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Environmental Contaminants in an Urban Fjord, 2022

Norwegian Institute for Water Research

REPORT

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Summary

This report presents data from the second year of a new 5-year period of the Urban Fjord programme. The programme started in 2013 and has since been altered/advanced. In 2022 the programme covers sampling and analyses of sediment, polychaetes, krill, shrimps, blue mussels, herring, cod, eider, and herring gull from the Inner Oslofjord. In addition, samples of Harbour seals from the Outer Oslofjord are analysed. A total of ~300 single compounds/isomers were analysed, and frequent detection was found of certain PFAS compounds (such as PFOS) in most matrices, certain QACs in sediment, MCCPs in most matrices (also SCCPs in birds and seals, as well as LCCPs in seals), D5 (siloxane) in all matrices, certain PBDEs (such as BDE 100) in most matrices, PCBs in all matrices, BCPS (phenolic) in seals and certain metals in all matrices. Biomagnification was observed for 28 PCB congeners and 6 PBDEs (lipid wt. basis). Furthermore, biomagnification was observed for 5 PFAS compounds, as well as for the metals As, Ag and Hg (wet wt. basis).

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Environmental Contaminants in an Urban Fjord, 2022

Preface

This report presents data from the second year of a new 5-year period of the Urban Fjord programme. The programme started in 2013 and has since been advanced. The content now differs between years, and the 2022 programme covers sampling and analyses of sediment, polychaetes, krill, shrimps, blue mussels, herring, cod, eider and herring gull from the Inner Oslofjord. In addition, samples of Harbour seals from the Outer Oslofjord are analysed. The seal samples were provided by Eivind Stensrud (University of Oslo). Eivind Stensrud also provided the biometric data for the seals, as well as the results of stable isotopes ($\delta^{13}C$ and $\delta^{15}N$) in seals.

This year's campaign was carried out by NIVA, with a majority of the chemical analyses performed by the Norwegian Institute for Air Research, NILU. Bird samples (eider and herring gull) were sampled by the University of Oslo.

Besides the authors of this report, several persons are acknowledged for their contribution in sample collection, sample preparation, data treatment and analysis: Ingar Johansen, Eivind Stensrud, Julie Rydning, Merete Schøyen, Gunhild Borgersen, Camilla With Fagerli, Marthe Torunn Solhaug Jenssen, Pawel Rostowski, Mikael Harju, Hilde Uggerud, Marit Vadset, Inger-Christin Steen, Carsten Lome, Dag Hjermann.

This report represents an extended summary of the Urban Fjord 2022 campaign and has been quality assured by Research Manager Morten Jartun.

Oslo, June 2022

Anders Ruus

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Summary

The 2022 “Urban fjord” programme covers sampling and analyses of sediment, polychaetes, krill, shrimps, blue mussels, herring, cod, eider and herring gull from the Inner Oslofjord. In addition, samples of Harbour seals from the Outer Oslofjord are analysed. A total of ~300 single compounds/isomers were analysed, and frequent detection was found of certain PFAS compounds (such as PFOS) in most matrices, certain QACs in sediment, MCCPs in most matrices (also SCCPs in birds and seals, as well as LCCPs in seals), D5 (siloxane) in all matrices, certain PBDEs (such as BDE 100) in most matrices, PCBs in all matrices, BCPS (phenolic) in seals and certain metals in all matrices.

Concentrations of PFAS were highest in Cod (liver) and birds (eggs and blood). PFOS was a dominating PFAS. OC was a dominating UV-compound in harbour seal, herring gull egg, cod liver, krill, polychaeta and sediment. UV-327 and UV-328 were also important UV-compounds in harbour seal, bird eggs and sediment. Quaternary ammonium compounds (QACs) were analysed in sediments only, and DADMAC-18, DADMAC-16 and ATAC-C22 were the most dominating compounds. Dechlorane plus syn and anti were important dechlorane compounds in matrices where dechloranes were detected. In cod liver, bird eggs and seal blubber, Dechlorane 602 constituted high proportions of the sum-dechloranes concentration. Chlorinated paraffins were detected in all matrices analysed, except shrimp, and generally, MCCPs constituted the highest concentrations. Phthalates were detected in sediments (the only matrix where they were analysed). DINP, DEHP and DNBP constituted the highest concentrations. OPFRs were detected in sediments (the only matrix where they were analysed). TCPP, TEHP and TIPPP constituted the highest concentrations. BCPS was detected in blubber and muscle of harbour seal (the only matrices where BCPS was analysed), however only in 1 of 10 muscle samples. Siloxanes were detected in all matrices, and D5 was a major constituent of the sum-siloxanes concentration. Among the musks, only Galoxolide was detected in all three sediment samples.

Biomagnification was observed for 28 PCB congeners and 6 PBDEs (lipid wt. basis). Furthermore, biomagnification was observed for 5 PFAS compounds, as well as for the metals As, Ag and Hg (wet wt. basis).

Sammendrag

Tittel: Environmental Contaminants in an Urban Fjord, 2022
År: 2023
Forfatter(e): Anders Ruus, Merete Grung, Morten Jartun, Kine Bæk, Thomas Rundberget, Bjørnar Beylich, Linda Hansen (NILU), Ellen Katrin Enge (NILU), Katrine Borgå (UiO), Morten Helberg (UiO)
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"Urban fjord"-programmet for 2022 har dekket prøvetaking og analyse av sediment, flerbørstemark, krill, reker, blåskjell, sild, torsk, ærfugl og gråmåke fra Indre Oslofjord. I tillegg er prøver av steinkobbe fra Ytre Oslofjord analysert. Totalt ~300 enkeltforbindelser/isomerer ble analysert og hyppig deteksjon ble funnet for visse PFAS-forbindelser (som PFOS) i de fleste matriser, visse QAC-forbindelser i sediment, mellomkjedede klorparafiner (MCCP) i de fleste matriser (også kortkjedede, SCCP, i fugl og sel, samt langkjedede, LCCP, i sel), D5 (siloksan) i alle matriser, visse PBDE (som BDE-100) i de fleste matriser, PCB i alle matriser, BCPS (fenolisk forbindelse) i sel, samt visse metaller i alle matriser.

Konsentrasjonene av PFAS var høyest i torsk (lever) og fugl (egg og blod). PFOS var en dominerende PFAS. OC var en dominerende UV-forbindelse i steinkobbe, gråmåkeegg, torskelever, krill, børstemark og sediment. UV-327 og UV-328 var også viktige UV-forbindelser i steinkobbe, fugleegg og sediment. Kvaternære ammoniumforbindelser (QAC) ble analysert kun i sediment, og DADMAC-18, DADMAC-16 og ATAC-C22 var de mest dominerende forbindelsene. Dekloran pluss syn og anti var viktige dekloranforbindelser i matriser der dekloraner ble påvist. I torskelever, fugleegg og selspekk utgjorde Dechlorane 602 høye andeler av sum-dekloran-konsentrasjonen. Klorparafiner ble påvist i alle analyserte matriser, unntatt reker, og generelt utgjorde MCCP de høyeste konsentrasjonene. Ftalater ble påvist i sedimenter (den eneste matrisen hvor de ble analysert). DINP, DEHP og DNBP utgjorde de høyeste konsentrasjonene. Fosfororganiske flammehemmere (OPFR) ble påvist i sedimenter (den eneste matrisen hvor de ble analysert). TCPP, TEHP og TIPPP utgjorde de høyeste konsentrasjonene. BCPS ble påvist i spekk og muskel fra steinkobbe (de eneste matrisene der BCPS ble analysert), men kun i 1 av 10 muskelprøver. Siloksaner ble påvist i alle matriser, og D5 var en hovedbestanddel av sum-siloksan-konsentrasjonen. Blant muskstoffene var det kun Galoxolide som kunne detekteres i samtlige tre sedimentprøver.

Biomagnifisering ble observert for 28 PCB-kongenere og 6 PBDE-forbindelser (lipidvektbasis). Videre ble det observert biomagnifisering for 5 PFAS-forbindelser, samt for metallene As, Ag og Hg (våtvektsbasis).

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 second year of a new 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 2022 programme covers sampling and analyses of sediment, polychaetes, krill, shrimps, blue mussels, herring, cod, eider and herring gull from the Inner Oslofjord. In addition, the programme in 2022 covers sampling and analysis of samples of harbour seal from the Outer Oslofjord.

This year’s campaign was carried out by NIVA, with a majority of the chemical analyses performed by the Norwegian Institute for Air Research, NILU. Bird samples (eider and herring gull) were sampled by the University of Oslo. Harbour seal samples and stabile isotope data for seals were also provided by the University of Oslo.

2 Extended summary of Urban Fjord 2022

2.1 Samples and localities

An overview of the samples collected in the Urban Fjord programme 2022 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 2022.

Species/sample	Matrix	Locality	Station code	No. for analysis
Sediment	Whole sediment	Bekkelaget Alna River outlet Ildjernet	Bq41 AL1 Cm21	3
Blue mussel	Pooled samples, soft body	Steilene	IO Blåskjell	3 pooled samples [1]
Polychaetes	Pooled samples, whole individuals	Ildjernet	Cm21	3 pooled samples [2]
Zooplankton (krill)	Pooled samples, whole individuals	Midtmeie	IO	3 pooled samples
Shrimp	Pooled samples, soft tissue tails	Midtmeie	IO	3 pooled samples
Herring	Muscle	Midtmeie	IO	3 pooled samples [3]
Cod	Muscle, liver, bile	Midtmeie	IO	3 pooled samples [3]
Herring gull (blood)	Blood	Søndre skjælholmen, Raudskjæra, Husbergøya	Skjælholmene Raudskjæra Husbergøya	3 pooled samples [3]
Herring gull (egg)	Egg	Søndre skjælholmen, Raudskjæra, Husbergøya	Skjælholmene Raudskjæra Husbergøya	3 pooled samples [3]
Eider (blood)	Blood	Husbergøya	Husbergøya	3 pooled samples [3]
Eider (egg)	Egg	Husbergøya	Husbergøya	3 pooled samples [3]
Harbour seal (blubber)	Blubber	Torbjørnskjær, Søndre Missingen, Singleøya, Garnholmen	Sel Torbj.sk., Sel S.Missing., Sel Singleøy, Sel Garnh.	10 [4]
Harbour seal (muscle)	Muscle	Torbjørnskjær, Søndre Missingen, Singleøya, Garnholmen	Sel Torbj.sk., Sel S.Missing., Sel Singleøy, Sel Garnh.	10 [4]

[1] 137 mussels (shell length 32-39 mm), 56 mussels (shell length 40-49 mm), and 36 mussels (shell length 50-69 mm)
[2] For species constituting polychaete samples, see **Table 2**.
[3] Each of 5 specimens (biometric data are given in Appendix, chapter 4).
[4] Biometric data are given in Appendix, chapter 4.

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

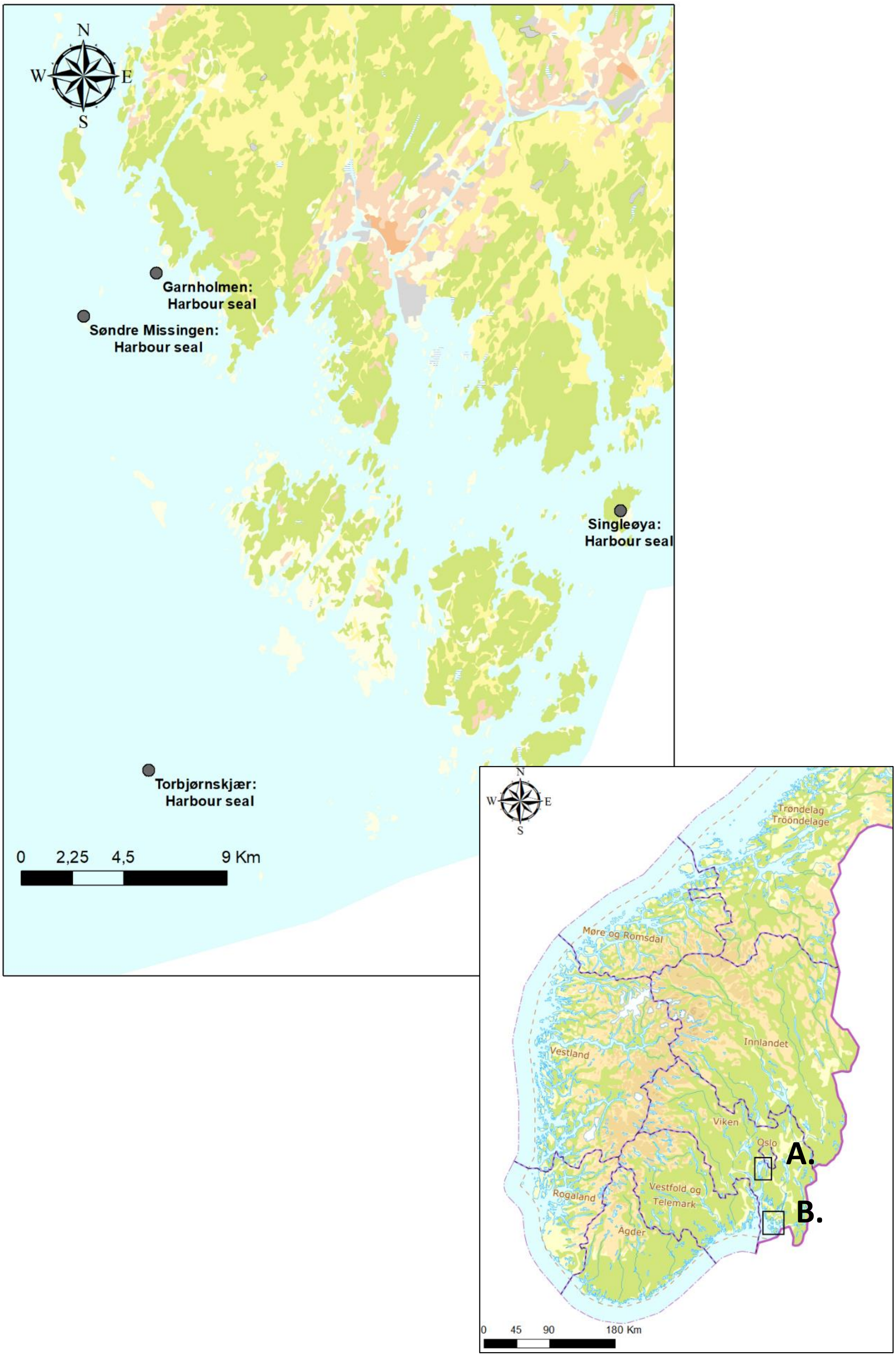
	Bekkelaget Bq41	**Alna River outlet Al1**	**Ildjernet Cm21**
Glycera	20	42	14
P.crassa	157	13	58
Lumbrineridae	0	6	27
Terbellidae	20	30	37
Aphrodita aculeata	73	35	12
*Misc. **	10	12	0
Goniada maculate	20	2	3
Nephtys sp.	0	0	11
Total (grams)	**300**	**140**	**162**

* *Inter alia*: *Ophelina, Ophiodromus flexuosus, Spiophanes kroyeri.*

A.

Figure 1. Map depicting stations for collection of sediment, blue mussel, polychaetes, krill, shrimp, herring, cod, herring gull and Eider in the Inner Oslofjord (**A.**), and map depicting stations for collection of samples of harbour seal in the Outer Oslofjord (**B.**; next page).

B.


N
W
E
S
Garnholmen:
Harbour seal
Søndre Missingen:
Harbour seal
Singleøya:
Harbour seal
Torbjørnskjær:
Harbour seal
0 2,25 4,5 9 Km
Trøndelag
Trööndelage
Møre og Romsdal
Vestland
Innlandet
Viken
Oslo
A.
B.
Rogaland
Vestfold og
Telemark
Agder
0 45 90 180 Km

2.2 Chemical analysis

Details of the chemical analysis are presented in chapter 3. **Table 3** shows and 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 ($\delta^{13}C$ and $\delta^{15}N$) were performed on individual muscle samples (n=15) of cod and herring (as well as of individual blood and egg samples, n=15, of herring gull and eider, and of individual muscle samples, n=10, of Harbour seal; see Appendix, chapter 4). In the biomagnification assessment, the mean $\delta^{15}N$ 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 $\delta^{13}C$ 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). Harbour seal is collected in the outer Oslofjord, far from the other species. 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 and PFASs. The concentrations of the following contaminants were expressed on a lipid weight basis: PCBs and other organochlorine compounds, chlorinated paraffins, brominated flame retardants (PBDEs and other), siloxanes, dechloranes and UV-compounds. The other contaminants were not analysed in sufficient number of species for biomagnification assessment. Cod was represented by the concentrations in liver, except for mercury concentration which were in muscle.

Biomagnification potential was evaluated by comparing contaminant concentrations with trophic position, calculated from $\delta^{15}N$ levels (assuming an enrichment, $\Delta^{15}N$, of 3.8 between each integer trophic level). Trophic Magnification Factors (TMFs) were calculated from statistically significant relationships:

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

as TMF = 10^b.

Table 3. Overview: Analyses in different matrices in 2022.

	Sediment	Polychaeta	Blue mussel	Krill	Shrimp	Herring	Cod*	Herring gull**	Eider**	Harbour seal***
Metals	X	X	X	X	X	X	X	X	X	X
Siloxanes	X	X	X	X	X	X	X	X	X	X
PCBs	X	X	X	X	X	X	X	X	X	X
PBDEs	X	X	X	X	X	X	X	X	X	X
Other BFRs	X	X	X	X	X	X	X	X	X	X
OPFRs	X									
Phenolic comp.	X						X			(X)
PFAS	X	X	X	X	X	X	X	X	X	X
UV-chemicals	X	X	X	X	X	X	X	X	X	X
Dechloranes	X	X	X	X	X	X	X	X	X	X
QAC	X									
Insecticides and medicaments										X
Musk	X									
Benzothiazoles	X									
Car tyre compounds										X
Phthalates	X									
Chlorinated paraffins	X	X	X	X	X	X	X	X	X	X
Stable isotopes of C and N		X	X	X	X	X	X	X	X	X

* Liver and muscle (stable isotopes only in muscle). Phenolic compounds in bile,

** Blood and eggs.

*** Blubber and muscle (stable isotopes only in muscle). Long linear (L6-L10) siloxanes, long chained chlorinated paraffins (LCCPs) and BCPS (phenolic) analysed in seals.

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 ~300 single compounds/isomers were analysed in this study. **Figure 2** gives the detection frequency of the various compounds in the different samples. The figure shows frequent detection of certain PFAS compounds (such as PFOS) in most matrices, certain QACs in sediment, MCCPs in most matrices (also SCCPs in birds and seals, as well as LCCPs in seals), D5 (siloxane) in all matrices, certain PBDEs (such as BDE 100) in most matrices, PCBs in all matrices, BCPS (phenolic) in seals and certain metals in all matrices.

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

A.

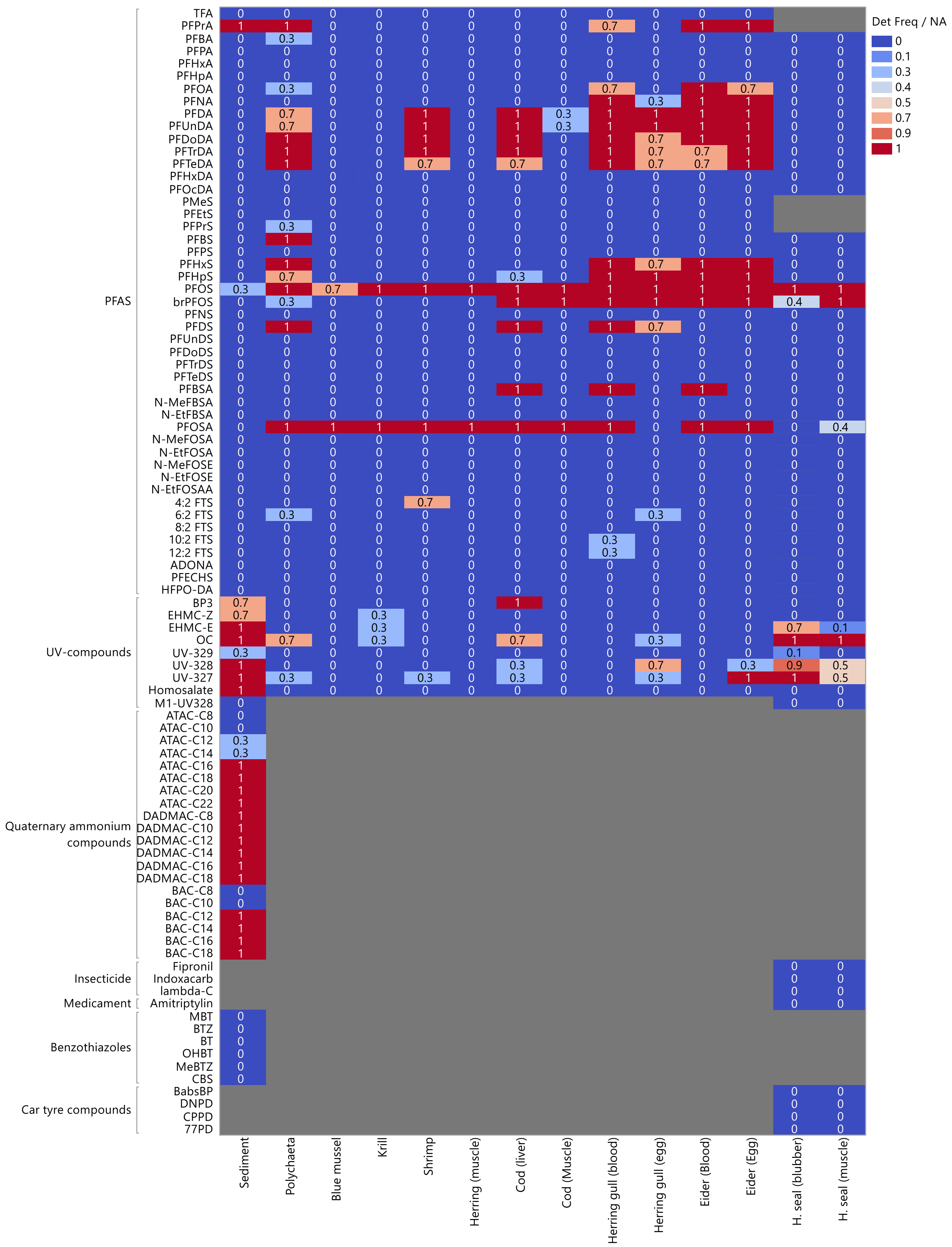
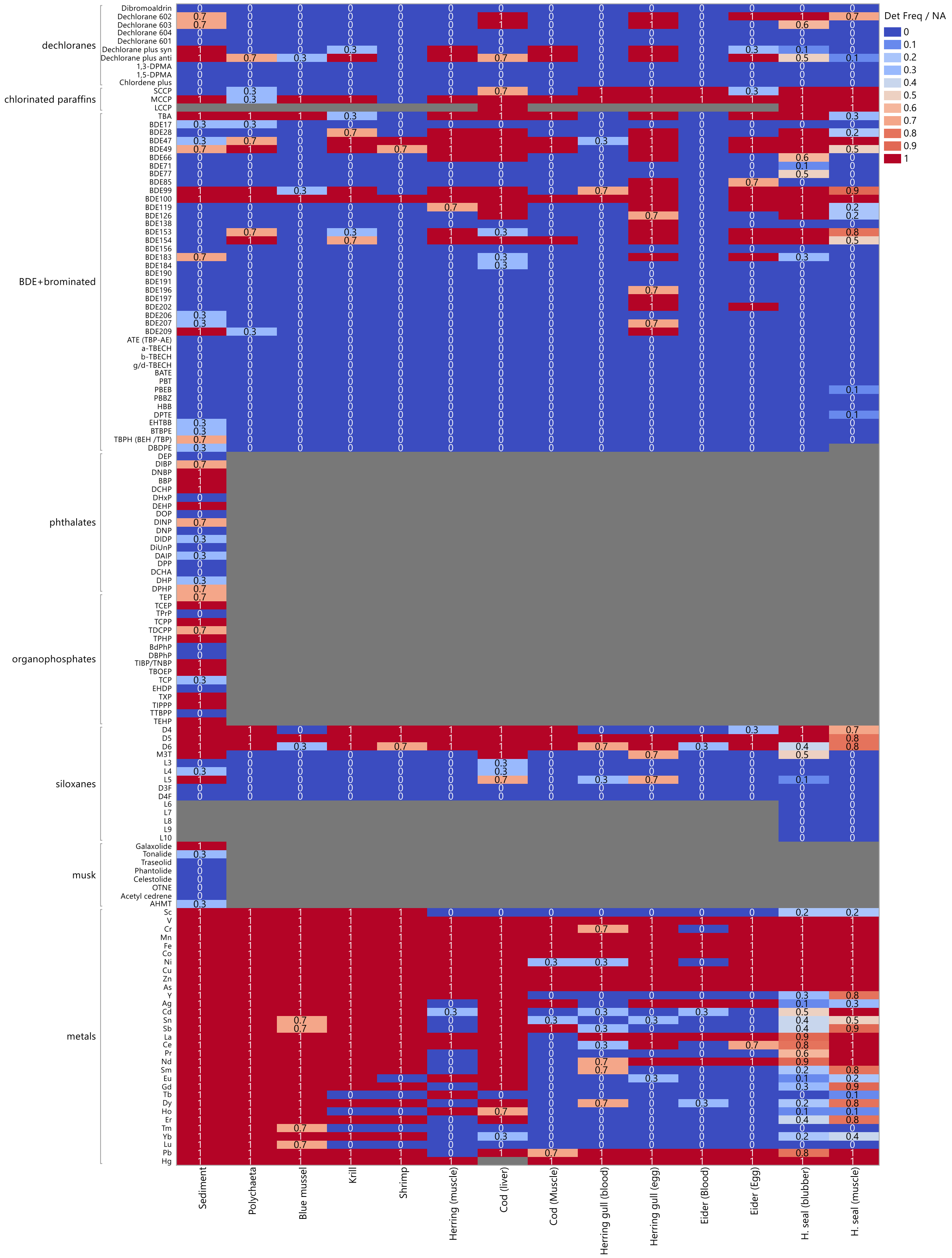
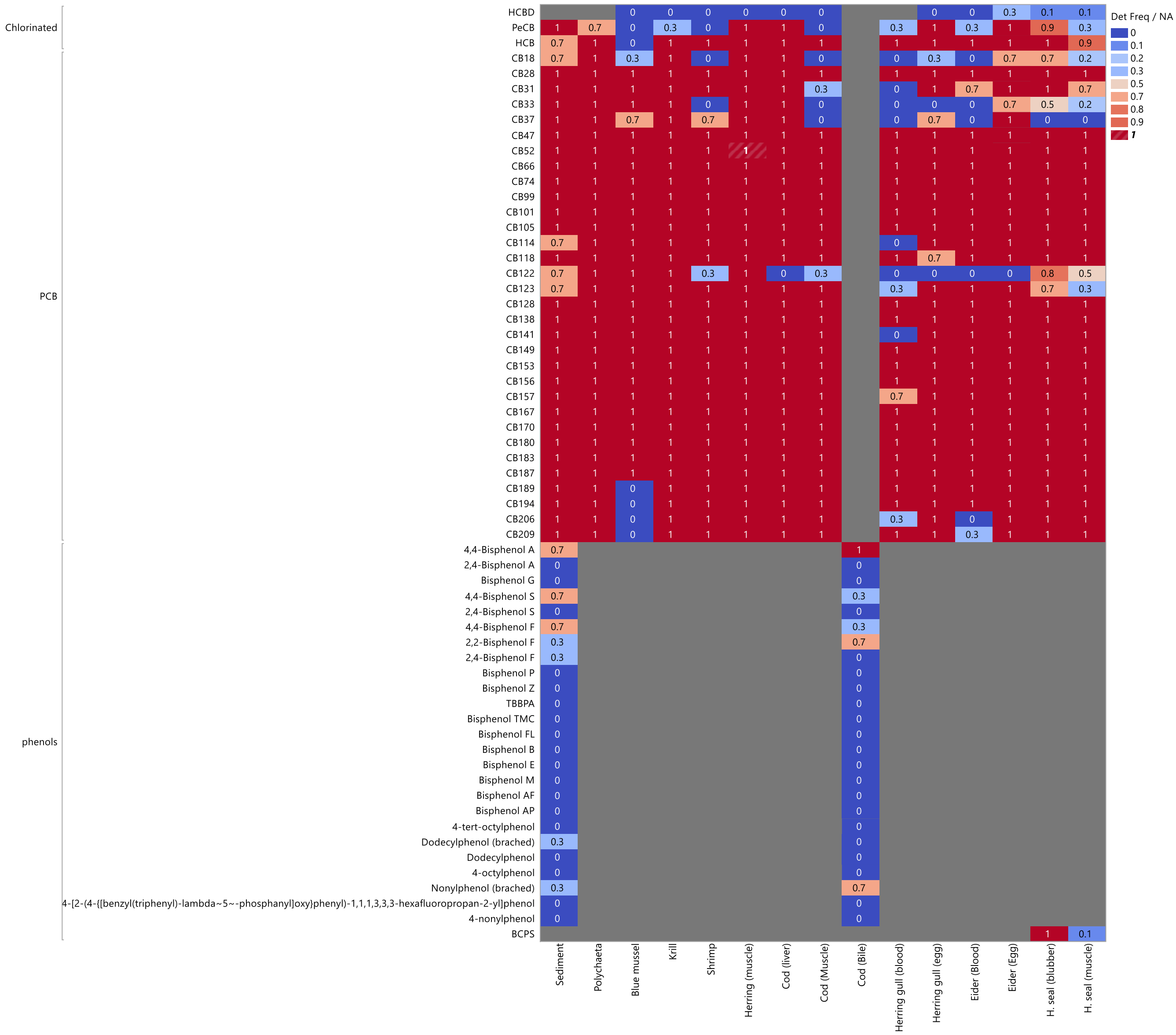


Figure 2. Detection frequency (as fraction; %/100) of all the analysed compounds in the different species/matrices in this study. **A**: PFAS, UV-compounds, quaternary ammonium compounds, insecticides and medicaments, benzothiazoles and car tyre compounds; **B**: Chlorinated and brominated compounds,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

B.


Det Freq / NA
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
dechloranes
chlorinated paraffins
BDE+brominated
phthalates
organophosphates
siloxanes
musk
metals
Dibromoaldrin
Dechlorane 602
Dechlorane 603
Dechlorane 604
Dechlorane 601
Dechlorane plus syn
Dechlorane plus anti
1,3-DPMA
1,5-DPMA
Chlordene plus
SCCP
MCCP
LCCP
TBA
BDE17
BDE28
BDE47
BDE49
BDE66
BDE71
BDE77
BDE85
BDE99
BDE100
BDE119
BDE126
BDE138
BDE153
BDE154
BDE156
BDE183
BDE184
BDE190
BDE191
BDE196
BDE197
BDE202
BDE206
BDE207
BDE209
ATE (TBP-AE)
a-TBECH
b-TBECH
g/d-TBECH
BATE
PBT
PBEB
PBBZ
HBB
DPTE
EHTBB
BTBPE
TBPH (BEH /TBP)
DBDPE
DEP
DIBP
DNBP
BBP
DCHP
DHxP
DEHP
DOP
DINP
DNP
DIDP
DiUnP
DAIP
DPP
DCHA
DHP
DPHP
TEP
TCEP
TPrP
TCPP
TDCPP
TPHP
BdPhP
DBPhP
TIBP/TNBP
TBOEP
TCP
EHDP
TXP
TIPPP
TTBPP
TEHP
D4
D5
D6
M3T
L3
L4
L5
D3F
D4F
L6
L7
L8
L9
L10
Galaxolide
Tonalide
Traseolid
Phantolide
Celestolide
OTNE
Acetyl cedrene
AHMT
Sc
V
Cr
Mn
Fe
Co
Ni
Cu
Zn
As
Y
Ag
Cd
Sn
Sb
La
Ce
Pr
Nd
Sm
Eu
Gd
Tb
Dy
Ho
Er
Tm
Yb
Lu
Pb
Hg
Sediment
Polychaeta
Blue mussel
Krill
Shrimp
Herring (muscle)
Cod (liver)
Cod (Muscle)
Herring gull (blood)
Herring gull (egg)
Eider (Blood)
Eider (Egg)
H. seal (blubber)
H. seal (muscle)

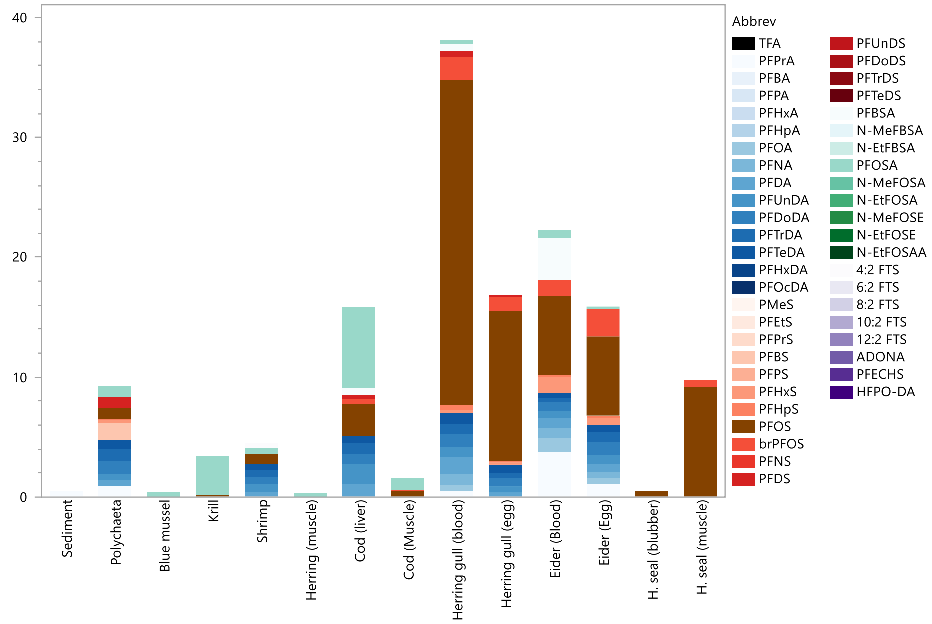
C.


Chlorinated
PCB
phenols
HCBD
PeCB
HCB
CB18
CB28
CB31
CB33
CB37
CB47
CB52
CB66
CB74
CB99
CB101
CB105
CB114
CB118
CB122
CB123
CB128
CB138
CB141
CB149
CB153
CB156
CB157
CB167
CB170
CB180
CB183
CB187
CB189
CB194
CB206
CB209
4,4-Bisphenol A
2,4-Bisphenol A
Bisphenol G
4,4-Bisphenol S
2,4-Bisphenol S
4,4-Bisphenol F
2,2-Bisphenol F
2,4-Bisphenol F
Bisphenol P
Bisphenol Z
TBBPA
Bisphenol TMC
Bisphenol FL
Bisphenol B
Bisphenol E
Bisphenol M
Bisphenol AF
Bisphenol AP
4-tert-octylphenol
Dodecylphenol (brached)
Dodecylphenol
4-octylphenol
Nonylphenol (brached)
4-[2-(4-{[benzyl(triphenyl)-lambda~5~-phosphanyl]oxy}phenyl)-1,1,1,3,3,3-hexafluoropropan-2-yl]phenol
4-nonylphenol
BCPS
Sediment
Polychaeta
Blue mussel
Krill
Shrimp
Herring (muscle)
Cod (liver)
Cod (Muscle)
Cod (Bile)
Herring gull (blood)
Herring gull (egg)
Eider (Blood)
Eider (Egg)
H. seal (blubber)
H. seal (muscle)
Det Freq / NA
0
0.1
0.2
0.3
0.5
0.7
0.8
0.9
1

2.4.3 PFAS

Concentrations of PFAS were highest in Cod (liver) and birds (eggs and blood; **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, krill and herring.

A.



B.

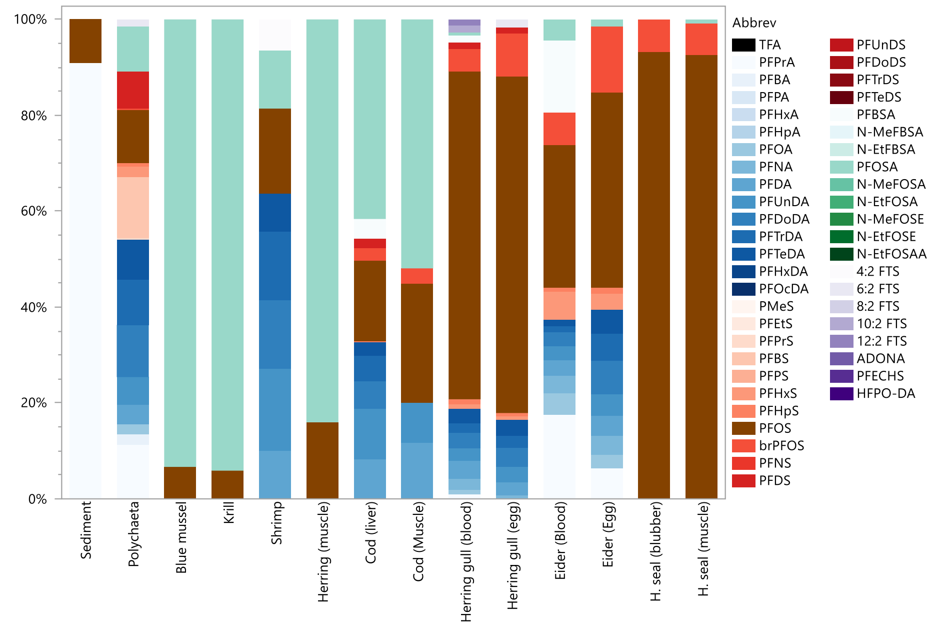
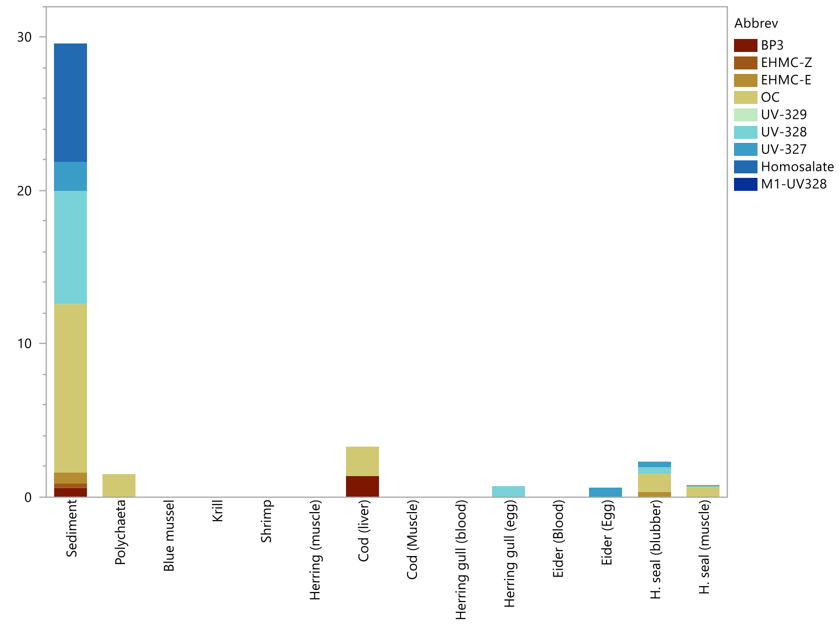


Figure 3. Concentrations (median; ng/g wet wt. in biota, ng/g dry wt. in sediment) of PFAS compounds in all matrices (**A**) and their contribution (%) to the sum-PFAS concentration (**B**). Non-detected compounds are assigned a value of zero (0).

2.4.4 UV-compounds

UV-compounds were not detected in blue mussel, herring (muscle), cod muscle, herring gull blood and eider blood (**Figure 4**). OC was a dominating compound in harbour seal (blubber and muscle), herring gull egg, cod liver, krill, polychaeta and sediment. UV-327 and UV-328 were also important UV-compounds in harbour seal (blubber and muscle), eider egg, herring gull egg and sediment.

A.



B.

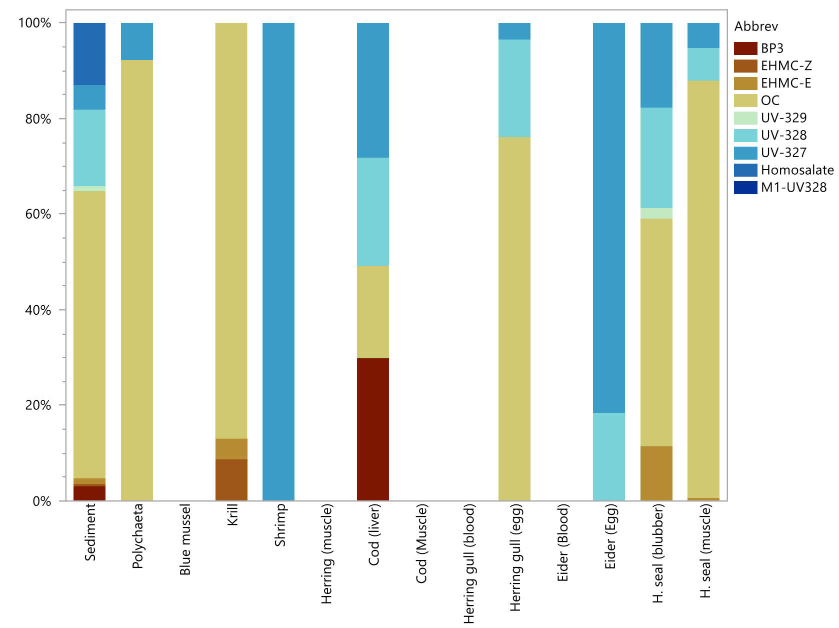
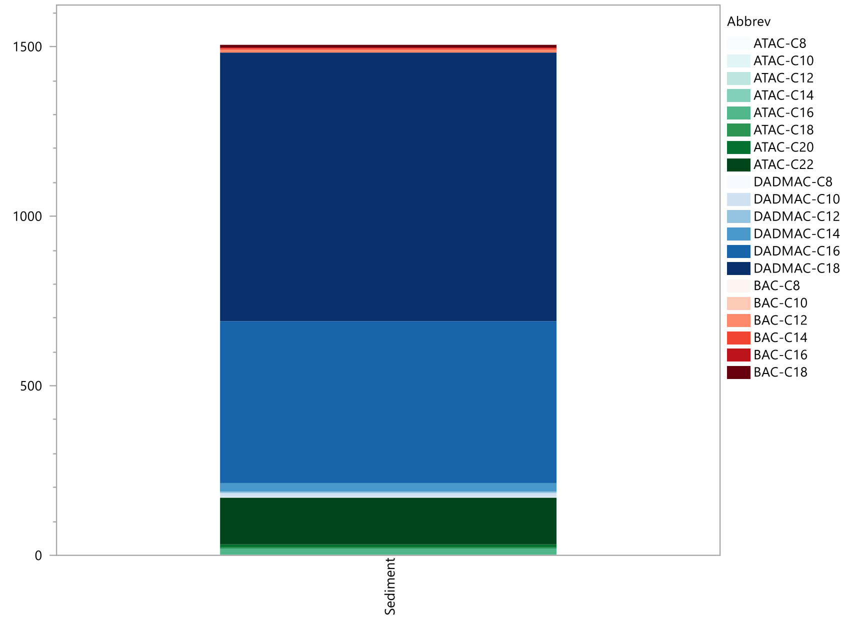


Figure 4. Concentrations (median; ng/g wet wt. in biota, ng/g dry wt. in sediment) of UV-compounds in all matrices (**A**) and their contribution (%) to the sum-UV-compounds concentration (**B**). Non-detected compounds are assigned a value of zero (0).

2.4.5 Quaternary ammonium compounds

Quaternary ammonium compounds (QACs) were analysed in sediments only. DADMAC-18, DADMAC-16 and ATAC-C22 were the most dominating compounds (**Figure 5**).

A.



B.

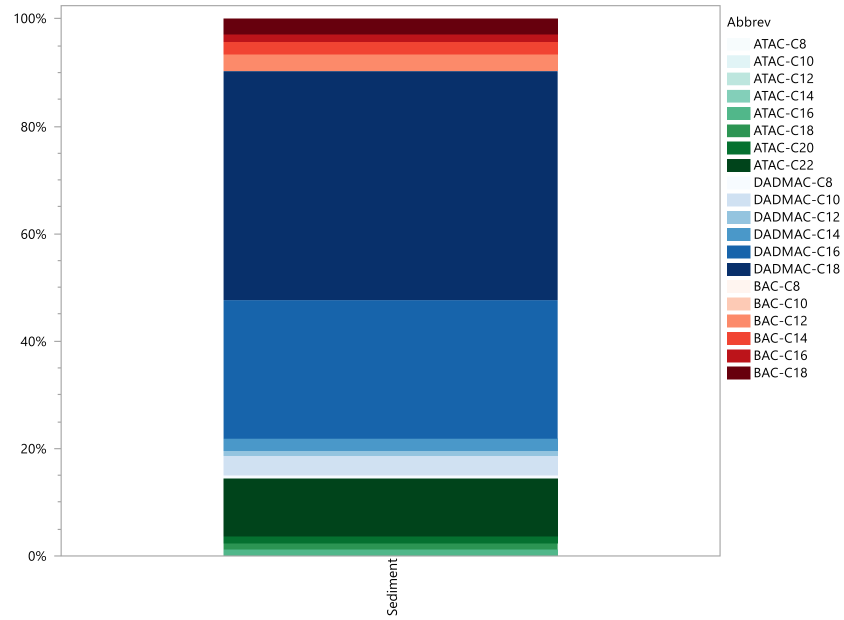


Figure 5. Concentrations (median; ng/g dry wt.) of quaternary ammonium compounds in sediment (**A**) and their contribution (%) to the sum-QAC concentration (**B**). Non-detected compounds are assigned a value of zero (0). QACs were analysed in sediments only.

2.4.6 Insecticides and medicaments

Fipronil, Indoxacarb, Lambda-C and Amitriptylin were only analysed in Harbour seal (blubber and muscle) but could not be detected (**Figure 2**).

2.4.7 Benzothiazoles

Benzothiazoles (MBT, BTZ, BT, OHBT, MeBTZ and CBS) were only analysed in sediment, but could not be detected (**Figure 2**).

2.4.8 Car tyre compounds

Car tyre compounds (BabsBP, DNPD, CPPD and 77PD) were only analysed in Harbour seal (blubber and muscle) but could not be detected (**Figure 2**).

Preliminary unpublished results indicate that the following car tyre related compounds could more likely be detected in environmental samples (at least abiotic matrices): primarily 6-PPD (N-(1,3-Dimethylbutyl)-N'-phenyl-p-phenylenediamine; Cas 793-24-8), but also DPDD (N,N'-Diphenyl-p-phenylenediamine; Cas 74-31-7) and IPDD (IPPD N-Isopropyl-N'-phenyl-p-phenylenediamine, Cas 101-72-4). No traces of these were found in the seal blubber.

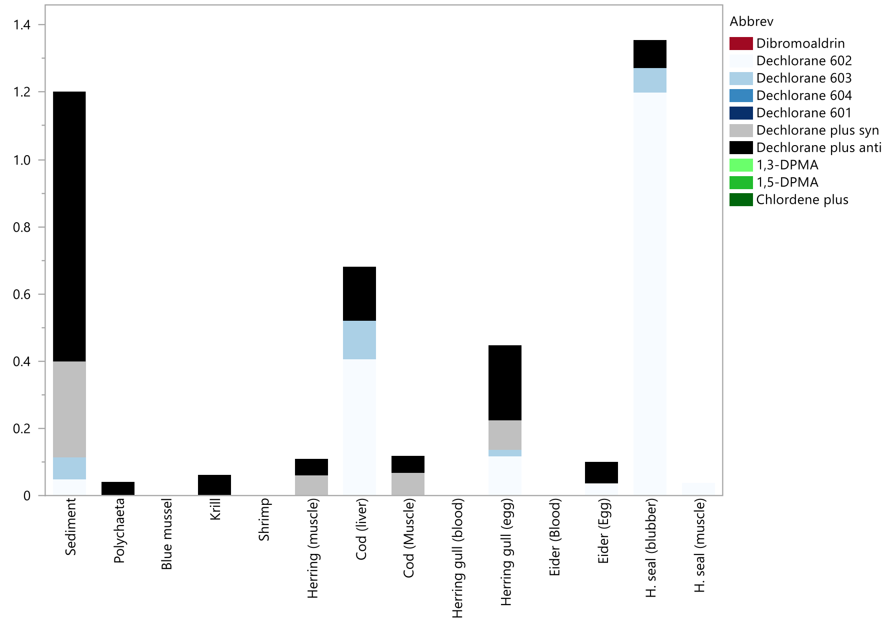
2.4.9 Organochlorines and PCBs

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

2.4.10 Dechloranes

Dechloranes were not detected in shrimp and blood of birds. In all other matrices, dechlorane plus syn and anti were important compounds. In cod liver, bird eggs and seal blubber, Dechlorane 602 constituted high proportions of the sum-dechloranes concentration (**Figure 6**).

A.



B.

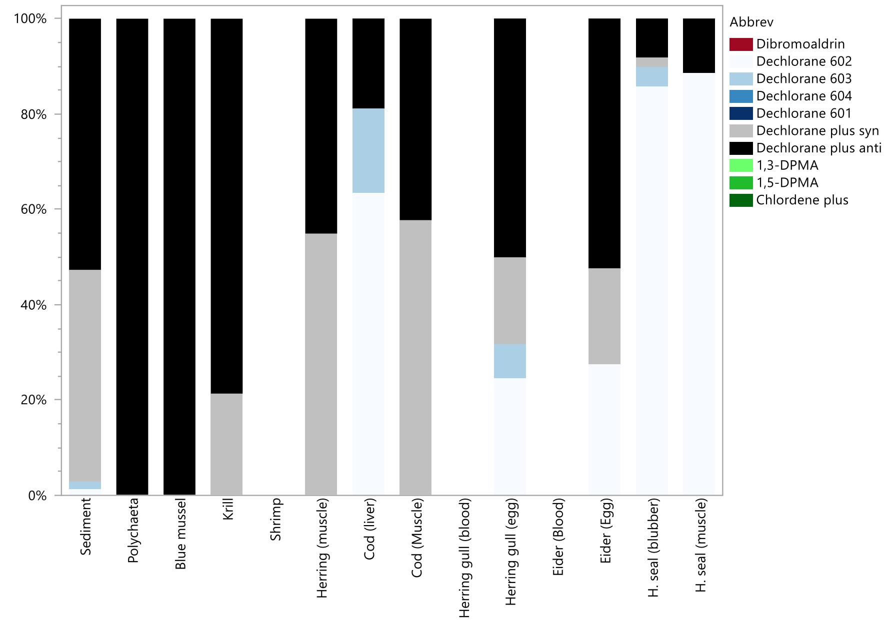
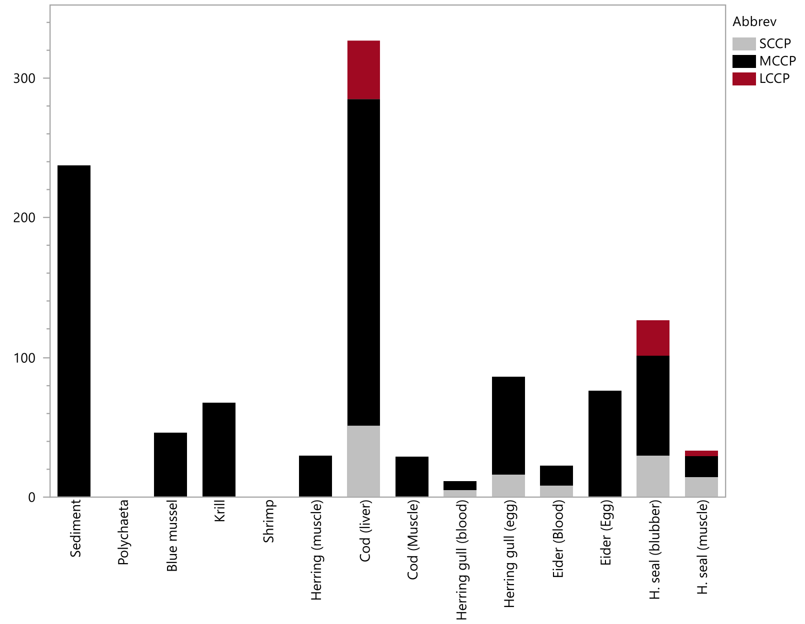


Figure 6. Concentrations (median; ng/g wet wt. in biota, ng/g dry wt. in sediment) of dechloranes in all matrices (**A**) and their contribution (%) to the sum-dechloranes concentration (**B**). Non-detected compounds are assigned a value of zero (0).

2.4.11 Chlorinated paraffins

Chlorinated paraffins were detected in all matrices analysed, except shrimp (**Figure 7**). Generally, MCCPs constituted the highest concentrations. LCCPs were only analysed in harbour seal, as well as in cod (liver), where the concentrations were comparable to those of SCCPs.

A.



B.

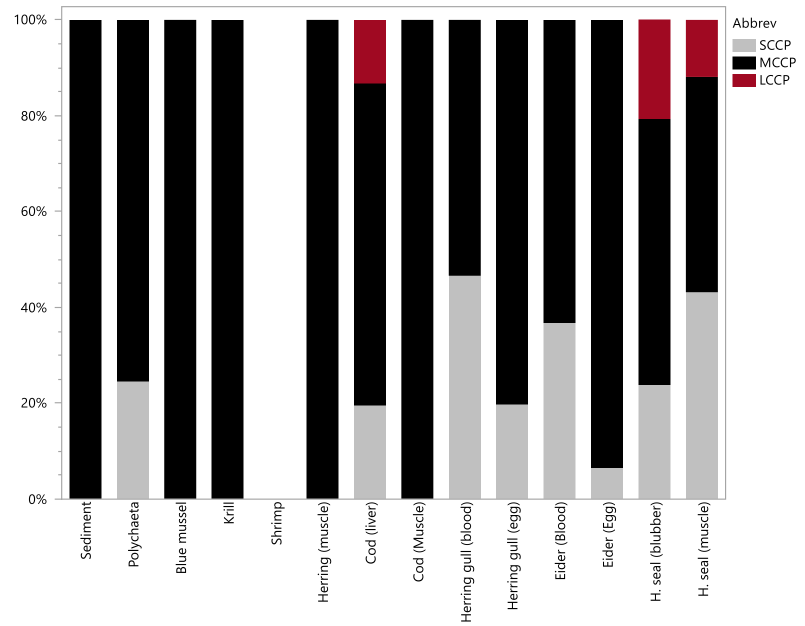
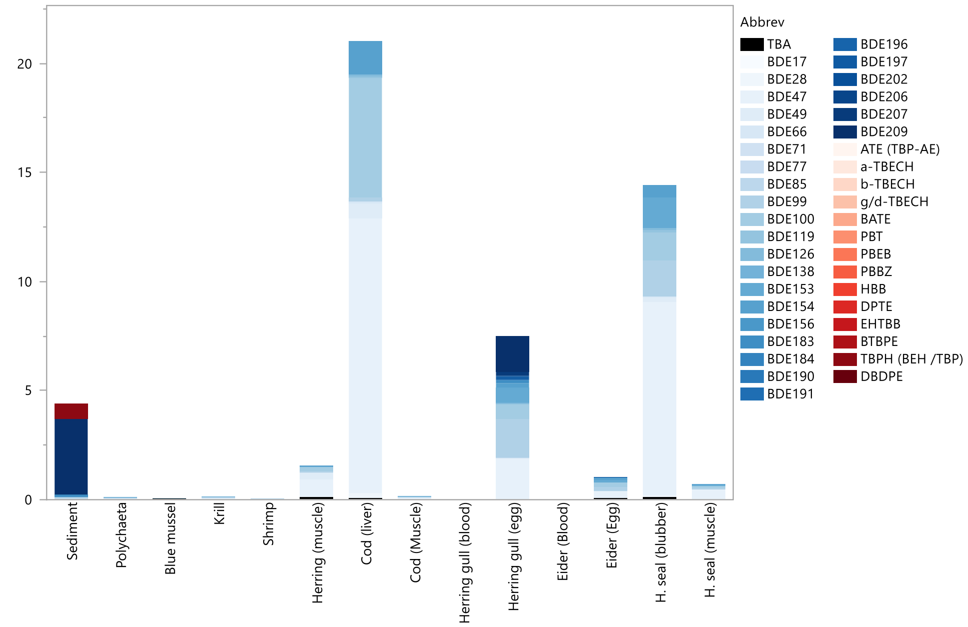


Figure 7. Concentrations (median; ng/g wet wt. in biota, ng/g dry wt. in sediment) of Chlorinated paraffins in all matrices (**A**) and their contribution (%) to the sum-chlorinated paraffins concentration (**B**). Non-detected compounds are assigned a value of zero (0). LCCPs were only analysed in Harbour seal, as well as in cod liver).

