EVALUATION OF CONTAMINANTS IN WILD-CAUGHT NORWEGIAN SEAFOOD

Prioritization of species for risk-based monitoring

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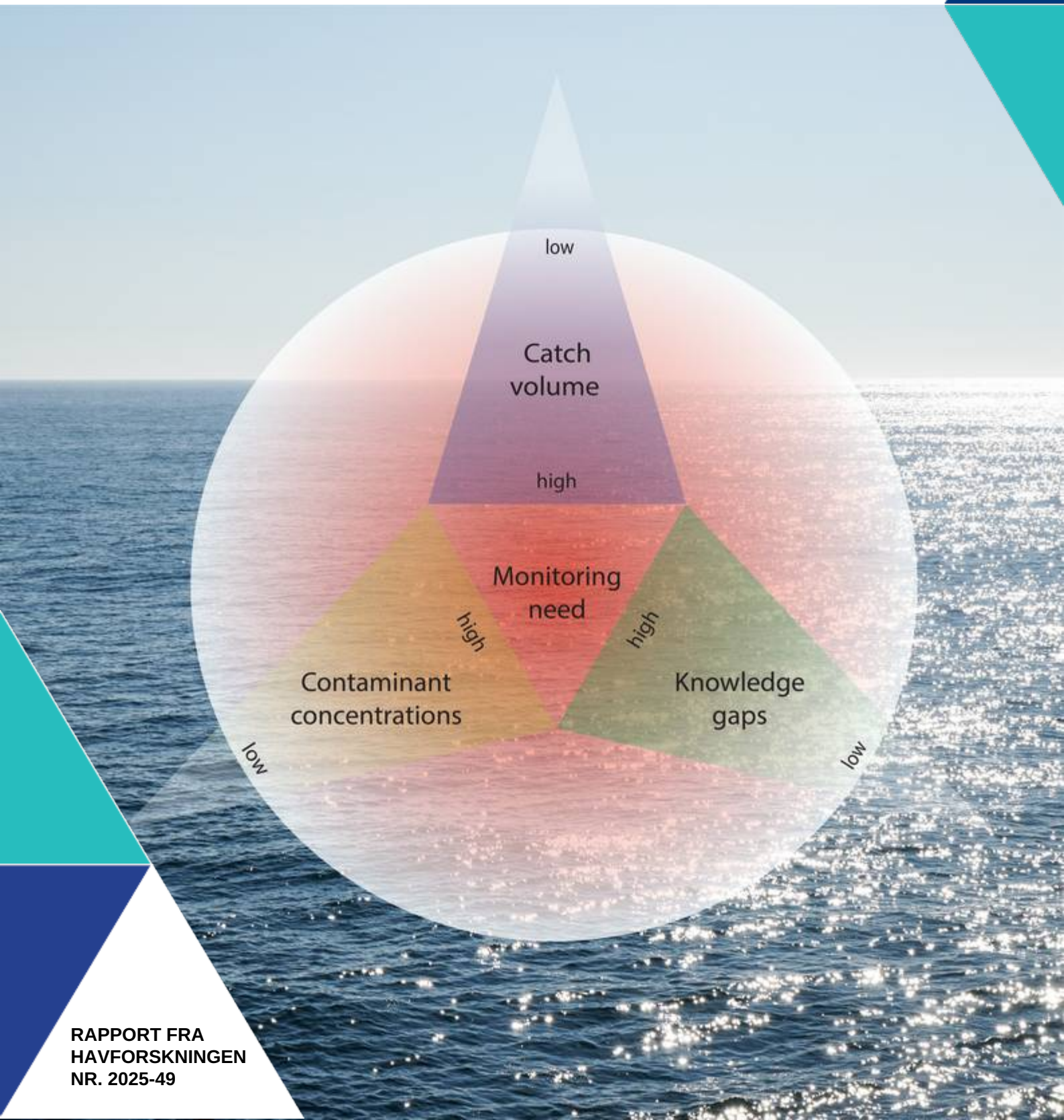

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Summary (English):

Official monitoring and control of foods to ensure the health of consumers is regulated through EU and Norwegian law. According to these regulations, monitoring of wild-caught seafood from Norwegian marine areas should be performed on a risk basis. The aim of this work was to provide an overview of existing knowledge about contaminants in wild-caught fish and other seafood and conduct a risk-based prioritization of seafood species as a basis for risk-based control plans to be implemented by the Norwegian Food Safety Authority (NFSA) for wild-caught Norwegian seafood.

Contaminant data collected by the Institute of Marine Research in several different monitoring programs during 2006-2023 were compiled for a wide range of different seafood species, including well-documented contaminants and seafood species as well as contaminants and species for which data were lacking. A risk-based prioritization of seafood species to be included in control plans was performed based on these data, primarily data from the most recent years available. We considered several relevant potential risk factors, including potential for high exposure due to high consumption (high catch volumes), potential for exceeding maximum levels (high contaminant levels), potential for exceeding tolerably weekly intake (high contaminant levels), and potential risks due to knowledge gaps (insufficient data). A final evaluation and prioritization based on all risk factors combined was performed for a total of 43 seafood species, and the seafood species were prioritized as high, medium, lower or lowest priority for inclusion in risk-based control plans.

Species with high catch volumes, Atlantic herring, Atlantic mackerel, Atlantic cod, saithe and haddock, were assigned a high priority since they contribute significantly to the overall exposure of the population to contaminants from seafood. In addition, Atlantic bluefin tuna was assigned a high priority due to a high fraction of individual fish having contaminant levels above the maximum level (ML) for both mercury (Hg) and dioxins and dioxin-like polychlorinated biphenyls (dl-PCBs).

Medium priority was assigned to Greenland halibut due to a (low) fraction of the individual fish exceeding the MLs for both Hg and dioxins and dl-PCB, and to Atlantic halibut due to a (low) fraction of the individual fish having contaminant levels in fillet above the MLs for Hg, dioxins and dl-PCB and sum 4PFAS. Medium priority was also assigned to tusk, anglerfish and blue ling due to a high fraction of individual fish having contaminant levels above the ML for Hg, but not for other contaminants. Brown meat of brown crab was assigned a medium priority due to risk of exceeding the tolerable weekly intake (TWI) for both Cd and dioxins and dl-PCB, whereas claw meat of brown crab was assigned a lower priority due to a (low) fraction of the individuals exceeding the ML for Cd.

A lower priority was assigned for ling, European plaice, pollack, Atlantic wolffish, Norway lobster and European lobster due to a fraction, albeit a low one, of the individuals exceeding the ML for a single contaminant (Hg or PFAS). Of these, Norway lobster and European lobster are also data deficient. A lower priority was also assigned to European plaice, European sprat, Atlantic horse mackerel, wild Atlantic salmon, European hake, greater argentine, spotted wolffish, and beaked redfish due to risk of exceeding TWI for a single contaminant group (i.e., dioxins and dl-PCB or PFAS). Of these, European sprat and Atlantic horse mackerel are also data deficient and for wild Atlantic salmon the data are old, which increases the need for further monitoring of these species.

The lowest priority was assigned for golden redfish and Northern shrimp, since no risks were identified for these species. For the remaining species that were evaluated, the data are insufficient to determine a priority level, and further monitoring is necessary for these species before potential risk can be evaluated.

Future monitoring should also focus on regions with high levels of contaminants in certain species, including fjords and coastal waters and data deficient areas. Even with limited commercial fishery in fjords and coastal areas, monitoring is important to assess the exposure of recreational and sustenance fishers. Data are also needed for all species on per- and polyfluoroalkyl substances (PFAS) and new contaminants including microplastic, which requires considerable efforts in method development.

Summary of the outcome of the risk evaluation of contaminants in wild caught Norwegian seafood. Three different factors were identified contributing to a potential health risk, and hence increase the need for monitoring: 1) a high **Catch volume** which increases the risk of high contaminant exposure 2) high **Contaminant concentrations** which increase the risk of exceeding EU and Norwegian maximum levels or tolerable weekly intake. 3) **Knowledge gap**s caused by a low number of samples analyzed, outdated data, insufficient geographical coverage, contaminants of emerging/increasing concern and new food resources.

Summary (Norwegian):

Offentlig overvåking og kontroll av mat for å sikre forbrukernes helse er regulert gjennom EU og norsk lov. I henhold

til nye reguleringer, skal overvåking av villfanget sjømat fra norske havområder være risikobasert. Målet med dette arbeidet var å gi en oversikt over eksisterende kunnskap om fremmedstoffer i villfanget fisk og annen sjømat og gjennomføre en risikobasert prioritering av sjømatarter som et grunnlag for Mattilsynet til å implementere risikobaserte kontrollplaner for villfanget norsk sjømat.

Data på miljøgifter samlet inn av Havforskningsinstituttet i flere ulike overvåkingsprogrammer i perioden 2006–2023 ble sammenstilt for en lang rekke sjømatarter og inkluderte både veldokumenterte miljøgifter og sjømatarter og miljøgifter og arter som mangler data. En risikobasert prioritering av sjømatartene ble deretter gjennomført basert på disse dataene, primært data fra de siste årene. Flere potensielle risikofaktorer ble vurdert, inkludert potensiale for høy eksponering på grunn av høyt konsum (høyt fangstvolum), potensiale for overskridelse av grenseverdier (høye nivåer av miljøgifter), potensiale for overskridelse av tolerabelt ukentlig inntak (TWI) (høye nivåer av miljøgifter) og potensiell risiko som skyldes kunnskapshull (for lite data). En samlet evaluering og prioritering basert på alle disse risikofaktorene ble gjennomført for til sammen 43 sjømatarter, og sjømatartene ble prioritert som høy, middels, lavere eller lavest prioritet for inkludering i risikobaserte kontrollplaner.

Arter med høyt fangstvolum, sild, makrell, torsk, sei og hyse, fikk høy prioritet siden de bidrar betydelig til befolkningens samlede eksponering for miljøgifter fra sjømat. I tillegg fikk makrellstørje høy prioritet på grunn av en høy andel fisk med nivåer over grenseverdier for mattrygghet for både kvikksølv og dioksiner og dioksinlignende PCB.

Blåkveite og Atlantisk kveite fikk middels prioritet på grunn av en liten andel individer som overskred grenseverdiene for mer enn én miljøgift. Dette gjaldt grenseverdiene for kvikksølv og dioksiner og dioksinlignende PCB for blåkveite og kvikksølv, dioksiner og dioksinlignende PCB samt PFAS for Atlantisk kveite. I tillegg fikk brosme, breiflabb og blålange middels prioritet på grunn av en høy andel individer over grenseverdien for kvikksølv, men ikke for andre miljøgifter. Brunmat av taskekrabbe fikk middels prioritet på grunn av risiko for overskridelse av TWI for kadmium og dioksiner og dioksinlignende PCB, mens klokjøtt av krabbe fikk en lavere prioritet på grunn av en liten andel individer over grenseverdien for kadmium.

Lange, rødspette, lyr, gråsteinbit, sjøkreps og hummer fikk lavere prioritet på grunn av kun en liten andel individer med nivåer over grenseverdien for en enkelt miljøgift (Hg eller PFAS). Av disse var sjøkreps og hummer imidlertid også datafattige. Rødspette, brisling, hestmakrell, villaks, lysing, vassild, flekksteinbit og snabeluer ble kategorisert med lavere prioritet på grunn av overskridelse av TWI for kun en enkelt gruppe av stoffer (dioksiner og dioksinlignende PCB eller PFAS). Av disse artene er brisling og hestmakrell også datafattige og for villaks er dataene gamle, noe som øker behovet for overvåking av disse artene.

Vanlig uer og reker fikk lavest prioritet av de evaluerte artene, siden ingen risikoer ble identifisert for disse artene. For resten av artene som ble evaluert er dataene ikke tilstrekkelige til å kunne vurdere prioriteringsnivå, og videre overvåkning av disse artene er nødvendig før potensiell risiko kan evalueres.

Fremtidig overvåking bør også fokusere på regioner med høye nivåer av miljøgifter i visse arter, slik som fjorder og kystområder og områder med datamangel. Selv med begrenset kommersielt fiske i fjorder og kystområder, er overvåking viktig for å vurdere hvordan fritidsfiskere og de som fisker til eget forbruk påvirkes. Det er også behov for data for alle arter på PFAS og nye kontaminanter som mikroplast, noe som krever betydelig innsats innen metodeutvikling.

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1 - Introduction

Official monitoring and control of foods to ensure the health of consumers is regulated through European Union (EU) and Norwegian law and is also important to ensure market access. The EU Regulation (EU) 2017/625, implemented in Norwegian law as FOR-2020-03-03-704, provides an obligation for member states to ensure that official controls are performed by competent authorities based on a multi-annual national control plan (MANCP). The obligation to include contaminants in wild caught seafood in a MANCP has recently been implemented in EU law through regulations (EU) 2022/931 and 2022/932. There, it is stated for unprocessed wild-caught fishery products as well as crustaceans and bivalve molluscs: "…the number of samples is to be determined by each Member State according to the level of production and the problems identified".

Thus, control plans to be implemented by the NFSA for wild caught seafood must be risk-based, and an overview of present knowledge and an identification of risks is needed for the preparation of these control plans. Therefore, in 2022, the NFSA asked the Institute of Marine Research (IMR) to prepare an overview of current knowledge on undesirable substances in wild caught seafood species, identifying substances and species that may constitute a potential health risk, along with professional justification for each identified species.

The overview should contain aggregated information about:

- Problematic contaminants in seafood
- Which contaminants and seafood species that are well documented and which are data deficient
- Geographical variation of contaminants in seafood

The knowledge gathered should be evaluated with regard to risk so that NFSA may use this information to prioritize which species and contaminant groups to analyse in the control plan.

The monitoring system for live bivalve molluscs (LBM) is not affected by the new regulations, since control of LBM are regulated by other EU regulations ((EU) 2019/627 and (EU) 2019/624 supplementing (EU) 2017/625), which are dealing with acute risks from microbiology and biotoxins and hence are more comprehensive than regulations for other types of seafood. Therefore, data from the LBM monitoring on behalf of the NFSA are not included in this evaluation.

1.1 - Monitoring of contaminants in wild fish

The production of wild caught Norwegian seafood is both larger and more diverse than that of farmed seafood, with a multitude of species captured over large geographical areas. The total volumes captured by commercial Norwegian fishing vessels were in recent years in the range of 2.3 – 2.4 million tons, excluding macroalgae. However, relatively few species account for most of the catch volume. Pelagic fish (Atlantic herring (*Clupea harengus*), Atlantic mackerel (*Scomber scombrus*), blue whiting (*Micromesistius poutassou*) and more), constitute about half of this volume, and the three cod fishes Atlantic cod (*Gadus morhua*), saithe (*Pollachius virens*) and haddock (*Melanogrammus aeglefinus*) approximately one third. The rest is a mixture of demersal fish, flatfishes, shellfish and an increasing volume of Antarctic krill (*Euphausia superba*), also included in the landing statistics of the Norwegian Directorate of Fisheries (Fangst fordelt på art (offisiell statistikk) | Fiskeridirektoratet).

A significant part of the total volume of wild capture production, including krill and several pelagic fish species (e.g. blue whiting, sandeel (*Ammodytes* spp.)), is primarily used for industrial production of fish meal and -oil, mainly as ingredients for feed for farmed fish. This is not evaluated in this report.

The control mechanisms for ensuring that levels of contaminants in seafood are within regulatory limits according to the European Commission Regulations (EC) No 1881/2006 and (EU) 2023/915, have until 2023 been regulated differently for wild caught seafood and farmed seafood. Farmed fish has, since the Council Directive (EU) 96/23/EC was implemented in 1996, been under a strict monitoring regime requiring a specific number of samples according to production volume for the analyses of veterinary products and contaminants. Before 2023, these regulations did not include wild-caught seafood. However, independent of regulations, surveillance and monitoring of contaminants in Norwegian wild-caught seafood have been carried out with the aim of obtaining an overview and documentation of the contents of different contaminants, to fulfil export requirements for the fishing industry and to ensure the protection of consumers.

The focus on contaminants and food safety increased greatly in the 1990s and a programme for systematic spot-check based monitoring of metals and PCBs in seafood was initiated by the Institute of Nutrition, Directorate of Fisheries. This institute became the National Institute of Nutrition and Seafood Research (NIFES) in 2003 and merged with the Institute of Marine Research (IMR) in 2018. As a consequence of several findings of contaminants in Norwegian fish above maximum levels (e.g., Hg in Greenland halibut in 2006 (Julshamn et al., 2006)), large systematic surveys, referred to as baseline studies, were initiated for selected species (see Table 1). The first species selected for baseline studies were chosen because of their large catch volumes, except Greenland halibut, which was chosen because of its risk of exceeding the ML for Hg. The baseline studies were designed, as far as possible, to cover the geographical areas where Norwegian fishery statistics showed that the respective species were captured, while also investigating seasonal variation. The number of samples in a baseline study ranged from about 800 to more than 2000 individual fish. After the initial comprehensive baseline studies with high numbers of samples of individual fish (Greenland halibut, herring, mackerel, cod, saithe, tusk and haddock), later baseline studies were mostly scaled down to fewer fish and/or a combination of individual fish and pooled samples (Table 1).

An important aim of the baseline studies was to establish a basis for continued knowledge-based monitoring of contaminants in our most important fish stocks. The baseline studies provided thorough documentation on a variety of factors influencing contaminant levels in the different species, including geographical catch area, season, age, size, and fat content of the fish. Based on this knowledge, more directed risk-based monitoring programs (“follow-up monitoring”) could be designed for each species. Such a follow-up monitoring program (“Oppfølging av basisundersøkelser”) was started in 2011. In the beginning, follow-up monitoring was performed for all the species where baseline studies had been completed (Table 1), i.e., Norwegian spring spawning herring (NSS-herring) and Greenland halibut from 2011, Atlantic mackerel from 2013 and North Sea herring, Atlantic cod and saithe from 2014. From 2019, tusk was also included in the follow-up monitoring, and haddock was included from 2024. The extent and frequency of follow-up monitoring for each species was determined based on both commercial importance of the species and risk of exceeding MLs. The remaining species for which baseline studies have been completed, have so far not been included in this program.

In parallel with the baseline studies and the follow-up monitoring program, spot-check monitoring was continued for species or areas with little data. Data from spot-check monitoring have also been used as basis for selection of new baseline studies. In the latest years, new resources (species expected to be of increasing interest as food and feed in coming decades or new species in Norwegian waters), and samples from fjords have been included in spot-check monitoring. Some wild bivalves with little data are included in the spot-check monitoring of new resources, and are used in this evaluation, even though the NFSA monitoring program for live bivalve molluscs (LBM) is not included here.

From the beginning in the 1990s and until now, sampling has been carried out via IMR’s research cruises, their

reference fleet (fishing vessels on contract with the IMR), and other directly engaged fishermen. The samples were analysed for contaminants for which maximum levels were set, such as heavy metals, PCBs and dioxins, but also other substances of emerging concern such as brominated flame retardants for which MLs were not in place. In recent surveys, PFAS and chlorinated pesticides have also been included. The chemical analyses were mostly performed at IMR/NIFES laboratories accredited according to NS-EN ISO/IEC 17025:2017.

The baseline studies were initially funded through a combination of means from the Norwegian Seafood Research Fund, the Herring Fishermen's Sales Organisation (Sildesalgslaget; for herring), the Ministry of Fisheries and Coastal Affairs (now Ministry of Trade, Industry and Fisheries), and the NFSA. Later baseline studies were mostly performed as a part of the NFSA's monitoring portfolio, through 3–4-year programmes. An exception in later years is the haddock baseline study, which was funded directly from the Ministry of Trade, Industry and Fisheries, as is also the follow-up monitoring program. Table 1 gives an overview of the different baseline studies, resulting reports and peer-review publications, and follow-up monitoring.

Table 1. Overview of the species/fish stock for which baseline studies were performed. Sampling years, number of fish, references for reports and published scientific articles, and frequency of follow-up monitoring is given for each species.

Species Norwegian/English (Latin)	Sampling years	Number of fish (approx.)	Report	Publ. in international peer reviewed journals	Follow-up monitoring
NVG-sild/ NSS herring (*Clupea harengus*)	2006-2007	800	Frantzen et al., 2009	Frantzen et al., 2011, Frantzen et al., 2015; Nøstbakken et al., 2018, Azad et al., 2019, Ho et al., 2021, Nøstbakken et al., 2021; Ho et al., 2021; Ho et al., 2023; Ho et al., 2024	Every third year
Blåkveite/ Greenland halibut (*Reinhardtius hippoglossoides*)	2006-2008	1300	Nilsen et al., 2010	Nøstbakken et al., 2018; Azad et al., 2019; Bank et al., 2021; Ho, Bank et al., 2021; Ho et al., 2024	Annual
Makrell/ Atlantic mackerel (*Scomber scombrus*)	2007-2009	1200	Frantzen et al., 2010	Nøstbakken et al., 2018; Azad et al., 2019; Nøstbakken et al., 2021; Ho, Bank et al., 2021; Ho, Frantzen et al., 2023; Frantzen et al., 2024a; Ho et al., 2024	Annual/every third year (depending on area)
Torsk/ Atlantic cod (*Gadus morhua*)	2009-2011	2100	Julshamn et al., 2012a	Julshamn et al., 2013a; Julshamn et al., 2013b; Julshamn et al., 2013c; Nøstbakken et al., 2018; Azad et al., 2019; Ho, Bank et al., 2021; Ho, Frantzen et al., 2023; Bank et al., 2023a	Annual
Nordsjøsild/ North Sea herring (*Clupea harengus*)	2009-2010	1000	Duinker et al., 2012	Nøstbakken et al., 2018; Azad et al., 2019; Nøstbakken et al., 2021; Ho, Bank et al., 2021; Ho, Frantzen et al., 2023; Ho et al., 2024	Every third year
Sei/ Saithe (*Pollachius virens*)	2010-2013	1600	Nilsen et al., 2012, Nilsen et al., 2013	Nøstbakken et al., 2018; Azad et al., 2019; Ho, Bank et al., 2021; Ho, Frantzen et al., 2023	Annual (every second year from 2023)
Taskekrabbe/ Brown crab (*Cancer pagurus*)	2011	400	Julshamn et al., 2012c		Irregular
Kongekrabbe/ Red king crab (*Paralithodes camtschaticus*)	2012	200	Julshamn et al., 2013d	Julshamn et al., 2015	None
Brosme/ Tusk (*Brosme brosme*)	2013-2016	1400	Frantzen and Maage, 2016	Ho, Bank et al., 2021; Ho, Frantzen et al., 2023	Annual

Species Norwegian/English (Latin)	Sampling years	Number of fish (approx.)	Report	Publ. in international peer reviewed journals	Follow-up monitoring
Lange/ Ling (*Molva molva*)	2013-2016	800	Frantzen and Maage, 2016	Ho, Bank et al., 2021; Ho, Frantzen et al., 2023	None
Kveite/ Atlantic halibut (*Hippoglossus hippoglossoides*)	2013-2016	400	Nilsen et al., 2016	Nøstbakken et al., 2018; Ho, Bank et al., 2021; Ho, Frantzen et al., 2023	Irregular
Hyse/ Haddock (*Melanogrammus aeglefinus*)	2015-2019	1250	Kögel et al., 2021	Ho, Bank et al., 2021	Every second year from 2024
Rødspette/ Plaice (*Pleuronectes platessoides*)	2016-2018	450	Frantzen et al., 2020	Ho, Bank et al., 2021; Ho, Frantzen et al., 2023	None
Breiflabb/ Anglerfish (*Lophius piscatorius*)	2016-2019	300	Frantzen et al., 2020	Ho, Frantzen et al., 2023	None
Lyr/ Pollack (*Pollachius pollachius*)	2016-2019	300	Frantzen et al., 2020	Ho, Frantzen et al., 2023	None
Uer/ Golden redfish (*Sebastes norvegicus*)	2016-2018	200	Nilsen et al., 2020b	Ho, Frantzen et al., 2023	None
Snabeluer/ Beaked redfish (*Sebastes mentella*)	2016-2018	500	Nilsen et al., 2020b	Ho, Frantzen et al., 2023	None
Lysing/ European hake (*Merluccius merluccius*)	2019-2022	800	Bank et al., 2023b	Zhu et al., 2025	None
Vassild/ Argentines (*Argentinus* spp.)	2019-2022	300	Wiech et al., 2023		None
Gråsteinbit/ Atlantic wolffish (Anarhichas lupus)	2019-2022	200	Wiech et al., 2023		None
Flekksteinbit/ Spotted wolffish (*A. minor*)	2019-2022	250	Wiech et al., 2023		None

Abbreviations: NVG-sild (norsk vårgytende sild), NSS herring (Norwegian spring spawning herring)

1.2 - Surveys of contaminants in seafood from polluted areas

Several marine areas in Norway are polluted with different contaminants potentially compromising seafood safety locally. Especially fjords, harbours, urban areas and generally areas close to known point sources of pollution have been identified as problematic. Often the contaminants were deposited in the bottom sediments years ago. In such areas, especially recreational fishermen and their families have a higher risk of critical exposure to contaminants from seafood. Some of these areas also have commercial fisheries. IMR has performed surveys of contaminants in fish from areas with known pollution, resulting in a series of reports addressing these challenges which threaten fish and/or population health as presented in Appendix Table A1. Data from these and other studies were used by the NFSA to issue necessary consumption advice to the public which are currently published at mattilsynet.no (Unngå fisk og skalldyr fra forurensede havner, fjorder og innsjøer | Mattilsynet).

1.3 - Data sharing

The data from the monitoring programs and surveys are freely available to users upon request, and much can be found in reports published at hi.no. Contaminant data are summarised online in Sjømatdata (Seafood data | hi.no), where annual mean, minimum and maximum values for each species and contaminant are presented and updated regularly. Data for the species defined as indicators in the Norwegian management plans (Meld. St. 20 (2019–2020) (regjeringen.no)) are reported regularly at miljostatus.no (Havindikatorer - indikatorer for tilstanden i havet (miljodirektoratet.no)), separately for each of the sea areas North Sea and Skagerrak, Norwegian Sea and Barents Sea. Data are submitted to scientific bodies that conduct comprehensive risk assessments and give advice on food safety, such as The Norwegian Scientific Committee for Food and Environment (VKM), The European Food Safety Authority (EFSA) and The Food and Agriculture Organization of the United Nations (FAO). The collected data on seafood is essential when new regulatory maximum levels in food and feed are being developed within the EU and is shared through the EFSA Call for data system.

1.4 - Contaminants found in fish and other seafood

A short description of important contaminants found in fish and other seafood is given in fact box 1.

For fish and other seafood, MLs have been set in EU and Norway (Commission regulation (EU) 2023/915; Forskrift om visse forurensende stoffer i næringsmidler, 2015) for Hg, Cd, lead (Pb), PFAS (perfluorooctanoic acid (PFOA), perfluorooctanesulfonic acid (PFOS), perfluorononanoic acid (PFNA), perfluorohexanesulfonic acid (PFHxS) and the sum of these), sum dioxins (PCDD/F), sum dioxins and dl-PCBs (PCDD/F+dl-PCB), and sum non-dioxin-like PCBs (PCB6). MLs have also been set for benzo(a)pyrene (BaP) and sum 4 PAH (polyaromatic hydrocarbons), but for fish and crustaceans these MLs only apply to smoked products (Table 2).

TWI-values have been established for many contaminants based on their toxicity. TWI gives the amount of a substance that a person can consume weekly per kilogram of bodyweight over a lifetime without risk of adverse health effects. An overview of TWI for substances considered here is given in Table 3.

Mercury (Hg): The main chemical form of Hg found in fish and other seafood is methyl mercury, which is also the most toxic form for humans (Hong et al., 2012). Methyl mercury binds to sulphur in amino acids in proteins and therefore accumulates in fish muscle. Seafood is the main source of methyl mercury exposure for humans. In many studies only total Hg is analysed, but methyl mercury often comprises a large fraction of the total Hg in fish muscle.

PFAS (per- and polyfluorinated alkyl substances) are a large group of more than 14 700 very stable substances with fat- and water-resistant properties (NIST). PFAS bind to serum proteins and distribute to blood, liver, muscle, and brain (Shi et al., 2012). In fish, the concentrations are often higher in liver than in fillet.

Lead (Pb) generally occurs in low levels in the fillet of most species. It can accumulate in the liver of finfish and in bivalves.

Dioxins and furans originate from natural and industrial combustion processes in the presence of chlorine and carbon. The toxic potential of dioxins, furans and dl-PCBs are expressed as toxic equivalents (TEQ). The highest concentrations of dioxins and furans are found in fish liver, fatty fish fillet and brown meat of crab.

Cadmium (Cd) generally occurs in low concentrations in fish fillet but accumulates in liver and kidney of finfish and hepatopancreas of molluscs and crustaceans including crabs.

PCBs (polychlorinated biphenyls) are persistent fat-soluble substances which bioaccumulate and biomagnify along the food chain. Out of 209 theoretical forms, 12 are dioxin-like (dl) and regarded more toxic. Six non-dl-PCBs, which often are found in relatively high concentrations (PCB6) are commonly used as indicators of total PCB exposure. The highest concentrations of PCBs are found in fish liver, fatty fish fillet and brown meat of crab.

Arsenic (As): Fish can contain high concentrations of As, but most of the As in fish and crabs is generally assumed to be bound in the organic arsenobetaine, which is not regarded as toxic (EFSA, 2009, Vandermeersch et al., 2015, Frantzen et al. 2024b). Only very low levels can occur as inorganic As (Julshamn et al., 2012b), although not all species have been analysed for the inorganic form.

PAH: Polyaromatic hydrocarbons (PAHs) accumulate to a very low degree in fish, as they are metabolised. With the exception of smoked products, bivalves and crustaceans there are no maximum levels in the EU and Norway for PAHs in seafood.

Fact box 1. Description of important contaminants found in fish and other seafood

Table 2. Maximum levels (MLs) for different contaminants in EU and Norway (Commission regulation (EU) 2023/915; Forskrift om visse forurensende stoffer i næringsmidler, 2015). Only MLs applying to species occurring in Norwegian waters are shown. MLs applicable in other countries, may be found in De Witte et al., 2022.

Contaminant	Fish muscle	Fish liver	Bivalves	Crustaceans*
Mercury (mg/kg ww)	0.3/0.5/1.0**		0.5	0.5
Cadmium (mg/kg ww)	0.05/0.1**		1.0	0.5
Lead (mg/kg ww)	0.30		1.5	0.5
Sum dioxins and furans (ng 2005-TEQ/kg ww)	3.5		3.5	3.5
Sum dioxins, furans and dl-PCBs (ng 2005-TEQ/kg ww)	6.5/ 10**	20	6.5	6.5
Sum non-dl- PCBs, PCB6 (µg/kg ww)	75/ 125/200/ 300**	200	75	75
PAH: Benzo(a)pyrene (µg/kg ww)	2.0/ 5.0** (smoked)		5.0 (6.0 smoked)	2.0 (smoked)
Sum 4 PAH (µg/kg ww)	12.0/ 30.0** (smoked)		30 (35 smoked)	12.0 (smoked)
Sum 4 PFAS (µg/kg ww)	2.0/8.0/45**		5.0	5.0
PFHxS (µg/kg ww)	0.20/1.5**		1.5	1.5
PFOS (µg/kg ww)	2.0/7.0/35**		3.0	3.0
PFOA (µg/kg ww)	0.20/1.0/8.0**		0.70	0.70
PFNA (µg/kg ww)	0.5/2.5/8.0**		1.0	1.0

Abbreviations: ww (wet weight), TEQ (toxic equivalent)
*ML applies to muscle of legs and claws
**Depending on species

Table 3. Tolerable Weekly Intake (TWI) for contaminants relevant for seafood.

Contaminant	TWI	Reference
Sum dioxins and dl-PCB	2 pg TEQ/kg bw	EFSA CONTAM Panel, 2018
Methylmercury	1.3 µg/kg bw	EFSA CONTAM Panel, 2012
Cadmium	2.5 µg/kg bw	EFSA CONTAM Panel, 2009
Sum of PFOA, PFOS, PFNA, PFHxS	4.4 ng/kg bw	EFSA CONTAM Panel 2020

Abbreviations: TEQ (toxic equivalent), bw (body weight)

1.5 - Aim of the work

The aim of this work was to prepare an overview of current knowledge about contaminants in wild-caught fish and other seafood and perform a risk-based prioritization of seafood species as a basis for preparation of risk-based control plans to be implemented by the NFSA for wild-caught Norwegian seafood.

Chemical contaminants in seafood may constitute a potential health risk. Therefore, we aimed to compile existing data for contaminants in various seafood species, including well-documented contaminants and seafood species as well as contaminants and species for which data are lacking. In addition, where available, information about geographical variation of contaminants in seafood was included in the compiled data.

Based on the aggregated existing knowledge, we aimed to identify and prioritize seafood species to be

considered for risk-based monitoring. Risk factors included were the potential for high exposure (high catch volumes), potential for exceeding maximum levels (high contaminant levels), potential for exceeding tolerably weekly intake (high contaminant levels), and potential risks due to knowledge gaps (insufficient data).

2 - Method

We evaluated contaminants in wild-caught Norwegian seafood by using data obtained by IMR/NIFES in several baseline studies and other monitoring programs during the period 2006-2023. Contaminant data obtained by other institutions were not included in this report.

2.1 - Compilation of the contaminant data

Data from IMR's monitoring during 2006-2023 was extracted from the IMR database LIMS (Laboratory Information Management System) and compiled in Appendix Tables A2-A8. Data for each of the contaminants Hg, Cd, and Pb, as well as sum of dioxins and furans (PCDD/F), sum of dioxins, furans and dioxin-like PCBs (PCDD/F+dl-PCB), sum of non-dioxin-like PCBs (PCB6) and PFAS were compiled in separate tables. If available, data for the last 5 years (2017-2021) were compiled in the table, but for species where only older data existed, the most recent available data were used. Contaminant data were presented for each species or fish stock. Where data for one species was available for different geographical areas, e.g. Barents Sea, Norwegian Sea and North Sea, data were presented separately for each area. For some species, data were also presented separately for different tissues, e.g. different parts of the fillet such as fatty belly parts and leaner parts. For each contaminant and species/fish stock/area/tissue, the following information was compiled in the Appendix Tables A2-A8:

- Name of species/fish stock
- Tissue (e.g. fillet, muscle, whole fish, claw meat…)
- Name of monitoring program(s) which was the source of the data
- Sampling year(s) for samples used in the evaluation
- Geographical area
- Maximum level (ML) relevant for the species/contaminant
- Individual or composite sample
- Number of samples analysed
- Number of samples above the ML
- Fraction of samples above the ML (%)
- Mean, median, minimum-maximum and 95% percentile of the concentrations
- Number of samples below the limit of quantification (LOQ)
- Amount that may be consumed before exceeding TWI for a person of 70 kg*

*For contaminants where a TWI has been set (Hg, Cd, PCDDF+dl-PCB and Sum 4 PFAS), the amount of tissue (fillet, muscle meat, liver etc.) which may be consumed by a person of body weight (bw) 70 kg before exceeding the TWI, was calculated as follows:

Equation 1: Amount (g) = $TWI*70/C_{contamin}$ *1000

where TWI is tolerable weekly intake (1.3 µg/kg bw for methyl mercury (MeHg), 2.5 µg/kg bw for Cd, 2 pg TEQ/kg bw for PCDDF+dl-PCB, and 4.4 ng/kg bw for sum 4 PFAS) and $C_{contamin}$ is the mean concentration of the contaminant given as mg/kg wet weight (ww) for Hg and Cd, as ng TEQ/kg ww for PCDDF+dl-PCB, or as µg/kg ww for sum 4 PFAS.

2.2 - Risk-based prioritization of seafood species to be included in control plans

2.2.1 - Evaluation of risk factors

Based on the data from IMR's monitoring compiled in Appendix Tables A2-A8, we performed a risk-based prioritization of seafood species to be included in the NFSA control plans for wild-caught Norwegian seafood. Seafood species to be considered for inclusion in the control plans were identified and evaluated according to the following potential risk factors:

1. Potential for high exposure due to high catch volume/high consumption
2. Potential for exceeding ML
3. Potential for exceeding TWI
4. Risks arising from knowledge gaps

Prioritization of species was performed by answering a set of questions (Questions 1 – 3), corresponding to the three first risk factors, as described in the following sections (2.2.1.1 – 2.2.1.3). Depending on the answer, a score between 0 and 3 was given for each risk factor and species. In addition, species in need of monitoring due to knowledge gaps were identified in three different categories as described in section 2.2.1.4.

2.2.1.1 - Potential for high exposure due to high catch volume/high consumption

Norwegian seafood species with high catch volumes were prioritized for inclusion in control plans due to potential for high exposure, since a high catch volume indicates high consumption by the population, and due to large export. Data on total catch volume was obtained from the Directorate of Fisheries for each species (Fangst fordelt på art (offisiell statistikk) | Fiskeridirektoratet).

Question 1:
What is the annual catch volume of the species?

- Catch volume less than 100 000 tons: score = 0
- Catch volume more than 100 000 tons: score = 3

Figure 1. Questions asked for assessing monitoring requirements with respect to potential for high exposure due to high catch volume/high consumption. A score of 0 or 3 was given depending on the answers.

2.2.1.2 - Potential for exceeding maximum levels

In the EU, Regulation EU 2023/915 sets maximum levels for certain contaminants in food, and Norwegian seafood species with high concentrations of one or more contaminants with a potential for exceeding one or more maximum levels were prioritized for inclusion in control plans. The contaminant concentrations compiled in Appendix Tables A2-A8, were evaluated against the maximum levels for Hg, Cd, Pb, sum dioxins, sum dioxins and dioxin-like PCBs and sum non-dioxin-like PCBs (PCB6) by calculating the fraction of individual fish exceeding the MLs. In addition, new data from 2023 on PFAS concentrations in a more limited set of 209 samples from eight different fish species and shrimp, analysed with a more sensitive analytical method and reported by Frantzen et al. (Frantzen et al., 2024b), were evaluated against the new maximum levels for PFOS, PFOA, PFNA, PFHxS and the sum of these four PFAS.

Question 2:
What percentage of individual samples of the species had contaminant concentrations above maximum levels during the last (five) years of surveys or monitoring?

- Less than 1% of individual samples exceeded any of the maximum levels: score = 0
- Between 1% and 10% exceeded the ML for **one** contaminant/contaminant group (outliers not considered): score = 1
- Between 1% and 10% exceeded the ML for **more than one** contaminant/contaminant group: score = 2
- More than 10% exceeded the MLs for **one** contaminant/contaminant group: score = 2
- More than 10% exceeded the MLs for **more than one** contaminant/contaminant group: score = 3

Only muscle samples were given a score, but since there are maximum levels for dioxins and dioxin-like PCBs and PCB6 in fish liver as well, the fraction of liver samples exceeding these MLs were evaluated and described in the text, whenever relevant.

Figure 2. Questions asked for assessing monitoring requirements with respect to potential for exceeding maximum levels. A score of 0-3 was given depending on the answers.

2.2.1.3 - Potential for exceeding tolerable weekly intake

Norwegian seafood species with high concentrations of one or more contaminants which may lead to a risk of exceeding TWI were prioritized for inclusion in control plans. To evaluate the health risk connected to the levels of Hg, Cd, dioxins and dl-PCBs (PCDD/F+dl-PCB), and polyfluorinated alkyl substances (PFAS), the maximum consumption of each species before exceeding the TWIs set by EFSA (EFSA, 2012a,b, Knutsen et al., 2018b) was calculated. For this purpose, mean concentrations of contaminants were used, not considering different geographical areas separately, and a consumer body weight of 70 kg was assumed (see Equation 1). Therefore, the risk may be higher for high consumers of seafood caught locally in areas where concentrations are higher, as well as for individuals of lower body weight such as small children. Intake of contaminants from other sources were not taken into account in this evaluation.

Question 3:
What is the maximum amount of fish meat from the species that may be consumed before exceeding the TWI for a 70 kg person?

