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MONITORING PROGRAMME FOR VETERINARY CONTROL ON SEAFOOD PRODUCTS IMPORTED TO NORWAY FROM THIRD COUNTRIES – RESULTS FROM 2017

– *In accordance with Commission Regulation (EC) No 136/2004, Annex II, Part 1.*

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Project Report

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Summary (English):
This report summarises results from 2017 from the ongoing monitoring programme for veterinary border control for seafood products imported to Norway from countries outside the European Economic Area. The Institute of Marine Research (IMR) carried out the analytical work on behalf of the Norwegian Food Safety Authority (NFSA), in cooperation with the personnel at the Norwegian Border Inspection Posts (BIP). We want to thank NFSA for very good cooperation during the conduct of this monitoring programme. An up to date risk assessment for different groups of imported products, made basis for the sampling plans and the selection of analytical activities. The current trend of hazards, as reported in The Rapid Alert System for Food and Feed (RASFF) notification system, the compositional nature of the products and the annual import quantity of relevant products, are evaluated in this risk assessment. A total of 116 samples from the NFSA at the Norwegian BIP, have been examined by a selection of methods for microorganisms, parasites and undesirable chemical compounds during 2017. The analytical results are listed in Annex 1 and are summarised below.

Microbiological analyses were performed on 116 samples. The results for microbiological indicator organisms for faecal contamination were mostly below detection limit, or showed low bacterial counts, with some exceptions. One samples of cod imported from Thailand had coliform counts of 560 colony-forming units (cfu/g) and enterococci in a concentration of 1600 cfu/g. One sample of marinated eel imported from Thailand had 330 coliforms/g and a thermotolerant coliform count of 30 cfu/g. One sample of seasoned cuttlefish imported from Thailand had high counts of sulphite-reducing bacteria and enterococci with 5100 cfu/g and 400 cfu/g, respectively. Bacteria in the family Enterobacteriaceae, were detected in three samples of surimi, two samples imported from USA and one sample imported from Vietnam.
Listeria monocytogenes (20 cfu/g) were detected in one sample of hoki imported from China. Pathogens in the genus *Salmonella* were not detected in any of the samples, neither was any disease-causing vibrios. Yeast and fungi were detected in two samples of seasoned cuttlefish imported from Thailand. Parasitological examinations were carried out on 53 fish samples, and nematodes were found in five samples (9 %). The nematodes were dead and thus not infective at the time of analysis. The highest numbers of nematodes were found in two samples of fillet of saithe imported from Russia, with 10 and 11 detected nematodes.
Eleven samples originating from aquaculture were analysed for residues of prohibited veterinary medicines (unauthorised dyes and antibacterial agents) in 2017. The programme included the dye compounds crystal violet (CV), leuco crystal violet (LCV), malachite green (MG), leuco malachite green (LMG), brilliant green (BG), and the antibacterial agents chloramphenicol and nitrofuran metabolites. No unauthorised dyes nor prohibited antibacterial agents were detected.
Heavy metals were measured in 89 samples. All samples were compliant with the maximum legal limits. The persistent organic pollutants (POPs) dioxins/ furans and PCBs (DLPCBs and NDLPCBs) and the PBDE class of compounds were measured in 29 samples. All samples were compliant with respect to their POPS maximum limits. The levels of PBDEs, which is not regulated with maximum limits, were within a range commonly observed in seafood. For the PAH class of compounds, 11 samples were analysed and found to have low levels, well within the compliant range of their regulatory maximum limits.

Subject heading (English):
Veterinary border control, seafood

Content

1 Introduction

As a member of the European Economic Area (EEA), Norway is obliged to monitor the conformity of products imported to the EEA area. A part of this activity analytical examination of seafood with respect to microorganisms, parasites and the presence of undesirable substances are conducted. The Norwegian Food Safety Authority (NFSA) is the competent authority regarding veterinary border control in Norway. On behalf of NFSA, IMR have carried out the analytical examination of the seafood samples in this monitoring programme and elaborated this report.

According to Commission Regulation (EC) No 136/2004, the monitoring plans must be based upon the nature of the products and the potential risks associated with different product categories, taking into account all relevant factors such as frequency and number of incoming consignments and results from previous monitoring. The selection of parameters included in the current analytical activity is selected based on previous findings in this program, as well as information available in the RASFF, "Rapid Alert System for Food and Feed" system.

The spectrum of products examined at veterinary border inspection points is large, and reflects the annual flux and the variation in the import activity. Thus, the methods to be used to examine the products will also be quite diverse.

Microbiological parameters are important to evaluate quality of seafood products and if proper hygienic measures were applied during production. To evaluate possible fecal contamination, analysis for common indicator organisms were conducted. These analysis included coliforms, bacteria in the Enterobacteriaceae family and enterococci. Furthermore, samples were analyzed for specific pathogens relevant for food safety, including bacteria in the geni *Salmonella, Listeria* and *Vibrio.* EU microbiological criteria have been established for *Salmonella* and *Listeria monocytogenes* (Commission Regulation 2073/2005).

Parasites are common in commercially harvested seafood species. Parasites may have a significant impact on the health of the organism, or they may reduce the aesthetical appearance of the product. However, only a few widely distributed parasite species are of direct consumer health concern. The larvae of several species of roundworms (nematodes) commonly occur in commercially harvested marine fish stocks in temperate sea areas worldwide. In addition to the quality reducing effect of these parasites, they are of direct human health concern when found alive in products. This is particularly relevant for the consumption of undercooked, lightly brined, marinated or raw fish meat. Thus the number of nematodes were determined. According to Regulation (EC) No 853/2004, fishery products to be consumed raw or almost raw should undergo a freezing treatment to kill viable parasites that may represent a risk to the health of the consumer. This regulation does not apply for farmed fish when the absence of such parasites are documented (Commission Regulation 1276/2011).

According to current EU legislation (Directive 96/23), some drugs are illegal to use in animals for food productions, and samples from aquaculture were analyzed such agents. Chloramphenicol is an antibiotic agent with activity against a broad spectrum of microorganisms. Due to a rare but serious dose-independent adverse effect (aplastic anaemia); this agent is not authorized in the treatment of any food-producing animal, including fish. Nitrofuranes were previously widely used in veterinary medicine as antimicrobials. They were banned from use in the European Union (EU) in 1995 due to concerns about the carcinogenicity of their residues in edible tissue.

Persistent organic pollutants are a heterogeneous group of lipophilic substances that exhibit a range of chemical and pharmacological properties. They are persistent and accumulate in the food chain. For this reason they are of environmental concern, and are considered as a hazard for human health. Thus, the compliance of selected samples with the established maximum limits for food stuffs in EC 1881/2006 was evaluated for PCBs, Dioxins, furans, and dioxin-like PCBs, and polyaromatic hydrocarbons (PAH). Furthermore the flame retardants polybrominated diphenyl ethers (PBDE) were measured.

Undesirable elements occur naturally in the environment with large geographical variations in their concentrations due to distribution, environmental processes and contribution from anthropogenic sources. Undesirable elements can be accumulated in both, cultured and wild seafood and therefore display a potential threat to human health. As implemented in in EC 1881/2006, the four toxic elements arsenic (As), cadmium (Cd), mercury (Hg), and lead (Pb) were measured and the compliance evaluated.

2 Materials and methods

Sampling was carried out by NFSA and the analytical examinations and the writing of this report was conducted by IMR. The sampling was targeting hazards associated with each kind of imported products, and took into account import volumes, compositional nature of the products, results from previous monitoring, geographical origin of samples, and information available in the RASFF (Rapid Alert System for Food and Feed). This report concerns samples imported in 2017.

At the Norwegian Border Inspection Posts (BIPs), the staff of NFSA selected samples. The samples were then stored frozen in the BIPs until shipment in the frozen state to IMR for analysis. Upon arrival, samples were registered at the IMR sample reception unit, each sample photographed, and relevant information registered in a Laboratory Information Management System (LIMS). The microbiological assay was carried out prior to other sample handling. The sample was then further prepared for analyses and split in sub-samples (aliquots) for the different assays and analytical methods.

In general, the edible part of food samples, usually the muscle, was selected for analyses. For species where a legal maximum level was defined, the tissue specified in the regulation was selected. The analytical methods and procedures used were accredited according to the ISO 17025 standard, unless otherwise specified. A summary of the chemical analytical methods, accreditation status and their performance data are listed in Annex 2.

For the scope of this report, the food safety interpretation of the analytical data was based primarily on the EU maximum levels (Commission Regulation (EU) No. 2006/1881 and 1259/2011) (summed up in Appendix 3) and EU recommendations. The EU maximum levels are founded on a thorough examination of the available toxicological information. Thus, they provide both a legal framework for trade as well as a useful food safety reference point for analytical data interpretation. For undesirables where no maximum level is in place, the reference “point” for the discussion/ interpretation of the data will primarily be the analytical range commonly observed for this undesirable in seafood from pristine or semi-pristine waters.

3 Results and discussion

A total of 116 samples from the NFSA at Norwegian BIPs, have been examined by a selection of methods for microorganisms, parasites and undesirable chemical compounds as shown in the table below. Data tables are presented in Annex 1. Method performance data are listed in Annex 2. A summary of EU maximum levels for certain contaminants in foodstuffs are listed in Annex 3.

Samples and assays included in the veterinary border control of 2017							
	Fish	Crustaceans	Cephalopods	Bivalves	Oils	Canned products	Total number
Microorganisms	82	7	6	3	3	15	116
Chemical spoilage indicators	24	-	1	-	-	-	25
Nematodes	53	-	-	-	-	-	53
Pharmaceuticals	9	1	-	1	-	-	11
Undesirable elements	66	9	5	3	6	-	89
POPs	24	-	1	-	4		29

3.1 Microbiology

The detailed results from the microbiological examinations are listed in Annex 1 (Table 1). A total of 116 samples were examined for microorganisms by a range of assays.

The incubation test for 15 canned seafood products, showed that these products were sterile.

During 2017, no samples were analysed for the quality reducing H_2S-producing seafood spoiling bacteria.

Three samples of marine bivalves were examined for *E. coli* by the Donovan method as specified by EU. This was one sample of scallops from USA, one sample of green-lipped mussel from New Zealand, and one sample of Pacific oyster from Korea. The sample of pacific oyster had a number of *E. coli* by the Donovan MPN method of 45 bacteria/100 gram sample material (result not shown in Table 1). The two first mentioned samples of bivalves, in addition to another sample of green-lipped mussel also imported from New Zealand, were analysed for the presence of Norovirus, however no Norovirus was detected in any of the three samples.

Sixty-eight samples were analysed for coliforms by the 3M TM Petrifilm method, and seven samples (10%) had numbers of 10 cfu/g or more. The highest count were 560 coliforms/g in a sample of Atlantic cod imported from Thailand and 330 coliforms/g in a sample of grilled, marinated eel imported from Thailand. The latter also had high counts of thermotolerant coliform bacteria (30 cfu/g).

Most results for the determination of thermotolerant coliforms by the 3M TM Petrifilm method in 92 samples examined, were below the detection limit of 10 cfu/g. In addition to the above mentioned sample of eel imported from Thailand, one sample of swordfish imported from Sri Lanka had 10 thermotolerant coliforms/g.

The number of *Staphylococcus aureus* were all under the levels of detection (100 cfu/g) in the 22 analysed samples. Anaerobic sulphite-reducing bacteria were detected in two out of 27 samples

analysed (7%). One sample of liver imported from Russia had counts of 1000 cfu/g and one sample of seasoned cuttlefish imported from Thailand had counts of sulphite-reducing bacteria of 5100 cfu/g. The latter sample also had 400 enterococci/g. Bacteria in the family Enterobacteriaceae, were generally under their respective levels of detection in examined samples, apart from three samples of surimi, two samples imported from USA, containing 590 cfu/g and 450 cfu/g, respectively, and one sample imported from Vietnam containing 20 Enterobacteriaceae/g.

For enterococci, six of 71 examined samples were above the detection limit of 100 cfu/g. The highest number of enterococci was 1600 cfu/g in the above mentioned sample of Atlantic cod imported from Thailand, with the high count of coliforms.

