

# **Provision of Statutory Shellfish Monitoring Services for Scotland- Chemical Contaminant Analysis of Shellfish from Classified Harvesting Areas (2021)**

Report to Food Standards Scotland - Final report V1



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## Chemical Contaminant Analysis of Shellfish from Classified Harvesting Areas (2021)

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## Glossary of Main Terms

Term or Acronym	General Meaning of Term
µg/kg	Microgram per kilogram (part per billion)
EC	European Commission
EU	European Union
FAPAS	Food Analysis Proficiency Assurance Scheme
fat weight	Values based on the assessed fat content of the sample
FSA	Food Standards Agency
FSS	Food Standards Scotland
GC-HRMS	Gas chromatography - high resolution mass spectrometry
GC-MS	Gas chromatography –unit resolution mass spectrometry
Heavy Metals	A loosely defined subset of naturally occurring metallic elements than have a high atomic weight and a density of 5g/mL or more.
ICP-MS	Inductively coupled plasma-mass spectrometry
LIMS	Laboratory Information Management System
LOD	Limit of Detection
LOQ	Limit of Quantification
Lower bound (lb)	Assumes values at less than the limit of detection is zero (e.g.<math><0.07 = 0</math>)
mg/kg	Milligram per kilogram (part per million)
ng/kg	Nanogram per kilogram (part per trillion)
<i>Non-ortho</i> -PCB	Non-ortho-substituted PCB (co-planar)
<i>Ortho</i> -PCB	Ortho-substituted PCB (non planar)
PAH 4	Sum of 4 PAHs (benzo[a]pyrene, benzo[a]anthracene, benzo[b]fluoranthene, chrysene)
PAHs	Polycyclic aromatic hydrocarbons
PCB	Polychlorinated biphenyl
PCDD/F	Polychlorinated dibenzo- <i>p</i> -dioxin/ polychlorinated dibenzofuran (dioxins)
Sum of ICES 6	Sum of PCB28, PCB52, PCB101, PCB138, PCB153 and PCB180
TEF	Toxic Equivalency Factor – toxicity expressed for each dioxin-like compound relative to 2,3,7,8-TCDD (TEF = 1).
TEQ	Toxic Equivalence – product of the congener concentration and the TEF
Total TEQ	Total of the Sum of all the Toxic Equivalences (TEQs) for each group of compounds
Trace Element	An element in a sample that has an average concentration of less than 100 parts per million (<math>< 100 \text{ mg/kg}</math>)
Upper bound (ub)	Assumes values at less than the limit of detection is equal to the limit of detection (e.g. <math><0.07 = 0.07</math>)
whole weight	Values based on the sample as received
WHO	World Health Organisation
WHO-TEQ 2005	World Health Organisation TEQ based on TEF values as set in 2005

## Executive Summary

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This study on chemical contaminants in shellfish from Scottish classified shellfish production areas fulfils the requirements of retained European Union legislation to adopt appropriate monitoring measures and carry out compliance checks on shellfish produced for human consumption. Marine shellfish bio-accumulate environmental contaminants because of their inability to metabolise them to easily excreted compounds. The study determines concentrations of regulated environmental contaminants in the flesh of edible species with a view to determine current levels of occurrence and to allow estimation of consumer exposure.

The study analysed 31 samples of shellfish including common mussels, pacific oysters, native oysters, common cockles, pullet carpet shells, surf clams and razor clams for polycyclic aromatic hydrocarbons (PAHs), trace elements, polychlorinated dibenzo-p-dioxins (PCDDs), polychlorinated dibenzofurans (PCDFs) and polychlorinated biphenyls (PCBs). The methodologies used for the analyses were UKAS accredited to the ISO 17025 standard and follow retained EU commission regulations for data quality criteria.

All measured analytes were below their maximum regulatory levels in the test samples. Contaminant profiles from the 2021 study are similar to the previous year's data.

# 1. Background to study

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Marine shellfish are an excellent source of protein, are high in essential minerals and low in fat. In many parts of the UK and in Scotland in particular, the shellfish industry makes a significant contribution to the local economy. Shellfish have a recognised potential for bio-accumulating contaminants and some bivalve species such as mussels, are commonly used as early indicators of local pollution. Bivalves feed by filtering plankton from the surrounding water. This feeding mechanism leads to the bio-accumulation of pollutants of biogenic and anthropogenic origin such as polychlorinated dibenzo-p-dioxins (PCDDs), polychlorinated dibenzofurans (PCDFs) collectively referred to as dioxins, polychlorinated biphenyls (PCBs), trace elements and polycyclic aromatic hydrocarbons (PAHs) from the surrounding waters. The bio-accumulation potential of the shellfish species used for food is particularly relevant in the case of environmental contaminants with long half-lives such as PCDD/Fs and PCBs. These contaminants have been the subject of several studies (Garraud et al 2007, Lee et al 2007, Fernandes et al 2009, Fernandes et al 2012) relating to the occurrence and bio-accumulation in marine species and the resulting potential for human exposure arising from the consumption of the edible species.

In recognising the requirements of food safety, the EU has defined limits for the control of these contaminants in a range of foods including shellfish. (Commission Regulation (EC) No 1881/2006, as amended). The European Union (Withdrawal) Act as amended (HMSO 2018) converted directly applicable EU legislation as it stood at the end of the transition period (11pm on 31 December 2020) into UK law. They are referred to as “retained” regulations (or legislation) throughout this document.

PCDD/Fs and PCBs are recognised environmental and food contaminants that are known to bio-accumulate in fish and shellfish. The extent of this accumulation is evident by the levels of these contaminants detected in various studies. In the UK, Total Diet Studies (TDS) (e.g. FSA 2003, FSA 2012 -FD 12/04) carried out over the last two decades; fish (including shellfish) has consistently been one of the highest PCDD/F and PCB containing food groups. Human dietary exposure can therefore be significantly influenced by the fish and shellfish component of the diet, particularly in high level consumers and low body-weight individuals. Although metabolised in many fish species, PAHs persist in shellfish as filter feeding species appear unable to affect bio-transformation of these contaminants. Other than this bio-accumulation pathway, PAHs can also arise in fish and shellfish through some food preparation and processing methods – e.g. smoked fish are known to contain elevated levels

of PAHs. Some PAH compounds have been shown to be genotoxic and carcinogenic, the most studied of which benzo[a]pyrene (BaP) is regulated in a range of foods including shellfish, within the EU (SCF Opinion 2002, Commission Regulation (EC) No. 208/2005). However, more recent evaluation by the European Food Safety Authority (EFSA) CONTAM panel, concluded that a set of 4 compounds; benzo[a]pyrene, chrysene, benzo[a]anthracene and benzo[b]fluoranthene (collectively referred to as PAH4) were more suitable indicators of PAH toxicity in food (EFSA, 2008). These four compounds were subsequently included in the updated Commission Regulation (EC) No. 835/2011.

Some trace elements e.g. cadmium, mercury and lead, are established toxic contaminants. Others, such as copper, chromium, selenium and zinc are essential to health but may be toxic at high levels of exposure. These elements may enter marine and aquatic environments and bio-accumulate in some species. Some potentially toxic elements occur naturally as part of the local geology, but others may also be found in the location of certain industries, as a result of unauthorised discharge, or as a result of other anthropogenic activity.