2.4.12 PBDEs and other brominated compounds

PBDEs were detected in all matrices analysed, and the highest concentrations were found in cod liver, herring gull eggs and harbour seal blubber, as well as in sediment (**Figure 8**). BDE47 was an important PBDE in the biota samples, while BDE209 constituted a large proportion of the sum-brominated compounds concentration in sediment. Furthermore, TBPH (BEH/TBP) and DBDPE concentrations displayed notable concentrations/proportions (higher than all PBDE analogues, except BDE-209) in the sediment. DBDPE was, however, only detected in one (of three) sediment samples.

A.



B.

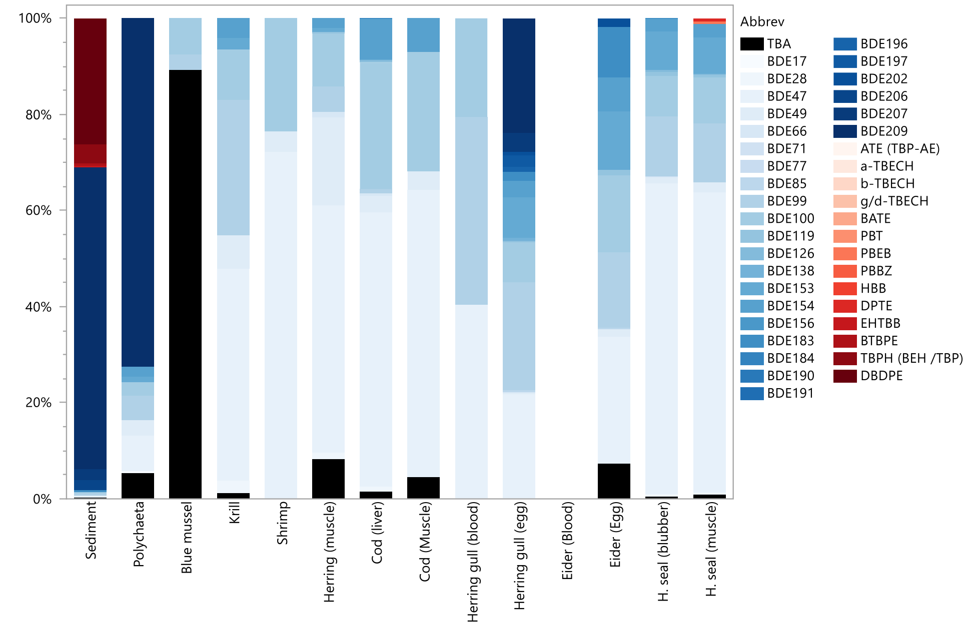
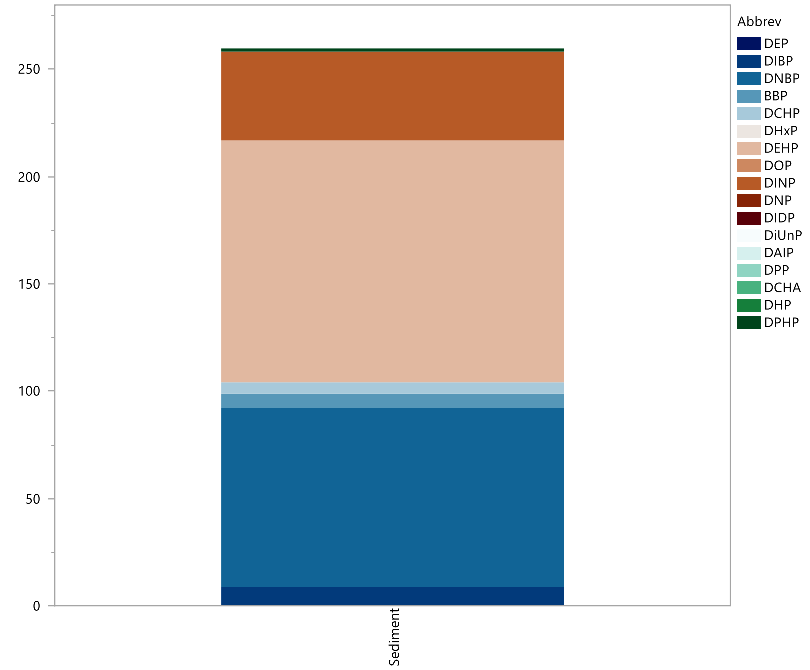


Figure 8. Concentrations (median; ng/g wet wt. in biota, ng/g dry wt. in sediment) of PBDEs and other brominated compounds in all matrices (**A**) and their contribution (%) to the sum-brominated compounds concentration (**B**). Non-detected compounds are assigned a value of zero (0).

2.4.13 Phthalates

Phthalates were detected in sediments (the only matrix where they were analysed; **Figure 9**). DINP, DEHP and DNBP constituted the highest concentrations.

A.



B.

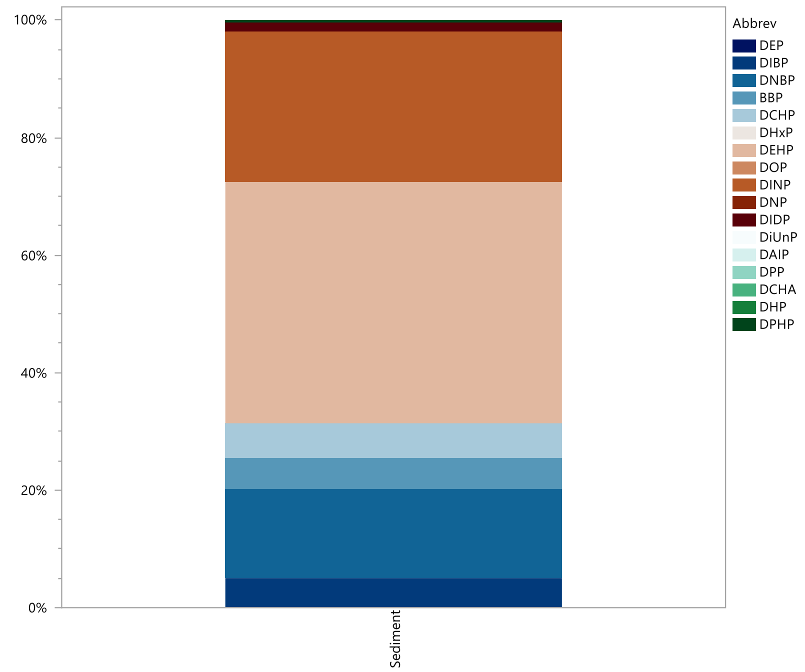
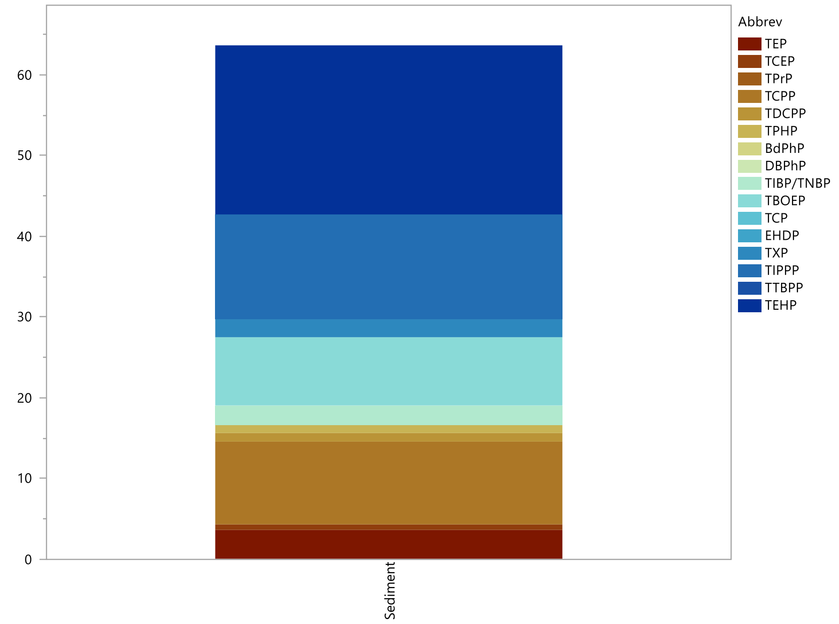


Figure 9. Concentrations (median; ng/g dry wt.) of phthalates in sediment (**A**) and their contribution (%) to the sum-phthalates concentration (**B**). Non-detected compounds are assigned a value of zero (0). Phthalates were analysed in sediments only.

2.4.14 OPFRs

OPFRs were detected in sediments (the only matrix where they were analysed; **Figure 10**). TCPP, TEHP and TIPPP constituted the highest concentrations.

A.



B.

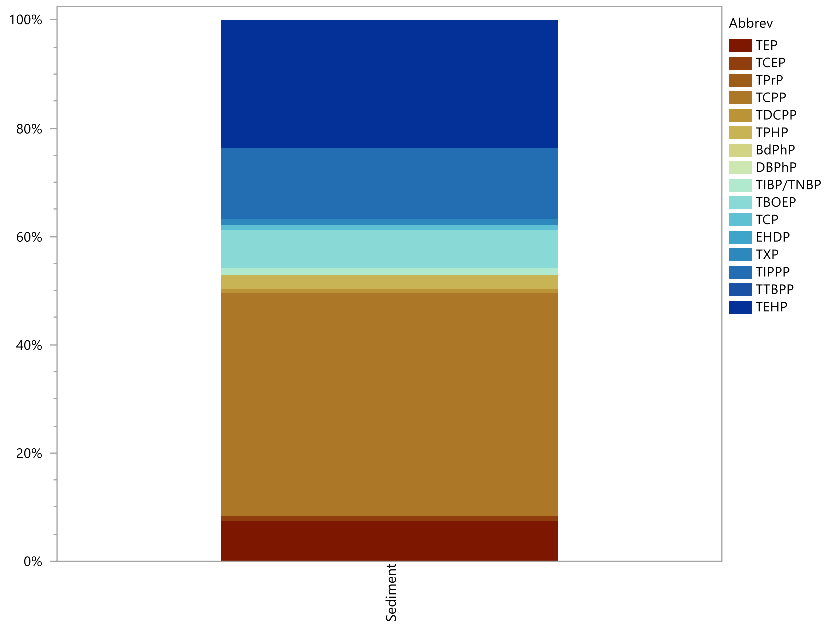


Figure 10. Concentrations (median; ng/g dry wt.) of OPFRs in sediment (**A**) and their contribution (%) to the sum-OPFR concentration (**B**). Non-detected compounds are assigned a value of zero (0). OPFRs were analysed in sediments only.

2.4.15 Phenolic compounds

Phenolic compounds were detected in sediments and bile of cod (the two matrices where they were analysed). In addition, BCPS was detected in blubber and muscle of harbour seal (the only matrices where BCPS was analysed), however only in 1 of 10 muscle samples (**Figure 2**). 4,4-Bisphenol A and nonylphenol (branched) constituted the highest concentrations in both sediment and cod bile (**Figure 11**). Note, however, that nonylphenol (branched) was detected in only one of three sediment samples (LoQs were high: 34-36 ng/g).

A.

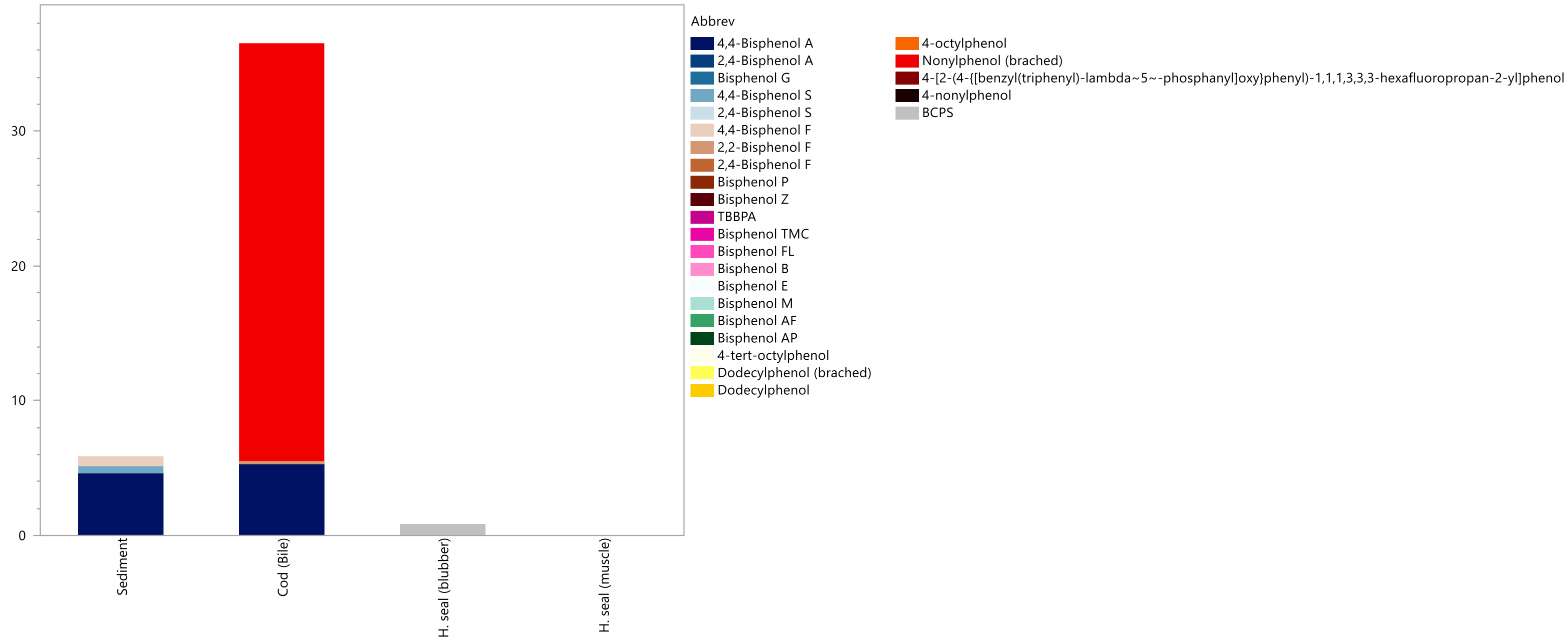
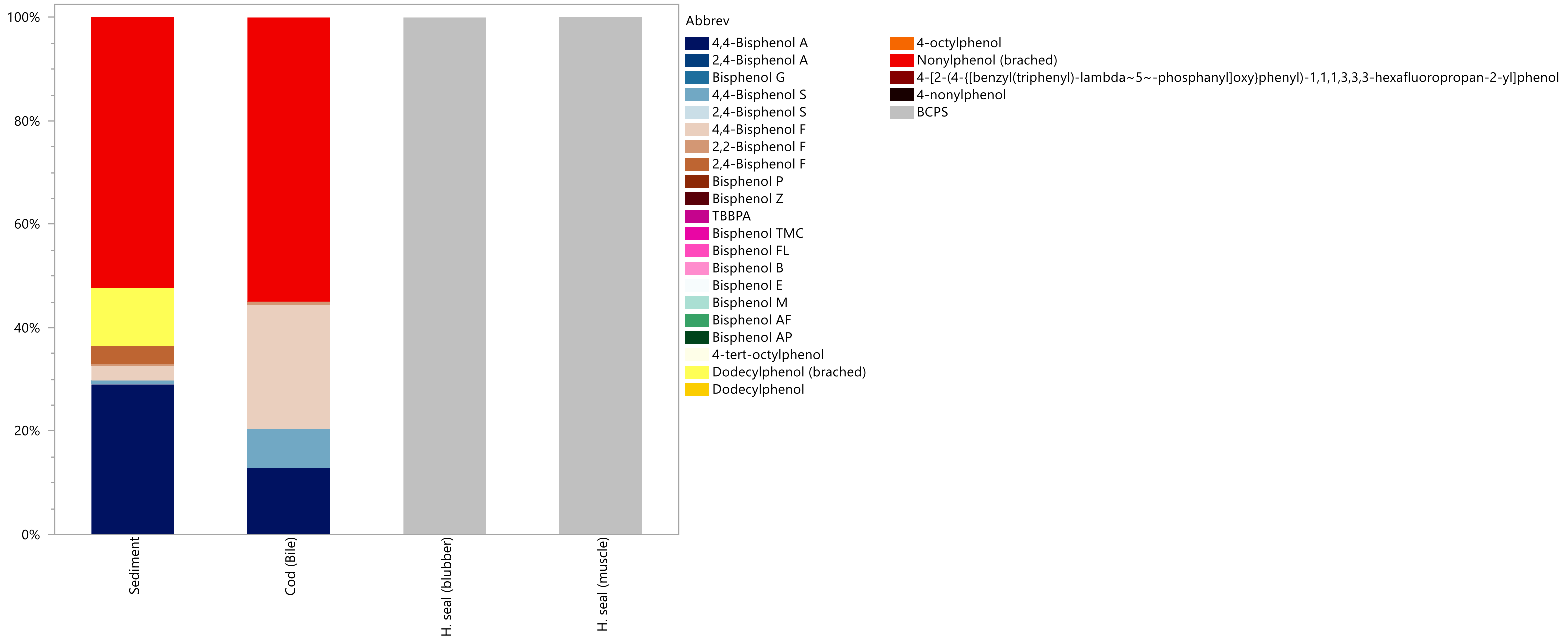


Figure 11. Concentrations (median; ng/g wet wt. in biota, ng/g dry wt. in sediment) of phenolic compounds in sediment, bile of cod, and blubber and muscle of harbour seal (**A**) and their contribution (%) to the sum-phenolic compounds concentration (**B**; next page). Non-detected compounds are assigned a value of zero (0). BCPS was the only phenolic compound analysed in harbour seal (blubber and muscle), and this compound was not analysed in any other matrices.

B.

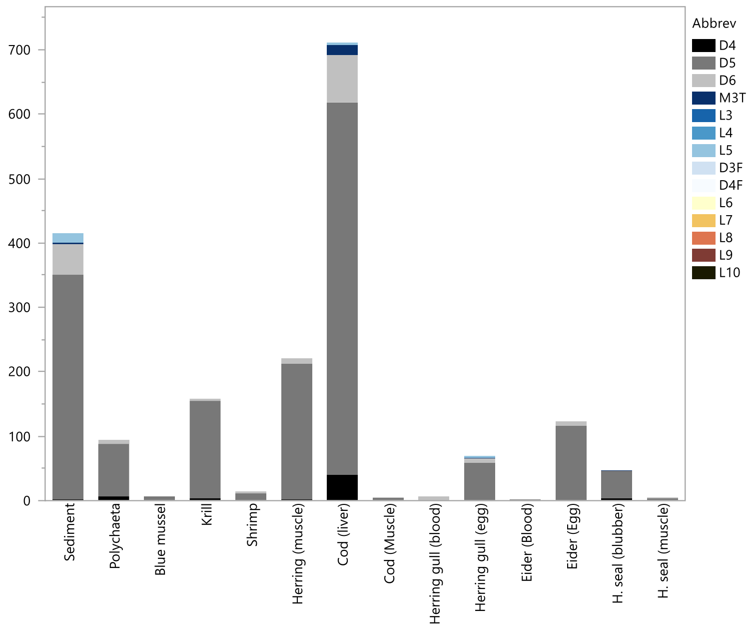

100%
80%
60%
40%
20%
0%
Sediment
Cod (Bile)
H. seal (blubber)
H. seal (muscle)
Abbrev
4,4-Bisphenol A
2,4-Bisphenol A
Bisphenol G
4,4-Bisphenol S
2,4-Bisphenol S
4,4-Bisphenol F
2,2-Bisphenol F
2,4-Bisphenol F
Bisphenol P
Bisphenol Z
TBBPA
Bisphenol TMC
Bisphenol FL
Bisphenol B
Bisphenol E
Bisphenol M
Bisphenol AF
Bisphenol AP
4-tert-octylphenol
Dodecylphenol (brached)
Dodecylphenol
4-octylphenol
Nonylphenol (brached)
4-[2-(4-{[benzyl(triphenyl)-lambda~5~-phosphanyl]oxy}phenyl)-1,1,1,3,3,3-hexafluoropropan-2-yl]phenol
4-nonylphenol
BCPS

2.4.16 Siloxanes

Siloxanes were detected in all matrices (**Figure 12**). The highest concentrations were observed in cod liver. D5 was a major constituent of the sum-siloxanes concentration. Long siloxanes (L6-L10) were only analysed in harbour seal (blubber and muscle) but could not be detected.

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). Furthermore, results from analyses of harbour seal blood plasma from Canada (Wang et al. 2017) showed presence of L3 in three individuals from Bic Island (L2, L4 and L5 were not detected), however the L3 concentrations accounted for <2% of total siloxane concentrations. D5 constituted the highest concentrtions.

A.



B.

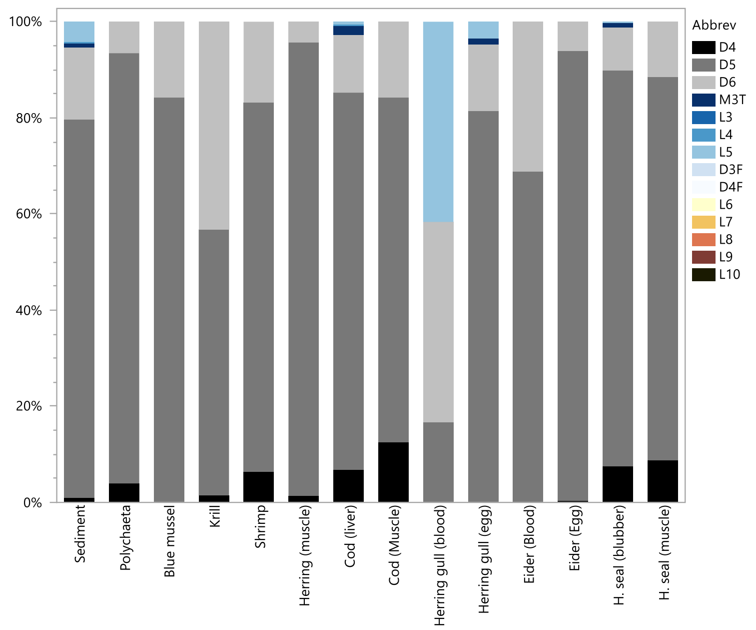


Figure 12. Concentrations (median; ng/g wet wt. in biota, ng/g dry wt. in sediment) of siloxanes in all matrices (**A**) and their contribution (%) to the sum-siloxanes concentration (**B**). Non-detected compounds are assigned a value of zero (0). Long siloxanes (L6-L10) were only analysed in harbour seal (blubber and muscle).

2.4.17 Musks

Musks were only analysed in sediment. Among the musks, only Galoxolide was detected in all three samples (**Figure 2**). Tonalide (AHMT) was detected in one sample (Al1, Alna River outlet).

2.4.18 Metals

Iron is the dominating metal in sediment and in haemoglobin or myoglobin rich matrices, such as bird blood and seal muscle (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 large proportions of the sum of metals in all matrices. Conspicuous concentrations/proportions of arsenic (constituting >30% of the sum-metal concentration, excluding iron) were also observed 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). A notable proportion (8.7% of the sum-metal concentration, excluding iron) of silver (Ag) was also observed in cod (liver). Rare earth metals (Sc, Y and lanthanides) were found mainly in sediment.

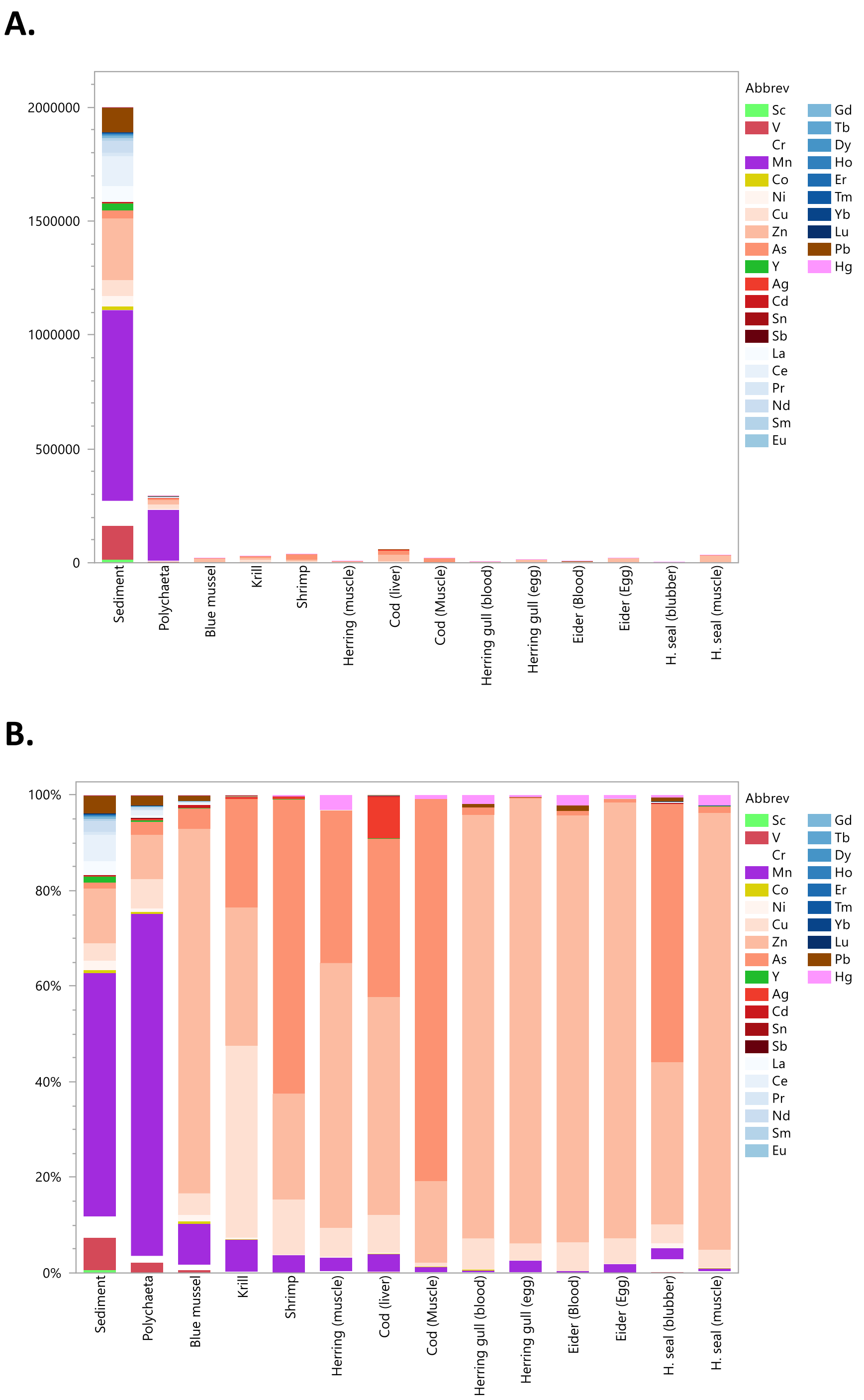


Figure 13. Concentrations (median; ng/g wet wt. in biota, ng/g dry wt. in sediment) of metals in all matrices (**A**) and their contribution (%) to the sum-metals concentration (**B**). Non-detected compounds are assigned a value of zero (0). Note that iron (Fe) has been omitted from the figure because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

The homogenizing effects of sedimentary processes should result in nearly constant distributions of rear 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, Ildjernet, post Archean Australian Shale (PAAS)-normalized ratios (Taylor and McLennan, 1985) of light rear earth elements (LREE), middle REE (MREE) and heavy REE (HREE) were (on average) 1.70, 1.81 and 1.13, while “continental crust”-normalized ratios (from McLennan, 2001) of LREE, MREE and HREE were (on average) 2.12, 2.24 and 1.43 (**Figure 14**).

In sediments from station Bq41, Bekkelaget, post Archean Australian Shale (PAAS)-normalized ratios (Taylor and McLennan, 1985) of LREE, MREE and HREE were (on average) 1.62, 1.68 and 1.03, while “continental crust”-normalized ratios (from McLennan, 2001) of LREE, MREE and HREE were (on average) 2.03, 2.08 and 1.30 (**Figure 14**).

In sediments from station Al1, Alna River outlet, post Archean Australian Shale (PAAS)-normalized ratios (Taylor and McLennan, 1985) of LREE, MREE and HREE were (on average) 1.69, 1.80 and 1.09, while “continental crust”-normalized ratios (from McLennan, 2001) of LREE, MREE and HREE were (on average) 2.12, 2.23 and 1.38 (**Figure 14**).

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

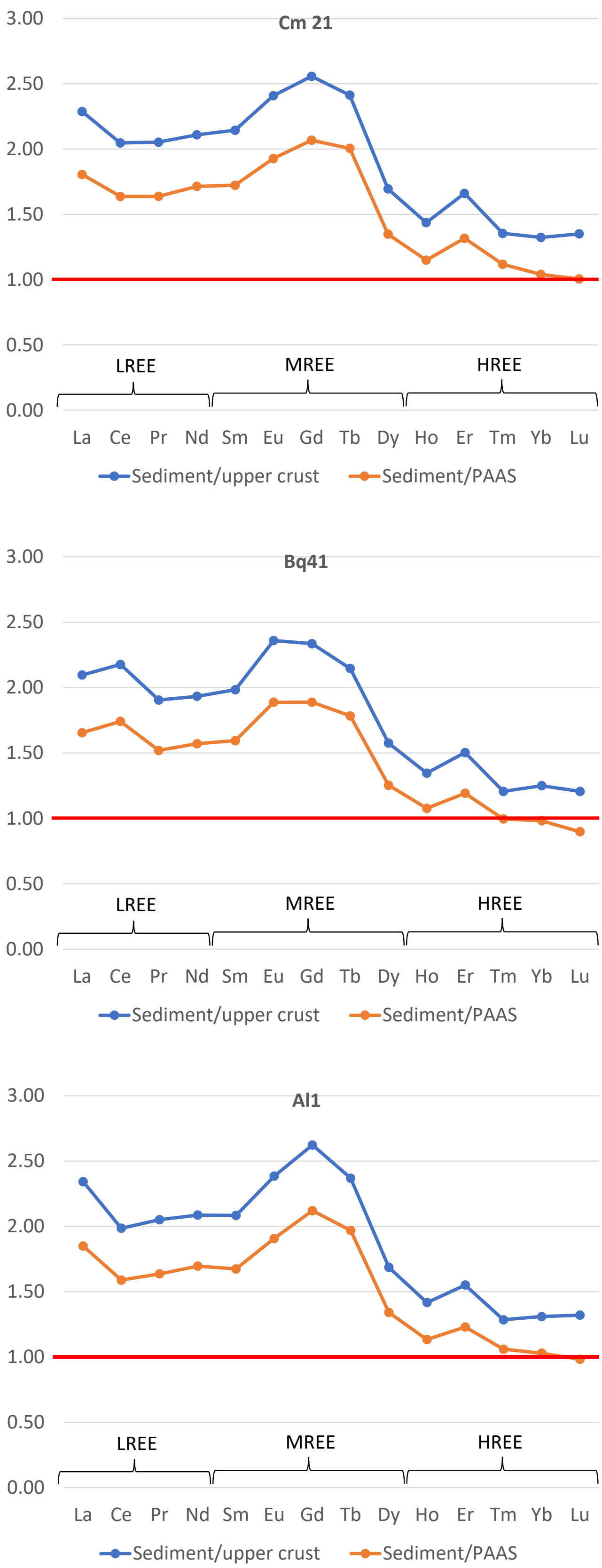


Figure 14. Ratio of lanthanide content in Inner Oslofjord sediments (top: Cm21; middle: Bq41; bottom: Al1) to lanthanide content in Post Archean Australian Shale (PAAS; Taylor and McLennan; 1985) and continental crust (McLennan, 2001).

2.4.19 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.

Siloxanes, Hg, phthalates and QACs were dominating contaminants in sediment. Hg constituted high proportions of the sum of all selected contaminants in nearly all matrices, and especially so in fish muscle, seal muscle, bird blood and shrimp. Siloxanes also constituted large proportions of the sum of all selected contaminants in biota, and especially in invertebrates and fish (herring and cod). Furthermore, PCBs constituted large proportions of the sum of all selected contaminants especially in lipid rich tissues, such as cod liver, bird eggs and seal blubber. Chlorinated paraffins constituted large proportions of the sum of all selected contaminants especially in blue mussel.

PFAS constituted larger proportions of the sum of all selected contaminants the blood of birds, than in any other matrix.

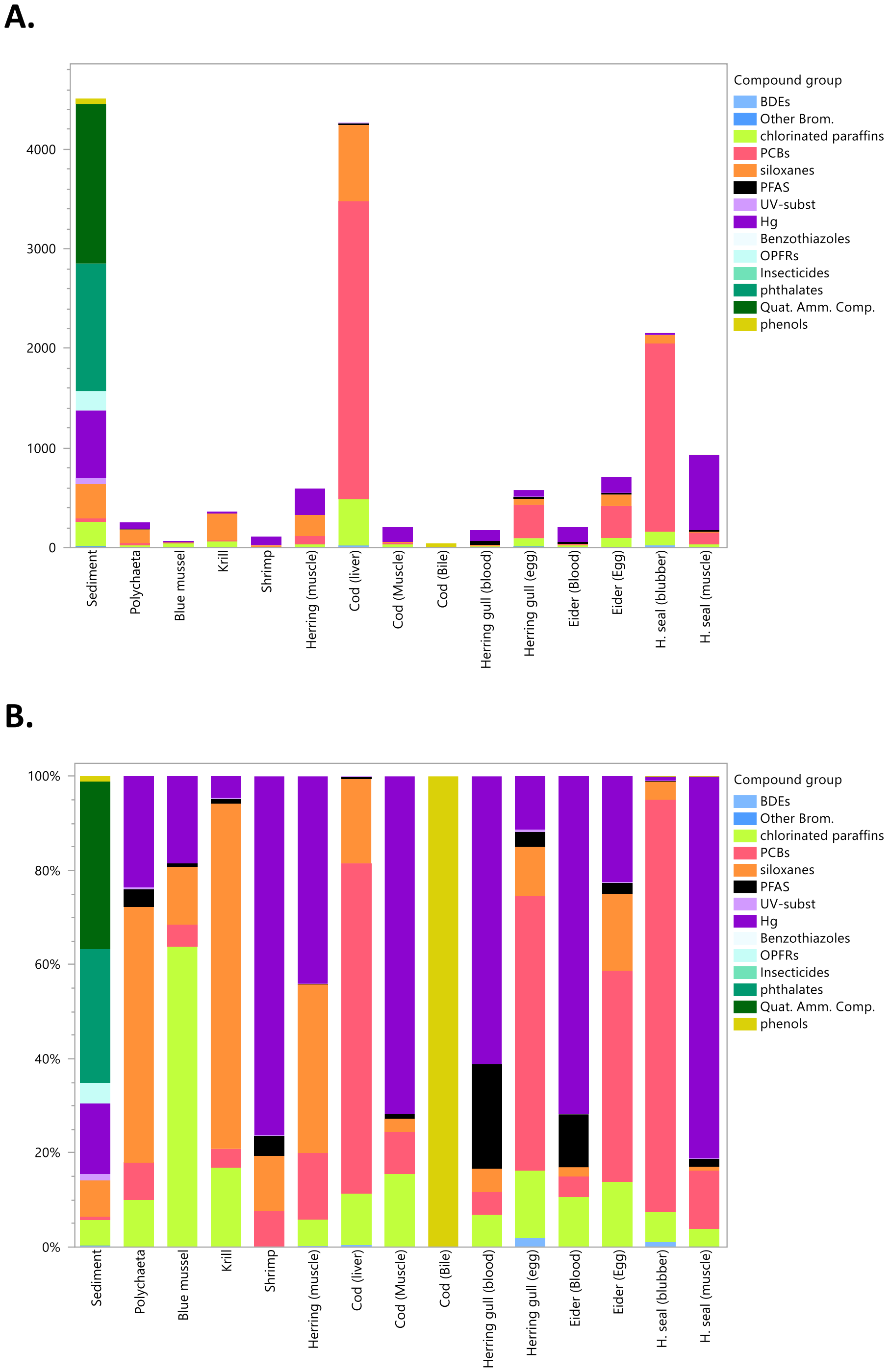


Figure 15. Concentrations (means; ng/g wet wt. in biota, ng/g dry wt. in sediment) of selected compounds/compound groups in all matrices (**A**) and their contribution (%) to the sum concentration of all these compounds/compound groups (**B**). Non-detected compounds are assigned a value of zero (0). Note: benzothiazoles, OPFRs, phthalates and quaternary ammonium compounds (QACs) were only analysed in sediment; insecticides were only analysed in harbour seal; phenolic compounds were only analysed in sediment, cod bile and harbour seal (however only BCPS in harbour seal). No other compounds than phenols were analysed in cod bile.

2.4.20 Relation to Environmental Quality Standards (EQSs)

In **Table 4** and **Table 5** concentrations (medians) are compared to environmental quality standards (EQS).

Table 4. Concentrations of contaminants (mg/kg dry wt) in sediment from the inner Oslofjord (mean, n=3), and the respective Norwegian quality standards (Direktoratsgruppen vanndirektivet 2018). Red numbers indicate concentrations exceeding the quality standard (annual average, AA-EQS).

River basin specific compounds	EQS (mg/kg dry wt.)	Sediment conc. (mg/kg dry wt.)
Bisphenol A *	0.0011	0.015
Dodecylphenol *	0.0044	0.0057
Decamethylcyclopentasiloxane (D5)	0.044	0.274
Medium chained chloroparafins (MCCPs)	4.6	0.242
Copper (Cu)	84	83.9
PCB7	0.0041	0.0175
PFOA	0.071	<0.0005
Zinc (Zn)	139	271
TBBPA	0.11	<0.0046
Arsenic (As)	18	31
Chromium (Cr)	620	107
TCEP	0.072	0.0018
EU priority substances		
Cadmium (Cd)	2.5	0.49
Lead (Pb)	150	91
Nickel (Ni)	42	48
Mercury (Hg)	0.52	0.68
Brominated diphenyl ethers *	0.062	<0.0003
Hexachlorobenzene	0.017	0.0002
C10-13 chloroalkanes **	0.8	<0.0375
Pentachlorobenzene	0.4	0.0002
Nonylphenol (4-)	0.016	<0.0022
Octylphenol (4-*tert*-)	0.0003	<0,0012 ***
PFOS *	0.00023	0.00005
DEHP	10	0.527

* Bisphenol A is sum of 4,4´- and 2,4´-; Dodecylphenol is the sum of Dodecylphenol and branched; BDEs are Sum of BDE-28, -47, -99, -100, -153 and -154; PFOS is sum of PFOS and brPFOS.
** Short chained chloroparaffins (SCCPs)
*** Too high limit of detection to evaluate

Table 5. Concentrations of contaminants (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 (Direktoratsgruppen vanndirektivet 2018). 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	6.99	200	4.07	601
Medium chained chlorinated paraffins (MCCPs)	170	43	32.9	32.1	312
PCB7	0.6	1.80	47.6	12.3	2004
PFOA	91	<0.5	<0.5	<0.5	<0.5
TCEP	7300	-	-	-	-
EU priority substances					
Mercury (Hg)	20	12.4	261	149	-
Brominated diphenyl ethers *	0.0085	0.0082	1.09	0.14	19.4
Hexachlorobenzene	10	<0.035	0.603	0.059	3.43
C10-13 chloroalkanes **	6000	<9.57	<9.61	<6.9	91
Pentachlorobenzene	50	<0.016	0.111	<0.036	0.421
Nonylphenol (4-)	3000	-	-	-	-
Octylphenol (4-*tert*-)	0.004	-	-	-	-
PFOS *	9.1	0.03	0.06	0.56	2.98
DEHP	2900	-	-	-	-

* BDEs are Sum of BDE-28, -47, -99, -100, -153 and -154; PFOS is sum of PFOS and brPFOS.
** Short chained chlorinated paraffins (SCCPs)

2.4.21 Biomagnification of environmental contaminants in the Inner Oslofjord food web

Statistically significant biomagnification was observed for 28 PCB congeners and 6 PBDEs (lipid wt. basis). Furthermore, significant biomagnification was observed for 5 PFAS compounds (PFOS, brPFOS, PFUnDA, PFOSA and PFDA), as well as for the metals As, Ag and Hg (wet wt. basis). **Figure 16** to **Figure 21** depict the significant regressions for a selection of the contaminants.

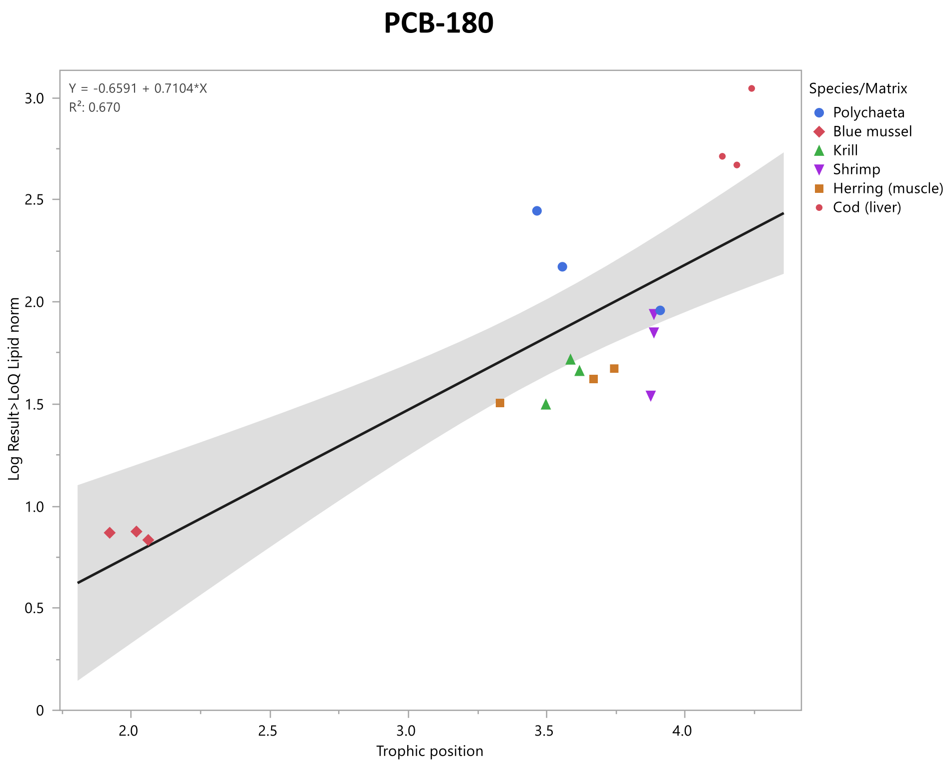


Figure 16. Trophic position against concentrations (ng/g lipid wt.; log_{10}-transformed) of **PCB-180** in the studied Inner Oslofjord food web. The confidence region of the fitted line is indicated with grey shading. **TMF=5.13**; *p*<0.0001.

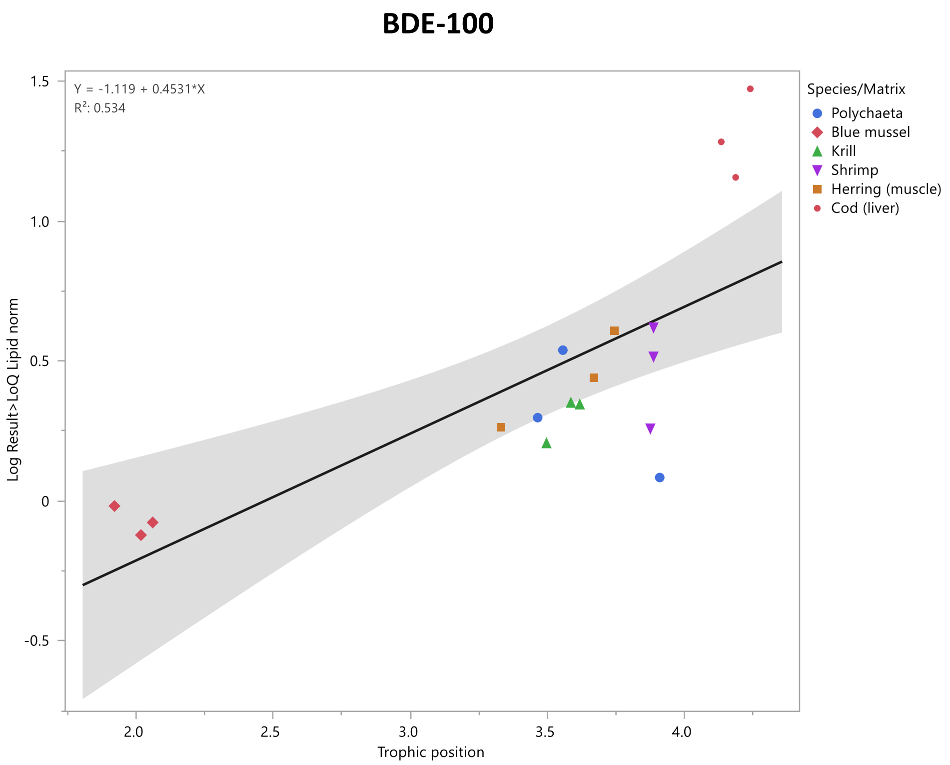


Figure 17. Trophic position against concentrations (ng/g lipid wt.; log_{10}-transformed) of **BDE-100** in the studied Inner Oslofjord food web. The confidence region of the fitted line is indicated with grey shading. **TMF=2.84**; *p*<0.0007.

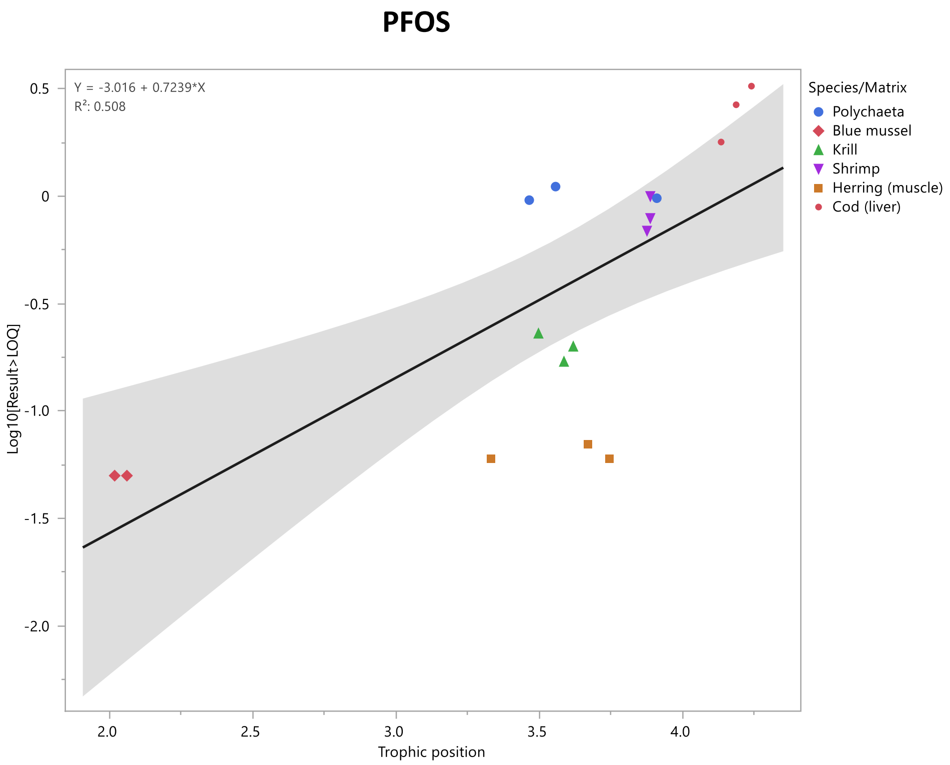


Figure 18. Trophic position against concentrations (ng/g wet wt.; log_{10}-transformed) of **PFOS** in the studied Inner Oslofjord food web. The confidence region of the fitted line is indicated with grey shading. **TMF=5.29**; *p*<0.002.

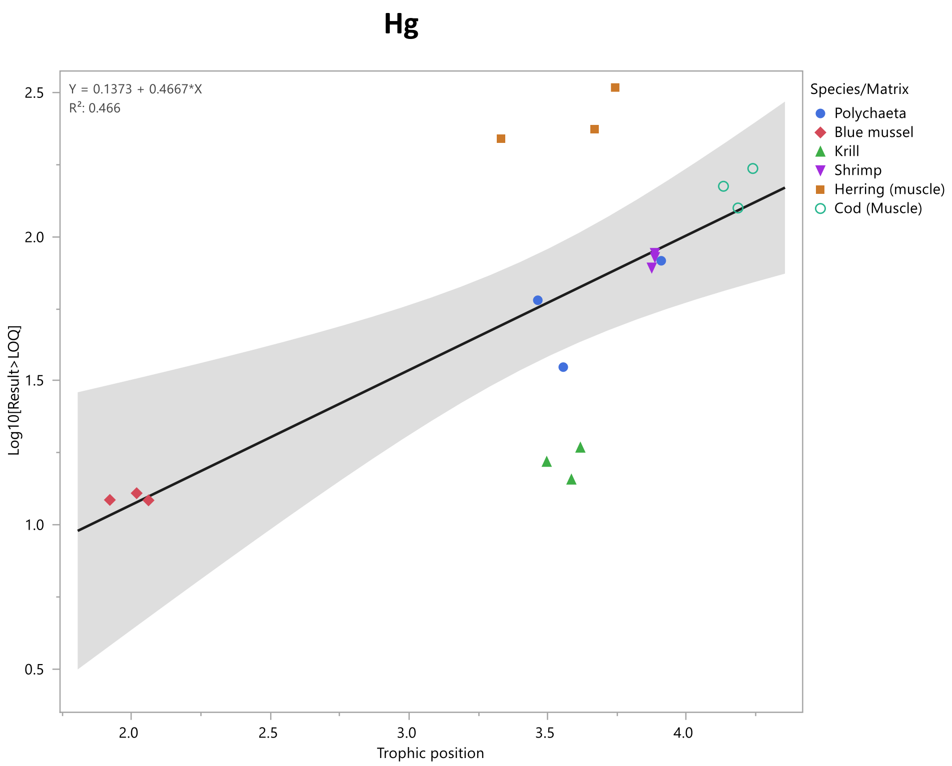


Figure 19. Trophic position against concentrations (ng/g wet wt.; log_{10}-transformed) of **mercury (Hg)** in the studied Inner Oslofjord food web. The confidence region of the fitted line is indicated with grey shading. **TMF=2.93**; *p*<0.002.

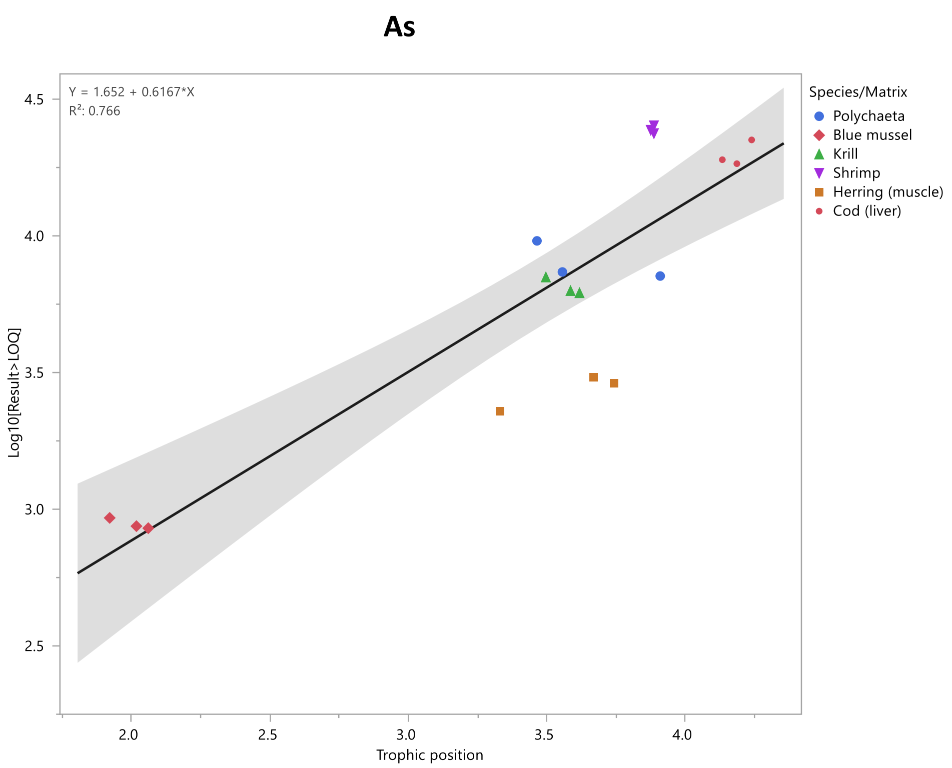


Figure 20. Trophic position against concentrations (ng/g wet wt.; log_{10}-transformed) of **arsenic (As)** in the studied Inner Oslofjord food web. The confidence region of the fitted line is indicated with grey shading. **TMF=4.14**; *p*<0.0001.

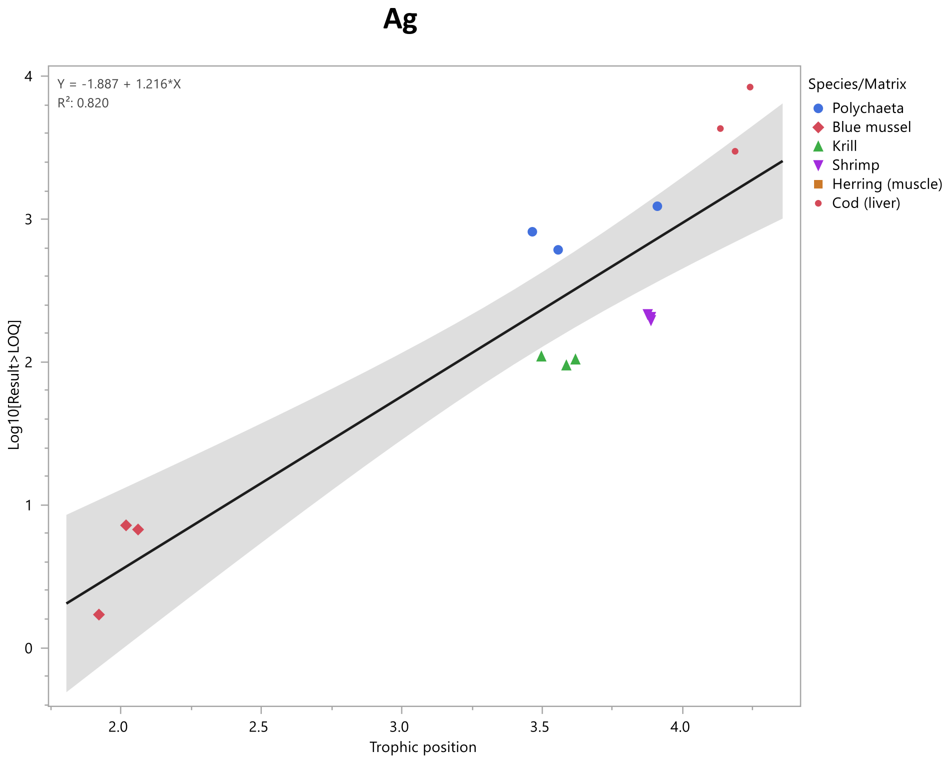


Figure 21. Trophic position against concentrations (ng/g wet wt.; $\log_{10}$-transformed) of **silver (Ag)** in the studied Inner Oslofjord food web. The confidence region of the fitted line is indicated with grey shading. **TMF=16.43**; p<0.0001. Ag was not detected in herring.

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^2) from Research Vessel Trygve Braarud on August 18th (Al1 and Cm21) and August 29th (Bq41), 2022. 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, Al and Cm21 (**Figure 1**) using a van Veen grab (0.15 m^2) from RV Trygve Braaarud. 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 17th, 2022, 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 and at the same time as zooplankton (krill); Midtmeie, southwest of Steilene (**Figure 1**).

3.1.5 Blue mussel

Mussels (*Mytilus edulis*) were collected at Steilene (**Figure 1**), on August 10th, 2022, by standard procedures (handpicked, using rake, or snorkelling; as done in the project "Contaminants in coastal waters", MILKYS; Schøyen et al. 2022; The Norwegian Environment Agency M-2124). 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 17th, 2022. 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 17th, 2022. 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 (15 of each) were sampled at Husbergøya (**Figure 1**), between May 5th and May 12th, 2022. 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. 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 samples (n=15).

3.1.9 Herring gull

Herring gull (*Larus argentatus*) blood samples (from adult individuals trapped at nest) and eggs (15 of each) were sampled at Søndre Skjælholmen, Raudskjæra and Husbergøya (**Figure 1**), between May 23rd and June 21st, 2022. 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. 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 samples (n=15).

3.1.10 Harbour seal

Samples of harbour seal (*Phoca vitulina*) were obtained from the University of Oslo (Eivind Stensrud) through other research activity (Stensrud, 2022). Seals were collected by five different hunting groups, at Torbjørnskjær, Søndre Missingen, Singleøya and Garnholmen (**Figure 1**), in the outer Oslofjord, during January 9th to January 11th, 2021.