Sixty-seven samples were analysed for *L. monocytogenes* during 2017, and the bacterium was detected qualitatively (20 cfu/g) in one sample of battered hoki imported from China. This concentration is below the criteria given by EU of 100 cfu/g at the day of expired shelf-life.

No pathogens in the geni *Salmonella* or *Vibrio* were detected in any of the samples analysed.

The presence of yeast and moulds were examined in eleven samples, and was detected in two samples of cuttlefish imported from Thailand. The counts of yeast were 4000 and 50000 cfu/g, respectively, and the counts of moulds in both samples were 400 cfu/g.

3.2 Rancidity and chemical spoilage indicators

The chemical spoilage indicator histamine was examined in twenty samples, and total volatile basic nitrogen (TVBN) was examined in twenty five samples (Table 5). The highest histamine value, 66 mg/kg w.w., and the highest TVBN value of 39 mg/100g w.w., are both compliant. However, values like these indicate that the products has been exposed to improper conditions during harvest/catch, production, transport or storage. As seen in the sections above, these conditions did not compromise the microbiological safety of the samples.

3.3 Parasites

Parasitological examinations were carried out on 53 fish samples (Annex 1, Table 2), and nematodes were found in five of them (9%). The fish were imported frozen, hence the nematodes were dead and not infective at the time of analysis. However, allergic symptoms may be triggered in sensitive individuals from dead as well as live nematodes. The highest numbers of nematodes, 10 and 11 nematodes, were found in two samples of saithe fillet imported from Russia.

3.4 Drug residues and dyes

Eleven samples originating from aquaculture were analysed for residues of prohibited veterinary medicines (unauthorised dyes and antibacterial agents) in 2017. The programme included the dye compounds crystal violet (CV), leuco crystal violet (LCV), malachite green (MG), leuco malachite green (LMG), brilliant green (BG), and the antibacterial agents chloramphenicol and nitrofuran metabolites. None unauthorised dyes were detected in any samples analysed, nor were any traces of chloramphenicol or nitrofuran detected. Details of analysed samples are given in Table 3 (unauthorised dyes) and Table 4 (antibacterial agents).

3.5 Oil authentication

No sample was selected for oil authentication in 2017.

3.6 Undesirable elements

The concentrations of the heavy metals arsenic, cadmium, lead and mercury were examined in 89 samples, selected by criteria intended to maximize the probability of finding non-compliant heavy metal concentrations. The analytical data is presented in Table 6.

In seafood, arsenic is mainly present as organo-metal chemical species of low toxicity, such as arsenobetaine and arsenolipids, This characteristic of marine foods set them apart from foods of

terrestrial origin, in which toxic inorganic arsenic species give a significant contribution to the elemental arsenic concentration Thus, no relevant maximum level on elemental As was in place for the samples analysed. The observed 2017 values for elemental As were all within a range that may occasionally be observed also in seafood from pristine waters.

All 2017 samples were compliant with their respective Cd maximum limits. Sample 2017-2087, baby shrimp imported from Thailand (0.56 mg/kg w.w.), was analytically above its maximum level (0.50 mg/kg w.w.), though was classified as compliant after the uncertainty of the chemical analytical method (±20% at this level) was taken into account in accordance with the EU regulation. In sample 2097-1997/3 of dried squid from Thailand, a value of 1.4 mg/kg based on dry weight was found. However, according to the EU regulation, the maximum level applies to wet samples and the sample was compliant considering the water content of fresh and moist squid.

A significant part of the elemental Hg in seafood is present as the chemical species methyl-mercury, a compound with a toxic character. Thus, there are maximum levels for elemental Hg for most of the analysed samples (Appendix 3). All 2017 data were compliant with their EU maximum levels. One swordfish imported from Sri Lanka, sample 2017-408, measured to 1.1 mg/kg w.w., was technically above its maximum limit (1.0 mg/kg w.w.). However, it was classified compliant after the uncertainty of the chemical analytical method (±20% at this level) was taken into account.

All 2017 Pb data were compliant with their respective maximum levels.

3.7 Persistent organic pollutants (POPs)

A selection of the most relevant samples were analysed for dioxins (PCDDs), furans (PCDFs) dioxin-like PCBs (DL-PCBs), non-dioxin-like PCBs (NDLPCBs, EU-PCB6 or "indicator" PCBs), polybrominated flame-retardants (PBDEs), chlorinated pesticides and PAHs. A summary of the relevant maximum levels is provided in Appendix 3. The PCDDs, PCDFs, DL-PCBs and the NDLPCBs

3.7.1 The PCDDs, PCDFs, DL-PCBs and the NDLPCBs

The sum values of DLPCBs, the sum of PCDD+DFs and the sum of the NDLPCBs, for each of the analysed samples are listed in Table 6. The maximum levels are defined in terms of these Upper bound[1] sum-parameters. Note that the sum-parameter NDLPCBs is provided as the summed analytical values in the scale ng/g w.w. while the other sum-parameters are provided in the TEQ pg/g w.w. scale (toxic equivalents), in effect summing toxicities rather than their analytical concentrations.[2] This choice of scale is in line with the scales used for the EU maximum levels.

Twenty nine samples were selected for analysis for criteria targeting the maximum POPS related risk. The analytical data-derived sum-parameters are listed in Table 7. All 2017 samples were compliant with their respective maximum levels, with regard to PCDDs/PCDFs, DLPCBs, total sum of TEQ and NDLPCBs.

3.7.2 Polybrominated diphenyl ethers (PBDE)

PBDEs are flame-retardant compounds found in plastics, textiles, electronic castings and circuitry. As these products age and eventually are discarded, the PBDEs finds their way into the environment and from there, into biota and into food and feed. The EU recommends a monitoring of the PBDE compound class[3]. However it is currently not considered troublesome enough to warrant the establishment of regulatory maximum levels in seafood.: None of the measured 2017-results stands out with analytical results of food safety concern. The data for individual PBDE congeners (PBDE-

[1] Upper bound sum is defined in Commission regulation 1881/2006, footnote 32, and Commission regulation (EU) No. 1259/2011 amending Regulation (EC) No. 1881/2006 as regards maximum levels for dioxins, dioxin-like PCBs and non dioxin-like PCBs in foodstuffs.
[2] TEQ is defined in Commission regulation 1881/2006, footnote 31.
[3] Commission recommendation 2014/118/EU

28, 47, 99, 100, 153, 154 and 183) and their upper bound sum (PBDE7) for the twenty nine samples are listed in Table 8.

3.7.3 Polyaromatic hydrocarbons, PAH

PAH-compounds are formed from incomplete combustion of organic matter. In food processing PAHs may be formed in the product as unwanted by-products from over-heating. A few PAH compounds have been found to exhibit food safety issues, and maximum levels are in place (Appendix 3) for Benzo(a)pyrene (BaP) alone, as well as for the lower bound[4] sum (LB-sum) of four PAH compounds BaP, Benzo(a) anthracene, Benzo(b)fluoranthene and chrysene (LB-sum PAH_4. Note BaP is also one of the four summed compounds.

Eleven samples were selected for analysis. Twenty individual PAH compounds were measured. The BaP and sum PAH_4 results, for which maximum limits are in place, are listed in Table 9. The four compounds were below the analytical method's limits of quantification (LOQ) in all samples. Thus, the lower bound sum PAH_4 were calculated to a zero value in each sample. Also, in the table the "values" for BaP are indicated by <value, which is the BaP LOQ value related to that sample. Also, for most of the other analysed PAH compounds, those not listed in the table, the levels were below their respective LOQ values, indicative of a general low food related level of PAH exposure from these samples.

[4] Lower bound sum is defined in Commission regulation 1881/2006, footnote 45.

4 Conclusion

In total 137 samples, collected by the official staff at the Norwegian Border Inspection Posts of the Norwegian Food Safety Authority, were examined for selected chemical, microbiological and/or parasitological undesirables in 2017.

The results for microbiological quality parameters and indicator organisms for faecal contamination generally showed low numbers in the 116 examined samples. However, higher counts were found in some samples. Two samples imported from Thailand had high coliform and thermotolerant coliform counts; one sample of Atlantic cod had 560 coliforms/g and 1600 thermotolerant coliform/g, and one sample of marinated eel had 330 coliforms/g and 30 thermotolerant coliform/g. Further, one sample of seasoned cuttlefish imported from Thailand had high counts of sulphite-reducing bacteria and enterococci, 5100 cfu/g and 400 cfu/g, respectively. One sample harboured 20 cfu/g *L. monocytogenes*, but no samples had pathogens in the genera *Salmonella*. Enterobacteriaceae were detected in three samples of surimi, two samples imported from USA and one sample from Vietnam.

Yeast and moulds were detected in two samples of seasoned cuttlefish imported from Thailand, the counts of yeast were 4000 and 50000 cfu/g, respectively, and the counts of moulds in both samples were 400 cfu/g.

Parasitological examinations were carried out on 53 fish samples, and nematodes were found in five samples (9 %). The nematodes were dead and not infective at the time of analysis. However, an allergic response might be triggered in some consumers also from dead as well as live nematodes.

Products originating from global aquaculture were examined for residues of selected prohibited pharmaceuticals. The programme included the dye compounds crystal violet, leuco crystal violet, malachite green, leuco malachite green and brilliant green, and also the antibacterial agents chloramphenicol and nitrofuran metabolites. No unauthorised dyes, nor residues of prohibited antibacterial agents were detected.

The chemical spoilage indicators histamine and total volatile basic nitrogen (TVBN) were examined in twenty and twenty-five samples, respectively. Some of the analysed samples had been exposed to improper conditions. However, not to the extent that affected their food safety.

The heavy metals were measured in terms of their elemental concentrations in eighty-nine samples, selected to target food safety issues. All of the analysed samples were found compliant with regard to their maximum limits for cadmium (Cd), lead (Pb) and mercury (Hg). There is no maximum limit for arsenic (As) in seafood, reflecting the low toxicity of marine As-containing chemical species. The measured elemental As values were all within a range commonly observed in seafood.

For POPS compounds, twenty-nine samples were analysed for dioxins and furans (PCDD and PCDF), for PCBs, including the twelve dioxin like PCBs (DLPCBs) and the six EU selected non-dioxin like PCBs (NDLPCB), and also for seven polybrominated diphenyl ethers (PBDEs). All samples were compliant with their maximum limits where such are presently established, and the remaining values were within ranges commonly found in seafood.

Eleven samples were selected for analysis of PAH compounds. Twenty different PAH compounds were measured. However, maximum limits were in effect only for Banzo(a)pyrene (BaP) and the sum of BaP, Benzo(a) anthracene, Benzo(b)fluoranthene and chrysene (the LB-sum PAH_4)[5]. All samples were compliant with their maximum limits. Most individual PAH results were below their method limit of quantification, indicating low levels of PAH.

[5] LB sum is defined in Commission regulation 1881/2006, footnote 45

ANNEX 1: Data tables

Table 1. Microbiological examination, n=116.

Abbreviations: n.d.: not detected; **D**: detected; **n.a.**: not available; **TNC**: Too numerous to count (>10^8); **CFU**: Colony forming units; **H_2SPB**: H_2S producing bacteria; **PC**: Plate count, **Ent.**: Enterobacteriaceae.