As part of its monitoring requirements in support of UK & EU regulations, Food Standards Scotland (FSS) has overseen the collection of shellfish each year, from classified shellfish production areas within relevant local authority areas. Shellfish from classified production areas are monitored, with the edible tissues analysed for the contaminants described above. Sampling officers from Scotland were required to obtain suitable shellfish samples from designated sampling points within classified shellfish production areas, as defined by the FSS. The collection of shellfish and transport logistics were co-ordinated by Cefas. Samples were taken and live shellfish sent to Fera, with the edible tissues analysed for the contaminants described above. The analysis was carried out at Fera Science Limited in York.

Fera has generated environmental contaminant data on shellfish collected from new and existing shellfish production areas in Scotland since 2007. This report collates the results of the individual analyses for dioxins, PAHs and trace elements in samples of shellfish collected from classified Scottish production areas in the first quarter of 2021.

## 2. Methods

### 2.1 Sample collection and preparation

Thirty-one samples of shellfish, including species of razor clams (9 samples), common mussels (8), pacific oysters (5), common cockles (5), surf clams (2), native oysters (1) and pullet carpet shells (1) were collected during January and March 2021. The sampling period was timed to coincide with the period of optimal contaminant concentrations in the shellfish which relates to the period before annual spawning.

Details on the locations, with descriptions of the samples and identification are given in Table 1. On receipt at the laboratory each sample was given a unique laboratory reference number and the sample details were logged into a Nautilus LIMS database. The samples were stored frozen prior to analysis. Sample preparation consisted of shelling followed by thorough homogenisation. Aliquots were then taken for PAH, trace element and dioxin analysis as appropriate. Dioxin sample aliquots underwent additional freeze-drying and were re-homogenised prior to analysis. Table 2 contains information on which analyses were performed on each sample.

### 2.2 Contaminants measured – Specific Analytes

The following analytes were determined: Regulated contaminants are highlighted in **bold**, and summarised regulation limits are listed below:

Analytes	Maximum regulatory levels (MRL) relevant for live bivalve molluscs (whole weight)
Lead	1.5 mg/kg
Cadmium	1.0 mg/kg
Mercury	0.50 mg/kg
Dioxins and PCBs	Sum of dioxins (WHO PCDD/F-TEQ): 3.5 pg/g  Sum of dioxins and dioxin-like PCBs (WHO PCDD/F-PCB-TEQ): 6.5 pg/g  Sum of PCB28, PCB52, PCB101, PCB138, PCB153 and PCB180 (ICES 6 Indicator PCBs): 75 ng/g
PAHs	Benzo[a]pyrene: 5.0 µg/kg  Sum of Benzo[a]pyrene, Benzo[a]anthracene, Benzo[b]fluoranthene and Chrysene (PAH4): 30 µg/kg

Dioxins - **all 17, 2378-Cl substituted PCDDs and PCDFs.**

Dioxin-like PCBs - **IUPAC no. 77, 81, 105, 114, 118, 123, 126, 156, 157, 167, 169 and 189.**



Non dioxin-like PCBs - IUPAC numbers 18, **28**, 31, 47, 49, 51, **52**, 99, **101**, 128, **138**, **153** and **180**.

PAHs - acenaphthene, acenaphthylene, fluorene, phenanthrene, anthracene, fluoranthene, benzo[c]fluorene, pyrene, benzo[e]pyrene, benzo[b]naphtho[2,1-d]thiophene, anthanthrene, coronene, benzo[ghi]fluoranthene, **benzo[a]anthracene**, **chrysene**, **benzo[b]fluoranthene**, benzo[j]fluoranthene, benzo[k]fluoranthene, **benzo[a]pyrene**, cyclopenta[cd]pyrene, indeno[1,2,3-cd]pyrene, dibenzo[a,h]anthracene, benzo[ghi]perylene, dibenzo[a,l]pyrene, dibenzo[a,e]pyrene, dibenzo[a,i]pyrene, dibenzo[a,h]pyrene and the alkylated PAH, 5-methylchrysene.

Trace elements – Chromium (Cr), Manganese (Mn), Cobalt (Co), Nickel (Ni), Copper (Cu), Zinc (Zn), Arsenic (As), Selenium (Se), Silver (Ag), **Cadmium (Cd)**, **Mercury (Hg)**, **Lead (Pb)**

### **2.3 PCDD/F and PCB - Analytical Methodology**

(Fera SOPs FSG 401-414)

The method used for the preparation, extraction and analysis of samples has been reported previously (Fernandes et al 2004) and is part of the CEN EN16215:2012 standard. In brief, samples were fortified with <sup>13</sup>C-labelled analogues of target compounds and exhaustively extracted using mixed organic solvents. Ortho substituted PCBs were separated from non-ortho substituted PCBs and PCDD/Fs by fractionation on activated carbon. The two fractions were further purified using adsorption chromatography on alumina. Analytical measurement was carried out using GC-HRMS for the seventeen, 2,3,7,8-Cl substituted PCDD/F congeners and non-ortho substituted PCBs. GC-MS was used for the measurement of the ortho substituted PCBs.

All analyses were UKAS accredited to ISO 17025 standards, with the inclusion of reference material (in-house reference material, LIMS No. S11-018695 crude cod liver oil) and method blanks which were evaluated prior to reporting. Further quality assurance measures included the successful participation in international inter-comparison exercises such as the Norwegian Institute of Public Health's "Dioxins in Food" on an annual basis. Quality control evaluation for the accompanying data follows the criteria specified for chlorinated dioxins and PCBs (retained Commission Regulation (EU) No 589/2014). In addition, as the National Reference Laboratory (NRL) for dioxins and halogenated contaminants, Fera participates in proficiency testing (PT) exercises and other inter-laboratory exercises organised by the European Union Reference Laboratory (EU-RL) and achieves consistently good results.

## **2.4 Polycyclic Aromatic Hydrocarbons (PAH) - Analytical Methodology**

(Fera SOP FSG 410)

The analytical methodology for the PAHs has been reported before (Rose et al. 2007) and is based on internal standardisation with GC-MS measurement. An aliquot of the homogenised sample was fortified with <sup>13</sup>C-labelled analogues of target compounds and saponified with methanolic potassium hydroxide. The extracted PAH solutions were purified in two stages with a dimethylformamide/cyclohexane partition followed by adsorption chromatography on activated silica. Purified extracts were sensitivity standardised and measured using GC-MS.

The analytical procedure for PAHs is UKAS accredited to the ISO 17025 standard and includes the assessment of method blanks and reference materials, (e.g. T0658, PAHs in cocoa butter) for compliance with the accreditation criteria. The methodology also meets the criteria required for evaluating data against the maximum permitted limits for benzo[a]pyrene as specified in retained EU Commission Regulations. Fera regularly participates in FAPAS PT exercises for PAHs in food. In addition, as NRL for PAHs, Fera participates in PT exercises and other inter-laboratory exercises organised by the EU-RL and achieves consistently good results.

## **2.5 Trace Elements - Analytical Methodology**

(Fera SOP FSG 461 and 457)

Aliquots of the homogenised sample were weighed into allotted digestion vessels and a mixture (4:1) of nitric acid and hydrochloric acid added. The vessels were capped and the contents digested using a high-pressure microwave digestion system. Reagent blanks, certified reference materials and a spiked sample were also taken through the procedure. The resulting solutions were transferred to pre-marked acid-clean plastic test tubes and diluted to 10 ml with deionised water. The digest solutions together with a set of standards covering the expected concentration range, were internally standardised with indium and rhodium in dilute nitric acid (1 %v/v). Measurements were made using an Agilent 7700x ICP-MS with collision cell.

