AMAP Faroe Islands 2017-2020

Heavy metals and POPs Core Programme

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AMAP Faroe Islands 2017-2020: Heavy Metals and POPs Core Programme

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Miljøministeriet
Miljøstyrelsen

Preface

The present report is part of the national contribution to the international Arctic Monitoring and Assessment Programme (AMAP), under the umbrella of the Arctic Council. The report summarises the results of the core programme monitoring of heavy metals and persistent organic pollutants (POPs) in terrestrial, freshwater and marine environments of the Faroe Islands. The monitoring is done according to guidelines adopted by AMAP, with adaptations that reflect the special Faroese pollution exposure issues and the experience gained from earlier work.

Úrtak

Hendan frágreiðingin tekur smanum úrslit, sum eru fingin í sambandi við eftiransing av dálkingarevnum í AMAP (Arctic Monitoring and Assessment Programme) kanningarsamstarvinum (sí eisini www.amap.no). Frágreiðingin fevnir um kanningar av tungmetalum og seint niðurbrótiligum lívrunnum eiturevnum (POPs) í úrvaldum verum í feskvatni, á landi og í havumhvørvinum í Føroyum. Úrslitini eru partur av áhaldandi arbeiði, sum byrjaði í 1996 og hevur hildið áfram við skiftandi orku síðani tá.

Í talvu 1 sæst hvørji sløg av djórum eru kannað í AMAP tungmetal og POP kanningarskránni fyri Føroyar, og verða viðgjørd í hesi frágreiðing. Støðugir isotopar eru eisini við í talvuni, hesir eru tó ikki dálkingarevni, men verða kannaðir, tí teir kunnu siga nakað um støði í føðinetinum. Talvan vísir eisini hvør vevnaður er kannaður, og hvørji dálkingarevni eru kannað.

Afturat nýggju kanningarúrslitunum eru aðrar dátur, sum stuðla uppundir tulkingina av úrslitunum, við í frágreiðingini; bæði lívfrøðilig dáta fyri viðurskifti, sum kunnu elva til variatión í innihaldinum av dálkingarevnum, men eisini ein útvaldur partur av eldri dátum, sum eru við til at seta nýggju úrslitini í perspektiv. Hendan lýsingin av eldri dátum er gjørd í tann mun, har dátur hava verið lutfalsliga lætt atkomulig, og er sostatt ikki gjørd miðvíst fyri øll sløg. Summi av hesum eldri úrslitunum eru fingin til vega í AMAP høpi, meðan onnur eru fingin til vega í sambandi við umhvørviseftiransingina ella serstakar kanningarverkætlanir. Metingar av broytingum í konsentratiónunum við tíðini eru ikki gjørdar sum ein innbygdur partur av kanningarætlanini, men verða eitt nú gjørdar í sambandi við arbeiðið í altjóða AMAP serfrøðingabólkum, og verða tøkar í sambandi við tað arbeiðið. Víst verður til https://www.amap.no/projects.

Table 1: Yvrlit yvir kannaði sløg í 2017 - 2020

			Kanningar:							
Slag	Innsavningar ár	Vevnaður	Hg	Cd	Se	POPs	PBDEs	PFAS	HBCD	SI
Northern fulmar	2019, 2020	egg	(+)		(+)	(+)		(+)		+
	2017, 2018, 2019, 2020	feather	+							
		liver	+	+	+					(+)
		muscle	+		+	+		+		+
Black guillemot	2018, 2020	egg	+		(+)	+		(+)		+
	2018	feather	+							
		liver	+	+	+					+
		muscle								+
Pilot whale	2017, 2018, 2019, 2020	blubber				+	+		(+)	
		kidney		+						
		liver	+	+	+			+		
		muscle	+		+					+
Atlantic cod	2017, 2018, 2019, 2020	liver				+	(+)			
		muscle	+		(+)					+
Brown trout	2017, 2018, 2019, 2020	muscle	+		+	(+)	(+)			+
Sheep	2017	liver	+	+	+					
		tallow				+				

* (+) Úrslit bert tøk fyri summi ár

1 Summary

The present report summarises the monitoring data acquired in partial fulfilment of the circumpolar Arctic Monitoring and Assessment Programme (AMAP), further details are available on the website www.amap.no. The contribution encompasses analyses of heavy metals and Persistent Organic Pollutants (POPs) in fresh water, terrestrial and marine biota of the Faroe Islands. The monitoring results are part of an ongoing effort that began in 1996, and which has continued though with adaptations and varying intensity.

The biotic sample types included in the AMAP Faroe Islands Heavy Metals and POPs Core Programme are shown in table 1. Stable isotopes are included in the monitoring programme as indicators of placement in the food web. The table also specifies the various tissues and contaminants that have been analysed.

In addition to presenting the newly acquired analytical data, the report also contains information that assists in the overall interpretation of the results. The biological parameters that give rise to variability in the concentration of pollutants are discussed, and the most recent data are given perspective by presenting a suitable selection of previously acquired data. Some of the older data included for perspective were acquired in the context of the AMAP programme and some were acquired in connection with other projects or programmes of the Environment Agency.

Table 1: Overview of the analysed species in 2017 - 2020

			Analysis:							
Species	Year	Tissue	Hg	Cd	Se	POPs	PBDEs	PFAS	HBCD	SI
Northern fulmar	2019, 2020	egg	(+)		(+)	(+)		(+)		+
	2017, 2018, 2019, 2020	feather	+							
		liver	+	+	+					(+)
		muscle	+		+	+		+		+
Black guillemot	2018, 2020	egg	+		(+)	+		(+)		+
	2018	feather	+							
		liver	+	+	+					+
		muscle								+
Pilot whale	2017, 2018, 2019, 2020	blubber				+	+		(+)	
		kidney		+						
		liver	+	+	+			+		
		muscle	+		+					+
Atlantic cod	2017, 2018, 2019, 2020	liver				+	(+)			
		muscle	+		(+)					+
Brown trout	2017, 2018, 2019, 2020	muscle	+		+	(+)	(+)			+
Sheep	2017	liver	+	+	+					
		tallow				+				

* (+) indicates that results are not available for every year

Contents

1 Introduction

The results in this report are from analyses in Faroe Islands 2017-2020 and are part of the Arctic Monitoring and Asessement Programme (AMAP) core monitoring programme of heavy metals and POPs in biota from terrestrial, freshwater and marine environment. The previous AMAP projects undertaken by the Food and Veterinary Authority and the Environment Agency of the Faroe Islands are reported in Larsen and Dam (1999), Olsen et al. (2003), Hoydal et al. (2003), Hoydal and Dam (2005), Hoydal and Dam (2009), Nielsen et al. (2014) and Andreasen et al. (2019).

Monitoring of environmental contaminants according to the guidelines adopted by the AMAP programme began in the Faroe Islands in 1996. The monitoring has been adjusted and optimized where pertinent, and the resulting monitoring scheme is shown in table **??**.

The metals analysed include mercury, cadmium and the metalloid selenium. The POPs analysed include hexachlorobenzene (HCB), 16 single congeners of polychlorinated biphenyls (PCBs), and pesticides such as chlordanes, hexachlorohexanes (α, β and γ-HCH), dichlorodiphenyltrichloroethane (DDT, in some instances both p,p- and o,p-isomers), mirex, and four individual congeners (parlars) of toxaphene. In certain species, polybrominated diphenyl ethers (PBDEs), hexabromocyclododecanes (HBCDs) and per- and polyfluoroalkyl substances (PFASs) were also analysed. In addition, stable isotope ratios of 15N/14N and 13C/12C have been analysed in all species.

This report focuses on contaminant concentration levels for 2017-2020. These results are also presented in our time series of analysed contaminants in biota. Individual results along with biometrical parameters are included in the appendix.

As part of the monitoring programme, additional samples are collected and stored in the *Environmental Specimen Bank* for later use. This enables retrospective studies of compounds that are currently unknown or compounds that we currently are unable to analyse.

1.1 Analytical methods

Mercury, cadmium and selenium analyses were performed at the Food and Veterinary Agency of the Faroe Islands (FVA). POPs analyses were performed at Centre de Toxicologie du Québec (CTQ) in Canada. However, since 2016, these analyses for birds and sheep are now done at Evnaskyn in Faroe Islands. PBDE and PFAS analyses were performed at the University of Örebro, Sweden, yet from 2018, PFAS analyses have been done at Evnaskyn, and PBDE analyses have been included in the POPs analyses package offered by CTQ. HBCD analyses were done at Aarhus University in Roskilde, Denmark. Stable isotopes of nitrogen and carbon were analysed at Stable Isotopes in Nature Laboratory (SINLAB), University of New Brunswick, Canada.

1.1.1 Metal analysis

Mercury, cadmium and selenium analyses were performed at the Food and Veterinary Agency of the Faroe Islands (FVA) using ICP-MS.

Quality assurance:

Double determinations were performed. A certified reference material and a blank control sample were analysed in connection with each series. The certified reference material and the blank were digested in the same manner as the samples. A 4-point standard curve was always made. The FVA laboratory participates in regular inter-calibration by Quasimeme (Quality assurance of information for marine environmental monitoring in Europe). The FVA laboratory is accredited (DANAK) for mercury and cadmium analysis.

1.1.2 POPs

When the term POPs is used in this report, it is used as a common term for PCBs, HCB, toxaphenes, DDTs and pesticides; thus PBDEs, HBCDs and PFASs are normally not included. Pilot whale, Atlantic cod and brown trout samples were analysed for POPs at CTQ, bird and sheep analyses were done at Evnaskyn.

POPs analyses at CTQ

The CTQ laboratory is accredited under ISO 17025 by the Standards Council of Canada and participates in many national and international quality control programs including, the Northern Contaminants Program (NCP) of the Ministry of the Environment of Ontario, the External Quality Assessment Scheme QUASIMEME (www.quasimeme.org), as well as the German External Quality Assessment Scheme (G-EQUAS) for Biological Monitoring in Occupational and Environmental Medicine. The CTQ laboratory also participates in AMAP.

Extraction and analysis by GC-MS

Tissue samples were analysed for the following compounds: PCBs 28, 52, 99, 101, 105, 118, 128, 138, 153, 156, 163, 170, 180, 183, 187 and 209, hexachlorobenzene, α, β and γ-HCH, α and γ-chlordane, oxychlordane, cis-nonachlor, trans-nonachlor, mirex, o,p'-DDE, p,p'-DDE, o,p'-DDT, p,p'-DDT, o,p'-DDD and p,p'-DDD, parlar 26, parlar 32, parlar 50 and parlar 62.

The sample weight used for the analyses was dependent on the nature of the matrix and the fat content and ranged from 0.025 g (whale blubber), 1.0 g (fish tissues, muscles, eggs and liver) to 4.0 g (subcutaneous fat). The tissue samples were enriched with isotopically labelled surrogate (internal) standards (hexachlorobenzene-13C6, β-HCH-13C6, oxychlordane-13C10, trans-nonachlor-13C10, p,p'-DDE-13C12, PCB 141-13C12, PCB 153-13C12, PCB 180-13C12, parlar 26-13C10 and parlar 50-13C10), mixed with dichloromethane and chemically dried using sodium sulphate. The compounds were then extracted from the matrix by ultrasound sonification followed by filtration. A part (10 %) of the organic solvent extract was used to gravimetrically determine the percentage of total lipids in the sample. The remaining fraction was concentrated by evaporation and subsequently purified using gel permeation chromatography (GPC) and cleaned-up on a Florisil column. The extracts were analysed on a GC-MS with an Agilent 6890 Network gas chromatograph (GC), coupled with an Agilent 5973 Network mass spectrometer (MS) (Agilent Technologies, Mississauga, Ontario, Canada) and with an Electron Capture Detector (ECD). The GC was fitted to the MS with an Agilent 60 m DB-XLB column (0.25 mm i.d., 0.25 µm film thickness) and to the ECD with an Agilent 50 m Ultra-1 column (0.20 mm i.d., 0.33 µm film thickness). The ECD detector served mainly to quantify the PCB congeners 28 and 52, if the detection limit was not obtained with the mass detector, and to validate MS results. The measurement of ions generated was performed in single ion monitoring (SIM), with negative chemical ionization (NCI) and methane (99.97 %) as the reagent gas. Samples (3 μL) were injected in pulsed split less mode. The temperature program was as follows: 2 min at 100°C followed by an increase to 200 °C at a rate of 20 °C min-1, increase to 245 °C at a rate of 1.5 °C min-1 hold 10 minutes, increase to 280 °C at a rate of 20 °C min-1 hold 5 minutes and finally an increase to 330 °C at a rate of 30 °C min-1 hold 15 minutes. The total run time was 70.42 minutes.

Quantitation and method performance

The calibration was made with an extracted curve using corn oil. The linearity of the six-point curve was evaluated during the validation of the analytical method, due to time considerations and to maintain a high throughput production, the quantitation was based on a single, extracted mid-point calibration. The concentration of the analytes was calculated with the ratio of peak areas relative to their labelled internal standards. Concentrations were reported per lipid weight (units of micrograms per kilogram) and the Limit of Detection (LOD) for all compounds ranged from 0.1

to 10 $\mu g\ kg^{-1}$. For each sample, the LOD was adjusted relative to the weight of the sample and the lipid content, providing different LODs for each sample. For each of the analytes, the LOD was determined by first estimating the concentration equivalent to a signal-to-noise ratio of three. The laboratory then measured 10 replicates of a sample with the analytes at a concentration from 4 to 10 times the estimated LOD. The calculated LOD became the value equivalent to thrice the standard deviation (SD) of those 10 replicates. The intra-day precision was between 1.7% and 8.3% and the inter-day was between 1.7% and 9.3%. Based on spiked levels (5 $\mu g\ kg^{-1}$in corn oil, n = 3), recovery was between 54% and 79% for all the analysed compounds. The certified reference material used during the analyses was fish tissue (SRM-1947), containing all the analysed compounds, and was provided by the National Institute of Standards & Technology (NIST; Gaithersburg, MD, USA). The overall quality and accuracy of the analyses was monitored by regular participation in the Northern Contaminants Program (NCP) of the Ministry of the Environment of Ontario and the External Quality Assessment Scheme QUASIMEME. The "Aroclor 1260" value reported in this report was calculated from individually quantified congeners, using a factor of calibration that was determined on a human tissue matrix. Thus, when applying this Aroclor 1260 value, it is implicitly assumed that the metabolism/degradation of the various PCB congeners in the species considered is the same as in humans.

PBDE

Polybrominated diphenyl ethers (PBDEs) were analysed in pilot whale blubber samples at the MTM Research Centre, University of Örebro, Sweden until and including 2017. From 2018, PBDEs have been analysed in pilot whale blubber at CTQ. The blubber samples were treated as described in Rotander et al. (2012b). Five to ten grams of blubber were homogenized in a mortar with anhydrous sodium sulphate and extracted with a mixture of n-hexane/toluene (1:1, v:v) using open column chromatography. Lipid content was determined gravimetrically. Sample clean up was performed using three different columns in series, i.e., multilayer silica column, alumina oxide column and carbon column. All samples were analysed on a high resolution GC-MS system (Autospec Ultima; Waters Inc.) operating at >10,000 resolution using EI ionization at 35 eV. All measurements were performed in the selective ion recording mode (SIR), monitoring the two most abundant ions of the molecular bromine cluster. Quantification was performed using the internal standard method. Split-less injection was used to introduce 1 μL of the final extracts on the column (a DB-5MS column from J&W; 30 m x 250 μm i.d. x 0.25 μm film thickness). Detection levels were calculated at an S/N ratio of three, corrected for recovery of the internal standard. The criteria for positive peak identification were an isotope ratio within ±15 % of the theoretical value and a retention time match with that of the corresponding labelled compound. Recoveries were between 50-150 % for all samples.

PFAS

Per- and polyfluorinated alkyl substances (PFASs) were analysed in pilot whale liver samples at the MTM Research Centre, University of Örebro, Sweden and later at Evnaskyn, Faroe Islands. At the MTM Research Centre, analyses were done as described in Rotander et al. (2012a). In short, standards used were native (C4, C6, C8-C12, C14, C16, C18) and mass-labelled (C4-C16) perfluorocarboxylic acids (PFCAs), native (C4-C10, C12) and mass-labelled perfluorosulfonates (PFSAs) (C4, C6, C8), native (4:2, 6:2, 8:2) and mass-labelled (6:2, 8:2) fluorotelomer sulfonates (FTSAs), and native and mass-labelled perfluorosulfonamide (PFOSA), all obtained from Wellington Laboratories (Guelph, Ontario, Canada). Liver samples were homogenized and 0.5 g was used for extraction. Labelled internal standards were added to the samples before extraction with acetonitrile. Further clean up was performed with ENVI-carb. PFASs were analysed using an Acquity UPLC system coupled to a triple quadruple mass spectrometer XEVO TQ-S (Waters Corporation, Milford, USA), in negative electrospray ionization mode. A 100 mm C18 BEH column (1.7 µm, 2.1 mm) was used for separation. Mobile phases were 2 mM ammonium acetate in water, and 2 mM ammonium acetate in methanol. PFASs in northern fulmar, black guillemot and pilot whale have been analysed at Evnaskyn, Faroe Islands. In short, the analysis was done on UPLC-MS/MS. The quantification was done using isotope dilution mass spectrometry with surrogate internal standards of C-13 isotope labeled perfluoroalkylcarboxylic acids (C4, C6, C8, C9, C10, C11 and C12) and perfluorooctanesulfonamide, and O18 and C13 labeled perfluorosulfonates (C6 and C8). All standards are from Wellington laboratories, Canada. Sample preparation was based on the method of Spaan et al. (2020). For chromatographic separation an Acquity BEH C18 column (5 x 2,1 mm, 1,7 µm) was used, and the quantitation was done using Waters TQ-S with the TargetLynx V4.1 software in tandem mass spectrometry with at least two fragment ions of each analyte for quantification. The elution was done using mobile phases A and B, where A: 10% methanol in water with 2mM NH4Ac, and B: 99% methanol with 2 mM NH4Ac (aq). For each batch of analyses, a method blank is produced. The accuracy of the analyses are checked against matrix-matched reference material (in-house or purchased). The LoQ is calculated in the TargetLynx software as 10 times the average noise in the relevant retention-time window.

HBCD

Hexabromocyclododecanes (HBCDs) were analysed in pilot whale blubber at the Department of Environmental Science, Aarhus University, Denmark. The analysis were conducted as previously described in Vorkamp et al. (2011). In brief, 0.5 g of the homogenized sample was spiked with 13C12-labelled standards of α-, β- and γ-HBCD (Cambridge Isotope Laboratories, Tewksbury, MA, USA). The samples were Soxhlet extracted with hexane:acetone (4:1), reduced in volume by rotary evaporation and cleaned on a column containing aluminium oxide, silica (with and without H2SO4) and Na2SO4. The first fraction was eluted with 250 mL hexane. The HBCD isomers eluted in the second fraction with 250 mL hexane:dichloromethane (1:1). The HBCD fraction was evaporated to dryness and re-dissolved in 500 μL methanol. The samples were analyzed by high performance liquid chromatography-mass spectrometry (HPLC-MS/MS).

1.1.3 Stable Isotopes

Stable isotopes of nitrogen and carbon were analysed at Stable Isotopes in Nature Laboratory (SINLAB), University of New Brunswick, Canada. The ratio analyses of the two stable isotopes 15N/14N and 13C/12C were done at SINLAB. The samples were analysed for δ^{13}C and δ^{15}N using a Thermo-Finnigan Delta Plus isotope-ratio mass spectrometer (Bremen, Germany) interfaced with a Carlo Erba NC2500 Elemental Analyzer (Milan, Italy) via the Conflo II or Conflo III, respectively. This is a continuous flow system using helium as a carrier gas. Samples were converted to a gaseous state via combustion. Four IAEA standards (N1, N2, CH6 and CH7), three elemental standards (acetanilide, cyclohexanone, and nicotinamide) and one internal standard (bovine liver) were used throughout each run to ensure high quality control.

1.2 Data Analysis

This report has been generated as an Rmarkdown document. Data were analysed and figures were produced using the open source software R version 4.2.1 (R Core Team, 2022) using the packages included in Tidyverse version 2.0.0 (Wickham et al., 2019).

2 Sampling

Specimens analysed within the monitoring programme include fresh water, terrestrial and marine biota of the Faroe Islands. This includes brown trout (*Salmo trutta*), sheep (*Ovis aries*), northern fulmar (*Fulmarus glacialis*), black guillemot (*Cepphus grylle*), Atlantic cod (*Gadus morhua*) and long-finned pilot whale (*Globicephala melas*).

Previously, Arctic char (*Salvelinus alpinus*) samples were analysed as well, yet due to difficulties in obtaining samples the monitoring has been discontinued and replaced with brown trout. Black guillemot will most likely be phased out naturally due to difficulties in obtaining samples. It will be substituted with northern fulmar. Sheep monitoring has been discontinued in 2018.

2.1 Black guillemot (*Cepphus grylle*)

Young black guillemots (2K) were shot at Tindhólmur 18th of May 2018. Due to the increased difficulties in obtaining permission to shoot black guillemots from the relevant authorities, the environmental monitoring of young black guillemot will cease in year 2018 and northern fulmar will instead be monitored.

The full weight of each bird was recorded prior to dissection. Feather samples were taken (body contour feather under the left wing) and analysed for Hg at the FVA.

Livers were sampled and stored in heat-treated glass jars (400°C for four hours) and frozen at -20°C until analysis. The livers were analysed for Hg, Se and Cd at the FVA, and stable isotopes at Sinlab. Muscle was analysed for stable isotopes at Sinlab, Canada.

The sex was recorded, and kidney and stomachs with their contents were stored in polyethylene bags at -20°C and deposited in the ESB for potential future use. The polyethylene bags used for sample storage are invariably Minigrip.

2.1.1 Black guillemot eggs

Black guillemot eggs were sampled in June 2018 and 2020 in Koltur (though only 3 eggs could be collected in 2020). One egg was sampled from each nest and the eggs were stored in a refrigerator (ca. 5°C) until further treatment.

The eggs were weighed, and height and breadth were measured. A hole was made in the centre of each egg using a scalpel, and the contents were poured into a heat-treated glass (400°C for four hours).

The yolk and white were mixed with a stainless steel fork, and subsamples were shipped in PMP containers for POPs analyses at CTQ or in eppendorf tubes for stable isotope analysis at SINLAB. The remaining egg sample was analysed for Hg at the FVA. The samples were stored at -20°C until shipment to the laboratories. The egg shells were dried at 60°C for 48 hours and the thickness was measured with a micrometre calliper at three different locations around the open hole. No membrane was removed.

2.2 Northern fulmar (*Fulmarus glacialis*)

Northern fulmars were caught north-west of the Faroe Islands on 31st of August in 2017, 5th of September in 2018 and 2019, and 1st of September 2020. The young birds (fledglings, hatched in June same year) are caught with nets while they lie on the surface of the sea.

The full weight of each bird was recorded prior to dissection. The sex was recorded post dissection visually by examining gonads. Livers were sampled and stored in heat-treated glass jars (400°C for four hours) and frozen at -20°C until analysis. The livers were analysed for Hg, Cd and Se at the FVA. Feather samples were taken (body contour feather under left wing) and analysed for Hg at the FVA. Muscle samples were stored in polyethylene bags and frozen at -20°C until analysis. Muscles were analysed for Hg.

Samples of subcutaneous fat were stored in heat treated aluminium foil, samples of kidney were stored in plastic containers, and the stomachs with their contents stored in minigrip bags. They were deposited in the Environmental Specimen Bank (ESB) for potential future use.

2.2.1 Northern fulmar eggs

Northern fulmar eggs were sampled 21st of May in 2019 in Lonin, Sandoy and 21st of May 2020 in Koltur. One egg was sampled from each nest and the eggs were stored in a refrigerator (ca. 5°C) until further treatment.

The eggs were weighed, and height and breadth were measured. A hole was made in the centre of each egg using a scalpel, and the contents were poured into a heat-treated glass (400°C for four hours). The egg shells were dried at 60°C for 48 hours and the thickness was measured with a micrometre calliper at three different locations around the open hole. No membrane was removed.

The yolk and white were mixed with a stainless steel fork, and subsamples were taken in eppendorf tubes for stable isotope analysis at SINLAB. The remaining egg sample was analysed for Hg at the FVA and POPs at Evnaskyn. The samples were stored at -20°C until shipment to the laboratories.

2.3 Atlantic cod (*Gadus morhua*)

Atlantic cod were sampled at Mýlingsgrunnur, north-west of the Faroe Islands in October 2017 (n = 26), 2018 (n = 26) and 2020 (n = 15), and in September 2019 (n = 17) with trawl by the research vessel Magnus Heinason. The cod were frozen whole until sample preparation.

During sample preparation, the thawed cods were weighed and the fork length measured. The liver was dissected and one lobe was placed in a heat treated jar or a Nalgene polymethylpentene (PMP) jar for subsequent persistent organic pollutants analyses.

Samples were taken of muscle from the right side fillet and stored in PE bags (samples intended for metal analyses), in eppendorf tubes (for stable isotopes analyses) or heat-treated aluminium foil for storage in the ESB at -20°C. The sex and reproductive maturity were determined visually from the gonads.

All samples of cod were analysed as individual samples at the FVA (metals), CTQ (POPs) and for stable isotopes at SINLAB.

2.4 Long-finned pilot whale (*Globicephala melas*)

Pilot whale samples are collected in connection with the traditional whale hunts. The sampling takes place after the killing and prior to the meat and blubber distribution. At this time, the whales are cut open by an abdominal cut, to facilitate cooling. The samples of blubber and muscle are taken at the ventral and caudal side of these abdominal cuts. Pieces of blubber, muscle, liver and kidney were sampled and placed in polyethylene bags and stored at -20°C until sub-sampling and shipment for analysis. As part of the sampling, the length of the whale in cm and/or the size in skinn (a special Faroese unit for measuring the size of the whale based on an assessment of the mass fit for human consumption) and the sex is determined; these data are also available from the authorities on site.

Pilot whale samples were collected in Tórshavn, Tjørnuvík and Hvalvík (2017), Tórshavn and Syðrugøta (2018), Vestmanna, Tórshavn, Sandavágur and Hvalvík (2019) and Hvalvík (2020).

The muscle samples were analysed for Hg and Se at the FVA in the Faroe Islands. Stable isotope analysis was conducted at SINLAB.

The liver samples were analysed for Hg, Se and Cd at the FVA in the Faroe Islands. Kidney samples were analysed for Cd at the FVA in the Faroe Islands. Blubber samples were analysed for POPs at CTQ, PBDE and PFAS at Örebro and Evnaskyn, respectively. During the preparation of the blubber samples, the outer part of the blubber that had been in contact with the wrapping was removed. The blubber samples were transferred to polymethylpentene jars, and all samples were kept frozen until analysis.

Defining whale groups

Following studies by Desportes et al. (1993) and Martin and Rothery (1993), pilot whales are divided into the following groups with regard to sex and sexual maturity:

- Juvenile females: All females < 375 cm
- Adult females: All females ≥ 375 cm
- Juvenile males: All males > 317 cm and < 494 cm
- Adult males: All males ≥ 494 cm

Muscle and blubber have been sampled from preferably young males with the purpose of eliminating variability stemming from the sex and age parameters in the time trend analyses. Liver and kidney have been sampled from preferably older (large) individuals.

This sampling strategy was different from the one used in previous years and was chosen following statistical analyses of time series (Dam and Rigét, 2006), which established a higher probability of detecting directional trends in younger (immature) whales than in older individuals. Thus, it was decided to adjust the monitoring so that pilot whale muscle and blubber samples were analysed with the purpose of detecting possible time-trends, whereas liver and kidney samples were analysed with the objective of detecting negative biological effects of pollutants.

2.5 Brown trout (*Salmo trutta*)

Due to the already mentioned difficulties in obtaining Arctic char, investigations into the suitability of brown trout as a monitoring species in AMAP has begun. Both the analysis of pollutant concentration variation and profiles within a lake and between lakes has been initiated by using the brown trout samples already available in the ESB.

Brown trout were caught by angling in the lakes Mjáuvøtn and Leitisvatn (2017), and in Fjallavatn (2018, 2019 and 2020). The fish were stored in plastic bags, frozen at -20 °C until further sampling.

The length and weight of each fish was recorded. Muscle samples were taken from the right side fillet and analysed for Hg and Se at the FVA, for POPs at CTQ and for stable isotopes at SINLAB. The otoliths and scales were sampled and age determined by the Natural History Museum of Kópavogur in Iceland.

The livers were placed in heat-treated glass jars and stored in the ESB at -20°C for potential future studies.

2.6 Sheep (*Ovis aries*)

The liver and tallow were sampled during the slaughtering season (October) in 2017 from sheep (ewes, n = 10, lambs, n = 10) that had been grazing in Norðradalur. The samples were kept frozen at -20°C until further sample preparation.

The sheep were analysed as four pooled samples, two with five ewes and two with five lambs. The livers were analysed for Hg, Se and Cd at FVA, and tallow was anlysed for POPs at Evnaskyn.

The monitoring of sheep has been discontinued as a regular monitoring species.

3 Results

3.1 Heavy Metals

3.1.1 Black guillemot and northern fulmar

Eggs

A summary of Hg in black guillemot eggs is given in table 1 and the complete data series of Hg in black guillemot eggs is plotted in figure 1. The results of the individual eggs are given in Appendix A.

Table 1: Hg and Se concentrations in black guillemot eggs from 2017 - 2020

Year		Dry matter (%)	Hg (mg/kg ww)	Se (mg/kg ww)
2018 (n = 10)	mean	25.77	0.49	
	sd	1.15	0.14	
	median	**25.75**	**0.43**	
	min	24.40	0.40	
	max	28.50	0.86	
2020 (n = 3)	mean	27.13	0.65	0.74
	sd	2.45	0.06	0.04
	median	**28.50**	**0.62**	**0.72**
	min	24.30	0.62	0.7
	max	28.60	0.72	0.79

The temporal data of Hg in black guillemot eggs are plotted in figure 1 for the two different egg sampling locations Koltur and Skúvoy. It can be observed that from 2000 up until 2016 there has been a steep incline in the concentration of mercury, but this incline in concentration appears to have flattened out in 2018 and 2020.

Black guillemot eggs have not been sampled from Skúvoy since 2014, and this could possibly influence the median annual results. The Hg concentration was generally higher in eggs collected in Skúvoy, and this difference was confirmed statistically significant in 2006 and 2010, as indicated by the asterix in figure 1.

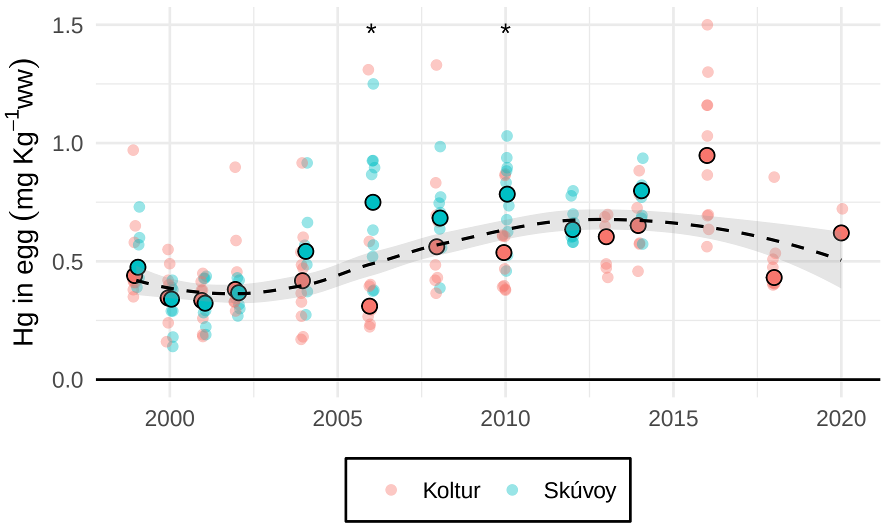

Figure 1: Hg concentration in black guillemot eggs from Koltur (red), and Skúvoy (blue) from 1999-2020. Black outlined points represent the median of a particular year for that particular location. The data have been robust LOESS fitted with a symmetric argument and the 95% confidence of the fit is shown. Asterixes indicate the year where there is a significant difference between the two sampling locations (p<0.05, Wilcoxon).

A summary of Hg in northern fulmar eggs is given in table 2. The results of the individual eggs are given in Appendix A.

Table 2: Hg and Se concentrations in northern fulmar eggs from 2017 - 2020

Year		Dry matter (%)	Hg (mg/kg ww)	Se (mg/kg ww)
	mean	24.27	0.32	1.11
	sd	1.18	0.12	0.12
2020 (n = 10)	**median**	**24.53**	**0.30**	**1.12**
	min	21.84	0.18	0.88
	max	25.91	0.53	1.30

Northern fulmar eggs have only been collected in 2020 as part of a potential transition in monitoring species from black guillemot, which might not be feasible to sample in the future.

Liver

The concentration of heavy metals in black guillemot liver was analysed in birds shot for scientific purposes near Tindhólmur. The same analysis was done in livers of fledging northern fulmars caught for consumption north-west of Vestmanna (2017-2020).

Table 3: Hg, Se and Cd concentrations in black guillemot liver from 2017 - 2020

Year		Dry matter (%)	Hg (mg/kg ww)	Cd (mg/kg ww)	Se (mg/kg ww)
2018 (n = 6)	mean	33.00	0.85	0.63	1.80
	sd	1.12	0.21	0.10	0.65
	median	**33.10**	**0.76**	**0.63**	**1.75**
	min	31.40	0.67	0.48	0.85
	max	34.60	1.13	0.74	2.70

The summary results of Hg, Cd and Se in black guillemot and northern fulmar livers are shown in table 3 and 4, respectively. The individual results are given in Appendix B.

Table 4: Hg, Se and Cd concentrations in northern fulmar liver from 2017 - 2020

Year		Dry matter (%)	Hg (mg/kg ww)	Cd (mg/kg ww)	Se (mg/kg ww)
2017 (n = 9)	mean	30.47	0.21	0.20	2.68
	sd	0.93	0.12	0.07	0.78
	median	**30.90**	**0.16**	**0.19**	**2.71**
	min	28.40	0.09	0.10	1.74
	max	31.20	0.42	0.33	3.87
2018 (n = 10)	mean	31.38	0.32	0.25	4.70
	sd	2.48	0.10	0.20	2.40
	median	**31.00**	**0.34**	**0.17**	**4.22**
	min	28.20	0.16	0.08	2.22
	max	36.60	0.49	0.74	8.09
2019 (n = 10)	mean	29.59	0.23	0.13	2.76
	sd	0.93	0.10	0.07	0.69
	median	**29.45**	**0.21**	**0.11**	**2.55**
	min	28.10	0.12	0.06	2.04
	max	31.10	0.42	0.25	3.88
2020 (n = 10)	mean	30.09	0.32	0.12	3.01
	sd	1.21	0.11	0.08	0.37
	median	**29.90**	**0.29**	**0.10**	**3.20**
	min	28.80	0.18	0.05	2.39
	max	32.80	0.52	0.31	3.42

The Hg, Cd and Se concentrations in black guillemot livers from 1995 to 2018 and northern fulmar livers from 2016 to 2020 are plotted in figure 2. It can be observed that there is a difference in concentration levels, northern fulmar having a lower concentration of Hg and Cd, while a higher concentrations of Se. This may be due to the sampled black guillemot generally being older than the sampled northern fulmar.

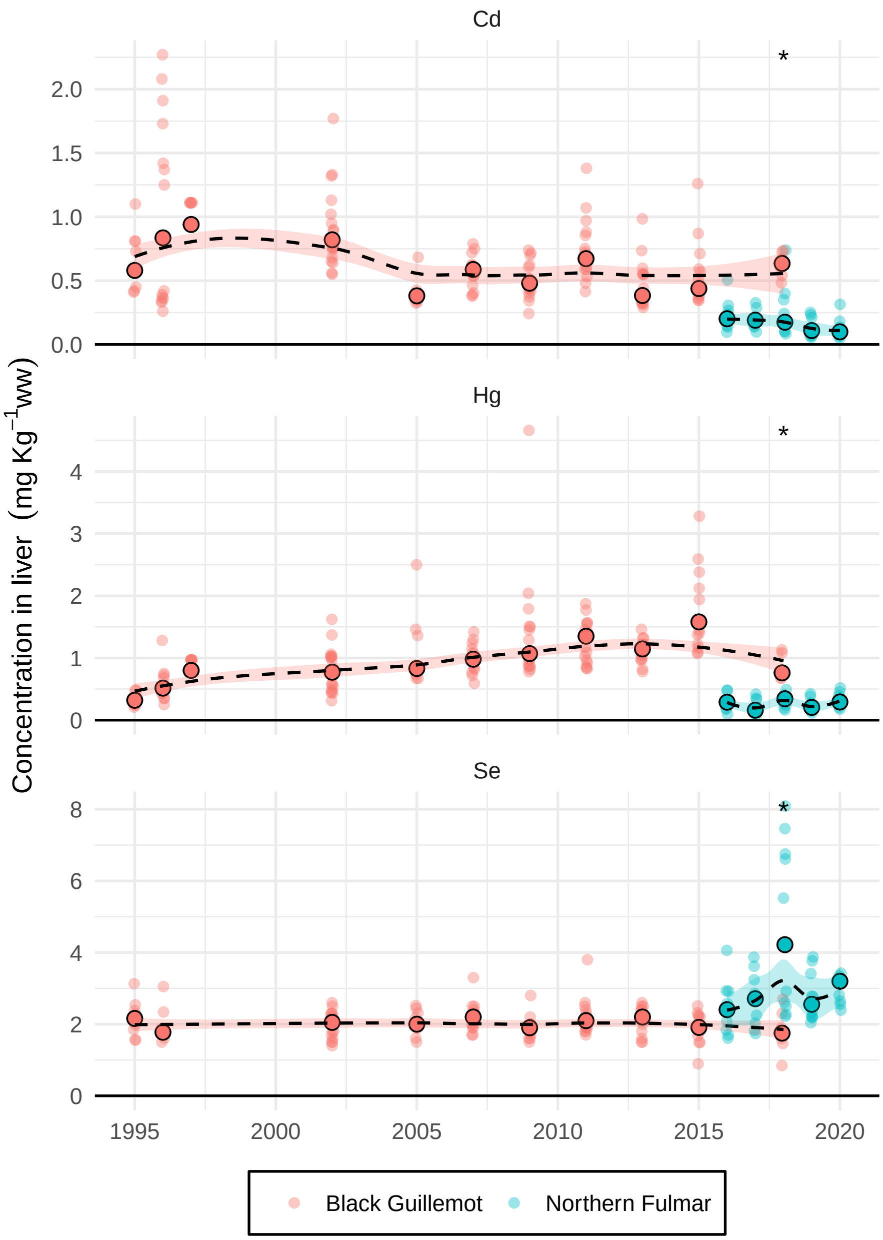

Figure 2: Temporal trends of metal concentration in black guillemot (red) and northern fulmar (blue) liver. The larger data points with a black outline represent the median of a particular year for that particular species. The data have been robust LOESS fitted with a symmetric argument (black dashed line) and the 95% confidence of the fit is shown. Asterisks on top indicate years where there is a significant difference between the two species ($p<0.05$, Wilcoxon).

Feather

The feathers of black guillemots sampled in 2018 and northern fulmar in 2017-2020 were analysed for Hg. A summary of the results is shown in tables 5 and 6. Individual results are shown in appendix B.

Table 5: Summary of metals in black guillemot feather from 2017 - 2020

Year		Dry matter %	Hg mg/kg ww	Hg mg/kg dw
2018 (n = 6)	mean	69.03	3.10	4.51
	sd	15.79	0.91	0.86
	median	**68.30**	**3.16**	**4.67**
	min	47.50	2.14	3.34
	max	90.90	4.66	5.70

Table 6: Summary of metals in northern fulmar feather from 2017 - 2020

Year		Dry matter %	Hg mg/kg ww	Hg mg/kg dw
2017 (n = 9)	mean	79.97	0.62	0.77
	sd	3.67	0.30	0.37
	median	**80.50**	**0.50**	**0.60**
	min	73.10	0.34	0.43
	max	84.00	1.31	1.57
2018 (n = 10)	mean	79.89	1.12	1.41
	sd	2.09	0.38	0.50
	median	**80.40**	**1.05**	**1.30**
	min	75.10	0.57	0.70
	max	82.10	1.83	2.29
2019 (n = 10)	mean	81.16	1.00	1.24
	sd	4.08	0.20	0.24
	median	**81.45**	**0.99**	**1.19**
	min	75.10	0.75	0.98
	max	87.60	1.34	1.61
2020 (n = 10)	mean	74.69	0.93	1.24
	sd	5.82	0.25	0.32
	median	**75.85**	**0.98**	**1.36**
	min	62.80	0.34	0.44
	max	81.80	1.26	1.55

The Hg concentrations in feather (under wing) of black guillemot from 1996 to 2018 and northern fulmar from 2016 to 2020 have been plotted in figure 3. There is a clear difference in the level of Hg concentrations, yet the trend appears similar. This difference could at least partially be explained by the difference in bird age at sampling.

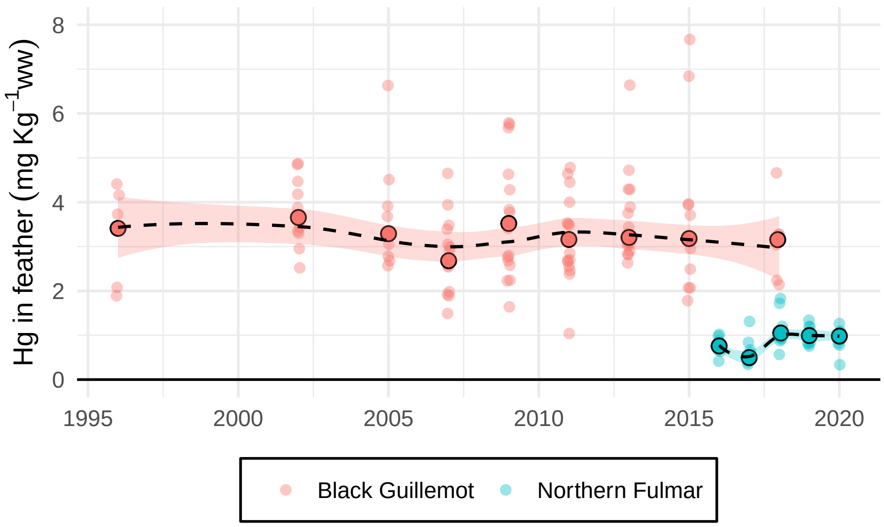

Figure 3: Temporal trend of the Hg concentration in black guillemot (red) and northern fulmar (blue) from 1996 to 2020. Larger black outlined points represent the median of particular species and year. The data has been robust LOESS fitted with a symmetric argument and the 95% confidence of the fit is shown.