						Aerobe PC (cfu/g) agar method			Indicator organisms (cfu/g) by agar method			Faecal indicator organisms (cfu/g) by agar method			Specific pathogens		
						30°C	20°C										
						Aerobes	PC	H_2SPB	*Enterococcus*	*Coag. pos. Staphylococcus*	Sulph.-red. bact.	Ent.	Coliforms	Thermotolerant coliforms	*Listeria monocytogenes*	*Salmonella*	*Vibrio*
Journal No.	**Origin**	**Product**	**Scientific name**	**Sample material**	**Incubation test**	**/g**	**/g**	**/g**	**/g**	**/g**	**/g**	**/g**	**/g**	**/g**	**/25 g**	**/25 g**	**/20 g**
2017-61/1	Japan	Japanese amberjack	*Seriola quinqueradiata*	Muscle/skin					<100				<10	<10	n.d.	n.d.	
2017-62/1	Japan	Japanese amberjack	*Seriola quinqueradiata*	Muscle/skin					<100				<10	<10	n.d.	n.d.	
2017-63/1	Australia	Yellowtail	*Seriola lalandi*	Muscle/skin					<100				40	<10	n.d.	n.d.	
2017-64/1	Sri Lanka	Swordfish	*Xiphias gladius*	Fillet/muscle					<100				<10	<10	n.d.	n.d.	
2017-65/1	Sri Lanka	Yellowfin tuna	*Thunnus albacares*	Fillet/muscle					<100				<10	<10	n.d.	n.d.	
2017-66/1	Sri Lanka	Swordfish	*Xiphias gladius*	Fillet/muscle					<100				<10	10	n.d.	n.d.	
2017-67/1	Sri Lanka	Yellowfin tuna	*Thunnus albacares*	Fillet/muscle					<100				<10	<10	n.d.	n.d.	
2017-115/1	Russian Federation	Haddock	*Melanogrammus aeglefinus*	Muscle/skin					<100				<10	<10	n.d.	n.d.	
2017-119/1	Canada	European lobster	*Homarus gammarus*	Whole					<100				<10	<10	n.d.	n.d.	n.d.
2017-255/1	Russian Federation	Atlantic cod	*Gadus morhua*	Fillet/muscle					<100				<10	<10	n.d.	n.d.	
2017-321/1	Japan	Fish feed, processed	Unknown	Fishmeal								<10		<10		n.d.	
2017-393/1	Russian Federation	Atlantic cod	*Gadus morhua*	Liver					<100		1000		<10	<10	n.d.	n.d.	

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Journal No.	**Origin**	**Product**	**Scientific name**	**Sample material**	**Incubation test**	**/g**	**/g**	**/g**	**/g**	**/g**	**/g**	**/g**	**/g**	**/g**	**/25 g**	**/25 g**	**/20 g**
2017-394/1	Peru	Oil, anchovy	*Engraulis ringens*	Anchovy oil							<100			<10		n.d.	
2017-395/1	Peru	Oil, anchovy	*Engraulis ringens*	Anchovy oil							<100			<10		n.d.	
2017-402/1	Maldives	Yellowfin tuna	*Thunnus albacares*	Fillet/muscle					<100				20	<10	n.d.	n.d.	
2017-406/1	Thailand	Processed seafood product	*Gadus macrocephalus*	Fillet/muscle, battered					200				<10	<10	n.d.	n.d.	
2017-407/1	Thailand	Pacific Cod	*Gadus macrocephalus*	Fillet/muscle					300				<10	<10	n.d.	n.d.	
2017-408/1	Sri Lanka	Swordfish	*Xiphias gladius*	Fillet/muscle					<100				<10	<10	n.d.	n.d.	
2017-409/1	Sri Lanka	Yellowfin tuna	*Thunnus albacares*	Fillet/muscle					<100				<10	<10	n.d.	n.d.	
2017-410/1	USA	Processed seafood product	*Merluccius productus*	Surimi						<100			<10	<10		n.d.	
2017-449/1	USA	Scallops	*Placopecten magellanicus*	Muscle					<100					<10	n.d.	n.d.	n.d.
2017-450/1	New Zealand	Green-lipped mussel	*Perna canalicula*	Muscle					<100					<10	n.d.	n.d.	n.d.
2017-629/1	Maldives	Yellowfin tuna	*Thunnus albacares*	Fillet/muscle					<100				<10	<10	n.d.	n.d.	
2017-645/1	Russian Federation	Atlantic cod	*Gadus morhua*	Fillet/muscle					<100				<10	<10	n.d.	n.d.	
2017-646/1	Russian Federation	Saithe	*Pollachius virens*	Fillet/muscle					<100				<10	<10	n.d.	n.d.	
2017-805/1	Philippines	Processed seafood product	*Sardina pilchardus*	Canned sardines, in tomatoes	Negative	< 10											
2017-807/1	China	Atlantic cod	*Gadus morhua*	Fillet/muscle					<100				<10	<10	n.d.	n.d.	
2017-808/1	China	Atlantic cod	*Gadus morhua*	Fillet/muscle					<100				<10	<10	n.d.	n.d.	
2017-813/1	China	Oil, tuna	*Thunnus* sp.	Fish oil							<100			<10		n.d.	

Table 1. Microbiological examination, n=116.

Abbreviations: n.d.: not detected; **D**: detected; **n.a.**: not available; **TNC**: Too numerous to count (>10^8); **CFU**: Colony forming units; **H_2SPB**: H_2S producing bacteria; **PC**: Plate count, **Ent.**: Enterobacteriaceae.

						Aerobe PC (cfu/g) agar method			Indicator organisms (cfu/g) by agar method			Faecal indicator organisms (cfu/g) by agar method			Specific pathogens		
						30°C	20°C										
						Aerobes	PC	H_2SPB	*Enterococcus*	Coag. pos. *Staphylococcus*	Sulph.-red. bact.	Ent.	Coliforms	Thermotolerant coliforms	*Listeria monocytogenes*	*Salmonella*	*Vibrio*
Journal No.	**Origin**	**Product**	**Scientific name**	**Sample material**	**Incubation test**	**/g**	**/g**	**/g**	**/g**	**/g**	**/g**	**/g**	**/g**	**/g**	**/25 g**	**/25 g**	**/20 g**
2017-814/1	USA	Oil, cod	*Gadus morhua*	Fish oil							<100			<10		n.d.	
2017-815/1	Philippines	Processed seafood product	*Acetes* sp.	Paste, shrimp	Negative	< 10											
2017-815/2	Philippines	Processed seafood product	*Acetes* sp.	Paste, shrimp	Negative	< 10											
2017-815/3	Philippines	Processed seafood product	*Acetes* sp.	Paste, shrimp	Negative	< 10											
2017-817/1	Thailand	Processed seafood product	*Portunus pelagicus*	Crab meat	Negative	< 10											
2017-818/1	Thailand	Processed seafood product	*Decapterus* sp.	Canned, mackerel	Negative	< 10											
2017-819/1	Thailand	Processed seafood product	*Acetes* sp.	Paste, shrimp						<100		<10				n.d.	
2017-820/1	Thailand	Processed seafood product	*Stolephorus* sp.	Fish sauce							<100			<10		n.d.	
2017-821/1	Philippines	Processed tuna	*Katsuwonus pelamis*	Canned tuna, in water	Negative	< 10											
2017-823/1	Thailand	Processed tuna	*Katsuwonus pelamis*	Paste/extract, tuna						<100		<10				n.d.	
2017-829/1	Thailand	Processed tuna	*Katsuwonus pelamis*	Canned tuna, in sunflower oil	Negative	< 10											
2017-830/1	Thailand	Processed tuna	*Katsuwonus pelamis*	Canned tuna (gelé)	Negative	< 10											
2017-831/1	Thailand	Processed seafood product	*Decapterus* sp.	Canned, mackerel	Negative	< 10											
2017-1011/1	Russian Federation	Saithe	*Pollachius virens*	Fillet/muscle					<100				<10	<10	n.d.	n.d.	
2017-1145/1	Russian Federation	Saithe	*Pollachius virens*	Fillet/muscle					<100				<10	<10	n.d.	n.d.	
2017-1146/1	Russian Federation	Haddock	*Melanogrammus aeglefinus*	Fillet/muscle					<100				<10	<10	n.d.	n.d.	

Table 1. Microbiological examination, n=116.

Abbreviations: n.d.: not detected; **D**: detected; **n.a.**: not available; **TNC**: Too numerous to count (>10^8); **CFU**: Colony forming units; **H_2SPB**: H_2S producing bacteria; **PC**: Plate count, **Ent.**: Enterobacteriaceae.

						Aerobe PC (cfu/g) agar method			Indicator organisms (cfu/g) by agar method			Faecal indicator organisms (cfu/g) by agar method			Specific pathogens		
						30°C	20°C										
						Aerobes	PC	H_2SPB	*Enterococcus*	*Coag. pos. Staphylococcus*	Sulph.-red. bact.	Ent.	Coliforms	Thermotolerant coliforms	*Listeria monocytogenes*	*Salmonella*	*Vibrio*
Journal No.	**Origin**	**Product**	**Scientific name**	**Sample material**	**Incubation test**	**/g**	**/g**	**/g**	**/g**	**/g**	**/g**	**/g**	**/g**	**/g**	**/25 g**	**/25 g**	**/20 g**
2017-1147/1	Russian Federation	Saithe	*Pollachius virens*	Fillet/muscle					<100				<10	<10	n.d.	n.d.	
2017-1148/1	Russian Federation	Atlantic cod	*Gadus morhua*	Fillet/muscle					<100				<10	<10	n.d.	n.d.	
2017-1172/1	Thailand	Processed tuna	*Katsuwonus pelamis*	Canned tuna, in sunflower oil	Negative	< 10											
2017-1265/1	Japan	Processed seafood product		Surimi, whitefish						<100		<10				n.d.	
2017-1266/1	China	Atlantic cod	*Gadus morhua*	Fillet/muscle					<100				<10	<10	n.d.	n.d.	
2017-1267/1	Thailand	Indian anchovy	*Stolephorus indicus*	Whole fish					<100	<100	<100		<10	<10		n.d.	
2017-1268/1	China	Atlantic cod	*Gadus morhua*	Fillet/muscle					<100	<100	<100		<10	<10		n.d.	
2017-1269/1	China	Alaska pollock	*Theragra chalcogramma*	Fillet/muscle					<100				<10	<10	n.d.	n.d.	
2017-1270/1	China	Alaska pollock	*Theragra chalcogramma*	Fillet/muscle					<100	<100	<100		<10	<10		n.d.	
2017-1271/1	Canada	Powder	*Pandalus borealis*	Shrimp powder								<10		<10		n.d.	
2017-1273/1	Myanmar	Processed seafood product	*Macruronus novaezelandiae*	Fillet/muscle, battered					<100	<100	<100			<10	n.d.	n.d.	
2017-1301/1	Korea	Pacific oyster	*Crassostrea gigas*	Muscle					<100						n.d.	n.d.	n.d.
2017-1375/1	Japan	Japanese amberjack	*Seriola quinqueradiata*	Muscle/Skin					<100				<10	<10	n.d.	n.d.	
2017-1377/1	Japan	Japanese amberjack	*Seriola quinqueradiata*	Muscle/Skin					<100				<10	<10	n.d.	n.d.	
2017-1378/1	Sri Lanka	Yellowfin tuna	*Thunnus albacares*	Fillet/muscle					<100				<10	<10	n.d.	n.d.	
2017-1388/1	Philippines	Yellowfin tuna	*Thunnus albacares*	Fillet/muscle					<100				<10	<10	n.d.	n.d.	
2017-1480/1	Vietnam	Processed seafood product	*Cancer pagurus*	Claw meat						<100	<100			<10		n.d.	n.d.

Table 1. Microbiological examination, n=116.