In common with the other two sets of analyses, the analytical procedure is accredited to the ISO 17025 standard. The criteria used to assess data included checks on instrument drift, spike recovery, replicate agreement, limits of detection and certified reference material (e.g. CE 278K mussel tissue) values. Regular, successful participation in FAPAS inter-comparison exercises provides further confidence in the data. In addition, as NRL for trace

elements, Fera participates in PT exercises and other inter-laboratory exercises organised by the EU-RL and achieves consistently good results.

## **2.6 Fat analysis**

For samples requiring dioxin and PCB analysis, total fat was determined by the Werner-Schmidt method under UKAS accreditation, by Aberdeen Scientific Services Laboratory.

### 3. Results

Analyte concentrations are presented in Tables 3 to 6. Concentration units reflect current convention as required by regulation, and data were rounded to two decimal places or as appropriate. The reporting limits (quoted as “<”) for dioxins, PCBs and PAHs are estimated as a dynamic parameter and therefore represent the limits of determination that prevail during the measurement. For PCDD/Fs, PCBs, metals and PAHs, the reporting limits are consistent with the requirements of UK and EU regulations. Data on the reference materials that were analysed concurrently with the samples, were within established acceptable limits, and are available if required. Measurement uncertainty (MU) was calculated and applied to data following guidelines and principals set out in Measurement Uncertainty For Persistent Organic Pollutants By Isotope-Dilution Mass Spectrometry (Epp, et al 2014). MU and reference material data can be made available if required.

In addition to the concentration of individual congeners, the dioxin-like toxicity of the samples arising from PCDD/Fs and dioxin-like PCBs has also been reported as a toxic equivalent (WHO-TEQ), which is calculated by multiplying the concentration of each congener of interest by its toxicity equivalency factor (WHO-TEF). The TEQs are presented in terms of the 2005 TEFs (van den Berg et al 2006). Additionally, the sum of the ICES-6 Marker PCBs is also provided. The regulations for shellfish are based on whole weight concentrations; however, in keeping with previous reports to Food Standards Scotland, the results for PCDD/Fs and PCBs have also been reported on a fat weight basis.

In general, the patterns and levels of the three contaminant classes were consistent with those recorded last year.

Thirteen samples were tested for PCDD/Fs and PCBs. All samples contained PCDD/Fs and PCBs above the LOQ. Levels found were well within the regulatory limits. The range for total TEQ (PCDD/F + PCB) on a whole weight, upper bound basis was 0.04 ng TEQ/kg. to 0.13 ng TEQ/kg. On average, PCDD/Fs contributed over half of the total TEQ.

The concentration of ICES-6 PCBs on an upper bound whole weight basis ranged from was 0.06 µg/kg to 0.70 µg/kg. Tables 3a and 3b summarise TEQ and ICES6 data, while Tables 4a and 4b presents results for analyte concentrations on a whole and fat weight basis respectively. The highest TEQ and ICES6 concentrations were measured in Troon South Beach razors (S21-001136). In general, higher levels of PCDD/Fs and PCBs were observed in razor clams compared to other species tested.

PAHs were detected in all 20 samples analysed. All samples showed levels below MRL for BaP (5 µg/kg) and PAH4 (30 µg/kg). Benzo[a]pyrene concentrations ranged from <0.14 µg/kg to 2.99 µg/kg and the sum of PAH4 concentrations ranged from 0.53 µg/kg to 15.21 µg/kg. The sample with the highest PAH4 were razor clams from Stevenston Sands (S21-011784) at 15.21 µg/kg. This sample also had the highest concentration of benzo[a]pyrene. In general, PAH4 concentrations were higher in razor clams than other species tested. The highest levels found for a regulated PAH were in common mussels from Loch Leven, with benzo[b]fluoranthene concentrations of 6.59 µg/kg (S21-001802, Loch Leven Lower) and 6.39 µg/kg (S21-001705, Loch Leven Upper). The results from PAH analysis are given in Table 5.

Twenty-six samples were analysed for heavy metals, results of which are detailed in Table 6. Concentrations of the regulated heavy metals (Cd, Hg, Pb) were all below the regulatory limit. The concentration ranges for Cd, Hg and Pb were 0.02 mg/kg to 0.34 mg/kg, <0.01 mg/kg to 0.03 mg/kg and 0.02 mg/kg to 0.77 mg/kg respectively. The highest concentration of Pb was found in a sample of common mussels (0.77 mg/kg, S21-002071, Loch Sunart, Liddesdale) The highest concentration of Cd was found in a sample of native oysters (0.34 mg/kg, S21-002247, Loch Ryan, Leffnoll Point), which also contained the highest levels of Cu, Zn and Ag. The 3 most abundant heavy metals were zinc, manganese and copper, with zinc present at the highest concentration.

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## Table 1: Overview of all Samples\*

Local Authority	Production Area	Site Name	Site Identification Number	Grid Reference	Species	Date Sample Taken	Date Received at Fera	FERA LIMS No.
Argyll & Bute	Dunstaffnage Cockles	Dunstaffnage Bay	AB-696-1511-04	NM 88118 33813	Common Cockles	16/02/2021	17/02/2021	S21-002033
Argyll & Bute	Eilean Gainimh	Eilean Gainimh	AB-870-2379-24	NM 89247 47536	Pullet Carpet Shell	19/01/2021	20/01/2021	S21-000622
Argyll & Bute	Loch na Cille	Loch Na Cille Cockles	AB-617-1204-04	NM 84135 12602	Common Cockles	15/03/2021	18/03/2021	S21-013305
Argyll & Bute	Loch Na Keal West	Eilean Casach	AB-286-082-13	NM 4580 3906	Pacific Oysters	09/03/2021	10/03/2021	S21-012479
Argyll & Bute	Loch Riddon Cockles	Loch Riddon Cockles	AB-656-1409-04	NS 01189 78860	Common Cockles	03/02/2021	04/02/2021	S21-001396
Argyll & Bute	North Connel Cockles	Ledaig Point Cockles	AB-758-1909-04	NM 89159 39202	Common Cockles	12/01/2021	14/01/2021	S21-000390
Comhairle nan Eilean Siar: Lewis & Harris	Loch Erisort: Gob Glas	Gob Glas	LH-891-711-08	NB 3520 2059	Common Mussels	13/01/2021	14/01/2021	S21-000391
Comhairle nan Eilean Siar: Lewis & Harris	Loch Roag: Eilean Chearstaigh	Eilean Scarastaigh	LH-344-697-08	NB 1920 3300	Common Mussels	01/03/2021	02/03/2021	S21-011746
Dumfries & Galloway	Loch Ryan	Leffnoll Point	DG-191-174-12	NX 07100 65711	Native Oysters	22/02/2021	23/02/2021	S21-002247
East Lothian	Gullane Point North	Gullane North	EL-601-1087-16	NT 4452 8212	Razor Clams	08/03/2021	10/03/2021	S21-012478
Fife	Elie Razors	Elie Razors	FF-868-2365-16	NT 4731 9881	Razor Clams	01/03/2021	03/03/2021	S21-011782
Fife	Fife Ness Surf Clams	Kingsbarns	FF-771-1974-19	NO 6316 1138	Surf Clams	01/03/2021	03/03/2021	S21-011781
Fife	Firth of Forth: North	Anstruther	FF-068-184-19	NO 5938 0474	Surf Clams	01/03/2021	03/03/2021	S21-011780
Fife	Forth Estuary: Largo Bay	Largo Bay	FF-072-188-16	NO 4544 0042	Razor Clams	01/03/2021	03/03/2021	S21-011783
Highland Council: Skye & Lochalsh	Kyles of Scalpay	Kyles of Scalpay Cockles	SL-864-2348-04	NG 5930 2715	Common Cockles	01/03/2021	02/03/2021	S21-011747
Highland Council: Skye & Lochalsh	Loch Harport: Inner	Carbost	SL-159-286-13	NG 3923 3137	Pacific Oysters	14/02/2021	17/02/2021	S21-002032

