



Literatuuronderzoek zeevisserij

Beknopte rapportage van een
literatuurscreening naar mogelijke
chemische gevaren in de zeevisserij



WAGENINGEN
UNIVERSITY & RESEARCH

Literatuuronderzoek in de zeevisserij als onderdeel van de visketen

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1 Introductie

De Nederlandse Voedsel- en Warenautoriteit (NVWA) bewaakt de gezondheid van dieren en planten, het dierenwelzijn en de veiligheid van voedsel en consumentenproducten, en handhaaft de natuurwetgeving. De drie kerntaken van de NVWA zijn handhaving (zowel toezicht als opsporing), risicobeoordeling en risicocommunicatie. Het systeem van toezicht omvat de hele keten, van boer tot consument.

De NVWA werkt aan structurele verbetering van toezicht. Door Bureau Risicobeoordeling & onderzoek (NVWA-BuRO) worden hiervoor ketengerichte risicobeoordelingen uitgevoerd die tot doel hebben het toezicht van de NVWA risicogerichter te maken. Er zijn 12 grote productieketens geïdentificeerd op het werkterrein van de NVWA. De risico's die per keten beoordeeld worden zijn die risico's die de publieke waarden volksgezondheid (voedselveiligheid en productveiligheid), diergezondheid, dierenwelzijn, plantgezondheid en -in beperkte mate- natuur bedreigen. De risicobeoordeling van NVWA-BuRO moet leiden tot een openbaar advies, voorzien van aanbevelingen aan toezicht en eventueel beleid om risicoreducties te bewerkstelligen.

NVWA-BuRO vraagt een aantal kennisinstellingen kennis aan te leveren voor de verschillende publieke waarden. RIKILT is gevraagd een bijdrage te leveren aan de prioritering van de chemische gevaren in de zeevisserij als onderdeel van de visketen.

De volgende vragen staan in dit onderzoek centraal:

1. Wat zijn de specifieke chemische gevaren die zich in de zeevisserij kunnen voordoen?
2. In welke schakels van de ketens doen die gevaren zich voor c.q. worden ze geïntroduceerd?

Doel van dit onderzoek was een screening – middels een literatuurstudie - van de chemische gevaren voor voedselveiligheid die zich in de verschillende schakels van *de zeevisserij* kunnen voordoen, en mogelijk een volksgezondheidsrisico kunnen vormen. NVWA-BuRO gebruikt de uitkomsten van dit onderzoek als startpunt om de chemische gevaren te kunnen prioriteren.

2 Materialen en methoden

2.1 Aanpak project

Binnen de beperkte tijd en budget van dit project, werd een literatuurscreening uitgevoerd met zoektermen die vooraf met NVWA-BuRO waren afgestemd. Het gevolgde stappenplan en de afbakening van het project zijn hieronder weergegeven.

2.1.1 Stappenplan

Het project was als volgt opgedeeld:

1. Een startgesprek werd gevoerd met de deskundigen van NVWA-BuRO over de afbakening van het onderzoek d.d. 13 februari 2018;
2. Er werd een literatuurscreening uitgevoerd zoals weergegeven in paragraaf 2.2.
3. De resultaten van deze screening werden besproken met de deskundigen van NVWA-BuRO d.d. 27 maart 2018;
4. De resultaten werden vervolgens samengevat in dit document waarbij de gebruikte zoektermen, literatuurdatabanken en zoekmachines zijn weergegeven (zie paragraaf 3.1.1) en een overzicht van relevante artikelen in tabelvorm met:
 - a. een lijst met relevante artikelen/rapporten
 - b. per artikel/rapport een beperkte set steekwoorden om aan te geven waar het artikel/rapport over gaat,
 - c. per artikel/rapport de regio en de diersoort,
 - d. per artikel/rapport een lijst met genoemde gevaren;
 - e. per gevaar in welke stap van de keten dit gevaar voorkomt (indien bekend)
5. Naar aanleiding van dit rapport kan er nog een eindbespreking met NVWA-BuRO plaatsvinden.

2.1.2 Afbakening

- Het ging om verse zeevis en -producten, halffabricaten of grondstoffen die in Nederland op de markt zijn en dus ook om invoer/import van verse of bevroren vis uit andere landen. Daarnaast ging het om productie en 1^e aanlanding op Nederlands grondgebied die consequenties hebben op voedselveiligheid.
- Verse vis, producten, halffabricaten of grondstoffen uit deze keten worden soms rechtstreeks door de consument gekocht, soms in bewerkte vorm en soms in een vorm van een samengesteld product. Deze samengestelde producten (bijvoorbeeld pizza met tonijn) bestaan uit productdelen afkomstig van meerdere productieketens. Deze producten werden niet meegenomen in deze beoordeling. Sportvisserij werd wel meegenomen in de ketenbeoordeling.
- In deze opdracht gingen we niet zoeken op specifieke chemische gevaren, bijvoorbeeld de zoekterm dioxine gebruiken. Ook werden geen gespecialiseerde artikelen of rapporten van EFSA bestudeerd (bv. een opinie over bepaalde mariene biotoxines in makreel). Ook werden de artikelen/rapporten niet uitgebreid gelezen, maar slechts gescreend op relevantie op basis van abstract, materiaal & methoden en conclusies.

2.2 Literatuurscreening

Er is literatuur gezocht in ASFA (Aquatic Sciences and Fisheries Abstracts) en SCOPUS voor de periode 2007-2018. De volgende zoektermen zijn gebruikt om relevante literatuur te zoeken m.b.t. chemische gevaren in de zeevisserij in deze literatuurdatabanken:

ASFA-zoektermen

#1 zeevis:

(MAINSUBJECT.EXACT.EXPLODE("Seafood") OR MAINSUBJECT.EXACT.EXPLODE("marine fish") OR MAINSUBJECT.EXACT.EXPLODE("Food fish") OR MAINSUBJECT.EXACT.EXPLODE("Fishery products")) In Anywhere

AND #2 chemische gevaren:

(MAINSUBJECT.EXACT.EXPLODE("Food contamination") OR MAINSUBJECT.EXACT.EXPLODE("Chemical pollutants") OR "chemical hazard*" OR contamina* OR Toxin* OR "toxic substance*" OR "toxic compound*" OR pollutant* OR "agricultural chemical*" OR "chemical compound*" OR "chemical substance*" OR residu*) In Anywhere

AND #3 volksgezondheid:

(MAINSUBJECT.EXACT.EXPLODE("Public health") OR MAINSUBJECT.EXACT.EXPLODE("HACCP") OR MAINSUBJECT.EXACT.EXPLODE("Consumer protection") OR MAINSUBJECT.EXACT.EXPLODE("Consumers") OR MAINSUBJECT.EXACT.EXPLODE("Food safety") OR "risk assessment*" OR "risk analys*" OR "hazard analys*" OR "Human health*" OR "Health impact" OR "health risk*") In Anywhere

NOT #4 exclusietermen:

(Harbo* OR Aquaculture OR Farm* OR "Inland water*" OR Swamp* OR Pond* OR Stream* OR Freshwater* OR River* OR Lake* OR Canal*) in TI

SCOPUS-zoektermen

#1 zeevis:

(Seafood OR "marine fish*" OR "Food fish*" OR "Fishery product*" OR "fish product*" OR "fish process*") In Keywords, abstract, title

AND #2 chemische gevaren:

("Food contamination" OR "chemical hazard*" OR contamina* OR toxin* OR "toxic substance*" OR "toxic compound*" OR pollutant* OR "agricultural chemical*" OR "chemical compound*" OR "chemical substance*" OR residu*) In Keywords, abstract, title

AND #3 volksgezondheid:

("public health" OR "HACCP" OR "Consumer*" OR "Food safety" OR "risk assessment*" OR "risk analys*" OR "hazard analys*" OR "Human health*" OR "Health impact" OR "health risk*") In Keywords, abstract, title

NOT #4 exclusietermen:

(Harbo* OR Aquaculture OR Farm* OR "Inland water*" OR Swamp* OR Pond* OR Stream* OR Freshwater* OR River* OR Lake* OR Canal*) in Title

De referenties die met deze combinaties zoektermen gevonden werden in beide databanken, zijn opgeslagen in een Endnote bestand, waarna dubbele referenties werden verwijderd.

Daarnaast is m.b.v. Google gezocht in de websites van de FAO en de voedselveiligheidsinstituten van Ierland en Nieuw-Zeeland (www.fsai.ie, www.marine.ie en foodsafety.govt.nz). Via Google kan geen gebruikgemaakt worden van combinaties van zoektermen. Daarom is hiervoor gezocht op 5 zoektermen voor zeevis: herring, tuna, mackerel, cod en pollock gecombineerd met 4 zoektermen voor chemische gevaren: food safety, contaminant, residue en hazard and risk assessment. Er is in eerste instantie

gezocht in alle jaren. Indien er meer dan 100 hits werden verkregen is gezocht in de periode 2007-2018. Wanneer dit nog steeds meer dan 100 hits gaf, werd er alleen gezocht naar rapporten met de extensie .pdf (via Google settings, advanced search, file type: .pdf). In sommige gevallen gaf dit nog steeds te veel hits. Aanvullend werden dan de hierboven genoemde exclusietermen gebruikt (via Google settings, advanced search, find pages with none of these words: ...). De relevante rapporten die via Google gevonden zijn, werden opgenomen in een tabel met een voetnoot waarin de link naar het rapport is weergegeven.

In de literatuurscreening werd een driestappenprocedure gevolgd:

1. Relevantie werd beoordeeld o.b.v. titel. Artikelen/rapporten die niet over chemische gevaren gingen of die niet over zeevis bleken te gaan, werden als niet relevant beschouwd. Artikelen die over pathogenen bleken te gaan (Vibrio, Legionella, Salmonella, Listeria, Escherichia, Virus), over bepaalde niet-relevante vissoorten (shellfish, oysters, mussel, clam, mollusc) of watersoorten (groundwater, wastewater, drinking water) werden niet meegenomen. Ook artikelen die over aquacultuur gingen, zijn niet meegenomen.
2. Voor referenties die in stap 1 beoordeeld werden als relevant, werden de abstract, en keywords gelezen en beoordeeld op relevantie.
3. Voor de referenties die in stap 2 als relevant werden beoordeeld, zijn de materiaal en methoden gelezen evenals de conclusies. De mogelijke chemische gevaren zoals genoemd in de referentie werden genoteerd evenals de regio waar de gevaren gevonden werden, de betreffende vissoort en de plaats in de keten waar de gevaren kunnen voorkomen. De resultaten zijn weergegeven in een tabel (Tabel 2).

3 Resultaten

Dit hoofdstuk beschrijft het aantal hits en het aantal relevante hits die met de zoektermen gevonden zijn voor de zeevisserij evenals een korte beschrijving van de relevante artikelen. Dit onderzoek pretendeert niet een volledig beeld te geven van alle mogelijke chemische gevaren in de zeevisserij. Het is slechts een beknopte screening van de literatuur met behulp van de zoektermen die in hoofdstuk twee zijn beschreven. De gevaren die genoemd werden in de relevante artikelen zijn opgenomen in tabelvorm en dienen als startpunt voor NVWA-BuRO om de chemische gevaren in zeevis te kunnen prioriteren.

3.1 Aantal relevante hits

3.1.1 Literaturoverzoekbanken

Met behulp van de zoektermen zoals aangegeven in de materiaal- en methodensectie is gezocht naar relevante literatuur m.b.t chemische gevaren in de zeevisserij. De combinatie zoektermen in ASFA leverde 1038 hits op en in SCOPUS 1957 hits. Deze hits werden opgeslagen in Endnote en de dubbele referenties verwijderd. In totaal leverde dit 2609 hits op. Op basis van de titel werden deze hits verdeeld in 3 groepen: relevant, maybe relevant en not relevant. In de titel werd gezocht op de volgende termen als mogelijke exclusietermen:

- Vibrio (127 hits -> 127 niet relevant)
- Legionella (4 hits -> 4 niet relevant)
- Salmonella (35 hits -> 35 niet relevant)
- Listeria (95 hits -> 95 niet relevant)
- Escherichia (11 hits -> 11 niet relevant)
- Virus (17 hits -> 17 niet relevant)
- Pathogen (59 hits -> 57 niet relevant)
- Bacterial (69 hits -> 55 niet relevant)
- Micro (146 hits -> 111 niet relevant)
- Drinking (11 hits -> 10 niet relevant)
- Groundwater (3hits -> 3 niet relevant)
- Wastewater (7 hits -> 7 niet relevant)
- Aquacultur (6 hits-> 6 niet relevant)
- Cultured (18 hits -> 15 niet relevant)
- Shellfish (114 hits -> 82 niet relevant)
- Oysters (39 hits -> 37 niet relevant)
- Mussel (51 hits -> 51 niet relevant)
- Clam (15 hits -> 14 niet relevant)
- Mollus (20 hits -> 15 niet relevant)

In totaal werden op deze manier 585 referenties in de "not relevant" groep geplaatst. De overige referenties werden beoordeeld op titel. Een sub-sectie van de 2609 referenties (in totaal 100 referenties) werden door 2 experts beoordeeld. Discrepancies werden besproken om de beoordeling op relevantie verder aan te scherpen. De resultaten hiervan zijn weergegeven in Bijlage 1. Evaluatie van referenties door twee experts

Na evaluatie van de 2609 artikelen bleken in totaal 1692 referenties niet relevant, 403 misschien relevant (niet duidelijk alleen op basis van de titel) en 518 relevant. Voor de laatste twee groepen zouden dan 921 artikelen verder beoordeeld moeten worden op de keywords en abstract. Dit bleek niet mogelijk binnen de beperkte tijd en het beperkte budget. Er is daarom besloten alleen review artikelen mee te nemen en artikelen die meerdere keren geciteerd werden. Het minimale aantal citaties in ASFA en SCOPUS werd zodanig bepaald dat het aantal referenties voldoende werd ingeperkt, maar tegelijkertijd ook nog recente artikelen (in ieder geval t/m 2015) werden meegenomen. Referenties na

2015 worden in de meeste gevallen nog niet veel geciteerd, omdat de tijd daarvoor nog te kort is. De recente artikelen (2016-2018) werden later nog apart beoordeeld op mogelijke relevantie. Voor ASFA was het minimale aantal citaties 5, voor SCOPUS 11. Dit leverde de volgende resultaten op:

ASFA

Review artikelen:	7
Meest geciteerde artikelen (5 of meer):	233
Totaal:	<u>240</u> uit 1038

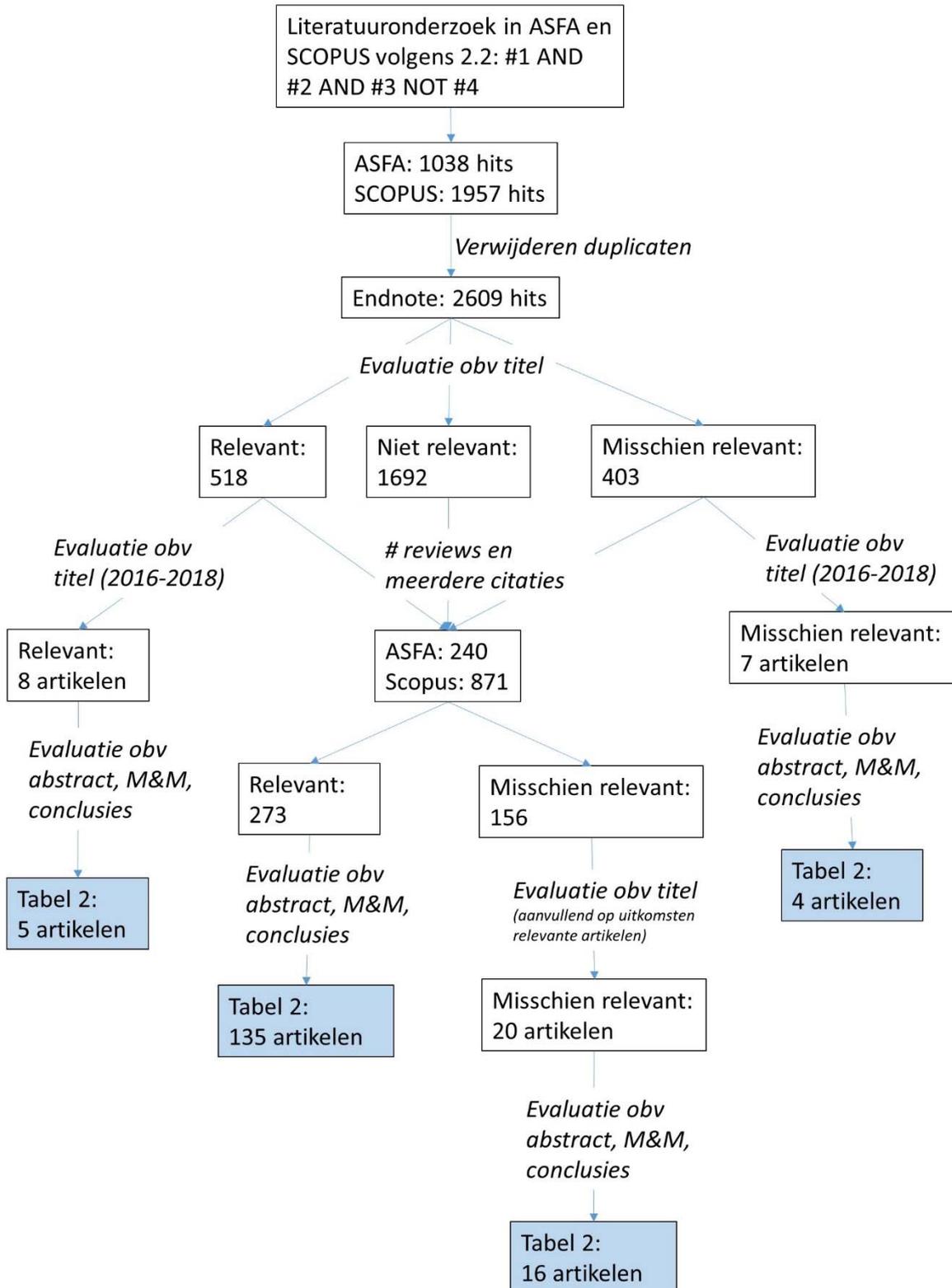
Scopus

Review artikelen:	197
Meest geciteerde artikelen (>11):	674
Total:	<u>871</u> uit 1957

Van deze 1.111 referenties uit ASFA en SCOPUS die reviewartikelen waren of meerdere keren geciteerd waren, waren in totaal 429 referenties relevant of misschien relevant. De abstract, keywords, materiaal en methoden en conclusies van de 273 relevante artikelen werden gelezen. Indien deze artikelen inderdaad relevant waren, werden ze verwerkt in Tabel 2 (in totaal 135 artikelen).

De artikelen die o.b.v. de titel misschien relevant waren (156 referenties), werden gescreend om te zien of er additionele gevaren benoemd werden die nog niet in tabel 2 verwerkt waren. Van deze 156 misschien relevante referenties gingen 89 artikelen over zware metalen (waarvan 39 over kwik of methylkwik, 19 over arseen en 4 over organotin of fenyltin). De overige artikelen gingen over dioxines en polychloorbifenyls (PCB's) (15 referenties), vlamvertragers (11 referenties), organochloorpesticiden (OCP's) (8 referenties), polyaromatische koolwaterstoffen (PAK's) (7 referenties), radionucliden (2 referenties) en overige gevaren (24 referenties). Referenties die nieuwe chemische gevaren bevatten die nog niet beschreven waren in de relevante artikelen werden ook verwerkt in Tabel 2. Dit waren totaal 16 artikelen van de 156 misschien relevante artikelen.

Verder werden de recente artikelen (> 2015) gescreend die in de categorie 'relevant' of 'misschien relevant' zaten. Deze artikelen werden in de meeste gevallen niet meer dan 5 (ASFA) of 11 (SCOPUS) keer geciteerd, maar kunnen wel relevante informatie bevatten. Over het algemeen gingen deze artikelen over de eerder genoemde gevaren: (methyl)kwik (40 artikelen), overige zware metalen (53 artikelen), dioxines en PCB's (17 artikelen), vlamvertragers, OCP's, PAK's, perfluorverbindingen, radionucliden, bisphenol A, marine toxines en overige gevaren. Indien nog niet eerder genoemde gevaren werden beschreven of artikelen trends en/of emerging issues beschreven, dan wel een specifiek effect van processing die nog niet eerder benoemd waren, werden deze artikelen ook opgenomen in Tabel 2. Dit waren in totaal 9 artikelen van de 189 relevante of misschien relevante artikelen tussen 2016 en 2018. Het proces van de literatuurstudie is weergegeven in Figuur 1.



Figuur 1. Stappen doorlopen tijdens de evaluatie van de literatuur verkregen via de zoektermen uit paragraaf 2.2

3.1.2 Websites

De zoektermen in Google zijn in eerste instantie gezocht voor alle jaren. Dit leverde in sommige gevallen meer dan 100 hits op. In die gevallen is de tijdsperiode verkleind naar de periode 2007-2017 en werd gezocht naar pdf's. Additioneel werden nog de exclusietermen toegevoegd die vermeld zijn in 2.2 Literatuurscreening. Het aantal hits en het aantal relevante hits is weergegeven in Tabel 1. Wanneer dezelfde relevante hits werden gevonden bij meerdere zoektermen, werden deze slechts 1 keer vermeld. Bijvoorbeeld indien een relevant rapport werd gevonden met de zoekterm "food safety" and herring en hetzelfde rapport werd ook gevonden met de zoekterm contaminant and herring, dan werd dit rapport alleen meegeteld bij de relevante hits van de eerste zoekterm, zodat in de tabel geen dubbele resultaten werden opgenomen.

Rapporten over de volgende onderwerpen werden als niet relevant beschouwd:

- Rapporten over herring gull (bird)
- auteursnamen met de naam van een vis (tuna, herring, cod, mackerel, pollack)
- rapporten over visvoorraden, visvangst, duurzaamheid, EU wetgeving, milieuaspecten (klimaat) etc.
- rapporten over visvoer en viskweek
- CODEX guidelines over kwaliteitsparameters van vis
- Rapporten over nutritionele aspecten
- Rapporten over pathogenen en virussen

Verder werd voor de zoekterm 'tuna' vaak rapporten gevonden waarin unfortunately werd genoemd. Deze waren in veel gevallen ook niet relevant. Rapporten over cod en pollack gingen veelal over mislabelling. Deze rapporten zijn ook niet meegenomen. De relevante hits (71 in totaal) werden verwerkt in Tabel 2.

Tabel 1. Aantal relevante hits met de gebruikte zoektermen in *Google*

Zoektermen	#hits (14-20 maart 2018)	# hits relevant o.b.v. keywords, abstract, titel
Herring		
"food safety" and herring Site: fao.org	948	NA ¹
"food safety" and herring Site: fao.org (2007-2018)	53	1
"food safety" and herring Site: FSAI.ie	44	3
"food safety" and herring Site: marine.ie	337	NA ¹
"food safety" and herring Site: marine.ie (2007-2018)	9	1
"food safety" and herring Site: mpi.govt.nz	34	3
Contaminant and herring Site: fao.org	377	NA ¹
Contaminant and herring Site: fao.org (2007-2018)	18	1
Contaminant and herring Site: fsai.ie	9	1
Contaminant and herring Site: marine.ie	180	NA ¹
Contaminant and herring Site: marine.ie (2007-2018)	7	0
Contaminant and herring Site: mpi.govt.nz	8	0

Residue and herring Site: fao.org	616	NA ¹
Residue and herring Site: fao.org (2007-2018)	22	0
Residue and herring Site: fsai.ie	17	0
Residue and herring Site: marine.ie	170	NA ¹
Residue and herring Site: marine.ie (2007-2018)	5	0
Residue and herring Site: mpi.govt.nz	6	0
Hazard and "risk assessment" and herring Site: fao.org	443	NA ¹
Hazard and "risk assessment" and herring Site: fao.org (2007-2018)	25	0
Hazard and "risk assessment" and herring Site: fsai.ie	9	0
Hazard and "risk assessment" and herring Site: marine.ie	56	1
Hazard and "risk assessment" and herring site: mpi.govt.nz	31	0
Tuna		
"food safety" and tuna Site: fao.org	2680	NA ¹
"food safety" and tuna Site: fao.org (2007-2018)	197	NA ¹
"food safety" and tuna Site: fao.org (2007-2018) filetype:pdf	144	NA ¹
"food safety" and tuna Site: fao.org (2007-2018) filetype:pdf NOT (exclusion terms; see 3.1.1)	18	0
"food safety" and tuna Site: FSAI.ie	108	NA ¹
"food safety" and tuna Site: FSAI.ie (2007-2018)	28	3
"food safety" and tuna Site: marine.ie	109	NA ¹
"food safety" and tuna Site: marine.ie (2007-2018)	7	2
"food safety" and tuna Site: mpi.govt.nz	146	NA ¹
"food safety" and tuna Site: mpi.govt.nz (2007-2018)	59	2
Contaminant and tuna Site: fao.org	556	NA ¹
Contaminant and tuna Site: fao.org (2007-2018)	56	3
Contaminant and tuna Site: fsai.ie	10	0
Contaminant and tuna Site: marine.ie	49	1
Contaminant and tuna Site: mpi.govt.nz	31	2
Residue and tuna Site: fao.org	1120	NA ¹
Residue and tuna Site: fao.org (2007-2018)		0

	99	
Residue and tuna Site: fsai.ie	15	0
Residue and tuna Site: marine.ie	29	1
Residue and tuna Site: mpi.govt.nz	25	0
Hazard and "risk assessment" and tuna Site: fao.org	788	NA ¹
Hazard and "risk assessment" and tuna Site: fao.org (2007-2018)	24	1
Hazard and "risk assessment" and tuna Site: fsai.ie	11	0
Hazard and "risk assessment" and tuna Site: marine.ie	20	0
Hazard and "risk assessment" and tuna: mpi.govt.nz	64	0
Mackerel		
"food safety" and mackerel Site: fao.org	1020	NA ¹
"food safety" and mackerel Site: fao.org (2007-2018)	49	6
"food safety" and mackerel Site: FSAI.ie	68	6
"food safety" and mackerel Site: marine.ie	195	NA ¹
"food safety" and mackerel Site: marine.ie (2007-2018)	13	2
"food safety" and mackerel Site: mpi.govt.nz	104	NA ¹
"food safety" and mackerel Site: mpi.govt.nz (2007-2018)	25	2
Contaminant and mackerel Site: fao.org	307	NA ¹
Contaminant and mackerel Site: fao.org (2007-2018)	30	2
Contaminant and mackerel Site: fsai.ie	18	0
Contaminant and mackerel Site: marine.ie	138	NA ¹
Contaminant and mackerel Site: marine.ie (2007-2018)	7	1
Contaminant and mackerel Site: mpi.govt.nz	18	1
Residue and mackerel Site: fao.org	493	NA ¹
Residue and mackerel Site: fao.org (2007-2018)	9	0
Residue and mackerel Site: fsai.ie	23	0
Residue and mackerel Site: marine.ie	218	NA ¹
Residue and mackerel Site: marine.ie (2007-2018)	13	0
Residue and mackerel Site: mpi.govt.nz	31	1
Hazard and "risk assessment" and mackerel Site: fao.org	384	NA ¹

Hazard and "risk assessment" and mackerel Site: fao.org (2007-2018)	4	0
Hazard and "risk assessment" and mackerel Site: fsai.ie	14	1
Hazard and "risk assessment" and mackerel Site: marine.ie	49	2
Hazard and "risk assessment" and mackerel: mpi.govt.nz	34	1
Cod		
"food safety" and cod Site: fao.org	1730	NA ¹
"food safety" and cod Site: fao.org (2007-2018)	71	2
"food safety" and cod Site: FSAI.ie	76	3
"food safety" and cod Site: marine.ie	345	NA ¹
"food safety" and cod Site: marine.ie (2007-2018)	27	1
"food safety" and cod Site: mpi.govt.nz	261	NA ¹
"food safety" and cod Site: mpi.govt.nz (2007-2018)	83	0
Contaminant and cod Site: fao.org	768	NA ¹
Contaminant and cod Site: fao.org (2007-2018)	27	0
Contaminant and cod Site: fsai.ie	17	0
Contaminant and cod Site: marine.ie	216	NA ¹
Contaminant and cod Site: marine.ie (2007-2018)	7	1
Contaminant and cod Site: mpi.govt.nz	38	
Residue and cod Site: fao.org	1240	NA ¹
Residue and cod Site: fao.org (2007-2018)	38	0
Residue and cod Site: fsai.ie	21	0
Residue and cod Site: marine.ie	122	NA ¹
Residue and cod Site: marine.ie (2007-2018)	7	0
Residue and cod Site: mpi.govt.nz		
Hazard and "risk assessment" and cod Site: fao.org	803	NA ¹
Hazard and "risk assessment" and cod Site: fao.org (2007-2018)	7	0
Hazard and "risk assessment" and cod Site: fsai.ie	22	0
Hazard and "risk assessment" and cod Site: marine.ie	36	2
Hazard and "risk assessment" and cod Site: mpi.govt.nz	68	0
Pollock		

"food safety" and pollock Site: fao.org	305	NA ¹
"food safety" and pollock Site: fao.org (2007-2018)	6	0
"food safety" and pollock Site: FSAI.ie	16	0
"food safety" and pollock Site: marine.ie	20	3
"food safety" and pollock Site: mpi.govt.nz	15	0
Contaminant and pollock Site: fao.org	70	0
Contaminant and pollock Site: fsai.ie	2	0
Contaminant and pollock Site: marine.ie	8	0
Contaminant and pollock Site: mpi.govt.nz	7	0
Residue and pollock Site: fao.org	149	NA ¹
Residue and pollock Site: fao.org (2007-2018)	7	0
Residue and pollock Site: fsai.ie	3	0
Residue and pollock Site: marine.ie	20	0
Residue and pollock Site: mpi.govt.nz	8	0
Hazard and "risk assessment" and pollock Site: fao.org	81	1
Hazard and "risk assessment" and pollock Site: fsai.ie	6	0
Hazard and "risk assessment" and pollock Site: marine.ie	6	0
Hazard and "risk assessment" and pollock: mpi.govt.nz	10	0

¹NA: Niet geanalyseerd, omdat er meer dan 100 hits waren

3.2 Overzicht van chemische gevaren in de zeevisserij

De relevante referenties zijn in onderstaande tabel samengevat (Tabel 2) en terug te vinden via de bijgeleverde Endnote file of de voetnoten in de tabel. De tabel laat zien dat de meeste artikelen die in de literatuur werden gevonden, over zware metalen gaan (92 artikelen). Een groot deel van deze artikelen ging specifiek over kwik of methylkwik (27 artikelen). Ook zijn er artikelen gericht op organotin en arseen. Andere veel genoemde gevaren zijn: dioxines en PCB's (26 artikelen), vlamvertragers (17 artikelen) en OCP's (14 artikelen). Overige artikelen gingen over een range aan gevaren: mariene toxines (o.a. ciguatera en microcystine; 10 artikelen), PAK's (10 artikelen), perfluorverbindingen (7 artikelen), radionucliden (5 artikelen), polychlooraфтаleen (PCN; 5 artikelen), allergenen (vnl. histamine; 5 artikelen) en verder incidentele artikelen over: muskus, (micro)plastic, bisfenol A, amines, residuen van farmaceutische middelen en persoonlijke verzorgingsmiddelen, parabenen en antibiotica.

De rapporten die via de verschillende websites gevonden werden gingen ook vooral over (methyl)kwik (26 referenties) en overige zware metalen (7 referenties) en dioxines en PCB's (20 referenties). Verder werden histamines veel behandeld (17 referenties). De overige gevaren die genoemd werden, waren vlamvertragers (11 referenties), OCP's (10 referenties), polychlooraфтаleen (PCN; 6 referenties), perfluorverbindingen (5 referenties), ciguatera (4 referenties) en monochloorpropaandiol (MCPD; 2 referenties).

Tabel 2: Overzicht van relevante referenties en de daarin vermelde chemische gevaren.

Referentie	Titel	Omschrijving referentie (steekwoorden)	Genoemde relevante gevaren	Concentratie	Vissoort (Latijnse naam)	Regio	Keten stap	Opmerkingen
(Žvab Rožič, et al., 2014)	Element levels in cultured and wild sea bass (<i>Dicentrarchus labrax</i>) and gilthead sea bream (<i>Sparus aurata</i>) from the Adriatic Sea and potential risk assessment	Element levels in wild sea bass	As, Cd, Cr, Cu, Hg, Pb, Se, Zn	Indicated as mean value for wild fishes in general (together with gilthead sea bream)	Sea bass (<i>Dicentrarchus labrax</i>)	Adriatic Sea (Korcula Islands, Pirovac Bay, Savudrija)	Not indicated	Cd, Cu, Pb, -levels were lower than guidelines by various authorities Concentration of As, Cr, Hg, Se, Zn often exceed permissible levels Highest concentration measured at Korcula Island
(Yusá, et al., 2008)	Monitoring programme on cadmium, lead and mercury in fish and seafood from Valencia, Spain: levels and estimated weekly intake	Monitoring of fish samples from local markets in Valencia 2005 - 2006	Cadmium, Mercury, Lead	Median and range concentration for the different fish species indicated for Cadmium, Mercury, Lead Mercury ranged from 0.02 to 3.15 mg kg ⁻¹ w.w. Cadmium ranged from 0.003 and 0.71 mg kg ⁻¹ w.w. Lead ranged from 0.02 to 0.36 mg kg ⁻¹ w.w	Sardine (<i>Sardina pilchardus</i>) Tuna (<i>Thunnus</i> spp.) Gilthead sea bream (<i>Sparus aurata</i>) Horse mackerel (<i>Trachurus</i> spp.) Hake (<i>Merluccius merluccius</i>) European anchovy (<i>Engraulis encrasicolus</i>)	Valencia (Spain)	Not indicated	Levels found were lower than limits fixed by European Regulations

					Luvar (<i>Luvarus imperialis</i>) Mackerel (<i>Scomber scombrus</i>) Others			
(Yu, Guo, & Zeng, 2010)	Dietary intake of persistent organic pollutants and potential health risks via consumption of global aquatic products	Concentration of four pollutant groups in aquatic products from major aquaculture countries around the world	Dioxins, OCP, PCB, PBDE	Concentration level of all contaminants varied for regions and aquatic products (see Figure 1 of Article)	Marine fish (and other aquatic products)	Africa—Egypt and Tanzania; North and South America—Brazil, Canada, Chile, and the United States; Asia—China, India, Indonesia, Japan, South Korea, and Vietnam; Europe—Belgium, Denmark, Norway, Spain, Sweden, and Switzerland; and Oceania—Australia	Not indicated	Data collection from literature published after 2000 Estimated daily intakes of PCDD, PCB, OCP and PBDE for global residents through consumption of aquatic products are in acceptable range of existing regulations and guidelines, except for marine fish and dioxins
(Yildirim, Gonulalan, Narin, & Soylak, 2009)	Evaluation of trace heavy metal levels of some fish species sold at retail in Kayseri, Turkey	Heavy metal concentration in fish from fish markets in Kayseri City, Turkey	Cu, Cr, Cd, Zn, Ni and Pb	Mean and comparison of heavy metal concentration are summarized in Table 2 of the Article	Sparus auratus, Pomatomus saltatrix, Sarda sarda, Engraulis encrasicolus, Sander lucioperca and Scomber scombrus	Kayseri City, Turkey	Not indicated	"Cd concentrations of at least 31 fish samples (50.8%) and Pb concentrations of at least six fish samples (9.8%) exceeded the corresponding Turkish permissible limit of 0.05 and 0.2 mg kg ⁻¹ respectively whereas Zn concentrations of 11 fish samples (18%) exceeded the Turkish Food Codex limits of 50 mg kg ⁻¹ for Zn" Cd, Pb and Zn contents can constitute a problem for public health

(Yabanli & Alparslan, 2015)	Potential Health Hazard Assessment in Terms of Some Heavy Metals Determined in Demersal Fishes Caught in Eastern Aegean Sea	Heavy metal concentration in five fish species and risk assessment for children and adults Fish (273 in total) were purchased from local fishermen	Cr, Cu, Cd, Hg and Pb	Mean heavy metal concentration for the five fish species is given in Table 3 of Article	Red mullet <i>Mullus barbatus</i> (I), surmullet <i>Mullus surmuletus</i> (II), sand steenbras <i>Lithognathus mormyrus</i> (III), common pandora <i>Pagellus erythrinus</i> (IV) and common two-banded seabream <i>Diplodus vulgaris</i> (V) species	Eastern Aegean Sea (Fethiye, Bodrum, Datça, Marmaris)	Not indicated	"The EDI values for each metal were ascertained not to exceed the tolerable daily intake amount. Fish did not contain sufficiently high levels of these metals to pose a carcinogenic risk."
(W. Zhang & Wang, 2012)	Large-scale spatial and interspecies differences in trace elements and stable isotopes in marine wild fish from Chinese waters	Trace elements in 29 marine wild fish from Chinese waters	Ag, Al, As, Cd, Cr, Cu, Fe, Mo, Ni, Pb, Se, and Zn	Trace elements concentration for 29 fish given in Table 1 of the article	29 marine wild fishes (see table 1 of article)	Coastal areas in China	Not indicated	"For each marine fish species, demersal fish were more liable to enriching trace elements than the pelagic fish. Risk assessments indicated that human health risks associated with trace elements exposure via consumption of marine wild fish are negligible."
(Xia, Lam, Wu, Xie, & Lam, 2012)	Polychlorinated biphenyls (PCBs) in marine fishes from China: Levels, distribution and risk assessment	PCB and dioxin-like PCBs in fish from nine coastal cities of East China	PCB, dioxin-like PCB	Concentrations given in Figure 2 of article	large yellow croaker (<i>Pseudosciaena crocea</i>) and silver pomfret (<i>Pampus argenteus</i>)	Coastal cities of East China (Dalian, Tianjin, Qingdao, Shanghai, Zhoushan, Wenzhou, Fuzhou, Quanzhou, and	Not indicated	"PCBs were detected in all the fish samples... higher concentrations of total PCBs were found in croakers than in pomfrets... Risk estimation indicated that PCBs may pose a health risk to heavy fish consumers"

						Xiamen in 2008)		
(Wu, et al., 2014)	The arsenic content in marketed seafood and associated health risks for the residents of Shandong, China	Arsenic content in 200 samples (81 fish) of 22 species (fish, shrimp, bivalves) collected from local markets	Arsenic	Total As levels for fish (mean, median and range) summarized in Table 1	Summarised in Table S1 and Figure 2	Shandong China	Not indicated	"Total As content in the three major consumption categories of seafood was bivalve>shrimp>fish. The results suggested that organisms which were more closely related with sediments may be more susceptible to As contamination."
(X. Wang, et al., 2015)	Assessment on dioxin-like compounds intake from various marine fish from Zhoushan Fishery, China	Dioxin-like compounds in 32 fish species most consumed by local residents, retrieved between September and October 2011	Dioxin-like compounds	"Levels of PCDDs, PCDFs and dl-PCBs in different fish species varied significantly ranging from 0.002 to 0.078 pg WHO-TEQ/g fresh weight, from 0.002 to 0.553 pg WHO-TEQ/g fresh weight and from 0.003 to 2.059 pg WHO-TEQ/g fresh weight, respectively" Levels for fish species indicated in Table 1	Summarised in Table A1	Zhoushan, China	Not indicated	" <i>Bullet mackerel</i> has the highest monthly intake level which was much higher than other fish species and very close to the provisional tolerable monthly intake (70 pg TEQ kg ⁻¹ bw month ⁻¹) proposed by the Joint FAO/WHO Expert Committee on Food Additives"
(W. Wang, Batterman, Chernyak, & Nriagu, 2008)	Concentrations and risks of organic and metal contaminants in Eurasian caviar	Organic contaminants in three caviar species imported from Azerbaijan, Bulgaria, Iran and	Organic contaminants (DDT, HCH, PCBs, PBDE, 23 metals)	"PCB concentrations averaged 15.4±25.8 ng/g wet weight basis (wwt), DDT averaged 79±139 ng/g wwt, arsenic (As) averaged 960±486 ng/g, and PBDEs were	Caviar (<i>Acipenser Huso huso</i> , <i>Acipenser gueldenstaedti</i> , and <i>Acipenser stellatus</i>)	Azerbaijan, Bulgaria, Iran and Russia	Not indicated	"Concentrations of organic contaminants measured in the caviar samples generally fell below those reported in earlier studies... Caviar showed very low PBDE levels in comparison to recent fish samples collected in North America and Europe"

		Russia before 2006		detected in all samples" Summarised in Table 2 of article				"Among the organic compounds, high concentrations of PCBs and DDTs were found in <i>Huso huso</i> samples" "available data, declining concentrations, and typically low per capita consumption rates suggest that advisories or consumption limits are not warranted."
(Voegborlo, Adimado, & Ephraim, 2007)	Total Mercury Distribution in Different Tissues of Frigate Tuna (<i>Auxis thazard thazard</i>) from the Atlantic Coastal Waters of Ghana, Gulf of Guinea	Mercury levels in different tissues 21 tuna samples from Tema in the Greater Accra Region collected in April 2004	Mercury	"concentration of total mercury detected in the edible muscle tissue of the tuna fish tested ranged from 0.044 to 0.201 $\mu\text{g g}^{-1}$ (mean = 0.108 $\mu\text{g g}^{-1}$) wet weight" Mercury levels in different tissues indicated in Figure 1 of article	Frigate Tuna (<i>Auxis thazard thazard</i>)	Gulf of Guinea	Not indicated	"levels are all within the limit (0.5 $\mu\text{g g}^{-1}$ wet weight) set by the Food and Agriculture Organisation/World Health Organisation and are therefore unlikely to constitute any significant mercury exposure to the general population because of consumption of tuna fish"
(Van Leeuwen & De Boer, 2008)	Brominated flame retardants in fish and shellfish – levels and contribution of fish consumption to dietary exposure of Dutch citizens to HBCD	BFR levels in fish commonly consumed by Dutch population and caught between May and December 2003	BFR (PBDE, TBBP-A, TBBP-B, HBCD)	Table 2 indicates BDE and HBCD levels for marine fishes	Clupea Harengus, Gadus morhua, Pollachius virens, Anguilla anguilla, Platichthys flesus, Melanogrammus Aeglefinus, Pleuronectes platessa, Sander lucioperca, Solea solea	Netherlands (different locations, see Table 1 of article)	Not indicated	"The highest BFR concentrations were found in pike-perch and eel from the highly industrialized and urbanized rivers Rhine and Meuse. The sum concentrations of BDE 28, 47, 99, 100, 153, 154, 183, 209, and brominated biphenyl (BB) 153 and HBCD (selection based on The European Food Safety Authority monitoring recommendation) ranged from below quantification limits to 17 ng/g wet weight (ww) in marine fish.... Total-HBCD was detected in 22 out of the 44 samples in concentrations between 0.20 ng/g in marine fish"

(Usyduś, et al., 2009)	Fish products available in Polish market – Assessment of the nutritive value and human exposure to dioxins and other contaminants	Contaminant levels in 120 fish products of the fish market in Poland during the period January to November 2006	Several contaminants (toxic metals – mercury, cadmium, lead, arsenic; dioxin/furans – PCDDFs; dioxin-like PCB – dl-PCBs; seven congeners of polybrominated diphenyl ethers – PBDEs; organochlorine pesticides – ΣDDT, HCB, ΣHCH and marker polychlorinated biphenyls – PCB ₇)	Contaminant levels indicated in Table 4 and 5 of the article	Smoked fish (mackerel, sprat, herring, baltic salmon, trout) Salted fish (herring fillets) Marinated fish (herring fillets, fried mackerel in vinegar)	Poland (Pomorskie, Zachodnio-Pomorskie, Śląskie, Wielkopolskie)	Not indicated	“The majority of contaminants studied were present in low levels. The possible threats, particularly in the case of pregnant/nursing women and young children, can pose the levels of dioxin/furans (PCDD/Fs) and dioxin-like (dl-PCBs) in smoked Baltic salmon and smoked sprat, elevated in a relation to particular requirements concerning the content of sum of PCDD/Fs and dl-PCBs in fish.”
(Türkmen, Tepe, & Türkmen, 2008)	Metal Levels in Tissues of the European Anchovy, <i>Engraulis encrasicolus</i> L., 1758, and Picarel, <i>Spicara smaris</i> L., 1758, from	Metal levels in anchovy and picarel from Turkey collected between January and May 2005	cadmium, cobalt, chromium, copper, iron, manganese, nickel, lead and zinc	Mean metal levels are indicated in Table 1 and 2 of the article “concentration ranges of cadmium, cobalt, chromium, copper, iron, manganese, nickel, lead and zinc in the samples were 0.01–	European Anchovy (<i>Engraulis encrasicolus</i> L., 1758) Picarel (<i>Spicara smaris</i> L., 1758)	Black, Marmara and Aegean seas, Turkey	Not indicated	“The present study show that although different metals were present in the samples at different levels but within the maximum residual levels prescribed by the TKB and FAO the specimens from these areas, in general, are safe for human consumption.”