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						Aerobe PC (cfu/g) agar method			Indicator organisms (cfu/g) by agar method			Faecal indicator organisms (cfu/g) by agar method			Specific pathogens		
						30°C	20°C										
						Aerobes	PC	H_2SPB	*Enterococcus*	Coag. pos. *Staphylococcus*	Sulph.-red. bact.	Ent.	Coliforms	Thermotolerant coliforms	*Listeria monocytogenes*	*Salmonella*	*Vibrio*
Journal No.	**Origin**	**Product**	**Scientific name**	**Sample material**	**Incubation test**	**/g**	**/g**	**/g**	**/g**	**/g**	**/g**	**/g**	**/g**	**/g**	**/25 g**	**/25 g**	**/20 g**
2017-1481/1	Canada	Lobster, American	*Homarus americanus*	Whole, in brine						<100	<100			<10		n.d.	n.d.
2017-1482/1	Vietnam	Processed seafood product	*Pangasius* sp.	Fillet/muscle, battered						<100		<10				n.d.	
2017-1483/1	USA	Processed seafood product	*Theragra chalcogramma*	Surimi						<100		<10				n.d.	
2017-1484/1	USA	Processed seafood product	*Theragra chalcogramma*	Surimi						<100		590				n.d.	
2017-1485/1	China	Saithe	*Pollachius virens*	Fillet/muscle					<100				<10	<10	n.d.	n.d.	
2017-1486/1	Vietnam	Processed seafood product	*Cypselurus poecilopterus*	Surimi						<100		20				n.d.	
2017-1487/1	Sri Lanka	Yellowfin tuna	*Thunnus albacares*	Fillet/muscle					<100				<10	<10	n.d.	n.d.	
2017-1487/2	Sri Lanka	Yellowfin tuna	*Thunnus albacares*	Fillet/muscle					<100				20	<10	n.d.	n.d.	
2017-1505/1	China	Pacific saury	*Cololabis Saira*	Whole					<100				<10	<10	n.d.	n.d.	
2017-1507/1	Taiwan	Pacific saury	*Cololabis Saira*	Whole					<100				<10	<10	n.d.	n.d.	
2017-1648/1	Maldives	Yellowfin tuna	*Thunnus albacares*	Fillet/muscle					<100				<10	<10	n.d.	n.d.	
2017-1649/1	New Zealand	Powder	*Galeorhinus galeus*	School shark powder								<10		<10		n.d.	
2017-1739/1	Argentina	Argentine red shrimp	*Pleoticus muelleri*	Shrimp tail					<100				<10	<10	n.d.	n.d.	n.d.
2017-1740/1	Taiwan	Purpleback squid	*Sthenoteuthis oualaniensis*	Whole					300				<10	<10	n.d.	n.d.	
2017-1746/1	Russian Federation	Atlantic cod	*Gadus morhua*	Fillet/muscle					<100				<10	<10	n.d.	n.d.	
2017-1747/1	Russian Federation	Atlantic cod	*Gadus morhua*	Fillet/muscle					<100				<10	<10	n.d.	n.d.	
2017-1770/1	Japan	Red seabream	*Pagrus major*	Fillet/muscle					300				<10	<10	n.d.	n.d.	

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						Aerobe PC (cfu/g) agar method			Indicator organisms (cfu/g) by agar method			Faecal indicator organisms (cfu/g) by agar method			Specific pathogens		
						30°C	20°C										
						Aerobes	PC	H_2SPB	*Enterococcus*	Coag. pos. *Staphylococcus*	Sulph.-red. bact.	Ent.	Coliforms	Thermotolerant coliforms	*Listeria monocytogenes*	*Salmonella*	*Vibrio*
Journal No.	**Origin**	**Product**	**Scientific name**	**Sample material**	**Incubation test**	**/g**	**/g**	**/g**	**/g**	**/g**	**/g**	**/g**	**/g**	**/g**	**/25 g**	**/25 g**	**/20 g**
2017-1868/1	Russian Federation	Greenland halibut	*Reinhardtius hippoglossoides*	Whole					<100				<10	<10	n.d.	n.d.	
2017-1890/1	Sri Lanka	Swordfish	*Xiphias gladius*	Muscle/Skin					<100				<10	<10	n.d.	n.d.	
2017-1997/1	Thailand	Processed seafood product	*Sepia pharonis*	Seasoned cuttlefish					300		<100		<10	<10		n.d.	
2017-1997/2	Thailand	Processed seafood product	*Sepia pharonis*	Seasoned cuttlefish					100		<100		20	<10		n.d.	
2017-1997/3	Thailand	Processed seafood product	*Sepia pharonis*	Seasoned cuttlefish					400		5100		<10	<10		n.d.	
2017-1997/4	Thailand	Processed seafood product	*Sepia pharonis*	Seasoned cuttlefish					<100		<100		10	<10		n.d.	
2017-1998/1	Canada	Lobster, American	*Homarus americanus*	Whole						<100	<100			<10		n.d.	
2017-1999/1	Thailand	Atlantic cod	*Gadus morhua*	Fillet/muscle					1600				560	<10	n.d.	n.d.	
2017-2001/1	New Zealand	Green-lipped mussel	*Perna canalicula*	Muscle						<100	<100			<10		n.d.	n.d.
2017-2002/1	USA	Processed seafood product	*Theragra chalcogramma*	Surimi						<100		450				n.d.	
2017-2003/1	Thailand	Processed seafood product	*Rastrelliger brachysoma*	Whole, steamed						<100			<10	<10	n.d.	n.d.	
2017-2004/1	Mauritius	Yellowfin tuna	*Thunnus albacares*	Fillet/muscle					100				<10	<100	n.d.	n.d.	
2017-2004/2	Mauritius	Yellowfin tuna	*Thunnus albacares*	Fillet/muscle					<100				<10	<100	n.d.	n.d.	
2017-2004/3	Mauritius	Yellowfin tuna	*Thunnus albacares*	Fillet/muscle					<100				<10	<100	n.d.	n.d.	
2017-2005/1	Philippines	Processed tuna	*Katsuwonus pelamis*	Canned tuna, in water	Negative	< 10											
2017-2006/1	Thailand	Processed tuna	*Katsuwonus pelamis*	Canned tuna	Negative	< 10											

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						Aerobe PC (cfu/g) agar method			Indicator organisms (cfu/g) by agar method			Faecal indicator organisms (cfu/g) by agar method			Specific pathogens		
						30°C	20°C										
						Aerobes	PC	H_2SPB	*Enterococcus*	Coag. pos. *Staphylococcus*	Sulph.-red. bact.	Ent.	Coliforms	Thermotolerant coliforms	*Listeria monocytogenes*	*Salmonella*	*Vibrio*
Journal No.	**Origin**	**Product**	**Scientific name**	**Sample material**	**Incubation test**	**/g**	**/g**	**/g**	**/g**	**/g**	**/g**	**/g**	**/g**	**/g**	**/25 g**	**/25 g**	**/20 g**
2017-2007/1	Morocco	Processed seafood product	*Sardina pilchardus*	Canned sardines, in oil	Negative	< 10											
2017-2009/1	Thailand	Processed seafood product	*Katsuwonus pelamis*	Tuna extract							<100			<10		n.d.	
2017-2018/1	USA	Oil	*Gadus morhua*	Fish oil							<100			<10		n.d.	
2017-2020/1	Thailand	Sushi	*Nemipterus japonicus*	Surimi, avocado					<100		<100			<10	n.d.	n.d.	
2017-2020/2	Thailand	Sushi	*Salmo salar*, *Penaeus vannamei*	Sushi burger					<100		<100			<10	n.d.	n.d.	
2017-2022/1	Thailand	Processed seafood product	*Scomber scombrus*	Fillet/muscle, grilled					<100		<100			<10	n.d.	n.d.	
2017-2023/1	Thailand	Processed seafood product	*Salmo salar*	Fillet/muscle, grilled						<100			<10	<10	n.d.	n.d.	
2017-2024/1	Philippines	Processed seafood product	*Spatelloides gracilis*	Fish sauce, Monamon-dilis	Negative	< 10											
2017-2025/1	Thailand	Processed seafood product	*Anguilla japonica*	Fillet/muscle, grilled						<100			330	30	n.d.	n.d.	
2017-2047/1	Canada	Lobster, American	*Homarus americanus*	White meat					<100				<10	<10	n.d.	n.d.	n.d.
2017-2050/1	Maldives	Yellowfin tuna	*Thunnus albacares*	Fillet/muscle					<100				<10	<10	n.d.	n.d.	
2017-2051/1	Japan	Yellowtail	*Seriola spp*	Fillet/muscle					<100				<10	<10	n.d.	n.d.	
2017-2057/1	Thailand	Processed seafood product	*Litopenaeus vannamei*	Scampi, spring rolls					<100		<100			<10	n.d.	n.d.	
2017-2087/1	Thailand	Marble shrimps	*Acetes sp.*	Whole, freeze dried								<10		<10		n.d.	
2017-2088/1	China	Atlantic cod	*Gadus morhua*	Fillet/muscle						<100			<10	<10	n.d.	n.d.	
2017-2089/1	China	Processed seafood product	*Macruronus novaezelandiae*	Fillet/muscle, battered					<100				<10	<10	500	n.d.	
2017-2090/1	China	Atlantic cod	*Gadus morhua*	Fillet/muscle					<100				<10	<10	n.d.	n.d.	

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						Aerobe PC (cfu/g) agar method			Indicator organisms (cfu/g) by agar method			Faecal indicator organisms (cfu/g) by agar method			Specific pathogens		
						30°C	20°C										
						Aerobes	PC	H_2SPB	*Enterococcus*	Coag. pos. *Staphylococcus*	Sulph.-red. bact.	Ent.	Coliforms	Thermotolerant coliforms	*Listeria monocytogenes*	*Salmonella*	*Vibrio*
Journal No.	**Origin**	**Product**	**Scientific name**	**Sample material**	**Incubation test**	**/g**	**/g**	**/g**	**/g**	**/g**	**/g**	**/g**	**/g**	**/g**	**/25 g**	**/25 g**	**/20 g**
2017-2091/1	China	Alaska pollock	*Theragra chalcogramma*	Fillet/muscle					<100				<10	<10	n.d.	n.d.	
2017-2092/1	Turkey	Oil, fish	Unknown	Fish oil							<100			<10		n.d.	
2017-2093/1	Thailand	Oil, tuna	*Thunnus albacares*	Tuna oil							<100			<10		n.d.	
2017-2094/1	China	Dried & salted cod	*Gadus macrocephalus*	Fillet/muscle, klippfisk					<100	<100	<100		<10	<10	n.d.	n.d.	

Table 2. Nematodes, n=53.						
Journal No.	**Imported from**	**Product group**	**Species**	**Scientific name**	**Tissue**	**# Nematodes**
2017-61/1	Japan	Marine fish	Japanese amberjack	*Seriola quinqueradiata*	Fillet/muscle w/skin	0
2017-62/1	Japan	Marine fish	Japanese amberjack	*Seriola quinqueradiata*	Fillet/muscle w/skin	0
2017-63/1	Australia	Marine fish	Yellowtail amberjack	*Seriola lalandi*	Fillet/muscle w/skin	0
2017-64/1	Sri Lanka	Marine fish	Swordfish	*Xiphias gladius*	Fillet/muscle	0
2017-65/1	Sri Lanka	Marine fish	Yellowfin tuna	*Thunnus albacares*	Fillet/muscle	0
2017-66/1	Sri Lanka	Marine fish	Swordfish	*Xiphias gladius*	Fillet/muscle	0
2017-67/1	Sri Lanka	Marine fish	Yellowfin tuna	*Thunnus albacares*	Fillet/muscle	0
2017-115/1	Russian Federation	Marine fish	Haddock	*Melanogrammus aeglefinus*	Fillet/muscle w/skin	0
2017-255/1	Russian Federation	Marine fish	Atlantic cod	*Gadus morhua*	Fillet/muscle	2
2017-402/1	Maldives	Marine fish	Yellowfin tuna	*Thunnus albacares*	Fillet/muscle	0
2017-406/1	Thailand	Marine fish	Pacific cod	*Gadus macrocephalus*	Fillet/muscle, processed	1
2017-407/1	Thailand	Marine fish	Pacific cod	*Gadus macrocephalus*	Fillet/muscle	0
2017-408/1	Sri Lanka	Marine fish	Swordfish	*Xiphias gladius*	Fillet/muscle	0
2017-409/1	Sri Lanka	Marine fish	Yellowfin tuna	*Thunnus albacares*	Fillet/muscle	0
2017-629/1	Maldives	Marine fish	Yellowfin tuna	*Thunnus albacares*	Fillet/muscle	0
2017-645/1	Russian Federation	Marine fish	Atlantic cod	*Gadus morhua*	Fillet/muscle	2
2017-646/1	Russian Federation	Marine fish	Saithe	*Pollachius virens*	Fillet/muscle	0
2017-807/1	China	Marine fish	Atlantic cod	*Gadus morhua*	Fillet/muscle	0