Chemical Contaminant Analysis of Shellfish from Classified Harvesting Areas in Scotland (2021)  
Report to Food Standards Scotland

Local Authority	Production Area	Site Name	Site Identification Number	Grid Reference	Species	Date Sample Taken	Date Received at Fera	FERA LIMS No.
Highland Council: Skye & Lochalsh	Sound of Sleat	Glenelg Bay	SL-833-2242-16	NG 71846 01278	Razor Clams	01/02/2021	03/02/2021	S21-001291
Highlands - Lochaber	Loch Ailort	Eilean Dubh	HL-892-937-08	NM 7509 8128	Common Mussels	09/02/2021	10/02/2021	S21-001622
Highlands - Lochaber	Loch Leven: Lower	Lower	HL-170-222-08	NN 0820 5868	Common Mussels	10/02/2021	12/02/2021	S21-001802
Highlands - Lochaber	Loch Leven: Upper	Upper	HL-171-223-08	NN 1510 6190	Common Mussels	10/02/2021	11/02/2021	S21-001751
Highlands - Lochaber	Loch Sunart	Liddesdale	HL-206-1237-08	NM 7869 5977	Common Mussels	17/02/2021	18/02/2021	S21-002071
Highlands - Ross & Cromarty	Little Loch Broom Pacific Oysters	Little Loch Broom Pacific Oysters	RC-805-2122-13	NH 0822 8877	Pacific Oysters	12/01/2021	13/01/2021	S21-000370
Highlands - Ross & Cromarty	Loch Kanaird	Ardmair	RC-625-1233-13	NH 1175 9918	Pacific Oysters	11/01/2021	13/01/2021	S21-000369
Highlands - Sutherland	Loch Inchard	Loch Inchard-Site 1-D. Ross	HS-162-311-08	NC 2510 5339	Common Mussels	11/01/2021	13/01/2021	S21-000371
North Ayrshire	Fairlie	Southannan Sands	NA-065-332-13	NS 19969 54356	Pacific Oysters	02/02/2021	03/02/2021	S21-001292
North Ayrshire	Stevenston Sands Razors	Stevenston Sands Razors	NA-825-2169-16	NS 26726 39736	Razor Clams	02/03/2021	03/03/2021	S21-011784
Shetlands	Wadbister Voe	Wadbister Voe	SI-294-466-08	HU 4298 5033	Common Mussels	10/02/2021	12/02/2021	S21-001803
South Ayrshire	Croy Bay South	Girvan Mains	SA-872-2381-16	NS 19067 04424	Razor Clams	13/01/2021	15/01/2021	S21-000425
South Ayrshire	North Bay	Barassie	SA-337-719-16	NS 31895 32702	Razor Clams	27/01/2021	29/01/2021	S21-001138
South Ayrshire	Prestwick Shore	Prestwick Shore Razors	SA-840-2262-16	NS 33958 27186	Razor Clams	27/01/2021	29/01/2021	S21-001137
South Ayrshire	Troon South Beach Razors	Troon South Beach Razors	SA-843-2267-16	NS 31185 30091	Razor Clams	27/01/2021	29/01/2021	S21-001136

*\*Quality statement: Information relating to the origin of the samples (place, date of collection and GR/NGR details) is as provided by sampling staff and has not undergone verification checks by Fera or Cefas*

## Table 2: Samples: Chemical contaminant testing

Local Authority	Production Area	Sample Site Name	Site Identification Number	Species	Trace elements	PAHs	DXN/PCBs	FERA LIMS No.
Argyll & Bute	Dunstaffnage Cockles	Dunstaffnage Bay	AB-696-1511-04	Common Cockles	X	---	---	S21-002033
Argyll & Bute	Eilean Gainimh	Eilean Gainimh	AB-870-2379-24	Pullet Carpet Shell	X	X	X	S21-000622
Argyll & Bute	Loch na Cille	Loch na Cille Cockles	AB-617-1204-04	Common Cockles	X	X	X	S21-013305
Argyll & Bute	Loch Na Keal West	Eilean Casach	AB-286-082-13	Pacific Oysters	X	X	X	S21-012479
Argyll & Bute	Loch Riddon Cockles	Loch Riddon Cockles	AB-656-1409-04	Common Cockles	X	X	---	S21-001396
Argyll & Bute	North Connel Cockles	Ledaig Point Cockles	AB-758-1909-04	Common Cockles	X	---	---	S21-000390
Comhairle nan Eilean Siar: Lewis & Harris	Loch Erisort: Gob Glas	Gob Glas	LH-891-711-08	Common Mussels	X	X	---	S21-000391
Comhairle nan Eilean Siar: Lewis & Harris	Loch Roag: Eilean Chearstaigh	Eilean Scarastaigh	LH-344-697-08	Common Mussels	---	X	X	S21-011746
Dumfries & Galloway	Loch Ryan	Leffnoll Point	DG-191-174-12	Native Oysters	X	X	---	S21-002247
East Lothian	Gullane Point North	Gullane North	EL-601-1087-16	Razor Clams	X	---	---	S21-012478
Fife	Elie Razors	Elie Razors	FF-868-2365-16	Razor Clams	X	X	X	S21-011782
Fife	Fife Ness Surf Clams	Kingsbarns	FF-771-1974-19	Surf Clams	X	---	---	S21-011781
Fife	Firth of Forth: North	Anstruther	FF-068-184-19	Surf Clams	X	---	---	S21-011780
Fife	Forth Estuary: Largo Bay	Largo Bay	FF-072-188-16	Razor Clams	X	X	---	S21-011783
Highland Council: Skye & Lochalsh	Kyles of Scalpay	Kyles of Scalpay Cockles	SL-864-2348-04	Common Cockles	X	X	X	S21-011747
Highland Council: Skye & Lochalsh	Loch Harport: Inner	Carbost	SL-159-286-13	Pacific oysters	X	---	---	S21-002032