- 200 g or more may be consumed before exceeding the TWI for any of the contaminants/contaminant groups: score = 0
- Less than 200 g may be consumed before exceeding the TWI for **one** contaminant/contaminant group: score = 1
- Less than 200 g may be consumed before exceeding the TWI for **two** contaminants/contaminant groups: score = 2
- Less than 200 g may be consumed before exceeding the TWI for **three** contaminants/contaminant groups: score = 3

Figure 3. Questions asked for assessing monitoring requirements with respect to potential for exceeding tolerable weekly intake. A score of 0-3 was given depending on the answers.

2.2.1.4 - Knowledge gaps for specific species or areas

Norwegian seafood species with knowledge gaps on the occurrence of contaminants were prioritized for inclusion in control plans (or other monitoring). Knowledge gaps increase the risk of potential challenges going unnoticed. Species in need of extended data collection to uncover possible challenges were identified in the following three categories:

- Low N: Species with insufficient number of analysed samples (less than 100 individuals)
- Old data: Species with outdated data (more than 10 years old)
- Low N in some areas: Species which have shown a potential for high levels of certain contaminants, but where data from certain geographical areas are insufficient.

2.2.1.5 - Other knowledge gaps

In addition to the knowledge gaps identified for specific species or areas, the following knowledge gaps in need of extended monitoring and method development, were identified and discussed:

- Contaminants of emerging/increasing concern (e.g., PFAS, microplastics).
- New resources: Macroalgae, mesopelagic species, new bivalve species etc.

2.2.2 - Priority of species and recommendation for inclusion in control plans

The final prioritization of seafood species to be included in control plans was based on the scores obtained when answering the questions for each of the three potential risk factors as presented in section 2.2.1.1-2.2.1.3. The priority was assigned based on the highest score among all three potential risk factors. The potential for exceeding maximum levels in fish **liver** was not taken into account in this prioritization, as consumption of liver was considered low. NFSA advises children, as well as pregnant and breast-feeding women, to avoid consuming fish liver. Additionally, the general population is warned against eating liver from fish from coastal areas (Advarsler | Mattilsynet).

The priority of each species was assigned according to the following categories:

- **High priority**: Species with score 3 as the highest score for any of the risk factors
- **Medium priority**: Species with score 2 as the highest score for any of the risk factors
- **Lower priority**: Species with score 1 as the highest score for any of the risk factors
- **Lowest priority**: Species with score 0 across all risk factors
- **Unknown priority**: Species for which there is insufficient data to determine a priority level

3 - Results and discussion

3.1 - Potential for high exposure due to high catch volumes

Data on catch volumes were obtained from the Norwegian Directorate of Fisheries (Appendix Table A9). Fish species with catch volumes >100 000 tons are Atlantic herring (*Clupea harengus*), Atlantic mackerel (*Scomber scombrus*), Atlantic cod (*Gadus morhua*), saithe (*Pollachius virens*), and haddock (*Melanogrammus aeglefinus*). These species generally have concentrations of contaminants below EU's current MLs in fish fillet, but because of their large catch volumes and frequent consumption, these species may contribute more than most other fish species to the total intake of some contaminants. Therefore, it is crucial to monitor and document the levels of contaminants in these species regularly.

3.1.1 - Atlantic herring

Norwegian spring spawning (NSS) herring: The NSS herring has relatively low levels of contaminants compared to other herring stocks, and all individual fish had concentrations below MLs (Frantzen et al., 2009, Frantzen et al., 2011, Frantzen et al., 2015). However, because it is a fatty fish species, concentrations of lipid-soluble contaminants such as PCBs, dioxins and polybrominated diphenyl ether (PBDE)s are higher than for the lean fish species. The NSS herring stock migrates seasonally between feeding areas in the Norwegian Sea, wintering areas off Northern Norway and spawning areas off the Norwegian coast (primarily north of 62°N). Levels of organic contaminants varied seasonally (and hence geographically) and were highest in February-March when the herring were in the spawning areas. Follow-up monitoring every third year since 2011 has focused on this season as worst-case scenario.

North Sea herring: North Sea herring has generally low levels of contaminants compared to other fish species with some exceptions. The baseline study revealed higher levels of dioxins and dl-PCBs in local spring spawning herring from the coast of Telemark with several fish exceeding the MLs, possibly originating from a local source of pollution. For North Sea herring from the open sea the baseline study found organic contaminants close to the MLs in autumn samples from the southern areas of the North Sea but outside the Norwegian fishery area, and one single fish exceeding the ML for dioxins and furans (PCDD/F) (Duinker et al., 2012). A few concentrations close to the ML for Cd were found in autumn samples from the northern North Sea in fish after spawning. Based on this, sampling every third year is recommended targeting worst-case scenarios, with samples of both mature fish during autumn in the southern areas of the Norwegian fishery and autumn samples of fish after spawning in the northern North Sea. No concentrations above the MLs have been found in follow-up monitoring performed every third year since 2014.

3.1.2 - Atlantic mackerel

Atlantic mackerel of the Northeast Atlantic mackerel stock generally has concentrations of contaminants below MLs but has shown a marked geographical variation (Frantzen et al., 2010; Frantzen et al., 2024a). Fillet from the Skagerrak has higher concentrations of Hg, dioxins and dl-PCB and non-dl-PCBs than mackerel from all other areas. Mackerel is a fatty fish species, and the concentrations of lipid-soluble contaminants are considerably higher than for the lean fish species. Because of higher levels in the Skagerrak than in other areas, follow-up monitoring was given a higher frequency in the Skagerrak than in the North Sea, with annual sampling in the Skagerrak and sampling every third year since 2013 in the North Sea. In addition, mackerel from the Norwegian Sea was included in the follow-up monitoring with annual sampling from 2016. Because sampling in baseline studies and follow-up monitoring focused on areas where the highest volumes are caught in fisheries, there is a lack of information on levels of contaminants in mackerel captured in coastal areas.

3.1.3 - Atlantic cod

Fillet of cod has low levels of contaminants, where Hg is the contaminant which is closest to the ML (Julshamn et al., 2012a, Julshamn et al., 2013b, c). The largest cod stock in Norwegian fisheries is the Northeast Arctic cod in the Barents Sea where the lowest levels are found. Fjord areas in southern Norway and the North Sea have smaller stocks but three times higher levels of Hg, around 0.1-0.2 mg/kg ww. For the North Sea, 6.4% of individual fishes sampled during the period 2017-2021 have exceeded the ML for Hg of 0.3 mg/kg. Cod is a lean fish species, and the concentrations of lipid-soluble organic contaminants in cod fillet is therefore very low, well below the MLs. For liver, the concentrations of organic contaminants are much higher, and monitoring in 2017-2021 showed that both the North Sea and the Norwegian Sea have relatively high proportions of individual fish liver samples above the ML for dioxins and dl-PCBs, whereas fish liver from the Barents Sea have lower levels with only a small proportion (<1%) above the ML for dioxins and dl-PCBs.

Based on the results from the baseline study and due to the size of the fishery, follow-up monitoring for cod have been performed annually with samples collected from all three ocean areas. In the first years of annual monitoring, samples were collected from four positions in the Barents Sea, two in the Norwegian Sea and four in the North Sea which has the smallest fishery but the highest concentrations of contaminants. In 2018, the monitoring program for cod was evaluated, and based on results obtained so far, a reduced number of positions was considered sufficient for continued monitoring. From 2018 onwards, samples were collected from two positions in the Barents Sea, one position in the Norwegian Sea and two positions in the North Sea.

3.1.4 - Saithe

The levels of contaminants in fillet of saithe are generally low and well below the MLs (Nilsen et al., 2012, Nilsen et al., 2013). For Hg in fillet, there is a marked geographical variation with highest levels in Skagerrak, medium levels in the North Sea and Norwegian Sea and lowest levels in the Barents Sea, but in all areas the mean concentrations are well below the ML. Since saithe is a lean fish, the levels of organic contaminants in fillet are very low, far below the MLs. However, in liver, the levels of organic contaminants are high, with 18% of the individual fish above the ML for sum dioxins and dl-PCB in the period 2017-2021. The levels in liver follow the same geographical pattern as the levels in fillet with highest levels in Skagerrak, medium levels in the North Sea and the Norwegian Sea, and lowest levels the Barents Sea. Annual monitoring for saithe has been performed in all the four marine areas, with one position in Skagerrak (low fisheries, but highest level of contaminants, worst case scenario), one position in the North Sea, and two positions in both the Norwegian Sea and the Barents Sea where most of the commercial fisheries take place.

3.1.5 - Haddock

The levels of contaminants in fillet of haddock are generally low. No individual had concentrations above the MLs for fish for human consumption in EU and Norway (Kögel et al., 2021). The levels of Hg in fillet from the North Sea was somewhat higher than from the Norwegian Sea and Barents Sea, with a pattern resembling the one observed earlier for cod. The concentrations of total As were, with an average of 10.6 mg/kg, somewhat higher than the levels reported in cod, saithe and Greenland halibut. There were no prominent geographical variations in the levels of total As. Concentrations of dioxins, furans, dl-PCB and PCB6 in haddock liver were relatively high compared to MLs, with the average sum of dioxins/furans and dl-PCB in total just above the ML, while average concentrations of PCB6 concentrations were above the MLs only at several geographically distinct stations. On average, these levels were still lower than reported earlier for cod.

3.2 - Potential for exceeding maximum levels

Based on results from earlier monitoring (Appendix Tables A2-A8), a potential for exceeding MLs have been identified for some species, as described below. Regarding metals in fillet, a few fish species have a potential for exceeding the ML for Hg, either in general or in specific areas. Regarding lipid-soluble organic contaminants in fish fillet, only a few large fatty fish species show a potential for exceeding the MLs for the sum of dioxins and dl-PCBs, the sum of dioxins or the sum of PCB6. Fish liver, on the other hand, particularly of lean fish species, often exceed MLs for the organic contaminants. In brown crab, Cd may leak from brown meat to claw meat during cooking in water, and cause exceedance of the ML which only applies to muscle meat from appendages. Reliable results for PFAS have been limited due to low sensitivity of earlier analytical methods, but recent results using a more sensitive analytical method show that a few species have a potential for exceeding one or more MLs for PFAS.

3.2.1 - Tusk

Fillet of tusk (*Brosme brosme*) has relatively high levels of Hg, and 19% of individual fish in the baseline study (2013-2016) had concentrations above ML (Frantzen and Maage, 2016). In some areas, mean levels were above ML, e.g., western Norwegian fjords including Hardangerfjord, Sognefjord and Boknafjord. In all areas except the Barents Sea, a significant portion of the tusk exceeded the ML for Hg. Also tusk from Vestfjorden and Skagerrak had mean fillet concentrations of Hg above ML. Fillets had very low levels of all other analysed contaminants.

More than 10% of tusk samples exceeded ML for Hg in fillet. Score: 2

Liver has high levels of lipid-soluble organic contaminants, and dioxins and dl-PCBs and PCB6 were above the MLs in 61% and 54%, respectively, of 56 pooled liver samples included in the baseline study. Mean levels of dioxins and dl-PCB were above ML in liver from both fjords, coastal areas and open sea of the North Sea, Skagerrak and the Norwegian Sea.

3.2.2 - Atlantic halibut

Large individuals of Atlantic halibut (*Hippoglossus hippoglossus*) may have very high concentrations of organic contaminants and Hg in fillet, often far exceeding the MLs in the largest individuals. The Norwegian Directorate of Fisheries has therefore prohibited fishing of Atlantic halibut over 100 kg (2 m length), in all Norwegian marine areas, due to the high risk of exceeding MLs for organic contaminants. In general, the levels of Hg and organic contaminants in Atlantic halibut are higher than in many other fish species, and of more than 500 fish investigated in the period 2013-2019, 4.1% exceeded the ML for Hg and 2.2% exceeded the ML for dioxins and dl-PCBs in fillet (B-cut) (Nilsen et al., 2016, Nilsen et al., 2019, Nilsen et al., 2020a). There is a clear geographical variation, and the highest concentrations of both Hg and organic contaminants were found in an area in Ytre Sklinnadjupet in the Norwegian Sea, where 25% of the halibut exceeded the ML for Hg (1.0 mg/kg ww for this species) and 5.6% exceeded the ML for dioxins and dl-PCB. Due to the high levels of contaminants, the Norwegian Directorate of Fisheries closed this area for halibut fishing starting in 2017, to reduce the risk of fish entering the market with concentrations exceeding the MLs.

Halibut from Skagerrak and the North Sea may also contain high levels of both Hg and organic contaminants, but the data from this sea area is extremely limited (only nine individuals analysed), and more data is needed to properly evaluate the potential for exceeding maximum levels for halibut in this geographical area.

Recent analyses of PFAS showed that 1 of 18 analysed samples of halibut muscle (5.5%) had concentrations exceeding the ML for the sum of 4 PFAS (Frantzen et al., 2024b). The halibut sample exceeding this ML were originally sampled in Ytre Sklinnadjupet.

Between 1% and 10% of fish exceeded the MLs for Hg, dioxins and dl-PCBs and/or PFAS. Score: 2.

3.2.3 - Greenland halibut

In the baseline study of Greenland halibut (*Reinhardtius hippoglossoides*) during 2006-2008 (Nilsen et al., 2010), high levels of both Hg and organic contaminants in fillet were observed, with 8% of the fish exceeding the ML for Hg and 24% of the fish exceeding the ML for dioxins and dl-PCB. There was large geographical variation, and the highest levels of Hg were found in fish caught between Bjørnøya and the area west of Svalbard, while the highest values of organic contaminants were found along the continental shelf edge (Eggakanten) between 66.9°N and 68.5°N. Due to the high levels of dioxins and dl-PCBs, two areas along Eggakanten in the Norwegian Sea were closed for fishing of Greenland halibut from 2011/2012.

Follow-up monitoring along Eggakanten in the Norwegian Sea in 2011-2015 showed significantly lower levels of dioxins and dl-PCB (and Hg) in this area (Nilsen and Måge, 2016), and as a result, the two areas closed for fishing were reopened in 2016.

Annual monitoring of fillet in both the Norwegian Sea and the Barents Sea in 2017-2021 have shown significantly lower levels of Hg and dioxins and dl-PCBs than in the baseline study, but the levels are still high compared to most other species (for Hg, see Bank et al., 2021). About 2.4% of individual fish exceed the ML for sum dioxins and dl-PCB and 2.1% exceeded the ML for Hg. There is still a marked geographical variation with the highest mean levels of sum dioxins and dl-PCB in the area between 67°N and 68°N in the Norwegian Sea, and the highest mean levels of Hg in the area between 67°N and 68°N in the Norwegian Sea and in the area west of Svalbard in the Barents Sea.

Between 1% and 10% exceed MLs for Hg and/or dioxins and dl-PCBs. Score: 2.

3.2.4 - Atlantic bluefin tuna

Irregular and limited monitoring of Atlantic bluefin tuna (*Thunnus thynnus*, ABFT) was performed since 2016 after reopening the ABFT fishery inside the Norwegian Exclusive Economic Zone (EEZ) in 2014. Only large individuals are caught in Norwegian waters and only fish weighing more than 100 kg were analysed. Large variation of contaminant levels was identified between the different parts of the fillet (Øyan, 2021) and the risk evaluation was performed accordingly. Regarding the lean and fatty white muscle, about 4% of the individual fish exceeded the ML of 1 mg/kg wet weight for Hg, while 33% of the red muscle samples exceeded this ML. Data for dioxins and PCBs is limited. However, the fatty muscle samples of all individuals analysed exceeded the ML for sum dioxins and dl-PCB and PCB6, and one of 15 lean muscle samples exceeded the ML for sum dioxins and dl-PCB.

More than 10% of samples exceeded the ML for Hg and/or dioxins and dl-PCBs. Score: 3.

3.2.5 - Blue ling

A limited number of blue ling (*Molva dypterygia*) were collected as bycatch in the baseline study for tusk and ling in 2013-2016, and the results showed high levels of Hg in fillet with 73% of 66 individual fish exceeding the ML for Hg. Blue ling is a lean fish species, and the levels of organic contaminants in fillet were low, far below the MLs for dioxin, dioxins and dl-PCBs and PCB6.

More than 10% of samples exceeded the ML for Hg. Score: 2.

Liver of blue ling had high levels of organic contaminants, with dioxins and dl-PCBs and PCB6 exceeding the MLs in 100% and 89% of the 10 pooled liver samples, respectively.

3.2.6 - European plaice

In the baseline study, fillet samples of 0.89% of individual plaice (*Pleuronectes platessa*) exceeded the current ML for Hg of 0.3 mg/kg. At the time of the baseline study, no fish exceeded the ML which then was 0.5 mg/kg for plaice, so the risk of exceeding ML has increased with the recent changes in the EU regulation.

Recent analyses showed that 1 of 30 analysed samples of plaice muscle (3.3%) had concentrations of PFNA and the sum of 4 PFAS exceeding the maximum levels of 2.5 and 8.0 µg/kg, respectively (Frantzen et al., 2024b).

Between 1% and 10% of fillet samples exceeded MLs for Hg and/or PFAS. Score: 1.

3.2.7 - Brown crab

For crabs, the MLs only apply to muscle meat of the appendages, which have much lower Cd concentrations than the brown meat (hepatopancreas). In freshly cooked brown crabs (*Cancer pagurus*), claw meat of about 5% of the individual crabs exceeded the ML for cadmium. This is, however, due to leakage from hepatopancreas to claw meat during cooking (Wiech et al., 2017). In crabs which were sampled without cooking in 2015, no samples of claw meat had Cd levels above ML. A significant difference in Cd levels was found between crabs from Northern and Southern Norway (Wiech et al., 2020).

Between 1% and 10% of claw meat from cooked crab were above ML for Cd. Score: 1.

3.2.8 - Atlantic cod

In the follow-up monitoring in 2017-2021, fillet samples of 2.6% of individual cod (from all areas combined) exceeded the ML for Hg of 0.3 mg/kg. In the North Sea, 6.4% of individual cod exceeded the ML, whereas no individual fish from the Barents Sea or the Norwegian Sea had concentrations above the ML.

Between 1% and 10% of fish exceeded the MLs for Hg. Score: 1.

Liver of cod has relatively high levels of organic contaminants, especially in the North Sea and Norwegian Sea. Monitoring in 2017-2021 showed that 39% of the individual fish from the North Sea and 61% of the fish from the Norwegian Sea had liver concentrations of dioxins and dl-PCBs above the ML, whereas less than 1% of the fish from the Barents Sea exceeded this ML. For PCB6, 13%, 15% and 0% of the individual fish from the North Sea, Norwegian Sea and Barents Sea, respectively, exceeded the ML for PCB6 in liver.

3.2.9 - Common ling

In the baseline study (2013-2015), where ling (*Molva molva*) was sampled along with tusk, ling had much lower Hg levels than tusk (Frantzen and Maage, 2016). Still, 4.8% of the fillet samples from all 748 individual fish had concentrations of Hg above ML. Most of the ling exceeding ML were exceptionally large fish sampled in the Skagerrak, where 42% of 50 fish were above the ML. In fjords in Western Norway, 15% of fillet samples were above the ML. In coastal and open sea areas of the North and Norwegian Seas, respectively, 1.0% and 1.7% exceeded ML.

Between 1% and 10% of fillet samples exceeded ML for Hg. Score: 1.

Liver of ling (composite samples only) had levels of dioxins and dl-PCB above ML in 80% of samples, and in Skagerrak and fjords in western Norway, concentrations were above ML in all liver samples.

3.2.10 - Atlantic wolffish

In recent monitoring of Atlantic wolffish (*Anarhichas lupus*), about 3% of individual fish, originating from different areas, exceeded the ML for Hg.

Between 1% and 10% of samples exceeded the ML for Hg. Score: 1.

3.2.11 - Anglerfish

In the baseline study, fillet samples of 10.5% of individual anglerfish (*Lophius piscatorius*) exceeded the current ML for Hg of 0.5 mg/kg. In the North Sea area, 17% of the fish exceeded the ML, and the highest levels were found along the coast. No single station had a mean Hg level above 0.5 mg/kg. At the time of the baseline study, not one fish exceeded the ML which then was 1.0 mg/kg for anglerfish, so the risk of exceeding ML has increased with the recent changes in the EU regulation.

More than 10% of individual fish exceeded ML for Hg. Score: 2.

Liver of anglerfish exceed ML for sum dioxins and dl-PCBs and sum PCB6 in 76% and 42% of samples, respectively.

3.2.12 - Pollack

In the baseline study, fillet samples of 1.7% of individual pollack (*Pollachius pollachius*) exceeded the current ML for Hg of 0.3 mg/kg. In the North Sea area, 4% of the fish exceeded the ML. At the time of the baseline study, no fish exceeded the ML which then was 0.5 mg/kg for pollack, so the risk of exceeding ML has increased with the recent changes in the EU regulation.

Between 1% and 10% of individual fish exceeded ML for Hg. Score: 1.

Liver of pollack exceed ML for sum dioxins and dl-PCBs and sum PCB6 in 44% and 22% of samples, respectively.

3.2.13 - Norway lobster

About 2% of the sampled individuals of Norway lobster (*Nephrops norvegicus*) exceeded the ML for Hg in muscle meat. The monitoring was mainly based on North Sea and coastal areas.

Between 1% and 10% of muscle samples exceeded MLs for Hg. Score: 1.

3.2.14 - European lobster

The limited data on lobster (*Homarus gammarus*) collected from four coastal stations indicated that about 2-3% of the sampled individuals exceeded the ML for Hg in muscle meat.

Between 1% and 10% of muscle samples exceeded MLs for Hg. Score: 1.

3.3 - Potential for exceeding the tolerable weekly intake (TWI) levels

Tolerable weekly intake (TWI) levels have been estimated by EFSA as a recommendation of how much of a substance a person can consume each week, without negative health effects. In this study, the potential for exceeding TWIs was evaluated regarding TWIs for dioxins and dl-PCBs, MeHg, Cd and PFAS, and the evaluation was based on results from earlier monitoring (Appendix Tables A2, A3, A6 and A8).

For some substances and seafood types, or seafood caught in particular areas, TWIs can be exceeded for individuals consuming the amounts recommended by the authorities. This particularly applies to individuals who often consume fish caught recreationally or for sustenance in their local area, or those who frequently consume the same seafood species. The Norwegian Directorate of Health recommends two to three portions of fish each week, corresponding to 300-450 g fish. At least 200 g should be fatty fish.

For dioxins and dl-PCB, a relatively new TWI of 2 pg TEQ/kg body weight (Knutsen et al., 2018b) greatly

reduced the amount of fatty seafood that can be eaten without risk of exceeding the TWI. For many fatty or semi-fatty fish species, a consumption of less than 200 g fillet per week can lead to exceedance of TWI for dioxins and dl-PCBs (Table 4a).

To calculate the potential for exceeding TWI with regard to Hg, the TWI for MeHg of 1.3 µg/kg bw has been used, with concentrations of total Hg as a proxy for MeHg. For a person of 70 kg bodyweight to exceed TWI for Hg with consumption of 200 g per week, a mean concentration of about 0.5 mg/kg is required (Table 4b). Thus, the lists of species with high risk for exceeding the TWI and the ML for Hg only partly overlap. Only the species with the highest risks of exceeding the ML, will lead to exceedance of the TWI.

Regarding Cd, crustaceans and molluscs tend to accumulate this heavy metal in their hepatopancreas, and TWI for Cd of 2.5 µg/kg bw may be exceeded for people consuming these particular organs. Fish fillet in general has very low concentrations of Cd.

With regard to PFAS, a TWI of 4.4 ng/kg body weight per week has been set by EFSA for the sum of four PFAS (PFOS, PFOA, PFNA and PFHxS; EFSA, 2020). These compounds have been determined in a wide range of species collected between 2007-2021, but unfortunately, the analytical methods used have been less than optimal, with varying and often quite high LOQ-values for each of the compounds. In 2023, PFAS were determined in 206 samples from 18 different species of fish and shrimp, using a more sensitive analytical method (Frantzen et al., 2024b). These data have been used to calculate the amount that can be consumed before exceeding the TWI.

3.3.1 - Tusk

Hg: For tusk fillet from the Skagerrak and in fjords bordering the North Sea, 142 and 149 g can be consumed before exceeding the TWI (Table 4b).

For tusk fillet from Skagerrak or North Sea fjords, the TWi for Hg may be exceeded by consumption of less than 200 g. Score: 1.

3.3.2 - Atlantic halibut

Dioxins and dl-PCBs: Levels vary between different parts of the fillet, with the highest levels in the fattier part, the I-cut, and significantly lower levels in a leaner part of the fillet, the B-cut. For both parts of the fillet, consumption of less than 200 g per week can result in exceeding the TWI. Depending on sea area, only 58-100 g B-cut or 25-47 g I-cut may be consumed before exceeding the TWI (Table 4a). The levels of organic contaminants in halibut increase with fish size, and for fish between 40-100 kg, only about 60 g B-cut may be consumed, whereas up to 150 g B-cut may be consumed from fish below 40 kg before exceeding the TWI.

For halibut fillet, the TWI for dioxins and dl-PCBs may be exceeded by consumption of less than 200 g. Score: 1.

3.3.3 - Greenland halibut

Dioxins and dl-PCBs: Levels vary between sea areas, but even for the Barents Sea, where the levels are the lowest, only about 80 g fillet may be consumed before exceeding the TWI (Table 4a).

For Greenland halibut fillet, the TWI for dioxins and dl-PCBs may be exceeded by consumption of less than 200 g. Score: 1.

3.3.4 - Atlantic bluefin tuna

Dioxins and dl-PCBs: Levels vary considerably between different parts of the fillet with higher levels in the fatty parts. However, even for the leanest parts, a consumption of about 40 g will lead to an exceedance of the TWI

(Table 4a).

Hg: The levels of Hg vary considerably between different parts of the fillet. Of red muscle meat, containing the highest concentrations, only about 75 g can be consumed before exceeding the TWI, while about 135 g and 150 g of white lean and fatty muscle could be consumed weekly respectively before exceeding the TWI (Table 4b).

For tuna fillet, the TWI for both dioxins and dl-PCBs and Hg may be exceeded by consumption of less than 200 g. Score: 2.

3.3.5 - Blue ling

Hg: Of blue ling fillet from all areas combined, 169 g per week can be consumed before exceeding the TWI. Only 66 samples were analysed (Table 4b).

For blue ling fillet, the TWI for Hg may be exceeded by consumption of less than 200 g. Score: 1.

3.3.6 - European plaice

PFAS: The new data from 2023 (n=30) indicates that 181 g plaice fillet can be consumed before exceeding TWI (Appendix Table A8).

For plaice fillet, the TWI for PFAS may be exceeded by consumption of less than 200 g. Score: 1.

3.3.7 - Brown crab

Dioxins and dl-PCBs: Based on measurements of brown meat from frozen and boiled crabs, only about 40 g can be consumed before exceeding the TWI (Table 4a).

Cd: Because of high levels in hepatopancreas, brown and inner meat contain high levels of Cd. Before and after cooking, only about 15 and 30 g, respectively, can be consumed before exceeding the TWI (Appendix Table A3). A clear trend of higher levels in the north compared to the south of Norway has been identified. As also other large crustaceans tend to efficiently accumulate Cd in their hepatopancreas, it can be assumed that the hepatopancreas of both European lobster and Norway lobster contain high levels. There is at present little data to confirm this.

PFAS: 68 g hepatopancreas from brown crab may be consumed before exceeding the TWI (Appendix Table A8).

For crab brown meat, the TWI for both dioxins and dl-PCBs, Cd and PFAS may be exceeded by consumption of less than 200 g. Score: 2.

3.3.8 - Atlantic mackerel

Dioxins and dl-PCBs: For mackerel from all areas combined, 144 g fillet per week can be consumed without exceeding the TWI. For Skagerrak, only 88 g per week can be consumed, while for the North Sea, Norwegian Sea and Barents Sea, 189, 237 and 241 g fillet per week, respectively, can be consumed without exceeding the TWI (Table 4a).

For fillet of mackerel caught in Skagerrak and the North Sea, the TWI for dioxins and dl-PCBs may be exceeded by consumption of less than 200 g. Score: 1.

3.3.9 - European sprat

Dioxins and dl-PCBs: European sprat (*Sprattus sprattus*) has been analysed as whole fish, and only 88 g of whole sprat may be consumed before exceeding the TWI (Table 4a).

For sprat fillet, the TWI for dioxins and dl-PCBs may be exceeded by consumption of less than 200 g. Score: 1.

3.3.10 - Atlantic salmon

Dioxins and dl-PCBs: Around 140 g fillet of wild caught Atlantic salmon (*Salmo salar*) may be consumed before exceeding the TWI (Table 4a).

For salmon fillet, the TWI for dioxins and dl-PCBs may be exceeded by consumption of less than 200 g. Score: 1.

3.3.11 - Greater argentine

Dioxins and dl-PCBs: Levels in greater argentine (*Argentina silus*) deviated particularly in one sample from Osterfjorden with significantly higher values. Only about 30 g of fillet originating from this fjord can be consumed before exceeding the TWI (Table 4a). For greater argentine from the North Sea and Norwegian Sea, about 145 g can be consumed before exceeding TWI.

For fillet of greater argentine, the TWI for dioxins and dl-PCBs may be exceeded by consumption of less than 200 g. Score: 1.

3.3.12 - Beaked redfish

Dioxins and dl-PCBs: The levels in beaked redfish (*Sebastes mentella*) are higher in the Norwegian Sea than in the Barents Sea, where most of the commercial fisheries takes place. For fish from the Norwegian Sea, only about 150 g fillet may be consumed, but for fish from the Barents Sea, around 250 g fillet may be consumed before exceeding the TWI (Table 4a).

For fillet of beaked redfish caught in the Norwegian Sea, the TWI for dioxins and dl-PCBs may be exceeded by consumption of less than 200 g. Score: 1.

3.3.13 - Spotted wolffish

Dioxins and dl-PCBs: About 160 g of spotted wolffish (*Anarhichas minor*) can be consumed before exceeding the TWI (Table 4a).

For spotted wolffish fillet, the TWI for dioxins and dl-PCBs may be exceeded by consumption of less than 200 g. Score: 1.

3.3.14 - Atlantic herring

Dioxins and dl -PCBs: Around 160 g fillet for Norwegian spring spawning (NSS) herring and 198 g for North Sea (NS) herring can be consumed before exceeding the TWI (Table 4a).

For fillet of herring, the TWI for dioxins and dl-PCBs may be exceeded by consumption of less than 200 g. Score: 1.

3.3.15 - Atlantic horse mackerel

Dioxins and dl-PCBs: For horse mackerel (*Trachurus trachurus*) from the North Sea (N=50 samples), 157 g fillet per week can be consumed without exceeding the TWI (Table 4a).

For horse mackerel fillet, the TWI for dioxins and dl-PCBs may be exceeded by consumption of less than 200 g. Score: 1.

3.3.16 - European hake

Dioxins and dl-PCBs: Levels in hake (*Merluccius merluccius*) vary between sea areas, with highest levels in the Norwegian Sea. Consumption of more than 170 g fillet from the Norwegian Sea can lead to exceedance of TWI,

whereas around 290 g and 320 g fillet may be consumed before exceeding the TWI for hake from Skagerrak and the North Sea, respectively (Table 4a).

For fillet of hake caught in the Norwegian Sea, the TWI for dioxins and dl-PCBs may be exceeded by consumption of less than 200 g. Score: 1.

3.3.17 - Fish liver

Dioxins and dl-PCBs: For various fish species, 2-44 g fish liver per week can lead to exceedance of TWI (Appendix Table A6). The highest levels of dioxins and dl-PCB are found in liver of lean fish species (cod, saithe, haddock, tusk, ling, pollack).

For liver of most fish species, the TWI for dioxins and dl-PCBs may be exceeded by consumption of less than 200 g.

Table 4a. Species with potential for exceeding the TWI for dioxins and dl-PCBs. Catch volume per species in Norwegian fisheries, tissues, geographical areas, number of samples analysed (N), mean concentrations (Sum PCDD/F+dl-PCB), and amount of seafood a person of 70 kg can consume before exceeding the TWI of 2 pg TEQ/kg body weight for sum PCDD/F+dl-PCB, are shown.

Species	Catch volume (ton)	Organ	Geographical area	N	Sum PCDD/F+dl-PCB (ng TEQ/kg ww)	Amount consumed (g) at TWI
Atlantic bluefin tuna	101	Fatty muscle	Skagerrak, North Sea, Norwegian Sea	6	13	11
		Lean muscle incl. neck	Skagerrak, North Sea, Norwegian Sea	15	4.1	34
		Red muscle	Skagerrak, North Sea, Norwegian Sea	5	3.3	42
Atlantic halibut	2 845	Fillet, B-cut	Barents Sea	132	1.6	88
		Fillet, B-cut	Norwegian Sea	365	1.4	100
		Fillet, B-cut	Skagerrak, North Sea	9	2.4	58
		Fillet, I-cut	Barents Sea	125	3.0	47
		Fillet, I-cut	Norwegian Sea	272	4.4	32
		Fillet, I-cut	Skagerrak, North Sea	8	5.5	25
Greenland halibut	17 099	Fillet	Barents Sea	299	1.7	82
		Fillet	Norwegian Sea	199	2.1	67
European sprat	11 701	Whole fish	Fjords and + some in the North Sea	47	1.60	88
Atlantic salmon (wild)	16	Fillet	Northern Norway	137	1	140
Greater argentine	10 000	Fillet	North Sea, Norwegian Sea, incl. Osterfjord	290	0.97	144
		Fillet	Osterfjord	25	4.5	31
Beaked redfish	32 678	Fillet	Barents Sea	447	0.56	249
		Fillet	Norwegian Sea	77	0.92	153
Spotted wolffish	4 108	Fillet	Norwegian Sea and Barents Sea	250	0.88	159

Species	Catch volume (ton)	Organ	Geographical area	N	Sum PCDD/F+dl-PCB (ng TEQ/kg ww)	Amount consumed (g) at TWI
North Sea herring	130 000	Fillet	North Sea	172	0.71	198
NSS-herring	415 346	Fillet	Norwegian Sea	98	0.86	163
Atlantic mackerel	207 146	Fillet	Barents Sea	60	0.58	241
		Fillet	Norwegian Sea	247	0.59	237
		Fillet	North Sea	75	0.74	189
		Fillet	Skagerrak	198	1.60	88
Atlantic horse mackerel	10 924	Fillet	North Sea	50	0.89	157
European hake	3 977	Fillet	Norwegian Sea	183	0.81	172
		Fillet	North Sea	570	0.43	323
		Fillet	Skagerrak	25	0.49	288
Spiny dogfish	356	Fillet	Skagerrak	17	0.71	197
Brown crab	5266	Brown meat	Coast, Hvaler to Vesterålen	435	3.6	39

Abbreviations: TEQ (toxic equivalent), ww (wet weight), NSS herring (Norwegian spring spawning herring)

Table 4b. Species with potential for exceeding the TWI for MeHg. Catch volume per species in Norwegian fisheries, tissues, geographical areas, number of samples analysed (N), mean concentrations of total Hg (THg), and amount of seafood a person of 70 kg can consume before exceeding the TWI of 1.3 µg/kg body weight for MeHg, are shown.*

Species	Catch volume (ton)	Organ	Geographical area	N	THg (mg/kg ww)	Amount consumed (g) at TWI for MeHg
Atlantic bluefin tuna	101	Fatty muscle	Skagerrak, North Sea, Norwegian Sea	2 1	0.61	149
		Lean muscle incl. neck	Skagerrak, North Sea, Norwegian Sea	4 6	0.67	136
		Red muscle	Skagerrak, North Sea, Norwegian Sea	21	1.18	77
Tusk	13 143	Fillet	Barents Sea	278	0.11	827
		Fillet	Norwegian Sea	684	0.27	337
		Fillet	North Sea, open sea and coast	263	0.31	294
		Fillet	North Sea, fjords	503	0.61	149
		Fillet	Skagerrak	42	0.64	142
Blue ling	537	Fillet	Skagerrak, North Sea, Norwegian Sea	66	0.54	169

*THg is used as a proxy for MeHg, since MeHg is usually assumed to make up near 100% of the THg content of fish muscle.

3.4 - Knowledge gaps

3.4.1 - Species with insufficient or outdated data (data deficient)

Species with an average annual landing volume of 100 t or more in the period of 2018-2021 (www.fiskeridir.no), were classified as data deficient if the number of measurements of trace elements and organic pollutants (PCDD/Fs +PCBs) was considered too low (< 100 analysed samples) or the data was too old (>10 years). Species identified as data deficient are shown in Table 5. Species used only for industrial processing (feed production), as cleaner fish in aquaculture, or those caught only in sea areas outside Norwegian waters, were not considered.

Table 5. Species with insufficient number of data or outdated data with an annual catch volume above 100 t. Species named in Norwegian and English and the average annual catch volume is given for 2019-2022. Number of samples (N) analysed for metals and dioxins and dl-PCBs are given, respectively, as well as the latest sampling year.

Species Norwegian/English (*latin*)	Catch volume (t)	N (metals)	N (dioxins and PCBs)	Year of most recent data	Comment
Brisling/ European sprat (*Sprattus sprattus*)	11 800	47	47	2017	
Hestmakrell/ Atlantic horse mackerel (*Trachurus trachurus*)	11 000	50	50	2017	
Kongekrabbe/ Red king crab (*Paralithodes camtchaticus*)	2060	185	50	2012	Old data
Hvitting/ Whiting (*Merlangius merlangus*)	1 300	77	5	2014	
Blålange/ Blue ling (*Molva dypterygia*)	540	66	10	2016	
Sjøkreps/ Norway lobster (*Nephrops norwegicus*)	434	436 (Hg) 201 (other)	9	2021	Data insufficient for certain areas
Pigghå/ Spiny dogfish (*Squalus acanthias*)	360	63	17	2008	Data only from Skagerrak
Skjellbrosme/ Greater forkbeard (*Phycis blennoides*)	350	59	11	2015	
Gapeflyndre/ American plaice (*Hippoglossoides platessoides*)	320	46	5	Hg: 2017 Dioxins and PCBs: 2006	
Havmus/ Rabbit fish (*Chimaera monstrosa*)	240	23	12	Hg: 2015 Dioxins and PCBs: 2016	
Knurr/ Gurnard (*Eutrigla gurnardus*)	240	0	0		
Gråskate/ Spinytail skate (*Bathyraja spinicauda*)	230	0	0		
Isgalt/ Roughhead grenadier (*Macrourus berglax*)	210	0	0		
Kloskate/ Starry ray (*Amblyraja radiata*)	200	11	0	2017	
Smørflyndre/ Witch flounder (*Glyptocephalus cynoglossus*)	200	11	0	2017	
Makrellstørje/ Atlantic bluefin tuna (*Thunnus thynnus*)	100	21/46/18*	6/15/5*	2021	
Hummer/ European lobster (*Homarus gammarus*)	< 100 t**	80	22	2022	
Laks (vill)/ Atlantic salmon (wild) (*Salmo salar*)	16**	137	137	2012	Old data

*Partly different tissues from the same individuals.
**Despite commercial catches under 100 tons, wild caught Atlantic salmon (*Salmo salar*), and European lobster (*Homarus gammarus*) are included in the table due to significant catches in recreational fisheries.

3.4.2 - Species with insufficient data from certain geographical areas

For some species, certain geographical areas were identified as data deficient. For anglerfish (*Lophius piscatorius*) we need more data from Western Norway. For Atlantic halibut more data is needed for the North Sea and Skagerrak, and for plaice, we need more data from Skagerrak. Greater argentine from one specific fjord contained high levels of organic pollutants and further fjords should be investigated to find out if the elevated values are specific for this fjord or apply to this species in fjords in general.

Due to their potential high intake of self-caught seafood from coastal areas, recreational and sustenance fishers and their families are a vulnerable group and contaminant data on their catches is crucial to be able to assess their exposure. Recent surveillance of the finfish catches of anglers identified Atlantic cod, saithe, redfish, Atlantic halibut, tusk and Atlantic wolffish in Troms and Atlantic mackerel, saithe, cod, pollack, ling and hake in Hordaland as commonly caught species (Ferter et al., 2022). For these species, coast and fjord data should be gathered as these are the most common fishing grounds. In particular, species that have previously shown elevated levels of one or more contaminants in some coast- and fjord areas, may also have high levels in other so far unexplored fjords and coastal areas, and should therefore be prioritized for such surveys.