	Black, Marmara and Aegean Seas			0.07, 0.01–0.08, 0.09–0.51, 0.21–8.58, 11.9–169, 0.14–2.82, 0.06–1.51, 0.12–0.87, 7.12–45.6 mg kg ⁻¹ for muscles, and 0.06–0.69, 0.06–0.53, 0.28–2.97, 0.99–30.7, 55.2–316, 0.72–9.67, 0.47–11.6, 0.26–3.38, 12.5–145 mg kg ⁻¹ for livers, respectively”				
(Trabalon, et al., 2015)	Exposure of the population of Catalonia (Spain) to musk fragrances through seafood consumption: Risk assessment	Musk concentration in fish species purchased from local markets in Tarragona	Synthetic musks	Concentration of 10 musk fragrances is indicated in Table 4 of the article	hake (<i>Merluccius merluccius</i>), tuna (<i>Thunnus Thynnus</i>), sole (<i>Solea solea</i>), sardine (<i>Sardina pilchardus</i>), codfish (<i>Gadus morhua</i>), salmon (<i>Salmo salar</i>), mackerel (<i>Scomber scombrus</i>), squid (<i>Loligo vulgaris</i>)	Tarragona, Catalonia, Spain	Not indicated	“Most polycyclic musks were identified in several samples. HHCB and AHTN were present in all the analyzed samples. HHCB showed the highest concentrations, being sardine and mackerel the species with the greatest values (367 and 304 ng g ⁻¹ (d.w.), respectively)... The highest exposure was estimated for HHCB and HHCB-Lactone, with average intakes of 19.7 and 6.8 ng kg ⁻¹ bw day ⁻¹ , respectively. Contrastingly, the mean exposure to AHTN, DPMI and ATII ranged between 1.1 and 3.7 ng kg ⁻¹ bw day ⁻¹ ...The current concentrations of musks in fish and shellfish should not mean human health risks for the adult population living in Tarragona.”
(Tepe, Tuerkmen, & Tuerkmen, 2008)	Assessment of heavy metals in two commercial fish species of four	Heavy metal contents in two fish species collected from May	Cd, Co, Cr, Cu, Fe, Mn, Ni, Pb, Zn	Contamination level are indicated in Table 3 of the article	Mullus barbatus (red mullet) and Merlangius merlangus (whiting)	Turkey: Trabzon (TRB), Sinop (SNP) and Bartın (BRT) in the Black Sea; Yalova	Not indicated	“The highest levels of each metal were found in the liver and this was followed by the muscle in both species. Cu, Zn and Fe were the most abundant in the different tissues while Cd and Pb were the least abundant both in Mullus

	Turkish seas	2005 to July 2005				(YLV) in the Marmara Sea; North Aegean Sea (NAS) and Central Aegean Sea (CAS) in Aegean Sea, Antalya (AB), Mersin (MB) and İskenderun Bays (IB) in Mediterranean Sea		barbatus (red mullet) and Merlangius merlangus (whiting)"
(Szlinder-Richert, Barska, Usydus, & Grabic, 2010)	Polybrominated diphenyl ethers (PBDEs) in selected fish species from the southern Baltic Sea	PBDE concentrations in fish collected 2004 - 2006	PBDE	Annual means of PBDE concentration is indicated in Table 1 of the article	herring, sprat, salmon	Southern Baltic sea (polish fishing grounds)	Not indicated	"Mean Σ_7 PBDE concentrations measured in herring (<i>Clupea harengus</i>), sprat (<i>Sprattus sprattus</i>), and salmon (<i>Salmo salar</i>) samples were 1.2 ng g ⁻¹ wet weight, 1.6 ng g ⁻¹ wet weight, and 2.5 ng g ⁻¹ wet weight, respectively."
(Sun, et al., 2014)	Persistent organic pollutants in marine fish from Yongxing Island, South China Sea: Levels, composition profiles and human dietary exposure assessment	POP concentration in marine fish collected between July and August 2012	Persistent organic pollutants (POP): PBDEs, PCBs, DDTs	Table 1 in the article indicates the concentration of POP	yellowband sweetlip (YS, <i>Plectorhinchus diagrammus</i> , yellow striped goatfish (YSG, <i>Parupeneus chrysopleuron</i> , pacific yellowtail emperor (PYE, <i>Lethrinus atkinsoni</i> , blue spotted grouper (BSG, <i>Cephalopholis argus</i> , and banded reef cod (BRC,	Yongxing Island, South China Sea	Not indicated	"Results showed that the levels of POPs were at the lower end of the global range... Among the five fish species studied, yellow striped goatfish had the highest concentrations of PBDEs, PCBs, and DDTs... consumption of marine fish in Yongxing Island, SCS, might not subject local residents to significant health risk as far as POPs are concerned"

					<i>Epinephelus fasciatus</i>			
(Su, et al., 2012)	Dioxin-like Potency of HO- and MeO-Analogues of PBDEs' the Potential Risk through Consumption of Fish from Eastern China	Concentration of PBDE and their analogues in marine fishes in Eastern China	Polybrominated diphenyl ethers (PBDEs) and their analogues, such as hydroxylated PBDE (HO-PBDEs) and methoxylated PBDE (MeO-PBDEs)	Table 1 in the article indicates the concentration of PBDEs	Five marine fishes (the razor clam (<i>Sinonovacula constrctta</i>), the spotted sicklefish (<i>Drepane punctata</i>), the elongate ilisha (<i>Ilisha elongate</i>), the bigeyed flathead (<i>Suggrundus meerdervoortii</i>), the small yellow croaker (<i>Pseudosciaena polyactis</i>)	Yellow Sea, Eastern China	Not indicated	Concentration of Σ PBDEs in marine fish ($1.8-2.3 \times 10^1$ ng/g lipid with mean of 1.2 ng/g lipid) was 56.7 fold lower than those in freshwater fish... analogues of PBDEs were detected in each of the marine fishes, especially 2'-MeO-BDE-68, 6-MeO-BDE-47, and 4-HO-BDE-90, which were detected in 80% of samples... 6 were found to have measurable dioxin-like potency.
(Struciński, et al., 2013)	PCDD/Fs and DL-PCBs intake from fish caught in Polish fishing grounds in the Baltic Sea — Characterizing the risk for consumers	Collected 2006 – 2011. Results from polish monitoring surveys	PCDD/Fs and DL-PCBs	Table 1 summarizes the PCDD/Fs and DL-PCBs content in Baltic fish species and cod liver	salmon (<i>Salmo salar</i>), sea trout (<i>Salmo trutta m. trutta</i>), sprat (<i>Sprattus sprattus balticus</i>), herring (<i>Clupea harengus membrus</i>), cod (<i>Gadus morrhua callarias</i>) canned baltic cod liver in own oil	Polish fishing grounds (Baltic Sea)	Not indicated	"Consumption of Baltic cod liver and salmonids caught in Polish fishing grounds might pose a risk for human health."

(M. M. Storelli, et al., 2012)	Toxic metals (Hg, Cd, and Pb) in fishery products imported into Italy: Suitability for human consumption	Level of toxic metals in fishery products	Mercury, cadmium, and lead	Only Abstract of Article	e.g. swordfish, longtail tuna, thornback ray	Imported into Italy from European and non-European coastal countries	Not indicated	Information only based on the Abstract of the article "The highest mean Hg concentration was found in fishes ($0.21 \mu\text{g g}^{-1}$ wet weight)... Swordfish ($0.80 \mu\text{g g}^{-1}$ wet weight), longtail tuna ($0.53 \mu\text{g g}^{-1}$ wet weight), and thornback ray ($0.52 \mu\text{g g}^{-1}$ wet weight) had the highest concentrations of Hg... The calculated mean weekly intakes of Hg, Cd, and Pb through consumption of the fishery products tested were all below the legislated respective provisional tolerable weekly intakes. In general, the samples analyzed were considered safe to eat with regard to the metal concentrations found and the allowable intakes based on legislation."
(Maria Maddalena Storelli, Barone, Perrone, & Giacomini-Stuffler, 2011)	Polychlorinated biphenyls (PCBs), dioxins and furans (PCDD/Fs): Occurrence in fishery products and dietary intake	PCBs, dioxins and furans in fishery products from the Adriatic sea	PCBs, PCDDs and PCDFs	Table 1 in the article indicates the concentration levels	Benthic: [conger (<i>Conger conger</i>), angler fish (<i>Lophius budegassa</i>), rosefish (<i>Helicolenus dactylopterus</i>), red mullet, (<i>Mullus barbatus</i>), fourspotted megrim (<i>Lepidorhombus boscii</i>), scaldfish (<i>Arnoglossus laterna</i>), yellow gurnard (<i>Trigla lucerna</i>), red gurnard	Adriatic Sea	Not indicated	"PCBs were the dominant chemicals, followed by PCDFs and PCDDs, in all samples, benthic organisms were the most contaminated, respectively compared to those of demersal and pelagic nature... the dietary consumption of these species does not represent a risk for human health, although the ingestion of some species may be of significance importance for consumer health."

					<p>(<i>Aspitrigla cuculus</i>),</p> <p>Demersal: [hake (<i>Merluccius merluccius</i>), Atlantic stargazer (<i>Uranoscopus scaber</i>), brown comber (<i>Serranus hepatus</i>), wreckfish (<i>Polyprion americanus</i>), bogue (<i>Boops boops</i>), sea bream (<i>Pagellus erythrinus</i>), forkbeard greater (<i>Phycis blennoides</i>)]</p> <p>pelagic organisms: [horse mackerel (<i>Trachurus trachurus</i>), mediterranean horse mackerel (<i>Trachurus mediterraneus</i>)]</p>			
(M. M. Storelli, Barone, Cuttone, Giungato, &	Occurrence of toxic metals (Hg, Cd and Pb) in fresh and canned	Contents of toxic metals in fresh and canned tuna from	Hg, Cd, Pb	Fresh tuna: "Hg (0.07–1.76, average: 0.61 µg g ⁻¹ wet wt) showed the highest concentration,	Bluefin tuna (T. thynnus)	Tyrrhenian Sea	Not indicated	"Hg had the highest concentrations, followed by Pb and Cd either in fresh tuna or canned tuna. None of the tested samples surpassed the European regulatory limits fixed for Cd and Pb, whereas 8.9% of the

Garofalo, 2010)	tuna: Public health implications			<p>followed by Pb (ND-0.33, average: 0.07 $\mu\text{g g}^{-1}$ wet wt) and Cd (ND-0.03, average: 0.01 $\mu\text{g g}^{-1}$ wet wt)."</p> <p>Canned tuna:</p> <p>"Hg and Cd were detected in all samples analysed with concentrations ranging from 0.04 to 1.79 $\mu\text{g g}^{-1}$ wet wt (average: 0.41 $\mu\text{g g}^{-1}$ wet wt) and from 0.01 to 0.14 $\mu\text{g g}^{-1}$ wet wt (average: 0.04 $\mu\text{g g}^{-1}$ wet wt), respectively, while Pb was encountered in 40 of samples analysed with levels varying between 0.02 and 0.16 $\mu\text{g g}^{-1}$ wet wt (average: 0.06 $\mu\text{g g}^{-1}$ wet wt)."</p>				tuna cans and 20% of fresh tuna samples exceeded standard for Hg... A continuous surveillance system of Hg content in these fishery products is crucial for consumer protection."
(M. M. Storelli & Barone, 2013)	Toxic Metals (Hg, Pb, and Cd) in Commercially Important Demersal Fish from Mediterranean Sea: Contamination Levels	Toxic Metal levels in demersal fish commonly consumed in Italy and caught in the Adriatic Sea (Mediterranean)	Hg, Pb, Cd	Range, mean and standard deviation of total Hg, Cd and Pb concentration indicated in Table 2 and 3 of the article	Conger conger (European conger eel), Raja miraletus (brown ray), Lophius budegassa (blackbellied angler), Helicolenus dactylopterus	Italy (Adriatic Sea)	Not indicated	"Among the metals tested, the dominating element was Hg ranging from 0.43 to 1.14 $\mu\text{g/g}$ wet weight, followed by Pb (0.09 to 0.14 $\mu\text{g/g}$ wet weight) and Cd (0.08 to 0.11 $\mu\text{g/g}$ wet weight)... Hg accumulation was species-specific...The Pb concentrations were within the prescribed limits set by European Community regulation, while except important exceptions were

	and Dietary Exposure Assessment	ean Sea) from May to June 2010			(rosefish), and <i>Mullus barbatus</i> (red mullet)			observed for Hg and Cd, whose content was above the legal limits in most of the samples examined... The estimated weekly intakes (EWIs) as well as the target hazard quotients (THQs) for Cd and Pb indicated that fish were safe for human consumption, whereas major concern was related to Hg."
(M. M. Storelli, 2008)	Potential human health risks from metals (Hg, Cd, and Pb) and polychlorinated biphenyls (PCBs) via seafood consumption: Estimation of target hazard quotients (THQs) and toxic equivalents (TEQs)	Metal- and PCB content in benthic, demersal and pelagic fish collected from May to June 2006	Hg, Cd, Pb PCBs	Range and mean concentration of heavy metals is indicated in Table 2 of the article Total PCB levels are indicated in Table 3 of the article	Benthic, Pelagic and Demersal fish species (see table 1 of the article)	Adriatic Sea	Not indicated	"Mercury maximum concentrations corresponded to fish (0.07–1.56 lg g ₋₁ w.w.)... Cadmium levels in fish (0.01–0.05 lg g ₋₁ w.w.)... Pb the concentrations were generally low (fish: ND–1.18 lg g ₋₁ w.w.)... For PCBs, concentrations in fish ranged between 141 and 3406 ng g ₋₁ l.w... Cd and Pb THQ values as well as estimates of PCB TEQ exposure indicated the absence of health risks through consumption of the various seafood. In contrast, mercury TEQs values due to consumption of certain fish species (albacore, rosefish and thornback ray) indicated that human health risk might be of concern."
(Spada, Annicchiarico, Cardellicchio, Giandomenico, & Di Leo, 2012)	Mercury and methylmercury concentrations in Mediterranean seafood and surface sediments,	Mercury concentration in corkwing wrasse	Mercury and Methylmercury	Mercury concentration indicated in table 2 of the article. "In fish <i>Symphodus m.</i> THg concentrations ranged from 324 to 1740 µg/kg d.w.,	corkwing wrasse (<i>Symphodus melops</i>)	Mar Piccolo and Mar Grande, Taranto seas (Adriatic Sea)	Not indicated	"THg concentrations in edible species were below limit established by the European Community (0.5 mg/kg w.w.)... The calculated weekly intake was in many cases over the Provisional Tolerable Weekly Intake established by EFSA for all edible species. These results seem to indicate that dietary consumption of this seafood

	intake evaluation and risk for consumers			while the levels of Me-Hg ranged from 190 to 1040 µg/kg d.w.”				implicates an appreciable risk for human health.”
(Sivaperumal, Sankar, & Nair, 2007)	Heavy metal concentrations in fish, shellfish and fish products from internal markets of India vis-a-vis international standards	Heavy metal concentration in fish species and fish products collected from fish markets in and around Cochin, India between December 2003 and January 2005	Zn, Cu, Cd, Pb, Cr, Ni	Table 5 and 6 of the article indicates the heavy metal concentration in fish species and fish products	Fish species indicated in Table 5 of the article Fish products are indicated in Table 6 of the article	Cochin, India	Not indicated	“The present study showed that different metals were present in the samples at different levels but within the maximum residual levels prescribed by the EU and USFDA and the fish and shellfish from these areas, in general, are safe for human consumption.”
(Sirot, Guerin, Volatier, & Leblanc, 2009)	Dietary exposure and biomarkers of arsenic in consumers of fish and shellfish from France	Arsenic concentration in different fish species and fish products collected according to a total diet study sampling method	Arsenic	As concentration indicated in Table 1 of the article	Fish species, canned fish products and smoked fish (indicated in Table 1)	France	Not indicated	“The fish species containing the highest concentrations of As _{Tot} are bottom fish: plaice (<i>Pleuronectes platessa</i> , <i>Glyptocephalus cynoglossus</i> , <i>Glyptocephalus cynoglossus</i>), pout (<i>Trisopterus luscus</i> , <i>Trisopterus minutus capelanus</i> , <i>Trisopterus minutus capelanus</i>), sole (<i>Solea solea</i>), goatfish (<i>Mullus barbatus</i> , <i>Mullus surmuletus</i>), ray (<i>Raja clavata</i> , <i>Raja naevus</i> , <i>Raja circularis</i>), common dab (<i>Limanda limanda</i> , <i>Microstomus kitt</i>) and catshark or dogfish (<i>Scyliorhinus canicula</i> , <i>Scyliorhinus stellaris</i>). Their levels range between 12 and 34 µg/g... The average As dietary exposure is 94.7 ± 67.5 µg/kg bw/week in females and 77.3 ± 54.6 µg/kg bw/week in males (<i>p</i> < 0.001) and

								the inorganic As dietary exposure is respectively $3.34 \pm 2.06 \mu\text{g/kg bw/week}$ and $3.04 \pm 1.86 \mu\text{g/kg bw/week}$ ($p < 0.05$)."
(Sioen, De Henauw, Van Camp, Volatier, & Leblanc, 2009)	Comparison of the nutritional-toxicological conflict related to seafood consumption in different regions worldwide	Contaminants in fish species around the world according to the Global Environmental Monitoring System	Mercury, MeHg, PCB congeners, PCDDs and PCDFs, dioxin like compounds		demersal marine fishes (i.e. fishes that live close to the bottom, also called bottom feeders or groundfish, e.g. cod, whiting, halibut, plaice, sole, haddock, saithe, dab), pelagic marine fishes (i.e. fishes that live in the open sea, e.g. salmon, herring, mackerel, tuna, swordfish) other marine fishes (i.e. marine fishes not classified as demersal or pelagic, e.g. shark, snapper, dogfish), and	Global	Not indicated	"From the toxicological side, the data indicate that none of the seafood groups had a median contaminant concentration above the EU maximum limits. Though, the results show that in some regions the contaminant intake exceeded the international health-based guidance values, mainly focussing on sensitive subpopulations. In contrast, when using less stringent guidance values relevant for non-sensitive subpopulations, the results show that the benefits of increased seafood consumption outweigh the risks."
(Sevillano-Morales, Cejudo-Gómez, Ramírez-Ojeda,	Risk profile of methylmercury in seafood	Brief review of risk by methylmercury in seafood	Methylmercury	Table 1 summarises Hg levels of different fish species from different studies in several countries	Fish species are indicated in Table 1 of the article	Global	Not indicated	"Predatory species (swordfish, shark or tuna) have higher levels of mercury, swordfish being the species that showed the highest content... Exposure data and risk, taken from different studies, are variable and

Cámara Martos, & Moreno-Rojas, 2015)								indicate that fish consumption may represent a risk only in certain geographic areas and in certain sectors of the population, and it warns of the potential risk in pregnant women, nursing women, women of childbearing age and children. "
(Santos, et al., 2009)	Organotin levels in seafood from Portuguese markets and the risk for consumers	Organotin levels in seafood most relevant for Portuguese consumers	Organotins: Tributyltin (TBT), dibutyltin (DBT), monobutyltin (MBT), triphenyltin (TPT), tetrabutyltin (TetraBT), tricyclohexyltin (TcHT), monoocetyl tin (MOT) and dioctyltin (DOT)	Table 1 of the article summarises the organotin-content	Fish species are indicated in Table 1	Portugal (but also imported fish)	Not indicated	"In general, levels of BTs in edible parts of fish, crustaceans and cephalopods collected in Portuguese markets during this study are in the lower range." Most TBT and DBT level were below the tolerable average residue level (TARL), which may indicate a low risk for consumers.
(Russo, et al., 2013)	Heavy Metals in Canned Tuna from Italian Markets	Heavy metals in canned tuna packaged in cans or glass, processed in Italy or elsewhere and obtained from Italian markets 2010 - 2011	Hg, Pb, Cd	Table 1 of the article summarizes the mean, standard deviation, minimum, and maximum levels	Canned tuna in olive oil	Italy	Not indicated	"At least one heavy metal was found in each analyzed sample; Pb was detected at the highest concentrations followed by Hg and Cd... Concentrations of Cd and Hg were within the limits set by European Commission Regulation (EC) No 1881/2006 and in many samples were below the detection limit. Pb concentrations exceeded European limits in 9.8% of the analyzed samples."

(Ruelas-Inzunza, Patiño-Mejía, Soto-Jiménez, Barba-Quintero, & Spanopoulos-Hernández, 2011)	Total mercury in canned yellowfin tuna <i>Thunnus albacares</i> marketed in northwest Mexico	Mercury level in canned tuna purchased in local supermarkets in Mazatlan, Mexico	Hg	Table 2 of the article indicates the total Hg concentration.	Yellowfin Tuna (<i>Thunnus albacares</i>) canned in oil and water	Mazatlan, Mexico	Not indicated	"Highest Hg concentrations were 0.51 ± 0.26 and $0.40 \pm 0.24 \mu\text{g g}^{-1}$ dry weight in water and oil, respectively... reference dose for this element was not exceeded; therefore, no human health risk is likely to occur."
(Rubio, Gutiérrez, Burgos, & Hardisson, 2008)	Total dietary intake of mercury in the canary islands, Spain	Mercury intake of consumers in the Canary Islands	Hg	$118.9 \pm 115.5 \text{ Hg } (\mu\text{g kg}^{-1} \text{ w/w})$	Fishery products	Canary Islands, Spain	Not indicated	"Fishery products contributed 96% of the total Hg intake... None of the fish samples went above the Hg maximum tolerance limit fixed for fishery products by European Legislation (0.5 mg kg^{-1})... The estimated total Hg intake of local population ($5.7 \mu\text{g/person day}^{-1}$) did not exceed the provisional tolerable weekly intake (PTWI) limit of 0.3 mg week^{-1} of total mercury ($43 \mu\text{g/person day}^{-1}$) fixed by the Joint Food and Agricultural Organization/World Health Organization (FAO/WHO) Expert Committee on Food Additives"
(Rodríguez-Hernández, et al., 2016)	Assessment of human health hazards associated with the dietary exposure to organic and inorganic contaminants through the consumption	Contaminants in fish species collected from multinational retailers in the Canary Islands between September and	Organochlorine Pesticides (OCPs) PCBs, As, Cd, Hg	Table 1 and 2 of the article indicate the contamination levels	White fish: wreckfish (<i>Polyprion americanus</i>), megrim (<i>Stephanolepis hispidus</i>), sole (<i>Solea vulgaris</i>), seabass (<i>Dicentrarchus labrax</i>), hake (<i>Merluccius merluccius</i>),	Canary Islands, Spain	Not indicated	"When these intakes are individually considered we found that none of the reference values (tolerated daily intakes) were exceeded, although the case of As, HCB, and B[a]P _{eq} could be somewhat of concern. However, when we estimated the risk associated to multiple contaminants acting together we found a moderate risk of carcinogenicity. Therefore, a decrease in the consumption of fish and seafood is recommended to avoid the carcinogenic risk

	n of fishery products in Spain	November 2014			<p>toothed sparus (<i>Dentex dentex</i>), parrot fish (<i>Sparisoma cretense</i>), gilt head fish (<i>Sparus aurata</i>) and iridescent shark (<i>Pangasius hypophthalmus</i>)</p> <p>blue fish: tuna (<i>Thunnus thynnus</i>), salmon (<i>Salmo salar</i>), sardine (<i>Sardina pilchardus</i>), and trout (<i>Salmo trutta</i>)</p>			associated to these pollutants, especially in the case of white fish, whose consumption should be reduced to one-third of the current level."
(Rochman, et al., 2015)	Anthropogenic debris in seafood: Plastic debris and fibers from textiles in fish and bivalves sold for human consumption	August to November 2014	Anthropogenic debris (plastics, fibre)	Table 1 and 2 summarize the number of pieces of debris/animal (average, range)	Indonesia: tilapia (<i>Oreochromis niloticus</i>), skipjack tuna (<i>Katsuwonus pelamis</i>), Indian mackerel (<i>Rastrelliger kanagurta</i>), shortfin scad (<i>Decapterus macrosoma</i>), silver-stripe round herring (<i>Spratelloides gracilis</i>), from the family Carangidae	Makassar, Sulawesi, Indonesia and Half Moon Bay, California USA	Not indicated	<p>Indonesia: "Overall, 21 out of 76 (28%) fish sampled had anthropogenic debris in their GI tract."</p> <p>USA: "Overall, 16 out of 64 (25%) individual fish had anthropogenic debris in their GI tract."</p> <p>"All of the anthropogenic debris recovered from fish in Indonesia was plastic, whereas anthropogenic debris recovered from fish in the USA was primarily fibers."</p>

					<p>(could not be identified to genera), rabbitfish (<i>Siganus argenteus</i>, <i>Siganus fuscescens</i>, <i>Siganus canaliculatus</i>), humpback red snapper (<i>Lutjanus gibbus</i>) and oxeye scad (<i>Selar boops</i>).</p> <p>USA: jacksmelt (<i>Atherinopsis californiensis</i>), Pacific anchovy (<i>Engraulis mordax</i>), Pacific mackerel (<i>Scomber japonicus</i>), yellowtail rockfish (<i>Sebastes flavidus</i>), striped bass (<i>Morone saxatilis</i>), Chinook salmon (<i>Oncorhynchus tshawytscha</i>), albacore tuna (<i>Thunnus alalunga</i>), blue rockfish</p>			
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					(<i>Sebastes mystinus</i>), Pacific sanddab (<i>Citharichthys sordidus</i>), lingcod (<i>Ophiodon elongatus</i>), copper rockfish (<i>Sebastes caurinus</i>) and vermilion rockfish (<i>Sebastes miniatus</i>)			
(Robertson, et al., 2014)	Invasive Lionfish (<i>Pterois volitans</i>): A Potential Human Health Threat for Ciguatera Fish Poisoning in Tropical Waters	CFP in lionfish collected between 2010 and 2011	Ciguatera Fish Poisoning	153 lionfish samples tested, 19 fish (St. Croix, $n = 3$; St. Thomas/St. John, $n = 16$) had a composite toxicity exceeding the FDA guidance level of 0.1 $\mu\text{g}/\text{kg}$ C-CTX-1 equivalents and were confirmed to contain C-CTX-1 and -2	Invasive Lionfish (<i>Pterois volitans</i>)	US Virgin Islands	Not indicated	"A 12% prevalence rate of ciguatoxic lionfish exceeding the FDA guidance level of 0.1 $\mu\text{g}/\text{kg}$ C-CTX-1 equivalents was identified in fish from the U.S. Virgin Islands, highlighting a potential consumption risk in this region. This study presents the first evidence that the invasive lionfish, pose a direct human health risk for CFP and highlights the need for awareness and research on this food safety hazard in known endemic areas."
(Reposi, Farabegoli, Gazzotti, Zironi, & Pagliuca, 2016)	Bisphenol a in edible part of seafood	Review of worldwide literature regarding Bisphenol A contamination in seafood	Bisphenol A	Not indicated in Abstract!	Canned and non-canned seafood	Global	Not indicated	Information only from Abstract! "The data evaluated underline that all concentrations for both canned and non-canned seafood were below the specific migration limit set by the European Community Directive for BPA in food. Moreover, the canned seafood is more contaminated than the non-canned one."
(Reindl, Falkowska, Szumilo, & ...)	Residue of chlorinated pesticides in fish caught	Residue of chlorinated pesticides in various fish	Chlorinated Pesticides	Table 1 and 2 of the article indicated the content of organochlorine	pelagic herring (<i>Clupea harengus</i>), the demersal cod	Gulf of Gdansk and in the Vistula Lagoon	Not indicated	"The highest mean concentrations of total DDT were found in the muscles of salmon (331.45 ng g^{-1} lw.) and sabre carp (306.29 ng g^{-1} lw.)"

Staniszewska, 2013)	in the Southern Baltic	species caught between September and October 2011		pesticides in the fish species	and flounder (<i>Gadus morhua</i> , <i>Platichthys flesus</i>) and species inhabiting the Vistula Lagoon: freshwater bream (<i>Abramis brama</i>), sabre carp (<i>Pelecus cultratus</i>) and roach (<i>Rutilus rutilus</i>) as well as the anadromous salmon (<i>Salmo salar</i>)			caught in the Vistula Lagoon, and in the muscles of cod (309.88 ng g ⁻¹ lw.) and herring (304.86 ng g ⁻¹ lw.) from the Gulf of Gdańsk. Moreover, it was discovered that the following were present in the muscles of fish: DDT metabolites (pp'-DDE and pp'-DDD isomers) as well as hexachlorobenzene and its metabolites and endrin, dieldrin, α -endosulfan isomers and methoxychlor... Because no concentration limits for pesticides have been defined, consumer safety assessment of fish caught in the Southern Baltic and in the Vistula Lagoon is not possible."
(L. Prester, 2016)	Seafood Allergy, Toxicity, and Intolerance: A Review	Allergens in fish species	Allergens	Table 4 of the article summarizes the allergenic proteins characterized in common fish species and fish products	Table 4 of the article indicates the fish species	Global	Not indicated	"Symptoms caused by HFP, histamine intolerance, and anisakiasis are similar to true seafood allergy."
(Ljerka Prester, 2011)	Biogenic amines in fish, fish products and shellfish: a review	Histamine poisoning in fish species	Histamine or scombroid fish poisoning (HFP)	Table 1 summarises the Histamine content in fish species in various countries over the last decade	scombroid (mackerel, tuna and saury) and non-scombroid (sardine, anchovies, bluefish, mahi-mahi, herring and marlin) species scombrototoxin-forming species such as	Global	Not indicated	

					sailfish, marlin, swordfish, billfish, fish cubes and escolar fish			
(Preece, Hardy, Moore, & Bryan, 2017)	A review of microcystin detections in Estuarine and Marine waters: Environmental implications and human health risk	Expansion of microcystin producing cyanobacteria blooms (CyanoHABs) from contaminated inland waters to estuarine and coastal marine waters and its effect on marine fishes	Microcystin		Finfish: tilapia (<i>Tilapia rendalli</i>), gizzard shad (<i>Dorosoma cepedianum</i>), threadfin shad (<i>D. petenense</i>), blue catfish (<i>Ictalurus furcatus</i>) and Atlantic menhaden (<i>Brevoortia tyrannus</i>)	Tilapia from Jacarepagua Lagoon, Brasil James River Estuary	Not indicated	<p>"blue catfish was the only finfish species potentially consumed by humans...however, the other fish species serve as prey for high trophic level fish thereby facilitating transfer of MCs to fish consumed by humans... Risks for human exposures to MCs, including from foodborne contamination, will likely increase as CyanoHABs expand their range in estuaries and as MC from inland waterbodies more frequently impact coastal waters."</p> <p>"We strongly suggest increased monitoring and research efforts to understand, react to, and prevent ecological and health problems associated with the growing problem of toxic CyanoHABs in coastal environments."</p>
(Perugini, et al., 2009)	Levels of Total Mercury in Marine Organisms from Adriatic Sea, Italy	Mercury levels in fish species collected in 2004 in the Adriatic Sea	Mercury	Mercury levels indicated in Figure 1, Table 1 and 2 of the article	red mullet (<i>Mullus barbatus</i>), European flying squid (<i>Todarodes sagittatus</i>), Atlantic mackerel (<i>Scomber scombrus</i>), blue whiting (<i>Micromesistius poutassou</i>) and European hake	Adriatic Sea	Not indicated	"Mercury was found in all samples at different concentrations...The highest total mercury mean concentration were observed in decreasing order in: ... European hake (0.59 ± 0.14 mg/kg), red mullet (0.48 ± 0.09 mg/kg), blue whiting (0.38 ± 0.09 mg/kg), Atlantic mackerel (0.36 ± 0.08 mg/kg) and European flying squid (0.25 ± 0.03 mg/kg).... More than 25% of all samples exceeded the maximum limit fixed by European Regulation"

					(<i>Merluccius merluccius</i>)			
(Perelló, et al., 2015)	Human exposure to PCDD/Fs and PCBs through consumption of fish and seafood in Catalonia (Spain): Temporal trend	Organic pollutants in fish species in Catalonia collected in 12 cities in Catalonia in July 2012	PCDD/Fs and PCBs	Table 1 and 2 indicate the average concentrations or organic pollutants in different fish species	fresh sardine, canned sardine, fresh tuna, canned tuna, anchovy, mackerel, swordfish, salmon, hake, red mullet, sole, cuttlefish, squid, clam, mussel, and shrimp	Catalonia, Spain	Not indicated	<p>PCDD/F: "Sardine, red mullet and mackerel presented the highest concentrations (0.249, 0.231 and 0.207 pg WHO-TEQ/g f.w., respectively), while the species with the lowest levels were canned tuna (0.016 pg WHO-TEQ/g f.w.), cuttlefish and squid (both 0.025 pg WHO-TEQ/g f.w.)... None of the analyzed fish and seafood species exceeded the maximum level, established at 3.5 pg WHO-TEQ/g f.w."</p> <p>PCB: "For total PCBs, red mullet (49.9 ng/g f.w.), swordfish (36.6 ng/g f.w.) and sardine (32.1 ng/g f.w.) showed the highest concentrations. By contrast, canned tuna, shrimp and cuttlefish showed the lowest PCB levels (0.21, 0.45 and 0.62 ng/g f.w., respectively)."</p> <p>"Although children were the group of population showing the highest intakes of PCDD/Fs and PCBs, the estimated exposure did not exceed the TDI. Moreover, neither for this group nor for the rest of age/gender groups, the current exposure to PCDD/Fs and PCBs through fish and shellfish consumption would mean additional health risks for the consumers."</p>
(Pastorelli, et al., 2012)	Human exposure to lead, cadmium and mercury	Metal contamination in different fish species purchased	Pb, Cd, Hg	Table 2 of the article indicates the mean and median metal contamination	red mullet, European seabass, gilthead seabream, Atlantic cod,	Italy	Not indicated	"In general terms, heavy metal concentrations varied widely among different organisms, indicating a species-specific bioaccumulation process. Metal concentrations ($\mu\text{g kg}^{-1}$ wet weight) were largely

	through fish and seafood product consumption in Italy: a pilot evaluation	from retail outlets in Italy			European hake, Atlantic bluefin tuna and swordfish			below the MLs established at the European Union level with the exception of Cd. In fact, this metal exceeded the MLs in some samples of red mullet, European hake and Atlantic cod."
(Park, et al., 2011)	Total mercury, methylmercury and ethylmercury in marine fish and marine fishery products sold in Seoul, Korea	Mercury content in fish species marketed in 2009	Total mercury, methylmercury, ethylmercury	"Levels of total and organic mercury in processed fishery products, such as canned tuna, ranged 0.0–2.6 and 0.0–1.3 mg/kg, respectively, and in fish such as cods or salmon they ranged 0.0–2.5 and 0.0–0.5 mg/kg, respectively. Ethylmercury, however, was not detected in any of the samples tested."	fish and fishery products, including cod, salmon, marlin and the canned tuna	Seoul, Korea	Not indicated	"Results indicate that fish and fishery products marketed in Seoul, except marlin steak, contain low amounts of total and organic mercury; thus, intake of these products is not harmful to public health."
(Ouédraogo & Amyot, 2011)	Effects of various cooking methods and food components on bioaccessibility of mercury from fish	Effects of three cooking methods (no cooking, frying, boiling) on mercury bioaccessibility in three fish species using in vitro techniques	Mercury		Spanish mackerel (<i>Scomberomorus maculatus</i>), cat shark (<i>Scyliorhinus</i> sp.) and red tuna (<i>Thunnus thynnus</i>),	Montreal, Canada	Not indicated	"Fried and boiled fish decreased Hg bioaccessibility when compared to raw fish... The exact mechanisms by which cooking affects Hg bioavailability should be further investigated... Bioaccessibility of Hg was decreased by co-digestion of tea or coffee"
(Ordiano-Flores, Galvan-	Bioaccumulation of Mercury in	Bioaccumulation of Mercury in	Mercury	Table 1 of the article indicates the Hg concentration	yellowfin tuna (<i>Thunnus albacares</i>)	Eastern Pacific Ocean	Not indicated	"No Hg concentration was over the Hg content thresholds for large marine predators adopted by

Magana, & Rosiles-Martinez, 2011)	Muscle Tissue of Yellowfin Tuna, <i>Thunnus albacares</i> , of the Eastern Pacific Ocean	tuna collected from two different sites of the Eastern Pacific Ocean between October to December 2006						Mexican norms and by North American authorities ($1 \mu\text{g g}^{-1}$ w.w.)... The target hazard quotient for Hg was <1 in each group of the population studied, which indicates that consumption of yellowfin tuna is not a threat to human health."
(Olmedo, Pla, et al., 2013)	Determination of toxic elements (mercury, cadmium, lead, tin and arsenic) in fish and shellfish samples. Risk assessment for the consumers	Levels of toxic elements in fish collected between 2009 and 2010	Hg, Cd, Pb, Sn, As	Concentration levels are indicated in Table 2 and 3 of the article	fresh, frozen and canned fish (see Table 2 and 3 of the article)	Andalusia, Southern Spain	Not indicated	"In general, and considering fish and shellfish species as a whole, we can conclude that the ingestion of the toxic elements studied from fish and shellfish does not present any health risk for the average consumer. Nevertheless, it should not be dismissed that a regular or excessive consumption of certain fish species, e.g. tuna, swordfish, blue shark and cat shark (in the case of mercury) and common sole (for lead) might exceed the recommended weekly intakes (PTWI) or the benchmark dose lower confidence limit (BMDL) for a certain toxic effect. However, this would not necessarily entail a noticeable risk for heavy consumers."
(Olmedo, Hernández, et al., 2013)	Determination of essential elements (copper, manganese, selenium and zinc) in fish and shellfish samples. Risk and	Level of essential elements in fish collected between 2009 and 2010	Cu, Mn, Se, Zn	Concentration levels are indicated in Table 2 - 4 of the article	fresh, frozen and canned fish (see Table 2 - 4 of the article)	Andalusia, southern Spain	Not indicated	"The ingestion of these [fish] products would never exceed the Toxicity Reference Values considered (TDI/PMTDI or RfD) for the essential elements studied, indicating the absence of risk for average consumers... nevertheless, shark species included in this study (blue shark and cat shark) presented inappropriate Hg:Se ratios and negative Se-HBVs, which make them less advisable"

	nutritional assessment and mercury-selenium balance							
(Muralidharan, Dhananjayan, & Jayanthi, 2009)	Organochlorine pesticides in commercial marine fishes of Coimbatore, India and their suitability for human consumption	Organochlorine residues in fish species collected between January and May 2004	Organochlorine pesticide residues	Mean concentration of organochlorine residues is indicated in Table 2 - 4 of the article	See Table 1 of the article	Coimbatore, India	Not indicated	<p>"Results show varying levels of residues of hexachlorocyclohexane (HCH), DDT, heptachlor epoxide, endosulfan and dieldrin. Among the 10 species, high concentration of pesticide residues were recorded in <i>Sardinella longiceps</i>, <i>Carangoides malabaricus</i>, <i>Chlorophthalmus agassizi</i>, <i>Saurida tumbil</i> and <i>Rastrelliger kanagurta</i>....</p> <p>About 22% of the fishes exceeded the maximum residue limits (MRL) of total HCH prescribed by FAO/WHO for fish products. The calculated dietary intake of total HCH through consumption of <i>C. malabaricus</i>, <i>C. agassizi</i> and <i>S. longiceps</i> exceeded the maximum acceptable dietary intake (ADI) limits prescribed for human consumption."</p>
(Moon, et al., 2011)	Exposure assessment for methyl and total mercury from seafood consumption in Korea, 2005 to 2008	Mercury content in fish species most commonly consumed and commercially important in Korea and collected during 2005 - 2008	Methylmercury and total Mercury	Methylmercury and total mercury concentration is indicated in Table 2 of the article	Fish species are indicated in Table 2 of the article	South Korea	Not indicated	<p>"The residue levels of Me-Hg and T-Hg in Korean seafood were moderate compared with those found in other countries... Mackerel, squid and tuna showed the highest contributions to the total intakes of Me-Hg and T-Hg. The residue levels and intakes of Me-Hg and T-Hg from Korean seafood were less than the allowable residue levels and threshold intake levels suggested by domestic and international authorities."</p>

(Moon, Kim, Choi, Yu, & Choi, 2009)	Human health risk of polychlorinated biphenyls and organochlorine pesticides resulting from seafood consumption in South Korea, 2005-2007	Organochlorine pesticides levels in fish species most commonly consumed and commercially important in Korea and collected during 2005 - 2007	Organochlorine Pesticides	Contamination levels are indicated in Table 1 of the article	Fish species are indicated in Table 1 of the article	South Korea	Not indicated	"OCs such as PCBs, DDTs, CHLs, and HCB were detected in all seafood samples, however HCHs were detected in almost half seafood samples analyzed... PCBs and DDTs were the predominant contaminants with concentrations from 0.2 to 41 ng/g wet wt and from < 0.04 to 37 ng/g wet wt, while CHLs (<0.01-1.9 ng/g wet wt), HCB (<0.004-1.0 ng/g wet wt), and HCHs (<0.02-0.4 ng/g wet wt) were 1-2 orders of magnitude lower than the concentrations of PCBs and DDTs... Mackerel, tuna, and hairtail were the main contributors to the dietary intakes of OCs. Among the eight age groups investigated, infants <2 years had the highest dietary exposure to Ocs."
(Moon, Kim, Choi, & Choi, 2010)	Intake and Potential Health Risk of Polycyclic Aromatic Hydrocarbons Associated with Seafood Consumption in Korea from 2005 to 2007	Polycyclic Aromatic Hydrocarbons- levels in fish species most commonly consumed and commercially important in Korea and collected between 2005 and 2007	Polycyclic Aromatic Hydrocarbons (PAH)	PAH concentrations are indicated in Table 2 of the article	Alaska pollack, mackerel, yellow croaker, anchovy, tuna, hairtail, olive flounder, Spanish mackerel, saury, cod, rockfish, eel, flounder, catfish, angler fish, filefish, ray, and herring	South Korea	Not indicated	"The PAH levels in Korean seafood were moderate compared with those found in other countries... Mackerel and yellow croaker contributed to the highest intakes of PAHs... Children <2 years and 3 to 6 years old have higher PAH intake compared with adults."
(Moon & Choi, 2009)	Human exposure to PCDDs, PCDFs and dioxin-like PCBs	PCDD/Fs and dioxin-like PCBs levels in fish species most	PCDD/Fs and dioxin-like PCBs	Contamination level are indicated in Table 2 of the article	Fish species are indicated in Table 2 of the article	South Korea	Not indicated	"The highest TEQ concentration in marine species was found for mackerel (<i>Scomber japonicus</i> ; 4.20 ± 2.23 pg TEQ/g wet wt), followed by herring (<i>Clupea pallasii</i> ; 4.05 ± 0.73 pg TEQ/g wet wt), eel

	associated with seafood consumption in Korea from 2005 to 2007	commonly consumed and commercially important in Korea and collected between 2005 - 2007						(<i>Conger myriaster</i> ; 4.04 ± 0.59 pg TEQ/g wet wt) and tuna (<i>Thunnus thynnus</i> ; 4.03 ± 0.46 pg TEQ/g wet wt). Hairtail (<i>Trichiurus lepturus</i>) and Spanish mackerel (<i>Scomberomorus niphoniu</i>) showed relatively high residues of PCDD/Fs and DLPCBs... Among the eight age groups investigated, 3–6 year old children had the highest TEQ exposure, followed by 50–64 years, 30–39 years and < 2 years. Considering contributions of seafood consumption to the total dietary intake studies, the dietary TEQ intakes to the general population appear to be below the threshold values by international organizations.”
(Mol, 2011b)	Levels of selected trace metals in canned tuna fish produced in Turkey	Trace elements in canned tuna collected from retail markets in Istanbul, Turkey in 2008	iron, zinc, copper, cadmium, tin, mercury and lead	Table 2 of the article indicates the concentration of trace elements in canned tuna of different brands	Canned tuna	Istanbul, Turkey	Not indicated	“The trace metals were found to be in the range of 20.2–38.7 mg/kg for iron, 8.20–12.4 mg/kg for zinc, 0.48–0.58 mg/kg for copper, 0.01–0.02 mg/kg for cadmium, 0.02–0.13 mg/kg for tin, 0.06–0.30 mg/kg for mercury, and 0.09–0.45 mg/kg for lead... Some of the canned tuna had higher contents of iron and lead than the acceptable limits, and two samples exceeded the levels proposed for mercury. It was also determined that there was no risk with respect to the concentrations of zinc, copper, cadmium and tin in canned tuna.”
(Mol, 2011a)	Levels of Heavy Metals in Canned Bonito, Sardines, and	Levels of trace elements in canned fish species obtained from retail	Fe, Zn, Cu, Cd, Sn, Hg, Pb	“The minimum and maximum concentrations of trace metals in canned bonito, sardines and mackerel were	canned bonito, sardines and mackerel	Istanbul, Turkey	Not indicated	“Canned bonito, sardines and mackerel have concentrations within permissible limits of Zn, Cu, Sn and Hg. However, it has been observed that some samples contain Fe, Cd and Pb above the recommended limits. This result underlines the

