS         |                |                          |                                                         |                                       |                                                                                                                                          |                      |
| 4:2 FTS         | 757124-72-4    | One blank per batch. LOQ | 0.1                                                     | Internal standard is added, and solid | 2                                                                                                                                        |                      |
| 6:2 FTS         | 27619-97-2     |                          | 0.1                                                     |                                       | 2                                                                                                                                        |                      |

| Parameter group | Name parameter  | CAS Number  | Blank subtraction and determination of LOQ | LOQ range, ng/g | Method                                                                                             | Uncertainty category |
|-----------------|-----------------|-------------|--------------------------------------------|-----------------|----------------------------------------------------------------------------------------------------|----------------------|
|                 | 8:2 FTS         | 481071-78-7 | based on 10 x signal-to-noise.             | 0.1             | samples are extracted twice. Water samples are concentrated on an SPE column. LC-QTOF-MS detection | 2                    |
|                 | 10:2 FTS        | 120226-60-0 |                                            | 0.1             |                                                                                                    | 2                    |
|                 | 12:2 FTS        | 149246-64-0 |                                            | 0.1             |                                                                                                    | 2                    |
|                 | ADONA           | 958445-44-8 |                                            | 0.1             |                                                                                                    | 2                    |
|                 | PFECHS          | 67584-42-3  |                                            | 0.1             |                                                                                                    | 2                    |
|                 | HFPO-DA (Gen-X) | 13252-13-6  |                                            | 0.3             |                                                                                                    | 3                    |

Comments to PFAS:

PFTeS; reference standard material was unavailable for this compound. The uncertainty category is therefore set to 3. However, knowledge from similar compounds provides confidence and we judge the results to be reliable.

brPFOS: The reference standard for branched PFOS is provided as a technical mixture. It is therefore difficult to get reliable results on spiked samples. It is possible that additional branched PFOS has not been reported, but the results here present the most significant.

HFPO-DA (Gen-X): The recovery of this compound can vary, so the concentration can be a bit uncertain. There might also be some false negative results.

Table 6 cont. Method information. Quaternary ammonium compounds.

| Parameter group               | Name parameter | CAS Number | Blank subtraction and determination of LOQ              | LOQ range, ng/g | Method                                                                            | Uncertainty category |
|-------------------------------|----------------|------------|---------------------------------------------------------|-----------------|-----------------------------------------------------------------------------------|----------------------|
| Quaternary ammonium compounds | DADMAC-C8      | 3026-69-5  | One blank per batch. LOQ based on 10 x signal-to-noise. | 0.1             | Internal Standard is added. Samples are then extracted twice LC-QTOF-MS detection | 2                    |
|                               | DADMAC-C10     | 2390-68-3  |                                                         | 0.1             |                                                                                   | 2                    |
|                               | DADMAC-C12     | 3282-73-3  |                                                         | 0.1             |                                                                                   | 2                    |
|                               | DADMAC-C14     | 68105-02-2 |                                                         | 0.1             |                                                                                   | 2                    |
|                               | DADMAC-C16     | 70755-47-4 |                                                         | 0.1             |                                                                                   | 2                    |
|                               | DADMAC-C18     | 3700-67-2  |                                                         | 0.1             |                                                                                   | 2                    |
|                               | BAC-C8         | 959-55-7   |                                                         | 0.1             |                                                                                   | 2                    |
|                               | BAC-C10        | 965-32-2   |                                                         | 0.1             |                                                                                   | 2                    |
|                               | BAC-C12        | 139-07-1   |                                                         | 0.1             |                                                                                   | 2                    |
|                               | BAC-C14        | 139-08-2   |                                                         | 0.1             |                                                                                   | 2                    |
|                               | BAC-C16        | 122-18-9   |                                                         | 0.5             |                                                                                   | 2                    |
|                               | BAC-C18        | 122-19-0   |                                                         | 0.8             |                                                                                   | 2                    |
|                               | ATAC-C8        | 2083-68-3  |                                                         | 0.1             |                                                                                   | 2                    |
|                               | ATAC-C10       | 2082-84-0  |                                                         | 0.1             |                                                                                   | 2                    |
|                               | ATAC-C12       | 1119-94-4  |                                                         | 0.1             |                                                                                   | 2                    |
|                               | ATAC-C14       | 1119-97-7  |                                                         | 0.1             |                                                                                   | 2                    |
|                               | ATAC-C16       | 57-09-0    |                                                         | 0.3             |                                                                                   | 2                    |
|                               | ATAC-C18       | 1120-02-1  |                                                         | 0.1             |                                                                                   | 2                    |
|                               | ATAC-C20       | 15809-05-9 |                                                         | 0.1             |                                                                                   | 2                    |
|                               | ATAC-C22       | 17301-53-0 |                                                         | 0.1             |                                                                                   | 2                    |

Table 6 cont. Method information. Benzothiazoles.

| Parameter group | Name parameter                                | CAS Number | Blank subtraction and determination of LOQ                                        | LOQ range, ng/g | Method                                                                                   | Uncertainty category |
|-----------------|-----------------------------------------------|------------|-----------------------------------------------------------------------------------|-----------------|------------------------------------------------------------------------------------------|----------------------|
| Benzothiazoles  | Mercaptobenzothiazole (MBT)                   | 149-30-4   | One blank per batch. LOQ based on 10 x signal-to-noise as measured in each sample | 1.0             | Internal Standard (IS) added. Solid samples are then extracted twice. LC-MS/MS detection | 2                    |
|                 | Benzotriazole (BTZ)                           | 95-14-7    |                                                                                   | 0.5             |                                                                                          | 2                    |
|                 | Benzothiazole (BT)                            | 95-16-9    |                                                                                   | 10.0            |                                                                                          | 2                    |
|                 | 2(3H)-Benzothiazolone (OHBT)                  | 934-34-9   |                                                                                   | 1.0             |                                                                                          | 2                    |
|                 | metyl-1H-benzotriazole (MeBTZ)                | 29385-43-1 |                                                                                   | 1.0             |                                                                                          | 2                    |
|                 | N-cyclohexylbenzothiazole-2-sulfenamide (CBS) | 95-33-0    |                                                                                   | 1.0             |                                                                                          | 2                    |
|                 | M1-UV328                                      | 84268-36-0 |                                                                                   | 1.0             |                                                                                          | 2                    |

Table 6 cont. Method information. Metals.

| Parameter group    | Compound | Cas no    | Blank                                                                                               | LOD range (mg/kg) | LOQ range (mg/kg) | Method                                                                                                                   | Uncertainty category |
|--------------------|----------|-----------|-----------------------------------------------------------------------------------------------------|-------------------|-------------------|--------------------------------------------------------------------------------------------------------------------------|----------------------|
| Metals<br>Sediment | Sc       | 7440-20-2 | Method blanks following sample series. LOD/LOQ based on calculation of 3 and 10 stddev respectively | 0.0001-0.0002     | 0.0005-0.001      | In-house accredited method. Microwave assisted decomposition with HNO <sub>3</sub> . Analysed by ICP-MS (Agilent 7700x). | 2                    |
|                    | Cr       | 7440-47-3 |                                                                                                     | 0.0001-0.0005     | 0.001-0.002       |                                                                                                                          | 1                    |
|                    | Fe       | 7439-89-6 |                                                                                                     | 0.002-0.01        | 0.02-0.1          |                                                                                                                          | 1                    |
|                    | Ni       | 7440-02-0 |                                                                                                     | 0.0002-0.0005     | 0.001-0.002       |                                                                                                                          | 1                    |
|                    | Cu       | 7440-50-8 |                                                                                                     | 0.0005-0.001      | 0.002-0.005       |                                                                                                                          | 1                    |
|                    | Zn       | 7440-66-6 |                                                                                                     | 0.002-0.005       | 0.01-0.05         |                                                                                                                          | 1                    |
|                    | As       | 7440-38-2 |                                                                                                     | 0.0001-0.0002     | 0.0005-0.001      |                                                                                                                          | 1                    |
|                    | Y        | 7440-65-5 |                                                                                                     | 0.00005-0.0001    | 0.0002-0.0005     |                                                                                                                          | 2*                   |
|                    | Ag       | 7440-22-4 |                                                                                                     | 0.0001-0.0002     | 0.0005-0.001      |                                                                                                                          | 1*                   |
|                    | Cd       | 7440-43-9 |                                                                                                     | 0.0001-0.0002     | 0.0004-0.001      |                                                                                                                          | 1                    |
|                    | Sn       | 7440-31-5 |                                                                                                     | 0.0005-0.001      | 0.002-0.005       |                                                                                                                          | 2*                   |
|                    | Sb       | 7440-36-0 |                                                                                                     | 0.0001-0.0001     | 0.0005-0.001      |                                                                                                                          | 1                    |
|                    | La       | 7439-91-0 |                                                                                                     | 0.00003-0.0001    | 0.0002-0.0005     |                                                                                                                          | 2                    |
|                    | Ce       | 7440-45-1 |                                                                                                     | 0.00003-0.00010   | 0.0002-0.0005     |                                                                                                                          | 2*                   |
|                    | Pr       | 7440-10-0 |                                                                                                     | 0.00001-0.0001    | 0.0002-0.0005     |                                                                                                                          | 2                    |
|                    | Nd       | 7440-00-8 |                                                                                                     | 0.00004-0.0001    | 0.0002-0.0005     |                                                                                                                          | 2*                   |
|                    | Sm       | 7440-19-9 |                                                                                                     | 0.00001-0.0001    | 0.0002-0.0005     |                                                                                                                          | 2*                   |
|                    | Eu       | 7440-53-1 |                                                                                                     | 0.00005-0.0001    | 0.0002-0.0005     |                                                                                                                          | 2*                   |
|                    | Gd       | 7440-54-2 |                                                                                                     | 0.00005-0.0001    | 0.0002-0.0005     |                                                                                                                          | 2*                   |
|                    | Tb       | 7440-27-9 |                                                                                                     | 0.00001-0.0001    | 0.0002-0.0005     |                                                                                                                          | 2*                   |
|                    | Dy       | 7429-91-6 |                                                                                                     | 0.00001-0.0001    | 0.0002-0.0005     |                                                                                                                          | 2*                   |
|                    | Ho       | 7440-60-0 |                                                                                                     | 0.00001-0.0001    | 0.0002-0.0005     |                                                                                                                          | 2*                   |
|                    | Er       | 7440-52-0 |                                                                                                     | 0.00001-0.0001    | 0.0002-0.0005     |                                                                                                                          | 2*                   |
|                    | Tm       | 7440-30-4 |                                                                                                     | 0.00001-0.0001    | 0.0002-0.0005     |                                                                                                                          | 2*                   |
|                    | Yb       | 7440-64-0 |                                                                                                     | 0.00001-0.0001    | 0.0002-0.0005     |                                                                                                                          | 2*                   |
|                    | Lu       | 7439-94-3 |                                                                                                     | 0.00001-0.0001    | 0.0002-0.0005     |                                                                                                                          | 2*                   |

| Parameter group | Compound | Cas no    | Blank | LOD range (mg/kg) | LOQ range (mg/kg) | Method                                                                                                                                                  | Uncertainty category |
|-----------------|----------|-----------|-------|-------------------|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
|                 | Pb       | 7439-92-1 |       | 0.0001-0.0003     | 0.0005-0.001      |                                                                                                                                                         | 1                    |
|                 | Hg       | 7439-97-6 |       | 0.0002-0.0004     | 0.0007-0.001      | In-house accredited method. Microwave assisted decomposition with HNO <sub>3</sub> . Digestate stabilized with HCl. Analysed by ICP-MS (Agilent 7700x). | 1                    |