Figure 4 shows the Hg concentrations (log-transformed) in feather vs liver in black guillemot (red) and northern fulmar (blue), along with the respective linear regression models.

The scientific community strives to facilitate non-destructive sampling, and therefore an attempt has been made to analyse whether feather contaminant concentration correlates with liver contaminant concentration.

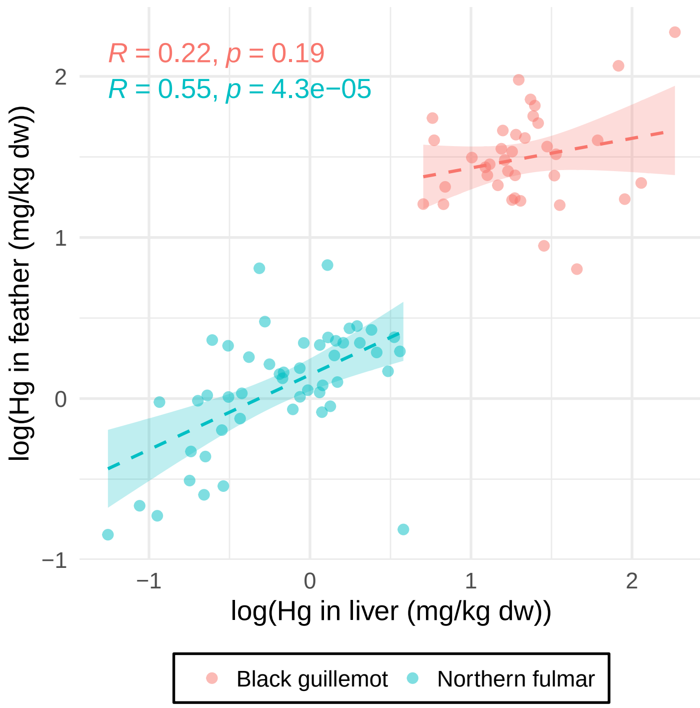

Figure 4: Log transformed Hg concentrations in feather vs liver (dry weight) of black guillemot and northern fulmar. Dashed lines indicate a linear fit of the data with a 95 % confidence interval.

The feather and liver Hg concentrations in black guillemot are not significantly correlated with a p-value of 0.187. For northern fulmar, feather and liver Hg concentrations are significantly correlated with a p-value of <0.005. The non-significant linear model of guillemot Hg data explains 0.22 of the variance, compared to 0.55 of the variance explained by the significant linear model of the northern fulmar Hg data.

This indicates that northern fulmar feather could potentially be used as an option to replace liver as a matrix for Hg analysis - however, further analysis is needed to establish this.

Muscle

Northern fulmar muscle is a fairly recent addition to our monitoring series. When it was decided to substitute northern fulmar as a seabird monitoring species, it was also decided to analyse fulmar muscle, as this is a staple diet of the Faroese people.

Table 7: Hg and Se concentrations in northern fulmar muscle from 2017 - 2020

Year		Dry matter (%)	Hg (mg/kg ww)	Se (mg/kg ww)
2017 (n = 10)	mean	30.84	0.02	0.68
	sd	1.19	0.01	0.13
	median	**30.70**	**0.02**	**0.66**
	min	28.60	0.01	0.51
	max	32.50	0.03	0.88
2018 (n = 10)	mean	30.67	0.03	0.74
	sd	0.88	0.01	0.13
	median	**30.80**	**0.03**	**0.76**
	min	29.00	0.02	0.56
	max	32.10	0.05	0.93
2019 (n = 10)	mean	30.56	0.03	0.91
	sd	1.86	0.01	0.23
	median	**30.60**	**0.02**	**0.94**
	min	27.30	0.01	0.40
	max	32.90	0.05	1.21
2020 (n = 10)	mean	31.15	0.04	0.76
	sd	1.65	0.01	0.11
	median	**31.37**	**0.04**	**0.75**
	min	29.14	0.02	0.58
	max	34.12	0.06	0.93

A summary of the results is shown in table 7. Individual results are shown in Appendix B.

The Hg concentrations in northern fulmar muscle was analysed from 2008 to 2020 and has been plotted in figure 5. The Hg concentration levels are low, and variation is large - but it appears that Hg levels are increasing in northern fulmar muscle. This should be monitored closely.

Se in northern fulmar muscle has been analysed from 2012 to 2020 and is also plotted in figure 5. The variation is large but overall concentration levels stay about the same over the past 9 years.

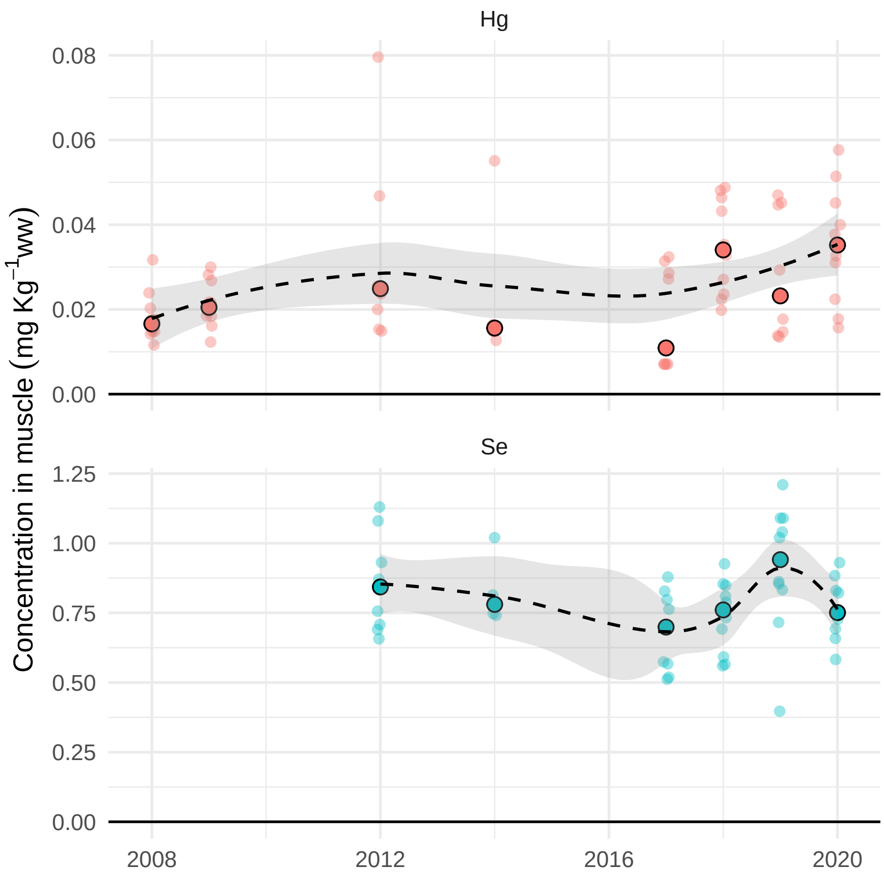

Figure 5: Temporal plot of the concentrations of Hg and Se in muscle of northern fulmar. The larger data points with black outline represent the median concentration of a particular year. The data have been robust LOESS fitted with a symmetric argument (black dashed line) and the 95 % confidence of the fit is shown. Censored values (n=4) are plotted as the square root of the detection limit (LOQ).

It is known that the toxicity of Hg is countered by the presence of Se, with Hg and Se molecules binding to each other at a 1:1 molar ratio (Yoneda and Suzuki, 1997).

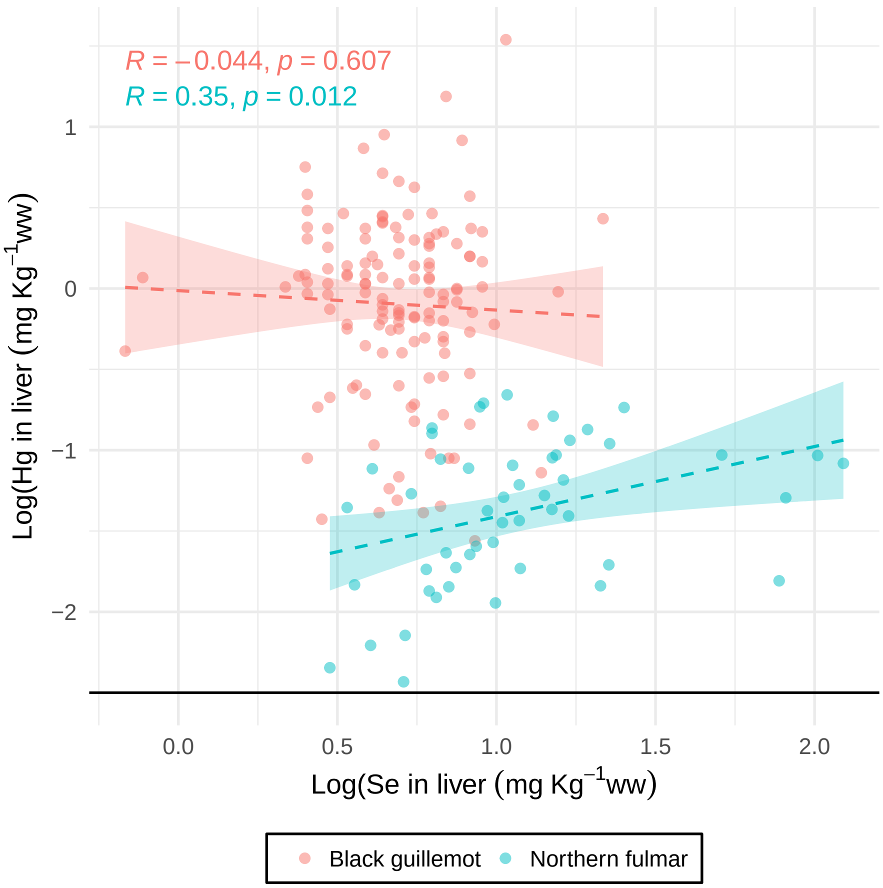

Figure 6: Log transformed Hg:Se concentrations in black guillemot and northern fulmar liver from 1996 to 2020. A linear regression model has been fitted to the data with a 95 % confidence interval shown.

For black guillemot, there is no significant linear correlation between Hg and Se (ratio = -0.04, p-value = 0.61). For northern fulmar, there is a significant linear correlation (ratio = 0.35, p-value <0.05) (see figure 6).

3.1.2 Atlantic cod

Atlantic cod muscle samples from 2017, 2018 and 2019 were analysed for Hg. Hg and Se were analysed in cod muscle samples from 2020. A summary of the results is shown in table 8. Individual results and data on biological parameters are reported in Appendix D.

Table 8: Summary of Hg and Se in Atlantic cod muscle from 2017 - 2020

Year		Dry matter %	Hg mg/kg ww	Se mg/kg ww
	mean	21.01	0.02	
	sd	0.72	0.00	
2017 (n = 15)	**median**	**21.00**	**0.02**	
	min	20.00	0.02	
	max	22.80	0.03	
	mean	19.31	0.02	
	sd	0.44	0.00	
2018 (n = 16)	**median**	**19.45**	**0.02**	
	min	18.30	0.02	
	max	19.90	0.04	
	mean	17.88	0.07	
	sd	1.68	0.04	
2019 (n = 17)	**median**	**17.80**	**0.06**	
	min	14.80	0.03	
	max	20.90	0.19	
	mean	20.57	0.04	0.30
	sd	0.75	0.01	0.03
2020 (n = 15)	**median**	**20.50**	**0.03**	**0.30**
	min	19.20	0.02	0.26
	max	22.10	0.05	0.36

We witnessed relatively high Hg concentrations in 2019, yet in 2020 the Hg concentration was again lower. Similarly, the high concentration of Hg in cod muscle that was observed in 2013 appeared to be an outlier, as the Hg concentrations subsequent years were lower (see figure 7).

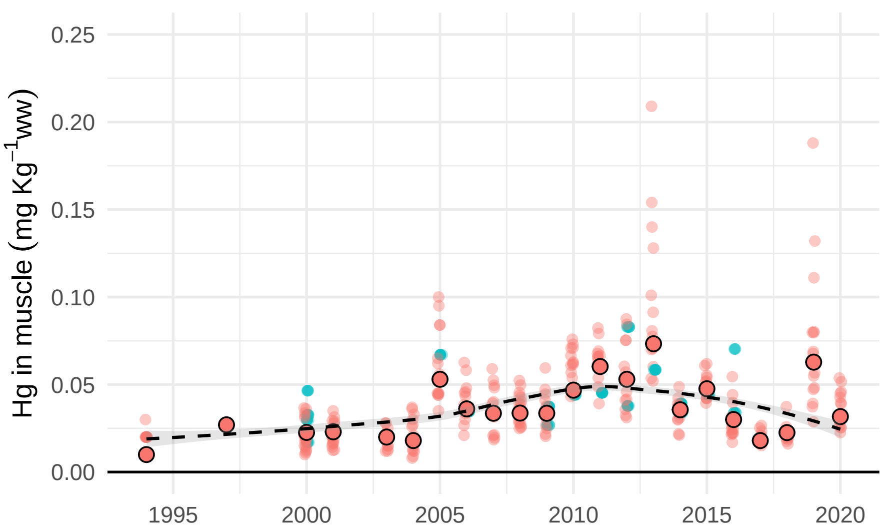

Figure 7: Temporal data of Hg concentration in Atlantic cod muscle from 1994 to 2020, individual (red) and pooled (blue) samples. The larger data points with a black outline represent the median of that particular year. The data has been robust LOESS fitted with a symmetric argument and the 95% confidence of the fit is shown.

Plotting mean Hg concentrations and mean fork length (length of cod from head to tail, where the middle of the tail is shorter) for each year shows that although the high Hg concentration in 2019 can be explained with the cod sampled in 2019 being larger compared to other years (see figure 8), fork length alone cannot explain the variability of Hg concentrations overall.

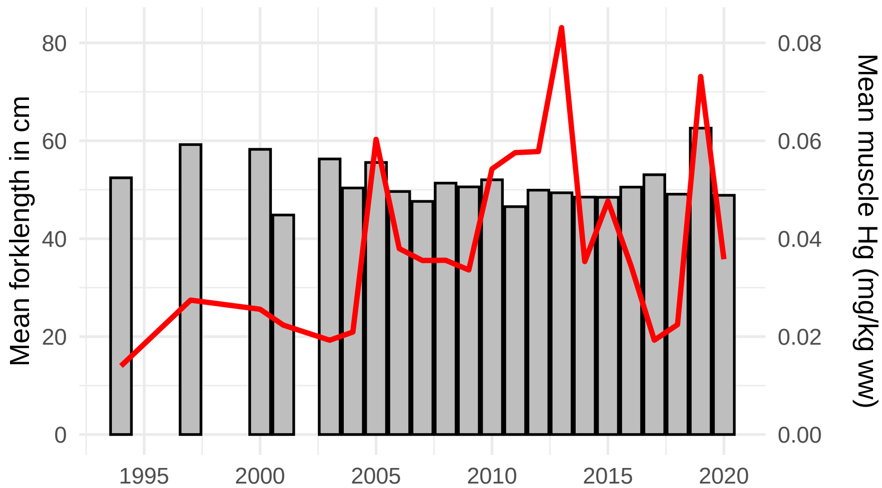

Figure 8: Temporal Hg concentrations (red line) in Atlantic cod muscle compared with forklength (bars) indicate that forklength alone cannot predict Hg concentration variability.

3.1.3 Pilot whale

Pilot whales sampled in 2017, 2018, 2019 and 2020 were analysed for Hg and Se in muscle, Hg, Se and Cd in liver, and Cd in kidney. The complete datasets for each individual whale and their biometrics are provided in Appendix C.

Muscle

A summary of the results of metal analyses (Hg and Se) in juvenile male pilot whale muscle is shown in table 9.

Table 9: Summary of metals in juvenile male pilot whale muscle from 2017 - 2020

Year		Dry matter (%)	Hg (mg/kg ww)	Se (mg/kg ww)
	mean	28.30	2.34	0.73
	sd	1.68	0.57	0.12
2017 (n = 25)	**median**	**28.40**	**2.34**	**0.72**
	min	24.90	1.36	0.55
	max	32.80	3.45	0.98
	mean	28.45	1.86	0.82
	sd	2.44	0.52	0.17
2018 (n = 25)	**median**	**27.70**	**1.81**	**0.82**
	min	25.30	0.79	0.50
	max	33.40	3.11	1.11
	mean	28.32	1.91	0.69
	sd	1.78	0.28	0.16
2019 (n = 25)	**median**	**27.80**	**1.85**	**0.66**
	min	25.50	1.39	0.50
	max	32.30	2.60	1.10
	mean	29.96	1.73	0.61
	sd	2.08	0.56	0.09
2020 (n = 9)	**median**	**29.90**	**1.80**	**0.62**
	min	26.40	0.47	0.47
	max	33.80	2.60	0.72

The temporal data of Hg and Se concentrations in juvenile male pilot whale muscle samples from 1997 to 2020 are shown in figure 9. The Hg concentration in juvenile male pilot whale muscle has been increasing, but this trend appears to have slowed down over the recent years, and even to be decreasing.

Se concentrations in juvenile male pilot whale increased in the years 2010 to 2015, but after that it has slowly returned to levels pre 2010.

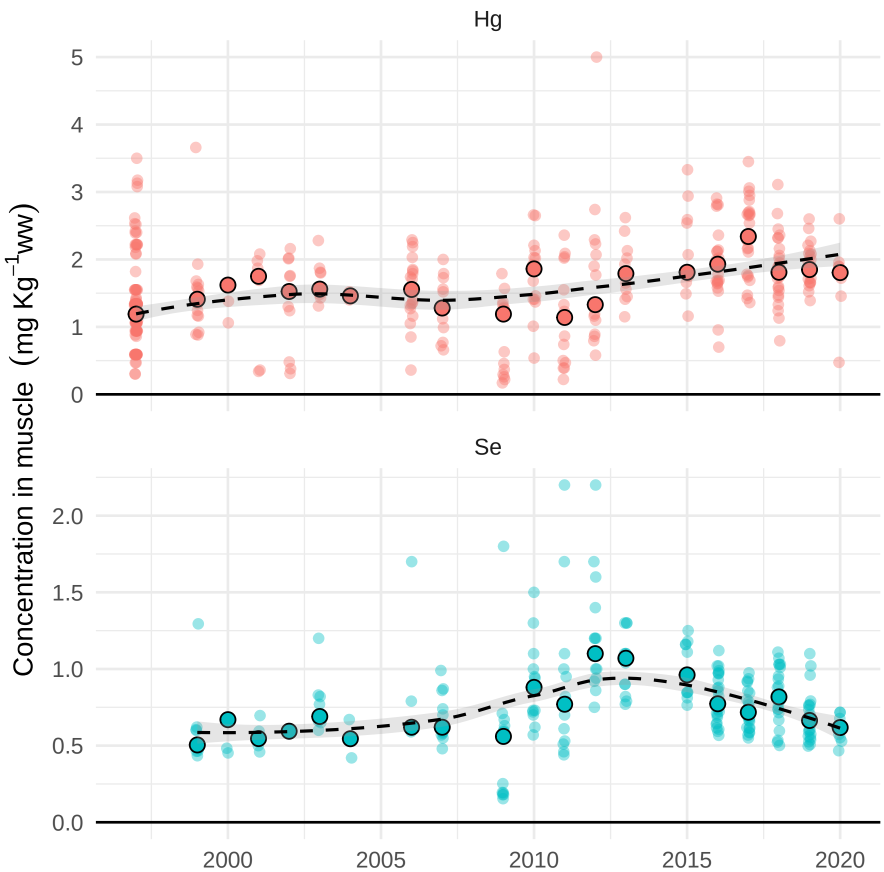

Figure 9: Time series of the concentrations of Hg and Se in muscle tissue of juvenile male pilot whales. The larger data points with a black outline represent the median concentration of that particular year. The crosses represent data recorded by other research groups. The data has been robust LOESS fitted (black dashed line) and the 95% confidence of the fit is shown.

It is well documented that Hg concentration increases with age in pilot whales due to bioaccumulation (Caurant et al., 1994; Caurant et al., 1993; Dam, 2000). Age is not a parameter that is easily measured in pilot whales; for the young individuals however, length may be used as a proxy for age (Bloch et al., 1993). In figure 10 the Hg muscle concentration in juvenile pilot whales (males and females) is plotted against the whale length. The figure contains all available data (i.e. this study along with previous studies) and the linear fit shows that there is a highly significant ($p < 0.005$) correlation between the Hg muscle concentration and whale length, both for female and male whales. This linear fit explains around 50% (51% and 55% in females and males, respectively) of the variation in the data.

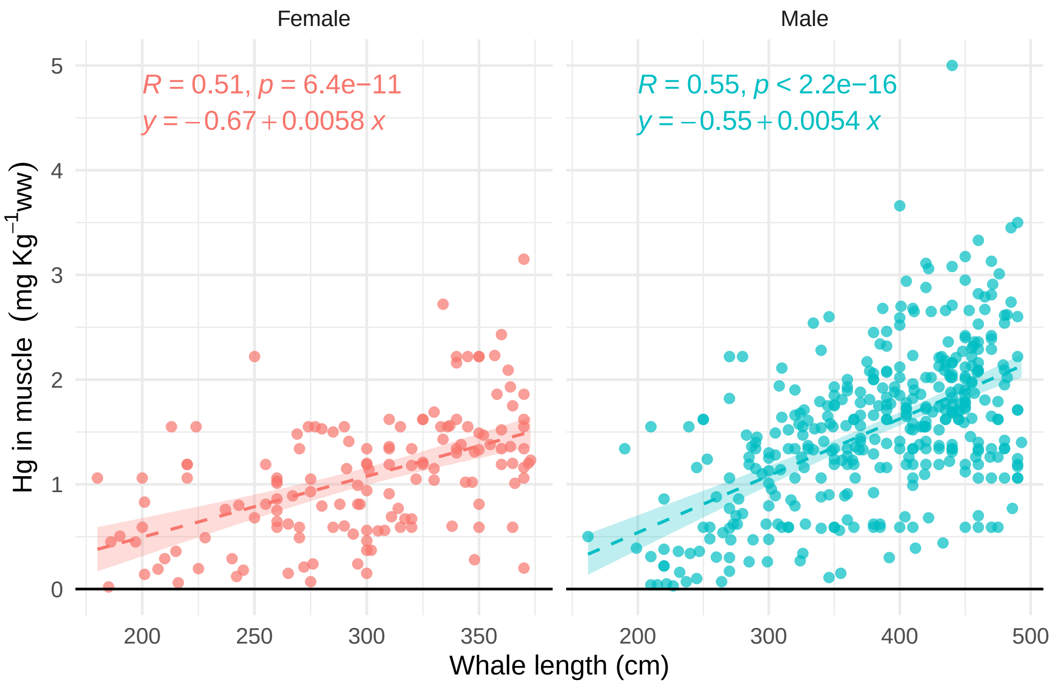

Figure 10: Hg concentration in muscle tissue of juvenile pilot whales plotted against the whale length (cm). The dashed lines indicate a linear fit of the data and the 95% confidence interval is depicted. The equations for each fit is also printed.

Liver

The metals Hg, Se and Cd were analysed in adult pilot whale liver tissue. A summary of the results are shown in table 10.

Temporal data of Hg, Se and Cd concentrations in pilot whale liver are depicted in figure 11 along with results acquired from previous years.

Table 10: Summary of metals in adult pilot whale liver from 2017 - 2020

Year		Dry matter (%)	Hg (mg/kg ww)	Se (mg/kg ww)	Cd (mg/kg ww)
	mean	27.84	90.29	26.27	34.98
	sd	2.47	66.64	10.97	26.68
2017 (n = 15)	**median**	**27.30**	**74.70**	**25.32**	**28.10**
	min	23.80	26.20	7.73	8.55
	max	34.40	302.00	52.74	121.00
	mean	26.98	79.91	20.83	33.13
	sd	2.08	58.70	9.67	21.88
2018 (n = 15)	**median**	**26.50**	**48.80**	**19.90**	**24.90**
	min	23.80	13.50	7.86	13.00
	max	32.00	207.00	43.70	85.40
	mean	28.77	127.52	22.96	40.17
	sd	1.63	78.02	13.84	23.55
2019 (n = 15)	**median**	**28.40**	**103.00**	**20.40**	**37.80**
	min	25.80	38.20	7.03	12.50
	max	31.70	321.00	56.00	101.00
	mean	27.31	98.53	17.68	29.83
	sd	0.98	82.00	14.32	23.09
2020 (n = 16)	**median**	**27.40**	**62.50**	**16.11**	**19.11**
	min	24.70	1.16	0.01	1.52
	max	28.80	276.65	49.13	75.62

Cd levels seem to be decreasing overall, whereas both Hg and Se levels remain at the same levels. A liver Hg level of 60 mg/kg ww has been suggested as a negative effects treshold level in marine mammals (Law, 1996), and it should be noted that the concentrations in pilot whale liver are notably higher than this (mean Hg concentration = 107.26 mg/kg ww).

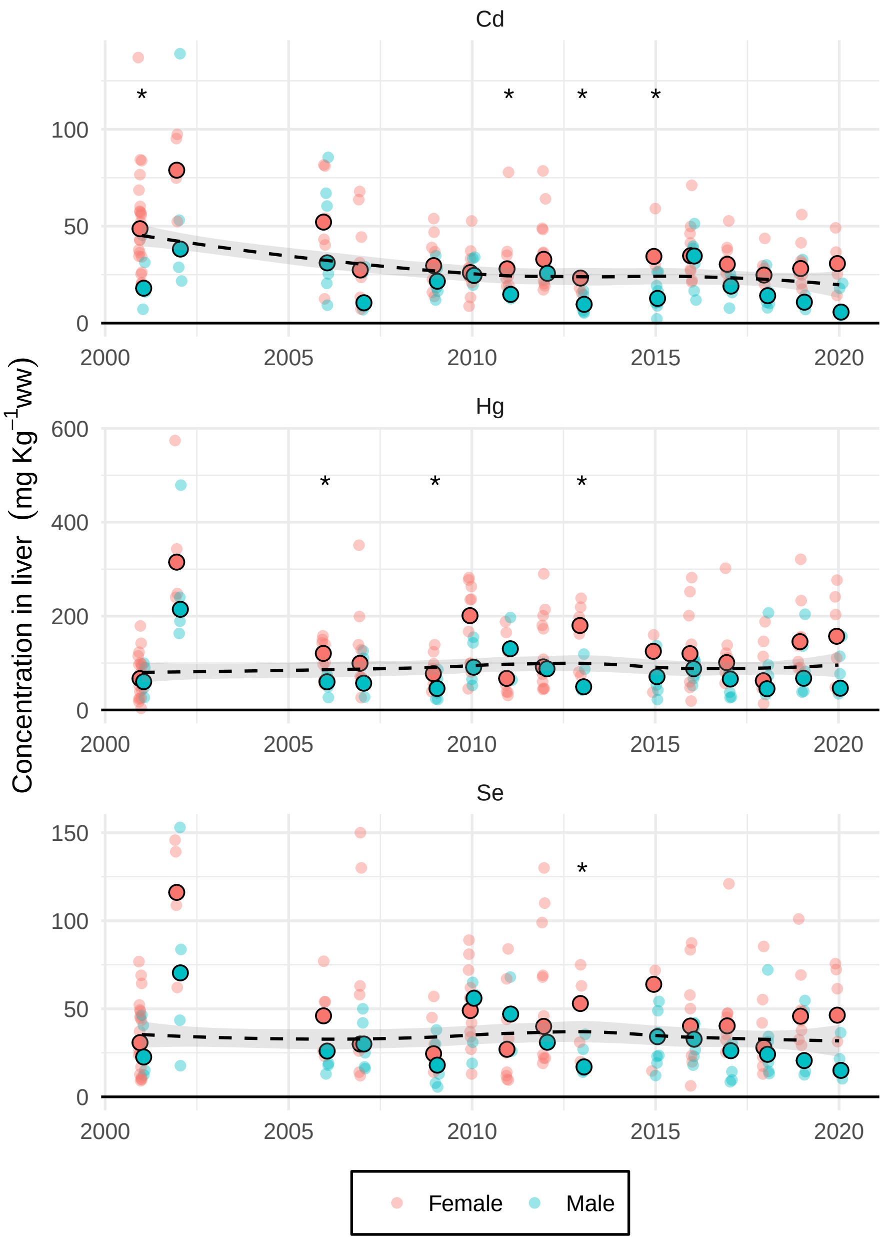

Figure 11: Time series of Cd, Hg and Se concentrations measured in adult pilot whale livers from 2001 to 2020. Female and male are represented by red and blue, respectively. The larger data points with a black outline represent the median of that particular year for the particular sex. The data has been robust LOESS fitted (dashed lines) and the 95% confidence interval is shown. The asterix on the top indicate year where there is a significant ($p<0.05$, by Wilcoxon) difference between male and female concentrations.

It is worth noting that adult male whales generally have higher liver concentrations than female whales, yet this is not seen in our monitoring. It is known that male pilot whales continue to grow during adulthood and that size generally correlates with higher Hg levels. Plotting mean liver Hg concentrations and mean length of adult male pilot whales for each year shows that mean length cannot explain the high and variable levels in mean liver Hg concentrations.

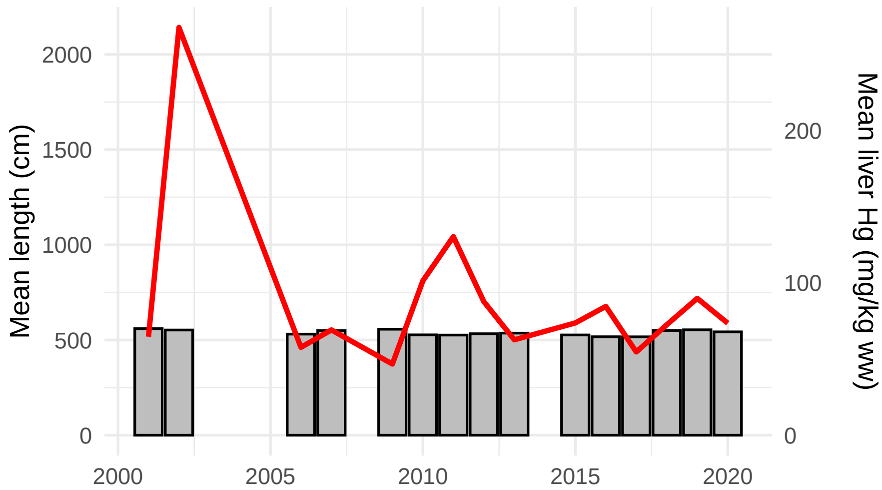

Figure 12: Temporal Hg concentrations (red line) in adult male pilot whale liver compared with length (bars) showing that mean length cannot explain the variability in mean liver Hg concentrations.

Figure 13 shows Hg vs Se in liver tissue of adult pilot whales. Se has been shown to negate the toxic effects of Hg by binding the Hg molecule.

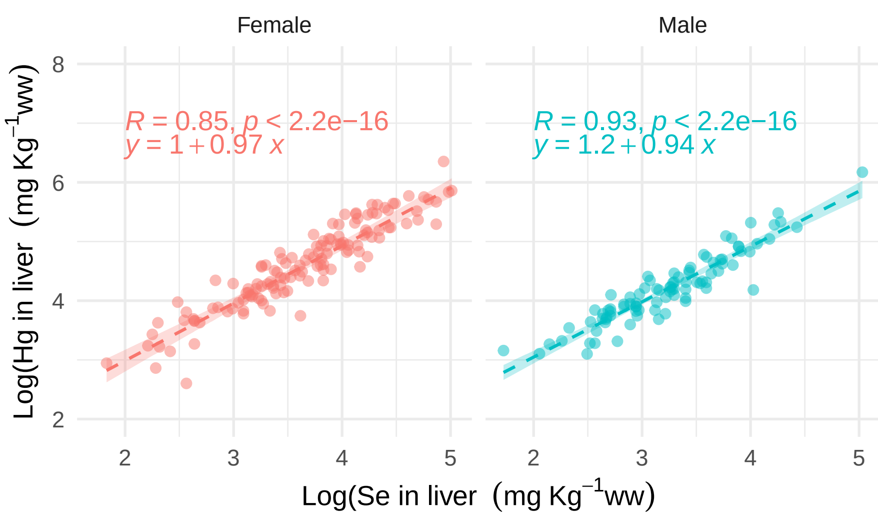

Figure 13: Log transformed Se and Hg concentrations in liver samples of female (red) and male (blue) adult pilot whales from 2001 to 2020. A linear regression model has been fitted to the data, the equation is printed on the plot.

The figure shows that there is a highly significant linear correlation between the two elements (male and female ratio = 0.88, male and female p-value = <0.005). A ratio of 0.88 indicates that most of the Hg is bound to Se in adult pilot whale livers.

Kidney

Kidney samples from adult pilot whales were analysed for Cd. A summary of the results is shown in table 11.

Table 11: Summary of metals in pilot whale kidney from 2017 - 2020

Year		Dry matter (%)	Cd (mg/kg ww)
2017 (n = 15)	mean	23.65	67.43
	sd	0.82	27.25
	median	**23.70**	**61.90**
	min	22.60	25.60
	max	25.10	131.00
2018 (n = 15)	mean	21.97	66.04
	sd	0.57	22.28
	median	**21.70**	**66.70**
	min	21.30	34.40
	max	23.10	105.00
2019 (n = 15)	mean	21.95	67.61
	sd	0.94	30.57
	median	**22.00**	**61.80**
	min	20.20	26.30
	max	23.30	130.00
2020 (n = 15)	mean	22.57	64.64
	sd	0.72	37.82
	median	**22.40**	**56.17**
	min	21.20	0.13
	max	23.80	130.36

The treshold for potential kidney dysfunction in marine mammals due to Cd contamination may be in the range of 200-400 mg/kg ww (Law, 1996). The maximum kidney Cd concentration measured in pilot whale was 131, thus all below the suggested limit range.

The results of this study has been combined with Cd concentration levels from previous years, and is depicted in figure 14.

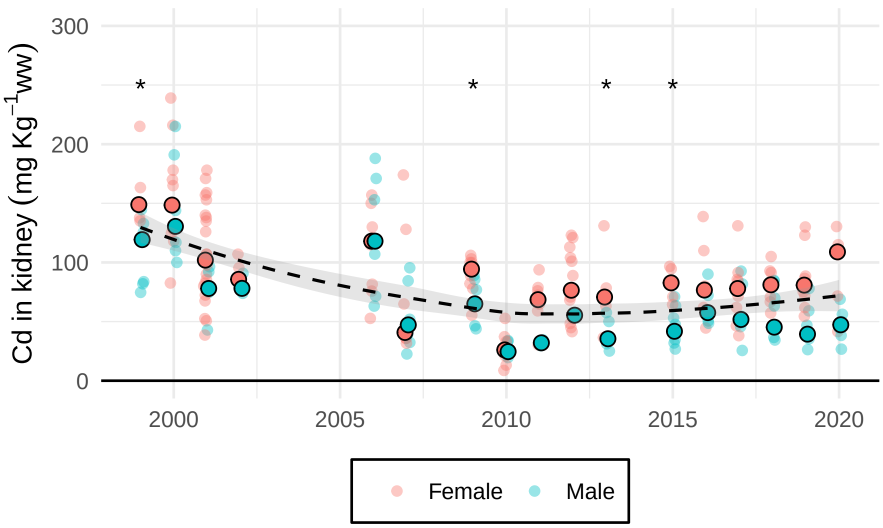

Figure 14: Temporal data of the Cd concentration in kidney tissue of adult pilot whales from 1999 to 2020. Female and male whales are represented by red and blue, respectively. The larger datapoints with a black outline represent the median of that particular year for each sex. The data has been robust LOESS fitted (dashed lines) and the 95% confidence interval is shown. The asterix on the top indicates years where there is a significant (p<0.05, by Wilcoxon) difference between male and female Cd concentrations.

3.1.4 Brown trout

While the Arctic char has been difficult to catch in recent years, the monitoring programme now includes brown trout as a substitute monitoring species. The summary results of Hg and Se are shown in table 12. Individual results along with biometric measures are found in Appendix E.

Table 12: Summary of metals in brown trout muscle from 2017 - 2020

Year		Dry matter (%)	Hg (mg/kg ww)	Se (mg/kg ww)
2017 (n = 20)	mean	23.10	0.28	1.00
	sd	1.72	0.18	0.18
	median	**23.40**	**0.25**	**1.01**
	min	18.00	0.06	0.68
	max	26.30	0.71	1.25
2018 (n = 9)	mean	24.91	0.29	1.38
	sd	1.38	0.11	0.55
	median	**24.60**	**0.27**	**1.43**
	min	22.80	0.16	0.69
	max	27.50	0.53	2.43
2019 (n = 9)	mean	24.83	0.47	1.62
	sd	1.34	0.08	0.30
	median	**25.00**	**0.50**	**1.58**
	min	22.20	0.36	1.23
	max	26.20	0.56	2.11
2020 (n = 2)	mean	26.10	0.49	1.56
	sd	3.82	0.14	0.12
	median	**26.10**	**0.49**	**1.56**
	min	23.40	0.38	1.47
	max	28.80	0.59	1.64

The Hg and Se concentrations in brown trout (from 1997 to now) and Arctic char (from 1998 to 2014) have been plotted in figures 15 and 16.

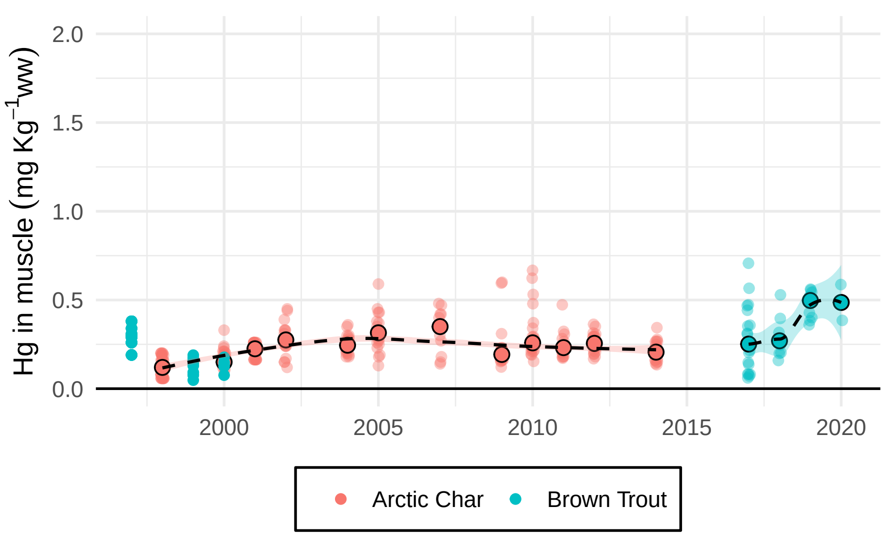

Figure 15: Hg concentrations in Arctic char (from 1998 to 2014) all sampled at Mýruvatn, and in brown trout (from 1997 to 2020) muscle sampled at various locations, e.g. at Mjáuvøtn and Leitisvatn in 2017, and in Fjallavatn from 2018-2020. The larger data points with a black outline represent the median concentration of that particular location that year.

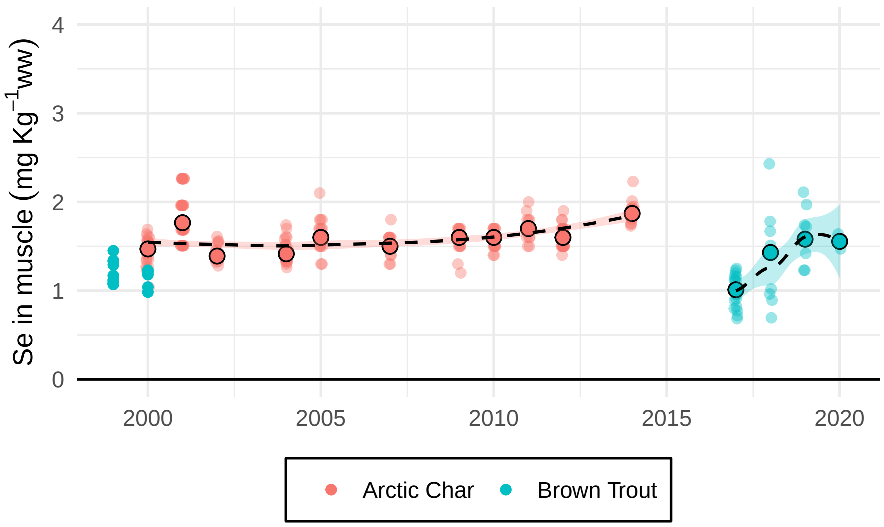

Figure 16: Se concentrations in Arctic char (from 1998 to 2014) and brown trout (from 1997 to 2020) muscle sampled at different locations. The larger data points with a black outline represent the median concentration of that particular location that year.

The Hg concentrations in Arctic char and brown trout are comparable, but yet there appears to be a rise in Hg levels in brown trout in the previous two years. The Se concentrations in brown trout were found to be slightly lower than those measured in Arctic char, but have increased rapidly over the past 4 years to levels resembling that found in Arctic char.

Plotting mean muscle Hg concentrations and mean forklength of brown trout for each year shows that mean length cannot fully explain the increase in muscle Hg concentrations (see figure 17). More data is needed to investigate this.

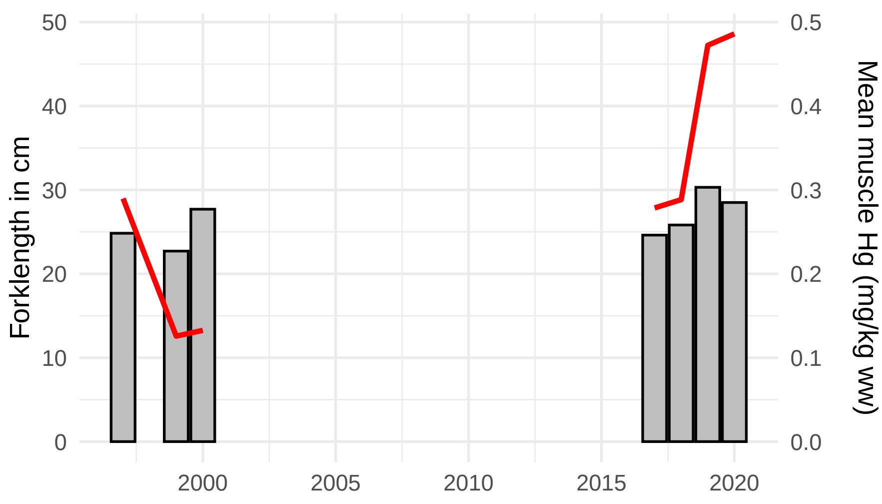

Figure 17: Temporal Hg concentrations (red line) in brown trout muscle compared with forklength (bars) showing that mean length cannot fully explain the increase in mean muscle Hg concentrations.

Including the location of sampling in the data analysis indicates that the rapid increase of Hg concentration in brown trout muscle in recent years could possibly be explained by sampling site (figure 18). This should be further investigated.