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 divides 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 establish, not only at NIVA/NILU, but also internationally. That means the quality of this analysis have been proven with intercalibration studies and quality parameters are good. Most of these analyses is 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. These 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 others.

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 might be less than favourable (insufficient to be defined in uncertainty category 2). 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 or ng/L	Method	Uncertainty category
UV compounds	Benzophenone-3	131-57-7	Three blanks per batch. Blank-subtraction and LOQ based on average signal of blanks + 3*std. Octocylene usually has the highest levels in blanks.	0,2-0,4	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)	5466-77-3		0,05-0,3		2
	Ethylhexylmethoxycinnamate (EHMZ-E)	5466-77-3		0,05-0,3		2
	Octocrylene	6197-30-4		0,5-2		2
	UV-327	3864-99-1		0,1-1		2
	UV-328	25973-55-1		0,1-1		2
	UV-329	3147-75-9		0,2-5		3
	homosalate	118-56-9		1-5		2
	3-(2H-benzotriazol-2-yl)-5-(1,1-dimethylethyl)-4-hydroxy-benzenepropanoic acid I	84268-36-0	One blank pr batch. LOQ based on 10 x signal-to-noise as measured in each sample	0,5-1	IS added. Solid samples then extracted twice, and water samples pre-concentrated on SPE. LC-MS/MS detection	2

Comments to UV filters:
Tests of the extraction and analysis recovery of UV-329 based on spiking experiments give results outside the range of 60-140%. The measured results of the analysis of complex samples (such as liver) could be overestimates as a consequence. A new internal standard will be tried out to improve the recovery. The pattern of the blank has changed a bit from earlier years, but it seems not to have changed the results.

Table 6 cont. Method information. PFAS.

Parameter group	Name parameter	CAS Number	Blank subtraction and determination of LOQ	LOQ range, ng/g or ng/L	Method	Uncertainty category
PFAS	***PFSA***					
	TFA	76-05-1	One blank per batch. LOQ as validated and externally controlled in proficiency testing.	5	Internal standard is added and solid samples are extracted twice. Water samples are concentrated by freeze drying. LC-MS/MS detection	2
	PFPrA	422-64-0		0,5		2
	PFBA	375-22-4		0,5	Internal standard is added and solid samples are extracted twice. Water samples are concentrated on an SPE column. LC-QTOF-MS detection	2
	PFPA	422-64-0		0,5		2
	PFHxA	307-24-4		0,5		1
	PFHpA	335-67-1		0,5		2
	PFOA	375-95-1		0,5		1
	PFNA	335-76-2		0,5		1
	PFDcA	2058-94-8		0,4		1
	PFUnA	307-55-1		0,4		1
	PFDoA	72629-94-8		0,4		1
	PFTriA	376-06-7		0,4		1
	PFTeA	67905-19-5		0,4		1
	PFHxDA	16517-11-6		0,4		2
	PFOcDA	16517-11-6		0,4		2
	PFSA					
	PMeS	1493-13-6	One blank per batch. LOQ as validated and externally controlled in proficiency testing.	0,1	Same method as for TFA	2
	PFEtS	354-88-1		0,1		2
	PFPrS	423-41-6		0,1		2
	PFBS	375-73-5		0,2	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		0,2		2
	PFHxS	355-46-4		0,1		1
	PFHpS	375-92-8		0,1		1
	PFOS	2795-39-3		0,05		1
	brPFOS	1763-23-1		0,05		2
	PFNS	17202-41-4		0,1		2
	PFDcS	67906-42-7		0,2		1
	PFUnS	441296-91-9		0,2		2
	PFDoS	79780-39-5		0,2		2
	PFTrS	749786-16-1		0,3		2
	PFTeS	n/a		0,3		3

Parameter group	Name parameter	CAS Number	Blank subtraction and determination of LOQ	LOQ range, ng/g or ng/L	Method	Uncertainty category
	nPFAS					
	PFBSA	30334-69-1	One blank per batch. LOQ as validated and externally controlled in proficiency testing.	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
	N-MeFBSA	68298-12-4		0,3		2
	N-EtFBSA	40630-67-9		0,3		2
	PFOSA	754-91-6		0,1		1
	meFOSA	31506-32-8		0,3		2
	etFOSA	4151-50-2		0,3		2
	meFOSE	24448-09-7		1,0		2
	etFOSE	1691-99-2		1,0		2
	etFOSAA	2991-50-6		0,3		2
	newPFAS					
	4:2 FTS	757124-72-4	One blank per batch. LOQ as validated and externally controlled in proficiency testing.	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
	6:2 FTS	27619-97-2		0,3		2
	8:2 FTS	481071-78-7		0,3		2
	10:2 FTS	120226-60-0		0,3		2
	12:2 FTS	149246-64-0		0,3		3
	NaDONA	958445-44-8		0,3		2
	PFECHS	67584-42-3		0,3		2
	HFPO-DA (Gen-X)	13252-13-6		0,3		3

Comments to PFAS:
PFTeS, 12:2 FTS and HFPO-DA (Gen-X): Reference standard materials were unavailable for these compounds. Uncertainty category is therefore reported as 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 have not been reported, but the results here present the most significant.

Table 6 cont. Method information. Quaternary ammonium compounds.

Parameter group	Name parameter	CAS Number	Blank subtraction and determination of LOQ	LOQ range, ng/g or ng/L	Method	Uncertainty category
Quaternary ammonium compounds	DADMAC-C8	3026-69-5	Three blanks per batch. Blank-subtraction and LOQ based on average signal of blanks + 3*std.	5	Internal Standard (IS) added. Samples are then extracted twice before clean-up via SPE. LC-MS/MS detection	2
	DADMAC-C10	2390-68-3		50		2
	DADMAC-C12	3282-73-3		5		2
	DADMAC-C14	68105-02-2		1		2
	DADMAC-C16	70755-47-4		5		2
	DADMAC-C18	3700-67-2		5		2
	BAC-C8	959-55-7		5		2
	BAC-C10	965-32-2		5		2
	BAC-C12	139-07-1		25		2
	BAC-C14	139-08-2		25		2
	BAC-C16	122-18-9		25		2
	BAC-C18	122-19-0		25		2
	ATAC-C8	2083-68-3		5		2
	ATAC-C10	2082-84-0		5		2
	ATAC-C12	1119-94-4		5		2
	ATAC-C14	1119-97-7		50		2
	ATAC-C16	57-09-0		50		2
	ATAC-C18	1120-02-1		50		2
	ATAC-C20	15809-05-9		25		2
	ATAC-C22	17301-53-0		5		2

Comments to QACs: The method has been significant improved since earlier years and the blank, and then also the LOQs has been reduced. The results are now considered have higher certainty than earlier years.

Table 6 cont. Method information. Benzothiazoles.

Parameter group	Name parameter	CAS Number	Blank subtraction and determination of LOQ	LOQ range, ng/g or ng/L	Method	Uncertainty category
Benzothiazoles	Mercaptobenzothiazole mBZT	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, while water samples are pre-concentrated on SPE. LC-MS/MS detection	2
	Benzotriazole BZT	95-14-7		0,5		2
	Benzothiazole	95-16-9		10,0		2
	2(3H)-Benzothiazolone (HBT)	934-34-9		1		2
	metyl-1H-benzotriazole	29385-43-1		0,5		2
	N-cyclohexylbenzothiazole-2-sulfenamide	95-33-0		1,0		2
	Cl-benzotriazole	94-97-3		0,5		2
	6 PPD quinone	No CAS		0,5		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 Biota	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 HNO3. Analysed by ICP-MS (Agilent 7700x).	2
	V	7440-62-2		0.001-0.002	0.005-0.01		1
	Cr	7440-47-3		0.0001-0.0005	0.001-0.002		1
	Mn	7439-96-5		0.0001-0.0002	0.0005-0.001		1
	Fe	7439-89-6		0.002-0.01	0.02-0.1		1
	Co	7440-48-4		0.0001-0.0002	0.0005-0.001		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	7440-00-8		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*

Parameter group	Compound	Cas no	Blank	LOD range (mg/kg)	LOQ range (mg/kg)	Method	Uncertainty category
	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*
	Pb	7439-92-1		0.0001-0.0003	0.0005-0.001		1
	Hg	7440-02-0		0.0002-0.0004	0.0007-0.001	In-house accredited method. Microwave assisted decomposition with HNO_3. 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 Sediment	Sc	7440-20-2	Method blanks following sample series. LOD/LOQ based on calculation of 3 and 10 stddev respectively	0.001-0.002	0.005-0.01	In-house accredited method. Microwave assisted decomposition with HNO3. Analysed by ICP-HRMS (ELEMENTZ).	2
	V	7440-62-2		0.01-0.02	0.05-0.1		1
	Cr	7440-47-3		0.001-0.002	0.005-0.01		1
	Mn	7439-96-5		0.001-0.002	0.005-0.01		1
	Fe	7439-89-6		0.02-0.1	0.2-0.5		1
	Co	7440-48-4		0.001-0.002	0.005-0.01		1
	Ni	7440-02-0		0.002-0.005	0.01-0.02		1
	Cu	7440-50-8		0.005-0.01	0.02-0.05		1
	Zn	7440-66-6		0.02-0.05	0.1-0.2		1
	As	7440-38-2		0.001-0.002	0.005-0.01		1
	Y	7440-65-5		0.0005-0.001	0.002-0.005		2*
	Ag	7440-22-4		0.001-0.002	0.005-0.01		1*
	Cd	7440-43-9		0.001-0.002	0.005-0.01		1
	Sn	7440-31-5		0.005-0.01	0.02-0.05		2*
	Sb	7440-36-0		0.001-0.002	0.005-0.01		1
	La	7439-91-0		0.0002-0.001	0.002-0.003		2
	Ce	7440-00-8		0.0003-0.001	0.002-0.003		2*
	Pr	7440-10-0		0.0001-0.001	0.002-0.003		2
	Nd	7440-00-8		0.0004-0.001	0.002-0.003		2*
	Sm	7440-19-9		0.0001-0.001	0.002-0.003		2*
	Eu	7440-53-1		0.000-0.001	0.002-0.003		2*
	Gd	7440-53-2		0.0005-0.001	0.002-0.003		2*
	Tb	7440-27-9		0.0001-0.001	0.002-0.003		2*
	Dy	7429-91-6		0.0001-0.001	0.002-0.003		2*
	Ho	7440-60-0		0.0001-0.001	0.002-0.003		2*
	Er	7440-52-0		0.0001-0.001	0.002-0.003		2*

Parameter group	Compound	Cas no	Blank	LOD range (mg/kg)	LOQ range (mg/kg)	Method	Uncertainty category
	Tm	7440-28-0		0.0001-0.001	0.002-0.003		2*
	Yb	7440-64-0		0.0001-0.001	0.002-0.003		2*
	Lu	7439-94-3		0.0001-0.001	0.002-0.003		2*
	Pb	7439-92-1		0.001-0.002	0.005-0.01		1
	Hg	7440-02-0		0.0006-0.001	0.001-0.002	In-house accredited method. Filtration of water. Microwave assisted decomposition of particles on filter with HNO3. 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 (ng/L)	LOQ range ng/g (ng/L)	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	0,02-0,04	0,06-0,14	In-house, accredited method for PCB, PeCB and HCB. Internal standard addition, extraction, GPC and/or H2SO4 cleanup followed by adsorption chromatography. GC/HRMS (autspec)	1	Y
	HCB	118-74-1		0,03-0,15	0,07-0,15		1	Y
	HCBD	87-68-3		0,1-0,5			3	N
	PCB 28	7012-37-5		0,001-0,03	0,003- 0,1		1	y
	PCB 52	35693-99-3		0,002-0,07	0,007-0,2		1	y
	PCB 101	37680-73-2		0,001-0,1	0,003-0,3		1	y
	PCB 118	31508-00-6		0,001-0,1	0,003-0,3		1	y
	PCB 138	35065-28-2		0,001-0,5	0,003-1,6		1	y
	PCB 153	35065-27-1		0,002-0,7	0,007-2,3		1	y
	PCB 180	35065-29-3		0,001-0,2	0,003-0,7		1	y

Table 6 cont. Method information. Dechloranes.

Parameter group	Navn compound	Cas no	Blank	LOD range ng/g (ng/L)	LOQ range ng/g (ng/L)	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	0,05-0,2	0,1-0,4	In-house method. Internal standard addition, extraction, GPC cleanup followed by adsorption chromatography. GCGC-qToF 7200 in ECNI	2	N
	Dechlorane 602	31107-44-5		0,008-0,03	0,02-0,1		2	y
	Dechlorane 603	13560-92-4		0,01-0,04	0,03-0,1		2	N
	Dechlorane 604	34571-16-9		0,2-0,7	0,4-2		2	N
	Dechlorane 601	13560-90-2		0,02-0,7	0,04-0,4		2	N
	Dechlorane plus syn	135821-03-3		0,04-0,2	0,1-0,4		2	y
	Dechlorane plus anti	135821-74-8		0,03-0,1	0,07-0,3		2	N
	1,3-DPMA	N/A		0,03-0,1	0,08-0,3		2	N
	1,5-DPMA	N/A		0,06-0,2	0,1-0,5		2	N
	Chlordene Plus	13560-91-3		0,02-0,08	0,05-0,2		2	N

Table 6 cont. Method information. PBDEs (next page)

Parameter group	Name parameter	Cas no	Blank	LOD range ng/g ng/g (ng/L)	LOQ range ng/g (ng/L)	Method	Uncertainty category	Stable isotope labeled (SIL) analogue
PBDE	TBA	607-99-8	Method blanks following sample series. LOD/LOQ based on calculation of 3 and 10 stddev respectively	0,003-0,02	0,006-0,04	In-house method. Internal standard addition, extraction, GPC and/or H2SO4 cleanup followed by adsorption chromatography. GC/HRMS (autspec)	2	N
	BDE-17	147217-75-2		0,003-0,02	0,01-0,05		2	N
	BDE-28	41318-75-6		0,003-0,02	0,01-0,05		1	Y
	BDE-47	5436-43-1		0,03-0,2	0,07-0,6		2	N
	BDE-49	123982-82-3		0,002-0,02	0,006-0,05		2	N
	BDE-66	189084-61-5		0,006-0,07	0,02-0,2		2	N
	BDE-71	189084-62-6		0,001-0,01	0,003-0,02		2	N
	BDE-77	93703-48-1		0,002-0,01	0,006-0,02		2	N
	BDE-85	446254-52-0		0,003-0,01	0,01-0,02		2	N
	BDE-99	60348-60-9		0,006-0,1	0,01-0,2		1	Y
	BDE-100	189084-64- 8		0,003-0,03	0,007-0,08		2	N
	BDE-119	189084-66-0		0,002-0,01	0,006-0,03		2	N
	BDE-126	366791-32-4		0,001-0,01	0,003-0,02		2	N
	BDE-138	182677-30-1		0,005-0,02	0,01-0,05		2	N
	BDE-153	68631-49-2		0,004-0,03	0,01-0,09		1	Y
	BDE-154	207122-15-4		0,004-0,02	0,01-0,05		2	N
	BDE-156	405237-85-6		0,007-0,03	0,02-0,07		2	N
	BDE-183	207122-16-5		0,004-0,02	0,01-0,05		1	Y
	BDE-184	117948-63-7		0,003-0,02	0,01-0,04		2	N
	BDE-191	446255-30-7		0,003-0,02	0,01-0,06		2	N
	BDE-196	32536-52-0		0,005-0,04	0,01-0,1		2	N
	BDE-197	117964-21-3		0,004-0,04	0,01-0,1		2	Y
	BDE-202	67797-09-5		0,006-0,04	0,02-0,1		2	N
	BDE-206	63387-28-0		0,04-0,1	0,1-0,3		2	Y
	BDE-207	437701-79-6		0,02-0,1	0,07-0,2		2	N
	BDE-209	1163-19-5		0,5-2	1,4-7		2	Y

Table 6 cont. Method information. Other BFRs.

Parameter group	Name parameter	Cas no	Blank	LOD range ng/g ng/g (ng/L)	LOQ range ng/g (ng/L)	Method	Uncertainty category	Stable isotope labeled (SIL) analogue
EBF	ATE (TBP-AE)	3278-89-5	Method blanks following sample series. LOD/LOQ based on calculation of 3 and 10 stddev respectively	0,02-0,1	0,06-0,2	In-house method. Internal standard addition, extraction, GPC and/or H2SO4 cleanup followed by adsorption chromatography. GC/HRMS (autspec)	2	N
	a-TBECH	3322-93-8		0,1-0,5	0,3-1,3		2	N
	b-TBECH	3322-93-8		0,08-0,3	0,2-0,9		2	N
	g/d-TBECH	3322-93-8		0,06-0,2	0,2-0,6		2	N
	BATE	99717-56-3		0,02-0,1	0,07-0,3		2	N
	PBT	87-83-2		0,03-0,1	0,1-0,5		2	N
	PBEB	85-22-3		0,02-0,09	0,06-0,2		2	N
	PBBZ	608-90- 2		0,2-0,7	0,6-2		2	y
	HBB	87-82-1		0,08-0,3	0,2-0,8		2	y
	DPTE	35109-60-5		0,02-0,07	0,05-0,2		2	N
	EHTBB	183658-27-7		0,02-0,08	0,05-0,2		2	y
	BTBPE	37853-59-1		0,04-0,2	0,1-0,4		2	y
	TBPH (BEH /TBP)	26040-51-7		0,08-0,3	0,2-0,9		2	N
	DBDPE	84852-53-9		1,7-7	4,8-19		2	y

Table 6 cont. Method information. Chlorinated paraffins.

<table>
<tr><th>Parameter group</th><th>Name parameter</th><th>Cas no</th><th>Blank</th><th>LOD range ng/g (ng/L)</th><th>LOQ range ng/g (ng/L)</th><th>Method</th><th>Uncertainty category</th><th>Stable isotope labeled (SIL) analogue</th></tr>
<tr><td rowspan="3">CP</td><td>SCCP</td><td>85535-84-8</td><td rowspan="3">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</td><td>3-50</td><td>10-170</td><td rowspan="2">In-house method. Internal standard addition, extraction, H2SO4 cleanup followed by adsorption chromatography. In some cases with high levels of sulfur and/or PCB an additional cleanup with florsil is needed. GC-qToF 7200 in ECNI</td><td>3</td><td rowspan="3">13C-hexachlorodecane</td></tr>
<tr><td>MCCP</td><td>85535-85-9</td><td>1-70</td><td>3-230</td><td>3</td></tr>
<tr><td>LCCP</td><td>63449-39-8</td><td>0,5-2</td><td>1,7-10</td><td>In-house method. Internal standard addition, extraction, GPC and/or H2SO4 cleanup followed by adsorption chromatography. Agilent LC-qToF 6546</td><td>3</td></tr>
</table>

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	DEP	84-66-2	Three blanks pr batch. Blank substraction for each batch based on the blank average. LOD and LOQ calculated from 3 x stdev and 10 x stdev. From blanks	10-20	20-60	2-5 g of soil was dried overnight and 2 g of dry material and deuterated internal standard was added and was extracted with acetone using vortex and sonication for 10 min (done three times). Samples was centrifuged and evaporated and transferred to analytical glass. Recovery standard added and analysis on LC-MSMS.	2	N
	DiBP	84-69-5		1-5	5-10		2	N
	DnBP	84-74-2		1-5	5-10		2	N
	DHxP	84-75-3		0.1-0.5	0.5-2		2	N
	BBP	85-68-7		0.1-0.5	0.5-2		2	N
	DEHP	117-81-7		5-20	10-50		2	Y
	DCHP	84-61-7		0.5-2	0.5-2		2	N
	DOP	117-84-0		0.1-1	0.5-2		2	N
	DNP	84-76-4		1-10	10-20		2	N
	DiNP	28553-12-0		10-30	20-50		2	N
	DiDP	26761-40-0		10-30	20-50		2	N
	DAIP	131-17-9		0.5-2	1-3		2	N
	DPP	131-16-8		0.5-2	1-3		2	N
	DCHA	849-99-0		0.2-1	1-3		2	N
	DHP	3648-21-3		0.2-1	1-3		2	N
	DEHT	6422-86-2		Coelutes with DEHP	Coelutes with DEHP		2	N
	DPHP	53306-54-0		0.2-1	1-3		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 soil 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 centrifuged, evaporated and transferred to analytical glass. Recovery standard added and analysis on LC-MSMS.	2	Y
	TCEP	115-96-8		0.5-2	2-3		2	Y
	TPrP	513-08-6		0.2-1	1-2		2	N
	TCPP	13674-84-5		0.5-2	2-5		2	Y
	TiBP	126-71-6		0.5-2	2-3		2	N
	DBPhP	2528-36-1		0.2-1	1-2		2	N
	TPP	115-86-6		0.2-1	1-2		2	Y
	TnBP	126-73-8		0.5-2	2-3		2	Y
	BdPhP	2752-95-6		0.2-1	1-2		2	N
	TDCPP	13674-87-8		0.5-2	2-3		2	Y
	TBOEP	78-51-3		0.2-1	1-2		2	N
	2-IPPDPP	64532-94-1		0.2-1	1-2		2	N
	4-IPPDPP	55864-04-5		0.2-1	1-2		2	N
	TCP	1330-78-5		0.5-3	1-6		2	N
	EHDP	1241-94-7		0.2-1	1-2		2	N
	IDDPP	29761-21-5		0.2-1	1-2		2	N
	B4IPPPP	55864-07-8		0.5-3	1-6		2	N
	TXP	25155-23-1		0.5-3	1-6		2	N
	TIPPP	64532-95-2		0.5-3	1-6		2	Y
	TEHP	78-42-2		0.2-1	1-2		2	Y
	TTBPP	78-33-1		0.5-3	2-6		2	N

Table 6 cont. Method information. Siloxanes.

Parameter group	Name parameter	Cas nr	Blank	LOQ range ng/g or ng/L	Method	Uncertainty category	Stable isotope labeled (SIL) analogue
Siloxanes, biota/sediment/ particles	D4 - octamethylcyclotetrasiloxane	556-67-2	Three blanks per batch. Blank subtraction for each batch based on the blank average. LOQ calculated from 10 x stdev. From blanks	0.255-0.6383	To 1-2 g of sample, ^{13}C D4, D5 and D6 were added as internal standard, followed by addition of acetonitrile and hexane. Ultrasonic bath and shaking before centrifugation. No further cleanup. Recovery standard added to a sub sample before analysis on GC/MSD. As described in previous MILFERSK/Urban fjord reports. No standard was available for L9-L10, and we used a crude product to estimate the retention time and transitions.	2	Y
	D5 - decamethylcyclopentasiloxane	541-02-6		0.174-0.910		2	y
	D6 - dodecamethylcyclohexasiloxane	540-97-6		0.316-1.20		2	y
	M3T (Ph)			0.035-0.791		2	N
	L3 - octamethyltrisiloxane	107-51-7		0.167-0.513		2	N
	L4 - decamethyltetrasiloxane	141-62-8		0.764-2.50		2	N
	L5 - dodecamethylpentasiloxane	141-63-9		2.23-10.02		2	N
	D3F - tris-(trifluoropropyl)trimethylcyclotrisiloxane	2374-14-3		2-50		2	N
	D4F - tetrakis-(trifluoropropyl)tetramethylcyclotetrasiloxane	429-67-4		3-30		2	N
	L6	107-52-8				3	N
	L7					3	N
	L8					3	N
	L9	no standard available				3	N
	L10	no standard available				3	N

Table 6 cont. Method information. Musks.

Parameter group	Name parameter	Cas nr	Blank	LOQ range ng/g or ng/L	Method	Uncertainty category	Stable isotope labeled (SIL) analogue
Musk, biota/sediment	Traseolide	68857-95-4	Three blanks pr batch. All extraction was done in clean room or clean cabinet. LOQ based on calculation of background in the instrument analysis.	0.132-1.24	1 g sample was mixed with Na2SO4, added d11-Tonalide as internal standard, and extracted with acetone/hexane (1:3). After up-concentration the extract was cleaned up with EZ-POP. The extracts were analysed on a GC/MSD with EI ionization. 5 µL of the extract were injected on a DB5 column with 5 m pre column.	3	N
	Phantolide	15323-35-0		0.029-0.28		3	N
	Otne	54464-57-2		0.132-1.24		3	N
	Acetyl cedrene	32388-55-9		0.132-1.24		3	N
	Galaxolide	1222-05-5		0.068-0.64		3	N
	AHMT/Tonalide	21145-77-7		0.132-1.24		3	Y
	Celestolide	13171-00-1		0.021-0.18		3	N

Table 6 cont. Method information. Phenolic compounds, incl. BCPS.

Parameter group	Name parameter	Cas nr	Blank	Method	LOD range (ng/g)	LOQ range (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)	3,8-4,3	9,9-11	3	Y
	2,4-bisphenol A	837-08-1			1,4-1,9	4,0-5,6	3	N
	bisphenol G	127-54-8			0,62-0,85	1,7-2,4	3	N
	4,4-Bisphenol S	80-09-1			0,41-1,0	1,0-2,8	3	Y
	2,4-bisphenol S	5397-34-2			0,26-0,33	0,7-0,9	3	Y
	4,4-bisphenol F	620-92-8			0,59-3,3	1,6-9,5	3	Y
	2,4-bisphenol F	2467-03-0			1,5-3,1	4,1-8,8	3	N
	2,2-bisphenol F	2467-02-9			0,17-0,25	0,4-0,7	3	Y
	Bisphenol P	2167-51-3			0,20-0,29	0,6-1,0	3	Y
	Bisphenol Z	843-55-0			0,85-1,3	2,3-3,7	3	Y
	TBBPA	79-94-7			3,3-4,6	9,3-13	3	Y
	Bisphenol TMC	129188-99-4			0,64-0,88	1,8-2,5	3	N
	Bisphenol FL	3236-71-3			0,69-0,93	1,9-2,6	3	N
	Bisphenol B	77-40-7			0,59-0,83	1,5-2,3	3	Y
	Bisphenol E	2081-08-5			0,47-0,64	1,2-1,7	3	N
	Bisphenol M	13595-25-0			0,10-0,14	0,3-0,5	3	N
	Bisphenol AF	1478-61-1			0,19-0,28	0,5-0,8	3	Y
	Bisphenol AP	1571-75-1			0,51-0,69	1,4-1,9	3	N
Alkylphenols	4-tert-octylphenol	140-66-9			1,2-1,3	3,1-3,6	3	Y
	Dodecylphenol (branched)	27193-86-8			5,2-7,1	15-21	3	N
	Dodecylphenol	104-43-8			0,61-0,82	1,7-2,3	3	N
	4-octylphenol	1806-26-4			1,2-1,6	3,2-4,6	3	N
	Nonylphenol (branched)	84852-15-3			28-36	71-90	3	N
	4-nonylphenol	104-40-5			1,5-2,2	4,4-6,6	3	Y
Other phenolic compounds	MB1	118-82-1		In-house method. Internal standard addition, extraction. HRMS			3	N
	4-[2-(4-{[benzyl(triphenyl)-lambda~5~-phosphanyl]oxy}phenyl)-1,1,1,3,3,3-hexafluoropropan-2-yl]phenol	75768-65-9			0,39-0,58*	1,0-1,6*	3	N

*Based on the analysis of Bisphenol AF

Parameter group	Name parameter	Cas nr	Blank	Method	LOD range (ng/g)	LOQ range (ng/g)	Uncertainty category	Stable isotope labelled (SIL) analogue
BCPS	BCPS	80-07-9		The extract from the siloxane analysis was further cleaned up by back-extraction with ACN. 13C-D6 was used as the internal standard.	0,05		3	N

Table 6 cont. Method information. Car tyre compounds, insecticides and medicaments.

Parameter group	Name parameter	Cas nr	Blank	LOQ range ng/g or ng/L	Method	Uncertainty category
Car tyre compounds (seal only)	BabsBP	68015-60-1	One blank per batch. Blank-subtraction and LOQ based on average signal of blanks + 3*std.	0,3	Internal standard is added, and samples are extracted twice. LC-MS/MS detection	2
	DNPD	93-46-9		1		2
	CPPD	101-87-1		1		2
	77PD	3081-14-9		1		2
Insecticides and medicaments (seal only)	Fipronil	120068-37-3		0,3		2
	Indoxacarb	173584-44-6		0,3		2
	Amitriptylin	549-18-8		0,3		2
	Lambda-C	91465-08-6	Three blanks per batch. Blank-subtraction and LOQ based on average signal of blanks + 3*std.	0,05-0,2	Internal Standard (IS) added. Samples then extracted twice, followed by clean-up via GPC and/or PSA. GC-MS/MS detection	2

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 inn 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: $\delta^{15}N$ 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
Metals		
Mercury	Hg	7440-02-0
Chrome	Cr	7440-47-3
Nickel	Ni	7440-02-0
Copper	Cu	7440-50-8
Zinc	Zn	7440-66-6
Arsenic	As	7440-38-2
Silver	Ag	7440-22-4
Cadmium	Cd	7440-43-9
Lead	Pb	7439-92-1
Antimony	Sb	7440-36-0
Tin	Sn	7440-31-5
Iron	Fe	7439-89-6
Rare earth metals	Sc, Y, La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu	
Additional metals	V, Mn, Co	
Siloxanes		
2,2,4,4,6,6,8,8-Octamethyl-1,3,5,7,2,4,6,8-tetroxatetrasilocane	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-pentoxapentasilecane	D5	541-02-6
Dodecamethylcyclohexasiloxane	D6	540-97-6
tris(trimethylsiloxy)phenylsilane	M3T	2116-84-9
OCTAMETHYLTRISILOXANE (L3)	L3	107-51-7
Decamethyltetrasiloxane (L4)	L4	141-62-8
Dodecamethylpentasiloxane (L5)	L5	141-63-9
2,4,6-Trimethyl-2,4,6-tris(3,3,3-trifluoropropyl)cyclotrisiloxane (D3F)	D3F	2374-14-3
2,4,6,8-tetramethyl-2,4,6,8-tetrakis(3,3,3-trifluoropropyl)cyclotetrasiloxane (D4F)	D4F	429-67-4

Long siloxanes	L6, L7, L8 , L9, L10	
Polychlorinated biphenyls (PCB)		
2,4,4'-Trichlorobiphenyl 28	PCB-28	7012-37-5
2,2',5,5'-Tetrachlorobiphenyl 52	PCB-52	35693-99-3
2,2',4,5,5'-Pentachlorobiphenyl 101	PCB-101	37680-73-2
2,3',4,4',5-Pentachlorobiphenyl 118	PCB-118	31508-00-6
2,2',3,4,4',5'-Hexachlorobiphenyl 138	PCB-138	35065-28-2
2,2',4,4',5,5'-Hexachlorobiphenyl 153	PCB-153	35065-27-1
2,2',3,4,4',5,5'-Heptachlorobiphenyl 180	PCB-180	35065-29-3
Other congeners	PCB-18, -31, -33, -37, -47, -66, -74, -99, -105, -114, -122, -123, -128, -141, -149, -156, -157, -167, -170, -183, -187, -189, -194, -206, -209	
PBDEs		
2,2',4-Tribromodiphenyl ether	BDE-17	147217-75-2
2,4,4'-Tribromodiphenyl ether	BDE-28	41318-75-6
2,2',4,4'-Tetrabromodiphenyl ether	BDE-47	5436-43-1
2,2',4,5'-Tetrabromodiphenyl ether	BDE-49	123982-82-3
2,3',4,4'-Tetrabromodiphenyl ether	BDE-66	189084-61-5
2,3',4',6-Tetrabromodiphenyl ether	BDE-71	189084-62-6
3,3',4,4'-Tetrabromodiphenyl ether	BDE-77	93703-48-1
2,2',3,4,4'-Pentabromodiphenyl ether	BDE-85	182346-21-0
2,2',4,4',5-Pentabromodiphenyl ether	BDE-99	60348-60-9
2,2',4,4',6-Pentabromodiphenyl ether	BDE-100	189084-64- 8
2,3',4,4',6-Pentabromodiphenyl ether	BDE-119	189084-66-0
3,3',4,4',5-Pentabromodiphenyl ether	BDE-126	366791-32-4
2,2',3,4,4',5'-Hexabromodiphenyl ether	BDE-138	182677-30-1
2,2',4,4',5,5'-Hexabromodiphenyl ether	BDE-153	68631-49-2
2,2',4,4',5,6'-Hexabromodiphenyl ether	BDE-154	207122-15-4

2,3,3',4,4',5-Hexabromodiphenyl ether	BDE-156	405237-85-6
2,2',3,4,4',5',6-Heptabromodiphenyl ether	BDE-183	207122-16-5
2,2',3,4,4',6,6'-Heptabromodiphenyl ether	BDE-184	117948-63-7
2,3,3',4,4',5,6- Heptabromodiphenyl ether	BDE-190	189084-68-2
2,3,3',4,4',5',6-Heptabromodiphenyl ether	BDE-191	446255-30-7
2,2',3,3',4,4',5',6-Octabromodiphenyl ether	BDE-196	32536-52-0
2,2',3,3',4,4',6,6'-Octabromodiphenyl ether	BDE-197	117964-21-3
2,2',3,3',5,5',6,6'-Octabromodiphenyl ether	BDE-202	67797-09-5
2,2',3,3',4,4',5,5',6-Nonabromodiphenyl ether	BDE-206	63387-28-0
2,2',3,3',4,4',5,6,6'-Nonabromodiphenyl ether	BDE-207	437701-79-6
Decabromodiphenyl ether	BDE-209	1163-19-5
Other BFRs		
2,4,6-tribromophenyl ether	ATE (TBP-AE)	3278-89-5
α-1,2-Dibromo-4-(1,2-di-bromo-ethyl)cyclohexane	α-TBECH	3322-93-8
β-1,2-Dibromo-4-(1,2-di-bromo-ethyl)cyclohexane	β-TBECH	n/a
γ/δ- 1,2-Dibromo-4-(1,2-di-bromo-ethyl)cyclohexane	γ/δ-TBECH	n/a
2-bromoallyl 2,4,6-tribromophenyl ether	BATE	99717-56-3
Pentabromotoluene	PBT	87-83-2
Pentabromoethylbenzene	PBEB	85-22-3
1,2,3,4,5 Pentabromobenzene	PBBZ	608-90-2
Hexabromobenzene	HBB	87-82-1
2,3-dibromopropyl 2,4,6-tribromophenyl ether	DPTE	35109-60-5
2-Ethylhexyl 2,3,4,5-tetrabromobenzoate	EHTBB	183658-27-7
1,2-Bis(2,4,6-tribromophenoxy)ethane	BTBPE	37853-59-1
2,3,4,5-tetrabromophthalate	TBPH (BEH /TBP)	26040-51-7
Decabromodiphenyl ethane	DBDPE	84852-53-9
Organochlorines		
Pentachlorobenzene	PECB	608-93-5
Hexachlorobenzene	HCB	118-74-1
hexachlorobutadiene	HCBD	87-68-3

Organophosphorus Flame Retardants (OPFRs)		
Triethyl phosphate	TEP	78-40-0
Tris(2-chloroethyl) phosphate	TCEP	115-96-8
Tripropyl phosphate	TPP/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 /TPP	115-86-6
Tri-n-butyl phosphate	TnBP	126-73-8
Tris(1,3-dichloro-2-propyl) phosphate	TDCPP	13674-87-8
Tris(2-butoxyethyl) phosphate	TBOEP/TBEP	78-51-3
Tricresyl phosphate	TCP	1330-78-5
2-Ethylhexyl diphenyl phosphate	EHDP	1241-94-7
Tris(2-ethylhexyl) phosphate	TEHP	78-42-2
Trixylyl phosphate	TXP	25155-23-1
Tris(4-isopropylphenyl) phosphate	TIPPP/T4IPP	26967-76-0
Tris(4-Tert-butylphenyl)phosphate	TTBPP	78-33-1
Phenols		
4-[2-(4-hydroxyphenyl)propan-2-yl]phenol	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-(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-[(2-hydroxyphenyl)methyl]phenol	2,2-Bisphenol F	2467-02-9
2-[(4-hydroxyphenyl)methyl]phenol	2,4-bisphenol F	2467-03-0
4-[2-[4-[2-(4-hydroxyphenyl)propan-2-yl]phenyl]propan-2-yl]phenol	Bisphenol P	2167-51-3
4-[1-(4-hydroxyphenyl)cyclohexyl]phenol	Bisphenol Z	843-55-0

2,6-dibromo-4-[2-(3,5-dibromo-4-hydroxyphenyl)propan-2-yl]phenol	TBBPA	79-94-7
4-[1-(4-hydroxyphenyl)-3,3,5-trimethylcyclohexyl]phenol	Bisphenol TMC	129188-99-4
4-[9-(4-hydroxyphenyl)fluoren-9-yl]phenol	Bisphenol FL	3236-71-3
4-[2-(4-hydroxyphenyl)butan-2-yl]phenol	Bisphenol B	77-40-7
4-[1-(4-hydroxyphenyl)ethyl]phenol	Bisphenol E	2081-08-5
4-[2-[3-[2-(4-hydroxyphenyl)propan-2-yl]phenyl]propan-2-yl]phenol	Bisphenol M	13595-25-0
4-[1,1,1,3,3,3-hexafluoro-2-(4-hydroxyphenyl)propan-2-yl]phenol	Bisphenol AF	1478-61-1
4-[1-(4-hydroxyphenyl)-1-phenylethyl]phenol	Bisphenol AP	1571-75-1
2,6-ditert-butyl-4-[(3,5-ditert-butyl-4-hydroxyphenyl)methyl]phenol	AO-MB1	118-82-1
4-[2-(4-{[benzyl(triphenyl)-lambda~5~-phosphanyl]oxy}phenyl)-1,1,1,3,3,3-hexafluoropropan-2-yl]phenol		75768-65-9
4-(2,4,4-trimethylpentan-2-yl)phenol	4-tert-octylphenol	140-66-9
4-octylphenol	p-octylphenol	1806-26-4
4-(7-methyloctyl)phenol	4-Nonylphenol, branched and linear	104-40-5, 84852-15-3*
Dodecylphenol branched and linear	Dodecylphenol	27193-86-8, 104-43-8, 121158-58-5 **
4,4'-Dichlorodiphenyl sulfone	BCPS	80-07-9
Per- and polyfluoroalkyl substances (PFAS)		
PFCA (perfluorinated carboxylate acids)		
Tri fluoro acetic acid	TFA	76-05-1
Perfluoro propanoic acid	PFPrA	422-64-0
Perfluorinated butanoic acid	PFBA	375-22-4
Perfluorinated pentanoic acid	PFPA	422-64-0
Perfluorinated hexanoic acid	PFHxA	307-24-4
Perfluorinated heptanoic acid	PFHpA	335-67-1
Perfluorinated octanoic acid	PFOA	375-95-1
Perfluorinated nonanoic acid	PFNA	335-76-2

Perfluorinated decanoic acid	PFDA	2058-94-8
Perfluorinated undecanoic acid	PFUnDA	307-55-1
Perfluorinated dodecanoic acid	PFDoDA	72629-94-8
Perfluorinated tridecanoic acid	PFTrDA	376-06-7
Perfluorinated tetradecanoic acid	PFTeDA	67905-19-5
Perfluorinated hexadecanoic acid	PFHxDA	16517-11-6
Perfluorinated octadecanoic acid	PFOcDA	16517-11-6
PFSA (Perfluoroalkane sulfonic acids)		
Perfluoro methane sulfonic acid	PMeS	1493-13-6
Perfluoro ethan sulfonic acid	PFEtS	354-88-1
perfluoropropan sulfonic acid	PFPrS	423-41-6
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	17202-41-4
Perfluorinated decane sulfonic acid	PFDS	67906-42-7
Perfluoroundecane sulfonic acid	PFUnDS	441296-91-9
Perfluorododecane sulfonic acid	PFDoDS	79780-39-5
Perfluorotridecane sulfonic acid	PFTrDS	749786-16-1
Perfluorotetradecane sulfonic acid	PFTeDS	n/a
nPFAS (polyfluorinated neutral compounds)		
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
newPFAS		
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
Perfluoro(2-ethoxyethane)sulfonate	PFEESA	113507-82-7
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
Perfluoro-3,6-dioxaheptanoic acid (Gen-X)	3,6-OPFHpA (Gen-X)	
Perfluoro-5-oxahexanoic acid (Gen-X)	PF5OHxA (Gen-X)	863090-89-5
UV Chemicals		
Benzophenone-3	BP3	131-57-7
Ethylhexylmethoxycinnamate	EHMC	5466-77-3
Octocrylene	OC	6197-30-4
UV-327	UV-327	3864-99-1
UV-328	UV-328	25973-55-1
UV-329	UV-329	3147-75-9
Homosalate		118-56-9
3-(2H-benzotriazol-2-yl)-5-(1,1-dimethylethyl)-4-hydroxy-benzenepropanoic acid l	M1-UV328	84268-36-0
Dechloranes		
Dibromoaldrin	DBA	20389-65-5
Dechlorane 601	Dec-601	3560-90-2
Dechlorane 602	Dec-602	31107-44-5
Dechlorane 603	Dec-603	13560-92-4
Dechlorane 604	Dec-604	34571-16-9

Dechlorane plus syn	syn-DP	135821-03-3
Dechlorane plus anti	anti-DP	135821-74-8
1,5-Dechlorane Plus monoadduct	1,5-DPMA	Not available
1,3-Dechlorane Plus monoadduct	1,3-DPMA	Not available
Chlordene Plus		13560-91-3
Quaternary ammonium compounds		
Dimethyldioctylammonium	DADMAC-C8	3026-69-5
Didecyldimethylammonium	DADMAC-C10	2390-68-3
Didodecyldimethylammonium	DADMAC-C12	3282-73-3
Dimethylditetradecylammonium	DADMAC-C14	68105-02-2
Dihexadecyldimethylammonium	DADMAC-C16	70755-47-4
Dimethyldioctadecylammonium	DADMAC-C18	3700-67-2
Benzyldimethyloctylammonium	BAC-C8	959-55-7
Benzyldimethyldecylammonium	BAC-C10	965-32-2
Benzyldimethyldodecylammonium	BAC-C12	139-07-1
Benzyldimethyltetradecylammonium	BAC-C14	139-08-2
Benzyldimethylhexadecylammonium	BAC-C16	122-18-9
Benzyldimethyloctadecylammonium	BAC-C18	122-19-0
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
Inecticides		
Lambda-Cyhalothrin:	Lambda-C	91465-08-6
Fipronil	Fipronil	120068-37-3
Indoxacarb	Indoxacarb	173584-44-6
Medicaments		

Amitriptyline	Amitriptylin	549-18-8
Musks		
Traseolide		68140-48-7
Phantolide		15323-35-0
OTNE		54464-57-2
Acetyl cedrene		32388-55-9
Galaxolide		1222-05-5
AHMT		1506-02-1
Celestolide		13171–00–1
Tonalide		21145–77–7
Benzothiazoles		
Mercaptobenzothiazole	MBT	149-30-4
benzotriazole	BTZ	95-14-7
Benzothiazole	BT	95-16-9
2(3H)-Benzothiazolone	OHBT	934-34-9
metyl-1H-benzotriazole	MeBTZ	29385-43-1
N-cyclohexylbenzothiazole-2-sulfenamide	CBS	95-33-0
5-Chlorobenzotriazole	Cl-BTZ	94-97-3
Phthalates		
Bis(2-ethylhexyl) phthalate	DEHP	117-81-7
Diisononyl phthalate	DINP	28553-12-0
Diisodecyl phthalate	DIDP	68515-49-1
Dioctyl phthalate	DOP	117-84-0
Butylbenzyl phthalate	BBP/BBzP	85-68-7
Diethyl phthalate	DEP	84-66-2
Diundecyl phthalate, branched and linear	DiUnP	85507-79-5
Dihexylphthalate	DHxP	84-75-3
Dicyclohexyl phthalate	DcHP	84-61-7
Diisobutyl phthalate	DBP/DIBP	84-69-5
Di-n-butyl phthalate	DNBP	84-74-2
Diallylphthalate	DAIP	131-17-9

Dipropylphthalate	DPP	131-16-8
Dicyclohexyladipate	DCHA	849-99-0
Diheptyl phthalate	DHP	3648-21-3
Bis(2-ethylhexyl) terephthalate	DEHT	6422-86-2
Bis (2-propylheptyl) phthalate	DPHP	53306-54-0
Chlorinated paraffins		
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	63449-39-8
Car tyre compounds		
4,4'-Bis(2-amino-benzenesulfonyl)bisphenol Ester	BabsBP	68015-60-1
N1,N4-Di(naphthalen-2-yl)benzene-1,4-diamine	DNPB	93-46-9
N1-Cyclohexyl-N4-phenylbenzene-1,4-diamine	CPPD	101-87-1
N,N'-bis(1,4-dimethylpentyl)-p-phenylenediamine	77PD	3081-14-9
Support parameters		
Stable isotopes $\delta^{15}N$, $\delta^{13}C$		
Lipid content (biota)		
Length/weight (fish)		
Biometric data (birds, seals)		
TOC (sediment) and pH		
Grain size distribution (sediment)		

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

Figure 22 shows an increase in $\delta^{15}N$ with expected increase in trophic position, where apex predators are cod and harbour seal. Herring gull display low $\delta^{15}N$, but also low $\delta^{13}C$, suggesting a more terrestrial carbon source, as previously discussed (see e.g. Grung et al. 2021). There was no significant relationship between $\delta^{15}N$ and fish length for cod or herring (see electronic Appendix).

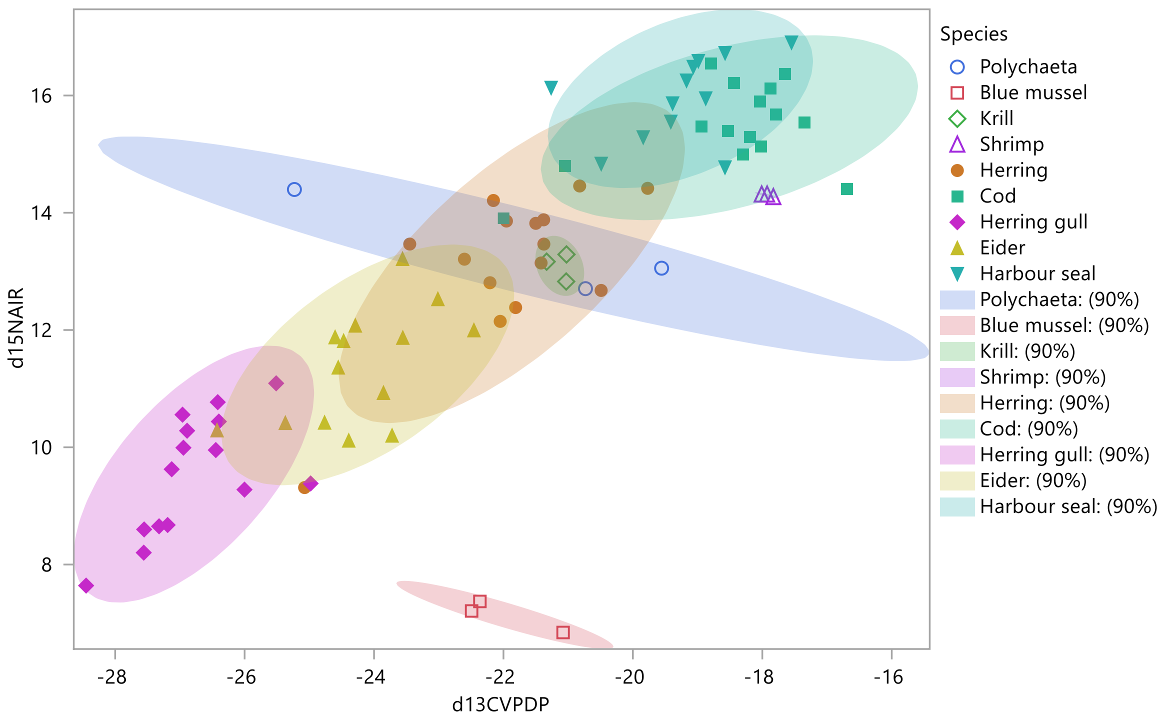


Figure 22. $\delta^{15}N$ plotted against $\delta^{13}C$ in all species collected from the Oslofjord (individual samples where available). The 90% confidence areas are indicated. Birds (herring gull and eider) are represented by the isotopic signatures in egg.

Herring gull displays bot lower δ^{15}N and δ^{13}C than eider (**Figure 23**). When blood and eggs are compared, the two matrices show approximately the same δ^{15}N within each species. However, δ^{13}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).

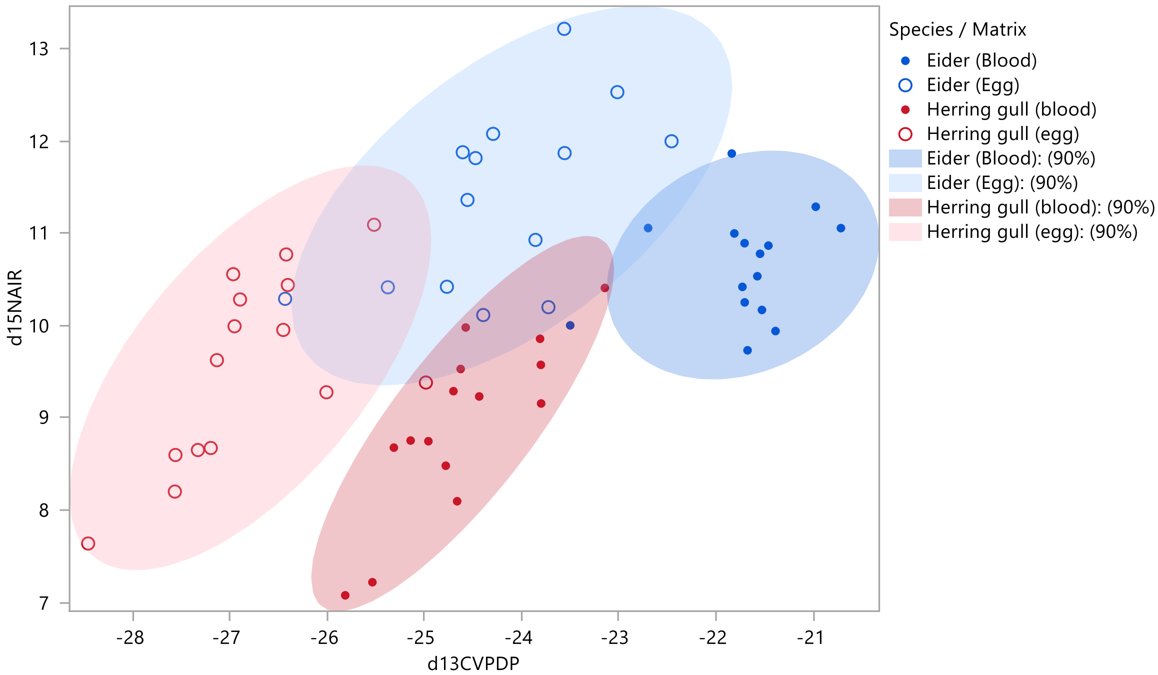


Figure 23. δ^{15}N plotted against δ^{13}C in herring gull and eider, both blood and egg. The 90% confidence areas are indicated.

Table 8. Biometric data for individual specimens of cod (**A**), herring (**B**), herring gull (**C**) and eider (**D**) from the Inner Oslofjord, and harbour seal (**E**) from the Outer Oslofjord, as well as stable isotopes in invertebrates (**F**) and characteristics of sediments (**G**) from the inner Oslofjord.