	Mackerel Produced in Turkey	markets in Istanbul from November 2008 to October 2009		found as 0.000–34.742, 0.000–89.015, 0.000–28.725 mg/kg for iron, 2.388–26.620, 10.930–41.340, 4.778–29.270 mg/kg for zinc, 0.331–1.548, 0.599–2.242, 0.336–2.884 mg/kg for copper, 0.000–0.065, 0.000–0.113, 0.000–0.115 mg/kg for cadmium, 0.000–0.190, 0.000–0.158, 0.000–0.385 mg/kg for tin, 0.000–0.111, 0.000–0.223, 0.000–0.208 mg/kg for mercury and 0.000–3.046, 0.000–2.875, 0.000–3.529 mg/kg for lead, respectively.” Table 3 of the article indicates the range and average values				significance of periodical controls of canned fish with respect to toxic elements.”
(Miyake, et al., 2008)	Preliminary health risk assessment for polybrominated diphenyl ethers and polybrominated dibenzo- <i>p</i> -	Brominated flame retardants in fish species in China collected between 2003 and 2004	BFR (PBDE, PBDD, PBDF)	PBDE concentrations are indicated in Table 2 of the article	Small yellow croaker (<i>Pseudosciaena plyacii</i>), Belt fish (<i>Pampus argenteus</i>), Silvery pomfret (<i>Pampus argenteus</i>), Japanese	Guangzhou and Zhoushan, China	Not indicated	“PBDE concentrations in fish were over six times higher in Guangzhou samples than in those from Zhoushan... Among the PBDE congeners, BDE 47 and BDE 209 were the predominant congeners found in all the seafood samples. Dietary consumption estimation indicated that fish was the major seafood item contributing to PBDE

	dioxins/furans in seafood from Guangzhou and Zhoushan, China				mackerel (<i>Pneumatophorus japonicus</i>), Conger pike (<i>Muraenesox cinereus</i>), White mouth croaker (<i>Argyrosomus argentatus</i>)			and PBDD/DF intake... PBDDs/DFs may pose some health risks to the local population"
(Mita, et al., 2011)	Bisphenol A content in fish caught in two different sites of the Tyrrhenian Sea (Italy)	Bisphenol A content in fish species with a high commercial value	Bisphenol A	Figure 3 - 5 of the article indicate the Bisphenol A - level	Mullet (<i>Mugil cephalus</i>), Salpa (<i>Sarpa salpa</i>), White Bream (<i>Diplodus sargus</i>), Bass (<i>Dicentrarchus labrax</i>), and Ombrine (<i>Umbrina cirrhosa</i>).	Tyrrhenian Sea, Italy	Not indicated	"Fish livers are about 2.5 times more polluted than muscle; (ii) fish caught in the Gulf of Naples are more polluted than those from the Latium coasts... percentages of fish found to be BPA-polluted in the Gulf of Naples ranged from 73% (for Bass) to 90% (for Mullet), while the Latium fish range from 60% (for Bass) to 90% (for Mullet). These data indicate that consumers of fish caught in the Gulf of Naples are at a greater risk for BPA-induced endocrine pathologies."
(Miklavčič, et al., 2011)	Mercury, selenium, PCBs and fatty acids in fresh and canned fish available on the Slovenian market	Contaminant level in fish species from local markets and supermarkets in Ljubljana, Slovenia, collected between March and May 2005	Mercury, Selenium, PCBs	Table 1 of the article indicates the level of contaminants in the fish products	Fresh and canned fish Table 1 of the article indicates the fish species	Ljubljana, Slovenia	Not indicated	"Based on the frequency of fish consumption and levels of MeHg, THg and PCBs determined in the present study, it can be concluded that fish available on the Slovenian market do not represent a health risk."
(Mezzetta, et al., 2011)	Concentration of DL-PCBs in fish from market of Parma city	PCB concentration in fish species collected from local	DL-PCB	Table 2 of the article indicates PCB concentrations	Table 2 of the article indicates the fish species	Parma, Italy	Not indicated	"Contaminant concentration (Σ DL-PCB) in most fishes remained well below the existing Italian limit of $4 \text{ pg g}^{-1} \text{ ww}$ WHO-TEQ. Only eel, smooth hound and starry smooth hound exceeded the limit, for these

	(north Italy): Estimated human intake	fish markets in Parma between January and October 2008						fishes the concentration was very high, especially for the eel... The situation seems to be not at a level sufficient to pose a risk to human health"
(Medeiros, et al., 2012)	Determination of inorganic trace elements in edible marine fish from Rio de Janeiro State, Brazil	Trace elements in fish obtained from a local market in Rio de Janeiro	Inorganic trace elements (Se, Fe, Mn, Zn, Co, Cu, Bi, Al, Ba, As, Cd, Pb)	Table 4 of the article indicates the levels of trace elements	<i>Salmo salar</i> , <i>Sardinella brasiliensis</i> , <i>Pomatomus saltatrix</i> , <i>Micropogonias furnieri</i> , <i>Cynoscion leiarchus</i> , <i>Caranx crysos</i> , <i>Priacanthus arenatus</i> , <i>Mugil cephalus</i> , <i>Genypterus brasiliensis</i> , <i>Lopholatilus villarii</i> and <i>Pseudopercis numida</i>	Rio de Janeiro State, Brasil	Not indicated	"Metal concentrations showed a great variability even within the same fish species... All fish samples presented cadmium and lead values below the Maximum Tolerable Limits established by the Brazilian legislation. Except of <i>M. cephalus</i> , <i>C. leiarchus</i> and <i>C. crysos</i> , all species showed arsenic concentrations higher than the maximum tolerable limit of 1 mg kg ⁻¹ , specified in the Brazilian regulations... Aluminum concentration was significantly high in all samples"
(A. L. Maulvault, et al., 2011)	Bioaccessibility of Hg, Cd and As in cooked black scabbard fish and edible crab	Contamination level in Black scabbard (cooked, uncooked) before and after in vitro human digestion and its changes in bioaccessibility	Hg, Cd, As	Table 4 of the article indicates the contamination levels of cooked and uncooked samples as well as changes in bioaccessibility during in vitro human consumption	Black scabbard fish (<i>A. carbo</i>)	Portugal	Not indicated	"Generally, Hg, Cd and As bioaccessibility increased throughout the digestion process. Cadmium and As revealed high bioaccessibility rates in raw and cooked samples (up to 100%), whereas lower bioaccessible fractions of Hg was observed (up to 40%)."
(Ana Luisa Maulvault, et al., 2015)	Toxic elements and speciation	Toxic elements in fish in various	Hg, As, Cd, Pb, Ni, Co, Cr, Zn, Cu and Fe,	Table 3 of the article indicates the concentration levels.	<i>Platichthys flesus</i> , <i>Liza aurata</i>	5 Regions in Europe (Tagus estuary, Ebro Delta, Po	Not indicated	"Highest content of Hg was found in <i>P. flesus</i> (0.86 mg kg ⁻¹). In fish species, most Hg was organic (MeHg; from 69 to 79%)."

	in seafood samples from different contaminated sites in Europe	European regions collected between September and December 2013	MeHg and iAs			Delta, Western Scheldt and vicinities of a fish farm in Norway)		
(Martí-Cid, Bocio, Llobet, & Domingo, 2007)	Intake of chemical contaminants through fish and seafood consumption by children of Catalonia, Spain: Health risks	Contaminants levels in most consumed fish species collected in Catalonia between March and April 2005	arsenic (As), cadmium (Cd), mercury (Hg), lead (Pb), polychlorinated dibenzo- <i>p</i> -dioxins and dibenzofurans (PCDD/Fs), polychlorinated biphenyls (PCBs), polychlorinated naphthalenes (PCNs), polybrominated diphenylethers (PBDEs), polychlorinated diphenylethers (PCDEs), hexachlorobenzene, and polycyclic	Contaminant levels are indicated in chapter 3 of the article	sardine (<i>Sardine pilchardus</i>), tuna (<i>Thunnus thynnus</i>), anchovy (<i>Engraulis encrasicolus</i>), mackerel (<i>Scomber scombrus</i> L.), swordfish (<i>Xiphias gladius</i>), salmon (<i>Salmo salar</i> L.), hake (<i>Merluccius merluccius</i> L.), red mullet (<i>Mullus surmuletus</i>), sole (<i>Solea vulgaris</i>), cuttlefish (<i>Sepia esculenta</i>)	6 cities in Catalonia, Spain	Not indicated	"For most pollutants, intake was higher in boys than in girls. Average exposure of children to contaminants through fish and seafood consumption did not exceed the respective tolerable daily intake of those pollutants for which it has been already established (metals, PCDD/Fs plus dioxin-like PCBs, HCB, and PAHs)."

			aromatic hydrocarbons					
(I. Mansilla-Rivera & Rodríguez-Sierra, 2011)	Metal Levels in Fish Captured in Puerto Rico and Estimation of Risk from Fish Consumption	Metal Levels in Fish Captured in Puerto Rico	As, Cd, Cu, Pb, Hg, Se, and Zn	Table 2 of the article indicates the average metal concentration in muscle tissue	<i>S. cavalla</i> , <i>M. undulatus</i> , <i>L. synagris</i> , and <i>L. analis</i> , <i>S. regalis</i>	Jobos Bay and La Parguera areas in Puerto Rico	Not indicated	As and Hg in fish species constitute a Health Risk for people frequently consuming fish
(Z. Liu, et al., 2010)	Organochlorine Pesticides in Consumer Fish and Mollusks of Liaoning Province, China: Distribution and Human Exposure Implications	Levels of organochlorine pesticides in fish samples from markets in the Liaoning province collected between August and September 2007	22 Organochlorine Pesticides	Table 2 and 3 of the article indicates the concentration of organochlorine pesticides	hairtail (<i>Trichiurus haumela</i>), small yellow croaker (<i>Pseudosciaena polyactis</i>), and Spanish mackerel (<i>Scomberomorus niphonius</i>)	Liaoning province, northeastern China	Not indicated	"DDT, HCH, endosulfan, chlordane, and HCB were the predominant and ubiquitous OCPs residues in the fish samples... OCP concentrations were obviously higher in fish than in mollusks, and higher in freshwater fish than in marine fish."
(J.-L. Liu, et al., 2014)	Mercury contamination in fish and human hair from Hainan Island, South China Sea: Implication for human exposure	Mercury concentration in Fish species frequently consumed by the local population on Hainan Islands	Mercury	Table 2 of the article indicates the mercury concentration in the fish samples	14 marine fish species (indicated in Table 2 of the article)	Hainan Islands, South China Sea	Not indicated	"The average THg and MeHg levels in the dietary marine fish muscles were 0.094±0.008 and 0.066±0.006 µg/g, respectively... Concentrations of THg and MeHg in the fish muscles from Hainan Island, SCS, were far below the limit considered safe for consumption (0.5 µg/g)... significant risk of MeHg exposure to children via fish consumption, rather than adults in Hainan Island. The local fishermen had significantly elevated hair Hg levels compared to students and the

								other general public, due to their higher fish consumption frequency.”
(J.-L. Liu, et al., 2015)	Heavy metals in wild marine fish from South China Sea: levels, tissue- and species-specific accumulation and potential risk to humans	Heavy metal content in fish species collected on Hainan Islands	Cd, Cr, Cu, Zn, Pb, As	Table 2 of the article indicates the concentration of heavy metals in the fish species	Fish species are indicated in Table 1 of the article	Hainan Islands, South China Sea	Not indicated	“The levels of Cd, Cu, Zn, and Pb in fish muscle were found to be below the established safety limits for these metals according to MOH and EC, but concentrations of Cr and As were above the maximum levels permitted. Cu, Zn, Cd and Cr were preferentially accumulated in the liver and Pb was always higher in the gill than in the other tissues. Significant differences in heavy metal concentrations were noted among the different fish species and was attributed to differences in habitat and diet. Hazard quotient values showed that Cr and As could pose health risks to fish consumers.”
(Kuballa, Moellers, Schoeberl, & Lachenmeier, 2011)	Survey of methylmercury in fish and seafood from the southwestern German market	Methylmercury concentration in fish species taken at retail in the German Federal State Baden Württemberg	Methylmercury	Table 1 of the article indicates the methylmercury concentration in the fish species	Fresh seawater fish, fish products tinned fish and fish products Table 1 of the article indicates the fish species	Germany	Not indicated	“From all samples, 87 were below the detection limit of 6 µg/kg. An additional 166 samples had detectable concentrations of methylmercury, but were below the quantification limit (LOQ) of 20 µg/kg. This means that only 286 samples (53%) had quantifiable methylmercury concentrations above 20 µg/kg. The average content of these samples above LOQ was 63 µg/kg, and the median was 41 µg/kg... All in all, we observed that the exposure of the consumer in southwestern Germany to methylmercury from fish and seafood is comparably low.”
(Korkmaz Görür, Keser, Akçay, & Dizman, 2012)	Radioactivity and heavy metal concentrations of some commercial	Radioactivity and heavy metal concentrations in four of the most	Radionuclides (²²⁶ Ra, ²³² Th, ⁴⁰ K and ¹³⁷ Cs) and heavy metal	Table 1 and 2 of the article indicates the concentration of radioactivity and the heavy metal content	<i>Engraulis encrasicolus</i> (anchovy), <i>Oncorhynchus mykiss</i> (trout), <i>Trachurus</i>	Black Sea Region, Turkey	Not indicated	“Radioactivity levels of ²²⁶ Ra, ²³² Th, ⁴⁰ K and ¹³⁷ Cs in fish samples of the present study is of no risk to public health. Generally significant differences were observed in mean metal values obtained for fish

	fish species consumed in the Black Sea Region of Turkey	common fish species collected 2010 in the Black Sea Region	concentrations (As, Mn, Fe, Cr, Ni, Zn, Cu and Pb)		<i>mediterranus</i> (bluefin) and <i>Merlangius merlangus</i> (whiting)			species from the Black Sea Region... According the concentrations of As, Mn, Fe, Cr, Ni, Zn, Cu and Pb obtained were far below the established values by the European Community regulations."
(Koenig, Solé, Fernández-Gómez, & Díez, 2013)	New insights into mercury bioaccumulation in deep-sea organisms from the NW Mediterranean and their human health implications	Mercury levels of deep sea fish species caught in February and May 2009 in the Mediterranean sea	Mercury	Mean total mercury levels are indicated in Table 1 of the article	Fish species are indicated in Table 1 of the article	Mediterranean deep sea (Catalan Sea, Balearic Sea in the western basin, the western Ionean Sea in the central basin and the eastern basin)	Not indicated	"THg levels ranged from 0.27 to 4.42 µg/g w.w. and exceeded in all, except one species, the recommended 0.5 µg/g w.w. guideline value... Overall, the present results point out a potential risk for human health from the consumption of deep-sea fish... In particular, for the commercially exploited fish <i>Mora moro</i> , THg levels considerably exceeded the recommended 0.5 µg/g w.w. limit and should be consumed with caution... THg content increases with species' habitat depth."
(Kehrig, Seixas, Di Benedetto, & Malm, 2013)	Selenium and mercury in widely consumed seafood from South Atlantic Ocean	Selenium and Mercury concentration in fish species from the South Atlantic Ocean	Selenium and Mercury	Mercury and selenium concentration are indicated in Table 2 of the article	Fish species are indicated in Table 1 of the article	South Atlantic Ocean, South-Eastern Brasil	Not indicated	"All organisms presented Se concentration in muscle of less than 2.0 µg g ⁻¹ , the maximum allowed selenium concentrations. Only seven individuals of a carnivorous fish species presented Hg in muscle above the maximum permissible limit of 0.5 µg g ⁻¹ established by WHO and Brazilian legislation for human consumption of most aquatic species... Two popular seafoods in the region, the carnivorous fish <i>Centropomus undecimalis</i> (common snook) and <i>Micropogonias furnieri</i> (Atlantic croaker), had the most favorable Se:Hg molar ratio values of 33 and 21, respectively."
(Kalyoncu, Agca, & ...)	Some organochlorine pesticide	Organochlorine pesticide	Organochlorine pesticides	Concentration of organochlorine pesticides are	Fish species are indicated in	Konya market, Turkey	Not indicated	"Total 14 different organochlorine pesticides were determined. These residues were detected in all fish

Aktumsek, 2009)	residues in fish species in Konya, Turkey	residue in fish species in Konya		indicated in Table 2 of the article	Table 2 of the article			<p>species, except in trout, horse mackerel and bonito. DDT and its metabolites and HCH were the predominant contaminants in fish muscles. The mean concentrations of ΣDDT were in the range between 0.0008 and 0.0828 $\mu\text{g g}^{-1}$. DDT was the predominant residue in <i>Sparus aurata</i>. Detectable levels of HCH, aldrin, and heptachlor were found in most samples. However, dieldrin, endrin, β endosulfan, <i>p-p'</i> DDT, and <i>p-p'</i> DDD were not found in <i>Salmo trutta</i>. The mean of endrin ranged from 0.0040 $\mu\text{g g}^{-1}$ (<i>Triglia lineate</i>) to 0.0326 $\mu\text{g g}^{-1}$ (<i>Trachurus trachurus</i>)...</p> <p>amount of residues in organochlorine pesticides in all investigated fish species was under the MRL of European Commission Directives (EC). Therefore, these results give no indication of important health risks associated with the consumption of these fishes in Konya markets."</p>
(Kalogero poulos, et al., 2012)	Heavy metals in raw, fried and grilled Mediterranean finfish and shellfish	Heavy metal content in finfish and the effect of pan-frying and grilling on heavy metal content in finfish	Cd, Cr, Cu, Fe, Hg, Ni, Pb and Zn	Metal concentration in raw and cooked fish is indicated in Table 3 of the article	Finfish (anchovy, bogue, hake, picarel, sardine, sand smelt, striped mullet)	Kallithea, Athens, Greece	Not indicated	<p>"The concentrations of the trace elements studied in the edible portion of raw fish and shellfish (in mg/kg fresh weight) ranged as follows: Cd: <0.003–0.48; Cr: <0.05–0.48; Cu: <0.20–10.9; Fe: 6.0–75.2; Hg: <0.008–0.18; Ni: <0.08–0.64; Pb: <0.04–0.77 and Zn: 3.3–69.8 mg/kg fresh weight, being in general within the range of values reported for fresh Mediterranean fish...</p> <p>The concentrations of the toxic trace elements Pd, and Hg did not exceed the maximum levels set by the European Commission Regulation No 1881/2006, while Cd content of</p>

								<p>bogue, picarel and striped mullet exceeded the respective maximum level of 0.05 mg/kg...</p> <p>Domestic pan-frying and grilling of small Mediterranean fish and shellfish resulted in cooked products with elevated metal concentrations compared to the fresh uncooked specimens... Cooked Mediterranean seafood do not pose health risk related to Cd, Hg and Pb."</p>
(Julshamn, et al., 2012)	Total and inorganic arsenic in fish samples from Norwegian waters	Arsenic content in fish species from the Norwegian open sea	Total arsenic, inorganic arsenic	Concentrations of arsenic are indicated in Table 5 of the article	Northeast Arctic cod, herring, mackerel, Greenland halibut, tusk, saithe and Atlantic halibut	Norway, open sea	Not indicated	<p>"The concentrations found for total arsenic varied greatly between fish species, and ranged from 0.3 to 110 mg kg⁻¹ wet weight. For inorganic arsenic, the concentrations found were very low (<0.006 mg kg⁻¹) in all cases. The obtained results question the assumptions made by the European Food Safety Authority (EFSA) on the inorganic arsenic level in fish used in the recent EFSA opinion on arsenic in food."</p>
(Jiang, et al., 2007)	Health risk assessment for polychlorinated biphenyls, polychlorinated dibenzo- <i>p</i> -dioxins and dibenzofurans, and polychlorinated naphthalenes in seafood from Guangzhou and	Organochlorine contaminants in fish samples from local markets from South and East China Sea collected 2003-2004	Organochlorine contaminants (PCBs, PCNs, PCDDs/DFs)	Mean concentration of organochlorine contaminants are indicated in Table 2 of the article	Small yellow croaker, Belt fish, Silvery pomfret, Japanese mackerel, Conger pike, White mouth croaker	Guangzhou and Zhoushan, China	Not indicated	<p>"The concentrations of total PCBs and coplanar PCBs in fish samples were higher in Guangzhou than in Zhoushan, while the levels of PCNs and PCDDs/DFs were comparable between the two cities. The total daily intake values of dioxin-like compounds were 1.05 and 0.86 pg WHO-TEQ/kg body weight in Guangzhou and Zhoushan, respectively...</p> <p>The results indicate that organochlorine contaminants, namely PCDDs, PCDFs, and non- and mono-<i>ortho</i>-PCBs, are unlikely to cause adverse effects in Chinese coastal populations in the two cities studied."</p>

	Zhoushan, China							
(Jewett & Duffy, 2007)	Mercury in fishes of Alaska, with emphasis on subsistence species	Review of numerous studies on mercury content in marine fish species from Alaska	Mercury	Concentrations of total mercury are indicated in Table 2 of the article	Table 2 of the article indicates the marine fishes	Alaska	Not indicated	"All of these fishes had mean concentrations of THg in muscle tissues well below the USFDA action level of 1.0 mg kg ⁻¹ ... Pacific salmon, the most commonly consumed fish group, had exceptionally low (≤ 0.1 mg kg ⁻¹) Hg concentrations. Pacific halibut muscle Hg content was less than 0.3 mg kg ⁻¹ ."
(Jarvis, Schiff, Sabin, & Allen, 2007)	Chlorinated hydrocarbons in pelagic forage fishes and squid of the Southern California Bight	DDTs and PCBs in pelagic species from the Southern California Bight collected from 2003 - 2004	DDT, PCB	Table 2 of the article indicates the Total DDT and total PCB concentrations in the fish species	Pelagic species (Pacific sardine (<i>Sardinops sagax</i>), Pacific chub mackerel (<i>Scomber japonicus</i>), northern anchovy (<i>Engraulis mordax</i>))	Southern California Bight	Not indicated	"Virtually all of the samples of Pacific sardine, northern anchovy, and Pacific chub mackerel had detectable levels of total DDT... Northern anchovy had the highest total DDT concentrations (60 ± 38 $\mu\text{g}/\text{kg}$ wet wt), followed by Pacific chub mackerel (41 ± 40 $\mu\text{g}/\text{kg}$ wet wt), Pacific sardine (34 ± 29 $\mu\text{g}/\text{kg}$ wet wt)."
(Jadhav, Bhosale, & Bhosle, 2011)	Baseline of organotin pollution in fishes, clams, shrimps, squids and crabs collected from the west coast of India	Organotin contamination in marine fishes from the west coast of India	Organotins (TBT, DBT, MBT, BT, MPhT, DPhT, TPhT, PT, BDI)	Table 1 of the article indicates the organotin concentrations	Table 1 of the article indicates the marine fish species	Mumbai, Goa and Karwar on the west coast of India	Not indicated	"In all the samples butyltins were predominant over phenyltins... In conclusion, the concentration of OTs in marine fishes, clams, solar shrimp, squid and crabs are of concern. It is evident that marine fishes were comparatively less contaminated than the bivalves or all other organisms used."
(S. V. Hosseini, Sobhanardakani, Tahergorabi, & Delfieh, 2013)	Selected Heavy Metals Analysis of Persian Sturgeon's (<i>Acipenser persicus</i>)	Heavy metal content in wild persian sturgeon collected during commercial	Fe, Cr, Pb, As, and Co	"Heavy metal concentrations (microgram per gram, wet weight; means \pm S.D.) in caviar samples were: Fe, 71.33 ± 0.37 ; Cr,	Persian sturgeon (<i>Acipenser persicus</i>)	Southern Caspian Sea	Not indicated	"The results indicated that except for Fe, the average concentrations of Cr, Pb, As, and Co in this study are significantly ($p < 0.05$) lower than the adverse level for human consumption with FAO/WHO; ASTDR permissible limits; EU acceptable limit; U.S. FDA and U.S. EPA

	Caviar from Southern Caspian Sea	harvest February to April 2011		0.27 ± 0.019; Pb, <0.01 ± 0.002; As, <0.01 ± 0.002; and Co, <0.01 ± 0.001, respectively."				recommended limits... Therefore, their contribution to the total body burden of these metals can be considered as negligibly small except for Fe."
(S. V. Hosseini, Aflaki, et al., 2013)	Analysis of mercury, selenium, and tin concentrations in canned fish marketed in Iran	Heavy metal content in canned fish collected from different markets in Tehran, Iran	mercury, selenium, and tin	"The levels of Hg ranged from 0.0003 to 0.408 µg/g, the levels of Sn ranged from 0.036 to 0.480 µg/g, while the levels of Se ranged from 0.130 to 4.500 µg/g." Table 1 of the article indicates the mean metal levels in canned fish	Canned fish: yellowfin tuna (<i>Thunnus albacares</i>), common Kilka (<i>Clupeonella cultriventris caspia</i>), Kawakawa (<i>Euthynnus affinis</i>), longtail tuna (<i>Thunnus tonggol</i>)	Tehran, Iran	Not indicated	"Comparative evaluation of these metals in different brands of canned fish showed that the average concentrations of Hg, Sn, and Se of all species is significantly lower than adverse level for the species themselves and for human consumption when compared with FAO/WHO permissible limits. Therefore, their contribution to the total body burden of these heavy metals can be considered as negligibly small."
(Hoo Fung, Antoine, Grant, & Buddo, 2013)	Evaluation of dietary exposure to minerals, trace elements and heavy metals from the muscle tissue of the lionfish <i>Pterois volitans</i> (Linnaeus 1758)	Trace elements and heavy metal content in lionfish from Jamaica	25 trace elements and heavy metals	Table 2o the article indicates the concentration of elements in lionfish	lionfish <i>Pterois volitans</i> (Linnaeus 1758)	Jamaica	Not indicated	"The muscle tissue of this lionfish species appears to contribute only modestly to human mineral and trace element nutrition, while not being a significant contributor to dietary exposure to potentially hazardous elements. It is particularly encouraging that the Se:Hg molar ratio shows a molar excess of selenium and that the calculated selenium health benefit value is strongly positive for the dataset."
(Ho & Leung, 2014)	Organotin contamination in seafood and its implication	Organotin contamination in fish species from Hong Kong	Organotin	Figure 1 and 2 indicate the organotin concentration in fish species	fish species (<i>Collichthys lucidus</i> , <i>Harpadon nehereus</i> , <i>Johnius</i>)	Southern Hong Kong waters	Not indicated	"The tongue sole <i>Paraplusia blochii</i> had the highest concentration of total OTs. Triphenyltin (TPT) accounted for 56–97% of total OTs. The highest hazard quotient (HQ) for TPT was 1.41 in <i>P. blochii</i> , while the

	for human health risk in Hong Kong				<i>belangerii</i> , <i>Nibeia albiflora</i> , <i>Paraplagusia blochii</i> and <i>Siganus canaliculatus</i>)			HQs for butyltins were much less than 1. The results indicated that it is likely to have certain health risks for consuming <i>P. blochii</i> due to its high TPT contamination. Therefore, TPT should be a priority pollutant of concern."
(J. Guo, Wu, Shen, & Zeng, 2010)	Dietary intake and potential health risk of DDTs and PBDEs via seafood consumption in South China	DDTs and PBDEs in commonly consumed fish species collected between November 2004 and October 2005	DDTs, PBDEs	Table 2 of the article indicates the concentration of DDTs and PBDEs in general for the fish category	13 fish species	Guangdong Province, South China	Not indicated	"Among the different seafood types, fish contributed the largest portion of the dietary intakes of DDTs (57%), followed by molluscs (38%). Similarly, the dietary intakes of PBDEs were also dominated by fish (45%) and molluscs (45%). Assessment based on several available guidelines suggested that though no significant human health risk associated with the dietary intake of PBDEs, a lifetime cancer risk from dietary exposure to DDTs remains a probability. Because dietary intake of DDTs was dominated by fish and molluscs, added concern should be paid to fish and molluscs."
(Guerin, Sirot, Volatier, & Leblanc, 2007)	Organotin levels in seafood and its implications for health risk in high-seafood consumers	Organotin levels in fish and fish products collected in French coastal areas between January and April 2005	Organotin	Table 2 and 3 indicate the mean concentration of organotin in fresh and frozen fish, and fish products	Fresh and frozen fish, smoked fish: Table 2 and 3 of the article indicates the fish species and the fish products	France	Not indicated	"Butyltins were usually predominant and the range of the contamination levels was generally below those of earlier studies (fish: mean 5.6; min-max 1.1–23 µg/kg; fishery products: mean 6; min-max 0.8–14 µg/kg). Fish, especially tuna, salmon, mackerel, saithe/coalfish and cod were largely the main contributors (38%) to the total organotin exposure."
(Y. G. Gu, Lin, Wang, et al., 2015)	Heavy metal concentrations in wild fishes captured from the	Heavy metal concentration in fish species from the South China	Fe, Zn, Cr, Cu, Mn, Ni, Cd, Pb	"Metal content (wet weight) had ranges of 0.51–115.81 ng/g for Cd, 0.54–27.31 ng/g for Pb, 0.02–1.26 µg/g for Cr, 8.32–	Marine wild species are indicated in Table 1 of the article	South China Sea	Not indicated	"Iron concentrations in all and Mn in some fish species were higher than the acceptable daily upper limit, suggesting human consumption of these wild fish species may pose a health risk. Human health risk assessment, however, indicated no

	South China Sea and associated health risks	Sea collected from September to October 2012		57.48 ng/g for Ni, 0.12–1.13 µg/g for Cu, 2.34–6.88 µg/g for Zn, 2.51–22.99 µg/g for Fe, and 0.04–0.81 µg/g for Mn. The highest concentrations found were in Fe, followed by Zn, Cr, Cu, Mn, Ni, Cd, and Pb.”				significant adverse health effects with consumption.”
(Groth Iii, 2010)	Ranking the contributions of commercial fish and shellfish varieties to mercury exposure in the United States: Implications for risk communication	Ranking of fish and shellfish varieties to mercury exposure based on FDA data on mercury content of each variety	Mercury	Table 1 of the article lists and ranks the fish species and their mercury levels in a descending order (mean mercury level)	Table 1 of the article indicates the fish species	USA	Not indicated	“All fish and shellfish contain at least traces of mercury, but the average mercury levels in the 51 commercially important varieties examined here differ by more than 100-fold... Except for swordfish, most fish with the highest mercury levels are relatively minor contributors to total inputs. Tuna (canned light, canned albacore and fresh/frozen varieties) accounts for 37.4 percent of total mercury inputs, while two-thirds of the seafood supply and nine of the 11 most heavily consumed fish and shellfish are low or very low in mercury.”
(Gerstenberger, Martinson, & Kramer, 2010)	AN EVALUATION OF MERCURY CONCENTRATIONS IN THREE BRANDS OF CANNED TUNA	Concentration of mercury in canned tuna from different brands purchased in grocery stores in Las Vegas, USA between November	Mercury	Table 1 indicates the mercury concentration in three brands of canned tuna Table 2 and 3 indicate the mercury concentration of two brands by tuna type (chunk white vs chunk light)	Canned tuna (different brands, types: chunk white vs chunk light, packaging medium oil and water)	Las Vegas, USA	Not indicated	“Brand 3 contained higher Hg concentrations ($\bar{x} \pm s$ standard deviation (SD) (0.777 ± 0.320 ppm) than Brands 1 (0.541 ± 0.114 ppm) and 2 (0.550 ± 0.199 ppm). Chunk white tuna (0.619 ± 0.212 ppm) and solid white tuna (0.576 ± 0.178 ppm) were both significantly ($p < 0.001$) higher in mean Hg than chunk light tuna (0.137 ± 0.063 ppm). No significant temporal variation was noted, and packaging had no significant effect on Hg concentration. In total, 55% of all

		2005 and February 2006		Table 4 indicates the mercury concentration by packaging medium (oil and water) Table 5 provides a summary of the data				tuna examined was above the U.S. Environmental Protection Agency's (U.S. EPA) safety level for human consumption (0.5 ppm), and 5% of the tuna exceeded the action level established by the U.S. Food and Drug Administration (U.S. FDA) (1.0 ppm). These results indicate that stricter regulation of the canned tuna industry is necessary to ensure the safety of sensitive populations such as pregnant women, infants, and children."
(Forsberg, et al., 2012)	Effect of Native American Fish Smoking Methods on Dietary Exposure to Polycyclic Aromatic Hydrocarbons and Possible Risks to Human Health	Effect of smoking methods (traditional Native American) on the PAHs content in fish	PAH	Figure 2 outlines the levels of PAHs measured in salmon smoked by four different methods	Spring Chinook Salmon	America	Not indicated	"Smoking methods considered smoking structure (tipi or shed) and wood type (apple or alder). Neither smoking structure nor wood type accounted for differences in smoked salmon content of 33 PAHs. Carcinogenic and noncarcinogenic PAH loads in traditionally smoked salmon were 40–430 times higher than those measured in commercial products ... Levels of PAHs present in smoked salmon prepared using traditional Native American methods may pose elevated cancer risks if consumed at high consumption rates over many years."
(Ferrara, Ademollo, Delise, Fabietti, & Funari, 2008)	Alkylphenols and their ethoxylates in seafood from the Tyrrhenian Sea	Alkylphenols (Aps) in fish species collected in the Tyrrhenian Sea during September – October 2003	Octylphenols (Ops), nonylphenols (NPs)	Table 3 of the report outlines the APs concentration in seafood samples	<i>Engraulis enchrasicolus</i> (anchovy), <i>Scomber scombrus</i> (Atlantic mackerel), <i>Trachurus trachurus</i> (Atlantic horse mackerel), <i>Diplodus sargus sargus</i>	Tyrrhenian Sea	Not indicated	"Almost all of the tested compounds were found in all the samples. NP was generally detected at the highest concentrations. Among the tested species common to the three sampling sites, mullets and seabreams generally showed high values of total alkylphenols (APs) and alkylphenol ethoxylates (APEOs) (44–55 ng g ⁻¹ and 27–525 ng g ⁻¹ fw)... The lowest concentrations were observed in hakes and anchovies

					(white seabream), <i>Lythognatus mormyrus</i> (striped seabream), <i>Mullus barbatus</i> (red mullet), <i>Merluccius merluccius</i> (European hake), <i>Thynnus thynnus</i> (Bluefin tuna) and <i>Xiphas gladius</i> (Swordfish)			(34–36 ng g ⁻¹ and 6–37 ng g ⁻¹ fw). Tuna, exhibited very high concentrations of total alkylphenolic compounds (APEs) (889 ng g ⁻¹ fw)... On the basis of the results of this study, the corresponding daily intakes of NPs are much lower than the TDI proposed by the Danish Environmental Agency.”
(Ferrantelli, et al., 2012)	Evaluation of mercury levels in Pangasius and Cod fillets traded in Sicily (Italy)	Mercury levels in pangasius and cod traded in Sicily, Italy	Mercury	presence of higher mercury levels in pangasius (0.41 ± 0.08 mg kg ⁻¹) than in cod (0.11 ± 0.004 mg kg ⁻¹) fillets Table 1 indicates the residual levels of mercury found in this study Table 2 indicates the mercury levels from different fish markets found in other studies.	pangasius (<i>Pangasius hypophthalmus</i>) cod (<i>Gadus morhua</i>)	Traded in Sicily, Italy, but originally from Vietnam (Pangasius) and Baltic and North Sea (cod)	Not indicated	“The Hg levels found in pangasius fillets traded in Sicily confirm the potential risk for the consumption of this fish, considering that five samples (12.8%) had highest levels than the maximum residual levels and 16 samples (41.0%) were near the established limit. The lowest Hg concentrations in cod samples, instead, suggest the quality of this fish from Northern Europe and a safer consumption of its frozen fillets.”
(Feng, Teuber, & Gershwin, 2016)	Histamine (Scombroid) Fish Poisoning: a Comprehensive Review	Cases of Histamine Fish Poisoning around the globe and typically	Histamine/Scombroid Fish Poisoning	Table 1 of the report outlines cases of histamine fish poisoning in several countries	Scombroidea and Scomberesocidae families, including mackerel, bonito,	USA, UK, Japan, Australia, Bermuda, Canada, China, Croatia, Czech Republic, Egypt, France,	Not indicated	“Between 1998 and 2012, the fish most frequently involved in histamine fish poisoning reactions in the USA, according to the CDC, are tuna, mahi mahi, escolar, marlin, and salmon. In fact, tuna and mahi mahi alone make up more than 80 % of reported cases.”

		related fish species			albacore, and skipjack	Germany, Indonesia, Israel, Italy, Korea, New Zealand, Netherlands, Norway, Oman, Papua New Guinea, Poland, Romania, Senegal, Spain, Sri Lanka, South Africa, Sweden, Switzerland, Taiwan, and the former Yugoslavia		
(M. Fattore, Russo, Barbato, Grumetto, & Albrizio, 2015)	Monitoring of bisphenols in canned tuna from Italian markets	Bisphenol concentration in canned tuna purchased from Italian markets	Bisphenol	Table 4 of the article outlines the Bisphenol contents in canned tuna	Canned tuna (either in oil or aqueous medium)	Italy	Not indicated	"Detected levels of bisphenols ranged from 19.1 to 187.0 ng/g in tuna matrix and from 6.3 to 66.9 ng/mL in oil medium. No bisphenols were found in aqueous medium... Bisphenol levels in all positive samples below the legal limits."
(Falcó, Llobet, Bocio, & Domingo, 2008)	Exposure to hexachlorobenzene through fish and seafood consumption in Catalonia, Spain	Hexachlorobenzene in fish species collected between March and April 2005 in local markets and supermarkets in Catalonia	Hexachlorobenzene (HCB)	"The highest HCB levels were found in salmon and mackerel: 1.68 and 0.80 ng/g of wet weight, respectively, whereas the lowest HCB levels were found in cuttlefish, mussel, and shrimp (0.02, 0.03, and 0.04 ng/g of wet weight, respectively)."	sardine (<i>Sardine pilchardus</i>), tuna (<i>Thunnus thynnus</i>), anchovy (<i>Engraulis encrasicolus</i>), mackerel (<i>Scomber scombrus L.</i>), swordfish (<i>Xiphias gladius</i>), salmon (<i>Salmo salar L.</i>), hake	Catalonia, Spain	Not indicated	"The results of the current study and the use of RIBEPEIX show that intake of HCB through fish and seafood should not be of concern for the health of the consumers if the type of fish and seafood, the frequency of consumption, and the meal size are adequately selected."