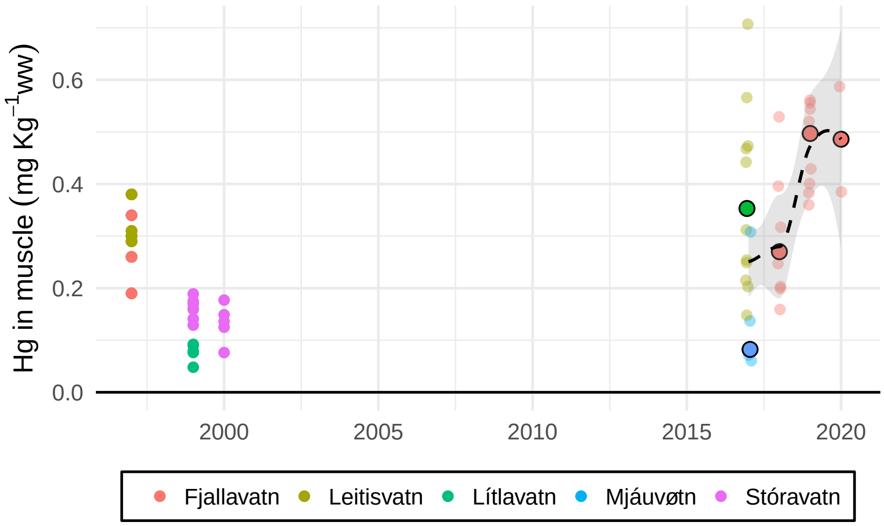

Figure 18: The sampling locations (red = Fjallavatn, brown = Leitisvatn, green = Lítlavatn, blue = Mjáuvøtn, purple = Stóravatn) of brown trout could explain the variations in temporal Hg concentrations in brown trout muscle.

3.1.5 Sheep

Livers from adult females (sheep) and juveniles (lamb) were analysed for Hg, Se, and Cd in 2017. This monitoring species has since been discontinued in the monitoring programme. The results of the metal analyses on pooled samples are shown in table 13. Information on the individuals can be found in Appendix F.

Table 13: Summary of Metals in sheep and lamb liver from 2017 - 2020

Year			Dry matter (%)	Hg (mg/kg ww)	Se (mg/kg ww)	Cd (mg/kg ww)
2017 (n = 10)	Ewe	mean	31.45	<0.01	0.46	0.08
		sd	0.05	0.00	0.05	0.01
		median	**31.45**	**<0.01**	**0.46**	**0.08**
		min	31.40	<0.01	0.41	0.07
		max	31.50	<0.01	0.51	0.09
	Lamb	mean	32.70	<0.01	0.38	0.02
		sd	0.00	0.00	0.04	0.00
		median	**32.70**	**<0.01**	**0.38**	**0.02**
		min	32.70	<0.01	0.34	0.02
		max	32.70	<0.01	0.42	0.02

The Hg concentration in both groups was below the detection limit (<0.01). The Cd concentration was fourfold higher in ewes than in lambs. The Se concentration in ewes was slightly higher than in lambs.

The sheep livers were analysed as pooled samples, and the individual variations can therefore not be evaluated. Sheep metal concentrations have been analysed since 1997 and Cd concentrations are shown in figure 19. Hg levels have only occasionally been detected these years.

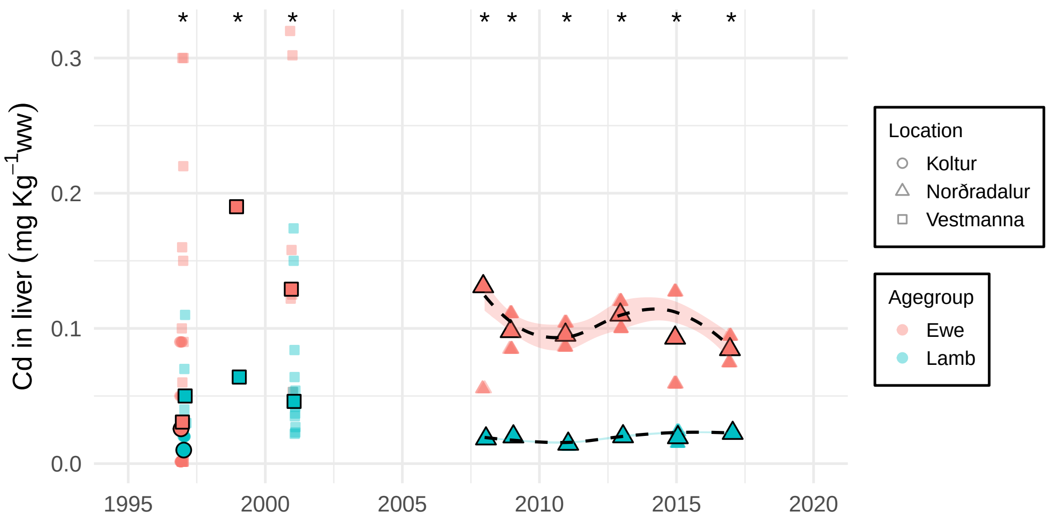

Figure 19: Time series of the Cd concentrations in liver tissue of sheep. Ewe and lamb are represented by red and blue, respectively, sampled at three different locations (point shape, see legend). The larger datapoints with a black outline represent the median of that particular year at that particular location. The data from Norðradalur has been robust LOESS fitted (dashed lines) and the 95% confidence of the fit is shown. Asterixes on top indicate years where there is a significant (p<0.05, by Wilcoxon) difference between ewe and lamb Cd concentrations. Censored values (n=16) are plotted as the square root of the detection limit (LOQ).

3.2 Persistent Organic Pollutants

3.2.1 Black guillemot and northern fulmar

Eggs

Black guillemot eggs were sampled in June at Koltur in 2016, 2018 and 2020. Eggs used to be sampled in Skúvoy as well but since 2016 we have only been able to sample in Koltur. Only three black guillemot eggs were sampled in Koltur in 2020, so northern fulmar eggs from Koltur were sampled and analysed in addition.

The summary of pollutants are shown in table 14 for black guillemot eggs and in table 15 for northern fulmar. Individual results are available in Appendix A.

Not all regular contaminants have been analysed. For POPs, Evnaskyn laboratory is still in the process of expanding their analytical capabilities - as such, only a select repertoire of PCBs and PFAS have been analysed.

Table 14: PCB concentrations in black guillemot eggs from 2016 - 2020

Year		Lipids %	PCB 52 ng/g lw	PCB 138 ng/g lw	PCB 153 ng/g lw	PCB 180 ng/g lw	PCB5* ng/g lw
	mean	11.07	6.66	125.60	361.5	151.90	716.3
	sd	1.59	4.08	36.90	114.3	60.63	227.8
2016 (n = 10)	**median**	**10.80**	**6.16**	**136.50**	**353.3**	**137.30**	**704.3**
	min	9.30	2.07	50.39	158.7	68.05	312.5
	max	13.90	14.39	170.90	567.0	271.40	1103.0
	mean	10.44	3.22	158.50	361.4	141.90	744.5
	sd	1.50	1.48	79.20	127.5	48.03	297.6
2018 (n = 4)	**median**	**11.12**	**2.80**	**134.50**	**331.5**	**126.70**	**656.9**
	min	8.20	1.95	91.96	243.6	104.10	494.0
	max	11.30	5.33	273.00	539.2	210.20	1170.0
	mean	10.03	8.53	169.10	396.3	162.30	820.9
	sd	1.17	1.05	70.10	111.0	37.60	253.9
2020 (n = 3)	**median**	**9.80**	**8.04**	**146.30**	**376.0**	**157.00**	**764.2**
	min	9.00	7.81	113.20	296.9	127.60	600.2
	max	11.30	9.73	247.70	516.1	202.20	1098.0

* The sum of PCB 101, PCB 118, PCB 138, PCB153 and PCB 180

Table 15: PCB concentrations in northern fulmar eggs from 2020

Year		Lipids %	PCB 52 ng/g lw	PCB 138 ng/g lw	PCB 153 ng/g lw	PCB 180 ng/g lw	PCB5* ng/g lw
	mean	8.29	2.08	495.0	1419.0	768.5	3132
	sd	0.88	1.32	256.0	502.4	278.9	1292
2020 (n = 10)	**median**	**8.35**	**1.65**	**440.1**	**1486.0**	**721.1**	**3012**
	min	6.30	0.90	165.1	597.1	328.6	1236
	max	9.40	5.18	1121.0	2314.0	1225.0	5897

* The sum of PCB 101, PCB 118, PCB 138, PCB153 and PCB 180

It is worth noting that the levels of PCBs in northern fulmar eggs from 2020 are much higher than in black guillemot eggs.

In figure 20 the data of selected POPs in black guillemot eggs from this work and previous years of AMAP monitoring have been plotted.

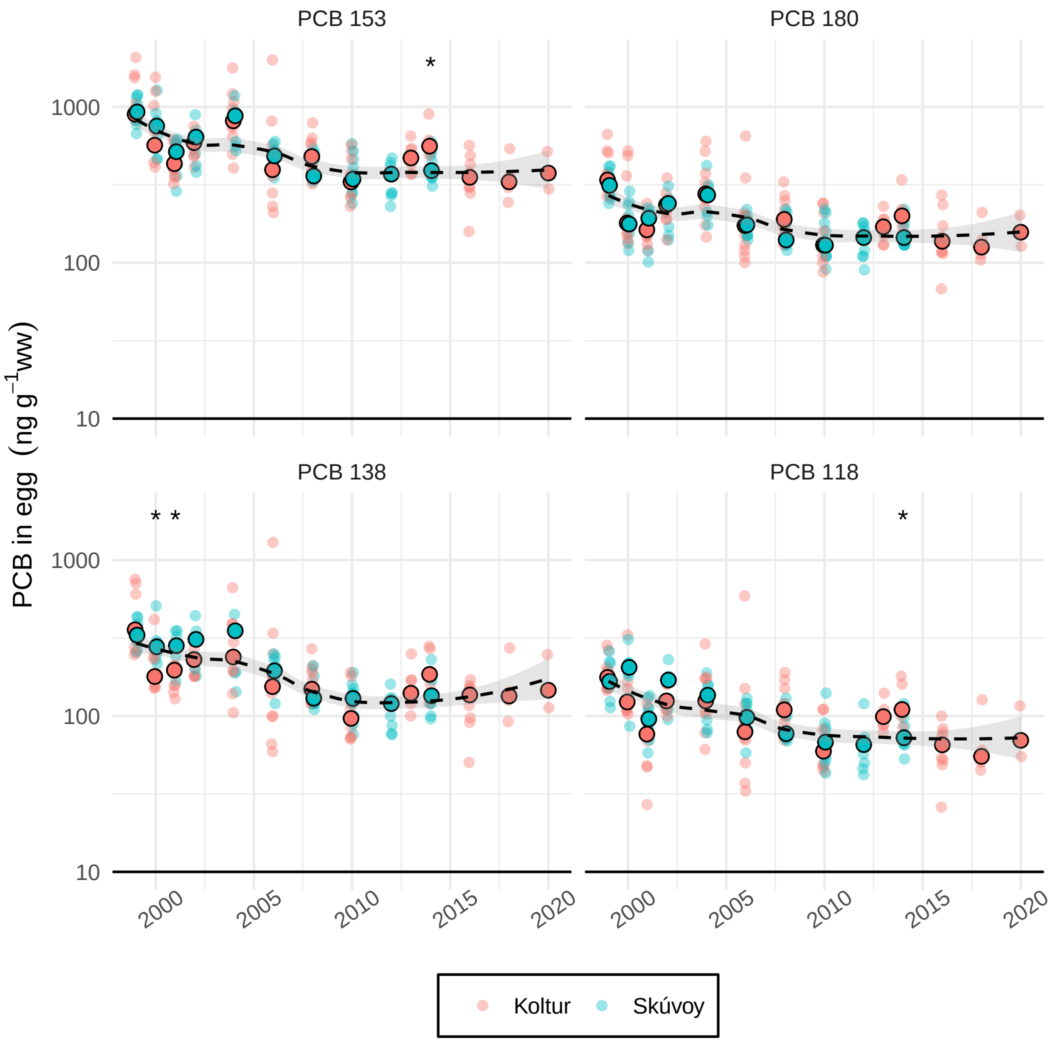

Figure 20: Selected POPs (PCBs 118, 138, 153 and 180) in black guillemot eggs from Koltur (red) and Skúvoy (blue) in the years 1999 to 2020. The larger data points with a black outline represent the median of that particular location per year. The data has been robust LOESS fitted and the 95% confidence interval is shown. The asteriks on the top indicates year where there is a significant (p<0.05, by Wilcoxon) difference in concentrations between the sampling locations.

Muscle

Northern fulmar muscle from 2016 to 2020 was analysed for PCBs 28, 101, 118, 138, 153 and 180. The summary of PCBs is shown in table 16, and the individual results are given in appendix B.

Table 16: PCB concentrations in northern fulmar muscle from 2016 - 2020

Year		Lipids %	PCB 52 ng/g lw	PCB 138 ng/g lw	PCB 153 ng/g lw	PCB 180 ng/g lw	PCB5* ng/g lw
2016 (n = 10)	mean	8.92	3.03	69.42	153.30	55.65	330.4
	sd	2.15	1.84	29.52	56.71	20.61	126.5
	median	**8.75**	**1.95**	**66.12**	**141.30**	**55.09**	**307.1**
	min	6.40	1.27	27.00	71.27	22.48	141.1
	max	14.05	6.12	132.40	284.00	97.86	611.2
2017 (n = 10)	mean	11.67	1.62	79.23	173.10	73.63	374.3
	sd	2.27	0.77	42.00	75.15	36.91	172.5
	median	**11.20**	**1.41**	**65.44**	**147.20**	**56.51**	**308.1**
	min	8.30	0.79	34.87	83.35	31.55	177.7
	max	15.60	3.33	173.70	294.80	135.40	685.5
2018 (n = 8)	mean	10.01	2.24	110.60	226.90	94.79	507.6
	sd	2.01	1.17	57.45	108.60	43.66	264.7
	median	**9.85**	**2.31**	**107.20**	**236.10**	**99.35**	**527.4**
	min	7.10	0.91	30.26	94.27	40.39	187.2
	max	13.10	3.95	214.40	443.10	184.20	982.9
2019 (n = 10)	mean	7.41	1.66	76.68	170.20	68.98	364.2
	sd	1.80	1.66	70.40	126.50	56.80	288.6
	median	**7.50**	**1.19**	**52.38**	**142.10**	**57.77**	**293.6**
	min	4.70	0.82	21.57	52.68	15.75	107.1
	max	9.50	6.34	238.00	432.90	198.30	999.1
2020 (n = 10)	mean	8.96	3.54	104.00	210.10	84.11	463.3
	sd	2.05	3.13	107.90	191.30	77.51	437.3
	median	**8.65**	**1.51**	**44.16**	**110.50**	**46.87**	**234.3**
	min	5.40	0.94	30.69	71.26	24.24	149.9
	max	11.80	8.28	316.00	583.40	230.10	1334.0

* The sum of PCB 101, PCB 118, PCB 138, PCB153 and PCB 180

3.2.2 Atlantic cod

The cod livers from 2017, 2018, 2019 and 2020 were analysed for POPs. The summaries of selected POPs are shown in table 17 and 18, and the individual POP results are given in appendix D.

The POP concentrations in 2019 in cod are considerably higher than 2017, 2018 and 2020. However, the lipid percentage was similarly considerably lower which explains the high concentrations per lipid weight.

Table 17: Selected PCBs, Toxaphenes and p,p'-DDE in Atlantic cod muscle from 2017 - 2020

Year		Lipids %	Aroclor 1260 ng/g lw	PCB 52 ng/g lw	PCB 153 ng/g lw	Par. 50 ng/g lw	p,p'-DDE ng/g lw
2017 (n = 15)	mean	50.60	135.10	22.67	16.63	8.01	27.87
	sd	4.95	42.48	4.58	5.04	1.30	14.99
	median	**51.00**	**120.00**	**20.00**	**15.00**	**8.10**	**22.00**
	min	43.00	89.00	20.00	11.00	5.80	17.00
	max	58.00	250.00	30.00	30.00	9.90	73.00
2018 (n = 14)	mean	49.64	211.60	2.95	25.36	28.70	48.21
	sd	9.73	118.60	1.39	14.14	13.26	26.93
	median	**49.50**	**175.00**	**2.80**	**21.50**	**29.00**	**40.50**
	min	28.00	75.00	0.40	9.00	3.80	16.00
	max	63.00	460.00	6.20	55.00	61.00	110.00
2019 (n = 17)	mean	17.63	1594.00	6.38	187.20	19.21	294.10
	sd	15.87	1037.00	4.35	122.30	28.43	177.80
	median	**10.00**	**1700.00**	**4.90**	**200.00**	**6.00**	**310.00**
	min	3.40	300.00	0.65	35.00	0.90	40.00
	max	54.00	3900.00	14.00	480.00	110.00	570.00
2020 (n = 15)	mean	50.47	153.90	1.36	18.54	9.12	21.95
	sd	11.12	85.84	0.50	10.64	3.72	12.66
	median	**53.00**	**130.00**	**1.30**	**15.00**	**8.50**	**17.00**
	min	26.00	61.00	0.64	7.40	4.00	9.80
	max	64.00	340.00	2.90	43.00	20.00	58.00

Table 18: Selected organochlorine pesticides in Atlantic cod liver from 2017 - 2020

Year		Lipids %	Trans-nonachlor ng/g lw	α-chlordane ng/g lw	Oxychlordane ng/g lw	HCB ng/g lw	HCH-β ng/g lw
2017 (n = 15)	mean	50.60	8.41	2.66	1.67	12.43	0.58
	sd	4.95	2.34	0.37	0.51	1.57	0.14
	median	**51.00**	**7.90**	**2.70**	**1.50**	**12.00**	**0.57**
	min	43.00	6.10	1.90	0.97	10.00	0.42
	max	58.00	15.00	3.30	3.00	15.00	0.89
2018 (n = 14)	mean	49.64	16.30	5.95	4.58		0.57
	sd	9.73	8.21	2.83	2.13		0.15
	median	**49.50**	**14.50**	**5.35**	**4.70**		**0.52**
	min	28.00	4.70	0.71	0.93		0.41
	max	63.00	37.00	13.00	8.70		0.96
2019 (n = 17)	mean	17.63	85.32	18.51	8.39	20.70	1.39
	sd	15.87	51.64	11.93	4.15	9.38	0.95
	median	**10.00**	**88.00**	**14.00**	**6.70**	**19.00**	**1.41**
	min	3.40	15.00	1.80	3.50	7.90	0.41
	max	54.00	180.00	39.00	16.00	42.00	3.54
2020 (n = 15)	mean	50.47	8.00	3.44	1.87	11.09	0.41
	sd	11.12	4.45	1.15	1.29	1.67	0.05
	median	**53.00**	**6.30**	**3.25**	**1.60**	**11.00**	**0.40**
	min	26.00	4.30	1.90	1.10	8.10	0.28
	max	64.00	19.00	6.70	6.30	14.00	0.49

Analysis of selected POPs in cod from the Faroe Shelf has been carried out since 1994, and the temporal data of selected POPs, here HCB, PCB 153, par.50 and p,p'-DDE, are plotted in figure 21. Unlike in other species, POP concentrations in cod liver have not shown a decreasing trend since 1994 and the concentrations have been variable since 2010. The highest concentration of many of the POPs was in 2015, even the highest since 1994 for certain POPs, e.g. for PCB 153 and p,p'-DDE, which are also plotted here. Similarly, in 2018 and 2019 there was a peak in certain POPs concentrations, yet the high concentrations per lipid weight in 2019 may be explained by a low lipid percentage in the same cod. Despite these, overall the trend appears to be decreasing since 2010 for all POPs analysed here.

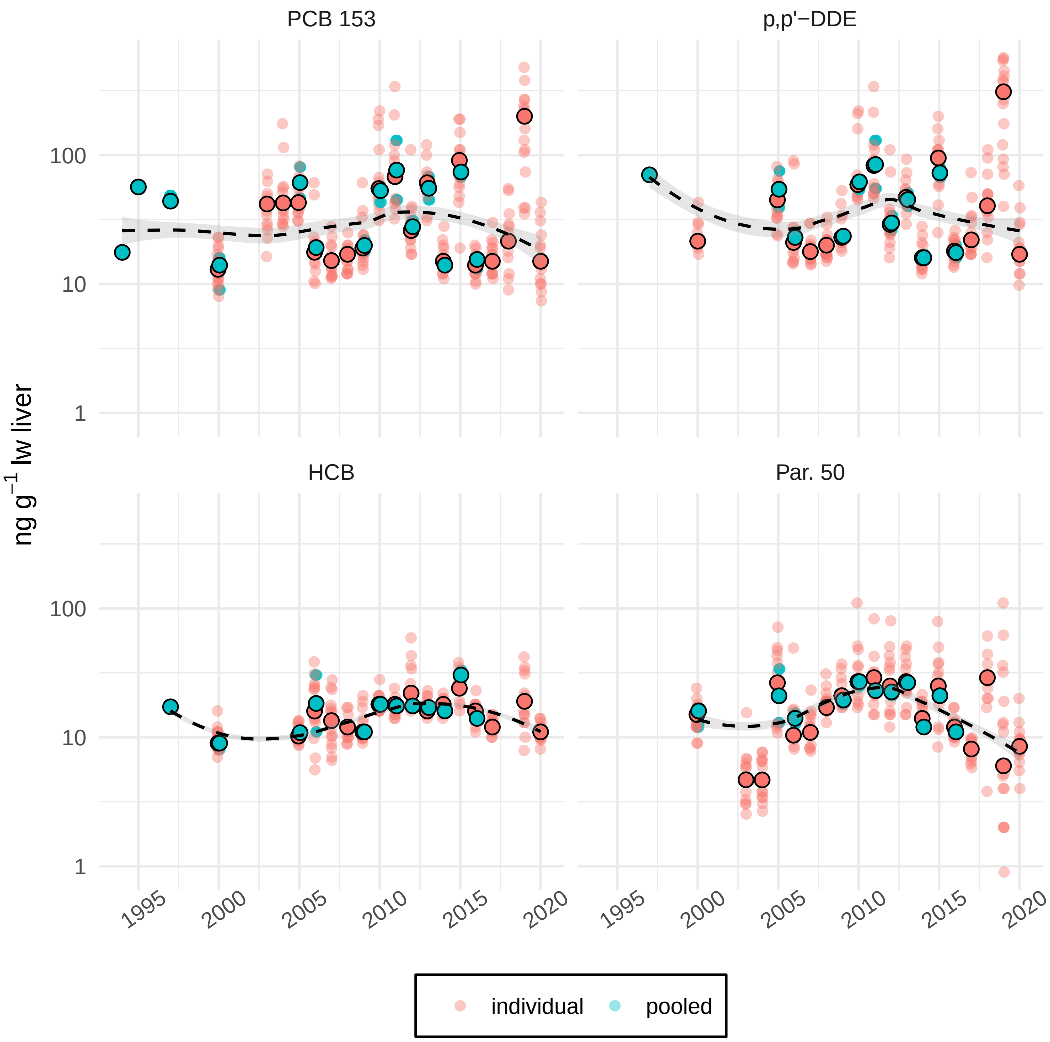

Figure 21: Selected POPs (HCB, PCB 153, toxaphene par.50 and p,p'-DDE) in Atlantic cod livers in the years 1994 to 2020. The larger data points with a black outline represent the median of that particular location per year. The data has been robust LOESS fitted and the 95% confidence interval is shown. The asterisk on the top indicates year where there is a significant (p<0.05, by Wilcoxon) difference in concentrations between the sampling locations.

3.2.3 Pilot whale

In pilot whales, as with other mammals, parameters like age and sex are important when assessing POP concentration. The age of pilot whales may be determined by analysis of the teeth, however, the age is correlated to length until they reach maturity (Bloch et al., 1993), which makes the juvenile whales the group of choice for analysis of possible trends in POPs concentrations. Thus, blubber from juvenile pilot whales was analysed for PCBs, DDTs, toxaphenes and other organochlorine pesticides. The summaries of selected POPs are shown in tables 19, 20 and 21 below, and the individual data and results are given in appendix C.

Table 19: PCB concentrations in juvenile pilot whale blubber from 2017 - 2020

Year		Lipids %	Aroclor 1260 ng/g lw	PCB 118 ng/g lw	PCB 153 ng/g lw	PCB 180 ng/g lw	PCB7* ng/g lw
	mean	84.86	10934	470.2	1263.0	442.2	3807
	sd	3.81	3811	122.5	426.5	142.7	1173
2017 (n = 25)	**median**	**86.00**	**10000**	**440.0**	**1200.0**	**420.0**	**3557**
	min	77.00	6500	320.0	750.0	260.0	2512
	max	89.00	23000	780.0	2500.0	850.0	7446
	mean	92.90	13654	502.4	1560.0	510.8	4429
	sd	5.16	5556	183.1	625.8	161.0	1662
2018 (n = 25)	**median**	**94.00**	**12000**	**430.0**	**1400.0**	**490.0**	**3934**
	min	80.00	6000	240.0	690.0	240.0	2058
	max	99.00	30000	890.0	3400.0	880.0	8955
	mean	92.36	9918	413.6	1100.0	388.0	3296
	sd	6.02	4326	199.9	462.1	165.0	1431
2019 (n = 25)	**median**	**94.00**	**8800**	**390.0**	**970.0**	**320.0**	**2987**
	min	73.00	4400	150.0	500.0	160.0	1421
	max	100.00	21000	960.0	2300.0	770.0	6841
	mean	92.23	7586	327.3	857.7	266.6	2567
	sd	5.92	3604	168.3	413.8	117.8	1247
2020 (n = 11)	**median**	**94.00**	**6100**	**250.0**	**690.0**	**240.0**	**2056**
	min	79.00	2600	130.0	280.0	78.0	943
	max	98.00	13000	610.0	1500.0	440.0	4674

* The sum of PCB28, PCB52, PCB 101, PCB 118, PCB 138, PCB153 and PCB 180

Figure 22 shows the median PCB 7 (sum of PCBs 28, 52, 101, 118, 138, 153 and 180) concentrations in juvenile pilot whale samples from 1996 to 2020.

For the PCB 7 plotted in figure 22 and for the selected POPs plotted in figure 23 the robust LOESS fit suggests a decreasing trend for all of the POPs.

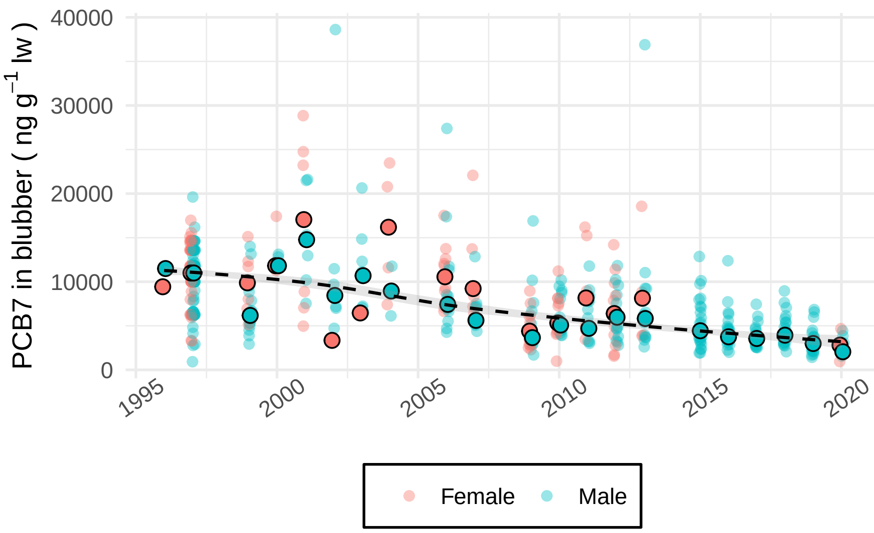

Figure 22: Time series of the PCB7 concentration in blubber of juvenile pilot whales from 1994 to 2020. Female and male whales are represented by red and blue, respectively. The larger data points with a black outline represent the median of that particular location per year. The data has been robust LOESS fitted and the 95% confidence interval is shown. The asterisk on the top indicates year where there is a significant ($p<0.05$, by Wilcoxon) difference in concentrations between the sexes.

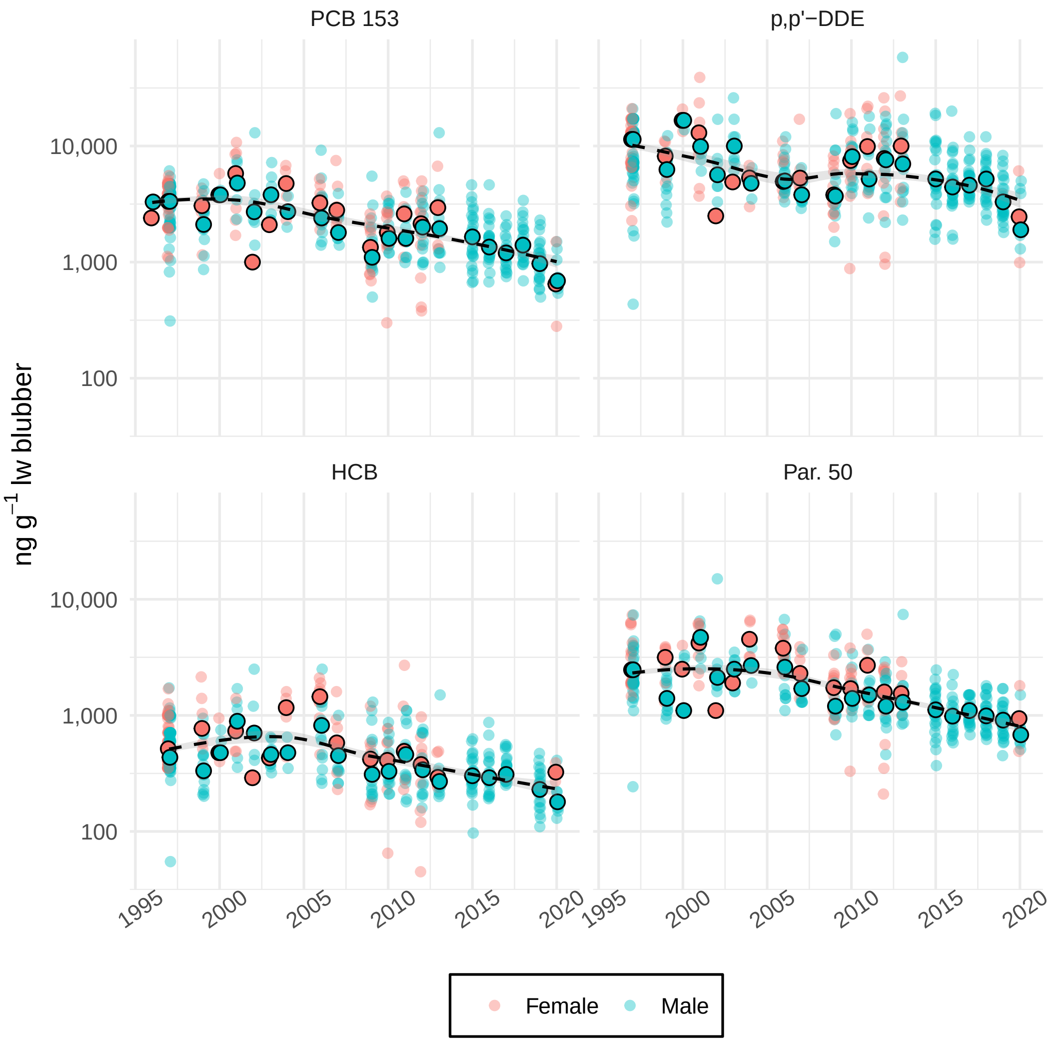

Figure 23: Selected POPs (HCB, PCB 153, toxaphene par.50 and p,p'-DDE) in juvenile pilot whale blubber, female (red) and male (blue) whales in the years 1996 to 2020. The larger data points with a black outline represent the median of that particular location per year. The data has been robust LOESS fitted and the 95% confidence interval is shown. The asterisk on the top indicates year where there is a significant (p<0.05, by Wilcoxon) difference in concentrations between the sexes.

Table 20: Toxaphenes and DDTs in juvenile pilot whale blubber from 2017 - 2020

Year		Lipids %	Par. 26 ng/g lw	Par. 50 ng/g lw	Par. 62 ng/g lw	p,p'-DDD ng/g lw	p,p'-DDE ng/g lw
	mean	84.86	722.4	1099.0	258.60	590.2	5272
	sd	3.81	175.4	250.7	81.03	146.2	2012
2017 (n = 25)	**median**	**86.00**	**700.0**	**1100.0**	**230.00**	**580.0**	**4600**
	min	77.00	535.0	680.0	130.00	390.0	3300
	max	89.00	1200.0	1500.0	440.00	970.0	12000
	mean	92.90	800.4	1074.0	184.40	601.0	5338
	sd	5.16	240.3	351.2	61.31	168.3	2238
2018 (n = 25)	**median**	**94.00**	**750.0**	**990.0**	**170.00**	**550.0**	**5200**
	min	80.00	450.0	620.0	100.00	300.0	2300
	max	99.00	1300.0	1800.0	300.00	1100.0	12000
	mean	92.36	616.8	938.0	158.40	451.4	3804
	sd	6.02	242.5	323.1	46.44	174.5	1735
2019 (n = 25)	**median**	**94.00**	**550.0**	**910.0**	**150.00**	**410.0**	**3300**
	min	73.00	290.0	450.0	91.00	220.0	1800
	max	100.00	1300.0	1700.0	240.00	920.0	8300
	mean	92.23	493.6	840.9	158.00	352.7	2817
	sd	5.92	241.5	424.5	87.70	183.5	1704
2020 (n = 11)	**median**	**94.00**	**380.0**	**680.0**	**120.00**	**260.0**	**1900**
	min	79.00	260.0	490.0	83.00	190.0	990
	max	98.00	1000.0	1800.0	380.00	770.0	6100

Table 21: Chlordanes and pesticides in juvenile pilot whale blubber from 2017 - 2020

Year		Lipids %	Trans-nonachlor ng/g lw	α-chlordane ng/g lw	Oxychlordane ng/g lw	HCB ng/g lw	β-HCH ng/g lw
	mean	84.86	1123.0	171.20	188.00	354.20	28.30
	sd	3.81	355.1	44.89	56.66	96.39	8.93
2017 (n = 25)	**median**	**86.00**	**1100.0**	**160.00**	**180.00**	**310.00**	**27.00**
	min	77.00	710.0	99.00	120.00	250.00	16.00
	max	89.00	2200.0	250.00	370.00	560.00	53.00
	mean	92.90	1242.0	137.60	166.30		24.12
	sd	5.16	441.4	47.91	63.61		7.41
2018 (n = 25)	**median**	**94.00**	**1100.0**	**130.00**	**140.00**		**23.00**
	min	80.00	560.0	80.00	98.00		14.00
	max	99.00	2200.0	240.00	330.00		46.00
	mean	92.36	957.2	106.80	139.50	245.80	18.52
	sd	6.02	444.9	33.90	65.31	87.53	6.79
2019 (n = 25)	**median**	**94.00**	**850.0**	**100.00**	**120.00**	**230.00**	**17.50**
	min	73.00	420.0	50.00	57.00	110.00	9.90
	max	100.00	2100.0	190.00	330.00	470.00	40.00
	mean	92.23	720.9	101.00	109.10	224.50	16.82
	sd	5.92	391.3	58.29	58.21	95.22	8.42
2020 (n = 11)	**median**	**94.00**	**520.0**	**84.00**	**80.00**	**180.00**	**13.00**
	min	79.00	300.0	55.00	54.00	130.00	10.00
	max	98.00	1500.0	250.00	230.00	410.00	36.00

PBDE

Nine congeners of PBDEs (28, 47, 66, 100, 99, 85, 154, 153 and 183) were analysed in blubber samples from juvenile male pilot whale from 2017, 2018, 2019 and 2020. Five individuals were analysed from each of these years, to add to a time-trend series established previously based mainly on pooled samples. PBDEs were detected in all of the samples. The summary of selected PBDEs are listed in table 22 and the individual concentrations are presented in attachment C.

Table 22: PBDE concentrations in juvenile pilot whale blubber from 2017 - 2020

Year		PBDE 47 ng/g lw	PBDE 99 ng/g lw	PBDE 100 ng/g lw	PBDE 153 ng/g lw	PBDE 154 ng/g lw	PBDE 183 ng/g lw
	mean	192.10	26.64	39.20	11.60	30.90	0.63
	sd	95.60	10.86	19.18	9.10	14.85	0.42
2017 (n = 5)	**median**	**178.00**	**24.60**	**31.00**	**8.90**	**22.50**	**0.45**
	min	57.60	14.90	25.00	5.10	19.60	0.26
	max	301.00	42.80	72.00	27.30	53.30	1.21
	mean	165.20	32.11	38.40	10.87	33.57	1.02
	sd	90.53	16.77	15.11	7.28	17.33	0.36
2018 (n = 30)	**median**	**130.00**	**26.00**	**33.70**	**8.25**	**29.00**	**0.89**
	min	85.00	15.00	23.00	4.40	17.00	0.68
	max	400.00	81.00	79.00	36.90	93.90	1.56
	mean	159.70	25.10	33.03	5.86	30.43	5.12
	sd	107.10	16.58	16.30	3.30	12.57	5.77
2019 (n = 30)	**median**	**120.00**	**21.00**	**31.00**	**4.78**	**27.50**	**1.00**
	min	48.00	9.10	13.00	2.20	12.00	1.00
	max	530.00	79.00	78.00	17.00	67.00	13.00
	mean	130.80	21.44	28.61	5.05	25.03	5.60
	sd	77.84	11.64	13.58	2.16	10.40	10.29
2020 (n = 16)	**median**	**103.50**	**17.50**	**25.50**	**5.40**	**23.00**	**1.00**
	min	38.00	5.30	7.80	1.10	7.00	1.00
	max	307.00	48.00	54.00	8.70	47.00	24.00

BDE 47 was the dominant congener in these samples, as well as in earlier ones (see figure 24).

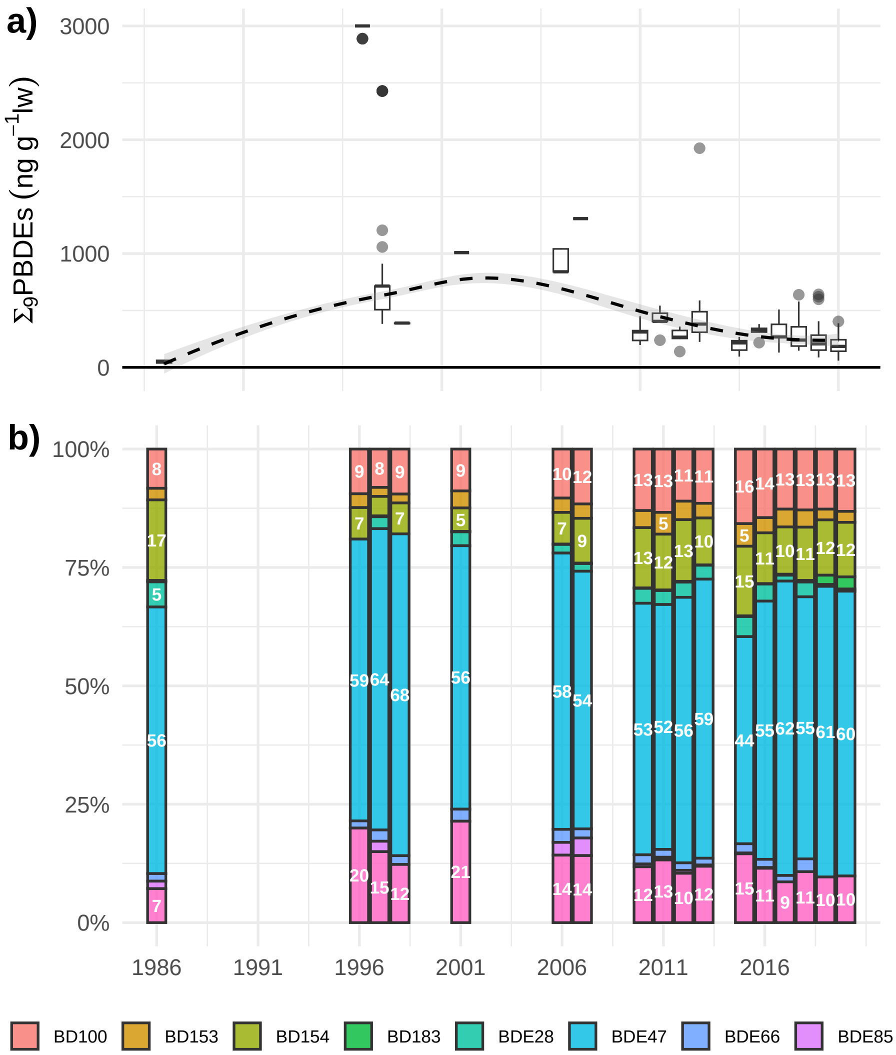

Figure 24: Temporal PBDE concentrations in juvenile pilot whale blubber between 1986 to 2020. a) shows a boxplot of the Σ_9PBDE (BDE congeners 28, 47, 66, 100, 99, 154, 153 and 183) and b) shows the changing composition of BDE congeners over time. The data are from: 1986, 1997, 2006 and 2007 (Rotander et al., 2012), 1996 (Lindström et al., 1999), 1997, 1998 (Bavel et al., 1999), 2010-2012 (Nielsen et al., 2014), 2013-2016 (Andreasen et al., 2019) and 2017-2020 is from this work.

PFAS

Livers from juvenile male pilot whales from 2017 to 2020 were analysed for per-and polyfluorinated alkyl substances (PFASs) building on previously published results (Andreasen et al., 2019; Rotander et al., 2012).The analysis consisted of perfluorinated carboxylic acids, perfluorinated sulfonic acids, fluorotelimer sulfonic acids, and perfluorinated sulfonamide acid (PFOSA).

The summary of selected PFAS results are listed in table 23, while the individual concentrations can be found in attachment C.