A. Cod

Ind. No.	$\delta^{13}C$	$\delta^{15}N$	W%C	W%N	Part of pooled sample	Length (cm)	Weight (g)	Sex	Trophic Level
1	-18.79	16.54	45.92	12.38	1	42	810	M	4.47
2	-22.00	13.91	45.04	12.77	1	36.5	460	M	3.78
3	-18.29	14.99	45.67	12.69	1	38	560	M	4.07
4	-18.02	15.13	35.84	10.58	1	35	440	F	4.10
5	-17.78	15.68	46.13	13.17	1	37.5	560	M	4.25
6	-17.34	15.54	45.80	12.93	2	37	510	M	4.21
7	-18.18	15.29	45.60	12.80	2	36.5	490	F	4.15
8	-18.52	15.40	45.10	12.52	2	35	390	F	4.17
9	-21.05	14.80	46.08	12.84	2	36.5	490	F	4.02
10	-18.43	16.21	45.57	13.10	2	36	470	F	4.39
11	-18.94	15.47	45.99	11.99	3	36	500	M	4.19
12	-17.64	16.37	44.75	12.85	3	34.5	400	M	4.43
13	-17.87	16.12	45.49	12.55	3	37	490	M	4.36
14	-18.03	15.89	45.69	13.17	3	36	480	F	4.30
15	-16.68	14.41	46.00	12.88	3	36	440	F	3.91

B. Herring

Ind. No.	δ^{13}C	δ^{15}N	W%C	W%N	Part of pooled sample	Length (cm)	Weight (g)	Sex	Trophic Level
1	-21.50	13.82	49.94	13.46	1	25.5	137.4	F	3.76
2	-20.49	12.67	47.58	12.35	1	26	133.5	M	3.46
3	-21.81	12.38	49.07	12.06	1	26.1	127.9	M	3.38
4	-22.21	12.81	50.54	12.48	1	26.2	157.9	F	3.49
5	-25.08	9.31	58.30	9.07	1	26.3	157.5	F	2.57
6	-22.05	12.15	50.42	11.83	2	26.5	152.3	M	3.32
7	-21.42	13.14	50.13	12.80	2	26.8	144.7	M	3.58
8	-20.82	14.46	47.03	14.08	2	26.9	172.9	F	3.93
9	-21.37	13.47	48.97	13.12	2	27.1	146.3	F	3.66
10	-22.15	14.21	53.52	12.12	2	27.1	154.3	M	3.86
11	-22.60	13.21	48.55	10.51	3	27.4	126	M	3.60
12	-19.77	14.42	46.87	13.60	3	27.6	147.1	M	3.91
13	-21.38	13.88	51.04	12.95	3	27.6	181.6	M	3.77
14	-23.45	13.47	57.30	10.49	3	28.2	163.6	M	3.66
15	-21.95	13.86	53.08	12.96	3	29.6	151.9	M	3.77

C. Herring gull

Ind.	Marking	δ13C	δ15N	W%C	W%N	Part of pooled sample	Weight (g)	Wing (mm)	Head (mm)	Sex	Trophic Level
JAY79	...4274521	-25.81	7.08	48.68	12.24	1	850	428	116.1	F	2.35
JCL94	...4298893	-24.57	9.98	52.15	11.55	1	860	412	119	F	3.12
JCL96	...4298895	-24.70	9.29	49.35	12.66	1	900	427	116.6	F	2.93
JCL97	...4298896	-24.78	8.48	49.48	11.81	1	940	416	120.7	F	2.72
JER00	...4284246	-24.63	9.53	52.15	11.11	1	920	428	115	F	3.00
JLR94	...4291135	-24.66	8.10	48.43	12.03	2	830	412	116.6	F	2.62
JUX83	...4291556	-25.31	8.68	46.60	11.67	2	920	439	117.7	F	2.77
JUX86	...4299611	-24.43	9.23	49.02	12.35	2	850	422	119	F	2.92
JUX87	FA...58017	-23.80	9.16	47.84	11.07	2	1110	443	126.6	M	2.90
JUX88	FA...58018	-23.14	10.41	50.17	12.42	2	1120	441	126.3	M	3.23
JUX89	...4291559	-24.96	8.75	50.23	12.04	3	860	417	118.8	F	2.79
J5841	...4130480	-25.53	7.22	48.28	11.81	3	940	419	119.65	F	2.39
JEL55	FA...41205	-23.80	9.57	51.32	13.79	3	910	424	117	F	3.01
JLU00	...4291150	-23.81	9.86	54.98	13.03	3	1080	441	126	M	3.08
JUX80	FA...58019	-25.14	8.75	52.44	13.42	3	770	423	119	F	2.79

C. Cont. Herring gull, egg

Ind.	$\delta^{13}C$	$\delta^{15}N$	W%C	W%N	Part of pooled sample	Weight (g)	Trophic Level
JAY79	-28.46	7.64	53.86	4.49	1	67.9	2.50
JCL94	-25.52	11.09	50.00	5.28	1	68.5	3.41
JCL96	-26.95	9.99	49.29	5.46	1	64.5	3.12
JCL97	-26.40	10.44	58.18	5.97	1	77.7	3.24
JER00	-26.42	10.77	53.10	6.88	1	72.8	3.32
JLR94	-26.89	10.28	56.18	5.19	2	56.2	3.20
JUX83	-27.13	9.63	53.44	5.80	2	70.7	3.02
JUX86	-26.01	9.28	50.99	7.49	2	84.1	2.93
Gm1	-27.56	8.60	52.09	5.79	2	87.7	2.75
Gm2	-24.98	9.38	50.64	7.03	2	68.5	2.96
Gm3	-27.56	8.20	49.85	5.37	3	69.8	2.65
Gm4	-27.33	8.65	56.48	5.84	3	80.3	2.77
Gm5	-27.19	8.67	54.20	6.04	3	77.4	2.77
Gm6	-26.96	10.56	53.96	5.46	3	74.6	3.27
Gm7	-26.45	9.95	50.29	5.14	3	80.5	3.11

D. Eider

Ind.	Marking	$\delta^{13}C$	$\delta^{15}N$	W%C	W%N	Part of pooled sample	Weight (g)	Wing (mm)	Head (mm)	Sex	Trophic Level
A06	CA...21525	-21.57	10.53	49.27	12.55	1	1790	307	127.7	F	3.26
A13	CA...21511	-21.73	10.42	51.24	12.61	1	1690	305		F	3.23
A14	CA...21534	-21.70	10.25	49.52	12.47	1	2300	316	126.7	F	3.19
A19	CA...46354	-21.39	9.94	49.22	12.74	1	1570	307	125.3	F	3.11
A20	CA...46357	-20.72	11.05	49.96	12.62	1	1630	308	125.2	F	3.40
A23	CA...46363	-21.68	9.73	48.79	12.47	2	1560	292	118.7	F	3.05
A39	CA...46380	-21.84	11.86	53.97	11.69	2	1700	297	124.7	F	3.61
A40	CA...21532	-21.53	10.17	48.94	11.74	2	1560	304	125.6	F	3.17
A41	CA...21519	-21.71	10.89	51.56	10.91	2	1770	305	127.8	F	3.36
A42	CA...46381	-21.81	11.00	51.67	11.23	2	1770	309	127.4	F	3.38
A43	CA...46382	-21.46	10.87	52.22	10.82	3	2160	306	127.2	F	3.35
A45	CA...46384	-20.97	11.29	53.11	11.34	3	1960	309	125	F	3.46
A46	CA...46385	-22.70	11.06	53.45	10.89	3	1610	303	126.9	F	3.40
A47	CA...46386	-23.50	10.00	52.66	10.90	3	1610	298	125.5	F	3.12
A60	CA...46398	-21.55	10.78	48.19	12.33	3	2430	318	127.7	F	3.33

D. Cont. Eider, egg

Ind.	$\delta^{13}C$	$\delta^{15}N$	W%C	W%N	Part of pooled sample	Weight (g)	Trophic Level
A06	-24.29	12.07	60.78	5.37	1	113.6	3.67
A13	-24.47	11.81	60.34	5.04	1	94.9	3.60
A14	-24.56	11.36	58.41	5.55	1	116.9	3.48
A19	-24.77	10.42	54.34	4.77	1	102.3	3.23
A20	-23.01	12.53	49.25	4.35	1	100	3.79
A23	-24.39	10.11	48.12	3.75	2	97.5	3.15
A39	-23.56	13.21	57.98	3.87	2	83.1	3.97
A40	-23.86	10.93	50.14	6.35	2	95	3.36
A41	-23.72	10.20	47.31	6.17	2	116.2	3.17
A42	-23.56	11.87	55.90	5.31	2	110	3.61
A43	-22.46	12.00	56.50	4.85	3	115	3.65
A45	-22.45	11.99	57.50	5.00	3	108	3.64
A46	-25.37	10.41	52.81	4.50	3	120.2	3.23
A47	-26.43	10.29	53.93	4.04	3	112.5	3.20
A60	-24.60	11.88	57.26	4.92	3	120.6	3.61

E. Harbour seal

Ind. No.	Alt. marking	$\delta^{13}C$	$\delta^{15}N$	W%C	W%N	Length (cm)	Weight (g)	Sex	Age (yr)	Trophic Level
1	Bag ID 6	-18.99	16.59	50.36	14.19			F	13	4.49
2	Bag ID 7	-20.49	14.84	52.03	14.96			F	3	4.03
3	Bag ID 8	-19.84	15.29	48.81	14.82			M	2	4.14
4	Bag ID 9	-19.38	15.86	49.55	14.42			F	5	4.30
5	Bag ID 10	-19.41	15.55	50.33	13.90			F	5	4.21
6	Bag ID 16	-18.87	15.95	48.28	14.55			F	0	4.32
7	Bag ID 26	-17.54	16.90	52.23	12.97			F	9	4.57
8	Bag ID 27	-19.06	16.49	51.28	13.60			F	22	4.46
9	Bag ID 28	-19.17	16.25	48.33	14.27			F	0	4.40
10	Bag ID 29	-18.57	16.72	49.82	14.19			M	7	4.52
11	Bag ID 30	-21.26	16.13	55.70	10.70			F		4.37
12	Bag ID 31	-18.57	14.77	49.91	13.56	139	66000	M		4.01

F. Invertebrates

Sample	$\delta^{13}C$	$\delta^{15}N$	W%C	W%N	Trophic Level
Polychaeta (Cm21)	-28.46	7.64	53.86	4.49	2.50
Polychaeta (Cm21)	-25.52	11.09	50.00	5.28	3.41
Polychaeta (Cm21)	-26.95	9.99	49.29	5.46	3.12
Krill 1	-26.40	10.44	58.18	5.97	3.24
Krill 1	-26.42	10.77	53.10	6.88	3.32
Krill 1	-26.89	10.28	56.18	5.19	3.20
Shrimp 1	-27.13	9.63	53.44	5.80	3.02
Shrimp 1	-26.01	9.28	50.99	7.49	2.93
Shrimp 1	-27.56	8.60	52.09	5.79	2.75
Blue mussel 1	-24.98	9.38	50.64	7.03	2.96
Blue mussel 1	-27.56	8.20	49.85	5.37	2.65
Blue mussel 1	-27.33	8.65	56.48	5.84	2.77

G. Sediments

Station	Grain size distribution (% <63 µm)	TOC (µg/mg)	pH (measured at 23 ± 2°C)
Cm21, Ildjernet	67	34.3	7.9
Bq41, Bekkelaget	84	22.3	7.6
Al1, Alna River outlet	75	36.8	7.8

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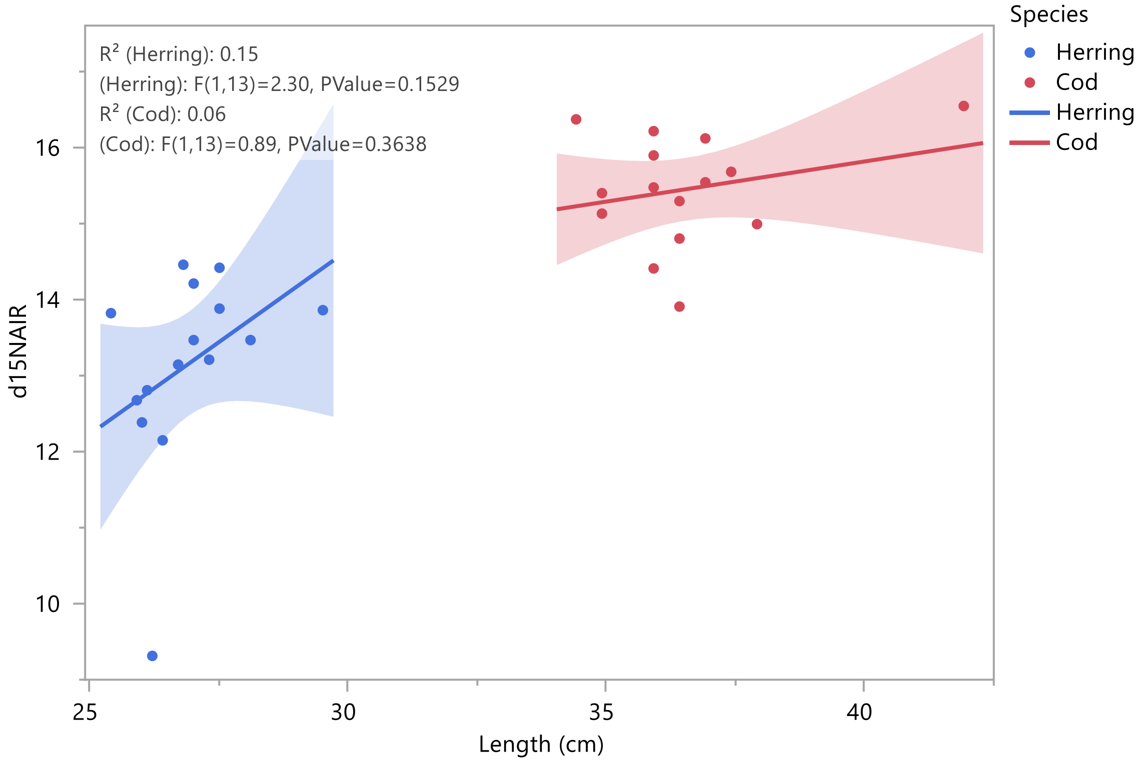
Appendix: Results from the "Urban fjord" programme 2022

Stable Isotopes:

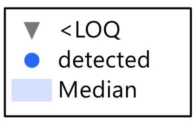


The figure depicts $\delta^{15}N$ vs length in herring and cod.

All concentrations:

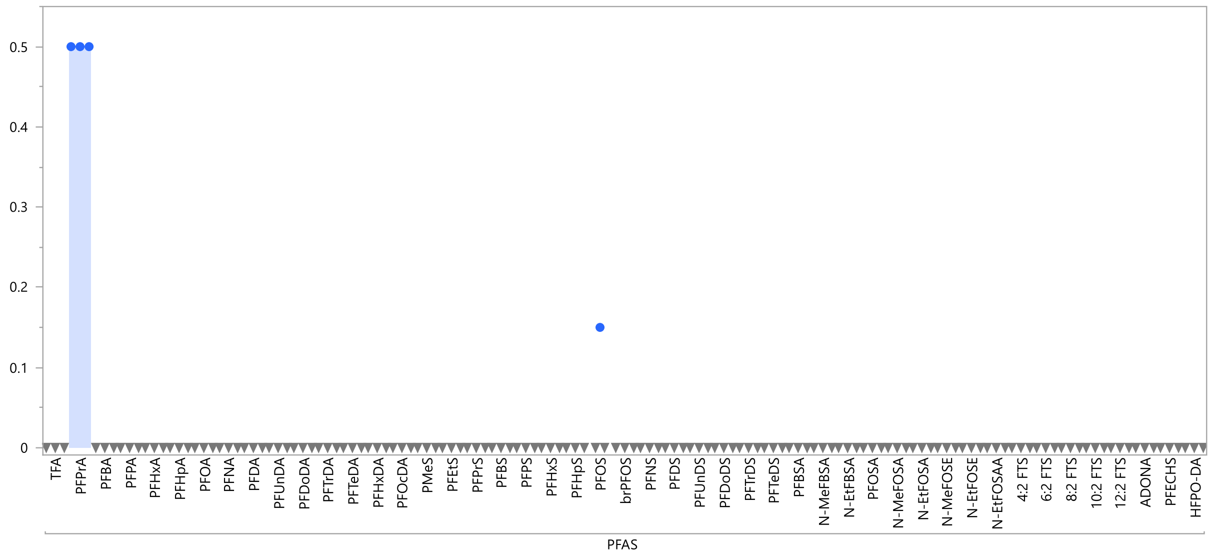
Concentrations (ng/g wet wt. in biota, ng/g dry wt. in sediment) of all compounds in all matrices are shown in the following. The bars represent median and individual observations are superimposed. Non-detects are assigned a value of zero (0). These are shown by grey triangles.

Legend for all figures in the following:

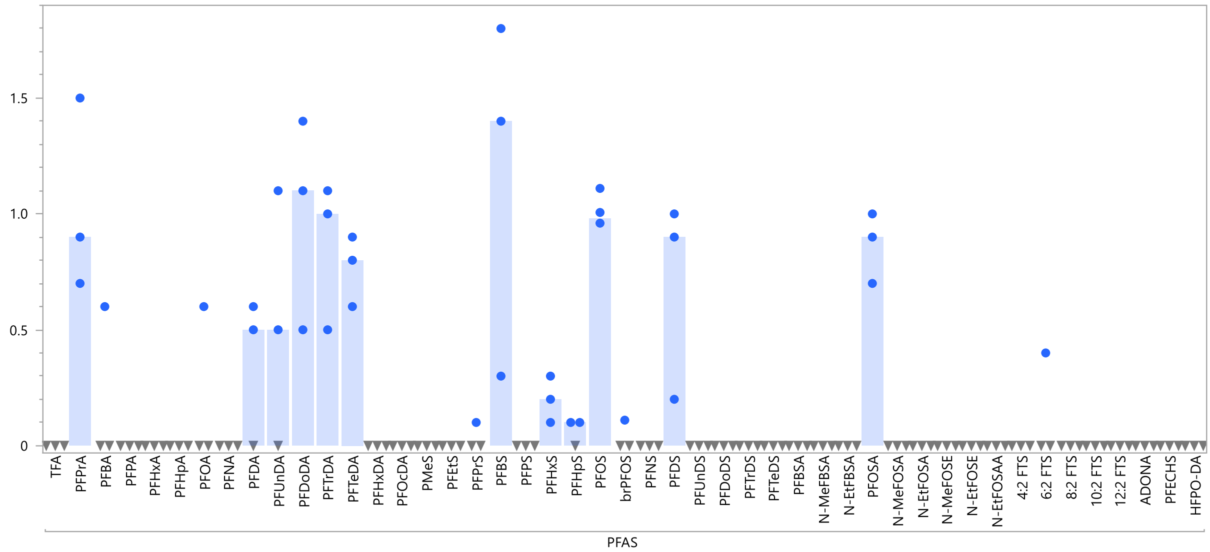


PFAS:

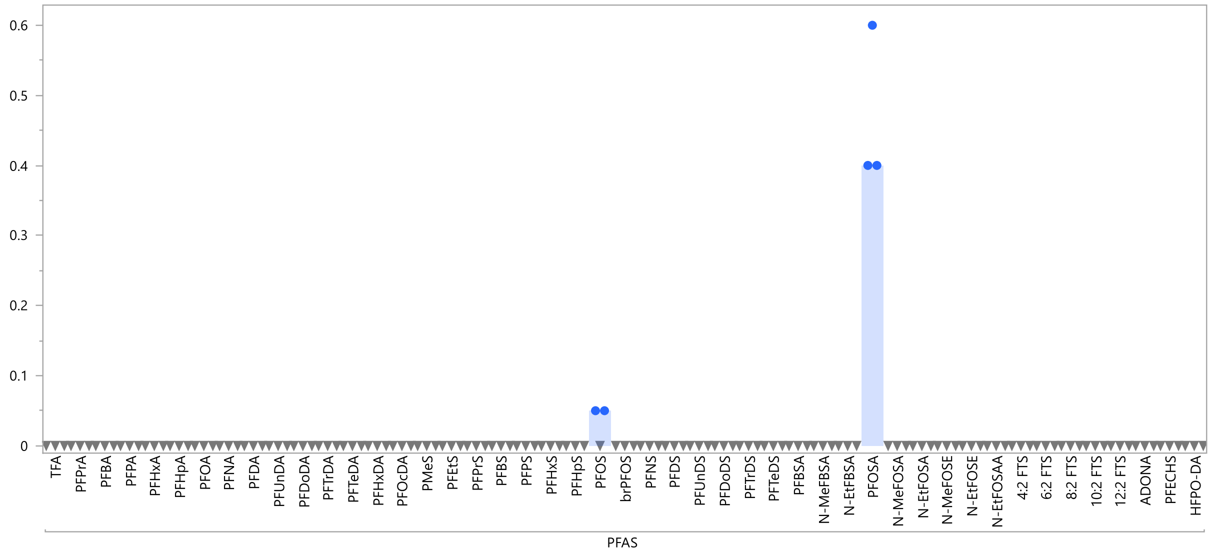
PFAS in Sediment (ng/g dry wt.):



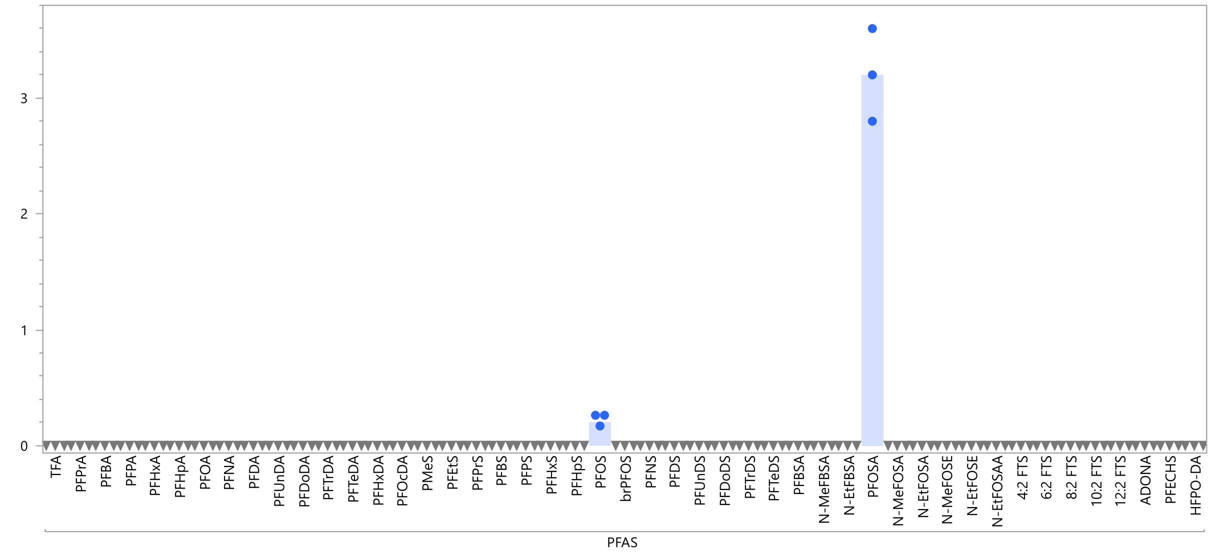
PFAS in Polychaeta (ng/g wet wt.):



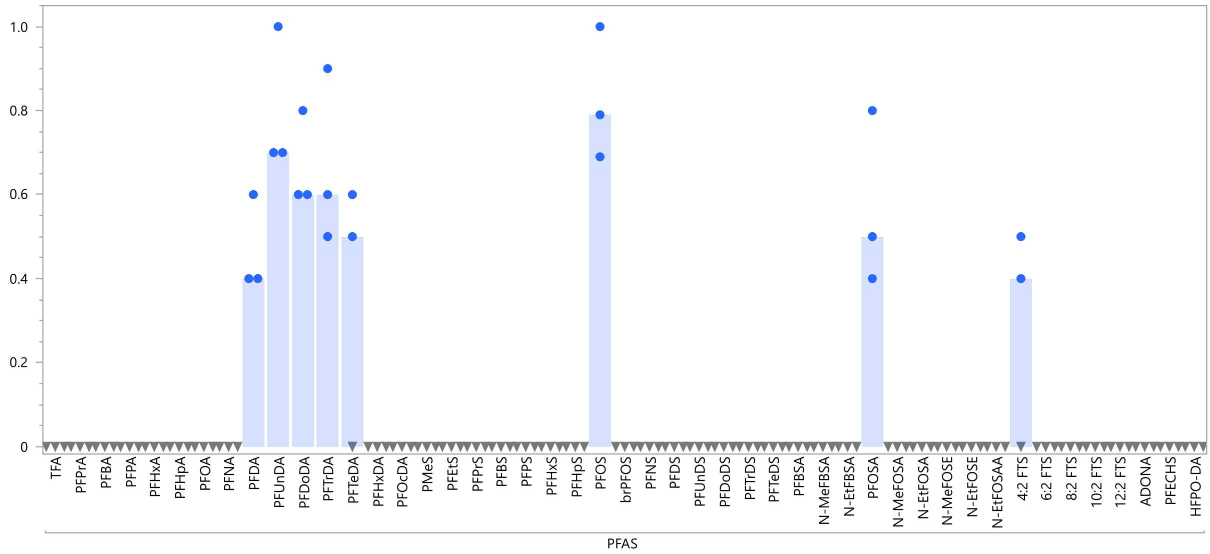
PFAS in Blue mussel (ng/g wet wt.):



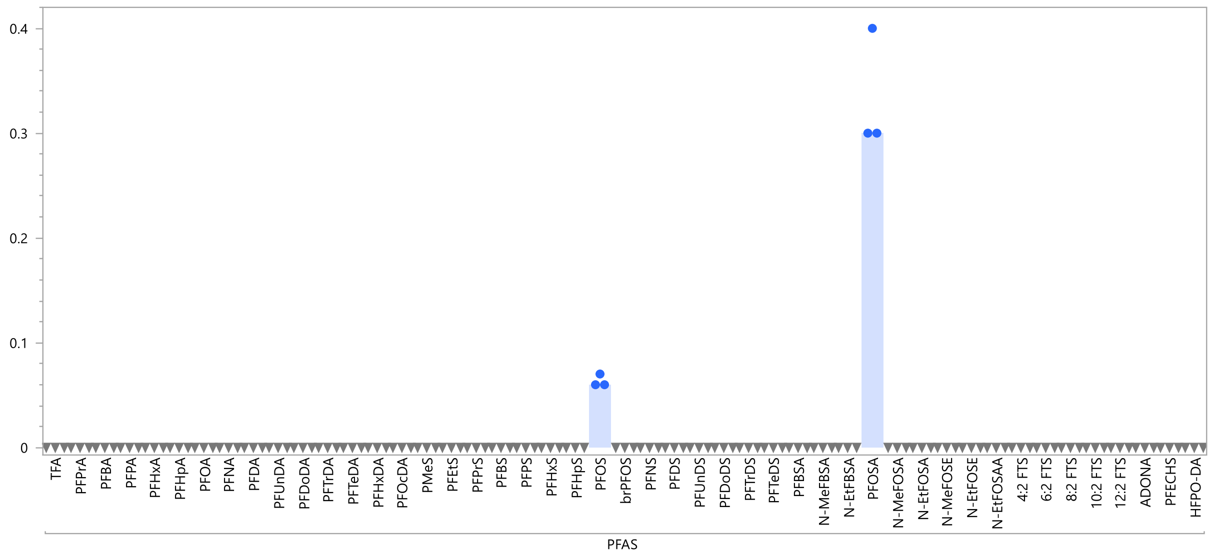
PFAS in Krill (ng/g wet wt.):



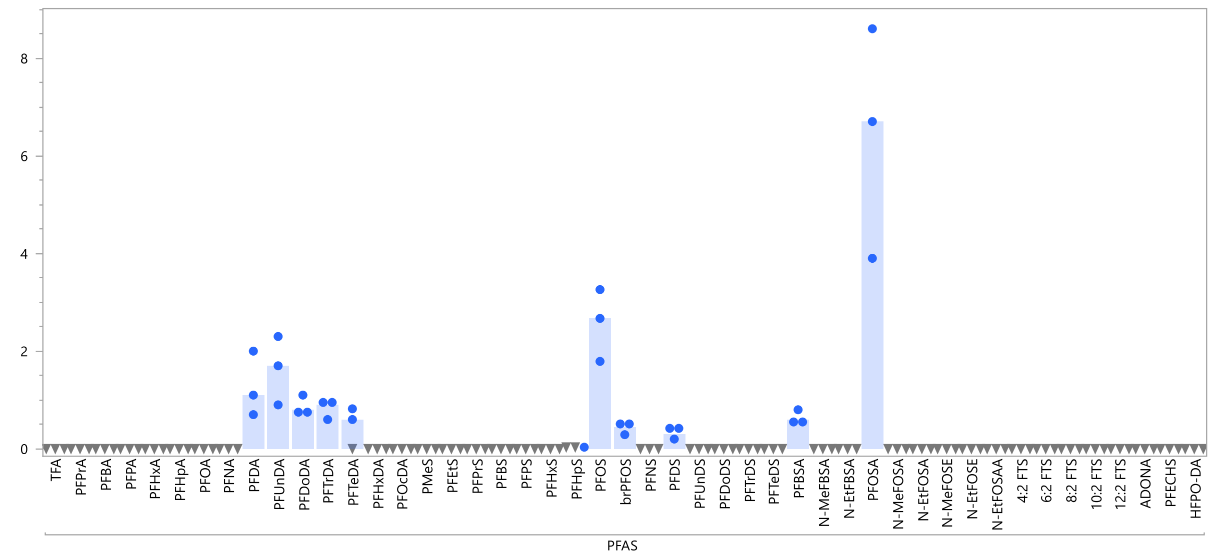
PFAS in Shrimp (ng/g wet wt.):



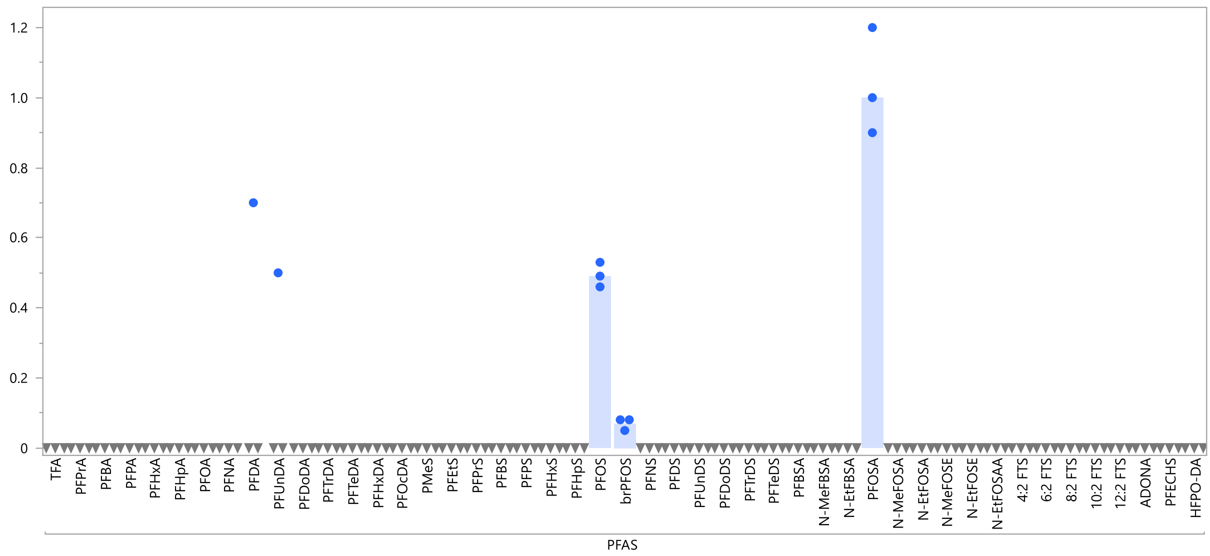
PFAS in Herring (muscle) (ng/g wet wt.):



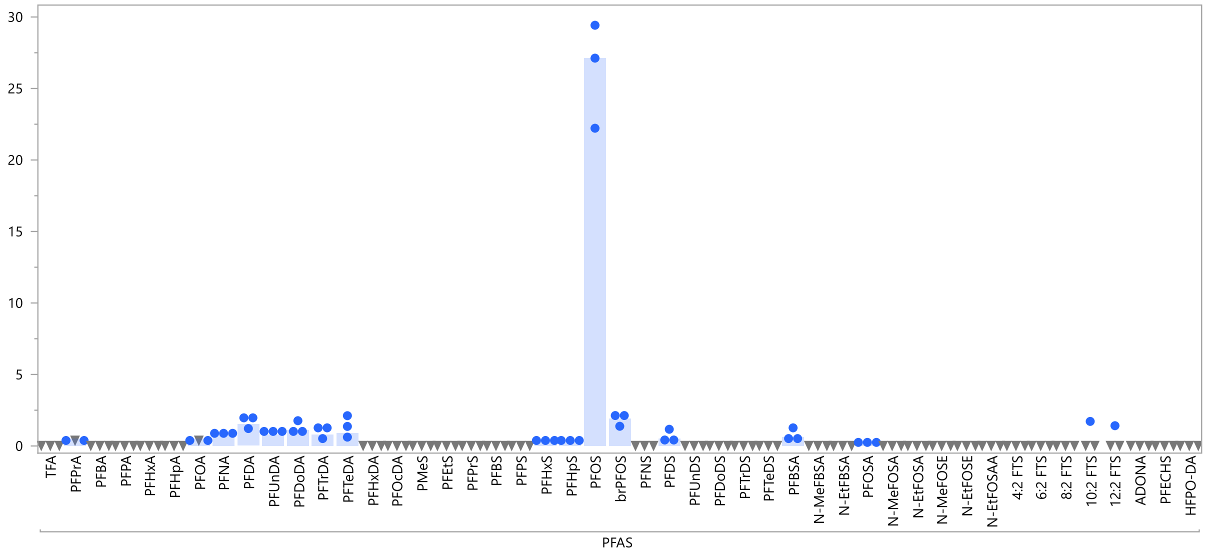
PFAS in Cod (liver) (ng/g wet wt.):



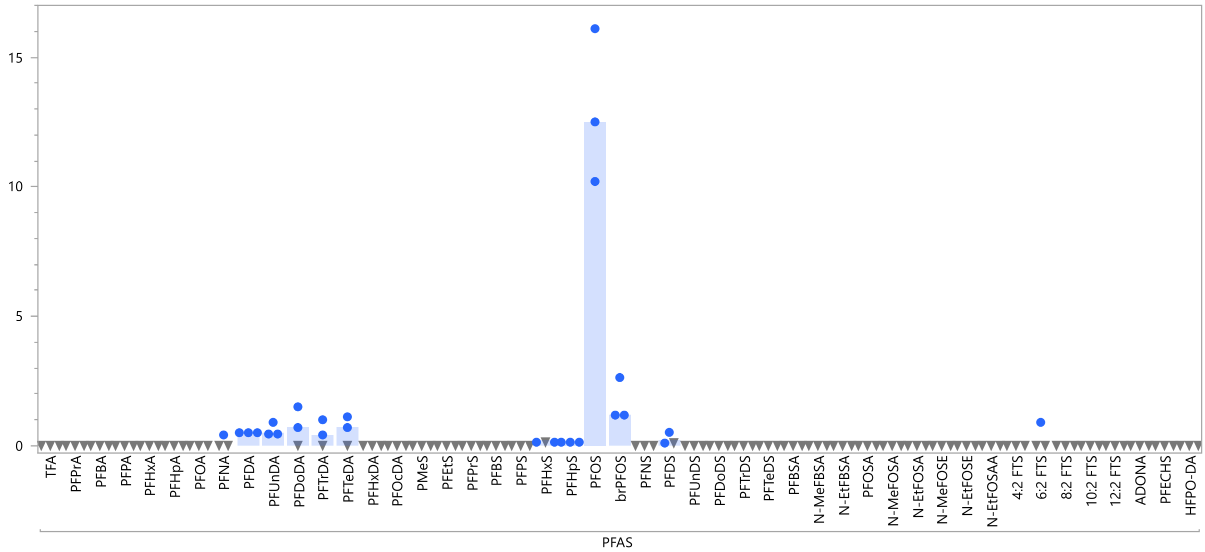
PFAS in Cod (Muscle) (ng/g wet wt.):



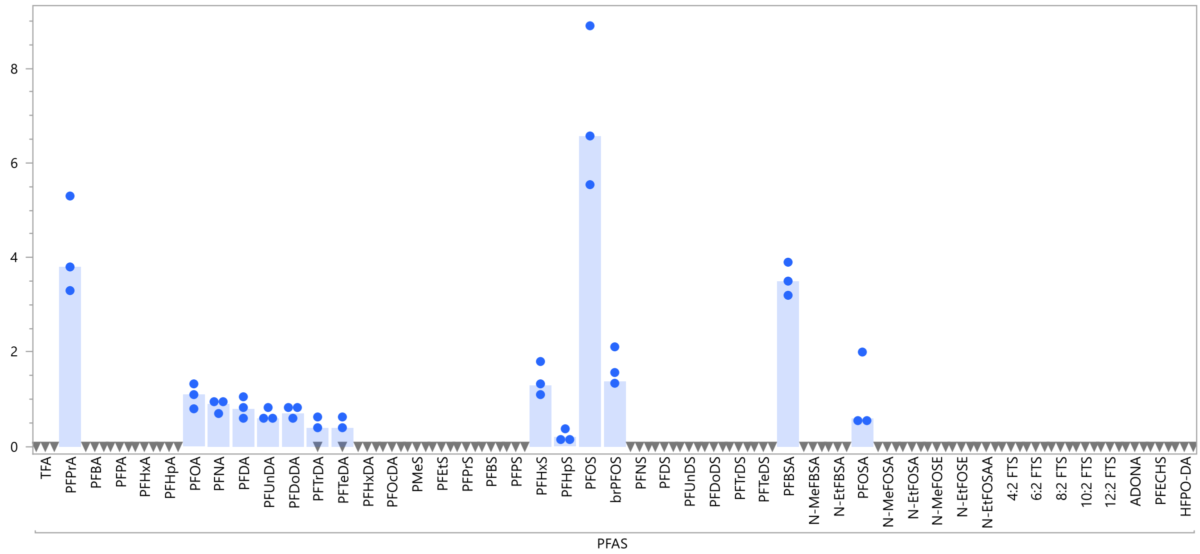
PFAS in Herring gull (blood) (ng/g wet wt.):



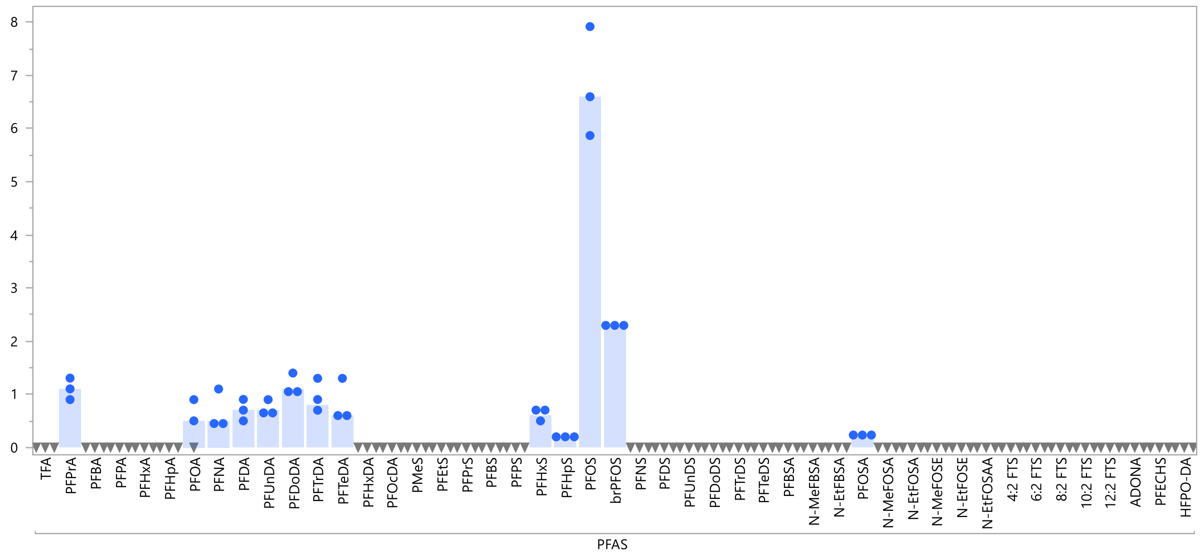
PFAS in Herring gull (egg) (ng/g wet wt.):



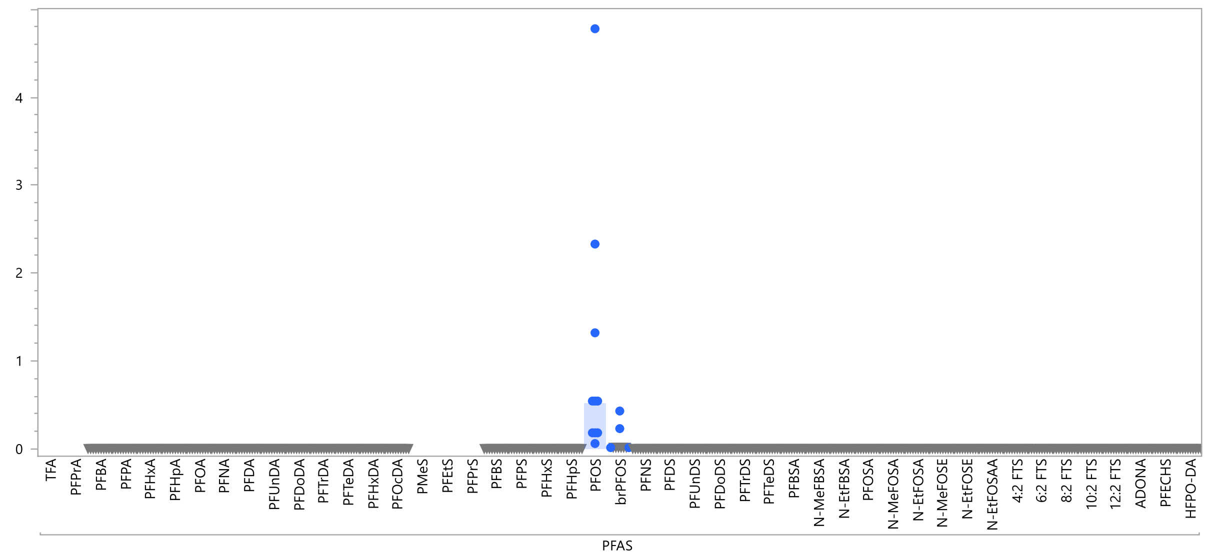
PFAS in Eider (Blood) (ng/g wet wt.):



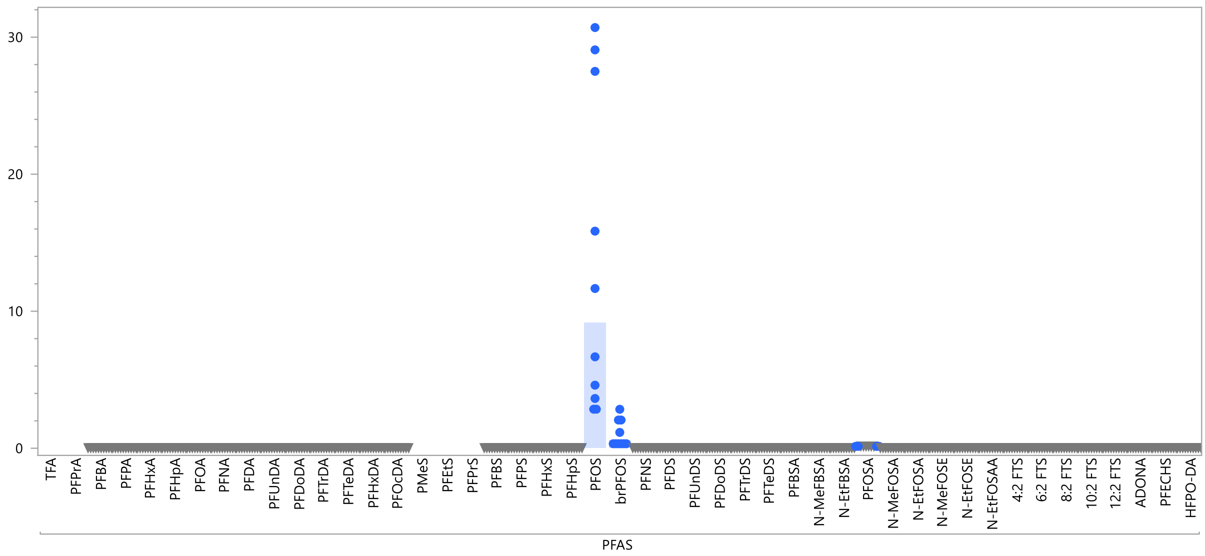
PFAS in Eider (Egg) (ng/g wet wt.):



PFAS in H. seal (blubber) (ng/g wet wt.):

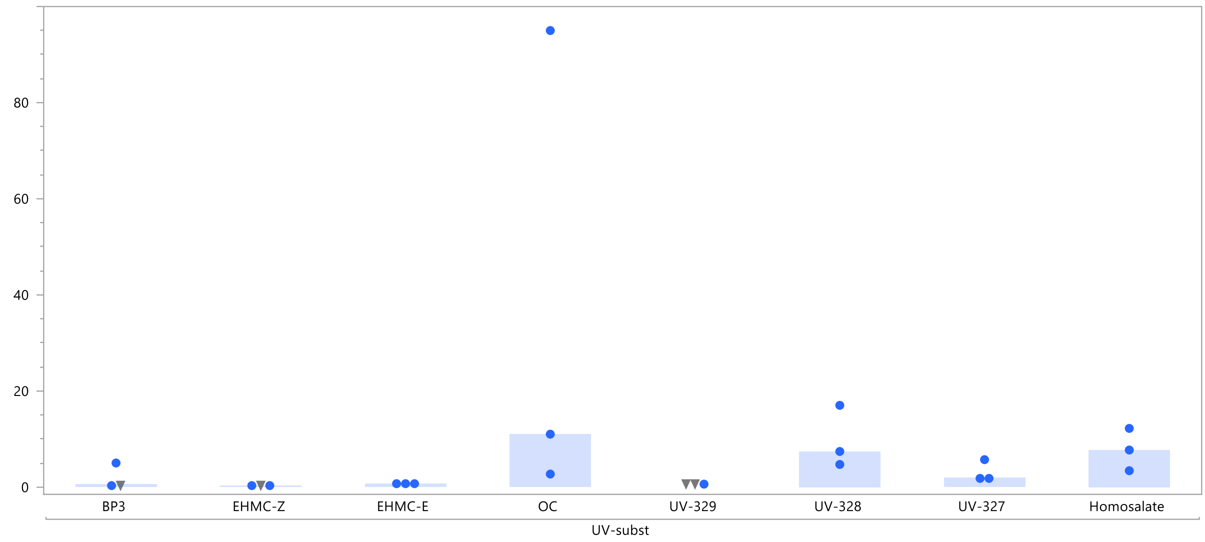


PFAS in H. seal (muscle) (ng/g wet wt.):

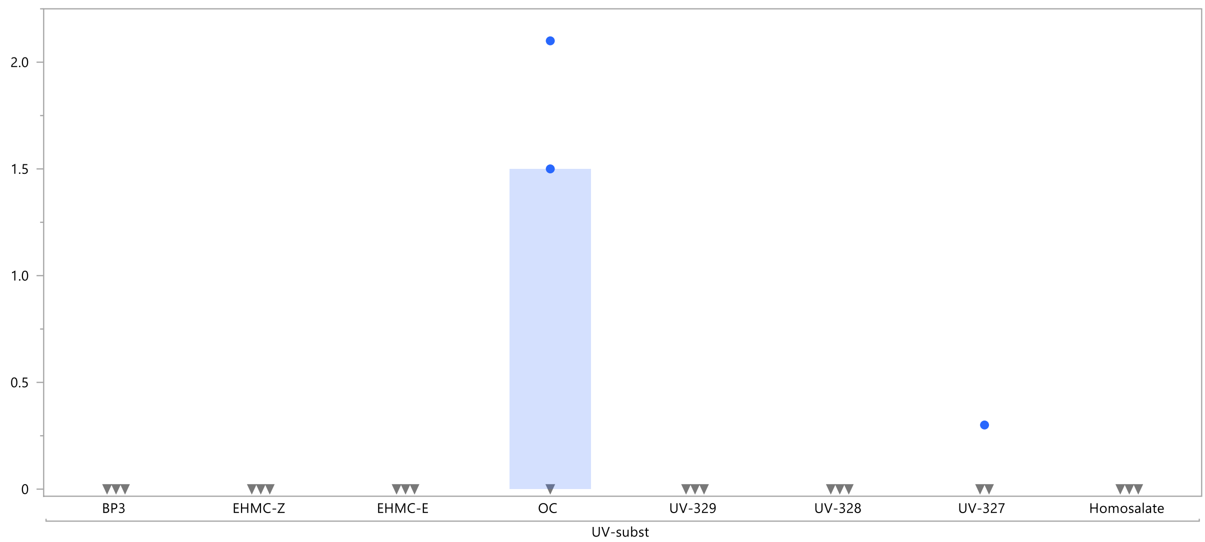


UV-substances:

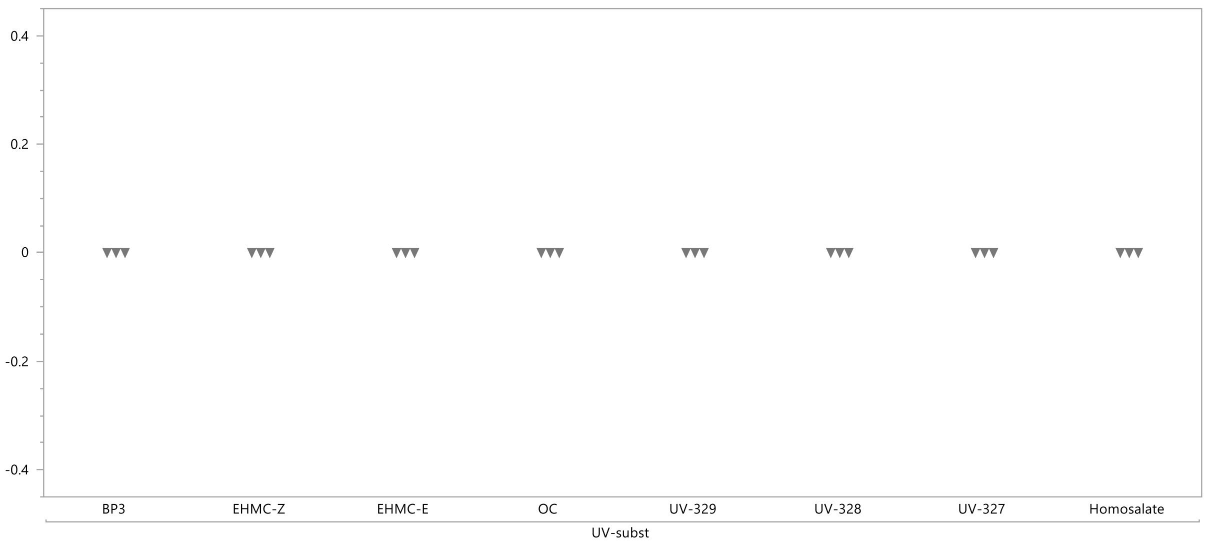
UV-substances in Sediment (ng/g dry wt.):



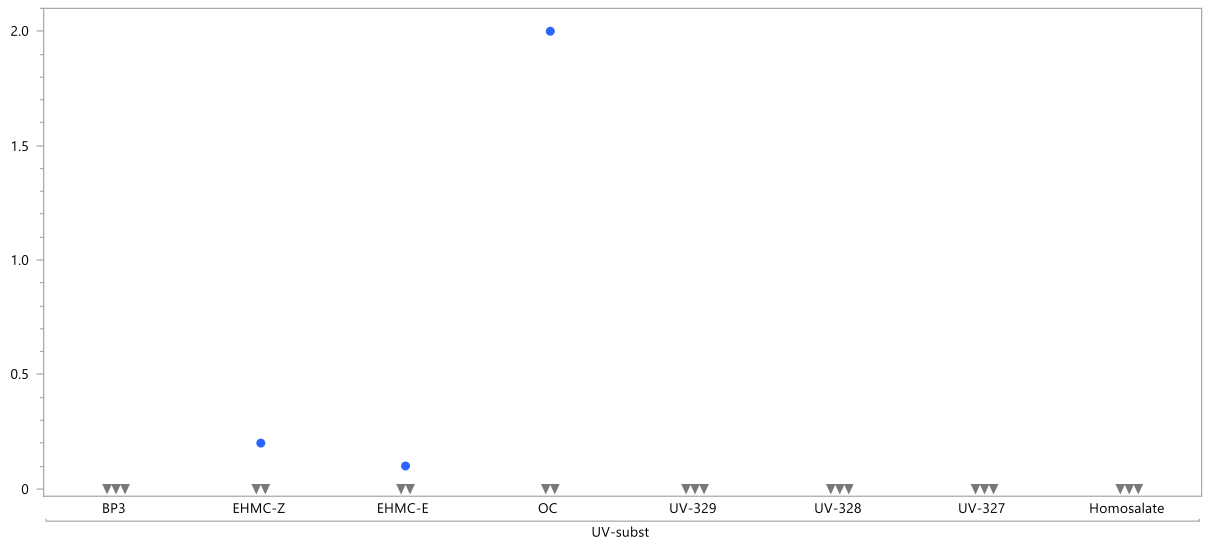
UV-substances in Polychaeta (ng/g wet wt.):



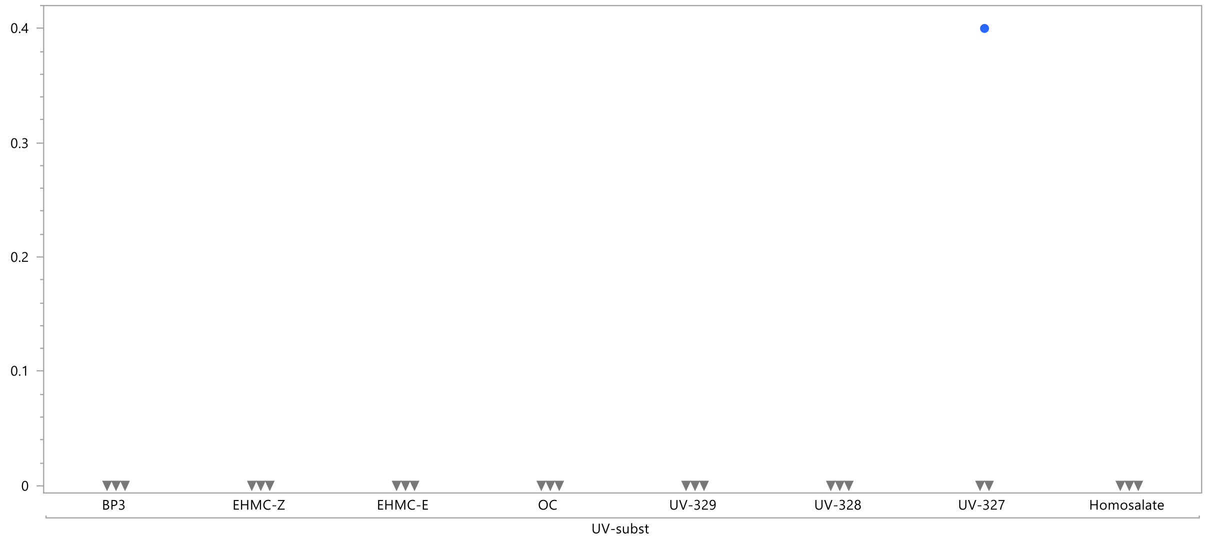
UV-substances in Blue mussel (ng/g wet wt.):



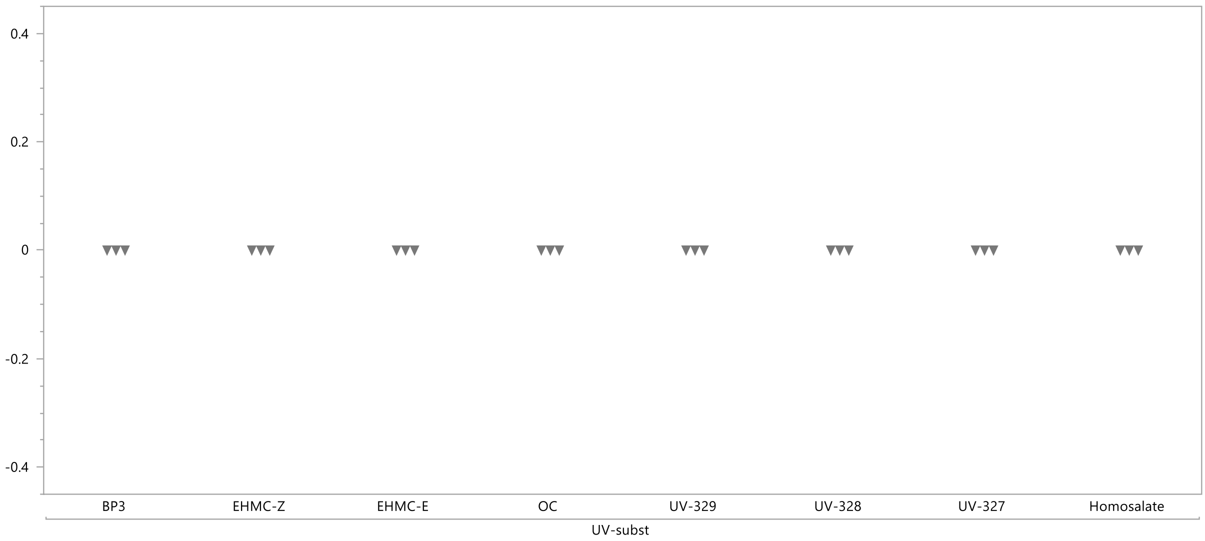
UV-substances in Krill (ng/g wet wt.):



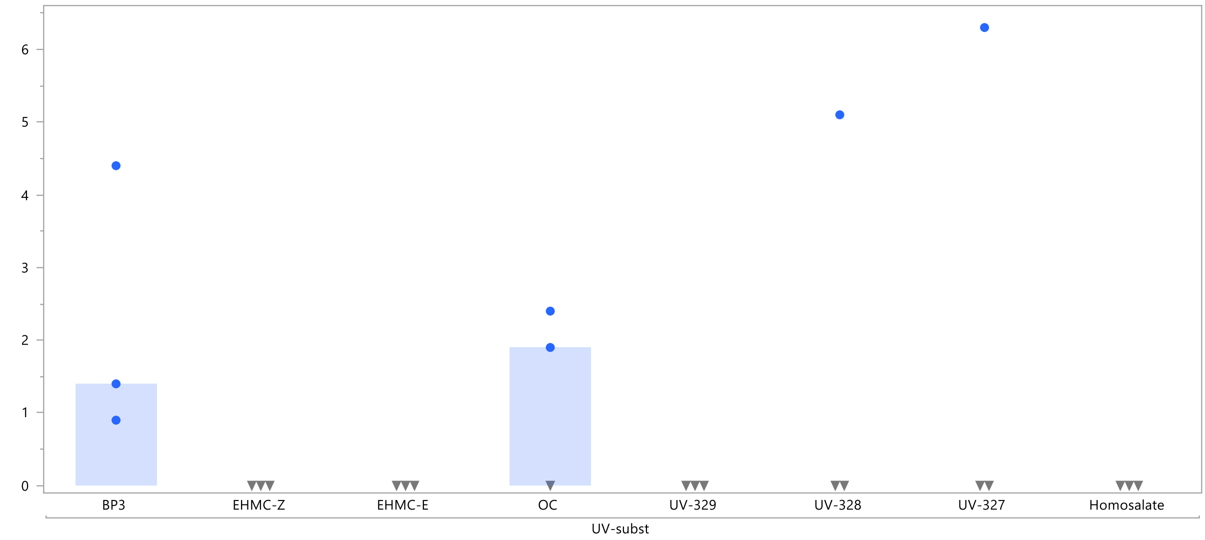
UV-substances in Shrimp (ng/g wet wt.):



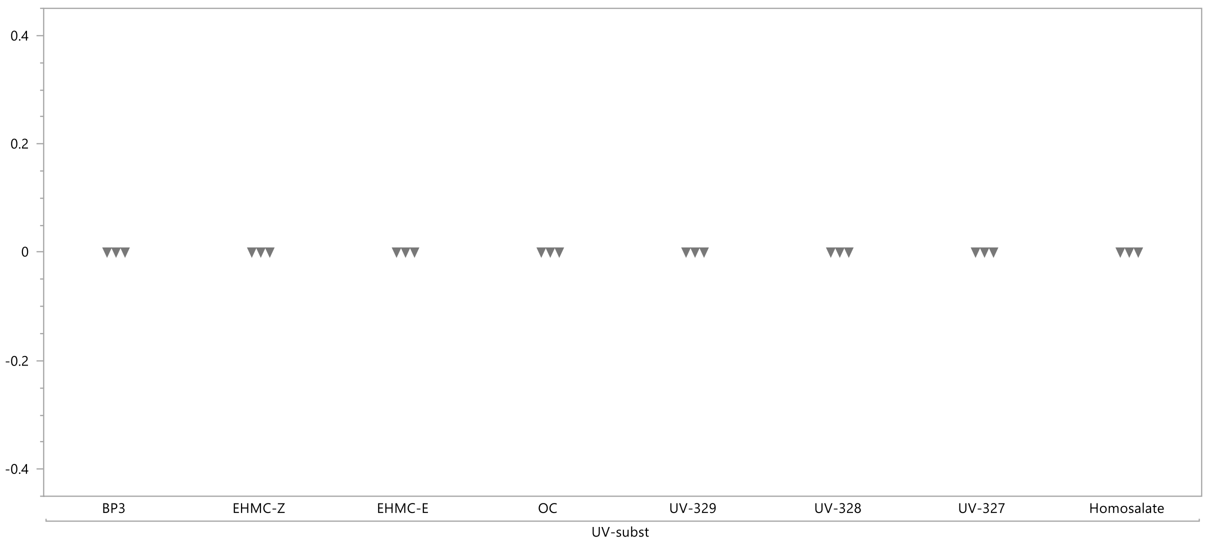
UV-substances in Herring (muscle) (ng/g wet wt.):