				Table 1 of the article indicates the HCB concentration in marine species	(<i>Merluccius merluccius</i> L.), red mullet (<i>Mullus surmuletus</i>), sole (<i>Solea vulgaris</i>), cuttlefish (<i>Sepia esculenta</i>)			
(Essuman g, Doodoo, & Adjei, 2013)	Effect of smoke generation sources and smoke curing duration on the levels of polycyclic aromatic hydrocarbon (PAH) in different suites of fish	Effects of different woods on the development of PAHs during smoking of fish (fish samples collected from Elmina landing beach, Ghana)	Polycyclic aromatic Hydrocarbon (PAH)	Table 1,2,3 and 4 of the article outline the mean PAHs concentration for fish smoked with different types of fires	mackerel, sardine, tuna, and Cigar minnows	Ghana	Not indicated	<p>“Fish smoked with acacia (hardwood) had elevated levels of PAH contamination with an associated elevated cancer and mutagenic risk posed when ingested by consumers...</p> <p>Alternative use of mangrove (hardwood) for smoke curing of fish may be appropriate but must be done at short smoking time duration of at most 4 h, which may be enough to give the smoke-cured fish the required good shelf life. Generally, it may be said that fish smoke-cured with any of the hardwoods for a longer duration (≥ 4 h) using the traditional kiln may be unsafe for consumption. Also, it could be said that smoke curing of fish with sugarcane bagasse using the traditional kiln may be the safest and the best fish smoking practice at short time duration.”</p>
(Essuman g, Doodoo, & Adjei, 2012)	Polycyclic aromatic hydrocarbon (PAH) contamination in smoke-cured fish products	PAHs concentration in smoked fish collected from fishmongers along the coastal belt of Ghana	Polycyclic aromatic Hydrocarbon (PAH)	Table 3 and 4 of the article outline the PAH concentrations in smoked herrings and smoked sardines	Smoked fish (<i>Sardinella aurita</i> /herrings)	Ghana	Not indicated	<p>“Smoked sardines on the Ghanaian markets showed elevated levels of polycyclic aromatic hydrocarbons (PAHs), and this may be a contributing factor to the recent increases in prevalence rates in cases of cancer and cancer-related ailments in Ghana... This study highlights the increased danger of consuming smoke-cured fish in</p>

		between April 2009 and February 2010						Ghana as some of the PAHs are known to be carcinogenic. These results indicate that there is a need to find alternative ways of curing fish other than the traditional smoking process."
(Ersoy & Çelik, 2010)	The essential and toxic elements in tissues of six commercial demersal fish from Eastern Mediterranean Sea	Essential and toxic elements in fish species in the Eastern Mediterranean Sea collected from September 2003 to May 2004	Essential and toxic elements	"The concentrations in muscles of fish species were 474–1534 mg/kg for Na, 574–3374 mg/kg for K, 72.7–496 m/kg Ca, 94.1–210 mg/kg for Mg." Table 4 and 5 of the article outline the mean elemental composition in the muscle and liver of fish	Gilthead seabream (<i>S. aurata</i>), Tub gurnard (<i>C. lucernus</i>), Goldband goatfish (<i>U. molluccensis</i>), Common sole (<i>S. solea</i>), European hake (<i>M. merluccius</i>) and Brushtooth lizardfish (<i>S. undosquamis</i>)	İskenderun Bay, Eastern Mediterranean Sea	Not indicated	"The Cr, Pb, Cd, Cu and Zn levels in muscle were found to be lower than permissible limits. Estimated weekly and daily intake for Pb and Cd was far below the PTWI and PTDI values. The consumption of these species from this region is not problem on human health."
(J. L. Domingo, et al., 2012)	Human Exposure to Perfluorinated Compounds in Catalonia, Spain: Contribution of Drinking Water and Fish and Shellfish	PFCs in fish species collected from local markets in December 2009 in Catalonia, Spain	Perfluorinated compounds (PFCs)	Table 3 of the article outlines the concentration of PFCs in fish	Sardine, tuna, red mullet, hake	Catalonia, Spain	Not indicated	"With respect to exposure to PFCs through the consumption of fish and shellfish, comprising the food group potentially containing the highest PFC concentrations, the results of the present study indicate that the current consumption should not be of concern. The amounts ingested are well below the recommended TDIs, at least for those PFCs for which information is currently available."
(J. L. Domingo, Bocio, Falcó, & Llobet, 2007)	Benefits and risks of fish consumption: Part I. A quantitative analysis of the intake of omega-3	Chemical contaminants in fish species collected from local fish markets and supermarkets	Hg, Cd, Pb, HCB, PCDD/Fs, DL-PCBs, PAHs, PCNs, PBDEs, PCDEs	Table 1 of the article outlines the concentration of organic and inorganic pollutants in fish	sardine, tuna, anchovy, mackerel, swordfish, salmon, hake, red mullet, sole	Catalonia, Spain	Not indicated	"In general terms, most marine species here analyzed should not mean adverse health effects for the consumers. However, the type of fish, the frequency of consumption, and the meal size are essential issues for the balance of the health benefits and risks of regular fish consumption."

	fatty acids and chemical contaminants	ts in Catalonia in March – April 2005						
(J. L. Domingo & Bocio, 2007)	Levels of PCDD/PCDFs and PCBs in edible marine species and human intake: A literature review	Literature review on PCDD/Fs and PCBs concentration in fish species	PCDD/Fs and PCBs	Table 1 and 2 of the article provide an summary of recent literature on PCDD/Fs and PCBs levels in marine species	Outlined in Table 1 of the article	Global	Not indicated	"This paper reviews the state of the science regarding recent literature on PCDD/F and PCB levels in marine species and human intake through fish and seafood consumption. The concentrations of these pollutants depend basically on the environment in which the respective species are caught."
(Dickey & Plakas, 2010)	Ciguatera: A public health perspective	Ciguatera fish poisoning in finfish	Ciguatera fish poisoning/ Ciguatoxin		Finfish		Not indicated	"Analytical information from case and outbreak investigations was used to derive Pacific and Caribbean ciguatoxin threshold contamination rates for adverse effects in seafood consumers. To these threshold estimates 10-fold safety factors were applied to address individual human risk factors; uncertainty in the amount of fish consumed; and analytical accuracy. The studies may serve as the basis for industry and consumer advisory levels of 0.10 ppb C-CTX-1 equivalent toxicity in fish from the tropical Atlantic, Gulf of Mexico, Caribbean, and 0.01 ppb P-CTX-1 equivalent toxicity in fish from Pacific regions."
(Di Bella, et al., 2015)	Trace elements in Thunnus thynnus from Mediterranean Sea and benefit-risk assessment	Trace elements in Tuna collected in the Mediterranean Sea from May to August 2013	Non-toxic element: Zn, Fe, Se, Cu, Ni, Cr, Mn Toxic elements: As, Hg, Cd, Pb	Table 4 of the article outlines the ranges and mean values of non-toxic and toxic elements. "The results provide evidence that in all muscle samples the highest non-toxic	bluefin tuna fishes	Mediterranean Sea	Not indicated	"None of the tested samples surpassed the European maximum limits. Cd, Hg and Pb remained within safety margins, while As is slightly higher than the provisional TWI."

	for consumers			metal concentrations were those of Zn (1.983–57.526 mg kg ⁻¹), Fe (3.649–21.138 mg kg ⁻¹), Se (0.270–1.207 mg kg ⁻¹) and Cu (0.158–0.684 mg kg ⁻¹), while the highest toxic metal concentrations were those of As (1.336–5.527 mg kg ⁻¹) and Hg (0.246–0.714 mg kg ⁻¹).”				
(É. Dewailly, et al., 2008)	Balancing the risks and the benefits of local fish consumption in Bermuda	Mercury concentration in local fish species collected in fall 2003 and summer 2006 in Bermuda	Mercury	Table 1 of the article outlines the mercury and selenium concentration in the flesh of local fish Table 2 outlines the mercury and selenium concentration in the liver of some local fish species	Fish generally caught at the top of the food chain (e.g. predatory reef fish, pelagic fish) and fish commonly consumed See Table 1 of the article	Bermuda	Not indicated	“Swordfish and blue marlin are the two species with the highest Hg content, followed by bar jack/green jack, blue runner and black grouper. For some species, the mean Hg concentration is below that threshold, but the range shows that some individuals may have values that are above. This is particularly the case for wahoo and yellowfin tuna. The lowest mean concentrations of Hg were found in flying fish, barber and Bermuda chub.”
(E. Dewailly, Ayotte, Lucas, & Blanchet, 2007)	Risk and benefits from consuming salmon and trout: A Canadian perspective	Levels of contaminants in wild salmon and trout obtained from fisherman of the Gaspé Peninsula and from	Mercury, PCBs, PCDD/Fs	Table 1 of the article indicates the concentration of contaminants	Atlantic salmon (<i>Salmo salar</i>) Rainbow trout (<i>Oncorhynchus mykiss</i>)	Gaspé Peninsula, Canada	Not indicated	“Concentrations of total mercury in fillets of farmed salmonids were about 3-fold lower than those determined in their wild counterparts. PCDD/F concentrations also appeared lower in farmed compared to wild salmonids, although statistically significant differences were not observed. In contrast, the mean total PCB concentration in farmed Atlantic salmon fillets was approximately

		various Canadian agencies						double that of their wild counterparts. Such a difference was not observed between farmed and wild Rainbow trout." "Overall the concentrations of key contaminants were low, such that the regular consumption of these fish would not cause significant health risks."
(Desideri, Meli, & Roselli, 2011)	NATURAL RADIONUCLIDES IN SEAFOOD FROM THE CENTRAL ADRIATIC SEA (ITALY)	Natural radionuclides in fish species from the Adriatic Sea	Natural Radionuclides (210Po, 210Pb, 40K)	Table 2 and 3 of the article outline the concentration of 210Po and 40K "The concentration trend is the following: 40K > 210Po > 210Pb. 40K concentration ranged between 54.9 and 235.9 Bq kg ⁻¹ fresh weight, and the arithmetic mean of 210Pb concentration for all samples is <0.7 Bq kg ⁻¹ fresh weight. 210Po activity concentration ranged between 0.3 and 44.6 Bq kg ⁻¹ fresh weight; its arithmetic mean was 5.7 – 7.2 Bq kg ⁻¹ fresh weight."	Table 1 of the article indicates the various fish species (pelagic and benthic species)	Central Adriatic Sea, Italy	Not indicated	"Among the pelagic species, anchovy displayed the highest polonium concentration. The data obtained depend upon the type of marine organism and the period of sampling. Committed effective dose due to 210Po ingestion from marine food for individuals in the two different population groups was calculated to be 95.9 and 466.4 μSv y ⁻¹ , respectively."

(Della Torre, et al., 2010)	DNA damage, severe organ lesions and high muscle levels of As and Hg in two benthic fish species from a chemical warfare agent dumping site in the Mediterranean Sea	As and Hg concentration in fish from a chemical warfare agent dumping site in the Mediterranean Sea	As, Hg	Table 1 of the article indicates the As and Hg levels in muscle of both fish species	<i>Conger conger</i> <i>Helicolenus dactylopterus</i>	Mediterranean Sea	Not indicated	"As and Hg levels were three-four times higher than those from the reference site in both species ($p < 0.001$). Both species captured in dumping site showed clear signs of chronic illness according to the health assessment index (HAI)."
(Deblois, Aranda-Rodriguez, Giani, & Bird, 2008)	Microcystin accumulation in liver and muscle of tilapia in two large Brazilian hydroelectric reservoirs	Microcystin concentration in fish species caught by fisherman in January and February 2003 in reservoirs in Brazil	Microcystin	Figure 4 and 5 indicated the concentration of microcystin in the liver and muscle of the fish species Table 3 outlines a summary of each known and unknown toxic variant detected in the fish species	Wild Nile and redbreast tilapia (<i>Oreochromis niloticus</i> and <i>Tilapia rendalli</i>)	Brasil: Funil reservoir, Rio de Janeiro Furnas reservoirs, upper Rio Grande in south-eastern Brasil	Not indicated	"All of the 27 fish sampled contained microcystin, ranging from 0.8 to 32.1 $\mu\text{g g liver}^{-1}$ and from 0.9 to 12.0 ng g muscle^{-1} . Most microcystin variants found in seston were also found in fish liver. <i>T. rendalli</i> had the lowest concentration in both tissues when compared to <i>O. niloticus</i> . In both reservoirs, one of every four fish sampled, always <i>O. niloticus</i> , had a level of microcystins beyond the World Health Organization tolerable daily intake ($8 \text{ ng g tissue}^{-1}$) and represented a risk for consumers."
(Davodi, Esmaili-Sari, & Bahramifarr, 2011)	Concentration of polychlorinated biphenyls and organochlorine pesticides in some edible	Concentration of contaminants in fish species purchased from local fisherman during	PCBs, OCPs, DDT, HCHs, HCB	Table 2 indicates the concentration of contaminants in the fish species	<i>Barbus sharpeyi</i> (Benni), <i>B. gerypus</i> (Shirbot), <i>Cyprinus carpio</i> (Common carp), <i>B. barbulus</i> (Common barbel), <i>Aspius</i>	Shadegan Marshes, Iran	Not indicated	"In all samples, OCPs were found in higher concentrations than PCBs. Common carp (<i>Cyprinus carpio</i>) had the highest OCs (1680 ng/g lipid wt.), with DDTs being most prevalent and p,p'-DDE contributing by 53–88% to the total DDTs. In all samples, OCs were found in order of DDTs>HCHs>PCBs>HCB. The highest concentration of HCHs was

	fish species from the Shadegan Marshes (Iran)	October and November 2007 in Iran			<i>vorax</i> (Shelej), <i>Ctenopharyngodon idella</i> (Grass carp), <i>Liza abu</i> (Abu mullet) and <i>B. luteus</i> (Golden barb)			found in common carp (410±180 ng/g lipid wt.) and α -HCH was the predominant compound among HCH isomers (range 70–90%, mean 82%) in all species. All samples contained PCBs and CB 28 (37%) and CB 52 (26%) were the most frequently occurring congeners. common barbel (<i>Barbus barbus</i>) (70±17 ng/g lipid wt.) exhibited the highest concentrations of HCB. OC levels in fish were relatively low, but the levels of several OCs in some of our specimens exceed the guidelines for food safety issued by the European Union (EU) and US Food and Drug Administration (FDA)."
(Damiano, Papetti, & Menesatti, 2011)	Accumulation of heavy metals to assess the health status of swordfish in a comparative analysis of Mediterranean and Atlantic areas	Heavy metal concentration in the European swordfish population examined in a 5 years-survey	Pb, Cd, Hg	"Mean concentrations of Hg, Cd, and Pb were in the following ranges: 0.66–2.41, 0.04–0.16, and 0.97–1.36 mg/kg ww, respectively." Table 3 indicates the concentration levels in the muscle tissues	swordfish (<i>Xiphias gladius</i> , L. 1758)	Mediterranean and Atlantic areas	Not indicated	"The average concentration of Cd did not exceed the maximum level set by EC. As for Pb and Hg, the analyzed individual showed concentrations that exceed the maximum level set."
(Cunha, et al., 2015)	Co-occurrence of musk fragrances and UV-filters in seafood and macroalgae collected in European hotspots	Concentration of musk fragrances and UV-filters in flounder and mullet from two European hotspots	Musk fragrances, UV-filters	Table 5 and 6 of the article indicate the concentration of UV filters and musk fragrances	European flounder (<i>Platichthys fesus</i>), mullet (<i>Liza aurata</i>)	Europe: Western Scheldt, Tagus Estuary	Not indicated	"Despite the fact that UV-filters were detected in three different kind of samples (mussel, mullet, and clam), in all cases they were below the limit of quantification. Galaxolide (HHCB) and tonalide (AHTN) were the musk fragrances most frequently detected and quantified in samples from the European hotspots. Cashmeran (DPMI) was also detected in most

								samples but only quantified in two of them (flounder/herring and mullet)."
(Cruz, Cunha, & Casal, 2015)	Brominated flame retardants and seafood safety: A review	Literature review on the occurrence of Brominated Flame Retardants in seafood published from 2004 - 2014	BFRs	Table S1 of the article summarises reported studies on assessment of PBDE in seafood	See Table S1 of the article	Global	Not indicated	
(Covaci, et al., 2007)	Anthropogenic and Naturally Occurring Organobrominated Compounds in Fish Oil Dietary Supplements	Contamination level in FODS collected between January and March 2006 in Belgian and FODS bought from the Netherlands, Ireland, U.K. and South Africa	PBDEs	Table 1 of the article outlines the median concentration and range of Brominated Contaminants	Fish oil dietary supplements (FODS)	Belgian, the Netherlands, Ireland, U.K., South Africa	Not indicated	"Consumption of FODS does not appear to substantially increase the total dietary intake of PBDEs since the median daily intake from FODS was 8 and 16 times lower than the intake from either fish consumption alone or from total diet. These findings indicate that FODS might be a suitable alternative to fish consumption for certain segments of the population for which fish consumption advices have been issued."
(Costa, Korn, Brito, Ferlin, & Fostier, 2016)	Preliminary results of mercury levels in raw and cooked seafood and their public health impact	Mercury levels in fish (raw and cooked) collected between in May and June 2013 in Brasil	Mercury	Figure 2 depicts the mercury concentration in raw and cooked fish	<i>Bagre marinus</i> and <i>Diapterus rhombeus</i>	Salinas de Margarida, Brasil	Not indicated	"The concentrations in the raw samples ranged 837.0–1585.3 $\mu\text{g kg}^{-1}$ for <i>B. marinus</i> , 53.0–212.0 $\mu\text{g kg}^{-1}$ for <i>D. rhombeus</i> ... In general, cooked samples presented higher Hg concentration than raw samples with significant increase ($p < 0.05$) after cooking... The highest concentrations were found in <i>B. marinus</i> samples ranging 837.0–1585.3 $\mu\text{g kg}^{-1}$, which exceeded those recommended by

								Brazilian Health Surveillance Agency (ANVISA)."
(Copat, et al., 2014)	Mercury and selenium intake by seafood from the Ionian Sea: A risk evaluation	Mercury concentration in fish species purchased from local fishermen in the Catania fish market February and March 2012	Mercury and Selenium	Table 1 of the article indicates the concentration of Hg and Se in the fish species	<i>Arnoglossus laterna</i> , <i>Mullus barbatus</i> , <i>Engraulis encrasicolus</i> , <i>Trachurus trachurus</i> , <i>Scomber scombrus</i>	Ionian Sea	Not indicated	"Of the trace elements investigated, only Hg has a limit set by the European Community for human consumption, and this was never exceeded... Hg concentrations revealed higher values for benthonic fish with respect to the other samples. In particular, <i>M. barbatus</i> and <i>A. laterna</i> had a higher load of this contaminant with respect to pelagic fish species ($p < 0.01$; $p < 0.05$, respectively). In contrast, Se concentrations are higher in pelagic fish species ($p < 0.01$) as compared to <i>M. barbatus</i> and <i>A. laterna</i> ."
(Copat, et al., 2013)	Heavy metals concentrations in fish and shellfish from eastern Mediterranean Sea: Consumption advisories	Heavy metal concentration in fish species purchased from local fishermen in the Catania fish market February and March 2012	As, Cd, Cr, Pb, Mn, Ni, V, Zn	Table 2 of the article outlines the mean concentrations of all analysed metals in the fish species	<i>Arnoglossus laterna</i> , <i>Mullus barbatus</i> , <i>Engraulis encrasicolus</i> , <i>Trachurus trachurus</i> , <i>Scomber scombrus</i>	Eastern Mediterranean Sea	Not indicated	"Arsenic concentration was found significantly higher in muscle tissue of <i>M. barbatus</i> compared to the other analyzed species ($p < 0.001$). The same was found for Cd, Cr, Pb, Mn, Ni ($p < 0.001$) and V ($p < 0.01$) concentrations in <i>D. trunculus</i> compared to the other fish species. <i>A. laterna</i> had also V ($p < 0.05$) and Mn ($p < 0.01$) concentrations significantly higher than the other fish species. Zn presented the major concentrations in all analyzed species, but only in <i>E. encrasicolus</i> and in <i>D. trunculus</i> values were significantly high." "Among metals investigated, only Cd and Pb have a limit set by European Community for human consumption, and the thresholds were not been exceeded in analyzed species... Arsenic target hazard quotient (THQ) values, suggest that human should minimizing meals/week of analyzed

								species to avoid deleterious effect during lifetime, furthermore, with As cancer risk assessment, for most of the fish, the risk for cancer is greater than the acceptable lifetime risk of 10 ⁻⁵ ."
(Clarke, et al., 2010)	Dietary intake estimate for perfluorooctanesulphonic acid (PFOS) and other perfluorocompounds (PFCs) in UK retail foods following determination using standard addition LC-MS/MS	PFC concentrations in fish species collected from retail in 10 regions in the UK in 2007 and 2008	Perfluorocompounds (PFCs)	Table 1 of the article indicates the levels of PFCs in different fish species Table 4 indicates the individual concentrations of PFCs in fish Table 5 outlines the concentration of PFOS, PFOA, PFAS and PFOSA in fish	See Table 1 of the article	UK	Not indicated	"These concentrations indicate that UK consumers are being exposed to a low level of PFC contamination from food. The estimated upper bound dietary intake of 10 ng/kg bodyweight (bw)/day of PFOS for average adult consumers is well below the 0.15 µg (150 ng)/kg bw tolerable daily intake (TDI) set by the European Food Safety Authority. The lower bound adult dietary intake estimate of 1 ng/kg bw/day is similar to estimates undertaken and reported in countries such as Canada, Germany and Spain."
(Cladis, Kleiner, & Santerre, 2014)	Mercury Content in Commercially Available Finfish in the United States	Mercury concentration in fish species obtained from commercial vendors across the U.S.	Mercury	Figure 1 of the article indicates the total mercury concentration in the fish species	Finfish See Figure 1 of the article	USA	Not indicated	"Total mercury in fish muscle tissue ranged from 1 ppb (channel catfish) to 1,425 ppb (king mackerel). Of the top 10 most commonly consumed seafoods in the United States, all finfish species, including salmon species (13 to 62 ppb), Alaskan pollock (11 ppb), tilapia (16 ppb), channel catfish (1 ppb), Atlantic cod (82 ppb), and pangasius (swai) (2 ppb), had low total mercury concentrations. However, two large predatory species, king mackerel and swordfish (1,107 ppb), contained mercury concentrations above the current U.S. Food and Drug Administration action level of

								1,000 ppb, indicating that consumers may be unaware that species that are high in mercury are being sold in the marketplace."
(Cirillo, Fasano, Viscardi, Arnese, & Amodio-Cocchieri, 2010)	Survey of lead, cadmium, mercury and arsenic in seafood purchased in Campania, Italy	Lead, cadmium, mercury, Arsenic in fish species collected from fish markets and supermarkets in Campania, Italy	Lead, cadmium, mercury, Arsenic	Figure 1 - 4 and Table 1 -4 indicate the concentration of the four elements "Pb levels in fresh catch species ranged between <20 and 689 ng/g... Cd values ranged in fresh catch seafood from <0.8 to 19.8 ng/g... Hg levels ranged 8-339 ng/g in wild seafood... In fresh catch seafood, As values ranged <10-231 ng/g."	Atlantic mackerel (<i>Scomber scombrus</i>), European hake (<i>Merluccius merluccius</i>), European seabass (<i>Dicentrarchus labrax</i>), flathead grey mullet (<i>Mugil cephalus</i>), gilthead seabream (<i>Sparus aurata</i>), red mullet (<i>Mullus barbatus</i>), common cuttlefish (<i>Sepia officinalis</i>), common octopus (<i>Octopus vulgaris</i>) and European squid (<i>Loligo vulgaris</i>).	Campania, Italy	Not indicated	"In this study, lead, cadmium, mercury and arsenic detected in fresh catch, farmed and frozen marine fish, cephalopods and mussels marketed in Campania (Italy) did not show levels of Pb, Cd, Hg or As that could concern the consumers at the mean level of consumption."
(Choi, Moon, & Choi, 2012)	Intake and potential health risk of butyltin compounds from seafood	Butyltin compounds in fish species most commonly consumed and	Butyltin compounds (BTs)	Table 2 of the article indicates the concentrations of BTs	Table 2 of the article indicates the fish species	South Korea	Not indicated	"The concentrations of BTs (the sum of dibutyltin and tributyltin) in seafood ranged from less than the limit of detection to 96.3 ng/g wet weight, which are levels similar to those reported for other countries... Relatively high concentrations were found in some fish such as Spanish

	consumption in Korea	commercially imported; collected in 2005 from the Busan cooperative fish market						mackerel (<i>Scomberomorus niphoniu</i> , 73.4 ng/g ww), finespotted flounder (<i>Pleuronichthys cornutus</i> , 67.1 ng/g ww)... The estimated intakes through seafood consumption by Korean populations were below the TDI. Our results suggest that the Korean population is not expected to exceed the threshold value for adverse health effects."
(Chahid, Hilali, Benlhachimi, & Bouzid, 2014)	Contents of cadmium, mercury and lead in fish from the Atlantic sea (Morocco) determined by atomic absorption spectrometry	Levels of cadmium, mercury and lead in fish species collected from different ports in the south of Morocco	Cadmium, mercury, lead	"The levels of Cd, Pb and Hg in muscles of fish were 0.009–0.036, 0.013–0.114 and 0.049–0.194 µg/g, respectively." Table 2 of the article indicates the mean concentration of Cd, Pb, Hg Table 3 indicates the concentration of elements in other previously conducted studies	<i>Sardina pilchardus</i> , <i>Scomber scombrus</i> , <i>Plectorhinchus mediterraneus</i> , <i>Trachurus trachurus</i> , <i>Octopus vulgaris</i> , <i>Boops boops</i> , <i>Sarda sarda</i> , <i>Trisopterus capellanus</i> , and <i>Conger conger</i>	Atlantic Sea (Morocco)	Not indicated	"Results show that Cadmium, lead and mercury occurs in the Moroccan aquatic organisms only in trace concentrations and do not exceed the legal limit of 0.1 mg/kg, 0.3 mg/kg and 0.5 mg/kg w/w, respectively... Therefore, the fish from this region, in general, are safe for human consumption."
(Carvalho, Matos, Mateus, Santos, & Batoréu, 2008)	High-fish consumption and risk prevention: Assessment of exposure to methylmercury in Portugal	Mercury concentration in fish species purchased in Sesimbra dock	Mercury	Table 3 of the article indicates the mean mercury concentration in the fish species	Table 3 of the article outlines the fish species	Portugal	Not indicated	"The predator species analyzed contained an average of 1.028 µg/g of total Hg, a consequence of the levels found in the dogfish "carocho" (2.1 times the legal limit), "lixa" (1.4 times), and "sapata" (1.9 times)... The nonpredator species contained a mean value of 0.035 µg/g Hg." "Dogfish specimens surpassed the legislated limit for predator species and increased the predators mean to 1 µg/g... The indices of risk calculated for youth reached values

								of 4.5, demonstrating the existence of risk to a part of the population exceeding the provisional tolerable weekly intake (PTWI) level mandated by WHO (1.6 µg/kg bw)."
(Carlsson, Herzke, & Kallenborn, 2014)	Polychlorinated biphenyls (PCBs), polybrominated diphenyl ethers (PBDEs) and perfluorinated alkylated substances (PFASs) in traditional seafood items from western Greenland	Level of contaminants in purchased at local fish market and grocery shops in Nuuk in June 2010	PCB, PBDEs, PFASs	Table 1 and 2 of the article indicate the concentration of contaminants	Fresh salmon fillet, smoked salmon fillet and smoked halibut fillet, commercial whale beef, narwhal mattak (Greenlandic traditional food consisting of blubber and parts of the skin) and commercial seal meat	Nuuk, Greenland	Not indicated	"Daily exposure was below the tolerable daily intake threshold for all compounds. BDE-47 was the only PBDE-congener detected in all food items, except in smoked halibut. The levels of BDE-47 varied from < LOD in smoked halibut up to 18 ng/g lw in narwhal mattak and 21 ng/g lw in whale beef. ΣPCB were lowest in smoked halibut (37 ng/g lw) and highest in narwhal mattak with 1,146 ng/g lw. Perfluorooctane sulfonate (PFOS) was the most common of the PFASs. However, ΣPFASs were below detection limits in most fish fillet samples, and varied from 2.9 ng/g ww in whale beef to 13.5 ng/g ww in seal beef."
(Burger, et al., 2007)	Heavy metals in Pacific cod (Gadus macrocephalus) from the Aleutians: Location, age, size, and risk	Heavy metals in pacific cod collected in 2004 in the North Pacific Ocean	As, Cd, Cr, Pb, Hg, Se	Table 1 of the article indicates the metal levels in muscle and liver of pacific cod	Pacific cod	Nikolski, Adak, Amchitka, and Kiska Islands in the Aleutian Chain (Alaska) in the Bering Sea/North Pacific Ocean	Not indicated	"As was higher in liver than in muscle (geometric mean 2420 versus 1590 ng/g or ppb wet weight), as were Cd (GM 224 versus 1.92) and Se (GM 1380 versus 165). Conversely, Cr was higher in muscle (76.8 versus 45 ppb), as were Pb (23.7 vs 12 ppb) and surprisingly Hg (128 versus 82 ppb). Adak, until recently a large military base, had the highest levels of As, Hg, and Se, while Amchitka had the highest Pb levels, but Nikolski, which generally had the lowest levels, had relatively high Pb in liver. In general, interisland differences were significant for most metals in muscle, but only for Cr in liver... In this study, the only metals that might pose a risk to cod-eating

								predators is Hg, as well as some of the higher values of Pb at Amchitka and Nikolski."
(Burger & Gochfeld, 2007)	Risk to consumers from mercury in Pacific cod (<i>Gadus macrocephalus</i>) from the Aleutians: Fish age and size effects	Mercury concentrations in Pacific cod collected in 2004 in the North Pacific Ocean	Mercury	Table 2 of the article indicates the levels of mercury and selenium Table 3 indicates the percent of mercury and selenium levels above guidance or risk levels	Pacific cod (<i>Gadus macrocephalus</i>)	Nikolski, Adak, Amchitka, and Kiska Islands in the Aleutian Chain (Alaska) in the Bering Sea/North Pacific Ocean	Not indicated	"Only 4% of the Pacific cod samples had mercury levels above 0.5 ppm, the action level promulgated by many states and countries, and none were above the 1 ppm action level of the U.S. FDA."
(Burger, 2009)	Risk to consumers from mercury in bluefish (<i>Pomatomus saltatrix</i>) from New Jersey: Size, season and geographical effects	Mercury levels in bluefish caught along the New Jersey shore	Mercury	"Mercury levels averaged 0.35 ± 0.02 (mean and standard error) ppm, and selenium levels averaged 0.37 ± 0.01 ppm ($N=206$). In this study, 41% of the fish had mercury levels above 0.3 ppm, 20% had levels above 0.5 ppm, and 4% had levels above 1 ppm." Table 3,4 and 5 of the article indicates the mean mercury levels in bluefish	bluefish (<i>Pomatomus saltatrix</i>)	New Jersey shore	Not indicated	"The levels of mercury in bluefish are not sufficiently high to cause problems for the bluefish themselves, based on known adverse health effects levels, but are high enough to cause potential adverse health effects in sensitive birds and mammals that eat them, and to provide a potential health risk to humans who consume them. Fish larger than 50 cm fork length averaged levels above 0.3 ppm, suggesting that eating them should be avoided by pregnant women, children, and others who are at risk."
(Bulushi, Poole, Deeth, & Dykes, 2009)	Biogenic Amines in Fish: Roles in Intoxication, Spoilage,	Biogenic amines and their relation to scombroid poisoning	Biogenic Amines (Histamine, cadaverine, spermidine, putrescine),	Table 3 of the article indicates the nitrosamine levels in fish products	Fish products (see Table 3)		Not indicated	"High levels of histamine are associated with scombroid poisoning but cadaverine has been found to potentiate histamine toxicity... Nitrosamines in fish products, particularly when salted, have been

	and Nitrosamine Formation— A Review	and nitrosamine in fish products	Nitrosamine					<p>correlated with certain human cancers. While some of these nitrosamines are derived from small amines such as DMA, nitrosamines derived from cadaverine and putrescines have also been reported. However, the effects of fish species, fish quality, and the methods of processing and storage conditions on the formation of these nitrosamines in fish have not been fully elucidated. Further investigations of these effects and the mechanisms of nitrosamine formation in fish products are required to understand and minimize the situations in which the safety of fish and fish products may be compromised. Importantly, from a public health perspective, cadaverine and putrescine levels need to be considered in any histamine toxicity assessment and nitrosamines levels should be closely monitored to secure the safety of salted, dried, and fermented fish."</p>
(Blanco, González, & Vieites, 2008)	Mercury, cadmium and lead levels in samples of the main traded fish and shellfish species in Galicia, Spain	Levels of mercury, cadmium and lead in the main traded fish species in Galicia collected from 40 commercial outlets between January 2002 and October 2003	Mercury, cadmium, lead	Contamination levels are indicated in Table 1, 2 and 3 of the article	Fish and fish products (see Table 1, 2 and 3 of the article)	Galicia, Spain	Not indicated	<p>"The results show that, according to European legislation, the products on the market are generally "safe", although the high levels of mercury in swordfish and shark are notable, with 22% of samples ($n = 37$) over the limit. We also indicate the relatively important contribution to mercury ingestion of widely consumed species, such as tuna, with 25% of samples ($n = 378$) over 0.25 mg kg^{-1}"</p>

(Bellés, Linares, Perelló, & Domingo, 2013)	Human Dietary Exposure to Uranium in Catalonia, Spain	Uranium concentration in fish samples and other food collected in local markets and supermarkets in Catalonia	Uranium	Table 1 of the article indicates the levels of Uranium in the fish species	fresh and canned sardine, fresh and canned tuna, anchovy, mackerel, swordfish, salmon, hake, red mullet, sole	Catalonia, Spain	Not indicated	"Fish and seafood was the food group showing the highest U concentrations (0.090 µg/g of fresh weight (fw))... Based on the tolerable daily intake established for U, the current dietary intake of this metal by the general population of Catalonia should not mean health risks for any of the different age/gender groups of consumers."
(Barone, et al., 2015)	Assessment of mercury and cadmium via seafood consumption in Italy: estimated dietary intake (EWI) and target hazard quotient (THQ)	Mercury and cadmium concentration in randomly collected fish species in supermarkets in Southern Italy during 2012-2013	Mercury and cadmium	Table 1 of the article outlines the concentration levels and legal limits	<i>Raja oxyrinchus</i> (long-nose skate), <i>Solea vulgaris</i> (common sole), <i>Conger conger</i> (European conger eel), <i>Helicolenus dactylopterus</i> (blackbelly rosefish), <i>Mugil cephalus</i> (flathead grey mullet), <i>Boops boops</i> (bogue), <i>Xiphias gladius</i> (swordfish), <i>Thunnus thynnus</i> (Atlantic bluefin tuna), <i>Engraulis encrasicolus</i> (European anchovy),	Italy	Not indicated	"In fish, Hg ranging from 0.04 µg g ⁻¹ wet weight to 0.80 µg g ⁻¹ wet weight (mean = 0.40 µg g ⁻¹ wet weight) was the dominating element, whereas Cd occurred at lower levels varying from 0.02 µg g ⁻¹ wet weight to 0.18 µg g ⁻¹ wet weight (0.07 µg g ⁻¹ wet weight) (<i>p</i> < 0.004). The statistical comparison also revealed that Hg concentrations were different among fish species. The highest levels were detected in swordfish and bluefin tuna with values of 0.80 µg g ⁻¹ wet weight and 0.74 µg g ⁻¹ wet weight, respectively, and the lowest in anchovies (0.06 µg g ⁻¹ wet weight) and sardines (0.04 µg g ⁻¹ wet weight)... Fish that are high on the trophic level might be expected to concentrate higher levels of bioaccumulative metals as Hg and the same was found in this study for swordfish and bluefin tuna, typical high-order marine predators." "The series describing interspecies differences are the following: fish > cephalopods = crustaceans"

					<i>Sardina pilchardus</i> (European pilchard), <i>Scomber scombrus</i> (Atlantic mackerel)			for Hg; and cephalopods > crustaceans > fish for Cd... Cd dietary exposure does not seem to pose any risk to consumers... Exposure in some cases was close to the safety margins and thus the Hg level in seafood should be under frequent surveillance... Hg levels, particularly high in swordfish, Atlantic bluefin tuna and European conger eel, suggest caution in their consumption, especially in regular fish consumers and particular population segments such as pregnant and lactating women, and young children."
(Barone, Giacomini-Stuffler, Garofalo, Castiglia, & Storelli, 2014)	PCBs and PCDD/PCDFs in fishery products: Occurrence, congener profile and compliance with European Union legislation	Contaminant level in randomly collected fish species in supermarkets in Southern Italy during 2012-2013	PCBs, PCDD/Fs	Table 1 of the article indicates the contaminants levels in the fish species	<i>Raja clavata</i> , <i>Solea vulgaris</i> , <i>Solea senegalensis</i> , <i>Merluccius merluccius</i> , <i>Mullus barbatus</i> , <i>Boops boops</i> , <i>Belone belone</i> , <i>Scomber scombrus</i>	Italy	Not indicated	"Contaminant accumulation followed the order PCBs > PCDFs > PCDDs in all samples... Pollutant concentrations in all fishery products did not exceed the maximum limits for human consumption... Non-dioxin-like indicator PCBs sum was below the legal limit... Therefore, the samples analyzed can be considered safe considering the levels obtained and the in-force legislation."
(Baeyens, et al., 2007)	PCBs and PCDD/FS in Fish and Fish Products and Their Impact on the Human Body Burden in Belgium	PCBs and PCDD/Fs concentration in fish species obtained from fish markets at Belgian sea harbors and caught in the North Sea and	PCBs and PCDD/Fs	Table 1 of the article indicates the PCB concentrations in fish in 2001 Table 2 outlines the PCB and PCDD/Fs concentration in fish in 2002 Table 3 outlines the PCDD/Fs + dioxin-	Table 1,2 and 3 outline the analysed fish species	Belgium	Not indicated	"Results of the PCB congeners analyses show that PCB-153 is the most abundant congener in almost all samples, with also main contributions of the 138- and 180-congeners. For some species such as the sand sole and lemon sole, a fairly constant PCB content, independent of the fat percentage, was observed. For a second group of species such as whelks, cod, and whiting, a positive correlation was observed between their PCB

		adjacent seas between 2001 and 2006		like PCBs levels in fish in 2004-2006				concentration (ng g ⁻¹ fat) and their % of fat."
(Aznar-Alemany, et al., 2017)	Occurrence of halogenated flame retardants in commercial seafood species available in European markets	Halogenated flame retardants in most commonly consumed fish species in Europe	PBDEs, HBCD, emerging brominated flame retardants, dechloranes, TBBPA	Table 2 of the article outlines the contaminant levels	cod, mackerel, monkfish, Nile perch, plaice, salmon, seabream and tuna	Mediterranean Sea, North Sea, North-East Atlantic Ocean, Pacific ocean See Table 1 for specific sampling site	Not indicated	"Concentrations of the priority substances analysed in European seafood ranged n. d.-356 ng/g lw and n. d.-41.1 ng/g ww. Anthropogenic PBDEs and natural MeO-PBDEs showed the highest frequencies of detection and concentrations, while HBCDs and most EFRs were found in half of the samples at similar and lower levels. DBDPE was not detected and 2,4,6-TBP was detected only in mussels but at levels comparable to those of PBDEs. Mussels and seabreams showed the highest occurrences and concentrations." "Legacy PBDEs and their naturally produced counterparts are present in most seafood species at high levels, creating environmental concerns. HBCDs and most EFRs are not as frequent but their concentrations are not negligible. This concern does not seem to transfer to human consumption; however, the process of cooking concentrates some FRs, which might lead to a higher risk for compounds such as BDE-99. Further studies are required on the risk of cooked seafood."
(Araújo & Cedeño-Macias, 2016)	Heavy metals in yellowfin tuna (Thunnus albacares)	Concentration of heavy metals in yellowfin tuna and common	Cd, Hg, Pb	Table 1 of the article indicates the mean, median and maximum and minimum	Yellowfin tuna (Thunnus albacares) Common dolphinfish	Manta, Ecuador (Eastern Pacific)	Not indicated	"Concentrations of Cd and Hg in the muscle tissue, in most of the individuals sampled, presented levels above the permissible intake limit: 0.1 and 1 ppm, respectively. Concentrations of Pb were, in

	and common dolphinfish (Coryphaena hippurus) landed on the Ecuadorian coast	dolphinfish collected in Manta during November 2013 to April 2014		concentration of Cd, Pb, Hg	(Coryphaena hippurus)			<p>general, below what is considered the permissible limit (0.3 ppm) with no risk for human beings."</p> <p>"Levels of Pb were considered acceptable for both species... High levels of Cd and Hg in both species can be considered unsafe for human health... For both species the recommended maximum ingestion is around 180 g week⁻¹ for an adult."</p>
(Al-Sarawi, Jha, Al-Sarawi, & Lyons, 2015)	Historic and contemporary contamination in the marine environment of Kuwait: An overview	Review of studies reporting levels of contaminants in Kuwait's marine environment	General		General	Kuwait	Not indicated	<p>"The majority of studies would indicate that while Kuwait's marine environment has been subjected to a wide array of pollution events, the actual levels of contamination remains relatively low when compared to heavily industrialised regions elsewhere in the world."</p> <p>Studies on human health risk related to fish consumption suggested that PAHs pose only little risk, while Hg in fish exceeded levels for human consumption.</p>
(Alina, et al., 2012)	Heavy metals (mercury, arsenic, cadmium, plumbum) in selected marine fish and shellfish along the straits of malacca	Heavy metal concentration in fish species most preferred by local consumers in Indonesia	Mercury, arsenic, cadmium, plumbum	"The range of heavy metals in samples were L0-3-6.5-3 ttg/ g wet sample for Hg, 0.5-2-47-2 ttg/ g wet sample for Cd, 0.01-039 ttg/ g wet sample for Pb and 0A4-6.57 ttg/ g wet sample for As."	Gymnura spp. (Long-tailed butterfly ray), Plotosus spp. (Gray eelcatfish), Nemipterus japonicus (Japanese threadfin bream), Epinephelus sexfasciatus (Sixbar grouper), Psettodes erumei (Large-	Straits of Malacca, Indonesia	Not indicated	"All metals were present in all samples but values obtained were below permitted limits set by FAO/WHO, (2004) and Food Act 1983 and Food Regulations 1985. Therefore, the local fish and shellfish from the Straits of Malacca are safe to consume in terms of these selected heavy metal concentrations."

					scale tongue sole), <i>Lutianus argentimaculatus</i> (Malabar red snapper), <i>Rastrelliger kanagurta</i> (Indian mackerel), <i>Scomberomorus guttatus</i> (Spanish mackerel), <i>Pampus argenteus</i> (Silver pompret), <i>Megalapsis cordyla</i> (Hardtail scad), <i>Eleutheronema tridactylum</i> (Fourfinger threadfin), <i>Chirocentrus dorab</i> (Dorab wolfherring),			
(Aligizaki, Katikou, Milandri, & Diogene, 2011)	Occurrence of palytoxin-group toxins in seafood and future strategies to complement the present state of the art	Literature review on PTIX occurrence in seafood, including fish	Palytoxin (PITX) and palytoxin-like (PITX-like) compounds	Table 1 of the article indicates the PTIX content	Table 1 of the article indicates the fish species which have been reported with PITX	Japan, the Philippines, Singapore, Micronesia, NE Australia, Hawaii, the SW Caribbean, Madagascar and the Mediterranean sea, Bangladesh (see Figure 1 of the article)	Not indicated	"PITX has been reported to be present in several species of fish, crustaceans, molluscs and echinoderms. In one occasion, PITX has been identified in freshwater puffer fish whereas all other records of PITXs refer to marine species and have been recorded in latitudes approximately between 43°N and 15°S."