Table 23: PFAS concentrations in juvenile pilot whale liver from 2017 - 2020

Year		PFOA ng/g ww	PFNA ng/g ww	PFDA ng/g ww	PFUnda ng/g ww	PFOS ng/g ww	PFHXS ng/g ww	PFOSA ng/g ww
	mean	0.10	5.34	6.94	13.27	18.30	0.08	
	sd	0.14	2.21	1.68	3.81	4.01	0.09	
2017 (n = 5)	**median**	**0.04**	**4.12**	**6.32**	**13.70**	**18.31**	**0.04**	
	min	0.04	3.35	4.91	8.44	13.54	0.04	
	max	0.36	8.68	8.88	18.40	24.26	0.25	
	mean	0.51	25.58	33.66	75.58	99.96	0.37	19.54
	sd	0.18	12.14	11.93	25.16	25.01	0.20	7.11
2018 (n = 5)	**median**	**0.43**	**28.40**	**35.30**	**68.60**	**104.00**	**0.31**	**17.70**
	min	0.40	4.80	16.90	44.30	59.80	0.14	13.20
	max	0.83	36.50	47.60	104.00	129.00	0.66	31.80
	mean	0.36	15.92	26.70	61.50	73.90	0.46	10.14
	sd	0.31	17.51	20.80	44.96	51.64	0.30	3.90
2019 (n = 5)	**median**	**0.17**	**6.70**	**17.00**	**43.00**	**63.00**	**0.41**	**11.00**
	min	0.13	1.30	5.50	18.00	17.00	0.17	4.90
	max	0.84	41.00	50.50	111.50	134.50	0.90	15.00
	mean	0.06	1.69	5.20	13.17	15.66	0.17	11.91
	sd	0.01	1.34	3.03	5.28	7.92	0.06	5.69
2020 (n = 5)	**median**	**0.07**	**1.09**	**3.38**	**11.24**	**11.60**	**0.15**	**11.78**
	min	0.05	0.61	2.79	9.26	9.20	0.14	5.08
	max	0.08	3.74	9.05	20.95	27.46	0.27	19.00

From year 1986 to 2020 the PFASs detected in all of the samples were PFHxS, PFOS, PFOA, PFNA, PFDA, and PFUnDA. The sum of the these six PFASs denoted as Σ_6PFAS along with the average PFAS profile for each year are plotted in figure 25.

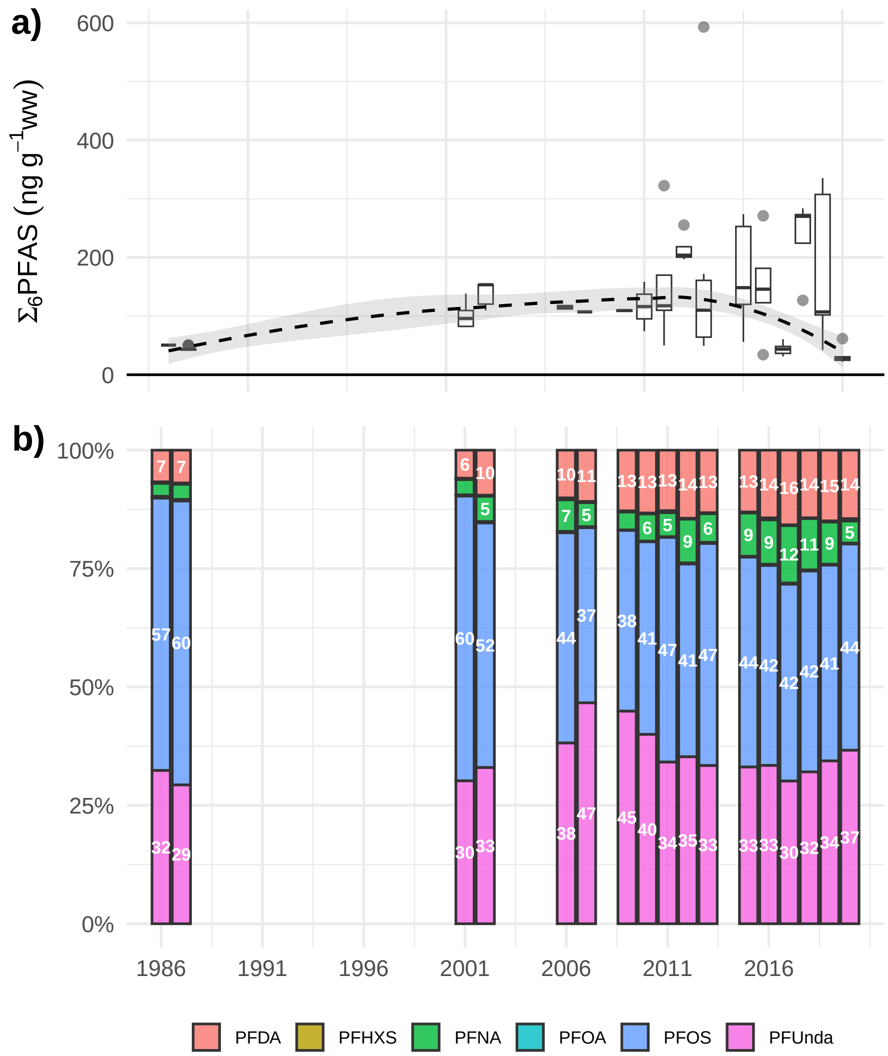

Figure 25: Temporal PFAS concentrations in juvenile pilot whale liver between 1986 to 2020. a) shows a boxplot of the Σ_6 (PFOS, PFOA, PFNA, PFDA, PFUnda and PFHxS) and b) shows the changing composition of over time. The data are from: 1986, 1987,2001,2002, 2006 and 2007 (Dam et al., 2011), 2009-2016 (Andreasen et al., 2019) and 2017-2020 is from this work.

3.2.4 Brown trout

While the Arctic char has been difficult to catch in recent years, the monitoring programme now includes brown trout as a substitute monitoring species. The summary results of selected POP concentrations in brown trout muscle are shown in tables 24 and 25. Individual results are given in appendix E.

Table 24: PCB concentrations in brown trout muscle from 2017 - 2020

Year		Lipids %	Aroclor 1260 ng/g lw	PCB 153 ng/g lw	PCB 187 ng/g lw	Par. 50 ng/g lw	p,p'-DDE ng/g lw
2017 (n = 20)	mean	0.62	642.5	82.12	16.93	14.10	71.27
	sd	0.49	487.8	63.76	12.01	11.23	49.92
	median	**0.51**	**490.0**	**64.00**	**13.75**	**12.25**	**69.25**
	min	0.14	0.5	0.07	0.02	0.01	0.09
	max	2.10	1600.0	230.00	38.00	38.00	180.00
2018 (n = 9)	mean	1.86	690.6	86.50	17.30	11.24	70.27
	sd	1.03	553.0	69.60	15.00	8.35	52.04
	median	**2.00**	**640.0**	**77.00**	**15.00**	**7.07**	**61.00**
	min	0.50	150.0	19.00	3.30	3.54	14.14
	max	3.90	1900.0	240.00	51.00	28.28	170.00
2019 (n = 9)	mean	1.77	1628.0	206.10	38.50	18.69	164.30
	sd	1.56	821.2	101.20	26.26	12.44	82.44
	median	**1.30**	**1500.0**	**190.00**	**32.00**	**14.14**	**140.00**
	min	0.50	700.0	90.00	15.00	7.07	86.00
	max	5.40	3000.0	370.00	90.50	39.00	315.00

Table 25: Chlordanes and other pesticides in brown trout from 2017 - 2019

Year		Lipids %	Trans-nonachlor ng/g lw	α-chlordane ng/g lw	Oxychlordane ng/g lw	Mirex ng/g lw	β-HCH ng/g lw
2017 (n = 20)	mean	0.62	10.27	2.98	4.28	4.92	8.72
	sd	0.49	7.00	2.07	2.85	3.07	7.01
	median	**0.51**	**8.85**	**2.83**	**4.24**	**5.30**	**7.07**
	min	0.14	0.01	0.01	0.01	0.01	0.05
	max	2.10	27.00	6.36	12.00	12.00	21.21
2018 (n = 9)	mean	1.86	10.03	17.13	8.82	6.62	9.43
	sd	1.03	3.81	12.95	5.54	4.40	6.79
	median	**2.00**	**8.60**	**14.14**	**6.36**	**4.95**	**7.07**
	min	0.50	4.95	5.66	4.24	2.83	3.54
	max	3.90	16.00	42.43	21.21	14.14	21.21
2019 (n = 9)	mean	1.77	15.23	15.87	10.99	8.84	12.57
	sd	1.56	5.67	10.74	5.86	4.36	8.32
	median	**1.30**	**15.00**	**14.14**	**10.54**	**7.07**	**14.14**
	min	0.50	7.40	2.83	3.20	2.80	2.83
	max	5.40	22.00	35.36	21.21	14.50	28.28

Figure 26 shows the concentrations of selected POPs from 1998 to 2014 (Arctic char) and 1999 to 2019 (brown trout).

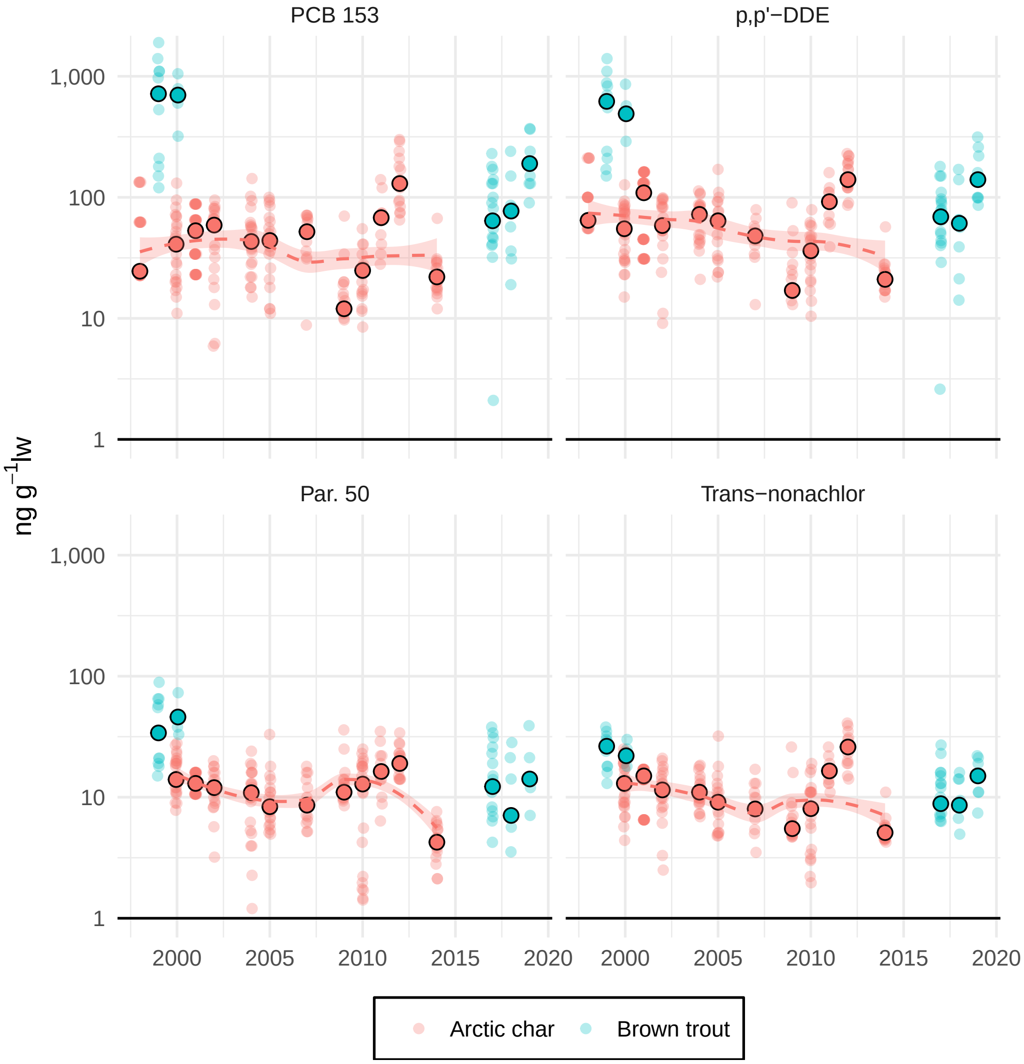

Figure 26: Selected POPs (PCB 153, toxaphene par.50, Trans-nonachlor and p,p'-DDE) in Arctic char (red) and brown trout (blue) muscle from 1998 to 2019. The larger data points with a black outline represent the median of that particular location per year. The data has been robust LOESS fitted and the 95% confidence interval is shown.

3.2.5 Sheep

Samples of tallow from sheep, both ewes and lamb, from 2017, were analysed for selected PCBs at Evnaskyn, and the summary results of the concentrations are shown in table 26. Individual results are shown in appendix F. The analysis of contaminants in sheep has now been discontinued.

Table 26: PCBs in sheep from 2017

Year	Agegroup		Lipids %	PCB 52 ng/g lw	PCB 118 ng/g lw	PCB153 ng/g lw	PCB 180 ng/g lw
2017 (n = 10)	Ewe	mean	99.90	0.19	0.31	1.60	0.64
		sd	0.11	0.13	0.19	0.48	0.20
		median	**99.90**	**0.19**	**0.31**	**1.60**	**0.64**
		min	99.80	0.07	0.13	1.14	0.45
		max	100.00	0.31	0.49	2.05	0.83
	Lamb	mean	99.95	0.10	0.21	0.72	0.14
		sd	0.05	0.00	0.02	0.28	0.00
		median	**99.95**	**0.10**	**0.21**	**0.72**	**0.14**
		min	99.90	0.10	0.20	0.46	0.14
		max	100.00	0.10	0.23	0.99	0.14

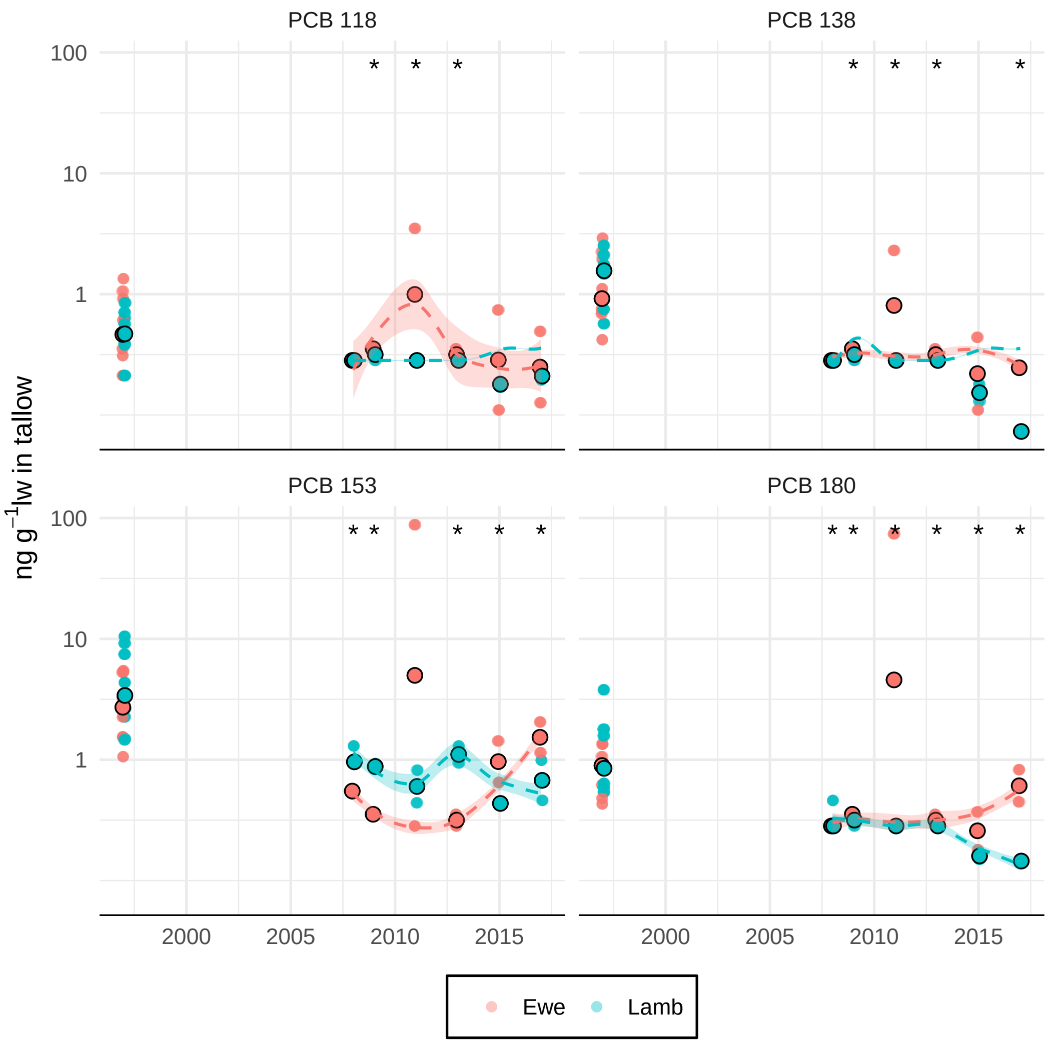

Figure 27: Selected POPs (PCBs 118, 138, 153 and 180) in sheep, adult female (ewe, red) and juvenile (lamb, blue) in the years 1997 to 2017. The larger data points with a black outline represent the median of that particular location per year. The data has been robust LOESS fitted and the 95% confidence interval is shown. The asterisk on the top indicates year where there is a significant (p<0.05, by Wilcoxon) difference in concentrations between the sexes.

3.3 Stable Isotopes

Stable isotope analysis of nitrogen and carbon has been carried out in tissue samples of pilot whale muscle, brown trout muscle, black guillemot muscle, liver and eggs, and northern fulmar muscle, liver and eggs. The ratios of heavier to lighter isotopes of nitrogen and carbon can be used to examine the trophic relationships in food webs (Hobson and Welch, 1992). The heavier isotopes are enriched in animal tissue relative to diet, with the enrichment factors between tissue and diet being about 1 ‰ for the ^{13}C isotope and 3-4 ‰ for the ^{15}N isotope (Fry, 1988; Sagerup et al., 2002).

The rationale for analysing stable isotopes as supporting parameters for a pollutants monitoring programme is to help improve the understanding of observed differences in contaminant concentrations spatially, over time, and between species. Because a consumers' isotope composition reflects the isotope composition of its diet, it is possible to analyse stable isotope ratios and derive information on both the diet and trophic position of a consumer in a food web. Since many of the contaminants analysed within the national monitoring programme are considered to biomagnify, the information of trophic level can be of importance and help explain why higher concentrations are observed in certain species and in which species high concentrations are expected.

The ratio of the stable nitrogen isotopes, 15N:14N (hereafter referred to as ^{15}N), is commonly used for diet reconstruction and, in addition, to assign species in a food web to their trophic position. This is possible because the ^{15}N value of a consumer is enriched with approximately 3-4‰ relative to its diet (Fry, 1988; Sagerup et al., 2002).

Contrary to ^{15}N, the ratio of 13C:12C (^{13}C) remains fairly stable throughout the food web and can therefore provide information about carbon sources at the base of the food web. ^{13}C is therefore used to help assign species into specific food webs. In aquatic environments, ^{13}C can be useful for distinguishing between benthic production and pelagic production since ^{13}C is less negative in the benthic compared to the pelagic food web (France, 1995), and in addition, between freshwater and marine waters as ^{13}C in freshwaters are depleted in 13C relative to the marine environment, with more negative ^{13}C values as a result (Boutton, 1991).

All samples were analysed for the fraction of stable isotopes of nitrogen ($^{15}N/^{14}N$) and carbon ($^{13}C/^{12}C$) at SINLAB in Canada.

Statistical methods

The enrichment of the heavier isotopes is described by $\delta^{15}N$ and $\delta^{13}C$, respectively, which are calculated as follows:

$$\delta X = (\frac{R_{sample}}{R_{standard}} - 1) * 1000$$

where X is ^{15}N or ^{13}C and R is the corresponding ratio $^{15}N/^{14}N$ or $^{13}C/^{12}C$ in the sample and in the standard, respectively. The standard materials used are described in section 1.3.3.

The lipid level in the samples was highly variable. This has an influence on the C/N ratio as ^{13}C is discriminated against during lipid synthesis, leading to higher C/N ratio and lower δ^{13}C level when the lipid content is high. To avoid lipid discrimination towards δ^{13}C, normalisation of δ^{13}C (δ^{13}C') was carried out using estimated lipid content (L) according to the equations from McConnaughey and McRoy (1979):

$$L = \frac{93}{1 + (0.246C/N - 0.775)^{-1}}$$

$$\delta' = \delta + D\frac{-0.207 + 3.90}{1 + \frac{287}{L}}$$

where L is % lipid, C/N is the carbon to nitrogen ratio in muscle and D is the depletion of ^{13}C (‰) relative to protein and assigned a value of 6‰ (McConnaughey and McRoy, 1979; Sagerup et al., 2002).

The δ^{15}N values versus lipid normalised δ^{13}C' are shown in figure 28 for all the monitored species, which clearly shows separation in isotope profile between species. The individual results are shown in appendix G.

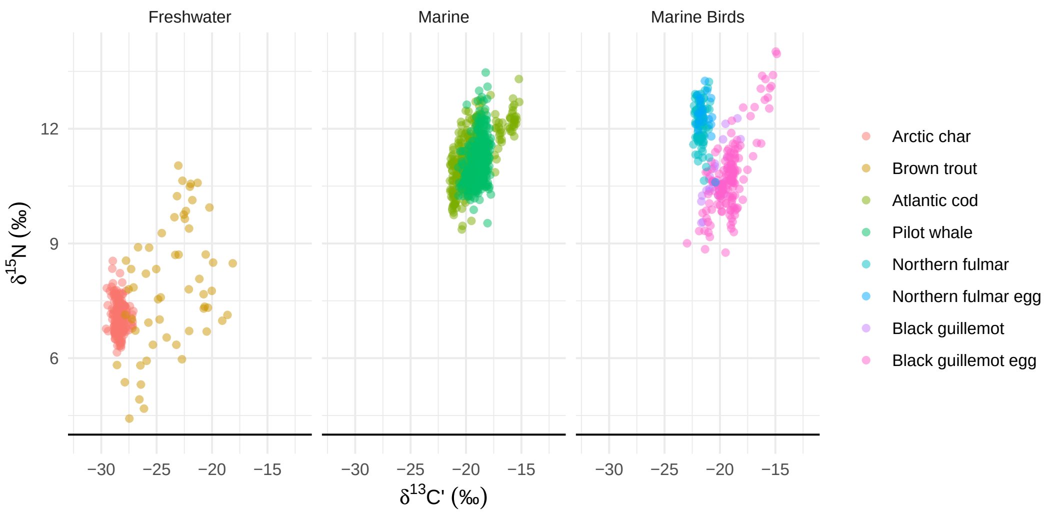

Figure 28: $\delta^{15}N$ versus $\delta^{13}C$' (lipid normalised) in egg and muscle of the monitored species.

3.3.1 Black guillemot and northern fulmar

Stable isotopes have been analysed in black guillemot liver, muscle and egg in 2018 and in egg in 2020. Northern fulmar liver, muscle and egg have been analysed in 2019, and in muscle and egg in 2020.

Eggs

The summary of the analysed stable isotopes in black guillemot (2018 and 2020) and northern fulmar eggs (2019 and 2020) are presented in tables 27 and 28.

Table 27: Stable isotopes in black guillemot eggs collected in 2018 and 2020

		δ^{13}C'					δ^{15}N				
Year	Location	mean	sd	median	min	max	mean	sd	median	min	max
2018 (n = 10)	Koltur	-19.11	0.37	-19.03	-19.71	-18.63	10.89	0.57	10.69	10.40	12.21
2020 (n = 3)	Koltur	-19.91	0.38	-20.07	-20.19	-19.48	10.78	0.72	10.82	10.04	11.48

Table 28: Stable isotopes in northern fulmar eggs collected in 2019 and 2020

		δ^{13}C'					δ^{15}N				
Year	Location	mean	sd	median	min	max	mean	sd	median	min	max
2019 (n = 10)	Sandoy	-21.57	0.46	-21.69	-22.12	-20.80	12.49	0.44	12.32	11.96	13.25
2020 (n = 10)	Koltur	-21.32	0.58	-21.56	-21.98	-20.41	12.24	0.65	12.40	10.60	12.80

Stable isotopes in black guillemot eggs have been analysed since 2002, while analysis of stable isotopes in northern fulmar eggs have started in 2019. Figure 29 shows the temporal variation of δ^{15}N and δ^{13}C' in these two species.

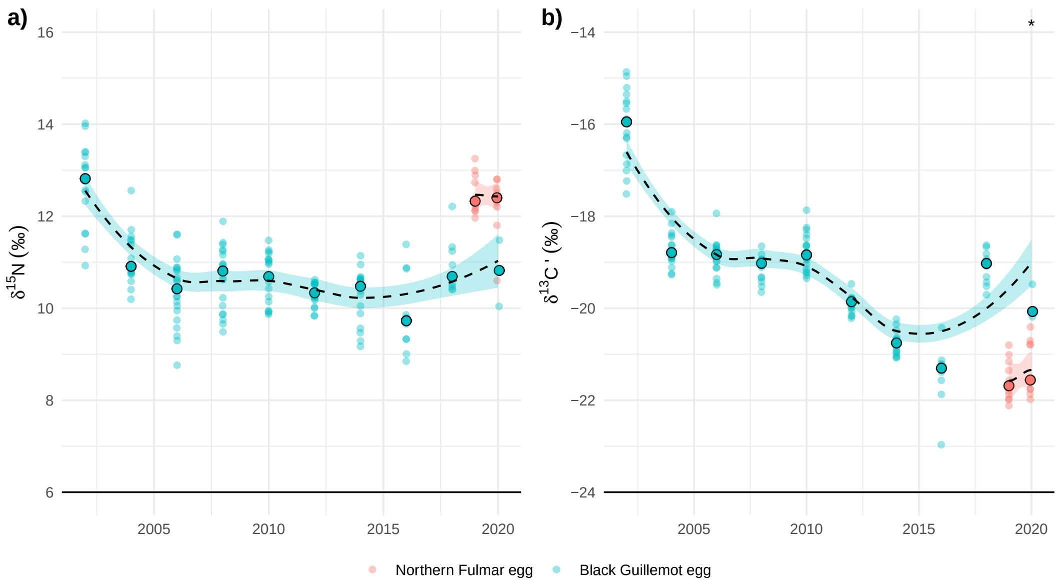

Figure 29: Stable isotopes in black guillemot eggs (collected in 2018 and 2020) and in northern fulmar eggs (collected in 2019 and 2020). The larger circles with black outline represent the median of that particular year. The data has been robust LOESS fitted and the 95% confidence interval is shown. Asterisks on the top indicate a significant difference between the two species for that year.

Muscle and liver

The summary of stable isotopes in black guillemot and northern fulmar liver and muscle are shown in table 29 and 30.

Table 29: Stable isotopes in black guillemot muscle and liver collected in 2018

		δ^{13}C'					δ^{15}N				
Year	Tissue	mean	sd	median	min	max	mean	sd	median	min	max
2018 (n = 6)	liver	-19.63	0.95	-19.20	-20.98	-18.79	12.27	0.72	12.14	11.52	13.38
2018 (n = 6)	muscle	-19.79	0.57	-19.55	-20.56	-19.29	11.11	0.59	11.03	10.30	12.13

Table 30: Stable isotopes in northern fulmar muscle collected in 2017, 2018 (muscle + liver), 2019 and 2020

		δ^{13}C'					δ^{15}N				
Year	Tissue	mean	sd	median	min	max	mean	sd	median	min	max
2017 (n = 10)	muscle	-21.46	0.21	-21.53	-21.70	-20.98	11.48	0.48	11.50	10.64	12.35
2018 (n = 10)	liver	-21.64	0.30	-21.56	-22.09	-21.18	13.03	0.46	12.88	12.36	13.70
2018 (n = 10)	muscle	-21.64	0.31	-21.60	-22.16	-21.03	12.24	0.38	12.18	11.65	12.91
2019 (n = 10)	muscle	-22.05	0.23	-22.11	-22.34	-21.66	12.52	0.33	12.59	11.80	12.90
2020 (n = 10)	muscle	-22.01	0.19	-21.95	-22.27	-21.70	12.47	0.31	12.46	12.02	12.87

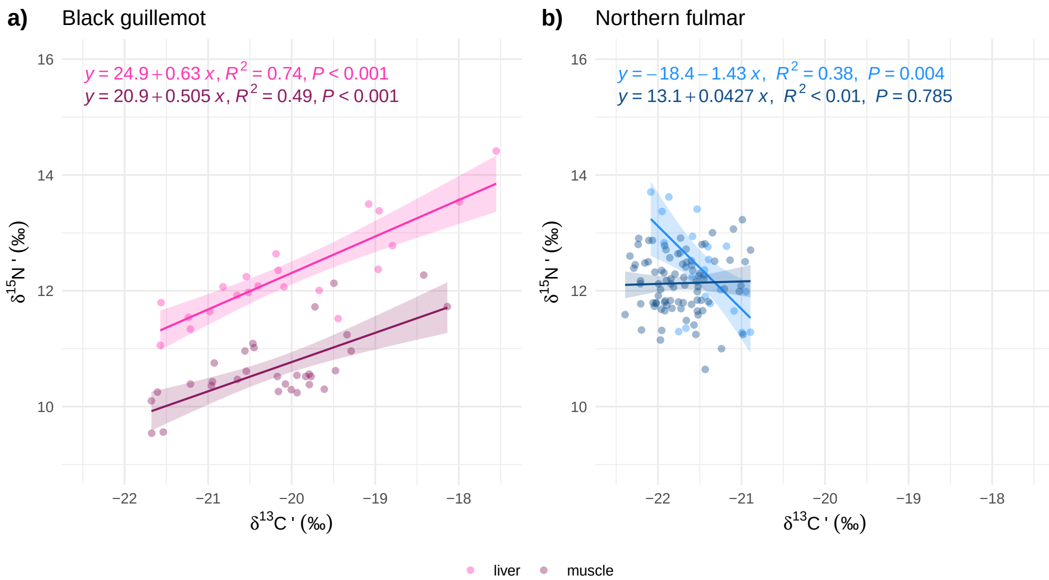

Figure 30: Comparing stable isotope results in liver (red dots) and muscle (blue dots) tissue in a) black guillemot and b) northern fulmar by scatterplot of $\delta^{15}N$ versus $\delta^{13}C$', with linear regression models fitted, and the 95% confidence interval shown. The equation of the fit, including R^2 and p-value, is shown.

In figures 30 and 31 the stable isotopes δ^{13}C' and δ^{15}N in liver and muscle tissue from black guillemot and northern fulmar are compared. A highly significant ($p < 0.001$) linear correlation is found between δ^{13}C' and δ^{15}N in both liver and muscle tissue in black guillemot. With northern fulmar, there is a highly significant ($p < 0.005$) negative correlation between δ^{13}C' and δ^{15}N in liver but no correlation seen with muscle.

When comparing the medians (Wilcox test) for each data group, the largest difference is found in the δ^{15}N results, where liver and muscle in black guillemot are significantly different, see figure 31a. This is not true for northern fulmar, where muscle and liver is not statistically different from eacher or from black guillemot liver. This is not the case for δ^{13}C' where liver and muscle are not significantly different in black guillemot, see figure 31b, but a small yet significant difference is found between Norhtern fulmar muscle and liver. Another thing to note is that δ^{15}N enrichment in black guillemot liver is higher than in muscle, while the opposite is true for northern fulmar (a more negative δ^{13}C').

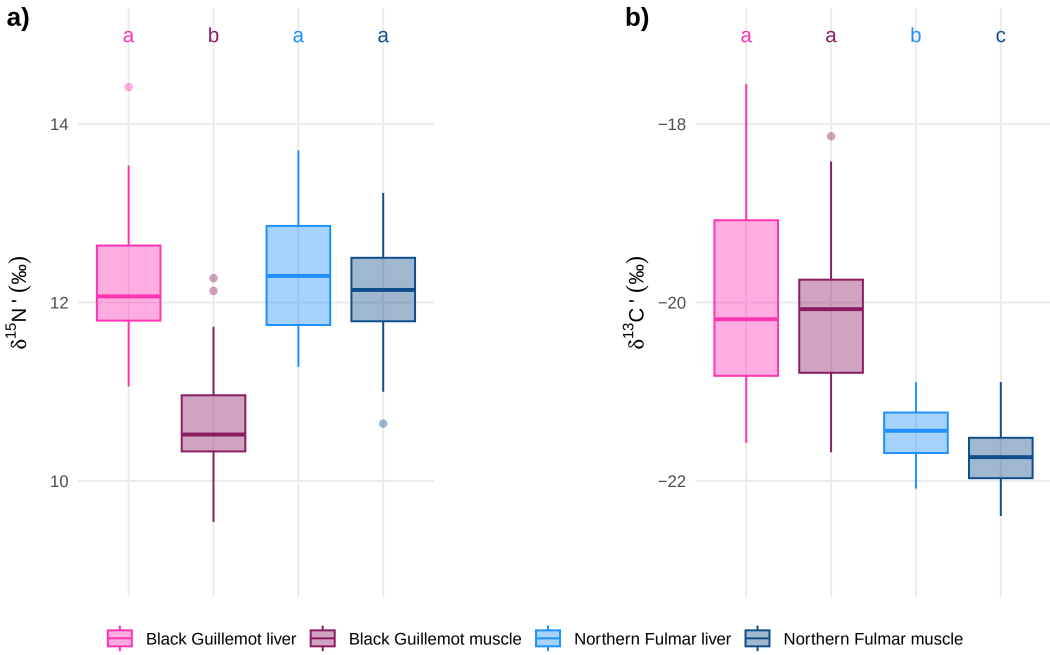

Figure 31: Comparing stable isotope results in liver and muscle tissue in black guillemot and northern fulmar, in pink and blue color, respectively. Boxplots show a) $\delta^{15}N$ and b) $\delta^{13}C$' of the two tissue types liver and muscle in black guillemot and northern fulmar. Common letters above each boxplot indicate groups with no significant difference by post hoc analysis using Wilcoxon.

3.3.2 Atlantic cod

The summary of stable isotopes in cod from 2017 to 2020 are in table 31 and plotted in figure 32. Data from 2000 to 2020 is plotted by year in figure 33.

Table 31: Stable isotopes in Atlantic cod muscle collected in 2017, 2018, 2019 and 2020

		δ^{13}C'					δ^{15}N				
Year	Tissue	mean	sd	median	min	max	mean	sd	median	min	max
2017 (n = 26)	muscle	-19.05	0.17	-19.03	-19.41	-18.68	11.65	0.28	11.64	10.97	12.21
2018 (n = 16)	muscle	-18.95	0.20	-18.94	-19.36	-18.59	12.13	0.34	12.14	11.31	12.68
2019 (n = 17)	muscle	-19.38	0.31	-19.44	-19.84	-18.70	11.77	0.53	11.67	10.96	12.77
2020 (n = 15)	muscle	-20.15	0.31	-20.07	-20.68	-19.68	11.90	0.28	11.87	11.41	12.47

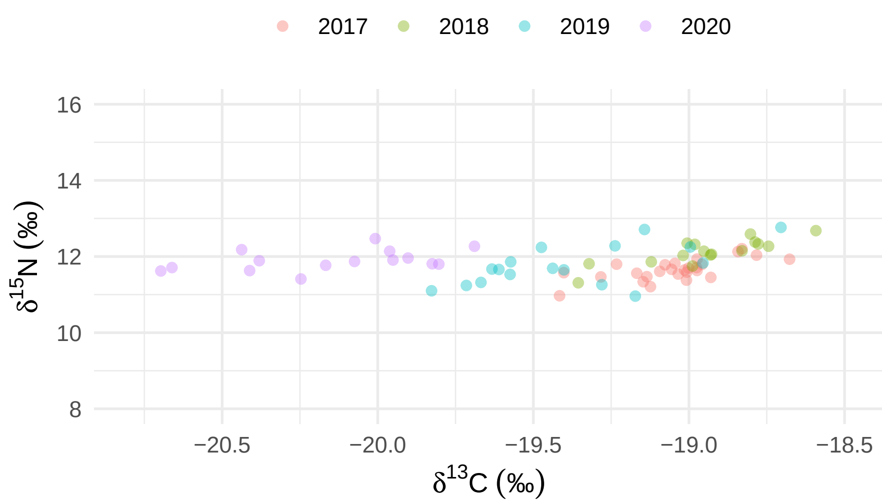

Figure 32: δ^{15}N versus δ^{13}C' in muscle from Atlantic cod in years 2000-2020.

In cod muscle, the δ^{15}N enrichment was more or less stable through these four years whereas the δ^{13}C' levels vary by approximately 2 ‰ in 2020 compared to 2018, with intermediate levels in 2019.

Figure 33: $\delta^{15}N$ versus $\delta^{13}C$' in muscle from Atlantic cod in years 2000-2020.

Plotting all data from 2000 to 2020 (figure 33) shows an increase in δ^{15}N (9.4 to 13.3 ‰), while there was a big decrease of 6 ‰ in δ^{13}C' (-15.2 to -21.4). Excluding data from 2000 and 2001, this difference is less variable (δ^{15}N = 9.4 to 12.9 ‰, and δ^{13}C' = -17.8 to -21.4).

3.3.3 Pilot whale

The summary of stable isotopes in juvenile male pilot whales from years 2017 to 2020 are shown in table 32 and plotted in figure 34.

Table 32: Stable isotopes in juvenile male pilot whale muscle collected in 2017, 2018, 2019 and 2020

Year	Tissue	δ^{13}C' mean	median	min	max	sd	δ^{15}N mean	median	min	max	sd
2017 (n = 25)	muscle	-19.15	-19.16	-19.94	-18.71	0.28	10.67	10.69	10.37	10.82	0.11
2018 (n = 25)	muscle	-19.15	-19.18	-19.71	-18.51	0.36	10.92	10.81	10.53	11.93	0.34
2019 (n = 25)	muscle	-19.90	-19.74	-20.68	-19.00	0.46	10.91	10.82	10.24	11.57	0.39
2020 (n = 11)	muscle	-20.08	-20.06	-20.36	-19.85	0.18	11.06	10.86	10.55	12.63	0.60

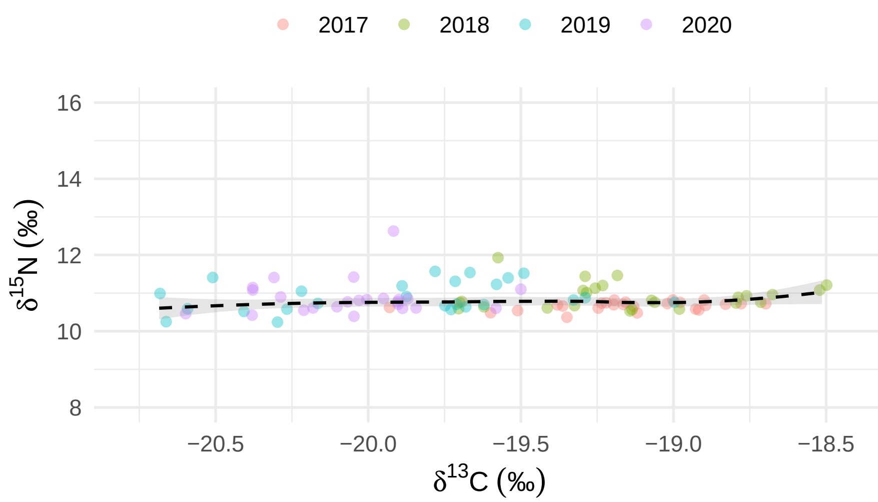

Figure 34: δ^{15}N versus δ^{13}C' in muscle from pilot whales in years 2017-2020.

δ^{15}N is stable at approximately 11 ‰ while δ^{13}C', while δ^{13}C' varies by about 2‰ (-18.5 to -20.7; see figure 34).

Figure 35: δ^{15}N versus δ^{13}C' in muscle from pilot whales in years 2001-2020.

Plotting δ^{15}N versus δ^{13}C' from pilot whale muscle in years 2001-2020 shows the same stable δ^{15}N, while δ^{13}C' varies by 3‰ over the 20 years (-17.7 to -20.7; see figure 35). δ^{13}C' is gradually more negative for each year.

3.3.4 Brown trout

The summary of stable isotopes in brown trout from 2017 to 2020 is shown in table 33.

Table 33: Stable isotopes in brown trout muscle collected in 2017, 2018, 2019 and 2020

		δ^{13}C'					δ^{15}N				
Year	Tissue	mean	median	min	max	sd	mean	median	min	max	sd
2017 (n = 20)	muscle	-23.55	-24.36	-27.85	-18.13	3.10	6.85	6.85	4.42	9.94	1.49
2018 (n = 9)	muscle	-24.01	-23.32	-28.58	-20.03	3.42	7.30	7.54	5.37	8.71	1.30
2019 (n = 9)	muscle	-26.58	-26.92	-27.53	-25.04	0.87	7.86	7.85	6.72	8.90	0.83
2020 (n = 2)	muscle	-25.25	-25.25	-25.97	-24.54	1.01	8.74	8.74	8.21	9.27	0.75

Figure 36 shows all brown trout from 1999 to 2020, including sampling sites and sampling year into the graph. Brown trout caught in stóravatn in 1999 and 2000 are high in both δ^{15}N and δ^{13}C', but brown trout caught in Lítlavatn in 1999 is lower in δ^{15}N and higher in δ^{13}C. Brown trout caught in 2017 in Mjáuvøtn shows a distinct population with both low δ^{15}N and δ^{13}C', yet brown trout caught same year in Leitisvatn has more variability in both δ^{15}N and δ^{13}C', although both isotopes are higher than in Mjáuvøtn. Brown trout was caught in Fjallavatn in 2018, 2019 and 2020. While the brown trout caught in 2019 and 2020 have similar δ^{15}N and δ^{13}C' values, the 2018 brown trout isotopes show much greater variability.

Overall, the stable isotopes are highly variable, and while it is mainly sampling site that determines this variation, between years has an impact too.

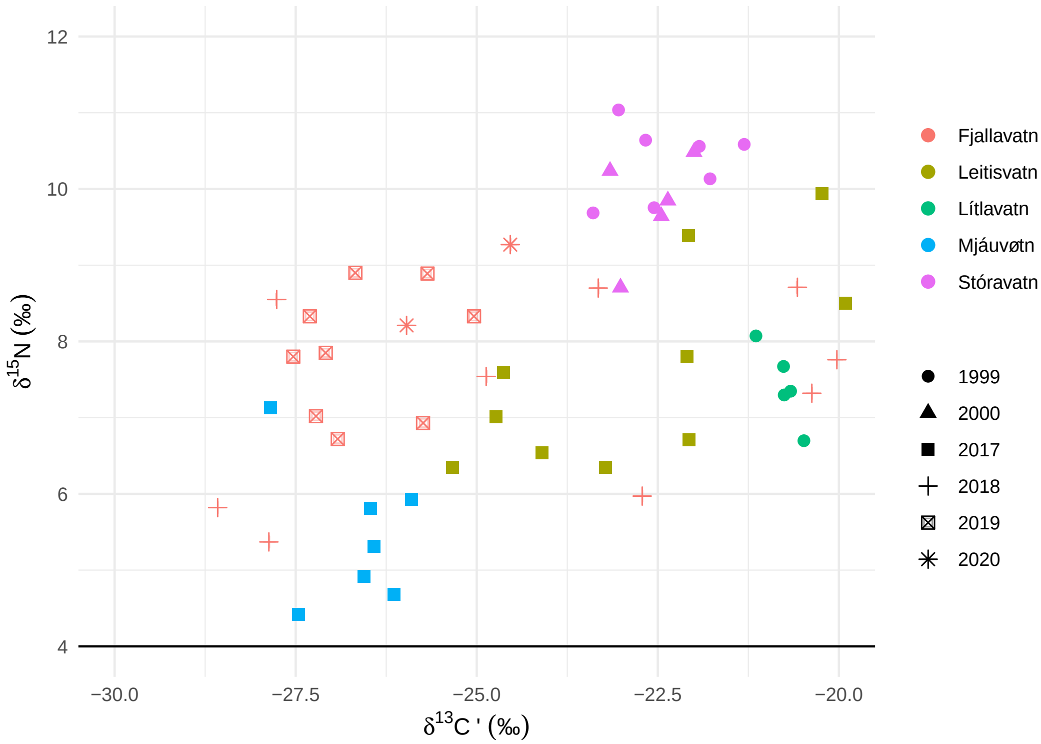

Figure 36: Plot showing $\delta^{15}N$ versus $\delta^{13}C'$ in muscle from brown trout in years 1999-2000 and 2017-2020. The different colors indicate sampling sites, and shapes denote the sampling year.