Table 2. Nematodes, n=53.						
Journal No.	**Imported from**	**Product group**	**Species**	**Scientific name**	**Tissue**	**# Nematodes**
2017-808/1	China	Marine fish	Atlantic cod	*Gadus morhua*	Fillet/muscle	0
2017-1011/1	Russian Federation	Marine fish	Saithe	*Pollachius virens*	Fillet/muscle	10
2017-1145/1	Russian Federation	Marine fish	Saithe	*Pollachius virens*	Fillet/muscle	0
2017-1146/1	Russian Federation	Marine fish	Haddock	*Melanogrammus aeglefinus*	Fillet/muscle	0
2017-1147/1	Russian Federation	Marine fish	Saithe	*Pollachius virens*	Fillet/muscle	11
2017-1148/1	Russian Federation	Marine fish	Atlantic cod	*Gadus morhua*	Fillet/muscle	0
2017-1266/1	China	Marine fish	Atlantic cod	*Gadus morhua*	Fillet/muscle	0
2017-1269/1	China	Marine fish	Alaska pollock	*Theragra chalcogramma*	Fillet/muscle	0
2017-1375/1	Japan	Marine fish	Japanese amberjack	*Seriola quinqueradiata*	Fillet/muscle w/skin	0
2017-1377/1	Japan	Marine fish	Japanese amberjack	*Seriola quinqueradiata*	Fillet/muscle w/skin	0
2017-1378/1	Sri Lanka	Marine fish	Yellowfin tuna	*Thunnus albacares*	Fillet/muscle	0
2017-1388/1	Philippines	Marine fish	Yellowfin tuna	*Thunnus albacares*	Fillet/muscle	0
2017-1485/1	China	Marine fish	Saithe	*Pollachius virens*	Fillet/muscle	0
2017-1505/1	China	Marine fish	Pacific saury	*Cololabis Saira*	Whole	0
2017-1507/1	Taiwan	Marine fish	Pacific saury	*Cololabis Saira*	Whole	0
2017-1648/1	Maldives	Marine fish	Yellowfin tuna	*Thunnus albacares*	Fillet/muscle	0
2017-1740/1	Taiwan	Marine fish	Purpleback squid	*Sthenoteuthis oualaniensis*	Whole	0
2017-1746/1	Russian Federation	Marine fish	Atlantic cod	*Gadus morhua*	Fillet/muscle	0
2017-1747/1	Russian Federation	Marine fish	Atlantic cod	*Gadus morhua*	Fillet/muscle	0

Table 2. Nematodes, n=53.						
Journal No.	**Imported from**	**Product group**	**Species**	**Scientific name**	**Tissue**	**# Nematodes**
2017-1770/1	Japan	Marine fish	Red seabream	*Pagrus major*	Fillet/muscle	0
2017-1868/1	Russian Federation	Marine fish	Greenland halibut	*Reinhardtius hippoglossoides*	Whole	0
2017-1890/1	Sri Lanka	Marine fish	Swordfish	*Xiphias gladius*	Fillet/muscle	0
2017-1999/1	Thailand	Marine fish	Atlantic cod	*Gadus morhua*	Muscle	0
2017-2003/1	Thailand	Marine fish	Indian mackerel	*Rastrelliger kanagurta*	Whole, processed	0
2017-2004/1	Mauritius	Marine fish	Yellowfin tuna	*Thunnus albacares*	Fillet/muscle	0
2017-2004/2	Mauritius	Marine fish	Yellowfin tuna	*Thunnus albacares*	Fillet/muscle	0
2017-2004/3	Mauritius	Marine fish	Yellowfin tuna	*Thunnus albacares*	Fillet/muscle	0
2017-2023/1	Thailand	Marine fish	Atlantic salmon	*Salmo salar*	Fillet/muscle, processed	0
2017-2025/1	Thailand	Marine fish	Eel	*Anguilla japonica*	Fillet/muscle, processed	0
2017-2050/1	Maldives	Marine fish	Yellowfin tuna	*Thunnus albacares*	Fillet/muscle	0
2017-2051/1	Japan	Marine fish	Yellowtail	*Seriola spp*	Fillet/muscle	0
2017-2088/1	China	Marine fish	Atlantic cod	*Gadus morhua*	Fillet/muscle	0
2017-2089/1	China	Marine fish	Hoki/blue hake	*Macruronus novaezelandiae*	Fillet/muscle, processed	0
2017-2090/1	China	Marine fish	Atlantic cod	*Gadus morhua*	Fillet/muscle	0
2017-2091/1	China	Marine fish	Alaska pollock	*Theragra chalcogramma*	Fillet/muscle	0

***Table 3. Residues of prohibited veterinary medicines*, Dyes, n=11.**										
n.d.: not detected, **CV**: crystal violet, **LCV**: leuco crystal violet, **MG**: malachite green **LMG**: leuco malachite green, **BG**: brilliant green										
Journal No.	**Imported from**	**Group**	**Species/ Presentation**	**Scientific name**	**Tissue**	**CV LOD: 0.3 µg/kg**	**LCV LOD: 0.15 µg/kg**	**MG LOD: 0.15 µg/kg**	**LMG LOD: 0.15 µg/kg**	**BG LOD: 0.15 µg/kg**
2017-61/2	Japan	Aquaculture	Japanese amberjack	*Seriola quinqueradiata*	Fillet /Muscle	n.d.	n.d.	n.d.	n.d.	n.d.
2017-62/2	Japan	Aquaculture	Japanese amberjack	*Seriola quinqueradiata*	Fillet /Muscle	n.d.	n.d.	n.d.	n.d.	n.d.
2017-63/2	Australia	Aquaculture	Yellowtail amberjack	*Seriola lalandi*	Fillet /Muscle	n.d.	n.d.	n.d.	n.d.	n.d.
2017-1375/2	Japan	Aquaculture	Japanese amberjack	*Seriola quinqueradiata*	Fillet /Muscle	n.d.	n.d.	n.d.	n.d.	n.d.
2017-1377/2	Japan	Aquaculture	Japanese amberjack	*Seriola quinqueradiata*	Fillet /Muscle	n.d.	n.d.	n.d.	n.d.	n.d.
2017-1770/1	Japan	Aquaculture	Red seabream	*Pagrus major*	Fillet /Muscle	n.d.	n.d.	n.d.	n.d.	n.d.
2017-2001/1	New Zealand	Aquaculture	Green-lipped mussel	*Perna canalicula*	Muscle	n.d.	n.d.	n.d.	n.d.	n.d.
2017-2023/1	Thailand	Aquaculture	Processed seafood product	*Salmo salar*	Fillet /Muscle	n.d.	n.d.	n.d.	n.d.	n.d.
2017-2025/1	Thailand	Aquaculture	Processed seafood product	*Anguilla japonica*	Fillet /Muscle	n.d.	n.d.	n.d.	n.d.	n.d.
2017-2051/1	Japan	Aquaculture	Yellowtail	*Seriola* spp.	Fillet /Muscle	n.d.	n.d.	n.d.	n.d.	n.d.
2017-2057/1	Thailand	Aquaculture	Processed seafood product	*Litopenaeus vannamei*	Spring rolls w/scampi	n.d.	n.d.	n.d.	n.d.	n.d.

Table 4. Residues of prohibited veterinary medicines, Antibacterial agents, n=11. Chloramphenicol and nitrofuran metabolites

CAM: chloramphenicol, **AHD**: 1-amino-hydantoin, **AOZ**: 3-amino-2-oxazolidinone, **AMOZ**: 3-amino-5-morpholinomethyl-2-oxazolidinone, **SEM**: semicarbazide

Journal No.	Imported from	Group	Product/ Presentation	Scientific name	Tissue	CAM LOD: 0.25 µg/kg	AHD LOD: 0.6 µg/kg	AOZ LOD: 0.5 µg/kg	AMOZ LOD: 0.4 µg/kg	SEM LOD: 0.5 µg/kg
2017-61/2	Japan	Aquaculture	Japanese amberjack	*Seriola quinqueradiata*	Fillet /Muscle	n.d.	n.d.	n.d.	n.d.	n.d.
2017-62/2	Japan	Aquaculture	Japanese amberjack	*Seriola quinqueradiata*	Fillet /Muscle	n.d.	n.d.	n.d.	n.d.	n.d.
2017-63/2	Australia	Aquaculture	Yellowtail amberjack	*Seriola lalandi*	Fillet /Muscle	n.d.	n.d.	n.d.	n.d.	n.d.
2017-1375/2	Japan	Aquaculture	Japanese amberjack	*Seriola quinqueradiata*	Fillet /Muscle	n.d.	n.d.	n.d.	n.d.	n.d.
2017-1377/2	Japan	Aquaculture	Japanese amberjack	*Seriola quinqueradiata*	Fillet /Muscle	n.d.	n.d.	n.d.	n.d.	n.d.
2017-1770/1	Japan	Aquaculture	Red seabream	*Pagrus major*	Fillet /Muscle	n.d.	n.d.	n.d.	n.d.	n.d.
2017-2001/1	New Zealand	Aquaculture	Green-lipped mussel	*Perna canalicula*	Muscle	n.d.	n.d.	n.d.	n.d.	n.d.
2017-2023/1	Thailand	Aquaculture	Processed seafood product	*Salmo salar*	Fillet /Muscle	n.d.	n.d.	n.d.	n.d.	n.d.
2017-2025/1	Thailand	Aquaculture	Processed seafood product	*Anguilla japonica*	Fillet /Muscle	n.d.	n.d.	n.d.	n.d.	n.d.
2017-2051/1	Japan	Aquaculture	Yellowtail	*Seriola* spp.	Fillet /Muscle	n.d.				
2017-2057/1	Thailand	Aquaculture	Processed seafood product	*Litopenaeus vannamei*	Spring rolls w/scampi	n.d.	n.d.	n.d.	n.d.	n.d.

***Table 5. Selected chemical spoilage indicators*, Histamine and total volatile basic nitrogen (TVBN)**						
Journal No.	**Imported from**	**Species**	**Scient. name**	**Tissue**	**Histamine n=20 mg/kg w.w.**	**TVBN n=25 mg/100g w.w.**
2017-214/1	Argentina	Argentine shortfin squid	*Illex argentinus*	Cephalopod meat		12.7
2017-1505/1	China	Pacific saury	*Cololabis Saira*	Fish fillet	< 5	
2017-1507/1	Taiwan	Pacific saury	*Cololabis Saira*	Fish fillet	< 5	
2017-407/2	Thailand	Pacific Cod	*Gadus macrocephalus*	Fish fillet		14.0
2017-255/1	Russian federation	Atlantic cod	*Gadus morhua*	Fish fillet		10.9
2017-807/1	China	Atlantic cod	*Gadus morhua*	Fish fillet		16.2
2017-808/1	China	Atlantic cod	*Gadus morhua*	Fish fillet		4.5
2017-1148/1	Russian federation	Atlantic cod	*Gadus morhua*	Fish fillet		15.9
2017-1268/1	China	Atlantic cod	*Gadus morhua*	Fish fillet		8.8
2017-1146/1	Russian federation	Haddock	*Melanogrammus aeglefinus*	Fish fillet		16.4
2017-1011/1	Russian federation	Saithe	*Pollachius virens*	Fish fillet		9.8
2017-1145/1	Russian federation	Saithe	*Pollachius virens*	Fish fillet		16.6
2017-1147/1	Russian federation	Saithe	*Pollachius virens*	Fish fillet		17.2
2017-63/2	Australia	Yellowtail	*Seriola lalandi*	Fish fillet	<5	17
2017-61/2	Japan	Japanese amberjack	*Seriola quinqueradiata*	Fish fillet	<5	17
2017-62/2	Japan	Japanese amberjack	*Seriola quinqueradiata*	Fish fillet	<5	16

***Table 5. Selected chemical spoilage indicators*, Histamine and total volatile basic nitrogen (TVBN)**						
Journal No.	**Imported from**	**Species**	**Scient. name**	**Tissue**	**Histamine n=20 mg/kg w.w.**	**TVBN n=25 mg/100g w.w.**
2017-1269/1	China	Alaska pollock	*Theragra chalcogramma*	Fish fillet		14.0
2017-65/1	Sri Lanka	Yellowfin tuna	*Thunnus albacares*	Fish fillet	< 5	20
2017-67/1	Sri Lanka	Yellowfin tuna	*Thunnus albacares*	Fish fillet	< 5	26
2017-402/2	Maldives	Yellowfin tuna	*Thunnus albacares*	Fish fillet		21.7
2017-409/2	Sri Lanka	Yellowfin tuna	*Thunnus albacares*	Fish fillet		22.1
2017-629/1	Maldives	Tuna	*Thunnus albacares*	Fish fillet	<5	21
2017-1487/1	Sri Lanka	Tuna	*Thunnus albacares*	Fish fillet	< 5	
2017-1487/2	Sri Lanka	Tuna	*Thunnus albacares*	Fish fillet	< 5	
2017-64/2	Sri Lanka	Swordfish	*Xiphias gladius*	Fish fillet	<5	33
2017-66/2	Sri Lanka	Swordfish	*Xiphias gladius*	Fish fillet	<5	39
2017-408/2	Sri Lanka	Swordfish	*Xiphias gladius*	Fish fillet		15.4
2017-406/1	Thailand	Processed seafood product	*Gadus macrocephalus*	Fish, processed		11.1
2017-818/1	Thailand	Processed seafood product	*Decapterus* sp	Fish, processed	14	
2017-831/1	Thailand	Processed seafood product	*Decapterus* sp	Fish, processed	5.4	
2017-823/1	Thailand	Processed tuna	*Katsuwonus pelamis*	Fish, processed	66	
2017-829/1	Thailand	Processed tuna	*Katsuwonus pelamis*	Fish, processed	< 5	

***Table 5. Selected chemical spoilage indicators*, Histamine and total volatile basic nitrogen (TVBN)**						
Journal No.	**Imported from**	**Species**	**Scient. name**	**Tissue**	**Histamine n=20 mg/kg w.w.**	**TVBN n=25 mg/100g w.w.**
2017-830/1	Thailand	Processed tuna	*Katsuwonus pelamis*	Fish, processed	< 5	
2017-1172/1	Thailand	Processed tuna	*Katsuwonus pelamis*	Fish, processed	< 5	
2017-410/2	USA	Surimi	*Merluccius productus*	Fish, processed	< 5	
2017-1265/1	Japan	Processed tuna	*Katsuwonus pelamis*	Fish, processed		4.5
2017-805/1	Philippines	Processed seafood product	*Sardina pilchardus*	Fish, processed	< 5	
			# samples N		20	25
			Maximum value		66	39

Table 6. Elemental concentration of heavy metals, n=89.