(Al-Busaidi, et al., 2011)	Toxic metals in commercial marine fish in Oman with reference to national and international standards	Toxic metals in imported fish species and collected from seafood processing units between January 2007 and December 2009 in Oman	Cadmium, Lead and mercury	Table 2 of the article indicates the concentration levels of cadmium, lead and mercury "The mean cadmium level ranged from 0.0049 to 0.036 mg kg ⁻¹ and 1.37% of the total samples exceeded the EU and FAO standards. Mean lead content varied between 0.029 and 0.196 mg kg ⁻¹ , few samples crossed the EU (2.63%) and FAO (1.6%) limits. Mean mercury level ranged from 0.015 to 0.101 mg kg ⁻¹ and none of the samples exceeded the EU limit."	Table 1 of the article outlines the fish species (fresh or frozen)	Oman	Not indicated	"The levels of toxic metals in fish samples are not high when compared to some other areas of the world and a range of international standards. Our results showed that the values are lower than these guidelines. Therefore, we can conclude that these metals have pose no threat for consumption of these fish. This study indicates that fresh and frozen fish follows a pattern of Pb > Cd > Hg and species wise red seabream > yellowfin tuna. Majority (84%) of the mercury detected samples showed the prevalence between 0.01 and 0.2 mg kg ⁻¹ and 1.37% of the total samples exceeded the limit for cadmium, and maximum (62.5%) of the lead detected samples exhibited in the range of 0.02-0.2 mg kg ⁻¹ ... The data in this paper suggests that most of the species have relatively low levels of contaminants of concern, such as cadmium, lead and mercury except, few yellowfin tuna and red seabream. Also, the mean concentrations for all the fish species were lower than the standard limits proposed by the EU and FAO."
(Alam & Mohamed, 2011)	Natural radionuclide of Po ²¹⁰ in the edible seafood affected by coal-fired power plant industry in Kapar coastal area of Malaysia	Effect on coal-fired power plant industry on fish in Malaysia collected in August 2008, December 2008 and February 2009	Radionuclide (Po ²¹⁰)	"The ranges of Po ²¹⁰ activities in the organism samples were 4.4 ± 0.12 to 6.4 ± 0.95 Bqkg ⁻¹ dry wt in fish (<i>Arius maculatus</i>)." Table 1 of the article outlines the activity of Po ²¹⁰ in seafood samples	<i>Arius maculatus</i>	Kapar coastal area, Malaysia	Not indicated	"The concentration factors calculated for fish and molluscs were higher than the recommended values by the IAEA... Results presented here suggest that the area around the Kapar Power station is susceptible to some contamination and people living near the area are exposed to higher alpha radiation through seafood consumption. These findings suggest that appropriate action needs to be

								done to mitigate possible risks to human and environmental health.”
(Akpambang, et al., 2009)	Determination of polycyclic aromatic hydrocarbons (PAHs) in commonly consumed Nigerian smoked/grilled fish and meat	PAHs concentration in raw and smoked fish purchased from local fish vendors in Akure, Nigeria	PAHs	Table 1 of the article outlines the PAH concentrations in raw and smoked/grilled fish	Raw fish and smoked fish: mudfish (<i>Clarias gariepinus</i> , Clariidae), croaker (<i>Pseudotolithus senegalensis</i> , Sciaenidae), mackerel (<i>Scomber scombrus</i> , Scombridae) and jackfish (<i>Selar crumenophthalmus</i> , Carangidae)	Nigeria	Not indicated	“Traditionally smoked and/or grilled fish and meat from the Nigerian market were found to be heavily contaminated with benzo[a]pyrene (BaP) in amounts often exceeding by far the limit of 5 µg kg ⁻¹ settled in 2005 by the European Commission. Margin of exposure (MOE) values lower than 10,000, which according to EFSA (2008) indicate a potential concern for consumer health, were generally found in commercially smoked samples for both BaP and eight polycyclic aromatic hydrocarbons (PAHs). This demonstrates the need for legal limits in traditionally smoked foodstuffs in Nigeria and possible risk management action.”
(Airaksinen, et al., 2010)	Organotin intake through fish consumption in Finland	OCTs concentration in fish species from the Baltic Sea, freshwater lakes, farmed fish and imported fish	Organotin compounds (OCTs)	Table 1 of the article indicates the OCT concentration in the fish samples	Table 1 outlines the fish species	Finland	Not indicated	“The average daily intake through fish consumption was well below the Tolerable Daily Intake. Therefore, we conclude that Finnish consumers are not likely to exceed the threshold level for adverse health effects due to OCT intake through fish consumption.”
(Agusa, et al., 2007)	Exposure assessment for trace elements from consumption of marine fish in	Trace elements in fish species collected in Cambodia, Indonesia, Malaysia and Thailand	Trace elements	Table 2 and 3 of the article outlines the trace element concentrations in liver and muscle of marine fishes	Table 1 outlines the fish species	Coastal areas of Cambodia, Indonesia, Malaysia and Thailand	Not indicated	“Large regional difference was observed in the levels of trace elements in liver of one fish family (Carangidae): the highest mean concentration was observed in fish from the Malaysian coastal waters for V, Cr, Zn, Pb and Bi and those from the Java Sea side of Indonesia for Sn and Hg. To assess the health

	Southeast Asia	between 1995 and 1999						risk to the Southeast Asian populations from consumption of fish, intake rates of trace elements were estimated. Some marine fish showed Hg levels higher than the guideline values by U.S. Environmental Protection Agency and Joint FAO/WHO Expert Committee on Food Additives (JECFA). This suggests that consumption of these fish may be hazardous to the people."
(Afonso, Lourenco, Dias, Nunes, & Castro, 2007)	Contaminant metals in black scabbard fish (<i>Aphanopus carbo</i>) caught off Madeira and the Azores	Mercury, cadmium and lead concentration in scabbard fish caught off Madeira and the Azores archipelagos	Mercury, cadmium, lead	Table 2 of the article outlines the concentration of mercury, cadmium and lead in tissues (muscle, skin) of scabbard fish	scabbard fish (<i>Aphanopus carbo</i>)	Madeira and the Azores archipelagos (Portugal)	Not indicated	"The mean mercury levels in liver were 4.50 and 2.37 whereas, in skin, such values were 0.59 and 0.36 (Madeira and Azores, respectively). On average, the muscle content was around 0.9 in fish from both areas. Cadmium maximum levels in muscle and skin were found in Azores samples (0.09 and 0.11, respectively). Mean lead contents in all samples were always below than 0.10... According to the permissible WHO and FAO levels, these results, suggest that this species does not represent a risk for human consumption if the liver is excluded and the edible part consumed with moderation."
(Afonso, Lourenço, et al., 2013)	From fish chemical characterization to the benefit-risk assessment – Part A	Contaminant elements in fish species from the Portuguese coast	Mercury, cadmium, lead and arsenic	Table 5 of the article indicates the concentration of mercury, cadmium, lead and arsenic in the muscle of the fish species	silver scabbardfish (<i>Lepidopus caudatus</i>), hake (<i>Merluccius merluccius</i>), and ray (<i>Raja</i> spp.)	Portugal	Not indicated	"With respect to the hazards, organic Hg is the main concern, especially in silver scabbardfish... More than one weekly meal of silver scabbardfish has to be avoided due to the organic mercury concentration."
(Afonso, et al., 2015)	Benefits and risks associated	Selenium and Methyl concentration	Selenium, Mercury,	Table 2 of the article outlines the	Raw, cooked (boiled and grilled) and	Portugal	Not indicated	"Selenium bioaccessibility was high in tuna, though slightly lower in canned than in raw products."

	with consumption of raw, cooked, and canned tuna (Thunnus spp.) based on the bioaccessibility of selenium and methylmercury	n and their bioaccessibility in tuna purchased from Portuguese grocery stores	Methylmercury	Selenium concentration Table 3 outlines the Se and Hg, and MeHg ratio	canned tuna (oil, water) (Thunnus spp.)			Mercury levels were high in raw and cooked tuna. Hg bioaccessibility percentages were low (39–48%) in the cooked tuna and even lower (<20%) in canned tuna... A probabilistic assessment of MeHg risk vs Se benefit showed that while a weekly meal of canned tuna presents very low risk, raw, boiled, and grilled tuna consumption should not exceed a monthly meal, at least, for pregnant and nursing women. As general recommendation, consumers should consume moderately tuna, preferably grilled or canned."
(Vandermersch, et al., 2015)	Environmental contaminants of emerging concern in seafood – European database on contaminant levels	Review article summarizing concentration levels of contaminants of emerging concern in seafood	Contaminants of emerging concern (toxic elements, endocrine disruptors, brominated flame retardants, pharmaceuticals and personal care products, polycyclic aromatic hydrocarbons and derivatives, microplastics and marine toxins)		Marine fish		Not indicated	Development of a database containing information about contaminants of emerging concern in seafood "The present review summarizes concentration levels of contaminants of emerging concern in seafood. Since the concentrations of several substances in seafood have not yet been properly determined (e.g. almost all studies of pharmaceuticals and personal care products have been done on freshwater fish only), monitoring programs of such contaminants in seafood should be prioritized in the future. In addition, detailed seafood consumption data is necessary to assess actual human health risks. Furthermore, the toxicological data of emerging contaminants is still scarce for several compounds and the toxicological impact of these contaminants needs further assessment. When all of this required information is available, improved risk assessments can be

								performed and mitigation strategies can then be implemented.”
(Szefer, 2013)	Safety assessment of seafood with respect to chemical pollutants in European Seas	Review article on chemical pollutants in fish species commonly consumed in the EU	Organic and inorganic pollutants		Baltic Herring, salmon, tuna, mackerel	EU	Not indicated	“It is concluded that fish are significantly exposed to certain pollutants: MeHg, POC, BFR, and OTs. The PTWI estimated for MeHg and dioxin-like compounds may be exceeded even if all other sources of dietary exposure are excluded. Farmed Atlantic salmon have significantly higher levels of PBDE than wild salmon. In the case of high PAH level consumers, the potential concern for consumer health and the possible need for risk management action is postulated. The PTWI for PCDD/Fs and DL-PCBs may be exceeded if adults eat Baltic herring or wild salmon more than once a week. It is found that the consumption of seafood from highly contaminated areas (in the vicinity of harbours or heavily used shipping routes) may lead to an OTC intake exceeding the group TDI. According to EFSA, women of childbearing age and pregnant and breast-feeding women should eliminate predatory fish and fatty fish enriched in MeHg from their diets.”
(M. Hosseini, Nabavi, Nabavi, & Pour, 2015)	Heavy metals (Cd, Co, Cu, Ni, Pb, Fe, and Hg) content in four fish commonly consumed in Iran: risk assessment for the consumers	Heavy metal concentration in fish species most commonly consumed in the south of Iran and collected from fish markets	Cd, Co, Cu, Ni, Pb, Fe, and Hg	Table 2 – 5 of the article outline the heavy metal concentration in the fish species.	<i>L. abu, E. orientalis, P. erumei, and O. ruber</i>	Khuzestan shore, Persian Gulf, Iran	Not indicated	“The liver and skin showed higher metal concentrations than the muscle. The results showed that heavy metal concentrations in different food habitats increase in the following order: benthic omnivorous fish < zooplanktivore fish < phytoplanktivore fish < piscivore fish. Also, the comparison indicated that benthic species (<i>Euryglossa orientalis, Otolithes ruber</i>) were more contaminated than pelagic species

		and supermarkets in July 2011						(<i>Liza abu</i> and <i>Psettodes erumei</i>). Therefore, the concentration of heavy metals in edible part of fish species did not exceed the permissible limits proposed by Food and Agriculture Organization (FAO) (1983), WHO (1996), Regional Organization for the Protection of the Marine Environment (ROPME) (1999), and FAD (2001) which are suitable for human consumption, except for Ni and Cd in <i>E. orientalis</i> and Pb in <i>O. ruber</i> ."
(Cimenci, et al., 2013)	Dietary exposure of the Belgian adult population to non-dioxin-like PCBs	PCB levels in fish purchased in supermarkets in Belgium in 2008	PCB 28, 52, 101, 138, 153 and 180	Table 1 indicates the PCBs levels in fish "In decreasing order, the contamination levels in ng/g fw were: Other fishes > Pilchard > Salmon > Mackerel > Herring > Mollusks > Fish salads > Crustaceans > Fish products > Cod > Tuna."	Table 1 of the article outlines the fish species and fishery products	Belgium	Not indicated	"The average exposure of the Belgian population to indicator PCBs was 5.33 ng/kg b.w./day. Fishery products was the major contributor (54.3%)."
(Cohen, et al., 2009)	Public Health Response to Puffer Fish (Tetrodotoxin) Poisoning from Mislabeled Product	Two cases of Tetrodotoxin poisoning reported from Pufferfish purchased in a retail in Chicago	Tetrodotoxin		Pufferfish	Chicago	Not indicated	"In 2007, two individuals developed symptoms consistent with tetrodotoxin poisoning after ingesting home-cooked puffer fish purchased in Chicago."
(J. L. Domingo)	Per- and polyfluoroalkyl	Review of articles on	Per- and polyfluoroalkyl	Table 1 of the article summarises recent articles on	See articles in this review paper	Global	Not indicated	"Fish and other seafood seem to be the food group in which more PFASs are detected and where the

& Nadal, 2017)	substances (PFASs) in food and human dietary intake: A review of the recent scientific literature	PFASs in food	substances (PFASs)	the occurrence of PFASs in food				concentrations of these compounds are higher. On the basis of the recommendations of the EFSA on the maximum dietary intakes of PFOS and PFOA, human health risks would not be of concern for nonoccupationally exposed populations, at least in the very limited countries for which recent data are available."
(Duedahl-Olesen, Christensen, Hoejgaard, Granby, & Timm-Heinrich, 2010)	Influence of smoking parameters on the concentration of polycyclic aromatic hydrocarbons (PAHs) in Danish smoked fish	PAH concentration in smoked fish products obtained from local production sites (fishmongers or industrial production) between July 2006 and May 2008	PAHs	Table 2 of the article outlines the average concentration of PAHs for different fish species and smoking techniques "The sum concentration of 25 PAHs (Σ PAH ₂₅) was highest in smoked herring ($n = 3$) and mackerel fillets ($n = 13$), with an average concentration of 320 and 235 $\mu\text{g kg}^{-1}$, respectively. Lowest average Σ PAH ₂₅ concentrations were obtained for indirectly smoked trout (26 $\mu\text{g kg}^{-1}$)."	Smoked fish products (herring, salmon, mackerel, greenland halibut, trout, eel, cod roe, kippers, butter fish, tuna)	Denmark	Smoking	"The present study showed that directly smoked fish and to some extent smoked fillets contained the highest Σ PAH ₂₅ . Generally, BaP levels below the European Union maximum limit of 5 $\mu\text{g kg}^{-1}$ were obtained, except for two smoked cod roe samples with BaP concentrations of 6.5 and 11 $\mu\text{g kg}^{-1}$. Different smoking techniques exist and even for smoking techniques used in Denmark differences between processes vary considerably and resulted in varying PAH profiles with no clear trends."
(H. Lin, Jiang, & Li, 2008)	Potential Hazards in Smoke-Flavored Fish	Comparing PAH levels in smoked-flavored fish with traditional smoking techniques	PAHs		Smoked fish		Smoking	"The lower content of PAHs in smoke-flavored fish is one of the advantages in comparing the liquid smoking techniques to traditional smoking techniques if the PAHs residue in smoke flavorings is controlled by regulations

								or standards.”
(E. Fattore, Fanelli, Dellatte, Turrini, & Domenico, 2008)	Assessment of the dietary exposure to non-dioxin-like PCBs of the Italian general population	Non dioxin-like PCBs in foodstuff (including fish) and total intake of PCBs	NDL-PCBs	Table 1 of the article indicates the mean concentration of PCBs	Fish and fishery products, fish oil	Italy	Not indicated	“Fish oil was by far the most contaminated food item, followed by fish and fishery products... Fish and fishery products and milk and dairy products are by far the main contributors: their sum is up to 74% of total intake for toddlers and young children, and 66% for both children and adults.”
(Fernandes, et al., 2011)	Polychlorinated naphthalenes (PCNs) in Irish foods: Occurrence and human dietary exposure	PCN levels in 100 commonly consumed foods in Ireland	PCNs	Table 1 of the article outlines the PCN concentration in foods	Mackerel, trout	Ireland	Not indicated	“The most frequently detected congeners were PCNs 66/67, PCN 52, and PCN 73. The highest concentrations were observed in fish, which generally showed congener profiles that reflect some commercial mixtures... The estimates of dietary intakes at approximately 0.14 pg TEQ kgbw ⁻¹ month ⁻¹ for adults on an average diet, reflects the relatively lower occurrence levels.”
(Fromme, Tittlemier, Volkel, Wilhelm, & Twardella, 2009)	Perfluorinated compounds – Exposure assessment for the general population in western countries	Review on PFC monitoring data	Perfluorinated compounds (PFCs)	This review outlines an overview of studies which investigated the PFC levels in fish in various regions.	See articles in this review		Not indicated	“Using a simplified model, the average (and upper) level of daily exposure including all potential routes amounts to 1.6 ng/kg _{body weight} (8.8 ng/kg _{body weight}) for PFOS and 2.9 ng/kg _{body weight} (12.6 ng/kg _{body weight}) for PFOA in adults in the general population. The majority of exposure can be attributed to the oral route, mainly to diet. Overall, the contribution of PFOS and PFOA precursors to total exposure seems to be limited... Consumption of higher contaminated fish results under some circumstances and in some regions (e.g. Baltic Sea, Great Lakes) in higher intakes and body burdens of

								perfluorocarboxylates and sulfonates."
(Katikou, Georgantelis, Sinouris, Petsi, & Fotaras, 2009)	First report on toxicity assessment of the Lessepsian migrant pufferfish <i>Lagocephalus sceleratus</i> (Gmelin, 1789) from European waters (Aegean Sea, Greece)	Toxicity assessment of pufferfish from Greece caught between June and December 2007	Tetrodotoxin, Paralytic Shellfish Poisoning	Table 2 of the report outlines the toxicological results	Pufferfish (<i>L. sceleratus</i>)	Aegean Sea, Greece	Not indicated	<p>"Toxicity of certain tissues (liver, gonads, gastrointestinal tract) in larger individuals, expressed as µg/g tetrodotoxin equivalents, was largely above levels required to cause death in human adults. On the other hand, all tested extracts provided a positive reaction in the ELISA test for PSP toxins. This constitutes the first report for presence of toxicity in <i>L. sceleratus</i> caught in European coastal waters."</p> <p>"Tetrodotoxin and/or possibly PSP toxins from the pufferfish <i>L. sceleratus</i> could be a new emerging risk in the European fisheries sector."</p>
(Klenow, et al., 2013)	Dietary exposure to selected perfluoroalkyl acids (PFAAs) in four European regions	PFAAs in fish and dietary exposure via food	Perfluoroalkyl acids (PFAAs)		Not indicated	Belgium, Czech Republic, Italy, Norway	Not indicated	<p>"Based on the presented dietary exposure estimates, considering LB and UB estimations as well as average and high consumption, there is no concern for adults or children based on the TDI given by EFSA for PFOS (150 ng kg⁻¹ BW day⁻¹) and PFOA (1500 ng kg⁻¹ BW day⁻¹)... Different food items are important for the various PFCA and PFSA homologues. Foods of plant origin (e.g. fruits and vegetables) are most important for the dietary exposure to PFHxA, PFOA and PFHxS, whereas the consumption of foods of animal origin (particularly fish and seafood) mostly contributes to the dietary exposure to PFDA and PFUnDA. For the dietary exposure to PFNA and PFOS, foods of animal and plant origin contribute with equal importance."</p>

(Lee, 2013)	Analysis and risk assessment of ethyl carbamate in various fermented foods	Ethyl carbamate in fermented fish from Korea	Ethyl carbamate (EC)	Table 2 of the article outlines the concentration of ethyl carbamate in jeotgal: N.D	Fermented fish products (jeotgal)	Seoul, Korea	Not indicated	EC was not detected in jeotgal
(Liao, Chen, & Kannan, 2013)	Occurrence of parabens in foodstuffs from China and its implications for human dietary exposure	Concentration of parabens in fish purchased from retail stores in nine cities in China from July to September 2012	Parabens	Table 1 of the article outlines the concentration of parabens in fish and seafood	Fish and seafood (freshwater and marine fish, shrimp, squid)	China	Not indicated	"Parabens were found in almost all (99%) food samples... Among paraben analogs, MeP, EtP, and PrP were predominant in foodstuffs, accounting for 59%, 24%, and 10%, respectively, of the total paraben concentrations. The estimated daily dietary intake of parabens (calculated from the mean concentration) was 1010 ng/kg bw/day for men and 1060 ng/kg bw/day for women in China. Further studies are needed to investigate the sources, pathways, and fate of parabens in the environment."
(W. F. Lin & Hwang, 2012)	Analysis of Poisoning Cases, Monitoring and Risk Warning for Marine Toxins (TTX, PSP and CTXs) in Taiwan	Marine toxins in marine fishes and seafood in Taiwan	Marine toxins (TTX, PSP, CTXs)	Table 1 – 3 outlines the poisoning cases in Taiwan (TTX, PSP, CTXs) Table 4 outlines common marine species with TTX, PSP and CTXs in Taiwan	Pufferfish,	Taiwan	Not indicated	"TTX poisoning cases in Taiwan were usually caused by puffer processed products such as dried dressed puffer fillet and puffer roe, followed by toxic puffer, gastropod and goby. PSP poisoning cases in Taiwan were usually caused by gastropod and shellfish contaminated from dinoflagellate <i>Alexandrium minutum</i> , and the main toxins were identified as saxitoxin, neo saxitoxin and gonyautoxin1-4. For CTXs poisoning cases, the causative species in Taiwan included snapper, moray eel and sardine, and the suspected toxins were implicated as ciguatoxin and palytoxin."

(Martí-Cid, Llobet, Castell, & Domingo, 2008)	Human Exposure to Polychlorinated Naphthalenes and Polychlorinated Diphenyl Ethers from Foods in Catalonia, Spain: Temporal Trend	PCN and PCDE concentration in fish species collected in 12 cities of Catalonia from March to June 2006	Polychlorinated Diphenyl Ethers (PCDEs), Polychlorinated naphthalenes (PCNs)	Table 1 and 2 of the article outline the PCN and PCDE concentration in fish samples	Sardine, tuna, anchovy, mackerel, swordfish, salmon, hake, red mullet, sole,	Catalonia, Spain	Not indicated	"The highest Σ PCNs corresponded to fish and seafood (47.1 ng/kg wet wt)... The highest Σ PCDEs corresponded also to fish and seafood (1094.7 ng/kg wet wt),"
(Mattei, et al., 2014)	Ciguatera fish poisoning: A first epidemic in Germany highlights an increasing risk for European countries	Ciguatera poisoning outbreak in Germany and risks in Europe	Ciguatera fish poisoning		Table 1 of the article outlines fish species that may contain CTXs	Germany	Not indicated	Report outlines ciguatera outbreaks in Germany between 2000 and 2013
(Witczak & Ciereszko, 2008)	Effect of Hot Smoking on the Content of Selected Polychlorinated Biphenyl Congeners in Herring (<i>Clupea harengus</i>) Slices	Effect of Hot Smoking on the Content of Selected Polychlorinated Biphenyl Congeners in Herring caught in the Norwegian Sea in September 2001	Polychlorinated Biphenyl Congeners	Table 1 of the article outlines the PCB concentration in raw herring slices before and after smoking	Herring (<i>Clupea harengus</i>)	Norwegian Sea	Heating	"Hot smoking of herring slices reduced the content of analyzed non-ortho- (PCB 77, PCB 126, and PCB 169) and mono-ortho- (PCB 114, PCB 156, and PCB 157) congeners in the final products... Hot smoking of herring slices contributed to a reduction of TEQ in the final product by 22.7% (converted into lipids 41.9%). The reduction was significantly higher than resulting from hot smoking of mackerel slices, when TEQs

								were reduced by 17.9% wet weight (converted into lipids 31.7%)."
(Guillier, et al., 2011)	A Risk-Based Sampling Plan for Monitoring of Histamine in Fish Products	Proposed new risk-monitoring plan of histamine exposure through fishery products	Histamine food poisoning		Table 1 of the article outlines a list of main fish species associated with histamine risk	France	Not indicated	Table 3 and 4 outlines a new risk-based monitoring plan for each fish category "Fresh fish with high histidine content was found to contribute most to the number of cases. The (estimated) risks associated with the consumption of canned and deep-frozen fish appear marginal as compared with the risk associated with fresh fish with high histidine concentrations. Accordingly, we recommend excluding canned and deep-frozen fish from the monitoring plan, although these risk estimates can be biased. Within a category, samples were proportional to the relative food consumption of the different fishes. The spatial and seasonal consumption patterns were also taken into account for the design of the new monitoring plan."
(Karami, et al., 2018)	Microplastic and mesoplastic contamination in canned sardines and sprats	Microplastic in canned fish manufactured in various countries and purchased from Australian and Malaysian markets	Microplastic, mesoplastic	Figure 1 and 2 of the article indicate the plastic particles detected in the fish samples	Canned sardines and sprats	Canada, Germany, Iran, Japan, Latvia, Malaysia, Morocco, Poland, Portugal, Russia, Scotland, Thailand, and Vietnam	Not indicated	"Plastic particles were absent in 16 brands while between 1 and 3 plastic particles per brand were found in the other 4 brands. The most abundant plastic polymers were polypropylene (PP) and polyethylene terephthalate (PET). The presence of micro- and mesoplastics in the canned sardines and sprats might be due to the translocation of these particles into the edible tissues, improper gutting, or the result of contamination from the canneries. The low prevalence of micro- and mesoplastics sized

								> 149 µm, and the absence of potentially hazardous inorganic elements on them, might indicate the limited health risks associated with their presence in canned sardines and sprats. Due to the possible increase in micro- and mesoplastic loads in seafood products over time, the findings of this study suggest their quantification to be included as one of the components of food safety management systems.”
(T. Domingo, et al., 2018)	Fukushima-derived radioactivity measurements in Pacific salmon and soil samples collected in British Columbia, Canada	Radioactivity in Pacific Salmon from British Columbia due to Fukushima Nuclear Accident collected in November 2013	Radionuclides (¹³⁴ Cs, ¹³⁷ Cs, ⁴⁰ K)	Table 1 of the article outlines the activity concentration for ⁴⁰ K, ¹³⁴ Cs and ¹³⁷ Cs in salmon	Pacific Salmon: sockeye (<i>Oncorhynchus nerka</i>), chum (<i>O. keta</i>), Chinook (<i>O. tshawytscha</i>)	British Columbia, Canada	Not indicated	<p>“Cesium-134 was not detected in the salmon samples. Cesium-137 was not detected in any of the sockeye or chum samples, although it was detected in all of the Chinook samples. The weighted average ($\pm 1\sigma$) ¹³⁷Cs activity concentration in the Chinook salmon collected in 2013 and 2014 was 0.23 (3) and 0.20 (3) Bq/kg fresh weight, respectively. A conservative annual dose estimate for an adult who consumes the average Canadian quantity of seafood per year, contaminated with radiocesium at the maximum concentrations measured in this campaign, was calculated to be 0.054 µSv per year.”</p> <p>“We conclude that despite there being greater activity concentrations of radiocesium in the soil and roof-debris samples than in the Pacific salmon samples, the measured activities are well below the Canadian action levels for radiocesium contamination in commercial food and beverages (1000 Bq/kg fw) and in public</p>

								drinking water (100 Bq/kg fw), ¹⁸ indicating little risk to no health risks for residents of BC."
(Winiarska-Mieczan & Grela, 2017)	Content of cadmium and lead in raw, fried and baked commercial frozen fishery products consumed in Poland	Effect of frying and baking on cadmium and lead content in frozen fishery products	Cadmium, Lead	<p>Table 3 and 4 indicate the content of cadmium and lead in raw and processed fishery products</p> <p>Table 5 compares the content of cadmium and lead in frozen and cooked fish products</p> <p>"The analysed frozen fishery products contained, on average, 14 µg Cd kg⁻¹ of the raw product (range < LOQ, 21.5 µg) and 18.5 µg Pb kg⁻¹ (range 8.2–29.1 µg) (Table 3). The values did not exceed the admissible standard limit, that is, 0.05 mg Cd kg⁻¹ for fish meat (0.1 mg for mackerel) and 0.3 mg Pb kg⁻¹ of meat."</p> <p>"Baked fish contained 56% more Cd (P = 0.003) and up to 72% more Pb (P < 0.001) compared to raw products (Table</p>	Table 1 of the article outlines the fishery products and fish species	Poland	Heating	"The content of Cd and Pb in the products did not exceed the acceptable standard. However, it cannot be clearly stated which method of culinary treatment of frozen fishery products is the best with regard to the level of Cd and Pb in the final products."

				5). Fried fish contained 16% more Cd (P = 0.023) and up to 15% more Pb (P = 0.035) than raw fish (Table 5). Compared to fried products, baked fish contained 34% more Cd (P = 0.011) and 49% more Pb (P = 0.001)."				
(Uekusa, et al., 2017)	Determination of polychlorinated biphenyls in marine fish obtained from tsunami-stricken areas of Japan	PCB content in fish species purchased from food markets in the tsunami-stricken area in Japan between 2012 and 2013	Polychlorinated biphenyls (PCB)	Figure 1 and Table 1 of the article outline the PCB concentration in the fish species "The Σ PCB concentration was 1.7–33 ng/g in fat greenling (<i>n</i> = 29), 0.44–25 ng/g in flounder (<i>n</i> = 36), and 1.6–86 ng/g in mackerel (<i>n</i> = 36)."	Fat greenling, flounder, mackerel	Tsunami-stricken areas (the Aomori, Iwate, Miyagi, and Chiba prefectures), Japan	Not indicated	"No sample was contaminated with PCB levels above the provisional regulatory limit in Japan or the regulatory limit in the EU. In the congener analysis, TeCBs, PeCBs, HxCBs and HpCBs dominated in all samples (comprising over 86% of the Σ PCB). In almost all samples, the proportion of chlorinated congeners was similar to the contamination patterns in previous reports, although slight compositional differences were observed in some samples. The average concentration proportion of the sum of six PCB indicators to the Σ NDL-PCB was 37%. Throughout the present investigation, there appeared to be no regional characteristic of the PCB contamination. Thus, any additional relationships between these compositional differences and the effects of tsunami-induced contamination are difficult to infer."
(Alves, et al., 2017)	Preliminary assessment on the bioaccessibility	Contaminants of emerging concern in	Contaminants of emerging	Table 3 of the article outlines the concentration of contaminants of	mackerel (<i>Scomber scombrus</i> ; Atlantic and	European market (see column fish species)	Not indicated	"Low PBDEs bioaccessibility in seafood... High PFCs and PPCPs bioaccessibility in seafood..."

	ity of contaminants of emerging concern in raw and cooked seafood	fish species available on the European market + effect of steaming on these contaminants; fish samples collected between April and 2014 and November 2015	concern (CEC): perfluorinated compounds (PFCs; i.e. PFOS and PFUnA), brominated flame retardants (BFRs; i.e. BDE47, BDE100, α -HBCD) and pharmaceuticals and personal care products (PPCPs; i.e. venlafaxine, methylparaben and UV-filter OC)	emerging concerns in raw and steamed fish samples Figure 1 outlines the effect of steaming on the bioaccessibility of contaminants of emerging concern	Adriatic Sea), mullet (<i>Liza aurata</i> ; Tagus estuary), flounder (<i>Platichthys flesus</i> ; Western Scheldt), plaice (<i>Pleuronectes platessa</i> ; North Sea), farmed seabream (<i>Sparus aurata</i> ; Greece), canned tuna (unknown species and origin)			The bioaccessibility of CEC decreased or unchanged after steaming... Low risks associated to cooked seafood consumption."
(Akhbarizadeh, Moore, & Keshavarzi, 2018)	Investigating a probable relationship between microplastics and potentially toxic elements in fish muscles from northeast of Persian Gulf	Microplastic and metal concentration in fish species purchased from local fishmongers at the Khark Island (Persian Gulf) in November 2015	Microplastics, metals (Hg, Zn, Cr, Mn, Fe, As)	Figure 1 of the report outlines the identified microplastics in different species Table 2 outlines the metal concentration in the fish species	Orange-spotted grouper (<i>Epinephelus coioides</i>), Pickhandle barracuda (<i>Sphyraena jello</i>), Bartail flathead (<i>Platycephalus indicus</i>)	Persian Gulf	Not indicated	"Microplastics were detected in all investigated fish muscle samples... Microplastics and Hg in all species and Pb in pelagic species increase with size... Benthic fish had higher amount of Microplastics in their muscles than pelagic species... Microplastics and metals relationship were significant in some species... Consumption of high doses of the studied fish may pose a health threat."

(Wüst, Rauscher-Gabernig, Steinwider, Bauer, & Paulsen, 2017)	Risk assessment of dietary exposure to tryptamine for the Austrian population	Tryptamine content in fish collected by the Food Safety Authority in Austria between 2010 and 2015	Tryptamine	<p>Table 3 of the article outlines the tryptamine concentration in fish and fish products from the Austrian market.</p> <p>"The highest tryptamine concentrations of 540.6, 397.9 and 307.6 mg kg⁻¹ were measured in samples of canned anchovy fillets... canned tuna contained tryptamine in concentrations of 11.3 and 29.0 mg kg... Tryptamine concentrations between 33.3 and 63.8 mg kg⁻¹ were also found in raw salmon fillet of salmon rolls."</p>	Fish and fish products are outlined in Table 3	Austria	Not indicated	"In our study, estimated ingested amounts of tryptamine were below the proposed dose without effect of 8 mg kg ⁻¹ bw day ⁻¹ , even in the worst-case scenario. Calculated tolerable maximum tryptamine levels in food were neither exceeded by samples analysed in the present study."
(S. Liu, Zhao, Lehmler, Cai, & Chen, 2017)	Antibiotic Pollution in Marine Food Webs in Laizhou Bay, North China: Trophodynamics and Human Exposure Implication	Antibiotic concentration in fish species from China collected from March 2014 to April 2015	Antibiotics	<p>Detection frequencies of 19 antibiotics are indicated in Table S5.</p> <p>Figure 1 outlines the abundance profiles of different antibiotic classes.</p> <p>"The total antibiotic concentrations in</p>	Benthic and Pelagic fish: Fish species are outlined in Table S2	Laizhou Bay, China	Not indicated	"Because of intensive local aquaculture activities, ambient wastewater discharge, and runoff from farming, large amounts of antibiotic residues have been discharged into the water bodies of Laizhou Bay, which increases the possibility of bioaccumulation and biomagnification of antibiotics in aquatic organisms. Our comprehensive investigation of the trophodynamics of antibiotics in a marine food web from this region

				<p>invertebrates (range = 57 to 1230 ng/g ww; 370 (270, 500) ng/g ww) were significantly higher ($p < 0.05$) than those in fish (98–610 ng/g ww; 240 (200, 300) ng/g ww). Benthic fish (i.e., flathead, eelgoby, javeline goby, fat greenling, and tongue sole; 170–610 ng/g ww, mean \pm SD = 360 \pm 130 ng/g ww) tended to accumulate more antibiotics ($p < 0.05$) than pelagic fish (i.e., halfbeak, dotted gizzard shad, silvery pomfret, Chinese sea perch and mullet; 98 –o 440 ng/g ww, 190 (150, 240) ng/g ww).”</p>				<p>demonstrates that several antibiotics undergo trophic transfer to top predators or low-trophic level invertebrates and accumulate in certain tissues, such as the liver and blood.(25) To reduce the potential exposure risks, more strict maximal residue limits (MRL) of antibiotics in seafood need to be set for Chinese residents.”</p> <p>“Although the calculated estimated daily intakes (EDI) for antibiotics suggest that consumption of seafood from Laizhou Bay is not associated with significant human health risks, this study provides important insights into the guidance of risk management of antibiotics.”</p>
(Juaniz, Zocco, Mouro, Cid, & Pena, 2016)	Effect of frying process on furan content in foods and assessment of furan exposure of Spanish population	Effect of frying on furan contents in fish fingers	Furan	<p>Figure 1 of the article outlines the Furan concentration in fish gingers before and after deep frying treatment with fresh and reheated olive oil.</p> <p>Table 3 outlines the food consumption and furan levels.</p>	Fish fingers	Spain	Not indicated	<p>“After frying the furan levels increased. Fish fingers fried with fresh oil had furan levels of 16 μg kg⁻¹. Using reheated oil had no significant differences in the furan levels. Fish fingers had the lowest furan levels among all tested products.”</p>

(FAO & WHO, 2010) ¹	JOINT FAO/WHO EXPERT CONSULTATION ON THE RISKS AND BENEFITS OF FISH CONSUMPTION - HEALTH RISKS ASSOCIATED WITH FISH CONSUMPTION FOCUS ON METHYLMERCURY, DIOXINS AND DIOXIN-LIKE PCBs	Contaminant levels in Herring from different regions	Dioxin and dioxin-like PCBs Mercury PCB		Herring	General, USA, Baltic Sea, Gulf of Finland, Gulf of Riga, Gulf of Bothnia, Germany, Poland, Russia	Not indicated	<p>Dioxin and dioxin-like PCBs are fat-soluble contaminants and accumulate in fatty fishes, such as herring.</p> <p>Wild herring from the Baltic Sea entailed higher levels of dioxin than their farmed counterparts, according to a EFSA report 2005</p> <p>Herring from the US market entailed a range mercury concentration from ND to 0.14mg/kg and a Mean concentration of 0.04 mg/kg, according to US FDA 2006</p> <p>Highest PCDD/F concentration in the Baltic Sea was measured inter alia in Herring (17.7 pg TEQ/g fw (41.6 pg/g fw of PCDD/Fs)). Also dioxin exceeded the EU's maximum limit. On average, the total TEQ from dioxin-like PCBs in Baltic herring is about 3.5 times that in herring that are not from the Baltic Sea. (according to a study from Isoaari et al. 2006)</p> <p>"Very low dioxin concentrations of 0.199 ng TEQ/kg ww were found in herring from fishing grounds around St. Kilda west of the British Isles, while contamination of herring from the central North Sea of comparable size and caught at the same time was substantially higher. The dioxins content of 0.842 ng/kg ww was comparable to the dioxins levels found in herring fillets from the Skagerrak and the Kattegatt. Concentrations of dioxins in herring</p>
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¹ <http://www.fao.org/docrep/meeting/024/k7107e.pdf>

							<p>caught at the coast of Mecklenburg and in the area of Rugen up to 1.841 ng/kg ww were found, but they remained under the current EU-limit of 4 ng TEQ/kg ww. The more the fishing grounds moved to the eastern Baltic area, the higher dioxin levels were found." (Karl and Ruoff, 2007)</p> <p>"herring from the Gulf of Finland there is a correlation between the PCDD/F content and the age of the fish. Baltic herring of age 4.5-5 years collected in 1999 from the Gulf of Finland contained two to four-fold higher concentrations than the same fish from the same region in 2002 and 2003... Another interesting finding is that about two-fold lower PCDD/F concentrations in 2004 and 2005 are measured for the younger (2 - 2,5 years) herring collected from the Gulf of Riga , compared to same species caught in 2002" (Pandelova et al., 2008)</p> <p>"The fat percentage of herring in the Gulf of Finland was significantly lower than in the Gulf of Bothnia, which accounted for higher dioxin concentrations in the latter area... Possible heavier exposure to some of PCDD/F and dl-PCBs in the Gulf of Bothnia and/or differences in feeding habits of large herring might explain their higher concentrations of dioxins in the fat. Herring feed mainly on zooplankton, but the older herring have a diet that also contains crustaceans and small fish. Total WHO-TEQ in old herring reached a value of 34 pg/g fw in the</p>
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							<p>Gulf of Finland, EC:RBFC/2010/3 44 and 50 pg/g fw in the Gulf of Bothnia." (Kiviranta et al., 2003)</p> <p>"Contents of PCDD/Fs of 184 pooled samples of 20 marine fish and fishery products (canned fish) from the German market. Dioxin concentrations in herring, based on wet weight (ww), ranged from 0.317 to 3.163 ng TEQ/kg ww, showing a clear dependency on the fishing area." (Karl et al., 2002)</p> <p>"From 1996 to 2002 the Polish national food monitoring programme examined more than 900 samples of Baltic fish and fish products for Hg... The lowest average content of MeHg was determined in sprat and herring." (Bykowski et al., 1997, 2002)</p> <p>"From 2006 according to Commission Recommendations 2004/705/EC and 2006/794/EC Poland monitors dioxins in Baltic fat fish species from the Polish EEZ . During four years of investigation the elevated concentrations - over EU limits - were observed in only one of 37 of herring EC:RBFC/2010/3 46 samples(range: 1.15- 3.96)."</p> <p>"There is a very limited data on dioxin contents of fish from Russia. Shelepchikov et al. (2008) examined a few samples of herring and sprat from the Russian EEZ near Kaliningrad. PCDD/Fs ranged between 2.94- 3.39 TEQ, % dl-PCBs to total WHO-TEQ was 54.8 to 74.8."</p>
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(FSAI, 2011) ²		Histamine found in many types of fish, e.g. herring	Histamine		Herring	Not indicated	Not indicated	General description
(FSAI, 2011) ³	Scientific Recommendations for a National Infant Feeding Policy, 2nd Edition	Methylmercury in Herring	Methylmercury	5.0 µg MeHg in 150g herring (EFSA, 2005)	Herring	Not indicated	Not indicated	
(FSAI, 2007) ⁴		Persistent organic pollutants in herring available on the Irish markets	PCDDs, PCDFs, PCBs		Fresh and canned herring	Ireland	Not indicated	Contaminants levels for these fishes available on the Irish markets were below limits established by the EU. Table 1 indicates mean upper-bound levels.
(Marine Institute, 2007) ⁵	Investigation into levels of dioxins, furans, polychlorinated biphenyls and brominated flame retardants in fishery	Contaminant levels in fresh herring and canned herring collected in the 2 nd half of 2004 in Ireland	PCDD/Fs, dioxin like PCBs, PBDEs and sum of 7 indicator PCBs		Fresh and tinned herring	Ireland	Not indicated	Table 4 and 6 of the report indicates the contamination level for fresh herring and tinned herring. "On the basis of these results, the FSAI considers that there is no need to amend existing advice on fish consumption, namely that consumers should consume two portions of fish per week, one of which should be oily (e.g. salmon, herring or mackerel)."

² <https://www.fsai.ie/Informationforcaterersonmicrobialtoxinsandmarinebiotoxins.html>

³ https://www.fsai.ie/resources_publications/national_infant_feeding_policy/

⁴ [https://www.fsai.ie/uploadedFiles/News_Centre/Newsletters/Newsletters_Listing/FINAL\(9\).pdf](https://www.fsai.ie/uploadedFiles/News_Centre/Newsletters/Newsletters_Listing/FINAL(9).pdf)

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<https://oar.marine.ie/bitstream/handle/10793/254/No%2026%20Marine%20Environment%20and%20Health%20Serie.pdf?sequence=1&isAllowed=y>

Trace elements, Persistent organic pollutants (PCB, dioxins, organochlorine pesticides, brominated flame retardants, polyfluorinated compounds, polychlorinated naphthalenes)		Herring	Ireland	Not indicated	<p>Figure 3.1 outlines the mercury concentration in Atlantic herring. Figure 4.1 outlines the PCB153 contamination in Atlantic Herring. Table 4.1 outlines the organochlorine contaminant levels in Herring. Figure 4.2 outlines the mean upper-bound TEQ PCDD/F and dl-PCB concentration. Table 4.3 outlines the concentration of brominated flame retardants in herring.</p> <p>“Concentrations of mercury, cadmium and lead consistently complied with the EC Maximum Limits for bivalve molluscs, finfish... In general POPs were detectable although concentrations were relatively low in Irish seafood. EC maximum levels for dioxins and dioxin-like PCBs, and other criteria such as the strictest standards for POPs in fisheries products for human consumption as applied in various European countries, were consistently met.”</p> <p>“Seafood consumption, including one to two portions of oily fish such as salmon, mackerel, herring per week, provides clear health benefits that outweigh the risk associated with intake of</p>

	Histamine/ Scombroid poisoning		Herring	Not indicated	Not indicat ed	General description: Herring can produce histamine when not chilled adequately
	Histamine/ Scombroid poisoning		Herring	Not indicated	Not indicat ed	"Scombroid fish contain high levels of an amino acid called histidine in their flesh. If the fish gets too warm after being caught (say, in the sun or in the car) the histidine begins to convert into histamine. If the levels of histamine get too high they cause the poisoning symptoms."
	Mercury		Herring	Not indicated	Not indicat ed	"Canned fish are not a higher risk for mercury than fresh fish. The mercury content of fish is not affected by processing techniques such as cooking, canning or freezing. The tuna and small fish species (such as sardines, pilchards and herring) sold in cans are short-lived species which accumulate only low amounts of mercury."
a	MCPD/ chloropropa nols	Free 3-MCPD: 28.19 µg/kg Bound 3-MCPD: 3.57 mg/kg fat Bound 3-MCPD: 0.28 mg/kg	Pickled Herring	Not indicated	Heat proces sing	

	G OF FOODS							
(FSAI, 2010) ¹¹	Investigation into levels of chlorinated and brominated organic pollutants in carcass fat, offal, eggs and milk produced in Ireland	Hexa-bromocyclo do-decane in herring in 2004	Hexa-bromocyclo do-decane (HBCD)		Herring	Not indicated	Not indicated	"Average levels for total HBCD observed in herring, salmon and mackerel samples are similar to those found in recent Latvian and UK surveys."
(FSAI, 2010) ¹²	Investigation into levels of polychlorinated naphthalenes (PCNs) in carcass fat, offal, fish, eggs, milk and processed products	Polychlorinated naphthalenes in Irish food (Herring)	Polychlorinated naphthalenes (PCNs)		Herring	Ireland	Not indicated	Median whole weight concentrations of 57 ng/kg for Baltic herring "The survey shows that Irish produce contains low amounts of the persistent bio-accumulative toxicants measured in this survey compared to other legacy POPs such as dioxins and PCBs, and levels observed do not raise concern for human health."
(Geus et al., n.d.) ¹³	Environmental occurrence, analysis and toxicology of toxaphene compounds	Reports of studies detecting Toxaphene in fish (herring)	Toxaphene		Herring	Canada, North Sea, Baltic Sea	Not indicated	Total toxaphene levels in biota: "Major contaminant in herring muscle from eastern Canadian waters with levels similar to PCB but generally higher than DDT."