For comparison, Arctic char from sampling site Á Mýrunum in years 2002-2014 show much less variable δ^{15}N and δ^{13}C' (figure 37).

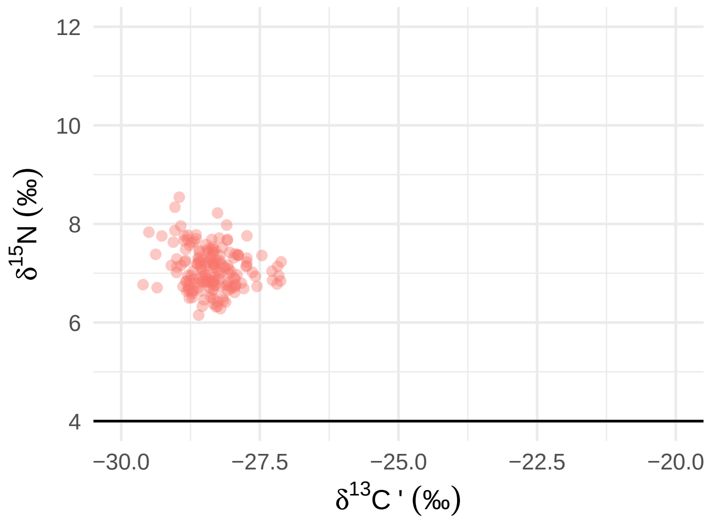

Figure 37: The plot shows $\delta^{15}N$ versus $\delta^{13}C$' in muscle from Arctic char in years 2002-2014.

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5 Appendices

Appendix A: Black Guillemot and Northern Fulmar Eggs

Table 1: Metals in Black guillemot and Northern fulmar eggs from 2017-2020 (mg/kg ww)

											Metals	
ID	Location	Date	Tissue	Weight g	Height mm	Breadth mm	Yolk/white g	Weight shell g	Shell thickness mm	Drymatter %	Hg mg/kg	Se mg/kg
Cepphus grylle												
Cg-0476	Koltur	2018-06-01	Egg	44.17	54.50	38.80	38.66	3.58	0.32	24.40	0.44	
Cg-0477	Koltur	2018-06-01	Egg	50.58	59.50	39.50	44.88	3.99	0.32	28.50	0.41	
Cg-0478	Koltur	2018-06-01	Egg	46.35	68.30	38.50	41.14	3.66	0.31	25.70	0.41	
Cg-0479	Koltur	2018-06-01	Egg	50.99	60.20	39.30	45.83	3.66	0.29	24.40	0.86	
Cg-0480	Koltur	2018-06-01	Egg	47.99	58.50	39.20	42.03	3.16	0.26	26.10	0.51	
Cg-0481	Koltur	2018-06-01	Egg	47.87	58.00	39.20	41.80	3.77	0.31	25.30	0.48	
Cg-0482	Koltur	2018-06-01	Egg	48.32	59.00	38.60	43.00	3.63	0.29	26.00	0.42	
Cg-0483	Koltur	2018-06-01	Egg	46.70	59.50	38.20	42.04	3.60	0.28	25.30	0.53	
Cg-0484	Koltur	2018-06-01	Egg	50.99	62.70	38.40	44.95	3.87	0.33	26.20	0.40	
Cg-0485	Koltur	2018-06-01	Egg	43.20	55.00	38.40	38.64	3.52	0.29	25.80	0.41	
Cg-0486	Koltur	2020-06-07	Egg	44.75	55.82	38.32	37.72	3.95	0.33	28.50	0.62	0.72
Cg-0487	Koltur	2020-06-14	Egg	48.94	58.57	39.50	43.09	3.97	0.30	24.30	0.72	0.70
Cg-0488	Koltur	2020-06-15	Egg	43.07	54.90	38.30	37.01	3.78	0.32	28.60	0.62	0.79
Fulmarus glacialis												
Fg-0387	Sandoy	2019-05-21	Egg	114.14	8.05	5.10	102.40	11.74	0.43			
Fg-0388	Sandoy	2019-05-21	Egg	125.90	7.80	5.50	111.96	13.94	0.44			
Fg-0389	Sandoy	2019-05-21	Egg	106.10	7.46	5.12	94.16	11.94	0.44			
Fg-0390	Sandoy	2019-05-21	Egg	111.47	7.67	5.20	98.80	12.67	0.44			
Fg-0391	Sandoy	2019-05-21	Egg	107.10	7.50	5.16	96.53	10.57	0.44			
Fg-0392	Sandoy	2019-05-21	Egg	112.62	7.50	5.26	99.75	12.87	0.44			
Fg-0393	Sandoy	2019-05-21	Egg	108.64	7.56	5.10	94.79	13.85	0.44			
Fg-0394	Sandoy	2019-05-21	Egg	96.18	7.19	5.00	85.69	10.49	0.35			
Fg-0395	Sandoy	2019-05-21	Egg	109.69	7.50	5.22	97.49	12.20	0.46			
Fg-0396	Sandoy	2019-05-21	Egg	95.33	7.65	4.72	83.33	12.00	0.42			
Fg-0407	Koltur	2020-05-21	Egg	108.65	78.32	50.04	94.32	14.33		23.11	0.26	1.04
Fg-0408	Koltur	2020-05-21	Egg	97.97	72.55	49.41	85.95	12.02		25.91	0.53	1.30
Fg-0409	Koltur	2020-05-21	Egg	108.37	74.70	51.95	97.02	11.35		25.25	0.29	1.26
Fg-0410	Koltur	2020-05-21	Egg	101.75	74.15	49.62	89.43	12.32		24.51	0.35	1.13
Fg-0411	Koltur	2020-05-21	Egg	101.23	75.00	49.30	88.43	12.80		24.03	0.22	1.12
Fg-0412	Koltur	2020-05-21	Egg	110.07	75.75	51.75	96.82	13.25		24.99	0.18	1.12
Fg-0413	Koltur	2020-05-21	Egg	99.93	71.10	48.10	88.70	11.23		21.84	0.41	1.14
Fg-0414	Koltur	2020-05-21	Egg	109.65	71.16	52.70	99.09	10.56		23.58	0.46	1.06
Fg-0415	Koltur	2020-05-21	Egg	117.68	76.30	53.35	105.37	12.31		24.55	0.32	1.07
Fg-0416	Koltur	2020-05-21	Egg	102.74	74.05	50.70	90.00	12.74		24.94	0.18	0.88

Table 2: PCBs in Black guillemot and Northern fulmar eggs from 2017-2020 (ng/g ww)

		PCB						PFAS								
ID	Lipids %	PCB 52 ng/g	PCB 101 ng/g	PCB 118 ng/g	PCB 138 ng/g	PCB 153 ng/g	PCB 180 ng/g	PFOS ng/g	PFOA ng/g	PFNA ng/g	PFDA ng/g	PFDS ng/g	PFHxS ng/g	PFUnda ng/g	PFDoA ng/g	PFTrDA ng/g
Cepphus grylle																
Cg-0476	11.3	0.28	1.07	5.07	10.39	27.53	11.77									
Cg-0477	11.05	0.59	2.28	14.05	30.16	59.58	23.22									
Cg-0478	8.2	0.16	0.54	4.12	10.36	24.92	9.27									
Cg-0479	11.2	0.35	1.27	6.75	15.98	40.23	15.72									
Cg-0486	9.8	0.79	1.58	11.38	24.28	50.57	19.82	4.7	0.09	0.8	0.4	0.07	0.14	2.1	0.7	2
Cg-0487	11.3	0.88	0.87	6.2	12.79	33.55	14.42	4	0.12	0.8	0.6	0.05	0.11	2.6	0.7	2.3
Cg-0488	9	0.88	1.37	6.28	13.16	33.84	14.13	19	0.06	1.1	1	0.15	0.13	3.4	0.6	1.1
Fulmarus glacialis																
Fg-0407	7.6	0.17	0.43	20.59	27.57	83.95	49.25	8.1	0.06	0.85	1.43	0.11	0.04	4.48	1.13	4.75
Fg-0408	8.3	0.28	0.77	32.74	49.12	140.37	70.61	11	0.13	1.3	1.8	0.21	0.09	6.3		9.4
Fg-0409	9.15	0.21	50.65	62.52	102.61	211.7	112.06	14.23	0.07	1.3	2.3	0.21	0.1	6.81	1.59	7.82
Fg-0410	9.4	0.14	0.73	37.04	44.74	142	71.26	14	0.06	1.3	1.9	0.23	0.09	5.8		6.7
Fg-0411	8.4	0.08	16.03	28.63	43.93	129.66	77.92	12	0.03	0.66	2.02	0.21	0.05	7.02	1.63	6.44
Fg-0412	8.7	0.1	10.54	21.33	26.91	84.86	43.83	12	0.06	1.1	2.05	0.19	0.08	5.59	1.48	6.39
Fg-0413	8.1	0.14	0.51	19.4	32.73	85.46	49.05	16	0.15	2.01	2.88	0.28	0.1	8.85	2.02	8.87
Fg-0414	8.1	0.07	0.15	11.57	13.37	48.37	26.61	7	0.12	1.05	1.04	0.08	0.12	2.94	0.74	3.65
Fg-0415	6.3	0.33	1.01	34.18	37.32	122	72.67	14	0.15	1.71	1.92	0.16	0.1	6.04	1.46	5.57
Fg-0416	8.8	0.14	0.42	28.39	35.57	128.63	60.21	9.13	0.06	1.03	1.45	0.13	0.09	5.09	1.2	3.89

Appendix B: Black Guillemot and Northern Fulmar

Table 3: Metals in Black guillemot from 2017-2020 (mg/kg ww)

ID	Location	Date	Gender	Agegroup	Age	Weight g	Liver g	Drymatter feathers (%)	Drymatter liver (%)	Metals Hg (feather) mg/kg	Hg (liver) mg/kg	Cd (liver) mg/kg	Se (liver) mg/kg
Cepphus grylle													
Cg-0470	Tindhólmur	2018-05-18	M	IM	2K	420	25.80	57.5	34.6	2.14	0.80	0.67	2.70
Cg-0471	Tindhólmur	2018-05-18	M	IM	2K	440	22.94	70.6	32.2	3.27	1.13	0.60	1.60
Cg-0472	Tindhólmur	2018-05-18	M	IM	2K	440	24.19	90.9	33.6	3.04	0.68	0.48	0.85
Cg-0473	Tindhólmur	2018-05-18	F	IM	2K	400	24.97	81.7	31.4	4.66	0.67	0.54	1.90
Cg-0474	Tindhólmur	2018-05-18	M	IM	2K	400	21.74	47.5	32.9	2.24	1.08	0.72	1.46
Cg-0475	Tindhólmur	2018-05-18	M	IM	2K	385	21.46	66.0	33.3	3.28	0.72	0.74	2.30

Table 4: Metals in Northern fulmar from 2017-2020 (mg/kg ww)

										Metals					
					Weight	Liver	Drymatter			Hg (liver)	Hg (muscle)	Hg (feather)	Cd (liver)	Se (muscle)	Se (liver)
ID	Location	Date	Gender	Agegroup	g	g	feathers (%)	liver (%)	muscle (%)	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Fulmarus glacialis															
Fg-0357	Vestanfyri	2017-08-31	F	IM	720	12.29	83.5	31.2	31.9	0.42	0.03	1.31	0.14	0.8	3.62
Fg-0358	Vestanfyri	2017-08-31	F	IM	900	14.17	78.3	31	32.1	0.18	<0.01	0.46	0.22	0.76	3.87
Fg-0359	Vestanfyri	2017-08-31	M	IM	1020	14.43	82.3	30.9	30.5	0.16	<0.01	0.45	0.17	0.51	1.74
Fg-0360	Vestanfyri	2017-08-31	F	IM	800	15.68	79.6	30.8	28.6	0.09	<0.01	0.34	0.14	0.52	2.03
Fg-0361	Vestanfyri	2017-08-31	M	IM	900	17.73	75.9	29.6	30.2	0.35	0.03	0.84	0.2	0.88	3.24
Fg-0362	Vestanfyri	2017-08-31	F	IM	820	15.96	73.1	31.1	32.5	0.34	0.03	0.67	0.19	0.83	2.86
Fg-0363	Vestanfyri	2017-08-31	F	IM	780	13.98	84	31	31.6	0.15	0.01	0.6	0.29	0.57	2.25
Fg-0364	Vestanfyri	2017-08-31	F	IM	720	16.74	82.5	30.2	30	0.14	0.03	0.5	0.1	0.7	2.71
Fg-0365	Vestanfyri	2017-08-31	U	NS	1120	20.92	82.6	27.5	30.1	0.21	0.03	0.66	0.07	0.62	2.69
Fg-0366	Vestanfyri	2017-08-31	F	IM	800	12.74	80.5	28.4	30.9	0.11	<0.01	0.39	0.33	0.57	1.83
Fg-0377	Vestanfyri	2018-09-05	F	IM	762	14.11	79	30.3	31.3	0.49	0.05	0.94	0.4	0.93	2.61
Fg-0378	Vestanfyri	2018-09-05	M	IM	879	22.72	81.1	31.4	31.1	0.16	0.02	0.57	0.08	0.85	6.61
Fg-0379	Vestanfyri	2018-09-05	M	IM	1044	15.61	80.4	33	32.1	0.36	0.03	0.87	0.35	0.56	5.52
Fg-0380	Vestanfyri	2018-09-05	F	IM	777	16.34	80.4	32.5	29	0.27	0.03	0.91	0.16	0.79	6.75
Fg-0381	Vestanfyri	2018-09-05	F	IM	855	16.22	81.1	30.6	29.7	0.36	0.04	1.06	0.16	0.73	7.46
Fg-0382	Vestanfyri	2018-09-05	M	IM	1012	22.88	82.1	30.3	30.5	0.34	0.05	1.2	0.24	0.81	8.09
Fg-0383	Vestanfyri	2018-09-05	M	IM	880	19.95	80.4	28.2	30.6	0.19	0.02	1.04	0.1	0.69	2.5
Fg-0384	Vestanfyri	2018-09-05	F	IM	833	17.69	77.8	28.3	31	0.35	0.04	1.1	0.18	0.56	2.28
Fg-0385	Vestanfyri	2018-09-05	M	IM	951	16.57	75.1	36.6	30.2	0.41	0.05	1.72	0.74	0.59	2.22
Fg-0386	Vestanfyri	2018-09-05	F	IM	778	14.56	81.5	32.6	31.2	0.24	0.02	1.83	0.1	0.85	2.92
Fg-0397	Vestanfyri	2019-09-05	F	IM	800	17.71	87.6	29.6	30.2	0.24	0.02	1.02	0.07	1.04	3.41
Fg-0398	Vestanfyri	2019-09-05	M	IM	800	19.26	83.1	31.1	31	0.23	0.03	1.34	0.07	1.02	2.77
Fg-0399	Vestanfyri	2019-09-05	F	IM	658	15.70	84.9	28.1	27.9	0.38	0.05	1.2	0.21	1.09	3.88
Fg-0400	Vestanfyri	2019-09-05	F	IM	1095	19.59	76.3	30.9	32.9	0.15	0.01	0.75	0.1	0.72	2.2
Fg-0401	Vestanfyri	2019-09-05	F	IM	774	12.23	83.8	30.1	32.4	0.16	0.01	0.86	0.08	1.21	3.77
Fg-0402	Vestanfyri	2019-09-05	F	IM	558	11.51	75.1	29	27.3	0.16	0.02	1.08	0.12	1.09	2.34
Fg-0403	Vestanfyri	2019-09-05	M	IM	958	18.43	83.8	29.8	32.6	0.12	0.02	0.82	0.06	0.4	2.04
Fg-0404	Vestanfyri	2019-09-05	M	IM	973	15.66	79.5	29.2	30.7	0.18	0.01	0.8	0.12	0.85	2.18
Fg-0405	Vestanfyri	2019-09-05	F	IM	800	16.10	79.8	29.3	30.5	0.28	0.04	0.96	0.23	0.86	2.78
Fg-0406	Vestanfyri	2019-09-05	F	IM	973	17.76	77.7	28.8	30.1	0.42	0.05	1.19	0.25	0.83	2.22
Fg-0429	Vestanfyri	2020-09-01	M	IM	867		76	29.6	31.1	0.18	0.02	1.05	0.14	0.69	2.39
Fg-0430	Vestanfyri	2020-09-01	F	IM	790		80.3	32.8	31.7	0.26	0.04	0.99	0.18	0.83	3.24
Fg-0431	Vestanfyri	2020-09-01	F	IM	784		69.4	28.8	29.14	0.31	0.04	0.97	0.1	0.76	3.36
Fg-0432	Vestanfyri	2020-09-01	M	IM	1079		78.4	30	32.45	0.45	0.05	1.04	0.05	0.82	3.25
Fg-0433	Vestanfyri	2020-09-01	M	IM	926		77.8	28.9	32.47	0.28	0.05	1.1	0.06	0.88	3.16
Fg-0434	Vestanfyri	2020-09-01	F	IM	1028		75.2	31	31.64	0.2	0.02	0.78	0.09	0.58	2.55
Fg-0435	Vestanfyri	2020-09-01	M	IM	995		81.8	30.6	34.12	0.39	0.03	1.26	0.31	0.93	3.42
Fg-0436	Vestanfyri	2020-09-01	F	IM	830		62.8	30.4	29.48	0.36	0.03	0.9	0.1	0.73	3.28
Fg-0437	Vestanfyri	2020-09-01	M	IM	1038		75.7	29	29.17	0.52	0.06	0.34	0.09	0.75	2.81
Fg-0438	Vestanfyri	2020-09-01	M	IM	1000		69.5	29.8	30.19	0.25	0.02	0.82	0.1	0.66	2.64

Table 5: PCBs in Black guillemot and Northern fulmar muscle from 2017-2020 (ng/g ww)

		PCB						PFAS									
	Lipids	PCB 52	PCB 101	PCB 118	PCB 138	PCB 153	PCB 180	PFOS	PFOA	PFNA	PFDA	PFDS	PFHxS	PFUnda	PFDoA	PFTrDA	PFOSA
ID	%	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g
Cepphus grylle																	
Cg-0470	7.6	0.69	0.8	3.96	8.81	22.28	9.22										
Cg-0471	10.9	0.68	1.28	4.59	9.53	26.25	10.07										
Cg-0472	11	0.16	0.31	3.62	7.61	23.31	10.39										
Cg-0473	8.8	0.19	0.58	4.25	9.58	26.43	10.23										
Cg-0474	8.4	0.45	0.76	3.24	6.87	18.88	7.36										
Cg-0475	9	0.36	0.88	5.18	9.76	28.2	11.79										
Fulmarus glacialis																	
Fg-0357	12.6	0.14	0.26	6.89	11.88	31.25	14.07	2.9	0.04	0.19	0.38		0.07	1.4	0.29	0.9	0.04
Fg-0358	9.3	0.11	0.09	2.35	5.08	11.7	4.84	3.4	0.04	0.16	0.33		0.1	1.2	0.22	0.61	0.02
Fg-0359	15.6	0.15	0.31	5.48	10.04	23.82	7.97	2.3	0.04	0.12	0.21		0.08	0.7			
Fg-0360	8.3	0.28	0.84	5.07	8.97	20.23	9.04	2.54	0.04	0.18	0.25		0.09	1.02	0.22	0.58	0.05
Fg-0361	10.6	0.2	0.38	8.28	18.41	31.25	14.35	3.86	0.03	0.24	0.48		0.06	1.83	0.41	0.94	0.02
Fg-0362	10.5	0.19	0.22	2.98	3.66	8.75	3.62										
Fg-0363	10.8	0.16	0.26	4.23	7.18	15.31	6.59										
Fg-0364	11.6	0.28	0.81	7.9	11.95	27	11.68										
Fg-0365	12.8	0.17	0.25	2.84	4.56	11.05	4.04										
Fg-0366	14.6	0.12	0.14	5.52	8.36	17.77	7.22										
Fg-0377	11.5	0.1	0.52	13.38	17.95	30.41	11.39	5.45	0.04	0.61	1.09	0.08	0.09	3.02	0.47	1.62	0.05
Fg-0378	8.5	0.29	0.41	5.19	8.94	21.73	8.57	2.79	0.03	0.26	0.36	0.03	0.07	1.06	0.2	0.49	0.03
Fg-0379	9.9	0.26	0.88	8.25	12.36	23.08	9.98	2.78	0.04	0.42	0.44		0.07	1.3	0.21	0.73	0.03
Fg-0380		0.38	0.61	6.28	9.04	21.08	9.29	4.87		0.47	0.71		0.12	2	0.33	1.02	0.04
Fg-0381	7.1			4.72	7.76	16.98	7.07	3.8	0.03	0.31	0.57		0.07	1.6	0.3	0.8	0.03
Fg-0382	9.8	0.39	1.21	12.63	21.01	43.42	18.05										
Fg-0383	8.4	0.1	0.08	1.79	2.54	7.92	3.39										
Fg-0384	11.75	0.14	0.21	5.01	6.37	13.36	5.64										
Fg-0386	13.1	0.3	0.77	6.54	11.89	22.49	11.2										
Fg-0397	4.7	0.07	0.07	2.29	3.02	8.49	3.37	2.11	<0.038	0.25	0.33			1	0.18		0.01
Fg-0398	8.7	0.1	0.1	3.3	4.74	12.24	5.36	4.02		0.35	0.7			1.95	0.37		0.01
Fg-0399	5.1	0.07	0.06	1.74	2.56	7.32	3.17	5.78	<0.07	0.68	0.86	0.08	0.1	2.35	0.39		0.02
Fg-0400	9.5	0.12	0.14	2.49	3.13	7.38	2.42	1.58	<0.05	0.18	0.24			0.69	0.19		0.04
Fg-0401	7.4	0.47	1.15	8.47	17.61	32.03	14.67	3.36	0.04	0.35	0.58		0.08	1.33	0.32		0.02
Fg-0402	5.5	0.08	0.11	5.03	9.24	19.5	7.39										
Fg-0403	9.1	0.07	0.12	1.43	2.08	4.79	1.73										
Fg-0404	7.6	0.07	0.07	1.22	1.64	4.01	1.2										
Fg-0405	9.4	0.08	0.1	3.87	6.53	13.82	5.07										
Fg-0406	7.1	0.07	0.1	2.14	3.18	8.48	3.36										
Fg-0429	5.4	0.31	1.06	6.6	14.92	27.82	11.71	4.3	<LOQ	0.43	0.71	0.05	0.1	2	0.39	1.31	0.05
Fg-0430	8.7	0.08	0.09	2.91	3.73	10.33	4.59	2.07	0.02	0.22	0.35	<0.05	0.08	1.03	0.22	0.99	<LOQ
Fg-0431	7.4	0.61	0.45	14.65	23.38	43.17	17.02	3.8	<LOQ	0.44	0.67	<LOQ	0.08	1.64	0.29	1.08	
Fg-0432	8.6	0.54	0.73	6.89	13.44	26.43	9.83	3.6	<LOQ	0.34	0.55	0.05	0.1	1.6	0.33	1.19	0.03
Fg-0433	7.2	0.57	0.29	1.79	2.69	6.7	3.06	3.8	<LOQ	0.22	0.51	<LOQ	0.06	1.43	0.25	1.22	0.02
Fg-0434	10.6	0.14	0.34	3.7	5.76	12.31	5.44										
Fg-0435	11.8	0.11	0.12	3.6	5.31	11.94	4.04										
Fg-0436	10.5	0.12	0.16	2.8	4.02	9.43	3.58										
Fg-0437	8.1	0.13	0.18	2.29	3.51	8.49	3.31										
Fg-0438	11.3	0.12	0.08	2.6	3.47	8.05	2.74										

Appendix C: Pilot Whale

Table 6: Metals in pilot whale muscle from 2017-2020 (mg/kg ww)

									Metals	
ID	Location	Date	Gender	Agegroup	Whale no.	Skinn	Length cm	Drymatter muscle (%)	Hg mg/kg	Se mg/kg
Globicephala melas										
160617-0024	Tórshavn	2017-06-16	M	Juvenile	24	7	420	28.0	2.88	0.62
160617-0035	Tórshavn	2017-06-16	M	Juvenile	35	8	450	27.9	1.74	0.86
160617-0037	Tórshavn	2017-06-16	M	Juvenile	37	10	480	29.4	1.42	0.66
160617-0079	Tórshavn	2017-06-16	M	Juvenile	79	4	350	29.9	1.76	0.69
160617-0092	Tórshavn	2017-06-16	M	Juvenile	92	7	405	30.0	1.78	0.92
160617-0094	Tórshavn	2017-06-16	M	Juvenile	94	9	465	26.1	2.67	0.57
160617-0098	Tórshavn	2017-06-16	M	Juvenile	98	9	460	27.7	2.16	0.84
160617-0103	Tórshavn	2017-06-16	M	Juvenile	103	8	425	29.0	1.69	0.94
160617-0107	Tórshavn	2017-06-16	M	Juvenile	107	7	385	30.0	2.34	0.98
260617-0002	Hvalvík	2017-06-26	M	Juvenile	2	5	326	25.9	1.47	0.74
260617-0007	Hvalvík	2017-06-26	M	Juvenile	7	9	455	29.3	2.30	0.72
260617-0010	Hvalvík	2017-06-26	M	Juvenile	10	11	476	26.9	3.01	0.61
260617-0016	Hvalvík	2017-06-26	M	Juvenile	16	8	387	26.6	2.68	0.66
260617-0038	Hvalvík	2017-06-26	M	Juvenile	38	12	485	27.5	3.45	0.68
260617-0041	Hvalvík	2017-06-26	M	Juvenile	41	8	411	26.1	2.65	0.80
260617-0044	Hvalvík	2017-06-26	M	Juvenile	44	8	401	28.2	2.70	0.62
260617-0057	Hvalvík	2017-06-26	M	Juvenile	57	3	287	24.9	1.36	0.92
260617-0093	Hvalvík	2017-06-26	M	Juvenile	93	0	422	28.4	3.06	0.73
290617-0003	Tjørnuvík	2017-06-29	M	Juvenile	3	6	450	29.3	2.95	0.72
290617-0010	Tjørnuvík	2017-06-29	M	Juvenile	10	6	440	28.5	2.71	0.58
290617-0014	Tjørnuvík	2017-06-29	M	Juvenile	14	4	310	28.5	2.11	0.59
290617-0020	Tjørnuvík	2017-06-29	M	Juvenile	20	4	340	28.0	2.28	0.55
290617-0021	Tjørnuvík	2017-06-29	M	Juvenile	21	5	375	28.9	2.17	0.69
290617-0040	Tjørnuvík	2017-06-29	M	Juvenile	40	5	334	29.7	2.54	0.79
290617-0042	Tjørnuvík	2017-06-29	M	Juvenile	42	9	453	32.8	2.66	0.77
220518-0001	Syðrugøta	2018-05-22	M	Juvenile	1	3	340	25.6	1.54	0.74
220518-0009	Syðrugøta	2018-05-22	M	Juvenile	9	5	370	27.0	1.44	1.03
220518-0022	Syðrugøta	2018-05-22	M	Juvenile	22	10	480	26.1	1.95	1.03
220518-0028	Syðrugøta	2018-05-22	M	Juvenile	28	6	410	26.7	2.68	0.89
220518-0037	Syðrugøta	2018-05-22	M	Juvenile	37	5	390	28.2	2.32	1.07
220518-0049	Syðrugøta	2018-05-22	M	Juvenile	49	6	420	33.3	3.11	0.95
220518-0051	Syðrugøta	2018-05-22	M	Juvenile	51	6	420	26.8	1.60	0.82
220518-0054	Syðrugøta	2018-05-22	M	Juvenile	54	7	440	26.4	2.16	0.80
220518-0056	Syðrugøta	2018-05-22	M	Juvenile	56	5	380	28.6	2.06	0.83
240718-0002	Tórshavn	2018-07-24	M	Juvenile	2	8	440	32.8	1.77	0.88
240718-0004	Tórshavn	2018-07-24	M	Juvenile	4	6	380	29.7	2.45	0.93
240718-0013	Tórshavn	2018-07-24	M	Juvenile	13	10	482	31.9	2.02	0.72
240718-0018	Tórshavn	2018-07-24	M	Juvenile	18	8	439	32.1	1.88	1.01
240718-0033	Tórshavn	2018-07-24	M	Juvenile	33	3	283	28.1	1.47	0.81
240718-0038	Tórshavn	2018-07-24	M	Juvenile	38	5	347	28.3	1.58	1.03
240718-0043	Tórshavn	2018-07-24	M	Juvenile	43	5	377	27.4	1.81	0.54
240718-0049	Tórshavn	2018-07-24	M	Juvenile	49	6	372	33.4	1.33	0.76
240718-0051	Tórshavn	2018-07-24	M	Juvenile	51	9	457	29.3	2.36	0.82
300718-0001	Tórshavn	2018-07-30	M	Juvenile	1	4	320	27.1	0.79	0.74
300718-0006	Tórshavn	2018-07-30	M	Juvenile	6	2	253	29.1	1.24	0.80
300718-0009	Tórshavn	2018-07-30	M	Juvenile	9	8	420	26.9	1.74	0.50
300718-0012	Tórshavn	2018-07-30	M	Juvenile	12	6	405	25.3	1.72	0.52
300718-0013	Tórshavn	2018-07-30	M	Juvenile	13	8	456	27.7	2.32	1.11
300718-0015	Tórshavn	2018-07-30	M	Juvenile	15	3	300	26.8	1.13	0.67
300718-0021	Tórshavn	2018-07-30	M	Juvenile	21	8	445	26.7	1.91	0.60

Table 6: Metals in pilot whale muscle from 2017-2020 (mg/kg ww) (continued)

									Metals	
ID	Location	Date	Gender	Agegroup	Whale no.	Skinn	Length cm	Drymatter muscle (%)	Hg mg/kg	Se mg/kg
290419-0006	Sandavágur	2019-04-29	M	Juvenile	6	7	450	26.8	1.84	1.02
290419-0022	Sandavágur	2019-04-29	M	Juvenile	22	8	460	26.8	2.08	0.60
290519-0003	Tórshavn	2019-05-29	M	Juvenile	3	9	450	28.5	1.90	0.67
290519-0005	Tórshavn	2019-05-29	M	Juvenile	5	11	448	29.2	2.27	0.96
290519-0037	Tórshavn	2019-05-29	M	Juvenile	37	10	455	28.8	1.97	0.74
290519-0055	Tórshavn	2019-05-29	M	Juvenile	55	7	390	27.6	1.39	0.76
290519-0084	Tórshavn	2019-05-29	M	Juvenile	84	6	370	26.8	1.88	1.10
290519-0085	Tórshavn	2019-05-29	M	Juvenile	85	5	330	27.5	1.61	0.64
020819-0004	Hvalvík	2019-08-02	M	Juvenile	4	6	346	28.8	2.60	0.51
020819-0015	Hvalvík	2019-08-02	M	Juvenile	15	5	350	27.1	1.85	0.70
270819-0001	Vestmanna	2019-08-27	M	Juvenile	1	6	410	31.4	1.52	0.68
270819-0010	Vestmanna	2019-08-27	M	Juvenile	10	8	440	27.4	2.05	0.59
270819-0021	Vestmanna	2019-08-27	M	Juvenile	21	8	440	32.1	1.83	0.60
270819-0025	Vestmanna	2019-08-27	M	Juvenile	25	4	320	27.2	1.66	0.50
270819-0026	Vestmanna	2019-08-27	M	Juvenile	26	5	370	27.9	1.66	0.55
270819-0028	Vestmanna	2019-08-27	M	Juvenile	28	5	380	29.4	2.00	0.79
270819-0031	Vestmanna	2019-08-27	M	Juvenile	31	10	470	26.3	1.65	0.54
270819-0040	Vestmanna	2019-08-27	M	Juvenile	40	6	390	26.7	2.46	0.66
270819-0061	Vestmanna	2019-08-27	M	Juvenile	61	7	410	27.8	1.82	0.57
270819-0076	Vestmanna	2019-08-27	M	Juvenile	76	6	390	30.4	1.71	0.76
270819-0077	Vestmanna	2019-08-27	M	Juvenile	77	7	400	29.7	1.85	0.52
270819-0083	Vestmanna	2019-08-27	M	Juvenile	83	8	420	32.3	1.72	0.56
270819-0084	Vestmanna	2019-08-27	M	Juvenile	84	7	430	27.6	2.13	0.68
270819-0085	Vestmanna	2019-08-27	M	Juvenile	85	8	460	28.4	2.09	0.77
270819-0089	Vestmanna	2019-08-27	M	Juvenile	89	7	430	25.5	2.21	0.65
161020-0002	Hvalvík	2020-10-16	M	Juvenile	2	8	454	30.2	1.46	0.55
161020-0004	Hvalvík	2020-10-16	M	Adult	4	13	505	31.9	2.16	0.54
161020-0005	Hvalvík	2020-10-16	M	Adult	5	13	535	31.6	5.24	1.18
161020-0006	Hvalvík	2020-10-16	M	Juvenile	6	10	465	29.2	1.80	0.53
161020-0007	Hvalvík	2020-10-16	F	Adult	7	8	425	30.2	7.09	2.21
161020-0009	Hvalvík	2020-10-16	M	Juvenile	9	15	490	33.8	2.60	0.72
161020-0010	Hvalvík	2020-10-16	M	Adult	10	14	515	30.7	2.66	0.56
161020-0011	Hvalvík	2020-10-16	M	Juvenile	11	8	410	32.1	1.96	0.68
161020-0012	Hvalvík	2020-10-16	F	Adult	12	9	420	32.5	2.87	0.81
161020-0013	Hvalvík	2020-10-16	M	Adult	13	18	560	30.6	2.19	0.42
161020-0014	Hvalvík	2020-10-16	M	Adult	14	20	550	28.9	2.53	0.56
161020-0016	Hvalvík	2020-10-16	F	Adult	16	7	405	31.2	3.47	1.14
161020-0019	Hvalvík	2020-10-16	F	Adult	19	7	405	31.4	2.50	0.45
161020-0022	Hvalvík	2020-10-16	M	Juvenile	22	4	300	28.9	0.47	0.72
161020-0028	Hvalvík	2020-10-16	M	Juvenile	28	5	360	29.9	1.89	0.62
161020-0034	Hvalvík	2020-10-16	F	Adult	34	8	415	31.1	1.84	0.40
161020-0043	Hvalvík	2020-10-16	F	Adult	43	7	405	31.1	1.90	0.41
161020-0045	Hvalvík	2020-10-16	M	Adult	45	19	575	33.1	2.83	0.57
161020-0047	Hvalvík	2020-10-16	M	Juvenile	47	9	450	29.1	1.72	0.47
161020-0050	Hvalvík	2020-10-16	M	Juvenile	50	10	450	30.0	1.78	0.63
161020-0057	Hvalvík	2020-10-16	M	Adult	57	18	560	29.8	2.69	0.63
161020-0059	Hvalvík	2020-10-16	M	Juvenile	59	4	320	26.4	1.90	0.57
161020-0060	Hvalvík	2020-10-16	F	Juvenile	60	1	190	26.9	0.50	1.05
161020-0066	Hvalvík	2020-10-16	F	Juvenile	66	2	265	30.9	0.62	0.49

Table 7: Metals in pilot whale liver and kidney from 2017-2020 (mg/kg ww)

		Metals					
		Liver				Kidney	
ID	Location	Drymatter (%)	mg/kg	mg/kg	mg/kg	Drymatter (%)	mg/kg
Globicephala melas							
160617-0004	Tórshavn	27.9	19.10	37.80	14.30	23.8	81.80
160617-0006	Tórshavn	30.5	15.75	27.70	9.59	22.6	92.70
160617-0011	Tórshavn	29.6	25.75	79.60	32.10	23.1	46.40
160617-0015	Tórshavn	34.4	37.64	111.00	45.20	24.8	61.90
160617-0016	Tórshavn	28.7	38.95	72.40	27.50	23.0	131.00
160617-0027	Tórshavn	25.8	17.81	81.30	28.10	23.0	49.10
160617-0036	Tórshavn	25.7	22.60	65.90	26.50	24.9	54.50
160617-0058	Tórshavn	23.8	7.73	26.20	8.55	24.1	25.60
260617-0003	Hvalvík	27.3	28.22	91.00	35.40	25.1	91.40
260617-0012	Hvalvík	26.7	28.38	56.80	25.30	23.3	84.30
260617-0059	Hvalvík	26.1	25.32	69.00	26.20	23.9	51.80
260617-0061	Hvalvík	27.2	20.58	74.70	30.10	23.9	45.70
290617-0011	Tjørnuvík	27.6	32.30	121.00	47.50	22.6	85.60
290617-0015	Tjørnuvík	29.0	52.74	302.00	121.00	22.9	38.10
290617-0022	Tjørnuvík	27.3	21.25	138.00	47.40	23.7	71.60
220518-0004	Syðrugøta	30.2	19.90	48.80	17.40	21.5	66.70
220518-0015	Syðrugøta	25.5	10.10	41.10	14.50	22.6	43.20
220518-0021	Syðrugøta	26.5	10.70	32.70	13.20	22.1	45.30
220518-0029	Syðrugøta	32.0	24.80	62.30	22.60	22.2	57.20
220518-0032	Syðrugøta	26.7	14.00	46.60	19.50	21.6	36.60
220518-0048	Syðrugøta	29.2	30.00	39.90	23.40	22.4	84.80
240718-0001	Tórshavn	27.0	43.70	188.00	85.40		
240718-0010	Tórshavn					23.1	84.30
240718-0011	Tórshavn	27.8	24.50	46.00	28.10	21.6	105.00
240718-0050	Tórshavn	25.3	7.86	43.80	24.90	21.3	69.90
300718-0004	Tórshavn	25.8	14.30	207.00	72.10	21.4	34.40
300718-0018	Tórshavn	25.9	23.70	114.00	42.00	22.9	91.40
300718-0019	Tórshavn	25.9	28.20	13.50	13.00	22.1	70.80
300718-0022	Tórshavn	23.8	14.90	95.70	31.40	21.6	63.30
300718-0023	Tórshavn	26.4	29.60	146.00	55.20	21.4	92.80
300718-0029	Tórshavn	26.7	16.20	73.20	34.30	21.7	44.90
290419-0002	Sandavágur	29.4	10.00	39.90	14.40	21.9	35.40
290419-0005	Sandavágur	31.2	17.50	103.00	32.50	22.5	75.20
290419-0011	Sandavágur	28.7	41.40	156.00	48.40	20.2	130.00
290419-0017	Sandavágur	27.5	32.10	233.00	69.20	22.1	71.90
290419-0020	Sandavágur	28.2	11.50	38.20	12.50	20.2	78.00
290419-0024	Sandavágur	26.8	14.40	82.20	21.20	22.1	59.10
290419-0026	Sandavágur	28.2	9.35	67.60	20.60	21.3	26.30
290519-0004	Tórshavn	28.3	25.40	90.80	29.30	22.5	54.50
290519-0006	Tórshavn	27.9	24.80	137.00	43.20	22.0	123.00
290519-0021	Tórshavn	29.1	7.03	204.00	54.70	21.7	39.40
290519-0030	Tórshavn	29.1	10.80	61.10	19.60	21.8	37.70
290519-0093	Tórshavn	31.7	20.40	154.00	49.20	21.4	61.80
020819-0021	Hvalvík	28.4	32.80	136.00	48.90	23.2	46.90
020819-0022	Hvalvík	31.2	56.00	321.00	101.00	23.3	86.50
270819-0018	Vestmanna	25.8	30.90	89.00	37.80	23.1	88.50
161020-0004	Hvalvík	27.5	20.55	46.45	14.71	22.4	56.17
161020-0005	Hvalvík	27.0	5.55	156.82	45.89		
161020-0006	Hvalvík	27.3	5.73	28.43	10.40	22.4	27.50
161020-0007	Hvalvík	26.2	14.27	276.65	75.62	22.1	41.53
161020-0009	Hvalvík	28.2	25.83	112.25	36.33	23.6	80.91
161020-0010	Hvalvík	27.5	17.95	114.31	36.41	23.6	68.88
161020-0012	Hvalvík	28.2	49.13	241.10	72.26	21.2	130.36

Table 7: Metals in pilot whale liver and kidney from 2017-2020 (mg/kg ww) (continued)

		Metals					
		Liver				Kidney	
ID	Location	Drymatter (%)	mg/kg	mg/kg	mg/kg	Drymatter (%)	mg/kg
161020-0013	Hvalvík	27.1	4.37	34.49	10.25	22.6	26.70
161020-0014	Hvalvík	27.5	5.70	76.95	21.61	22.9	38.28
161020-0016	Hvalvík	26.9	31.53	203.27	61.41	22.1	106.51
161020-0019	Hvalvík	28.8	36.66	40.14	13.88	23.1	71.59
161020-0034	Hvalvík	28.0	25.32	48.05	16.61	22.2	111.39
161020-0043	Hvalvík	28.4	29.91	110.74	31.36	23.8	115.02
161020-0045	Hvalvík	26.9	6.42	40.40	13.94	22.0	49.97
161020-0057	Hvalvík	24.7	3.92	45.31	15.02	22.0	44.65
161020-0060	Hvalvík	26.8	0.01	1.16	1.52	22.5	0.13

Table 8: PCB congeners in Pilot Whale from 2017-2020 (ng/g lw)