\*Not accredited

Table 6 cont. Method information. Metals cont.

| Parameter group | Compound | Cas no    | Blank                                                                                               | LOD range (mg/kg) | LOQ range (mg/kg) | Method                                                                                                                   | Uncertainty category |
|-----------------|----------|-----------|-----------------------------------------------------------------------------------------------------|-------------------|-------------------|--------------------------------------------------------------------------------------------------------------------------|----------------------|
| Metals<br>Biota | Sc       | 7440-20-2 | Method blanks following sample series. LOD/LOQ based on calculation of 3 and 10 stddev respectively | 0.0001-0.002      | 0.0005-0.001      | In-house accredited method. Microwave assisted decomposition with HNO <sub>3</sub> . Analysed by ICP-MS (Agilent 7700x). | 2                    |
|                 | Cr       | 7440-47-3 |                                                                                                     | 0.002-0.004       | 0.007-0.009       |                                                                                                                          | 1                    |
|                 | Fe       | 7439-89-6 |                                                                                                     | 0.002-0.01        | 0.02-0.1          |                                                                                                                          | 1                    |
|                 | Ni       | 7440-02-0 |                                                                                                     | 0.004-0.006       | 0.01-0.03         |                                                                                                                          | 1                    |
|                 | Cu       | 7440-50-8 |                                                                                                     | 0.0005-0.001      | 0.002-0.005       |                                                                                                                          | 1                    |
|                 | Zn       | 7440-66-6 |                                                                                                     | 0.002-0.005       | 0.01-0.05         |                                                                                                                          | 1                    |
|                 | As       | 7440-38-2 |                                                                                                     | 0.0007-0.0009     | 0.004-0.006       |                                                                                                                          | 1                    |
|                 | Y        | 7440-65-5 |                                                                                                     | 0.00005-0.0001    | 0.0002-0.0005     |                                                                                                                          | 2*                   |
|                 | Ag       | 7440-22-4 |                                                                                                     | 0.0004-0.0007     | 0.0005-0.001      |                                                                                                                          | 1*                   |
|                 | Cd       | 7440-43-9 |                                                                                                     | 0.0001-0.0004     | 0.0005-0.001      |                                                                                                                          | 1                    |
|                 | Sn       | 7440-31-5 |                                                                                                     | 0.0005-0.001      | 0.002-0.005       |                                                                                                                          | 2*                   |
|                 | Sb       | 7440-36-0 |                                                                                                     | 0.0002-0.0004     | 0.0007-0.001      |                                                                                                                          | 1                    |
|                 | La       | 7439-91-0 |                                                                                                     | 0.00003-0.0001    | 0.0002-0.0005     |                                                                                                                          | 2                    |
|                 | Ce       | 7440-00-8 |                                                                                                     | 0.00003-0.00010   | 0.0002-0.0005     |                                                                                                                          | 2*                   |
|                 | Pr       | 7440-10-0 |                                                                                                     | 0.00001-0.0001    | 0.0002-0.0005     |                                                                                                                          | 2                    |
|                 | Nd       | 7440-00-8 |                                                                                                     | 0.00004-0.0001    | 0.0002-0.0005     |                                                                                                                          | 2*                   |
|                 | Sm       | 7440-19-9 |                                                                                                     | 0.00001-0.0001    | 0.0002-0.0005     |                                                                                                                          | 2*                   |
|                 | Eu       | 7440-53-1 |                                                                                                     | 0.00005-0.0001    | 0.0002-0.0005     |                                                                                                                          | 2*                   |
|                 | Gd       | 7440-53-2 |                                                                                                     | 0.00005-0.0001    | 0.0002-0.0005     |                                                                                                                          | 2*                   |
|                 | Tb       | 7440-27-9 |                                                                                                     | 0.00001-0.0001    | 0.0002-0.0005     |                                                                                                                          | 2*                   |
|                 | Dy       | 7429-91-6 |                                                                                                     | 0.00001-0.0001    | 0.0002-0.0005     |                                                                                                                          | 2*                   |
|                 | Ho       | 7440-60-0 |                                                                                                     | 0.00001-0.0001    | 0.0002-0.0005     |                                                                                                                          | 2*                   |
|                 | Er       | 7440-52-0 |                                                                                                     | 0.00001-0.0001    | 0.0002-0.0005     |                                                                                                                          | 2*                   |
|                 | Tm       | 7440-28-0 |                                                                                                     | 0.00001-0.0001    | 0.0002-0.0005     |                                                                                                                          | 2*                   |
|                 | Yb       | 7440-64-0 |                                                                                                     | 0.00001-0.0001    | 0.0002-0.0005     |                                                                                                                          | 2*                   |
|                 | Lu       | 7439-94-3 |                                                                                                     | 0.00001-0.0001    | 0.0002-0.0005     |                                                                                                                          | 2*                   |

| Parameter group | Compound | Cas no    | Blank | LOD range (mg/kg) | LOQ range (mg/kg) | Method                                                                                                                                                  | Uncertainty category |
|-----------------|----------|-----------|-------|-------------------|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
|                 | Pb       | 7439-92-1 |       | 0.0003-0.0005     | 0.0008-0.002      |                                                                                                                                                         | 1                    |
|                 | Hg       | 7439-97-6 |       | 0.0002-0.0004     | 0.0007-0.001      | In-house accredited method. Microwave assisted decomposition with HNO <sub>3</sub> . Digestate stabilized with HCl. Analysed by ICP-MS (Agilent 7700x). | 1                    |

\*Not accredited

Table 6 cont. Method information. PCBs and organochlorines.

| Parameter group | Name parameter | Cas no     | Blank                                                                                               | LOD range ng/g | LOQ range ng/g | Method                                                                                                                                                                                                | Uncertainty category | Stable isotope labeled (SIL) analogue |
|-----------------|----------------|------------|-----------------------------------------------------------------------------------------------------|----------------|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|---------------------------------------|
| PCB/HCB         | PECB           | 608-93-5   | Method blanks following sample series. LOD/LOQ based on calculation of 3 and 10 stddev respectively | 0.01-0.2       | 0.02-0.5       | In-house, accredited method for PCB, PeCB and HCB. Internal standard addition, extraction, GPC and/or H <sub>2</sub> SO <sub>4</sub> cleanup followed by adsorption chromatography. GC/HRMS (autspec) | 1                    | Y                                     |
|                 | HCB            | 118-74-1   |                                                                                                     | 0.01-0.1       | 0.03-0.3       |                                                                                                                                                                                                       | 1                    | Y                                     |
|                 | HCBd           | 87-68-3    |                                                                                                     | 0.1-0.3        | 0.3-1          |                                                                                                                                                                                                       | 3                    | N                                     |
|                 | PCB 28         | 7012-37-5  |                                                                                                     | 0.005-0.02     | 0.01-0.05      |                                                                                                                                                                                                       | 1                    | Y                                     |
|                 | PCB 52         | 35693-99-3 |                                                                                                     | 0.009-0.04     | 0.03-0.1       |                                                                                                                                                                                                       | 1                    | Y                                     |
|                 | PCB 101        | 37680-73-2 |                                                                                                     | 0.01-0.04      | 0.03-0.1       |                                                                                                                                                                                                       | 1                    | Y                                     |
|                 | PCB 118        | 31508-00-6 |                                                                                                     | 0.007-0.04     | 0.02-0.05      |                                                                                                                                                                                                       | 1                    | Y                                     |
|                 | PCB 138        | 35065-28-2 |                                                                                                     | 0.01-0.04      | 0.03-0.1       |                                                                                                                                                                                                       | 1                    | Y                                     |
|                 | PCB 153        | 35065-27-1 |                                                                                                     | 0.01-0.05      | 0.03-0.1       |                                                                                                                                                                                                       | 1                    | Y                                     |
|                 | PCB 180        | 35065-29-3 |                                                                                                     | 0.01-0.02      | 0.04-0.05      |                                                                                                                                                                                                       | 1                    | Y                                     |