¹¹ <https://www.fsai.ie/WorkArea/DownloadAsset.aspx?id=9456>

¹² <https://www.fsai.ie/WorkArea/DownloadAsset.aspx?id=10133>

¹³

<https://oar.marine.ie/bitstream/handle/10793/1200/de%20Geus%20et%20al.%20Environmental%20occurrence.pdf?sequence=1&isAllowed=y>

								<p>Total toxaphene residues in herring from the Baltic Sea.</p> <p>High residues of toxaphene in herring "from the North Sea and the relatively remote waters west and northwest of Ireland and Shetland Islands exceeded the German tolerance level."</p> <p>Study in fish from northern Europe detected highest toxaphene concentrations in herring oil from the Baltic Sea (7 µg g lipid).</p>
(Marine Institute, 2003) ¹⁴	THE OCCURRENCE AND RISK ASSESSMENT OF THE PESTICIDE TOXAPHENE IN FISH FROM IRISH WATERS	Toxaphene in Herring collected from Irish waters	Toxaphene (pesticide)	<p>Table 2 indicates the toxaphene levels in herring</p> <p>"Concentrations determined in herring from this study ranged 6.5-49 µg kg-1 lipid weight for the sum of the 3 selected CHB's."</p>	Herring	Ireland	Not indicated	<p>"A single sample of herring shows a concentration level that is slightly higher than expected for its species and would require further investigation with a larger sample set."</p> <p>"Limited concentration data for herring, halibut and mackerel from the North Sea and North Atlantic have shown that levels sometimes exceed the German ordinance level of 0.1 mg kg-1 wet weight for fish and fish products."</p>
(FSAI, 2009) ¹⁵	Mercury, Lead, Cadmium, Tin and Arsenic in Food	Mercury in tuna	Mercury		Tuna, canned tuna	Not indicated	Not indicated	<p>Generic description:</p> <p>"Larger, older, predatory species such as shark, marlin, swordfish and fresh tuna usually contain higher levels [of mercury] than other marine fish. Canned tuna on average has been found to contain half the amount of mercury of fresh tuna."</p>

¹⁴

<https://oar.marine.ie/bitstream/handle/10793/235/No%2012%20Marine%20Environment%20and%20Health%20Series.pdf?sequence=1&isAllowed=y>

¹⁵ <https://www.fsai.ie/WorkArea/DownloadAsset.aspx?id=8412>

								This is because different species and smaller more immature fish are used for canning."
(FSAI, 2011) ¹⁶	Information for Caterers on Microbial Toxins and Marine Biotoxins	Histamine in tuna	Histamine		Tuna	Not indicated	Not indicated	Generic description: "Histamine is a by-product of bacterial activity on histidine, a naturally occurring amino acid found in many types of fish, e.g. tuna."
(FSAI, 2016) ¹⁷	Report on a Total Diet Study carried out by the Food Safety Authority of Ireland in the period 2012 - 2014	Mercury in tuna	Mercury		Tuna	Ireland	Not indicated	"Exposure to mercury was found to be well below the EFSA PTWI of 1.6 µg/kg bw for both adults and children. For both adult and child populations, intake of white fish (52% and 59%, respectively) and canned fish (29% and 36%, respectively) were found to be the major contributors to dietary exposure. Fish, particularly predatory fish (such as shark, marlin, swordfish and fresh tuna), are recognised to be the major source of exposure to mercury in the diet, and since fish consumption in Ireland is below the EU average, Irish consumers are unlikely to be at risk from this source."
(Marine Institute, 2007) ¹⁸	Investigation into levels of dioxins, furans, polychlorinated biphenyls and	Contaminant levels in fresh tuna and canned tuna collected in the 2 nd half	PCDD/Fs, dioxin like PCBs, PBDE, HBCD and sum of 7 indicator PCBs		Fresh and canned tuna	Ireland	Not indicated	Table 4, 6 and 8 of the report indicates the contamination level for fresh tuna and canned tuna. "This study has demonstrated that levels of dioxins, furans, PCBs in Irish seafood are in general well below the relevant legislative limits

¹⁶ <https://www.fsai.ie/Informationforcaterersonmicrobialtoxinsandmarinebiotoxins.html>

¹⁷ https://www.fsai.ie/publications_TDS_2012-2014/

¹⁸

<https://oar.marine.ie/bitstream/handle/10793/254/No%2026%20Marine%20Environment%20and%20Health%20Serie.pdf?sequence=1&isAllowed=y>

	brominated flame retardants in fishery produce in Ireland	of 2004 in Ireland						for these contaminants. Levels of the indicator PCBs 28, 52, 101, 118, 138, 153, and 180 are similarly low, as are levels of those brominated flame retardants measured in the study.”
(Marine Institute, 2011) ¹⁹	Assuring Seafood Safety: Contaminants and Residues in Irish Seafood 2004-2008	Trace elements and persistent organic pollutants in tuna from Irish waters from the monitoring period 2004 - 2008	Mercury Persistent organic pollutants/POP: (PCB, organochlorine contaminants, brominated flame retardants)		Tuna and tinned tuna	Ireland	Not indicated	<p>Table 3.5 outlines the mercury concentration in tuna sampled at retail in 2008. All samples were below the EU maximum limit of 1.0 mg kg.</p> <p>Figure 4.1 outlines the PCB153 contamination in tuna</p> <p>Table 4.1 outlines the organochlorine contaminant levels in tuna</p> <p>Figure 4.2 outlines the mean upper-bound TEQ PCDD/F and dl-PCB concentration in tuna and tinned tuna.</p> <p>Table 4.3 outlines the concentration of brominated flame retardants in tuna and tinned tuna.</p> <p>Highest concentration of POPs are found in lipid-rich fish such as tuna.</p> <p>“FSAI have issued guidelines on consumption of certain top predatory fish species by breastfeeding women, women of childbearing age and young children. The guidance recommends these groups continue to eat fish, selecting from a wide range of species, but not to eat swordfish, marlin and shark, and to</p>

¹⁹ http://oar.marine.ie/bitstream/10793/706/1/Assuring_Seafood_Safety.pdf

								limit consumption of tuna to one fresh tuna steak or two 8oz cans per week."
(MPI, 2018) ²⁰		Mercury in fish	Mercury		Southern bluefin tuna	Not indicated	Not indicated	MPI advises pregnant woman to limit the consumption of southern bluefin tuna, as they contain higher levels of mercury
(MPI, 2018) ²¹		Histamine/Scombroid poisoning from tuna	Histamine/Scombroid poisoning		tuna	Not indicated	Not chilled adequately	General description: tuna can produce histamine when not chilled adequately
(FAO & WHO, 2016) ²²	DISCUSSION PAPER ON MAXIMUM LEVELS FOR METHYLMERCURY IN FISH	Dataset of Methylmercury content in tuna provided by EWG members	Methylmercury		Tuna-fresh and tuna-canned (Albacore tuna, yellowfin tuna, skipjack tuna, bigeye tuna)	Australia, Chile, China, France, Ghana, Ireland, Japan, Mexico, Norway, Poland, Spain, Seychelles, Thailand and FoodDrink Europe	Not indicated	Table 2 of the report outlines a summary of occurrence data total mercury in tuna (average, median, and maximum content).
(FAO & WHO, 2010) ²³	JOINT FAO/WHO EXPERT CONSULTATION ON THE RISKS AND BENEFITS OF FISH CONSUMPTION - HEALTH RISKS ASSOCIATE	Contaminant levels in tuna from different regions	Dioxin and dioxin-like PCBs Mercury PCB		Tuna (e.g. Albacore tuna, yellowfin tuna, skipjack tuna) Canned tuna	General, Fiji Islands, Japan, USA, France, Germany, Spain, Portugal, UK, Australia	Not indicated	Methylmercury bio-accumulates in higher amounts in larger predators, e.g. tuna. High consumption of especially albacore tuna may lead to an exceedance of the PTWI for MeHg. Mercury concentrations in tuna have been found to exceed 1 µg/g. Content related to age of the fish. 90 % of total mercury is presumably methylmercury.

²⁰ <https://www.mpi.govt.nz/food-safety/whats-in-our-food/chemicals-and-food/mercury-in-fish/>

²¹ <https://www.mpi.govt.nz/food-safety/food-safety-for-consumers/is-it-safe-to-eat/shellfish-and-scombroid-fish/>

²² http://www.fao.org/fao-who-codexalimentarius/sh-proxy/zh/?lnk=1&url=https%253A%252F%252Fworkspace.fao.org%252Fsites%252Fcodex%252FMeetings%252FCX-735-10%252FWD%252Fcf10_15e.pdf

²³ <http://www.fao.org/docrep/meeting/024/k7107e.pdf>

	<p>D WITH FISH CONSUMPTION FOCUS ON METHYLMERCURY, DIOXINS AND DIOXIN-LIKE PCBs</p>						<p>Table 3 indicates the range and mean total mercury concentration in different tuna species and canned tuna found in several literature.</p> <p>Tuna was contributing the most to the MeHg intake (19.2 %) in a study assessing the seafood consumption and MeHg levels in four French coastal regions (Sirot et al., 2008)</p> <p>Highest contents of mercury in fish was found to be inter alia in tuna in studies conducted in Germany (Schweinsberg, 2003).</p> <p>In studies conducted in Spain and Portugal, tuna was found to contain the highest levels of mercury in fish.</p> <p>A monitoring programme on PCDDs, PCDFs and dioxin-like PCBs concentrations in fish and shellfish species from 1995 to 2003 on Spanish markets found the lowest concentration of these contaminants to be inter alia in tuna. (Gomera et al., 2005)</p> <p>A UK survey data on MeHg content in domestic and imported fish species found tuna to contain higher levels of methylmercury than other commonly eaten fish species (fresh, 0.40 mg/kg; canned, 0.19 mg/kg). "Consumption of up to two 140-g portions/week of fresh tuna or four 140-g portions/week of canned tuna would not exceed the PTWI in women who were pregnant or likely to become pregnant in the next year."</p>
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							<p>Methylmercury content in fish reported in the US in a 2006 FDA database: "One of the most highly consumed commercial fish products, canned tuna in the aggregate contained on average 0.17 ppm. Albacore accounted for about one-third of canned tuna."</p> <p>Indonesia: yellow-fish tuna had very low TEQ levels for PCDD/Fs and dioxin-like PCBs.</p> <p>Mean concentration in wild Australian Southern Bluefin Tuna was 0.36 mg/kg (Padule et al., 2008)</p> <p>Appendix 1 of the report indicates the dioxins levels in seafood (including tuna) from different areas in the world.</p> <p>Appendix 2 of the report indicates the mercury levels in seafood (including tuna) from different areas of the world.</p>
(FAO, 2013) ²⁴	Technical guide to fish canning	Histamine and Heavy metals in tuna	Histamine, Heavy metals		Tuna	Not applicable	<p>Heavy metals via industries releasing pollutants into the atmosphere,</p> <p>General description:</p> <p>Histamine can occur post-mortem in tuna.</p> <p>Heavy metals may accumulate in tuna and subsequently in human bodies.</p>

²⁴ <http://www.fao.org/3/a-bb214e.pdf>

							and subsequently in rivers and seas	
(FSAI, 2017) ²⁵		Mercury in tuna	Mercury		Tuna	General	Not indicated	"The FSAI is advising pregnant and breastfeeding women, women of childbearing age and young children to limit their intake of predatory fish (shark, swordfish, tuna, etc)... and to limit consumption of tuna to one fresh tuna steak or two 8oz cans of tuna per week."
(Marine Institute, 2013) ²⁶	Investigation into Levels of Dioxins, Furans, Polychlorinated Biphenyls and Brominated Flame Retardants in Fishery Products in Ireland	Contaminant levels in fresh tuna and canned tuna collected as part of the targeted surveillance study in 2010 – 2011 by the FSAI collected from retail groupings	Dioxins, Furans, Polychlorinated Biphenyls, Brominated Flame Retardants		Tuna albacore	Ireland	Not indicated	<p>"Levels of PCDDs, PCDFs and PCBs in the non-oily marine species surveyed, and also in mussels and crustaceans, were much lower than those found in the four oily fish species surveyed (salmon, sea reared trout, mackerel and tuna)."</p> <p>"Comparison of the data from 2004 and 2010 also showed lower concentrations of PCDDs and PCDFs in albacore tuna than in 2004."</p> <p>Highest concentration of brominated flame retardants were observed inter alia in tuna (0.46 µg/kg).</p> <p>"α-HBCD was the predominant hexabromocyclododecane isomer detected, the β- and γ-isomers were generally below the LOQ or were only found in trace amounts. α-HBCD was detected above the LOQ in all samples of mackerel, farmed salmon, sea reared trout, tuna."</p>

²⁵ https://www.fsai.ie/faq/mercury_and_fish_consumption.html

²⁶ <https://oar.marine.ie/bitstream/handle/10793/875/Dioxins,%20Furans%20-%20FSAI%20&%20MI.pdf?sequence=1>

					Table 5, 8, 9, 10, 11, 12 of the report indicate the contaminant levels.
Mercury		Tuna	New Zealand	Not indicated	"The concentrations of mercury in fish in the 2009 NZTDS were consistent with international Literature. Most oceanic species have average mercury levels of about 0.15 mg/kg or less. However, large predatory species (shark, tuna, and lemon fish) usually have mercury levels in the 0.20-1.5 mg/kg range (FAO/UNEP/WHO, 1988)."
Mercury		Tuna Albacore (Thunnus alabunga) Tuna - Southern Bluefin	New Zealand	Not indicated	NZ commercial fish species and categorised mercury levels: Tuna Albacore known to be 0.5ppm/1.0 ppm mercury or below Southern Bluefin Tuna known to be greater than 1.0 ppm mercury
Heavy metals Chlorinated Hydrocarbons		Tuna (Thunnus species and Euthynnus species)	Ireland	Not indicated	"The highest concentrations of chlorinated hydrocarbons were detected in a tuna sample, as would be expected due to their lipid content, longevity and diet. The levels measured in this sample were within strictest standards available in OSPAR contracting countries." Table 1a of the report indicates mercury content of tuna.

	LANDED AT SELECTED IRISH PORTS, 2001							Table 1b indicates heavy metal and chlorinated hydrocarbon concentrations.
(FAO & WHO, 2012) ³⁰	Joint FAO/WHO Expert Meeting on the Public Health Risks of Histamine and Other Biogenic Amines from Fish and Fishery Products	Scombrotox in fish poisoning/ Histamine in Tuna	Scombrotox in fish poisoning (SFP)/ Histamine		Tuna (Table 2.3 outlines the market and scientific fish species)	Not indicated	Not indicated	Table 2.3 outlines the free Histidine levels and mean annual production levels for fish associated with SFP or high free histidine levels.
(FAO & WHO, 2006) ³¹	Food Safety risk analysis – A guide for national food safety authorities	High mercury levels in King mackerel	Mercury		King Mackerel	General	Not indicated	“In the United States, the FDA issued a national “advisory” on methylmercury and fish consumption in 2001, targeting women of childbearing age, telling them to avoid four species with high mercury levels, i.e. swordfish, tilefish, shark and king mackerel.”
(FAO & WHO, 2017)	FAO-WHO work on ciguatera and current challenges	Ciguatera in Spanish Mackerel	Ciguatera		Spanish mackerel (Scomberomorus maculatus)	Western Atlantic	Not indicated	Generic description: Spanish mackerel associated with ciguatera
(FAO & WHO, 2012) ³²	Joint FAO/WHO Expert Meeting on the Public Health Risks of	Scombrotox in fish poisoning/ Histamine in Mackerel	Scombrotox in fish poisoning (SFP)/ Histamine		Mackerel (Market names and scientific names are outlined in Table 2.3)	Not indicated	Not indicated	Table 2.3 outlines the free Histidine levels and mean annual production levels for fish associated with SFP or high free histidine levels.

³⁰ http://www.fao.org/fileadmin/user_upload/agns/news_events/Histamine_Final_Report.pdf

³¹ <http://www.fao.org/docs/up/easypol/489/food-safety-risk-analysis.pdf>

³² http://www.fao.org/fileadmin/user_upload/agns/news_events/Histamine_Final_Report.pdf

	Histamine and Other Biogenic Amines from Fish and Fishery Products							
(FAO & WHO, 2010) ³³	JOINT FAO/WHO EXPERT CONSULTATION ON THE RISKS AND BENEFITS OF FISH CONSUMPTION - HEALTH RISKS ASSOCIATED WITH FISH CONSUMPTION FOCUS ON METHYLMERCURY, DIOXINS AND DIOXIN-LIKE PCBs	Contaminant levels in Mackerel from different regions	Dioxin and dioxin-like PCBs Mercury PCB		Mackerel (e.g. Atlantic, chub, King, Spanish, shad)	General, USA, Italy, Slovakia, Spain, Portugal, China, Japan	Not indicated	<p>Large predatory fish, such as king mackerel, contain the highest mercury content, as mercury biomagnifies in the aquatic food web.</p> <p>Table 3 indicates the range and mean total mercury concentration in mackerel in the USA markets.</p> <p>PCBs concentration in fish from two sites of the Italian coast were highest in mackerel, according to a study by Mineiro et al., 2005</p> <p>In Slovakia, "the maximum TEQ concentrations [Dioxin] in fish specimens analysed were measured in imported smoked mackerel samples."</p> <p>Mackerel shad, commonly consumed in Spain and Portugal contained a mercury level of 0.033 µg/g, which was below the EU maximum level (Cabanero et al, 2005).</p> <p>Highest concentration for PCDD/Fs in fish from Spain and Portugal were found in red mullet, followed by mackerel (Comara et al, 2005).</p> <p>High levels of PCB were found in mackerel (2.5 ng/g ww.) collected in</p>

³³ <http://www.fao.org/docrep/meeting/024/k7107e.pdf>

								North East China (Zhao et al., 2005). Mackerel and Japanese horse mackerel from Tokyo Bay in Japan had the highest TEQ levels for dioxin (0.397-3.841 pg/g ww and 0.128-1.916 pg/g ww, respectively) (Nalto et al., 2003). Appendix 1 and 2 indicates the dioxins and mercury levels in mackerel from different areas of the world.
(FAO, 2003) ³⁴	CODE OF PRACTICE FOR FISH AND FISHERY PRODUCTS	Toxins in Mackerel	Ciguatera toxin, Scombrototoxin in (Histamine poisoning)		Mackerel	Not indicated	Not indicated	Generic description: Mackerel may accumulate ciguatera toxin Mackerel is a susceptible fish to scombrototoxin
(FAO & WHO, 2017) ³⁵	DISCUSSION PAPER ON MAXIMUM LEVELS FOR METHYLMERCURY IN FISH	Data on mercury levels in mackerel and Jack mackerel taken from GEMS/Food database	Mercury		Mackerel and Jack mackerel	Worldwide	Not indicated	Table 11 to 14 indicated the total mercury and methylmercury level in mackerel and Jack mackerel samples "Spanish or King mackerel has an average of over 0.3 mg/kg... Kingfish or Amberjack just meets the criterion of 0.3 mg/kg. There are no other species with averages above 0.3 mg/kg, indicating that based on these data, there would be no need for an ML for other species mackerel or Jack mackerel."
(FAO, 2012) ³⁶	Manual of Good	Toxins in Mackerel	Ciguatera toxin,		Mackerel	Not applicable	Scombrototoxin	General description:

³⁴ http://www.fao.org/input/download/standards/10273/CXP_052e.pdf

³⁵ http://www.fao.org/fao-who-codexalimentarius/sh-proxy/en/?lnk=1&url=https%253A%252F%252Fworkspace.fao.org%252Fsites%252Fcodex%252FMeetings%252FCX-735-11%252FWD%252Fcf11_12e.pdf

³⁶ <http://www.fao.org/3/a-ar502e.pdf>

	Hygiene Practice for Fishing Boats and Fish Landing Sites in Small Scale Fisheries		Scombrotoxin in (Histamine poisoning)				n builds up if fish is not kept cool.	Scrombotoxin may occur in mackerel. Mackerel may contain ciguatera toxin, which leads to ciguatera poisoning. Toxin originates in toxic algae found in tropic waters.
(FSAI, 2017) ³⁷³⁸ 39		Recall of Mackerel Fillets from Lidl, Tesco and Aldi due to Elevated Histamine	Histamine		Mackerel fillets	Ireland and unkown	Not indicated	
(FSAI, 2010) ⁴⁰	Investigation into levels of perfluoroalkylated substances (PFAs) in meat, offal, fish, eggs, milk and processed products	PFAs in mackerel	Perfluoro-Alkylated substances (PFAs)		Mackerel	Ireland	Not indicated	Table 2 indicates the concentration of PFAs in mackerel. "Overall, the survey shows that Irish produce contains low amounts of the persistent bio-accumulative toxicants measured in this survey, however levels observed do not raise concern for human health."
(FSAI, 2011) ⁴¹	Information for Caterers on Microbial Toxins and	Histamine formation in mackerel	Histamine		Mackerel	Not applicable	"Histamine formation is directly linked	Generic description: Toxic amounts of Histamine can be found in mackerel.

³⁷ https://www.fsai.ie/news_centre/food_alerts/lidl_inismara_mackerel.html

³⁸ https://www.fsai.ie/news_centre/food_alerts/recall_tesco_mackerel.html

³⁹ https://www.fsai.ie/news_centre/food_alerts/aldi_skellig_bay_mackerel.html

⁴⁰ <https://www.fsai.ie/WorkArea/DownloadAsset.aspx?id=10134>

⁴¹ <https://www.fsai.ie/Informationforcaterersonmicrobialtoxinsandmarinebiotoxins.html>

	Marine Biotoxins						to mishandling and incorrect temperature storage.”	
(FSAI, 2010) ⁴²	Investigation into levels of polychlorinated naphthalenes (PCNs) in carcass fat, offal, fish, eggs, milk and processed products	PCNs in mackerel collected from retail in Ireland	PCNs	median whole weight concentrations: 6.5 ng/kg for mackerel	Mackerel	Ireland	Not indicated	Table 2 indicates the levels of PCNs in mackerel.
(FSAI, 2011) ⁴³	Scientific Recommendations for a National Infant Feeding Policy, 2nd Edition	Methylmercury in mackerel	Methylmercury	6.5 µg in 150g Mackerel (EFSA, 2005)	Mackerel	Not indicated	Not indicated	
(FSAI, 2007) ⁴⁴	FSAI news	Contaminants in Mackerel sampled in 2007 from	PCDD/Fs and PCBs		Fresh and canned Mackerel	Ireland	Not indicated	Figure 1 indicates the mean upper bound WHO TEQ PCDD/F and dl-PCB ng/kg whole weight for fresh and canned mackerel

⁴² <https://www.fsai.ie/WorkArea/DownloadAsset.aspx?id=10133>

⁴³ https://www.fsai.ie/resources_publications/national_infant_feeding_policy/

⁴⁴ [https://www.fsai.ie/uploadedFiles/News_Centre/Newsletters/Newsletters_Listing/FINAL\(9\).pdf](https://www.fsai.ie/uploadedFiles/News_Centre/Newsletters/Newsletters_Listing/FINAL(9).pdf)

		the Irish market						“The results showed that levels of PCDDs, PCDFs and PCBs in Irish fish and fishery products available on the Irish market were well below existing EC legal limits for these contaminants.”
(Marine Institute, 2011) ⁴⁵	Assuring Seafood Safety: Contaminants and Residues in Irish Seafood 2004-2008	Trace elements and persistent organic pollutants in mackerel from Irish waters from the monitoring period 2004 - 2008	Trace elements, Mercury, Persistent organic pollutants (PCB, dioxins, organochlorine pesticides, brominated flame retardants, polyfluorinated compounds, polychlorinated naphthalenes)		Mackerel (atlantic), tinned mackerel	Ireland	Not indicated	<p>Figure 3.1 outlines the mercury concentration in Atlantic mackerel.</p> <p>Table 3.2 outlines the maximum and upperboard mean values for mercury, cadmium and lead in Atlantic Mackerel.</p> <p>Table 3.3 outlines the maximum and upperbound mean values for arsenic, chromium, copper, nickel, silver and zinc in Atlantic Mackerel.</p> <p>Figure 4.1 outlines the PCB153 contamination in Atlantic Mackerel.</p> <p>Table 4.1 outlines the organochlorine contaminant levels in Atlantic Mackerel.</p> <p>Figure 4.2 outlines the mean upperbound TEQ PCDD/F and dl-PCB concentration in Mackerel and tinned mackerel.</p> <p>Table 4.3 outlines the concentration of brominated flame retardants in mackerel and tinned mackerel.</p> <p>Table 4.4 outlines summary data for PCNs in mackerel.</p> <p>“Highest concentrations of POPs are found in lipid-rich fish such as mackerel.”</p>

⁴⁵ http://oar.marine.ie/bitstream/10793/706/1/Assuring_Seafood_Safety.pdf

								<p>“Current advice from the FSAI is that consumers should eat two portions of fish a week, one of which should be oily (e.g. mackerel, herring and salmon). Data presented in this report supports the FSAI recommendation on fish consumption.”</p> <p>“Seafood consumption, including one to two portions of oily fish such as salmon, mackerel, herring per week, provides clear health benefits that outweigh the risk associated with intake of contaminants.”</p>
(Marine Institute, 2007) ⁴⁶	Investigation into levels of dioxins, furans, polychlorinated biphenyls and brominated flame retardants in fishery produce in Ireland	Contaminant levels in fresh and canned mackerel collected in the 2 nd half of 2004 in Ireland	PCDD/Fs, dioxin like PCBs, PBDEs and sum of 7 indicator PCBs		Fresh and tinned mackerel (Scomber scombrus)	Ireland	Not indicated	<p>Table 4 and 6 of the report indicates the contamination level for fresh tinned mackerel.</p> <p>“This study has demonstrated that levels of dioxins, furans, PCBs in Irish seafood are in general well below the relevant legislative limits for these contaminants. Levels of the indicator PCBs 28, 52, 101, 118, 138, 153, and 180 are similarly low, as are levels of those brominated flame retardants measured in the study.”</p> <p>“On the basis of these results, the FSAI considers that there is no need to amend existing advice on fish consumption, namely that consumers should consume two portions of fish per week, one of</p>

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<https://oar.marine.ie/bitstream/handle/10793/254/No%2026%20Marine%20Environment%20and%20Health%20Serie.pdf?sequence=1&isAllowed=y>

								which should be oily (e.g. salmon, herring or mackerel)."
(MPI, 2018) ⁴⁷		Scombroid poisoning from Mackerel	Scombroid poisoning/Histamine		Mackerel	Not applicable	Mackerel which is not chilled adequately	General Description: Mackerel may produce histamine that can be toxic to humans.
(MPI, 2013) ⁴⁸	Marae Food Safety Guide	Histamine/Scombroid poisoning from mackerel	Histamine/Scombroid poisoning		Mackerel	Not indicated	Not indicated	"Scombroid fish contain high levels of an amino acid called histidine in their flesh. If the fish gets too warm after being caught (say, in the sun or in the car) the histidine begins to convert into histamine. If the levels of histamine get too high they cause the poisoning symptoms."
(FAO, 2013) ⁴⁹	Technical guide to fish canning	Histamine, Mercury and Heavy metals in Mackerel	Histamine, Mercury, Heavy metals		Mackerel	Not indicated	"Industrial processes, such as coal burning power plants, release pollutants such as mercury into the atmosphere and hence	General description "Mercury and other heavy metals may accumulate over lengthy periods in certain species of fish, including tuna and mackerel."

⁴⁷ <https://www.mpi.govt.nz/food-safety/food-safety-for-consumers/is-it-safe-to-eat/shellfish-and-scombroid-fish/>

⁴⁸ <https://www.mpi.govt.nz/dmsdocument/1053-te-kai-manawa-ora-marae-food-safety-guide>

⁴⁹ <http://www.fao.org/3/a-bb214e.pdf>

							into rivers and finally to the sea.”	
(FAO & WHO, 2007) ⁵⁰	DISCUSSION PAPER ON CHLOROPROPANOLS DERIVED FROM THE MANUFACTURE OF ACID-HVP AND THE HEAT PROCESSING OF FOODS	Chloropropans in smoked mackerel	MCPD/ chloropropans	Free 3-MCPD: 18.62 µg/kg Bound 3-MCPD: <3.30 mg/kg fat Bound 3-MCPD: <0.53 mg/kg	Smoked mackerel	Not indicated	Heat processing	
(Marine Institute, 1991) ⁵¹		Heavy metals in mackerel sampled from landings at Killybegs between 1982 and 1983	Cd, Cu, Hg, Pb, Zn		Mackerel	Killybegs, Ireland	Not indicated	Table 3 and 4 indicates the heavy metal concentration
(MPI, 2017) ⁵²	Mercury Certification Guide	Mercury in mackerel	Mercury		Mackerel – Jack (<i>Trachurus novaezelandiae</i> , <i>Trachurus declivis</i>)	New Zealand	Not indicated	NZ commercial fish species and categorised mercury levels: <i>Scomber australasicus</i> , <i>Trachurus novaezelandiae</i> , <i>Trachurus declivis</i> and

⁵⁰ http://www.fao.org/tempref/codex/Meetings/CCCF/CCCF1/cf01_13e.pdf

⁵¹

<https://oar.marine.ie/bitstream/handle/10793/179/No%2010%201991%20Chemical%20contaminants%20in%20Irish%20estuarine%20and%20costal%20waters.pdf?sequence=1&isAllowed=y>

⁵² <https://www.mpi.govt.nz/dmsdocument/203-mercury-certification-guide>

					<i>Trachurus murphyi</i> Mackerel – Blue (<i>Scomber australasicus</i>)			<i>Trachurus murphyi</i> known to be 0.5ppm/ 1 ppm mercury or below
(MPI, 2009) ⁵³	RISK MANAGEMENT PROGRAMME TEMPLATE FOR INSHORE VESSELS - FISH FILLETING	Histamine in Mackerel	Histamine		Scombroid species (e.g. Jack Mackerel)	Not indicated	Not indicated	
(FSAI, 2010) ⁵⁴	Investigation into levels of chlorinated and brominated organic pollutants in carcass fat, offal, eggs and milk produced in Ireland	Hexa-bromocyclo-decane in mackerel in 2004	Hexa-bromocyclo-decane (HBCD)		Mackerel	Not indicated	Not indicated	“Average levels for total HBCD observed in herring, salmon and mackerel samples are similar to those found in recent Latvian and UK surveys.”
(Marine Institute, 2013) ⁵⁵	Investigation into Levels of Dioxins, Furans, Polychlorinated Biphenyls and Brominated	Contaminant levels in mackerel collected as part of the targeted surveillance study in 2010 – 2011 by the	Dioxins, Furans, Polychlorinated Biphenyls, Brominated Flame Retardants		Mackerel (<i>Scomber scombrus</i>)	Ireland	Not indicated	“Levels of PCDDs, PCDFs and PCBs in the non-oily marine species surveyed, and also in mussels and crustaceans, were much lower than those found in the four oily fish species surveyed (salmon, sea reared trout, mackerel and tuna).”

⁵³ <https://www.mpi.govt.nz/dmsdocument/974-inshore-vessels-fish-filleting-rmp>

⁵⁴ <https://www.fsai.ie/WorkArea/DownloadAsset.aspx?id=9456>

⁵⁵ <https://oar.marine.ie/bitstream/handle/10793/875/Dioxins,%20Furans%20-%20FSAI%20&%20MI.pdf?sequence=1>

					<p>Highest concentration of brominated flame retardants were observed inter alia in mackerel (1.02 µg/kg).</p> <p>"α-HBCD was the predominant hexabromocyclododecane isomer detected, the β- and γ-isomers were generally below the LOQ or were only found in trace amounts. α-HBCD was detected above the LOQ in all samples of mackerel, farmed salmon, sea reared trout, tuna."</p> <p>Levels of POP contaminants were higher in oily fish (e.g. mackerel) compared to non-oily fish.</p> <p>"FSAI recommends that consumers should eat at least two portions of fish per week, including at least one serving of oily fish, e.g. salmon, trout, herring or mackerel."</p> <p>Table 5, 7, 8, 9, 10, 11, 12 of the report indicate the contaminant levels.</p>
Toxaphene (pesticide)	"Toxaphene levels in mackerel in this study range 5.5-36 µg kg ⁻¹ lipid weight..."	Mackerel	Ireland	Not indicated	<p>Table 2 indicates the toxaphene levels in mackerel</p> <p>"Limited concentration data for herring, halibut and mackerel from the North Sea and North Atlantic have shown that levels sometimes exceed the German ordinance level of 0.1 mg kg⁻¹ wet weight for fish and fish products."</p>

(MPI, 2007) ⁵⁷	RISK PROFILE: CIGUATOXINS IN SEAFOOD	Ciguatoxin levels in Spanish mackerel from Queensland coastal waters in 1992	Ciguatoxins, Histamine	Ciguatoxin: The respective amounts found were 0.19 (CTX-1), 0.09 and (CTX-2) 0.02 µg/kg (CTX-3) in the flesh of narrow-barred Spanish mackerel	Spanish mackerel (Scomberomorus commersoni)	Queensland coast, Australia	Not indicated	Generic description: Mackerel is a Histamine susceptible fish species
(FAO & WHO, 2010) ⁵⁸	JOINT FAO/WHO EXPERT CONSULTATION ON THE RISKS AND BENEFITS OF FISH CONSUMPTION - HEALTH RISKS ASSOCIATED WITH FISH CONSUMPTION FOCUS ON METHYLMERCURY, DIOXINS AND DIOXIN-LIKE PCBs	Contaminant levels in cod from different regions	Dioxin and dioxin-like PCBs Mercury PCB		Atlantic Cod (Gadus morhua)	USA, France, Norway, Poland, Russia, Canada	Not indicated	Table 3 indicates the range and mean total mercury concentration in cod from the US markets. France: MeHg levels in fish from french coastal areas. Predator fish (e.g. cod) contributed the most to the MeHg intake (cod: 7.18 %) Norway: Levels of PCDD/Fs determined in marine organism. "In edible fillets, or muscle of molluscs, TEQ for PCDD/Fs ranged between 0.85 (cod) and 28.0 ng/kg ww (flounder). The highest value was found in cod liver (587 ng TEQ/kg ww)." Poland: Highest levels of MeHg found in predators, e.g. cod in a national food monitoring programme 1996 -2002 Russia: Lowest mean concentration of PCB in fish from the White Sea were found in cod muscle (16 ng/g ww) Appendix 1 of the report indicates the dioxins levels in seafood

⁵⁷ <https://www.mpi.govt.nz/dmsdocument/26141-risk-profile-ciguatoxins-in-seafood>

⁵⁸ <http://www.fao.org/docrep/meeting/024/k7107e.pdf>

								(including tuna) from different areas in the world. Appendix 2 of the report indicates the mercury levels in seafood (including tuna) from different areas of the world.
(FAO & WHO, 2017) ⁵⁹	JOINT FAO/WHO FOOD STANDARDS PROGRAMME CODEX COMMITTEE ON CONTAMINANTS IN FOODS - DISCUSSION PAPER ON MAXIMUM LEVELS FOR METHYLMERCURY IN FISH	Mercury in cod – results from a preliminary analysis of the sum of mercury and methylmercury in fish species in the GEMS/Food database	Mercury	4345 samples, average concentration 0.08 mg/kg, maximum 1.00 mg/kg	Cod	Not indicated	Not indicated	Further analysis for Cod recommended to determine whether an ML should be developed.
(FSAI, 2002) ⁶⁰	Dioxins, Furans and PCBs in Farmed and Wild Salmon, Farmed Trout and Fish Oil Capsules	Contaminants in cod liver oil produced in Ireland	PCDD/Fs, dioxin-like PCBs		Cod liver oil	Ireland	Not indicated	Table 8 outlines the concentration of PCDD/Fs and dioxin-like PCBs in cod liver oil from different brands/manufacturers/ distributors "Examination of market share data provided by the industry has shown that in Ireland only 10% of the market for cod liver oil capsules is supplied by brands that had dioxin levels in excess of the legislative limit. Therefore, the vast majority of

⁵⁹ http://www.fao.org/fao-who-codexalimentarius/sh-proxy/en/?lnk=1&url=https%253A%252F%252Fworkspace.fao.org%252Fsites%252Fcodex%252FMeetings%252FCX-735-11%252FWD%252Fcf11_12e.pdf

⁶⁰ https://www.fsai.ie/monitoring_and_enforcement/monitoring/surveillance/dioxins_furans_pcb.html

								the Irish consumers of these products are only being exposed to very low levels of dioxin from this source."
(FSAI, 2005) ⁶¹	Investigation into levels of dioxins, furans, PCBs and PBDEs in food supplements, offal and milk (2005)	PCDD/Fs in food supplements (cod liver oil) of different brands provided by industry or purchased at retail outlets	PCDD/Fs, dl-PCBs		Cod liver oil (food supplement)	Ireland	Not indicated	Highest PCDD/Fs concentration found in pure cod liver oil, but still in compliance with legislation. "As reported in Table 4 the highest level of Total TEQ was observed in food supplements. The two highest concentrations were found in cod liver oil, at 10.15 ng/kg fat weight and 8.87 ng/kg fat respectively."
(FSAI, 2001) ⁶²	Investigation on PCDDs/PCDFs and several PCBs in Fish liver oil capsules	PCDD/Fs concentration in cod oil liver capsules	PCDD/Fs, PCBs		Cod liver oil capsules	Not indicated	Not indicated	Chapter 6.1 outlines the concentration levels of PCDD/Fs for different samples of cod liver oil capsules Page 11 – 41 of the report outline detailed information about methods and results for PCB and PCDD/Fs in the different cod liver oil samples
(Marine, 2011) ⁶³	Assuring Seafood Safety: Contaminants and Residues in Irish Seafood 2004-2008	Trace elements and persistent organic pollutants in cod from Irish waters from the monitoring period 2004 - 2008	Trace elements, Persistent organic pollutants (PCB, dioxins, organochlorine pesticides, brominated flame retardants, polyfluorina		Atlantic Cod (Gadus morhua)	Ireland	Not indicated	Figure 3.1 outlines the mercury concentration in Atlantic cod. Table 3.2 outlines the maximum and upperbound mean values for mercury, cadmium and lead in Atlantic cod. Table 3.3 outlines the maximum and upperbound mean values for arsenic, chromium, copper, nickel, silver and zin in Atlantic cod.