	PCB congeners																
ID	Aroclor ng/g	PCB 28 ng/g	PCB 52 ng/g	PCB 99 ng/g	PCB 101 ng/g	PCB 105 ng/g	PCB 118 ng/g	PCB 128 ng/g	PCB 138 ng/g	PCB 153 ng/g	PCB 156 ng/g	PCB 163 ng/g	PCB 170 ng/g	PCB 180 ng/g	PCB 183 ng/g	PCB 187 ng/g	PCB 209 ng/g
Globicephala melas																	
160617-0024	12000	26	290	330	450	150	490	130	920	1300	52	250	130	420	110	420	
160617-0035	11000	17	180	300	360	110	410	130	860	1200	48	210	160	530	130	440	
160617-0037	11000	34	350	370	510	170	490	150	870	1300	57	250	130	410	110	410	
160617-0079	9700	40	260	280	400	130	430	110	750	1100	46	200	110	350	91	350	
160617-0092	10000	27	220	270	370	120	400	110	790	1200	49	200	130	440	110	410	
160617-0094	9300	45	190	260	370	120	370	110	730	1100	49	200	120	390	99	380	
160617-0098	8600	23	200	240	340	110	350	96	660	1000	40	180	100	320	84	320	
160617-0103	14000	38	380	450	630	190	630	180	1100	1600	59	300	140	430	120	430	
160617-0107	8200	23	180	230	320	100	330	90	620	960	39	170	100	330	85	310	
260617-0002	14000	47	300	320	470	150	480	130	1100	1700	59	250	160	530	140	520	
260617-0007	7250	22	170	215	315	98	330	82.5	585	805	34.5	150	86.5	285	72	275	
260617-0010	17000	24	330	440	540	180	560	200	1300	2000	68	330	240	750	180	660	
260617-0016	10000	25	230	300	520	130	440	130	800	1200	57	240	140	440	110	460	
260617-0038	10000	47	350	360	530	170	560	150	810	1200	61	240	150	490	120	460	
260617-0041	6500	26	250	240	380	110	360	95	500	750	35	170	91	290	75	290	
260617-0044	7500	29	200	220	320	100	320	85	580	860	34	140	84	260	69	260	
260617-0057	10000	49	270	310	460	150	470	130	780	1100	51	220	130	400	100	390	
260617-0093	9600	43	270	320	480	150	500	130	730	1100	48	220	130	410	100	400	
290617-0003	12000	42	330	380	570	170	580	150	910	1400	59	270	160	500	130	490	
290617-0010	7700	38	250	290	420	130	420	110	590	890	49	200	130	400	100	380	
290617-0014	23000	76	550	570	790	280	780	310	1900	2500	110	480	310	850	240	770	
290617-0020	7000	43.5	220	240	385	115	365	92.5	530	815	36.5	165	91	290	74.5	290	
290617-0021	10000	38	270	340	510	150	490	120	820	1200	50	220	130	420	100	380	
290617-0040	18000	33	370	490	740	210	760	190	1400	2100	70	330	190	680	150	570	
290617-0042	10000	28.5	240	300	460	130	440	110	775	1200	48	210	130	440	105	395	
220518-0001	17000	93	390	560	740	230	730	200	1400	1900	71	370	200	550	170	630	1.6
220518-0009	8700	44	230	280	390	110	360	100	670	1000	34	190	120	350	96	340	1.8
220518-0022	15000	37	250	410	480	150	520	160	1200	1700	54	280	220	680	170	630	2.8
220518-0028	9550	30.5	165	290	400	100	395	86.5	725	1100	31.5	155	98	390	82.5	385	2
220518-0037	11000	46	210	310	410	120	390	110	820	1200	40	200	130	450	120	450	2.2
220518-0049	17000	22	200	450	480	120	490	140	1400	2000	45	320	270	810	170	760	2.7
220518-0051	6000	28	140	190	250	81	240	73	470	690	24	130	81	240	68	240	1.3
220518-0054	14000	34	300	400	500	160	550	140	1100	1600	48	270	170	540	150	560	2.5
220518-0056	13000	36	260	380	490	140	500	130	1000	1500	47	240	170	570	140	550	2.2
240718-0002	13000	19	180	360	430	130	430	140	1100	1500	46	230	180	580	140	520	2.1
240718-0004	17000	23	310	530	620	180	610	160	1300	1900	52	320	170	590	150	560	1.7
240718-0013	10000	21	170	305	385	105	375	100	805	1200	36.5	180	135	440	110	415	3.25
240718-0018	12000	18	170	370	430	100	430	110	990	1400	35	180	130	460	100	440	1.9
240718-0033	8800	38	180	260	360	98	360	87	670	1000	31	170	100	350	86	360	1.8
240718-0038	8300	27	150	210	360	86	350	77	650	950	28	150	89	310	73	310	2
240718-0043	11000	36	200	340	440	120	430	110	860	1300	41	200	140	490	120	480	2.1
240718-0049	9500	40	190	290	390	110	360	99	730	1100	35	190	120	380	98	380	2.7
240718-0051	13000	28	220	380	450	130	460	130	1000	1400	43	240	150	490	120	470	2.3
300718-0001	22000	45	410	730	800	270	880	270	1800	2500	74	420	230	630	180	660	1.6
300718-0006	19000	39	330	610	710	200	710	190	1500	2200	65	350	190	650	150	620	2.8
300718-0009	30000	25	460	980	900	300	890	330	2400	3400	72	470	330	880	240	830	1.8
300718-0012	24000	24	440	770	820	280	890	270	2000	2700	73	430	280	750	210	720	2.4
300718-0013	8500	18	140	270	310	96	320	93	670	960	30	150	100	310	79	290	1.7
300718-0015	12000	44	200	350	450	130	470	120	920	1400	40	210	120	450	97	440	1.6
300718-0021	12000	17	180	340	380	110	420	120	930	1400	38	200	130	430	110	400	2.8
290419-0006	8300	40	180	260	380	100	360	99	670	940	32	160	96	290	76	300	1.8
290419-0022	11000	29	230	330	400	130	450	140	900	1200	41	180	150	470	110	450	1.8
290519-0003	10000	26	200	290	350	120	410	120	820	1100	38	150	130	410	99	380	2.3
290519-0005	7400	25	150	210	270	84	280	82	590	830	28	110	87	270	68	270	2.7
290519-0037	8800	29	190	260	330	110	380	100	740	950	37	120	110	310	77	320	2.4
290519-0055	18000	52	370	540	680	200	730	220	1500	1900	71	270	240	750	160	650	1.2

Table 8: PCB congeners in Pilot Whale from 2017-2020 (ng/g lw) (continued)

	PCB congeners																
	Aroclor	PCB 28	PCB 52	PCB 99	PCB 101	PCB 105	PCB 118	PCB 128	PCB 138	PCB 153	PCB 156	PCB 163	PCB 170	PCB 180	PCB 183	PCB 187	PCB 209
ID	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g
290519-0084	5200	18	100	140	190	59	200	55	420	590	19	77	51	160	40	170	1.2
290519-0085	6300	23	130	180	240	70	260	71	490	720	23	120	83	270	61	270	2.1
020819-0004	11000	35	300	340	440	140	530	130	890	1200	45	180	110	320	76	320	2
020819-0015	6550	21.5	145	180	260	73.5	270	68.5	520	740	24.5	100.5	75.5	245	60	255	1.02
270819-0001	6000	21	140	170	220	71	250	69	470	680	22	93	76	250	61	260	2.1
270819-0010	13000	25	260	400	455	145	535	160	1000	1450	47.5	225	160	460	110	425	4.35
270819-0021	6300	18	130	170	220	70	260	72	490	720	23	100	93	290	69	290	2
270819-0025	19000	43	460	700	810	250	960	280	1500	2100	76	290	250	690	150	590	1.6
270819-0026	9700	31	190	280	330	110	400	130	770	1100	43	180	140	400	97	380	2.7
270819-0028	4400	12	79	110	130	42	150	47	350	500	16	63	63	200	49	200	0.96
270819-0031	7900	23	150	240	310	88	330	91	630	890	29	160	98	300	74	280	3.7
270819-0040	9700	24	180	270	360	100	390	100	760	1100	34	170	120	410	100	400	2.4
270819-0061	8800	37	200	300	360	120	390	120	710	970	38	140	110	320	76	310	2.7
270819-0076	5200	22	120	150	200	60	220	58	420	580	20	81	66	220	49	220	1.6
270819-0077	14000	23	250	440	490	140	570	180	1100	1500	53	230	190	550	120	470	2.1
270819-0083	12000	15.5	215	370	390	120	435	145	950	1300	37.5	170	165	505	110	455	1.25
270819-0084	21000	21	380	690	790	210	880	270	1700	2300	75	420	270	770	180	630	2.4
270819-0085	8400	34	150	240	290	93	310	100	680	940	33	120	120	370	84	330	2.9
270819-0089	10000	16	190	310	340	100	390	130	810	1200	38	170	150	470	100	390	3.3
161020-0002	5700	32	120	180	230	73	240	73	470	630	23	96	63	180	48	190	2.3
161020-0004	6600	20	110	180	220	71	250	77	520	750	25	100	91	270	66	250	3
161020-0005	26000	29	420	700	750	240	930	300	2000	3000	85	380	390	1200	260	1000	15
161020-0006	4800	17	91	130	160	51	180	58	390	540	18	87	60	180	46	180	1.6
161020-0007	11000	37.5	220	350	420	135	475	145	900	1250	45.5	185	170	515	110	435	22
161020-0009	9050	20	165	275	350	97	350	104.5	720	1045	33	155	130	395	97	360	4.25
161020-0010	18000	20	320	620	610	150	620	220	1500	2000	50	270	250	730	170	580	4.1
161020-0011	5200	21	110	160	220	59	220	59	410	590	20	86	64	200	51	200	1.8
161020-0012	3600	15	74	100	140	40	140	38	280	400	14	65	51	160	43	160	11
161020-0013	7000	25	160	230	290	82	300	85	570	770	27	120	93	270	70	240	2.7
161020-0014	21000	35	390	690	810	220	860	270	1700	2400	89	350	340	990	220	770	16
161020-0016	7900	30	150	230	320	87	310	89	620	900	30	140	110	340	84	320	19
161020-0019	5900	17	95	160	210	60	210	67	470	670	24	110	82	240	62	240	2
161020-0022	13000	49	290	450	600	160	590	160	1000	1500	50	260	140	410	110	410	1.2
161020-0028	5500	21	110	160	220	63	240	62	430	620	21	100	66	200	51	190	1.7
161020-0034	2400	3.25	15.5	40.5	44.5	14	50.5	23.5	180	270	11	42	47	145	37.5	140	2.1
161020-0043	1800	7.9	32	44	56	17	55	18	140	200	8	31	43	150	36	130	4.1
161020-0045	8400	27	150	250	320	94	350	100	680	940	35	150	110	310	81	300	3.3
161020-0047	6500	17	120	190	240	71	270	74	520	740	25	120	80	240	60	230	3.3
161020-0050	12000	34	220	370	490	140	520	140	930	1300	45	220	130	370	95	360	1.9
161020-0057	23000	46	410	740	900	240	1000	310	1800	2600	100	450	350	1000	230	780	19
161020-0059	6100	26	130	180	240	68	250	65	480	690	24	110	77	240	63	240	0.96
161020-0060	2600	24	91	90	130	38	130	29	210	280	9.4	49	26	78	22	86	<0.6
161020-0066	13000	54	330	470	640	170	610	170	1100	1500	54	270	150	440	120	460	0.8

Table 9: Organochlorinated Pesticides and Toxaphenes in Pilot Whale from 2017-2020 (ng/g lw)

		Organochlorinated Pesticides								
	Lipids	α-chlordane	γ-chlordane	Cisnonachlor	Transnonachlor	Hexachlorobenzen	α-HCH	β-HCH	Mirex	Ocychlordane
ID	%	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g
Globicephala melas										
020819-0004	99	110	1.9	350	1100	360	1.8	18	78	190
020819-0015	95.5	120	3.5	210	620	260	1.95	15.5	62.5	91.5
160617-0024	87	160	4.8	310	1200	330		23	94	190
160617-0035	86	110	3.2	240	900	250		16	93	120
160617-0037	87	160	3.9	320	1300	300		26	78	230
160617-0079	85	230	7.4	310	1100	370		26	94	160
160617-0092	84	99	2.7	240	910	270		21	100	140
160617-0094	87	140	4.3	270	930	270		22	100	160
160617-0098	88	130	3.9	240	810	270		20	76	140
160617-0103	87	140	2.6	340	1400	280		27	64	220
160617-0107	88	130	3.9	230	710	260		17	83	120
161020-0002	96	58	1.9	150	520	160	2.9	14	42	89
161020-0004	98	69	1.8	150	510	140	3.2	9.3	55	73
161020-0005	96	170	4.1	460	1900	330	2.4	25	200	260
161020-0006	95	71	2.2	130	420	130	3.1	11	38	58
161020-0007	98.5	71.5	2.2	250	1000	255	3.7	19.5	130	165
161020-0009	91.5	75.5	3.3	225	850	150	2.85	13	90.5	110
161020-0010	99	120	4.6	370	1600	210	2.6	18	100	180
161020-0011	94	72	2.6	160	480	160	3.7	12	56	79
161020-0012	96	69	3.5	110	320	150	3.1	7.9	61	48
161020-0013	90	110	3.4	230	670	230	4.2	19	61	120
161020-0014	89	120	4.5	410	1700	290	3.4	29	150	240
161020-0016	90	120	4.5	220	660	230	3.2	15	110	120
161020-0019	98	60	3.7	150	450	130	3.4	8.5	50	64
161020-0022	88	170	6.3	410	1300	410	8	30	69	190
161020-0028	98	55	2.1	140	460	180	2.9	10	44	75
161020-0034	96.5	20.5	1.95	48.5	170	24	1.9	2.05	43	13.5
161020-0043	98	37	3.1	54	160	76	2.7	4.4	62	21
161020-0045	100	80	3.3	210	700	200	3	12	65	98
161020-0047	98	84	3.3	180	520	180	2.8	14	54	75
161020-0050	87	92	3.4	250	1000	220	4.2	19	62	160
161020-0057	91	110	3.8	390	1700	250	2.8	28	140	220
161020-0059	98	99	4.2	190	580	220	3.6	13	50	80
161020-0060	79	84	5.7	110	300	270	8.4	13	15	54
161020-0066	90	250	10	490	1500	390	7	36	73	230
220518-0001	85	200	5	500	1900			46	100	290
220518-0009	94	190	7.2	300	940			33	68	160
220518-0022	96	140	4.6	370	1300			28	99	180
220518-0028	97.5	102	3.8	290	960			20	70.5	125
220518-0037	83	130	5.3	280	1100			23	89	140
220518-0049	99	100	4.6	300	1600			18	120	140
220518-0051	96	120	4.2	190	560			19	42	98
220518-0054	80	190	4.8	430	1400			34	110	200
220518-0056	97	240	7.6	440	1300			30	100	170
240718-0002	95	82	3.3	240	1100			16	76	120
240718-0004	94	80	2.9	310	1400			25	80	220
240718-0013	97	120	5.15	265	930			18	77	115
240718-0018	98	84	3.5	270	1200			16	58	110
240718-0033	90	180	6.4	330	910			26	70	140
240718-0038	95	110	2.9	260	810			20	61	100
240718-0043	88	140	5.3	310	1100			25	88	140
240718-0049	86	140	4.2	300	950			25	81	140
240718-0051	94	100	4.6	280	1100			21	82	160

Table 9: Organochlorinated Pesticides and Toxaphenes in Pilot Whale from 2017-2020 (ng/g lw) (continued)

		Organochlorinated Pesticides								
ID	Lipids %	α-chlordane ng/g	γ-chlordane ng/g	Cisnonachlor ng/g	Transnonachlor ng/g	Hexachlorobenzen ng/g	α-HCH ng/g	β-HCH ng/g	Mirex ng/g	Ocychlordane ng/g
260617-0002	87	210	4.9	350	1300	540		38	110	200
260617-0007	89	140	5.4	230	810	275		16.5	76.5	120
260617-0010	86	140	3.2	330	1500	310		21	160	220
260617-0016	86	130	3.4	280	990	290		20	100	170
260617-0038	85	230	8	370	1200	380		32	140	230
260617-0041	89	150	4.5	260	780	290		29	76	150
260617-0044	89	140	4.9	230	850	290		27	62	140
260617-0057	79	190	4.3	320	970	560		32	92	190
260617-0093	78	240	6.1	370	1100	420		38	120	200
270819-0001	73	85	1.9	190	630	180	3.8	15	61	93
270819-0010	86.5	130	5	315	1150	315	3.5	23	82.5	185
270819-0021	91	84	2.3	190	640	140	3.3	15	70	93
270819-0025	91	170	5.7	490	2100	470	5	34	81	330
270819-0026	90	130	3.8	270	850	350	4.1	19	68	120
270819-0028	90	50	1.6	120	420	110	3	9.9	42	57
270819-0031	90	100	4.4	210	700	220	2.8	13	70	92
270819-0040	95	83	2.2	230	890	160	2.5	17	99	120
270819-0061	94	170	6.2	310	880	310	3.7	20	70	130
270819-0076	98	80	2	160	520	160	2.6	12	54	83
270819-0077	99	110	2.9	300	1300	290	2.2	18	80	190
270819-0083	94	91	2.65	305	1350	130	3.35	17.5	80.5	165
270819-0084	95	140	4.2	490	1800	270	3.7	24	99	250
270819-0085	97	72	3.1	190	710	220	3.1	12	70	110
270819-0089	97	110	3.5	250	880	220	3.1	14	84	120
290419-0006	96	86	3.7	220	800	220	4.4	20	58	120
290419-0022	88	86	2.6	270	1200	210	5.3	20	79	170
290519-0003	100	100	2.3	290	930	240	2.8	22	89	130
290519-0005	82	100	3.9	210	640	230	2.4	17	69	100
290519-0037	96	120	2.8	290	850	260	3.4	22	76	130
290519-0055	89	190	4.3	550	1900	410	3.4	40	120	260
290519-0084	88	64	2.1	150	480	180	<1	12	50	70
290519-0085	95	89	2.4	180	590	230	3.6	13	67	88
290617-0003	77	200	5.1	390	1300	360		34	150	240
290617-0010	78	140	4.4	280	850	370		28	120	180
290617-0014	80	230	4	480	2200	540		53	150	370
290617-0020	80	225	6	310	770	520		32.5	90	165
290617-0021	85	250	8.6	350	1200	370		35	88	180
290617-0040	87	200	3.4	410	1900	430		44	120	290
290617-0042	87.5	165	4.7	290	1100	310		29.5	110	175
300718-0001	98	200	7.2	530	1900			33	76	260
300718-0006	89	220	9.1	500	1600			30	87	200
300718-0009	98	81	2.8	360	2200			19	77	330
300718-0012	96	130	4.3	520	2200			26	110	270
300718-0013	91	100	4.6	210	730			15	47	100
300718-0015	92	170	6.9	320	910			23	56	130
300718-0021	94	91	3.6	260	940			14	65	120

Table 10: DDEs and Toxaphenes in Pilot Whale from 2017-2020 (ng/g lw)

		DDT isomers and metabolites						Toxaphenes			
ID	Lipids %	p,p'-DDD ng/g	p,p'-DDE ng/g	p,p'-DDT ng/g	o,p'-DDD ng/g	o,p'-DDE ng/g	o,p'-DDT ng/g	Parlar no. 26 ng/g	Parlar no. 32 ng/g	Parlar no. 50 ng/g	Parlar no. 62 ng/g
160617-0024	87	690	5500	400	100	100	360	750	5.4	1100	200
160617-0035	86	390	4700	250	61	61	270	550	4.6	910	190
160617-0037	87	710	5600	410	110	100	460	820	<1	1100	230
160617-0079	85	730	4400	430	100	88	280	800	8.9	1500	370
160617-0092	84	480	4300	310	81	77	270	580	<1	680	130
160617-0094	87	540	4300	360	86	85	300	600	<1	950	200
160617-0098	88	480	3900	330	76	71	280	540	<1	920	200
160617-0103	87	580	7700	350	110	120	460	830	<1	1100	220
160617-0107	88	430	3300	310	71	57	210	560	<1	790	170
260617-0002	87	800	6100	490	140	110	420	920	6.9	1500	310
260617-0007	89	435	3700	335	75.5	67.5	250	535	<1	840	205
260617-0010	86	600	7500	470	100	100	460	790	<1	1100	210
260617-0016	86	490	4400	400	83	68	270	600	<1	860	160
260617-0038	85	620	5600	500	130	130	470	750	<1	1200	350
260617-0041	89	450	3500	400	91	76	270	550	6.5	810	210
260617-0044	89	460	3800	460	84	74	280	580	<1	870	220
260617-0057	79	550	4200	450	100	82	310	690	<1	1200	370
260617-0093	78	610	4600	470	130	100	360	770	<1	1300	360
290617-0003	77	660	5800	590	130	110	370	840	<1	1100	230
290617-0010	78	480	3800	560	100	88	330	570	<1	950	310
290617-0014	80	970	12000	630	230	200	790	1200	<1	1500	300
290617-0020	80	510	3500	565	110	81	260	595	<1	1100	370
290617-0021	85	620	5500	500	130	110	370	840	11	1500	440
290617-0040	87	890	9200	600	190	180	550	1100	<1	1500	240
290617-0042	87.5	580	4900	525	115	110	330	700	<1	1100	270
220518-0001	85	1100	8300	760	180	180	620	1300	<1	1800	270
220518-0009	94	550	3200	330	86	71	230	770	<1	1200	270
220518-0022	96	590	6100	380	89	88	410	790	<1	1100	200
220518-0028	97.5	520	4000	395	74.5	70	290	660	<1	885	150
220518-0037	83	540	4500	360	90	85	320	760	<1	930	190
220518-0049	99	580	7600	410	91	97	480	750	<1	780	120
220518-0051	96	300	2300	210	52	45	160	450	<1	620	170
220518-0054	80	680	5200	440	100	100	360	900	<2	1500	240
220518-0056	97	720	5600	540	140	110	420	940	<1	1400	300
240718-0002	95	510	6000	360	78	75	390	610	<1	680	130
240718-0004	94	680	7000	430	100	120	450	890	<1	1000	130
240718-0013	97	475	4250	370	72.5	63	305	640	<1	815	180
240718-0018	98	530	5600	360	68	63	360	720	<1	700	110
240718-0033	90	560	3600	430	100	80	270	750	<1	1200	280
240718-0038	95	510	3300	400	70	58	210	580	<1	810	140
240718-0043	88	630	4600	450	99	86	340	710	<1	990	170
240718-0049	86	550	3900	430	92	72	270	700	<1	910	180
240718-0051	94	550	5400	400	69	73	320	670	<1	950	170
300718-0001	98	880	7300	530	160	130	570	1300	<1	1700	210
300718-0006	89	780	5900	550	120	91	470	1000	<1	1500	280
300718-0009	98	660	12000	360	130	150	760	1100	<1	1200	110
300718-0012	96	820	8600	520	130	140	610	1300	<1	1700	170
300718-0013	91	360	2600	240	62	49	220	490	<1	670	110
300718-0015	92	520	3100	390	90	64	260	650	<1	1100	230
300718-0021	94	430	3500	270	62	53	240	580	<1	710	100
290419-0006	96	380	3600	240	56	61	210	570		930	180
290419-0022	88	490	5600	340	77	90	350	670		770	130
290519-0003	100	440	3900	320	45	43	190	640		1100	170
290519-0005	82	360	2700	240	47	41	170	480		950	180

Table 10: DDEs and Toxaphenes in Pilot Whale from 2017-2020 (ng/g lw) (continued)

		DDT isomers and metabolites						Toxaphenes			
ID	Lipids %	p,p'-DDD ng/g	p,p'-DDE ng/g	p,p'-DDT ng/g	o,p'-DDD ng/g	o,p'-DDE ng/g	o,p'-DDT ng/g	Parlar no. 26 ng/g	Parlar no. 32 ng/g	Parlar no. 50 ng/g	Parlar no. 62 ng/g
290519-0037	96	460	3500	360	46	32	170	630		1200	230
290519-0055	89	900	7400	560	140	140	550	1200		1700	240
290519-0084	88	260	2000	170	45	47	130	340		580	95
290519-0085	95	340	2500	260	57	49	190	440		670	130
020819-0004	99	570	3700	590	56	36	270	770		1300	190
020819-0015	95.5	365	2450	255	60	50.5	165	475		910	170
270819-0001	73	330	2700	220	54	51	180	440		630	120
270819-0010	86.5	540	4350	340	90	75	325	765		1300	220
270819-0021	91	350	2900	230	56	52	200	440		660	130
270819-0025	91	920	6700	540	150	140	610	1300		1700	240
270819-0026	90	430	2800	310	79	59	250	550		920	180
270819-0028	90	220	1800	160	36	31	130	290		450	91
270819-0031	90	310	2500	220	53	46	170	460		860	140
270819-0040	95	410	4300	280	68	80	250	550		700	99
270819-0061	94	460	2700	330	81	59	240	630		1000	230
270819-0076	98	310	2200	210	48	43	150	400		590	110
270819-0077	99	530	5100	360	84	80	360	740		1000	150
270819-0083	94	490	5500	325	85.5	97.5	420	700		820	125
270819-0084	95	710	8300	410	120	120	490	940		1200	150
270819-0085	97	320	2600	240	55	48	200	460		700	120
270819-0089	97	390	3300	270	62	58	250	540		810	140
161020-0002	96	260	1800	160	39	35	140	380		590	100
161020-0004	98	230	1900	150	34	32	120	320		490	94
161020-0005	96	740	11000	560	96	74	470	980		1300	210
161020-0006	95	200	1300	130	32	24	110	290		510	110
161020-0007	98.5	455	3650	280	65.5	68.5	270	630		930	130
161020-0009	91.5	370	3900	230	49	60.5	225	530		780	135
161020-0010	99	490	8600	280	110	130	540	770		890	120
161020-0011	94	260	1900	170	38	36	110	360		640	100
161020-0012	96	180	1200	140	29	27	88	260		550	120
161020-0013	90	330	2400	200	31	22	110	530		880	180
161020-0014	89	680	7400	410	86	94	430	940		1100	130
161020-0016	90	320	2300	200	53	48	160	460		810	140
161020-0019	98	210	1700	140	35	35	120	290		540	92
161020-0022	88	600	5000	370	110	110	350	860		1500	250
161020-0028	98	230	1700	150	39	41	120	340		570	83
161020-0034	96.5	58.5	495	59	8.35	7.1	41.5	85.5		180	46
161020-0043	98	88	510	74	14	10	41	120		250	75
161020-0045	100	320	2600	210	43	45	160	440		810	150
161020-0047	98	260	1900	150	39	37	120	370		680	120
161020-0050	87	440	4300	260	66	72	250	630		910	120
161020-0057	91	660	7300	340	87	110	390	810		1100	140
161020-0059	98	300	2100	220	49	42	140	410		780	190
161020-0060	79	190	990	120	33	23	74	260		490	150
161020-0066	90	770	6100	480	130	120	390	1000		1800	380

Table 11: PBDEs in Pilot Whale blubber from 2017-2020 (ng/g lw)

		PBDEs							
	Lipids	PBDE 28	PBDE 47	PBDE 66	PBDE 99	PBDE 100	PBDE 153	PBDE 154	PBDE 183
ID	%	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g
160617-0092	84	2.2	301	9.1	42.8	72	27.3	53.3	1.21
160617-0107	88	4.1	57.6	2.3	14.9	25	5.1	20.1	0.94
260617-0016	86	6.8	265	3.4	24.6	28	11	39	0.26
260617-0093	78	4.2	178	3	19.7	31	8.9	22.5	0.45
290617-0010	78	1.9	159	2.9	31.2	40	5.7	19.6	0.3
220518-0001	85		250		44	62	8.1	33	
220518-0009	94		130		22	31	6.5	22	
220518-0022	96		160		35	43	10	31	
220518-0028	97.5	10.9	97.5	7.5	17.5	26.5	5.05	20.5	0.89
220518-0037	83	6	120	4.2	23	36	6.7	31	1.56
220518-0049	99	7	97	6.3	24	30	8.4	27	1.2
220518-0051	96		93		17	23	5.1	17	
220518-0054	80		160		30	43	11	32	
220518-0056	97		130		26	39	7.7	29	
240718-0002	95		93		21	27	5.5	19	
240718-0004	94	12.6	180	8.6	42	43	9.4	29	0.76
240718-0013	97		98		21.5	26	7	19.5	
240718-0018	98		86		18	24	5.2	18	
240718-0033	90		98		18	27	5.1	21	
240718-0038	95		85		15	25	4.4	17	
240718-0043	88		120		22	34	6.3	26	
240718-0049	86		110		20	31	6.3	23	
240718-0051	94		120		26	34	7.5	27	
300718-0001	98		380		55	70	15	43	
300718-0006	89		230		46	64	15	45	
300718-0009	98		380		73	67	18	41	
300718-0012	96	10	400	14	81	79	22	56	0.68
300718-0013	91		120		25	31	8.4	23	
300718-0015	92		140		33	44	10	29	
300718-0021	94		140		34	40	14	33	
290419-0006	96		120		23	31	4.1	27	
290419-0022	88		120		21	27	4.3	23	
290519-0003	100		120		18	31	5.5	33	
290519-0005	82		97		15	24	4.3	25	
290519-0037	96		120		16	27	4.5	27	
290519-0055	89	<LOQ	213	<LOQ	36	54	5.1	34	<1
290519-0084	88		71		11	17	2.9	19	
290519-0085	95		77		14	21	3.5	21	
020819-0004	99		190		21	39	5.5	31	
020819-0015	95.5	<LOQ	146	<LOQ	12	20	2.4	17	<1
270819-0001	73	<1	90	<LOQ	9.1	13	2.2	12	9.6
270819-0010	86.5		215		37.5	47.5	10	48	
270819-0021	91		83		14	20	3.4	20	
270819-0025	91		390		74	74	11	49	
270819-0026	90		150		31	42	8.8	40	
270819-0028	90		48		10	13	2.5	14	
270819-0031	90		120		24	35	7.8	42	
270819-0040	95		110		21	31	4.9	33	
270819-0061	94		150		26	39	7.6	40	
270819-0076	98	<1	151	<LOQ	17	22	3.3	21	<1
270819-0077	99	<LOQ	530	<LOQ	32	31	7.4	28	13
270819-0083	94		120		24.5	25	4.65	23	
270819-0084	95		380		79	78	17	67	
270819-0085	97		130		24	37	7.8	34	

Table 11: PBDEs in Pilot Whale blubber from 2017-2020 (ng/g lw) (continued)

		PBDEs							
ID	Lipids %	PBDE 28 ng/g	PBDE 47 ng/g	PBDE 66 ng/g	PBDE 99 ng/g	PBDE 100 ng/g	PBDE 153 ng/g	PBDE 154 ng/g	PBDE 183 ng/g
270819-0089	97		140		27	36	9.5	42	
161020-0002	96	<LOQ	129	<LOQ	15	24	3.4	18	<1
161020-0004	98		94		22	29	6.6	28	
161020-0005	96		250		38	56	16	68	
161020-0006	95	<1	89	<LOQ	25	30	7	25	<1
161020-0007	98.5		210		40	55.5	15	57	
161020-0009	91.5		115		25	28	6.65	31.5	
161020-0010	99		180		36	39	11	46	
161020-0011	94	<LOQ	61	<LOQ	6.7	10	1.3	10	24
161020-0012	96		48		8.7	13	3.7	19	
161020-0013	90		110		11	25	3.7	27	
161020-0014	89		340		72	78	23	77	
161020-0016	90		120		22	35	11	53	
161020-0019	98		88		21	27	6.3	31	
161020-0022	88		240		39	53	8.3	47	
161020-0028	98		86		16	23	4.5	25	
161020-0034	96.5		20.5		8.6	11.5	4.75	22.5	
161020-0043	98		18		5	6.9	3.6	17	
161020-0045	100		140		26	37	8	38	
161020-0047	98	<1	134	<LOQ	13	23	4.3	18	<1
161020-0050	87	<LOQ	307	<LOQ	29	39	5.8	22	<1
161020-0057	91		430		88	110	26	83	
161020-0059	98		80		16	22	3.7	21	
161020-0060	79		38		5.3	7.8	1.1	7	
161020-0066	90		230		35	48	5.4	35	

Table 12: PFAS in Pilot Whale liver from 2017-2020 (ng/g ww)

	PFAS										
	PFOS	PFOA	PFNA	PFDA	PFDS	PFHxS	PFUnda	PFDoA	PFTrDA	PFOSA	PFTDA
ID	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g
160617-0092	16.03	<0.04	3.35	6.11	0.14	<0.04	10.9	1.3	2.11	<LOQ	<0.04
160617-0107	24.26	0.36	8.68	8.88	<0.04	<0.04	18.4	2.38	6.23	<LOQ	<0.04
260617-0016	13.54	<0.04	4.07	4.91	0.17	0.25	8.44	0.95	3.73	<LOQ	0.5
260617-0093	19.37	<0.04	4.12	6.32	0.12	<0.04	13.7	2.27	5.05	<LOQ	1.35
290617-0010	18.31	<0.04	6.48	8.48	0.25	<0.04	14.9	2.02	10.4	<LOQ	1.4
220518-0028	102	0.49	30.8	41	0.45	0.3	98.5	15.3	27.1	17.3	8.45
220518-0037	105	0.83	28.4	27.5	0.54	0.14	62.5	10.1	26.2	17.7	6.41
220518-0049	129	0.43	36.5	35.3	0.84	0.31	68.6	9.88	36.9	17.7	6.56
240718-0004	104	<0.40	27.4	47.6	0.86	0.46	104	12.4	24.1	31.8	6.42
300718-0012	59.8	<0.40	4.8	16.9	0.2	0.66	44.3	6.77	23.1	13.2	4.97
290519-0055	120	0.53	27.5	47.5	0.55	0.41	111.5	11		15	
020819-0015	134.5	0.84	41	50.5	1.2	0.6	108	12.5		7.8	
270819-0001	35	0.17	6.7	17	0.68	0.17	43	5.7		4.9	
270819-0076	63	0.13	3.1	13		0.9	27	4		12	
270819-0077	17	0.15	1.3	5.5	0.19	0.21	18	2.9		11	
161020-0002	9.2	0.05	0.66	2.87	<LOQ	0.16	9.26	1.69	6.24	19	
161020-0006	11.6	0.05	0.61	3.38	0.14	0.14	11.72	2.22	7.98	11.49	
161020-0011	27.46	0.07	3.74	9.05	0.34	0.27	20.95	3.27	9.02	5.08	
161020-0047	20.13	0.08	2.33	7.93	0.22	0.15	<LOQ	2.89	6.53	12.07	
161020-0050	9.9	0.07	1.09	2.79	0.11	0.14	10.76	1.94	7.62	<LOQ	

Table 13: HBCD in Pilot Whale Blubber from 2017-2020 (ng/g ww)

ID	Drymatter %	Lipids %	α-HBCD ng/g	β-HBCD ng/g	γ-HBCD ng/g
260716-0077	89.58	91.8	44.46	< 0.12	0.11
260716-0099	91.16	93.96	38.14	< 0.12	0.1
260716-0102	90.29	92.71	45.33	< 0.11	0.1
260716-0108	89.95	93.89	34.77	< 0.12	0.08
071116-0015	88.54	90.71	43.92	< 0.12	0.12
160617-0024	89.24	94.59	35.25	< 0.11	0.1
160617-0103	86.17	88.44	36.45	< 0.11	0.11
260617-0041	89.39	99.81	26	< 0.12	0.08
260617-0044	90.94	89.52	27.04	< 0.12	0.08
290617-0021	88.43	88.83	35.81	< 0.11	0.1
220518-0028	93.94	86.45	20.61	< 0.12	0.18
220518-0037	91.54	81.95	22.82	< 0.12	0.18
220518-0049	93.84	90.21	14.46	< 0.11	0.17
240718-0004	87.79	90.58	16.38	< 0.12	< 0.12
300718-0012	94.44	86.12	45.24	< 0.12	0.31

Appendix D: Cod

Table 14: Metals in cod muscle from 2017-2020 (mg/kg ww)

									Metals	
ID	Location	Date	Gender	Length cm	Weight g	Liver g	Gonad g	Drymatter %	Hg mg/kg	Se mg/kg
Gadus morhua										
Gm-0627	Mýlingsgrunnur	2017-10-18	M	56.0	1850	83.36	1.09	20.2	0.02	
Gm-0628	Mýlingsgrunnur	2017-10-18	M	54.0	2000	80.49	1.00	20.9	0.02	
Gm-0629	Mýlingsgrunnur	2017-10-18	F	50.0	1400	64.18	4.01	21.0	0.02	
Gm-0630	Mýlingsgrunnur	2017-10-18	M	52.0	1650	78.53	4.25	20.0	0.02	
Gm-0631	Mýlingsgrunnur	2017-10-18	F	52.0	1750	81.61	5.80	20.4	0.02	
Gm-0632	Mýlingsgrunnur	2017-10-18	F	50.5	1700	81.93	3.50	21.2	0.02	
Gm-0633	Mýlingsgrunnur	2017-10-18	M	51.0	1650	61.54	1.58	21.0	0.02	
Gm-0634	Mýlingsgrunnur	2017-10-18	F	54.0	1900	88.29	5.62	21.0	0.02	
Gm-0635	Mýlingsgrunnur	2017-10-18	F	52.0	1700	86.12	5.06	21.4	0.02	
Gm-0636	Mýlingsgrunnur	2017-10-18	M	55.0	2200	178.87	6.35	22.8	0.02	
Gm-0637	Mýlingsgrunnur	2017-10-18	M	52.0	1700	109.97	1.44	21.6	0.02	
Gm-0638	Mýlingsgrunnur	2017-10-18	F	53.5	1850	104.01	5.55	20.8	0.02	
Gm-0639	Mýlingsgrunnur	2017-10-18	M	56.0	2050	89.07	1.39	20.3	0.03	
Gm-0640	Mýlingsgrunnur	2017-10-18	F	53.5	1900	94.92	8.48	21.9	0.02	
Gm-0641	Mýlingsgrunnur	2017-10-18	M	54.5	2000	113.64	3.98	20.6	0.03	
Gm-1386	Mýlingsgrunnur	2018-10-14	M	49.0	1210	22.58		19.9	0.02	
Gm-1387	Mýlingsgrunnur	2018-10-14	M	45.5	915	18.72		19.7	0.02	
Gm-1388	Mýlingsgrunnur	2018-10-14	M	49.0	1180	43.70	1.80	19.2	0.02	
Gm-1389	Mýlingsgrunnur	2018-10-14	F	38.0	598	10.83	0.83	19.5	0.02	
Gm-1390	Mýlingsgrunnur	2018-10-14	F	51.0	1374	26.50	4.51	19.0	0.02	
Gm-1391	Mýlingsgrunnur	2018-10-14	M	51.0	1455	47.00	0.93	19.4	0.02	
Gm-1392	Mýlingsgrunnur	2018-10-14	M	50.0	1389	37.00	1.72	19.7	0.02	
Gm-1393	Mýlingsgrunnur	2018-10-14	M	46.0	1083	47.60	1.26	19.6	0.02	
Gm-1394	Mýlingsgrunnur	2018-10-14	F	48.5	1222	40.00	4.69	19.7	0.03	
Gm-1395	Mýlingsgrunnur	2018-10-14	M	51.5	1436	67.10	1.24	18.9	0.02	
Gm-1396	Mýlingsgrunnur	2018-10-14	F	49.5	1255	30.42	4.81	19.7	0.02	
Gm-1397	Mýlingsgrunnur	2018-10-14	F	50.0	1251	16.85	4.13	19.1	0.02	
Gm-1398	Mýlingsgrunnur	2018-10-14	F	47.5	1024	30.30	2.78	19.6	0.02	
Gm-1399	Mýlingsgrunnur	2018-10-14	M	54.5	1486	86.90		18.9	0.04	
Gm-1400	Mýlingsgrunnur	2018-10-14	F	49.0	1070	22.20	3.98	18.8	0.02	
Gm-1401	Mýlingsgrunnur	2018-10-14	F	55.5	1875	60.40	8.98	18.3	0.02	
Gm-1412	Mýlingsgrunnur	2019-09-27	F	53.0	1350	28.04	5.14	20.9	0.03	
Gm-1413	Mýlingsgrunnur	2019-09-27	M	47.5	1060	20.58	1.18	19.6	0.04	
Gm-1414	Mýlingsgrunnur	2019-09-27	F	58.0	1500	16.26	11.33	19.2	0.08	
Gm-1415	Mýlingsgrunnur	2019-09-27	F	57.5	1800	21.30	9.74	19.3	0.05	
Gm-1416	Mýlingsgrunnur	2019-09-27	M	46.0	1000	15.61	1.46	19.1	0.05	
Gm-1417	Mýlingsgrunnur	2019-09-27	M	67.0	2300	6.89	3.51	17.2	0.08	
Gm-1418	Mýlingsgrunnur	2019-09-27	F	62.0	2000	30.80	12.65	17.8	0.07	
Gm-1419	Mýlingsgrunnur	2019-09-27	F	58.5	1900	57.49	16.72	19.4	0.04	
Gm-1420	Mýlingsgrunnur	2019-09-27	F	63.0	2000	23.50	12.85	16.7	0.06	
Gm-1421	Mýlingsgrunnur	2019-09-27	M	66.5	2700	44.10	10.76	17.7	0.11	
Gm-1422	Mýlingsgrunnur	2019-09-27	M	63.0	2300	20.00	9.04	18.1	0.06	
Gm-1423	Mýlingsgrunnur	2019-09-27	M	71.0	2300	13.45		14.8	0.06	
Gm-1424	Mýlingsgrunnur	2019-09-27	M	64.0	2300	22.00	4.94	18.9	0.05	
Gm-1425	Mýlingsgrunnur	2019-09-27	F	68.3	2200	16.90	14.78	15.6	0.08	
Gm-1426	Mýlingsgrunnur	2019-09-27	F	73.6	3400	45.60	29.00	16.3	0.13	
Gm-1427	Mýlingsgrunnur	2019-09-27	F	66.5	2450	32.00	9.10	17.8	0.07	
Gm-1428	Mýlingsgrunnur	2019-09-27	F	78.5	4350	38.90	40.60	15.6	0.19	
Gm-1429	Mýlingsgrunnur	2020-10-01	M	47.5	1259	25.78	1.88	19.6	0.05	0.31
Gm-1430	Mýlingsgrunnur	2020-10-01	M	51.0	1319	27.86		19.2	0.04	0.28

Table 14: Metals in cod muscle from 2017-2020 (mg/kg ww) (continued)