Local Authority	Production Area	Site Name	Site Identification Number	Species	Trace elements	PAHs	DXN/PCBs	FERA LIMS No.
Highland Council: Skye & Lochalsh	Sound of Sleat	Glenelg Bay	SL-833-2242-16	Razor Clams	X	---	X	S21-001291
Highlands - Lochaber	Loch Ailort	Eilean Dubh	HL-892-937-08	Common Mussels	X	---	---	S21-001622
Highlands - Lochaber	Loch Leven: Lower	Lower	HL-170-222-08	Common Mussels	---	X	---	S21-001802
Highlands - Lochaber	Loch Leven: Upper	Upper	HL-171-223-08	Common Mussels	---	X	---	S21-001751
Highlands - Lochaber	Loch Sunart	Liddisdale	HL-206-1237-08	Common Mussels	X	---	---	S21-002071
Highlands - Ross & Cromarty	Little Loch Broom Pacific Oysters	Little Loch Broom Pacific Oysters	RC-805-2122-13	Pacific Oysters	X	---	---	S21-000370
Highlands - Ross & Cromarty	Loch Kanaird	Ardmair	RC-625-1233-13	Pacific Oysters	X	---	X	S21-000369
Highlands - Sutherland	Loch Inchard	Loch Inchard - Site 1 - D. Ross	HS-162-311-08	Common Mussels	---	X	---	S21-000371
North Ayrshire	Fairlie	Southannan Sands	NA-065-332-13	Pacific Oysters	---	X	---	S21-001292
North Ayrshire	Stevenston Sands Razors	Stevenston Sands Razors	NA-825-2169-16	Razor Clams	X	X	X	S21-011784
Shetlands	Wadbister Voe	Wadbister Voe	SI-294-466-08	Common Mussels	X	X	X	S21-001803
South Ayrshire	Croy Bay South	Girvan Mains	SA-872-2381-16	Razor Clams	X	X	X	S21-000425
South Ayrshire	North Bay	Barassie	SA-337-719-16	Razor Clams	X	X	---	S21-001138
South Ayrshire	Prestwick Shore	Prestwick Shore Razors	SA-840-2262-16	Razor Clams	X	X	X	S21-001137
South Ayrshire	Troon South Beach Razors	Troon South Beach Razors	SA-843-2267-16	Razor Clams	X	X	X	S21-001136

**Table 3a: PCDD/Fs and PCB - TEQ and ICES6 summary, Whole weight**

Fera LIMS No.	Species	Production Area	Site Name	PCDD/F ng/kg TEQ lb	PCDD/F ng/kg TEQ ub	PCB ng/kg TEQ lb	PCB ng/kg TEQ ub	Total (PCDD/F+ PCB) ng/kg TEQ lb	Total (PCDD/F+ PCB) TEQ ng/kg ub	ICES6 µg/kg lb	ICES6 µg/kg ub
S21-000622	Pullet Carpet Shell	Eilean Gainimh	Eilean Gainimh	0.01	0.04	0.01	0.01	0.02	0.05	0.12	0.12
S21-013305	Common Cockles	Loch na Cille	Loch Na Cille Cockles	<0.01	0.03	0.01	0.01	0.01	0.04	0.04	0.08
S21-012479	Pacific Oysters	Loch Na Keal West	Eilean Casach	0.05	0.06	0.02	0.02	0.07	0.08	0.11	0.14
S21-011746	Common Mussels	Loch Roag: Eilean Chearstaigh	Eilean Scarastaigh	0.02	0.04	0.01	0.01	0.03	0.05	0.08	0.11
S21-011782	Razor Clams	Elie Razors	Elie Razors	0.03	0.05	0.04	0.04	0.07	0.09	0.38	0.39
S21-011747	Cockles	Kyles of Scalpay	Kyles of Scalpay Cockles	<0.01	0.03	0.01	0.01	0.01	0.04	<0.01	0.06
S21-001291	Razor Clams	Sound of Sleat	Glenelg Bay	0.02	0.04	0.02	0.02	0.04	0.06	0.11	0.13
S21-000369	Pacific Oysters	Loch Kanaird	Ardmair	0.02	0.05	0.02	0.02	0.04	0.07	0.11	0.13
S21-011784	Razor Clams	Stevenston Sands Razors	Stevenston Sands Razors	0.02	0.05	0.03	0.04	0.05	0.09	0.57	0.58
S21-001803	Common Mussels	Wadbister Voe	Wadbister Voe	0.03	0.06	0.03	0.03	0.06	0.09	0.12	0.15
S21-000425	Razor Clams	Croy Bay South	Girvan Mains	0.02	0.04	0.02	0.02	0.04	0.06	0.23	0.24
S21-001137	Razor Clams	Prestwick Shore	Prestwick Shore Razors	0.04	0.06	0.04	0.05	0.08	0.11	0.64	0.65
S21-001136	Razor Clams	Troon South Beach Razors	Troon South Beach Razors	0.05	0.07	0.05	0.06	0.10	0.13	0.69	0.70

**Table 3b: PCDD/Fs and PCB - TEQ and ICES6 summary, Fat weight**

Fera LIMS No.	Species	Production Area	Site Name	Fat as % of whole	PCDD/F ng/kg TEQ lb	PCDD/F ng/kg TEQ ub	PCB ng/kg TEQ lb	PCB ng/kg TEQ ub	Total (PCDD/F+ PCB) ng/kg TEQ lb	Total (PCDD/F+ PCB) TEQ ng/kg ub	ICES6 µg/kg lb	ICES6 µg/kg ub
S21-000622	Pullet Carpet Shell	Eilean Gainimh	Eilean Gainimh	1.34	1.71	2.30	0.97	0.97	2.68	3.27	9.89	9.89
S21-013305	Common Cockles	Loch na Cille	Loch Na Cille Cockles	0.41	2.32	2.65	2.59	2.60	4.91	5.25	12.14	12.92
S21-012479	Pacific Oysters	Loch Na Keal West	Eilean Casach	0.66	8.14	8.17	3.79	3.79	11.93	11.96	18.17	18.79
S21-011746	Common Mussels	Loch Roag: Eilean Chearstaigh	Eilean Scarastaigh	0.49	5.75	5.79	3.05	3.06	8.80	8.85	18.31	18.75
S21-011782	Razor Clams	Elie Razors	Elie Razors	0.78	5.22	5.26	5.80	5.82	11.02	11.08	48.42	48.42
S21-011747	Cockles	Kyles of Scalpay	Kyles of Scalpay Cockles	0.24	2.13	3.01	2.48	2.49	4.61	5.50	6.38	8.43
S21-001291	Razor Clams	Sound of Sleat	Glenelg Bay	0.73	3.05	4.78	2.72	2.92	5.77	7.70	15.42	15.75
S21-000369	Pacific Oysters	Loch Kanaird	Ardmair	0.58	6.10	7.18	3.49	3.50	9.59	10.68	21.54	21.54
S21-011784	Razor Clams	Stevenston Sands Razors	Stevenston Sands Razors	0.77	4.30	4.38	4.78	4.78	9.08	9.16	74.46	74.46
S21-001803	Common Mussels	Wadbister Voe	Wadbister Voe	0.56	6.58	9.79	4.58	4.63	11.16	14.42	24.96	24.96
S21-000425	Razor Clams	Croy Bay South	Girvan Mains	0.72	2.38	4.28	3.06	3.10	5.44	7.38	31.97	31.97
S21-001137	Razor Clams	Prestwick Shore	Prestwick Shore Razors	0.97	4.55	5.30	4.61	4.63	9.16	9.93	66.03	66.30
S21-001136	Razor Clams	Troon South Beach Razors	Troon South Beach Razors	1.03	4.89	5.69	5.03	5.05	9.92	10.74	67.92	67.92