High Hg levels with mean concentrations above ML were found in fillet of tusk caught in several fjords in Western Norway, and dietary advices were issued for Hardangerfjord and Sognefjord. In Sognefjord this is not connected to a particular source, and it may be a problem also in many other fjords. Since tusk is captured by recreational fishers in many different fjords, there is a need to collect data from more local fjord areas. In 2024, a survey was performed of tusk sampled in three different data deficient western Norwegian fjords. But there are still a large number of fjords for which there is no data on Hg in tusk.

3.4.3 - Contaminants with insufficient data

For some contaminants there are insufficient data for all species due to lack of adequate analytical methods:

3.4.3.1 - PFAS

TWIs and maximum levels, were set for four PFAS (see Table 2 and 3), but it is challenging to develop a method with a sufficiently low LOQ to match the TWI range and the new MLs. The development of a new method heeding both low LOQ and the multitude of PFAS (>9000 substances) through suspect/non target screening is in progress and financed by IMR and through a project for the Norwegian Research Council. In 2023, 206 fish samples were analyzed with a more sensitive method (Eurofins), but there is still a need for more data to get a comprehensive overview of the PFAS contamination in wild caught fish. For instance, in the baseline study for haddock, a pooled fillet sample was discovered exceeding the TWI by consumption of 62 g per week, indicating a potential for high PFAS-levels in this species. However, in the study from 2023 including only 30 samples of haddock from all areas, no such high concentrations were found, and according to those results more than 850 g of haddock fillet can be consumed per week before exceeding TWI for PFAS.

3.4.3.2 - Plastics and plastic chemicals

Regarding micro- and nanoplastic and plastic chemicals, fish and people have been shown to be contaminated, and mammalian, fish and invertebrate model systems have shown that micro- and nanoplastic can lead to negative effects including effects on growth, reproduction, metabolism, activity, hormonal regulation, organ toxicity, development, intestinal function, oxidative stress, neurofunction and tissue changes (Kögel et al., 2020, Banerjee and Shelver, 2021, Brito et al., 2022, Kögel et al., 2023). Unfortunately, the exact levels of micro- and

nanoplastic in fish are unknown due to methodological difficulties owed to the particle nature of this contaminant. While we have detected microplastic of 10 µm to 250 µm size in fish fillet and liver of different species (Gomero et al., 2020), only semi-quantitative methods are available. Reference material is so far lacking and even large international consortia such as BASEMAN and EuroQcharm have so far failed to produce fully quantitative methods for the critical small microplastic size ranges. Considerable method development is needed before the establishment of TWI will be possible. Additionally, plastic chemicals such as bisphenols and phthalates deserve attention, as they often have hormone or brain function disrupting effects at environmentally relevant concentrations (Hamilton et al., 2023, Horodytska et al., 2020). The multitude of 16 000 substances, with 4200 chemicals of concern, because they are persistent, bioaccumulative, mobile and/or toxic, renders method development challenging. Wagner et al. (2025) state that more than 1300 chemicals of concern are known to be marketed for use in plastics and 29–66% of the chemicals used or found in well-studied plastic types are of concern. This means that chemicals of concern can be present in all plastic types. For this, non-target screening method development has been initiated.

3.4.3.3 - Species of As and Hg

There is no maximum level or TWI for As in seafood. As consists of many different chemical species, where inorganic arsenic (arsenite and arsenate) are the most toxic ones. Inorganic arsenic has previously been found in only very low concentrations in fish, even when total As levels were high (Julshamn et al., 2012b). This was recently confirmed with analyses in 2023 of 459 seafood samples from 10 different species (Frantzen et al., 2024b). For molluscs, occasionally high levels of inorganic arsenic are found (Gomez-Delgado et al., 2023), and some species of seaweed are known to have high levels of inorganic arsenic (Duinker et al,. 2020). It is generally assumed that the major part of the arsenic present in seafood is the non-toxic arsenobetaine, but there is little documentation of this in Norwegian species of seafood. Other organic arsenic species may be more problematic than arsenobetaine, and it is therefore also a need for data on organic arsenic species in seafood. The data on inorganic and organic arsenic species are needed for risk assessment and regulatory development in EU.

Hg also exists in different chemical forms, but here the most toxic one, MeHg, is usually assumed to make up near 100% of the total Hg content (THg) of fish muscle. Because THg is much easier and cheaper to analyse than MeHg, it is most often used as a proxy for MeHg when risk assessments are being made based on the TWI for MeHg. This makes for a worst-case scenario when doing the risk assessments. There is, however, very little documentation of actual MeHg levels in Norwegian fish. Earlier, the method used for MeHg determination at IMR was performed separately from the THg determination, and due to the added measurement uncertainties of the two different methods, this sometimes resulted in a percentage MeHg of considerably more than 100% of THg. In 2023, 459 samples of 10 different seafood species were analysed with a new method where both MeHg and THg were determined simultaneously, resulting in a more correct estimate of the percentage contribution of MeHg to the THg concentration (Frantzen et al., 2024b). Muscle tissue of the different fish species had mean percentages MeHg between 96% and 99% of THg. More data on MeHg in more fish species is needed for more accurate risk assessments and regulatory development in EU.

3.4.4 - New resources

New resources include species that do not yet have significant catch volumes but are expected to be of increasing interest as food and feed in the coming decades, or new species in Norwegian waters that have already reached higher catch volumes. Spot-check monitoring of these species was initiated in 2017 to get data preceding commercial exploitation as food and feed.

For macroalgae a data collection was reported to EFSA in 2020 and data were also published as an IMR report

(Duinker et al, 2020). Following this, the focus has been processing of two farmed kelp species with iodine reduction and nutrient retention, in addition to spot-check sampling of species with lowest n or highest risk. As there are no MLs for contaminants in macroalgae yet, this group of seafood is not covered in detail here.

Mesopelagic species might be exploited in future, and basic data on nutrients and contaminants is available for some of the most relevant species. Species from Norwegian fjords were found to be nutrient dense (Alvheim et al., 2020). Identified challenges regarding nutrients are: High levels of fluoride in northern krill (*Meganyctiphanes norvegica*), of wax esters in glacier lantern fish (*Benthosema glaciale*) and of long-chain monounsaturated fatty acids in Mueller's pearlside (*Maurolicus muelleri*) (Wiech et al., 2020). Further investigations are needed to understand geographical and seasonal variations within species (Zhu et al., 2023). Due to the high biodiversity in open waters further contaminant profiling is needed to understand variation between species.

For sea urchins, sea cucumbers, and jellyfish, spot-check monitoring is ongoing, so far with low numbers of analyses (n). No exceedances of ML have been detected so far.

Pacific oysters (*Magallana gigas*), as invasive species, have been observed for the last ten years. There is increasing interest in harvesting these oysters and they have hence been included in spot-check monitoring. Levels are close to, but below ML for Cd and lower than for European oysters (*Ostrea edulis*). Specific attention is necessary since they are harvested in more populated areas around the Oslofjord and at the coast of southern Norway. Mapping of dioxins and PCB would also be meaningful, since Pacific oysters in some areas have elevated levels, probably due to local pollution sources.

Recently, harvest of wild stocks of razor shells (*Solenidae spp.*), cockles (*Cerastoderma edule*), sand gapers (*Mya arenaria*) and rayed artemis (*Dosinia exoleta*) – which are new species for commercial harvest in Norway - has started and spot-check samples of these species are being collected to attain a basis for evaluating the risk of harmful levels of heavy metals.

The fishery of snow crab has developed significantly in a rather limited geographical area. According to the limited existing data, the levels of contaminants are not likely to exceed existing MLs.

A report has been published on the feasibility of a fishery of shore crab (*Carcinus maenas*) (van der Meeren et al., 2022). As the legal limit only applies to the appendages of crustaceans, no levels above the MLs for elements and organic pollutants have been found based on the limited data gathered so far. However, high consumption of hepatopancreas might lead to an exceedance of the TWI for Cd and dioxins and dl-PCBs. The main use of these crabs is probably for soup, and results from Cd concentrations in shore crab soup indicate low levels of exposure (Knutsen et al., 2018a).

4 - Summary of all risk factors combined

In this report, a risk-based prioritization of seafood species was performed as a basis for preparation of risk-based control plans to be implemented by the Norwegian Food Safety Authority for wild-caught Norwegian seafood. To this end, seafood species to be considered for inclusion in the control plans were identified and evaluated according to the potential risk factors described above. A final evaluation and prioritization based on all risk factors combined was performed as described in section 2.2.2 for a total of 43 seafood species. With the exception of wild Atlantic salmon and European lobster, species with an annual landing volume of less than 100 tons were not included in the evaluation. The results are summarized in Table 6. An extended table detailing which MLs or TWIs were exceeded for each species is given in Appendix Table A10.

Table 6. Overview of risk-based prioritization of Norwegian wild-caught seafood species to be included in control plans. Scores are shown for the following potential risk factors: Potential for high exposure due to high catch volume (Potential for high exposure), potential for exceeding maximum levels for Cd, Hg, PCDD/F+dl-PCB, PCB6 and/or PFAS in muscle (Potential for exceeding ML), potential for exceeding tolerable weekly intake for Cd, Hg, PCDD/F+dl-PCB and/or PFAS (Potential for exceeding TWI). The priority of each species for inclusion in risk-based control plans is shown according to the following categories: High priority (dark blue): Species with score 3 as the highest score for any of the risk factors, Medium priority (medium blue): Species with score 2 as the highest score for any of the risk factors, Lower priority (light blue): Species with score 1 as the highest score for any of the risk factors, Lowest priority (white): Species with score 0 across all the risk factors, and Unknown priority (white): Species for which there is insufficient data to determine a priority level. Data deficiency per species is noted in the last column.

Species (Norwegian/English)	Potential for high exposure due to high catch volume	Potential for exceeding ML	Potential for exceeding TWI	Priority	Data deficiency
Sild/ Atlantic herring	3	0	1	High	
Makrell/ Atlantic mackerel	3	0	1	High	Low N in some areas
Torsk/ Atlantic cod	3	1	0	High	
Sei/ Saithe	3	0	0	High	
Hyse/ Haddock	3	0	0	High	
Makrellstørje/ Atlantic bluefin tuna	0	3	2	High	Low N
Blåkveite/ Greenland halibut	0	2	1	Medium	
Kveite/ Atlantic halibut	0	2	1	Medium	Low N in some areas
Brosme/ Tusk	0	2	1	Medium	Low N in some areas
Blålange/ Blue ling	0	2	1	Medium	Low N
Breiflabb/ Anglerfish	0	2	0	Medium	Low N in some areas
Taskekrabbe/ Brown crab	0	1 (claw meat)	2 (brown meat)	Medium	
Rødspette/ European plaice	0	1	1	Lower	Low N in some areas

Species (Norwegian/English)	Potential for high exposure due to high catch volume	Potential for exceeding ML	Potential for exceeding TWI	Priority	Data deficiency
Lange/ Common ling	0	1	0	Lower	Low N in some areas
Lyr/ Pollack	0	1	0	Lower	Low N in some areas
Gråsteinbit/ Atlantic wolffish	0	1	0	Lower	Low N in some areas
Sjøkreps/ Norway lobster	0	1	0	Lower	Low N
Hummer/ European lobster	0	1	0	Lower	Low N
Brisling/ European sprat	0	0	1	Lower	Low N
Hestmakrell/ Atlantic horse mackerel	0	0	1	Lower	Low N
Laks (vill)/ Atlantic salmon (wild)	0	0	1	Lower	Old data
Lysing/ European hake	0	0	1	Lower	Low N in some areas
Vassild/ Greater argentine	0	0	1	Lower	Low N in some areas
Flekksteinbit/ Spotted wolffish	0	0	1	Lower	
Snabeluer/ Beaked redfish	0	0	1	Lower	Low N in some areas
Vanlig uer/ Golden redfish	0	0	0	Lowest	
Dypvannsreke/ Northern shrimp	0	0	0	Lowest	
Pigghå/ Spiny dogfish	0	0	0	Unknown	Low N
Kongekrabbe/ Red king crab	0	0	0	Unknown	Old data
Hvitting/ Whiting	0	0	0	Unknown	Low N
Skjellbrosme/ Greater forkbeard	0	0	0	Unknown	Low N
Gapeflyndre/ American plaice	0	0	0	Unknown	Low N
Havmus/ Ratfish	0	0	0	Unknown	Low N
Kloskate/ Starry ray	0	0	0	Unknown	Low N
Smørflyndre/ Witch flounder	0	0	0	Unknown	Low N
Knurr/ Gurnard	0	not evaluated	not evaluated	Unknown	No data

Species (Norwegian/English)	Potential for high exposure due to high catch volume	Potential for exceeding ML	Potential for exceeding TWI	Priority	Data deficiency
Gråskate/ Spinytail skate	0	not evaluated	not evaluated	Unknown	No data
Isgalt/ Roughhead grenadier	0	not evaluated	not evaluated	Unknown	No data
Strandkrabbe/ Shore crab	0	0	0	Unknown	New resource
Snøkrabbe/ Snow crab	0	0	0	Unknown	New resource
Stillehavsøsters/ Pacific oyster	0	not evaluated	not evaluated	Unknown	New resource
Echinoderms	0	not evaluated	not evaluated	Unknown	New resource
Mesopelagic species	0	not evalated	not evaluated	Unknown	New resource

In conclusion, species with high catch volumes, Atlantic herring, Atlantic mackerel, Atlantic cod, saithe and haddock, were assigned a high priority (dark blue), since they contribute significantly to the overall exposure of the population to contaminants from seafood. In addition, Atlantic bluefin tuna was assigned a high priority due to a high fraction of individual fish (> 10%) having contaminant levels above the ML for more than one contaminant, i.e., Hg and dioxins and dl-PCBs.

Medium priority (medium blue) was assigned to Greenland halibut and Atlantic halibut due to a (low) fraction of individual fish (between 1% and 10%) exceeding the MLs for more than one contaminant, i.e., Hg and dioxins and dl-PCB in fillet for Greenland halibut and Hg, dioxins and dl-PCB and sum 4PFAS in fillet for Atlantic halibut. Medium priority was also assigned to tusk, anglerfish and blue ling due to a high fraction of individual fish (>10%) having contaminant levels above the ML for one contaminant (Hg). Brown meat of brown crab was assigned a medium priority due to risk of exceeding the tolerable weekly intake (TWI) for both Cd and dioxins and dl-PCB, whereas claw meat of brown crab was assigned a lower priority due to a (low) fraction of the individuals exceeding the ML for Cd.

A lower priority (light blue) was assigned to ling, European plaice, pollack, Atlantic wolffish, Norway lobster and European lobster due to a fraction, albeit a low one, of the individuals exceeding the ML for a single contaminant (Hg or PFAS). Of these, Norway lobster and European lobster are also data deficient. A lower priority was also assigned to European plaice, European sprat, Atlantic horse mackerel, wild Atlantic salmon, European hake, greater argentine, spotted wolffish, and beaked redfish due to risk of exceeding TWI for a single contaminant group (dioxins and dl-PCB). Of these, European sprat and Atlantic horse mackerel are also data deficient and for wild Atlantic salmon the data are old, which increases the need for further monitoring of these species.

The lowest priority was assigned for golden redfish and Northern shrimp, since no risks were identified for these species. For the remaining species in Table 6, the data are insufficient to determine a priority level (unknown priority), and further monitoring is necessary for these species before potential risk can be evaluated.

In addition to the prioritization summarized in Table 6, future monitoring should also focus on regions with high levels of contaminants in certain species, including fjords and coastal waters and data deficient areas. Even

with limited commercial fishery in fjords and coastal areas, monitoring is important to assess the exposure of recreational and sustenance fishers. Data are also needed for all species on PFAS and new contaminants including microplastic, which requires considerable efforts in method development.

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6 - Appendix Table A1 - Surveys of contaminants in seafood from polluted areas

Table A1. An overview of surveys of contaminants in seafood from Norwegian fjords and harbours, conducted by IMR, year(s) of sampling, reports and funding sources.

Area	Year(s)	Report	Funding
Jøssingfjord	2018	Bank et al., 2024	Ministry of Trade, Industry and Fisheries
U-864, Fedje	2005-2023	Måge et al., 2006, 2007, Frantzen et al., 2008, 2010, 2011, 2012, Haldorsen et al., 2013, Frantzen et al., 2014, Frantzen and Måge, 2015, 2016, Frantzen et al., 2018, 2019a, 2019b, 2020, 2021, 2023, 2024	The Norwegian Coastal Administration
Bergen	2007-2009 2019-2021	Måge and Frantzen, 2008, 2009, Frantzen and Måge, 2009, Kögel et al., 2023	County Governor, NFSA
Ålesund	2019-2021	Kögel et al., 2023	NFSA
Grenlandsfjord/Kragerø	2019-2021	Kögel et al., 2023	NFSA
Førdefjord	2017	Kögel, 2019	NFSA
Repparfjord and Revsbotn	2016-2017	Kögel et al., 2021	IMR
Årdalsfjord	2016	Kögel et al., 2017	NFSA
Frænfjord	2016	Kögel and Maage, 2017	Hustad marmor
Oslofjord	2007, 2013-2015	Nesje et al., 2007, Kögel et al., 2016	MS Trygg, NFSA
Vatsfjord	2013-2014	Frantzen and Måge, 2013, Frantzen and Maage, 2014	Jacob Hatteland AS
Hardangerfjord	2011, 2021	Måge et al., 2012, Måge and Frantzen, 2022	NFSA, County Governor
Ølenfjord	2011	Sanden and Ørnsrud, 2012	NFSA
Salten	2012	Ørnsrud and Måge, 2013, Julshamn et al., 2013a	NFSA
Vesterålen	2012	Julshamn et al., 2013b	Ministry of Trade, Industry and Fisheries
Salten - Vesterålen	2013-2014	Frantzen et al., 2015	Ministry of Trade, Industry and Fisheries, County of Nordland
Tønsberg/Vrengen	2009	Nilsen et al., 2011, Nilsen and Julshamn, 2011, Valdersnes et al., 2017	NFSA
Sandefjord	2009	Nilsen et al., 2011, Nilsen and Julshamn, 2011, Valdersnes et al., 2017	NFSA
Kragerø	2009	Nilsen et al., 2011, Nilsen and Julshamn, 2011, Valdersnes et al., 2017	NFSA
Tvedestrand	2009	Nilsen et al., 2011, Nilsen and Julshamn, 2011, Valdersnes et al., 2017	NFSA
Lillesand	2009	Nilsen et al., 2011, Nilsen and Julshamn, 2011, Valdersnes et al., 2017	NFSA

Area	Year(s)	Report	Funding
Farsund	2009	Nilsen et al., 2011, Nilsen and Julshamn, 2011, Valdersnes et al., 2017	NFSA
Flekkefjord	2009	Nilsen et al., 2011, Nilsen and Julshamn, 2011, Valdersnes et al., 2017	NFSA
Egersund	2009	Nilsen et al., 2011, Nilsen and Julshamn, 2011, Valdersnes et al., 2017	NFSA
Sandnes	2009	Nilsen et al., 2011, Nilsen and Julshamn, 2011, Valdersnes et al., 2017	NFSA
Stavanger	2009	Nilsen et al., 2011, Nilsen and Julshamn, 2011, Valdersnes et al., 2017	NFSA
Karmsundet	2009	Nilsen et al., 2011, Nilsen and Julshamn, 2011, Valdersnes et al., 2017	NFSA
Narvik	2009	Nilsen et al., 2011, Nilsen and Julshamn, 2011, Valdersnes et al., 2017	NFSA
Hammerfest	2009	Nilsen et al., 2011, Nilsen and Julshamn, 2011, Valdersnes et al., 2017	NFSA
Honningsvåg	2009	Nilsen et al., 2011, Nilsen and Julshamn, 2011, Valdersnes et al., 2017	NFSA
Svolvær	2008-2009	Nilsen et al., 2011, Nilsen and Julshamn, 2011, Valdersnes et al., 2017	NFSA

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7 - Appendix Table A2 - Hg

Table A2. Mercury (Hg) levels for wild-caught fish and other seafood collected by IMR in various monitoring programs conducted in the period 2006-2022. The maximum level (ML) and the mean, median, minimum (min), maximum (max) and 95% percentile concentrations are given as mg/kg wet weight, and concentrations above the ML are indicated in red. For each species and tissue, the maximum amount in gram (g) that may be consumed before exceeding the tolerable weekly intake (TWI; 1.3 µg MeHg/kg bw) for a 70 kg person is given in the last column.

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceedi the ML (%)
American plaice (*Hippoglossus platessoides*)	Fillet	Spot-check monitoring + NFSA Fjords and harbours 2016-2017	2006, 2016-2017	Barents Sea, Repparfjord, Revsbotn, Bøkfjord	0.5	Individual+ 5 Composite	46	0	0
Anglerfish (*Lophius piscatorius*)	Fillet	Baseline study 2016-2019, spot check monitoring 2015	2015-2016	Skagerrak	0.5	Individual	50	5	10
Anglerfish (*Lophius piscatorius*)	Fillet	Baseline study 2016-2019	2016-2019	North Sea	0.5	Individual	167	29	17
Anglerfish (*Lophius piscatorius*)	Fillet	Baseline study 2016-2019	2017-2019	Norwegian Sea	0.5	Individual	123	2	1.6
Anglerfish (*Lophius piscatorius*)	Fillet	Baseline study 2016-2019, spot check monitoring 2015	2015-2019	Total, all areas	0.5	Individual	340	36	10.6
Atlantic bluefin tuna (*Thunnus thynnus*)	Fatty muscle (o-toro)	Spot-check monitoring	2016, 2018-2021	Skagerrak/North Sea/Norwegian Sea	1.0	Individual	21	1	4.76
Atlantic bluefin tuna (*Thunnus thynnus*)	Lean muscle	Spot-check monitoring	2016, 2018-2021	Skagerrak/North Sea/Norwegian Sea	1.0	Individual	46	2	4.35
Atlantic bluefin tuna (*Thunnus thynnus*)	Red muscle	Spot-check monitoring	2016, 2018-2021	Skagerrak/North Sea/Norwegian Sea	1.0	Individual	21	7	33.33
Atlantic cod (*Gadus morhua*)	Fillet	Follow-up monitoring	2017-2021	North Sea	0.3	Individual	265	17	6.4
Atlantic cod (*Gadus morhua*)	Fillet	Follow-up monitoring	2017-2021	Norwegian Sea	0.3	Individual	61	0	0
Atlantic cod (*Gadus morhua*)	Fillet	Follow-up monitoring	2017-2021	Barents Sea	0.3	Individual	322	0	0
Atlantic cod (*Gadus morhua*)	Fillet	Follow-up monitoring	2017-2021	Total, all areas	0.3	Individual	648	17	2.6

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceedi the ML (%)
Atlantic cod (*Gadus morhua*)	Fillet	Polluted fjords and harbours	2015-2017, 2019, 2021	Oslofjorden, Frænfjorden, Årdalsfjord, Repparfjord og Revsbotn, Førdefjorden, Bergen, Grenland/Kragerø, Ålesund	0.3	Individual+46 composite	281	4	1.4
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, B-cut	Baseline study+follow-up monitoring	2014-2016, 2019	Skagerrak, North Sea	1.0	Individual	9	1	11
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, B-cut	Baseline study+follow-up monitoring	2013-2015, 2017-2019	Norwegian Sea	1.0	Individual	366	20	5.5
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, B-cut	Baseline study	2013-2016	Barents Sea	1.0	Individual	133	0	0
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, B-cut	Baseline study+follow-up monitoring	2013-2019	Total, all areas	1.0	Individual	508	21	4.1
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, I-cut	EU-Dioxin 2007, mini-baseline (2008-2010), baseline study	2007, 2008, 2013	Norwegian Sea	1.0	Individual	29	0	0
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, I-cut	Mini-baseline (2008-2010), baseline study	2008-2010, 2013	Barents Sea	1.0	Individual	15	0	0
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, I-cut	EU-Dioxin 2007, mini-baseline (2008-2010), baseline study	2007-2010, 2013	Total, both areas	1.0	Individual	44	0	0
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet	Polluted fjords and harbours	2016, 2017, 2021	Repparfjord and Revsbotn	1.0	Individual	50	0	0
Atlantic herring (*Clupea harengus*)	Fillet	Follow-up monitoring	2017, 2020	North Sea	0.3	Individual	173	0	0
Atlantic herring (*Clupea harengus*)	Fillet	Follow-up monitoring	2017, 2020	Norwegian Sea	0.3	Individual	98	0	0
Atlantic horse mackerel (*Trachurus trachurus*)	Fillet	Spot-check monitoring	2017	North Sea	0.5	Individual	50	0	0
Atlantic mackerel (*Scomber scombrus*)	Fillet	Follow-up monitoring	2017-2021	Skagerrak	0.3	Individual	223	1	0.45

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceedi the ML (%)
Atlantic mackerel (*Scomber scombrus*)	Fillet	Follow-up monitoring	2018, 2019, 2022	North Sea	0.3	Individual	150	0	0
Atlantic mackerel (*Scomber scombrus*)	Fillet	Follow-up monitoring	2017-2021	Norwegian Sea	0.3	Individual	270	0	0
Atlantic mackerel (*Scomber scombrus*)	Fillet	Follow-up monitoring	2019-2020	Barents Sea	0.3	Individual	60	0	0
Atlantic mackerel (*Scomber scombrus*)	Fillet	Follow-up monitoring	2017-2022	Total, all areas	0.3	Individual	703	1	0.14
Atlantic salmon (*Salmo salar*), wild	Fillet	Wild salmon project 2012	2012	Coast of Northern Norway	0.3	Individual	137	0	0
Atlantic wolffish (*Anarhichas lupus*)	Fillet	Baseline study	2018-2021	North Sea, Norwegian Sea, Barents Sea	0.5	Individual	176	5	2.8
Beaked redfish (*Sebastes mentella*)	Fillet	Baseline study	2016-2018	Norwegian Sea	0.5	Individual	77	0	0
Beaked redfish (*Sebastes mentella*)	Fillet	Baseline study	2016-2018	Barents Sea	0.5	Individual	447	0	0
Beaked redfish (*Sebastes mentella*)	Fillet	Baseline study	2016-2018	Total, both areas	0.5	Individual	524	0	0
Blue ling (*Molva dipterygia*)	Fillet	NFSA Bycatch 2013-2015	2013-2016	Skagerrak, North Sea, Norwegian Sea	0.5	Individual	66	48	72.7
Common ling (*Molva molva*)	Fillet	Baseline study	2014	Skagerrak	0.5	Individual	50	21	42
Common ling (*Molva molva*)	Fillet	Baseline study	2013-2014, 2016	North Sea	0.5	Individual	98	1	1.0
Common ling (*Molva molva*)	Fillet	Baseline study	2014-2015	North Sea, fjords	0.5	Individual	41	6	15
Common ling (*Molva molva*)	Fillet	Baseline study	2013-2015	Norwegian Sea	0.5	Individual	484	8	1.7
Common ling (*Molva molva*)	Fillet	Baseline study	2014	Barents Sea	0.5	Individual	75	0	0
Common ling (*Molva molva*)	Fillet	Baseline study	2013-2015	Total, all areas	0.5	Individual	748	36	4.8
Common ling (*Molva molva*)	Fillet	Spot check monitoring	2008-2009	Barents Sea, Norwegian Sea, Skagerrak, North Sea, Atlantic Ocean	0.5	Individual	238	2	0.8

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceedi the ML (%)
Edible crab (*Cancer pagurus*) (cooked)	Claw meat	Baseline+various surveys + spot check monitoring	2011-2012, 2014-2016, 2020-2022	Southern Norway	0.5	Individual	479	0	0
Edible crab (*Cancer pagurus*) (cooked)	Claw meat	Baseline+various surveys + spot check monitoring	2011-2012, 2014-2016, 2020-2022	Northern Norway	0.5	Individual	344	0	0
Edible crab (*Cancer pagurus*) (cooked)	Claw meat	Baseline+various surveys + spot check monitoring	2011-2012, 2014-2016, 2020-2022	Total, all areas	0.5	Individual	823	0	0
Edible crab (*Cancer pagurus*) (cooked)	Brown meat	Baseline+various surveys + spot check monitoring	2011-2012, 2014-2016, 2020-2022	Southern Norway	No ML	Individual	474	NA	NA
Edible crab (*Cancer pagurus*) (cooked)	Brown meat	Baseline+various surveys + spot check monitoring	2011-2012, 2014-2016, 2020-2022	Northern Norway	No ML	Individual	325	NA	NA
Edible crab (*Cancer pagurus*) (cooked)	Brown meat	Baseline+various surveys + spot check monitoring	2011-2012, 2014-2016, 2020-2022	Total, all areas	No ML	Individual	799	NA	NA
Edible crab (*Cancer pagurus*) (cooked)	Claw meat	Polluted fjords and harbours	2013, 2016	Different areas in south of Norway	0.5	Individual+ composite	62	5	8.06
Edible crab (*Cancer pagurus*) (cooked)	Brown meat	Polluted fjords and harbours	2013, 2016	Different areas in south of Norway	No ML	Individual+ composite	62	NA	NA
Edible crab (*Cancer pagurus*) (fresh)	Claw meat	PhD M. Wiech + spot check monitoring	2014-2016, 2020-2022	Southern Norway	0.5	Individual	170	2	1.18
Edible crab (*Cancer pagurus*) (fresh)	Claw meat	PhD M. Wiech + spot check monitoring	2014-2016, 2020-2022	Northern Norway	0.5	Individual	167	0	0

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceedi the ML (%)
Edible crab (*Cancer pagurus*) (fresh)	Claw meat	PhD M. Wiech + spot check monitoring	2014-2016, 2020-2022	Total, all areas	0.5	Individual	337	2	
Edible crab (*Cancer pagurus*) (fresh)	Hepatopancreas	PhD M. Wiech + spot check monitoring	2014-2016, 2020-2022	Southern Norway	No ML	Individual	303	NA	NA
Edible crab (*Cancer pagurus*) (fresh)	Hepato-pancreas	PhD M. Wiech + spot check monitoring	2014-2016, 2020-2022	Northern Norway	No ML	Individual	255	NA	NA
Edible crab (*Cancer pagurus*) (fresh)	Hepato-pancreas	PhD M. Wiech + spot check monitoring	2014-2016, 2020-2022	Total, all areas	No ML	Individual	558	NA	
Edible crab (*Cancer pagurus*) (fresh)	Claw meat	Polluted fjords and harbours	2019	Bergen	0.5	Composite	8	0	0
Edible crab (*Cancer pagurus*) (fresh)	Hepato-pancreas	Polluted fjords and harbours	2019	Bergen	No ML	Composite	4	NA	NA
European hake (*Merluccius merluccius*)	Fillet	Baseline study	2019-2021	Skagerrak	0.5	Individual	25	0	0
European hake (*Merluccius merluccius*)	Fillet	Baseline study	2019-2021	North Sea	0.5	Individual	570	3	0.53
European hake (*Merluccius merluccius*)	Fillet	Baseline study	2019-2021	Norwegian Sea	0.5	Individual	183	0	0
European hake (*Merluccius merluccius*)	Fillet	Baseline study	2019-2021	Total, all areas	0.5	Individual	778	3	0.39
European lobster (*Homarus gammarus*)	Muscle meat	Spot-check monitoring	2017-2022	North Sea	0.5	Individual	80	2	2.5
European plaice (*Pleuronectes platessa*)	Fillet	Baseline study	2016	Skagerrak	0.3	Individual	25	0	0
European plaice (*Pleuronectes platessa*)	Fillet	Baseline study	2016-2018	North Sea	0.3	Individual	123	1	0.81
European plaice (*Pleuronectes platessa*)	Fillet	Baseline study	2016-2017	Barents Sea	0.3	Individual	150	2	1.33
European plaice (*Pleuronectes platessa*)	Fillet	Baseline study	2016-2017	Norwegian Sea	0.3	Individual	150	0	0

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceedi the ML (%)
European plaice (*Pleuronectes platessa*)	Fillet	Baseline study	2016-2018	Total, all areas	0.3	Individual	448	3	0.67
European plaice (*Pleuronectes platessa*)	Fillet	Spot-check monitoring	2007, 2014-2016	Barents Sea, Norwegian Sea, Skagerrak	0.3	Individual	267	1	0.37
European sprat (*Sprattus sprattus*)	Whole fish	Miljøgifter i fisk og fiskevarer (NFSA 2010), Spot-check monitoring 2017	2010, 2017	Fjords and North Sea	0.3	Composite	47	0	0
Golden redfish (*Sebastes norvegicus*)	Fillet	Baseline study	2016-2018	Norwegian Sea	0.5	Individual	148	0	0
Golden redfish (*Sebastes norvegicus*)	Fillet	Baseline study	2016-2018	Barents Sea	0.5	Individual	75	0	0
Golden redfish (*Sebastes norvegicus*)	Fillet	Baseline study	2016-2018	Total, both areas	0.5	Individual	223	0	0
Greater argentine (*Argentina silus*)	Fillet	Baseline study	2018-2021	North Sea, Norwegian Sea, incl. Osterfjorden	0.5	Individual	300	0	0
Greater forkbeard (*Physis blennoides*)	Fillet	NFSA Bycatch 2013-2015	2013-2015	All areas	0.5	Individual	59	0	0
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Follow-up monitoring	2017-2021	Norwegian Sea	0.5	Individual	200	3	1.5
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Follow-up monitoring	2017, 2019-2021	Barents Sea	0.5	Individual	324	8	2.5
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Follow-up monitoring	2017-2021	Total, both areas	0.5	Individual	524	11	2.1
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Follow-up monitoring	2011, 2013	Barents Sea	0.5	Composite	31	0	0
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Follow-up monitoring	2011-2015	Norwegian Sea	0.5	Composite	81	0	0
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Follow-up monitoring	2011-2015	Total, both areas	0.5	Composite	112	0	0

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceedi the ML (%)
Haddock (*Melanogrammus aeglefinus*)	Fillet	Baseline study	2015-2017	Skagerrak	0.5	Individual	70	0	0
Haddock (*Melanogrammus aeglefinus*)	Fillet	Baseline study + NFSA Bycatch 2013-2015	2013-2019	North Sea	0.5	Individual	300	0	0
Haddock (*Melanogrammus aeglefinus*)	Fillet	Baseline study + NFSA Bycatch 2013-2015	2014-2017	Norwegian Sea	0.5	Individual	307	0	0
Haddock (*Melanogrammus aeglefinus*)	Fillet	Baseline study + NFSA Bycatch 2013-2015	2014-2018	Barents Sea	0.5	Individual	712	0	0
Haddock (*Melanogrammus aeglefinus*)	Fillet	Baseline study + NFSA Bycatch 2013-2015	2013-2019	Skagerrak, North Sea, Norwegian Sea, Rockall, Barents Sea	0.5	Individual	1401	0	0
Haddock (*Melanogrammus aeglefinus*)	Fillet	Polluted fjords and harbours	2009, 2016-2017	Bergen, Repparfjord, Revsbotn, Bøkfjord	0.5	Individual+ 1 Composite	115	0	0
Northern shrimp (*Pandalus borealis*)	Muscle (cooked)	Monitoring for management plans	2007, 2014-2022	North Sea and Skagerrak	0.5	Composite	21	0	0
Northern shrimp (*Pandalus borealis*)	Muscle (cooked)	Monitoring for management plans	2007, 2012-2021	Norwegian Sea	0.5	Composite	27	0	0
Northern shrimp (*Pandalus borealis*)	Muscle (cooked)	Monitoring for management plans	2007-2022	Barents Sea	0.5	Composite	51	0	0
Northern shrimp (*Pandalus borealis*)	Muscle (cooked)	Monitoring for management plans	2007-2022	Total, all areas	0.5	Composite	99	0	0
Northern wolffish (*Anarhichas denticulatus*)	Fillet	NFSA Bycatch 2013-2015	2014	Barents Sea	0.5	Individual	12	0	0
Norway lobster (*Nephrops norvegicus*)	Muscle	Spot-check monitoring + Master thesis	2011, 2014, 2020, 2021	North Sea, fjords	0.5	Individual	436	8	1.83
Pollack (*Pollachius pollachius*)	Fillet	Baseline study	2016	Skagerrak	0.3	Individual	25	1	4.0
Pollack (*Pollachius pollachius*)	Fillet	Baseline study	2016-2019	North Sea	0.3	Individual	125	3	2.4
Pollack (*Pollachius pollachius*)	Fillet	Baseline study	2016-2019	Norwegian Sea	0.3	Individual	146	1	0.68

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceedi the ML (%)
Pollack (*Pollachius pollachius*)	Fillet	Baseline study	2016-2019	Total, all areas	0.3	Individual	296	5	1.7
Pollack (*Pollachius pollachius*)	Fillet	Spot-check monitoring	2014	North Sea, Norwegian Sea, coast	0.3	Individual	50	1	2.0
Ratfish (*Chimaera monstrosa*)	Fillet	Spot check monitoring	2016	Lustrafjord	0.5	Individual	23	0	0
Red king crab (*Paralithodes camtchaticus*)	Claw meat	Baseline study 2012	2012	Barents Sea	0.5	Individual	185	0	0
Saithe (*Pollachius virens*)	Fillet	Follow-up monitoring	2017-2019	Skagerrak	0.3	Individual	71	0	0
Saithe (*Pollachius virens*)	Fillet	Follow-up monitoring	2017-2021	North Sea	0.3	Individual	120	0	0
Saithe (*Pollachius virens*)	Fillet	Follow-up monitoring	2018-2021	Norwegian Sea	0.3	Individual	195	0	0
Saithe (*Pollachius virens*)	Fillet	Follow-up monitoring	2017-2021	Barents Sea	0.3	Individual	223	0	0
Saithe (*Pollachius virens*)	Fillet	Follow-up monitoring	2017-2021	All areas	0.3	Individual	609	0	0
Saithe (*Pollachius virens*)	Fillet	Polluted fjords and harbours	2009	Bergen	0.3	Individual	105	1	0.95
Snow crab (*Chionoecetes opilio*)	Leg meat	Spot-check monitoring	2015, 2016, 2018-2021	Barents Sea	0.5	Individual	145	0	0
Spiny dogfish (*Squalus acanthias*)	Fillet	Spot check monitoring	2007-2008	Skagerrak, Norskehavet	1.0	Individual	63	0	0
Spotted wolffish (*Anarhichas minor*)	Fillet	Baseline study	2018-2021	Norwegian Sea and Barents Sea	0.5	Individual	250	0	0
Starry ray (*Amblyraja radiata*)	Fillet	Polluted fjords and harbours	2016-2017	Barents Sea (Repparfjord and Revsbotn)	0.5	Individual	10	0	0
Tusk (*Brosme brosme*)	Fillet	Baseline study 2013-2015	2013-2015	Skagerrak	0.5	Individual	42	35	83.3
Tusk (*Brosme brosme*)	Fillet	Baseline study 2013-2015, follow-up monitoring 2019-2021	2013-2021	North Sea, open sea and coast	0.5	Individual	263	36	13.7

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceedi the ML (%)
Tusk (*Brosme brosme*)	Fillet	Baseline study 2013-2015, follow-up-monitoring 2019-2021 + spot-check monitoring 2021 + MT fjorder og havner (NFSA 2017) + Vatsfjorden 2013-2014	2013-2021	North Sea, Fjords	0.5	Individual	503	240	47.7
Tusk (*Brosme brosme*)	Fillet	Baseline study 2013-2015, follow-up monitoring 2019-2021	2013-2022	Norwegian Sea	0.5	Individual	684	79	11.5
Tusk (*Brosme brosme*)	Fillet	Baseline study 2013-2015	2013-2015	Barents Sea	0.5	Individual	278	0	0
Tusk (*Brosme brosme*)	Fillet	Baseline study 2013-2015, follow-up-monitoring 2019-2021 + spot-check monitoring 2021 + MT fjorder og havner (NFSA 2017) + Vatsfjorden 2013-2014	2013-2015	Total, all areas	0.5	Individual	1770	390	22.0
Tusk (*Brosme brosme)*	Fillet	Polluted fjords and harbours	2017, 2019, 2021	Førdefjorden, Bergen, Ålesund	0.5	Individual+ 29 Composite	88	33	37.5
Tusk (*Brosme brosme*)	Fillet	Monitoring around submarine U-864	2017-2021	Fedje; by the submarine wreck U-864 and 4 nm north and south of the wreck	0.5	Individual	345	33	9.57
Whiting (*Merlangius merlangus*)	Fillet	NFSA Bycatch 2013-2015 + spot check monitoring 2016	2013-2016	All areas	0.3	Individual	77	0	0
Witch flounder (*Glyptocephalus cynoglossus*)	Fillet	Polluted fjords and harbours	2016-2017	Repparfjord and Revsbotn	0.5	Individual	10	0	0

8 - Appendix Table A3 - Cd

Table A3. Cadmium (Cd) levels for wild-caught fish and other seafood collected by IMR in various monitoring programs conducted in the period 2006-2022. The maximum level (ML) and the mean, median, minimum (min), maximum (max) and 95% percentile concentrations are given as mg/kg wet weight, and concentrations above the ML are indicated in red. Mean values were calculated only when more than 50% of the samples had concentrations above the limit of quantification (LOQ). Based on the mean values for each species and tissue, the maximum amount in gram (g) that may be consumed before exceeding the tolerable weekly intake (TWI; 2.5 µg Cd/kg bw) for a 70 kg person is given in the last column.