									Metals	
				Length	Weight	Liver	Gonad	Drymatter	Hg	Se
ID	Location	Date	Gender	cm	g	g	g	%	mg/kg	mg/kg
Gm-1431	Mýlingsgrunnur	2020-10-01	F	50.0	1589	63.33	11.15	21.1	0.05	0.26
Gm-1432	Mýlingsgrunnur	2020-10-01	M	48.0	1246	55.33	3.03	20.8	0.03	0.30
Gm-1433	Mýlingsgrunnur	2020-10-01	M	47.0	1117	58.98		21.4	0.03	0.33
Gm-1434	Mýlingsgrunnur	2020-10-01	M	49.0	1411	80.63	2.41	20.4	0.02	0.27
Gm-1435	Mýlingsgrunnur	2020-10-01	M	47.0	1188	56.46	1.88	21.2	0.03	0.29
Gm-1436	Mýlingsgrunnur	2020-10-01	M	47.0	1215	57.73	1.40	22.1	0.03	0.27
Gm-1437	Mýlingsgrunnur	2020-10-01	F	47.5	1105	62.22	8.28	20.6	0.03	0.36
Gm-1438	Mýlingsgrunnur	2020-10-01	F	59.0	1918	64.29	13.15	20.2	0.04	0.30
Gm-1439	Mýlingsgrunnur	2020-10-01	M	42.5	993	43.74	3.00	20.4	0.04	0.29
Gm-1440	Mýlingsgrunnur	2020-10-01	M	48.0	1229	39.73	0.81	20.5	0.03	0.31
Gm-1441	Mýlingsgrunnur	2020-10-01	F	49.0	1369	46.06	7.69	19.9	0.04	0.30
Gm-1442	Mýlingsgrunnur	2020-10-01	F	46.5	1155	52.13	5.36	20.0	0.03	0.27
Gm-1443	Mýlingsgrunnur	2020-10-01	M	54.0	1703	68.25		21.2	0.05	0.30

Table 15: PCBs in cod liver from 2017-2020 (ng/g ww)

ID	Aroclor ng/g	PCB 28 ng/g	PCB 52 ng/g	PCB 99 ng/g	PCB 101 ng/g	PCB 105 ng/g	PCB 118 ng/g	PCB 128 ng/g	PCB 138 ng/g	PCB 153 ng/g	PCB 156 ng/g	PCB 163 ng/g	PCB 170 ng/g	PCB 180 ng/g	PCB 183 ng/g	PCB 187 ng/g	PCB 209 ng/g
Gadus morhua																	
Gm-0627	120	<2	<20	3	3.2	1.2	4.2	1.2	8	14	0.48	1.4	1.1	3.7	0.76	2.5	
Gm-0628	250	<2	<20	5.6	3.1	1.6	5.9	2.4	19	30	0.73	1.9	2.9	9.2	2.1	4.3	
Gm-0629	120	<2	<20	3	3	1.3	4.2	1.3	8.7	15	0.49	1.1	1.1	3.7	0.78	1.8	
Gm-0630	150	<2	<20	3.9	3.9	1.3	4.5	1.6	11	19	0.51	1.6	1.5	4.9	1	2.6	
Gm-0631	120	<2	<20	3	3	1.3	4.2	1.2	8.1	15	0.47	1.2	1.2	3.6	0.72	2	
Gm-0632	105	<2	<20	2	3.45	1.2	3.95	1.2	7.5	13.5	0.44	1.45	1	3.15	0.68	2.25	
Gm-0633	180	<2	<20	3.9	2.5	1.2	4.4	1.6	12	22	0.49	1.6	2	6.3	1.3	3.3	
Gm-0634	140	<3	<30	3.2	2.4	1.2	4	1.4	9.3	17	0.44	0.77	1.4	4.4	0.9	1.4	
Gm-0635	100	<2	<20	2	2.1	0.93	3.5	1.1	6.9	12	0.31	0.56	0.93	3	0.64	1	
Gm-0636	98	<3	<30	<3	2.8	1.1	3.7	0.97	6.4	12	0.38	0.85	0.94	3	0.6	1.6	
Gm-0637	95	<2	<20	<2	2.7	1	3.3	0.99	6.5	12	0.33	1.1	0.92	2.9	0.62	2.1	
Gm-0638	89	<2	<20	<2	3.3	1	3.4	0.98	6.2	11	0.3	1.4	0.81	2.5	0.56	2.2	
Gm-0639	130	<2	<20	3	3.3	1.4	4.8	1.3	8.6	17	0.55	1.2	1.4	4.4	0.85	2	
Gm-0640	170	<3	<30	3.8	3.9	1.5	5.2	1.7	12	21	0.54	2.1	1.7	5.4	1.1	3.3	
Gm-0641	160	<3	<30	3.8	4.7	1.9	6.4	1.9	12	19	0.68	1.3	1.6	4.8	1.1	2.1	
Gm-1387	290	1.5	4.6	9.8	11	2.9	10	3.3	21	35	1.3	2.7	3.1	9.1	2.2	5.6	0.23
Gm-1388	150	1.1	2.2	4.8	4.3	2.1	6.7	1.9	12	18	0.76	1.1	1.8	5.2	1.1	1.9	0.18
Gm-1390	75	<0.5	<0.4	2.2	0.95	0.83	2.8	0.87	5.4	9	<0.4	<0.3	0.9	2.7	0.6	<0.3	<0.3
Gm-1391	170	1.2	3.7	5.5	7.2	2.1	7.2	2.1	13	21	0.72	2.5	1.8	5	1.3	3.6	<0.2
Gm-1392	230	1.2	3.3	7.5	7	2.9	9.7	2.9	17	29	1.2		2.7	7.6	1.6	4.1	0.25
Gm-1393	100	0.9	2.1	3.3	3.3	1.6	4.9	1.3	7.9	12	0.57		1.2	3	0.69	2	
Gm-1394	230	1.1	1.7	7.1	3.9	2.5	8.1	2.6	17	28	1.1	<0.2	2.7	8.1	1.7	1.4	
Gm-1395	140	0.9	2.2	4.2	4.3	1.8	5.7	1.7	10	16	0.64	2	1.6	4.3	1	2.9	0.18
Gm-1396	220	1.2	2.8	6.7	5.9	2.7	9.1	2.7	16	25	1.1	2.8	2.3	6.7	1.6	4.8	<0.2
Gm-1397	460	2	6.2	16	17	5.4	18	5.4	34	55	2.1	<0.2	5	15	3.2	4.6	0.31
Gm-1398	170	1.2	2.8	5.7	6.3	2.5	7.2	2	13	21	0.82	1.8	2	5.4	1.2	2.9	0.2
Gm-1399	98	1.1	2.8	2.9	4.7	1.4	4.2	1.1	7.3	11	0.43	1.3	0.98	2.6	0.63	1.9	<0.1
Gm-1400	450	1.7	3.9	13	10	4.1	13	5	34	53	1.6	<0.2	5.1	16	3.7	3.8	
Gm-1401	180	1	2.6	5.1	5.5	2.4	7.2	2.1	13	22	0.81	<0.2	2.1	5.3	1.2	3.4	
Gm-1412	320	0.43	0.65	5.2	2.4	4.7	14	3.3	23	39	1.6	1	4.1	9.9	2.4	2.5	<0.2
Gm-1413	330	1.6	4.8	7.8	10	4.5	14	3.7	25	39	1.4	2.7	3.2	9	1.9	4.3	0.18
Gm-1414	950	<3	<2	16	5.6	9.6	29	9.7	69	110	5	<1	12	37	7.8	<1	<2
Gm-1415	895	1.6	3.95	20	14.5	9.6	35	9.45	65.5	105	3.75	<0.3	8.65	26	5.5	3.4	0.44
Gm-1416	600	1.1	2.2	12	7.2	6.6	23	6.2	42	74	2.9	<0.3	6.9	20	4	2	0.38
Gm-1417	2300	3.4	<1	55	9.3	28	93	27	170	270	11	<0.8	26	73	17	<0.7	1.7
Gm-1418	1400	3.4	3.5	34	16	16	59	16	100	160	6.8	<2	13	39	9.3	3	<2
Gm-1419	300	3.8	8.8	8.3	12	4.5	15	3.4	23	35	1.3	2.9	2.3	6.9	1.7	4.7	<0.2
Gm-1420	1700	5.3	13	41	38	19	68	18	130	200	7.1	<0.9	16	49	11	14	<0.9
Gm-1421	3900	3.8	12	75	56	35	140	38	270	480	16	<0.8	45	110	29	15	2
Gm-1422	1800	4.7	9.8	45	30	18	69	19	140	220	7.3	<0.6	18	54	12	9.1	1
Gm-1423	1900	<2	2.9	37	21	20	73	22	140	230	8.9	<0.9	20	59	13	4.5	<1
Gm-1424	1100	5	14	28	32	13	49	12	84	130	4.5	<0.4	9.3	29	6.5	8	0.47
Gm-1425	1700	2	4.9	34	23	18	62	18	130	200	8.4	<0.8	19	58	13	9.6	1.1
Gm-1426	3400	<4	6.5	66	38	36	120	37	270	380	17	<2	34	110	24	9.8	<2
Gm-1427	2400	4	11	58	42	26	96	27	190	270	11	<0.8	26	77	18	15	1.5
Gm-1428	2100	3.6	7.5	41	27	24	84	23	160	240	12	<2	23	72	15	5.8	<2
Gm-1429	340	0.81	1.3	6.5	2.9	3.5	12	3.2	22	43	2	<0.3	4	12	2.2	1.1	0.44
Gm-1430	160	0.51	1.5	3	2.8	1.8	5.9	1.6	11	19	0.65	<0.2	1.7	4.5	1	1.4	<0.2
Gm-1431	130	0.5	0.64	2.7	1.3	1.8	5.2	1.4	9.9	15	0.65	<0.2	1.6	4.4	0.93	0.62	<0.2
Gm-1432	110	0.5	1.4	2.3	2.2	1.35	4.4	1.1	7.85	13	0.55		0.98	2.9	0.58	1	<0.2
Gm-1433	61	0.45	1.5	1.5	2	0.78	2.6	0.62	4.4	7.4	0.3	0.64	0.59	1.6	0.31	0.73	<0.1
Gm-1434	73	0.45	1.3	1.6	1.9	1	3	0.76	5.3	8.7	0.32	0.57	0.69	1.9	0.42	0.92	<0.1
Gm-1435	92	0.48	1.4	2	2.3	1.1	3.6	0.98	6.8	11	0.4	0.63	0.91	2.4	0.55	1.1	<0.1
Gm-1436	120	0.41	1.1	2.3	2.2	1.8	5.4	1.3	8.4	14	0.48	0.96	1.4	3.7	0.83	1.6	
Gm-1437	88	0.4	1.2	1.8	2	1.1	3.6	0.93	6.6	10	0.3	0.53	0.9	2.5	0.55	0.84	<0.1
Gm-1438	300	0.48	1.2	6.3	2.8	3.7	12	3.4	21	36	1.5	0.4	3.1	8.9	2	0.93	<0.2
Gm-1439	160	0.36	0.83	3	1.5	1.9	6.3	1.5	11	20	0.77	<0.2	1.8	5	0.95	0.46	<0.2

Table 15: PCBs in cod liver from 2017-2020 (ng/g ww) (continued)

ID	Aroclor ng/g	PCB 28 ng/g	PCB 52 ng/g	PCB 99 ng/g	PCB 101 ng/g	PCB 105 ng/g	PCB 118 ng/g	PCB 128 ng/g	PCB 138 ng/g	PCB 153 ng/g	PCB 156 ng/g	PCB 163 ng/g	PCB 170 ng/g	PCB 180 ng/g	PCB 183 ng/g	PCB 187 ng/g	PCB 209 ng/g
Gm-1440	130	0.59	1.7	2.6	2.4	1.9	5.9	1.4	9.7	16	0.68	0.51	1.6	4.2	0.8	1.2	0.27
Gm-1441	270	0.78	2.9	6.8	8	3.8	12	2.8	20	31	1.1	1.5	2.2	6.6	1.5	3	<0.2
Gm-1442	85	0.39	1.2	1.8	1.9	1.2	3.6	0.87	6.3	10	0.38	0.61	0.87	2.3	0.48	1.1	<0.2
Gm-1443	190	0.49	1.3	3.7	3.1	2.4	7.9	2	14	24	0.97	0.43	2.2	6.6	1.3	1	<0.2

Table 16: Organochlorinated Pesticides and Toxaphenes in cod livers from 2017-2020 (ng/g lw)

		Organochlorinated Pesticides								
ID	Lipids %	α-chlordane ng/g	γ-chlordane ng/g	Cisnonachlor ng/g	Transnonachlor ng/g	Hexachlorobenzen ng/g	α-HCH ng/g	β-HCH ng/g	Mirex ng/g	Ocychlordane ng/g
Gadus morhua										
Gm-0627	47	2.8	0.26	2.7	7.1	15		0.69	0.69	1.5
Gm-0628	44	2.7	<0.2	4.9	15	15		0.89	1.1	3
Gm-0629	43	2.7	0.27	3.1	7.9	14		0.77	0.81	1.7
Gm-0630	51	2.9	0.24	3.4	10	13		<0.6	0.67	1.9
Gm-0631	54	2.5	0.2	3.2	7.6	13		<0.6	0.75	1.5
Gm-0632	53	2.85	0.3	2.95	7.05	13.5		<0.6	0.54	1.45
Gm-0633	54	1.9	<0.2	3.5	11	12		<0.7	0.89	2.3
Gm-0634	50	2.2	<0.3	3	8.1	12		<0.8	0.77	1.7
Gm-0635	55	2.4	<0.2	2.5	6.1	11		<0.7	0.53	0.97
Gm-0636	47	2.6	<0.3	2.7	6.4	11		<0.8	0.55	1.5
Gm-0637	54	2.2	<0.2	2.7	6.2	10		<0.7	0.51	1.3
Gm-0638	58	3.3	0.35	2.9	6.6	12		0.72	0.42	1.3
Gm-0639	57	2.8	<0.2	3.4	8.3	12		<0.7	0.86	2.1
Gm-0640	43	2.8	<0.3	3.6	9.3	13		<0.9	0.77	1.7
Gm-0641	49	3.2	<0.3	4.2	9.5	10		<0.8	0.79	1.1
Gm-1387	44	8.8	1.1	9	21			0.48	1.4	5
Gm-1388	58	4.8	0.67		13			0.64		4.7
Gm-1390	28	<1	<0.4	1.8	4.7			<0.7	0.46	0.93
Gm-1391	57	6.9	0.76	6.6	14			0.52	0.86	3
Gm-1392	50	6	0.59	7.6	18			0.44	1.7	5
Gm-1393	63	3.8		3.7	9.1			0.55	0.74	3.1
Gm-1394	47	5.6	0.53	7.4	19			0.46	1.7	7.4
Gm-1395	56	4.5	0.45	4.7	11			0.64	0.89	3.4
Gm-1396	48	4.7	0.42	6.6	17			0.77	1.5	5.6
Gm-1397	38	13	1.5	16	37			0.53	2.8	8.7
Gm-1398	52	6.3	0.66	6.4	15			0.52	1.2	4
Gm-1399	63	5.1	0.71	3.8	8.4			0.41	0.54	1.8
Gm-1400	42	8.4	1.1	11	27			0.52	2	6.8
Gm-1401	49	4.7	0.47	5.7	14			0.96	1.3	4.7
Gm-1412	45	1.8	<0.2	4.2	15	7.9	0.82	0.5	3.4	5
Gm-1413	54	9.5	0.98	11	23	19	0.82	0.41	2.1	3.5
Gm-1414	5	5.4	<2	17	26	13	<4	<3	5.7	4.1
Gm-1415	25	13.5	1.15	23	50.5	19	<0.9	<0.7	5	5.35
Gm-1416	22	5.5	0.61	13	33	13	<1	<0.8	4.6	5.1
Gm-1417	10	20	<1	49	120	16	<2	<2	12	11
Gm-1418	5.4	17	<2	40	89	21	<4	<4	6.3	6.7
Gm-1419	45	17	2.2	14	28	42	1	0.46	1.3	6.9
Gm-1420	9.2	27	2.2	55	110	31	<3	<2	7.8	13
Gm-1421	9.1	36	2.7	80	180	20	<2	<2	17	15
Gm-1422	14	36	2.9	52	120	33	<2	<1	8.7	16
Gm-1423	8	12	<1	33	88	10	<3	<2	8.4	4.7
Gm-1424	21	36	3.7	40	86	35	<1	<0.9	5	12
Gm-1425	9.3	12	1.7	36	78	15	<2	<2	9.6	5
Gm-1426	3.4	14	<3	70	130	15	<7	<5	16	6.2
Gm-1427	10	39	2.6	76	180	22	<2	<2	14	13
Gm-1428	4.3	13	<2	50	94	20	<5	<4	13	10
Gm-1429	26	4.5	0.47	6.4	16	14	<0.9	<0.7	3.7	6.3
Gm-1430	47	3.9	0.47	3.1	7.1	12	0.65	0.44	1.8	1.6
Gm-1431	44	1.9	<0.2	3.1	7.2	8.1	0.58	<0.4	2	1.9
Gm-1432	53	3.25	0.5	2.65	6.3	11	0.66	0.38	0.92	1.4
Gm-1433	63	3.4	0.49	1.8	4.3	11	0.57	0.4	0.51	1.1
Gm-1434	64	3	0.44	2	4.5	9.7	0.58	0.37	0.73	1.1
Gm-1435	61	3.5	0.54	2.4	5.2	11	0.56	0.41	0.93	1.1

Table 16: Organochlorinated Pesticides and Toxaphenes in cod livers from 2017-2020 (ng/g lw) (continued)

		Organochlorinated Pesticides								
	Lipids	α-chlordane	γ-chlordane	Cisnonachlor	Transnonachlor	Hexachlorobenzen	α-HCH	β-HCH	Mirex	Ocychlordane
ID	%	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g
Gm-1436	57	2.4	0.32	2.5	5.7	10	0.81	0.4	1.3	1.4
Gm-1437	58	2.9	0.41	2.1	4.9	10	0.64	0.4	0.75	1.2
Gm-1438	32	4.1	0.42	5.9	13	12	0.73	<0.5	2.3	1.8
Gm-1439	48	2.6	0.31	3.2	7.6	9.5	0.73	0.38	1.7	1.8
Gm-1440	46	4	0.48	2.8	6.2	14	0.69	0.43	1.6	1.7
Gm-1441	57	6.7	0.5	8.5	19	13	0.67	0.41	2	2.6
Gm-1442	58	2.8	0.34	2.1	4.8	10	0.71	0.44	0.94	1.4
Gm-1443	43	2.6		3.7	8.2	11	0.86	0.49	2.1	1.6

Table 17: DDEs and Toxaphenes in cod livers from 2017-2020 (ng/g lw)

ID	Lipids %	DDT isomers and metabolites: p,p'-DDD ng/g	p,p'-DDE ng/g	p,p'-DDT ng/g	o,p'-DDD ng/g	o,p'-DDE ng/g	o,p'-DDT ng/g	Toxaphenes: Parlar no. 26 ng/g	Parlar no. 32 ng/g	Parlar no. 50 ng/g	Parlar no. 62 ng/g
Gadus morhua											
Gm-0627	47	<1	22	<0.6	<0.6	<0.4	<1	4.6	0.6	7.7	1.6
Gm-0628	44	<1	73	<0.7	<0.7	<0.5	<1	4.9	0.42	7	<0.5
Gm-0629	43	<1	22	<0.6	<0.6	<0.4	<1	5.2	0.63	9.5	2.1
Gm-0630	51	<1	34	<0.6	<0.6	<0.4	<1	5.1	0.46	9.7	2
Gm-0631	54	<0.9	19	<0.6	<0.6	<0.4	<0.9	5	0.49	8.6	1.7
Gm-0632	53	<1	20	<0.6	<0.6	<0.4	<1	4.8	0.53	8.45	2.55
Gm-0633	54	<1	47	<0.7	<0.7	<0.5	<1	4.4	0.35	6.5	2.1
Gm-0634	50	<1	25	<0.8	<0.8	<0.6	<1	4.3	0.53	7.1	2.3
Gm-0635	55	<1	17	<0.7	<0.7	<0.4	<1	3.5	0.44	6.2	2.1
Gm-0636	47	<1	17	<0.8	<0.8	<0.6	<1	4.1	0.39	8.5	2.1
Gm-0637	54	<1	19	<0.7	<0.7	<0.5	<1	4	0.47	8.1	2
Gm-0638	58	<1	17	<0.7	<0.7	<0.5	<1	4.9	0.42	9.9	2.9
Gm-0639	57	<1	23	<0.7	<0.7	<0.4	<1	4.9	0.31	7.8	2
Gm-0640	43	<2	33	<0.9	<0.9	<0.6	<2	4.8	0.61	9.3	2.4
Gm-0641	49	<1	30	<0.8	<0.8	<0.5	<1	4.2	0.65	5.8	1.7
Gm-1387	44	7.7	71	3.4	0.7	0.26	<0.3	18	<0.5	37	7.2
Gm-1388	58	4.1	36	2.1	<0.4	0.16	<0.2	12	<0.4	27	4.7
Gm-1390	28	1	16	<0.4	<0.8	<0.3	<0.5	2.7	<0.8	3.8	<1
Gm-1391	57	5.5	42	2.7	0.75	0.31	<0.2	12	<0.4	30	6.4
Gm-1392	50	5.9	50	3.8	<0.4	<0.2	<0.3	16	4.5	29	3.2
Gm-1393	63	3.1	25	1.3	0.38	<0.2	<0.2	9	<0.4	17	2.7
Gm-1394	47	3.7	49	2.3	<0.5	<0.2	<0.3	15	4.2	31	4.1
Gm-1395	56	3.5	33	1.5	<0.4	<0.2	<0.2	10	<0.4	20	3.9
Gm-1396	48	5.4	50	2.2	<0.5	<0.2	<0.3	13	<0.5	29	<0.9
Gm-1397	38	12	110	5.4	0.67	<0.2	0.65	29	<0.6	61	8.7
Gm-1398	52	5.1	39	2.3	0.45	0.24	0.36	14	<0.4	29	5.5
Gm-1399	63	4.1	22	1.9	0.85	0.51	0.83	8.8	<0.3	20	5.3
Gm-1400	42	6.9	95	4.4	<0.5	<0.2	0.29	20	<0.5	44	6.3
Gm-1401	49	4.6	37	2	0.54	<0.2	0.53	12	<0.5	24	2.7
Gm-1412	45	2.2	40	0.86	<0.5	<0.2	<0.3	5.9	<0.5	5.2	<0.9
Gm-1413	54	7.6	71	5.4	0.65	<0.2	1.5	18	1.6	36	9
Gm-1414	5	7.2	120	<2	<4	<2	<2	<3	<4	<4	<7
Gm-1415	25	18.5	175	<0.4	<0.8	<0.3	<0.5	19	1.6	12.5	<2
Gm-1416	22	8.2	93	<0.4	<0.9	<0.4	<0.5	5.2	1	<0.9	<2
Gm-1417	10	18	450	1.1	<2	<0.8	<1	32	2.1	19	<4
Gm-1418	5.4	27	270	<2	<4	<2	<2	<4	<4	<4	<7
Gm-1419	45	17	81	5.6	1.5	0.5	1.9	33	3.5	62	17
Gm-1420	9.2	48	380	<1	<2	<1	<1	11	<2	<2	<4
Gm-1421	9.1	52	560	1.3	<2	<0.9	<1	38	4.9	13	<4
Gm-1422	14	38	410	9.6	<2	<0.6	<0.9	69	5.7	110	8.9
Gm-1423	8	18	310	<1	<2	<1	<1	4.2	3.3	<2	<5
Gm-1424	21	46	250	<0.5	2.1	<0.4	<0.6	49	3.9	32	<2
Gm-1425	9.3	22	310	<1	<2	<0.9	<1	2.7	<2	<2	<4
Gm-1426	3.4	33	570	<3	<6	<2	<3	<5	<6	<6	<10
Gm-1427	10	62	540	1	<2	<0.9	<1	33	3.8	11	<4
Gm-1428	4.3	28	370	<2	<5	<2	<3	<4	<5	<5	<9
Gm-1429	26	3.8	30	0.53	<0.8	<0.3	<0.4	11	0.99	13	<1
Gm-1430	47	2.7	19	0.62	0.59	<0.2	<0.3	4.9	0.62	7.3	
Gm-1431	44	1.9	19	<0.2	<0.5	<0.2	<0.3	4.8	<0.5	4	<0.8
Gm-1432	53	2.65	16.5	0.82	0.44	<0.2	0.26	5.35		9.45	
Gm-1433	63	2.6	9.8	0.57	0.7	0.16	0.28	4.7		8.8	2.5
Gm-1434	64	2.3	12	0.74	0.49	<0.1	0.26	4.7		7.7	2.9
Gm-1435	61	2.6	15	1	0.51	<0.1	0.35	5.4		9.7	3.1

Table 17: DDEs and Toxaphenes in cod livers from 2017-2020 (ng/g lw) (continued)

		DDT isomers and metabolites						Toxaphenes			
ID	Lipids %	p,p'-DDD ng/g	p,p'-DDE ng/g	p,p'-DDT ng/g	o,p'-DDD ng/g	o,p'-DDE ng/g	o,p'-DDT ng/g	Parlar no. 26 ng/g	Parlar no. 32 ng/g	Parlar no. 50 ng/g	Parlar no. 62 ng/g
Gm-1436	57	2.3	17	0.6	0.36	<0.1	<0.2	4.5		8	0.95
Gm-1437	58	2.5	15	0.77	0.4	<0.1	0.22	4.6		8.5	1.2
Gm-1438	32	4.3	39	0.3	<0.6	<0.2	<0.3	5.5		5.5	<1
Gm-1439	48	2	21	0.53	<0.4	<0.2	<0.2	4.9		7.7	<0.8
Gm-1440	46	3.5	17	0.61	<0.5	<0.2	<0.3	6.2		11	0.84
Gm-1441	57	6.8	58	3.4	0.52	<0.2	0.38	12		20	1.5
Gm-1442	58	2.1	12	0.67	<0.4	<0.2	<0.2	4.2		9.7	
Gm-1443	43	2.8	29	0.5	<0.5	<0.2	<0.3	4.6	0.66	6.4	<0.9

Appendix E: Brown Trout

Table 18: Metals in Brown Trout Muscle from 2017-2020 (mg/kg ww)

ID	Location	Date	Gender	Length cm	Weight g	Liver g	Gonad g	Age years	Drymatter %	Metals Hg mg/kg	Se mg/kg
Salmo trutta											
St-0108	Leitisvatn	2017-07-01	F	22.00	105.90	1.04	0.74		21.9	0.25	0.95
St-0109	Leitisvatn	2017-07-01	F	24.50	165.00	1.25	1.18		24	0.35	0.99
St-0110	Leitisvatn	2017-07-01	M	23.40	167.17	1.99	3.85		23.3	0.22	0.72
St-0111	Leitisvatn	2017-07-01	F	24.70	178.30	2.13	1.10		23.7	0.2	0.8
St-0112	Leitisvatn	2017-07-01	M	26.30	198.02	1.95	4.62		24	0.25	0.82
St-0113	Leitisvatn	2017-07-01	F	26.00	193.46	3.43	3.98		24.3	0.47	1.11
St-0114	Leitisvatn	2017-07-01	F	27.50	216.90	2.18	1.49		22.3	0.44	1.2
St-0115	Leitisvatn	2017-07-01	F	26.50	191.49	2.75	2.01		23.3	0.57	1.16
St-0116	Leitisvatn	2017-07-01	F	24.10	154.97	1.43	1.64		23.5	0.36	1.03
St-0117	Leitisvatn	2017-08-13	M	35.50	529.00	6.28	13.24		26.3	0.31	0.68
St-0118	Leitisvatn	2017-08-26	M	22.00	116.00	1.22			23.7	0.15	0.77
St-0119	Leitisvatn	2017-08-26	F	24.00	146.00	1.59	0.78		24.6	0.47	1.12
St-0120	Leitisvatn	2017-08-26	F	28.50	286.00	5.27	26.47		25.3	0.71	1.23
St-0122	Mjáuvøtn	2017-09-07	F	17.80	61.00	0.50	0.10		22.2	0.07	0.89
St-0124	Mjáuvøtn	2017-09-07	M	22.00	210.00	0.93	0.04		21.9	0.08	0.91
St-0125	Mjáuvøtn	2017-09-07	F	22.00	110.00	0.94	0.96		23.8	0.06	1.13
St-0126	Mjáuvøtn	2017-09-07	M	22.00	123.00	0.73	4.94		22.4	0.08	1.17
St-0127	Mjáuvøtn	2017-09-07	M	22.00	119.00	0.94	4.12		22.1	0.08	1.25
St-0128	Mjáuvøtn	2017-09-07	M	26.00	177.00	1.50	2.17		21.5	0.14	0.96
St-0129	Mjáuvøtn	2017-09-07	F	25.50	128.00	0.91	1.11		18	0.31	1.03
St-0130	Fjallavatn	2018-07-01	U	31.50	380.00	3.62		4	27.5	0.4	2.43
St-0131	Fjallavatn	2018-07-01	U	21.00	97.50	1.00		4	23.8	0.28	1.51
St-0132	Fjallavatn	2018-07-01	M	21.50	109.20	1.03	1.04	3	25.2	0.32	1.67
St-0133	Fjallavatn	2018-07-01	U	21.00	99.40	1.07		3	22.8	0.25	1.78
St-0134	Fjallavatn	2018-07-01	U	28.74	213.90			4	24.2	0.53	1.43
St-0135	Fjallavatn	2018-07-01	U	27.59	201.20			4	26.1	0.16	0.69
St-0136	Fjallavatn	2018-07-01	U	24.14	133.00			4	24.6	0.27	1.02
St-0137	Fjallavatn	2018-07-01	U	28.16	202.30			3	24.4	0.2	0.96
St-0138	Fjallavatn	2018-07-01	U	28.74	219.90			4	25.6	0.2	0.89
St-0139	Fjallavatn	2019-08-01	M	40.20	700.00	6.54	13.50	5	24.6	0.52	1.97
St-0140	Fjallavatn	2019-08-01	M	32.50	460.00	5.24	2.40	4	26.2	0.56	1.72
St-0141	Fjallavatn	2019-08-01	M	36.30	600.00	5.40	13.30	5	26.1	0.4	2.11
St-0142	Fjallavatn	2019-08-01	F	28.80	300.00	3.90	15.98	4	25	0.5	1.58
St-0143	Fjallavatn	2019-08-01	F	28.90	300.00	3.14	0.81	3	23.4	0.38	1.42
St-0144	Fjallavatn	2019-08-01	F	29.20	320.00	5.20	17.90	4	26	0.54	1.23
St-0145	Fjallavatn	2019-08-01	F	28.50	280.00	2.94	1.10	4	24.5	0.56	1.74
St-0146	Fjallavatn	2019-08-01	M	27.40	240.00	1.94	5.29	4	25.5	0.36	1.23
St-0147	Fjallavatn	2019-08-01	M	21.00	120.00	1.10		3	22.2	0.43	1.55
St-0148	Fjallavatn	2020-08-01	M	32.50	395.00	6.06	7.43	5	28.8	0.38	1.64
St-0149	Fjallavatn	2020-08-01	F	24.50	178.00	3.86	11.65	4	23.4	0.59	1.47

Table 19: PCBs in Brown trout liver from 2017-2020 (ng/g ww)

ID	Aroclor ng/g	PCB 28 ng/g	PCB 52 ng/g	PCB 99 ng/g	PCB 101 ng/g	PCB 105 ng/g	PCB 118 ng/g	PCB 128 ng/g	PCB 138 ng/g	PCB 153 ng/g	PCB 156 ng/g	PCB 163 ng/g	PCB 170 ng/g	PCB 180 ng/g	PCB 183 ng/g	PCB 187 ng/g	PCB 209 ng/g
Salmo trutta																	
St-0108	990	<90	<900		<30	<9	18	9.7	61	130	<9	12	16	61	11	28	
St-0109	830	<40	<400	<40	<10	5.3	18	7.8	57	100	<4	9.7	11	39	7.4	19	
St-0110	320	<30	<300	<30	<9	<3	5	<3	16	46	<3	<3	3.5	18	4	7.4	
St-0111	360	<40	<400		<10	<4	7.2	<4	23	47	<4	4.2	4.1	15	<4	8.6	
St-0112	480	<30	<300	<30	<9	<3	8.9	<3	27	66	<3	3.8	4.3	22	5.2	9.4	
St-0113	500	<10	<100	<10	7.35	3.55	11.5	5.1	33	62	2.05	6.05	7	23	4.5	12.5	
St-0114	630	<60	<600	<60	<20	<6	13	5.8	39	81	<6	7.1	8.5	29	6	15	
St-0115	1500	<50	<500	<50	18	10	34	15	100	180	7.2	19	23	77	14	36	
St-0116	1400	<40	<400	<40	14	8.9	31	14	93	170	7.6	19	22	76	14	34	
St-0117	1600	<10	<100	13	6.6	5	23	9.6	85	230	4.5	11	15	74	17	32	
St-0118	990	<90	<900	<90	<30	<9	23	<9	64	130	<9	14	10	37	<9	38	
St-0119	720	<30	<300	<30	<10	4.6	15	7.6	48	90	3.4	9.2	10	36	7.5	19	
St-0120	1100	<30	<300	<30	8.9	7.4	24	11	76	140	6.7	14	18	63	11	28	
St-0122	260	<90	<900	<90	<30	<9	<9	<9	18	32	<9	<9	<9	9.2	<9	11	
St-0124	0.5	<0.3	<3	<0.3	<0.08	<0.03	<0.03	<0.03	0.04	0.07	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	
St-0125	330	<50	<500	<50	<10	<5	9.7	<5	24	40	<5	6.1	5.6	15	<5	12	
St-0126	350	<60	<600	<60	<20	<6	10	<6	26	41	<6	7	<6	16	<6	12	
St-0127	470	<80	<800	<80	<20	<8	14	<8	34	55	<8	9.1	7.8	19	<8	16	
St-0128	1.8	<0.2	<2	<0.2	<0.07	<0.02	0.05	<0.02	0.12	0.22	<0.02	0.03	0.03	0.07	<0.02	0.06	
St-0129	17	<0.3	<3	<0.3	0.2	0.06	0.36	0.15	1.2	2.1	7.5	0.27	0.26	0.98	0.21	0.67	
St-0130	655	<3	<3	9.5	7.8	4.45	15	7	44	82.5	4.35	7.4	11.5	39.5	6.85	16	3
St-0131	690	<20	<20	<10	<20	<10	15	<9	47	86	<10	<10	14	40	<10	17	<10
St-0132	640	<8	<6	8.8	8.1		14	6.8	45	77	<5	<4	12	35	6.7	15	<5
St-0133	1900	<30	<20	23	22	<10	44	21	130	240	<20	<10	38	120	23	51	<20
St-0134	1200	<6	<5	17	16	8.2	29	13	82	150	7.1	17	19	63	12	30	4
St-0135	150	<5	<4	<4	<4	<3	3.8	<2	9.1	19	<4	<3	<3	7.9	<4	3.3	<3
St-0136	470	<8	<6	9	8.7	5	11	6.1	32	57	<5	<4	8.4	25	5.5	12	<5
St-0137	250	<10	<8	<7	<8	<5	8.6	<5	17	31	<7	<6		12	<7	<6	<6
St-0138	260	<8	<6	<6	<6	<4	<5	<4	15	36	<6	<5	5	14	<5	7.2	<5
St-0139	1500	<10	<8	15	15	8.6	32	13	98	190	9.7	15	30	96	16	37	<6
St-0140	2850	<5	<4	27	7.1	9.9	59.5	43	185	365	29	30	48	185	32	90.5	3.45
St-0141	700	<3	<2	8.7	4.5	4.2	16	6.3	46	90	3.5	5.9	9.3	39	5.6	15	<2
St-0142	1000	<10	<9	10	8.9	<6	20	8.9	63	130	<8	9.6	13	51	8.4	20	<7
St-0143	1900	<20	<20	25	<20	<10	39	16	120	240	<20	19	20	86	<10	32	<10
St-0144	1000	<8	<7	11	8.7	5.2	20	8.1	64	130	<6	10	13	52	8.2	18	<5
St-0145	1600	<20	<10	18	13	8.6	30	16	110	190	<10	14	20	82	13	35	<9
St-0146	1100	<10	<10	12	9.6	<7	24	11	71	150	<9	13	16	60	9.6	25	<8
St-0147	3000	<30	<20	28	<20	<20	52	26	200	370	<20	33	47	170	27	74	<20

Table 20: Organochlorinated Pesticides and Toxaphenes in brown trout livers from 2017-2020 (ng/g lw)

ID	Lipids %	Organochlorinated Pesticides α-chlordane ng/g	γ-chlordane ng/g	Cisnonachlor ng/g	Transnonachlor ng/g	Hexachlorobenzen ng/g	α-HCH ng/g	β-HCH ng/g	Mirex ng/g	Ocychlordane ng/g
Salmo trutta										
St-0108	0.3	<9	<9	<9	15	36		<30	<9	<9
St-0109	0.65	<4	<4	6.6	16	50		<10	5.5	5.4
St-0110	0.87	<3	<3	4.3	8.5	29		<9	3	3.2
St-0111	0.67	<4	<4	4.3	8.5	31		<10	<4	<4
St-0112	0.79	<3	<3	4.6	12	23		<9	3.9	4.4
St-0113	1.65	<1	<1	3.55	7.35	25		<4	3.25	2.2
St-0114	0.43	<6	<6	<6	6.3	36		<20	6.6	<6
St-0115	0.52	<5	<5	6.5	13	43		<10	12	<5
St-0116	0.63	<4	<4	9	23	55		<10	7.5	7.2
St-0117	2.1	1.6	<1	11	27	38		<4	10	12
St-0118	0.3	<9	<9	<9	13	35		<30	<9	<9
St-0119	0.71	<3	<3	5	10	33		<10	5.1	<3
St-0120	0.85	<3	<3	6.1	16	38		<8	6.1	5.8
St-0122	0.3	<9	<9	<9	<9	32		<30	<9	<9
St-0124	<0.2	<0.03	<0.03	<0.03	<0.03	0.06		<0.08	<0.03	<0.03
St-0125	0.5	<5	<5	<5	7.2	25			<5	<5
St-0126	0.41	<6	<6	<6	6.9	30		<20	<6	<6
St-0127	0.34	<8	<8	<8	9.2	31		<20	<8	<8
St-0128	<0.2	<0.02	<0.02	<0.02	<0.02	0.07		<0.07	<0.02	<0.02
St-0129	<0.2	<0.03	<0.03	0.03	0.05	<0.05		<0.08	0.1	<0.03
St-0130	3.9	<8	<3	5.4	8.6			<5	3.15	4.7
St-0131	0.7	<50	<10		<20			<30	<20	<20
St-0132	2	<20	<6	9.3	8.1			<10	<6	<9
St-0133	0.5	<60	<20	<20	<20			<30	<20	<30
St-0134	2.2	<10	<5		16			<8	6.2	9.6
St-0135	2.4	<10	<4		6.7			<7	<4	<6
St-0136	2	<20	<5		8.2			<10	<6	<8
St-0137	1	<20	<7	<8	9.4			<10	<8	<10
St-0138	2	<20	<6		<7			<10	<7	<9
St-0139	1.4	<20	<7	10	11	28	<20	<10	8.5	
St-0140	3.1	<8	<3	11.5	19	28	<8	<6	14.5	14
St-0141	5.4	<4	<2	4.6	7.4	16	<4	<4	2.8	3.2
St-0142	1.3	<20	<8	<9	11		<20	<20	<9	<10
St-0143	0.6	<40	<20	<20	22		<40	<30	<20	<20
St-0144	1.6	<10	<6	<7		34	<10	<10	<7	<10
St-0145	0.9	<30	<10	<10	15	36	<30	<20	<10	<20
St-0146	1.1	<20	<9	<10		34	<20	<20	<10	<10
St-0147	0.5	<50	<20	<20	<30		<50	<40	<20	<30

Table 21: DDEs and Toxaphenes in Brown trout livers from 2017-2020 (ng/g lw)

		DDT isomers and metabolites						Toxaphenes			
ID	Lipids %	p,p'-DDD ng/g	p,p'-DDE ng/g	p,p'-DDT ng/g	o,p'-DDD ng/g	o,p'-DDE ng/g	o,p'-DDT ng/g	Parlar no. 26 ng/g	Parlar no. 32 ng/g	Parlar no. 50 ng/g	Parlar no. 62 ng/g
Salmo trutta											
St-0108	0.3	<40	89	<30	<30	<20	<40	<9	<9	23	<20
St-0109	0.65	<20	93	<10	<10	<8	<20	9	<4	31	<8
St-0110	0.87	<10	29	<9	<9	<6	<10	4.8	<3	11	<6
St-0111	0.67	<20	44	<10	<10	<7	<20	5	<4	12	<7
St-0112	0.79	<20	40	<9	<9	<6	<20	6.4	<3	13	<6
St-0113	1.65	<7	64.5	<4	<4	<3	<7	3.65	<1	12.5	<3
St-0114	0.43	<30	80	<20	<20	<10	<30	<6	<6	<6	<10
St-0115	0.52	<20	180	<10	<10	<10	<20	<5	<5	14	<10
St-0116	0.63	<20	150	<10	<10	<8	<20	9.1	<4	38	<8
St-0117	2.1	<6	150	<4	<4	<2	<6	13	<1	26	4.9
St-0118	0.3	<40	110	<30	<30	<20	<40	<9	<9	15	<20
St-0119	0.71	<20	78	<10	<10	<7	<20	5.8	<3	19	<7
St-0120	0.85	<10	97	<8	<8	<6	<10	7.7	<3	34	6.2
St-0122	0.3	<40	42	<30	<30	<20	<40	<9	<9	<9	<20
St-0124	<0.2	<0.1	0.09	<0.08	<0.08	<0.05	<0.1	<0.03	<0.03	<0.03	<0.05
St-0125	0.5	<20	52	<10	<10	<10	<20	<5	<5	6.9	<10
St-0126	0.41	<30	50	<20	<20	<10	<30	<6	<6	7.7	<10
St-0127	0.34	<40	74	<20	<20	<20	<40	<8	<8	8.3	<20
St-0128	<0.2	<0.1	0.3	<0.07	<0.07	<0.05	<0.1	<0.02	<0.02	<0.02	<0.05
St-0129	<0.2	<0.1	2.6	<0.08	<0.08	<0.05	<0.1	<0.03	<0.03	<0.03	<0.05
St-0130	3.9	<2	65.5	4.5	<5	<2	<3	<5	<5	<5	<10
St-0131	0.7	<10	<80	14	<30	<10	<20	<30	<30	<30	<60
St-0132	2	<4	65	<5	<10	<5	<7	<10	<10	<10	<20
St-0133	0.5	<10	170	<20	<40	<20	<20	<30	<40	<40	<70
St-0134	2.2	<4	140	<4	<10	<4	<5	<8	<10	<10	<20
St-0135	2.4	<3	<20	<4	<8	<3	<5	<7	<8	<8	<20
St-0136	2	<4	61	<5	<10	<5	<7	<10	<10	<10	<20
St-0137	1	<6	39	7.3	<20	<6	<9	<10	<20	<20	<30
St-0138	2	<5	<30	<6	<10	<5	<7	<10	<10	<10	<20
St-0139	1.4	<6	160	<7	<10	<6	<8	<10	<10	<10	<30
St-0140	3.1	5.05	315	8.3	<7	<3	<4	12.5	<7	39	<10
St-0141	5.4	<1	86	2.3	<4	<2	<2	4.1	<4	12	<7
St-0142	1.3	<7	100	<8	<20	<7	<10	<20	<20	<20	<30
St-0143	0.6	<10	220	<20	<30	<10	<20	<30	<30	<30	<60
St-0144	1.6	<5	99	<6	<10	<5	<7	<10	<10		<20
St-0145	0.9	<9	140	<10	<20	<9	<10	<20	<20		<40
St-0146	1.1	<7	99	<9	<20	<8	<10	<20	<20		<40
St-0147	0.5	<20	260	<20	<50	<20	<30	<40	<50		<80