Table 6 cont. Method information. Dechloranes

| Parameter group | Name compound        | Cas no      | Blank                                                                                               | LOD range ng/g | LOQ range ng/g | Method                                                                                                                              | Uncertainty category | Stable isotope labeled (SIL) analogue |
|-----------------|----------------------|-------------|-----------------------------------------------------------------------------------------------------|----------------|----------------|-------------------------------------------------------------------------------------------------------------------------------------|----------------------|---------------------------------------|
| Dechlorane      | Dibromoaldrin        | 20389-65-5  | Method blanks following sample series. LOD/LOQ based on calculation of 3 and 10 stddev respectively | 0.1-0.7        | 0.3-1.7        | In-house method. Internal standard addition, extraction, GPC cleanup followed by adsorption chromatography. GC/MS-qToF 7200 in ECNI | 2                    | N                                     |
|                 | Dechlorane 602       | 31107-44-5  |                                                                                                     | 0.01-0.1       | 0.03-0.3       |                                                                                                                                     | 2                    | Y                                     |
|                 | Dechlorane 603       | 13560-92-4  |                                                                                                     | 0.01-0.        | 0.03-2         |                                                                                                                                     | 2                    | N                                     |
|                 | Dechlorane 604       | 34571-16-9  |                                                                                                     | 0.2-1.4        | 0.7-4.6        |                                                                                                                                     | 2                    | N                                     |
|                 | Dechlorane 601       | 13560-90-2  |                                                                                                     | 0.02-0.1       | 0.07-0.3       |                                                                                                                                     | 2                    | N                                     |
|                 | Dechlorane plus syn  | 135821-03-3 |                                                                                                     | 0.03-0.1       | 0.1-0.3        |                                                                                                                                     | 2                    | Y                                     |
|                 | Dechlorane plus anti | 135821-74-8 |                                                                                                     | 0.04-0.2       | 0.2-0.7        |                                                                                                                                     | 2                    | N                                     |

Table 6 cont. Method information. Chlorinated paraffins.

| Parameter group | Name parameter | Cas no     | Blank                                                                                                                                                                                                                                                                      | LOD range ng/g | LOQ range ng/g | Method                                                                                                                                                                 | Uncertainty category | Stable isotope labeled (SIL) analogue |
|-----------------|----------------|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|---------------------------------------|
| CP              | SCCP           | 85535-84-8 | Method blanks following sample series. S, M and LCCP are corrected for blanks prior to deconvolution. Results are corrected for blanks. Blanks are subtracted on congener group level prior to deconvolution. LOD/LOQ based on calculation of 3 and 10 stddev respectively | 15-30          |                | In-house method. Internal standard addition, extraction, H <sub>2</sub> SO <sub>4</sub> cleanup followed by adsorption chromatography.                                 | 3                    | <sup>13</sup> C-hexachlorodecane      |
|                 | MCCP           | 85535-85-9 |                                                                                                                                                                                                                                                                            | 23-49          |                | In some cases with high levels of sulfur and/or PCB an additional cleanup with florsil is needed. GC-qToF 7200 in ECNI                                                 | 3                    |                                       |
|                 | LCCP           | 85535-86-0 |                                                                                                                                                                                                                                                                            | 0.4-3          |                | In-house method. Internal standard addition, extraction, GPC and/or H <sub>2</sub> SO <sub>4</sub> cleanup followed by adsorption chromatography. Agilent LC-qToF 6546 | 3                    |                                       |

Table 6 cont. Method information. Phthalates.

| Parameter group    | Compound                | Cas no     | Blank                                                                                                                                                 | LOD range (ng/g) | LOQ range (ng/g) | Method                                                                                                                                                                                                                                                                                                                                                                                        | Uncertainty category | Stable isotope labeled (SIL) analogue |
|--------------------|-------------------------|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|---------------------------------------|
| Phthalate sediment | BMEP                    | 117-82-8   | Three blanks pr batch. Blank subtraction for each batch based on the blank average. LOD and LOQ calculated from 3 x stdev and 10 x stdev. From blanks | <5               | <15              | 2-5 g of sediment was dried overnight and 2 g of dry material and deuterated internal standard was added and was taken for extraction with acetone using vortex and sonication for 10min (done three times). Samples were evaporated and added water. Samples were cleaned up on SPE-HLB and evaporated and transferred to analytical glass. Recovery standard added and analysis on LC-HRMS. | 2                    | N                                     |
|                    | DEP                     | 84-66-2    |                                                                                                                                                       | <5               | <15              |                                                                                                                                                                                                                                                                                                                                                                                               | 2                    | Y                                     |
|                    | BEEP                    | 605-54-9   |                                                                                                                                                       | <5               | <15              |                                                                                                                                                                                                                                                                                                                                                                                               | 2                    | N                                     |
|                    | DIBP                    | 84-69-5    |                                                                                                                                                       | <5               | <15              |                                                                                                                                                                                                                                                                                                                                                                                               | 2                    | Y                                     |
|                    | DNBP                    | 84-74-2    |                                                                                                                                                       | <5               | <15              |                                                                                                                                                                                                                                                                                                                                                                                               | 2                    | Y                                     |
|                    | BBP                     | 85-68-7    |                                                                                                                                                       | <5               | <15              |                                                                                                                                                                                                                                                                                                                                                                                               | 2                    | N                                     |
|                    | BnBP                    | 117-83-9   |                                                                                                                                                       | <5               | <15              |                                                                                                                                                                                                                                                                                                                                                                                               | 2                    | N                                     |
|                    | DCHP                    | 84-61-7    |                                                                                                                                                       | <1               | <3               |                                                                                                                                                                                                                                                                                                                                                                                               | 2                    | Y                                     |
|                    | DPP (Dipentylphthalate) | 131-18-0   |                                                                                                                                                       | <5               | <15              |                                                                                                                                                                                                                                                                                                                                                                                               | 2                    | N                                     |
|                    | DMPP                    | 84-63-9    |                                                                                                                                                       | <5               | <15              |                                                                                                                                                                                                                                                                                                                                                                                               | 2                    | N                                     |
|                    | DHxP                    | 84-75-3    |                                                                                                                                                       | <5               | <15              |                                                                                                                                                                                                                                                                                                                                                                                               | 2                    | Y                                     |
|                    | DEHP                    | 117-81-7   |                                                                                                                                                       | <5               | <15              |                                                                                                                                                                                                                                                                                                                                                                                               | 2                    | Y                                     |
|                    | DOP                     | 117-84-0   |                                                                                                                                                       | <5               | <15              |                                                                                                                                                                                                                                                                                                                                                                                               | 2                    | N                                     |
|                    | DINP                    | 28553-12-0 |                                                                                                                                                       | <30              | <90              |                                                                                                                                                                                                                                                                                                                                                                                               | 2                    | N                                     |
|                    | DIDP                    | 26761-40-0 |                                                                                                                                                       | <30              | <90              |                                                                                                                                                                                                                                                                                                                                                                                               | 2                    | N                                     |
|                    | DIUP                    | 85507-79-5 |                                                                                                                                                       | <30              | <90              |                                                                                                                                                                                                                                                                                                                                                                                               | 2                    | N                                     |
|                    | DMP                     | 131-11-3   |                                                                                                                                                       | <15              | <45              |                                                                                                                                                                                                                                                                                                                                                                                               | 2                    | N                                     |
|                    | DAIP                    | 131-17-9   |                                                                                                                                                       | <5               | <15              |                                                                                                                                                                                                                                                                                                                                                                                               | 2                    | N                                     |
|                    | DPP (Dipropylphthalate) | 131-16-8   |                                                                                                                                                       | <20              | <60              |                                                                                                                                                                                                                                                                                                                                                                                               | 2                    | N                                     |

Table 6 cont. Method information. OPFRs.

| Parameter group | Name of parameter | Cas no     | Blank                                                                                                                                                  | LOD range (ng/g) | LOQ range (ng/g) | Method                                                                                                                                                                                                                                                                                                                                                                                        | Uncertainty category | Stable isotope labeled (SIL) analogue |
|-----------------|-------------------|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|---------------------------------------|
| OPFR sediment   | TEP               | 78-40-0    | Three blanks per batch. Blank subtraction for each batch based on the blank average. LOD and LOQ calculated from 3 x stdev and 10 x stdev. From blanks | 1-5              | 5-10             | 2-5 g of sediment was dried overnight and 2 g of dry material and deuterated internal standard was added and was taken for extraction with acetone using vortex and sonication for 10min (done three times). Samples were evaporated and added water. Samples were cleaned up on SPE-HLB and evaporated and transferred to analytical glass. Recovery standard added and analysis on LC-MSMS. | 2                    | Y                                     |
|                 | TCEP              | 115-96-8   |                                                                                                                                                        | <0.1             | <0.3             |                                                                                                                                                                                                                                                                                                                                                                                               | 2                    | Y                                     |
|                 | TPrP              | 513-08-6   |                                                                                                                                                        | <0.1             | <0.3             |                                                                                                                                                                                                                                                                                                                                                                                               | 2                    | N                                     |
|                 | TCPP              | 13674-84-5 |                                                                                                                                                        | 0.5-2            | 2-5              |                                                                                                                                                                                                                                                                                                                                                                                               | 2                    | Y                                     |
|                 | TiBP              | 126-71-6   |                                                                                                                                                        | 0.5-2            | 2-3              |                                                                                                                                                                                                                                                                                                                                                                                               | 2                    | Y                                     |
|                 | BdPhP             | 2752-95-6  |                                                                                                                                                        | <0.1             | <0.3             |                                                                                                                                                                                                                                                                                                                                                                                               | 2                    | N                                     |
|                 | DBPhP             | 2528-36-1  |                                                                                                                                                        | <0.1             | <0.3             |                                                                                                                                                                                                                                                                                                                                                                                               | 2                    | N                                     |
|                 | TPhP              | 115-86-6   |                                                                                                                                                        | 0.2-1            | 1-2              |                                                                                                                                                                                                                                                                                                                                                                                               | 2                    | Y                                     |
|                 | TnBP              | 126-73-8   |                                                                                                                                                        | 0.2-1            | 1-2              |                                                                                                                                                                                                                                                                                                                                                                                               | 2                    | Y                                     |
|                 | TDCP              | 13674-87-8 |                                                                                                                                                        | <0.1             | <0.3             |                                                                                                                                                                                                                                                                                                                                                                                               | 2                    | Y                                     |
|                 | TBEP              | 78-51-3    |                                                                                                                                                        | <0.1             | <0.3             |                                                                                                                                                                                                                                                                                                                                                                                               | 2                    | N                                     |
|                 | TCP               | 1330-78-5  |                                                                                                                                                        | 0.5-2            | 2-3              |                                                                                                                                                                                                                                                                                                                                                                                               | 2                    | N                                     |
|                 | EHDPP             | 1241-94-7  |                                                                                                                                                        | 0.5-2            | 2-3              |                                                                                                                                                                                                                                                                                                                                                                                               | 2                    | N                                     |
|                 | TEHP              | 78-42-2    |                                                                                                                                                        | 0.5-2            | 2-3              |                                                                                                                                                                                                                                                                                                                                                                                               | 2                    | Y                                     |
|                 | TIPPP/T4IPP       | 26967-76-0 |                                                                                                                                                        | 0.5-2            | 2-3              |                                                                                                                                                                                                                                                                                                                                                                                               | 2                    | Y                                     |
|                 | TTBPP             | 78-33-1    |                                                                                                                                                        | <1               | <3               |                                                                                                                                                                                                                                                                                                                                                                                               | 2                    | N                                     |
|                 | TDTBPP            | 95906-11-9 |                                                                                                                                                        | <50              | <150             |                                                                                                                                                                                                                                                                                                                                                                                               | 2                    | N                                     |
|                 | TPPT              | 957-82-0   |                                                                                                                                                        | <0.1             | <0.3             |                                                                                                                                                                                                                                                                                                                                                                                               | 2                    | N                                     |