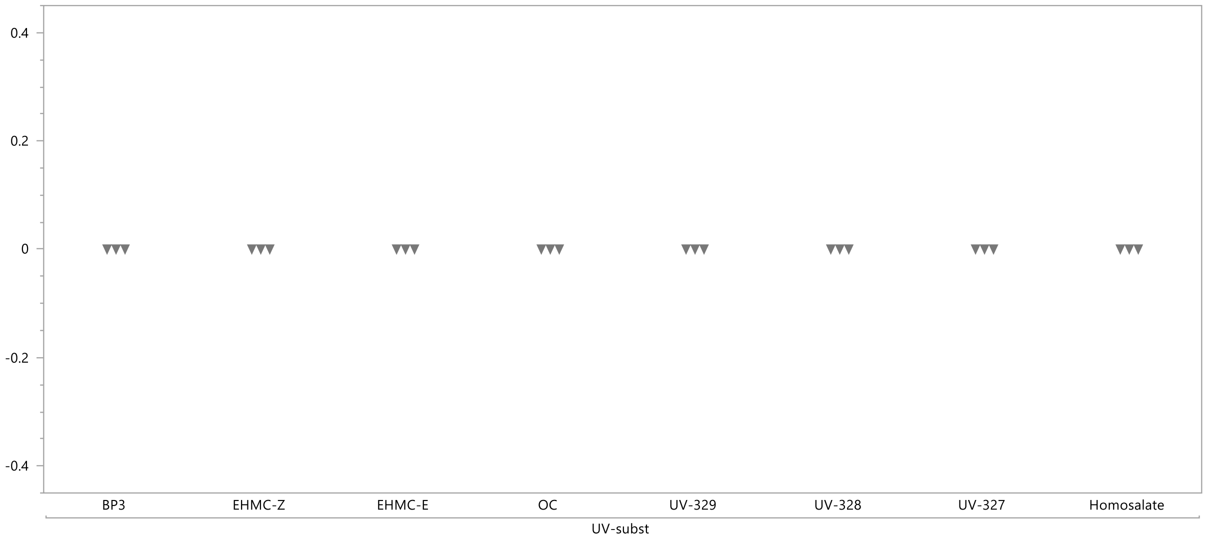
UV-substances in Cod (liver) (ng/g wet wt.):



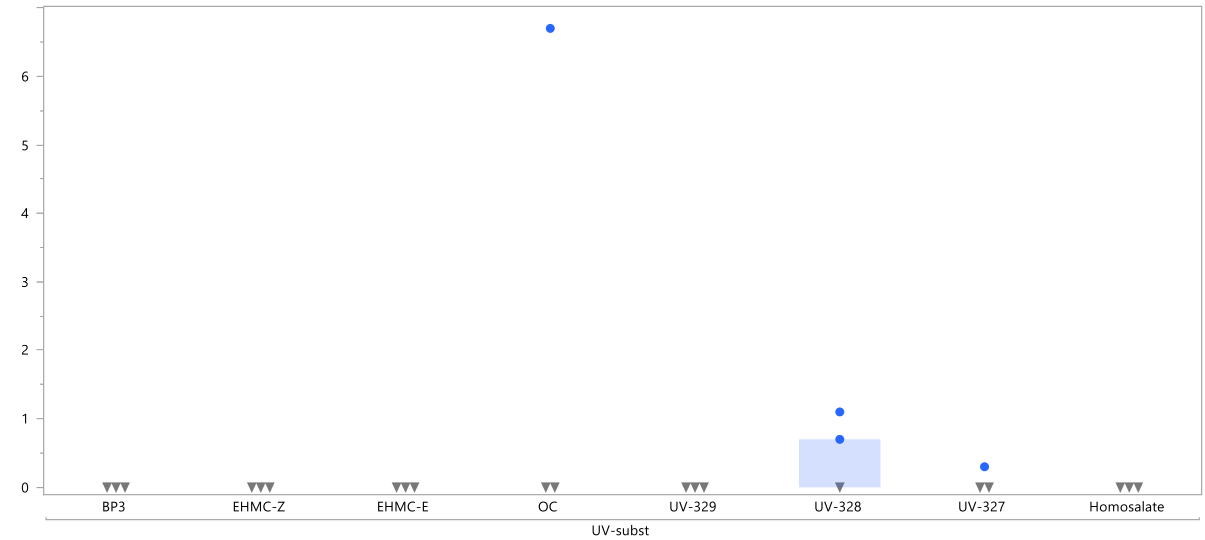
UV-substances in Cod (Muscle) (ng/g wet wt.):



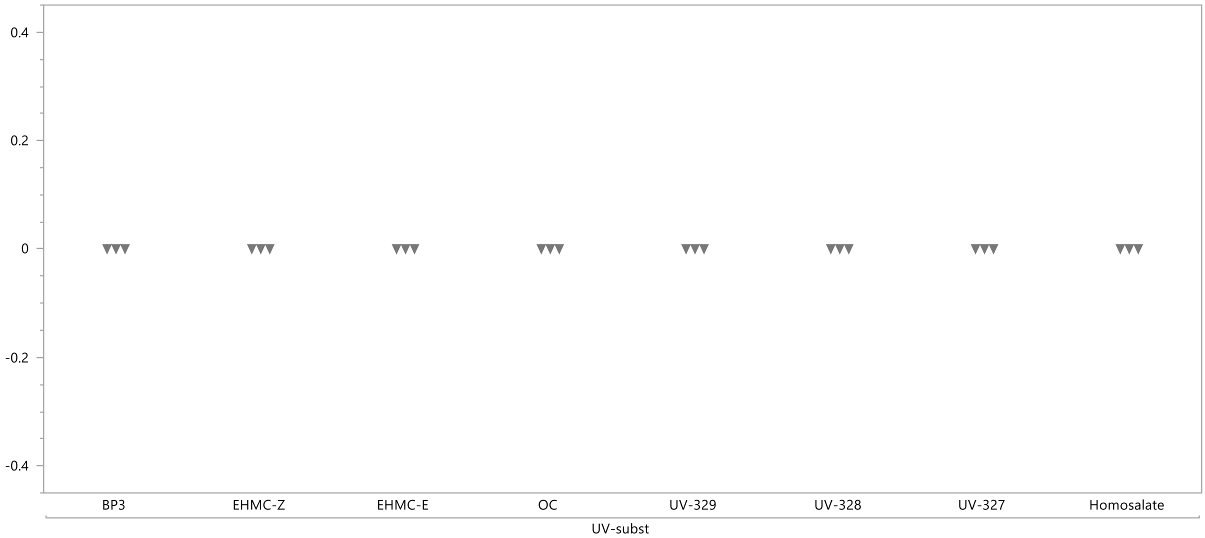
UV-substances in Herring gull (blood) (ng/g wet wt.):



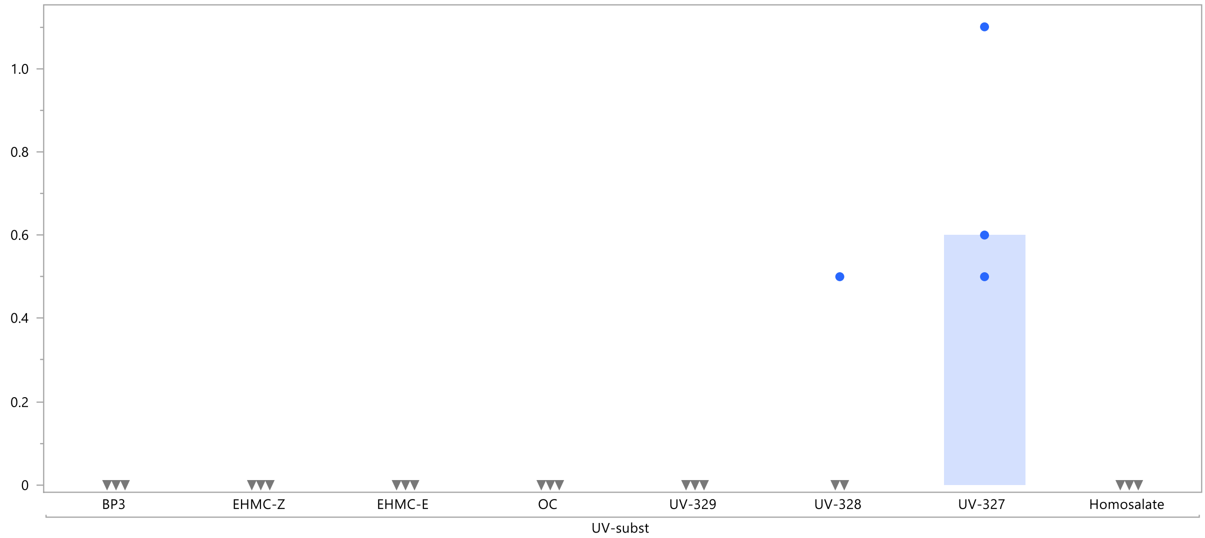
UV-substances in Herring gull (egg) (ng/g wet wt.):



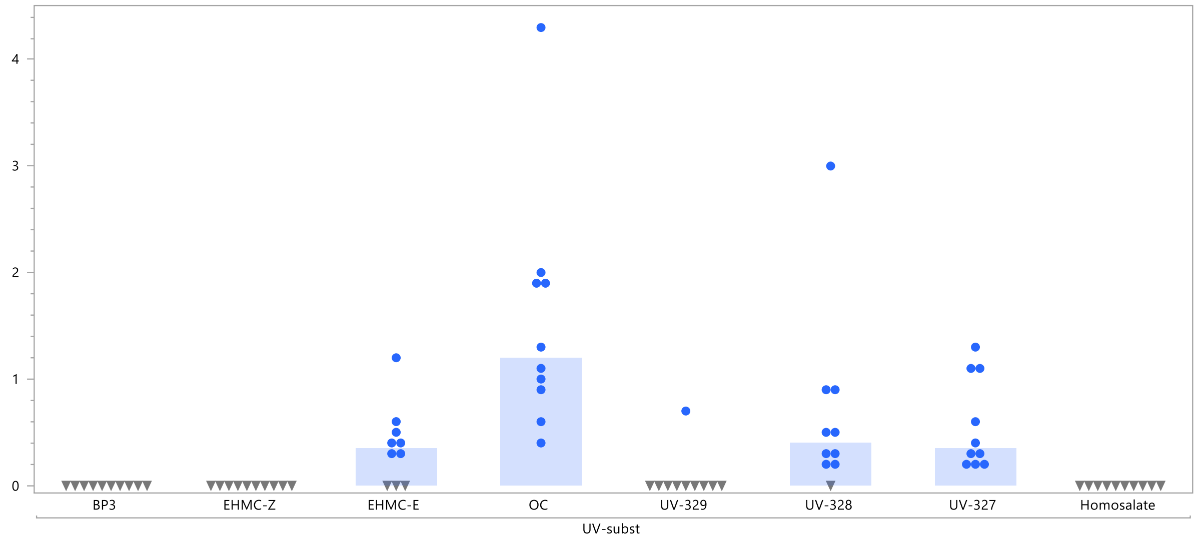
UV-substances in Eider (Blood) (ng/g wet wt.):



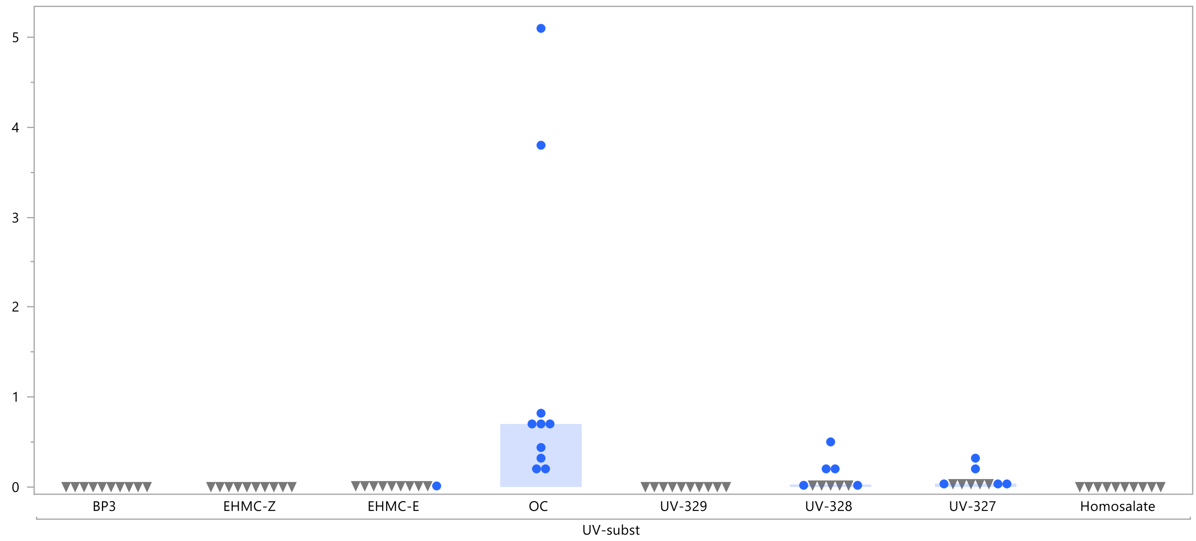
UV-substances in Eider (Egg) (ng/g wet wt.):



UV-substances in H. seal (blubber) (ng/g wet wt.):

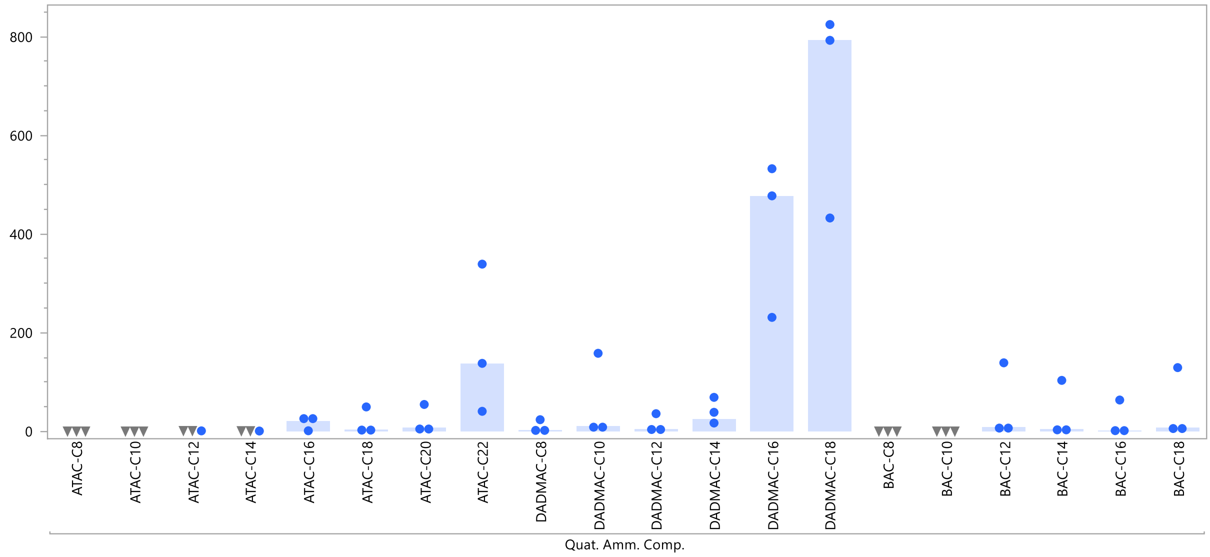


UV-substances in H. seal (muscle) (ng/g wet wt.):



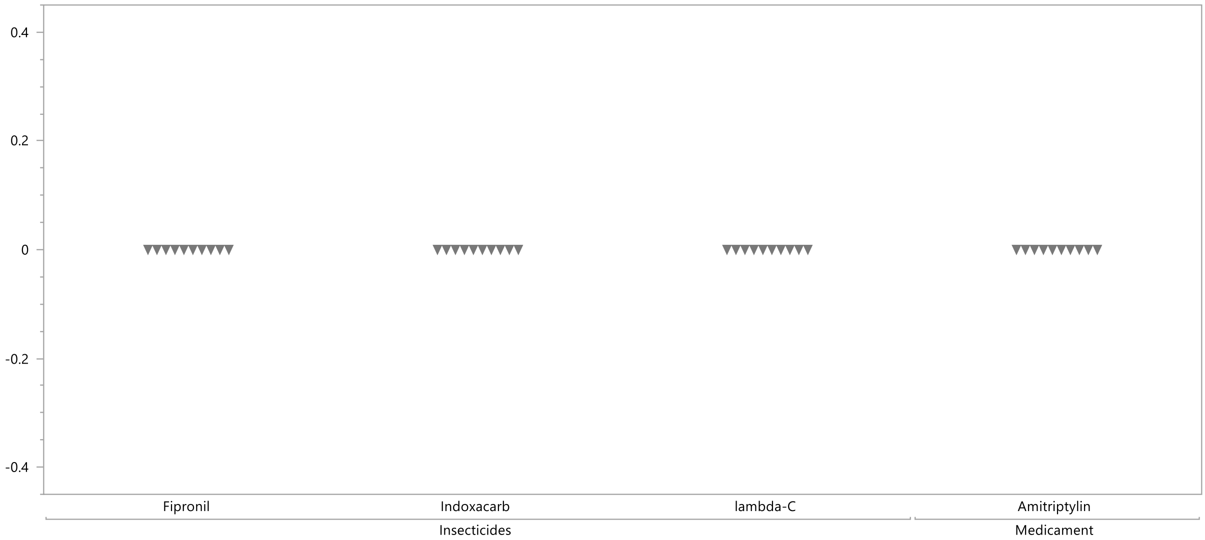
Quaternary ammonium compounds (QACs):

Quaternary ammonium compounds in Sediment (ng/g dry wt.):

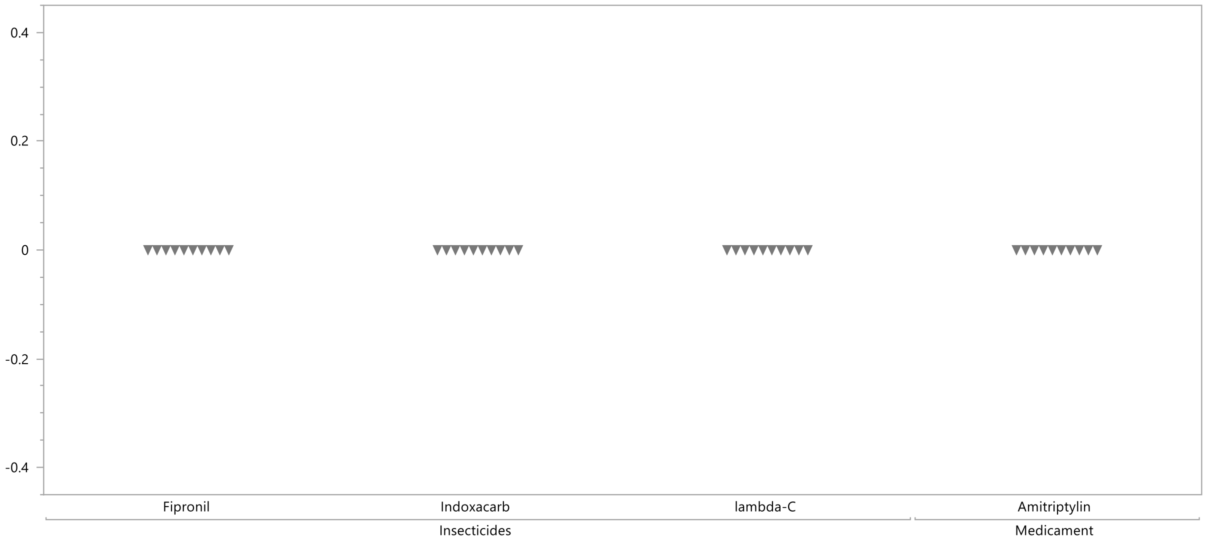


Insecticides and medicaments:

Insecticides and medicaments in H. seal (blubber) (ng/g wet wt.):

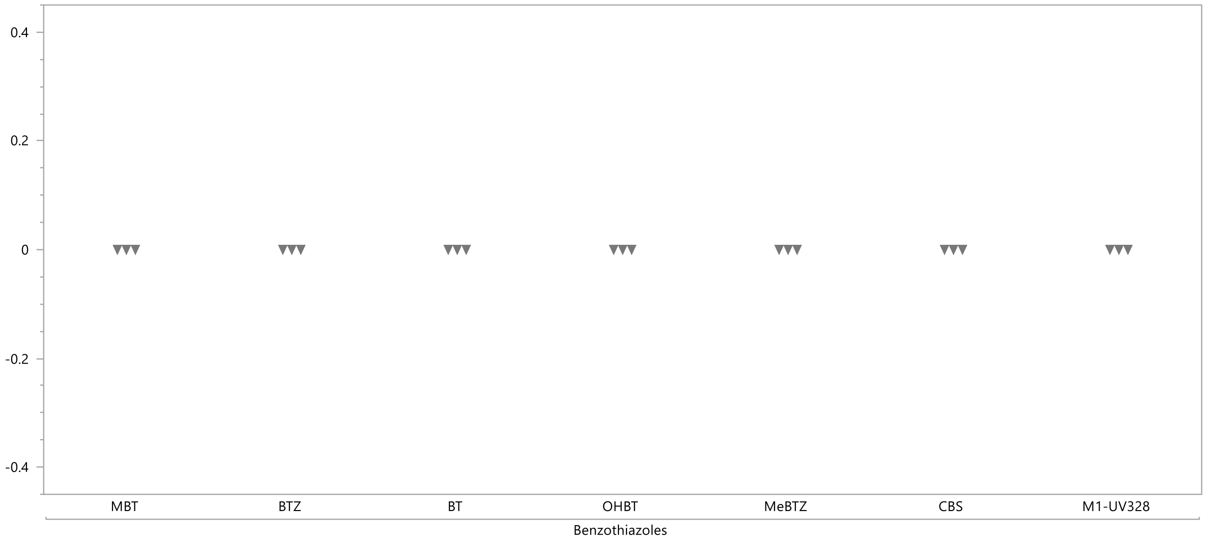


Insecticides and medicaments in H. seal (muscle) (ng/g wet wt.):

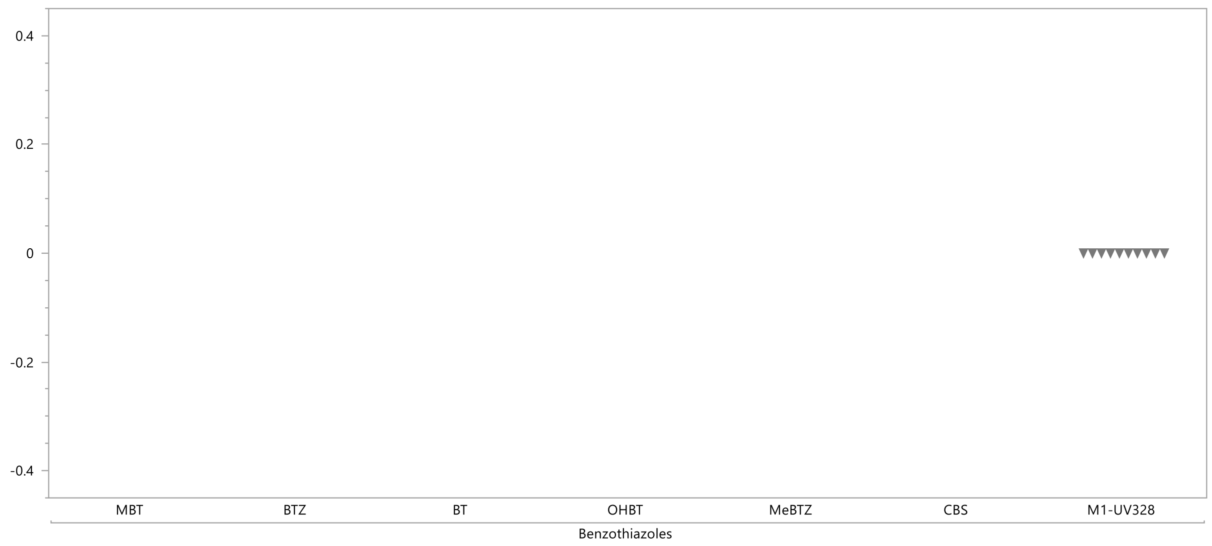


Benzothiazoles:

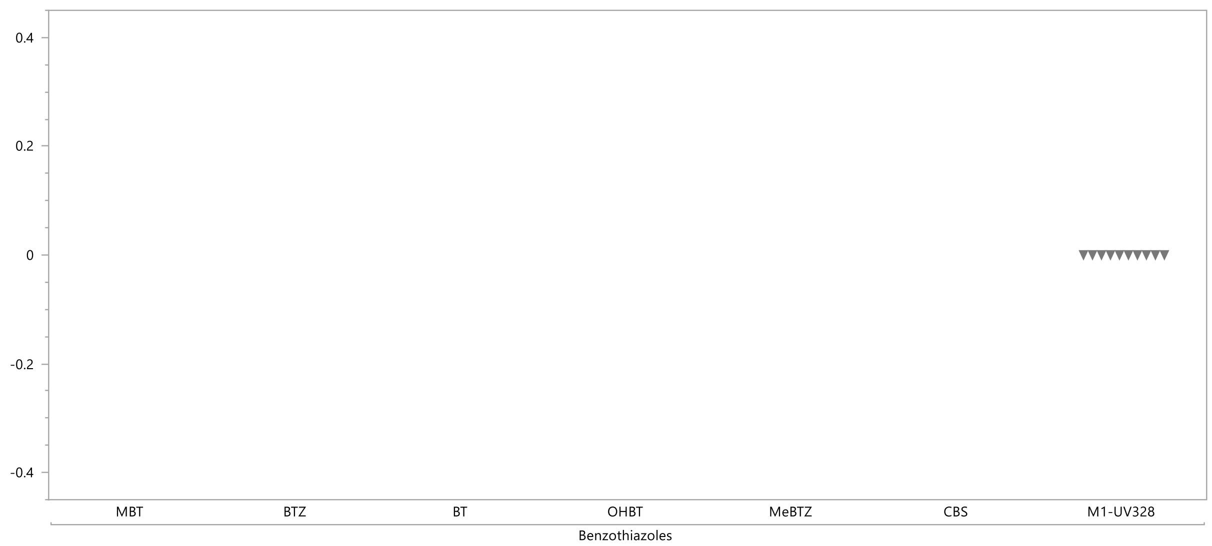
Benzothiazoles in Sediment (ng/g dry wt.):



Benzothiazoles in H. seal (blubber) (ng/g wet wt.):

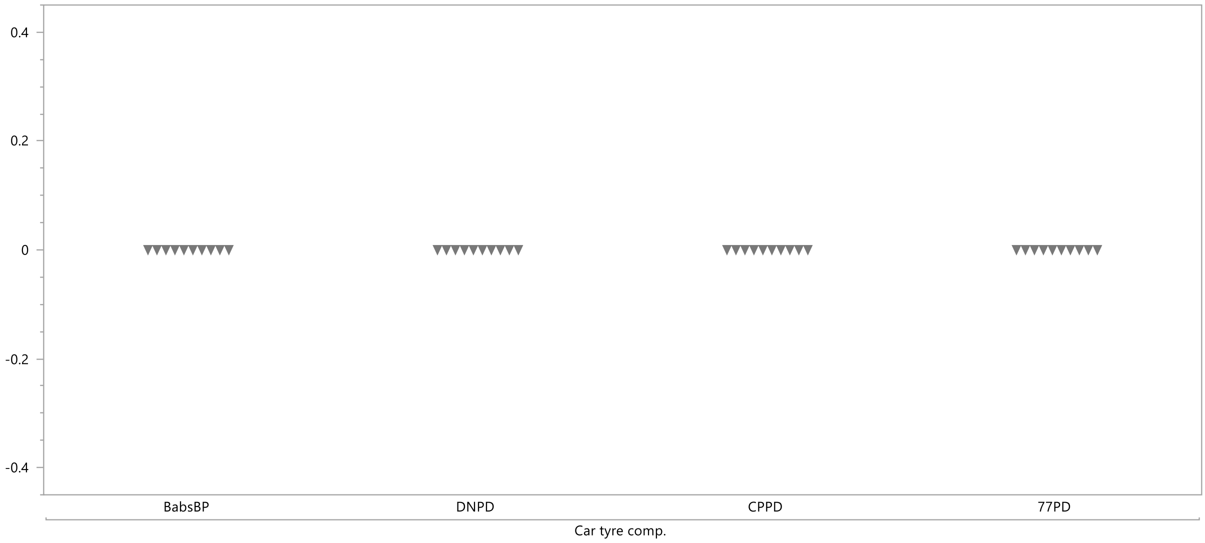


Benzothiazoles in H. seal (muscle) (ng/g wet wt.):

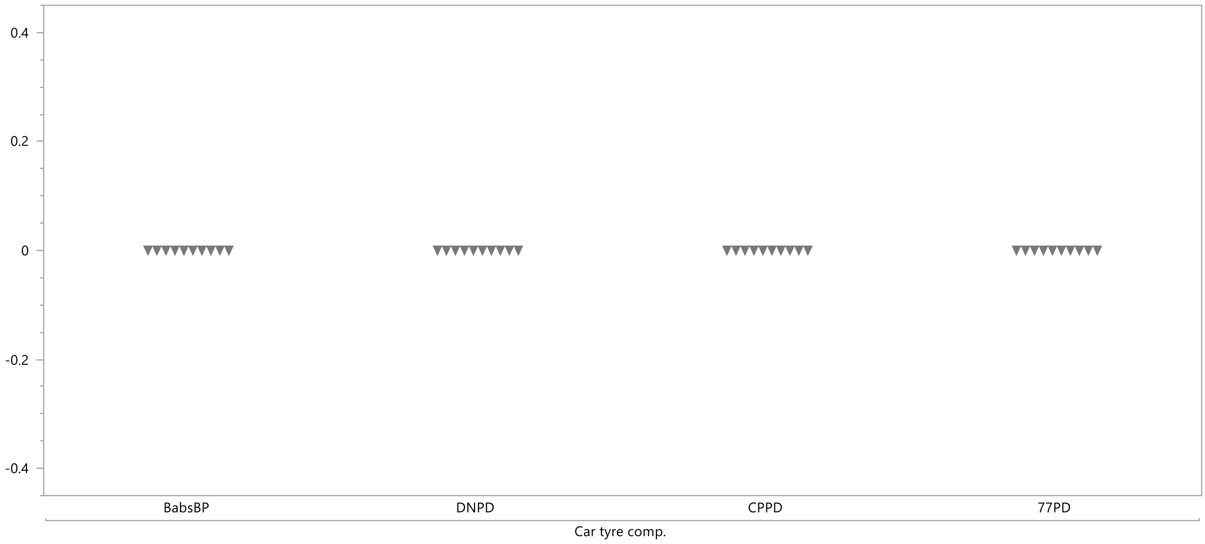


Car tyre compounds:

Car tyre compounds in H. seal (blubber) (ng/g wet wt.):

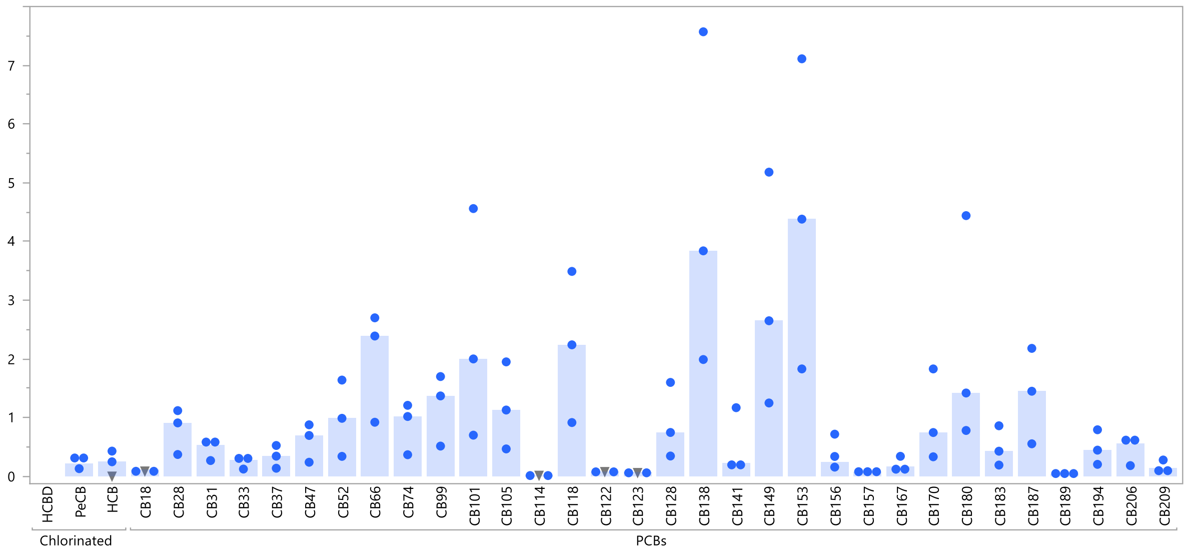


Car tyre compounds in H. seal (muscle) (ng/g wet wt.):

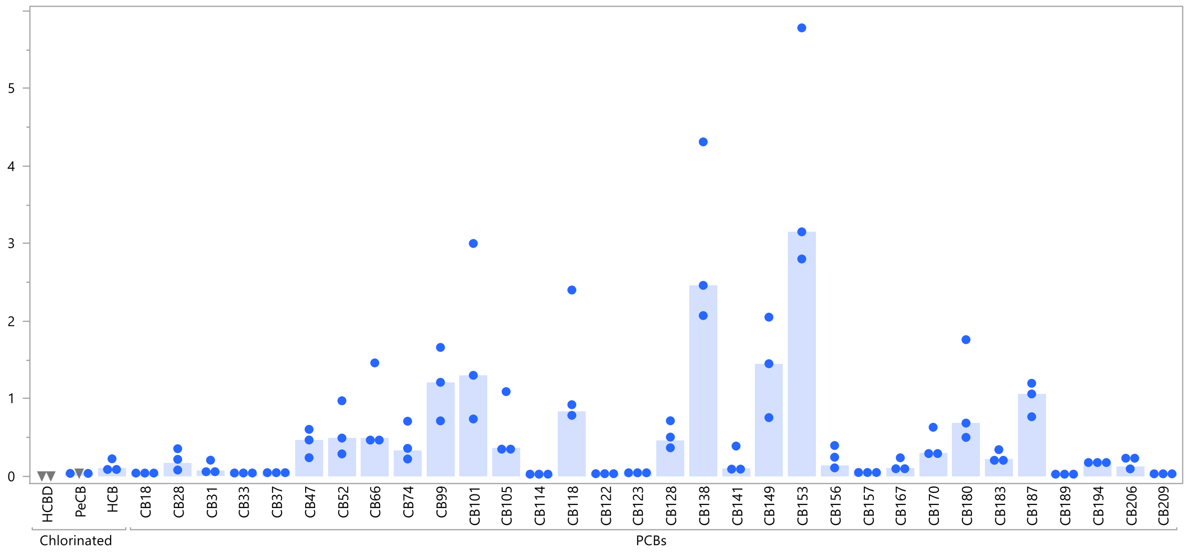


Organochlorines and PCBs:

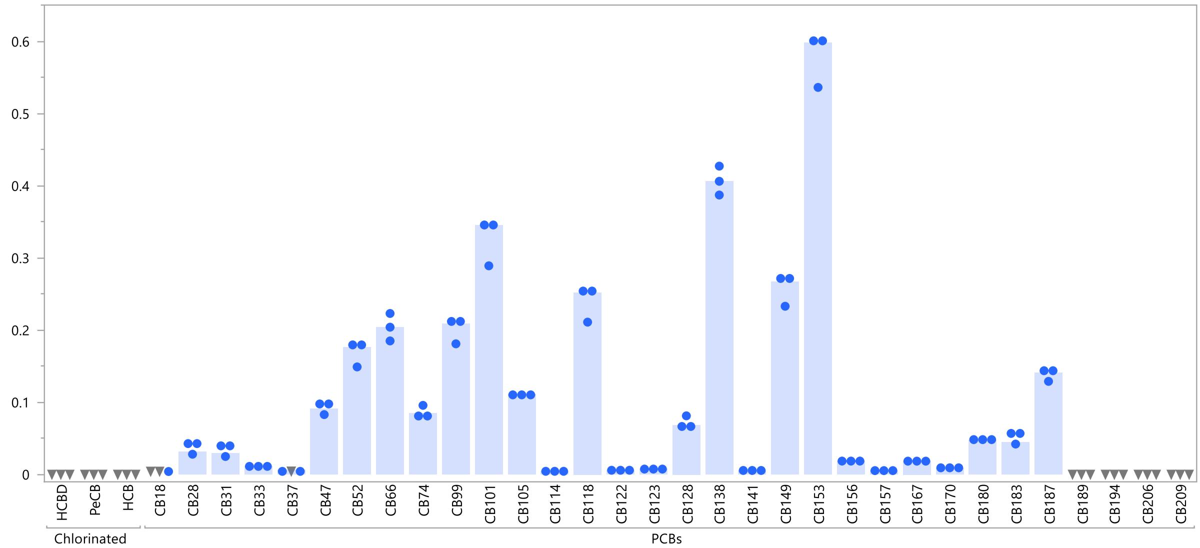
Organochlorines and PCBs in Sediment (ng/g dry wt.):



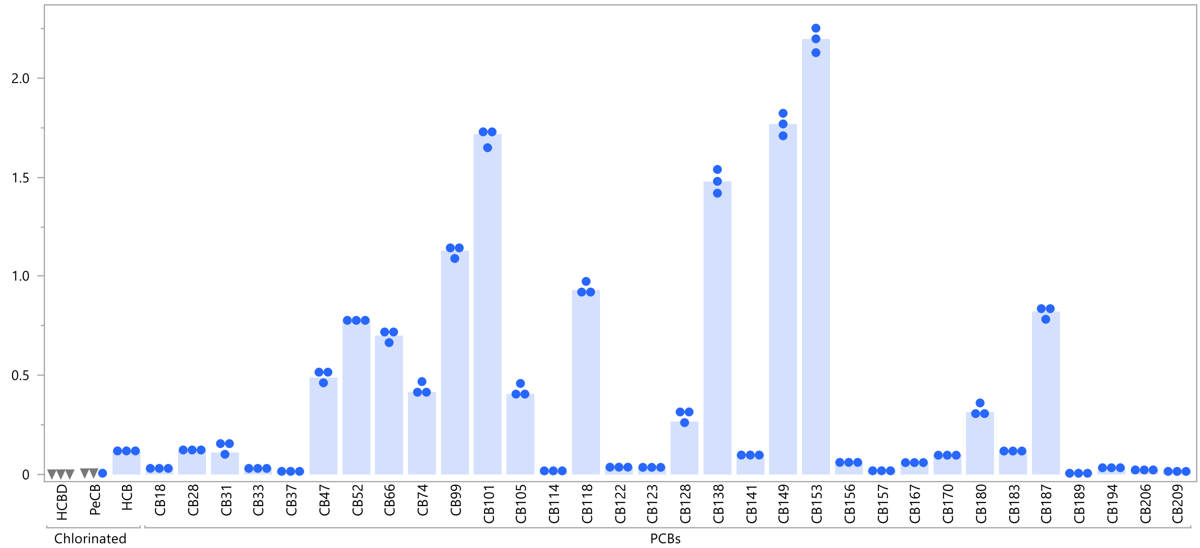
Organochlorines and PCBs in Polychaeta (ng/g wet wt.):



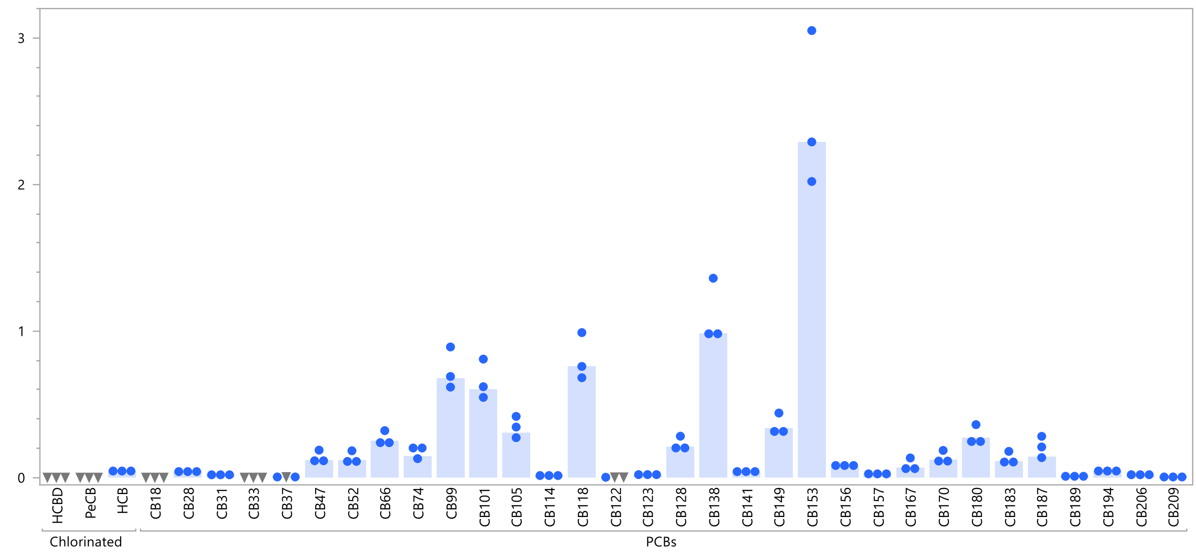
Organochlorines and PCBs in Blue mussel (ng/g wet wt.):



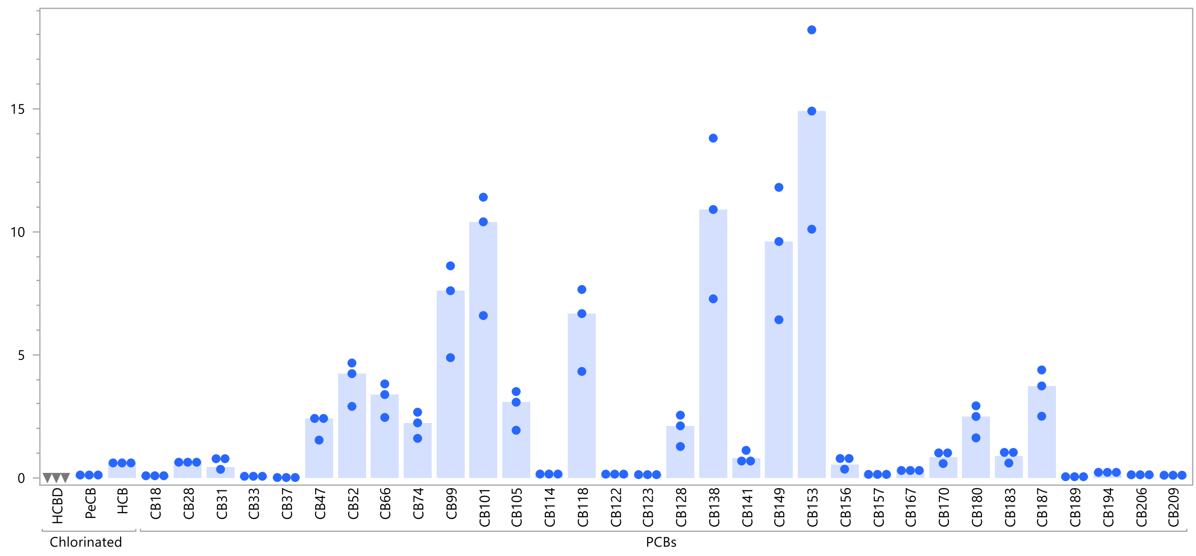
Organochlorines and PCBs in Krill (ng/g wet wt.):



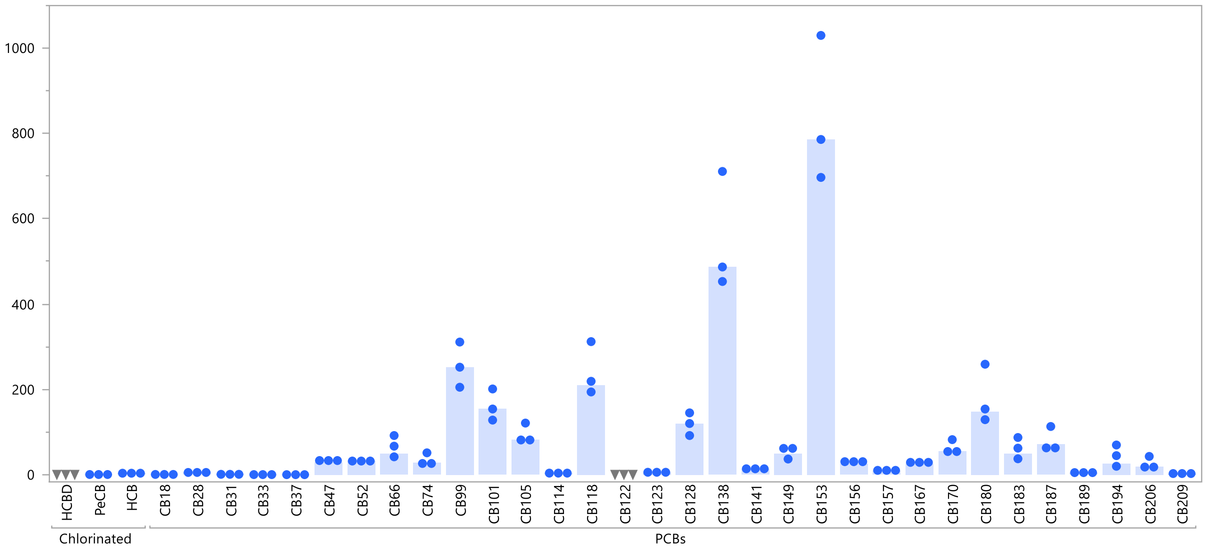
Organochlorines and PCBs in Shrimp (ng/g wet wt.):



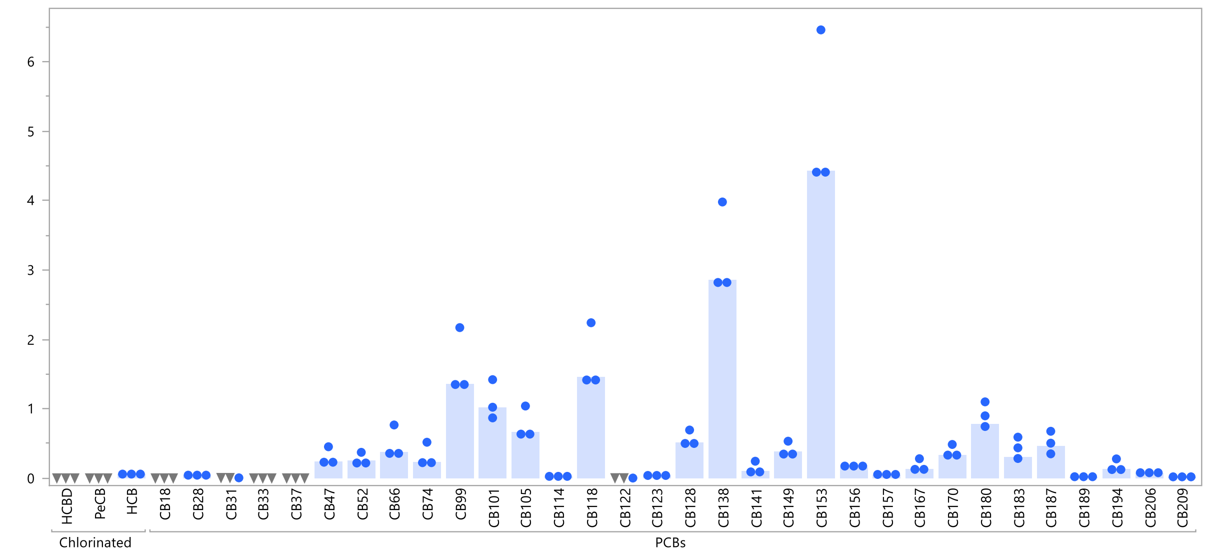
Organochlorines and PCBs in Herring (muscle) (ng/g wet wt.):



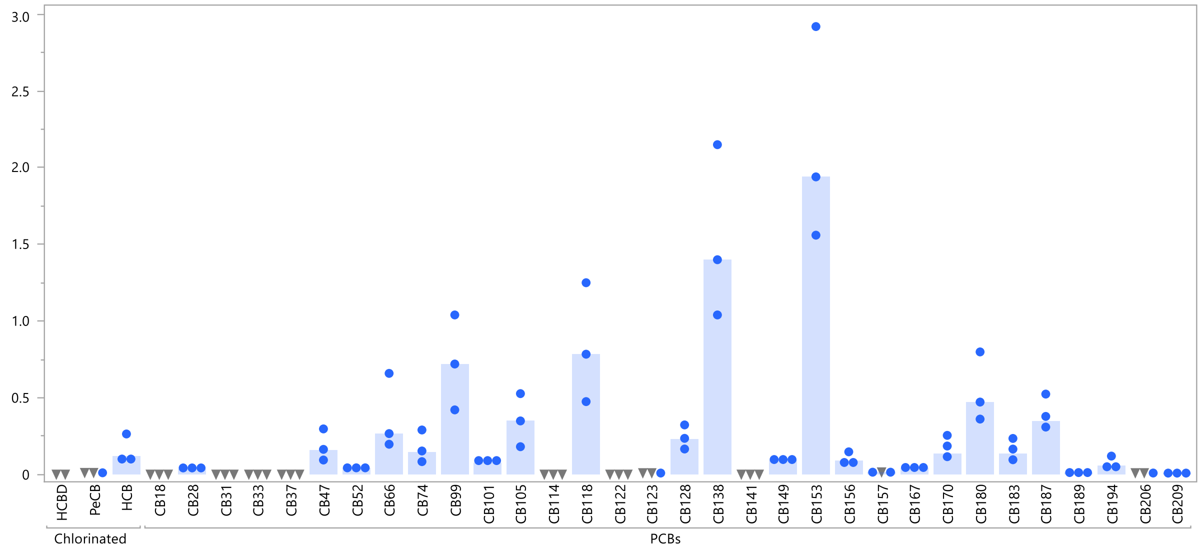
Organochlorines and PCBs in Cod (liver) (ng/g wet wt.):



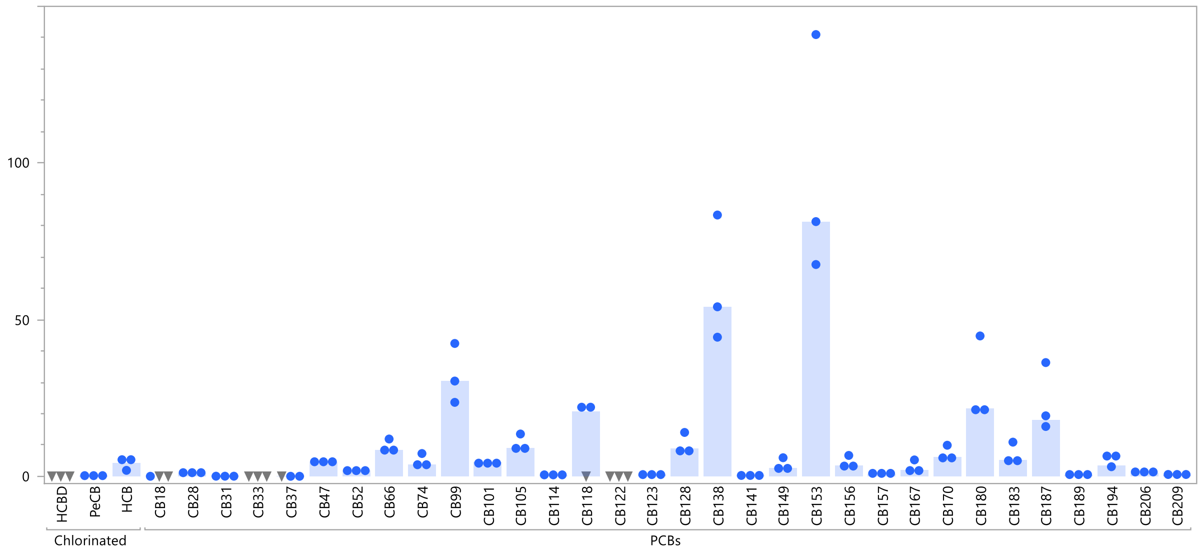
Organochlorines and PCBs in Cod (Muscle) (ng/g wet wt.):



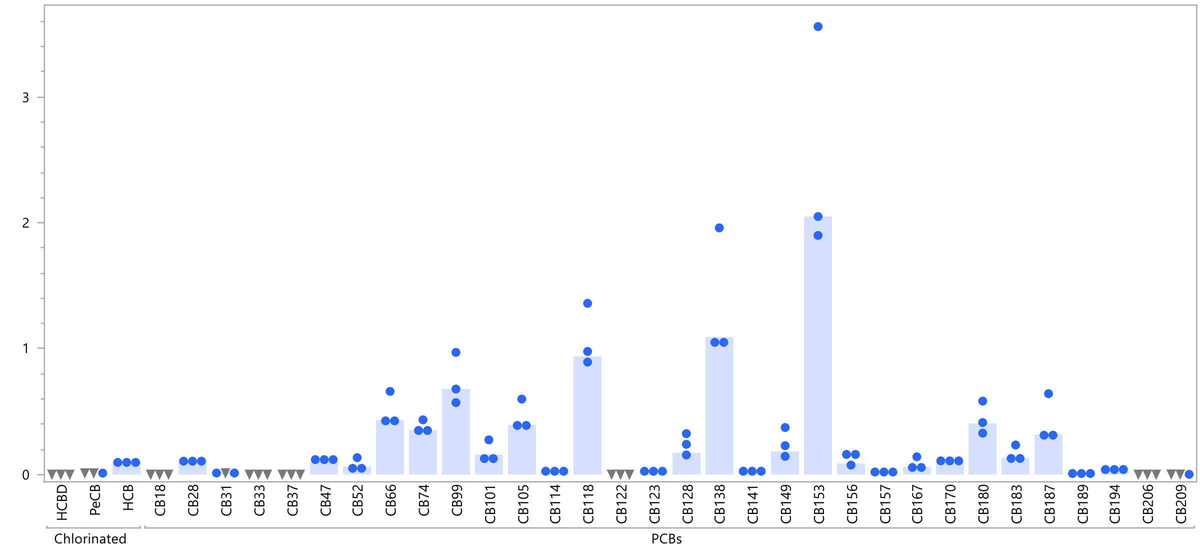
Organochlorines and PCBs in Herring gull (blood) (ng/g wet wt.):



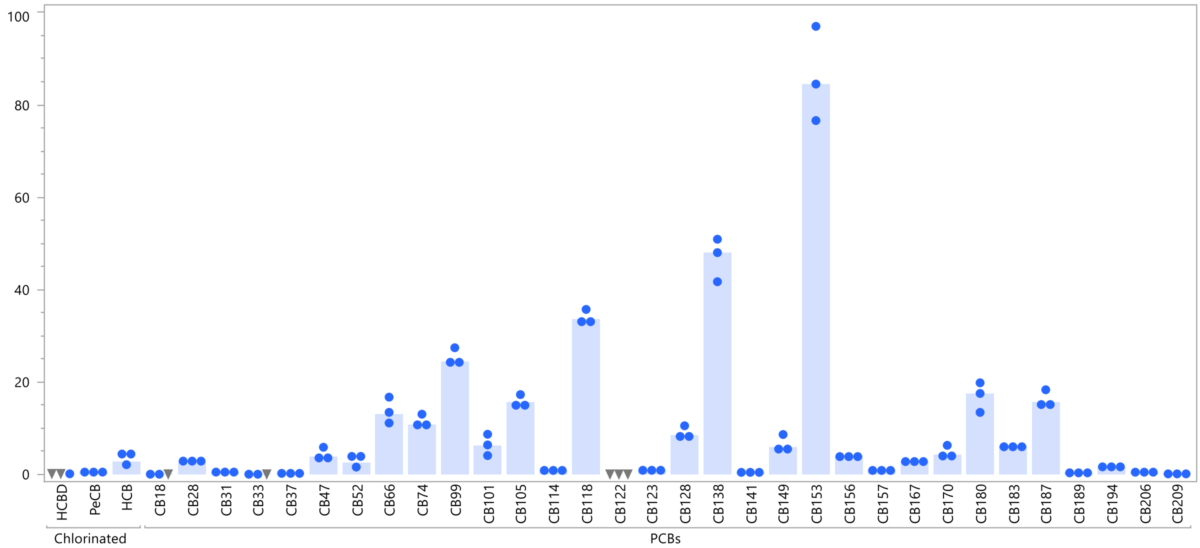
Organochlorines and PCBs in Herring gull (egg) (ng/g wet wt.):