Appendix F: Sheep

Table 22: Metals (mg/kg ww) in sheep liver and PCBs (ng/g ww) in sheep tallow from 2017

							Metals				PCBs						
ID	Location	Date	Gender	Agegroup	Tissue	Bulk ID	Dry %	Hg mg/kg	Cd mg/kg	Se mg/kg	Lipids %	PCB 52 ng/g	PCB 101 ng/g	PCB 118 ng/g	PCB 138 ng/g	PCB 153 ng/g	PCB 180 ng/g
Ovis aries																	
Oa-0643	Heimi hagi	2017-10-01	U	JV	liver	Oa-2017-1	32.7	<0.01	0.02	0.34							
Oa-0643	Heimi hagi	2017-10-01	U	JV	tallow	Oa-2017-1					99.9	0.1	0.05	0.23	0.07	0.46	<LOQ
Oa-0644	Heimi hagi	2017-10-01	U	JV	liver	Oa-2017-1	32.7	<0.01	0.02	0.34							
Oa-0644	Heimi hagi	2017-10-01	U	JV	tallow	Oa-2017-1					99.9	0.1	0.05	0.23	0.07	0.46	<LOQ
Oa-0645	Heimi hagi	2017-10-01	U	JV	liver	Oa-2017-1	32.7	<0.01	0.02	0.34							
Oa-0645	Heimi hagi	2017-10-01	U	JV	tallow	Oa-2017-1					99.9	0.1	0.05	0.23	0.07	0.46	<LOQ
Oa-0646	Heimi hagi	2017-10-01	U	JV	liver	Oa-2017-1	32.7	<0.01	0.02	0.34							
Oa-0646	Heimi hagi	2017-10-01	U	JV	tallow	Oa-2017-1					99.9	0.1	0.05	0.23	0.07	0.46	<LOQ
Oa-0647	Heimi hagi	2017-10-01	U	JV	liver	Oa-2017-1	32.7	<0.01	0.02	0.34							
Oa-0647	Heimi hagi	2017-10-01	U	JV	tallow	Oa-2017-1					99.9	0.1	0.05	0.23	0.07	0.46	<LOQ
Oa-0648	Heimi hagi	2017-10-01	U	JV	liver	Oa-2017-2	32.7	<0.01	0.02	0.42							
Oa-0648	Heimi hagi	2017-10-01	U	JV	tallow	Oa-2017-2					100	0.1	0.03	0.2	<LOQ	0.99	0.14
Oa-0649	Heimi hagi	2017-10-01	U	JV	liver	Oa-2017-2	32.7	<0.01	0.02	0.42							
Oa-0649	Heimi hagi	2017-10-01	U	JV	tallow	Oa-2017-2					100	0.1	0.03	0.2	<LOQ	0.99	0.14
Oa-0650	Heimi hagi	2017-10-01	U	JV	liver	Oa-2017-2	32.7	<0.01	0.02	0.42							
Oa-0650	Heimi hagi	2017-10-01	U	JV	tallow	Oa-2017-2					100	0.1	0.03	0.2	<LOQ	0.99	0.14
Oa-0651	Heimi hagi	2017-10-01	U	JV	liver	Oa-2017-2	32.7	<0.01	0.02	0.42							
Oa-0651	Heimi hagi	2017-10-01	U	JV	tallow	Oa-2017-2					100	0.1	0.03	0.2	<LOQ	0.99	0.14
Oa-0652	Heimi hagi	2017-10-01	U	JV	liver	Oa-2017-2	32.7	<0.01	0.02	0.42							
Oa-0652	Heimi hagi	2017-10-01	U	JV	tallow	Oa-2017-2					100	0.1	0.03	0.2	<LOQ	0.99	0.14
Oa-0653	Heimi hagi	2017-10-01	F	AD	liver	Oa-2017-3-Ær	31.4	<0.01	0.09	0.51							
Oa-0653	Heimi hagi	2017-10-01	F	AD	tallow	Oa-2017-3-Ær					99.8	0.07	0.02	0.13	<LOQ	1.14	0.45
Oa-0654	Heimi hagi	2017-10-01	F	AD	liver	Oa-2017-3-Ær	31.4	<0.01	0.09	0.51							
Oa-0654	Heimi hagi	2017-10-01	F	AD	tallow	Oa-2017-3-Ær					99.8	0.07	0.02	0.13	<LOQ	1.14	0.45
Oa-0655	Heimi hagi	2017-10-01	F	AD	liver	Oa-2017-3-Ær	31.4	<0.01	0.09	0.51							
Oa-0655	Heimi hagi	2017-10-01	F	AD	tallow	Oa-2017-3-Ær					99.8	0.07	0.02	0.13	<LOQ	1.14	0.45
Oa-0656	Heimi hagi	2017-10-01	F	AD	liver	Oa-2017-3-Ær	31.4	<0.01	0.09	0.51							
Oa-0656	Heimi hagi	2017-10-01	F	AD	tallow	Oa-2017-3-Ær					99.8	0.07	0.02	0.13	<LOQ	1.14	0.45
Oa-0657	Heimi hagi	2017-10-01	F	AD	liver	Oa-2017-3-Ær	31.4	<0.01	0.09	0.51							
Oa-0657	Heimi hagi	2017-10-01	F	AD	tallow	Oa-2017-3-Ær					99.8	0.07	0.02	0.13	<LOQ	1.14	0.45
Oa-0658	Heimi hagi	2017-10-01	F	AD	liver	Oa-2017-4-Ær	31.5	<0.01	0.07	0.41							
Oa-0658	Heimi hagi	2017-10-01	F	AD	tallow	Oa-2017-4-Ær					100	0.31	0.1	0.49	0.25	2.05	0.83
Oa-0659	Heimi hagi	2017-10-01	F	AD	liver	Oa-2017-4-Ær	31.5	<0.01	0.07	0.41							
Oa-0659	Heimi hagi	2017-10-01	F	AD	tallow	Oa-2017-4-Ær					100	0.31	0.1	0.49	0.25	2.05	0.83
Oa-0660	Heimi hagi	2017-10-01	F	AD	liver	Oa-2017-4-Ær	31.5	<0.01	0.07	0.41							
Oa-0660	Heimi hagi	2017-10-01	F	AD	tallow	Oa-2017-4-Ær					100	0.31	0.1	0.49	0.25	2.05	0.83
Oa-0661	Heimi hagi	2017-10-01	F	AD	liver	Oa-2017-4-Ær	31.5	<0.01	0.07	0.41							
Oa-0661	Heimi hagi	2017-10-01	F	AD	tallow	Oa-2017-4-Ær					100	0.31	0.1	0.49	0.25	2.05	0.83
Oa-0662	Heimi hagi	2017-10-01	F	AD	liver	Oa-2017-4-Ær	31.5	<0.01	0.07	0.41							
Oa-0662	Heimi hagi	2017-10-01	F	AD	tallow	Oa-2017-4-Ær					100	0.31	0.1	0.49	0.25	2.05	0.83

Appendix G: Stable Isotopes

Table 23: Stable Isotopes

ID	Tissue	Date	Year	%C	%N	C/N	d13C	d15N	d13C'
Cepphus grylle									
Cg-0476	egg	2018-06-01	2018	56.82	8.72	6.52	-21.19	10.42	-19.44
Cg-0477	egg	2018-06-01	2018	58.64	7.83	7.49	-20.78	11.33	-18.67
Cg-0478	egg	2018-06-01	2018	57.88	8.06	7.18	-20.83	10.48	-18.82
Cg-0479	egg	2018-06-01	2018	57.81	8.21	7.04	-20.59	11.24	-18.63
Cg-0480	egg	2018-06-01	2018	57.58	8.07	7.13	-21.31	10.53	-19.32
Cg-0481	egg	2018-06-01	2018	57.40	7.92	7.25	-21.74	10.40	-19.71
Cg-0482	egg	2018-06-01	2018	56.04	9.44	5.94	-20.45	10.66	-18.97
Cg-0483	egg	2018-06-01	2018	59.43	7.75	7.67	-21.69	10.72	-19.52
Cg-0484	egg	2018-06-01	2018	59.72	7.44	8.02	-21.20	12.21	-18.93
Cg-0485	egg	2018-06-01	2018	60.16	7.03	8.55	-21.50	10.94	-19.09
Cg-0486	egg	2020-06-07	2020	56.93	8.22	6.93	-21.99	10.82	-20.07
Cg-0487	egg	2020-06-14	2020	54.13	9.30	5.82	-21.61	11.48	-20.19
Cg-0488	egg	2020-06-15	2020	59.16	6.99	8.47	-21.87	10.04	-19.48
Cg-0470	liver	2018-05-18	2018	51.05	11.66	4.38	-19.36	12.37	-18.96
Cg-0471	liver	2018-05-18	2018	49.61	12.59	3.94	-20.91	11.64	-20.98
Cg-0472	liver	2018-05-18	2018	50.72	11.64	4.36	-19.17	12.78	-18.79
Cg-0473	liver	2018-05-18	2018	50.40	11.96	4.21	-19.18	13.38	-18.95
Cg-0474	liver	2018-05-18	2018	50.22	12.05	4.17	-19.63	11.52	-19.44
Cg-0475	liver	2018-05-18	2018	50.39	11.58	4.35	-21.02	11.92	-20.65
Cg-0470	muscle	2018-05-18	2018	48.23	13.27	3.63	-18.82	10.96	-19.29
Cg-0471	muscle	2018-05-18	2018	48.53	13.59	3.57	-19.91	11.09	-20.46
Cg-0472	muscle	2018-05-18	2018	48.50	13.63	3.56	-18.77	11.24	-19.34
Cg-0473	muscle	2018-05-18	2018	48.66	13.39	3.64	-19.04	12.13	-19.49
Cg-0474	muscle	2018-05-18	2018	49.13	13.02	3.77	-19.33	10.30	-19.61
Cg-0475	muscle	2018-05-18	2018	47.71	12.96	3.68	-20.16	10.96	-20.56
Fulmarus glacialis									
Fg-0387	egg	2019-05-21	2019	56.53	7.81	7.24	-23.19	12.99	-21.16
Fg-0388	egg	2019-05-21	2019	62.13	7.16	8.69	-24.25	12.73	-21.81
Fg-0389	egg	2019-05-21	2019	56.88	7.41	7.68	-24.29	12.12	-22.12
Fg-0390	egg	2019-05-21	2019	53.50	9.16	5.84	-23.00	12.18	-21.57
Fg-0391	egg	2019-05-21	2019	57.70	6.67	8.65	-24.31	12.40	-21.88
Fg-0392	egg	2019-05-21	2019	57.06	7.51	7.60	-22.95	12.11	-20.80
Fg-0393	egg	2019-05-21	2019	57.75	7.05	8.20	-24.29	11.96	-21.97
Fg-0394	egg	2019-05-21	2019	57.59	7.07	8.15	-23.66	13.25	-21.35
Fg-0395	egg	2019-05-21	2019	58.14	6.79	8.56	-24.40	12.89	-21.99
Fg-0396	egg	2019-05-21	2019	57.30	7.12	8.05	-23.29	12.25	-21.01
Fg-0407	egg	2020-05-21	2020	59.88	7.58	7.90	-23.80	12.40	-21.56
Fg-0408	egg	2020-05-21	2020	61.53	6.92	8.90	-23.20	12.30	-20.71
Fg-0409	egg	2020-05-21	2020	60.50	7.30	8.30	-24.10	12.80	-21.75
Fg-0410	egg	2020-05-21	2020	62.48	6.15	10.16	-24.30	12.50	-21.56
Fg-0411	egg	2020-05-21	2020	60.18	7.34	8.19	-24.30	12.40	-21.98
Fg-0412	egg	2020-05-21	2020	60.24	7.30	8.25	-24.20	12.20	-21.87
Fg-0413	egg	2020-05-21	2020	60.78	7.07	8.59	-23.20	11.80	-20.78
Fg-0414	egg	2020-05-21	2020	57.82	8.08	7.16	-22.80	12.80	-20.80
Fg-0415	egg	2020-05-21	2020	60.13	7.09	8.48	-22.80	10.60	-20.41
Fg-0416	egg	2020-05-21	2020	58.86	8.09	7.27	-23.80	12.60	-21.76
Fg-0377	liver	2018-09-05	2018	49.37	10.76	4.59	-22.67	13.70	-22.08
Fg-0378	liver	2018-09-05	2018	52.95	10.65	4.97	-22.84	13.37	-21.95
Fg-0379	liver	2018-09-05	2018	49.17	10.02	4.91	-22.43	12.94	-21.59
Fg-0380	liver	2018-09-05	2018	53.25	10.70	4.98	-22.34	12.36	-21.44
Fg-0381	liver	2018-09-05	2018	49.30	11.51	4.28	-21.70	12.76	-21.40

Table 23: Stable Isotopes (continued)

ID	Tissue	Date	Year	%C	%N	C/N	d13C	d15N	d13C'
Fg-0382	liver	2018-09-05	2018	50.87	12.08	4.21	-21.62	12.54	-21.39
Fg-0383	liver	2018-09-05	2018	50.25	12.46	4.03	-21.96	12.83	-21.93
Fg-0384	liver	2018-09-05	2018	48.07	11.17	4.30	-21.85	13.41	-21.53
Fg-0385	liver	2018-09-05	2018	57.58	8.49	6.78	-23.04	12.77	-21.18
Fg-0386	liver	2018-09-05	2018	50.69	10.95	4.63	-22.49	13.62	-21.87
Fg-0357	muscle	2017-08-31	2017	55.15	9.39	5.88	-23.03	12.35	-21.58
Fg-0358	muscle	2017-08-31	2017	55.13	10.15	5.43	-22.77	11.41	-21.57
Fg-0359	muscle	2017-08-31	2017	54.40	9.74	5.58	-22.99	11.80	-21.70
Fg-0360	muscle	2017-08-31	2017	53.13	10.27	5.17	-22.47	10.64	-21.44
Fg-0361	muscle	2017-08-31	2017	52.92	10.62	4.98	-22.29	11.81	-21.39
Fg-0362	muscle	2017-08-31	2017	54.56	9.55	5.71	-22.96	11.77	-21.60
Fg-0363	muscle	2017-08-31	2017	54.15	9.39	5.77	-22.63	11.00	-21.24
Fg-0364	muscle	2017-08-31	2017	55.20	10.05	5.49	-22.22	11.25	-20.99
Fg-0365	muscle	2017-08-31	2017	52.34	10.82	4.84	-22.31	11.58	-21.52
Fg-0366	muscle	2017-08-31	2017	55.45	9.17	6.05	-23.08	11.25	-21.54
Fg-0377	muscle	2018-09-05	2018	55.58	9.95	5.59	-23.45	12.48	-22.16
Fg-0378	muscle	2018-09-05	2018	55.06	10.21	5.39	-22.91	12.65	-21.74
Fg-0379	muscle	2018-09-05	2018	54.89	10.44	5.26	-22.63	12.16	-21.54
Fg-0380	muscle	2018-09-05	2018	53.52	10.97	4.88	-22.35	11.65	-21.53
Fg-0381	muscle	2018-09-05	2018	52.53	11.18	4.70	-22.13	12.20	-21.45
Fg-0382	muscle	2018-09-05	2018	55.08	10.25	5.37	-22.69	11.84	-21.53
Fg-0383	muscle	2018-09-05	2018	54.33	10.44	5.21	-23.05	12.12	-21.99
Fg-0384	muscle	2018-09-05	2018	54.56	10.63	5.13	-22.67	12.41	-21.67
Fg-0385	muscle	2018-09-05	2018	53.96	10.82	4.99	-21.93	11.99	-21.03
Fg-0386	muscle	2018-09-05	2018	55.57	10.01	5.55	-23.00	12.91	-21.73
Fg-0397	muscle	2019-09-05	2019	50.41	10.41	4.84	-22.90	12.87	-22.11
Fg-0398	muscle	2019-09-05	2019	54.19	9.07	5.98	-23.62	12.50	-22.12
Fg-0399	muscle	2019-09-05	2019	49.67	10.70	4.64	-22.39	12.64	-21.76
Fg-0400	muscle	2019-09-05	2019	54.21	8.72	6.22	-23.91	12.39	-22.29
Fg-0401	muscle	2019-09-05	2019	56.15	9.44	5.95	-23.72	12.90	-22.23
Fg-0402	muscle	2019-09-05	2019	51.29	11.23	4.57	-22.49	11.80	-21.92
Fg-0403	muscle	2019-09-05	2019	56.47	9.32	6.06	-23.88	12.60	-22.34
Fg-0404	muscle	2019-09-05	2019	52.84	9.89	5.34	-23.35	12.17	-22.21
Fg-0405	muscle	2019-09-05	2019	55.96	9.02	6.20	-23.47	12.57	-21.86
Fg-0406	muscle	2019-09-05	2019	53.34	10.18	5.24	-22.74	12.72	-21.66
Fg-0429	muscle	2020-09-01	2020	52.75	10.99	4.80	-22.97	12.12	-22.21
Fg-0430	muscle	2020-09-01	2020	53.68	10.82	4.96	-22.81	12.31	-21.93
Fg-0431	muscle	2020-09-01	2020	55.04	10.38	5.30	-23.02	12.71	-21.90
Fg-0432	muscle	2020-09-01	2020	53.63	10.53	5.09	-22.68	12.46	-21.70
Fg-0433	muscle	2020-09-01	2020	55.37	9.75	5.68	-23.41	12.87	-22.07
Fg-0434	muscle	2020-09-01	2020	55.32	9.80	5.65	-23.60	12.45	-22.27
Fg-0435	muscle	2020-09-01	2020	42.68	7.54	5.66	-23.57	12.80	-22.24
Fg-0436	muscle	2020-09-01	2020	54.52	10.80	5.05	-22.79	12.21	-21.84
Fg-0437	muscle	2020-09-01	2020	54.60	10.83	5.04	-22.86	12.78	-21.92
Fg-0438	muscle	2020-09-01	2020	56.09	9.98	5.62	-23.28	12.02	-21.97
Gadus morhua									
Gm-0627	muscle	2017-10-18	2017	45.18	13.37	3.38	-18.18	11.65	-19.02
Gm-0628	muscle	2017-10-18	2017	45.34	14.13	3.21	-17.86	11.38	-18.99
Gm-0629	muscle	2017-10-18	2017	44.51	13.94	3.19	-17.96	11.21	-19.13
Gm-0630	muscle	2017-10-18	2017	45.80	14.11	3.25	-17.97	11.82	-19.03
Gm-0631	muscle	2017-10-18	2017	44.46	13.84	3.21	-17.56	11.93	-18.69
Gm-0632	muscle	2017-10-18	2017	45.08	14.15	3.19	-17.89	11.66	-19.06
Gm-0633	muscle	2017-10-18	2017	45.52	14.35	3.17	-17.76	11.63	-18.97
Gm-0634	muscle	2017-10-18	2017	44.52	13.90	3.20	-17.94	11.78	-19.09
Gm-0635	muscle	2017-10-18	2017	46.13	14.35	3.22	-17.88	11.59	-19.00
Gm-0636	muscle	2017-10-18	2017	45.86	13.99	3.28	-17.84	12.13	-18.85

Table 23: Stable Isotopes (continued)

ID	Tissue	Date	Year	%C	%N	C/N	d13C	d15N	d13C'
Gm-0637	muscle	2017-10-18	2017	44.52	13.81	3.22	-17.88	11.71	-19.00
Gm-0638	muscle	2017-10-18	2017	44.99	13.90	3.24	-18.33	10.97	-19.41
Gm-0639	muscle	2017-10-18	2017	43.53	13.36	3.26	-17.93	11.79	-18.97
Gm-0640	muscle	2017-10-18	2017	46.46	14.39	3.23	-18.06	11.34	-19.16
Gm-0641	muscle	2017-10-18	2017	46.09	14.24	3.24	-18.31	11.58	-19.39
Gm-0642	muscle	2017-10-18	2017	46.88	14.39	3.26	-17.93	11.93	-18.97
Gm-0643	muscle	2017-10-18	2017	46.90	14.08	3.33	-18.20	11.47	-19.13
Gm-0644	muscle	2017-10-18	2017	46.31	14.36	3.22	-17.82	11.45	-18.94
Gm-0645	muscle	2017-10-18	2017	42.48	13.32	3.19	-17.83	11.70	-19.00
Gm-0646	muscle	2017-10-18	2017	44.85	14.16	3.17	-18.07	11.46	-19.28
Gm-0647	muscle	2017-10-18	2017	45.08	14.21	3.17	-17.59	12.04	-18.80
Gm-0648	muscle	2017-10-18	2017	45.73	14.41	3.17	-17.89	11.61	-19.10
Gm-0649	muscle	2017-10-18	2017	46.59	14.27	3.26	-18.12	11.56	-19.16
Gm-0650	muscle	2017-10-18	2017	44.19	13.88	3.18	-17.85	11.54	-19.04
Gm-0651	muscle	2017-10-18	2017	46.39	13.68	3.39	-18.39	11.80	-19.22
Gm-0652	muscle	2017-10-18	2017	46.40	13.97	3.32	-17.89	12.21	-18.83
Gm-1386	muscle	2018-10-14	2018	45.97	14.75	3.12	-17.72	12.03	-19.02
Gm-1387	muscle	2018-10-14	2018	47.62	14.80	3.22	-17.84	12.14	-18.96
Gm-1388	muscle	2018-10-14	2018	37.96	11.83	3.21	-17.85	11.75	-18.98
Gm-1389	muscle	2018-10-14	2018	45.67	14.51	3.15	-17.59	12.15	-18.83
Gm-1390	muscle	2018-10-14	2018	46.87	14.70	3.19	-17.42	12.68	-18.59
Gm-1391	muscle	2018-10-14	2018	47.18	14.79	3.19	-18.15	11.81	-19.32
Gm-1392	muscle	2018-10-14	2018	44.12	13.66	3.23	-17.91	12.35	-19.01
Gm-1393	muscle	2018-10-14	2018	47.91	14.50	3.30	-17.76	12.27	-18.74
Gm-1394	muscle	2018-10-14	2018	44.40	14.27	3.11	-17.47	12.33	-18.79
Gm-1395	muscle	2018-10-14	2018	47.02	14.96	3.14	-17.72	12.32	-18.98
Gm-1396	muscle	2018-10-14	2018	46.98	14.77	3.18	-17.61	12.38	-18.80
Gm-1397	muscle	2018-10-14	2018	45.75	14.63	3.13	-17.85	11.86	-19.13
Gm-1398	muscle	2018-10-14	2018	46.46	14.96	3.11	-17.47	12.59	-18.79
Gm-1399	muscle	2018-10-14	2018	47.11	15.00	3.14	-18.10	11.31	-19.36
Gm-1400	muscle	2018-10-14	2018	41.10	13.10	3.14	-17.66	12.06	-18.92
Gm-1401	muscle	2018-10-14	2018	44.47	14.18	3.14	-17.67	12.04	-18.93
Gm-1412	muscle	2019-09-27	2019	42.44	13.32	3.18	-17.52	12.77	-18.71
Gm-1413	muscle	2019-09-27	2019	44.63	13.76	3.24	-18.64	11.24	-19.72
Gm-1414	muscle	2019-09-27	2019	44.77	13.97	3.20	-18.32	12.24	-19.47
Gm-1415	muscle	2019-09-27	2019	42.98	13.70	3.14	-18.14	11.65	-19.40
Gm-1416	muscle	2019-09-27	2019	44.73	14.11	3.17	-18.03	12.28	-19.24
Gm-1417	muscle	2019-09-27	2019	43.51	13.80	3.15	-17.72	11.83	-18.96
Gm-1418	muscle	2019-09-27	2019	44.37	14.23	3.12	-18.34	11.67	-19.64
Gm-1419	muscle	2019-09-27	2019	45.34	14.18	3.20	-18.01	10.96	-19.16
Gm-1420	muscle	2019-09-27	2019	47.90	15.58	3.07	-17.90	11.26	-19.30
Gm-1421	muscle	2019-09-27	2019	39.10	12.51	3.13	-18.28	11.86	-19.56
Gm-1422	muscle	2019-09-27	2019	47.27	14.93	3.17	-17.80	12.25	-19.01
Gm-1423	muscle	2019-09-27	2019	44.96	14.40	3.12	-18.28	11.53	-19.58
Gm-1424	muscle	2019-09-27	2019	45.78	14.62	3.13	-18.40	11.32	-19.68
Gm-1425	muscle	2019-09-27	2019	40.10	12.85	3.12	-18.14	11.69	-19.44
Gm-1426	muscle	2019-09-27	2019	47.46	15.19	3.12	-18.31	11.66	-19.61
Gm-1427	muscle	2019-09-27	2019	46.55	14.39	3.24	-18.05	12.71	-19.13
Gm-1428	muscle	2019-09-27	2019	42.90	13.76	3.12	-18.54	11.10	-19.84
Gm-1429	muscle	2020-10-01	2020	45.09	14.09	3.20	-18.81	11.91	-19.96
Gm-1430	muscle	2020-10-01	2020	44.07	13.37	3.30	-19.20	11.77	-20.18
Gm-1431	muscle	2020-10-01	2020	45.63	14.22	3.21	-18.69	11.81	-19.82
Gm-1432	muscle	2020-10-01	2020	46.39	14.52	3.20	-19.24	11.89	-20.39
Gm-1433	muscle	2020-10-01	2020	46.87	14.25	3.29	-19.69	11.62	-20.68
Gm-1434	muscle	2020-10-01	2020	45.61	14.34	3.18	-19.46	11.71	-20.65
Gm-1435	muscle	2020-10-01	2020	46.10	14.37	3.21	-19.29	11.63	-20.42

Table 23: Stable Isotopes (continued)

ID	Tissue	Date	Year	%C	%N	C/N	d13C	d15N	d13C'
Gm-1436	muscle	2020-10-01	2020	45.36	14.42	3.15	-18.66	11.96	-19.90
Gm-1437	muscle	2020-10-01	2020	46.38	14.47	3.21	-18.94	11.87	-20.07
Gm-1438	muscle	2020-10-01	2020	45.95	14.29	3.22	-18.68	11.80	-19.80
Gm-1439	muscle	2020-10-01	2020	45.12	14.16	3.19	-18.80	12.14	-19.97
Gm-1440	muscle	2020-10-01	2020	46.17	14.52	3.18	-18.83	12.47	-20.02
Gm-1441	muscle	2020-10-01	2020	44.73	14.11	3.17	-19.05	11.41	-20.26
Gm-1442	muscle	2020-10-01	2020	46.06	14.55	3.17	-19.24	12.18	-20.45
Gm-1443	muscle	2020-10-01	2020	45.90	14.34	3.20	-18.53	12.27	-19.68
Globicephala melas									
160617-0024	muscle	2017-06-16	2017	47.75	14.07	3.39	-18.11	10.58	-18.94
160617-0035	muscle	2017-06-16	2017	48.53	13.89	3.49	-18.52	10.69	-19.19
160617-0037	muscle	2017-06-16	2017	49.18	12.81	3.84	-19.75	10.62	-19.94
160617-0079	muscle	2017-06-16	2017	48.83	12.28	3.98	-19.30	10.37	-19.32
160617-0092	muscle	2017-06-16	2017	50.24	13.30	3.78	-18.63	10.82	-18.90
160617-0094	muscle	2017-06-16	2017	49.04	13.48	3.64	-18.72	10.82	-19.17
160617-0098	muscle	2017-06-16	2017	48.47	13.79	3.52	-18.13	10.72	-18.76
160617-0103	muscle	2017-06-16	2017	48.45	13.84	3.50	-18.95	10.48	-19.61
160617-0107	muscle	2017-06-16	2017	47.27	13.41	3.52	-18.09	10.72	-18.72
260617-0002	muscle	2017-06-26	2017	47.65	13.89	3.43	-18.45	10.75	-19.21
260617-0007	muscle	2017-06-26	2017	52.35	11.72	4.47	-19.64	10.76	-19.16
260617-0010	muscle	2017-06-26	2017	51.85	12.42	4.18	-19.41	10.74	-19.21
260617-0016	muscle	2017-06-26	2017	47.05	14.18	3.32	-18.05	10.82	-18.99
260617-0038	muscle	2017-06-26	2017	49.41	13.17	3.75	-18.67	10.76	-18.98
260617-0041	muscle	2017-06-26	2017	46.28	13.70	3.38	-18.16	10.73	-19.00
260617-0044	muscle	2017-06-26	2017	47.70	14.64	3.26	-17.79	10.71	-18.83
260617-0057	muscle	2017-06-26	2017	49.05	13.28	3.69	-18.87	10.61	-19.26
260617-0093	muscle	2017-06-26	2017	48.61	13.87	3.50	-18.28	10.56	-18.94
290617-0003	muscle	2017-06-29	2017	51.18	12.22	4.19	-19.56	10.66	-19.35
290617-0010	muscle	2017-06-29	2017	45.56	13.11	3.48	-18.19	10.68	-18.88
290617-0014	muscle	2017-06-29	2017	48.99	13.64	3.59	-18.60	10.65	-19.12
290617-0020	muscle	2017-06-29	2017	51.22	12.60	4.07	-19.46	10.69	-19.38
290617-0021	muscle	2017-06-29	2017	48.15	12.71	3.79	-18.85	10.48	-19.10
290617-0040	muscle	2017-06-29	2017	50.82	12.39	4.10	-19.64	10.54	-19.53
290617-0042	muscle	2017-06-29	2017	50.69	12.63	4.01	-19.18	10.70	-19.17
220518-0001	muscle	2018-05-22	2018	48.43	14.16	3.42	-17.91	10.96	-18.69
220518-0009	muscle	2018-05-22	2018	48.25	14.67	3.29	-18.14	10.57	-19.13
220518-0022	muscle	2018-05-22	2018	48.48	14.76	3.28	-18.06	10.81	-19.07
220518-0028	muscle	2018-05-22	2018	48.91	14.38	3.40	-17.97	10.89	-18.78
220518-0037	muscle	2018-05-22	2018	47.64	14.38	3.31	-17.82	10.74	-18.78
220518-0049	muscle	2018-05-22	2018	49.55	14.01	3.54	-17.92	11.08	-18.52
220518-0051	muscle	2018-05-22	2018	48.36	15.04	3.22	-17.94	10.76	-19.06
220518-0054	muscle	2018-05-22	2018	49.04	14.91	3.29	-17.77	10.93	-18.76
220518-0056	muscle	2018-05-22	2018	49.10	14.54	3.38	-17.67	11.21	-18.51
240718-0002	muscle	2018-07-24	2018	54.02	13.16	4.11	-19.55	10.61	-19.43
240718-0004	muscle	2018-07-24	2018	53.76	11.19	4.80	-20.45	10.78	-19.69
240718-0013	muscle	2018-07-24	2018	51.99	12.35	4.21	-19.38	10.53	-19.15
240718-0018	muscle	2018-07-24	2018	53.23	11.95	4.45	-20.17	10.75	-19.71
240718-0033	muscle	2018-07-24	2018	49.38	14.39	3.43	-18.23	10.58	-18.99
240718-0038	muscle	2018-07-24	2018	51.85	12.85	4.03	-19.67	10.64	-19.64
240718-0043	muscle	2018-07-24	2018	49.26	14.31	3.44	-17.97	10.76	-18.72
240718-0049	muscle	2018-07-24	2018	51.42	12.80	4.02	-19.73	10.59	-19.71
240718-0051	muscle	2018-07-24	2018	52.11	12.70	4.10	-19.43	10.67	-19.32
300718-0001	muscle	2018-07-30	2018	48.68	14.81	3.29	-18.28	11.44	-19.27
300718-0006	muscle	2018-07-30	2018	47.70	13.73	3.47	-18.87	11.93	-19.57
300718-0009	muscle	2018-07-30	2018	49.23	14.69	3.35	-18.35	11.20	-19.24
300718-0012	muscle	2018-07-30	2018	48.99	14.72	3.33	-18.25	11.46	-19.18

Table 23: Stable Isotopes (continued)

ID	Tissue	Date	Year	%C	%N	C/N	d13C	d15N	d13C'
300718-0013	muscle	2018-07-30	2018	49.54	14.09	3.52	-18.63	11.13	-19.26
300718-0015	muscle	2018-07-30	2018	48.74	14.86	3.28	-18.27	11.07	-19.28
300718-0021	muscle	2018-07-30	2018	49.90	14.52	3.44	-18.55	11.01	-19.30
290419-0006	muscle	2019-04-29	2019	50.94	11.84	4.30	-20.02	10.71	-19.70
290419-0022	muscle	2019-04-29	2019	47.41	13.17	3.60	-18.49	10.76	-19.00
290519-0003	muscle	2019-05-29	2019	48.97	12.34	3.97	-19.70	10.67	-19.74
290519-0005	muscle	2019-05-29	2019	51.33	11.47	4.47	-20.16	10.64	-19.68
290519-0037	muscle	2019-05-29	2019	50.39	12.09	4.17	-19.91	10.57	-19.72
290519-0055	muscle	2019-05-29	2019	49.62	12.13	4.09	-19.72	10.70	-19.62
290519-0084	muscle	2019-05-29	2019	50.57	12.12	4.17	-19.49	10.88	-19.30
290519-0085	muscle	2019-05-29	2019	51.58	11.78	4.38	-19.72	10.82	-19.32
020819-0004	muscle	2019-08-02	2019	51.24	12.12	4.23	-19.75	11.52	-19.50
020819-0015	muscle	2019-08-02	2019	51.54	11.42	4.51	-20.40	10.91	-19.88
270819-0001	muscle	2019-08-27	2019	52.07	11.43	4.55	-20.95	10.52	-20.40
270819-0010	muscle	2019-08-27	2019	49.30	12.97	3.80	-19.48	11.31	-19.72
270819-0021	muscle	2019-08-27	2019	52.40	10.68	4.90	-21.51	10.25	-20.67
270819-0025	muscle	2019-08-27	2019	47.49	13.33	3.56	-18.97	11.40	-19.54
270819-0026	muscle	2019-08-27	2019	57.52	8.15	7.06	-22.48	11.41	-20.51
270819-0028	muscle	2019-08-27	2019	53.76	10.57	5.09	-21.66	10.99	-20.68
270819-0031	muscle	2019-08-27	2019	54.55	9.83	5.55	-21.48	11.05	-20.21
270819-0040	muscle	2019-08-27	2019	51.40	11.45	4.49	-20.78	10.24	-20.28
270819-0061	muscle	2019-08-27	2019	50.15	11.81	4.24	-20.16	11.19	-19.90
270819-0076	muscle	2019-08-27	2019	57.38	8.95	6.41	-22.30	10.59	-20.59
270819-0077	muscle	2019-08-27	2019	46.99	12.36	3.80	-19.53	11.57	-19.77
270819-0083	muscle	2019-08-27	2019	51.94	11.64	4.46	-20.75	10.58	-20.28
270819-0084	muscle	2019-08-27	2019	48.20	12.04	4.00	-20.15	10.73	-20.15
270819-0085	muscle	2019-08-27	2019	48.81	13.14	3.72	-19.24	11.23	-19.59
270819-0089	muscle	2019-08-27	2019	50.25	12.21	4.12	-19.81	11.54	-19.68
161020-0002	muscle	2020-10-16	2020	50.17	13.43	3.73	-19.73	10.77	-20.06
161020-0004	muscle	2020-10-16	2020	51.28	13.22	3.88	-19.90	10.81	-20.04
161020-0005	muscle	2020-10-16	2020	55.21	11.04	5.01	-21.28	11.15	-20.36
161020-0006	muscle	2020-10-16	2020	49.03	14.42	3.40	-19.13	10.86	-19.94
161020-0007	muscle	2020-10-16	2020	48.23	14.42	3.35	-18.69	10.60	-19.58
161020-0009	muscle	2020-10-16	2020	50.14	13.69	3.66	-19.45	10.60	-19.88
161020-0010	muscle	2020-10-16	2020	51.48	12.69	4.06	-20.16	10.64	-20.09
161020-0011	muscle	2020-10-16	2020	50.13	12.90	3.89	-20.09	10.55	-20.22
161020-0012	muscle	2020-10-16	2020	53.62	11.80	4.54	-20.92	10.42	-20.38
161020-0013	muscle	2020-10-16	2020	54.53	11.07	4.92	-21.44	10.46	-20.59
161020-0014	muscle	2020-10-16	2020	48.69	13.85	3.52	-19.29	10.77	-19.92
161020-0016	muscle	2020-10-16	2020	51.12	13.00	3.93	-19.95	10.39	-20.03
161020-0019	muscle	2020-10-16	2020	48.41	14.38	3.37	-18.64	11.10	-19.50
161020-0022	muscle	2020-10-16	2020	49.08	13.82	3.55	-19.48	11.42	-20.06
161020-0028	muscle	2020-10-16	2020	51.72	12.23	4.23	-20.61	11.08	-20.36
161020-0034	muscle	2020-10-16	2020	48.49	14.24	3.40	-19.09	10.83	-19.90
161020-0043	muscle	2020-10-16	2020	51.53	13.49	3.82	-19.98	10.61	-20.20
161020-0045	muscle	2020-10-16	2020	48.08	13.76	3.50	-19.26	10.71	-19.92
161020-0047	muscle	2020-10-16	2020	46.76	13.48	3.47	-19.15	10.61	-19.85
161020-0050	muscle	2020-10-16	2020	48.92	14.56	3.36	-19.12	10.83	-20.00
161020-0057	muscle	2020-10-16	2020	50.17	13.42	3.74	-19.56	10.85	-19.88
161020-0059	muscle	2020-10-16	2020	50.89	12.94	3.93	-20.20	10.90	-20.28
161020-0060	muscle	2020-10-16	2020	48.70	13.77	3.54	-19.33	12.63	-19.93
161020-0066	muscle	2020-10-16	2020	51.47	12.84	4.01	-20.31	11.41	-20.30
Salmo trutta									
St-0108	muscle	2017-07-01	2017	46.31	14.39	3.22	-18.79	8.50	-19.91
St-0109	muscle	2017-07-01	2017	47.23	14.17	3.33	-21.17	7.80	-22.10
St-0110	muscle	2017-07-01	2017	46.54	13.55	3.44	-18.33	6.98	-19.08

Table 23: Stable Isotopes (continued)

ID	Tissue	Date	Year	%C	%N	C/N	d13C	d15N	d13C'
St-0111	muscle	2017-07-01	2017	47.55	14.22	3.34	-21.16	6.71	-22.07
St-0112	muscle	2017-07-01	2017	47.17	13.44	3.51	-22.58	6.35	-23.22
St-0113	muscle	2017-07-01	2017	47.47	13.70	3.47	-24.03	7.01	-24.73
St-0114	muscle	2017-07-01	2017	46.58	13.74	3.39	-23.27	6.54	-24.10
St-0115	muscle	2017-07-01	2017	45.93	13.83	3.32	-23.69	7.59	-24.63
St-0116	muscle	2017-07-01	2017	42.49	11.31	3.76	-19.94	9.94	-20.23
St-0117	muscle	2017-08-13	2017	48.30	13.52	3.57	-17.58	8.48	-18.13
St-0118	muscle	2017-08-26	2017	45.26	14.04	3.22	-17.49	7.13	-18.61
St-0119	muscle	2017-08-26	2017	48.22	13.70	3.52	-24.71	6.35	-25.34
St-0120	muscle	2017-08-26	2017	47.44	13.65	3.48	-21.39	9.39	-22.08
St-0122	muscle	2017-09-07	2017	45.87	14.22	3.23	-25.46	4.92	-26.56
St-0124	muscle	2017-09-07	2017	46.53	14.38	3.24	-25.34	5.31	-26.42
St-0125	muscle	2017-09-07	2017	46.98	14.39	3.26	-25.42	5.81	-26.46
St-0126	muscle	2017-09-07	2017	45.88	14.13	3.25	-26.40	4.42	-27.46
St-0127	muscle	2017-09-07	2017	40.88	12.58	3.25	-25.08	4.68	-26.14
St-0128	muscle	2017-09-07	2017	45.58	14.01	3.25	-24.84	5.93	-25.90
St-0129	muscle	2017-09-07	2017	45.46	14.34	3.17	-26.64	7.13	-27.85
St-0130	muscle	2018-07-01	2018	51.92	12.11	4.29	-28.07	8.55	-27.76
St-0131	muscle	2018-07-01	2018	47.41	14.45	3.28	-26.86	5.37	-27.87
St-0132	muscle	2018-07-01	2018	49.23	13.92	3.54	-27.98	5.82	-28.58
St-0133	muscle	2018-07-01	2018	47.34	14.06	3.37	-24.01	7.54	-24.87
St-0134	muscle	2018-07-01	2018	48.01	13.52	3.55	-22.74	8.70	-23.32
St-0135	muscle	2018-07-01	2018	48.86	13.79	3.54	-19.43	7.76	-20.03
St-0136	muscle	2018-07-01	2018	49.05	13.81	3.55	-19.99	8.71	-20.57
St-0137	muscle	2018-07-01	2018	48.12	13.68	3.52	-22.09	5.97	-22.72
St-0138	muscle	2018-07-01	2018	48.52	14.08	3.45	-19.64	7.32	-20.37
St-0139	muscle	2019-08-01	2019	44.82	13.70	3.27	-24.01	8.33	-25.04
St-0140	muscle	2019-08-01	2019	48.27	14.48	3.33	-25.75	8.90	-26.68
St-0141	muscle	2019-08-01	2019	47.32	14.02	3.37	-24.82	8.89	-25.68
St-0142	muscle	2019-08-01	2019	48.31	14.67	3.29	-26.54	7.80	-27.53
St-0143	muscle	2019-08-01	2019	41.70	13.06	3.19	-25.75	6.72	-26.92
St-0144	muscle	2019-08-01	2019	47.66	14.14	3.37	-26.36	7.02	-27.22
St-0145	muscle	2019-08-01	2019	48.16	14.79	3.26	-26.04	7.85	-27.08
St-0146	muscle	2019-08-01	2019	47.76	14.04	3.40	-24.93	6.93	-25.74
St-0147	muscle	2019-08-01	2019	44.94	13.78	3.26	-26.26	8.33	-27.30
St-0148	muscle	2020-08-01	2020	49.59	12.56	3.95	-25.91	8.21	-25.97
St-0149	muscle	2020-08-01	2020	47.59	13.43	3.54	-23.94	9.27	-24.54

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