Arsenic (As), Cadmium (Cd), Mercury (Hg) and Lead (Pb).

NHC = Imported as: Not for human consumption: different maximum limits then apply.

Journal No.	Imported from	Group	Product	Scientific name	Tissue/ variant	As mg/kg	Cd mg/kg	Hg mg/kg	Pb mg/kg
2017-1301/1	Republic of Korea	Bivalve	Pacific oyster	*Crassostrea gigas*	Muscle	2.4	0.43	0.01	0.14
2017-450/1	New Zealand	Bivalve	Greenshell mussel	*Perna canaliculi*	Muscle	7.4	0.49	0.01	0.07
2017-449/1	USA	Bivalve	Scallops	*Placopecten Magellanicus*	Muscle	0.84	0.02	0.01	0.00
2017-214/1	Argentina	Cephalopod	Argentine shortfin squid	*Illex argentinus*	Muscle	0.72	0.09	0.01	< .005
2017-1740/1	Taiwan	Cephalopod	Purpleback squid	*Sthenoteuthis oualaniensis*	NHC	3.6	0.28	0.03	0.01
2017-1997/2	Thailand	Cephalopod	Processed seafood product	*Sepia pharonis*	Dried, spiced, fried meat	0.94	0.11	0.07	< .02
2017-1997/3	Thailand	Cephalopod	Processed seafood product	*Sepia pharonis*	Dried, spiced, fried meat	21	1.4	0.02	0.04
2017-1997/4	Thailand	Cephalopod	Processed seafood product	*Sepia pharonis*	Dried, spiced, fried meat	0.91	0.12	0.08	< .02
2017-2087/1	Thailand	Crustacean	Baby shrimp	*Acetes* sp	White meat	6.7	0.56	0.01	0.25
2017-1480/1	Viet Nam	Crustacean	Processed seafood product	*Cancer pagurus*	White meat	18	0.02	0.06	0.01
2017-119/2	Canada	Crustacean	American lobster	*Homarus americanus*	White meat	6.9	0.13	0.10	0.01
2017-1998/1	Canada	Crustacean	American lobster	*Homarus americanus*	White meat	2.5	0.15	0.06	< .005
2017-2047/1	Canada	Crustacean	American lobster	*Homarus americanus*	White meat	5.6	n.a.	0.06	0.01
2017-1481/1	Canada	Crustacean	Lobster	*Homarus spp*	White meat	2.0	0.04	0.04	< .005
2017-1739/2	Argentina	Crustacean	Argentine red shrimp	*Pleoticus muelleri*	White meat	2.0	0.25	0.04	0.01

Table 6. Elemental concentration of heavy metals, n=89.
Arsenic (As), Cadmium (Cd), Mercury (Hg) and Lead (Pb).
NHC = Imported as: Not for human consumption: different maximum limits then apply.

Journal No.	Imported from	Group	Product	Scientific name	Tissue/ variant	As mg/kg	Cd mg/kg	Hg mg/kg	Pb mg/kg
2017-819/1	Thailand	Crustacean processed	Processed seafood product	*Acetes* sp	Paste	3.2	0.28	0.01	0.17
2017-2057/1	Thailand	Crustacean processed	Processed seafood product	*Litopenaeus vannamei*	Paste	0.03	0.01	< .002	< .009
2017-1505/1	China	Fish	Pacific saury	*Cololabis saira*	NHC	2.3	0.16	0.05	< .009
2017-1507/1	Taiwan	Fish	Pacific saury	*Cololabis saira*	NHC	2.1	0.13	0.05	< .01
2017-407/2	Thailand	Fish	Pacific Cod	*Gadus macrocephalus*	Fillet	5.9	< .0007	0.06	< .004
2017-807/1	China	Fish	Atlantic cod	*Gadus morhua*	Fillet	0.46	< .0008	0.03	< .004
2017-808/1	China	Fish	Atlantic cod	*Gadus morhua*	Fillet	0.47	< .0005	0.04	< .002
2017-1266/1	China	Fish	Atlantic cod	*Gadus morhua*	Fillet	2.3	< .0009	0.05	< .004
2017-1268/1	China	Fish	Atlantic cod	*Gadus morhua*	Fillet	2.6	< .0006	0.02	< .003
2017-1999/1	Thailand	Fish	Atlantic cod	*Gadus morhua*	Fillet	13	< .0009	0.04	< .004
2017-2088/1	China	Fish	Atlantic cod	*Gadus morhua*	Fillet	2.0	< .0008	0.03	< .004
2017-2090/1	China	Fish	Atlantic cod	*Gadus morhua*	Fillet	2.6	< .0007	0.03	< .004
2017-115/2	Russian federation	Fish	Haddock	*Melanogrammus aeglefinus*	Fillet	4.6	< .001	0.03	0.01
2017-1146/1	Russian federation	Fish	Haddock	*Melanogrammus aeglefinus*	Fillet	2.2	< .001	0.05	< .005

Table 6. Elemental concentration of heavy metals, n=89.
Arsenic (As), Cadmium (Cd), Mercury (Hg) and Lead (Pb).
NHC = Imported as: Not for human consumption: different maximum limits then apply.

Journal No.	Imported from	Group	Product	Scientific name	Tissue/ variant	As mg/kg	Cd mg/kg	Hg mg/kg	Pb mg/kg
2017-1770/1	Japan	Fish	Red seabream	*Pagrus major*	Fillet	1.5	< .001	0.08	< .01
2017-2001/1	New Zealand	Fish	Greenshell mussel	*Perna canaliculi*	Fillet	1.6	0.13	0.03	0.27
2017-646/1	Russian federation	Fish	Saithe	*Pollachius virens*	Fillet	1.9	< .001	0.06	< .004
2017-1011/1	Russian federation	Fish	Saithe	*Pollachius virens*	Fillet	2.4	< .0009	0.06	< .004
2017-1145/1	Russian federation	Fish	Saithe	*Pollachius virens*	Fillet	1.2	< .001	0.06	< .005
2017-1147/1	Russian federation	Fish	Saithe	*Pollachius virens*	Fillet	1.3	< .001	0.02	< .004
2017-1485/1	China	Fish	Saithe	*Pollachius virens*	Fillet	0.70	< .0008	0.04	< .004
2017-1868/2	Russian federation	Fish	Greenland halibut	*Reinhardtius hippoglossoides*	Fillet	11	< .001	0.14	< .005
2017-63/2	Australia	Fish	Yellowtail	*Seriola lalandi*	Fillet	0.32	< .002	0.09	< .009
2017-61/2	Japan	Fish	Japanese amberjack	*Seriola quinqueradiata*	Fillet	0.31	< .002	0.14	< .009
2017-62/2	Japan	Fish	Japanese amberjack	*Seriola quinqueradiata*	Fillet	0.35	< .002	0.16	< .01
2017-1375/2	Japan	Fish	Japanese amberjack	*Seriola quinqueradiata*	Fillet	0.63	< .001	0.11	< .007
2017-1377/2	Japan	Fish	Japanese amberjack	*Seriola quinqueradiata*	Fillet	0.72	< .001	0.09	< .007

Table 6. Elemental concentration of heavy metals, n=89.
Arsenic (As), Cadmium (Cd), Mercury (Hg) and Lead (Pb).
NHC = Imported as: Not for human consumption: different maximum limits then apply.

Journal No.	Imported from	Group	Product	Scientific name	Tissue/ variant	As mg/kg	Cd mg/kg	Hg mg/kg	Pb mg/kg
2017-2051/1	Japan	Fish	Yellowtail	*Seriola* spp	Fillet	2.0	0.01	0.10	< .01
2017-1269/1	China	Fish	Alaska pollock	*Theragra chalcogramma*	Fillet	0.65	< .001	0.01	< .004
2017-2091/1	China	Fish	Alaska pollock	*Theragra chalcogramma*	Fillet	4.1	< .001	0.15	< .004
2017-65/1	Sri Lanka	Fish	Yellowfin tuna	*Thunnus albacares*	Fillet	1.4	0.01	0.55	< .007
2017-67/1	Sri Lanka	Fish	Yellowfin tuna	*Thunnus albacares*	Fillet	0.65	0.01	0.16	< .006
2017-402/2	Maldives	Fish	Yellowfin tuna	*Thunnus albacares*	Fillet	0.30	0.01	0.47	< .007
2017-409/2	Sri Lanka	Fish	Yellowfin tuna	*Thunnus albacares*	Fillet	0.89	0.01	0.51	< .006
2017-629/1	Maldives	Fish	Tuna	*Thunnus albacares*	Fillet	1.1	0.02	0.42	< .007
2017-1378/1	Sri Lanka	Fish	Yellowfin tuna	*Thunnus albacares*	Fillet	1.2	0.01	0.29	< .006
2017-1388/1	Philippines	Fish	Yellowfin tuna	*Thunnus albacares*	Fillet	1.9	< .001	0.06	< .007
2017-1487/1	Sri Lanka	Fish	Tuna	*Thunnus albacares*	Fillet	1.2	0.01	0.35	< .007
2017-1487/2	Sri Lanka	Fish	Tuna	*Thunnus albacares*	Fillet	0.73	0.02	0.43	< .006
2017-1648/1	Maldives	Fish	Yellowfin tuna	*Thunnus albacares*	Fillet	1.0	0.01	0.47	< .006
2017-2004/1	Mauritius	Fish	Yellowfin tuna	*Thunnus albacares*	Fillet	0.37	0.01	0.17	< .006
2017-2004/2	Mauritius	Fish	Yellowfin tuna	*Thunnus albacares*	Fillet	0.38	0.01	0.49	< .006

Table 6. Elemental concentration of heavy metals, n=89.

Arsenic (As), Cadmium (Cd), Mercury (Hg) and Lead (Pb).

NHC = Imported as: Not for human consumption: different maximum limits then apply.