⁶¹ https://www.fsai.ie/uploadedFiles/Dioxins_milk_survey_2005.pdf

⁶² https://www.fsai.ie/uploadedFiles/Monitoring_and_Enforcement/Monitoring/Surveillance/Fishoilreport.pdf

⁶³ http://oar.marine.ie/bitstream/10793/706/1/Assuring_Seafood_Safety.pdf

			<p>ted compounds, polychlorina ted naphtalenes)</p>				<p>Table 3.5 outlines the total mercury concentration in cod sampled at retail 2008.</p> <p>Figure 4.1 outlines the PCB153 contamination and other POP concentrations in Atlantic Cod.</p> <p>Table 4.1 outlines the organochlorine contaminant levels in Atlantic cod.</p> <p>Table B2.1 outlines the concentration of trace elements in Atlantic Cod landed and sampled at Irish ports.</p> <p>Table B2.2 outlines the concentration of organochlorine substances in Atlantic Cod landed and sampled at Irish ports.</p> <p>“Concentrations of mercury, cadmium and lead consistently complied with the EC Maximum Limits for bivalve molluscs, finfish... In general POPs were detectable although concentrations were relatively low in Irish seafood. EC maximum levels for dioxins and dioxin-like PCBs, and other criteria such as the strictest standards for POPs in fisheries products for human consumption as applied in various European countries, were consistently met.”</p> <p>“Seafood consumption, including one to two portions of oily fish such as salmon, mackerel, herring per week, provides clear health</p>
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					benefits that outweigh the risk associated with intake of contaminants."
Cd, Cu, Hg, Pb, Zn		Cod	Ireland	Not indicated	<p>Table 3 and 4 indicates the heavy metal concentration and Table 7 outlines the PCBs and organochlorine pesticides concentration in cod.</p> <p>Levels of mercury, cadmium, lead, copper and zinc complies with strict standards guidevalues by OSPARCOM countries.</p> <p>PCB levels in cod were very low. Organochlorine pesticides were not detected in cod or in negligible quantities.</p>
Dioxins, Furans, Polychlorinated Biphenyls, Brominated Flame Retardants		Cod (Gadus morhua)	Ireland	Not indicated	<p>Table 5, 8, 9 ,11, 12 of the report indicate the contaminant levels.</p> <p>"The levels of contaminants were somewhat higher in the oily fish examined in this survey, namely farmed salmon, sea reared trout, mackerel and tuna, compared with the extensive range of nonoily fish such as cod, hake, lemon sole and whiting also investigated."</p>

Toxaphene (pesticide)		Arctic Cod (<i>Boreogadus saida</i>) Atlantic cod (<i>Gadus morhua</i>) Antarctic cod (<i>Dissostichus eleginoides</i>)	Eastern Arctic locations, Eastern Canadian waters, Northern Europe		<p>Total toxaphene levels in biota:</p> <p>"Toxaphene was also the major organochlorine residue in Canadian Arctic marine invertebrates and fish. Arctic cod (<i>Boreogadus saida</i>) in three eastern Arctic locations had concentrations five- to ten-fold higher than for DDT or PCB."</p> <p>"Levels of CHBs in Arctic cod liver were about two-fold lower than those of Atlantic cod (<i>Gadus morhua</i>)."</p> <p>"Toxaphene was found to be a major contaminant in Atlantic cod liver ... from eastern Canadian waters with levels similar (lipid wt basis) to PCB but generally higher than DDT."</p> <p>Toxaphene found in Antarctic cod (liver) from South Georgia. Northern Europe: "Toxaphene in cod liver showed an upward trend from southern to northern North Sea, increasing from 0.4 to 1 µg g⁻¹ lipid. This was somewhat unexpected since the northern North Sea usually is considered less polluted than southern North Sea."</p>
Mercury		Cod Blue (<i>Parapercis colias</i>) Cod Red (<i>Pseudophycis bachus</i>)	New Zealand	Not indicat ed	<p>NZ commercial fish species and categorised mercury levels:</p> <p>Cod Blue and Cod Red know to be 0.5ppm/ 1.0 ppm mercury or below</p>

(FAO & WHO, 2010) ⁶⁸	JOINT FAO/WHO EXPERT CONSULTATION ON THE RISKS AND BENEFITS OF FISH CONSUMPTION - HEALTH RISKS ASSOCIATED WITH FISH CONSUMPTION FOCUS ON METHYLMERCURY, DIOXINS AND DIOXIN-LIKE PCBs	Mercury levels in Pollock from USA markets	Mercury	Range Hg concentration (mg/kg): ND - 0.78 Mean Hg + SD (mg/kg): 0.04 + 0.10	Pollock (<i>Pollachius virens</i>)	USA	Not indicated	
(Marine, 2011) ⁶⁹	Assuring Seafood Safety: Contaminants and Residues in Irish Seafood 2004-2008	Trace elements and persistent organic pollutants in Pollock from Irish waters from the monitoring period 2004 - 2008	Trace elements, Persistent organic pollutants (PCB, dioxins, organochlorine pesticides, brominated flame retardants, polyfluorinated compounds,		Pollock (<i>Pollachius virens</i>) Black Pollock (<i>Pollachius pollachius</i>)	Ireland	Not indicated	Table 3.2 outlines the maximum and upperbound mean values for mercury, cadmium and lead in Pollock Table 3.3 outlines the maximum and upperbound mean values for arsenic, chromium, copper, nickel, silver and zinc in Pollock Table 4.1 outlines the concentration of organochlorine contaminants in Pollock

⁶⁸ <https://pdfs.semanticscholar.org/bac6/fb073d830c5cb0e04fcfbf220523541423d9.pdf>

⁶⁹ http://oar.marine.ie/bitstream/10793/706/1/Assuring_Seafood_Safety.pdf

			polychlorinated naphthalenes)					Table 4.3 outlines the concentration of brominated flame retardants in Pollock Table B2.1 outlines the metal concentration in Pollock and Black Pollock Table B2.2 outlines the concentration of organochlorine substances in Black Pollock
(Marine Institute, 2005) ⁷⁰	Trace Metal Concentrations in Various Fish Species Landed at Selected Irish Ports, 2003	Mercury concentration in Black Pollock and Pollock collected from Irish Ports 2003	Mercury	Black Pollack: 0.05 mg kg-1 wet weight Pollack: 0.06 mg kg-1 wet weight	Pollock (<i>Pollachius virens</i>) Black Pollock (<i>Pollachius pollachius</i>)	Irish fishing ports, Ireland	Not indicated	
(Marine Institute, 2003) ⁷¹	TRACE METAL AND CHLORINATED HYDROCARBON CONCENTRATIONS IN VARIOUS FISH SPECIES LANDED AT SELECTED IRISH PORTS, 2001	Mercury concentration in Pollock collected in 2001 from Irish ports	Mercury	0.09 mg kg-1 wet weight	Pollock (<i>Pollachius Pollachius</i>)	Irish fishing ports, Ireland	Not indicated	

⁷⁰

<https://oar.marine.ie/bitstream/handle/10793/229/No%202020Marine%20Environment%20and%20Health%20Series.pdf?sequence=1>

⁷¹

<https://oar.marine.ie/bitstream/handle/10793/237/No%2013%20Marine%20Environment%20and%20Health%20Series.pdf?sequence=1>

Referenties

- Aarnisalo, K., Sheen, S., Raaska, L., & Tamplin, M. (2007). Modelling transfer of *Listeria monocytogenes* during slicing of 'gravad'salmon. *International Journal of Food Microbiology*, *118*(1), 69-78.
- Ababneh, F. A., & Al-Momani, I. F. (2013). Levels of mercury, cadmium, lead and other selected elements in canned tuna fish commercialised in Jordan. *International Journal of Environmental Analytical Chemistry*, *93*(7), 755-766.
- Abal, P., Louzao, M. C., Antelo, A., Alvarez, M., Cagide, E., Vilariño, N., Vieytes, M. R., & Botana, L. M. (2017). Acute oral toxicity of tetrodotoxin in mice: Determination of Lethal Dose 50 (LD50) and no observed adverse effect level (NOAEL). *Toxins*, *9*(3).
- Abal, P., Louzao, M. C., Cifuentes, J. M., Vilariño, N., Rodriguez, I., Alfonso, A., Vieytes, M. R., & Botana, L. M. (2017). Characterization of the dinophysistoxin-2 acute oral toxicity in mice to define the Toxicity Equivalency Factor. *Food and Chemical Toxicology*, *102*, 166-175.
- Aballay-Gonzalez, A., Ulloa, V., Rivera, A., Hernandez, V., Silva, M., Caprile, T., Delgado-Rivera, L., & Astuya, A. (2016). Matrix effects on a cell-based assay used for the detection of paralytic shellfish toxins in bivalve shellfish samples. *Food Additives & Contaminants: Part A - Chemistry, Analysis, Control, Exposure & Risk Assessment*, *33*(5), 869-875.
- Abballe, A., Ballard, T. J., Dellatte, E., Domenico, A., Ferri, F., Fulgenzi, A. R., Grisanti, G., Iacovella, N., Ingelido, A. M., Malisch, R., Miniero, R., Porpora, M. G., Risica, S., Ziemacki, G., & Felip, E. D. (2008). Persistent environmental contaminants in human milk: Concentrations and time trends in Italy. *Chemosphere*, *73*(1), S220-S227.
- Abdallah, M. A. M. (2013). Bioaccumulation of heavy metals in mollusca species and assessment of potential risks to human health. *Bulletin of Environmental Contamination and Toxicology*, *90*(5), 552-557.
- Abdou, N. S., & Palm, H. W. (2008). New record of two genera of Trypanorhynch cestodes infecting Red Sea fishes in Egypt. *Journal of the Egyptian Society of Parasitology*, *38*(1), 281-292.
- Abebe, L. S., Chen, X., & Sobsey, M. D. (2016). Chitosan Coagulation to Improve Microbial and Turbidity Removal by Ceramic Water Filtration for Household Drinking Water Treatment. *International Journal of Environmental Research and Public Health*, *13*(3), 1.
- Abidli, S., Lahbib, Y., González, P. R., Alonso, J. I. G., & Trigui El Menif, N. (2016). Butyltin compounds in sediment and biota from the lagoon of Bizerte (northern Tunisia): Potential risk for consumers? *Human and Ecological Risk Assessment*, *22*(2), 337-349.
- Abidli, S., Toumi, H., Lahbib, Y., & Trigui El Menif, N. (2017). The First Evaluation of Microplastics in Sediments from the Complex Lagoon-Channel of Bizerte (Northern Tunisia). *Water, Air and Soil Pollution*, *228*(7), 1-10.
- Abraham, A., & Rambla-Alegre, M. (2017). Marine Toxins Analysis for Consumer Protection. In *Comprehensive Analytical Chemistry* (Vol. 78, pp. 343-378).
- Adams, D. H., Sonne, C., Basu, N., Dietz, R., Nam, D. H., Leifsson, P. S., & Jensen, A. L. (2010). Mercury contamination in spotted seatrout, *Cynoscion nebulosus*: An assessment of liver, kidney, blood, and nervous system health. *Science of the Total Environment*, *408*(23), 5808-5816.
- Adamse, P., Van der Fels-Klerx, H. J., Schoss, S., de Jong, J., & Hoogenboom, R. L. A. P. (2015). Concentrations of dioxins and dioxin-like PCBs in feed materials in the Netherlands, 2001-11. *Food Additives and Contaminants - Part A Chemistry, Analysis, Control, Exposure and Risk Assessment*, *32*(8), 1301-1311.
- Adamski, M., Chrapusta, E., Bober, B., Kamiński, A., & Białczyk, J. (2014). Cylindrospermopsin: cyanobacterial secondary metabolite. Biological aspects and potential risk for human health and life. *Oceanological and Hydrobiological Studies*, *43*(4), 442-449.
- Adebayo-Tayo, B. C., Okonko, I. O., Esen, C. U., Odu, N. N., Onoh, C. C., & Igwiloh, N. J. P. (2011). Incidence of potentially pathogenic *Vibrio* spp. in fresh seafood from Itu creek in Uyo, Akwa Ibom State, Nigeria. *World Applied Sciences Journal*, *15*(7), 985-991.
- Adel, M., Mohammadmoradi, K., & Ley-Quinonez, C. P. (2017). Trace element concentrations in muscle tissue of milk shark, (*Rhizoprionodon acutus*) from the Persian Gulf. *Environmental Science and Pollution Research*, *24*(6), 5933-5937.
- Adeleye, A. O., Jin, H., Di, Y., Li, D., Chen, J., & Ye, Y. (2016). Distribution and ecological risk of organic pollutants in the sediments and seafood of Yangtze Estuary and Hangzhou Bay, East China Sea. *Science of the Total Environment*, *541*, 1540-1548.
- Ademollo, N., Ferrara, F., Delise, M., Fabietti, F., & Funari, E. (2008). Nonylphenol and octylphenol in human breast milk. *Environment International*, *34*(7), 984-987.
- Adenugba, A. A., Headley, J., McMartin, D., & Beck, A. J. (2008). Comparison of levels of polychlorinated biphenyls in edible oils and oil-based products - Possible link to environmental factors. *Journal of Environmental Science and Health - Part B Pesticides, Food Contaminants, and Agricultural Wastes*, *43*(5), 422-428.
- Adenugba, A. A., McMartin, D. W., & Beck, A. J. (2008). In vitro approaches to assess bioavailability and human gastrointestinal mobilization of food-borne polychlorinated biphenyls (PCBs). *Journal of Environmental Science and Health, Part B: Pesticides, Food Contaminants and Agricultural Wastes*, *43*(5), 410-421.
- Afonso, C., Cardoso, C., Lourenço, H. M., Anacleto, P., Bandarra, N. M., Carvalho, M. L., Castro, M., & Nunes, M. L. (2013). Evaluation of hazards and benefits associated with the consumption of six fish species from the Portuguese coast. *Journal of Food Composition and Analysis*, *32*(1), 59-67.
- Afonso, C., Costa, S., Cardoso, C., Oliveira, R., Lourenço, H. M., Viula, A., Batista, I., Coelho, I., & Nunes, M. L. (2015). Benefits and risks associated with consumption of raw, cooked, and canned tuna (*Thunnus*

- spp.) based on the bioaccessibility of selenium and methylmercury. *Environmental Research*, *143*, 130-137.
- Afonso, C., Lourenço, H. M., Cardoso, C., Bandarra, N. M., Carvalho, M. L., Castro, M., & Nunes, M. L. (2013). From fish chemical characterisation to the benefit-risk assessment - Part A. *Food Chemistry*, *137*(1-4), 99-107.
- Afonso, C., Lourenço, H. M., Dias, A., Nunes, M. L., & Castro, M. (2007). Contaminant metals in black scabbard fish (*Aphanopus carbo*) caught off Madeira and the Azores. *Food Chemistry*, *101*(1), 120-125.
- Agusa, T., Kunito, T., Sudaryanto, A., Monirith, I., Kan-Atireklap, S., Iwata, H., Ismail, A., Sanguansin, J., Muchtar, M., Tana, T. S., & Tanabe, S. (2007). Exposure assessment for trace elements from consumption of marine fish in Southeast Asia. *Environmental Pollution*, *145*(3), 766-777.
- Airaksinen, R., Rantakokko, P., Turunen, A. W., Vartiainen, T., Vuorinen, P. J., Lappalainen, A., Vihervuori, A., Mannio, J., & Hallikainen, A. (2010). Organotin intake through fish consumption in Finland. *Environmental Research*, *110*(6), 544-547.
- Akhbarizadeh, R., Moore, F., & Keshavarzi, B. (2018). Investigating a probable relationship between microplastics and potentially toxic elements in fish muscles from northeast of Persian Gulf. *Environmental Pollution*, *232*, 154-163.
- Akpambang, V. O. E., Purcaro, G., Lajide, L., Amoo, I. A., Conte, L. S., & Moret, S. (2009). Determination of polycyclic aromatic hydrocarbons (PAHs) in commonly consumed Nigerian smoked/grilled fish and meat. *Food Additives and Contaminants - Part A Chemistry, Analysis, Control, Exposure and Risk Assessment*, *26*(7), 1096-1103.
- Al-Busaidi, M., Yesudhasan, P., Al-Mughairi, S., Al-Rahbi, W. A. K., Al-Harthy, K. S., Al-Mazrooei, N. A., & Al-Habsi, S. H. (2011). Toxic metals in commercial marine fish in Oman with reference to national and international standards. *Chemosphere*, *85*(1), 67-73.
- Al-Sarawi, H. A., Jha, A. N., Al-Sarawi, M. A., & Lyons, B. P. (2015). Historic and contemporary contamination in the marine environment of Kuwait: An overview. *Marine Pollution Bulletin*, *100*(2), 621-628.
- Alam, L., & Mohamed, C. A. R. (2011). Natural radionuclide of Po210 in the edible seafood affected by coal-fired power plant industry in Kapar coastal area of Malaysia. *Environmental Health: A Global Access Science Source*, *10*(1).
- Aligizaki, K., Katikou, P., Milandri, A., & Diogene, J. (2011). Occurrence of palytoxin-group toxins in seafood and future strategies to complement the present state of the art. *Toxicon*, *57*(3), 390-399.
- Alina, M., Azrina, A., Mohd Yunus, A. S., Mohd Zakiuddin, S., Mohd Izuan Effendi, H., & Muhammad Rizal, R. (2012). Heavy metals (mercury, arsenic, cadmium, plumbum) in selected marine fish and shellfish along the straits of malacca. *International Food Research Journal*, *19*(1), 135-140.
- Alves, R. N., Maulvault, A. L., Barbosa, V. L., Cunha, S., Kwadijk, C. J. A. F., Álvarez-Muñoz, D., Rodríguez-Mozaz, S., Aznar-Alemany, Ò., Eljarrat, E., Barceló, D., Fernandez-Tejedor, M., Tedioli, A., & Marques, A. (2017). Preliminary assessment on the bioaccessibility of contaminants of emerging concern in raw and cooked seafood. *Food and Chemical Toxicology*, *104*, 69-78.
- Araújo, C. V. M., & Cedeño-Macias, L. A. (2016). Heavy metals in yellowfin tuna (*Thunnus albacares*) and common dolphinfish (*Coryphaena hippurus*) landed on the Ecuadorian coast. *Science of the Total Environment*, *541*, 149-154.
- Aznar-Alemany, Ò., Trabalón, L., Jacobs, S., Barbosa, V. L., Tejedor, M. F., Granby, K., Kwadijk, C., Cunha, S. C., Ferrari, F., Vandermeersch, G., Sioen, I., Verbeke, W., Vilavert, L., Domingo, J. L., Eljarrat, E., & Barceló, D. (2017). Occurrence of halogenated flame retardants in commercial seafood species available in European markets. *Food and Chemical Toxicology*, *104*, 35-47.
- Baeyens, W., Leermakers, M., Elskens, M., Larebeke, N., Bont, R., Vanderperren, H., Fontaine, A., Degroodt, J. M., Goeyens, L., Hanot, V., & Windal, I. (2007). PCBs and PCDD/FS in Fish and Fish Products and Their Impact on the Human Body Burden in Belgium. *Archives of Environmental Contamination and Toxicology*, *52*(4), 563-571.
- Barone, G., Giacomini-Stuffler, R., Garofalo, R., Castiglia, D., & Storelli, M. M. (2014). PCBs and PCDD/PCDFs in fishery products: Occurrence, congener profile and compliance with European Union legislation. *Food and Chemical Toxicology*, *74*, 200-205.
- Barone, G., Storelli, A., Garofalo, R., Busco, V. P., Quaglia, N. C., Centrone, G., & Storelli, M. M. (2015). Assessment of mercury and cadmium via seafood consumption in Italy: estimated dietary intake (EWI) and target hazard quotient (THQ). *Food Additives & Contaminants: Part A - Chemistry, Analysis, Control, Exposure & Risk Assessment*, *32*(8), 1277-1286.
- Bellés, M., Linares, V., Perelló, G., & Domingo, J. L. (2013). Human Dietary Exposure to Uranium in Catalonia, Spain. *Biological Trace Element Research*, *152*(1), 1-8.
- Blanco, S. L., González, J. C., & Vieites, J. M. (2008). Mercury, cadmium and lead levels in samples of the main traded fish and shellfish species in Galicia, Spain. *Food Additives and Contaminants: Part B Surveillance*, *1*(1), 15-21.
- Bulushi, I. A., Poole, S., Deeth, H. C., & Dykes, G. A. (2009). Biogenic Amines in Fish: Roles in Intoxication, Spoilage, and Nitrosamine Formation--A Review. *Critical Reviews in Food Science and Nutrition*, *49*(4), 369-377.
- Burger, J. (2009). Risk to consumers from mercury in bluefish (*Pomatomus saltatrix*) from New Jersey: Size, season and geographical effects. *Environmental Research*, *109*(7), 803-811.
- Burger, J., & Gochfeld, M. (2007). Risk to consumers from mercury in Pacific cod (*Gadus macrocephalus*) from the Aleutians: Fish age and size effects. *Environmental Research*, *105*(2), 276-284.
- Burger, J., Gochfeld, M., Shukla, T., Jeitner, C., Burke, S., Donio, M., Shukla, S., Snigaroff, R., Snigaroff, D., Stamm, T., & Volz, C. (2007). Heavy metals in Pacific cod (*Gadus macrocephalus*) from the Aleutians: Location, age, size, and risk. *Journal of Toxicology and Environmental Health - Part A: Current Issues*, *70*(22), 1897-1911.

- Carlsson, P., Herzke, D., & Kallenborn, R. (2014). Polychlorinated biphenyls (PCBs), polybrominated diphenyl ethers (PBDEs) and perfluorinated alkylated substances (PFASs) in traditional seafood items from western Greenland. *Environmental Science and Pollution Research*, 21(6), 4741-4750.
- Carvalho, C. M. L., Matos, A. I. N. M., Mateus, M. L., Santos, A. P. M., & Batoréu, M. C. C. (2008). High-fish consumption and risk prevention: Assessment of exposure to methylmercury in Portugal. *Journal of Toxicology and Environmental Health - Part A: Current Issues*, 71(18), 1279-1288.
- Chahid, A., Hilali, M., Benlhachimi, A., & Bouzid, T. (2014). Contents of cadmium, mercury and lead in fish from the Atlantic sea (Morocco) determined by atomic absorption spectrometry. *Food Chemistry*, 147, 357-360.
- Choi, M., Moon, H. B., & Choi, H. G. (2012). Intake and potential health risk of butyltin compounds from seafood consumption in Korea. *Archives of Environmental Contamination and Toxicology*, 62(2), 333-340.
- Cimenci, O., Vandevijvere, S., Gosciny, S., Van Den Bergh, M. A., Hanot, V., Vinkx, C., Bolle, F., & Van Loco, J. (2013). Dietary exposure of the Belgian adult population to non-dioxin-like PCBs. *Food and Chemical Toxicology*, 59, 670-679.
- Cirillo, T., Fasano, E., Viscardi, V., Arnese, A., & Amodio-Cocchieri, R. (2010). Survey of lead, cadmium, mercury and arsenic in seafood purchased in Campania, Italy. *Food Additives and Contaminants: Part B Surveillance*, 3(1), 30-38.
- Cladis, D. P., Kleiner, A. C., & Santerre, C. R. (2014). Mercury Content in Commercially Available Finfish in the United States. *Journal of Food Protection*, 77(8), 1361.
- Clarke, D. B., Bailey, V. A., Routledge, A., Lloyd, A. S., Hird, S., Mortimer, D. N., & Gem, M. (2010). Dietary intake estimate for perfluorooctanesulphonic acid (PFOS) and other perfluorocompounds (PFCs) in UK retail foods following determination using standard addition LC-MS/MS. *Food Additives and Contaminants - Part A Chemistry, Analysis, Control, Exposure and Risk Assessment*, 27(4), 530-545.
- Cohen, N. J., Deeds, J. R., Wong, E. S., Hanner, R. H., Yancy, H. F., White, K. D., Thompson, T. M., Wahl, M., Pham, T. D., Guichard, F. M., Huh, I., Austin, C., Dizikes, G., & Gerber, S. I. (2009). Public Health Response to Puffer Fish (Tetrodotoxin) Poisoning from Mislabeled Product. *Journal of Food Protection*, 72(4), 810.
- Copat, C., Arena, G., Fiore, M., Ledda, C., Fallico, R., Sciacca, S., & Ferrante, M. (2013). Heavy metals concentrations in fish and shellfish from eastern Mediterranean Sea: Consumption advisories. *Food and Chemical Toxicology*, 53, 33-37.
- Copat, C., Vinceti, M., D'Agati, M. G., Arena, G., Mauceri, V., Grasso, A., Fallico, R., Sciacca, S., & Ferrante, M. (2014). Mercury and selenium intake by seafood from the Ionian Sea: A risk evaluation. *Ecotoxicology and Environmental Safety*, 100(1), 87-92.
- Costa, F. D. N., Korn, M. G. A., Brito, G. B., Ferlin, S., & Fostier, A. H. (2016). Preliminary results of mercury levels in raw and cooked seafood and their public health impact. *Food Chemistry*, 192, 837-841.
- Covaci, A., Voorspoels, S., Vetter, W., Gelbin, A., Jorens, P. G., Blust, R., & Neels, H. (2007). Anthropogenic and Naturally Occurring Organobrominated Compounds in Fish Oil Dietary Supplements. *Environmental Science & Technology*, 41(15), 5237-5244.
- Cruz, R., Cunha, S. C., & Casal, S. (2015). Brominated flame retardants and seafood safety: A review. *Environment International*, 77, 116-131.
- Cunha, S. C., Fernandes, J. O., Vallecillos, L., Cano-Sancho, G., Domingo, J. L., Pocurull, E., Borrull, F., Maulvault, A. L., Ferrari, F., Fernandez-Tejedor, M., Van den Heuvel, F., & Kotterman, M. (2015). Co-occurrence of musk fragrances and UV-filters in seafood and macroalgae collected in European hotspots. *Environmental Research*, 143, 65-71.
- Damiano, S., Papetti, P., & Menesatti, P. (2011). Accumulation of heavy metals to assess the health status of swordfish in a comparative analysis of Mediterranean and Atlantic areas. *Marine Pollution Bulletin*, 62(8), 1920-1925.
- Davodi, M., Esmaili-Sari, A., & Bahramifarr, N. (2011). Concentration of polychlorinated biphenyls and organochlorine pesticides in some edible fish species from the Shadegan Marshes (Iran). *Ecotoxicology and Environmental Safety*, 74(3), 294-300.
- Deblois, C. P., Aranda-Rodriguez, R., Giani, A., & Bird, D. F. (2008). Microcystin accumulation in liver and muscle of tilapia in two large Brazilian hydroelectric reservoirs. *Toxicon*, 51(3), 435-448.
- Della Torre, C., Petoichi, T., Corsi, I., Dinardo, M. M., Baroni, D., Alcaro, L., Focardi, S., Tursi, A., Marino, G., Frigeri, A., & Amato, E. (2010). DNA damage, severe organ lesions and high muscle levels of As and Hg in two benthic fish species from a chemical warfare agent dumping site in the Mediterranean Sea. *Science of the Total Environment*, 408(9), 2136-2145.
- Desideri, D., Meli, M. A., & Roselli, C. (2011). Natural radionuclides in seafood from the central Adriatic Sea (Italy). *Health Physics*, 100(2), 160-166.
- Dewailly, E., Ayotte, P., Lucas, M., & Blanchet, C. (2007). Risk and benefits from consuming salmon and trout: A Canadian perspective. *Food and Chemical Toxicology*, 45(8), 1343-1348.
- Dewailly, É., Rouja, P., Dallaire, R., Pereg, D., Tucker, T., Ward, J., Weber, J. P., Maguire, J. S., & Julien, P. (2008). Balancing the risks and the benefits of local fish consumption in Bermuda. *Food Additives and Contaminants - Part A Chemistry, Analysis, Control, Exposure and Risk Assessment*, 25(11), 1328-1338.
- Di Bella, G., Potorti, A. G., Lo Turco, V., Bua, D., Licata, P., Cicero, N., & Dugo, G. (2015). Trace elements in Thunnus thynnus from Mediterranean Sea and benefit-risk assessment for consumers. *Food Additives and Contaminants: Part B Surveillance*, 8(3), 175-181.
- Dickey, R. W., & Plakas, S. M. (2010). Ciguatera: A public health perspective. *Toxicon*, 56(2), 123-136.
- Domingo, J. L., & Bocio, A. (2007). Levels of PCDD/PCDFs and PCBs in edible marine species and human intake: A literature review. *Environment International*, 33(3), 397-405.

- Domingo, J. L., Bocio, A., Falcó, G., & Llobet, J. M. (2007). Benefits and risks of fish consumption. Part I. A quantitative analysis of the intake of omega-3 fatty acids and chemical contaminants. *Toxicology*, 230(2-3), 219-226.
- Domingo, J. L., Ericson-Jogsten, I., Perelló, G., Nadal, M., Van Bavel, B., & Kärrman, A. (2012). Human exposure to perfluorinated compounds in Catalonia, Spain: Contribution of drinking water and fish and shellfish. *Journal of Agricultural and Food Chemistry*, 60(17), 4408-4415.
- Domingo, J. L., & Nadal, M. (2017). Per- and polyfluoroalkyl substances (PFASs) in food and human dietary intake: A review of the recent scientific literature. *Journal of Agricultural and Food Chemistry*, 65(3), 533-543.
- Domingo, T., Starosta, K., Chester, A., Williams, J., Lehnert, S. J., Gantner, N., & Alava, J. J. (2018). Fukushima-derived radioactivity measurements in Pacific salmon and soil samples collected in British Columbia, Canada. *Canadian Journal of Chemistry*, 96(2), 124-131.
- Duedahl-Olesen, L., Christensen, J. H., Hoejgard, A., Granby, K., & Timm-Heinrich, M. (2010). Influence of smoking parameters on the concentration of polycyclic aromatic hydrocarbons (PAHs) in Danish smoked fish. *Food Additives & Contaminants: Part A - Chemistry, Analysis, Control, Exposure & Risk Assessment*, 27(9), 1294-1305.
- Ersoy, B., & Çelik, M. (2010). The essential and toxic elements in tissues of six commercial demersal fish from Eastern Mediterranean Sea. *Food and Chemical Toxicology*, 48(5), 1377-1382.
- Essumang, D. K., Dodoo, D. K., & Adjei, J. K. (2012). Polycyclic aromatic hydrocarbon (PAH) contamination in smoke-cured fish products. *Journal of Food Composition and Analysis*, 27(2), 128-138.
- Essumang, D. K., Dodoo, D. K., & Adjei, J. K. (2013). Effect of smoke generation sources and smoke curing duration on the levels of polycyclic aromatic hydrocarbon (PAH) in different suites of fish. *Food and Chemical Toxicology*, 58, 86-94.
- Falcó, G., Llobet, J. M., Bocio, A., & Domingo, J. L. (2008). Exposure to hexachlorobenzene through fish and seafood consumption in Catalonia, Spain. *Science of the Total Environment*, 389(2-3), 289-295.
- Fattore, E., Fanelli, R., Dellatte, E., Turrini, A., & Domenico, A. d. (2008). Assessment of the dietary exposure to non-dioxin-like PCBs of the Italian general population. *Chemosphere*, 73(1 SUPPL.), S278-S283.
- Fattore, M., Russo, G., Barbato, F., Grumetto, L., & Albrizio, S. (2015). Monitoring of bisphenols in canned tuna from Italian markets. *Food and Chemical Toxicology*, 83, 68-75.
- Feng, C., Teuber, S., & Gershwin, M. (2016). Histamine (Scombroid) Fish Poisoning: a Comprehensive Review. *Clinical Reviews in Allergy & Immunology*, 50(1), 64-69.
- Fernandes, A. R., Tlustos, C., Rose, M., Smith, F., Carr, M., & Panton, S. (2011). Polychlorinated naphthalenes (PCNs) in Irish foods: Occurrence and human dietary exposure. *Chemosphere*, 85(3), 322-328.
- Ferrantelli, V., Giangrosso, G., Cicero, A., Naccari, C., Macaluso, A., Galvano, F., D'Orazio, N., Arcadipane, G. E., & Naccari, F. (2012). Evaluation of mercury levels in Pangasius and Cod filets traded in Sicily (Italy). *Food Additives & Contaminants: Part A - Chemistry, Analysis, Control, Exposure & Risk Assessment*, 29(7), 1046-1051.
- Ferrara, F., Ademollo, N., Delise, M., Fabietti, F., & Funari, E. (2008). Alkylphenols and their ethoxylates in seafood from the Tyrrhenian Sea. *Chemosphere*, 72(9), 1279-1285.
- Forsberg, N. D., Stone, D., Harding, A., Harper, B., Harris, S., Matzke, M. M., Cardenas, A., Waters, K. M., & Anderson, K. A. (2012). Effect of native American fish smoking methods on dietary exposure to polycyclic aromatic hydrocarbons and possible risks to human health. *Journal of Agricultural and Food Chemistry*, 60(27), 6899-6906.
- Fromme, H., Tittlemier, S. A., Volkel, W., Wilhelm, M., & Twardella, D. (2009). Review: Perfluorinated compounds - Exposure assessment for the general population in western countries. *International Journal of Hygiene and Environmental Health*, 212(3), 239-270.
- Gerstenberger, S. L., Martinson, A., & Kramer, J. L. (2010). An evaluation of mercury concentrations in three brands of canned tuna. *Environmental Toxicology and Chemistry*, 29(2), 237-242.
- Groth Iii, E. (2010). Ranking the contributions of commercial fish and shellfish varieties to mercury exposure in the United States: Implications for risk communication. *Environmental Research*, 110(3), 226-236.
- Grzunov Letinić, J., Matek Sarić, M., Piasek, M., Jurasović, J., Varnai, V. M., Sulimanec Grgec, A., & Orct, T. (2016). Use of human milk in the assessment of toxic metal exposure and essential element status in breastfeeding women and their infants in coastal Croatia. *Journal of Trace Elements in Medicine and Biology*, 38, 117-125.
- Gu, H., Hao, L., Duan, N., Wu, S., Xia, Y., Ma, X., & Wang, Z. (2017). A competitive fluorescent aptasensor for okadaic acid detection assisted by rolling circle amplification. *Microchimica Acta*, 184(8), 2893-2899.
- Gu, Y., Yu, J., Hu, X., & Yin, D. (2016). Characteristics of the alkylphenol and bisphenol A distributions in marine organisms and implications for human health: A case study of the East China Sea. *Science of the Total Environment*, 539, 460-469.
- Gu, Y. G., Lin, Q., Wang, X. H., Du, F. Y., Yu, Z. L., & Huang, H. H. (2015). Heavy metal concentrations in wild fishes captured from the South China Sea and associated health risks. *Marine Pollution Bulletin*, 96(1-2), 508-512.
- Gu, Y. G., Lin, Q., Yu, Z. L., Wang, X. N., Ke, C. L., & Ning, J. J. (2015). Speciation and risk of heavy metals in sediments and human health implications of heavy metals in edible nekton in Beibu Gulf, China: A case study of Qinzhou Bay. *Marine Pollution Bulletin*, 101(2), 852-859.
- Guandalini, E. (2011). *Fish production chain: safety and quality for consumers*. Hygiene and safety in the fish supply chain: Ministero delle Politiche Agricole, Alimentari e Forestali, Rome (Italy).
- Guardiola, F. A., Chaves-Pozo, E., Espinosa, C., Romero, D., Meseguer, J., Cuesta, A., & Esteban, M. A. (2016). Mercury Accumulation, Structural Damages, and Antioxidant and Immune Status Changes in the Gilthead Seabream (*Sparus aurata* L.) Exposed to Methylmercury. *Archives of Environmental Contamination and Toxicology*, 70(4), 734-746.

- Guardone, L., Nucera, D., Lodola, L. B., Tinacci, L., Acutis, P. L., Guidi, A., & Armani, A. (2018). Anisakis spp. larvae in different kinds of ready to eat products made of anchovies (*Engraulis encrasicolus*) sold in Italian supermarkets. *International Journal of Food Microbiology*, 268, 10-18.
- Guei, J. (2010). A novel calorimetric reagent for the detection of biogenic amines.
- Guenther, S., Herzig, O., Fieseler, L., Klumpp, J., & Loessner, M. J. (2012). Biocontrol of *Salmonella* Typhimurium in RTE foods with the virulent bacteriophage FO1-E2. *International Journal of Food Microbiology*, 154(1-2), 66-72.
- Guenther, S., Huwylar, D., Richard, S., & Loessner, M. J. (2009). Virulent bacteriophage for efficient biocontrol of *Listeria monocytogenes* in ready-to-eat foods. *Applied and Environmental Microbiology*, 75(1), 93-100.
- Guerin, T., Sirot, V., Volatier, J. L., & Leblanc, J. C. (2007). Organotin levels in seafood and its implications for health risk in high-seafood consumers. *Science of the Total Environment*, 388(1-3), 66-77.
- Guevel, M. R., Sirot, V., Volatier, J. L., & Leblanc, J. C. (2008). A risk-benefit analysis of French high fish consumption: A QALY approach. *Risk Analysis*, 28(1), 37-48.
- Guilherme, S., Santos, M. A., Gaivao, I., & Pacheco, M. (2014). DNA and chromosomal damage induced in fish (*Anguilla anguilla* L.) by aminomethylphosphonic acid (AMPA)-the major environmental breakdown product of glyphosate. *Environmental Science and Pollution Research International*, 21(14), 8730-8739.
- Guillier, L., Thebault, A., Gauchard, F., Pommepuy, M., Guignard, A., & Malle, P. (2011). A Risk-Based Sampling Plan for Monitoring of Histamine in Fish Products. *Journal of Food Protection*, 74(2), 302.
- Guo, J.-Y., Zeng, E. Y., Wu, F.-C., Meng, X.-Z., Mai, B.-X., & Luo, X.-J. (2007). Organochlorine Pesticides in Seafood Products from Southern China and Health Risk Assessment. *Environmental Toxicology and Chemistry*, 26(6), 1109-1115.
- Guo, J., Wu, F., Shen, R., & Zeng, E. Y. (2010). Dietary intake and potential health risk of DDTs and PBDEs via seafood consumption in South China. *Ecotoxicology and Environmental Safety*, 73(7), 1812-1819.
- Guo, M., Jin, T. Z., Scullen, O., & Sommers, C. H. (2013). Effects of Antimicrobial Coatings and Cryogenic Freezing on Survival and Growth of *Listeria innocua* on Frozen Ready-to-Eat Shrimp during Thawing. *Journal of Food Science*, 78(8), 1195-1200.
- Guo, Q., Jia, L., Qin, J., Li, H., & Gu, Z. (2015). Myxozoans and Our Dinner Table: Pathogenicity Studies of *Myxobolus honghuensis* (Myxosporea: Bivalvulida) Using a Suckling Mice Model. *Foodborne Pathogens and Disease*, 12(8), 653-660.
- Guo, Y., Zhou, H., Qin, L., Pang, Z., Qin, T., Ren, H., Pan, Z., & Zhou, J. (2016). Frequency, antimicrobial resistance and genetic diversity of *Klebsiella pneumoniae* in food samples. *PLoS ONE*, 11(4).
- Guo, Z., Zhang, W., Du, S., Green, I., Tan, Q., & Zhang, L. (2016). Developmental patterns of copper bioaccumulation in a marine fish model *Oryzias melastigma*. *Aquatic Toxicology*, 170, 216-222.
- Gusso-Choueri, P. K., Choueri, R. B., Santos, G. S., de Araujo, G. S., Cruz, A. C. F., Stremel, T., de Campos, S. X., Cestari, M. M., Ribeiro, C. A. O., & de Sousa Abessa, D. M. (2016). Assessing genotoxic effects in fish from a marine protected area influenced by former mining activities and other stressors. *Marine Pollution Bulletin*, 104(1-2), 229-239.
- Gutierrez, A. J., Gonzalez-Weller, D., Gonzalez, T., Burgos, A., Lozano, G., Reguera, J. I., & Hardisson, A. (2007). Research Note: Content of Toxic Heavy Metals (Mercury, Lead, and Cadmium) in Canned Variegated Scallops (*Chlamys varia*). *Journal of Food Protection*, 70(12), 2911-2915.
- Gutiérrez, D., Delgado, S., Vázquez-Sánchez, D., Martínez, B., Cabo, M. L., Rodríguez, A., Herrera, J. J., & García, P. (2012). Incidence of *Staphylococcus aureus* and analysis of associated bacterial communities on food industry surfaces. *Applied and Environmental Microbiology*, 78(24), 8547-8554.
- Ha, C., Kim, S.-K., Lee, M.-N., & Lee, J.-H. (2014). Quorum sensing-dependent metalloprotease VvpE is important in the virulence of *Vibrio vulnificus* to invertebrates. *Microbial Pathogenesis*, 71, 8-14.
- Ho, K. K. Y., & Leung, K. M. Y. (2014). Organotin contamination in seafood and its implication for human health risk in Hong Kong. *Marine Pollution Bulletin*, 85(2), 634-640.
- Hoo Fung, L. A., Antoine, J. M. R., Grant, C. N., & Buddo, D. S. A. (2013). Evaluation of dietary exposure to minerals, trace elements and heavy metals from the muscle tissue of the lionfish *Pterois volitans* (Linnaeus 1758). *Food and Chemical Toxicology*, 60, 205-212.
- Hosseini, M., Nabavi, S. M. B., Nabavi, S. N., & Pour, N. A. (2015). Heavy metals (Cd, Co, Cu, Ni, Pb, Fe, and Hg) content in four fish commonly consumed in Iran: risk assessment for the consumers. *Environmental Monitoring and Assessment*, 187(5), 1-7.
- Hosseini, S. V., Aflaki, F., Sobhanardakani, S., Tayebi, L., Lashkan, A. B., & Regenstein, J. M. (2013). Analysis of mercury, selenium, and tin concentrations in canned fish marketed in Iran. *Environmental Monitoring and Assessment*, 185(8), 6407-6412.
- Hosseini, S. V., Sobhanardakani, S., Tahergorabi, R., & Delfieh, P. (2013). Selected Heavy Metals Analysis of Persian Sturgeon's (*Acipenser persicus*) Caviar from Southern Caspian Sea. *Biological Trace Element Research*, 154(3), 357-362.
- Jadhav, S., Bhosale, D., & Bhosle, N. (2011). Baseline of organotin pollution in fishes, clams, shrimps, squids and crabs collected from the west coast of India. *Marine Pollution Bulletin*, 62(10), 2213-2219.
- Jarvis, E., Schiff, K., Sabin, L., & Allen, M. (2007). Chlorinated Hydrocarbons in Pelagic Forage Fishes and Squid of the Southern California Bight. *Environmental Toxicology and Chemistry*, 26(11), 2290-2298.
- Jewett, S. C., & Duffy, L. K. (2007). Mercury in fishes of Alaska, with emphasis on subsistence species. *Science of the Total Environment*, 387(1-3), 3-27.
- Jiang, Q., Hanari, N., Miyake, Y., Okazawa, T., Lau, R. K. F., Chen, K., Wyrzykowska, B., So, M. K., Yamashita, N., & Lam, P. K. S. (2007). Health risk assessment for polychlorinated biphenyls, polychlorinated dibenzo-p-dioxins and dibenzofurans, and polychlorinated naphthalenes in seafood from Guangzhou and Zhoushan, China. *Environmental Pollution*, 148(1), 31-39.

- Juaniz, I., Zocco, C., Mouro, V., Cid, C., & Pena, M. D. (2016). Effect of frying process on furan content in foods and assessment of furan exposure of Spanish population. *Food Science and Technology/Lebensmittel-Wissenschaft und Technologie*, *68*, 549-555.
- Julshamn, K., Nilsen, B. M., Frantzen, S., Valdernes, S., Maage, A., Nedreaas, K., & Sloth, J. J. (2012). Total and inorganic arsenic in fish samples from Norwegian waters. *Food Additives and Contaminants: Part B Surveillance*, *5*(4), 229-235.
- Kalogeropoulos, N., Karavoltzos, S., Sakellari, A., Avramidou, S., Dassenakis, M., & Scoullou, M. (2012). Heavy metals in raw, fried and grilled Mediterranean finfish and shellfish. *Food and Chemical Toxicology*, *50*(10), 3702-3708.
- Kalyoncu, L., Agca, I., & Aktumsek, A. (2009). Some organochlorine pesticide residues in fish species in Konya, Turkey. *Chemosphere*, *74*(7), 885-889.
- Karami, A., Golieskardi, A., Choo, C. K., Larat, V., Karbalaei, S., & Salamatnia, B. (2018). Microplastic and mesoplastic contamination in canned sardines and sprats. *Science of the Total Environment*, *612*, 1380-1386.
- Katikou, P., Georgantelis, D., Sinouris, N., Petsi, A., & Fotaras, T. (2009). First report on toxicity assessment of the Lessepsian migrant pufferfish *Lagocephalus sceleratus* (Gmelin, 1789) from European waters (Aegean Sea, Greece). *Toxicol*, *54*(1), 50-55.
- Kehrig, H. A., Seixas, T. G., Di Benedetto, A. P. M., & Malm, O. (2013). Selenium and mercury in widely consumed seafood from South Atlantic Ocean. *Ecotoxicology and Environmental Safety*, *93*, 156-162.
- Klenow, S., Heinemeyer, G., Brambilla, G., Dellatte, E., Herzke, D., & de Voogt, P. (2013). Dietary exposure to selected perfluoroalkyl acids (PFAAs) in four European regions. *Food Additives and Contaminants - Part A Chemistry, Analysis, Control, Exposure and Risk Assessment*, *30*(12), 2141-2151.
- Koenig, S., Solé, M., Fernández-Gómez, C., & Díez, S. (2013). New insights into mercury bioaccumulation in deep-sea organisms from the NW Mediterranean and their human health implications. *Science of the Total Environment*, *442*, 329-335.
- Korkmaz Görür, F., Keser, R., Akçay, N., & Dizman, S. (2012). Radioactivity and heavy metal concentrations of some commercial fish species consumed in the Black Sea Region of Turkey. *Chemosphere*, *87*(4), 356-361.
- Kuballa, T., Moellers, M., Schoeberl, K., & Lachenmeier, D. W. (2011). Survey of methylmercury in fish and seafood from the southwestern German market. *European Food Research and Technology*, *232*(4), 737-742.
- Lee, K. G. (2013). Analysis and risk assessment of ethyl carbamate in various fermented foods. *European Food Research and Technology*, *236*(5), 891-898.
- Liao, C., Chen, L., & Kannan, K. (2013). Occurrence of parabens in foodstuffs from China and its implications for human dietary exposure. *Environment International*, *57-58*, 68-74.
- Lin, H., Jiang, J., & Li, D. (2008). Potential Hazards in Smoke-Flavored Fish. *Journal of Ocean University of China*, *7*(3), 294-298.
- Lin, W. F., & Hwang, D. F. (2012). Analysis of poisoning cases, monitoring and risk warning for marine toxins (TTX, PSP and CTXs) in Taiwan. *Journal of Food and Drug Analysis*, *20*(4), 764-771+981.
- Liu, J.-L., Xu, X.-R., Ding, Z.-H., Peng, J.-X., Jin, M.-H., Wang, Y.-S., Hong, Y.-G., & Yue, W.-Z. (2015). Heavy metals in wild marine fish from South China Sea: levels, tissue- and species-specific accumulation and potential risk to humans. *Ecotoxicology*, *24*(7-8), 1583-1592.
- Liu, J.-L., Xu, X.-R., Yu, S., Cheng, H., Peng, J.-X., Hong, Y.-G., & Feng, X.-B. (2014). Mercury contamination in fish and human hair from Hainan Island, South China Sea: Implication for human exposure. *Environmental Research*, *135*, 42-47.
- Liu, S., Zhao, H., Lehmler, H.-J., Cai, X., & Chen, J. (2017). Antibiotic Pollution in Marine Food Webs in Laizhou Bay, North China: Trophodynamics and Human Exposure Implication. *Environmental Science & Technology*, *51*(4), 2392.
- Liu, Z., Zhang, H., Tao, M., Yang, S., Wang, L., Liu, Y., Ma, D., & He, Z. (2010). Organochlorine pesticides in consumer fish and mollusks of Liaoning province, China: Distribution and human exposure implications. *Archives of Environmental Contamination and Toxicology*, *59*(3), 444-453.
- Magbitang, R. A., Bucsit, M. A., Tia, E. S. F., Rumbaoa, G., Cervas, L. L. M., Dimaya, D. A., & Rodriguez, I. B. (2013). Determination of Cd and Pb in fruit juice, bottled tea, condiments and dried fish samples using ICP-MS. *Science Diliman: a journal of pure and applied sciences*, *25*(1), 1-14.
- Maguire, J., Cusack, C., Ruiz-Villarreal, M., Silke, J., McElligott, D., & Davidson, K. (2016). Applied simulations and integrated modelling for the understanding of toxic and harmful algal blooms (ASIMUTH): Integrated HAB forecast systems for Europe's Atlantic Arc. *Harmful Algae*, *53*, 160-166.
- Maheux, A. F., Bouchard, S., Bérubé, É., & Bergeron, M. G. (2017). Comparison of MI, Chromocult® coliform, and Compass CC chromogenic culture-based methods to detect *Escherichia coli* and total coliforms in water using 16S rRNA sequencing for colony identification. *Journal of Water and Health*, *15*(3), 353-359.
- Maheux, A. F., Dion-Dupont, V., Bisson, M.-A., Bouchard, S., Jubinville, É., Nkuranga, M., Rodrigue, L., Bergeron, M. G., & Rodriguez, M. J. (2015). Multiparametric comparison of chromogenic-based culture methods used to assess the microbiological quality of drinking water and the mFC method combined with a molecular confirmation procedure. *Journal of Water and Health*, *13*(1), 67-72.
- Mahmoudi, R., & Norian, R. (2014). Occurrence of histamine in canned tuna fish from Iran. *Journal fuer Verbraucherschutz und Lebensmittelsicherheit/Journal for Consumer Protection and Food Safety*, *9*(2), 133-136.
- Maiwore, J., Ngoune, T. L., Goli, T., Montet, D., & Mboufung, C. M. F. (2012). Influence of technological treatments on bacterial communities in tilapia (*Oreochromis niloticus*) as determined by 16S rDNA fingerprinting using polymerase chain reaction-denaturing gradient gel electrophoresis (PCR-DGGE). *African Journal of Biotechnology*, *11*(34), 8586-8593.