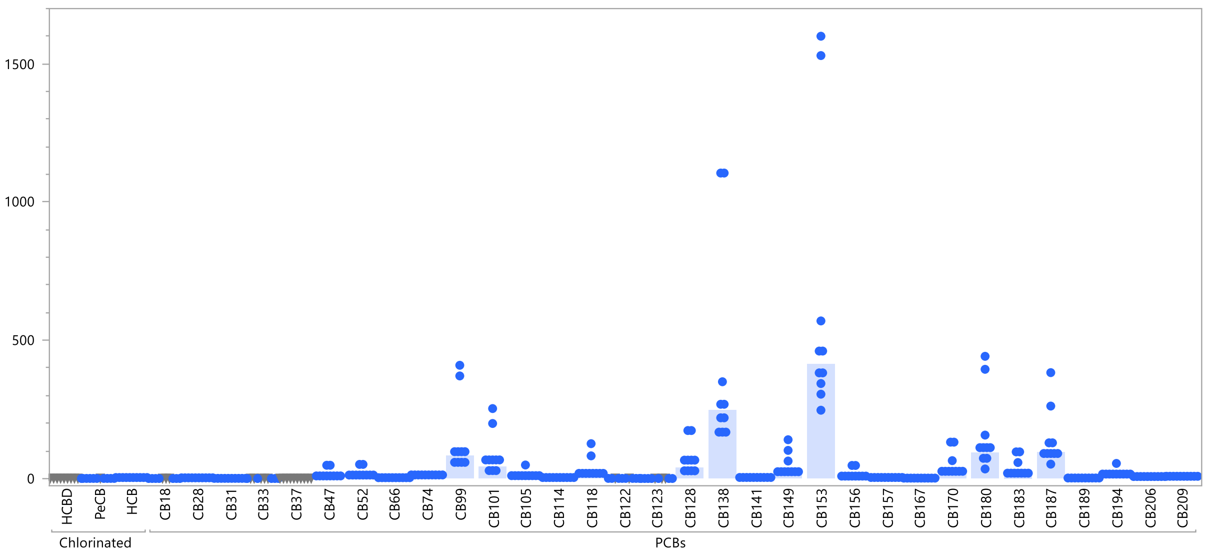
Organochlorines and PCBs in Eider (Blood) (ng/g wet wt.):



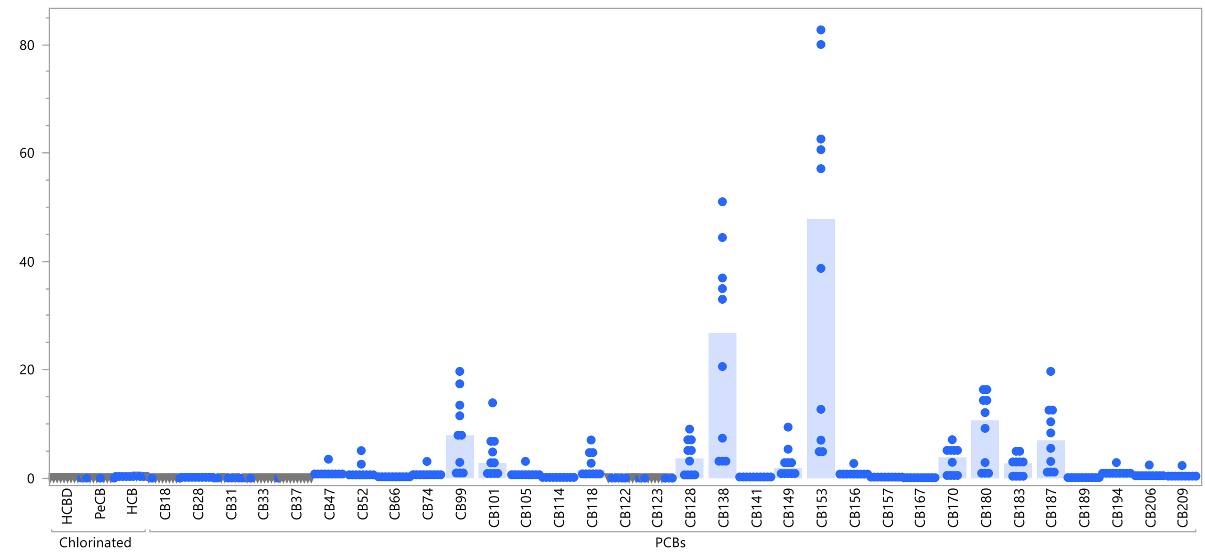
Organochlorines and PCBs in Eider (Egg) (ng/g wet wt.):



Organochlorines and PCBs in H. seal (blubber) (ng/g wet wt.):

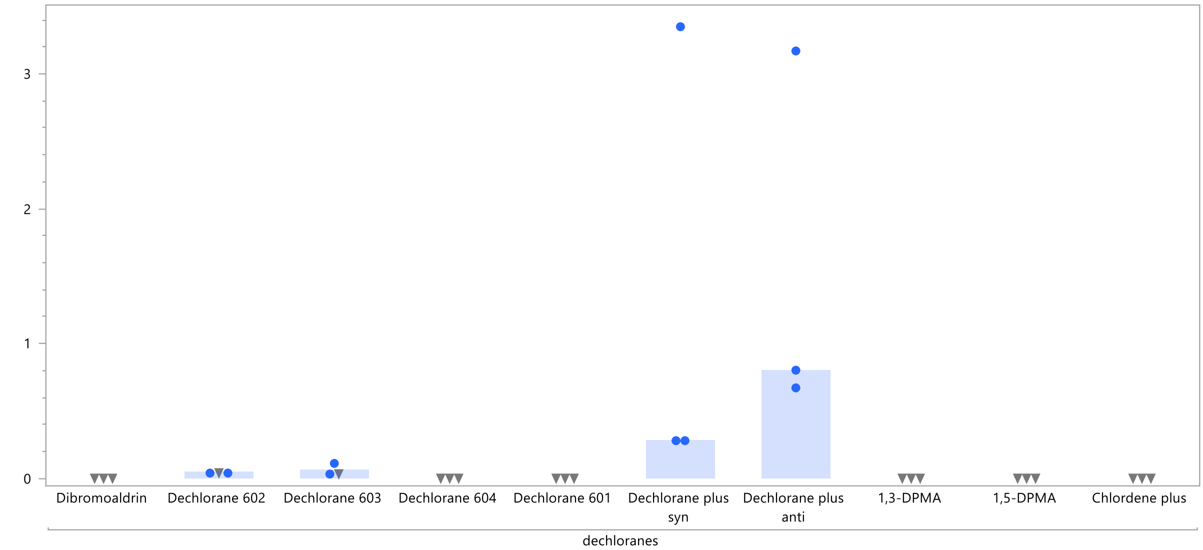


Organochlorines and PCBs in H. seal (muscle) (ng/g wet wt.):

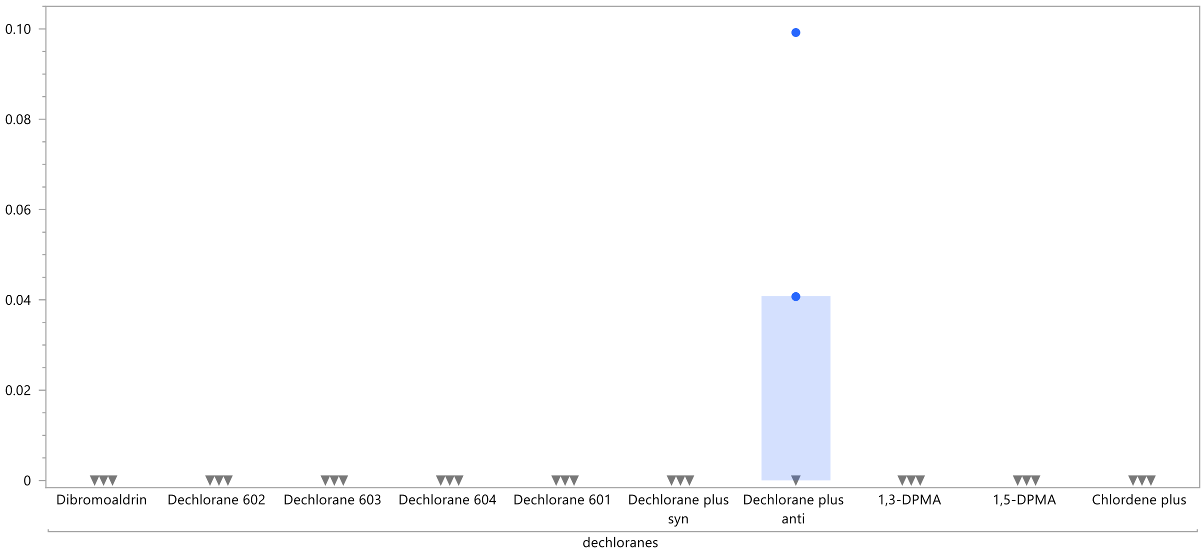


Dechloranes:

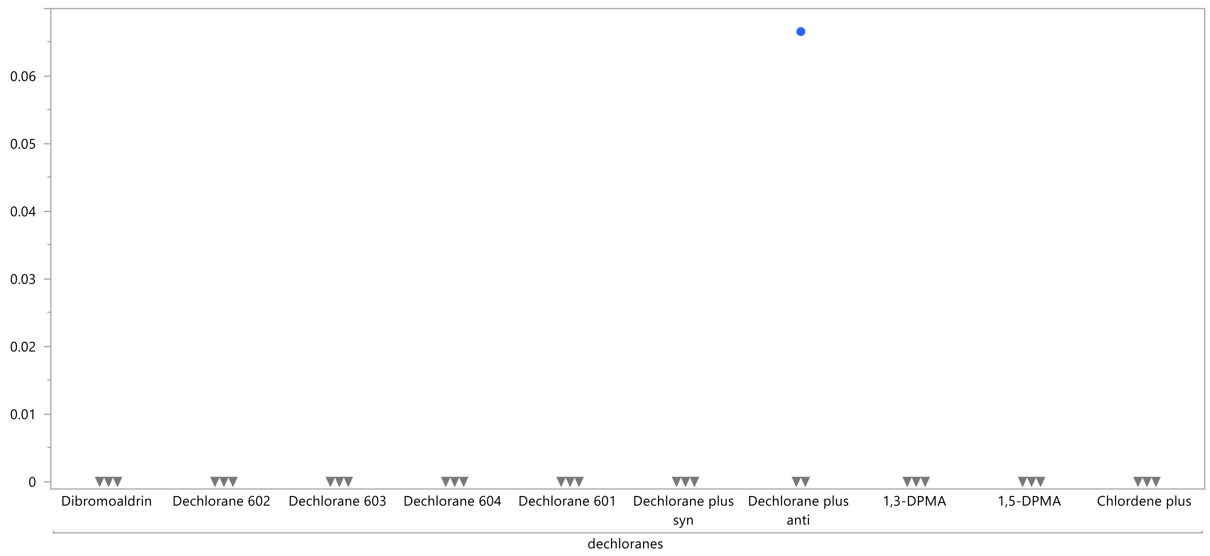
Dechloranes in Sediment (ng/g dry wt.):



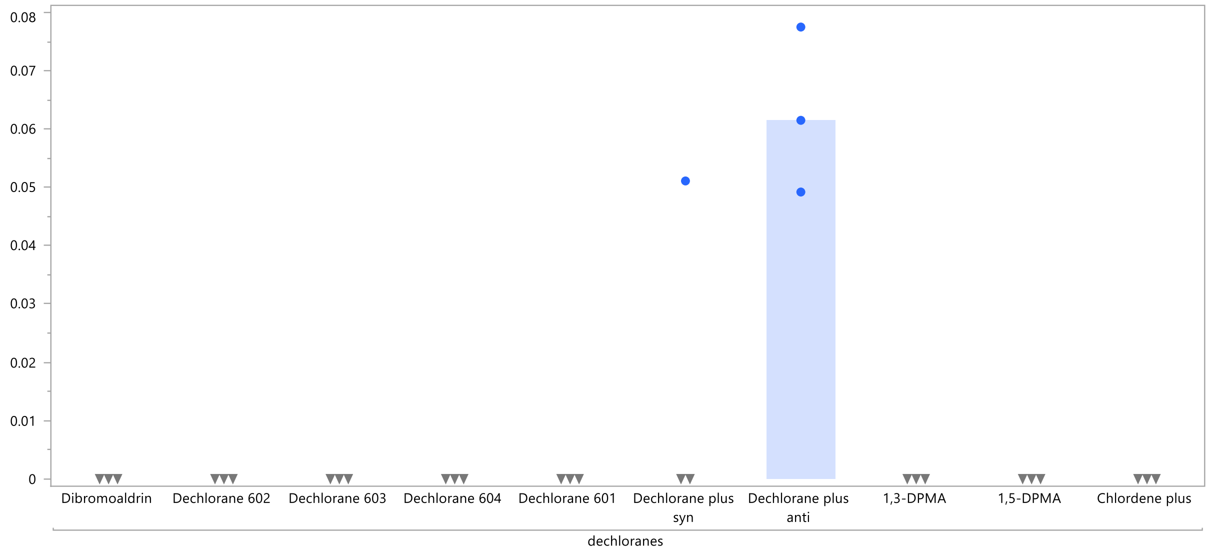
Dechloranes in Polychaeta (ng/g wet wt.):



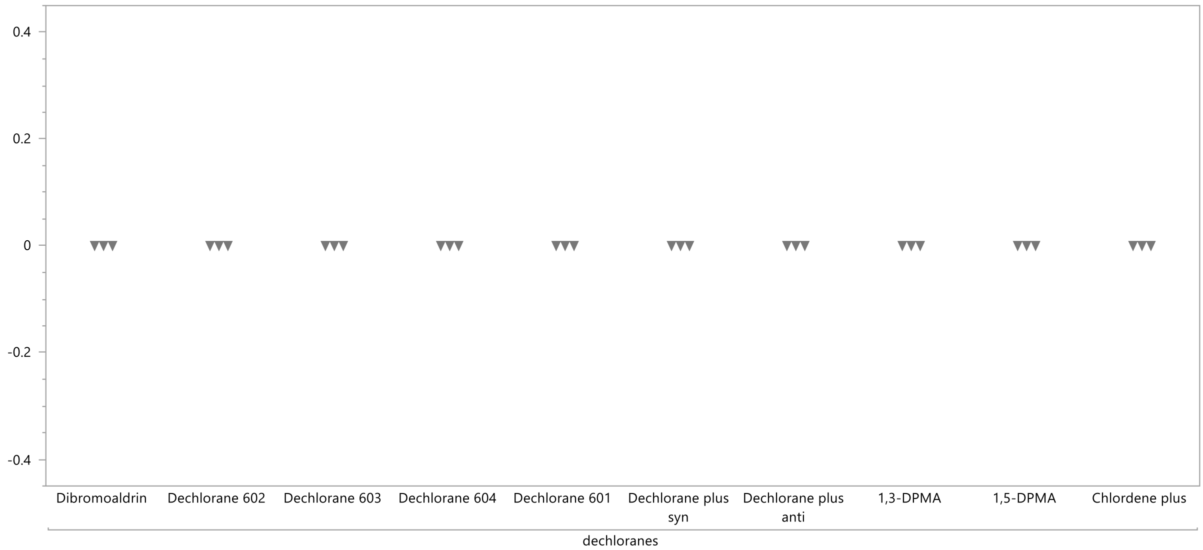
Dechloranes in Blue mussel (ng/g wet wt.):



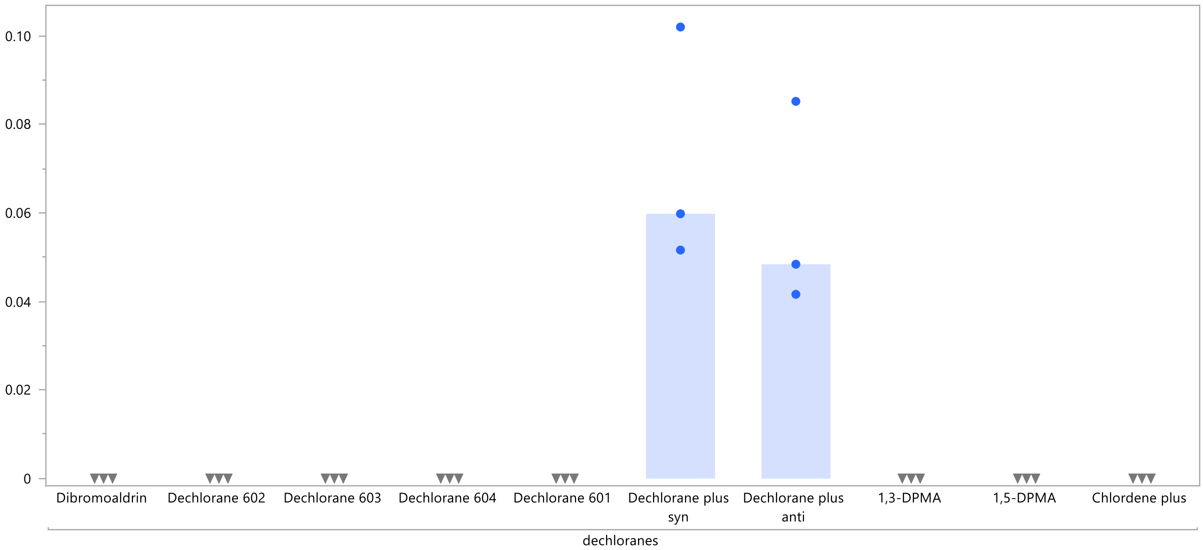
Dechloranes in Krill (ng/g wet wt.):



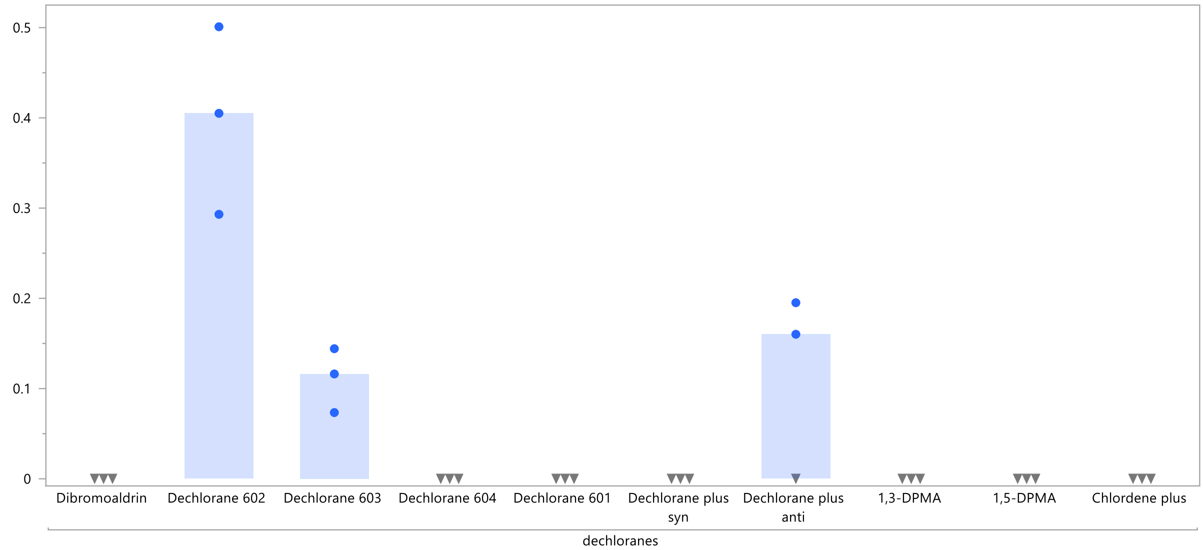
Dechloranes in Shrimp (ng/g wet wt.):



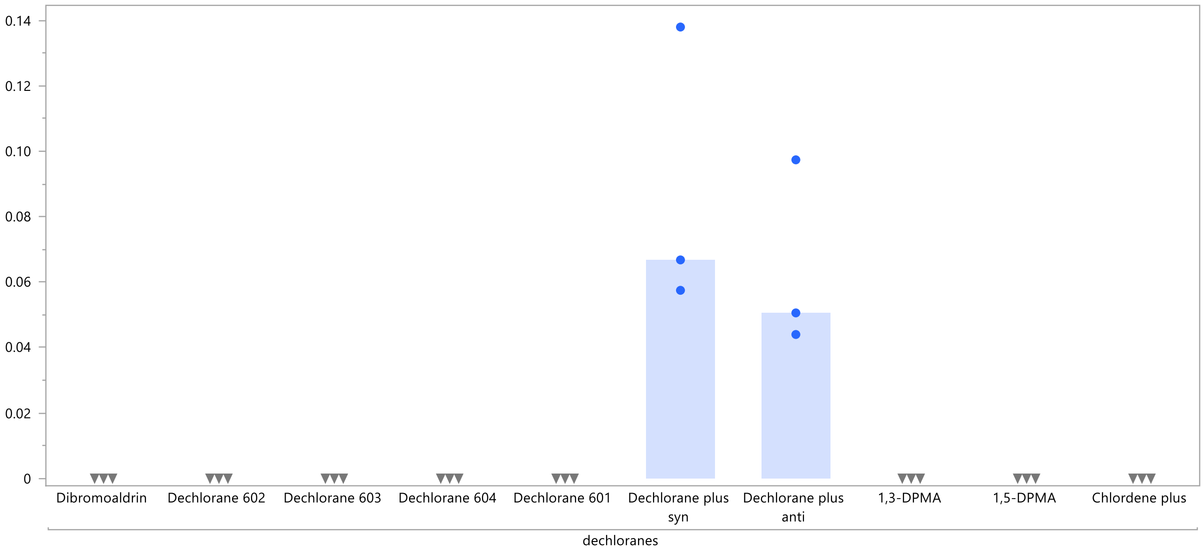
Dechloranes in Herring (muscle) (ng/g wet wt.):



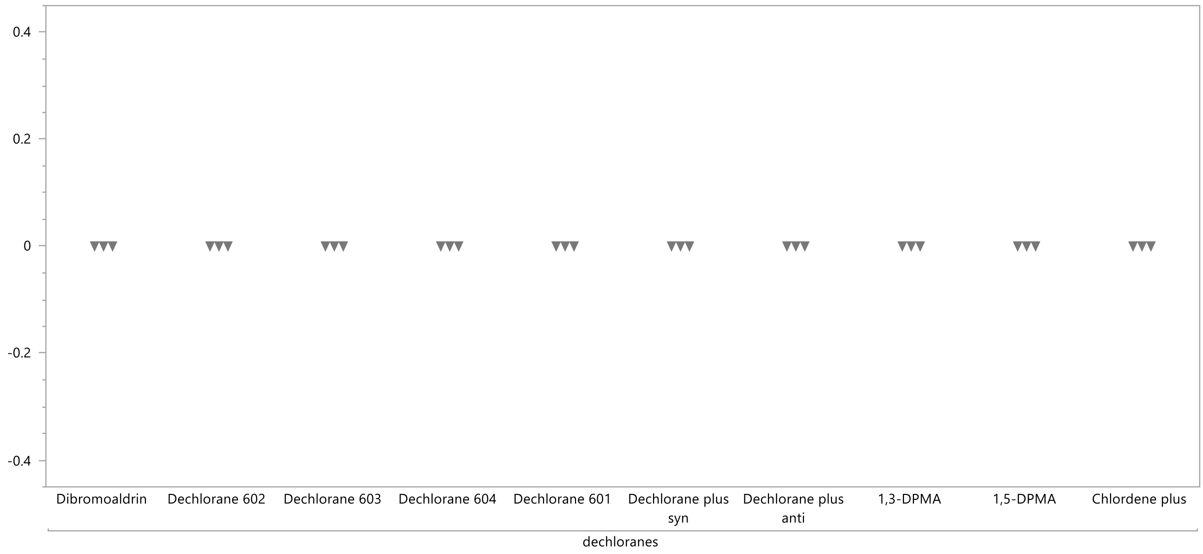
Dechloranes in Cod (liver) (ng/g wet wt.):



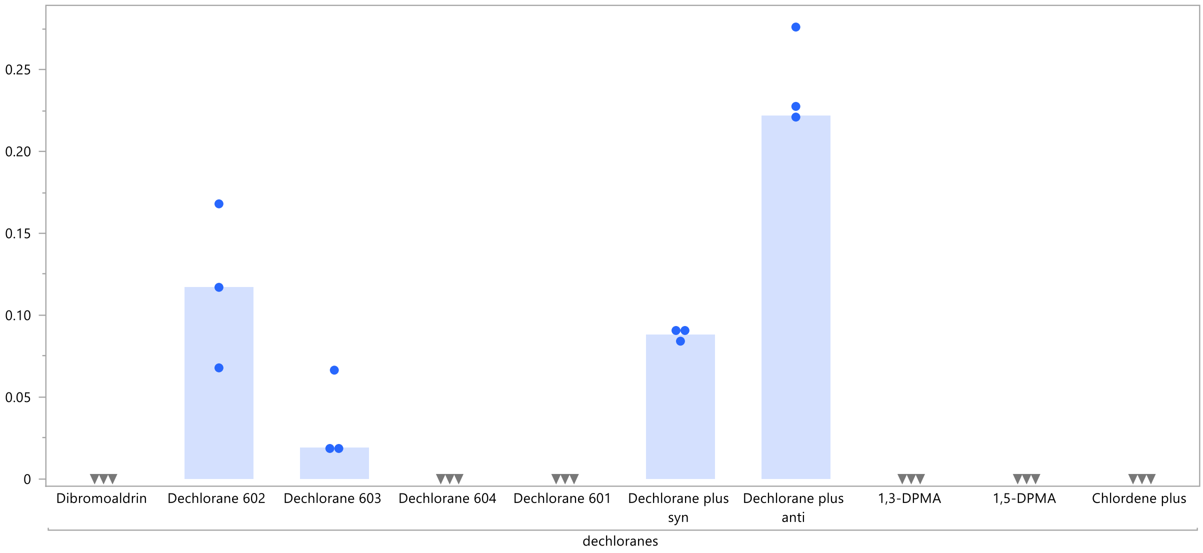
Dechloranes in Cod (Muscle) (ng/g wet wt.):



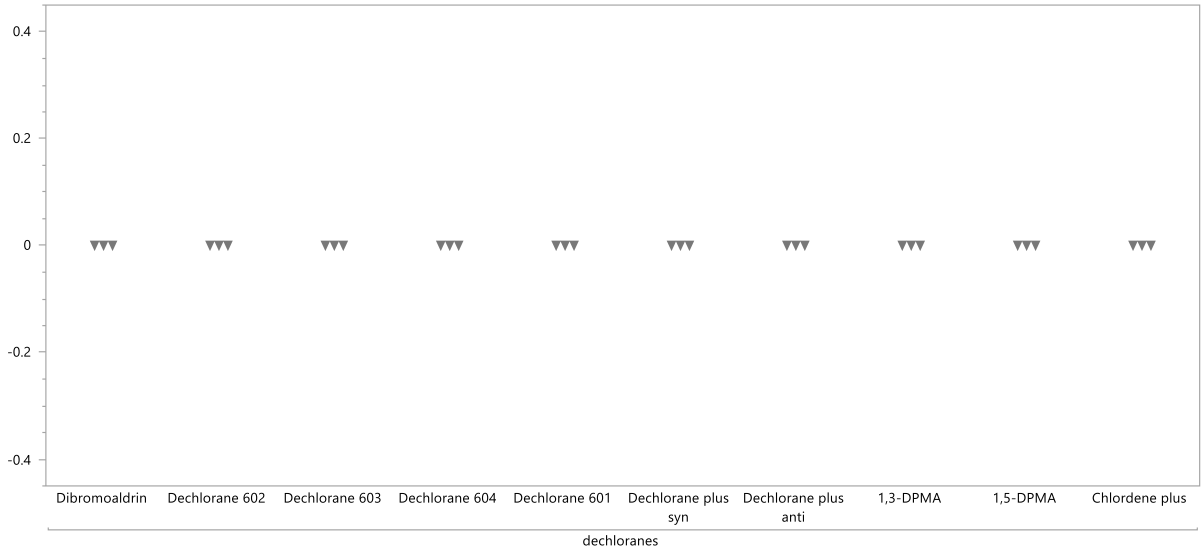
Dechloranes in Herring gull (blood) (ng/g wet wt.):



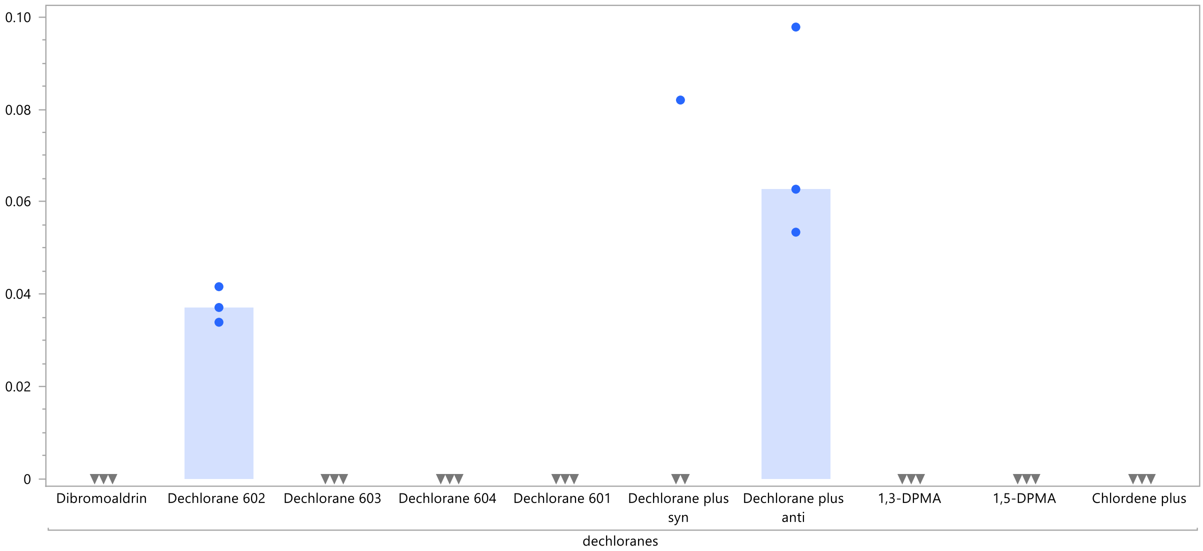
Dechloranes in Herring gull (egg) (ng/g wet wt.):



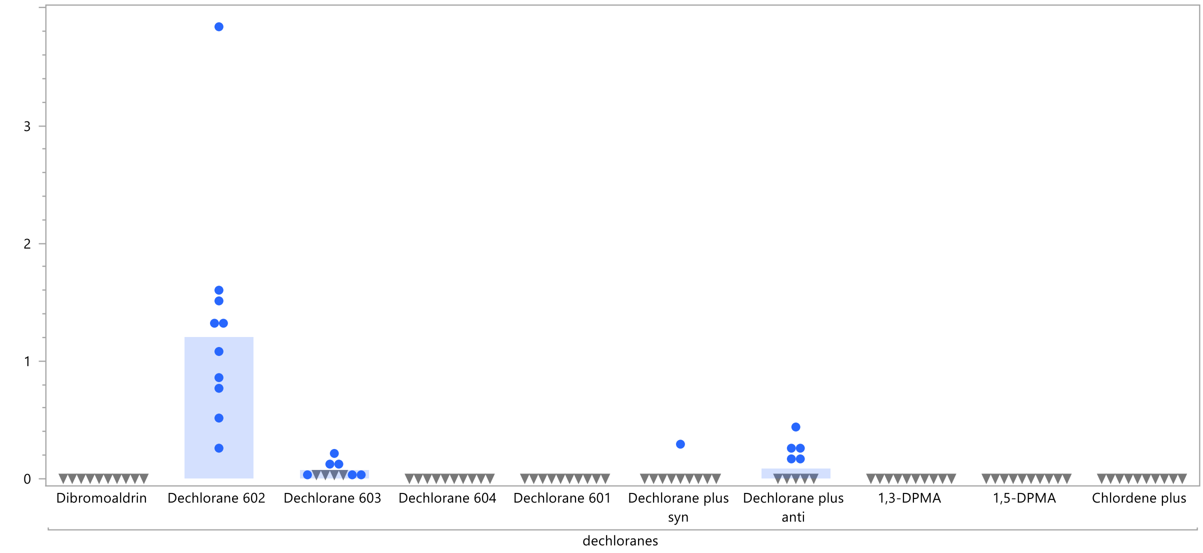
Dechloranes in Eider (Blood) (ng/g wet wt.):



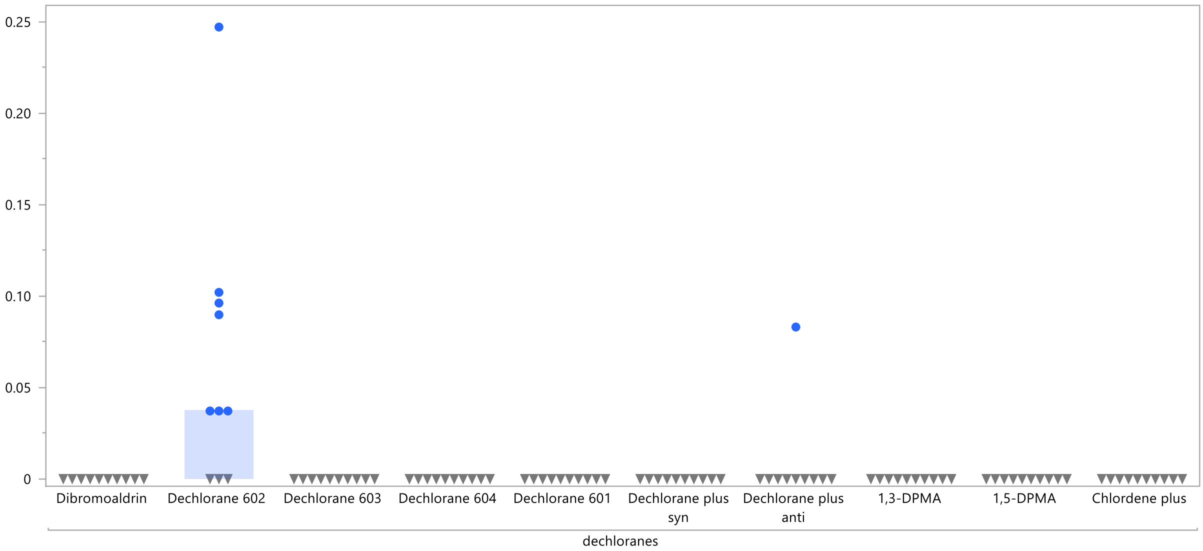
Dechloranes in Eider (Egg) (ng/g wet wt.):



Dechloranes in H. seal (blubber) (ng/g wet wt.):

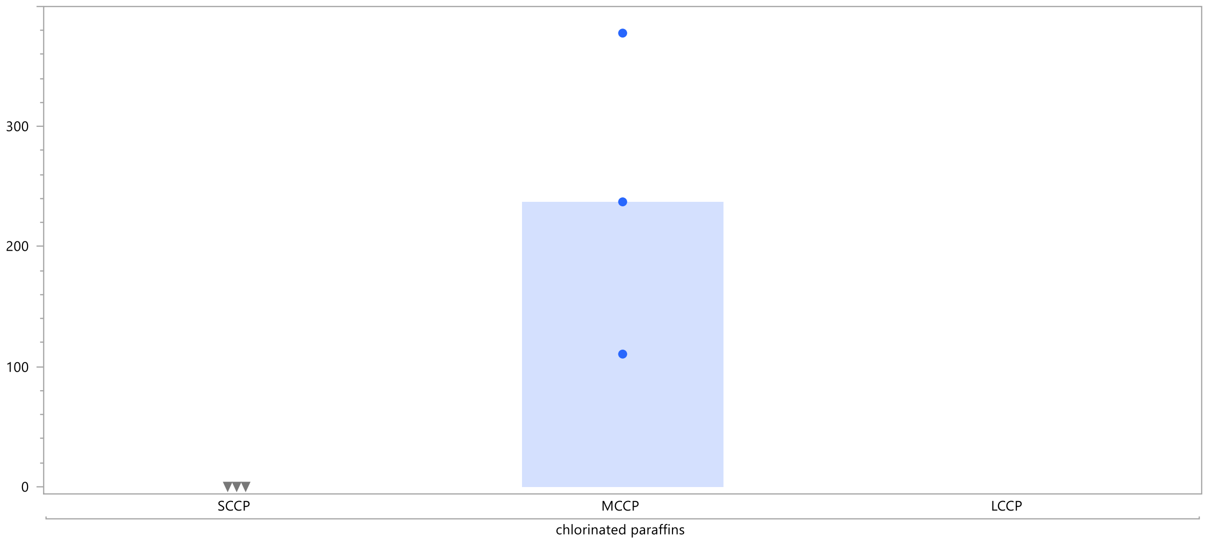


Dechloranes in H. seal (muscle) (ng/g wet wt.):

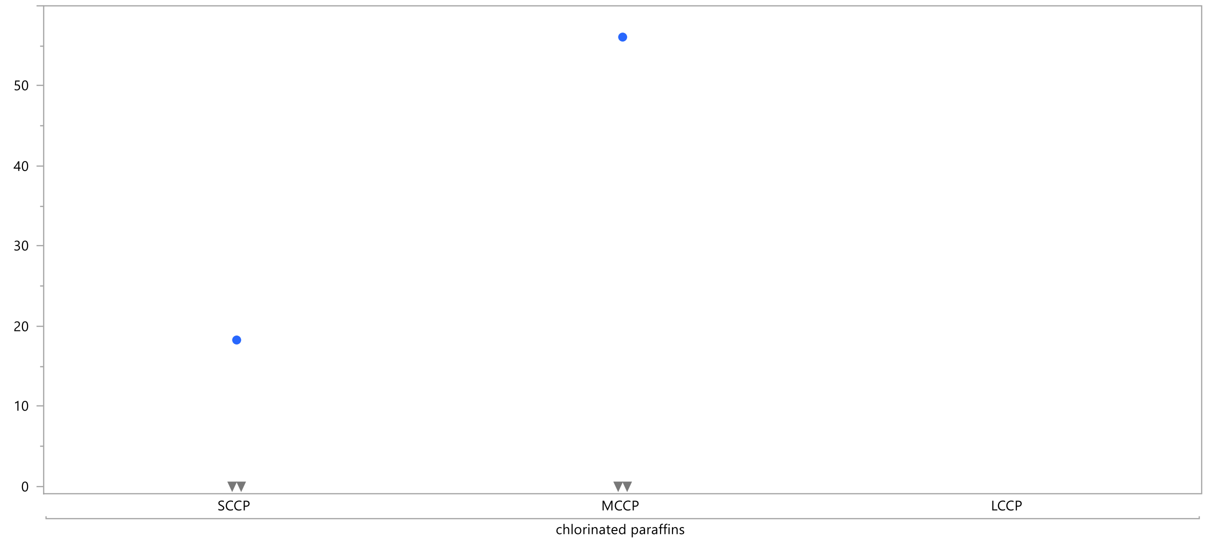


Chlorinated paraffins:

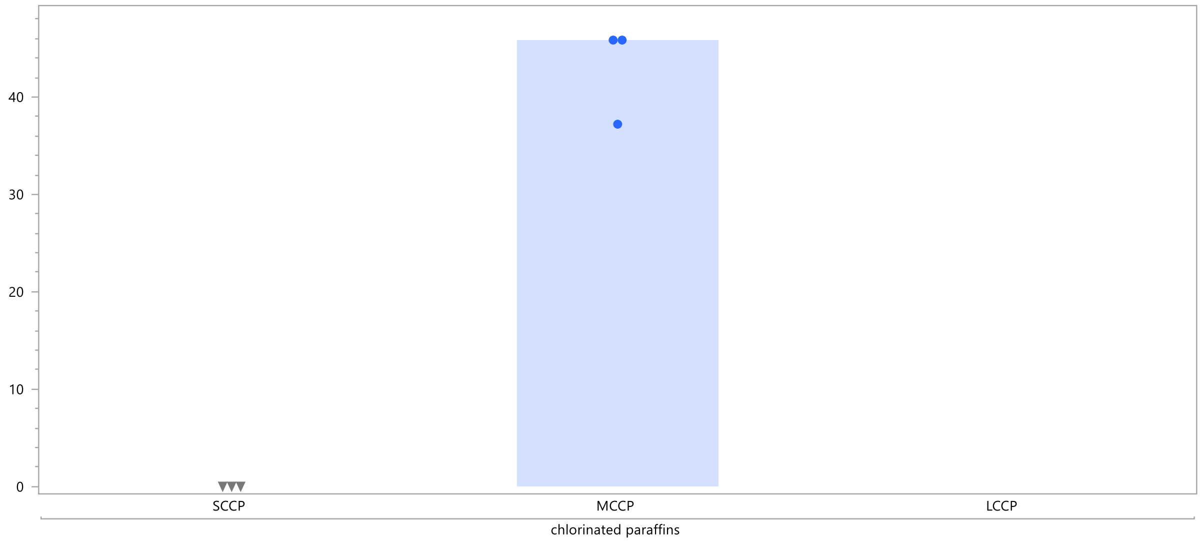
Chlorinated paraffins in Sediment (ng/g dry wt.):



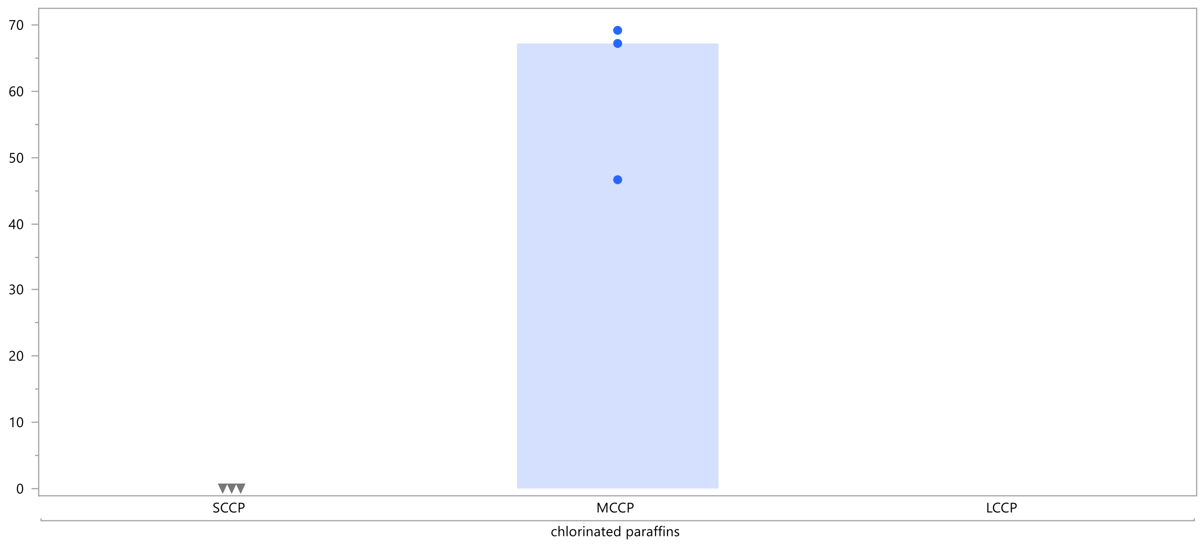
Chlorinated paraffins in Polychaeta (ng/g wet wt.):



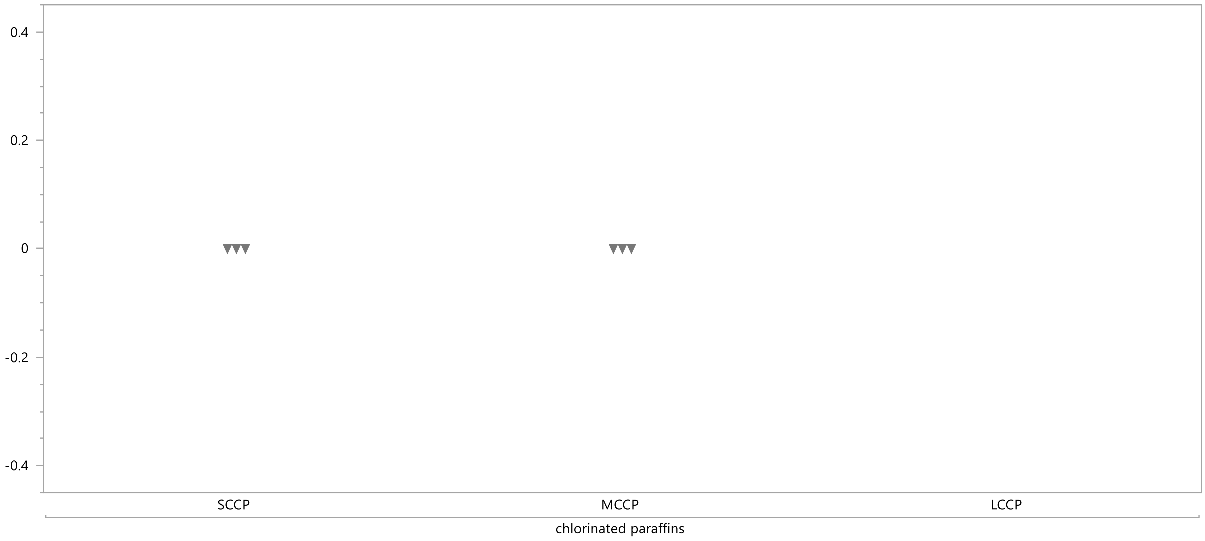
Chlorinated paraffins in Blue mussel (ng/g wet wt.):



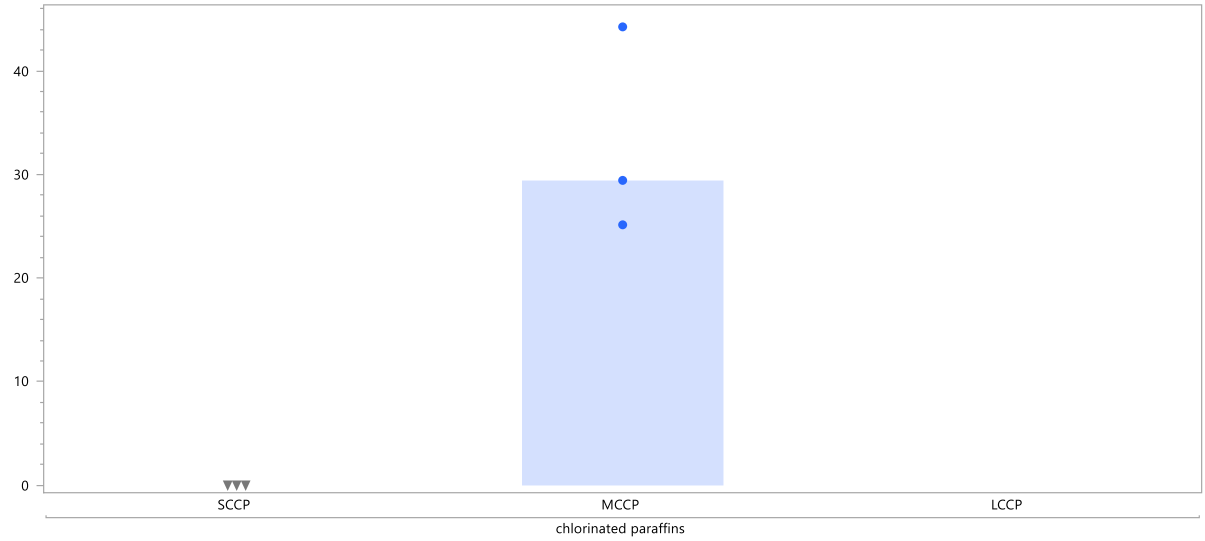
Chlorinated paraffins in Krill (ng/g wet wt.):



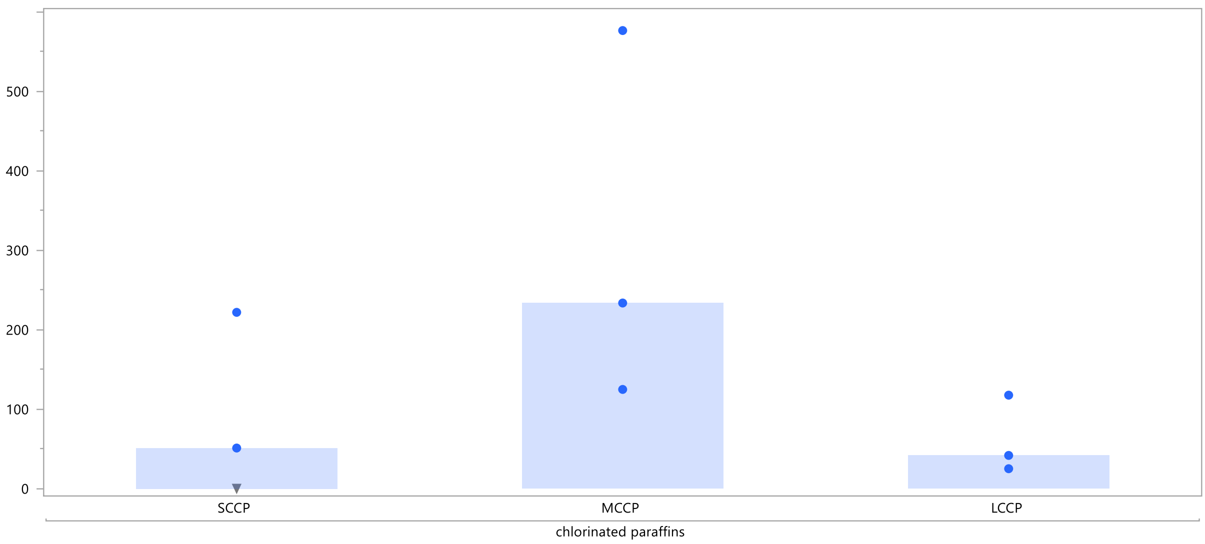
Chlorinated paraffins in Shrimp (ng/g wet wt.):



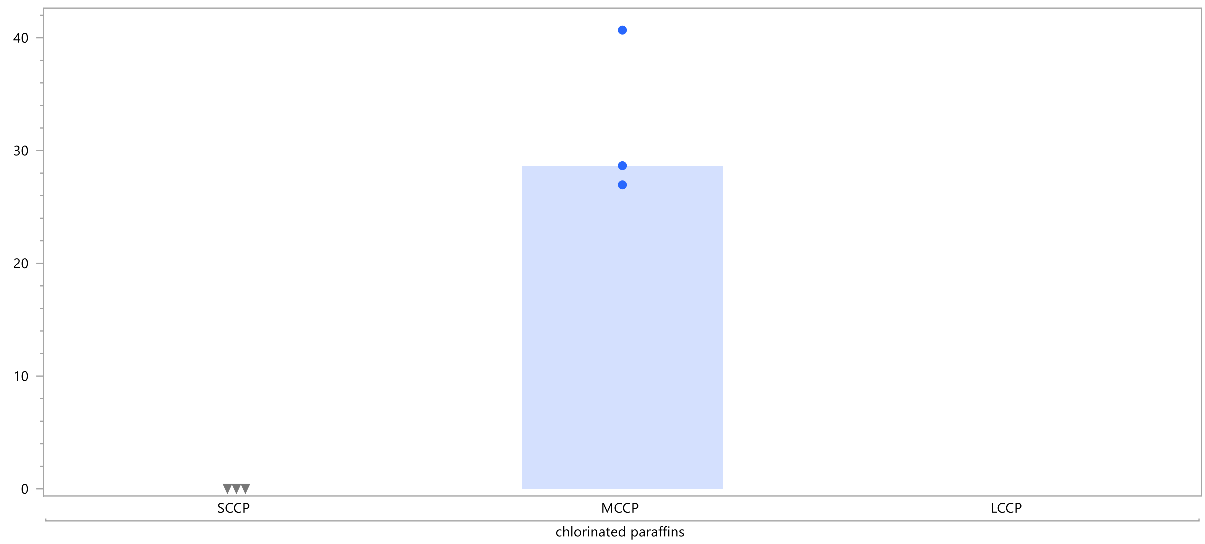
Chlorinated paraffins in Herring (muscle) (ng/g wet wt.):



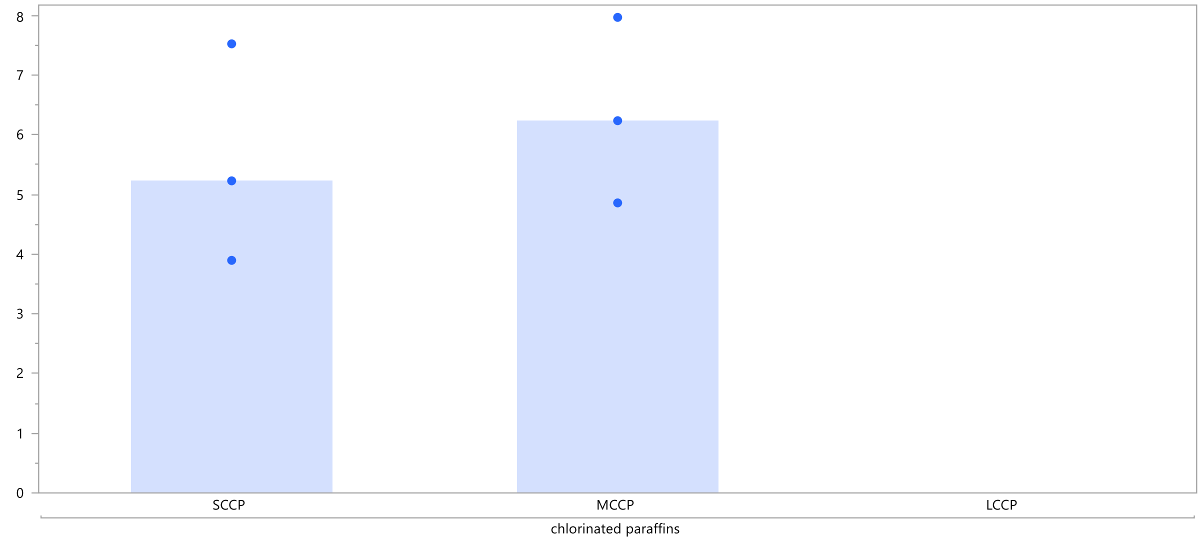
Chlorinated paraffins in Cod (liver) (ng/g wet wt.):



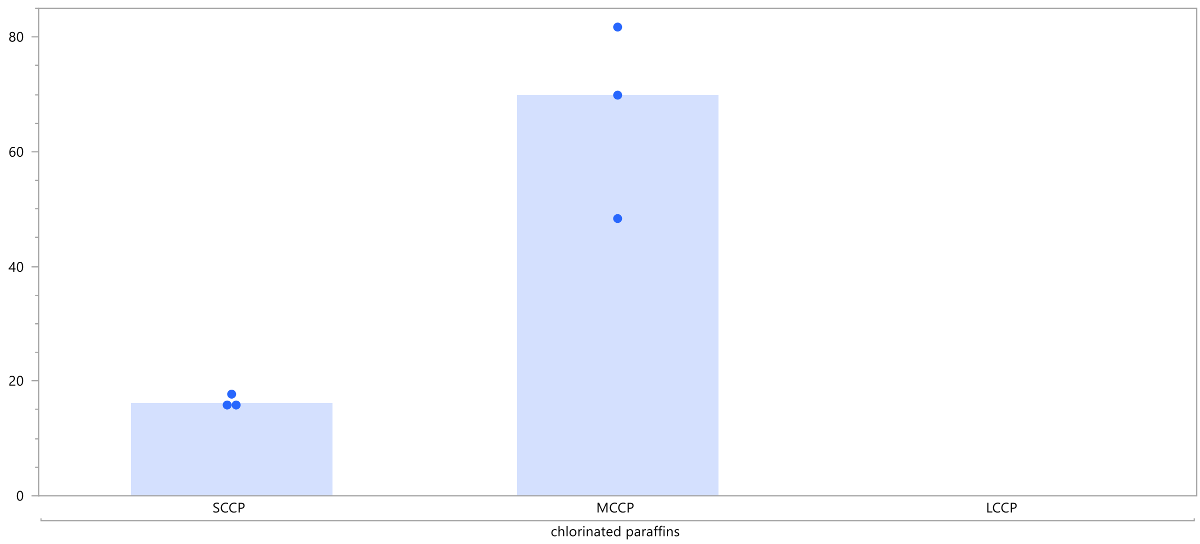
Chlorinated paraffins in Cod (Muscle) (ng/g wet wt.):