Table 6 cont. Method information. Siloxanes.

| Parameter group              | Name parameter                     | Cas nr    | Blank                                                                                                                                                 | LOQ range<br>ng/g | Method                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Uncertainty<br>category | Stable isotope<br>labeled (SIL)<br>analogue |
|------------------------------|------------------------------------|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------------------------------|
| Siloxanes,<br>biota/sediment | D4 - octamethylcyclotetrasiloxane  | 556-67-2  | Three blanks per<br>batch. Blank<br>subtraction for each<br>batch based on the<br>blank average.<br>LOQ calculated from<br>10 x stdev. From<br>blanks | <2.833            | To 1-2 g of sample, <sup>13</sup> C D4, D5<br>and D6 were added as internal<br>standard, followed by addition<br>of acetonitrile and hexane.<br>Ultrasonic bath and shaking<br>before centrifugation. No<br>further cleanup. Recovery<br>standard added to a sub sample<br>before analysis on GC/MSD. As<br>described in previous<br>MILFERSK/Urban fjord reports.<br>No standard was available for<br>L9-L10, and we used a crude<br>product to estimate the<br>retention time and transitions. | 2                       | Y                                           |
|                              | D5 - decamethylcyclopentasiloxane  | 541-02-6  |                                                                                                                                                       | <1.388            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 2                       | Y                                           |
|                              | D6 - dodecamethylcyclohexasiloxane | 540-97-6  |                                                                                                                                                       | <0.167            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 2                       | Y                                           |
|                              | M3T (Ph)                           | 2116-84-9 |                                                                                                                                                       | <0.434            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 2                       | N                                           |
|                              | L3 - octamethyltrisiloxane         | 107-51-7  |                                                                                                                                                       | <1                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 2                       | N                                           |
|                              | L4 - decamethyltetrasiloxane       | 141-62-8  |                                                                                                                                                       | <0.38             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 2                       | N                                           |
|                              | L5 - dodecamethylpentasiloxane     | 141-63-9  |                                                                                                                                                       | <2.42             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 2                       | N                                           |
|                              | L6 - tetradecamethylhexasiloxane   | 107-52-8  |                                                                                                                                                       | <0.878            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 3                       | N                                           |
|                              | L7 - hexadecamethylheptasiloxane   | 541-01-5  |                                                                                                                                                       | <0.352            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 3                       | N                                           |
|                              | L8 - octadecamethyloctasiloxane    | 556-69-4  |                                                                                                                                                       | <0.388            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 3                       | N                                           |
|                              | L9 – eicosamethylnonasiloxane *    | 2652-13-3 |                                                                                                                                                       | <1                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 3                       | N                                           |
|                              | L10 – docosamethyldecasiloxane *   | 556-70-7  |                                                                                                                                                       | <1                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 3                       | N                                           |

\* No standard available

Table 6 cont. Method information. Musks.

| Parameter group     | Name parameter   | Cas nr     | Blank                                                                                                                                                                                                                                                                                                                                                                                              | LOQ range ng/g | Method                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Uncertainty category | Stable isotope labeled (SIL) analogue |
|---------------------|------------------|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|---------------------------------------|
| Musk sediment/biota | Traseolide       | 68140-48-7 | <p>Sediment/Biota: One laboratory blank was prepared alongside each batch of ~6 samples.</p> <p>For all samples, LODs were calculated by 3xSD of the associated laboratory blanks. Where compounds were not present in the laboratory blanks, sample/calibration standard peaks with signal:noise ratios of ~3:1 were converted to a sample concentration using the average blank volume/mass.</p> | <4.51          | <p>Sediment/Biota: 1 g sample was mixed with Na<sub>2</sub>SO<sub>4</sub>. extracted via sonication with 2x 10 mL of acetone:hexane (1:1). After concentration. the extract was cleaned-up with EZ-POP SPE and concentrated.</p> <p>For all samples. d11-Tonalide was added as the internal standard prior to extraction and <sup>13</sup>C-PCB-159 was added as the recovery standard immediately prior to analysis on a GC-MS/MS with EI ionisation.</p> | 3                    | N                                     |
|                     | Phantolide       | 15323-35-0 |                                                                                                                                                                                                                                                                                                                                                                                                    | <1.96          |                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 3                    | N                                     |
|                     | Otne/Iso-E-super | 54464-57-2 |                                                                                                                                                                                                                                                                                                                                                                                                    | <4.88          |                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 3                    | N                                     |
|                     | Acetyl cedrene   | 32388-55-9 |                                                                                                                                                                                                                                                                                                                                                                                                    | <8.74          |                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 3                    | N                                     |
|                     | Galaxolide       | 1222-05-5  |                                                                                                                                                                                                                                                                                                                                                                                                    | <1.29          |                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 3                    | N                                     |
|                     | AHMT/Tonalide    | 21145-77-7 |                                                                                                                                                                                                                                                                                                                                                                                                    | <0.52          |                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 3                    | Y                                     |
|                     | Celestolide      | 13171-00-1 |                                                                                                                                                                                                                                                                                                                                                                                                    | <2.57          |                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 3                    | N                                     |

Table 6 cont. Method information. Phenolic compounds.

| Parameter group          | Name parameter                | Cas nr               | Blank                                                                                                                                                | Method                                                                                                                                                                              | LOD (ng/g) | LOQ (ng/g) | Uncertainty category | Stable isotope labelled (SIL) analogue |
|--------------------------|-------------------------------|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------------|----------------------|----------------------------------------|
| Bisphenols               | 4,4-bisphenol A               | 80-05-7              | Method blanks following sample series. LOD/LOQ based on calculation of 3 and 10 stdev respectively (or instrument detection limit if this is higher) | In-house method. Internal standard addition, accelerated solvent extraction (ASE) or supramolecular solvent extraction (SUPRAS), solid phase extraction cleanup. LC/HRMS (Orbitrap) | 1.3        | 4          | 3                    | Y                                      |
|                          | 2,4-bisphenol A               | 837-08-1             |                                                                                                                                                      |                                                                                                                                                                                     | 0.3        | 1          | 3                    | N                                      |
|                          | bisphenol G                   | 127-54-8             |                                                                                                                                                      |                                                                                                                                                                                     | 0.2        | 0,7        | 3                    | N                                      |
|                          | 4,4-Bisphenol S               | 80-09-1              |                                                                                                                                                      |                                                                                                                                                                                     | 0.5        | 1,7        | 3                    | Y                                      |
|                          | 2,4-bisphenol S               | 5397-34-2            |                                                                                                                                                      |                                                                                                                                                                                     | 0.2        | 0,7        | 3                    | Y                                      |
|                          | 4,4-bisphenol F               | 620-92-8             |                                                                                                                                                      |                                                                                                                                                                                     | 0.7        | 2.3        | 3                    | Y                                      |
|                          | 2,4-bisphenol F               | 2467-03-0            |                                                                                                                                                      |                                                                                                                                                                                     | 0.9        | 3          | 3                    | N                                      |
|                          | Bisphenol P                   | 2167-51-3            |                                                                                                                                                      |                                                                                                                                                                                     | 0.3        | 1          | 3                    | Y                                      |
|                          | Bisphenol Z                   | 843-55-0             |                                                                                                                                                      |                                                                                                                                                                                     | 0.1        | 0,3        | 3                    | Y                                      |
|                          | TBBPA                         | 79-94-7              |                                                                                                                                                      |                                                                                                                                                                                     | 2          | 7          | 3                    | Y                                      |
|                          | Bisphenol TMC                 | 129188-99-4          |                                                                                                                                                      |                                                                                                                                                                                     | 0,3        | 1          | 3                    | N                                      |
|                          | Bisphenol FL                  | 3236-71-3            |                                                                                                                                                      |                                                                                                                                                                                     | 0,3        | 1          | 3                    | N                                      |
|                          | Bisphenol M                   | 13595-25-0           |                                                                                                                                                      |                                                                                                                                                                                     | 0.2        | 0,7        | 3                    | N                                      |
|                          | Bisphenol AF                  | 1478-61-1            |                                                                                                                                                      |                                                                                                                                                                                     | 0.1        | 0,3        | 3                    | Y                                      |
|                          | Bisphenol AP                  | 1571-75-1            |                                                                                                                                                      |                                                                                                                                                                                     | 0.2        | 0,7        | 3                    | N                                      |
|                          | Biosphenol E                  | 2081-08-5            |                                                                                                                                                      |                                                                                                                                                                                     | 0.1        | 0,3        | 3                    | N                                      |
|                          | Biosphenol B                  | 77-40-7              |                                                                                                                                                      |                                                                                                                                                                                     | 0.1        | 0,3        | 3                    | Y                                      |
| Alkylphenols             | 4-tert-octylphenol            | 140-66-9             |                                                                                                                                                      |                                                                                                                                                                                     | 1          | 3          | 3                    | Y                                      |
|                          | Dodecylphenol (branched)      | 27193-86-8           |                                                                                                                                                      |                                                                                                                                                                                     | 0.2        | 0,7        | 3                    | N                                      |
|                          | 4-octylphenol                 | 1806-26-4            |                                                                                                                                                      |                                                                                                                                                                                     | 0.2        | 0,7        | 3                    | N                                      |
|                          | Nonylphenol (branched/linear) | 84852-15-3, 104-40-5 |                                                                                                                                                      |                                                                                                                                                                                     | 14-100     | 46-330     | 3                    | N                                      |
| Other phenolic compounds | MB1                           | 118-82-1             |                                                                                                                                                      | In-house method. Internal standard addition, extraction. HRMS                                                                                                                       | 5          | 17         | 3                    | N                                      |

## 4 Appendix

Three electronic appendices are also associated with this report:

1. Concentrations of all compounds/isomers in all matrices (n, mean, median, min, max, LoQ and number of detected are presented).
2. Median concentrations of all compounds/isomers in all matrices, compared (cross table). Two tables where (a.) medians are calculated with non-detected compounds assigned a value of zero (0) and (b.) medians are calculated from concentrations >LoQ only.
3. Additional figures:  $\delta^{15}\text{N}$  vs length in cod and herring, as well as all concentrations in all samples presented in bar plots.