- Malagon, I., Garcia, S., & Heredia, N. (2010). Adherence, Invasion, Toxigenic, and Chemotactic Properties of Mexican *Campylobacter* Strains. *Journal of Food Protection*, 73(11), 2093.
- Man, Y. B., Chan, J. K. Y., Wu, S. C., Wong, C. K. C., & Wong, M. H. (2013). Dietary exposure to DDTs in two coastal cities and an inland city in China. *Science of the Total Environment*, 463, 264-273.
- Mandal, B. K., Suzuki, K. T., & Anzai, K. (2007). Impact of arsenic in foodstuffs on the people living in the arsenic-affected areas of West Bengal, India. *Journal of Environmental Science and Health, Part A: Toxic/Hazardous Substances & Environmental Engineering*, 42(12), 1741-1752.
- Mansfield, B. (2012). Environmental Health as Biosecurity: "Seafood Choices," Risk, and the Pregnant Woman as Threshold. *Annals of the Association of American Geographers*, 102(5), 969-976.
- Mansilla-Rivera, I., Nazario, C. M., Ramirez-Marrero, F. A., Crespo, C. J., & Rodriguez-Sierra, C. J. (2014). Assessing Arsenic Exposure from Consumption of Seafood from Vieques-Puerto Rico: A Pilot Biomonitoring Study Using Different Biomarkers. *Archives of Environmental Contamination and Toxicology*, 66(2), 162-175.
- Mansilla-Rivera, I., & Rodríguez-Sierra, C. J. (2011). Metal levels in fish captured in Puerto Rico and estimation of risk from fish consumption. *Archives of Environmental Contamination and Toxicology*, 60(1), 132-144.
- Mao, X., Wang, L., Gu, S., Duan, Y., Zhu, Y., Wang, C., & Lichtfouse, E. (2018). Synthesis of a three-dimensional network sodium alginate-poly(acrylic acid)/attapulgite hydrogel with good mechanic property and reusability for efficient adsorption of Cu²⁺ and Pb²⁺. *Environmental Chemistry Letters*, 1-6.
- Maranghi, F., Tassinari, R., Moracci, G., Altieri, I., Rasinger, J. D., Carroll, T. S., Hogstrand, C., Lundebye, A. K., & Mantovani, A. (2013). Dietary exposure of juvenile female mice to polyhalogenated seafood contaminants (HBCD, BDE-47, PCB-153, TCDD): Comparative assessment of effects in potential target tissues. *Food and Chemical Toxicology*, 56, 443-449.
- Marchan, L. F., Lee Chang, K. J., Nichols, P. D., Polglase, J. L., Mitchell, W. J., & Gutierrez, T. (2017). Screening of new British thraustochytrids isolates for docosahexaenoic acid (DHA) production. *Journal of Applied Phycology*, 29(6), 2831-2843.
- Maria Filomena de, J., Alcina Maria Miranda, B., Morais, d., & Santos Costa, R. M. (2016). Emergent Sources of Prebiotics: Seaweeds and Microalgae. *Marine Drugs*, 14(2), 27.
- Marques, A., Lourenco, H. M., Nunes, M. L., Roseiro, C., Santos, C., Barranco, A., Rainieri, S., Langerholc, T., & Cencic, A. (2011). New tools to assess toxicity, bioaccessibility and uptake of chemical contaminants in meat and seafood. *Food Research International*, 44(2), 510-522.
- Marques, C., Roberto, V. P., Granadeiro, L., Trindade, M., Gavaia, P. J., Laizé, V., Cancela, M. L., & Fernández, I. (2017). The xenobiotic sensor PXR in a marine flatfish species (*Solea senegalensis*): Gene expression patterns and its regulation under different physiological conditions. *Marine Environmental Research*, 130, 187.
- Marques, R. C., Bernardi, J. V., Dórea, J. G., Leão, R. S., & Malm, O. (2013). Mercury Transfer During Pregnancy and Breastfeeding: Hair Mercury Concentrations as Biomarker. *Biological Trace Element Research*, 154(3), 326-332.
- Marrugo-Negrete, J., Benitez, L. N., & Olivero-Verbel, J. (2008). Distribution of Mercury in Several Environmental Compartments in an Aquatic Ecosystem Impacted by Gold Mining in Northern Colombia. *Archives of Environmental Contamination and Toxicology*, 55(2), 305-316.
- Marrugo-negrete, J. L., Ruiz-guzmán, J. A., & Díez, S. (2013). Relationship Between Mercury Levels in Hair and Fish Consumption in a Population Living Near a Hydroelectric Tropical Dam. *Biological Trace Element Research*, 151(2), 187-194.
- Marsico, E. T., Machado, M. E. S., Knoff, M., & Clemente, S. C. S. (2007). Total mercury in sharks along the southern Brazilian Coast. *Arquivo Brasileiro de Medicina Veterinaria e Zootecnia*, 59(6).
- Marti-Cid, R., Bocio, A., Llobet, J. M., & Domingo, J. L. (2007). Intake of chemical contaminants through fish and seafood consumption by children of Catalonia, Spain: Health risks. *Food and Chemical Toxicology*, 45(10), 1968-1974.
- Martí-Cid, R., Llobet, J. M., Castell, V., & Domingo, J. L. (2008). Human exposure to polychlorinated naphthalenes and polychlorinated diphenyl ethers from foods in Catalonia, Spain: Temporal trend. *Environmental Science and Technology*, 42(11), 4195-4201.
- Marti, M., Ortiz, X., Gasser, M., Marti, R., Montana, M. J., & Diaz-Ferrero, J. (2010). Persistent organic pollutants (PCDD/Fs, dioxin-like PCBs, marker PCBs, and PBDEs) in health supplements on the Spanish market. *Chemosphere*, 78(10), 1256-1262.
- Martone-Rocha, S., Piveli, R. P., Matté, G. R., Dória, M. C., Dropa, M., Morita, M., Peternella, F. A., & Matté, M. H. (2010). Dynamics of *Aeromonas* species isolated from wastewater treatment system. *Journal of Water and Health*, 8(4), 703-711.
- Mattei, C., Vetter, I., Eisenblätter, A., Krock, B., Ebbecke, M., Desel, H., & Zimmermann, K. (2014). Ciguatera fish poisoning: A first epidemic in Germany highlights an increasing risk for European countries. *Toxicon*, 91, 76-83.
- Maulvault, A. L., Anacleto, P., Barbosa, V., Sloth, J. J., Rasmussen, R. R., Tediosi, A., Fernandez-Tejedor, M., van den Heuvel, F. H. M., Kotterman, M., & Marques, A. (2015). Toxic elements and speciation in seafood samples from different contaminated sites in Europe. *Environmental Research*, 143, 72-81.
- Maulvault, A. L., Machado, R., Afonso, C., Lourenço, H. M., Nunes, M. L., Coelho, I., Langerholc, T., & Marques, A. (2011). Bioaccessibility of Hg, Cd and As in cooked black scabbard fish and edible crab. *Food and Chemical Toxicology*, 49(11), 2808-2815.
- Medeiros, R. J., Santos, L. M. G., Freire, A. S., Santelli, R. E., Braga, A. M. C. B., Krauss, T. M., & Jacob, S. d. C. (2012). Determination of inorganic trace elements in edible marine fish from Rio de Janeiro State, Brazil. *Food Control*, 23(2), 535-541.

- Mezzetta, S., Cirlini, M., Ceron, P., Tecleanu, A., Caligiani, A., Palla, G., & Sansebastiano, G. E. (2011). Concentration of DL-PCBs in fish from market of Parma city (north Italy): Estimated human intake. *Chemosphere*, 82(9), 1293-1300.
- Miklavčič, A., Stibilj, V., Heath, E., Polak, T., Tratnik, J. S., Klavž, J., Mazej, D., & Horvat, M. (2011). Mercury, selenium, PCBs and fatty acids in fresh and canned fish available on the Slovenian market. *Food Chemistry*, 124(3), 711-720.
- Mita, L., Bianco, M., Viggiano, E., Zollo, F., Bencivenga, U., Sica, V., Monaco, G., Portaccio, M., Diano, N., Colonna, A., Lepore, M., Canciglia, P., & Mita, D. G. (2011). Bisphenol A content in fish caught in two different sites of the Tyrrhenian Sea (Italy). *Chemosphere*, 82(3), 405-410.
- Miyake, Y., Jiang, Q., Yuan, W., Hanari, N., Okazawa, T., Wyrzykowska, B., So, M. K., Lam, P. K. S., & Yamashita, N. (2008). Preliminary health risk assessment for polybrominated diphenyl ethers and polybrominated dibenzo-p-dioxins/furans in seafood from Guangzhou and Zhoushan, China. *Marine Pollution Bulletin*, 57(6-12), 357-364.
- Mol, S. (2011a). Levels of Heavy Metals in Canned Bonito, Sardines, and Mackerel Produced in Turkey. *Biological Trace Element Research*, 143(2), 974-982.
- Mol, S. (2011b). Levels of selected trace metals in canned tuna fish produced in Turkey. *Journal of Food Composition and Analysis*, 24(1), 66-69.
- Moon, H. B., & Choi, H. G. (2009). Human exposure to PCDDs, PCDFs and dioxin-like PCBs associated with seafood consumption in Korea from 2005 to 2007. *Environment International*, 35(2), 279-284.
- Moon, H. B., Kim, H. S., Choi, M., & Choi, H. G. (2010). Intake and potential health risk of polycyclic aromatic hydrocarbons associated with seafood consumption in Korea from 2005 to 2007. *Archives of Environmental Contamination and Toxicology*, 58(1), 214-221.
- Moon, H. B., Kim, H. S., Choi, M., Yu, J., & Choi, H. G. (2009). Human health risk of polychlorinated biphenyls and organochlorine pesticides resulting from seafood consumption in South Korea, 2005-2007. *Food and Chemical Toxicology*, 47(8), 1819-1825.
- Moon, H. B., Kim, S. J., Park, H., Jung, Y. S., Lee, S., Kim, Y. H., & Choi, M. (2011). Exposure assessment for methyl and total mercury from seafood consumption in Korea, 2005 to 2008. *Journal of Environmental Monitoring*, 13(9), 2400-2405.
- Muralidharan, S., Dhananjayan, V., & Jayanthi, P. (2009). Organochlorine pesticides in commercial marine fishes of Coimbatore, India and their suitability for human consumption. *Environmental Research*, 109(1), 15-21.
- Olmedo, P., Hernández, A. F., Pla, A., Femia, P., Navas-Acien, A., & Gil, F. (2013). Determination of essential elements (copper, manganese, selenium and zinc) in fish and shellfish samples. Risk and nutritional assessment and mercury-selenium balance. *Food and Chemical Toxicology*, 62, 299-307.
- Olmedo, P., Pla, A., Hernandez, A. F., Barbier, F., Ayouni, L., & Gil, F. (2013). Determination of toxic elements (mercury, cadmium, lead, tin and arsenic) in fish and shellfish samples. Risk assessment for the consumers. *Environment International*, 59, 63-72.
- Ordiano-Flores, A., Galvan-Magana, F., & Rosiles-Martinez, R. (2011). Bioaccumulation of Mercury in Muscle Tissue of Yellowfin Tuna, *Thunnus albacares*, of the Eastern Pacific Ocean. *Biological Trace Element Research*, 144(1-3), 606-620.
- Ouédraogo, O., & Amyot, M. (2011). Effects of various cooking methods and food components on bioaccessibility of mercury from fish. *Environmental Research*, 111(8), 1064-1069.
- Park, J.-S., Jung, S.-Y., Son, Y.-J., Choi, S.-J., Kim, M.-S., Kim, J.-G., Park, S.-H., Lee, S.-M., Chae, Y.-Z., & Kim, M.-Y. (2011). Total mercury, methylmercury and ethylmercury in marine fish and marine fishery products sold in Seoul, Korea. *Food Additives & Contaminants: Part B - Surveillance Communications*, 4(4), 268-274.
- Pastorelli, A. A., Baldini, M., Stacchini, P., Baldini, G., Morelli, S., Sagratella, E., Zaza, S., & Ciardullo, S. (2012). Human exposure to lead, cadmium and mercury through fish and seafood product consumption in Italy: a pilot evaluation. *Food Additives and Contaminants - Part A Chemistry, Analysis, Control, Exposure and Risk Assessment*, 29(12), 1913-1921.
- Perelló, G., Díaz-Ferrero, J., Llobet, J. M., Castell, V., Vicente, E., Nadal, M., & Domingo, J. L. (2015). Human exposure to PCDD/Fs and PCBs through consumption of fish and seafood in Catalonia (Spain): Temporal trend. *Food and Chemical Toxicology*, 81, 28-33.
- Perugini, M., Visciano, P., Manera, M., Zaccaroni, A., Olivieri, V., & Amorena, M. (2009). Levels of Total Mercury in Marine Organisms from Adriatic Sea, Italy. *Bulletin of Environmental Contamination and Toxicology*, 83(2), 244-248.
- Preece, E. P., Hardy, F. J., Moore, B. C., & Bryan, M. (2017). A review of microcystin detections in Estuarine and Marine waters: Environmental implications and human health risk. *Harmful Algae*, 61, 31-45.
- Prester, L. (2011). Biogenic amines in fish, fish products and shellfish: a review. *Food Additives & Contaminants: Part A - Chemistry, Analysis, Control, Exposure & Risk Assessment*, 28(11), 1547-1560.
- Prester, L. (2016). Seafood Allergy, Toxicity, and Intolerance: A Review. *Journal of the American College of Nutrition*, 35(3), 271-283.
- Reindl, A. R., Falkowska, L., Szumio, E., & Staniszevska, M. (2013). Residue of chlorinated pesticides in fish caught in the Southern Baltic. *Oceanological and Hydrobiological Studies*, 42(3), 251-259.
- Reposi, A., Farabegoli, F., Gazzotti, T., Zironi, E., & Pagliuca, G. (2016). Bisphenol a in edible part of seafood. *Italian Journal of Food Safety*, 5(2), 98-105.
- Robertson, A., Garcia, A. C., Flores Quintana, H. A., Smith, T. B., Castillo II, B. F., Reale-Munroe, K., Gulli, J. A., Olsen, D. A., Hooe-Rollman, J. I., Jester, E. L. E., Klimek, B. J., & Plakas, S. M. (2014). Invasive lionfish (*Pterois volitans*): A potential human health threat for ciguatera fish poisoning in tropical waters. *Marine Drugs*, 12(1), 88-97.

- Rochman, C. M., Tahir, A., Williams, S. L., Baxa, D. V., Lam, R., Miller, J. T., Teh, F. C., Werorilangi, S., & Teh, S. J. (2015). Anthropogenic debris in seafood: Plastic debris and fibers from textiles in fish and bivalves sold for human consumption. *Scientific Reports*, 5.
- Rodriguez-Hernandez, A., Camacho, M., Henriquez-Hernandez, L. A., Boada, L. D., Ruiz-Suarez, N., Valeron, P. F., Almeida Gonzalez, M., Zaccaroni, A., Zumbado, M., & Luzardo, O. P. (2016). Assessment of human health hazards associated with the dietary exposure to organic and inorganic contaminants through the consumption of fishery products in Spain. *Science of the Total Environment*, 557, 808-818.
- Rubio, C., Gutiérrez, Á., Burgos, A., & Hardisson, A. (2008). Total dietary intake of mercury in the canary islands, Spain. *Food Additives and Contaminants - Part A Chemistry, Analysis, Control, Exposure and Risk Assessment*, 25(8), 946-952.
- Ruelas-Inzunza, J., Patiño-Mejía, C., Soto-Jiménez, M., Barba-Quintero, G., & Spanopoulos-Hernández, M. (2011). Total mercury in canned yellowfin tuna *Thunnus albacares* marketed in northwest Mexico. *Food and Chemical Toxicology*, 49(12), 3070-3073.
- Russo, R., Voi, A. L., De Simone, A., Serpe, F. P., Anastasio, A., Pepe, T., Cacace, D., & Severino, L. (2013). Heavy Metals in Canned Tuna from Italian Markets. *Journal of Food Protection*, 76(2), 355.
- Santos, M. M., Enes, P., Reis-Henriques, M. A., Kuballa, J., Castro, L. F. C., & Vieira, M. N. (2009). Organotin levels in seafood from Portuguese markets and the risk for consumers. *Chemosphere*, 75(5), 661-666.
- Sevillano-Morales, J. S., Cejudo-Gómez, M., Ramírez-Ojeda, A. M., Cámara Martos, F., & Moreno-Rojas, R. (2015). Risk profile of methylmercury in seafood. *Current Opinion in Food Science*, 6, 53-60.
- Sioen, I., De Henaauw, S., Van Camp, J., Volatier, J. L., & Leblanc, J. C. (2009). Comparison of the nutritional-toxicological conflict related to seafood consumption in different regions worldwide. *Regulatory Toxicology and Pharmacology*, 55(2), 219-228.
- Sirov, V., Guerin, T., Volatier, J. L., & Leblanc, J. C. (2009). Dietary exposure and biomarkers of arsenic in consumers of fish and shellfish from France. *Science of the Total Environment*, 407(6), 1875-1885.
- Sivaperumal, P., Sankar, T. V., & Nair, P. (2007). Heavy metal concentrations in fish, shellfish and fish products from internal markets of India vis-a-vis international standards. *Food Chemistry*, 102(3), 612-620.
- Spada, L., Annicchiarico, C., Cardellicchio, N., Giandomenico, S., & Di Leo, A. (2012). Mercury and methylmercury concentrations in Mediterranean seafood and surface sediments, intake evaluation and risk for consumers. *International Journal of Hygiene and Environmental Health*, 215(3), 418-426.
- Storelli, M. M. (2008). Potential human health risks from metals (Hg, Cd, and Pb) and polychlorinated biphenyls (PCBs) via seafood consumption: Estimation of target hazard quotients (THQs) and toxic equivalents (TEQs). *Food and Chemical Toxicology*, 46(8), 2782-2788.
- Storelli, M. M., & Barone, G. (2013). Toxic Metals (Hg, Pb, and Cd) in Commercially Important Demersal Fish from Mediterranean Sea: Contamination Levels and Dietary Exposure Assessment. *Journal of Food Science*, 78(2), T362-T366.
- Storelli, M. M., Barone, G., Cuttone, G., Giungato, D., & Garofalo, R. (2010). Occurrence of toxic metals (Hg, Cd and Pb) in fresh and canned tuna: Public health implications. *Food and Chemical Toxicology*, 48(11), 3167-3170.
- Storelli, M. M., Barone, G., Perrone, V. G., & Giacomini-Stuffler, R. (2011). Polychlorinated biphenyls (PCBs), dioxins and furans (PCDD/Fs): Occurrence in fishery products and dietary intake. *Food Chemistry*, 127(4), 1648-1652.
- Storelli, M. M., Normanno, G., Barone, G., Dambrosio, A., Errico, L., Garofalo, R., & Giacomini-Stuffler, R. (2012). Toxic metals (Hg, Cd, and Pb) in fishery products imported into Italy: Suitability for human consumption. *Journal of Food Protection*, 75(1), 189-194.
- Struciński, P., Piskorska-Pliszczynska, J., Maszewski, S., Góralczyk, K., Warenik-Bany, M., Mikołajczyk, S., Czaja, K., Hernik, A., & Ludwicki, J. K. (2013). PCDD/Fs and DL-PCBs intake from fish caught in Polish fishing grounds in the Baltic Sea - Characterizing the risk for consumers. *Environment International*, 56, 32-41.
- Su, G., Xia, J., Liu, H., Lam, M. H. W., Yu, H., Giesy, J. P., & Zhang, X. (2012). Dioxin-like potency of HO-and MeO-analogues of PBDEs' the potential risk through consumption of fish from eastern China. *Environmental Science and Technology*, 46(19), 10781-10788.
- Sun, Y. X., Hao, Q., Xu, X. R., Luo, X. J., Wang, S. L., Zhang, Z. W., & Mai, B. X. (2014). Persistent organic pollutants in marine fish from Yongxing Island, South China Sea: Levels, composition profiles and human dietary exposure assessment. *Chemosphere*, 98, 84-90.
- Szefer, P. (2013). Safety assessment of seafood with respect to chemical pollutants in European Seas. *Oceanological and Hydrobiological Studies*, 42(1), 110-118.
- Szinder-Richert, J., Barska, I., Usyduš, Z., & Grabic, R. (2010). Polybrominated diphenyl ethers (PBDEs) in selected fish species from the southern Baltic Sea. *Chemosphere*, 78(6), 695-700.
- Tepe, Y., Tuerkmen, M., & Tuerkmen, A. (2008). Assessment of heavy metals in two commercial fish species of four Turkish seas. *Environmental Monitoring and Assessment*, 146(1-3), 277-284.
- Trabalón, L., Cano-Sancho, G., Pocurull, E., Nadal, M., Domingo, J. L., & Borrull, F. (2015). Exposure of the population of Catalonia (Spain) to musk fragrances through seafood consumption: Risk assessment. *Environmental Research*, 143, 116-122.
- Türkmen, A., Tepe, Y., & Türkmen, M. (2008). Metal levels in tissues of the European anchovy, *Engraulis encrasicolus* L., 1758, and picarel, *Spicara smaris* L., 1758, from Black, Marmara and Aegean seas. *Bulletin of Environmental Contamination and Toxicology*, 80(6), 521-525.
- Uekusa, Y., Takatsuki, S., Tsutsumi, T., Akiyama, H., Matsuda, R., Teshima, R., Hachisuka, A., & Watanabe, T. (2017). Determination of polychlorinated biphenyls in marine fish obtained from tsunami-stricken areas of Japan. *PLoS ONE*, 12(4).
- Usyduš, Z., Szinder-Richert, J., Polak-Juszczak, L., Komar, K., Adamczyk, M., Malesa-Cieciewicz, M., & Ruczynska, W. (2009). Fish products available in Polish market - Assessment of the nutritive value and human exposure to dioxins and other contaminants. *Chemosphere*, 74(11), 1420-1428.

- Van Leeuwen, S. P. J., & De Boer, J. (2008). Brominated flame retardants in fish and shellfish - Levels and contribution of fish consumption to dietary exposure of Dutch citizens to HBCD. *Molecular Nutrition and Food Research*, *52*(2), 194-203.
- Vandermeersch, G., Lourenco, H. M., Alvarez-Munoz, D., Cunha, S., Diogene, J., Cano-Sancho, G., Sloth, J. J., Kwadijk, C., Barcelo, D., Allegaert, W., Bekaert, K., Fernandes, J. O., Marques, A., & Robbens, J. (2015). Environmental contaminants of emerging concern in seafood - European database on contaminant levels. *Environmental Research*, *143*, 29-45.
- Voegborlo, R. B., Adimado, A. A., & Ephraim, J. H. (2007). Total Mercury Distribution in Different Tissues of Frigate Tuna (*Auxis thazard thazard*) from the Atlantic Coastal Waters of Ghana, Gulf of Guinea. *Environmental Monitoring and Assessment*, *132*(1-3), 503-508.
- Wang, W., Batterman, S., Chernyak, S., & Nriagu, J. (2008). Concentrations and risks of organic and metal contaminants in Eurasian caviar. *Ecotoxicology and Environmental Safety*, *71*(1), 138-148.
- Wang, X., Zhang, H., Zhang, L., Zhong, K., Shang, X., Zhao, Y., Tong, Z., Yu, X., Li, J., & Wu, Y. (2015). Assessment on dioxin-like compounds intake from various marine fish from Zhoushan Fishery, China. *Chemosphere*, *118*, 163-169.
- Winiarska-Mieczan, A., & Grela, E. R. (2017). Content of cadmium and lead in raw, fried and baked commercial frozen fishery products consumed in Poland. *Journal of the Science of Food and Agriculture*, *97*(9), 2969-2974.
- Witczak, A., & Ciereszko, W. (2008). Effect of Hot Smoking on the Content of Selected Polychlorinated Biphenyl Congeners in Herring (*Clupea harengus*) Slices. *Journal of Agricultural and Food Chemistry*, *56*(11), 4278-4282.
- Wu, X., Gao, M., Wang, L., Luo, Y., Bi, R., Li, L., & Xie, L. (2014). The arsenic content in marketed seafood and associated health risks for the residents of Shandong, China. *Ecotoxicology and Environmental Safety*, *102*, 168-173.
- Wüst, N., Rauscher-Gabernig, E., Steinwider, J., Bauer, F., & Paulsen, P. (2017). Risk assessment of dietary exposure to tryptamine for the Austrian population. *Food Additives and Contaminants - Part A Chemistry, Analysis, Control, Exposure and Risk Assessment*, *34*(3), 404-420.
- Xia, C., Lam, J. C. W., Wu, X., Xie, Z., & Lam, P. K. S. (2012). Polychlorinated biphenyls (PCBs) in marine fishes from China: Levels, distribution and risk assessment. *Chemosphere*, *89*(8), 944-949.
- Yabanli, M., & Alparslan, Y. (2015). Potential health hazard assessment in terms of some heavy metals determined in demersal fishes caught in Eastern Aegean Sea. *Bulletin of Environmental Contamination and Toxicology*, *95*(4), 494-498.
- Yildirim, Y., Gonulalan, Z., Narin, I., & Soylok, M. (2009). Evaluation of trace heavy metal levels of some fish species sold at retail in Kayseri, Turkey. *Environmental Monitoring and Assessment*, *149*(1-4), 223-228.
- Yu, H. Y., Guo, Y., & Zeng, E. Y. (2010). Dietary intake of persistent organic pollutants and potential health risks via consumption of global aquatic products. *Environmental Toxicology and Chemistry*, *29*(10), 2135-2142.
- Yusá, V., Suelves, T., Ruiz-Atienza, L., Cervera, M. L., Benedito, V., & Pastor, A. (2008). Monitoring programme on cadmium, lead and mercury in fish and seafood from Valencia, Spain: Levels and estimated weekly intake. *Food Additives and Contaminants: Part B Surveillance*, *1*(1), 22-31.
- Zhang, W., Huang, L., & Wang, W. X. (2011). Arsenic bioaccumulation in a marine juvenile fish *Terapon jarbua*. *Aquatic Toxicology*, *105*(3-4), 582-588.
- Zhang, W., & Wang, W. X. (2012). Large-scale spatial and interspecies differences in trace elements and stable isotopes in marine wild fish from Chinese waters. *Journal of Hazardous Materials*, *215-216*, 65-74.
- Zhang, X., Gandhi, N., & Bhavsar, S. P. (2016). Persistent Organohalogenes in Paired Fish Fillet and Eggs: Implications for Fish Consumption Advisories. *Journal of Agricultural and Food Chemistry*, *64*(14), 2832-2840.
- Zhang, X. P., Jiang, S. F., Hong, G. B., Fu, Y. H., He, Y. Y., Ma, X. J., Wang, Z. Y., Zhang, Y. G., Zhu, Q., & Ma, X. B. (2012). Investigation on food contamination with parasites in Shanghai market. *Chinese Journal of Schistosomiasis Control*, *24*(4), 404-409.
- Zhang, Y., Huang, Y., Zhai, F., Du, R., Liu, Y., & Lai, K. (2012). Analyses of enrofloxacin, furazolidone and malachite green in fish products with surface-enhanced Raman spectroscopy. *Food Chemistry*, *135*(2), 845-850.
- Zhang, Y., Jaeglé, L., Thompson, L., & Streets, D. G. (2014). Six centuries of changing oceanic mercury. *Global Biogeochemical Cycles*, *28*(11), 1251-1261.
- Zhang, Y., Lu, Y., Wang, P., & Shi, Y. (2018). Biomagnification of Hexabromocyclododecane (HBCD) in a coastal ecosystem near a large producer in China: Human exposure implication through food web transfer. *Science of the Total Environment*, *624*, 1213-1220.
- Zhang, Y., Nakai, S., & Masunaga, S. (2009). An exposure assessment of methyl mercury via fish consumption for the Japanese population. *Risk Analysis*, *29*(9), 1281-1291.
- Zhang, Y., Yu, W., Pei, L., Lai, K., Rasco, B. A., & Huang, Y. (2015). Rapid analysis of malachite green and leucomalachite green in fish muscles with surface-enhanced resonance Raman scattering. *Food Chemistry*, *169*, 80-84.
- Zhang, Z., Liu, H., Lou, Y., Xiao, L., Liao, C., Malakar, P. K., Pan, Y., & Zhao, Y. (2015). Quantifying viable *Vibrio parahaemolyticus* and *Listeria monocytogenes* simultaneously in raw shrimp. *Applied Microbiology and Biotechnology*, *99*(15), 6451-6462.
- Zhang, Z., Lou, Y., Du, S., Xiao, L., Niu, B., Pan, Y., & Zhao, Y. (2017). Prevalence of *Vibrio parahaemolyticus* in seafood products from hypermarkets in Shanghai. *Journal of the Science of Food and Agriculture*, *97*(2), 705-710.
- Zhao, K., Zhao, Y., Ling, Y., & Chu, X. (2008). Analysis the pollution level of organotins in aquatic food and port wine. *Wei sheng yan jiu = Journal of hygiene research*, *37*(3), 327-331.

- Zhao, R., Yan, S., Liu, M., Wang, B., Hu, D., Guo, D., Wang, J., Xu, W., & Fan, C. (2016). Seafood consumption among Chinese coastal residents and health risk assessment of heavy metals in seafood. *Environmental Science and Pollution Research*, 23(16), 16834-16844.
- Zhilin, A., Kireeva, L. I., Litovskaya, A. M., & Draganov, D. M. (2012). *Polycyclic aromatic hydrocarbons in the fish fauna of the Barents Sea: Dalrybvtuz, Vladivostok (Russia)*.
- Zhou, P., Chen, N., Zhang, R. L., Lin, R. Q., & Zhu, X. Q. (2008). Food-borne parasitic zoonoses in China: perspective for control. *Trends in Parasitology*, 24(4), 190-196.
- Zhou, S., Hou, Z., Li, N., & Qin, Q. (2007). Development of a SYBR Green I real-time PCR for quantitative detection of *Vibrio alginolyticus* in seawater and seafood. *Journal of Applied Microbiology*, 103(5), 1897-1906.
- Zhou, S., Sheen, S., Pang, Y. H., Liu, L., & Yam, K. L. (2013). Antimicrobial effects of vapor phase thymol, modified atmosphere, and their combination against *Salmonella* spp. on Raw Shrimp. *Journal of Food Science*, 78(5), M725-M730.
- Zhu, A., Zhang, W., Xu, Z., Huang, L., & Wang, W. X. (2013). Methylmercury in fish from the South China Sea: Geographical distribution and biomagnification. *Marine Pollution Bulletin*, 77(1-2), 437-444.
- Zhu, L., Santiago-Schübel, B., Xiao, H., Thiele, B., Zhu, Z., Qiu, Y., Hollert, H., & Küppers, S. (2015). An efficient laboratory workflow for environmental risk assessment of organic chemicals. *Chemosphere*, 131, 34-40.
- Zhu, P., Gao, W., Huang, H., Jiang, J., Chen, X., Fan, J., & Yan, X. (2018). Rapid Detection of *Vibrio parahaemolyticus* in Shellfish by Real-Time Recombinase Polymerase Amplification. *Food Analytical Methods*, 1-9.
- Zhu, S. X., Yang, H. L., Huang, X. D., Wu, H. I., Hu, Y. H., Shen, Q., & Xu, S. L. (2011). Imposex in thais clavigera used for biomonitoring butyltins pollution along the coastal waters of Zhejiang, China. *Fresenius Environmental Bulletin*, 20(10), 2540-2545.
- Zhuang, Q., Yang, Y., Su, Y., Lyu, C., Wang, S., Yu, H., Qin, M., Li, Y., & Zhao, B. (2014). Exposure risk assessment of plasticizer in dietary food in Xiamen. *Zhonghua yu fang yi xue za zhi [Chinese journal of preventive medicine]*, 48(7), 602-606.
- Zizza, M., Di Lorenzo, M., Laforgia, V., Furia, E., Sindona, G., Canonaco, M., & Facciolo, R. M. (2017). HSP90 and pCREB alterations are linked to mancozeb-dependent behavioral and neurodegenerative effects in a marine teleost. *Toxicology and Applied Pharmacology*, 323, 26-35.
- Zou, L., Wang, Q., Tong, M., Li, H., Wang, J., Hu, N., & Wang, P. (2016). Detection of diarrhetic shellfish poisoning toxins using high-sensitivity human cancer cell-based impedance biosensor. *Sensors and Actuators B: Chemical*, 222, 205-212.
- Žvab Rožič, P., Dolenc, T., Baždarić, B., Karamarko, V., Kniewald, G., & Dolenc, M. (2014). Element levels in cultured and wild sea bass (*Dicentrarchus labrax*) and gilthead sea bream (*Sparus aurata*) from the Adriatic Sea and potential risk assessment. *Environmental Geochemistry and Health*, 36(1), 19-39.

Bijlage 1. Evaluatie van referenties door twee experts

In totaal werden 100 referenties door twee experts beoordeeld. Expert 1 beoordeelde 67 van de 100 referenties als niet relevant. Twee van deze 67 referenties werden door expert 2 als misschien relevant bevonden ((Y. Zhang, et al., 2012) en (Magbitang, et al., 2013)). Het ging hier om een verschillende interpretatie van de titel. Expert 1 oordeelde dat het artikel voornamelijk over een analytische methode ging, terwijl expert 2 oordeelde dat er misschien ook wel analysesresultaten in het artikel zouden kunnen staan. Van de overige relevante en misschien relevante artikelen van expert 1 oordeelde expert 2 dat er 2 artikelen niet relevant waren. Een van de artikelen ging over health supplements, de ander over het effect op de vis zelf.

Nr	Referentie	Expert 1	Expert 2
1	(Aarnisalo, Sheen, Raaska, & Tamplin, 2007)	Not relevant	Not relevant
2	(Ababneh & Al-Momani, 2013)	Relevant	Relevant
3	(Abal, Louzao, Antelo, et al., 2017)	Not relevant	Not relevant (paper on animal experiment)
4	(Abal, Louzao, Cifuentes, et al., 2017)	Not relevant	Not relevant (paper on animal experiment)
5	(Aballay-Gonzalez, et al., 2016)	Not relevant	Not relevant (shellfish)
6	(Abballe, et al., 2008)	Not relevant	Not relevant (human milk)
7	(Abdallah, 2013)	Not relevant	Not relevant (shellfish)
8	(Abdou & Palm, 2008)	Not relevant	Not Relevant (parasite)
9	(Abebe, Chen, & Sobsey, 2016)	Not relevant	Not relevant (not about topic)
10	(S. Abidli, Lahbib, González, Alonso, & Trigui El Menif, 2016)		Maybe relevant
11	(Sami Abidli, Toumi, Lahbib, & Trigui El Menif, 2017)	Not relevant	Not Relevant (about water, not about fish)
12	(Abraham & Rambla-Alegre, 2017)	Relevant	Relevant
13	(Adams, et al., 2010)	Maybe relevant	Maybe relevant
14	(Adamse, Van der Fels-Klerx, Schoss, de Jong, & Hoogenboom, 2015)	Not relevant	Not relevant (feed)
15	(Adamski, Chrapusta, Bober, Kamiński, & Białczyk, 2014)	Not relevant	Not relevant (m.o.)
16	(Adebayo-Tayo, et al., 2011)	Not relevant	Not relevant (m.o.)
17	(Adel, Mohammadmoradi, & Ley-Quiñonez, 2017)	Not relevant	Not relevant (shark)
18	(Adeleye, et al., 2016)	Maybe relevant	Relevant
19	(Ademollo, Ferrara, Delise, Fabietti, & Funari, 2008)	Not relevant	Not relevant (human milk)
20	(A. A. Adenugba, Headley, McMartin, & Beck, 2008)	Not relevant	Not relevant
21	(Adeola A. Adenugba, McMartin, & Beck, 2008)	Not relevant	Not relevant (bioavailability)
22	(Afonso, Cardoso, et al., 2013)	Maybe relevant (coastal area)	Relevant
23	(Afonso, et al., 2015)	Relevant	Relevant
24	(Afonso, Lourenço, et al., 2013)	Relevant	Maybe relevant
25	(Afonso, et al., 2007)	Relevant	Relevant
26	(Žvab Rožič, et al., 2014)	Relevant	Relevant
27	(Zou, et al., 2016)	Not relevant	Not relevant (shellfish)
28	(Zizza, et al., 2017)	Not relevant	Not relevant (effect on fish)
29	(Zhuang, et al., 2014)	Maybe relevant	Maybe relevant
30	(S. X. Zhu, et al., 2011)	Maybe relevant	Maybe relevant
31	(P. Zhu, et al., 2018)	Not relevant	Not relevant (vibrio, shellfish)
32	(L. Zhu, et al., 2015)	Not relevant	Not relevant (lab work flow)
33	(A. Zhu, Zhang, Xu, Huang, & Wang, 2013)	Relevant	Relevant
34	(S. Zhou, Sheen, Pang, Liu, & Yam, 2013)	Not relevant	Not relevant (Salmonella)
35	(S. Zhou, Hou, Li, & Qin, 2007)	Not relevant	Not relevant (Vibrio)
36	(P. Zhou, Chen, Zhang, Lin, & Zhu, 2008)	Not relevant	Not relevant (zoonoses)
37	(Zhilin, Kireeva, Litovskaya, & Draganov, 2012)	Relevant	Relevant
38	(R. Zhao, et al., 2016)	Maybe relevant	Relevant

39	(K. Zhao, Zhao, Ling, & Chu, 2008)	Maybe relevant	Maybe relevant
40	(Z. Zhang, et al., 2017)	Not relevant	Not relevant (Vibrio)
41	(Z. Zhang, et al., 2015)	Not relevant	Not relevant (Vibrio)
42	(Y. Zhang, et al., 2015)	Not relevant	Not relevant (analytical method)
43	(Y. Zhang, Nakai, & Masunaga, 2009)	Maybe relevant	Maybe relevant
44	(Y. Zhang, Lu, Wang, & Shi, 2018)	Maybe relevant	Maybe relevant
45	(Y. Zhang, Jaeglé, Thompson, & Streets, 2014)	Not relevant	Not relevant
46	(Y. Zhang, et al., 2012)	Not relevant	Maybe relevant
47	(X. P. Zhang, et al., 2012)	Not relevant	Not relevant (parasites)
48	(X. Zhang, Gandhi, & Bhavsar, 2016)	Maybe relevant	Relevant
49	(W. Zhang & Wang, 2012)	Relevant	Relevant
50	(W. Zhang, Huang, & Wang, 2011)	Not relevant	Not relevant (coastal fish)
51	(Magbitang, et al., 2013)	Not relevant	Maybe relevant
52	(Maguire, et al., 2016)	Not relevant	Not relevant (algal blooms)
53	(Maheux, Bouchard, Bérubé, & Bergeron, 2017)	Not relevant	Not relevant (E coli)
54	(Maheux, et al., 2015)	Not relevant	Not relevant (microbial quality)
55	(Mahmoudi & Norian, 2014)	Relevant	Relevant
56	(Maiwore, Ngoune, Goli, Montet, & Mbofung, 2012)	Not relevant	Not relevant (microbiology)
57	(Malagon, Garcia, & Heredia, 2010)	Not relevant	Not relevant (Campylobacter)
58	(Man, Chan, Wu, Wong, & Wong, 2013)	Not relevant	not relevant (no marine fish species)
59	(Mandal, Suzuki, & Anzai, 2007)	Maybe relevant	Maybe relevant (arsenic contaminated region)
60	(Mansfield, 2012)	Not relevant	Not relevant (no specific hazrds mentioned)
61	(Imar Mansilla-Rivera, Nazario, Ramirez-Marrero, Crespo, & Rodriguez-Sierra, 2014)	Relevant	Maybe relevant (arsenic exposure)
62	(Mao, et al., 2018)	Not relevant	Not relevant (method)
63	(Maranghi, et al., 2013)	Not relevant	Not relevant (animal testing)
64	(Marchan, et al., 2017)	Not relevant	Not relevant (algae)
65	(Maria Filomena de, Alcina Maria Miranda, Morais, & Santos Costa, 2016)	Not relevant	Not relevant (positive effects on human health)
66	(A. Marques, et al., 2011)	Not relevant	Not relevant (effect on seafish)
67	(C. Marques, et al., 2017)	Not relevant	Not relevant (gene expression)
68	(R. C. Marques, Bernardi, Dórea, Leão, & Malm, 2013)	Not relevant	Not relevant (breast feeding)
69	(R. C. Marques, et al., 2013)		Not relevant (breast feeding)
70	(J. Marrugo-Negrete, Benitez, & Olivero-Verbel, 2008)	Maybe relevant	Maybe relevant (Hg contaminated area)
71	(J. L. Marrugo-negrete, Ruiz-guzmán, & Díez, 2013)	Maybe relevant	Relevant
72	(Marsico, Machado, Knoff, & Clemente, 2007)	Not relevant	Not relevant (shark)
73	(Marti, et al., 2010)	Maybe relevant	Not relevant (health supplements)
74	(Marti-Cid, et al., 2007)	Relevant	Maybe relevant
75	(Martone-Rocha, et al., 2010)	Not relevant	Not relevant (aeromonas)
76	(Grzunov Letinić, et al., 2016)	Not relevant	Not relevant (uhman milk)
77	(H. Gu, et al., 2017)	Not relevant	Not relevant (analytical mehods)
78	(Y. Gu, Yu, Hu, & Yin, 2016)	Maybe relevant	Relevant (bisphenol A)
79	(Y. G. Gu, Lin, Wang, et al., 2015)	Relevant	Relevant (heavy metal)
80	(Y. G. Gu, Lin, Yu, et al., 2015)	Maybe relevant	Relevant (heavy metal)
81	(Guandalini, 2011)	Maybe relevant	Relevant
82	(Guardiola, et al., 2016)	Maybe relevant	Not relevant (effect on fish)
83	(Guardone, et al., 2018)	Not relevant	Not relevant (anisakis)
84	(Guei, 2010)	Not relevant	Not relevant (analytical method)
85	(Guenther, Herzig, Fieseler, Klumpp, & Loessner, 2012)	Not relevant	Not relevant (salmonella)
86	(Guenther, Huwyler, Richard, & Loessner, 2009)	Not relevant	Not relevant (listeria)

87	(Guerin, et al., 2007)	Relevant	Relevant (organotin)
88	(Guevel, Sirot, Volatier, & Leblanc, 2008)	Maybe relevant	Maybe relevant (QALY)
89	(Guilherme, Santos, Gaivao, & Pacheco, 2014)	Not relevant	Not relevant (effect on fish)
90	(Guillier, et al., 2011)	Maybe relevant	Relevant (histamine)
91	(J. Guo, et al., 2010)	Relevant	Maybe relevant (intake)
92	(J.-Y. Guo, et al., 2007)	Not relevant	Not Relevant (coastal area)
93	(M. Guo, Jin, Scullen, & Sommers, 2013)	Not relevant	Not relevant (listeria)
94	(Q. Guo, Jia, Qin, Li, & Gu, 2015)	Not relevant	Not relevant
95	(Y. Guo, et al., 2016)	Not relevant	Not relevant (klebsiella)
96	(Z. Guo, et al., 2016)	Not relevant	Not relevant (marine fish model)
97	(Gusso-Choueri, et al., 2016)	Not relevant	Not relevant (genotoxic effects)
98	(Gutierrez, et al., 2007)	Not relevant	Not relevant (scallop)
99	(Gutiérrez, et al., 2012)	Not relevant	Not relevant (s. aureus)
100	(Ha, Kim, Lee, & Lee, 2014)	Not relevant	Not relevant (Vibrio)