Journal No.	Imported from	Group	Product	Scientific name	Tissue/ variant	As mg/kg	Cd mg/kg	Hg mg/kg	Pb mg/kg
2017-2004/3	Mauritius	Fish	Yellowfin tuna	*Thunnus albacares*	Fillet	0.72	0.02	0.16	< .007
2017-2050/1	Maldives	Fish	Yellowfin tuna	*Thunnus albacares*	Fillet	0.96	0.01	0.33	< .006
2017-64/2	Sri Lanka	Fish	Swordfish	*Xiphias gladius*	Fillet	0.96	0.05	0.87	< .005
2017-66/2	Sri Lanka	Fish	Swordfish	*Xiphias gladius*	Fillet	1.8	0.02	0.34	< .005
2017-408/2	Sri Lanka	Fish	Swordfish	*Xiphias gladius*	Fillet	1.0	0.08	1.1	< .006
2017-1890/2	Sri Lanka	Fish	Swordfish	*Xiphias gladius*	Fillet	0.82	0.02	0.20	< .006
2017-393/1	Russian federation	Fish liver	Atlantic cod	*Gadus morhua*	Liver	5.1	0.12	0.01	< .02
2017-2025/1	Thailand	Fish	Processed seafood product	*Anguilla japonica*	Processed, heated, etz	0.24	< .003	0.06	< .01
2017-1486/1	Viet Nam	Fish	Processed seafood product	*Cypselurus poecilopterus*	Processed, heated, etz	0.19	0.01	0.01	< .006
2017-406/1	Thailand	Fish	Processed seafood product	*Gadus macrocephalus*	Processed, heated, etz	3.1	< .001	0.04	< .01
2017-2009/1	Thailand	Fish	Processed tuna	*Katsuwonus pelamis*	Processed, heated, etz	17	0.02	0.01	< .02
2017-1273/1	Myanmar	Fish	Processed seafood product	*Macruronus novaezelandiae*	Processed, heated, etz	0.59	< .001	0.02	< .01
2017-2089/1	China	Fish	Processed seafood product	*Macruronus novaezelandiae*	Processed, heated, etz	0.51	< .001	0.06	< .01
2017-410/2	USA	Fish	Surimi	*Merluccius productus*	Processed, heated, etz	0.11	< .001	0.03	< .005

Table 6. Elemental concentration of heavy metals, n=89.
Arsenic (As), Cadmium (Cd), Mercury (Hg) and Lead (Pb).
NHC = Imported as: Not for human consumption: different maximum limits then apply.

Journal No.	Imported from	Group	Product	Scientific name	Tissue/ variant	As mg/kg	Cd mg/kg	Hg mg/kg	Pb mg/kg
2017-1265/1	Japan	Fish	Processed seafood product	*Multiple species*	Processed, heated, etz	0.12	< .001	0.02	< .007
2017-2020/1	Thailand	Fish	Sushi	*Multiple species*	Fillet	0.23	0.02	0.00	< .009
2017-2020/2	Thailand	Fish	Sushi	*Multiple species*	Fillet	0.21	0.01	0.00	< .009
2017-1482/1	Viet Nam	Fish	Processed seafood product	*Pangasius hypothalamus*	Processed, heated, etz	0.02	< .001	0.00	< .01
2017-2023/1	Thailand	Fish	Processed seafood product	*Salmo salar*	Processed, heated, etz	1.8	< .002	0.04	< .01
2017-2022/1	Thailand	Fish	Processed seafood product	*Scomber scombrus*	Processed, heated, etz	2.2	< .001	0.03	< .01
2017-2024/1	Philippines	Fish	Processed seafood product	*Spratelloides gracilis*	Processed, heated, etz	1.22	0.04	0.01	< .02
2017-820/1	Thailand	Fish	Processed seafood product	*Stolephorus sp*	Processed, heated, etz	0.80	< .002	< .002	< .01
2017-1483/1	USA	Fish	Processed seafood product	*Theragra chalcogramma*	Processed, heated, etz	0.27	< .001	0.02	< .006
2017-1484/1	USA	Fish	Processed seafood product	*Theragra chalcogramma*	Processed, heated, etz	0.32	< .001	0.01	< .006
2017-2002/1	USA	Fish	Processed seafood product	*Theragra chalcogramma*	Processed, heated, etz	0.88	< .001	0.01	< .004
2017-2003/1	Thailand	Fish	Processed seafood product	*Theragra chalcogramma*	Processed, heated	0.89	0.03	0.00	0.02
2017-394/2	Peru	Marine Oil	Oil	*Engraulida* sp	Oil	9.9	< .005	< .005	< .02
2017-395/2	Peru	Marine Oil	Oil	*Engraulida* sp	Oil	9.3	< .004	< .004	< .02

Table 6. Elemental concentration of heavy metals, n=89.
Arsenic (As), Cadmium (Cd), Mercury (Hg) and Lead (Pb).
NHC = Imported as: Not for human consumption: different maximum limits then apply.

Journal No.	Imported from	Group	Product	Scientific name	Tissue/ variant	As mg/kg	Cd mg/kg	Hg mg/kg	Pb mg/kg
2017-814/1	USA	Marine Oil	Oil	*Gadus morhua*	Oil	0.01	< .002	< .002	< .01
2017-2018/1	USA	Marine oil	Oil	*Gadus morhua*	Oil	< .009	< .005	< .005	< .02
2017-2092/1	Turkey	Marine Oil	Oil	n.a.	Oil	9.5	< .005	< .005	< .02
2017-813/1	China	Marine Oil	Oil	*Thunnus* spp	Oil	< .009	< .004	< .004	0.02
	Maximum value					21	1.4	1.1	0.3
	Second largest value					18	0.6	0.9	0.3

Table 7. Dioxins and PCBs, n=29.
Dioxins (PCDD) + furans (PCDF), dioxin like PCBs (DLPCBC), and non-dioxinlike PCBs NDL-PCBs.

The analytical concentrations of 28 different compounds are summed as "Toxic Equivalence values" (TEQ-values)[6], to give three distinct (Upper bound) sum-parameters: Sum-PCDD+PCDF, sum DLPCBs and total TEQ sum. TEQ-values are provided in the pg/g (w/w) scale (pico-grams per gram in the naturally moist sample state. The indicator NDL-PCBs are provided as the Upper bound sum of their analytical concentrations (Not TEQ-values), in the µg/kg (w/w) scale.

Journal No.	Imported from	Product	Scientific name	Tissue/ sample type	Sum DLPCBs pg/g w.w. TEQ	PCDDs+ PCDFs pg/g w.w. TEQ	Total TEQ pg/g w.w. TEQ	Sum NDL-PCBS µg/kg w.w.
2017-214/1	Argentina	Argentine shortfin squid	*Illex argentinus*	Cephalopod-meat	0.01	0.09	0.10	0.07
2017-63/2	Australia	Yellowtail	*Seriola lalandi*	Fish fillet	0.49	0.20	0.69	2.9
2017-61/2	Japan	Japanese amberjack	*Seriola quinqueradiata*	Fish fillet	1.2	0.32	1.6	9.5
2017-62/2	Japan	Japanese amberjack	*Seriola quinqueradiata*	Fish fillet	1.5	0.34	1.8	10
2017-1375/2	Japan	Japanese amberjack	*Seriola quinqueradiata*	Fish fillet	0.51	0.21	0.73	4.5
2017-1377/2	Japan	Japanese amberjack	*Seriola quinqueradiata*	Fish fillet	0.66	0.27	0.94	5.9
2017-65/1	Sri Lanka	Yellowfin tuna	*Thunnus albacares*	Fish fillet	0.29	0.07	0.36	0.64
2017-67/1	Sri Lanka	Yellowfin tuna	*Thunnus albacares*	Fish fillet	0.05	0.07	0.12	0.13
2017-402/2	Maldives	Yellowfin tuna	*Thunnus albacares*	Fish fillet	0.03	0.08	0.11	0.09
2017-409/2	Sri Lanka	Yellowfin tuna	*Thunnus albacares*	Fish fillet	0.26	0.08	0.35	0.71
2017-629/1	Maldives	Tuna	*Thunnus albacares*	Fish fillet	0.03	0.06	0.09	0.11
2017-1378/1	Sri Lanka	Yellowfin tuna	*Thunnus albacares*	Fish fillet	0.01	0.05	0.06	0.06
2017-1388/1	Philippines	Yellowfin tuna	*Thunnus albacares*	Fish fillet	0.004	0.05	0.05	0.05
2017-64/2	Sri Lanka	Swordfish	*Xiphias gladius*	Fish fillet	0.04	0.09	0.14	0.14

[6] TEQ is defined in is defined in Commission regulation 1881/2006, footnote 31, upper bound sum in footnote 32.

Table 7. Dioxins and PCBs, n=29.
Dioxins (PCDD) + furans (PCDF), dioxin like PCBs (DLPCBC), and non-dioxinlike PCBs NDL-PCBs.

The analytical concentrations of 28 different compounds are summed as "Toxic Equivalence values" (TEQ-values)[6], to give three distinct (Upper bound) sum-parameters: Sum-PCDD+PCDF, sum DLPCBs and total TEQ sum. TEQ-values are provided in the pg/g (w/w) scale (pico-grams per gram in the naturally moist sample state. The indicator NDL-PCBs are provided as the Upper bound sum of their analytical concentrations (Not TEQ-values), in the µg/kg (w/w) scale.

Journal No.	Imported from	Product	Scientific name	Tissue/ sample type	Sum DLPCBs pg/g w.w. TEQ	PCDDs+ PCDFs pg/g w.w. TEQ	Total TEQ pg/g w.w. TEQ	Sum NDL-PCBS µg/kg w.w.
2017-66/2	Sri Lanka	Swordfish	*Xiphias gladius*	Fish fillet	0.07	0.09	0.17	0.23
2017-408/2	Sri Lanka	Swordfish	*Xiphias gladius*	Fish fillet	0.10	0.08	0.18	0.25
2017-393/1	Russian federation	Atlantic cod	*Gadus morhua*	Fish liver	4.6	1.4	6.0	35
2017-818/1	Thailand	Processed seafood	*Decapterus sp*	Fish, processed	0.13	0.15	0.28	0.36
2017-831/1	Thailand	Processed seafood	*Decapterus sp*	Fish, processed	0.03	0.15	0.18	0.09
2017-821/1	Philippines	Processed seafood	*Katsuwonus pelamis*	Fish, processed	0.01	0.06	0.08	0.13
2017-823/1	Thailand	Processed seafood	*Katsuwonus pelamis*	Fish, processed	0.02	0.18	0.20	0.9
2017-829/1	Thailand	Processed seafood	*Katsuwonus pelamis*	Fish, processed	0.01	0.13	0.14	0.07
2017-830/1	Thailand	Processed seafood	*Katsuwonus pelamis*	Fish, processed	0.00	0.06	0.06	0.04
2017-1172/1	Thailand	Processed seafood	*Katsuwonus pelamis*	Fish, processed	0.02	0.11	0.13	0.25
2017-805/1	Philippines	Processed seafood	*Sardina pilchardus*	Fish, processed	0.02	0.08	0.11	0.07
2017-394/2	Peru	Oil	*Engraulida sp*	Marine Oil	0.57	0.46	1.0	5.1
2017-395/2	Peru	Oil	*Engraulida sp*	Marine Oil	0.53	0.26	0.78	3.5
2017-814/1	USA	Oil	*Gadus morhua*	Marine Oil	0.05	0.45	0.51	1.5
2017-813/1	China	Oil	*Thunnus spp*	Marine Oil	0.10	0.58	0.68	8.5

Table 8. Selected Brominated flame retardants PBDEs (µg/kg w.w.), n=29.												
Journal No.	**Imported from**	**Species**	**Scient. Name**	**Tissue**	PBDE-28	PBDE-47	PBDE-99	PBDE-100	PBDE-153	PBDE-154	PBDE-183	UB Sum 7-PBDE
2017-214/1	Argentina	Argentine shortfinsquid	*Illex argentinus*	Cephalo-pod	< .002	< .003	< .003	< .002	< .002	< .002	< .003	0.01
2017-63/2	Australia	Yellowtail	*Seriola lalandi*	Fish fillet	0.01	0.34	0.09	0.07	0.02	0.08	< .007	0.62
2017-61/2	Japan	Japanese amberjack	*Seriola quinqueradiata*	Fish fillet	0.03	0.49	0.03	0.11	0.02	0.15	< .008	0.85
2017-62/2	Japan	Japanese amberjack	*Seriola quinqueradiata*	Fish fillet	0.02	0.43	0.03	0.10	0.02	0.16	< .01	0.78
2017-1375/2	Japan	Japanese amberjack	*Seriola quinqueradiata*	Fish fillet	0.01	0.33	0.02	0.04	0.01	0.04	< .009	0.46
2017-1377/2	Japan	Japanese amberjack	*Seriola quinqueradiata*	Fish fillet	0.02	0.23	0.02	0.05	0.01	0.05	< .01	0.39
2017-65/1	Sri Lanka	Yellowfin tuna	*Thunnus albacares*	Fish fillet	< .002	0.02	0.00	0.01	0.004	0.03	< .003	0.07
2017-67/1	Sri Lanka	Yellowfin tuna	*Thunnus albacares*	Fish fillet	< .002	0.02	0.01	0.01	0.003	0.01	< .003	0.05
2017-402/2	Maldives	Yellowfin tuna	*Thunnus albacares*	Fish fillet	< .02	0.004	< .003	0.002	< .02	0.01	< .003	0.02
2017-409/2	Sri Lanka	Yellowfin tuna	*Thunnus albacares*	Fish fillet	< .02	0.02	< .003	0.01	0.003	0.03	< .003	0.07
2017-629/1	Maldives	Tuna	*Thunnus albacares*	Fish fillet	< .02	< .003	< .003	< .02	< .02	0.003	< .003	0.02
2017-1378/1	Sri Lanka	Yellowfin tuna	*Thunnus albacares*	Fish fillet	< .0008	0.002	< .02	< .0008	< .02	< .0008	< .006	0.01