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceedin the ML (%)
American plaice (*Hippoglossus platessoides*)	Fillet	Spot-check monitoring + NFSA Fjords and harbours 2016-2017	2006, 2016-2017	Barents Sea, Repparfjord, Revsbotn, Bøkfjord	0.05	Individual+ 5 Composite	46	0	0
Anglerfish (*Lophius piscatorius*)	Fillet	Baseline study 2016-2019, spot check monitoring 2015	2015-2016	Skagerrak	0.05	Individual	50	0	0
Anglerfish (*Lophius piscatorius*)	Fillet	Baseline study 2016-2019	2016-2019	North Sea	0.05	Individual	167	0	0
Anglerfish *(Lophius piscatorius*)	Fillet	Baseline study 2016-2019	2017-2019	Norwegian Sea	0.05	Individual	123	0	0
Anglerfish (*Lophius piscatorius*)	Fillet	Baseline study 2016-2019, spot check monitoring 2015	2015-2019	Total, all areas	0.05	Individual	340	0	0
Atlantic bluefin tuna (*Thunnus thynnus*)	Fatty muscle (o-toro)	Spot-check monitoring	2016, 2018-2021	Skagerrak/North Sea/Norwegian Sea	0.10	Individual	21	0	0
Atlantic bluefin tuna (*Thunnus thynnus*)	Lean muscle	Spot-check monitoring	2016, 2018-2021	Skagerrak/North Sea/Norwegian Sea	0.10	Individual	46	0	0
Atlantic bluefin tuna (*Thunnus thynnus*)	Red muscle	Spot-check monitoring	2016, 2018-2021	Skagerrak/North Sea/Norwegian Sea	0.10	Individual	17	0	0
Atlantic cod (*Gadus morhua*)	Fillet	Follow-up monitoring	2017-2021	North Sea	0.05	Individual	265	0	0
Atlantic cod (*Gadus morhua*)	Fillet	Follow-up monitoring	2017-2021	Norwegian Sea	0.05	Individual	61	0	0
Atlantic cod (*Gadus morhua*)	Fillet	Follow-up monitoring	2017-2021	Barents Sea	0.05	Individual	322	0	0
Atlantic cod (*Gadus morhua*)	Fillet	Follow-up monitoring	2017-2021	Total, all areas	0.05	Individual	648	0	0

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceedin the ML (%)
Atlantic cod (*Gadus morhua*)	Fillet	Polluted fjords and harbours	2015-2017, 2019, 2021	Oslofjorden, Frænfjorden, Årdalsfjord, Repparfjord og Revsbotn, Førdefjorden, Bergen, Grenland/Kragerø, Ålesund	0.05	Individual+46 composite	281	0	0
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, B-cut	Baseline study+follow-up monitoring	2014-2016, 2019	Skagerrak, North Sea	0.05	Individual	9	0	0
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, B-cut	Baseline study+follow-up monitoring	2013-2015, 2017-2019	Norwegian Sea	0.05	Individual	366	0	0
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, B-cut	Baseline study	2013-2016	Barents Sea	0.05	Individual	133	0	0
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, B-cut	Baseline study+follow-up monitoring	2013-2019	Total, all areas	0.05	Individual	508	0	0
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, I-cut	EU-Dioxin 2007, mini-baseline (2008-2010), baseline study	2007, 2008, 2013	Norwegian Sea	0.05	Individual	29	0	0
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, I-cut	Mini-baseline, baseline study	2008-2010, 2013	Barents Sea	0.05	Individual	15	0	0
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, I-cut	EU-Dioxin 2007, mini-baseline (2008-2010), baseline study	2007-2010, 2013	Total, both areas	0.05	Individual	44	0	0
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet	Polluted fjords and harbours	2016, 2017, 2021	Repparfjord and Revsbotn	0.05	Individual	50	0	0
Atlantic herring (*Clupea harengus*)	Fillet	Follow-up monitoring	2017, 2020	North Sea	0.05	Individual	173	0	0
Atlantic herring (*Clupea harengus*)	Fillet	Follow-up monitoring	2017, 2020	Norwegian Sea	0.05	Individual	98	1	1.0
Atlantic horse mackerel (*Trachurus trachurus*)	Fillet	Spot-check monitoring	2017	North Sea	0.05	Individual	50	0	0
Atlantic mackerel (*Scomber scombrus*)	Fillet	Follow-up monitoring	2017-2021	Skagerrak	0.10	Individual	223	0	0

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceedin the ML (%)
Atlantic mackerel (*Scomber scombrus*)	Fillet	Follow-up monitoring	2018, 2019, 2022	North Sea	0.10	Individual	150	0	0
Atlantic mackerel (*Scomber scombrus*)	Fillet	Follow-up monitoring	2017-2021	Norwegian Sea	0.10	Individual	270	0	0
Atlantic mackerel (*Scomber scombrus*)	Fillet	Follow-up monitoring	2019-2020	Barents Sea	0.10	Individual	60	0	0
Atlantic mackerel (*Scomber scombrus*)	Fillet	Follow-up monitoring	2017-2022	Total, all areas	0.10	Individual	703	0	0
Atlantic salmon (*Salmo salar*), wild	Fillet	Wild salmon project 2012	2012	Coast of Northern Norway	0.05	Individual	137	0	0
Atlantic wolffish (*Anarhichas lupus*)	Fillet	Baseline study	2018-2021	North Sea, Norwegian Sea, Barents Sea	0.05	Individual	176	0	0
Beaked redfish (*Sebastes mentella*)	Fillet	Baseline study	2016-2018	Norwegian Sea	0.05	Individual	77	0	0
Beaked redfish (*Sebastes mentella*)	Fillet	Baseline study	2016-2018	Barents Sea	0.05	Individual	447	0	0
Beaked redfish (*Sebastes mentella*)	Fillet	Baseline study	2016-2018	Total, both areas	0.05	Individual	524	0	0
Blue ling (*Molva dipterygia*)	Fillet	NFSA Bycatch 2013-2015	2013-2016	Skagerrak, North Sea, Norwegian Sea	0.05	Individual	66	0	0
Common ling (*Molva molva*)	Fillet	Baseline study	2014	Skagerrak	0.05	Individual	50	0	0
Common ling (*Molva molva*)	Fillet	Baseline study	2013-2014, 2016	North Sea	0.05	Individual	98	0	0
Common ling (*Molva molva*)	Fillet	Baseline study	2014-2015	North Sea, fjords	0.05	Individual	41	0	0
Common ling (*Molva molva*)	Fillet	Baseline study	2013-2015	Norwegian Sea	0.05	Individual	484	0	0
Common ling (*Molva molva*)	Fillet	Baseline study	2014	Barents Sea	0.05	Individual	75	0	0
Common ling (*Molva molva*)	Fillet	Baseline study	2013-2015	Total, all areas	0.05	Individual	748	0	0

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceedin the ML (%)
Common ling (*Molva molva*)	Fillet	Spot check monitoring	2008-2009	Barents Sea, Norwegian Sea, Skagerrak, North Sea, Atlantic Ocean	0.05	Individual	238	0	0
Edible crab (*Cancer pagurus*) (cooked)	Claw meat	Baseline+various surveys + spot check monitoring	2011-2012, 2014-2016, 2020-2022	Southern Norway	0.5	Individual	479	12	2.5
Edible crab (*Cancer pagurus*) (cooked)	Claw meat	Baseline+various surveys + spot check monitoring	2011-2012, 2014-2016, 2020-2022	Northern Norway	0.5	Individual	344	108	31.4
Edible crab (*Cancer pagurus*) (cooked)	Claw meat	Baseline+various surveys + spot check monitoring	2011-2012, 2014-2016, 2020-2022	Total, all areas	0.5	Individual	823	120	14.6
Edible crab (*Cancer pagurus*) (cooked)	Brown meat	Baseline+various surveys + spot check monitoring	2011-2012, 2014-2016, 2020-2022	Southern Norway	No ML	Individual	474	NA	NA
Edible crab (*Cancer pagurus*) (cooked)	Brown meat	Baseline+various surveys + spot check monitoring	2011-2012, 2014-2016, 2020-2022	Northern Norway	No ML	Individual	325	NA	NA
Edible crab (*Cancer pagurus*) (cooked)	Brown meat	Baseline+various surveys + spot check monitoring	2011-2012, 2014-2016, 2020-2022	Total, all areas	No ML	Individual	799	NA	NA
Edible crab (*Cancer pagurus*) (cooked)	Claw meat	Polluted fjords and harbours	2013, 2016	Different areas in south of Norway	0.5	Individual+ composite	62	1	1.6
Edible crab (*Cancer pagurus*) (cooked)	Brown meat	Polluted fjords and harbours	2013, 2016	Different areas in south of Norway	No ML	Individual+ composite	62	NA	NA
Edible crab (*Cancer pagurus*) (fresh)	Claw meat	PhD M. Wiech + spot check monitoring	2014-2016, 2020-2022	Northern Norway	0.5	Individual	167	0	0

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceedin the ML (%)
Edible crab (*Cancer pagurus*) (fresh)	Claw meat	PhD M. Wiech + spot check monitoring	2014-2016, 2020-2022	Southern Norway	0.5	Individual	170	0	0
Edible crab (*Cancer pagurus*) (fresh)	Claw meat	PhD M. Wiech + spot check monitoring	2014-2016, 2020-2022	Total, all areas	0.5	Individual	337	0	0
Edible crab (*Cancer pagurus*) (fresh)	Hepato-pancreas	PhD M. Wiech + spot check monitoring	2014-2016, 2020-2022	Northern Norway	No ML	Individual	255	NA	NA
Edible crab (*Cancer pagurus*) (fresh)	Hepato-pancreas	PhD M. Wiech + spot check monitoring	2014-2016, 2020-2022	Southern Norway	No ML	Individual	303	NA	NA
Edible crab (*Cancer pagurus*) (fresh)	Hepato-pancreas	PhD M. Wiech + spot check monitoring	2014-2016, 2020-2022	Total, all areas	No ML	Individual	558	NA	NA
Edible crab (*Cancer pagurus*) (fresh)	Claw meat	Polluted fjords and harbours	2019	Bergen	0.5	Composite	8	0	0
Edible crab (*Cancer pagurus*) (fresh)	Hepato-pancreas	Polluted fjords and harbours	2019	Bergen	No ML	Composite	4	0	0
European hake (*Merluccius merluccius*)	Fillet	Baseline study	2019-2021	Skagerrak	0.05	Individual	25	0	0
European hake (*Merluccius merluccius*)	Fillet	Baseline study	2019-2021	North Sea	0.05	Individual	570	0	0
European hake (*Merluccius merluccius*)	Fillet	Baseline study	2019-2021	Norwegian Sea	0.05	Individual	183	0	0
European hake (*Merluccius merluccius*)	Fillet	Baseline study	2019-2021	Total, all areas	0.05	Individual	778	0	0
European lobster (*Homarus gammarus*)	Muscle meat (tail)	Spot-check monitoring	2017-2022	North Sea	0.5	Individual	80	0	0
European plaice (*Pleuronectes platessa*)	Fillet	Baseline study	2016	Skagerrak	0.05	Individual	25	0	0
European plaice (*Pleuronectes platessa*)	Fillet	Baseline study	2016-2018	North Sea	0.05	Individual	123	0	0

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceedin the ML (%)
European plaice (*Pleuronectes platessa*)	Fillet	Baseline study	2016-2017	Norwegian Sea	0.05	Individual	150	0	0
European plaice (*Pleuronectes platessa*)	Fillet	Baseline study	2016-2017	Barents Sea	0.05	Individual	150	0	0
European plaice (*Pleuronectes platessa*)	Fillet	Baseline study	2016-2018	Total, all areas	0.05	Individual	448	0	0
European plaice (*Pleuronectes platessa*)	Fillet	Spot-check monitoring	2007, 2014-2016	Barents Sea, Norwegian Sea, Skagerrak	0.05	Individual	267	0	0
European sprat (*Sprattus sprattus*)	Whole fish	Miljøgifter i fisk og fiskevarer (NFSA 2010), Spot-check monitoring 2017	2010, 2017	Fjords and North Sea	0.05	Composite	47	0	0
Golden redfish (*Sebastes norvegicus*)	Fillet	Baseline study	2016-2018	Norwegian Sea	0.05	Individual	148	0	0
Golden redfish (*Sebastes norvegicus*)	Fillet	Baseline study	2016-2018	Barents Sea	0.05	Individual	75	0	0
Golden redfish (*Sebastes norvegicus*)	Fillet	Baseline study	2016-2018	Total, both areas	0.05	Individual	223	0	0
Greater argentine (*Argentina silus*)	Fillet	Baseline study	2018-2021	North Sea, Norwegian Sea, incl. Osterfjorden	0.05	Individual	300	0	0
Greater forkbeard (*Physis blennoides*)	Fillet	NFSA Bycatch 2013-2015	2013-2015	Total, all areas	0.05	Individual	59	0	0
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Follow-up monitoring	2017-2021	Norwegian Sea	0.05	Individual	200	0	0
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Follow-up monitoring	2017, 2019-2021	Barents Sea	0.05	Individual	324	1	0.31
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Follow-up monitoring	2017-2021	Total, both areas	0.05	Individual	524	1	0.19
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Follow-up monitoring	2011, 2013	Barents Sea	0.05	Composite	31	0	0

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceedin the ML (%)
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Follow-up monitoring	2011-2015	Norwegian Sea	0.05	Composite	81	0	0
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Follow-up monitoring	2011-2015	Total, both areas	0.05	Composite	112	0	0
Haddock (*Melanogrammus aeglefinus*)	Fillet	Baseline study + NFSA Bycatch 2013-2015	2015-2017	Skagerrak	0.05	Individual	70	0	0
Haddock (*Melanogrammus aeglefinus*)	Fillet	Baseline study + NFSA Bycatch 2013-2015	2013-2019	North Sea	0.05	Individual	300	0	0
Haddock (*Melanogrammus aeglefinus*)	Fillet	Baseline study + NFSA Bycatch 2013-2015	2014-2017	Norwegian Sea	0.05	Individual	307	0	0
Haddock (*Melanogrammus aeglefinus*)	Fillet	Baseline study + NFSA Bycatch 2013-2015	2014-2018	Barents Sea	0.05	Individual	712	0	0
Haddock (*Melanogrammus aeglefinus*)	Fillet	Baseline study + NFSA Bycatch 2013-2015	2013-2019	Skagerrak, North Sea, Norwegian Sea, Rockall, Barents Sea	0.05	Individual	1401	0	0
Haddock (*Melanogrammus aeglefinus*)	Fillet	Polluted fjords and harbours	2009, 2016-2017	Bergen, Repparfjord, Revsbotn, Bøkfjord	0.05	Individual+ 1 Composite	115	0	0
Northern shrimp (*Pandalus borealis*)	Muscle (cooked)	Monitoring for management plans	2007, 2014-2022	North Sea and Skagerrak	0.5	Composite	21	0	0
Northern shrimp (*Pandalus borealis*)	Muscle (cooked)	Monitoring for management plans	2007, 2012-2021	Norwegian Sea	0.5	Composite	27	0	0
Northern shrimp (*Pandalus borealis*)	Muscle (cooked)	Monitoring for management plans	2007-2022	Barents Sea	0.5	Composite	51	0	0
Northern shrimp (*Pandalus borealis*)	Muscle (cooked)	Monitoring for management plans	2007-2022	Total, all areas	1.5	Composite	99	1	1
Northern wolffish (*Anarhichas denticulatus*)	Fillet	NFSA Bycatch 2013-2015	2014	Barents Sea	0.05	Individual	12	0	0
Norway lobster (*Nephrops norvegicus*)	Muscle	Spot-check monitoring	2014, 2020-2021	North Sea, fjords	0.5	Individual	146	0	0

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceedin the ML (%)
Pollack (*Pollachius pollachius*)	Fillet	Baseline study	2016	Skagerrak	0.05	Individual	25	0	0
Pollack (*Pollachius pollachius*)	Fillet	Baseline study	2016-2019	North Sea	0.05	Individual	125	0	0
Pollack (*Pollachius pollachius*)	Fillet	Baseline study	2016-2019	Norwegian Sea	0.05	Individual	146	0	0
Pollack (*Pollachius pollachius*)	Fillet	Baseline study	2016-2019	Total, all areas	0.05	Individual	296	0	0
Pollack (*Pollachius pollachius*)	Fillet	Spot-check monitoring	2014	North Sea, Norwegian Sea, coast	0.05	Individual	50	0	0
Ratfish (*Chimaera monstrosa*)	Fillet	Spot-check monitoring	2016	Lustrafjord	0.05	Individual	23	0	0
Red king crab (*Paralithodes* camtchaticus)	Claw meat	Baseline study 2012	2012	Barents Sea	0.5	Individual	185	0	0
Saithe (*Pollachius virens*)	Fillet	Follow-up monitoring	2017-2019	Skagerrak	0.05	Individual	71	0	0
Saithe (*Pollachius virens*)	Fillet	Follow-up monitoring	2017-2021	North Sea	0.05	Individual	120	0	0
Saithe (*Pollachius virens*)	Fillet	Follow-up monitoring	2018-2021	Norwegian Sea	0.05	Individual	195	0	0
Saithe (*Pollachius virens*)	Fillet	Follow-up monitoring	2017-2021	Barents Sea	0.05	Individual	223	0	0
Saithe (*Pollachius virens*)	Fillet	Follow-up monitoring	2017-2021	Total, all areas	0.05	Individual	609	0	0
Saithe (*Pollachius virens*)	Fillet	Polluted fjords and harbours	2009	Bergen	0.05	Individual	105	0	0
Snow crab (*Chionoecetes opilio*)	Leg meat	Spot-check monitoring	2015, 2016, 2018-2021	Barents Sea	No ML	Individual	145	NA	NA
Spiny dogfish (*Squalus acanthias*)	Fillet	Spot check monitoring	2007-2008	Skagerrak, Norskehavet	0.05	Individual	63	0	0

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceedin the ML (%)
Spotted wolffish (*Anarhichas minor*)	Fillet	Baseline study	2018-2021	Total, Norwegian Sea and Barents Sea	0.05	Individual	250	0	0
Starry ray (*Amblyraja radiata*)	Fillet	Polluted fjords and harbours	2016-2017	Barents Sea (Repparfjord and Revsbotn)	0.05	Individual	10	0	0
Tusk (*Brosme brosme*)	Fillet	Baseline study 2013-2015	2013-2015	Skagerrak	0.05	Individual	42	0	0
Tusk (*Brosme brosme*)	Fillet	Baseline study 2013-2015, follow-up monitoring 2019-2021	2013-2021	North Sea, open sea and coast	0.05	Individual	263	0	0
Tusk (*Brosme brosme*)	Fillet	Baseline study 2013-2015, follow-up-monitoring 2019-2021 + spot-check monitoring 2021 + MT fjorder og havner (NFSA 2017) + Vatsfjorden 2013-2014	2013-2021	North Sea, Fjords	0.05	Individual	503	0	0
Tusk (*Brosme brosme)*	Fillet	Baseline study 2013-2015, follow-up monitoring 2019-2021	2013-2022	Norwegian Sea	0.05	Individual	684	0	0
Tusk (*Brosme brosme*)	Fillet	Baseline study 2013-2015	2013-2015	Barents Sea	0.05	Individual	278	0	0
Tusk (*Brosme brosme*)	Fillet	Baseline study 2013-2015, follow-up-monitoring 2019-2021 + spot-check monitoring 2021 + MT fjorder og havner (NFSA 2017) + Vatsfjorden 2013-2014	2013-2015	Total. all areas	0.05	Individual	1770	0	0
Tusk (*Brosme brosme*)	Fillet	Polluted fjords and harbours	2017, 2019, 2021	Førdefjorden, Bergen, Ålesund	0.05	Individual+ 29 Composite	88	0	0
Tusk (*Brosme brosme*)	Fillet	Monitoring around submarine U-864	2017-2021	Fedje; by the submarine wreck U-864 and 4 nm north and south of the wreck	0.05	Individual	345	0	0

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceedin the ML (%)
Whiting (*Merlangius merlangus*)	Fillet	NFSA Bycatch 2013-2015 + spot check monitoring 2016	2013-2016	Total, all areas	0.05	Individual	77	0	0
Witch flounder (*Glyptocephalus cynoglossus*)	Fillet	Polluted fjords and harbours	2016-2017	Repparfjord and Revsbotn	0.05	Individual	10	0	0

9 - Appendix Table A4 - Pb

Table A4. Lead (Pb) levels for wild-caught fish and other seafood collected by IMR in various monitoring programs conducted in the period 2006-2022. The maximum level (ML) and the mean, median, minimum (min), maximum (max) and 95% percentile concentrations are given as mg/kg wet weight, and concentrations above the ML are indicated in red. Mean values were calculated only when more than 50% of the samples had concentrations above the limit of quantification (LOQ).

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite	No of samples analysed	No of samples above ML	Fraction exceeding the ML (%)
American plaice (*Hippoglossus platessoides*)	Fillet	Spot-check monitoring + NFSA Fjords and harbours 2016-2017	2006, 2016-2017	Barents Sea, Repparfjord, Revsbotn, Bøkfjord	0.3	Individual+ 5 Composite	46	0	0
Anglerfish (*Lophius piscatorius*)	Fillet	Baseline study 2016-2019, spot check monitoring 2015	2015-2016	Skagerrak	0.3	Individual	50	0	0
Anglerfish (*Lophius piscatorius*)	Fillet	Baseline study 2016-2019	2016-2019	North Sea	0.3	Individual	167	0	0
Anglerfish (*Lophius piscatorius*)	Fillet	Baseline study 2016-2019	2017-2019	Norwegian Sea	0.3	Individual	123	0	0
Anglerfish (*Lophius piscatorius*)	Fillet	Baseline study 2016-2019, spot check monitoring 2015	2015-2019	Total, all areas	0.3	Individual	340	0	0
Atlantic bluefin tuna (*Thunnus thynnus*)	Fatty muscle (o-toro)	Spot-check monitoring	2016, 2018-2021	Skagerrak/North Sea/Norwegian Sea	1.0	Individual	21	0	0
Atlantic bluefin tuna (*Thunnus thynnus*)	Lean muscle	Spot-check monitoring	2016, 2018-2021	Skagerrak/North Sea/Norwegian Sea	1.0	Individual	45	0	0
Atlantic bluefin tuna (*Thunnus thynnus*)	Red muscle	Spot-check monitoring	2016, 2018-2021	Skagerrak/North Sea/Norwegian Sea	1.0	Individual	18	0	0
Atlantic cod (*Gadus morhua*)	Fillet	Follow-up monitoring	2017-2021	North Sea	0.3	Individual	265	0	0
Atlantic cod (*Gadus morhua*)	Fillet	Follow-up monitoring	2017-2021	Norwegian Sea	0.3	Individual	61	0	0
Atlantic cod (*Gadus morhua*)	Fillet	Follow-up monitoring	2017-2021	Barents Sea	0.3	Individual	322	0	0
Atlantic cod (*Gadus morhua*)	Fillet	Follow-up monitoring	2017-2021	Total. All areas	0.3	Individual	648	0	0

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite	No of samples analysed	No of samples above ML	Fraction exceeding the ML (%)
Atlantic cod (*Gadus morhua*)	Fillet	Polluted fjords and harbours	2015-2017, 2019, 2021	Oslofjorden, Frænfjorden, Årdalsfjord, Repparfjord og Revsbotn, Førdefjorden, Bergen, Grenland/Kragerø, Ålesund	0.3	Individual+46 composite	281	0	0
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, B-cut	Baseline study+follow-up monitoring	2014-2016, 2019	Skagerrak, North Sea	0.3	Individual	9	0	0
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, B-cut	Baseline study+follow-up monitoring	2013-2015, 2017-2019	Norwegian Sea	0.3	Individual	366	0	0
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, B-cut	Baseline study	2013-2016	Barents Sea	0.3	Individual	133	0	0
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, B-cut	Baseline study+follow-up monitoring	2013-2019	Total, all areas	0.3	Individual	508	0	0
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, I-cut	EU-Dioxin 2007, mini-baseline (2008-2010), baseline study	2007, 2008, 2013	Norwegian Sea	0.3	Individual	29	0	0
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, I-cut	Mini-baseline, baseline study	2008-2010, 2013	Barents Sea	0.3	Individual	15	0	0
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, I-cut	EU-Dioxin 2007, mini-baseline (2008-2010), baseline study	2007-2010, 2013	Total, both areas	0.3	Individual	44	0	0
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet	Polluted fjords and harbours	2016, 2017, 2021	Repparfjord and Revsbotn	0.3	Individual	50	0	0
Atlantic herring (*Clupea harengus*)	Fillet	Follow-up monitoring	2017, 2020	North Sea	0.3	Individual	173	0	0
Atlantic herring (*Clupea harengus*)	Fillet	Follow-up monitoring	2017, 2020	Norwegian Sea	0.3	Individual	98	0	0
Atlantic horse mackerel (*Trachurus trachurus*)	Fillet	Spot-check monitoring	2017	North Sea	0.3	Individual	50	0	0
Atlantic mackerel (*Scomber scombrus*)	Fillet	Follow-up monitoring	2017-2021	Skagerrak	0.3	Individual	223	0	0

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite	No of samples analysed	No of samples above ML	Fraction exceeding the ML (%)
Atlantic mackerel (*Scomber scombrus*)	Fillet	Follow-up monitoring	2018, 2019, 2022	North Sea	0.3	Individual	150	0	0
Atlantic mackerel (*Scomber scombrus*)	Fillet	Follow-up monitoring	2017-2021	Norwegian Sea	0.3	Individual	270	0	0
Atlantic mackerel (*Scomber scombrus*)	Fillet	Follow-up monitoring	2019-2020	Barents Sea	0.3	Individual	60	0	0
Atlantic mackerel (*Scomber scombrus*)	Fillet	Follow-up monitoring	2017-2022	Total, all areas	0.3	Individual	703	0	0
Atlantic salmon (*Salmo salar)*, wild		Wild salmon project 2012	2012	Coast of Northern Norway	0.3	Individual	136	0	0
Atlantic wolffish (*Anarhichas lupus*)	Fillet	Baseline study	2018-2021	North Sea, Norwegian Sea, Barents Sea	0.3	Individual	176	0	0
Beaked redfish (*Sebastes mentella*)	Fillet	Baseline study	2016-2018	Norwegian Sea	0.3	Individual	77	0	0
Beaked redfish (*Sebastes mentella*)	Fillet	Baseline study	2016-2018	Barents Sea	0.3	Individual	447	0	0
Beaked redfish (*Sebastes mentella*)	Fillet	Baseline study	2016-2018	Total, all areas	0.3	Individual	524	0	0
Blue ling (*Molva dipterygia*)	Fillet	NFSA Bycatch 2013-2015	2013-2016	Skagerrak, North Sea, Norwegian Sea	0.3	Individual	66	0	0
Common ling (*Molva molva*)	Fillet	Baseline study	2014	Skagerrak	0.3	Individual	50	0	0
Common ling (*Molva molva*)	Fillet	Baseline study	2013-2014, 2016	North Sea	0.3	Individual	98	0	0
Common ling (*Molva molva*)	Fillet	Baseline study	2014-2015	North Sea, fjords	0.3	Individual	41	0	0
Common ling (*Molva molva*)	Fillet	Baseline study	2013-2015	Norwegian Sea	0.3	Individual	484	0	0
Common ling (*Molva molva*)	Fillet	Baseline study	2014	Barents Sea	0.3	Individual	75	0	0
Common ling (*Molva molva*)	Fillet	Baseline study	2013-2015	Total, all areas	0.3	Individual	748	0	0
Common ling (*Molva molva*)	Fillet	Spot check monitoring	2005, 2008-2009	Barents Sea, Norwegian Sea, Skagerrak, North Sea, Atlantic Ocean	0.3	Individual	238	0	0

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite	No of samples analysed	No of samples above ML	Fraction exceeding the ML (%)
Edible crab (*Cancer pagurus*) (cooked)	Claw meat	Baseline+various surveys + spot check monitoring	2014-2016, 2020-2022	Southern Norway	0.5	Individual	479	0	0
Edible crab (*Cancer pagurus*) (cooked)	Claw meat	Baseline+various surveys + spot check monitoring	2014-2016, 2020-2022	Northern Norway	0.5	Individual	344	0	0
Edible crab (*Cancer pagurus*) (cooked)	Claw meat	Baseline+various surveys + spot check monitoring	2014-2016, 2020-2022	Total, all areas	0.5	Individual	823	0	0
Edible crab (*Cancer pagurus*) (cooked)	Brown meat	Baseline+various surveys + spot check monitoring	2014-2016, 2020-2022	Southern Norway	No ML	Individual	474	NA	NA
Edible crab (*Cancer pagurus*) (cooked)	Brown meat	Baseline+various surveys + spot check monitoring	2014-2016, 2020-2022	Northern Norway	No ML	Individual	325	NA	NA
Edible crab (*Cancer pagurus*) (cooked)	Brown meat	Baseline+various surveys + spot check monitoring	2014-2016, 2020-2022	Total, all areas	No ML	Individual	799	NA	NA
Edible crab (*Cancer pagurus*) (cooked)	Claw meat	Polluted fjords and harbours	2013, 2016	Different areas in south of Norway	0.5	Individual+ composite	62	0	0
Edible crab (*Cancer pagurus*) (cooked)	Brown meat	Polluted fjords and harbours	2013, 2016	Different areas in south of Norway	No ML	Individual+ composite	62	NA	NA
Edible crab (*Cancer pagurus*) (fresh)	Claw meat	PhD M. Wiech + spot check monitoring	2014-2016, 2020-2022	Southern Norway	0.5	Individual	170	0	0
Edible crab (*Cancer pagurus*) (fresh)	Claw meat	PhD M. Wiech + spot check monitoring	2014-2016, 2020-2022	Northern Norway	0.5	Individual	167	0	0
Edible crab (*Cancer pagurus*) (fresh)	Claw meat	PhD M. Wiech + spot check monitoring	2014-2016, 2020-2022	Total, all areas	0.5	Individual	337	0	0
Edible crab (*Cancer pagurus*) (fresh)	Hepato-pancreas	PhD M. Wiech + spot check monitoring	2014-2016, 2020-2022	Northern Norway	No ML	Individual		NA	NA
Edible crab (*Cancer pagurus*) (fresh)	Hepato-pancreas	PhD M. Wiech + spot check monitoring	2014-2016, 2020-2022	Southern Norway	No ML	Individual	303	0	0

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite	No of samples analysed	No of samples above ML	Fraction exceeding the ML (%)
Edible crab (*Cancer pagurus*) (fresh)	Hepato-pancreas	PhD M. Wiech + spot check monitoring	2014-2016, 2020-2022	Total, all areas	No ML	Individual	558	NA	NA
Edible crab (*Cancer pagurus*) (fresh)	Claw meat	Polluted fjords and harbours	2019	Bergen	0.5	Composite	8	0	0
Edible crab (*Cancer pagurus*) (fresh)	Hepato-pancreas	Polluted fjords and harbours	2019	Bergen	No ML	Composite	4	NA	NA
European hake (*Merluccius merluccius*)	Fillet	Baseline study	2019-2021	Skagerrak	0.3	Individual	25	0	0
European hake (*Merluccius* merluccius)	Fillet	Baseline study	2019-2021	North Sea	0.3	Individual	570	0	0
European hake (*Merluccius merluccius*)	Fillet	Baseline study	2019-2021	Norwegian Sea	0.3	Individual	183	0	0
European hake (*Merluccius merluccius*)	Fillet	Baseline study	2019-2021	Total, all areas	0.3	Individual	778	0	0
European lobster (*Homarus gammarus*)	Hale	Spot-check monitoring	2017-2022	North Sea	0.5	Individual	80	0	0
European plaice (*Pleuronectes platessa*)	Fillet	Baseline study	2016	Skagerrak	0.3	Individual	25	0	0
European plaice (*Pleuronectes platessa*)	Fillet	Baseline study	2016-2018	North Sea	0.3	Individual	123	0	0
European plaice (*Pleuronectes platessa*)	Fillet	Baseline study	2016-2017	Norwegian Sea	0.3	Individual	150	0	0
European plaice (*Pleuronectes platessa*)	Fillet	Baseline study	2016-2017	Barents Sea	0.3	Individual	150	0	0
European plaice (*Pleuronectes platessa*)	Fillet	Baseline study	2016-2018	Total, all areas	0.3	Individual	448	0	0
European plaice (*Pleuronectes platessa*)		Spot-check monitoring	2007, 2014-2016	Barents Sea, Norwegian Sea, Skagerrak	0.3	Individual	267	0	0
European sprat (*Sprattus sprattus*)	Whole fish	Miljøgifter i fisk og fiskevarer (NFSA 2010), Spot-check monitoring 2017	2010, 2017	Fjords and North Sea	0.3	Composite	47	0	0

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite	No of samples analysed	No of samples above ML	Fraction exceeding the ML (%)
Golden redfish (*Sebastes norvegicus*)	Fillet	Baseline study	2016-2018	Norwegian Sea	0.3	Individual	148	0	0
Golden redfish (*Sebastes norvegicus*)	Fillet	Baseline study	2016-2018	Barents Sea	0.3	Individual	75	0	0
Golden redfish (*Sebastes norvegicus*)	Fillet	Baseline study	2016-2018	Total, all areas	0.3	Individual	223	0	0
Greater argentine (*Argentina silus*)	Fillet	Baseline study	2018-2021	North Sea, Norwegian Sea, incl.Osterfjorden	0.3	Individual	300	0	0
Greater forkbeard (*Physis blennoides*)	Fillet	NFSA Bycatch 2013-2015	2013-2015	Total, all areas	0.3	Individual	59	0	0
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Follow-up monitoring	2017-2021	Norwegian Sea	0.3	Individual	200	0	0
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Follow-up monitoring	2017, 2019-2021	Barents Sea	0.3	Individual	324	0	0
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Follow-up monitoring	2017-2021	Total, both areas	0.3	Individual	524	0	0
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Follow-up monitoring	2011-2015	Norwegian Sea	0.3	Composite	81	0	0
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Follow-up monitoring	2011, 2013	Barents Sea	0.3	Composite	31	0	0
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Follow-up monitoring	2011-2015	Total, both areas	0.3	Composite	112	0	0
Haddock (*Melanogrammus aeglefinus*)	Fillet	Baseline study + NFSA Bycatch 2013-2015	2015-2017	Skagerrak	0.3	Individual	70	0	0
Haddock (*Melanogrammus aeglefinus*)	Fillet	Baseline study + NFSA Bycatch 2013-2015	2013-2019	North Sea	0.3	Individual	300	0	0
Haddock (*Melanogrammus aeglefinus*)	Fillet	Baseline study + NFSA Bycatch 2013-2015	2014-2017	Norwegian Sea	0.3	Individual	307	0	0

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite	No of samples analysed	No of samples above ML	Fraction exceeding the ML (%)
Haddock (*Melanogrammus aeglefinus*)	Fillet	Baseline study + NFSA Bycatch 2013-2015	2014-2018	Barents Sea	0.3	Individual	712	0	0
Haddock (*Melanogrammus aeglefinus*)	Fillet	Baseline study + NFSA Bycatch 2013-2015	2013-2019	Skagerrak, Nordsjø, Norwegian Sea, Rockall, Barents Sea	0.3	Individual	1401	0	0
Haddock (*Melanogrammus aeglefinus*)	Fillet	Polluted fjords and harbours	2009, 2016-2017	Bergen, Repparfjord, Revsbotn, Bøkfjord	0.3	Individual+ 1 Composite	115	0	0
Northern shrimp (*Pandalus borealis*)	Muscle (cooked)	Monitoring for management plans	2007, 2014-2022	North Sea and Skagerrak	0.5	Composite	21	0	0
Northern shrimp (*Pandalus borealis*)	Muscle (cooked)	Monitoring for management plans	2007, 2012-2021	Norwegian Sea	0.5	Composite	27	0	0
Northern shrimp (*Pandalus borealis*)	Muscle (cooked)	Monitoring for management plans	2007-2022	Barents Sea	0.5	Composite	51	0	0
Northern shrimp (*Pandalus borealis*)	Muscle (cooked)	Monitoring for management plans	2007-2022	Total, all areas	1.5	Composite	99	0	0
Northern wolffish (*Anarhichas denticulatus*)	Fillet	NFSA Bycatch 2013-2015	2014	Barents Sea	0.3	Individual	12	0	0
Norway lobster (*Nephrops norvegicus*)	Muscle	Spot-check monitoring	2014, 2020-2021	North Sea, fjords	0.5	Individual	146	0	0
Pollack (*Pollachius pollachius*)	Fillet	Baseline study	2016	Skagerrak	0.3	Individual	25	0	0
Pollack (*Pollachius pollachius*)	Fillet	Baseline study	2016-2019	North Sea	0.3	Individual	125	0	0
Pollack (*Pollachius pollachius*)	Fillet	Baseline study	2016-2019	Norwegian Sea	0.3	Individual	146	0	0
Pollack (*Pollachius pollachius*)	Fillet	Baseline study	2016-2019	Total, all areas	0.3	Individual	296	0	0
Pollack (*Pollachius pollachius*)	Fillet	Spot-check monitoring	2014	North Sea, Norwegian Sea, coast	0.3	Individual	50	0	0
Ratfish (*Chimaera monstrosa*)	Fillet	Spot-check monitoring	2016	Lustrafjord	0.3	Individual	23	0	0

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite	No of samples analysed	No of samples above ML	Fraction exceeding the ML (%)
Red king crab (*Paralithodes camtchaticus*)	Claw meat	Baseline study 2012	2012	Barents Sea	0.5	Individual	185	0	0
Saithe (*Pollachius virens)*	Fillet	Follow-up monitoring	2017-2019	Skagerrak	0.3	Individual	71	0	0
Saithe (*Pollachius virens*)	Fillet	Follow-up monitoring	2017-2021	North Sea	0.3	Individual	120	0	0
Saithe (*Pollachius virens*)	Fillet	Follow-up monitoring	2018-2021	Norwegian Sea	0.3	Individual	195	0	0
Saithe (*Pollachius virens*)	Fillet	Follow-up monitoring	2017-2021	Barents Sea	0.3	Individual	223	0	0
Saithe (*Pollachius virens*)	Fillet	Follow-up monitoring	2017-2021	Total, all areas	0.3	Individual	609	0	0
Saithe (*Pollachius virens*)	Fillet	Polluted fjords and harbours	2009	Bergen	0.3	Individual	105	0	0
Snow crab (*Chionoecetes opilio*)	Leg meat	Spot-check monitoring	2015, 2016, 2018-2021	Barents Sea	0.5	Individual	86	0	0
Spiny dogfish (*Squalus acanthias*)	Fillet	Spot check monitoring	2007-2008	Skagerrak, Norskehavet	0.3	Individual	63	0	0
Spotted wolffish (*Anarhichas minor*)	Fillet	Baseline study	2018-2021	Total, Norwegian Sea and Barents Sea	0.3	Individual	250	0	0
Starry ray (*Amblyraja radiata*)	Fillet	Polluted fjords and harbours	2016-2017	Barents Sea (Repparfjord and Revsbotn)	0.3	Individual	10	0	0
Tusk (*Brosme brosme*)	Fillet	Baseline study 2013-2015	2013-2015	Skagerrak	0.3	Individual	42	0	0
Tusk (*Brosme brosme*)	Fillet	Baseline study 2013-2015, follow-up monitoring 2019-2021	2013-2021	North Sea, open sea and coast	0.3	Individual	263	0	0

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite	No of samples analysed	No of samples above ML	Fraction exceeding the ML (%)
Tusk (*Brosme brosme*)	Fillet	Baseline study 2013-2015, follow-up-monitoring 2019-2021 + spot-check monitoring 2021 + MT fjorder og havner (NFSA 2017) + Vatsfjorden 2013-2014	2013-2021	North Sea, Fjords	0.3	Individual	503	1	0.20
Tusk (*Brosme brosme*)	Fillet	Baseline study 2013-2015, follow-up monitoring 2019-2021	2013-2022	Norwegian Sea	0.3	Individual	684	0	0
Tusk (*Brosme brosme*)	Fillet	Baseline study 2013-2015	2013-2015	Barents Sea	0.3	Individual	278	0	0
Tusk (*Brosme brosme*)	Fillet	Baseline study 2013-2015, follow-up-monitoring 2019-2021 + spot-check monitoring 2021 + MT fjorder og havner (NFSA 2017) + Vatsfjorden 2013-2014	2013-2015	Total. all areas	0.3	Individual	1770	1	0.06
Tusk (*Brosme brosme*)	Fillet	Polluted fjords and harbours	2017, 2019, 2021	Førdefjorden, Bergen, Ålesund	0.3	Individual+ 29 Composite	88	0	0
Tusk (*Brosme brosme*)	Fillet	Monitoring around submarine U-864	2017-2021	Fedje; by the submarine wreck U-864 and 4 nm north and south of the wreck	0.3	Individual	345	0	0
Whiting (*Merlangius merlangus*)	Fillet	NFSA Bycatch 2013-2015 + spot check monitoring 2016	2013-2016	Total, all areas	0.3	Individual	77	0	0
Witch flounder (*Glyptocephalus cynoglossus*)	Fillet	Polluted fjords and harbours	2016-2017	Repparfjord and Revsbotn	0.3	Individual	10	0	0

10 - Appendix Table A5 - PCDD/F

Table A5. Concentrations of sum dioxins (PCDD/F) for wild-caught fish and other seafood collected by IMR in various monitoring programs conducted in the period 2006-2022. The maximum level (ML) and the mean, median, minimum (min), maximum (max) and 95% percentile concentrations are given as ng TEQ/kg wet weight, and concentrations above the ML are indicated in red.