**Table 7. Analytes and support parameters analysed/evaluated in this study.**

| Substances                                                                 | Abbreviation | CAS       |
|----------------------------------------------------------------------------|--------------|-----------|
| <b><i>Metals</i></b>                                                       |              |           |
| Mercury                                                                    | Hg           | 7439-97-6 |
| Chromium                                                                   | Cr           | 7440-47-3 |
| Iron                                                                       | Fe           | 7439-89-6 |
| Nickel                                                                     | Ni           | 7440-02-0 |
| Copper                                                                     | Cu           | 7440-50-8 |
| Zinc                                                                       | Zn           | 7440-66-6 |
| Arsenic                                                                    | As           | 7440-38-2 |
| Yttrium                                                                    | Y            | 7440-65-5 |
| Silver                                                                     | Ag           | 7440-22-4 |
| Cadmium                                                                    | Cd           | 7440-43-9 |
| Antimony                                                                   | Sb           | 7440-36-0 |
| Tin                                                                        | Sn           | 7440-31-5 |
| Lead                                                                       | Pb           | 7439-92-1 |
| Scandium                                                                   | Sc           | 7440-20-2 |
| Lanthanum                                                                  | La           | 7439-91-0 |
| Cerium                                                                     | Ce           | 7440-45-1 |
| Praeseodymium                                                              | Pr           | 7440-10-0 |
| Neodymium                                                                  | Nd           | 7440-00-8 |
| Samarium                                                                   | Sm           | 7440-19-9 |
| Europium                                                                   | Eu           | 7440-53-1 |
| Gadolinium                                                                 | Gd           | 7440-54-2 |
| Terbium                                                                    | Tb           | 7440-27-9 |
| Dysprosium                                                                 | Dy           | 7429-91-6 |
| Holmium                                                                    | Ho           | 7440-60-0 |
| Erbium                                                                     | Er           | 7440-52-0 |
| Thulium                                                                    | Tm           | 7440-30-4 |
| Ytterbium                                                                  | Yb           | 7440-64-4 |
| Lutetium                                                                   | Lu           | 7439-94-3 |
| <b><i>Siloxanes</i></b>                                                    |              |           |
| 2,2,4,4,6,6,8,8-Octamethyl-1,3,5,7,2,4,6,8-tetroxatetrasiloxane            | D4           | 556-67-2  |
| 2,2,4,4,6,6,8,8,10,10-Decamethyl-1,3,5,7,9,2,4,6,8,10-pentoxapentasiloxane | D5           | 541-02-6  |
| Dodecamethylcyclohexasiloxane                                              | D6           | 540-97-6  |
| tris(trimethylsiloxy)phenylsilane                                          | M3T (Ph)     | 2116-84-9 |
| Octamethyltrisiloxane (L3)                                                 | L3           | 107-51-7  |
| Decamethyltetrasiloxane (L4)                                               | L4           | 141-62-8  |
| Dodecamethylpentasiloxane (L5)                                             | L5           | 141-63-9  |
| Tetradecamethylhexasiloxane (L6)                                           | L6           | 107-52-8  |
| Hexadecamethylheptasiloxane (L7)                                           | L7           | 541-01-5  |

|                                                  |         |            |
|--------------------------------------------------|---------|------------|
| Octadecamethyloctasiloxane (L8)                  | L8      | 556-69-4   |
| Eicosamethylnonasiloxane (L9)                    | L9      | 2652-13-3  |
| Docosamethyldecasiloxane (L10)                   | L10     | 556-70-7   |
| <b>Polychlorinated biphenyls (PCB)</b>           |         |            |
| 2,2',5-Trichlorobiphenyl                         | PCB 18  | 37680-65-2 |
| 2,4,4'-Trichlorobiphenyl                         | PCB 28  | 7012-37-5  |
| 2,4',5-Trichlorobiphenyl                         | PCB 31  | 16606-02-3 |
| 2,3',4'-Trichlorobiphenyl                        | PCB 33  | 38444-86-9 |
| 3,4,4'-Trichlorobiphenyl                         | PCB 37  | 38444-90-5 |
| 2,2',4,4'-Tetrachlorobiphenyl                    | PCB 47  | 2437-79-8  |
| 2,2',5,5'-Tetrachlorobiphenyl                    | PCB 52  | 35693-99-3 |
| 2,3',4,4'-Tetrachlorobiphenyl                    | PCB 66  | 32598-10-0 |
| 2,4,4',5-Tetrachlorobiphenyl                     | PCB 74  | 32690-93-0 |
| 2,2',4,4',5-Pentachlorobiphenyl                  | PCB 99  | 38380-01-7 |
| 2,2',4,5,5'-Pentachlorobiphenyl                  | PCB 101 | 37680-73-2 |
| 2,3,3',4,4'-Pentachlorobiphenyl                  | PCB 105 | 32598-14-4 |
| 2,3,4,4',5-Pentachlorobiphenyl                   | PCB 114 | 74472-37-0 |
| 2,3',4,4',5-Pentachlorobiphenyl                  | PCB 118 | 31508-00-6 |
| 2,3',4,4',5'-Pentachlorobiphenyl                 | PCB 123 | 65510-44-3 |
| 2,2',3,3',4,4'-Hexachlorobiphenyl                | PCB 128 | 38380-07-3 |
| 2,2',3,4,4',5'-Hexachlorobiphenyl                | PCB 138 | 35065-28-2 |
| 2,2',3,4,5,5'-Hexachlorobiphenyl                 | PCB 141 | 52712-04-6 |
| 2,2',3,4',5',6-Hexachlorobiphenyl                | PCB 149 | 38380-04-0 |
| 2,2',4,4',5,5'-Hexachlorobiphenyl                | PCB 153 | 35065-27-1 |
| 2,3,3',4,4',5-Hexachlorobiphenyl                 | PCB 156 | 38380-08-4 |
| 2,3,3',4,4',5'-Hexachlorobiphenyl                | PCB 157 | 69782-90-7 |
| 2,3',4,4',5,5'-Hexachlorobiphenyl                | PCB 167 | 52663-72-6 |
| 2,2',3,3',4,4',5-Heptachlorobiphenyl             | PCB 170 | 35065-30-6 |
| 2,2',3,4,4',5,5'-Heptachlorobiphenyl             | PCB 180 | 35065-29-3 |
| 2,2',3,4,4',5',6-Heptachlorobiphenyl             | PCB 183 | 52663-69-1 |
| 2,2',3,4',5,5',6-Heptachlorobiphenyl             | PCB 187 | 52663-68-0 |
| 2,3,3',4,4',5,5'-Heptachlorobiphenyl             | PCB 189 | 39635-31-9 |
| 2,2',3,3',4,4',5,5'-Octachlorobiphenyl           | PCB 194 | 35694-08-7 |
| 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl         | PCB 206 | 40186-72-9 |
| Decachlorobiphenyl                               | PCB 209 | 2051-24-3  |
| <b>Organochlorines</b>                           |         |            |
| Pentachlorobenzene                               | PCB     | 608-93-5   |
| Hexachlorobenzene                                | HCB     | 118-74-1   |
| Hexachlorobutadiene                              | HCBD    | 87-68-3    |
| <b>Organophosphorus Flame Retardants (OPFRs)</b> |         |            |
| Triethyl phosphate                               | TEP     | 78-40-0    |
| Tris(2-chloroethyl) phosphate                    | TCEP    | 115-96-8   |
| Tripropyl phosphate                              | TPrP    | 513-08-6   |
| Tris(1-chloropropyl) phosphate                   | TCPP    | 13674-84-5 |
| Triisobutyl phosphate                            | TiBP    | 126-71-6   |