Table 8. Selected Brominated flame retardants PBDEs (µg/kg w.w.), n=29.												
Journal No.	**Imported from**	**Species**	**Scient. Name**	**Tissue**	PBDE-28	PBDE-47	PBDE-99	PBDE-100	PBDE-153	PBDE-154	PBDE-183	UB Sum 7-PBDE
2017-1388/1	Philippines	Yellowfin tuna	*Thunnus albacares*	Fish fillet	< .0008	0.001	< .02	< .0008	< .02	< .0008	< .006	0.01
2017-64/2	Sri Lanka	Swordfish	*Xiphias gladius*	Fish fillet	< .002	0.004	< .004	< .002	< .002	0.01	< .004	0.02
2017-66/2	Sri Lanka	Swordfish	*Xiphias gladius*	Fish fillet	< .0022	0.01	< .004	0.002	< .002	0.01	< .004	0.03
2017-408/2	Sri Lanka	Swordfish	*Xiphias gladius*	Fish fillet	< .0023	0.01	< .005	0.003	0.003	0.01	< .005	0.04
2017-393/1	Russian federation	Atlantic cod	*Gadus morhua*	Fish liver	0.08	1.3	< .07	0.19	< .04	0.17	< .07	2.0
2017-818/1	Thailand	Processed seafood product	*Decapterus* sp	Fish, processd	0.004	0.06	0.01	0.01	0.004	0.02	0.02	0.12
2017-831/1	Thailand	Processed seafood product	*Decapterus* sp	Fish, processd	< .02	0.01	< .003	0.003	< .003	0.01	< .01	0.04
2017-821/1	Philippines	Processed tuna	*Katsuwonus pelamis*	Fish, processd	< .0009	0.005	< .02	< .0009	< .02	< .0009	< .006	0.02
2017-823/1	Thailand	Processed tuna	*Katsuwonus pelamis*	Fish, processd	< .02	0.02	< .03	< .02	< .03	< .02	< .1	0.22
2017-829/1	Thailand	Processed tuna	*Katsuwonus pelamis*	Fish, processd	0.0005	0.002	0.001	0.001	< .0003	< .001	0.02	0.02
2017-830/1	Thailand	Processed tuna	*Katsuwonus pelamis*	Fish, processd	< .0007	0.001	0.000	< .0001	< .001	< .0007	0.01	0.02
2017-1172/1	Thailand	Processed tuna	*Katsuwonus pelamis*	Fish, processd	< .001	0.004	< .002	< .001	< .002	< .001	< .009	0.02

Table 8. Selected Brominated flame retardants PBDEs (µg/kg w.w.), n=29.												
Journal No.	**Imported from**	**Species**	**Scient. Name**	**Tissue**	PBDE-28	PBDE-47	PBDE-99	PBDE-100	PBDE-153	PBDE-154	PBDE-183	UB Sum 7-PBDE
2017-805/1	Philippines	Processed seafood product	*Sardina pilchardus*	Fish, processd	0.001	0.01	< .02	0.002	< .02	< .001	< .007	0.02
2017-394/2	Peru	Oil	*Engraulida* sp	Marine Oil	< .04	0.15	< .074	< .04	< .04	< .04	< .07	0.44
2017-395/2	Peru	Oil	*Engraulida* sp	Marine Oil	< .03	0.08	< .07	< .03	< .03	< .03	< .07	0.35
2017-814/1	United States	Oil	*Gadus morhua*	Marine Oil	< .01	0.14	< .02	0.07	< .02	0.10	< .08	0.42
2017-813/1	China	Oil	*Thunnus* spp	Marine Oil	0.03	1.2	0.28	0.36	0.03	0.24	< .09	2.2
			Maximum value		0.08	1.3	0.28	0.36	0.03	0.24	0.02	2.2

Table 9. Selected PAH compounds (µg/kg w.w.), n=11.						
Journal No.	**Imported from**	**Species**	**Scient. name**	**Tissue**	**BaP**	**LB Sum PAH_4**
2017-2088/1	China	Atlantic cod	*Gadus morhua*	Fish fillet	< .5	0
2017-393/1	Russian federation	Atlantic cod	*Gadus morhua*	Fish liver	< .5	0
2017-2025/1	Thailand	Processed seafood product	*Anguilla japanica*	Fish, processed	< .5	0
2017-2023/1	Thailand	Processed seafood product	*Salmo salar*	Fish, processed	< .1	0
2017-2022/1	Thailand	Processed seafood product	*Scomber scombrus*	Fish, processed	< .2	0
2017-394/2	Peru	Oil	*Engraulida* sp	Marine Oil	< .7	0
2017-395/2	Peru	Oil	*Engraulida* sp	Marine Oil	< .7	0
2017-814/1	USA	Oil	*Gadus morhua*	Marine Oil	< .6	0
2017-2092/1	Turkey	Oil	n.a.	Marine Oil	< .5	0
2017-2093/1	Thailand	Oil	*Thunnus albacares*	Marine Oil	< .5	0
2017-813/1	China	Oil	*Thunnus* spp	Marine Oil	< .7	0

ANNEX 2: Method performance data

A summary of the 2017 chemical analytical methods. *IMR=Institute of Marine Research, Bergen, Norway.*							
Compounds		**Matrix**	**Method principle**	**Analytical method LOD in muscle (µg/kg w.w.)**	**Analytical method LOQ (µg/kg w.w.)**	**Level of action**	**Laboratory**
Therapeutic agents and dyes1	Chloramphenicol	Muscle	LC-MS/MS	0.25	-	Presence (MRPL=0.3)	IMR
	3-Amino-2-oxazolidinone (AOZ)	Muscle	LC-MS/MS	0.5	-	Presence (MRPL=1.0)	IMR
	1-Aminohydrantoin (AHD)	Muscle	LC-MS/MS	0.6	-	Presence (MRPL=1.0)	IMR
	3-Amino-5-morpholinomethyl-2-oxazolidinone (AMOZ)	Muscle	LC-MS/MS	0.4	-	Presence (MRPL=1.0)	IMR
	Semicarbazide (SEM)	Muscle	LC-MS/MS	0.5	-	Presence (MRPL=1.0)	IMR
	Malachite green (MG)	Muscle	LC-MS/MS	0.15	-	Presence (MRPL=2.0)	IMR
	Leuco malachite green (LMG)	Muscle	LC-MS/MS	0.15	-	Presence (MRPL=2.0)	IMR
	Crystal violet (CV)	Muscle	LC-MS/MS	0.15	-	Presence	IMR
	Leuco crystal violet (LCV)	Muscle	LC-MS/MS	0.15	-	Presence	IMR
	Brilliant green (BG)	Muscle	LC-MS/MS	0.15	-	Presence	IMR

A summary of the 2017 chemical analytical methods. *IMR=Institute of Marine Research, Bergen, Norway.*							
Compounds		**Matrix**	**Method principle**	**Analytical method LOD in muscle (µg/kg w.w.)**	**Analytical method LOQ (µg/kg w.w.)**	**Level of action**	**Laboratory**
POPS	PCDD and PCDF (dioxin and furan) congeners	Muscle	HRGC-HRMS	-	$2*10^{-5}$-0.02 ng/kg[1] TEQ	See annex 3	IMR
	non-orto PCB congeners	Muscle	HRGC-MSMS	-	$2*10^{-5}$-0.02 ng/kg[1] TEQ	See annex 3	IMR
	Mono-orto PCB congeners	Muscle	HRGC-MSMS	-	$2*10^{-5}$-0.02 ng/kg[1] TEQ	See annex 3	IMR
	NDLPCB congeners	Muscle	HRGC-MSMS	-	0.005-0.2	See annex 3	IMR
	PBDE-congeners	Muscle	HRGC-NCI/MS	-	$2*10^{-6}$-0.02	n.a.	IMR
	PAH, benzo(a)pyrene(BaP) SUM PAH	See annex 3	GC-MS	-	0.1-0.7	See Annex 3	IMR
Chemical elements	Pb	Muscle	ICPMS	-	5-20	See Annex 3	IMR
	Cd	Muscle	ICPMS	-	0.5-10	See Annex 3	IMR
	As	Muscle	ICPMS	-	90	See Annex 3	IMR
	Hg	Muscle	ICPMS	-	20-40	See Annex 3	IMR
Indicator of Spoilage	TVB-N	Muscle	CONWAY	-	0.6 mg(N)	-	IMR
	Histamine	Muscle	HPLC-UV	-	5 mg/kg	-	IMR

ANNEX 3: Regulatory maximum levels

A selection of regulatory maximum levels for contaminants in seafood
from on EU Commission regulation no 1881/2006

Element or pollutant	Unit of measure-ment	Marin Fish Fillet[1]	Some fish species Fillet[1]	Wild caught Eel Fillet[1]	Fresh water Fish Fillet[1]	Smoked seafood products	Fish liver	Crusta-ceans: White meat	Bivalves and (smoked bivalves)[2]	Cephalo-pods[3]	Marine Oils HC[4]
Arsenic (As)	mg/kg w.w.[6]	-		-	-	-	-	-	-	-	-
Cadmium (Cd)		0.05	0.1-0.3[8]	0.1	0.05	*[6,8]	-	0.5	1.0[6]	1.0	-
Mercury (Hg)		0.5	1.0	1.0	0.5	*[6,8]	0.5	0.5	0.5[6]	0.5	-
Lead (Pb)		0.3	0.3	0.3	0.3	*[6,8]	-	0.5	1.5[6]	1.0	-
Sum of dioxins and furans[5]	pg/g TEQ w.w. [6]	3.5	3.5	3.5	3.5	*[6,8]	-	3.5	3.5[6]	3.5	1.75
Sum of dioxin like PCBs[5]		-	-	-	-	*[6,8]	-	-	-	-	-
Sum of dioxins. furans and dioxin like PCBs[5]		6.5	6.5	10	6.5	*[6,8]	20	6.5	6.5[6]	6.5	6
Sum of six NDLPCBs[5]	ng/g w.w.[6]	75	75	300	125	*[6,8]	200	75	75[6]	75	200
PAH Benzo[a]pyrene	µg/kg w.w. [6]	-	-	-	-	2 - 5[6,8]	-	-	5 (6)[2]	-	2
PAH_4, sum of 4 PAH compounds[7]	µg/kg w.w.[6]	-	-	-	-	12 - 30[6,8]	-	-	30 (35)[2]	-	10

Based on Commission regulation 1881/2006, Commission Regulation 1259/2011 amending Regulation 1881/2006 and Commission regulation (EU) 835/2011 amending Regulation 1881/2006.

- 1) When fish is intended to be eaten whole, the level should be applied to the whole product.
- 2) Value in brackets concerns smoked bivalves.
- 3) Without viscera.
- 4) HC = Human consumption pg/g fat
- 5) Upper bound sum calculation is assumed.
- 6) Wet weight (w.w.); the concentration in a naturally moist sample. Values for dried or otherwise processed food should be transformed to w.w.
- 7) Benzo(a)pyrene, Benzo(a)anthracene, Benzo(b)fluoranthene and chrysene, assuming a lower bound sum calculation.
- 8) Value change with different biological species

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