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceeding the ML (%)
American plaice (*Hippoglossus platessoides*)	Fillet	Spot-check monitoring	2006	Barents Sea	3.5	Composite	5	0	0
Anglerfish (*Lophius piscatorius*)	Fillet	Spot check monitoring	2015	Skagerrak	3.5	Individual	25	0	0
Anglerfish (*Lophius piscatorius*)	Fillet	Baseline study 2016-2019	2016	Skagerrak	3.5	Composite	3	0	0
Anglerfish (*Lophius piscatorius*)	Fillet	Baseline study 2016-2019	2016-2019	North Sea	3.5	Composite	22	0	0
Anglerfish (*Lophius piscatorius*)	Fillet	Baseline study 2016-2019	2017-2019	Norwegian Sea	3.5	Composite	15	0	0
Anglerfish (*Lophius piscatorius*)	Fillet	Baseline study 2016-2019	2016-2019	Total, all areas	3.5	Composite	40	0	0
Anglerfish (*Lophius piscatorius*)	Liver	Baseline study 2016-2019, spot check monitoring 2015	2015-2016	Skagerrak	No ML	Composite	6	NA	NA
Anglerfish (*Lophius piscatorius*)	Liver	Baseline study 2016-2019	2016-2019	North Sea	No ML	Composite	22	NA	NA
Anglerfish (*Lophius piscatorius*)	Liver	Baseline study 2016-2019	2017-2019	Norwegian Sea	No ML	Composite	13	NA	NA
Anglerfish (*Lophius piscatorius*)	Liver	Baseline study 2016-2019, spot check monitoring 2015	2016-2019	Total, all areas	No ML	Composite	41	NA	NA
Atlantic bluefin tuna (*Thunnus thynnus*)	Fatty muscle (o-toro)	Spot-check monitoring	2018-2021	Skagerrak/North Sea/Norwegian Sea	3.5	Individual	6	1	16.7
Atlantic bluefin tuna (*Thunnus thynnus*)	Lean muscle	Spot-check monitoring	2018-2021	Skagerrak/North Sea/Norwegian Sea	3.5	Individual	15	0	0
Atlantic bluefin tuna (*Thunnus thynnus*)	Red muscle	Spot-check monitoring	2018-2021	Skagerrak/North Sea/Norwegian Sea	3.5	Individual	5	0	0

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceeding the ML (%)
Atlantic cod (*Gadus morhua*)	Fillet	Follow-up monitoring	2017-2021	North Sea	3.5	Individual	45	0	0
Atlantic cod (*Gadus morhua*)	Fillet	Follow-up monitoring	2017-2021	Norwegian Sea	3.5	Individual	15	0	0
Atlantic cod (*Gadus morhua*)	Fillet	Follow-up monitoring	2017-2021	Barents Sea	3.5	Individual	45	0	0
Atlantic cod (*Gadus morhua*)	Fillet	Follow-up monitoring	2017-2021	Total, all areas	3.5	Individual	105	0	0
Atlantic cod (*Gadus morhua*)	Fillet	Polluted fjords and harbours	2009, 2015	Tønsberg, Vrengen, Narvik, Oslofjord	3.5	Individual+ 6 composite	17	0	0
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, B-cut	Baseline study+follow-up monitoring	2014-2016, 2019	Skagerrak, North Sea	3.5	Individual	9	0	0
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, B-cut	Baseline study+follow-up monitoring	2013-2015, 2017-2019	Norwegian Sea	3.5	Individual	365	3	0.82
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, B-cut	Baseline study	2013-2016	Barents Sea	3.5	Individual	132	2	1.5
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, B-cut	Baseline study+follow-up monitoring	2013-2019	Total, all areas	3.5	Individual	506	5	0.99
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, I-cut	Baseline study+follow-up monitoring	2014-2016, 2019	Skagerrak, North Sea	3.5	Individual	8	1	12.5
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, I-cut	Baseline study+follow-up monitoring	2013-2015, 2017-2018	Norwegian Sea	3.5	Individual	272	19	7.0
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, I-cut	Baseline study	2013-2016	Barents Sea	3.5	Individual	125	2	1.6
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, I-cut	Baseline study+follow-up monitoring	2013-2019	Total, all areas	3.5	Individual	405	22	5.4
Atlantic herring (*Clupea harengus*)	Fillet	Follow-up monitoring	2017, 2020	North Sea	3.5	Individual	172	0	0
Atlantic herring (*Clupea harengus*)	Fillet	Follow-up monitoring	2017, 2020	Norwegian Sea	3.5	Individual	98	0	0

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceeding the ML (%)
Atlantic horse mackerel (*Trachurus trachurus*)	Fillet	Spot-check monitoring	2017	North Sea	3.5	Individual	50	0	0
Atlantic mackerel (*Scomber scombrus*)	Fillet	Follow-up monitoring	2017-2020	Skagerrak	3.5	Individual	198	2	1.0
Atlantic mackerel (*Scomber scombrus*)	Fillet	Follow-up monitoring	2018-2019	North Sea	3.5	Individual	100	0	0
Atlantic mackerel (*Scomber scombrus*)	Fillet	Follow-up monitoring	2017-2020	Norwegian Sea	3.5	Individual	222	0	0
Atlantic mackerel (*Scomber scombrus*)	Fillet	Follow-up monitoring	2019-2020	Barents Sea	3.5	Individual	60	0	0
Atlantic mackerel (*Scomber scombrus*)	Fillet	Follow-up monitoring	2017-2020	Total, all areas	3.5	Individual	580	2	0.34
Atlantic salmon (*Salmo salar*), wild	Fillet	Wild salmon project 2012	2012	Coast of Northern Norway	3.5	Individual	137	0	0
Atlantic wolffish (*Anarhichas lupus*)	Fillet	Baseline study	2018-2021	North Sea, Norwegian Sea, Barents Sea	3.5	Individual	176	0	0
Atlantic wolffish (*Anarhichas lupus*)	Liver	Baseline study	2018-2021	North Sea, Norwegian Sea, Barents Sea	No ML	Composite	9	NA	NA
Beaked redfish (*Sebastes mentella*)	Fillet	Baseline study	2016-2018	Norwegian Sea	3.5	Individual	77	0	0
Beaked redfish (*Sebastes mentella*)	Fillet	Baseline study	2016-2018	Barents Sea	3.5	Individual	447	0	0
Beaked redfish (*Sebastes mentella*)	Fillet	Baseline study	2016-2018	Total, all areas	3.5	Individual	524	0	0
Blue ling (*Molva dipterygia*)	Fillet	NFSA Bycatch 2013-2015	2013-2015	Skagerrak, North Sea, Norwegian Sea	3.5	Composite	10	0	0
Blue ling (*Molva dipterygia*)	Liver	NFSA Bycatch 2013-2015	2013-2015	Skagerrak, North Sea, Norwegian Sea	No ML	Composite	9	NA	NA
Common ling (*Molva molva*)	Fillet	Baseline study	2014	Skagerrak	3.5	Composite	3	0	0
Common ling (*Molva molva*)	Fillet	Baseline study	2013-2014, 2016	North Sea	3.5	Composite	4	0	0

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceeding the ML (%)
Common ling (*Molva molva*)	Fillet	Baseline study	2014-2015	North Sea, fjords	3.5	Composite	8	0	0
Common ling (*Molva molva*)	Fillet	Baseline study	2013-2015	Norwegian Sea	3.5	Composite	22	0	0
Common ling (*Molva molva*)	Fillet	Baseline study	2014	Barents Sea	3.5	Composite	4	0	0
Common ling (*Molva molva*)	Fillet	Baseline study	2013-2015	Total, all areas	3.5	Composite	41	0	0
Common ling (*Molva molva*)	Fillet	Spot check monitoring	2008-2009	Barents Sea, Norwegian Sea, Skagerrak, North Sea, Atlantic Ocean	3.5	Individual	167	0	0
Edible crab (*Cancer pagurus*) (cooked)	Brown meat	Baseline study 2011-2012	2011 - 2012	Coast Hvaler to Vesterålen	No ML	Individual	435	NA	NA
Edible crab (*Cancer pagurus*) (cooked)	Brown meat	Polluted fjords and harbours	2013, 2016	Different areas in south of Norway	No ML	Composite	13	NA	NA
Edible crab (*Cancer pagurus*) (cooked)	Claw meat	Polluted fjords and harbours	2013	Different areas in south of Norway	3.5	Composite	11	0	0
Edible crab (*Cancer pagurus*) (raw)	Hepato-pancreas	Spot check monitoring	2022	Austevoll, Hvaler, Vestfjorden	No ML	Composite	6	NA	NA
Edible crab (*Cancer pagurus*) (raw)	Hepato-pancreas	Polluted fjords and harbours	2019	Bergen	No ML	Composite	8	NA	NA
European hake (*Merluccius merluccius*)	Fillet	Baseline study	2019-2021	Skagerrak	3.5	Individual	25	0	0
European hake (*Merluccius merluccius*)	Fillet	Baseline study	2019-2021	North Sea	3.5	Individual	570	0	0
European hake (*Merluccius merluccius*)	Fillet	Baseline study	2019-2021	Norwegian Sea	3.5	Individual	183	0	0
European hake (*Merluccius merluccius*)	Fillet	Baseline study	2019-2021	Total, all areas	3.5	Individual	778	0	0
European hake (*Merluccius merluccius*)	Liver	Baseline study	2019-2021	Skagerrak	No ML	Composite	1	NA	NA
European hake (*Merluccius merluccius*)	Liver	Baseline study	2019-2021	North Sea	No ML	Composite	23	NA	NA
European hake (*Merluccius merluccius*)	Liver	Baseline study	2019-2021	Norwegian Sea	No ML	Composite	7	NA	NA

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceeding the ML (%)
European hake (*Merluccius merluccius*)	Liver	Baseline study	2019-2021	Total, all areas	No ML	Composite	31	NA	NA
European lobster (*Homarus gammarus*)	Hale	Spot-check monitoring	2017-2022	North Sea	3.5	Individual	20	0	0
European plaice (*Pleuronectes platessa*)	Fillet	Baseline study	2016	Skagerrak	3.5	Composite	3	0	0
European plaice (*Pleuronectes platessa*)	Fillet	Baseline study	2016-2018	North Sea	3.5	Composite	15	0	0
European plaice (*Pleuronectes platessa*)	Fillet	Baseline study	2016-2017	Norwegian Sea	3.5	Composite	18	0	0
European plaice (*Pleuronectes platessa*)	Fillet	Baseline study	2016-2017	Barents Sea	3.5	Composite	18	0	0
European plaice (*Pleuronectes platessa*)	Fillet	Baseline study	2016-2018	Total, all areas	3.5	Composite	54	0	0
European plaice (*Pleuronectes platessa*)	Fillet	Spot-check monitoring	2007, 2014-2016	Barents Sea, Norwegian Sea, Skagerrak	3.5	Individual	102	0	0
European sprat (*Sprattus sprattus*)	Whole fish	Miljøgifter i fisk og fiskevarer (NFSA 2010), Spot-check monitoring 2017	2010, 2017	Fjords+ some in North Sea	3.5	Composite	47	0	0
Golden redfish (*Sebastes norvegicus*)	Fillet	Baseline study	2016-2018	Norwegian Sea	3.5	Individual	148	0	0
Golden redfish (*Sebastes norvegicus*)	Fillet	Baseline study	2016-2018	Barents Sea	3.5	Individual	74	0	0
Golden redfish (*Sebastes norvegicus*)	Fillet	Baseline study	2016-2018	Total, all areas	3.5	Individual	222	0	0
Greater argentine (*Argentina silus*)	Fillet	Baseline study	2018-2021	North Sea, Norwegian Sea, incl. Osterfjorden	3.5	Individual	290	0	0
Greater argentine (*Argentina silus*)	Liver	Baseline study	2018-2021	North Sea, Norwegian Sea, incl. Osterfjorden	No ML	Composite	12	NA	NA
Greater forkbeard (*Physis blennoides*)	Fillet	NFSA Bycatch 2013-2015	2013-2015	Total, all areas	3.5	Composite	11	0	0

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceeding the ML (%)
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Follow-up monitoring	2017-2021	Norwegian Sea	3.5	Individual	199	0	0
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Follow-up monitoring	2017, 2019-2021	Barents Sea	3.5	Individual	299	4	1.34
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Follow-up monitoring	2017-2021	Total, Norwegian Sea and Barents Sea	3.5	Individual	498	4	0.80
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Follow-up monitoring	2011-2015	Norwegian Sea	3.5	Composite	81	5	6.17
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Follow-up monitoring	2011, 2013	Barents Sea	3.5	Composite	31	0	0
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Follow-up monitoring	2011-2015	Total, Norwegian Sea and Barents Sea	3.5	Composite	112	5	4.46
Haddock (*Melanogrammus aeglefinus*)	Fillet	NFSA Bycatch 2013-2015	2013-2014	North Sea	3.5	Composite	12	0	0
Haddock (*Melanogrammus aeglefinus*)	Fillet	NFSA Bycatch 2013-2015	2014-2015	Norwegian Sea	3.5	Composite	13	0	0
Haddock (*Melanogrammus aeglefinus*)	Fillet	NFSA Bycatch 2013-2015	2014-2015	Barents Sea	3.5	Composite	12	0	0
Haddock (*Melanogrammus aeglefinus*)	Fillet	NFSA Bycatch 2013-2015	2013-2015	Total, all areas	3.5	Composite	37	0	0
Haddock (*Melanogrammus aeglefinus*)	Liver	Baseline study + NFSA Bycatch 2013-2015	2015-2017	Skagerrak	No ML	Individual + 70 Composite	66	NA	NA
Haddock (*Melanogrammus aeglefinus*)	Liver	Baseline study + NFSA Bycatch 2013-2015	2014-2019	North Sea	No ML	Individual + 10 Composite	304	NA	NA
Haddock (*Melanogrammus aeglefinus*)	Liver	Baseline study + NFSA Bycatch 2013-2016	2014-2017	Norwegian Sea	No ML	Individual + 12 Composite	272	NA	NA

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceeding the ML (%)
Haddock (*Melanogrammus aeglefinus*)	Liver	Baseline study + NFSA Bycatch 2013-2017	2014-2018	Barents Sea	No ML	Individual + 13 Composite	610	NA	NA
Haddock (*Melanogrammus aeglefinus*)	Liver	Baseline study + NFSA Bycatch 2013-2018	2014-2019	Total, all areas	No ML	Individual + 35 Composite	1257	NA	NA
Northern shrimp (*Pandalus borealis*)	Muscle (cooked)	Monitoring for management plans	2014-2022	North Sea and Skagerrak	3.5	Composite	16	0	0
Northern shrimp (*Pandalus borealis*)	Muscle (cooked)	Monitoring for management plans	2012-2021	Norwegian Sea	3.5	Composite	25	0	0
Northern shrimp (*Pandalus borealis*)	Muscle (cooked)	Monitoring for management plans	2007-2022	Barents Sea	3.5	Composite	46	0	0
Northern shrimp (*Pandalus borealis*)	Muscle (cooked)	Monitoring for management plans	2007-2022	Total, all areas	3.5	Composite	87	0	0
Northern wolffish (*Anarhichas denticulatus*)	Fillet	NFSA Bycatch 2013-2015	2014	Barents Sea	3.5	Composite	2	0	0
Northern wolffish (*Anarhichas denticulatus*)	Liver	NFSA Bycatch 2013-2015	2014	Barents Sea	3.5	Composite	2	0	0
Norway lobster (*Nephrops norvegicus*)	Muscle	Spot-check monitoring	2014, 2020-2021	North Sea, fjords	3.5	Composite	9	0	0
Pollack (*Pollachius pollachius*)	Fillet	Baseline study	2016	Skagerrak	3.5	Composite	3	0	0
Pollack (*Pollachius pollachius*)	Fillet	Baseline study	2016-2019	North Sea	3.5	Composite	15	0	0
Pollack (*Pollachius pollachius*)	Fillet	Baseline study	2016-2019	Norwegian Sea	3.5	Composite	18	0	0
Pollack (*Pollachius pollachius*)	Fillet	Baseline study	2016-2019	Total, all areas	3.5	Composite	36	0	0

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceeding the ML (%)
Ratfish (*Chimaera monstrosa*)	Fillet	NFSA Bycatch 2013-2015+spot-check monitoring	2015-2016	Faroe Islands+Lustrafjorden	3.5	Composite	12	0	0
Red king crab (*Paralithodes camtchaticus*)	Claw meat	Baseline study 2012	2012	Barents Sea	3.5	Individual	50	0	0
Saithe (*Pollachius virens*)	Fillet	Follow-up monitoring	2019	Skagerrak	3.5	Individual	5	0	0
Saithe (*Pollachius virens*)	Fillet	Follow-up monitoring	2019-2021	North Sea	3.5	Individual	15	0	0
Saithe (*Pollachius virens*)	Fillet	Follow-up monitoring	2019-2021	Norwegian Sea	3.5	Individual	29	0	0
Saithe (*Pollachius virens*)	Fillet	Follow-up monitoring	2019-2020	Barents Sea	3.5	Individual	20	0	0
Saithe (*Pollachius virens*)	Fillet	Follow-up monitoring	2019-2021	Total, all areas	3.5	Individual	69	0	0
Saithe (*Pollachius virens*)	Liver	Follow-up monitoring	2017-2019	Skagerrak	No ML	Individual	67	NA	NA
Saithe (*Pollachius virens*)	Liver	Follow-up monitoring	2017-2021	North Sea	No ML	Individual	119	NA	NA
Saithe (*Pollachius virens*)	Liver	Follow-up monitoring	2018-2021	Norwegian Sea	No ML	Individual	189	NA	NA
Saithe (*Pollachius virens*)	Liver	Follow-up monitoring	2017-2020	Barents Sea	No ML	Individual	170	NA	NA
Saithe (*Pollachius virens*)	Liver	Follow-up monitoring	2017-2021	Total, all areas	No ML	Individual	545	NA	NA
Snow crab (*Chionoecetes opilio*)	Leg meat	Spot-check monitoring	2015,2016, 2018, 2020, 2021	Barents Sea	3.5	Composite	22	0	0
Spiny dogfish (*Squalus acanthias*)	Fillet	Spot check monitoring	2007-2008	Skagerrak, Norskehavet	3.5	Individual	17	0	0
Spotted wolffish (*Anarhichas minor*)	Fillet	Baseline study	2018-2021	Total, Norwegian Sea and Barents Sea	3.5	Individual	250	0	0

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceeding the ML (%)
Spotted wolffish (*Anarhichas minor*)	Liver	Baseline study	2018-2021	Total, Norwegian Sea and Barents Sea	No ML	Composite	9	NA	NA
Tusk (*Brosme brosme*)	Fillet	Baseline study 2013-2015	2013	Skagerrak	3.5	Composite	3	0	0
Tusk (*Brosme brosme*)	Fillet	Baseline study 2013-2015	2013-2015	North Sea, open sea and coast	3.5	Composite	7	0	0
Tusk (*Brosme brosme*)	Fillet	Baseline study 2013-2015	2013-2015	North Sea, fjords	3.5	Composite	7	0	0
Tusk (*Brosme brosme*)	Fillet	Baseline study 2013-2015	2013-2015	Norwegian Sea	3.5	Composite	22	0	0
Tusk (*Brosme brosme*)	Fillet	Baseline study 2013-2015	2014, 2016	Barents Sea	3.5	Composite	14	0	0
Tusk (*Brosme brosme*)	Fillet	Baseline study 2013-2015	2013-2016	Total, all areas	3.5	Composite	53	0	0
Tusk (*Brosme brosme*)	Fillet	Fjord survey	2015	Sognefjord	3.5	Individual	51	0	0
Tusk (*Brosme brosme*)	Fillet	Polluted fjords and harbours	2007, 2009	Bergen	3.5	Composite	6	0	0
Whiting (*Merlangius merlangus*)	Fillet	NFSA Bycatch 2013-2015	2013-2014	Norwegian Sea and North Sea	3.5	Composite	5	0	0

11 - Appendix Table A6 - PCDD/F+dl-PCB

Table A6. Concentrations of sum dioxins and dl-PCBs (PCDD/F+dl-PCB) for wild-caught fish and other seafood collected by IMR in various monitoring programs conducted in the period 2006-2022. The maximum level (ML) and the mean, median, minimum (min), maximum (max) and 95% percentile concentrations are given as ng TEQ/kg wet weight, and concentrations above the ML are indicated in red. For each species and tissue, the maximum amount in gram (g) that may be consumed before exceeding the tolerable weekly intake (TWI; 2 pg TEQ/kg bw) for a 70 kg person is given in the last column.

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceeding the ML (%)
American plaice (*Hippoglossus platessoides*)	Fillet	Spot-check monitoring	2006	Barents Sea	6.5	Composite	5	0	0
Anglerfish (*Lophius piscatorius*)	Fillet	Spot check monitoring	2015	Skagerrak	6.5	Individual	25	0	0
Anglerfish (*Lophius piscatorius*)	Fillet	Baseline study 2016-2019	2016	Skagerrak	6.5	Composite	3	0	0
Anglerfish (*Lophius piscatorius*)	Fillet	Baseline study 2016-2019	2016-2019	North Sea	6.5	Composite	22	0	0
Anglerfish (*Lophius piscatorius*)	Fillet	Baseline study 2016-2019	2017-2019	Norwegian Sea	6.5	Composite	15	0	0
Anglerfish (*Lophius piscatorius*)	Fillet	Baseline study 2016-2019	2016-2019	Total, all areas	6.5	Composite	40	0	0
Anglerfish (*Lophius piscatorius*)	Liver	Baseline study 2016-2019, spot check monitoring 2015	2015-2016	Skagerrak	20	Composite	6	6	100
Anglerfish (*Lophius piscatorius*)	Liver	Baseline study 2016-2019	2016-2019	North Sea	20	Composite	22	16	73
Anglerfish (*Lophius piscatorius*)	Liver	Baseline study 2016-2019	2017-2019	Norwegian Sea	20	Composite	13	9	69
Anglerfish (*Lophius piscatorius*)	Liver	Baseline study 2016-2019, spot check monitoring 2015	2015-2019	Total, all areas	20	Composite	41	31	76
Atlantic bluefin tuna (*Thunnus thynnus*)	Fatty muscle (o-toro)	Spot-check monitoring	2018-2021	Skagerrak/North Sea/Norwegian Sea	6.5	Individual	6	6	100

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceeding the ML (%)
Atlantic bluefin tuna (*Thunnus thynnus*)	Lean muscle	Spot-check monitoring	2018-2021	Skagerrak/North Sea/Norwegian Sea	6.5	Individual	15	1	6.7
Atlantic bluefin tuna (*Thunnus thynnus*)	Red muscle	Spot-check monitoring	2018-2021	Skagerrak/North Sea/Norwegian Sea	6.5	Individual	5	0	0
Atlantic cod (*Gadus morhua*)	Fillet	Follow-up monitoring	2017-2021	North Sea	6.5	Individual	45	0	0
Atlantic cod (*Gadus morhua*)	Fillet	Follow-up monitoring	2017-2021	Norwegian Sea	6.5	Individual	15	0	0
Atlantic cod (*Gadus morhua*)	Fillet	Follow-up monitoring	2017-2021	Barents Sea	6.5	Individual	45	0	0
Atlantic cod (*Gadus morhua*)	Fillet	Follow-up monitoring	2017-2021	Total, all areas	6.5	Individual	105	0	0
Atlantic cod (*Gadus morhua*)	Fillet	Polluted fjords and harbours	2009, 2015	Tønsberg, Vrengen, Narvik, Oslofjord	6.5	Individual+ 6 composite	17	0	0
Atlantic cod (*Gadus morhua*)	Liver	Follow-up monitoring	2017-2021	North Sea	20	Individual	261	102	39.1
Atlantic cod (*Gadus morhua*)	Liver	Follow-up monitoring	2017-2021	Norwegian Sea	20	Individual	61	37	60.7
Atlantic cod (*Gadus morhua*)	Liver	Follow-up monitoring	2017-2021	Barents Sea	20	Individual	313	2	0.6
Atlantic cod (*Gadus morhua*)	Liver	Follow-up monitoring	2017-2021	Total, all areas	20	Individual	635	141	22.2
Atlantic cod (*Gadus morhua*)	Liver	Polluted fjords and harbours	2015-2017, 2019, 2021	Oslofjorden, Frænfjorden, Årdalsfjord, Repparfjord og Revsbotn, Førdefjorden, Bergen, Grenland/Kragerø, Ålesund	20	Composite+ 2 individual	66	58	87.9
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, B-cut	Baseline study+follow-up monitoring	2014-2016, 2019	Skagerrak, North Sea	6.5	Individual	9	1	11.1
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, B-cut	Baseline study+follow-up monitoring	2013-2015, 2017-2019	Norwegian Sea	6.5	Individual	365	8	2.2
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, B-cut	Baseline study	2013-2016	Barents Sea	6.5	Individual	132	2	1.5

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceeding the ML (%)
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, B-cut	Baseline study+follow-up monitoring	2013-2019	Total, all areas	6.5	Individual	506	11	2.2
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, I-cut	Baseline study+follow-up monitoring	2014-2016, 2019	Skagerrak, North Sea	6.5	Individual	8	2	25.0
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, I-cut	Baseline study+follow-up monitoring	2013-2015, 2017-2018	Norwegian Sea	6.5	Individual	272	54	19.9
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, I-cut	Baseline study	2013-2016	Barents Sea	6.5	Individual	125	7	5.6
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, I-cut	Baseline study+follow-up monitoring	2013-2019	Total, all areas	6.5	Individual	405	63	15.6
Atlantic herring (*Clupea harengus*)	Fillet	Follow-up monitoring	2017, 2020	North Sea	6.5	Individual	172	0	0
Atlantic herring (*Clupea harengus*)	Fillet	Follow-up monitoring	2017, 2020	Norwegian Sea	6.5	Individual	98	0	0
Atlantic horse mackerel (*Trachurus trachurus*)	Fillet	Spot-check monitoring	2017	North Sea	6.5	Individual	50	0	0
Atlantic mackerel (*Scomber scombrus*)	Fillet	Follow-up monitoring	2017-2020	Skagerrak	6.5	Individual	198	4	2.0
Atlantic mackerel (*Scomber scombrus*)	Fillet	Follow-up monitoring	2018, 2019	North Sea	6.5	Individual	100	0	0
Atlantic mackerel (*Scomber scombrus*)	Fillet	Follow-up monitoring	2017-2020	Norwegian Sea	6.5	Individual	222	0	0
Atlantic mackerel (*Scomber scombrus*)	Fillet	Follow-up monitoring	2019-2020	Barents Sea	6.5	Individual	60	0	0
Atlantic mackerel (*Scomber scombrus*)	Fillet	Follow-up monitoring	2017-2020	Total, all areas	6.5	Individual	580	4	0.69
Atlantic salmon (*Salmo salar*), wild	Fillet	Wild salmon project 2012	2012	Coast of Northern Norway	6.5	Individual	137	0	0

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceeding the ML (%)
Atlantic wolffish (*Anarhichas lupus*)	Fillet	Baseline study	2018-2021	North Sea, Norwegian Sea, Barents Sea	6.5	Individual	176	0	0
Atlantic wolffish (*Anarhichas lupus)*	Liver	Baseline study	2018-2021	North Sea, Norwegian Sea, Barents Sea	20	Composite	9	0	0
Beaked redfish (*Sebastes mentella*)	Fillet	Baseline study	2016-2018	Norwegian Sea	6.5	Individual	77	0	0
Beaked redfish (*Sebastes mentell*a)	Fillet	Baseline study	2016-2018	Barents Sea	6.5	Individual	447	0	0
Beaked redfish (*Sebastes mentella*)	Fillet	Baseline study	2016-2018	Total, all areas	6.5	Individual	524	0	0
Beaked redfish (*Sebastes mentella*)	Liver	Baseline study	2016-2018	Norwegian Sea	20	Composite	3	1	33
Beaked redfish (*Sebastes mentella*)	Liver	Baseline study	2016-2018	Barents Sea	20	Composite	18	0	0
Beaked redfish (*Sebastes mentella*)	Liver	Baseline study	2016-2018	Total, all areas	20	Composite	21	1	5
Blue ling (*Molva dipterygia*)	Fillet	NFSA Bycatch 2013-2015	2013-2015	Skagerrak, North Sea, Norwegian Sea	6.5	Composite	10	0	0
Blue ling (*Molva dipterygia*)	Liver	NFSA Bycatch 2013-2016	2013-2015	Skagerrak, North Sea, Norwegian Sea	20	Composite	9	9	100
Common ling (*Molva molva*)	Fillet	Baseline study	2014	Skagerrak	6.5	Composite	3	0	0
Common ling (*Molva molva*)	Fillet	Baseline study	2013-2014, 2016	North Sea	6.5	Composite	4	0	0
Common ling (*Molva molva*)	Fillet	Baseline study	2014-2015	North Sea, fjords	6.5	Composite	8	0	0
Common ling (*Molva molv*a)	Fillet	Baseline study	2013-2015	Norwegian Sea	6.5	Composite	22	0	0
Common ling (*Molva molva*)	Fillet	Baseline study	2014	Barents Sea	6.5	Composite	4	0	0
Common ling (*Molva molva*)	Fillet	Baseline study	2013-2015	Total, all areas	6.5	Composite	41	0	0

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceeding the ML (%)
Common ling (*Molva molva*)	Fillet	Spot check monitoring	2008-2009	Barents Sea, Norwegian Sea, Skagerrak, North Sea, Atlantic Ocean	6.5	Individual	167	0	0
Common ling (*Molva molva*)	Liver	Baseline study	2014	Skagerrak	20	Composite	3	3	100
Common ling (*Molva molva*)	Liver	Baseline study	2013-2014, 2016	North Sea	20	Composite	4	3	75
Common ling (*Molva molva*)	Liver	Baseline study	2014-2015	North Sea, fjords	20	Composite	8	8	100
Common ling (*Molva molva*)	Liver	Baseline study	2013-2015	Norwegian Sea	20	Composite	22	16	73
Common ling (*Molva molva*)	Liver	Baseline study	2014	Barents Sea	20	Composite	4	3	75
Common ling (*Molva molva*)	Liver	Baseline study	2013-2015	Total, all areas	20	Composite	41	33	80
Edible crab (*Cancer pagurus*) (cooked)	Brown meat	Baseline study 2011-2012	2011-2012	Coast Hvaler to Vesterålen	No ML	Individual	435	NA	NA
Edible crab (*Cancer pagurus*) (cooked)	Brown meat	Polluted fjords and harbours	2013, 2016	Different areas south of Norway	No ML	Composite	13	NA	NA
Edible crab (*Cancer pagurus*) (cooked)	Claw meat	Polluted fjords and harbours	2013	Different areas in south of Norway	6.5	Composite	11	0	
Edible crab (*Cancer pagurus*) (raw)	Hepato-pancreas	Spot check monitoring	2022	Austevoll, Hvaler, Vestfjorden	No ML	Composite	6	NA	NA
Edible crab (*Cancer pagurus*) (raw)	Hepato-pancreas	Polluted fjords and harbours	2019	Bergen	No ML	Composite	8	NA	NA
European hake (*Merluccius merluccius*)	Fillet	Baseline study	2019-2021	Skagerrak	6.5	Individual	25	0	0
European hake (*Merluccius merluccius*)	Fillet	Baseline study	2019-2021	North Sea	6.5	Individual	570	0	0
European hake (*Merluccius merluccius*)	Fillet	Baseline study	2019-2021	Norwegian Sea	6.5	Individual	183	0	0
European hake (*Merluccius merluccius*)	Fillet	Baseline study	2019-2021	Total, all areas	6.5	Individual	778	0	0

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceeding the ML (%)
European hake (*Merluccius merluccius*)	Liver	Baseline study	2019-2021	Skagerrak	20	Composite	1	0	0
European hake (*Merluccius merluccius*)	Liver	Baseline study	2019-2021	North Sea	20	Composite	23	1	4.3
European hake (*Merluccius merluccius*)	Liver	Baseline study	2019-2021	Norwegian Sea	20	Composite	7	3	42.9
European hake (*Merluccius merluccius*)	Liver	Baseline study	2019-2021	Total, all areas	20	Composite	31	4	12.9
European lobster (*Homarus gammarus*)	Muscle meat	Spot-check monitoring	2017-2022	North Sea	6.5	Composite	20	0	0
European plaice (*Pleuronectes platessa*)	Fillet	Baseline study	2016	Skagerrak	6.5	Composite	3	0	0
European plaice (*Pleuronectes platessa*)	Fillet	Baseline study	2016-2018	North Sea	6.5	Composite	15	0	0
European plaice (*Pleuronectes platessa*)	Fillet	Baseline study	2016-2017	Norwegian Sea	6.5	Composite	18	0	0
European plaice (*Pleuronectes platessa*)	Fillet	Baseline study	2016-2017	Barents Sea	6.5	Composite	18	0	0
European plaice (*Pleuronectes platessa*)	Fillet	Baseline study	2016-2018	Total, all areas	6.5	Composite	54	0	0
European plaice (*Pleuronectes platessa*)	Fillet	Spot-check monitoring	2007, 2014-2016	Barents Sea, Norwegian Sea, Skagerrak	6.5	Individual	102	0	0
European plaice (*Pleuronectes platessa*)	Liver	Baseline study	2016	Skagerrak	20	Composite	3	0	0
European plaice (*Pleuronectes platessa*)	Liver	Baseline study	2016-2018	North Sea	20	Composite	14	0	0
European plaice (*Pleuronectes platessa*)	Liver	Baseline study	2016-2017	Norwegian Sea	20	Composite	18	0	0
European plaice (Pleuronectes platessa)	Liver	Baseline study	2016-2017	Barents Sea	20	Composite	18	1	5.6

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceeding the ML (%)
European plaice (*Pleuronectes platessa*)	Liver	Baseline study	2016-2018	Total, all areas	20	Composite	53	1	1.9
European sprat (*Sprattus sprattus*)	Whole fish	Miljøgifter i fisk og fiskevarer (NFSA 2010), Spot-check monitoring 2017	2010, 2017	Fjords + some in North Sea	6.5	Composite	47	0	0
Golden redfish (*Sebastes norvegicus*)	Fillet	Baseline study	2016-2018	Norwegian Sea	6.5	Individual	148	0	0
Golden redfish (*Sebastes norvegicus*)	Fillet	Baseline study	2016-2018	Barents Sea	6.5	Individual	74	0	0
Golden redfish (*Sebastes norvegicus*)	Fillet	Baseline study	2016-2018	Total, all areas	6.5	Individual	222	0	0
Golden redfish (*Sebastes norvegicus*)	Liver	Baseline study	2016-2018	Norwegian Sea	20	Composite	6	0	0
Golden redfish (*Sebastes norvegicus*)	Liver	Baseline study	2016-2018	Barents Sea	20	Composite	3	0	0
Golden redfish (*Sebastes norvegicus*)	Liver	Baseline study	2016-2018	Total, all areas	20	Composite	9	0	0
Greater argentine (*Argentina silus*)	Fillet	Baseline study	2018-2021	Osterfjorden	6.5	Individual	25	3	12
Greater argentine (*Argentina silus*)	Fillet	Baseline study	2018-2021	North Sea, Norwegian Sea, incl. Osterfjorden	6.5	Individual	290	3	1.0
Greater argentine (*Argentina silus*)	Liver	Baseline study	2018-2021	North Sea, Norwegian Sea, incl. Osterfjorden	20	Composite	12	0	0
Greater forkbeard (*Physis blennoides*)	Fillet	NFSA Bycatch 2013-2015	2013-2015	Total, all areas	6.5	Composite	11	0	0
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Follow-up monitoring	2017-2021	Norwegian Sea	6.5	Individual	199	3	1.5

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceeding the ML (%)
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Follow-up monitoring	2017, 2019-2021	Barents Sea	6.5	Individual	299	9	3.0
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Follow-up monitoring	2017-2021	Total, Norwegian Sea and Barents Sea	6.5	Individual	498	12	2.4
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Follow-up monitoring	2011, 2013	Barents Sea	6.5	Composite	31	0	0
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Follow-up monitoring	2011-2015	Norwegian Sea	6.5	Composite	81	6	7.4
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Follow-up monitoring	2011-2015	Total, Norwegian Sea and Barents Sea	6.5	Composite	112	6	5.4
Haddock (*Melanogrammus aeglefinus*)	Fillet	NFSA Bycatch 2013-2015	2013-2014	North Sea	6.5	Composite	12	0	0
Haddock (*Melanogrammus aeglefinus*)	Fillet	NFSA Bycatch 2013-2015	2014-2015	Norwegian Sea	6.5	Composite	13	0	0
Haddock (*Melanogrammus aeglefinus*)	Fillet	NFSA Bycatch 2013-2015	2014-2015	Barents Sea	6.5	Composite	12	0	0
Haddock (*Melanogrammus aeglefinus*)	Fillet	NFSA Bycatch 2013-2015	2013-2015	Total, all areas	6.5	Composite	37	0	0
Haddock (*Melanogrammus aeglefinus*)	Liver	Baseline study + NFSA Bycatch 2013-2015	2015-2017	Skagerrak	20	Individual + 12 Composite	66	59	89.4
Haddock (*Melanogrammus aeglefinus*)	Liver	Baseline study + NFSA Bycatch 2013-2015	2015-2019	North Sea	20	Individual + 10 Composite	304	176	57.9
Haddock (*Melanogrammus aeglefinus*)	Liver	Baseline study + NFSA Bycatch 2013-2016	2015-2017	Norwegian Sea	20	Individual + 13 Composite	272	125	46.0