**Table 4a: PCDD/F & PCB concentrations, Whole weight**

	FERA LIMS No.	S21-000622	S21-013305	S21-012479	S21-011746
	Species	Pullet Carpet Shell	Common Cockles	Pacific Oysters	Common Mussels
	Production Area	Eilean Gainimh	Loch na Cille	Loch Na Keal West	Loch Roag: Eilean Chearstaigh
	Site Name	Eilean Gainimh	Loch Na Cille Cockles	Eilean Casach	Eilean Scarastaigh
	Units				
PCB 18	µg/kg	<0.01	<0.01	<0.01	<0.01
PCB 28	µg/kg	0.01	<0.01	<0.01	<0.01
PCB 31	µg/kg	0.02	<0.01	<0.01	<0.01
PCB 47	µg/kg	<0.01	<0.01	<0.01	<0.01
PCB 49	µg/kg	<0.01	<0.01	<0.01	<0.01
PCB 51	µg/kg	<0.01	<0.01	<0.01	<0.01
PCB 52	µg/kg	0.01	<0.01	<0.01	<0.01
PCB 99	µg/kg	0.01	<0.01	0.01	<0.01
PCB 101	µg/kg	0.02	<0.01	0.02	0.01
PCB 105	µg/kg	<0.01	<0.01	<0.01	<0.01
PCB 114	µg/kg	<0.01	<0.01	<0.01	<0.01
PCB 118	µg/kg	0.01	<0.01	0.02	0.01
PCB 123	µg/kg	<0.01	<0.01	<0.01	<0.01
PCB 128	µg/kg	<0.01	<0.01	<0.01	<0.01
PCB 138	µg/kg	0.03	0.02	0.03	0.03
PCB 153	µg/kg	0.04	0.02	0.06	0.04
PCB 156	µg/kg	<0.01	<0.01	<0.01	<0.01
PCB 157	µg/kg	<0.01	<0.01	<0.01	<0.01
PCB 167	µg/kg	<0.01	<0.01	<0.01	<0.01
PCB 180	µg/kg	0.01	<0.01	<0.01	<0.01
PCB 189	µg/kg	<0.01	<0.01	<0.01	<0.01
PCB 77	ng/kg	1.04	0.49	1.00	0.48
PCB 81	ng/kg	0.07	0.03	0.06	0.03
PCB 126	ng/kg	0.11	0.09	0.22	0.13
PCB 169	ng/kg	0.05	0.05	0.07	0.06
2378TCDD	ng/kg	<0.01	<0.01	<0.01	<0.01
12378PeCDD	ng/kg	<0.01	<0.01	0.02	0.01
123478HxCDD	ng/kg	<0.01	<0.01	<0.01	<0.01
123678HxCDD	ng/kg	<0.01	<0.01	0.01	0.01
123789HxCDD	ng/kg	<0.01	<0.01	<0.01	<0.01
1234678HpCDD	ng/kg	0.03	0.04	0.02	0.10
OCDD	ng/kg	0.11	0.13	0.06	0.56
2378TCDF	ng/kg	0.07	0.02	0.13	0.04
12378PeCDF	ng/kg	<0.02	<0.01	0.02	<0.01
23478PeCDF	ng/kg	0.02	<0.01	0.04	0.02
123478HxCDF	ng/kg	<0.01	<0.01	<0.01	<0.01
123678HxCDF	ng/kg	<0.01	<0.01	<0.01	<0.01
123789HxCDF	ng/kg	<0.01	<0.01	<0.01	<0.01
234678HxCDF	ng/kg	<0.01	<0.01	0.01	<0.01
1234678HpCDF	ng/kg	<0.01	0.02	<0.01	0.02
1234789HpCDF	ng/kg	<0.01	<0.01	<0.01	<0.01
OCDF	ng/kg	<0.02	0.01	<0.01	0.01

	FERA LIMS No.	S21-011782	S21-011747	S21-001291	S21-000369
	Species	Razor Clams	Common Cockles	Razor Clams	Pacific Oysters
	Production Area	Elie Razors	Kyles of Scalpay	Sound of Sleat	Loch Kanaird
	Site Name	Elie Razors	Kyles of Scalpay Cockles	Glenelg Bay	Ardmair
	Units				
PCB 18	µg/kg	<0.01	<0.01	<0.01	<0.01
PCB 28	µg/kg	0.02	<0.01	<0.01	0.01
PCB 31	µg/kg	0.02	<0.01	<0.01	<0.01
PCB 47	µg/kg	0.01	<0.01	<0.01	<0.01
PCB 49	µg/kg	0.02	<0.01	<0.01	<0.01
PCB 51	µg/kg	<0.01	<0.01	<0.01	<0.01
PCB 52	µg/kg	0.03	<0.01	0.01	<0.01
PCB 99	µg/kg	0.04	<0.01	0.01	0.01
PCB 101	µg/kg	0.07	<0.01	0.02	0.01
PCB 105	µg/kg	0.02	<0.01	<0.01	<0.01
PCB 114	µg/kg	<0.01	<0.01	<0.01	<0.01
PCB 118	µg/kg	0.05	<0.01	0.02	0.01
PCB 123	µg/kg	<0.01	<0.01	<0.01	<0.01
PCB 128	µg/kg	0.02	<0.01	<0.01	<0.01
PCB 138	µg/kg	0.12	<0.01	0.04	0.03
PCB 153	µg/kg	0.14	<0.01	0.04	0.06
PCB 156	µg/kg	<0.01	<0.01	<0.01	<0.01
PCB 157	µg/kg	<0.01	<0.01	<0.01	<0.01
PCB 167	µg/kg	<0.01	<0.01	<0.01	<0.01
PCB 180	µg/kg	<0.01	<0.01	<0.01	<0.01
PCB 189	µg/kg	<0.01	<0.01	<0.01	<0.01
PCB 77	ng/kg	3.60	0.26	1.74	1.01
PCB 81	ng/kg	0.30	0.02	0.09	0.06
PCB 126	ng/kg	0.40	0.05	0.19	0.18
PCB 169	ng/kg	0.10	0.04	<0.05	0.05
2378TCDD	ng/kg	<0.01	<0.01	<0.01	<0.01
12378PeCDD	ng/kg	0.01	<0.01	<0.01	0.01
123478HxCDD	ng/kg	<0.01	<0.01	<0.01	<0.01
123678HxCDD	ng/kg	0.02	<0.01	<0.01	<0.01
123789HxCDD	ng/kg	0.01	<0.01	<0.01	<0.05
1234678HpCDD	ng/kg	0.15	0.03	0.07	0.01
OCDD	ng/kg	0.63	0.18	0.43	0.06
2378TCDF	ng/kg	0.09	<0.01	0.10	0.08
12378PeCDF	ng/kg	<0.01	<0.01	<0.01	<0.01
23478PeCDF	ng/kg	0.03	<0.01	0.02	0.02
123478HxCDF	ng/kg	<0.01	<0.01	0.01	<0.01
123678HxCDF	ng/kg	<0.01	<0.01	<0.01	<0.01
123789HxCDF	ng/kg	<0.01	<0.01	<0.01	<0.01
234678HxCDF	ng/kg	0.01	<0.01	0.01	<0.01
1234678HpCDF	ng/kg	0.06	0.01	0.02	<0.04
1234789HpCDF	ng/kg	<0.01	<0.01	<0.01	<0.01
OCDF	ng/kg	0.04	<0.01	0.03	<0.01