|                                                                      |                                    |                                   |
|----------------------------------------------------------------------|------------------------------------|-----------------------------------|
| Butyl diphenyl phosphate                                             | BdPhP                              | 2752-95-6                         |
| Dibutyl phenyl phosphate                                             | DBPhP                              | 2528-36-1                         |
| Triphenyl phosphate                                                  | TPhP                               | 115-86-6                          |
| Tri-n-butyl phosphate                                                | TnBP                               | 126-73-8                          |
| Tris(1,3-dichloro-2-propyl) phosphate                                | TDCP                               | 13674-87-8                        |
| Tris(2-butoxyethyl) phosphate                                        | TBEP                               | 78-51-3                           |
| Tricresyl phosphate                                                  | TCP                                | 1330-78-5                         |
| 2-Ethylhexyl diphenyl phosphate                                      | EHDPP                              | 1241-94-7                         |
| Tris(2-ethylhexyl) phosphate                                         | TEHP                               | 78-42-2                           |
| Tris(4-isopropylphenyl) phosphate                                    | TIPPP/T4IPP                        | 26967-76-0                        |
| Tris(4-Tert-butylphenyl) phosphate                                   | TTBPP                              | 78-33-1                           |
| Tri(2,4-di-t-butylphenyl) phosphate                                  | TDTBPP                             | 95906-11-9                        |
| O,O,O-triphenylphosphorothiate                                       | TPPT                               | 597-82-0                          |
| <b>Phenols</b>                                                       |                                    |                                   |
| 4-[2-(4-hydroxyphenyl)propan-2-yl]phenol                             | 4,4-bisphenol A                    | 80-05-7                           |
| 2-[2-(4-hydroxyphenyl)propan-2-yl]phenol                             | 2,4-bisphenol A                    | 837-08-1                          |
| 4-[2-(4-hydroxy-3-propan-2-ylphenyl)propan-2-yl]-2-propan-2-ylphenol | Bisphenol G                        | 127-54-8                          |
| 4-[1-(4-hydroxyphenyl)-1-phenylethyl]phenol                          | Bisphenol AP                       | 1571-75-1                         |
| 4-[9-(4-hydroxyphenyl)fluoren-9-yl]phenol                            | Bisphenol FL                       | 3236-71-3                         |
| 4-[1-(4-hydroxyphenyl)-3,3,5-trimethylcyclohexyl]phenol              | Bisphenol TMC                      | 129188-99-4                       |
| 4-[2-(4-hydroxyphenyl)butan-2-yl]phenol                              | Bisphenol B                        | 77-40-7                           |
| 4-(4-hydroxyphenyl)sulfonylphenol                                    | 4,4-bisphenol S                    | 80-09-1                           |
| 2-(4-hydroxyphenyl)sulfonylphenol                                    | 2,4-bisphenol S                    | 5397-34-2                         |
| 4-[(4-hydroxyphenyl)methyl]phenol                                    | 4,4-bisphenol F                    | 620-92-8                          |
| 2-[(4-hydroxyphenyl)methyl]phenol                                    | 2,4-bisphenol F                    | 2467-03-0                         |
| 2,6-ditert-butyl-4-[(3,5-ditert-butyl-4-hydroxyphenyl)methyl]phenol  | AO-MB1                             | 118-82-1                          |
| 4-[2-[4-[2-(4-hydroxyphenyl)propan-2-yl]phenyl]propan-2-yl]phenol    | Bisphenol P                        | 2167-51-3                         |
| 4-[2-[3-[2-(4-hydroxyphenyl)propan-2-yl]phenyl]propan-2-yl]phenol    | Bisphenol M                        | 13595-25-0                        |
| 4-[1-(4-hydroxyphenyl)cyclohexyl]phenol                              | Bisphenol Z                        | 843-55-0                          |
| 4-[1,1,1,3,3,3-hexafluoro-2-(4-hydroxyphenyl)propan-2-yl]phenol      | Bisphenol AF                       | 1478-61-1                         |
| 2,6-dibromo-4-[2-(3,5-dibromo-4-hydroxyphenyl)propan-2-yl]phenol     | TBBPA                              | 79-94-7                           |
| 4-(2,4,4-trimethylpentan-2-yl)phenol                                 | 4-tert-octylphenol                 | 140-66-9                          |
| 4-octylphenol                                                        | 4-octylphenol                      | 1806-26-4                         |
| 4-(7-methyloctyl)phenol                                              | 4-nonylphenol, branched and linear | 104-40-5, 84852-15-3              |
| Dodecylphenol                                                        | Dodecylphenol                      | 27193-86-8, 104-43-8, 121158-58-5 |
| 4-[1-(4-hydroxyphenyl)ethyl]phenol<br>1,1-Bis(4-hydroxyphenyl)ethane | Bisphenol E                        | 2081-08-5                         |
| <b>Per- and polyfluoroalkyl substances (PFAS)</b>                    |                                    |                                   |

|                                                         |           |              |
|---------------------------------------------------------|-----------|--------------|
| <b><i>PFCA (perfluorinated carboxylate acids)</i></b>   |           |              |
| Perfluorinated butanoic acid                            | PFBA      | 375-22-4     |
| Perfluorinated pentanoic acid                           | PFPA      | 2706-90-3    |
| Perfluorinated hexanoic acid                            | PFHxA     | 307-24-4     |
| Perfluorinated heptanoic acid                           | PFHpA     | 375-85-9     |
| Perfluorinated octanoic acid                            | PFOA      | 335-67-1     |
| Perfluorinated nonanoic acid                            | PFNA      | 375-95-1     |
| Perfluorinated decanoic acid                            | PFDA      | 335-76-2     |
| Perfluorinated undecanoic acid                          | PFUnDA    | 2058-94-8    |
| Perfluorinated dodecanoic acid                          | PFDoDA    | 307-55-1     |
| Perfluorinated tridecanoic acid                         | PFTTrDA   | 72629-94-8   |
| Perfluorinated tetradecanoic acid                       | PFTeDA    | 376-06-7     |
| Perfluorinated hexadecanoic acid                        | PFHxDA    | 67905-19-5   |
| Perfluorinated octadecanoic acid                        | PFOcDA    | 16517-11-6   |
| <b><i>PFSA (Perfluoroalkane sulfonic acids)</i></b>     |           |              |
| Perfluorinated butane sulfonic acid                     | PFBS      | 375-73-5     |
| Perfluorinated pentane sulfonic acid                    | PFPS      | 2706-91-4    |
| Perfluorinated hexane sulfonic acid                     | PFHxS     | 355-46-4     |
| Perfluorinated heptane sulfonic acid                    | PFHpS     | 375-92-8     |
| Perfluorinated octane sulfonic acid (linear)            | PFOS      | 2795-39-3    |
| Perfluorinated octane sulfonic acid (branched)          | brPFOS    | 1763-23-1    |
| Perfluorinated nonane sulfonic acid                     | PFNS      | 474511-07-4  |
| Perfluorinated decane sulfonic acid                     | PFDS      | 335-77-3     |
| Perfluoroundecane sulfonic acid                         | PFUnDS    | 441296-91-9  |
| Perfluorododecane sulfonic acid                         | PFDoDS    | 79780-39-5   |
| Perfluorotridecane sulfonic acid                        | PFTTrDS   | 791563-89-8  |
| Perfluorotetradecane sulfonic acid                      | PFTeDS    | 1379460-39-5 |
| <b><i>nPFAS (polyfluorinated neutral compounds)</i></b> |           |              |
| Perfluorobutylsulphonamide                              | PFBSA     | 30334-69-1   |
| n-(methyl)nonafluorobutanesulfonamide                   | N-MeFBSA  | 68298-12-4   |
| N-ethyl-perfluorobutane-1-sulfonamide                   | N-EtFBSA  | 40630-67-9   |
| Perfluorooctane sulfonamide                             | PFOSA     | 754-91-6     |
| N-Methyl perfluorooctane sulphonamide                   | N-MeFOSA  | 31506-32-8   |
| N-Ethyl perfluorooctane sulfonamide                     | N-EtFOSA  | 4151-50-2    |
| N-Methyl perfluorooctane sulfonamidoethanol             | N-MeFOSE  | 24448-09-7   |
| N-Ethyl perfluorooctane sulfonamidoethanol              | N-EtFOSE  | 1691-99-2    |
| N-Ethyl perfluorooctane sulfonamidoacetic acid          | N-EtFOSAA | 2991-50-6    |
| <b><i>newPFAS</i></b>                                   |           |              |
| 4:2 Fluorotelomer sulfonic acid                         | 4:2 FTS   | 757124-72-4  |
| 6:2 Fluorotelomer sulfonic acid                         | 6:2 FTS   | 27619-97-2   |
| 8:2 Fluorotelomer sulfonic acid                         | 8:2 FTS   | 481071-78-7  |
| 10:2 Fluorotelomer sulfonic acid                        | 10:2 FTS  | 120226-60-0  |
| 12:2 Fluorotelomer sulfonic acid                        | 12:2 FTS  | 149246-64-0  |
| Sodium Dodecafluoro-3H- 4,8-dioxanonanoate              | ADONA     | 958445-44-8  |
| Cyclohexanesulfonic acid                                | PFECHS    | 67584-42-3   |

|                                                                                  |                 |             |
|----------------------------------------------------------------------------------|-----------------|-------------|
| 2,3,3,3-Tetrafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)propanoic acid (Gen-X)   | HFPO-DA (Gen-X) | 13252-13-6  |
| <b>UV Chemicals</b>                                                              |                 |             |
| Benzophenone-3                                                                   | BP3             | 131-57-7    |
| Ethylhexylmethoxycinnamate Z                                                     | EHMC-Z          | 177352-99-7 |
| Ethylhexylmethoxycinnamate E                                                     | EHMC-E          | 5466-77-3   |
| Octocrylene                                                                      | OC              | 6197-30-4   |
| UV-329                                                                           | UV-329          | 3147-75-9   |
| UV-328                                                                           | UV-328          | 25973-55-1  |
| UV-327                                                                           | UV-327          | 3864-99-1   |
| Homosalate                                                                       | Homosalate      | 118-56-9    |
| 3-(2H-benzotriazol-2-yl)-5-(1,1-dimethylethyl)-4-hydroxy-benzenepropanoic acid I | M1-UV328        | 84268-36-0  |
| <b>Dechloranes</b>                                                               |                 |             |
| Dibromoaldrin                                                                    | DBA             | 20389-65-5  |
| Dechlorane 602                                                                   | Dec-602         | 31107-44-5  |
| Dechlorane 603                                                                   | Dec-603         | 13560-92-4  |
| Dechlorane 604                                                                   | Dec-604         | 34571-16-9  |
| Dechlorane 601                                                                   | Dec-601         | 3560-90-2   |
| Dechlorane plus syn                                                              | syn-DP          | 135821-03-3 |
| Dechlorane plus anti                                                             | anti-DP         | 135821-74-8 |
| <b>Quaternary ammonium compounds</b>                                             |                 |             |
| Trimethyloctylammonium                                                           | ATAC-C8         | 2083-68-3   |
| Decyltrimethylammonium                                                           | ATAC-C10        | 2082-84-0   |
| Dodecyltrimethylammonium                                                         | ATAC-C12        | 1119-94-4   |
| Tetradecyltrimethylammonium                                                      | ATAC-C14        | 1119-97-7   |
| Hexadecyltrimethylammonium                                                       | ATAC-C16        | 57-09-0     |
| Trimethyloctadecylammonium                                                       | ATAC-C18        | 1120-02-1   |
| ATAC-C20                                                                         | ATAC-C20        | 15809-05-9  |
| ATAC-C22                                                                         | ATAC-C22        | 17301-53-0  |
| Dimethyldioctylammonium                                                          | DADMAC-C8       | 3026-69-5   |
| Didecyltrimethylammonium                                                         | DADMAC-C10      | 2390-68-3   |
| Didodecyltrimethylammonium                                                       | DADMAC-C12      | 3282-73-3   |
| Dimethylditetradecylammonium                                                     | DADMAC-C14      | 68105-02-2  |
| Dihexadecyltrimethylammonium                                                     | DADMAC-C16      | 70755-47-4  |
| Dimethyldioctadecylammonium                                                      | DADMAC-C18      | 3700-67-2   |
| Benzyltrimethyloctylammonium                                                     | BAC-C8          | 959-55-7    |
| Benzyltrimethyldecylammonium                                                     | BAC-C10         | 965-32-2    |
| Benzyltrimethyldodecylammonium                                                   | BAC-C12         | 139-07-1    |
| Benzyltrimethyltetradecylammonium                                                | BAC-C14         | 139-08-2    |
| Benzyltrimethylhexadecylammonium                                                 | BAC-C16         | 122-18-9    |
| Benzyltrimethyloctadecylammonium                                                 | BAC-C18         | 122-19-0    |
| <b>Musks</b>                                                                     |                 |             |
| Galaxolide                                                                       | HHCB            | 1222-05-5   |
| Tonalide                                                                         | TONA            | 21145-77-7  |