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceeding the ML (%)
Haddock (*Melanogrammus aeglefinus*)	Liver	Baseline study + NFSA Bycatch 2013-2017	2014-2018	Barents Sea	20	Individual + 35 Composite	610	109	17.9
Haddock (*Melanogrammus aeglefinus*)	Liver	Baseline study + NFSA Bycatch 2013-2018	2014-2019	Total, all areas	20	Individual + 70 Composite	1257	469	37.3
Northern shrimp (*Pandalus borealis*)	Muscle (cooked)	Monitoring for management plans	2014-2022	North Sea and Skagerrak	6.5	Composite	16	0	0
Northern shrimp (*Pandalus borealis*)	Muscle (cooked)	Monitoring for management plans	2012-2021	Norwegian Sea	6.5	Composite	25	0	0
Northern shrimp (*Pandalus borealis*)	Muscle (cooked)	Monitoring for management plans	2007-2022	Barents Sea	6.5	Composite	46	0	0
Northern shrimp (*Pandalus borealis*)	Muscle (cooked)	Monitoring for management plans	2007-2022	Total, all areas	6.5	Composite	87	0	0
Northern wolffish (*Anarhichas denticulatus*)	Fillet	NFSA Bycatch 2013-2015	2013-2015	Barents Sea	6.5	Composite	2	0	0
Northern wolffish (*Anarhichas denticulatus*)	Liver	NFSA Bycatch 2013-2015	2013-2015	Barents Sea	6.5	Composite	2	0	0
Norway lobster (*Nephrops norvegicus*)	Muscle	Spot-check monitoring	2014, 2020-2021	North Sea, fjords	6.5	Composite	9	0	0
Pollack (*Pollachius pollachius*)	Fillet	Baseline study	2016	Skagerrak	6.5	Composite	3	0	0
Pollack (*Pollachius pollachius*)	Fillet	Baseline study	2016-2019	North Sea	6.5	Composite	15	0	0
Pollack (*Pollachius pollachius*)	Fillet	Baseline study	2016-2019	Norwegian Sea	6.5	Composite	18	0	0
Pollack (*Pollachius pollachius*)	Fillet	Baseline study	2016-2019	Total, all areas	6.5	Composite	36	0	0

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceeding the ML (%)
Pollack (*Pollachius pollachius*)	Liver	Baseline study	2016	Skagerrak	20	Composite	3	3	100
Pollack (*Pollachius pollachius*)	Liver	Baseline study	2016-2019	North Sea	20	Composite	15	10	67
Pollack (*Pollachius pollachius*)	Liver	Baseline study	2016-2019	Norwegian Sea	20	Composite	18	3	17
Pollack (*Pollachius pollachius*)	Liver	Baseline study	2016-2019	Total, all areas	20	Composite	36	16	44
Ratfish (*Chimaera monstrosa*)	Fillet	NFSA Bycatch 2013-2015+spot check	2015-2016	Faroe Islands+Lustrafjorden	6.5	Composite	12	0	0
Red king crab (*Paralithodes camtchaticus*)	Claw meat	Baseline study 2012	2012	Barents Sea	6.5	Individual	50	0	0
Saithe (*Pollachius virens*)	Fillet	Follow-up monitoring	2019	Skagerrak	6.5	Individual	5	0	0
Saithe (*Pollachius virens*)	Fillet	Follow-up monitoring	2019-2021	North Sea	6.5	Individual	15	0	0
Saithe (*Pollachius virens*)	Fillet	Follow-up monitoring	2019-2021	Norwegian Sea	6.5	Individual	29	0	0
Saithe (*Pollachius virens*)	Fillet	Follow-up monitoring	2019-2020	Barents Sea	6.5	Individual	20	0	0
Saithe (*Pollachius virens*)	Fillet	Follow-up monitoring	2019-2021	Total, all areas	6.5	Individual	69	0	0
Saithe (*Pollachius virens*)	Liver	Follow-up monitoring	2017-2019	Skagerrak	20	Individual	67	30	45
Saithe (*Pollachius virens*)	Liver	Follow-up monitoring	2017-2021	North Sea	20	Individual	119	9	8
Saithe (*Pollachius virens*)	Liver	Follow-up monitoring	2018-2021	Norwegian Sea	20	Individual	189	58	31
Saithe (*Pollachius virens*)	Liver	Follow-up monitoring	2017-2020	Barents Sea	20	Individual	170	0	0

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceeding the ML (%)
Saithe (*Pollachius virens*)	Liver	Follow-up monitoring	2017-2021	Total, all areas	20	Individual	545	97	18
Snow crab (*Chionoecetes opilio*)	Leg meat	Spot-check monitoring	2015, 2016, 2018, 2020, 2021	Barents Sea	6.5	Composite	22	0	0
Spiny dogfish (*Squalus acanthias*)	Fillet	Spot check monitoring	2007-2008	Skagerrak, Norskehavet	6.5	Individual	17	0	0
Spotted wolffish (*Anarhichas minor*)	Fillet	Baseline study	2018-2021	Total, Norwegian Sea and Barents Sea	6.5	Individual	250	1	0.4
Spotted wolffish (*Anarhichas minor*)	Liver	Baseline study	2018-2021	Total, Norwegian Sea and Barents Sea	20	Composite	9	0	0
Tusk (*Brosme brosme*)	Fillet	Baseline study 2013-2015	2013	Skagerrak	6.5	Composite	3	0	0
Tusk (*Brosme brosme*)	Fillet	Baseline study 2013-2015	2013-2015	North Sea, open sea and coast	6.5	Composite	7	0	0
Tusk (*Brosme brosme*)	Filet	Baseline study 2013-2015	2013-2015	North Sea, fjords	6.5	Composite	7	0	0
Tusk (*Brosme brosme*)	Fillet	Baseline study 2013-2015	2013-2015	Norwegian Sea	6.5	Composite	22	0	0
Tusk (*Brosme brosme*)	Fillet	Baseline study 2013-2015	2014, 2016	Barents Sea	6.5	Composite	14	0	0
Tusk (*Brosme brosme*)	Fillet	Baseline study 2013-2015	2013-2016	Total, all areas	6.5	Composite	53	0	0
Tusk (*Brosme brosme*)	Fillet	Fjord survey	2015	Sognefjord	6.5	Individual	51	0	0
Tusk (*Brosme brosme*)	Fillet	Polluted fjords and harbours	2007, 2009	Bergen	6.5	Composite	6	0	0
Tusk (*Brosme brosme)*	Liver	Baseline study 2013-2015	2013	Skagerrak	20	Composite	3	3	100

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceeding the ML (%)
Tusk (*Brosme brosme*)	Liver	Baseline study 2013-2015, follow-up monitoring 2019-2021	2013-2015, 2019-2021	North Sea, open sea and coast	20	Composite	22	13	59
Tusk (*Brosme brosme*)	Liver	Baseline study 2013-2015, follow-up monitoring 2019-2021, spot-check monitoring 2021, MT fjorder og havner (NFSA 2017)	2013-2015, 2017, 2019-2021	North Sea, fjords	20	Composite	28	28	100
Tusk (*Brosme brosme*)	Liver	Baseline study 2013-2015, follow-up monitoring 2019-2021	2013-2015, 2019-2021	Norwegian Sea	20	Composite	46	33	72
Tusk (*Brosme brosme*)	Liver	Baseline study 2013-2015, follow-up monitoring 2019-2021	2014-2016	Barents Sea	20	Composite	14	2	14
Tusk (*Brosme brosme*)	Liver	Baseline study 2013-2015, follow-up monitoring 2019-2021, spot-check monitoring 2021, MT fjorder og havner (NFSA 2017)	2013-2015, 2017, 2019-2021	Total all areas	20	Composite	113	79	70
Tusk (*Brosme brosme*)	Liver	Polluted fjords and harbours	2015, 2017	Sognefjord, Førdefjord	20	Composite	11	11	100
Whiting (*Merlangius merlangus*)	Fillet	NFSA Bycatch 2013-2015	2013-2014	Norwegian Sea and North Sea	6.5	Composite	5	0	0

12 - Appendix Table A7 - PCB6

Table A7. Concentrations of sum non-dl PCBs (PCB6) for wild-caught fish and other seafood collected by IMR in various monitoring programs conducted in the period 2006-2022. The maximum level (ML) and the mean, median, minimum (min), maximum (max) and 95% percentile concentrations are given as µg/kg wet weight, and concentrations above the ML are indicated in red.

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceeding the ML (%)
American plaice (*Hippoglossus platessoides*)	Fillet	Spot-check monitoring	2006	Barents Sea	75	Composite	5	0	0
Anglerfish (*Lophius piscatorius*)	Fillet	Spot check monitoring	2015	Skagerrak	75	Individual	25	0	0
Anglerfish (*Lophius piscatorius*)	Fillet	Baseline study 2016-2019	2016	Skagerrak	75	Composite	3	0	0
Anglerfish (*Lophius piscatorius*)	Fillet	Baseline study 2016-2019	2016-2019	North Sea	75	Composite	22	0	0
Anglerfish (*Lophius piscatorius*)	Fillet	Baseline study 2016-2019	2017-2019	Norwegian Sea	75	Composite	15	0	0
Anglerfish (*Lophius piscatorius*)	Fillet	Baseline study 2016-2019	2016-2019	Total, all areas	75	Composite	40	0	0
Anglerfish (*Lophius piscatorius*)	Liver	Baseline study 2016-2019, spot check monitoring 2015	2015-2016	Skagerrak	200	Composite	6	4	66.7
Anglerfish (*Lophius piscatorius*)	Liver	Baseline study 2016-2019	2016-2019	North Sea	200	Composite	22	13	59.1
Anglerfish (*Lophius piscatorius*)	Liver	Baseline study 2016-2019	2017-2019	Norwegian Sea	200	Composite	13	0	0
Anglerfish (*Lophius piscatorius*)	Liver	Baseline study 2016-2019, spot check monitoring 2015	2015-2019	Total, all areas	200	Composite	41	17	41.5
Atlantic bluefin tuna (*Thunnus thynnus*)	Fatty muscle (o-toro)	Spot-check monitoring	2018-2021	Skagerrak/North Sea/Norwegian Sea	75	Individual	6	6	100
Atlantic bluefin tuna (*Thunnus thynnus*)	Lean muscle	Spot-check monitoring	2018-2021	Skagerrak/North Sea/Norwegian Sea	75	Individual	15	0	0
Atlantic bluefin tuna (*Thunnus thynnus*)	Red muscle	Spot-check monitoring	2018-2021	Skagerrak/North Sea/Norwegian Sea	75	Individual	5	0	0

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceeding the ML (%)
Atlantic cod (*Gadus morhua*)	Fillet	Follow-up monitoring	2017-2021	North Sea	75	Individual	45	0	0
Atlantic cod (*Gadus morhua*)	Fillet	Follow-up monitoring	2017-2021	Norwegian Sea	75	Individual	15	0	0
Atlantic cod (*Gadus morhua*)	Fillet	Follow-up monitoring	2017-2021	Barents Sea	75	Individual	45	0	0
Atlantic cod (*Gadus morhua*)	Fillet	Follow-up monitoring	2017-2021	Total, all areas	75	Individual	105	0	0
Atlantic cod (*Gadus morhua*)	Fillet	Polluted fjords and harbours	2015	Oslofjord	75	Composite	6	0	0
Atlantic cod (*Gadus morhua*)	Liver	Follow-up monitoring	2017-2021	North Sea	200	Individual	260	34	13.1
Atlantic cod (*Gadus morhua*)	Liver	Follow-up monitoring	2017-2021	Norwegian Sea	200	Individual	61	9	14.8
Atlantic cod (*Gadus morhua*)	Liver	Follow-up monitoring	2017-2021	Barents Sea	200	Individual	308	0	0
Atlantic cod (*Gadus morhua*)	Liver	Follow-up monitoring	2017-2021	Total, all areas	200	Individual	629	43	6.8
Atlantic cod (*Gadus morhua*)	Liver	Polluted fjords and harbours	2015-2017, 2019, 2021	Oslofjorden, Frænfjorden, Årdalsfjord, Repparfjord og Revsbotn, Førdefjorden, Bergen, Grenland/Kragerø, Ålesund	200	Composite+ 2 individual	66	49	74.2
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, B-cut	Baseline study+follow-up monitoring	2014-2016, 2019	Skagerrak, North Sea	75	Individual	9	1	11.1
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, B-cut	Baseline study+follow-up monitoring	2013-2015, 2017-2019	Norwegian Sea	75	Individual	365	2	0.5
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, B-cut	Baseline study	2013-2016	Barents Sea	75	Individual	132	2	1.5
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, B-cut	Baseline study+follow-up monitoring	2013-2019	Total, all areas	75	Individual	506	4	0.80
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, I-cut	Baseline study+follow-up monitoring	2014-2016, 2019	Skagerrak, North Sea	75	Individual	8	2	25.0

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceeding the ML (%)
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, I-cut	Baseline study+follow-up monitoring	2013-2015, 2017-2018	Norwegian Sea	75	Individual	272	28	10.3
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, I-cut	Baseline study	2013-2016	Barents Sea	75	Individual	125	3	2.4
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, I-cut	Baseline study+follow-up monitoring	2013-2019	Total, all areas	75	Individual	405	33	8.1
Atlantic herring (*Clupea harengus*)	Fillet	Follow-up monitoring	2017, 2020	North Sea	75	Individual	172	0	0
Atlantic herring (*Clupea harengus*)	Fillet	Follow-up monitoring	2017, 2020	Norwegian Sea	75	Individual	98	0	0
Atlantic horse mackerel (*Trachurus trachurus*)	Fillet	Spot-check monitoring	2017	North Sea	75	Individual	50	0	0
Atlantic mackerel (*Scomber scombrus*)	Fillet	Follow-up monitoring	2017-2020	Skagerrak	75	Individual	198	1	0.50
Atlantic mackerel (*Scomber scombrus*)	Fillet	Follow-up monitoring	2018, 2019	North Sea	75	Individual	100	0	0
Atlantic mackerel (*Scomber scombrus*)	Fillet	Follow-up monitoring	2017-2020	Norwegian Sea	75	Individual	220	0	0
Atlantic mackerel (*Scomber scombrus*)	Fillet	Follow-up monitoring	2019-2020	Barents Sea	75	Individual	60	0	0
Atlantic mackerel (*Scomber scombrus*)	Fillet	Follow-up monitoring	2017-2020	Total, all areas	75	Individual	578	1	0.20
Atlantic salmon (*Salmo salar*), wild	Fillet	Wild salmon project 2012	2012	Coast of Northern Norway	75	Individual	137	0	0
Atlantic wolffish (*Anarhichas lupus*)	Fillet	Baseline study	2018-2021	North Sea, Norwegian Sea, Barents Sea	75	Individual	176	0	0
Atlantic wolffish (*Anarhichas lupus*)	Liver	Baseline study	2018-2021	North Sea, Norwegian Sea, Barents Sea	200	Composite	9	0	0
Beaked redfish (*Sebastes mentella*)	Fillet	Baseline study	2016-2018	Norwegian Sea	75	Individual	77	0	0

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceeding the ML (%)
Beaked redfish (*Sebastes mentella*)	Fillet	Baseline study	2016-2018	Barents Sea	75	Individual	447	0	0
Beaked redfish (*Sebastes mentella*)	Fillet	Baseline study	2016-2018	Total, all areas	75	Individual	524	0	0
Beaked redfish (*Sebastes mentella*)	Liver	Baseline study	2016-2018	Norwegian Sea	200	Composite	3	0	0
Beaked redfish (*Sebastes mentella*)	Liver	Baseline study	2016-2018	Barents Sea	200	Composite	18	0	0
Beaked redfish (*Sebastes mentella*)	Liver	Baseline study	2016-2018	Total, all areas	200	Composite	21	0	0
Blue ling (*Molva dipterygia*)	Fillet	NFSA Bycatch 2013-2015	2013-2015	Skagerrak, North Sea, Norwegian Sea	75	Composite	10	0	0
Blue ling (*Molva dipterygia*)	Liver	NFSA Bycatch 2013-2015	2013-2015	Skagerrak, North Sea, Norwegian Sea	200	Composite	9	8	88.9
Common ling (*Molva molva*)	Fillet	Baseline study	2014	Skagerrak	75	Composite	3	0	0
Common ling (*Molva molva*)	Fillet	Baseline study	2013-2014, 2016	North Sea	75	Composite	4	0	0
Common ling (*Molva molva*)	Fillet	Baseline study	2014-2015	North Sea, fjords	75	Composite	8	0	0
Common ling (*Molva molva*)	Fillet	Baseline study	2013-2015	Norwegian Sea	75	Composite	22	0	0
Common ling (*Molva molva*)	Fillet	Baseline study	2014	Barents Sea	75	Composite	4	0	0
Common ling (*Molva molva*)	Fillet	Baseline study	2013-2015	Total, all areas	75	Composite	41	0	0
Common ling (*Molva molva*)	Fillet	Spot check monitoring	2008-2009	Barents Sea, Norwegian Sea, Skagerrak, North Sea, Atlantic Ocean	75	Individual	76	0	0
Common ling (*Molva molva*)	Liver	Baseline study	2014	Skagerrak	200	Composite	3	3	100
Common ling (*Molva molva*)	Liver	Baseline study	2013-2014, 2016	North Sea	200	Composite	4	3	75.0
Common ling (*Molva molva*)	Liver	Baseline study	2014-2015	North Sea, fjords	200	Composite	8	7	87.5
Common ling (*Molva molva*)	Liver	Baseline study	2013-2015	Norwegian Sea	200	Composite	22	13	59.1

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceeding the ML (%)
Common ling (*Molva molva)*	Liver	Baseline study	2014	Barents Sea	200	Composite	4	2	50.0
Common ling (*Molva molva*)	Liver	Baseline study	2013-2015	Total, all areas	200	Composite	41	28	68.3
Edible crab (*Cancer pagurus*) (cooked)	Brown meat	Baseline study 2011-2012	2011-2012	Coast Hvaler to Vesterålen	No ML	Individual	435	NA	NA
Edible crab (*Cancer pagurus*) (cooked)	Brown meat	Polluted fjords and harbours	2013, 2016	Different areas in south of Norway	No ML	Composite	13	NA	NA
Edible crab (*Cancer pagurus*) (cooked)	Claw meat	Polluted fjords and harbours	2013	Different areas in south of Norway	75.0	Composite	11	0	0
Edible crab (*Cancer pagurus*) (raw)	Hepato-pancreas	Spot check monitoring	2022	Austevoll, Hvaler, Vestfjorden	No ML	Composite	6	NA	NA
Edible crab (*Cancer pagurus*) (raw)	Hepato-pancreas	Polluted fjords and harbours	2019	Bergen	No ML	Composite	8	NA	NA
European hake (*Merluccius merluccius*)	Fillet	Baseline study	2019-2021	Skagerrak	75	Individual	25	0	0
European hake (*Merluccius merluccius*)	Fillet	Baseline study	2019-2021	North Sea	75	Individual	570	2	0.40
European hake (*Merluccius merluccius*)	Fillet	Baseline study	2019-2021	Norwegian Sea	75	Individual	183	0	0
European hake (*Merluccius merluccius*)	Fillet	Baseline study	2019-2021	Total, all areas	75	Individual	778	2	0.30
European hake (*Merluccius merluccius*)	Liver	Baseline study	2019-2021	Skagerrak	200	Composite	1	0	0
European hake (*Merluccius merluccius*)	Liver	Baseline study	2019-2021	North Sea	200	Composite	23	2	8.7
European hake (*Merluccius merluccius*)	Liver	Baseline study	2019-2021	Norwegian Sea	200	Composite	7	4	57.1
European hake (*Merluccius merluccius*)	Liver	Baseline study	2019-2021	Total, all areas	200	Composite	31	6	19.4
European lobster (*Homarus gammarus*)	Muscle meat	Spot-check monitoring	2017-2022	North Sea	75	Individual	20	0	0

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceeding the ML (%)
European plaice (*Pleuronectes platessa*)	Fillet	Baseline study	2016	Skagerrak	75	Composite	3	0	0
European plaice (*Pleuronectes platessa*)	Fillet	Baseline study	2016-2018	North Sea	75	Composite	15	0	0
European plaice (*Pleuronectes platessa*)	Fillet	Baseline study	2016-2017	Norwegian Sea	75	Composite	18	0	0
European plaice (*Pleuronectes platessa*)	Fillet	Baseline study	2016-2017	Barents Sea	75	Composite	18	0	0
European plaice (*Pleuronectes platessa*)	Fillet	Baseline study	2016-2018	Total, all areas	75	Composite	54	0	0
European plaice (*Pleuronectes platessa*)	Fillet	Spot-check monitoring + Repparfjord	2007, 2014-2017	Barents Sea, Norwegian Sea, Skagerrak	75	Individual	102	0	0
European plaice (*Pleuronectes platessa*)	Liver	Baseline study	2016	Skagerrak	200	Composite	3	0	0
European plaice (*Pleuronectes platessa*)	Liver	Baseline study	2016-2018	North Sea	200	Composite	14	0	0
European plaice (*Pleuronectes platessa*)	Liver	Baseline study	2016-2017	Norwegian Sea	200	Composite	18	0	0
European plaice (*Pleuronectes platessa*)	Liver	Baseline study	2016-2017	Barents Sea	200	Composite	18	0	0
European plaice (*Pleuronectes platessa*)	Liver	Baseline study	2016-2018	Total, all areas	200	Composite	53	0	0
European sprat (*Sprattus sprattus*)	Whole fish	Miljøgifter i fisk og fiskevarer (NFSA 2010), Spot-check monitoring 2017	2010, 2017	Fjords + some in North Sea	75	Composite	46	0	0
Golden redfish (*Sebastes norvegicus*)	Fillet	Baseline study	2016-2018	Norwegian Sea	75	Individual	148	0	0
Golden redfish (*Sebastes norvegicus*)	Fillet	Baseline study	2016-2018	Barents Sea	75	Individual	74	0	0
Golden redfish (*Sebastes norvegicus*)	Fillet	Baseline study	2016-2018	Total, all areas	75	Individual	222	0	0

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceeding the ML (%)
Golden redfish (*Sebastes norvegicus*)	Liver	Baseline study	2016-2018	Norwegian Sea	200	Composite	6	0	0
Golden redfish (*Sebastes norvegicus*)	Liver	Baseline study	2016-2018	Barents Sea	200	Composite	3	0	0
Golden redfish (*Sebastes norvegicus*)	Liver	Baseline study	2016-2018	Total, all areas	200	Composite	9	0	0
Greater argentine (*Argentina silus*)	Fillet	Baseline study	2018-2021	Osterfjorden	75	Individual	25	2	8.0
Greater argentine (*Argentina silus*)	Fillet	Baseline study	2018-2021	North Sea, Norwegian Sea, incl. Osterfjorden	75	Individual	290	2	0.70
Greater argentine (*Argentina silus*)	Liver	Baseline study	2018-2021	North Sea, Norwegian Sea, incl. Osterfjorden	200	Composite	12	0	0
Greater forkbeard (*Physis blennoides*)	Fillet	NFSA Bycatch 2013-2015	2013-2015	Total, all areas	75	Composite	11	0	0
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Follow-up monitoring	2017-2021	Norwegian Sea	75	Individual	199	2	1.0
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Follow-up monitoring	2017, 2019-2021	Barents Sea	75	Individual	299	3	1.0
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Follow-up monitoring	2017-2021	Total, Norwegian Sea and Barents Sea	75	Individual	498	5	1.0
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Follow-up monitoring	2011-2015	Norwegian Sea	75	Composite	81	3	3.7
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Follow-up monitoring	2011, 2013	Barents Sea	75	Composite	31	0	0
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Follow-up monitoring	2011-2015	Total, Norwegian Sea and Barents Sea	75	Composite	112	3	2.7
Haddock (*Melanogrammus aeglefinus*)	Fillet	NFSA Bycatch 2013-2015	2013-2014	North Sea	75	Composite	12	0	0

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceeding the ML (%)
Haddock (*Melanogrammus aeglefinus*)	Fillet	NFSA Bycatch 2013-2015	2014-2015	Norwegian Sea	75	Composite	13	0	0
Haddock (*Melanogrammus aeglefinus*)	Fillet	NFSA Bycatch 2013-2015	2014-2015	Barents Sea	75	Composite	12	0	0
Haddock (*Melanogrammus aeglefinus*)	Fillet	NFSA Bycatch 2013-2015	2013-2015	Total, Norwegian Sea and Barents Sea	75	Composite	37	0	0
Haddock (*Melanogrammus aeglefinus*)	Liver	Baseline study + NFSA Bycatch 2013-2015	2015-2017	Skagerrak	200	Individual+ 70 Composite	66	21	31.8
Haddock (*Melanogrammus aeglefinus*)	Liver	Baseline study + NFSA Bycatch 2013-2015	2014-2019	North Sea	200	Individual+ 10 Composite	304	57	18.8
Haddock (*Melanogrammus aeglefinus*)	Liver	Baseline study + NFSA Bycatch 2013-2016	2014-2017	Norwegian Sea	200	Individual+ 12 Composite	272	38	14.0
Haddock (*Melanogrammus aeglefinus*)	Liver	Baseline study + NFSA Bycatch 2013-2017	2014-2018	Barents Sea	200	Individual+ 13 Composite	610	22	3.6
Haddock (*Melanogrammus aeglefinus*)	Liver	Baseline study + NFSA Bycatch 2013-2018	2014-2019	Total, all areas	200	Individual+ 35 Composite	1257	140	11.1
Northern shrimp (*Pandalus borealis*)	Muscle (cooked)	Monitoring for management plans	2014-2022	North Sea with Skagerrak	75	Composite	20	0	0
Northern shrimp (*Pandalus borealis*)	Muscle (cooked)	Monitoring for management plans	2012-2021	Norwegian Sea	75	Composite	25	0	0
Northern shrimp (*Pandalus borealis*)	Muscle (cooked)	Monitoring for management plans	2007-2022	Barents Sea	75	Composite	46	0	0
Northern shrimp (*Pandalus borealis*)	Muscle (cooked)	Monitoring for management plans	2007-2022	Total, all areas	76	Composite	91	0	0

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceeding the ML (%)
Northern wolffish (*Anarhichas denticulatus*)	Fillet	NFSA Bycatch 2013-2015	2013-2015	Barents Sea	75	Composite	2	0	0
Northern wolffish (*Anarhichas denticulatus*)	Liver	NFSA Bycatch 2013-2015	2013-2015	Barents Sea	200	Composite	2	0	0
Norway lobster (*Nephrops norvegicus*)	Muscle	Spot-check monitoring	2014, 2020-2021	North Sea, fjords	75	Composite	9	0	0
Pollack (*Pollachius pollachius*)	Fillet	Baseline study	2016	Skagerrak	75	Composite	3	0	0
Pollack (*Pollachius pollachius*)	Fillet	Baseline study	2016-2019	North Sea	75	Composite	15	0	0
Pollack (*Pollachius pollachius*)	Fillet	Baseline study	2016-2019	Norwegian Sea	75	Composite	18	0	0
Pollack (*Pollachius pollachius*)	Fillet	Baseline study	2016-2019	Total, all areas	75	Composite	36	0	0
Pollack (*Pollachius pollachius*)	Liver	Baseline study	2016	Skagerrak	200	Composite	3	1	33.3
Pollack (*Pollachius pollachius*)	Liver	Baseline study	2016-2019	North Sea	200	Composite	15	6	40.0
Pollack (*Pollachius pollachius*)	Liver	Baseline study	2016-2019	Norwegian Sea	200	Composite	18	1	5.6
Pollack (*Pollachius pollachius)*	Liver	Baseline study	2016-2019	Total, all areas	200	Composite	36	8	22.2
Ratfish (*Chimaera monstrosa*)	Fillet	NFSA Bycatch 2013-2015+spot check	2015-2016	Faroe Islands+Lustrafjorden	75	Composite	12	0	
Red king crab (*Paralithodes camtchaticus*)	Claw meat	Baseline study 2012	2012	Barents Sea	75	Individual	50	0	0
Saithe (*Pollachius virens*)	Fillet	Follow-up monitoring	2019	Skagerrak	75	Individual	5	0	0
Saithe (*Pollachius virens*)	Fillet	Follow-up monitoring	2019-2021	North Sea	75	Individual	15	0	0

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceeding the ML (%)
Saithe (*Pollachius virens*)	Fillet	Follow-up monitoring	2019-2021	Norwegian Sea	75	Individual	29	0	0
Saithe (*Pollachius virens*)	Fillet	Follow-up monitoring	2019-2020	Barents Sea	75	Individual	20	0	0
Saithe (*Pollachius virens*)	Fillet	Follow-up monitoring	2019-2021	Total, all areas	75	Individual	69	0	0
Saithe (*Pollachius virens*)	Liver	Follow-up monitoring	2017-2019	Skagerrak	200	Individual	67	14	20.9
Saithe (*Pollachius virens*)	Liver	Follow-up monitoring	2017-2021	North Sea	200	Individual	119	5	4.2
Saithe (*Pollachius virens*)	Liver	Follow-up monitoring	2018-2021	Norwegian Sea	200	Individual	187	18	9.6
Saithe (*Pollachius virens*)	Liver	Follow-up monitoring	2017-2020	Barents Sea	200	Individual	170	0	0
Saithe (*Pollachius virens*)	Liver	Follow-up monitoring	2017-2021	Total, all areas	200	Individual	543	37	6.8
Saithe (*Pollachius virens*)	Liver	Polluted fjords and harbours	2009	Bergen	200	Individual + 3 Composite	6	4	67
Snow crab (*Chionoecetes opilio*)	Leg meat	Spot-check monitoring	2015, 2016, 2018, 2020, 2021	Barents Sea	75	Composite	22	0	0
Spiny dogfish (*Squalus acanthias*)	Fillet	Spot check monitoring	2007-2008	Skagerrak, Norskehavet	75	Individual	17	1	5.9
Spotted wolffish (*Anarhichas minor*)	Fillet	Baseline study	2018-2021	Total, Norwegian Sea and Barents Sea	75	Individual	250	0	0
Spotted wolffish (*Anarhichas minor*)	Liver	Baseline study	2018-2021	Total, Norwegian Sea and Barents Sea	200	Composite	9	0	0
Tusk (*Brosme brosme*)	Fillet	Baseline study	2013	Skagerrak	75	Composite	3	0	0
Tusk (*Brosme brosme*)	Fillet	Baseline study	2013-2015	North Sea, open sea and coast	75	Composite	7	0	0
Tusk (*Brosme brosme*)	Fillet	Baseline study	2013-2015	North Sea, fjords	75	Composite	7	1	14.3

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceeding the ML (%)
Tusk (*Brosme brosme*)	Fillet	Baseline study	2013-2015	Norwegian Sea	75	Composite	22	0	0
Tusk (*Brosme brosme*)	Fillet	Baseline study	2014, 2016	Barents Sea	75	Composite	14	0	0
Tusk (*Brosme brosme*)	Fillet	Baseline study	2013-206	Total, all areas	75	Composite	53	1	2
Tusk (*Brosme brosme*)	Fillet	Fjord survey	2015	Sognefjorden	75	Individual	51	0	0
Tusk (*Brosme brosme*)	Fillet	Polluted fjords and harbours	2007, 2009	Bergen	75	Composite	12	0	0
Tusk (*Brosme brosme*)	Liver	Baseline study 2013-2015	2013	Skagerrak	200	Composite	3	3	100
Tusk (*Brosme brosme*)	Liver	Baseline study 2013-2015, follow-up monitoring 2019-2021	2013-2015, 2019-2021	North Sea, open sea and coast	200	Composite	22	15	68.2
Tusk (*Brosme brosme*)	Liver	Baseline study 2013-2015, follow-up monitoring 2019-2021, spot-check monitoring 2021, MT fjorder og havner (NFSA 2017)	2013-2015, 2017, 2019-2021	North Sea, fjords	200	Composite	28	28	100
Tusk (*Brosme brosme*)	Liver	Baseline study 2013-2015, follow-up monitoring 2019-2021	2013-2015, 2019-2021	Norwegian Sea	200	Composite	46	28	60.9
Tusk (*Brosme brosme*)	Liver	Baseline study 2013-2015, follow-up monitoring 2019-2021	2014-2016	Barents Sea	200	Composite	14	4	28.6

Name of Species English (Latin)	Tissue	Name of monitoring program for source data	Sampling year(s)	Geographical area	ML	Individual or composite samples	No of samples analysed	No of samples above ML	Fraction exceeding the ML (%)
Tusk (*Brosme brosme*)	Liver	Baseline study 2013-2015, follow-up monitoring 2019-2021, spot-check monitoring 2021, MT fjorder og havner (NFSA 2017)	2013-2015, 2017, 2019-2021	Total all areas	200	Composite	113	78	69.0
Tusk (*Brosme brosme*)	Liver	Polluted fjords and harbours	2015, 2017	Sognefjord, Førdefjord	200	Composite	11	11	100
Whiting (*Merlangius merlangus*)	Fillet	NFSA Bycatch 2013-2015	2013-2014	North Sea and Norwegian Sea	75	Composite	5	0	0

13 - Appendix Table A8 - PFAS

Table A8. Concentrations of PFOS, PFOA, PFNA, PFHxS and sum 4 PFAS for wild-caught fish and other seafood collected by IMR in various monitoring programs conducted in the period 2006-2023. Due to changes in the analytical method over time, the limit of quantification (LOQ) for the compounds varied across different years of analysis; therefore, the results are organized based on the LOQ of the method in each case. LOQ and the mean, minimum (min), and maximum (max) concentrations are given as µg/kg wet weight. Mean values were calculated when less than 50% of the samples had concentrations below LOQ (%<LOQ) for one or more of the 4 PFAS. Based on the mean values for each species and tissue, the maximum amount in gram (g) that may be consumed before exceeding the tolerable weekly intake (TWI; 4.4 ng/kg bw) for a 70 kg person is given. NA=not applicable. The maximum levels (ML) applicable from 2023 for PFOS, PFOA, PFNA, PFHxS and sum 4 PFAS, and the percentage of samples above ML (%>ML), are shown for samples analysed in 2023.