	<b>FERA LIMS No.</b>	S21-011784	S21-001803	S21-000425	S21-001137
	<b>Species</b>	Razor Clams	Common Mussels	Razor Clams	Razor Clams
	<b>Production Area</b>	Stevenston Sands Razors	Wadbister Voe	Croy Bay South	Prestwick Shore
	<b>Site Name</b>	Stevenston Sands Razors	Wadbister Voe	Girvan Mains	Prestwick Shore Razors
	<b>Units</b>				
PCB 18	µg/kg	<0.01	<0.01	0.01	0.01
PCB 28	µg/kg	0.02	<0.01	0.01	0.03
PCB 31	µg/kg	0.02	<0.01	0.01	0.03
PCB 47	µg/kg	0.02	<0.01	0.01	0.02
PCB 49	µg/kg	0.02	<0.01	0.02	0.04
PCB 51	µg/kg	<0.01	<0.01	<0.01	<0.01
PCB 52	µg/kg	0.04	<0.01	0.02	0.06
PCB 99	µg/kg	0.07	0.01	0.03	0.08
PCB 101	µg/kg	0.13	0.02	0.05	0.14
PCB 105	µg/kg	0.04	<0.01	0.02	0.04
PCB 114	µg/kg	<0.01	<0.01	<0.01	<0.01
PCB 118	µg/kg	0.11	0.02	0.05	0.11
PCB 123	µg/kg	<0.01	<0.01	<0.01	<0.01
PCB 128	µg/kg	0.03	<0.01	<0.01	0.04
PCB 138	µg/kg	0.18	0.04	0.06	0.19
PCB 153	µg/kg	0.20	0.06	0.09	0.22
PCB 156	µg/kg	<0.01	<0.01	<0.01	<0.01
PCB 157	µg/kg	<0.01	<0.01	<0.01	<0.01
PCB 167	µg/kg	<0.01	<0.01	<0.01	<0.01
PCB 180	µg/kg	<0.01	<0.01	<0.01	<0.01
PCB 189	µg/kg	<0.01	<0.01	<0.01	<0.01
PCB 77	ng/kg	4.43	1.19	2.88	6.61
PCB 81	ng/kg	0.21	0.08	0.12	0.31
PCB 126	ng/kg	0.30	0.23	0.19	0.37
PCB 169	ng/kg	0.05	0.07	0.03	0.06
2378TCDD	ng/kg	<0.01	<0.01	<0.01	<0.01
12378PeCDD	ng/kg	<0.01	<0.02	<0.01	0.01
123478HxCDD	ng/kg	<0.01	<0.01	<0.01	<0.01
123678HxCDD	ng/kg	<0.01	0.02	<0.01	<0.01
123789HxCDD	ng/kg	<0.01	0.01	<0.01	<0.01
1234678HpCDD	ng/kg	0.04	0.05	0.03	0.04
OCDD	ng/kg	0.20	0.12	0.12	0.29
2378TCDF	ng/kg	0.13	0.09	0.09	0.16
12378PeCDF	ng/kg	<0.01	<0.02	<0.01	<0.01
23478PeCDF	ng/kg	0.02	0.03	0.02	0.04
123478HxCDF	ng/kg	<0.01	0.01	<0.01	0.01
123678HxCDF	ng/kg	<0.01	0.01	<0.01	<0.01
123789HxCDF	ng/kg	<0.01	<0.01	<0.01	<0.01
234678HxCDF	ng/kg	<0.01	0.02	<0.01	0.01
1234678HpCDF	ng/kg	0.02	0.02	<0.01	0.02
1234789HpCDF	ng/kg	<0.01	<0.01	<0.01	<0.01
OCDF	ng/kg	0.02	0.03	<0.01	<0.02

	<b>FERA LIMS No.</b>	S21-001136
	<b>Species</b>	Razor Clams
	<b>Production Area</b>	Troon South Beach Razors
	<b>Site Name</b>	Troon South Beach Razors
	Units	
PCB 18	µg/kg	<0.01
PCB 28	µg/kg	0.03
PCB 31	µg/kg	0.03
PCB 47	µg/kg	0.02
PCB 49	µg/kg	0.04
PCB 51	µg/kg	<0.01
PCB 52	µg/kg	0.06
PCB 99	µg/kg	0.08
PCB 101	µg/kg	0.15
PCB 105	µg/kg	0.04
PCB 114	µg/kg	<0.01
PCB 118	µg/kg	0.11
PCB 123	µg/kg	<0.01
PCB 128	µg/kg	0.02
PCB 138	µg/kg	0.20
PCB 153	µg/kg	0.25
PCB 156	µg/kg	<0.01
PCB 157	µg/kg	<0.01
PCB 167	µg/kg	<0.01
PCB 180	µg/kg	<0.01
PCB 189	µg/kg	<0.01
PCB 77	ng/kg	6.63
PCB 81	ng/kg	0.33
PCB 126	ng/kg	0.44
PCB 169	ng/kg	0.06
2378TCDD	ng/kg	<0.01
12378PeCDD	ng/kg	0.02
123478HxCDD	ng/kg	<0.01
123678HxCDD	ng/kg	<0.01
123789HxCDD	ng/kg	<0.01
1234678HpCDD	ng/kg	0.05
OCDD	ng/kg	0.23
2378TCDF	ng/kg	0.17
12378PeCDF	ng/kg	<0.01
23478PeCDF	ng/kg	0.05
123478HxCDF	ng/kg	0.01
123678HxCDF	ng/kg	<0.01
123789HxCDF	ng/kg	<0.01
234678HxCDF	ng/kg	<0.01
1234678HpCDF	ng/kg	0.02
1234789HpCDF	ng/kg	<0.01
OCDF	ng/kg	<0.02

**Table 4b: PCDD/F & PCB concentrations, Fat weight**

	FERA LIMS No.	S21-000622	S21-013305	S21-012479	S21-011746
	Species	Pullet Carpet Shell	Common Cockles	Pacific Oysters	Common Mussels
	Production Area	Eilean Gainimh	Loch na Cille	Loch Na Keal West	Loch Roag: Eilean Chearstaigh
	Site Name	Eilean Gainimh	Loch Na Cille Cockles	Eilean Casach	Eilean Scarastaigh
	Units				
PCB 18	µg/kg	<0.96	<0.74	<0.43	0.58
PCB 28	µg/kg	0.87	<0.78	<0.62	0.95
PCB 31	µg/kg	1.13	0.83	<0.45	0.95
PCB 47	µg/kg	0.39	0.39	0.54	0.47
PCB 49	µg/kg	0.67	0.50	0.60	0.58
PCB 51	µg/kg	<0.10	0.08	0.10	<0.06
PCB 52	µg/kg	1.04	0.83	1.00	1.00
PCB 99	µg/kg	0.86	0.97	1.72	1.35
PCB 101	µg/kg	1.36	1.64	2.27	2.04
PCB 105	µg/kg	0.33	0.44	0.62	0.60
PCB 114	µg/kg	<0.09	<0.06	<0.05	<0.04
PCB 118	µg/kg	1.00	1.58	2.35	2.06
PCB 123	µg/kg	<0.03	<0.01	0.02	<0.04
PCB 128	µg/kg	0.23	<0.42	0.38	0.51
PCB 138	µg/kg	2.48	3.86	5.05	5.73
PCB 153	µg/kg	3.21	4.45	9.39	8.59
PCB 156	µg/kg	0.12	0.22	<0.02	0.20
PCB 157	µg/kg	0.07	<0.14	<0.02	<0.11
PCB 167	µg/kg	0.07	0.17	0.21	0.20
PCB 180	µg/kg	0.93	1.36	0.46	<0.44
PCB 189	µg/kg	<0.09	<0.06	<0.10	<0.04
PCB 77	ng/kg	77.90	118.07	151.30	97.06
PCB 81	ng/kg	5.21	6.53	9.41	5.97
PCB 126	ng/kg	8.08	21.15	33.60	26.12
PCB 169	ng/kg	3.39	13.09	10.39	11.23
2378TCDD	ng/kg	<0.32	<0.17	0.94	0.58
12378PeCDD	ng/kg	0.62	0.56	2.72	2.17
123478HxCDD	ng/kg	<0.45	0.72	0.84	1.04
123678HxCDD	ng/kg	<0.57	1.33	1.92	2.17
123789HxCDD	ng/kg	<0.22	<0.92	1.30	2.00
1234678HpCDD	ng/kg	2.16	10.12	2.70	19.95
OCDD	ng/kg	7.90	32.08	8.49	114.84
2378TCDF	ng/kg	5.16	3.64	18.96	8.54
12378PeCDF	ng/kg	<1.20	1.39	2.83	1.80
23478PeCDF	ng/kg	1.49	1.72	5.91	3.44
123478HxCDF	ng/kg	0.46	1.45	<0.19	0.60
123678HxCDF	ng/kg	0.61	1.50	1.06	0.69
123789HxCDF	ng/kg	<0.46	<0.69	<0.06	<0.38
234678HxCDF	ng/kg	<0.49	1.72	1.81	1.35
1234678HpCDF	ng/kg	<0.94	5.06	<1.10	4.35
1234789HpCDF	ng/kg	<0.38	<0.61	<0.17	<0.36
OCDF	ng/kg	<1.60	2.95	0.51	3.04