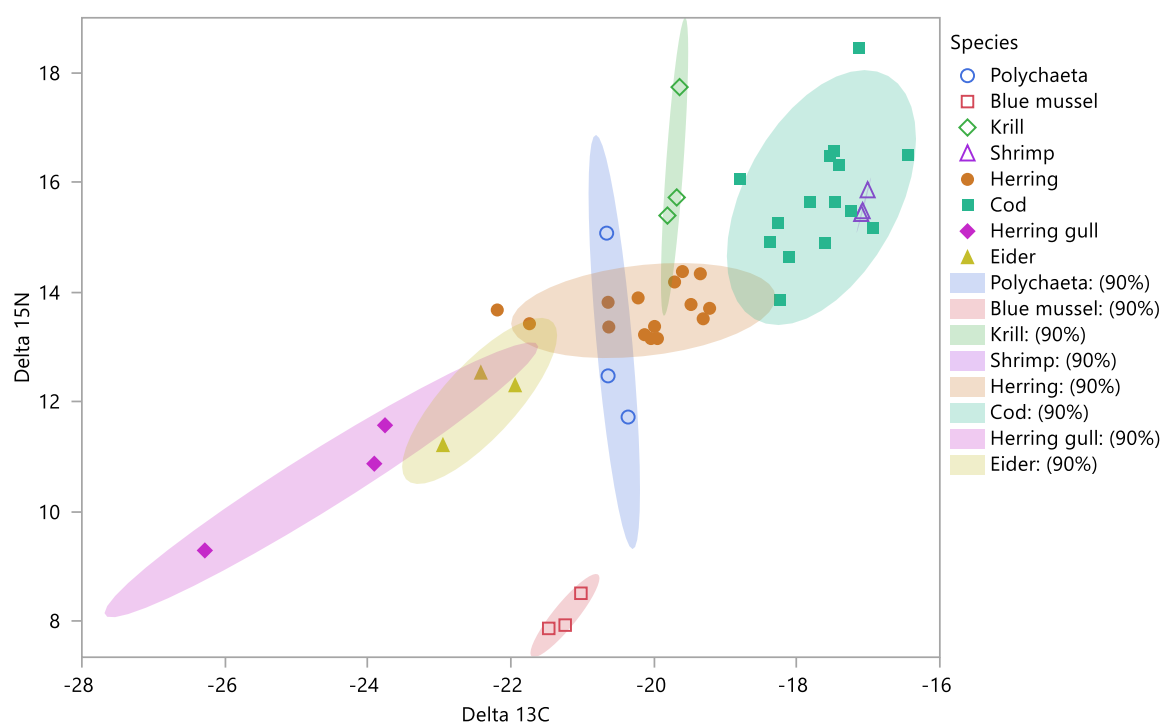
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|---------------------------------------------------------------|----------------------------|------------|
| Traseolide                                                    | TRAS                       | 68140-48-7 |
| Phantolide                                                    | PANT                       | 15323-35-0 |
| Celestolide                                                   | KELE                       | 13171-00-1 |
| Iso-E-super                                                   | OTNE                       | 54464-57-2 |
| Acetyl cedrene                                                | MCKETON                    | 32388-55-9 |
| <b><i>Benzothiazoles</i></b>                                  |                            |            |
| Mercaptobenzothiazole                                         | MBT                        | 149-30-4   |
| Benzotriazole                                                 | BTZ                        | 95-14-7    |
| Benzothiazole                                                 | BT                         | 95-16-9    |
| 2(3H)-Benzothiazolone                                         | OHBT                       | 934-34-9   |
| Methyl-1H-benzotriazole                                       | MeBTZ                      | 29385-43-1 |
| N-cyclohexylbenzothiazole-2-sulfenamide                       | CBS                        | 95-33-0    |
| <b><i>Phthalates</i></b>                                      |                            |            |
| Bis(2-methoxyethyl) phthalate                                 | BMEP (DMEP)                | 117-82-8   |
| Diethyl phthalate                                             | DEP                        | 84-66-2    |
| Bis(2-ethoxyethyl) phthalate                                  | BEEP                       | 605-54-9   |
| Diisobutyl phthalate                                          | DIBP                       | 84-69-5    |
| Di-n-butyl phthalate                                          | DNBP                       | 84-74-2    |
| Butylbenzyl phthalate                                         | BBP                        | 85-68-7    |
| Bis(2-butoxyethyl) phthalate                                  | BnBP (DBOEP)               | 117-83-9   |
| Dicyclohexyl phthalate                                        | DcHP                       | 84-61-7    |
| Dipentylphthalate                                             | DDP                        | 131-18-0   |
| Bis(4-methyl-2-pentyl) phthalate                              | DMPP                       | 84-63-9    |
| Dihexylphthalate                                              | DHxP                       | 84-75-3    |
| Bis(2-ethylhexyl) phthalate                                   | DEHP                       | 117-81-7   |
| Dioctyl phthalate                                             | DOP                        | 117-84-0   |
| Diisononyl phthalate                                          | DINP                       | 28553-12-0 |
| Diisodecyl phthalate                                          | DIDP                       | 26761-40-0 |
| Diundecyl phthalate, branched and linear                      | DiUP                       | 85507-79-5 |
| Dimethyl phthalate                                            | DMP                        | 131-11-3   |
| Diallylphthalate                                              | DAIP                       | 131-17-9   |
| Dipropylphthalate                                             | DPP<br>(dipropylphthalate) | 131-16-8   |
| <b><i>Chlorinated paraffins</i></b>                           |                            |            |
| Short-chain chlorinated paraffins (C10-C13)                   | SCCP                       | 85535-84-8 |
| Medium-chain chlorinated paraffins (C14-C17)                  | MCCP                       | 85535-85-9 |
| Long-chain chlorinated paraffins (C>17)                       | LCCP                       | 85535-86-0 |
| <b><i>Support parameters</i></b>                              |                            |            |
| Stable isotopes $\delta^{15}\text{N}$ , $\delta^{13}\text{C}$ |                            |            |
| Lipid content (biota)                                         |                            |            |
| Length/weight (fish)                                          |                            |            |

## Stable isotopes

The results of the individual stable isotope-analysis of C and N are given in Table 8.

Stable isotopes of carbon and nitrogen are useful indicators of food origin and trophic levels.  $\delta^{13}\text{C}$  gives an indication of carbon source in the diet or a food web.  $\delta^{15}\text{N}$  increases in organisms with higher trophic level because of a greater retention of the heavier isotope ( $^{15}\text{N}$ ) and provides a continuous descriptor of trophic position.

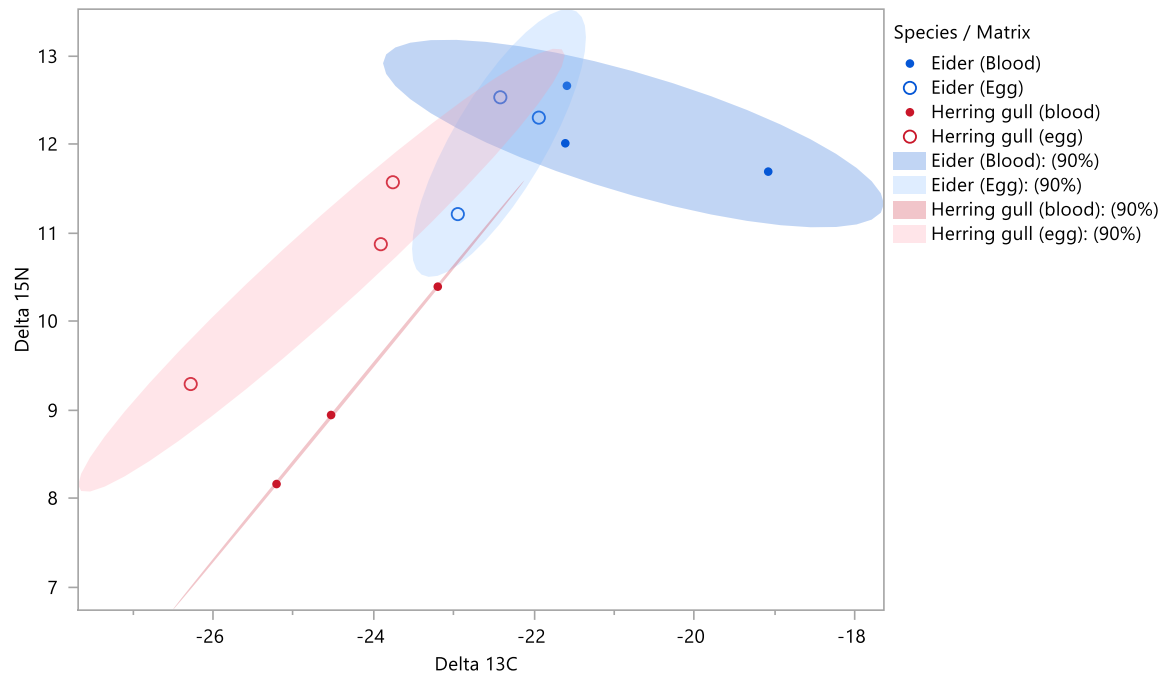
Figure 23 shows an increase in  $\delta^{15}\text{N}$  with expected increase in trophic position. Herring gull display low  $\delta^{15}\text{N}$ , but also low  $\delta^{13}\text{C}$ , suggesting a more terrestrial carbon source, as previously discussed (see e.g. Grung et al. 2021). There was no significant relationship between  $\delta^{15}\text{N}$  and fish length for cod or herring (see electronic Appendix).