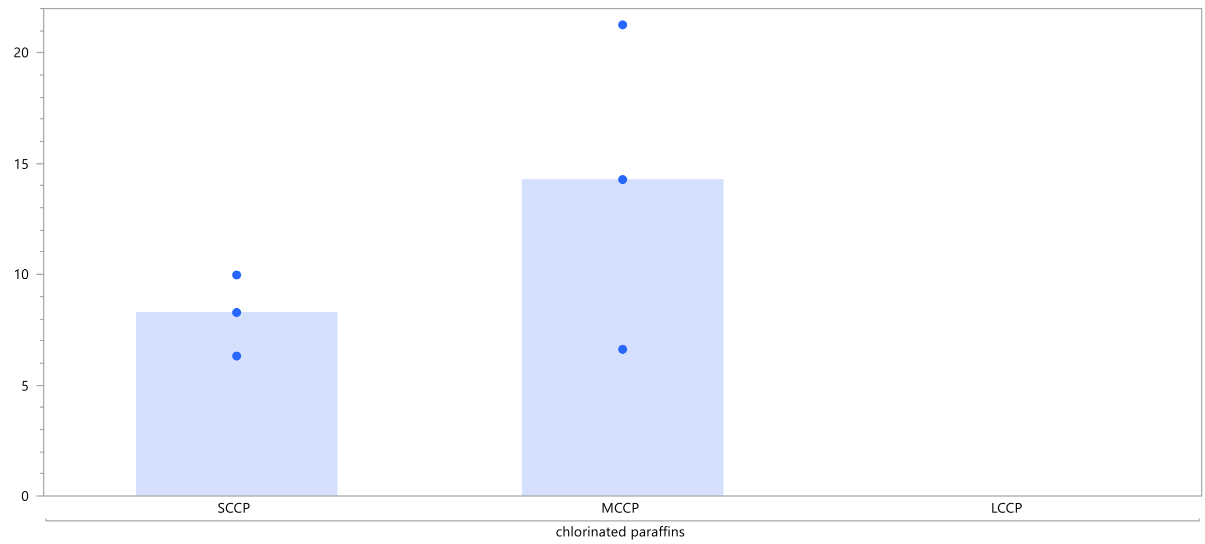
Chlorinated paraffins in Herring gull (blood) (ng/g wet wt.):



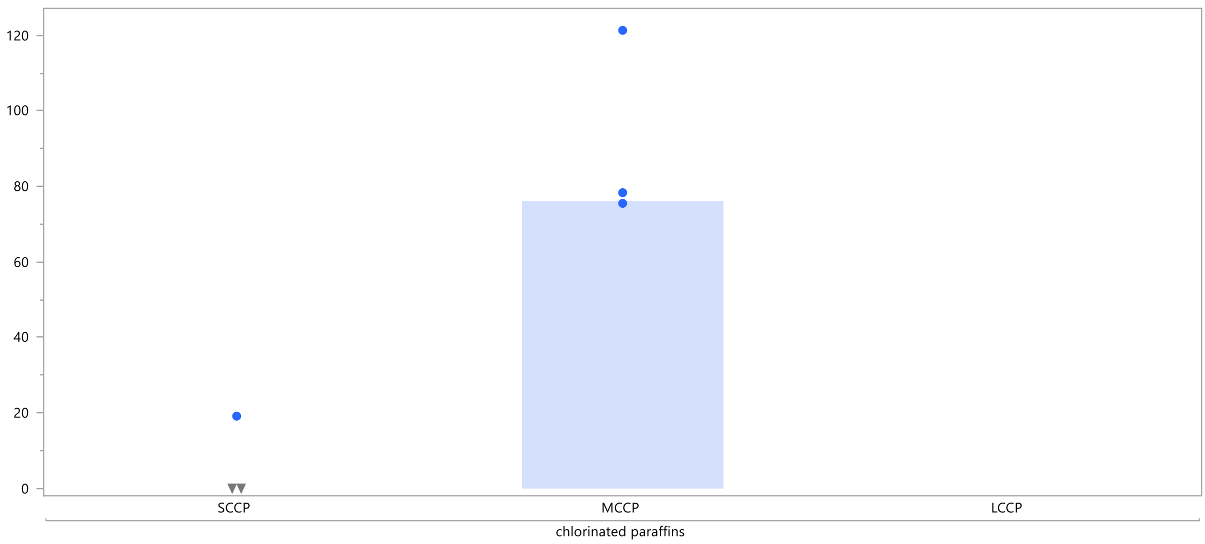
Chlorinated paraffins in Herring gull (egg) (ng/g wet wt.):



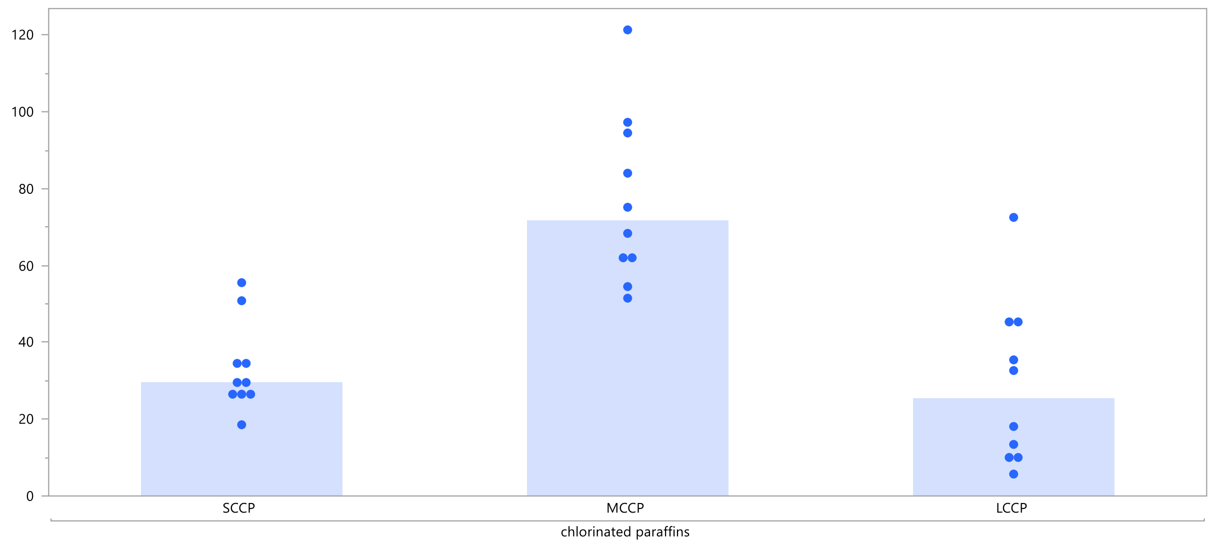
Chlorinated paraffins in Eider (Blood) (ng/g wet wt.):



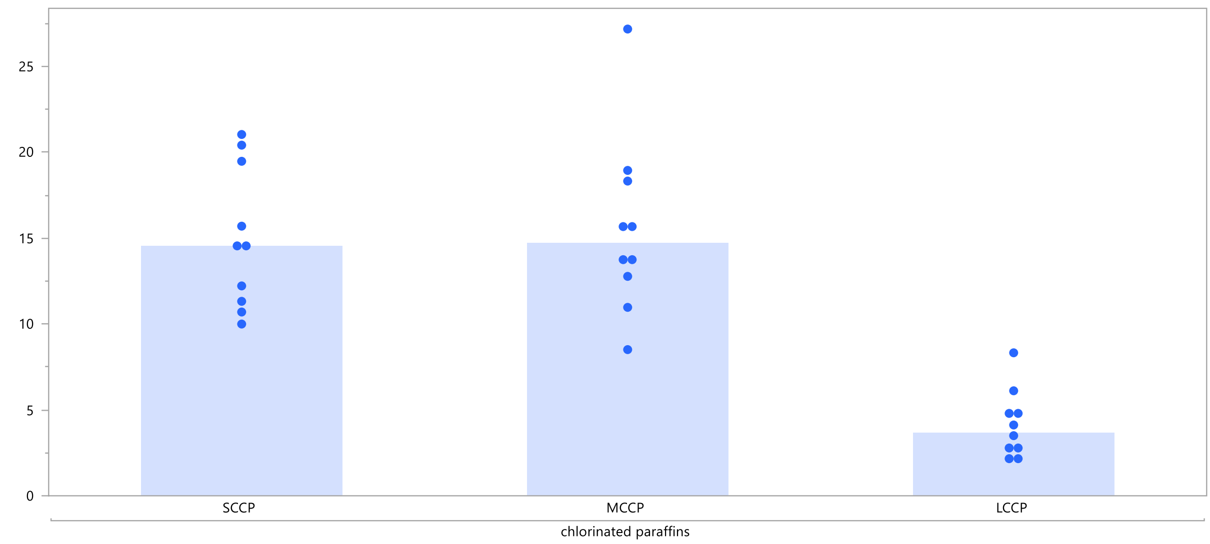
Chlorinated paraffins in Eider (Egg) (ng/g wet wt.):



Chlorinated paraffins in H. seal (blubber) (ng/g wet wt.):

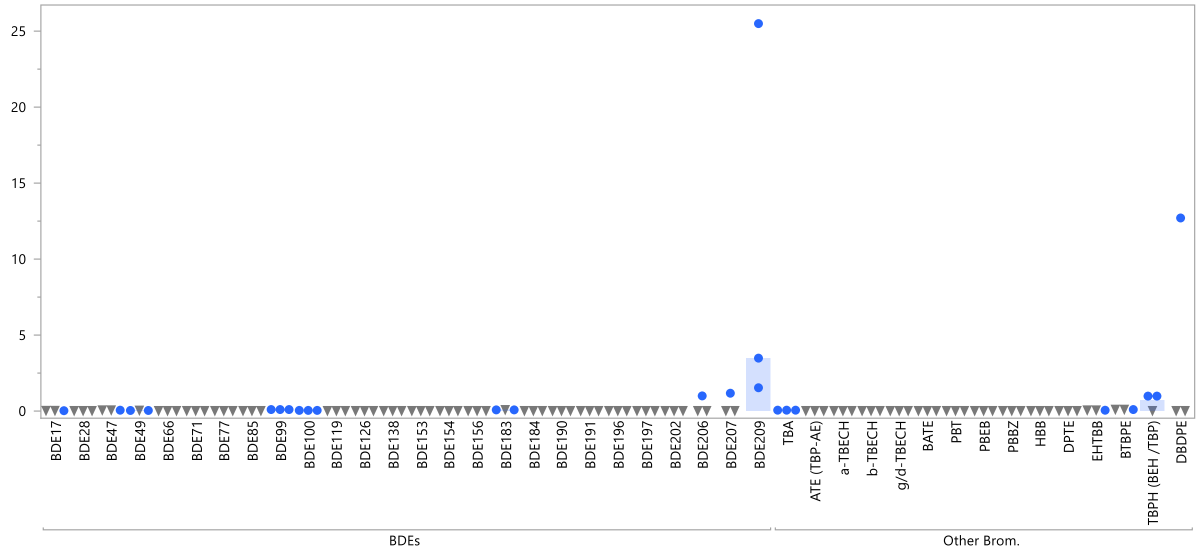


Chlorinated paraffins in H. seal (muscle) (ng/g wet wt.):

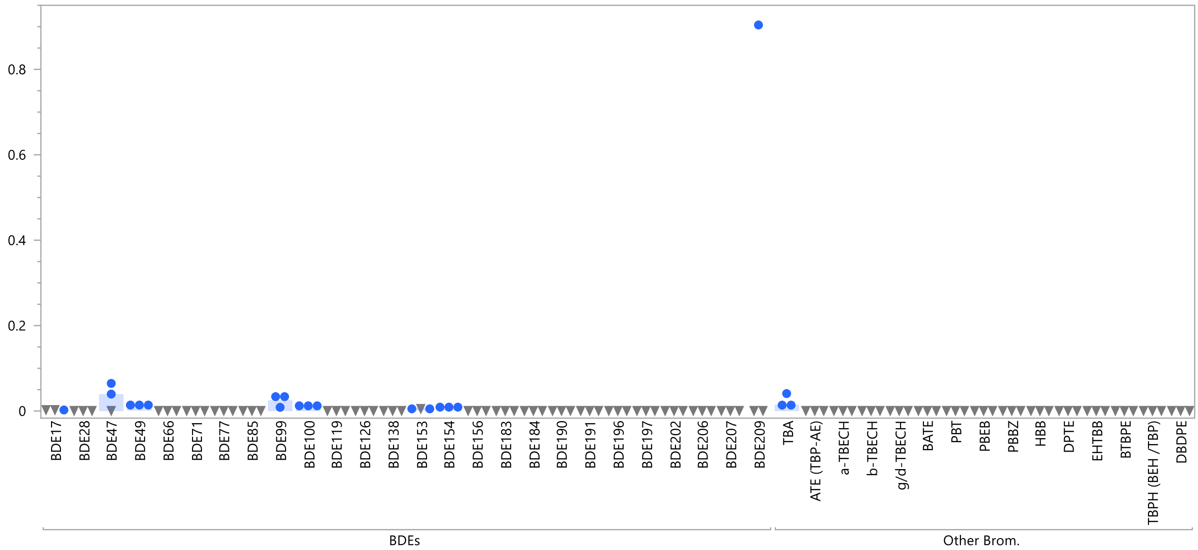


PBDEs and other brominated compounds:

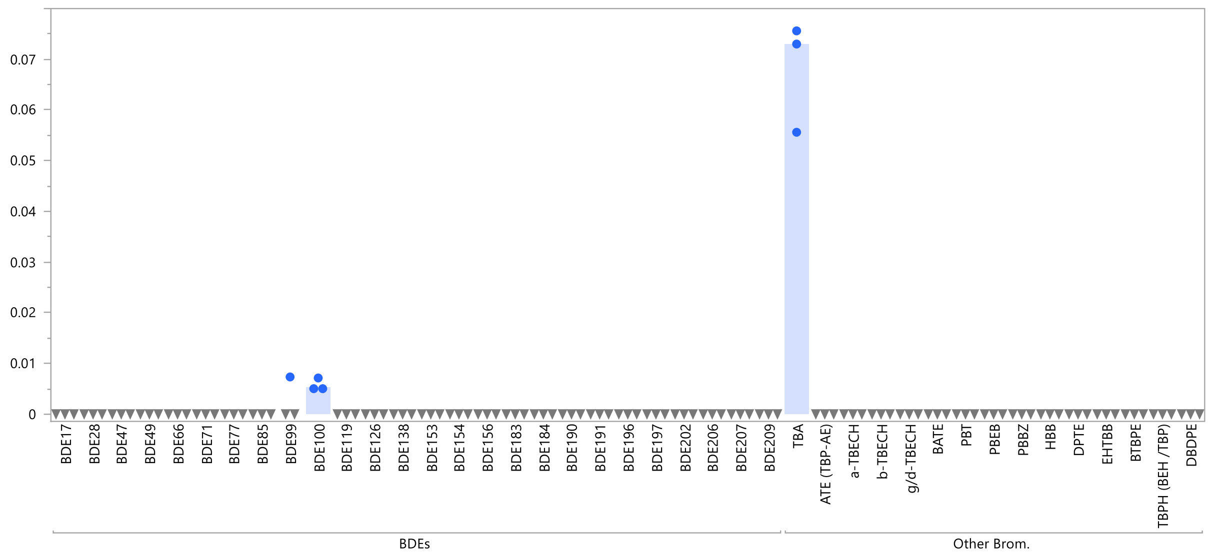
PBDEs + brominated in Sediment (ng/g dry wt.):



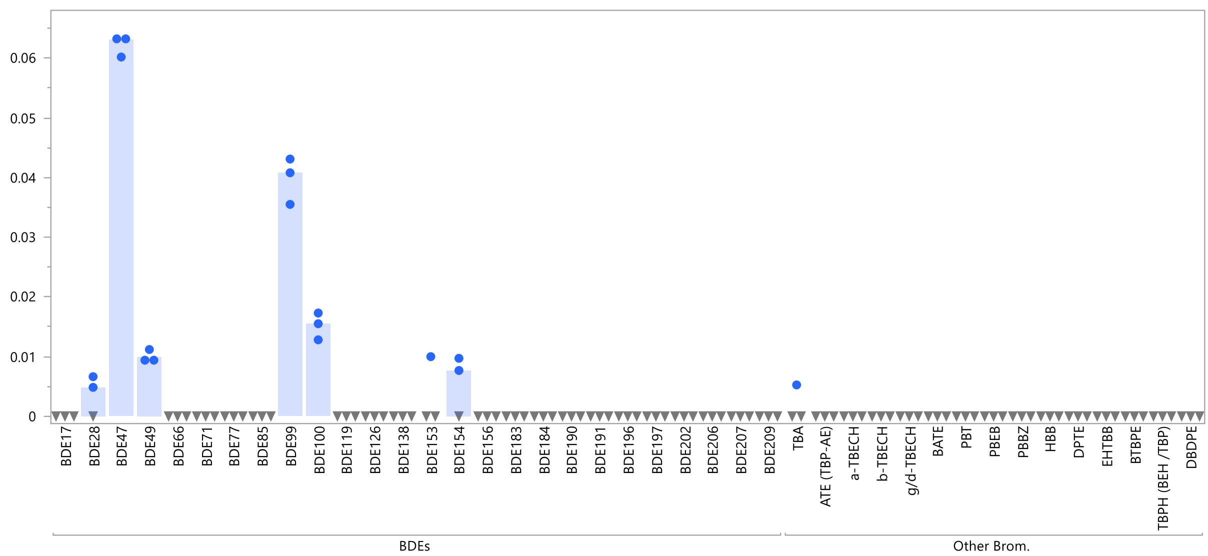
PBDEs + brominated in Polychaeta (ng/g wet wt.):



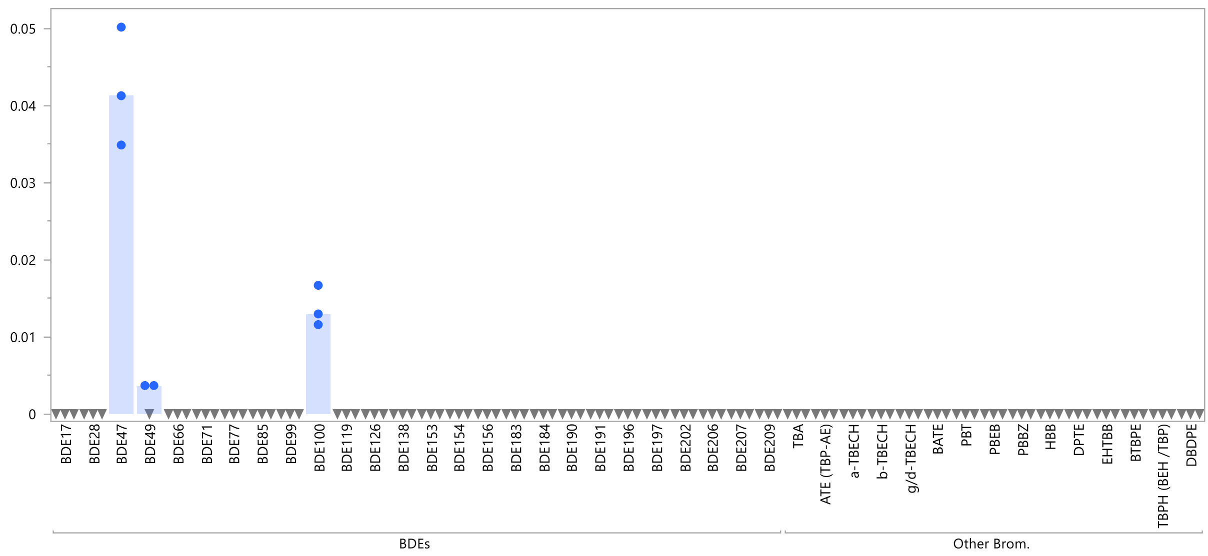
PBDEs + brominated in Blue mussel (ng/g wet wt.):



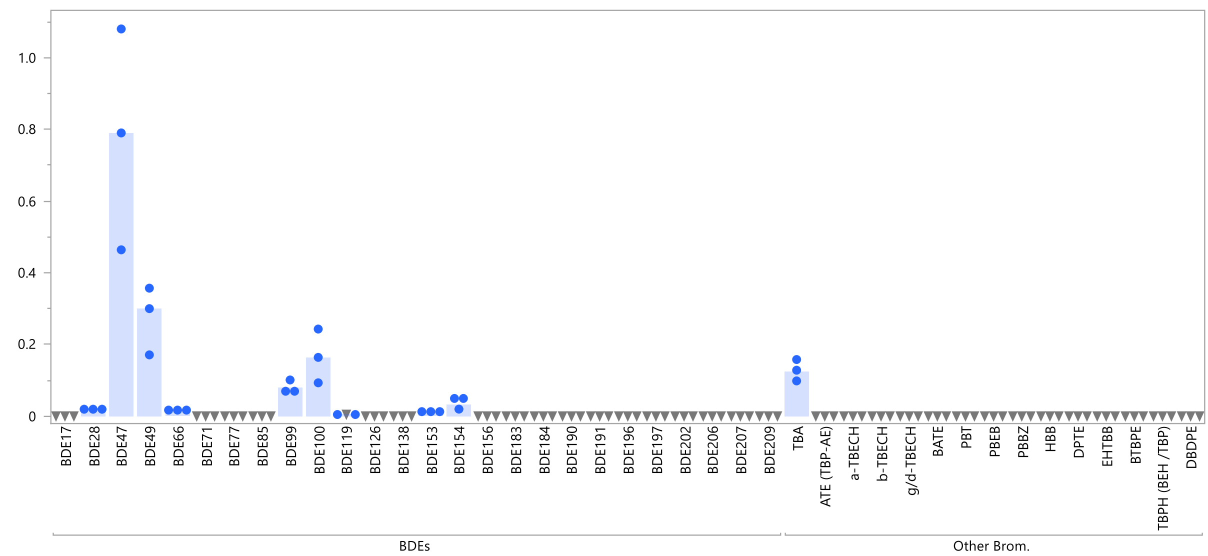
PBDEs + brominated in Krill (ng/g wet wt.):



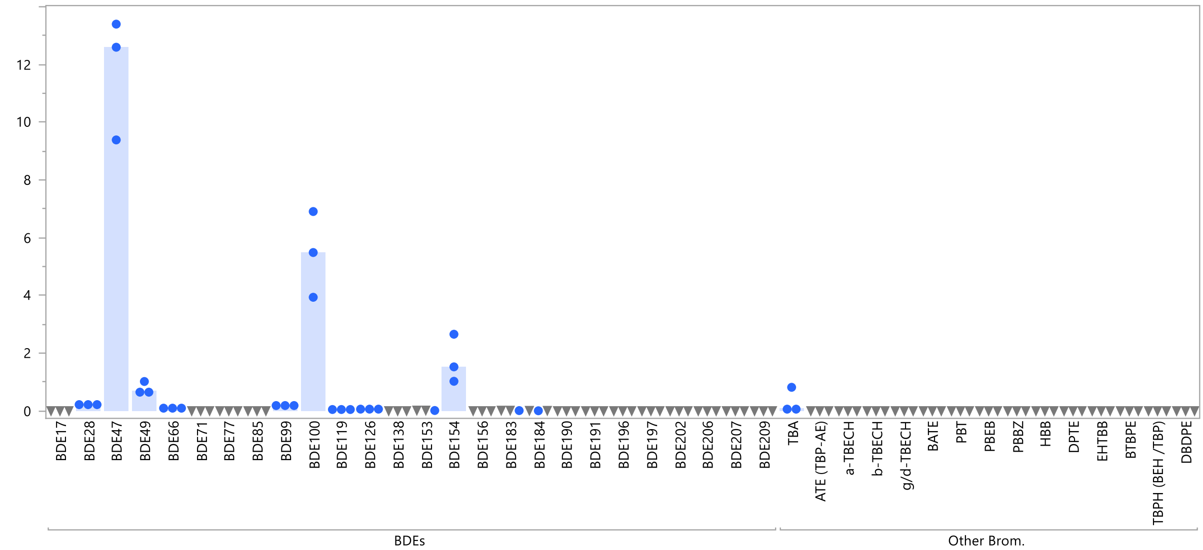
PBDEs + brominated in Shrimp (ng/g wet wt.):



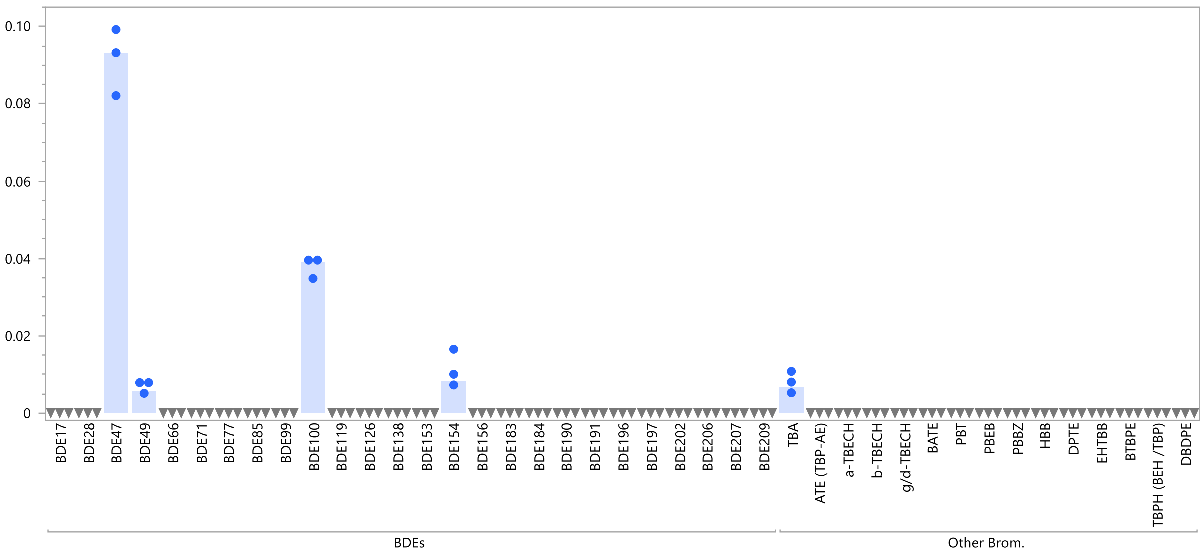
PBDEs + brominated in Herring (muscle) (ng/g wet wt.):



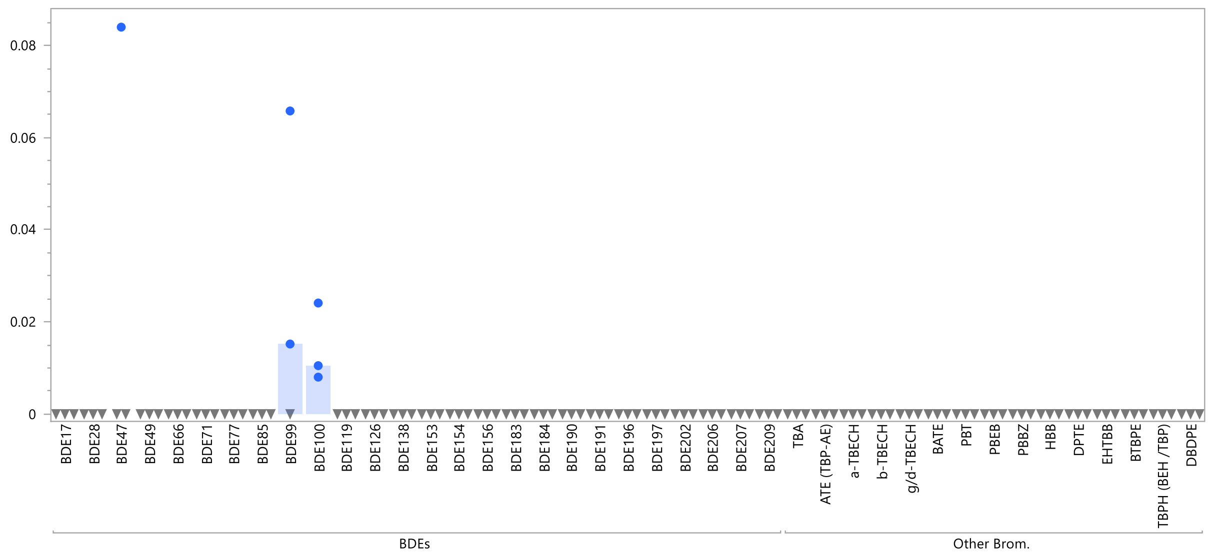
PBDEs + brominated in Cod (liver) (ng/g wet wt.):



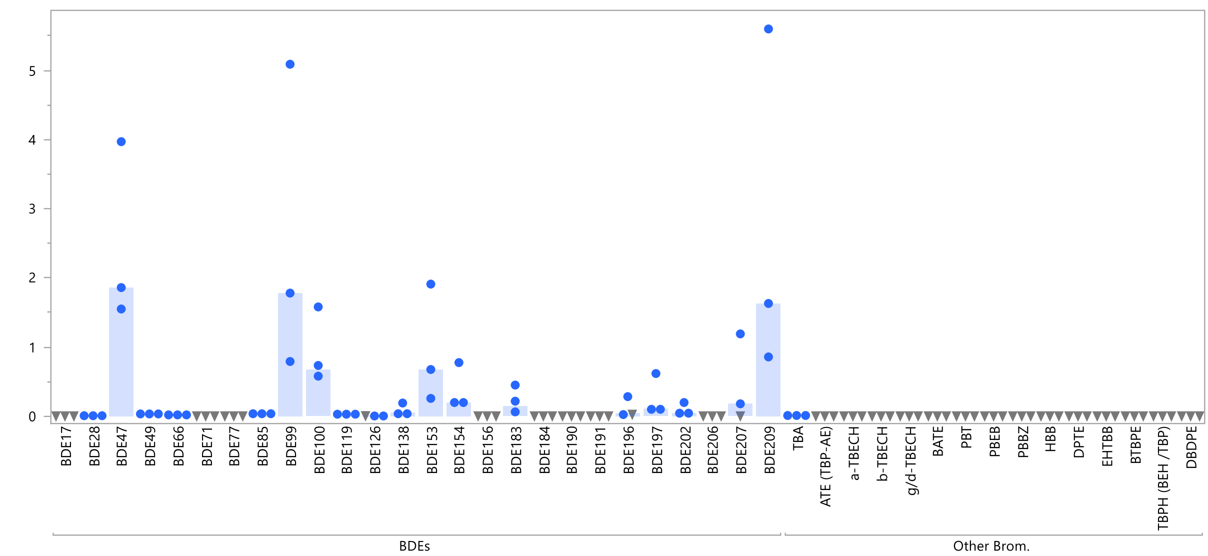
PBDEs + brominated in Cod (Muscle) (ng/g wet wt.):



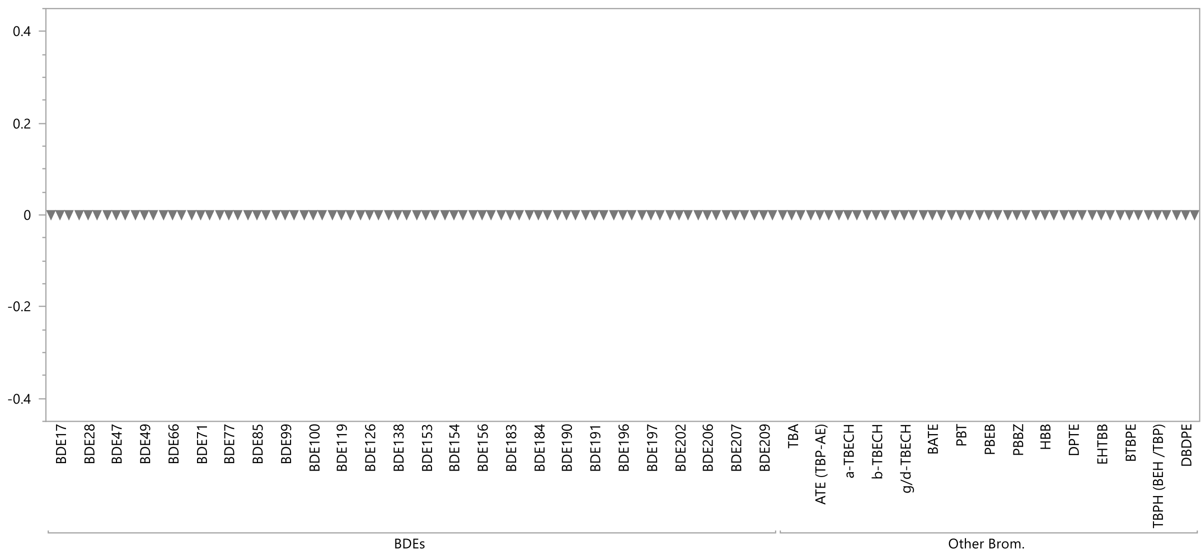
PBDEs + brominated in Herring gull (blood) (ng/g wet wt.):



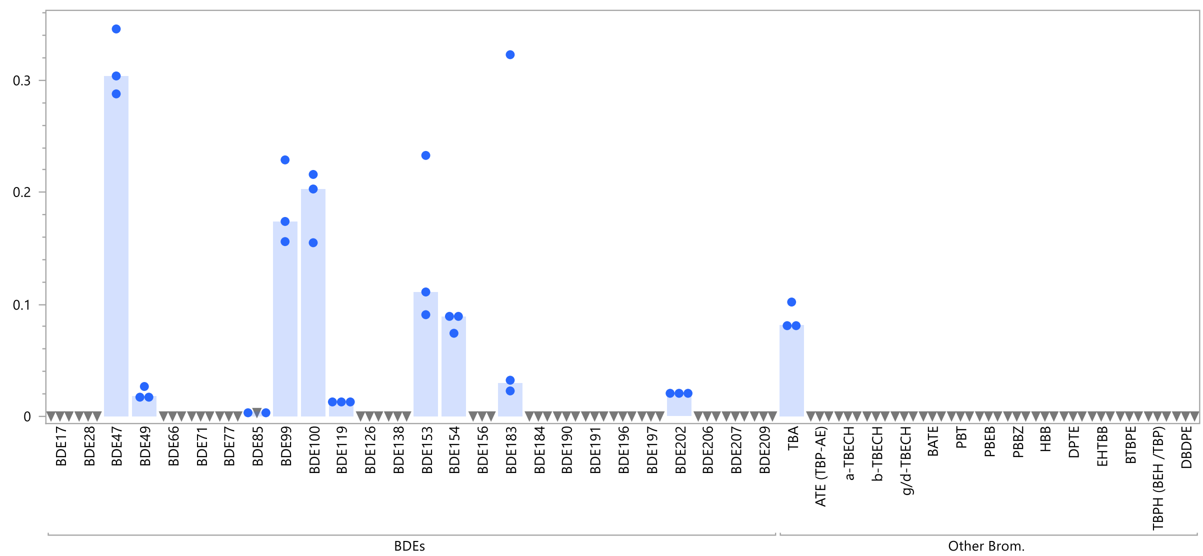
PBDEs + brominated in Herring gull (egg) (ng/g wet wt.):



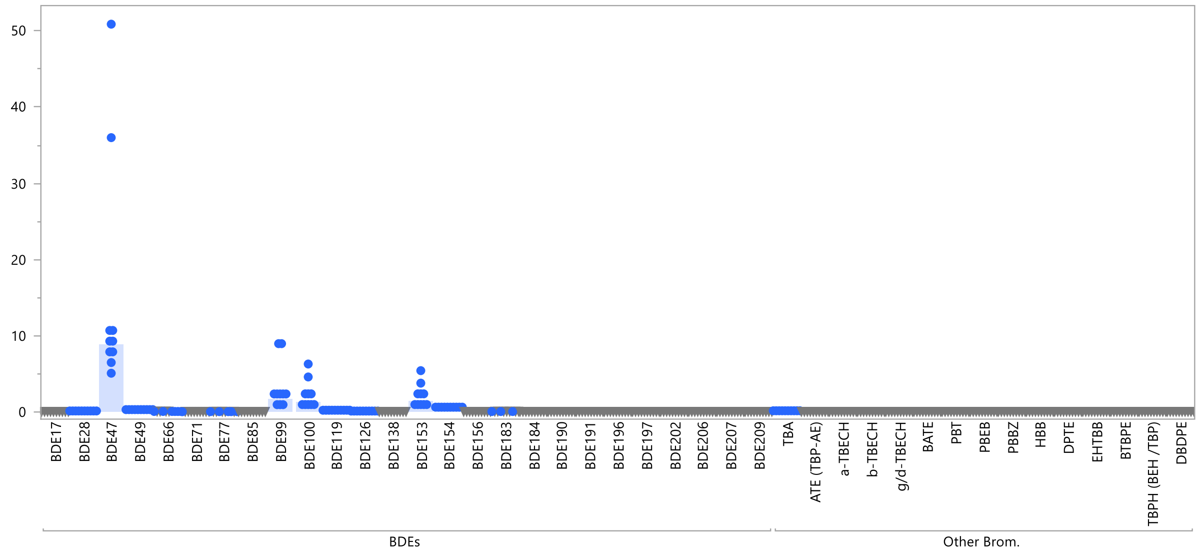
PBDEs + brominated in Eider (Blood) (ng/g wet wt.):



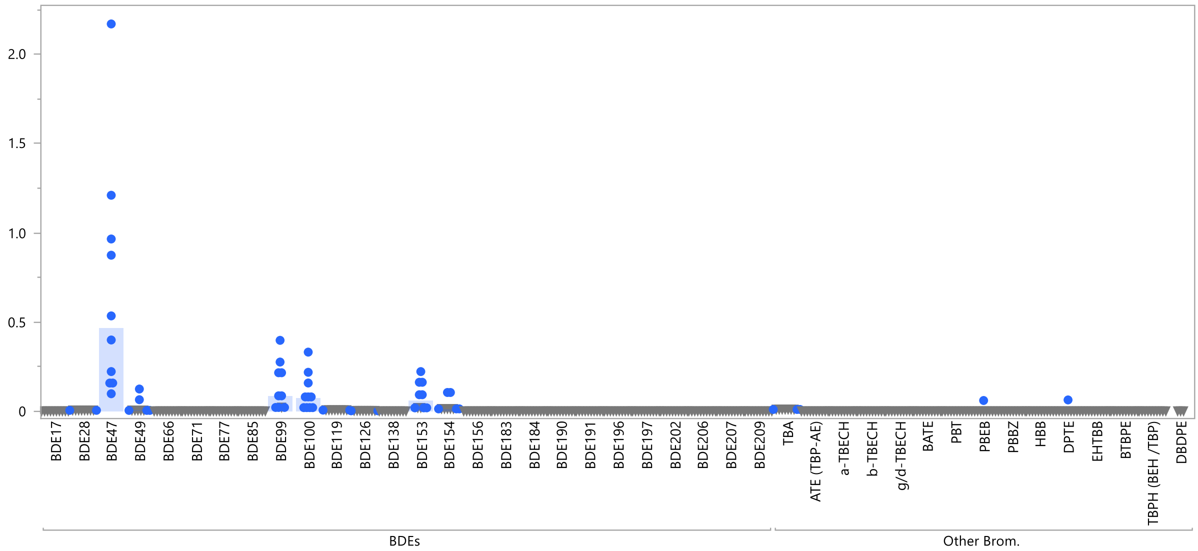
PBDEs + brominated in Eider (Egg) (ng/g wet wt.):



PBDEs + brominated in H. seal (blubber) (ng/g wet wt.):

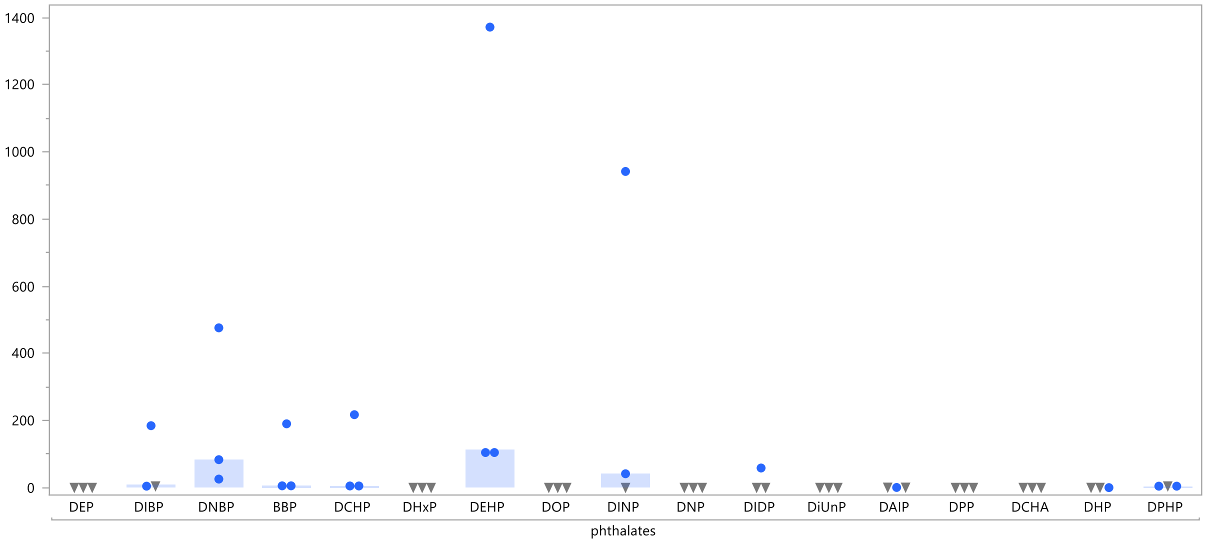


PBDEs + brominated in H. seal (muscle) (ng/g wet wt.):



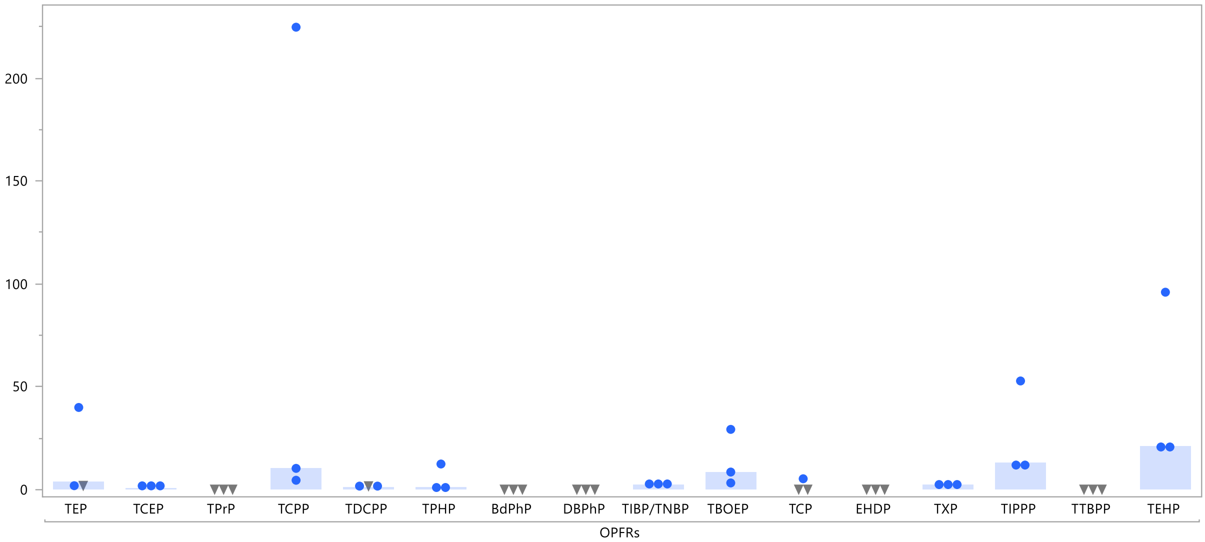
Phthalates:

Phthalates in Sediment (ng/g dry wt.):



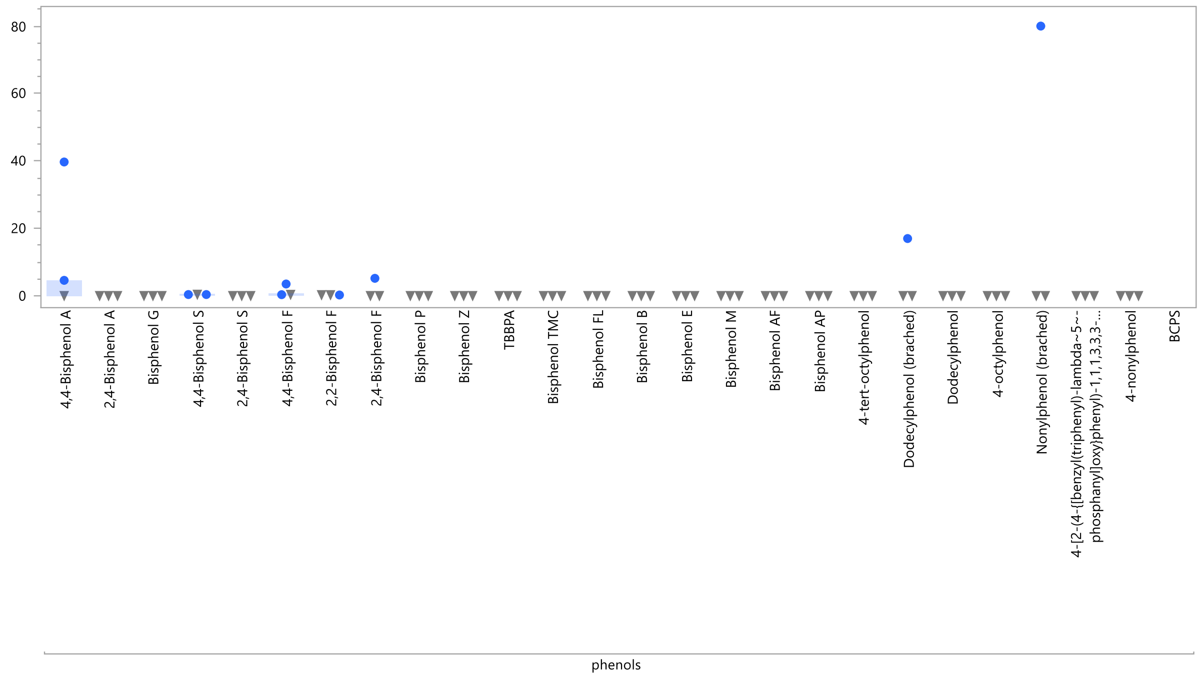
OPFRs:

OPFRs in Sediment (ng/g dry wt.):

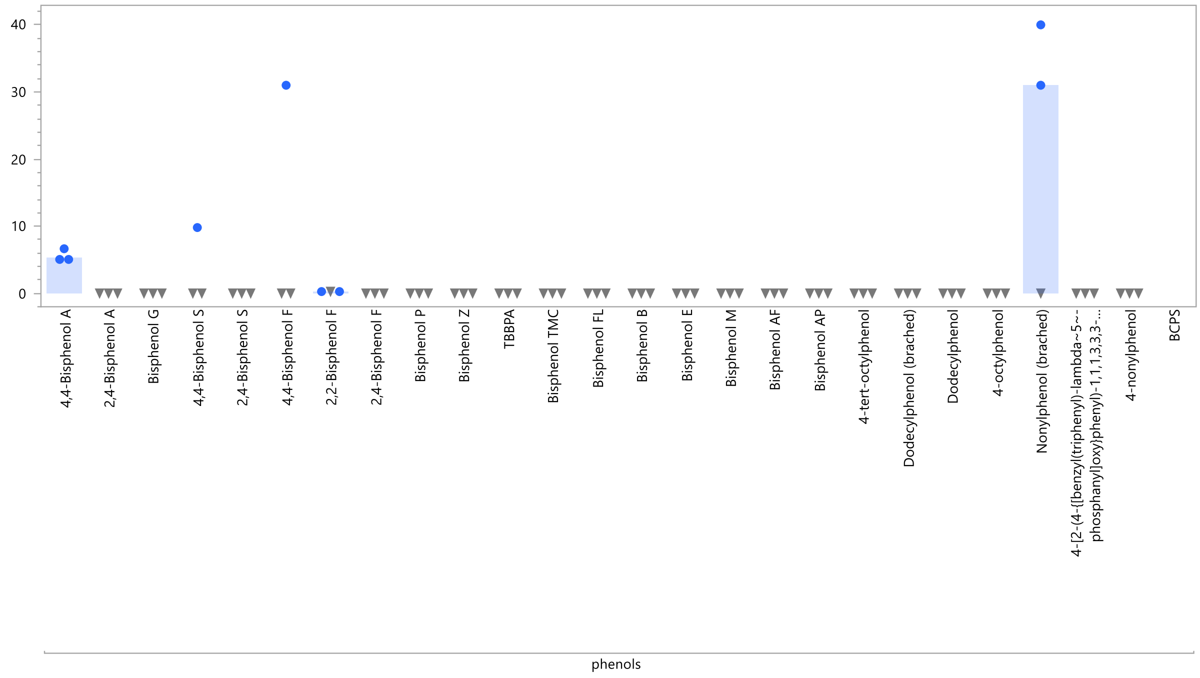


Phenolic compounds:

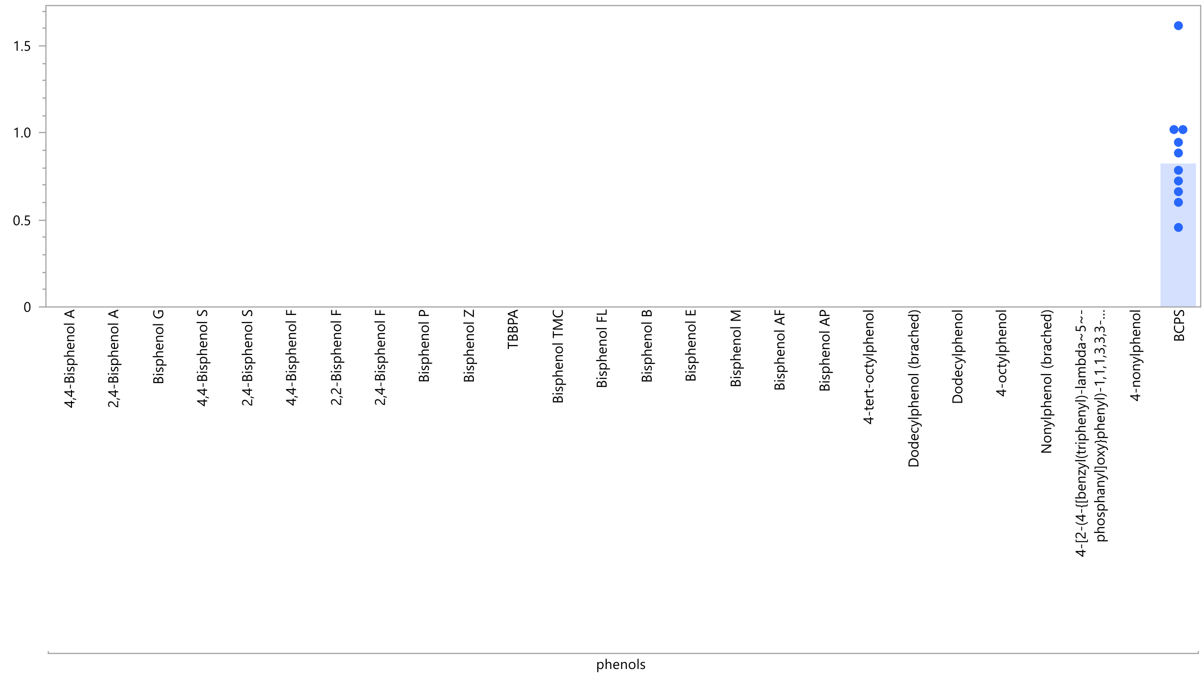
Phenolic compounds in Sediment (ng/g dry wt.):



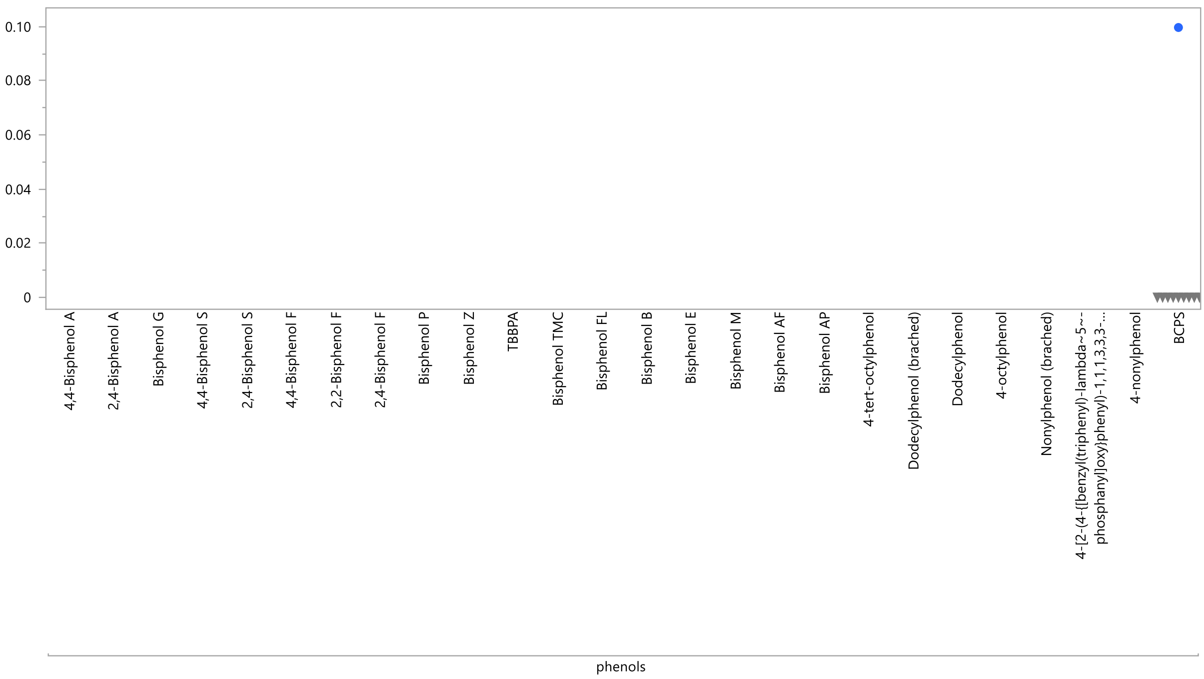
Phenolic compounds in Cod (Bile) (ng/g wet wt.):



Phenolic compounds in H. seal (blubber) (ng/g wet wt.):

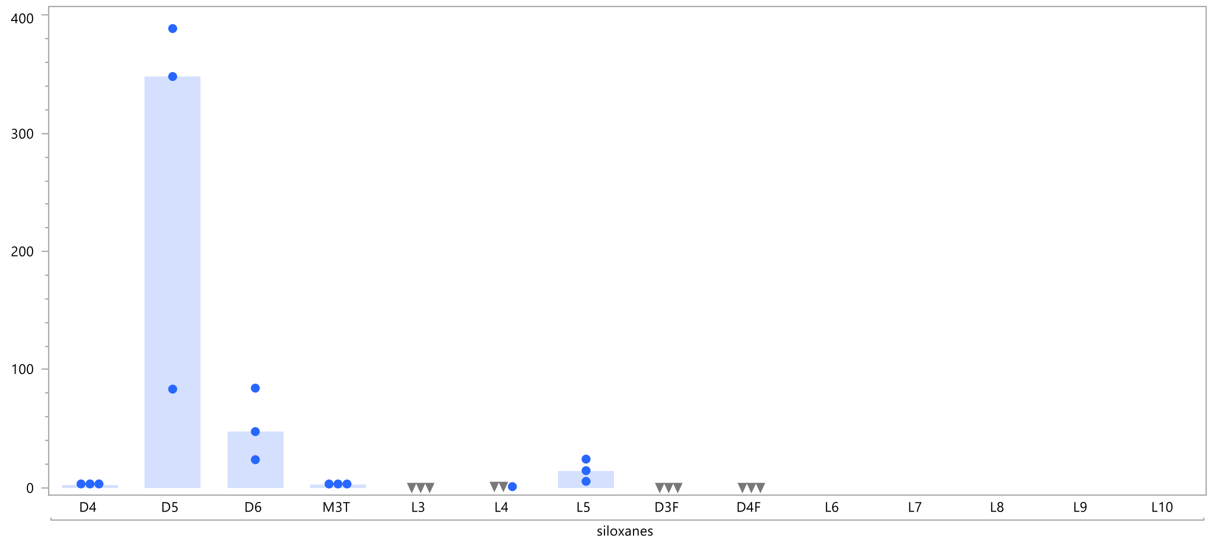


Phenolic compounds in H. seal (muscle) (ng/g wet wt.):

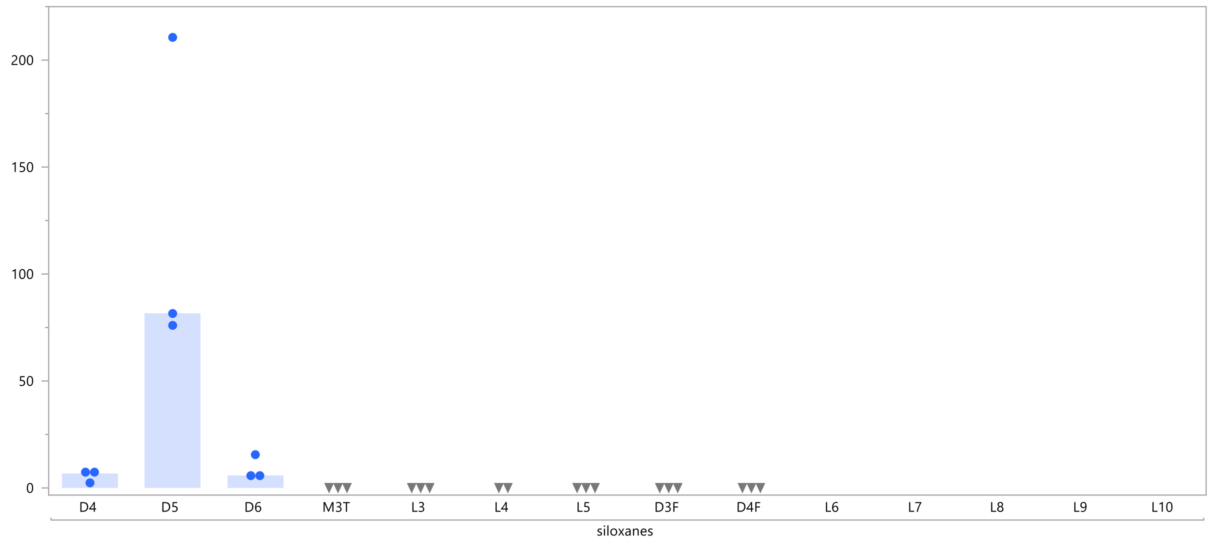


Siloxanes:

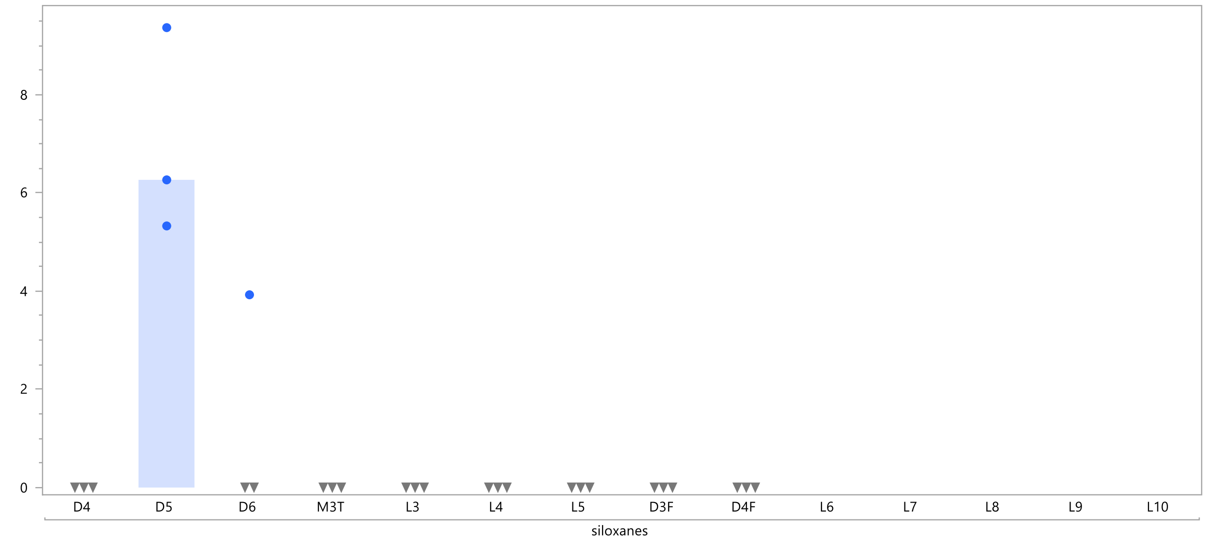
Siloxanes in Sediment (ng/g dry wt.):



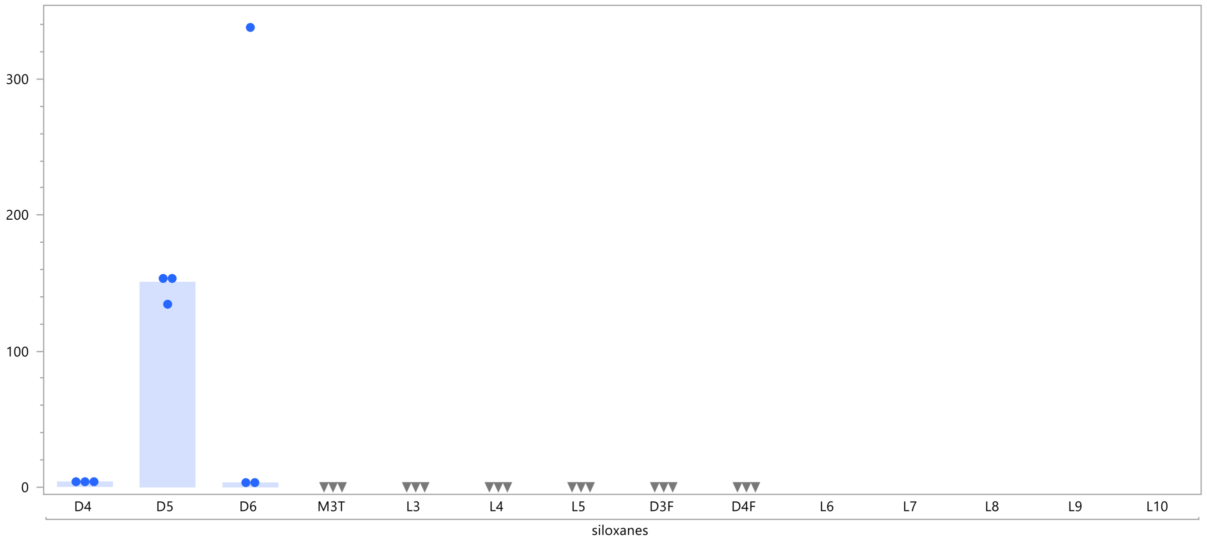
Siloxanes in Polychaeta (ng/g wet wt.):



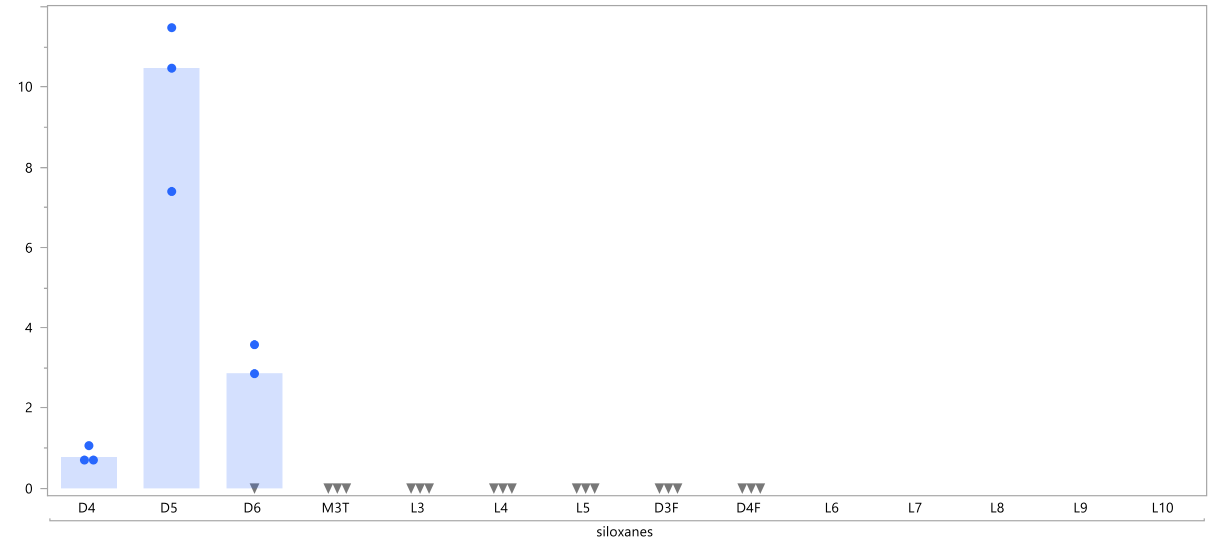
Siloxanes in Blue mussel (ng/g wet wt.):



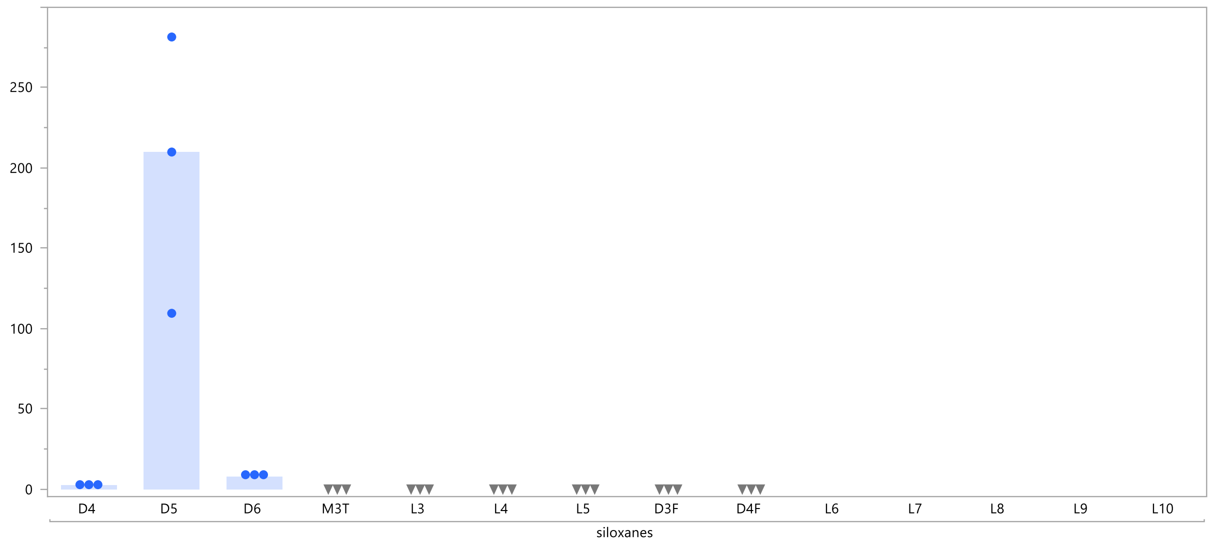
Siloxanes in Krill (ng/g wet wt.):



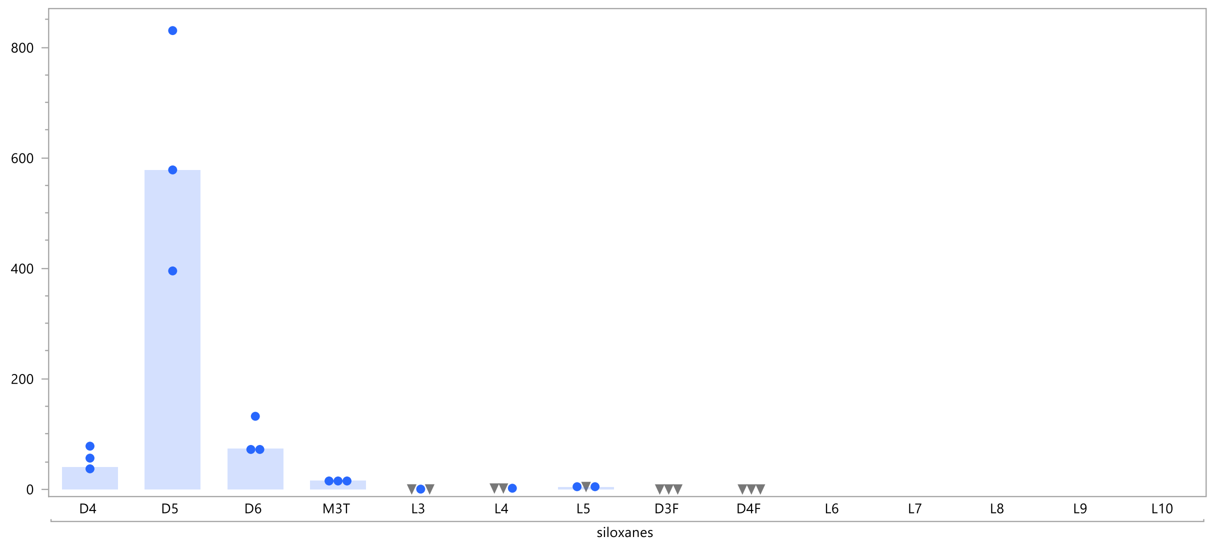
Siloxanes in Shrimp (ng/g wet wt.):



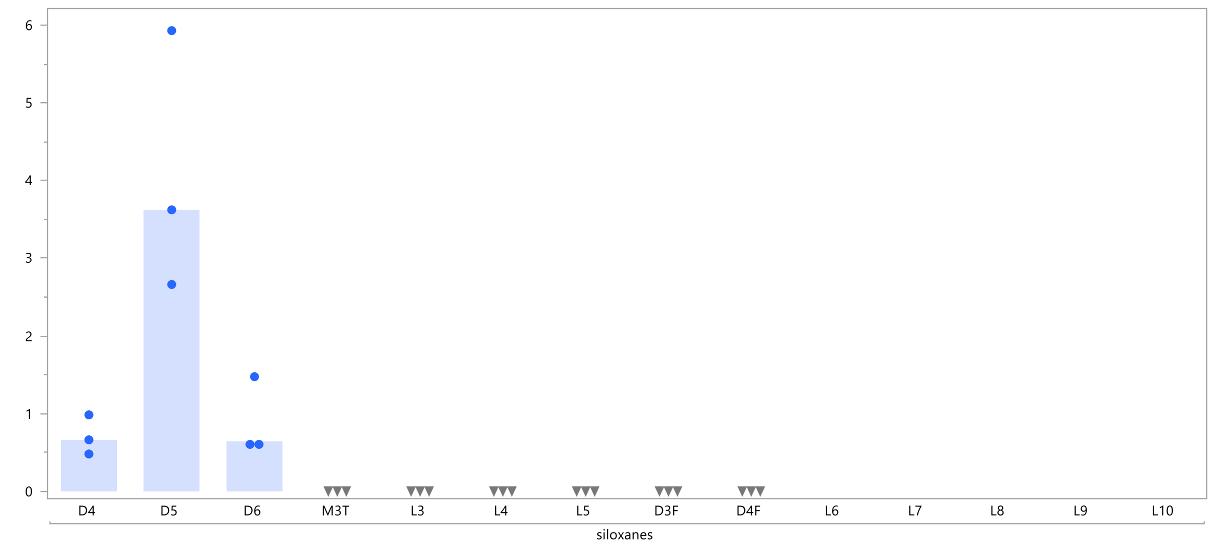
Siloxanes in Herring (muscle) (ng/g wet wt.):



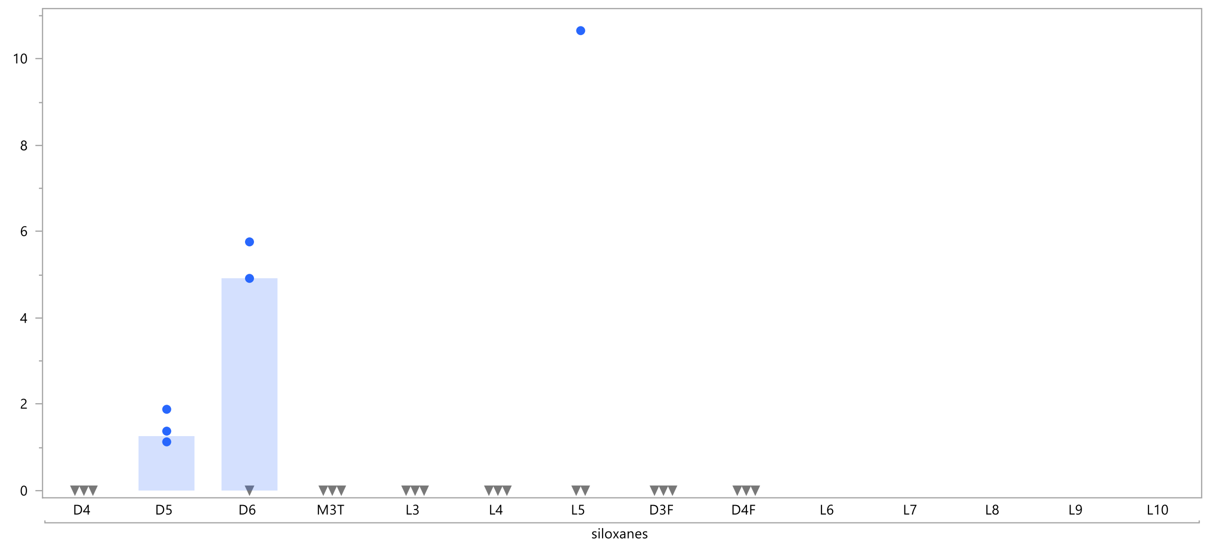
Siloxanes in Cod (liver) (ng/g wet wt.):



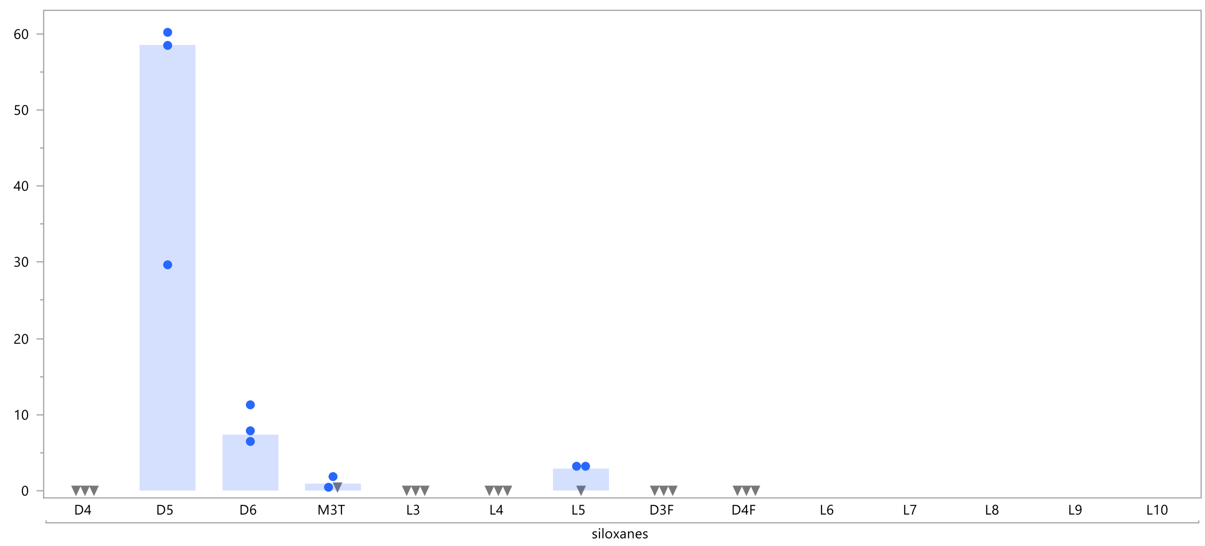
Siloxanes in Cod (Muscle) (ng/g wet wt.):



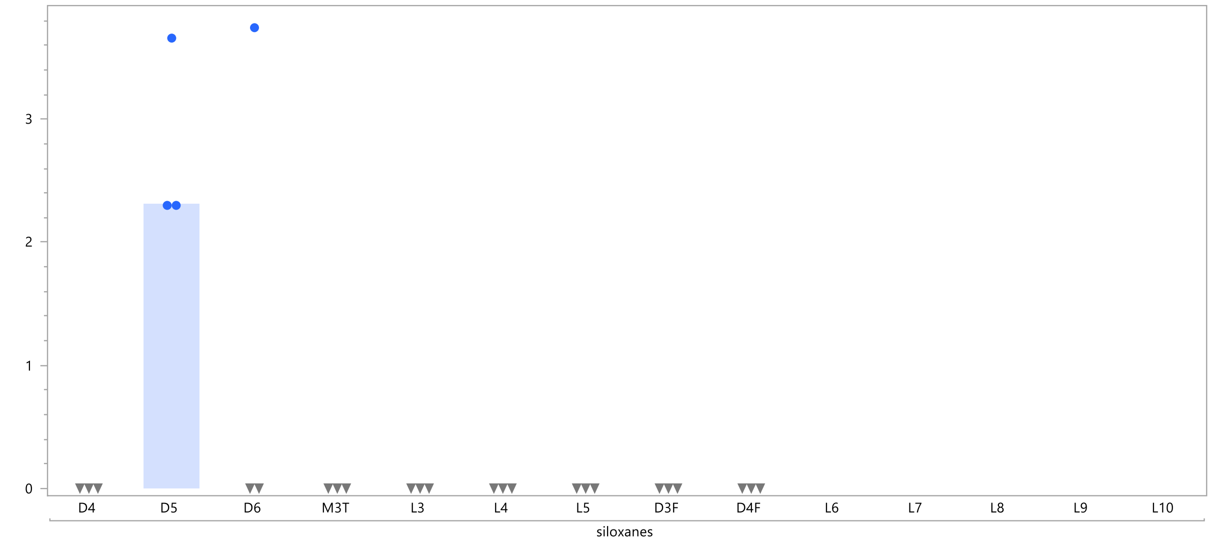
Siloxanes in Herring gull (blood) (ng/g wet wt.):



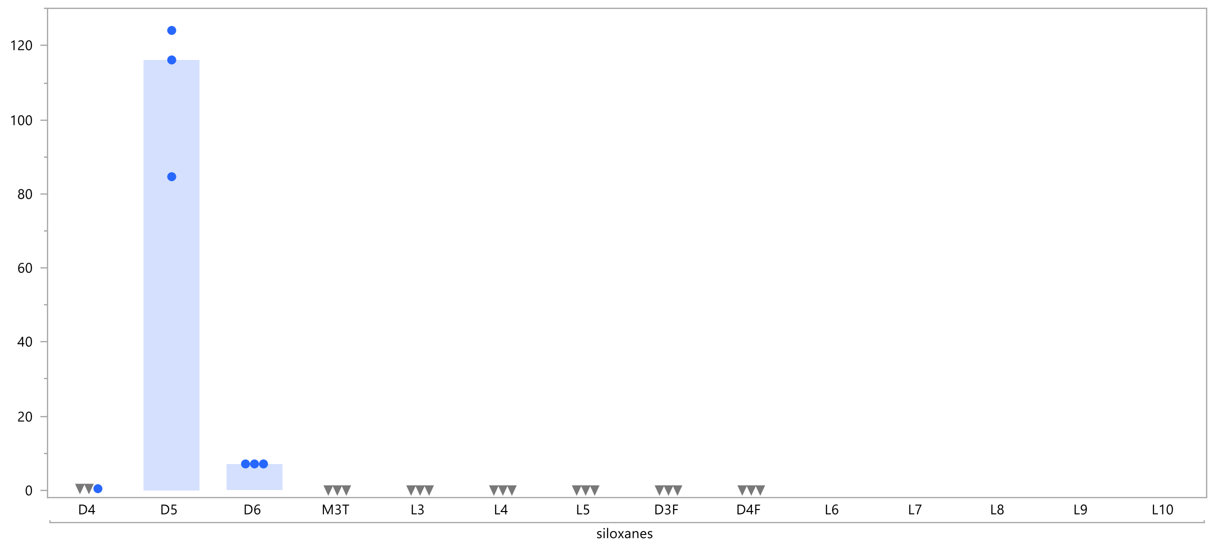
Siloxanes in Herring gull (egg) (ng/g wet wt.):



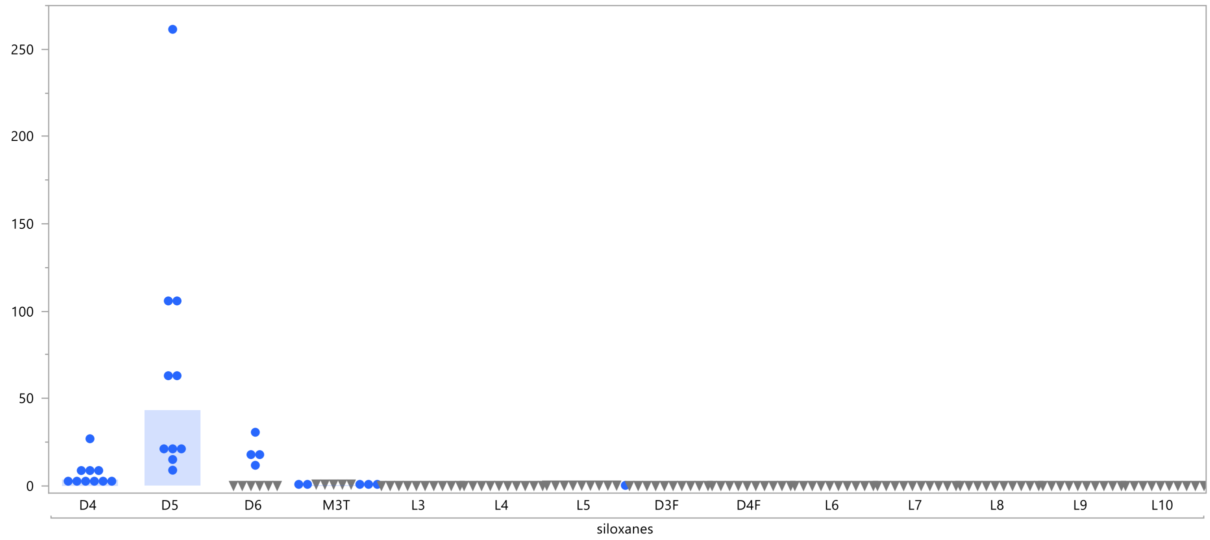
Siloxanes in Eider (Blood) (ng/g wet wt.):



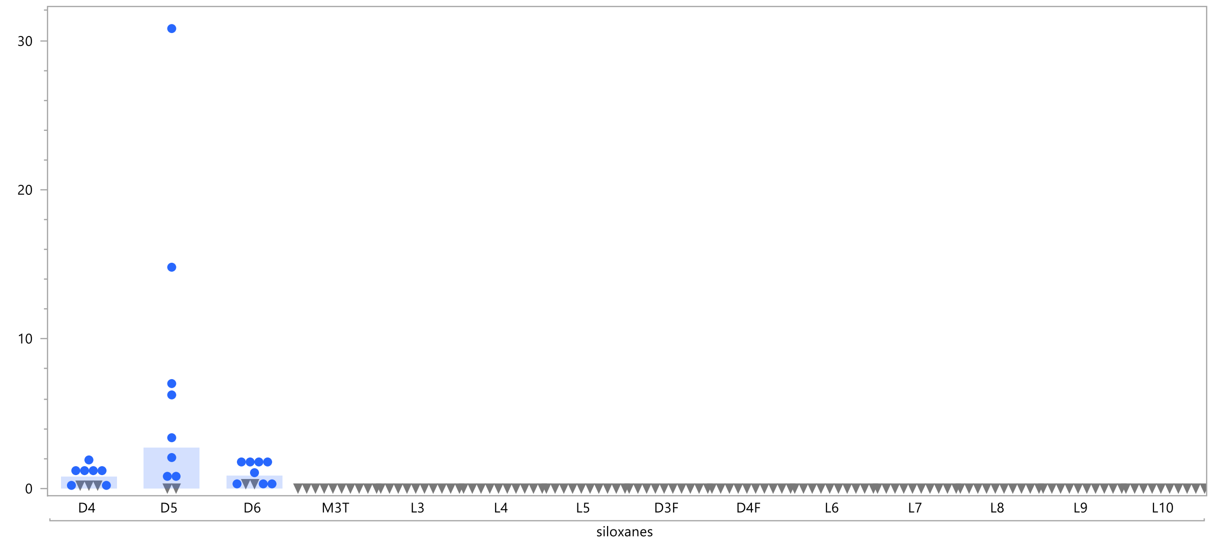
Siloxanes in Eider (Egg) (ng/g wet wt.):



Siloxanes in H. seal (blubber) (ng/g wet wt.):

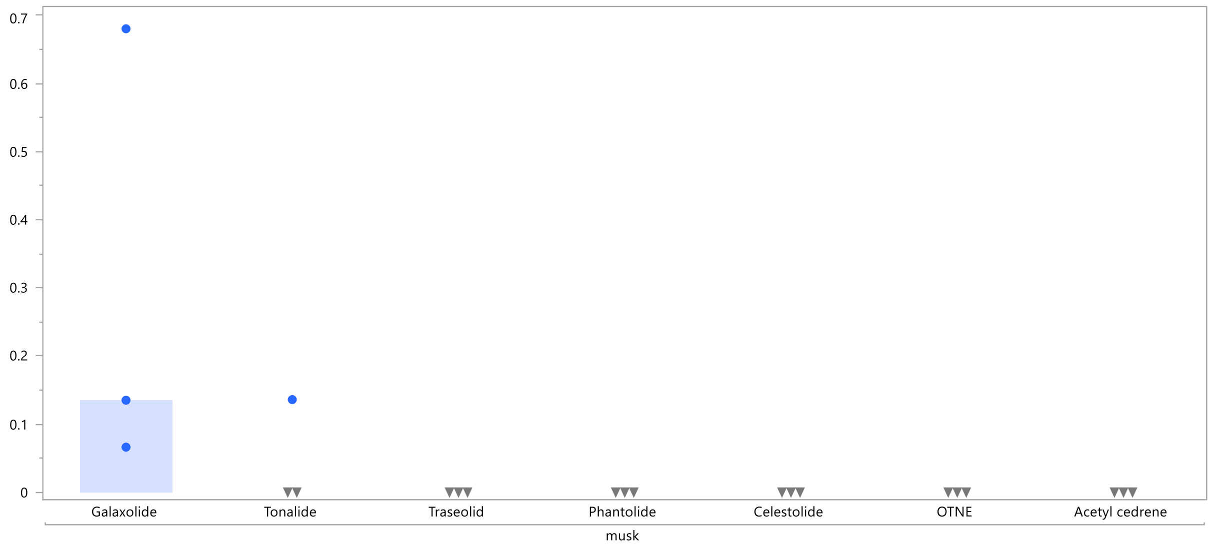


Siloxanes in H. seal (muscle) (ng/g wet wt.):



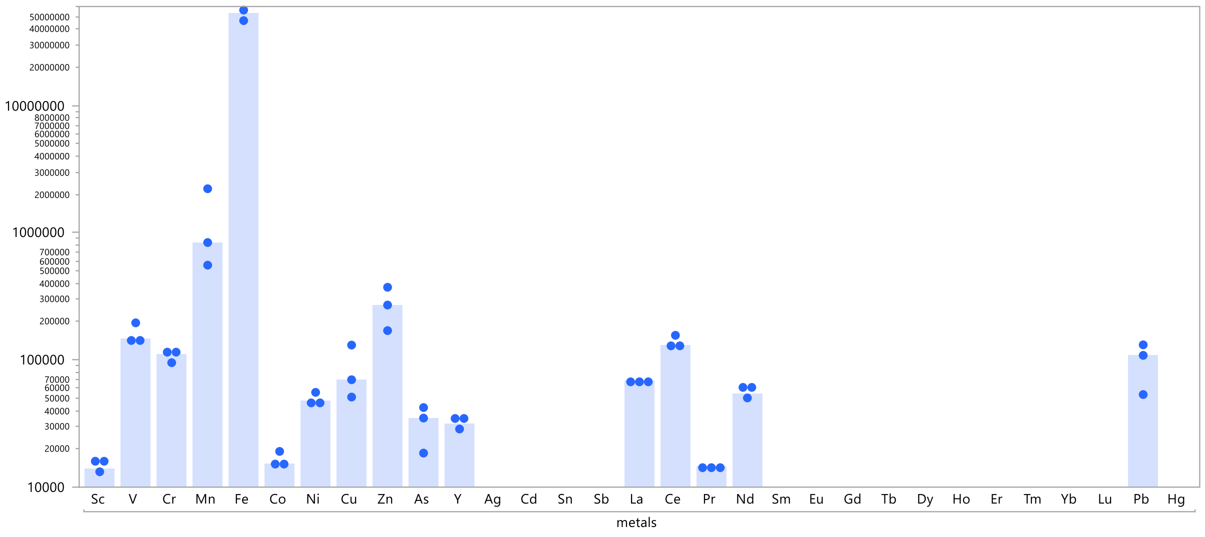
Musks:

Musks in Sediment (ng/g dry wt.):

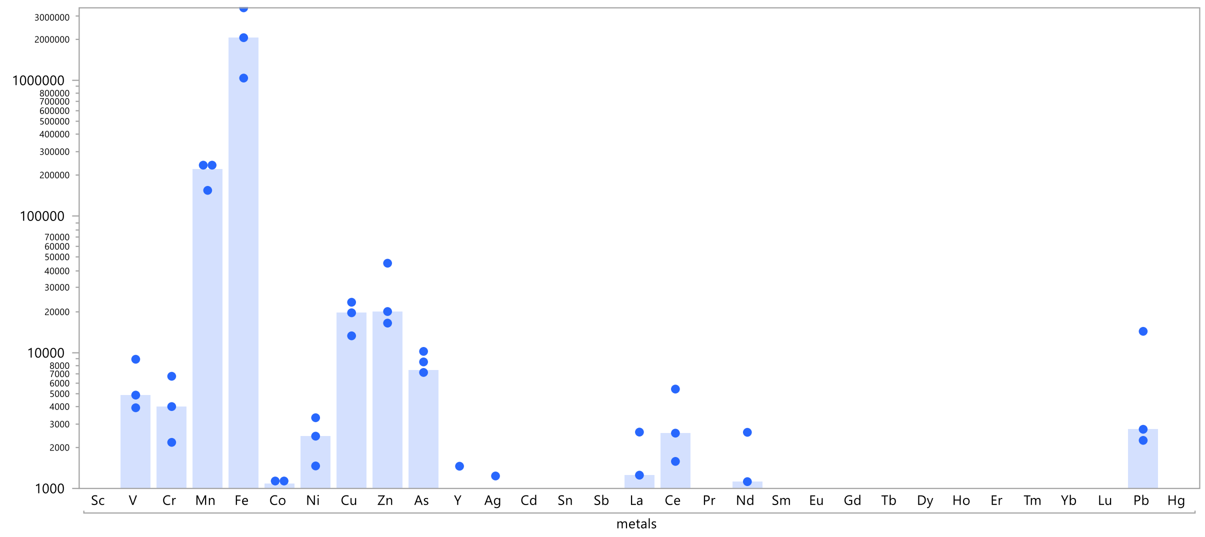


Metals (note logarithmic scale on concentration axis):

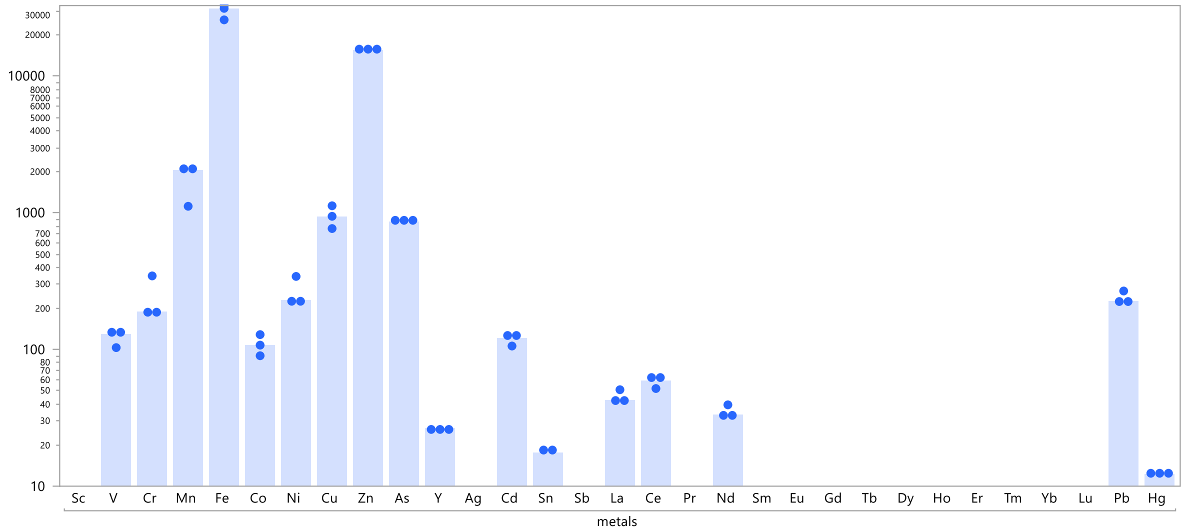
Metals in Sediment (ng/g dry wt.):



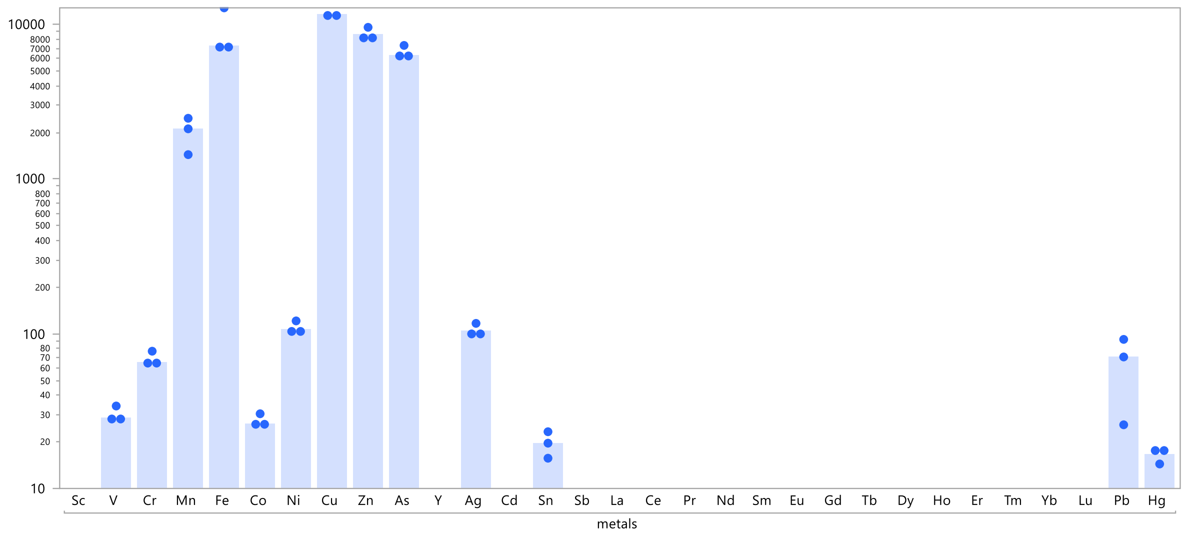
Metals in Polychaeta (ng/g wet wt.):



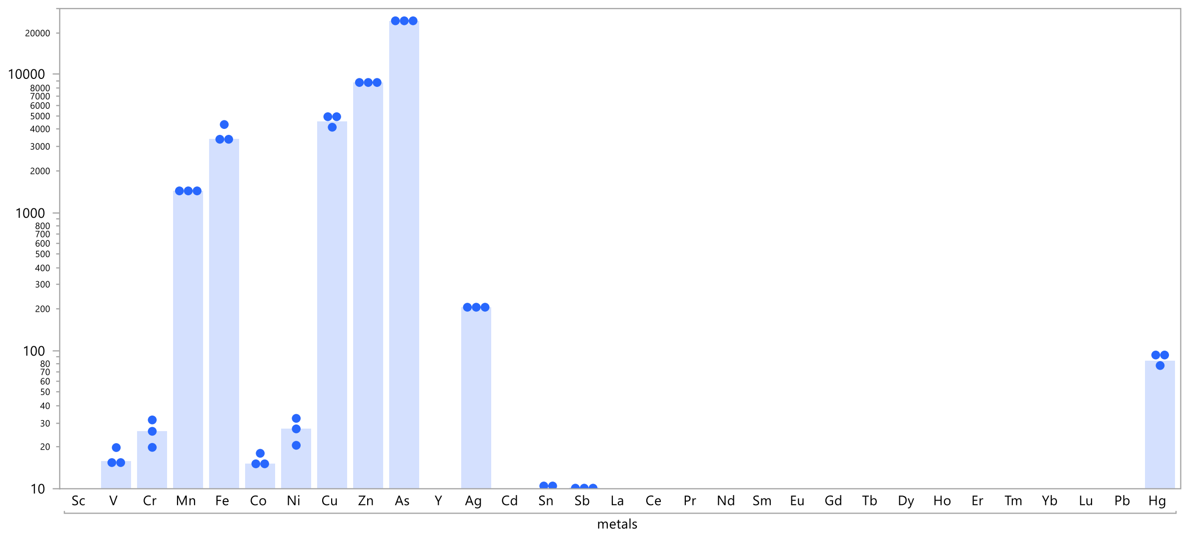
Metals in Blue mussel (ng/g wet wt.):



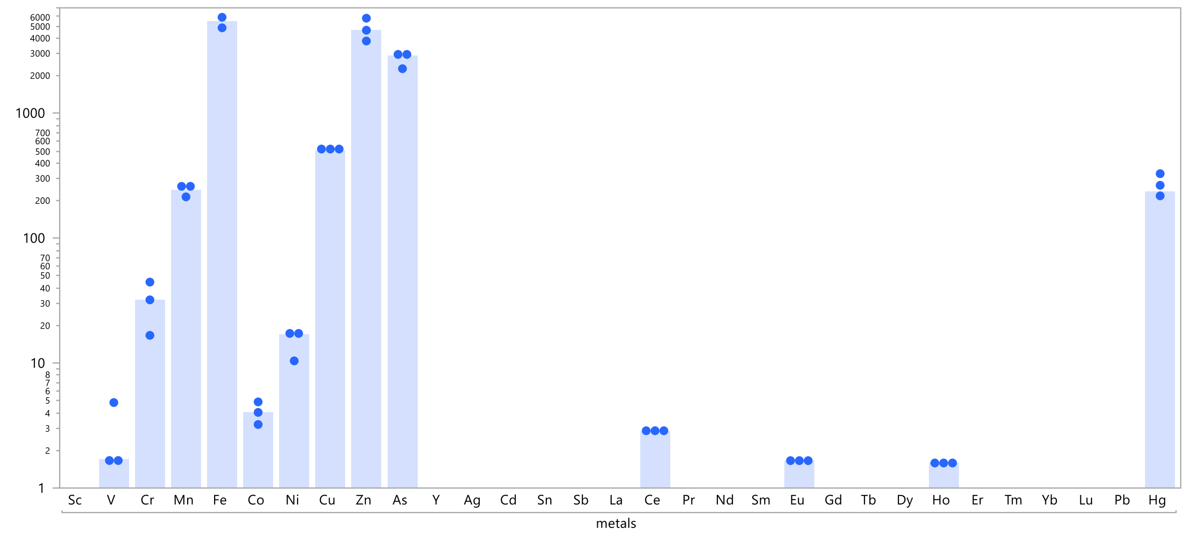
Metals in Krill (ng/g wet wt.):



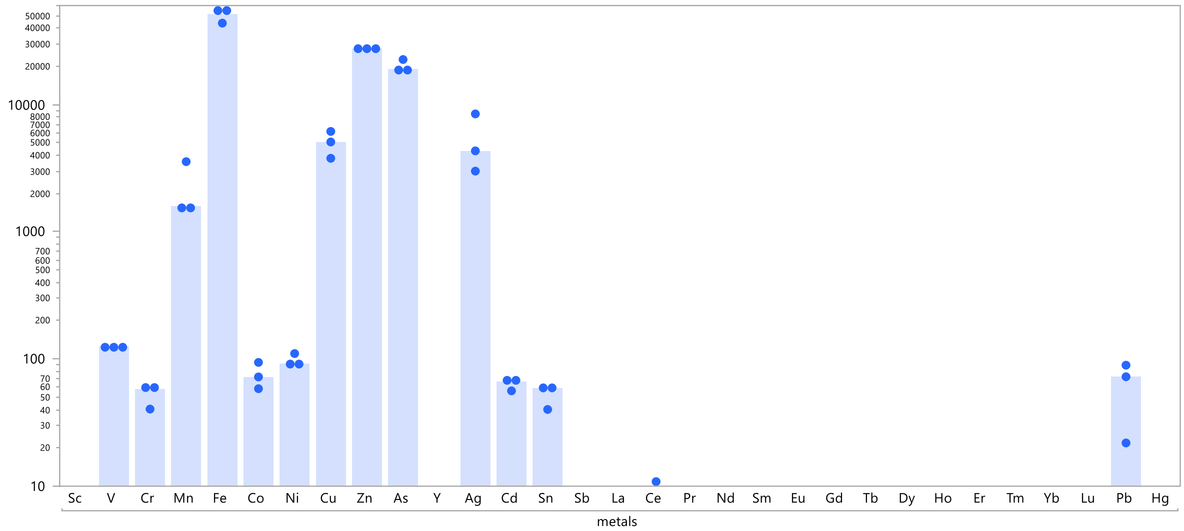
Metals in Shrimp (ng/g wet wt.):



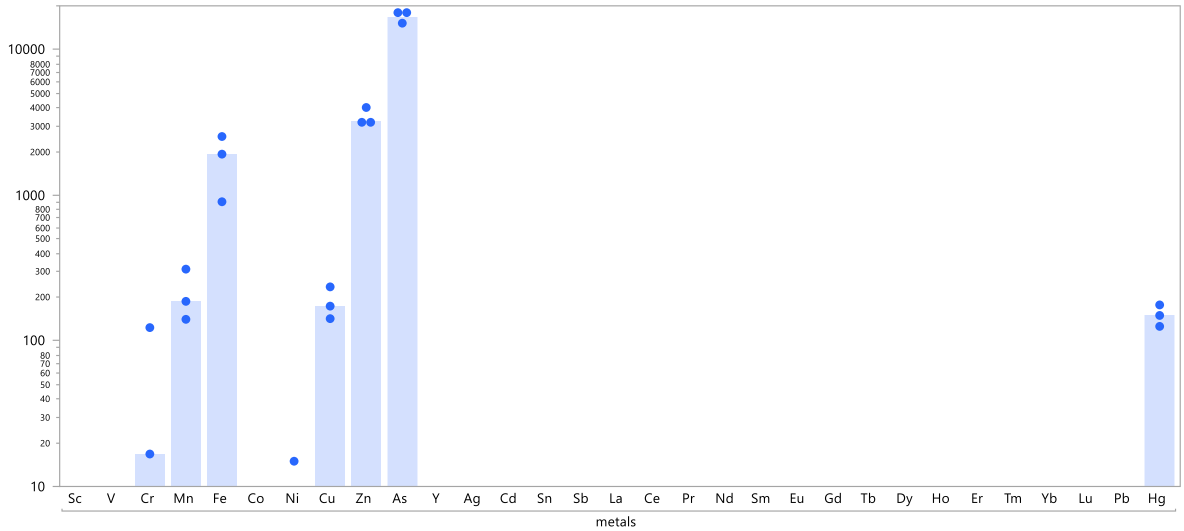
Metals in Herring (muscle) (ng/g wet wt.):



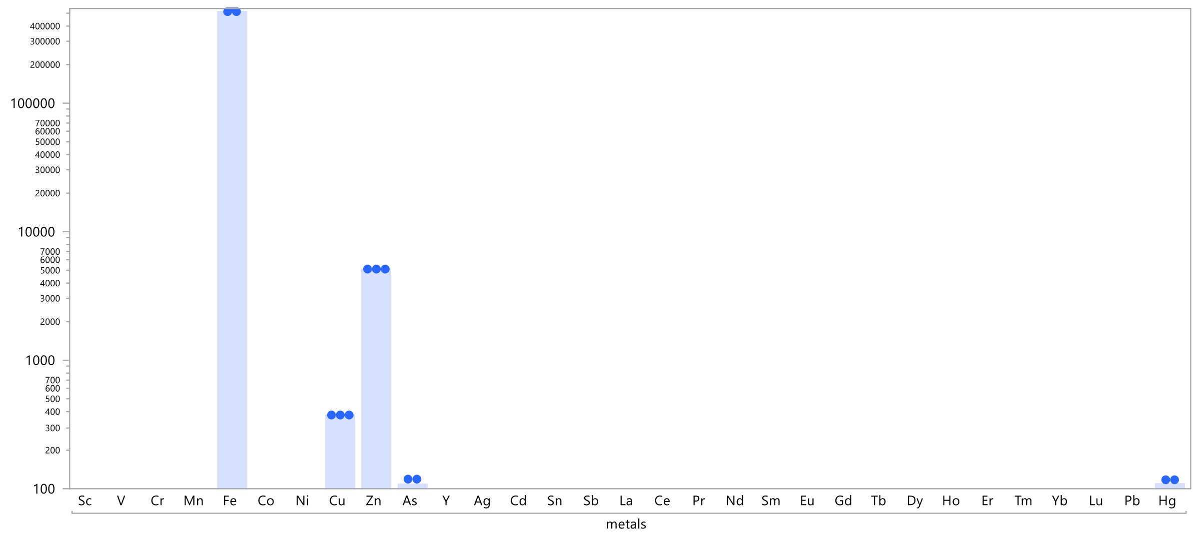
Metals in Cod (liver) (ng/g wet wt.):



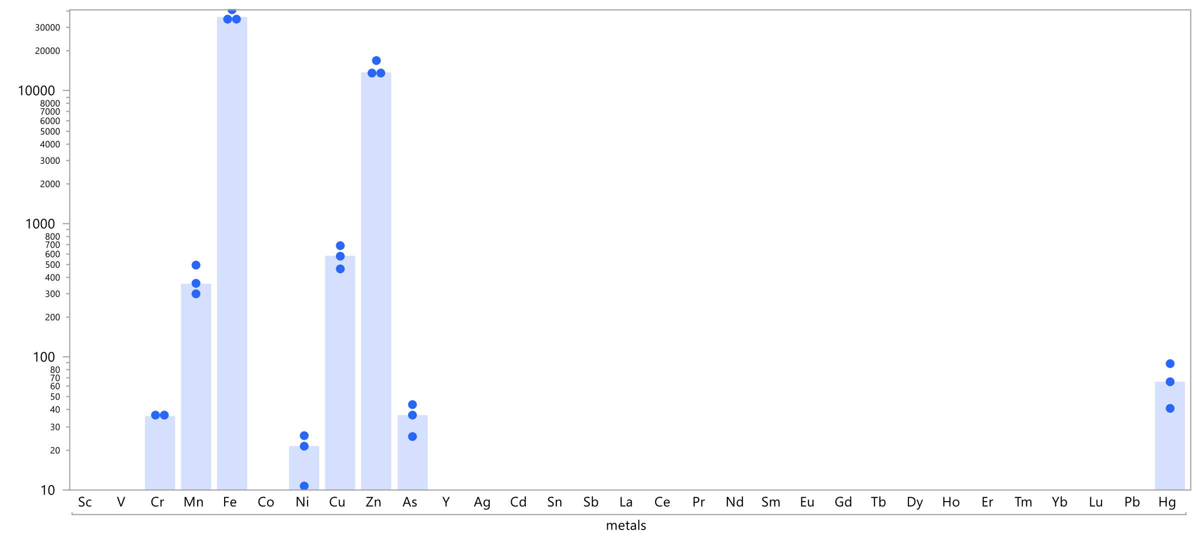
Metals in Cod (Muscle) (ng/g wet wt.):



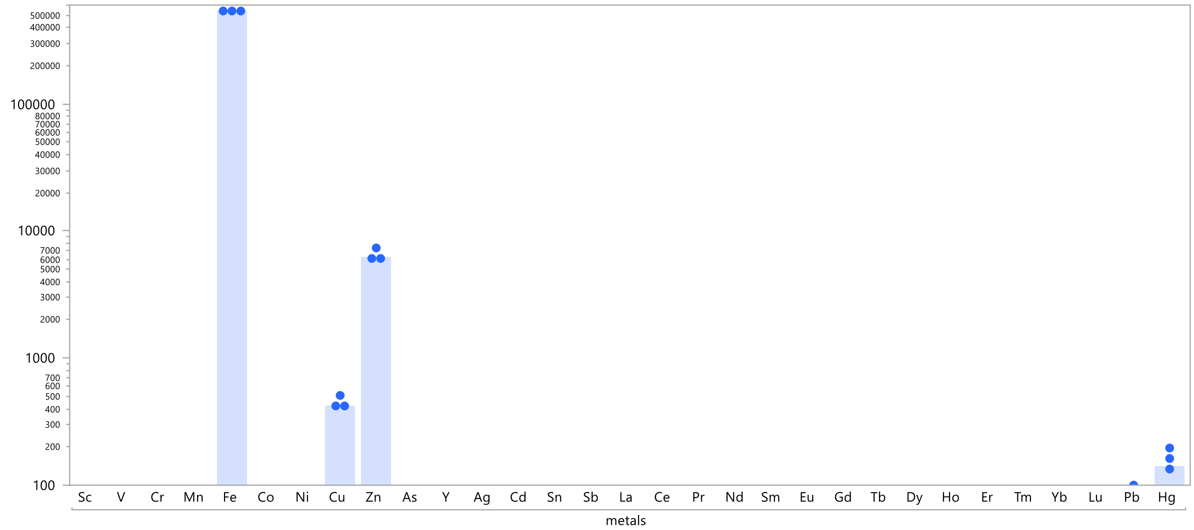
Metals in Herring gull (blood) (ng/g wet wt.):



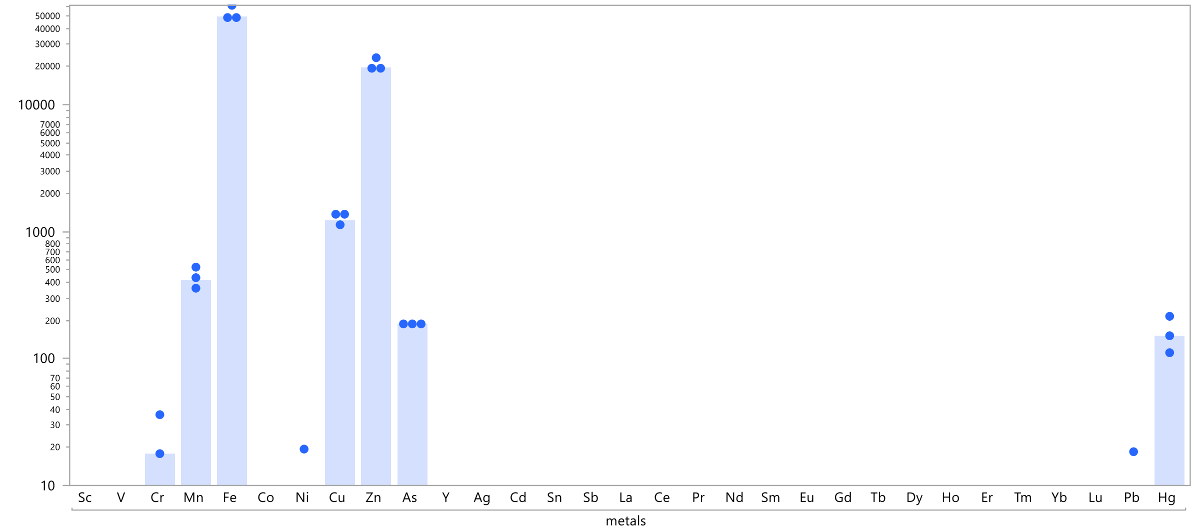
Metals in Herring gull (egg) (ng/g wet wt.):



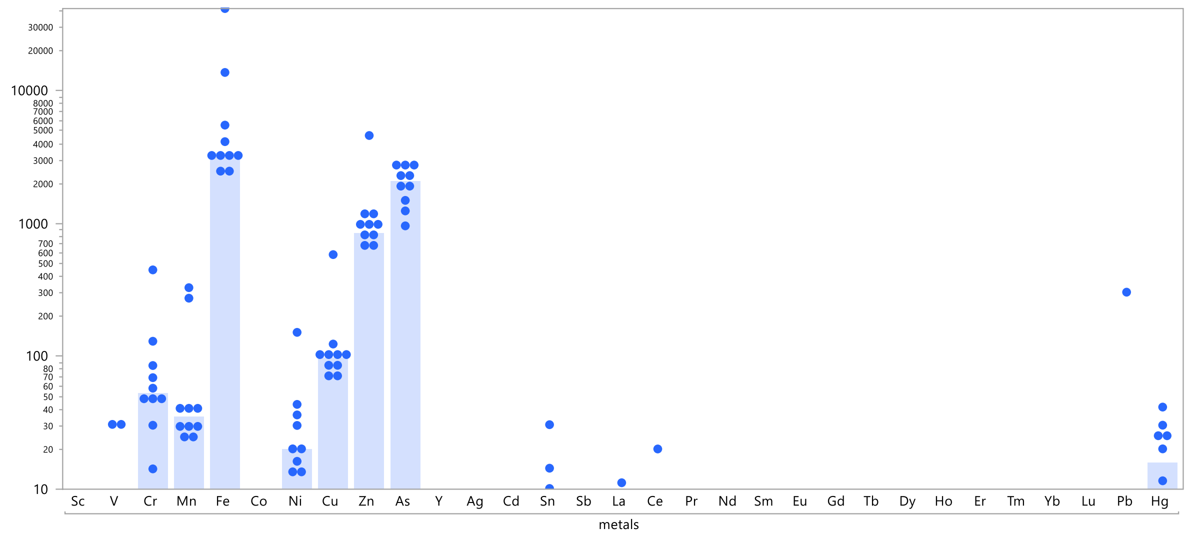
Metals in Eider (Blood) (ng/g wet wt.):



Metals in Eider (Egg) (ng/g wet wt.):



Metals in H. seal (blubber) (ng/g wet wt.):



Metals in H. seal (muscle) (ng/g wet wt.):