Name of Species English (Latin)	Tissue	Individual or composite sample	Sampling year(s)	Year of analysis	Compound	No of samples analysed	LOQ	% <LOQ	Min	Max	Mean
Anglerfish (*Lophius piscatorius*)	Fillet	Individual (25) and Composite (19)	2015-2017	2016-2018	PFOS	44	1.8	100			
Anglerfish (*Lophius piscatorius*)	Fillet	Individual (25) and Composite (19)	2015-2017	2016-2018	PFOA	44	2.4	100			
Anglerfish (*Lophius piscatorius*)	Fillet	Individual (25) and Composite (19)	2015-2017	2016-2018	PFNA	44	1.8	100			
Anglerfish (*Lophius piscatorius*)	Fillet	Individual (25) and Composite (19)	2015-2017	2016-2018	PFHxS	44	1.8	100			
Anglerfish (*Lophius piscatorius*)	Fillet	Individual (25) and Composite (19)	2015-2017	2016-2018	Sum 4 PFAS (LB)	44	7.8	100			
Anglerfish (*Lophius piscatorius*)	Fillet	Composite	2018	2018	PFOS	6	0.2	67	<0.2	0.4	
Anglerfish (*Lophius piscatorius*)	Fillet	Composite	2018	2018	PFOA	6	4.0	100			
Anglerfish (*Lophius piscatorius*)	Fillet	Composite	2018	2018	PFNA	6	0.2	100			
Anglerfish (*Lophius piscatorius*)	Fillet	Composite	2018	2018	PFHxS	6	1.0	100			
Anglerfish (*Lophius piscatorius*)	Fillet	Composite	2018	2018	Sum 4 PFAS (LB)	6	5.4	67	0	0.4	

Name of Species English (Latin)	Tissue	Individual or composite sample	Sampling year(s)	Year of analysis	Compound	No of samples analysed	LOQ	% <LOQ	Min	Max	Mean
Anglerfish *(Lophius piscatorius*)	Fillet	Composite	2018-2019	2019	PFOS	9	0.2	100			
Anglerfish (*Lophius piscatorius*)	Fillet	Composite	2018-2019	2019	PFOA	9	0.6	100			
Anglerfish (*Lophius piscatorius*)	Fillet	Composite	2018-2019	2019	PFNA	9	0.2	100			
Anglerfish (*Lophius piscatorius*)	Fillet	Composite	2018-2019	2019	PFHxS	9	1.0	100			
Anglerfish (*Lophius piscatorius*)	Fillet	Composite	2018-2019	2019	Sum 4 PFAS (LB)	9	2.0	100			
Atlantic bluefin tuna (*Thunnus thynnus*)	Fillet	Individual	2015	2016	PFOS	2	0.8	100			
Atlantic bluefin tuna (*Thunnus thynnus*)	Fillet	Individual	2015	2016	PFOA	2	1.3	100			
Atlantic bluefin tuna (*Thunnus thynnus*)	Fillet	Individual	2015	2016	PFNA	2	0.9	100			
Atlantic bluefin tuna (*Thunnus thynnus*)	Fillet	Individual	2015	2016	PFHxS	2	0.8	100			
Atlantic bluefin tuna (*Thunnus thynnus*)	Fillet	Individual	2015	2016	Sum 4 PFAS (LB)	2	3.8	100			
Atlantic bluefin tuna (*Thunnus thynnus*)	Fillet	Different tissues from the same individual	2018	2018-2019	PFOS	10	0.2	60	<0.2	0.5	
Atlantic bluefin tuna (*Thunnus thynnus*)	Fillet	Different tissues from the same individual	2018	2018-2020	PFOA	10	0.6	100			
Atlantic bluefin tuna (*Thunnus thynnus*)	Fillet	Different tissues from the same individual	2018	2018-2021	PFNA	10	0.2	100			

Name of Species English (Latin)	Tissue	Individual or composite sample	Sampling year(s)	Year of analysis	Compound	No of samples analysed	LOQ	% <LOQ	Min	Max	Mean
Atlantic bluefin tuna (*Thunnus thynnus*)	Fillet	Different tissues from the same individual	2018	2018-2022	PFHxS	10	1	100			
Atlantic bluefin tuna (*Thunnus thynnus*)	Fillet	Different tissues from the same individual	2018	2018-2023	Sum 4 PFAS (LB)	10	2	60	0	0.5	
Atlantic cod (*Gadus morhua*)	Fillet	Individual	2007-2009	2008-2009	PFOS	50	1	100			
Atlantic cod (*Gadus morhua*)	Fillet	Individual	2007-2009	2008-2009	PFOA	50	1	100			
Atlantic cod (*Gadus morhua*)	Fillet	Individual	2007-2009	2008-2009	PFNA	50	1	100			
Atlantic cod (*Gadus morhua*)	Fillet	Individual	2007-2009	2008-2009	PFHxS	0					
Atlantic cod (*Gadus morhua*)	Fillet	Individual	2007-2009	2008-2009	Sum 4 PFAS (LB)	0					
Atlantic cod (*Gadus morhua*)	Fillet	Individual	2017	2018	PFOS	25	0.2	84	<0.2	0.3	
Atlantic cod (*Gadus morhua*)	Fillet	Individual	2017	2018	PFOA	25	4	100			
Atlantic cod (*Gadus morhua*)	Fillet	Individual	2017	2018	PFNA	25	0.2	100			
Atlantic cod (*Gadus morhua*)	Fillet	Individual	2017	2018	PFHxS	25	1	100			
Atlantic cod (*Gadus morhua*)	Fillet	Individual	2017	2018	Sum 4 PFAS (LB)	25	5.4	84	0	0.3	
Atlantic cod (*Gadus morhua*)	Fillet	Individual	2017, 2021	2019, 2021	PFOS	10	0.2	70	<0.2	0.3	
Atlantic cod (*Gadus morhua*)	Fillet	Individual	2017, 2021	2019, 2021	PFOA	10	0.6	100			
Atlantic cod (*Gadus morhua*)	Fillet	Individual	2017, 2021	2019, 2021	PFNA	10	0.2	100			
Atlantic cod (*Gadus morhua*)	Fillet	Individual	2017, 2021	2019, 2021	PFHxS	10	1	100			
Atlantic cod (*Gadus morhua*)	Fillet	Individual	2017, 2021	2019, 2021	Sum 4 PFAS (LB)	10	2	70	0	0.3	
Atlantic cod (*Gadus morhua*)	Fillet	Individual	2014-2016	2015-2017	PFOS	24	1.8	100			

Name of Species English (Latin)	Tissue	Individual or composite sample	Sampling year(s)	Year of analysis	Compound	No of samples analysed	LOQ	% <LOQ	Min	Max	Mean
Atlantic cod (*Gadus morhua*)	Fillet	Individual	2014-2016	2015-2017	PFOA	24	2.4	100			
Atlantic cod (*Gadus morhua*)	Fillet	Individual	2014-2016	2015-2017	PFNA	24	1.8	100			
Atlantic cod (*Gadus morhua*)	Fillet	Individual	2014-2016	2015-2017	PFHxS	24	1.8	100			
Atlantic cod (*Gadus morhua*)	Fillet	Individual	2014-2016	2015-2017	Sum 4 PFAS (LB)	24	7.8	100			
Atlantic cod (*Gadus morhua*)	Fillet	Individual	2007	2007-2008	PFOS	59	1	44	<1	3.3	1.4
Atlantic cod (*Gadus morhua*)	Fillet	Individual	2007	2007-2008	PFOA	59	1.5	100			
Atlantic cod (*Gadus morhua*)	Fillet	Individual	2007	2007-2008	PFNA	59	1.5	100			
Atlantic cod (*Gadus morhua*)	Fillet	Individual	2007	2007-2008	PFHxS	0					
Atlantic cod (*Gadus morhua*)	Fillet	Individual	2007	2007-2008	Sum 4 PFAS (LB)	0					
Atlantic cod (*Gadus morhua*)	Fillet	Individual	2007	2007	PFOS	7	1	0	1	2	1.6
Atlantic cod (*Gadus morhua*)	Fillet	Individual	2007	2007	PFOA	7	1	100			
Atlantic cod (*Gadus morhua*)	Fillet	Individual	2007	2007	PFNA	7	1.5	100			
Atlantic cod (*Gadus morhua*)	Fillet	Individual	2007	2007	PFHxS	0					
Atlantic cod (*Gadus morhua*)	Fillet	Individual	2007	2007	Sum 4 PFAS (LB)	7		0	1.0	2.0	1.6
Atlantic cod (*Gadus morhua*)	Fillet	Individual	2022-2023	2023	PFOS	40		0	0.023	0.43	0.17
Atlantic cod (*Gadus morhua*)	Fillet	Individual	2022-2023	2023	PFOA	40		30	<0.0018	0.053	0.007
Atlantic cod (*Gadus morhua*)	Fillet	Individual	2022-2023	2023	PFNA	40		2.5	<0.0068	0.18	0.045
Atlantic cod (*Gadus morhua*)	Fillet	Individual	2022-2023	2023	PFHxS	40		82.5	<0.0018	0.02	0.003
Atlantic cod (*Gadus morhua*)	Fillet	Individual	2022-2023	2023	Sum 4 PFAS (LB)	40			0.039	0.53	0.22
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, B-cut	Individual	2013-2016	2013-2016	PFOS	380	0.8	87	<0.8	2	

Name of Species English (Latin)	Tissue	Individual or composite sample	Sampling year(s)	Year of analysis	Compound	No of samples analysed	LOQ	% <LOQ	Min	Max	Mean
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, B-cut	Individual	2013-2016	2013-2016	PFOA	380	1.3	100			
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, B-cut	Individual	2013-2016	2013-2016	PFNA	380	0.9	100			
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, B-cut	Individual	2013-2016	2013-2016	PFHxS	380	0.8	100			
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, B-cut	Individual	2013-2016	2013-2016	Sum 4 PFAS (LB)	380		87	0	2	
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, B-cut	Individual	2008-2010, 2013	2010, 2013	PFOS	21	0.3	0	0.4	1.5	0.78
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, B-cut	Individual	2008-2010, 2013	2010, 2013	PFOA	21	0.3	100			
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, B-cut	Individual	2008-2010, 2013	2010, 2013	PFNA	21	0.3	100			
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, B-cut	Individual	2008-2010, 2013	2010, 2013	PFHxS	21	0.3	100			
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, B-cut	Individual	2008-2010, 2013	2010, 2013	Sum 4 PFAS (LB)	21		0	0.4	1.5	0.78
Atlantic halibut (*Hippoglossus hippoglossus)*	Fillet, B-cut	Individual	2008	2010	PFOS	5	0.3	0	0.6	1.3	0.98
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, B-cut	Individual	2008	2010	PFOA	5	0.3	100			
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, B-cut	Individual	2008	2010	PFNA	5	0.3	100			
Atlantic halibut (*Hippoglossus* hippoglossus)	Fillet, B-cut	Individual	2008	2010	PFHxS	0					
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, B-cut	Individual	2008	2010	Sum 4 PFAS (LB)	5		0	0.6	1.3	0.98
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, I-cut	Individual	2008	2010	PFOS	5	0.3	0	0.6	1.3	1.4

Name of Species English (Latin)	Tissue	Individual or composite sample	Sampling year(s)	Year of analysis	Compound	No of samples analysed	LOQ	% <LOQ	Min	Max	Mean
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, I-cut	Individual	2008	2010	PFOA	5	0.3	100			
Atlantic halibut (*Hippoglossus hippoglossus)*	Fillet, I-cut	Individual	2008	2010	PFNA	5	0.3	100			
Atlantic halibut (*Hippoglossus hippoglossus)*	Fillet, I-cut	Individual	2008	2010	PFHxS	0					
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, I-cut	Individual	2008	2010	Sum 4 PFAS (LB)	5		0	0.6	1.3	1.4
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, I-cut	Individual	2013-2016	2013-2016	PFOS	378	0.8	71	<0.8	5.2	
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, I-cut	Individual	2013-2016	2013-2016	PFOA	378	1.3	100			
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, I-cut	Individual	2013-2016	2013-2016	PFNA	378	0.9	99.7	<0.9	1.8	
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, I-cut	Individual	2013-2016	2013-2016	PFHxS	378	0.8	100			
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, I-cut	Individual	2013-2016	2013-2016	Sum 4 PFAS (LB)	378		71	0	7.0	
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, I-cut	Individual	2008-2010, 2013	2010, 2013	PFOS	20	0.3	0	0.5	2	1.1
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, I-cut	Individual	2008-2010, 2013	2010, 2013	PFOA	20	0.3	100			
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, I-cut	Individual	2008-2010, 2013	2010, 2013	PFNA	20	0.3	100			
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, I-cut	Individual	2008-2010, 2013	2010, 2013	PFHxS	20	0.3	100			
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, I-cut	Individual	2008-2010, 2013	2010, 2013	Sum 4 PFAS (LB)	20		0	0.5	2	1.1
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, B-cut	Individual	2019	2023	PFOS	18	0.5	0	0.09	1.30	0.46

Name of Species English (Latin)	Tissue	Individual or composite sample	Sampling year(s)	Year of analysis	Compound	No of samples analysed	LOQ	% <LOQ	Min	Max	Mean
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, B-cut	Individual	2019	2023	PFOA	18	0.1	61	<0.0019	0.063	0.019
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, B-cut	Individual	2019	2023	PFNA	18	0.1	0	0.019	0.65	0.2
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, B-cut	Individual	2019	2023	PFHxS	18	0.1	56	<0.004	0.22	0.07
Atlantic halibut (*Hippoglossus hippoglossus*)	Fillet, B-cut	Individual	2019	2023	Sum 4 PFAS (LB)	18	0.8		0.12	2.2	0.74
Atlantic herring (*Clupea harengus*)	Fillet	Individual	2017	2018	PFOS	72	0.2	100			
Atlantic herring (*Clupea harengus*)	Fillet	Individual	2017	2018	PFOA	72	4	100			
Atlantic herring (*Clupea harengus*)	Fillet	Individual	2017	2018	PFNA	72	0.2	100			
Atlantic herring (*Clupea harengus*)	Fillet	Individual	2017	2018	PFHxS	72	1	100			
Atlantic herring (*Clupea harengus*)	Fillet	Individual	2017	2018	Sum 4 PFAS (LB)	72	5.4	100			
Atlantic herring (*Clupea harengus*)	Fillet	Individual	2017, 2020	2019, 2021	PFOS	75	0.2	100			
Atlantic herring (*Clupea harengus*)	Fillet	Individual	2017, 2020	2019, 2021	PFOA	75	0.6	100			
Atlantic herring (*Clupea harengus)*	Fillet	Individual	2017, 2020	2019, 2021	PFNA	75	0.2	100			
Atlantic herring (*Clupea harengus*)	Fillet	Individual	2017, 2020	2019, 2021	PFHxS	75	1	100			
Atlantic herring (*Clupea harengus*)	Fillet	Individual	2017, 2020	2019, 2021	Sum 4 PFAS (LB)	75	2	100			
Atlantic herring (*Clupea harengus*)	Fillet	Individual	2017	2017	PFOS	76	0.8	100			

Name of Species English (Latin)	Tissue	Individual or composite sample	Sampling year(s)	Year of analysis	Compound	No of samples analysed	LOQ	% <LOQ	Min	Max	Mean
Atlantic herring (*Clupea harengus*)	Fillet	Individual	2017	2017	PFOA	76	1.3	100			
Atlantic herring (*Clupea harengus*)	Fillet	Individual	2017	2017	PFNA	76	0.9	100			
Atlantic herring (*Clupea harengus*)	Fillet	Individual	2017	2017	PFHxS	76	0.8	100			
Atlantic herring (*Clupea harengus*)	Fillet	Individual	2017	2017	Sum 4 PFAS (LB)	76	3.8	100			
Atlantic herring (*Clupea harengus*)	Fillet	Individual	2007, 2009-2010	2010	PFOS	200	0.3	94	<0.3	0.6	
Atlantic herring (*Clupea harengus*)	Fillet	Individual	2007, 2009-2010	2010	PFOA	200	0.3	99	<0.3	0.4	
Atlantic herring (*Clupea harengus*)	Fillet	Individual	2007, 2009-2010	2010	PFNA	200	0.3	93	<0.3	0.3	
Atlantic herring (*Clupea harengus*)	Fillet	Individual	2007, 2009-2010	2010	PFHxS	200	0.3	100			
Atlantic herring (*Clupea harengus*)	Fillet	Individual	2007, 2009-2010	2010	Sum 4 PFAS (LB)	200	1.2	87	0	0.7	0.051
Atlantic herring (*Clupea harengus*)	Fillet	Individual	2014	2016	PFOS	125	0.2	98	<0.2	0.31	
Atlantic herring (*Clupea harengus*)	Fillet	Individual	2014	2016	PFOA	125	0.2	100			
Atlantic herring (*Clupea harengus*)	Fillet	Individual	2014	2016	PFNA	125	0.2	100			
Atlantic herring (*Clupea harengus*)	Fillet	Individual	2014	2016	PFHxS	125	0.3	100			
Atlantic herring (*Clupea harengus*)	Fillet	Individual	2014	2016	Sum 4 PFAS (LB)	125	0.9	98	0	0.31	

Name of Species English (Latin)	Tissue	Individual or composite sample	Sampling year(s)	Year of analysis	Compound	No of samples analysed	LOQ	% <LOQ	Min	Max	Mean
Atlantic horse mackerel (*Trachurus trachurus*)	Fillet	Individual	2017	2017-2018	PFOS	50	0.8	56	<0.8	5.0	
Atlantic horse mackerel (*Trachurus trachurus*)	Fillet	Individual	2017	2017-2018	PFOA	50	1.3	100			
Atlantic horse mackerel (*Trachurus trachurus*)	Fillet	Individual	2017	2017-2018	PFNA	50	0.9	100			
Atlantic horse mackerel (*Trachurus trachurus*)	Fillet	Individual	2017	2017-2018	PFHxS	50	0.8	100			
Atlantic horse mackerel (*Trachurus trachurus*)	Fillet	Individual	2017	2017-2018	Sum 4 PFAS (LB)	50	3.8	56	0	5.0	0.98
Atlantic mackerel (*Scomber scombrus*)	Fillet	Individual	2008-2009, 2012	2010, 2012-2013	PFOS	149	0.3	85	<0.3	0.7	
Atlantic mackerel (*Scomber scombrus*)	Fillet	Individual	2008-2009, 2012	2010, 2012-2014	PFOA	149	0.3	99	<0.3	0.3	
Atlantic mackerel (*Scomber scombrus*)	Fillet	Individual	2008-2009, 2012	2010, 2012-2015	PFNA	149	0.3	100			
Atlantic mackerel (*Scomber scombrus*)	Fillet	Individual	2008-2009, 2012	2010, 2012-2016	PFHxS	149	0.3	100			
Atlantic mackerel (*Scomber scombrus*)	Fillet	Individual	2008-2009, 2012	2010, 2012-2017	Sum 4 PFAS (LB)	149	1.2	83	0	0.7	
Atlantic mackerel (*Scomber scombrus*)	Fillet	Individual	2014-2015	2016	PFOS	75	0.2	44	<0.2	1.2	0.35
Atlantic mackerel (*Scomber scombrus*)	Fillet	Individual	2014-2015	2016	PFOA	75	0.2	97	<0.2	0.27	
Atlantic mackerel (*Scomber scombrus*)	Fillet	Individual	2014-2015	2016	PFNA	75	0.2	100			

Name of Species English (Latin)	Tissue	Individual or composite sample	Sampling year(s)	Year of analysis	Compound	No of samples analysed	LOQ	% <LOQ	Min	Max	Mean
Atlantic mackerel (*Scomber scombrus*)	Fillet	Individual	2014-2015	2016	PFHxS	75	0.3	99	<0.3	0.4	
Atlantic mackerel (*Scomber scombrus*)	Fillet	Individual	2014-2015	2016	Sum 4 PFAS (LB)	75	0.9	44	0	1.4	0.26
Atlantic mackerel (*Scomber scombrus)*	Fillet	Individual	2016	2017	PFOS	150	0.8	99	<0.8	1.2	
Atlantic mackerel (*Scomber scombrus*)	Fillet	Individual	2016	2017	PFOA	150	1.3	100			
Atlantic mackerel (*Scomber scombrus*)	Fillet	Individual	2016	2017	PFNA	150	0.9	100			
Atlantic mackerel (*Scomber scombrus*)	Fillet	Individual	2016	2017	PFHxS	150	0.8	100			
Atlantic mackerel (*Scomber scombrus*)	Fillet	Individual	2016	2017	Sum 4 PFAS (LB)	150	3.8	99	0	1.2	
Atlantic wolffish (*Anarhichas lupus*)	Fillet	Composite (6) and Individual (12)	2014, 2017	2015, 2017-2018	PFOS	18	1.8	100			
Atlantic wolffish (*Anarhichas lupus*)	Fillet	Composite (6) and Individual (12)	2014, 2018	2015, 2017-2019	PFOA	18	2.4	100			
Atlantic wolffish (*Anarhichas lupus*)	Fillet	Composite (6) and Individual (12)	2014, 2019	2015, 2017-2020	PFNA	18	1.8	100			
Atlantic wolffish (*Anarhichas lupus*)	Fillet	Composite (6) and Individual (12)	2014, 2020	2015, 2017-2021	PFHxS	18	1.8	100			
Atlantic wolffish (*Anarhichas lupus*)	Fillet	Composite (6) and Individual (12)	2014, 2021	2015, 2017-2022	Sum 4 PFAS (LB)	18	7.8	100			
Atlantic wolffish (*Anarhichas lupus*)	Fillet	Individual	2017	2018	PFOS	12	0.2	100			

Name of Species English (Latin)	Tissue	Individual or composite sample	Sampling year(s)	Year of analysis	Compound	No of samples analysed	LOQ	% <LOQ	Min	Max	Mean
Atlantic wolffish (*Anarhichas lupus*)	Fillet	Individual	2017	2018	PFOA	12	4	100			
Atlantic wolffish (*Anarhichas lupus*)	Fillet	Individual	2017	2018	PFNA	12	0.2	83	<0.2	0.3	
Atlantic wolffish (*Anarhichas lupus*)	Fillet	Individual	2017	2018	PFHxS	12	1	100			
Atlantic wolffish (*Anarhichas lupus)*	Fillet	Individual	2017	2018	Sum 4 PFAS (LB)	12	5.4	83	0	0.3	
Atlantic wolffish (*Anarhichas lupus*)	Fillet	Individual	2019-2020	2019-2020	PFOS	9	0.2	78	<0.2	0.4	
Atlantic wolffish (*Anarhichas lupus*)	Fillet	Individual	2019-2020	2019-2020	PFOA	9	0.6	100			
Atlantic wolffish (*Anarhichas lupus*)	Fillet	Individual	2019-2020	2019-2020	PFNA	9	0.2	100			
Atlantic wolffish (*Anarhichas lupus*)	Fillet	Individual	2019-2020	2019-2020	PFHxS	9	1	100			
Atlantic wolffish (*Anarhichas lupus)*	Fillet	Individual	2019-2020	2019-2020	Sum 4 PFAS (LB)	9	2	78	0	0.4	
Beaked redfish (*Sebastes mentella*)	Fillet	Individual	2017-2018	2018	PFOS	9	0.2	100			
Beaked redfish (*Sebastes mentella*)	Fillet	Individual	2017-2018	2018	PFOA	9	4	100			
Beaked redfish (*Sebastes mentella*)	Fillet	Individual	2017-2018	2018	PFNA	9	0.2	100			
Beaked redfish (*Sebastes mentella*)	Fillet	Individual	2017-2018	2018	PFHxS	9	1	100			
Beaked redfish (*Sebastes mentella*)	Fillet	Individual	2017-2018	2018	Sum 4 PFAS (LB)	9	5.4	100			
Beaked redfish (*Sebastes mentella*)	Fillet	Individual	2018	2018-2019	PFOS	8	0.2	63	<0.2	0.3	

Name of Species English (Latin)	Tissue	Individual or composite sample	Sampling year(s)	Year of analysis	Compound	No of samples analysed	LOQ	% <LOQ	Min	Max	Mean
Beaked redfish (*Sebastes mentella*)	Fillet	Individual	2018	2018-2019	PFOA	8	0.6	100			
Beaked redfish (*Sebastes mentella*)	Fillet	Individual	2018	2018-2019	PFNA	8	0.2	88	<0.2	2	
Beaked redfish (*Sebastes mentella*)	Fillet	Individual	2018	2018-2019	PFHxS	8	1	100			
Beaked redfish (*Sebastes mentella*)	Fillet	Individual	2018	2018-2019	Sum 4 PFAS (LB)	8	2	63	0	0.5	
Beaked redfish (*Sebastes mentella*)	Fillet	Individual	2014, 2016-2018	2015-2019	PFOS	5	1.8	100			
Beaked redfish (*Sebastes mentella*)	Fillet	Individual	2014, 2016-2018	2015-2019	PFOA	5	2.4	100			
Beaked redfish (*Sebastes mentella*)	Fillet	Individual	2014, 2016-2018	2015-2019	PFNA	5	1.8	100			
Beaked redfish (*Sebastes mentella*)	Fillet	Individual	2014, 2016-2018	2015-2019	PFHxS	5	1.8	100			
Beaked redfish (*Sebastes mentella*)	Fillet	Individual	2014, 2016-2018	2015-2019	Sum 4 PFAS (LB)	5	7.8	100			
Beaked redfish (*Sebastes mentella*)	Fillet	Individual	2018	2023	PFOS	20		50	0.063	0.2	0.12
Beaked redfish (*Sebastes mentella*)	Fillet	Individual	2018	2023	PFOA	20		75	<0.022	0.055	
Beaked redfish (*Sebastes mentella*)	Fillet	Individual	2018	2023	PFNA	20		5	<0.022	0.16	0.095
Beaked redfish (*Sebastes mentella*)	Fillet	Individual	2018	2023	PFHxS	20		100	<0.021	<0.028	
Beaked redfish (*Sebastes mentella*)	Fillet	Individual	2018	2023	Sum 4 PFAS (LB)	20			0	0.38	0.165

Name of Species English (Latin)	Tissue	Individual or composite sample	Sampling year(s)	Year of analysis	Compound	No of samples analysed	LOQ	% <LOQ	Min	Max	Mean
Blue ling (*Molva dipterygia*)	Fillet	Individual (4) and Composite (5)	2013-2015	2015	PFOS	9	1.8	100			
Blue ling (*Molva dipterygia*)	Fillet	Individual (4) and Composite (5)	2013-2015	2015	PFOA	9	2.4	100			
Blue ling (*Molva dipterygia*)	Fillet	Individual (4) and Composite (5)	2013-2015	2015	PFNA	9	1.8	100			
Blue ling (*Molva dipterygia*)	Fillet	Individual (4) and Composite (5)	2013-2015	2015	PFHxS	9	1.8	100			
Blue ling (*Molva dipterygia*)	Fillet	Individual (4) and Composite (5)	2013-2015	2015	Sum 4 PFAS (LB)	9	7.8	100			
Common ling (*Molva molva*)	Fillet	Individual	2008	2009	PFOS	25	1	100			
Common ling (*Molva molva*)	Fillet	Individual	2008	2009	PFOA	25	1	100			
Common ling (*Molva molva*)	Fillet	Individual	2008	2009	PFNA	25	1	100			
Common ling (*Molva molva*)	Fillet	Individual	2008	2009	PFHxS	0		100			
Common ling (*Molva molva*)	Fillet	Individual	2008	2009	Sum 4 PFAS (LB)	0		100			
Common ling (*Molva molva*)	Fillet	Individual	2008	2010	PFOS	6	0.6	100			
Common ling (*Molva molva*)	Fillet	Individual	2008	2010	PFOA	6	0.6	100			
Common ling (*Molva molva*)	Fillet	Individual	2008	2010	PFNA	6	0.6	100			
Common ling (*Molva molva*)	Fillet	Individual	2008	2010	PFHxS	0					
Common ling (*Molva molva*)	Fillet	Individual	2008	2010	Sum 4 PFAS (LB)	0					
Common ling (*Molva molva)*	Fillet	Individual	2013	2013	PFOS	3	0.6	100			

Name of Species English (Latin)	Tissue	Individual or composite sample	Sampling year(s)	Year of analysis	Compound	No of samples analysed	LOQ	% <LOQ	Min	Max	Mean
Common ling (Molva molva)	Fillet	Individual	2013	2013	PFOA	3	0.6	100			
Common ling (*Molva molva*)	Fillet	Individual	2013	2013	PFNA	3	0.6	100			
Common ling (*Molva molva*)	Fillet	Individual	2013	2013	PFHxS	3	0.6	100			
Common ling (*Molva molva*)	Fillet	Individual	2013	2013	Sum 4 PFAS (LB)	3	2.4	100			
Common ling (*Molva molva*)	Fillet	Individual	2013-2016	2013-2016	PFOS	40	1.8	100			
Common ling (*Molva molva*)	Fillet	Individual	2013-2016	2013-2016	PFOA	40	2.4	100			
Common ling (*Molva molva*)	Fillet	Individual	2013-2016	2013-2016	PFNA	40	1.8	100			
Common ling (*Molva molva*)	Fillet	Individual	2013-2016	2013-2016	PFHxS	40	1.8	100			
Common ling (*Molva molva*)	Fillet	Individual	2013-2016	2013-2016	Sum 4 PFAS (LB)	40	7.8	100			
Edible crab (*Cancer pagurus*)	Claw meat (boiled)	Individual	2011	2011-2012	PFOS	5	0.3	40	<0.3	1.1	0.54
Edible crab (*Cancer pagurus*)	Claw meat (boiled)	Individual	2011	2011-2012	PFOA	5	0.3	60	<0.3	0.7	
Edible crab (*Cancer pagurus*)	Claw meat (boiled)	Individual	2011	2011-2012	PFNA	5	0.3	60	<0.3	0.4	
Edible crab (*Cancer pagurus*)	Claw meat (boiled)	Individual	2011	2011-2012	PFHxS	5	0.3	80	<0.3	0.8	
Edible crab (*Cancer pagurus)*	Claw meat (boiled)	Individual	2011	2011-2012	Sum 4 PFAS (LB)	5	1.2	40	0	1.7	1
Edible crab (*Cancer pagurus*)	Claw meat (boiled)	Individual	2014	2015	PFOS	20	1.8	100			
Edible crab (*Cancer pagurus)*	Claw meat (boiled)	Individual	2014	2015	PFOA	20	2.4	100			
Edible crab (*Cancer pagurus*)	Claw meat (boiled)	Individual	2014	2015	PFNA	20	1.8	100			

Name of Species English (Latin)	Tissue	Individual or composite sample	Sampling year(s)	Year of analysis	Compound	No of samples analysed	LOQ	% <LOQ	Min	Max	Mean
Edible crab (*Cancer pagurus*)	Claw meat (boiled)	Individual	2014	2015	PFHxS	20	1.8	100			
Edible crab (*Cancer pagurus*)	Claw meat (boiled)	Individual	2014	2015	Sum 4 PFAS (LB)	20	7.8	100			
Edible crab (*Cancer pagurus*)	Brown meat (boiled)	Individual	2011	2011-2012	PFOS	5	0.3	0	0.6	5.3	2.1
Edible crab (*Cancer pagurus*)	Brown meat (boiled)	Individual	2011	2011-2012	PFOA	5	0.3	40	<0.3	2	1
Edible crab (*Cancer pagurus*)	Brown meat (boiled)	Individual	2011	2011-2012	PFNA	5	0.3	40	<0.3	1.4	0.64
Edible crab (*Cancer pagurus*)	Brown meat (boiled)	Individual	2011	2011-2012	PFHxS	5	0.3	60	<0.3	4.9	
Edible crab (*Cancer pagurus*)	Brown meat (boiled)	Individual	2011	2011-2012	Sum 4 PFAS (LB)	5	1.2	0	0.8	13.6	4.5
Edible crab (*Cancer pagurus*)	Brown meat (boiled)	Individual	2014	2015	PFOS	12	1.8	83	<1.8	2	
Edible crab (*Cancer pagurus*)	Brown meat (boiled)	Individual	2014	2015	PFOA	12	2.4	100			
Edible crab (*Cancer pagurus*)	Brown meat (boiled)	Individual	2014	2015	PFNA	12	1.8	100			
Edible crab (*Cancer pagurus*)	Brown meat (boiled)	Individual	2014	2015	PFHxS	12	1.8	100			
Edible crab (*Cancer pagurus*)	Brown meat (boiled)	Individual	2014	2015	Sum 4 PFAS (LB)	12	7.8	83	0	2	
Edible crab (*Cancer pagurus*)	Brown meat (boiled)	Individual	2014	2015	PFOS	8	1.8	88	<1.8	3	
Edible crab (*Cancer pagurus*)	Brown meat (boiled)	Individual	2014	2015	PFOA	8	1.8	100			
Edible crab (*Cancer pagurus*)	Brown meat (boiled)	Individual	2014	2015	PFNA	8	1.2	100			

Name of Species English (Latin)	Tissue	Individual or composite sample	Sampling year(s)	Year of analysis	Compound	No of samples analysed	LOQ	% <LOQ	Min	Max	Mean
Edible crab (*Cancer pagurus*)	Brown meat (boiled)	Individual	2014	2015	PFHxS	8	1.8	100			
Edible crab (*Cancer pagurus*)	Brown meat (boiled)	Individual	2014	2015	Sum 4 PFAS (LB)	8	6.6	88	0	3	
European hake (*Merluccius merluccius*)	Fillet	Individual	2014	2015	PFOS	3	1.8	100			
European hake (*Merluccius merluccius*)	Fillet	Individual	2014	2015	PFOA	3	2.4	100			
European hake (*Merluccius merluccius*)	Fillet	Individual	2014	2015	PFNA	3	1.8	100			
European hake (*Merluccius merluccius*)	Fillet	Individual	2014	2015	PFHxS	3	1.8	100			
European hake (*Merluccius merluccius*)	Fillet	Individual	2014	2015	Sum 4 PFAS (LB)	3	7.8	100			
European hake (*Merluccius merluccius*)	Fillet	Individual	2018	2018	PFOS	38	0.2	100			
European hake (*Merluccius merluccius*)	Fillet	Individual	2018	2018	PFOA	38	4	100			
European hake (*Merluccius merluccius*)	Fillet	Individual	2018	2018	PFNA	38	0.2	100			
European hake (*Merluccius merluccius*)	Fillet	Individual	2018	2018	PFHxS	38	1	100			
European hake (*Merluccius merluccius*)	Fillet	Individual	2018	2018	Sum 4 PFAS (LB)	38	5.4	100			
European hake (*Merluccius merluccius*)	Fillet	Individual	2018-2020	2018-2021	PFOS	52	0.2	100			
European hake (*Merluccius merluccius*)	Fillet	Individual	2018-2020	2018-2021	PFOA	52	0.6	100			
European hake (*Merluccius merluccius*)	Fillet	Individual	2018-2020	2018-2021	PFNA	52	0.2	100			

Name of Species English (Latin)	Tissue	Individual or composite sample	Sampling year(s)	Year of analysis	Compound	No of samples analysed	LOQ	% <LOQ	Min	Max	Mean
European hake (*Merluccius merluccius*)	Fillet	Individual	2018-2020	2018-2021	PFHxS	52	1	100			
European hake (*Merluccius merluccius*)	Fillet	Individual	2018-2020	2018-2021	Sum 4 PFAS (LB)	52	2	100			
European lobster (*Homarus gammarus*)	Hepato-pancreas	Composite	2017	2018	PFOS	5	3.0	100			
European lobster (*Homarus gammarus*)	Hepato-pancreas	Composite	2017	2018	PFOA	5	7.0	100			
European lobster (*Homarus gammarus*)	Hepato-pancreas	Composite	2017	2018	PFNA	5	0.5	60	<0.5	0.6	0.52
European lobster (*Homarus gammarus*)	Hepato-pancreas	Composite	2017	2018	PFHxS	5	3.0	100			
European lobster (*Homarus gammarus*)	Hepato-pancreas	Composite	2017	2018	Sum 4 PFAS (LB)	5	13.5	60	0	0.6	0.2
European plaice (*Pleuronectes platessa*)	Fillet	Individual	2007	2008	PFOS	10	1	70	<1.0	2.2	
European plaice (*Pleuronectes platessa*)	Fillet	Individual	2007	2008	PFOA	10	1	100			
European plaice (*Pleuronectes platessa*)	Fillet	Individual	2007	2008	PFNA	10	1	100			
European plaice (*Pleuronectes platessa*)	Fillet	Individual	2007	2008	PFHxS	0					
European plaice (*Pleuronectes platessa*)	Fillet	Individual	2007	2008	Sum 4 PFAS (LB)	0		70	0	2.2	
European plaice (*Pleuronectes platessa*)	Fillet	Composite (41) and Individual (98)	2014-2017	2016-2018	PFOS	139	1.8	88	<1.8	3	
European plaice (*Pleuronectes platessa*)	Fillet	Composite (41) and Individual (98)	2014-2017	2016-2018	PFOA	139	2.4	100			

Name of Species English (Latin)	Tissue	Individual or composite sample	Sampling year(s)	Year of analysis	Compound	No of samples analysed	LOQ	% <LOQ	Min	Max	Mean
European plaice (*Pleuronectes platessa*)	Fillet	Composite (41) and Individual (98)	2014-2017	2016-2018	PFNA	139	1.8	100			
European plaice (*Pleuronectes platessa*)	Fillet	Composite (41) and Individual (98)	2014-2017	2016-2018	PFHxS	139	1.8	100			
European plaice (*Pleuronectes platessa)*	Fillet	Composite (41) and Individual (98)	2014-2017	2016-2018	Sum 4 PFAS (LB)	139	7.8	88	0	3	
European plaice (*Pleuronectes platessa*)	Fillet	Composite (4) and Individual (13)	2016-2018	2018-2019	PFOS	17	0.2	11	<0.2	1	0.49
European plaice (*Pleuronectes platessa*)	Fillet	Composite (4) and Individual (13)	2016-2018	2018-2019	PFOA	17	0.6	100			
European plaice (*Pleuronectes platessa*)	Fillet	Composite (4) and Individual (13)	2016-2018	2018-2019	PFNA	17	0.2	71	<0.2	0.3	
European plaice (*Pleuronectes platessa*)	Fillet	Composite (4) and Individual (13)	2016-2018	2018-2019	PFHxS	17	1	100			
European plaice (*Pleuronectes platessa*)	Fillet	Composite (4) and Individual (13)	2016-2018	2018-2019	Sum 4 PFAS (LB)	17	2	11	0	1.3	0.54
European plaice (*Pleuronectes platessa*)	Fillet	Individual	2017	2018	PFOS	11	0.2	18	<0.2	0.9	0.41
European plaice *(Pleuronectes platessa*)	Fillet	Individual	2017	2018	PFOA	11	4	100			
European plaice (*Pleuronectes platessa*)	Fillet	Individual	2017	2018	PFNA	11	0.2	81	<0.2	0.2	
European plaice (*Pleuronectes platessa)*	Fillet	Individual	2017	2018	PFHxS	11	1	100			
European plaice (*Pleuronectes platessa*)	Fillet	Individual	2017	2018	Sum 4 PFAS (LB)	11	5.4	18	0	0.9	0.41

Name of Species English (Latin)	Tissue	Individual or composite sample	Sampling year(s)	Year of analysis	Compound	No of samples analysed	LOQ	% <LOQ	Min	Max	Mean
European plaice (*Pleuronectes platessa*)	Fillet	Individual	2017	2023	PFOS	30		0	0.023	5.6	1.4
European plaice (*Pleuronectes platessa*)	Fillet	Individual	2017	2023	PFOA	30		6.7	<0.0019	0.069	0.012
European plaice (*Pleuronectes platessa*)	Fillet	Individual	2017	2023	PFNA	30		0	0.027	3.5	0.26
European plaice (*Pleuronectes platessa*)	Fillet	Individual	2017	2023	PFHxS	30		33	<0.0017	0.19	0.026
European plaice (*Pleuronectes platessa*)	Fillet	Individual	2017	2023	Sum 4 PFAS (LB)	30			0.11	9.1	1.7
European sprat (*Sprattus sprattus*)	Whole fish	Individual (29) and Composite (3)	2010	2010-2011	PFOS	32	0.3	9.4	<0.3	2.2	0.76
European sprat (Sprattus sprattus)	Whole fish	Individual (29) and Composite (3)	2010	2010-2011	PFOA	32	0.3	94	<0.3	0.3	
European sprat (*Sprattus sprattus*)	Whole fish	Individual (29) and Composite (3)	2010	2010-2011	PFNA	32	0.3	100			
European sprat (*Sprattus sprattus*)	Whole fish	Individual (29) and Composite (3)	2010	2010-2011	PFHxS	32	0.3	100			
European sprat (*Sprattus sprattus*)	Whole fish	Individual (29) and Composite (3)	2010	2010-2011	Sum 4 PFAS (LB)	32	1.2	9.4	0	2.2	0.82
European sprat (*Sprattus sprattus*)	Whole fish	Composite	2017	2018	PFOS	9	3.0	100			
European sprat (*Sprattus sprattus*)	Whole fish	Composite	2017	2018	PFOA	9	7.0	100			
European sprat (*Sprattus sprattus*)	Whole fish	Composite	2017	2018	PFNA	9	0.5	100			

Name of Species English (Latin)	Tissue	Individual or composite sample	Sampling year(s)	Year of analysis	Compound	No of samples analysed	LOQ	% <LOQ	Min	Max	Mean
European sprat (*Sprattus sprattus*)	Whole fish	Composite	2017	2018	PFHxS	9	3.0	100			
European sprat (*Sprattus sprattus*)	Whole fish	Composite	2017	2018	Sum 4 PFAS (LB)	9	13.5	100			
European sprat (*Sprattus sprattus*)	Whole fish	Composite	2017	2018	PFOS	6	0.8	83	<0.8	1.2	
European sprat (*Sprattus sprattus*)	Whole fish	Composite	2017	2018	PFOA	6	1.3	100			
European sprat (*Sprattus sprattus*)	Whole fish	Composite	2017	2018	PFNA	6	0.9	100			
European sprat (*Sprattus sprattus*)	Whole fish	Composite	2017	2018	PFHxS	6	0.8	100			
European sprat (*Sprattus sprattus*)	Whole fish	Composite	2017	2018	Sum 4 PFAS (LB)	6	3.8	83	0	1.2	
Golden redfish (*Sebastes norvegicus*)	Fillet	Individual	2014, 2016-2017	2015, 2017	PFOS	9	1.8	100			
Golden redfish (*Sebastes norvegicus*)	Fillet	Individual	2014, 2016-2017	2015, 2017	PFOA	9	2.4	100			
Golden redfish (*Sebastes norvegicus)*	Fillet	Individual	2014, 2016-2017	2015, 2017	PFNA	9	1.8	100			
Golden redfish (*Sebastes norvegicus*)	Fillet	Individual	2014, 2016-2017	2015, 2017	PFHxS	9	1.8	100			
Golden redfish (*Sebastes norvegicus*)	Fillet	Individual	2014, 2016-2017	2015, 2017	Sum 4 PFAS (LB)	9	7.8	100			
Golden redfish (*Sebastes norvegicus*)	Fillet	Individual	2017-2018	2018	PFOS	3	0.2	100			
Golden redfish (*Sebastes norvegicus*)	Fillet	Individual	2017-2018	2018	PFOA	3	4	100			
Golden redfish (*Sebastes norvegicus*)	Fillet	Individual	2017-2018	2018	PFNA	3	0.2	100			

Name of Species English (Latin)	Tissue	Individual or composite sample	Sampling year(s)	Year of analysis	Compound	No of samples analysed	LOQ	% <LOQ	Min	Max	Mean
Golden redfish (*Sebastes norvegicus*)	Fillet	Individual	2017-2018	2018	PFHxS	3	1	100			
Golden redfish (*Sebastes norvegicus*)	Fillet	Individual	2017-2018	2018	Sum 4 PFAS (LB)	3	5.4	100			
Golden redfish (*Sebastes norvegicus*)	Fillet	Individual	2018	2018-2019	PFOS	2	0.2	100			
Golden redfish (*Sebastes norvegicus*)	Fillet	Individual	2018	2018-2019	PFOA	2	0.6	100			
Golden redfish (*Sebastes norvegicus*)	Fillet	Individual	2018	2018-2019	PFNA	2	0.2	100			
Golden redfish (*Sebastes norvegicus*)	Fillet	Individual	2018	2018-2019	PFHxS	2	1	100			
Golden redfish (*Sebastes norvegicus*)	Fillet	Individual	2018	2018-2019	Sum 4 PFAS (LB)	2	2	100			
Greater argentine (*Argentina silus*)	Fillet	Individual	2019-2020	2019-2021	PFOS	8	0.2	100			
Greater argentine (*Argentina silus*)	Fillet	Individual	2019-2020	2019-2021	PFOA	8	0.6	100			
Greater argentine (*Argentina silus*)	Fillet	Individual	2019-2020	2019-2021	PFNA	8	0.2	100			
Greater argentine (*Argentina silus*)	Fillet	Individual	2019-2020	2019-2021	PFHxS	8	1	100			
Greater argentine (*Argentina silus*)	Fillet	Individual	2019-2020	2019-2021	Sum 4 PFAS (LB)	8	2	100			
Greater argentine (*Argentina silus*)	Whole fish	Individual	2015	2016	PFOS	9	0.8	100			
Greater argentine (*Argentina silus*)	Whole fish	Individual	2015	2016	PFOA	9	1.3	100			
Greater argentine (*Argentina silus*)	Whole fish	Individual	2015	2016	PFNA	9	0.9	100			