**Figure 23.**  $\delta^{15}\text{N}$  plotted against  $\delta^{13}\text{C}$  in all species collected from the Inner Oslofjord (individual samples where available). The 90% confidence areas are indicated. Birds (herring gull and eider) are represented by the isotopic signatures in egg.

Herring gull displays both lower  $\delta^{15}\text{N}$  and  $\delta^{13}\text{C}$  than eider (Figure 24). When blood and eggs are compared, the two matrices show approximately the same  $\delta^{15}\text{N}$  within each species. However,  $\delta^{13}\text{C}$  is lower in eggs than in blood, for both species, likely because of higher lipid content in the eggs, as previously discussed (see e.g. Grung et al. 2021).

I.e. The stable isotopes displayed very much the same patterns as in 2022 (Ruus et al. 2023).



**Figure 24.**  $\delta^{15}\text{N}$  plotted against  $\delta^{13}\text{C}$  in herring gull and eider, both blood and egg. The 90% confidence areas are indicated.

**Table 8. Biometric data for individual specimens of cod (A), herring (B), herring gull (C), eider (D) and invertebrates (E) from the inner Oslofjord.**

**A. (Cod)**

| Ind. No. | $\delta^{13}\text{C}$ | $\delta^{15}\text{N}$ | W%C  | W%N  | Part of pooled sample | Length (cm) | Weight (g) | Sex | Trophic Level |
|----------|-----------------------|-----------------------|------|------|-----------------------|-------------|------------|-----|---------------|
| 1        | -17.53                | 16.47                 | 48.2 | 14.5 | 1                     | 35          | 410        | M   | 4.46          |
| 2        | -17.24                | 15.47                 | 47.6 | 14.5 | 1                     | 33.5        | 370        | F   | 4.17          |
| 3        | -18.11                | 14.63                 | 47.3 | 14.5 | 1                     | 35          | 260        | M   | 3.92          |
| 4        | -17.48                | 16.57                 | 48.4 | 14.5 | 1                     | 31          | 290        | F   | 4.49          |
| 5        | -18.27                | 15.25                 | 47.9 | 14.7 | 1                     | 30          | 290        | M   | 4.10          |
| 6        | -17.61                | 14.89                 | 47.3 | 14.5 | 2                     | 32          | 310        | M   | 4.00          |
| 7        | -17.47                | 15.64                 | 47.8 | 15   | 2                     | 30          | 220        | F   | 4.22          |
| 8        | -18.23                | 13.85                 | 45.4 | 13.6 | 2                     | 30.5        | 260        | M   | 3.69          |
| 9        | -17.81                | 15.63                 | 48.3 | 14.8 | 2                     | 28.5        | 220        | M   | 4.21          |
| 10       | -16.45                | 16.5                  | 49.2 | 15.5 | 2                     | 29          | 220        | M   | 4.47          |
| 11       | -18.79                | 16.05                 | 48.1 | 14.9 | 3                     | 35.5        | 420        | F   | 4.34          |
| 12       | -18.38                | 14.9                  | 47.3 | 14.6 | 3                     | 32          | 320        | M   | 4.00          |
| 13       | -17.41                | 16.31                 | 47.8 | 15   | 3                     | 32          | 300        | M   | 4.41          |
| 14       | -17.13                | 18.44                 | 34.4 | 10.6 | 3                     | 43          | 780        | F   | 5.04          |
| 15       | -16.93                | 15.17                 | 48.1 | 15   | 3                     | 36          | 400        | M   | 4.08          |

## B. (Herring)

| Ind. No. | $\delta^{13}\text{C}$ | $\delta^{15}\text{N}$ | W%C  | W%N  | Part of pooled sample | Length (cm) | Weight (g) | Sex | Trophic Level |
|----------|-----------------------|-----------------------|------|------|-----------------------|-------------|------------|-----|---------------|
| 1        | -20.64                | 13.81                 | 50.4 | 12.2 | 1                     | 27          | 140        | F   | 3.68          |
| 2        | -20.04                | 13.15                 | 48.7 | 13.7 | 1                     | 26.5        | 137        | F   | 3.48          |
| 3        | -20.13                | 13.22                 | 48.9 | 13.9 | 1                     | 27          | 129        | F   | 3.50          |
| 4        | -22.19                | 13.67                 | 57.4 | 9.71 | 1                     | 28.5        | 149        | F   | 3.64          |
| 5        | -19.35                | 14.33                 | 49.3 | 13   | 1                     | 27.5        | 115        | M   | 3.83          |
| 6        | -19.95                | 13.15                 | 54.4 | 12.1 | 2                     | 28          | 128        | F   | 3.48          |
| 7        | -21.74                | 13.42                 | 55.4 | 11   | 2                     | 27          | 133        | F   | 3.56          |
| 8        | -20.22                | 13.89                 | 50.8 | 12.6 | 2                     | 28          | 139        | F   | 3.70          |
| 9        | -20.63                | 13.36                 | 50.3 | 12.2 | 2                     | 26.5        | 123        | F   | 3.55          |
| 10       | -19.22                | 13.7                  | 48.3 | 13.6 | 2                     | 24.5        | 104        | M   | 3.65          |
| 11       | -19.31                | 13.51                 | 48.8 | 14   | 3                     | 26.5        | 113        | F   | 3.59          |
| 12       | -19.48                | 13.77                 | 48.8 | 13.9 | 3                     | 27          | 114        | F   | 3.67          |
| 13       | -19.6                 | 14.37                 | 49   | 13.1 | 3                     | 27.5        | 119        | F   | 3.84          |
| 14       | -19.71                | 14.18                 | 52.7 | 13.1 | 3                     | 28          | 127        | M   | 3.79          |
| 15       | -19.99                | 13.37                 | 48.8 | 12.3 | 3                     | 26          | 109        | F   | 3.55          |

### C. (Herring gull)

| Ind.         | Marking   | $\delta^{13}\text{C}$ | $\delta^{15}\text{N}$ | W%C  | W%N  | Weight (g) | Wing (mm) | Head (mm) | Sex | Trophic Level |
|--------------|-----------|-----------------------|-----------------------|------|------|------------|-----------|-----------|-----|---------------|
| <b>Blood</b> |           |                       |                       |      |      |            |           |           |     |               |
| JA0C0        | 4298225   | -24.53                | 8.94                  | 57.9 | 11   | 950        | 429       | 115.4     | F   | 2.54          |
| JA1C0        | 4298031   | -23.2                 | 10.39                 | 57.7 | 12.2 | 940        | 424       | 115.2     | F   | 2.97          |
| JLA29        | FA54605   | -25.21                | 8.16                  | 58.3 | 12.5 | 1080       | 431       | 118.5     | F   | 2.31          |
| <b>Egg</b>   |           |                       |                       |      |      |            |           |           |     |               |
| (JA0C0)      | (4298225) | -23.91                | 10.87                 | 59.4 | 8.68 |            |           |           |     | 3.11          |
| (JA1C0)      | (4298031) | -23.76                | 11.57                 | 55.1 | 10.5 |            |           |           |     | 3.31          |
| (JLA29)      | (FA54605) | -26.28                | 9.29                  | 57.6 | 9.07 |            |           |           |     | 2.64          |

### D. (Eider)

| Ind.         | Marking   | $\delta^{13}\text{C}$ | $\delta^{15}\text{N}$ | W%C  | W%N  | Weight (g) | Wing (mm) | Head (mm) | Sex | Trophic Level |
|--------------|-----------|-----------------------|-----------------------|------|------|------------|-----------|-----------|-----|---------------|
| <b>Blood</b> |           |                       |                       |      |      |            |           |           |     |               |
| A55          | CA46393   | -21.61                | 12.01                 | 56.7 | 12.7 | 2410       | 301       | 125.95    | F   | 3.44          |
| P06          | CA55116   | -21.59                | 12.66                 | 55.5 | 12   | 1810       | 302       | 123.93    | F   | 3.63          |
| J12          | CA55114   | -19.08                | 11.69                 | 48.9 | 14   | 1890       | 302       | 125.1     | F   | 3.35          |
| <b>Egg</b>   |           |                       |                       |      |      |            |           |           |     |               |
| (A55)        | (CA46393) | -21.94                | 12.3                  | 63.1 | 7.32 |            |           |           |     | 3.53          |
| (P06)        | (CA55116) | -22.95                | 11.21                 | 60   | 5.95 |            |           |           |     | 3.21          |
| (J12)        | (CA55114) | -22.42                | 12.53                 | 64.6 | 6.15 |            |           |           |     | 3.60          |

## E. (Invertebrates)

| Species/Matrix | Sample No. | $\delta^{13}\text{C}$ | $\delta^{15}\text{N}$ | W%C  | W%N  | Trophic Level |
|----------------|------------|-----------------------|-----------------------|------|------|---------------|
| Blue mussel    | 1          | -21.47                | 7.87                  | 46.4 | 8.09 | 1.93          |
| Blue mussel    | 2          | -21.02                | 8.51                  | 46.9 | 8.57 | 2.12          |
| Blue mussel    | 3          | -21.24                | 7.93                  | 46.9 | 8.13 | 1.95          |
| Polychaeta     | 1 (Bq41)   | -20.36                | 11.72                 | 29.1 | 7.03 | 3.06          |
| Polychaeta     | 2 (Al1)    | -20.66                | 15.07                 | 36.9 | 8.22 | 4.05          |
| Polychaeta     | 3 (Cm21)   | -20.64                | 12.47                 | 38.8 | 6.72 | 3.28          |
| Krill          | 1          | -19.81                | 15.39                 | 42.6 | 10.2 | 4.14          |
| Krill          | 2          | -19.68                | 15.72                 | 39.4 | 9.43 | 4.24          |
| Krill          | 3          | -19.64                | 17.73                 | 40.5 | 9.51 | 4.83          |
| Shrimp         | 1          | -17.08                | 15.47                 | 45.4 | 13.1 | 4.17          |
| Shrimp         | 2          | -17.01                | 15.85                 | 44.2 | 12.8 | 4.28          |
| Shrimp         | 3          | -17.1                 | 15.42                 | 45.4 | 13   | 4.15          |

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