Name of Species English (Latin)	Tissue	Individual or composite sample	Sampling year(s)	Year of analysis	Compound	No of samples analysed	LOQ	% <LOQ	Min	Max	Mean
Greater argentine (*Argentina silus*)	Whole fish	Individual	2015	2016	PFHxS	9	0.8	100			
Greater argentine (*Argentina silus*)	Whole fish	Individual	2015	2016	Sum 4 PFAS (LB)	9	3.8	100			
Greater forkbeard (*Physis blennoides*)	Fillet	Individual	2013	2013	PFOS	2	0.3	100			
Greater forkbeard (*Physis blennoides*)	Fillet	Individual	2013	2013	PFOA	2	0.3	100			
Greater forkbeard (*Physis blennoides*)	Fillet	Individual	2013	2013	PFNA	2	0.3	100			
Greater forkbeard (*Physis blennoides*)	Fillet	Individual	2013	2013	PFHxS	2	0.3	100			
Greater forkbeard (*Physis blennoides*)	Fillet	Individual	2013	2013	Sum 4 PFAS (LB)	2	1.2	100			
Greater forkbeard (*Physis blennoides*)	Fillet	Individual	2014-2015	2015-2016	PFOS	9	1.8	100			
Greater forkbeard (*Physis blennoides*)	Fillet	Individual	2014-2015	2015-2016	PFOA	9	2.4	100			
Greater forkbeard (*Physis blennoides*)	Fillet	Individual	2014-2015	2015-2016	PFNA	9	1.8	100			
Greater forkbeard (*Physis blennoides*)	Fillet	Individual	2014-2015	2015-2016	PFHxS	9	1.8	100			
Greater forkbeard (*Physis blennoides*)	Fillet	Individual	2014-2015	2015-2016	Sum 4 PFAS (LB)	9	7.8	100			
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Individual	2006-2008	2010	PFOS	100	0.3	20	<0.3	1.1	0.46
Greenland halibut (*Reinhardtius hippoglossoides)*	Fillet	Individual	2006-2008	2010	PFOA	100	0.3	94	<0.3	0.8	

Name of Species English (Latin)	Tissue	Individual or composite sample	Sampling year(s)	Year of analysis	Compound	No of samples analysed	LOQ	% <LOQ	Min	Max	Mean
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Individual	2006-2008	2010	PFNA	100	0.3	100			
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Individual	2006-2008	2010	PFHxS	100	0.3	100			
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Individual	2006-2008	2010	Sum 4 PFAS (LB)	100	1.2	19	0	1.2	0.42
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Individual (19) and Composite (2)	2016-2017	2017-2018	PFOS	21	0.8	100			
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Individual (19) and Composite (2)	2016-2017	2017-2018	PFOA	21	1.3	100			
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Individual (19) and Composite (2)	2016-2017	2017-2018	PFNA	21	0.9	100			
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Individual (19) and Composite (2)	2016-2017	2017-2018	PFHxS	21	0.8	100			
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Individual (19) and Composite (2)	2016-2017	2017-2018	Sum 4 PFAS (LB)	21		100			
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Individual	2017	2018	PFOS	11	0.2	36	<0.2	0.5	0.28
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Individual	2017	2018	PFOA	11	4.0	100			
Greenland halibut (*Reinhardtius* hippoglossoides)	Fillet	Individual	2017	2018	PFNA	11	0.2	100			

Name of Species English (Latin)	Tissue	Individual or composite sample	Sampling year(s)	Year of analysis	Compound	No of samples analysed	LOQ	% <LOQ	Min	Max	Mean
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Individual	2017	2018	PFHxS	11	1.0	100			
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Individual	2017	2018	Sum 4 PFAS (LB)	11		36	0	0.5	0.28
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Individual	2022-2023	2023	PFOS	20		0	0.08	0.35	0.21
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Individual	2022-2023	2023	PFOA	20		100	<0.0019	<0.0029	
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Individual	2022-2023	2023	PFNA	20		0	0.011	0.18	0.055
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Individual	2022-2023	2023	PFHxS	20		20	<0.0023	0.013	0.004
Greenland halibut (*Reinhardtius hippoglossoides*)	Fillet	Individual	2022-2023	2023	Sum 4 PFAS (LB)	20		0	0.091	0.42	0.27
Haddock (*Melanogrammus aeglefinus*)	Fillet	Composite	2013	2013	PFOS	2	0.6	100			
Haddock (*Melanogrammus aeglefinus*)	Fillet	Composite	2013	2013	PFOA	2	0.6	100			
Haddock (*Melanogrammus aeglefinus*)	Fillet	Composite	2013	2013	PFNA	2	0.6	100			
Haddock (*Melanogrammus aeglefinus*)	Fillet	Composite	2013	2013	PFHxS	2	0.6	100			
Haddock (*Melanogrammus aeglefinus*)	Fillet	Composite	2013	2013	Sum 4 PFAS (LB)	2	2.4	100			
Haddock (*Melanogrammus aeglefinus*)	Fillet	Composite (89) and Individual (1)	2014-2017	2015-2018	PFOS	90	1.8	99	<1.8	3.0	

Name of Species English (Latin)	Tissue	Individual or composite sample	Sampling year(s)	Year of analysis	Compound	No of samples analysed	LOQ	% <LOQ	Min	Max	Mean
Haddock (*Melanogrammus aeglefinus*)	Fillet	Composite (89) and Individual (1)	2014-2017	2015-2018	PFOA	90	2.4	100			
Haddock (*Melanogrammus aeglefinus*)	Fillet	Composite (89) and Individual (1)	2014-2017	2015-2018	PFNA	90	1.8	99	<1.8	2.0	
Haddock (*Melanogrammus aeglefinus*)	Fillet	Composite (89) and Individual (1)	2014-2017	2015-2018	PFHxS	90	1.8	100			
Haddock (*Melanogrammus aeglefinus*)	Fillet	Composite (89) and Individual (1)	2014-2017	2015-2018	Sum 4 PFAS (LB)	90	7.8	99	0	5.0	
Haddock (*Melanogrammus aeglefinus*)	Fillet	Composite	2018-2019	2018-2019	PFOS	2	0.2	100			
Haddock (*Melanog*rammus aeglefinus)	Fillet	Composite	2018-2019	2018-2019	PFOA	2	4.0/0.6	100			
Haddock (*Melanogrammus aeglefinus)*	Fillet	Composite	2018-2019	2018-2019	PFNA	2	0.2	50	<0.2	0.3	
Haddock (*Melanogrammus aeglefinus*)	Fillet	Composite	2018-2019	2018-2019	PFHxS	2	1.0	100			
Haddock (*Melanogrammus aeglefinus*)	Fillet	Composite	2018-2019	2018-2019	Sum 4 PFAS (LB)	2	5.4/2.0	50	0.0	0.3	0.15
Haddock (*Melanogrammus aeglefinus*)	Fillet	Individual	2016, 2018-2019	2023	PFOS	30		0	0.060	0.30	0.176
Haddock (*Melanogrammus aeglefinus*)	Fillet	Individual	2016, 2018-2020	2023	PFOA	30		0	0.003	0.096	0.025
Haddock (*Melanogrammus aeglefinus*)	Fillet	Individual	2016, 2018-2021	2023	PFNA	30		0	0.0099	0.48	0.155
Haddock (*Melanogrammus aeglefinus*)	Fillet	Individual	2016, 2018-2022	2023	PFHxS	30		67	<0.0021	0.054	0.008

Name of Species English (Latin)	Tissue	Individual or composite sample	Sampling year(s)	Year of analysis	Compound	No of samples analysed	LOQ	% <LOQ	Min	Max	Mean
Haddock (*Melanogrammus aeglefinus*)	Fillet	Individual	2016, 2018-2023	2023	Sum 4 PFAS (LB)	30			0.078	0.88	0.361
Northern shrimp (*Pandalus borealis*)	Whole shrimp (boiled)	Individual	2008-2009	2009	PFOS	4	1	0	1.3	4.1	2.2
Northern shrimp (*Pandalus borealis*)	Whole shrimp (boiled)	Individual	2008-2009	2009	PFOA	4	1	100			
Northern shrimp (*Pandalus borealis*)	Whole shrimp (boiled)	Individual	2008-2009	2009	PFNA	4	1	100			
Northern shrimp (*Pandalus borealis*)	Whole shrimp (boiled)	Individual	2008-2009	2009	PFHxS	0					
Northern shrimp (*Pandalus borealis*)	Whole shrimp (boiled)	Individual	2008-2009	2009	Sum 4 PFAS (LB)	0		0	1.3	4.1	2.2
Northern shrimp (*Pandalus borealis*)	Whole shrimp (boiled)	Individual	2012-2013	2012-2013	PFOS	11	0.6	0	0.7	2.3	1.5
Northern shrimp (*Pandalus borealis*)	Whole shrimp (boiled)	Individual	2012-2013	2012-2013	PFOA	11	0.6	100			
Northern shrimp (*Pandalus borealis*)	Whole shrimp (boiled)	Individual	2012-2013	2012-2013	PFNA	11	0.6	100			
Northern shrimp (*Pandalus borealis*)	Whole shrimp (boiled)	Individual	2012-2013	2012-2013	PFHxS	11	0.6	100			
Northern shrimp (*Pandalus borealis*)	Whole shrimp (boiled)	Individual	2012-2013	2012-2013	Sum 4 PFAS (LB)	11	2.4	0	0.7	2.3	1.5
Northern shrimp (*Pandalus borealis*)	Whole shrimp (boiled)	Individual	2013-2015	2014-2018	PFOS	29	1.8	79	<1.8	4	
Northern shrimp (*Pandalus borealis*)	Whole shrimp (boiled)	Individual	2013-2015	2014-2018	PFOA	29	2.4	100			
Northern shrimp (*Pandalus borealis*)	Whole shrimp (boiled)	Individual	2013-2015	2014-2018	PFNA	29	1.8	100			
Northern shrimp (*Pandalus borealis*)	Whole shrimp (boiled)	Individual	2013-2015	2014-2018	PFHxS	29	1.8	100			

Name of Species English (Latin)	Tissue	Individual or composite sample	Sampling year(s)	Year of analysis	Compound	No of samples analysed	LOQ	% <LOQ	Min	Max	Mean
Northern shrimp (*Pandalus borealis*)	Whole shrimp (boiled)	Individual	2013-2015	2014-2018	Sum 4 PFAS (LB)	29	7.8	79	0	4	
Northern shrimp (*Pandalus borealis*)	Whole shrimp (boiled)	Individual	2018	2018	PFOS	6	0.2	0	0.4	0.8	0.62
Northern shrimp (*Pandalus borealis*)	Whole shrimp (boiled)	Individual	2018	2018	PFOA	6	4	100			
Northern shrimp (*Pandalus borealis*)	Whole shrimp (boiled)	Individual	2018	2018	PFNA	6	0.2	71	<0.2	0.3	
Northern shrimp (*Pandalus borealis*)	Whole shrimp (boiled)	Individual	2018	2018	PFHxS	6	1	100			
Northern shrimp (*Pandalus borealis*)	Whole shrimp (boiled)	Individual	2018	2018	Sum 4 PFAS (LB)	6	5.4	0	0.4	1	0.77
Northern shrimp (*Pandalus borealis*)	Whole shrimp (boiled)	Individual	2016-2019	2018-2020	PFOS	19	0.2	0	0.2	5	1.2
Northern shrimp (*Pandalus borealis*)	Whole shrimp (boiled)	Individual	2016-2019	2018-2020	PFOA	19	0.6	100			
Northern shrimp (*Pandalus borealis*)	Whole shrimp (boiled)	Individual	2016-2019	2018-2020	PFNA	19	0.2	47	<0.2	1.1	0.31
Northern shrimp (*Pandalus borealis*)	Whole shrimp (boiled)	Individual	2016-2019	2018-2020	PFHxS	19	1	58	<1	6	
Northern shrimp (*Pandalus borealis*)	Whole shrimp (boiled)	Individual	2016-2019	2018-2020	Sum 4 PFAS (LB)	19	2	0	0.2	9.7	2.8
Northern shrimp (*Pandalus borealis*)	Whole shrimp (boiled)	Individual	2020-2021	2020-2021	PFOS	13	1	54	<1.0	3.3	
Northern shrimp (*Pandalus borealis*)	Whole shrimp (boiled)	Individual	2020-2021	2020-2021	PFOA	13	0.7	100			
Northern shrimp (*Pandalus borealis*)	Whole shrimp (boiled)	Individual	2020-2021	2020-2021	PFNA	13	0.5	92	<0.5	0.6	
Northern shrimp (*Pandalus borealis*)	Whole shrimp (boiled)	Individual	2020-2021	2020-2021	PFHxS	13	1	69	<1	2.5	

Name of Species English (Latin)	Tissue	Individual or composite sample	Sampling year(s)	Year of analysis	Compound	No of samples analysed	LOQ	% <LOQ	Min	Max	Mean
Northern shrimp (*Pandalus borealis*)	Whole shrimp (boiled)	Individual	2020-2021	2020-2021	Sum 4 PFAS (LB)	13	3.2	38	0	3.7	1.2
Northern shrimp (*Pandalus borealis*)	Peeled shrimp (boiled)	Individual	2007-2009	2009	PFOS	12	1	8	<1.0	10	3.2
Northern shrimp (*Pandalus borealis*)	Peeled shrimp (boiled)	Individual	2007-2009	2009	PFOA	12	1	92	<1.0	1.3	
Northern shrimp (*Pandalus borealis*)	Peeled shrimp (boiled)	Individual	2007-2009	2009	PFNA	12	1	85	<1.0	2.6	
Northern shrimp (*Pandalus borealis*)	Peeled shrimp (boiled)	Individual	2007-2009	2009	PFHxS	0					
Northern shrimp (*Pandalus borealis*)	Peeled shrimp (boiled)	Individual	2007-2009	2009	Sum 4 PFAS (LB)	12		8	0	14	3.6
Northern shrimp (*Pandalus borealis*)	Peeled shrimp (boiled)	Individual	2012-2013	2012-2013	PFOS	11	0.6	9	<0.6	1.8	1.1
Northern shrimp (*Pandalus borealis*)	Peeled shrimp (boiled)	Individual	2012-2013	2012-2013	PFOA	11	0.6	100			
Northern shrimp (*Pandalus borealis*)	Peeled shrimp (boiled)	Individual	2012-2013	2012-2013	PFNA	11	0.6	100			
Northern shrimp (*Pandalus borealis*)	Peeled shrimp (boiled)	Individual	2012-2013	2012-2013	PFHxS	11	0.6	100			
Northern shrimp (*Pandalus borealis*)	Peeled shrimp (boiled)	Individual	2012-2013	2012-2013	Sum 4 PFAS (LB)	11	2.4	9	0	1.8	1.1
Northern shrimp (*Pandalus borealis*)	Peeled shrimp (boiled)	Individual	2013-2017	2014-2018	PFOS	30	1.8	80	<1.8	3.7	
Northern shrimp (*Pandalus borealis*)	Peeled shrimp (boiled)	Individual	2013-2017	2014-2018	PFOA	30	2.4	100			
Northern shrimp (*Pandalus borealis*)	Peeled shrimp (boiled)	Individual	2013-2017	2014-2018	PFNA	30	1.8	100			
Northern shrimp (*Pandalus borealis*)	Peeled shrimp (boiled)	Individual	2013-2017	2014-2018	PFHxS	30	1.8	100			

Name of Species English (Latin)	Tissue	Individual or composite sample	Sampling year(s)	Year of analysis	Compound	No of samples analysed	LOQ	% <LOQ	Min	Max	Mean
Northern shrimp (*Pandalus borealis*)	Peeled shrimp (boiled)	Individual	2013-2017	2014-2018	Sum 4 PFAS (LB)	30	7.8	80	0	3.7	
Northern shrimp (*Pandalus borealis*)	Whole shrimp (boiled)	Individual	2022-2023	2023	PFOS	12		0	0.79	1.5	1.1
Northern shrimp (*Pandalus borealis*)	Whole shrimp (boiled)	Individual	2022-2023	2023	PFOA	12		17	<0.002	0.18	0.079
Northern shrimp (*Pandalus borealis*)	Whole shrimp (boiled)	Individual	2022-2023	2023	PFNA	12		0	0.17	0.48	0.28
Northern shrimp (*Pandalus borealis*)	Whole shrimp (boiled)	Individual	2022-2023	2023	PFHxS	12		17	<0.0081	0.027	0.015
Northern shrimp (*Pandalus borealis*)	Whole shrimp (boiled)	Individual	2022-2023	2023	Sum 4 PFAS (LB)	12			1	1.8	1.4
Northern shrimp (*Pandalus borealis*)	Peeled shrimp (boiled)	Individual	2022-2023	2023	PFOS	6		0	0.002	0.8	0.62
Northern shrimp (*Pandalus borealis*)	Peeled shrimp (boiled)	Individual	2022-2023	2023	PFOA	6		0	0.015	0.086	0.046
Northern shrimp (*Pandalus borealis*)	Peeled shrimp (boiled)	Individual	2022-2023	2023	PFNA	6		0	0.095	0.24	0.16
Northern shrimp (*Pandalus borealis*)	Peeled shrimp (boiled)	Individual	2022-2023	2023	PFHxS	6		17	<0.0027	0.12	0.026
Northern shrimp (*Pandalus borealis*)	Peeled shrimp (boiled)	Individual	2022-2023	2023	Sum 4 PFAS (LB)	6			0.15	1.1	0.83
Pollack (*Pollachius pollachius*)	Fillet	Individual	2014, 2016-2017	2015, 2017	PFOS	18	1.8	100			
Pollack (*Pollachius pollachius*)	Fillet	Individual	2014, 2016-2017	2015, 2017	PFOA	18	2.4	100			
Pollack (*Pollachius pollachius*)	Fillet	Individual	2014, 2016-2017	2015, 2017	PFNA	18	1.8	100			
Pollack (*Pollachius pollachius*)	Fillet	Individual	2014, 2016-2017	2015, 2017	PFHxS	18	1.8	100			

Name of Species English (Latin)	Tissue	Individual or composite sample	Sampling year(s)	Year of analysis	Compound	No of samples analysed	LOQ	% <LOQ	Min	Max	Mean
Pollack (*Pollachius pollachius*)	Fillet	Individual	2014, 2016-2017	2015, 2017	Sum 4 PFAS (LB)	18	7.8	100			
Pollack (*Pollachius pollachius*)	Fillet	Individual	2018	2018	PFOS	15	0.2	80	<0.2	0.4	
Pollack (*Pollachius pollachius*)	Fillet	Individual	2018	2018	PFOA	15	4	100			
Pollack (*Pollachius pollachius*)	Fillet	Individual	2018	2018	PFNA	15	0.2	100			
Pollack (*Pollachius pollachius*)	Fillet	Individual	2018	2018	PFHxS	15	1	100			
Pollack (*Pollachius pollachius*)	Fillet	Individual	2018	2018	Sum 4 PFAS (LB)	15	5.4	80	0	0.4	
Pollack (*Pollachius pollachius*)	Fillet	Individual	2019	2019-2020	PFOS	9	0.2	67	<0.2	0.9	
Pollack (*Pollachius pollachius*)	Fillet	Individual	2019	2019-2020	PFOA	9	0.6	100			
Pollack (*Pollachius pollachius*)	Fillet	Individual	2019	2019-2020	PFNA	9	0.2	100			
Pollack (*Pollachius pollachius*)	Fillet	Individual	2019	2019-2020	PFHxS	9	1	100			
Pollack (*Pollachius pollachius*)	Fillet	Individual	2019	2019-2020	Sum 4 PFAS (LB)	9	2	67	0	0.9	
Ratfish (*Chimaera monstrosa*)	Fillet	Composite	2015	2015	PFOS	2	1.8	100			
Ratfish (*Chimaera monstrosa*)	Fillet	Composite	2015	2015	PFOA	2	2.4	100			
Ratfish (*Chimaera monstrosa*)	Fillet	Composite	2015	2015	PFNA	2	1.8	100			
Ratfish (*Chimaera monstrosa*)	Fillet	Composite	2015	2015	PFHxS	2	1.8	100			

Name of Species English (Latin)	Tissue	Individual or composite sample	Sampling year(s)	Year of analysis	Compound	No of samples analysed	LOQ	% <LOQ	Min	Max	Mean
Ratfish (*Chimaera monstrosa*)	Fillet	Composite	2015	2015	Sum 4 PFAS (LB)	2	7.8	100			
Red king crab (*Paralithodes camtchaticus*)	Claw meat	Individual	2012	2013	PFOS	45	0.6	100			
Red king crab (*Paralithodes camtchaticus*)	Claw meat	Individual	2012	2013	PFOA	45	0.6	100			
Red king crab (*Paralithodes camtchaticus*)	Claw meat	Individual	2012	2013	PFNA	45	0.6	100			
Red king crab (*Paralithodes camtchaticus*)	Claw meat	Individual	2012	2013	PFHxS	45	0.6	100			
Red king crab (*Paralithodes camtchaticus*)	Claw meat	Individual	2012	2013	Sum 4 PFAS (LB)	45	2.4	100			
Saithe (*Pollachius virens)*	Fillet	Individual	2017	2017-2018	PFOS	45	1.8	100			
Saithe (*Pollachius virens*)	Fillet	Individual	2017	2017-2018	PFOA	45	2.4	100			
Saithe (*Pollachius virens*)	Fillet	Individual	2017	2017-2018	PFNA	45	1.8	100			
Saithe (*Pollachius virens*)	Fillet	Individual	2017	2017-2018	PFHxS	45	1.8	100			
Saithe (*Pollachius virens*)	Fillet	Individual	2017	2017-2018	Sum 4 PFAS (LB)	45	7.8	100			
Saithe (*Pollachius virens*)	Fillet	Individual	2021	2021	PFOS	5	0.2	0	0.2	0.6	0.34
Saithe (*Pollachius virens*)	Fillet	Individual	2021	2021	PFOA	5	0.6	100			
Saithe (*Pollachius virens*)	Fillet	Individual	2021	2021	PFNA	5	0.2	100			
Saithe (*Pollachius virens*)	Fillet	Individual	2021	2021	PFHxS	5	1	100			

Name of Species English (Latin)	Tissue	Individual or composite sample	Sampling year(s)	Year of analysis	Compound	No of samples analysed	LOQ	% <LOQ	Min	Max	Mean
Saithe (*Pollachius virens*)	Fillet	Individual	2021	2021	Sum 4 PFAS (LB)	5	2	0	0.2	0.6	0.34
Saithe (*Pollachius virens*)	Fillet	Individual	2022-2023	2023	PFOS	30		0	0.021	0.35	0.13
Saithe (*Pollachius virens*)	Fillet	Individual	2022-2023	2023	PFOA	30		53	<0.0017	0.01	0.003
Saithe (*Pollachius virens*)	Fillet	Individual	2022-2023	2023	PFNA	30		0	<0.003	0.051	0.018
Saithe (*Pollachius virens*)	Fillet	Individual	2022-2023	2023	PFHxS	30		87	<0.0017	0.01	0.003
Saithe (*Pollachius virens*)	Fillet	Individual	2022-2023	2023	Sum 4 PFAS (LB)	30			0.026	0.38	0.15
Snow crab (*Chionoecetes opilio*)	Leg meat	Composite (4) and Individual (25)	2014, 2016	2016-2017	PFOS	29	1.8	100			
Snow crab (*Chionoecetes opilio*)	Leg meat	Composite (4) and Individual (25)	2014, 2016	2016-2017	PFOA	29	2.4	97	<2.4	2.9	
Snow crab (*Chionoecetes opilio*)	Leg meat	Composite (4) and Individual (25)	2014, 2016	2016-2017	PFNA	29	1.8	100			
Snow crab (*Chionoecetes opilio*)	Leg meat	Composite (4) and Individual (25)	2014, 2016	2016-2017	PFHxS	29	1.8	100			
Snow crab (*Chionoecetes opilio*)	Leg meat	Composite (4) and Individual (25)	2014, 2016	2016-2017	Sum 4 PFAS (LB)	29	7.8	97	0	2.9	
Spiny dogfish (*Squalus acanthias*)	Fillet	Individual	2007	2008	PFOS	5	1	100			
Spiny dogfish (*Squalus acanthias*)	Fillet	Individual	2007	2008	PFOA	5	1	100			

Name of Species English (Latin)	Tissue	Individual or composite sample	Sampling year(s)	Year of analysis	Compound	No of samples analysed	LOQ	% <LOQ	Min	Max	Mean
Spiny dogfish (*Squalus acanthias*)	Fillet	Individual	2007	2008	PFNA	5	1	100			
Spiny dogfish (*Squalus acanthias*)	Fillet	Individual	2007	2008	PFHxS	0					
Spiny dogfish (*Squalus acanthias*)	Fillet	Individual	2007	2008	Sum 4 PFAS (LB)	0					
Spotted wolffish (*Anarhichas minor*)	Fillet	Individual	2014	2015	PFOS	3	1.8	100			
Spotted wolffish (*Anarhichas minor*)	Fillet	Individual	2014	2015	PFOA	3	2.4	100			
Spotted wolffish (*Anarhichas minor*)	Fillet	Individual	2014	2015	PFNA	3	1.8	100			
Spotted wolffish (*Anarhichas minor*)	Fillet	Individual	2014	2015	PFHxS	3	1.8	100			
Spotted wolffish (*Anarhichas minor*)	Fillet	Individual	2014	2015	Sum 4 PFAS (LB)	3	7.8	100			
Spotted wolffish (*Anarhichas minor*)	Fillet	Individual	2019	2019	PFOS	8	0.2	63	<0.2	4	
Spotted wolffish (*Anarhichas minor*)	Fillet	Individual	2019	2019	PFOA	8	0.6	100			
Spotted wolffish (*Anarhichas minor*)	Fillet	Individual	2019	2019	PFNA	8	0.2	100			
Spotted wolffish (*Anarhichas minor*)	Fillet	Individual	2019	2019	PFHxS	8	1	100			
Spotted wolffish (*Anarhichas minor*)	Fillet	Individual	2019	2019	Sum 4 PFAS (LB)	8	2	63	0	4	
Tusk (*Brosme brosme*)	Fillet	Individual	2008	2008-2009	PFOS	28	1.0	100			
Tusk (*Brosme brosme*)	Fillet	Individual	2008	2008-2009	PFOA	28	1.0	100			

Name of Species English (Latin)	Tissue	Individual or composite sample	Sampling year(s)	Year of analysis	Compound	No of samples analysed	LOQ	% <LOQ	Min	Max	Mean
Tusk (*Brosme brosme*)	Fillet	Individual	2008	2008-2009	PFNA	28	1.0	100			
Tusk (*Brosme brosme*)	Fillet	Individual	2008	2008-2009	PFHxS	0					
Tusk (*Brosme brosme*)	Fillet	Individual	2008	2009	Sum 4 PFAS (LB)	28					
Tusk (*Brosme brosme*)	Fillet	Individual (5) and Composite (3)	2009, 2013	2010, 2013	PFOS	9	0.6	78	<0.6	0.7	
Tusk (*Brosme brosme*)	Fillet	Individual (5) and Composite (3)	2009, 2013	2010, 2013	PFOA	9	0.6	89	<0.6	0.8	
Tusk (*Brosme brosme*)	Fillet	Individual (5) and Composite (3)	2009, 2013	2010, 2013	PFNA	9	0.6	100			
Tusk (*Brosme brosme*)	Fillet	Individual (5) and Composite (3)	2009, 2013	2010, 2013	PFHxS	9	0.6	100			
Tusk (*Brosme brosme)*	Fillet	Individual (5) and Composite (3)	2009, 2013	2010, 2013	Sum 4 PFAS (LB)	9	2.4	67	0	0.8	
Tusk (*Brosme brosme*)	Fillet	Individual (69) and Composite (50)	2013-2016	2013-2017	PFOS	119	1.8	98	<1.8	2.6	
Tusk (*Brosme brosme*)	Fillet	Individual (69) and Composite (50)	2013-2016	2013-2017	PFOA	119	2.4	100			
Tusk (*Brosme brosme)*	Fillet	Individual (69) and Composite (50)	2013-2016	2013-2017	PFNA	119	1.8	100			
Tusk (*Brosme brosme*)	Fillet	Individual (69) and Composite (50)	2013-2016	2013-2017	PFHxS	119	1.8	100			
Tusk (*Brosme brosme*)	Fillet	Individual (69) and Composite (50)	2013-2016	2013-2017	Sum 4 PFAS (LB)	119	7.8	98	0	2.6	

Name of Species English (Latin)	Tissue	Individual or composite sample	Sampling year(s)	Year of analysis	Compound	No of samples analysed	LOQ	% <LOQ	Min	Max	Mean
Whiting (*Merlangius merlangus*)	Fillet	Composite	2013	2013	PFOS	2	0.6	100			
Whiting (*Merlangius merlangus*)	Fillet	Composite	2013	2013	PFOA	2	0.6	100			
Whiting (*Merlangius merlangus*)	Fillet	Composite	2013	2013	PFNA	2	0.6	100			
Whiting (*Merlangius merlangus*)	Fillet	Composite	2013	2013	PFHxS	2	0.6	100			
Whiting (*Merlangius merlangus*)	Fillet	Composite	2013	2013	Sum 4 PFAS (LB)	2	2.4	100			
Whiting (*Merlangius merlangus*)	Fillet	Composite	2014	2015	PFOS	3	1.8	100			
Whiting (*Merlangius merlangus*)	Fillet	Composite	2014	2015	PFOA	3	2.4	100			
Whiting (*Merlangius merlangus*)	Fillet	Composite	2014	2015	PFNA	3	1.8	100			
Whiting (*Merlangius merlangus*)	Fillet	Composite	2014	2015	PFHxS	3	1.8	100			
Whiting (*Merlangius merlangus*)	Fillet	Composite	2014	2015	Sum 4 PFAS (LB)	3	7.8	100			

14 - Appendix Table A9 - Catch volume per species

Table A9. Catch volume per year (mean value in the period 2018-2021) for wild caught fish and other seafood from Norwegian fisheries. Data from the landing statistics of the Norwegian Directorate of Fisheries (https://www.fiskeridir.no/statistikk-tall-og-analyse/data-og-statistikk-om-yrkesfiske/fangst/fangst-fordelt-pa-art-offisiell-statistikk).

Name of species, Norwegian	Name of species, English (Latin)	Catch volume (ton)
Atlantisk kveite	Atlantic halibut (*Hippoglossus hippoglossus*)	2 845
Blåkveite	Greenland halibut (*Reinhardtius hippoglossoides*)	17 099
Blålange	Blue ling (*Molva dipterygia*)	537
Blåsteinbit	Northern wolffish (*Anarhichas denticulatus*)	3 464
Breiflabb	Anglerfish (*Lophius piscatorius*)	3 677
Brisling	European sprat (*Sprattus sprattus*)	11 701
Brosme	Tusk (*Brosme brosme*)	13 143
Dypvannsreke	Northern shrimp (*Pandalus borealis*)	40 535
Flekksteinbit	Spotted wolffish (*Anarhichas minor*)	4 108
Gapeflyndre	American plaice (*Hippoglossus platessoides*)	320
Gråskate	Spinytail skate (*Bathyraja spinicauda*)	230
Gråsteinbit	Atlantic wolffish (*Anarhichas lupus*)	2 275
Havmus	Rat fish (*Chimaera monstrosa*)	243
Hestmakrell	Atlantic horse mackerel (*Trachurus trachurus*)	10 924
Hummer	European lobster (*Homarus gammarus*)	47
Hvitting	Whiting (*Merlangius merlangus*)	1 273
Hyse	Haddock (*Melanogrammus aeglefinus*)	111 225
Isgalt	Roughhead grenadier (*Macrourus berglax*)	210
Kloskate	Starry ray (*Amblyraja radiata*)	199
Knurr	Gurnard (*Eutrigla gurnardus*)	240
Kongekrabbe	Red king crab (*Paralithodes camtchaticus*)	2 060
Lange	Common ling (*Molva molva*)	18 701
Lyr	Pollack (*Pollachius pollachius*)	2 600
Lysing	European hake (*Merluccius merluccius*)	3 977
Makrell	Atlantic mackerel (*Scomber scombrus*)	207 146
Makrellstørje	Atlantic bluefin tuna (*Thunnus thynnus*)	101
Nordsjøsild	Atlantic herring (*Clupea harengus*)	130 000
NVG-sild	Atlantic herring (*Clupea harengus*)	415 346
Pigghå	Spiny dogfish (*Squalus acanthias*)	356
Rødspette	European plaice (*Pleuronectes platessa*)	772
Sei	Saithe (*Pollachius virens*)	203 947
Sjøkreps	Norway lobster (*Nephrops norvegicus*)	434

Name of species, Norwegian	Name of species, English (Latin)	Catch volume (ton)
Skjellbrosme	Greater forkbeard (*Physis blennoides*)	350
Smørflyndre	Witch flounder (*Glyptocephalus cynoglossus*)	196
Snabeluer	Beaked redfish (*Sebastes mentella*)	32 678
Snøkrabbe	Snow crab (*Chionoecetes opilio*)	4 530
Taskekrabbe rå	Edible crab (*Cancer pagurus*) (fresh)	5 266
Torsk	Atlantic cod (*Gadus morhua*)	451 015
Vanlig uer	Golden redfish (*Sebastes norvegicus*)	8 371
Vassild	Greater argentine (*Argentina silus*)	10 000
Villaks	Atlantic salmon (*Salmo salar*), wild	16

15 - Appendix Table A10 - Extended overview of all risk factors combined

Table A10. Extended overview of risk-based prioritization of Norwegian wild-caught seafood species to be included in control plans. Scores are shown for the following potential risk factors: Potential for high exposure due to high catch volume (Potential for high exposure), potential for exceeding maximum levels for Hg, Cd, PCDD/F +dl-PCB, PCB6 and/or PFAS in muscle (Potential for exceeding ML), potential for exceeding tolerable weekly intake for Hg, Cd, PCDD/F +dl-PCB and/or PFAS (Potential for exceeding TWI). The priority of each species for inclusion in risk-based control plans is shown according to the following categories: High priority (dark blue): Species with score 3 as the highest score for any of the risk factors, Medium priority (medium blue): Species with score 2 as the highest score for any of the risk factors, Lower priority (light blue): Species with score 1 as the highest score for any of the risk factors, Lowest priority (white): Species with score 0 across all the risk factors, and Unknown priority (white): Species for which there is insufficient data to determine a priority level. Data deficiency per species is noted in the last column.

Species (Norwegian/ English)	Potential for high exposure	Potential for exceeding ML for Hg	Potential for exceeding ML for Cd	Potential for exceeding ML for dioxin+dl-PCB	Potential for exceeding ML for PCB6	Potential for exceeding ML for PFAS	Potential for exceeding MLs - Total score	Potential for exceeding TWI for Hg	Potential for exceeding TWI for Cd	P f e T c P
Sild/ Atlantic herring	3	0	0	0	0	0	0	0	0	
Makrell/ Atlantic mackerel	3	0	0	0	0	0	0	0	0	
Torsk/ Atlantic cod	3	1	0	0	0	0	1	0	0	
Sei/ Saithe	3	0	0	0	0	0	0	0	0	
Hyse/ Haddock	3	0	0	0	0	0	0	0	0	
Makrellstørje/ Atlantic bluefin tuna	0	2	0	2	2	0	3	1	0	
Blåkveite/ Greenland halibut	0	1	0	1	0	0	2	0	0	
Kveite/ Atlantic halibut	0	1	0	1	0	1	2	0	0	
Brosme/ Tusk	0	2	0	0	0	0	2	1	0	
Blålange/ Blue ling	0	2	0	0	0	0	2	1	0	
Breiflabb/ Anglerfish	0	2	0	0	0	0	2	0	0	
Taskekrabbe/ Brown crab	0	0	1 (claw meat)	0	0	0	1 (claw meat)	0	1 (brown meat)	
Rødspette/ European plaice	0	0	0	0	0	1	1	0	0	
Lange/ Common ling	0	1	0	0	0	0	1	0	0	

Species (Norwegian/ English)	Potential for high exposure	Potential for exceeding ML for Hg	Potential for exceeding ML for Cd	Potential for exceeding ML for dioxin+dl-PCB	Potential for exceeding ML for PCB6	Potential for exceeding ML for PFAS	Potential for exceeding MLs - Total score	Potential for exceeding TWI for Hg	Potential for exceeding TWI for Cd	P f e T c P
Lyr/ Pollack	0	1	0	0	0	0	1	0	0	
Gråsteinbit/ Atlantic wolffish	0	1	0	0	0	0	1	0	0	
Sjøkreps/ Norway lobster	0	1	0	0	0	0	1	0	0	
Hummer/ European lobster	0	1	0	0	0	0	1	0	0	
Brisling/ European sprat	0	0	0	0	0	0	0	0	0	
Hestmakrell/ Atlantic horse mackerel	0	0	0	0	0	0	0	0	0	
Laks (vill)/ Atlantic salmon (wild)	0	0	0	0	0	0	0	0	0	
Lysing/ European hake	0	0	0	0	0	0	0	0	0	
Vassild/ Greater argentine	0	0	0	0	0	0	0	0	0	
Flekksteinbit/ Spotted wolffish	0	0	0	0	0	0	0	0	0	
Snabeluer/ Beaked redfish	0	0	0	0	0	0	0	0	0	
Vanlig uer/ Golden redfish	0	0	0	0	0	0	0	0	0	
Dypvannsreke/ Northern shrimp	0	0	0	0	0	0	0	0	0	
Pigghå/ Spiny dogfish	0	0	0	0	0	0	0	0	0	
Kongekrabbe/ Red king crab	0	0	0	0	0	0	0	0	0	
Hvitting/ Whiting	0	0	0	0	0	0	0	0	0	
Skjellbrosme/ Greater forkbeard	0	0	0	0	0	0	0	0	0	
Gapeflyndre/ American plaice	0	0	0	0	0	0	0	0	0	
Havmus/ Ratfish	0	0	0	0	0	0	0	0	0	

Species (Norwegian/ English)	Potential for high exposure	Potential for exceeding ML for Hg	Potential for exceeding ML for Cd	Potential for exceeding ML for dioxin+dl-PCB	Potential for exceeding ML for PCB6	Potential for exceeding ML for PFAS	Potential for exceeding MLs - Total score	Potential for exceeding TWI for Hg	Potential for exceeding TWI for Cd	P f e T c P
Kloskate/ Starry ray	0	0	0	0	0	0	0	0	0	
Smørflyndre/ Witch flounder	0	0	0	0	0	0	0	0	0	
Knurr/ Gurnard	0	not evaluated	not evaluated	not evaluated	not evaluated	not evaluated	not evaluated	not evaluated	not evaluated	
Gråskate/ Spinytail skate	0	not evaluated	not evaluated	not evaluated	not evaluated	not evaluated	not evaluated	not evaluated	not evaluated	
Isgalt/ Roughhead grenadier	0	not evaluated	not evaluated	not evaluated	not evaluated	not evaluated	not evaluated	not evaluated	not evaluated	
Strandkrabbe/ Shore crab	0	0	0	0	0	0	0	0	0	
Snøkrabbe/ Snow crab	0	0	0	0	0	0	0	0	0	
Stillehavsøsters/ Pacific oyster	0	not evaluated	not evaluated	not evaluated	not evaluated	not evaluated	not evaluated	not evaluated	not evaluated	
Echinoderms	0	not evaluated	not evaluated	not evaluated	not evaluated	not evaluated	not evaluated	not evaluated	not evaluated	
Mesopelagic species	0	not evaluated	not evaluated	not evaluated	not evaluated	not evaluated	not evaluated	not evaluated	not evaluated	

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