	FERA LIMS No.	S21-011782	S21-011747	S21-001291	S21-000369
	Species	Razor Clams	Common Cockles	Razor Clams	Pacific Oysters
	Production Area	Elie Razors	Kyles of Scalpay	Sound of Sleat	Loch Kanaird
	Site Name	Elie Razors	Kyles of Scalpay Cockles	Glenelg Bay	Ardmair
	Units				
PCB 18	µg/kg	0.79	<1.01	<1.81	0.66
PCB 28	µg/kg	2.46	<1.04	1.24	1.73
PCB 31	µg/kg	2.13	<1.06	1.32	1.04
PCB 47	µg/kg	1.44	0.41	0.88	0.82
PCB 49	µg/kg	2.27	0.56	1.02	0.86
PCB 51	µg/kg	0.12	0.11	<0.11	<0.13
PCB 52	µg/kg	3.34	<1.01	1.48	1.44
PCB 99	µg/kg	4.57	0.60	1.43	1.93
PCB 101	µg/kg	8.72	0.98	2.31	2.54
PCB 105	µg/kg	2.39	0.26	0.85	0.69
PCB 114	µg/kg	0.14	<0.08	<0.16	<0.06
PCB 118	µg/kg	6.70	0.94	2.42	2.49
PCB 123	µg/kg	<0.02	<0.01	<0.05	<0.10
PCB 128	µg/kg	2.20	0.23	0.63	0.35
PCB 138	µg/kg	15.63	2.29	5.11	5.21
PCB 153	µg/kg	18.18	2.55	5.28	10.04
PCB 156	µg/kg	<0.23	<0.04	0.19	0.10
PCB 157	µg/kg	<0.01	<0.01	0.14	<0.08
PCB 167	µg/kg	0.46	<0.08	0.16	0.19
PCB 180	µg/kg	0.09	0.56	<0.33	0.58
PCB 189	µg/kg	<0.28	<0.15	<0.16	<0.08
PCB 77	ng/kg	461.08	109.72	237.98	173.14
PCB 81	ng/kg	38.09	6.79	12.26	11.00
PCB 126	ng/kg	50.86	19.74	25.85	31.32
PCB 169	ng/kg	12.31	15.13	<6.35	7.87
2378TCDD	ng/kg	0.49	<0.23	<0.66	0.70
12378PeCDD	ng/kg	1.44	<0.60	<0.82	2.22
123478HxCDD	ng/kg	0.67	0.83	0.63	1.26
123678HxCDD	ng/kg	2.06	1.46	<1.26	1.31
123789HxCDD	ng/kg	1.48	2.63	1.02	<9.07
1234678HpCDD	ng/kg	18.80	14.19	9.54	2.37
OCDD	ng/kg	80.21	75.83	58.90	10.50
2378TCDF	ng/kg	11.94	3.75	13.97	13.88
12378PeCDF	ng/kg	0.79	1.24	<0.82	1.58
23478PeCDF	ng/kg	3.66	2.03	3.24	4.25
123478HxCDF	ng/kg	0.60	1.28	1.37	<0.42
123678HxCDF	ng/kg	0.60	1.43	1.02	0.67
123789HxCDF	ng/kg	<0.39	<0.53	<0.88	<0.51
234678HxCDF	ng/kg	1.51	1.24	1.37	1.22
1234678HpCDF	ng/kg	7.35	5.29	2.72	<7.18
1234789HpCDF	ng/kg	<0.02	<0.34	<0.71	<0.29
OCDF	ng/kg	5.42	3.72	4.70	<0.66

	FERA LIMS No.	S21-011784	S21-001803	S21-000425	S21-001137
	Species	Razor Clams	Common Mussels	Razor Clams	Razor Clams
	Production Area	Stevenston Sands Razors	Wadbister Voe	Croy Bay South	Prestwick Shore
	Site Name	Stevenston Sands Razors	Wadbister Voe	Girvan Mains	Prestwick Shore Razors
	Units				
PCB 18	µg/kg	0.87	<1.45	1.92	<1.49
PCB 28	µg/kg	2.27	1.62	2.07	2.71
PCB 31	µg/kg	2.01	1.14	1.61	3.00
PCB 47	µg/kg	2.01	0.83	1.95	2.28
PCB 49	µg/kg	3.06	0.99	2.66	4.45
PCB 51	µg/kg	0.24	<0.09	<0.23	0.27
PCB 52	µg/kg	5.01	1.62	2.97	6.16
PCB 99	µg/kg	8.76	2.04	3.93	7.74
PCB 101	µg/kg	16.42	3.40	6.62	14.87
PCB 105	µg/kg	4.75	<1.05	2.15	3.86
PCB 114	µg/kg	0.16	<0.13	<0.20	<0.23
PCB 118	µg/kg	14.09	3.29	6.25	11.30
PCB 123	µg/kg	<0.03	<0.07	0.40	<0.16
PCB 128	µg/kg	3.54	0.64	0.31	3.93
PCB 138	µg/kg	24.02	7.11	7.72	19.34
PCB 153	µg/kg	26.42	10.62	12.00	22.95
PCB 156	µg/kg	0.69	0.22	<0.54	0.54
PCB 157	µg/kg	0.21	<0.13	<0.42	0.23
PCB 167	µg/kg	0.48	0.26	0.37	0.45
PCB 180	µg/kg	0.32	0.59	0.59	<0.27
PCB 189	µg/kg	<0.05	<0.13	<0.48	<0.18
PCB 77	ng/kg	577.25	211.38	398.21	679.91
PCB 81	ng/kg	27.64	14.00	16.10	31.77
PCB 126	ng/kg	39.22	40.71	25.97	38.56
PCB 169	ng/kg	6.20	12.44	4.75	6.21
2378TCDD	ng/kg	0.63	1.51	<0.62	<0.50
12378PeCDD	ng/kg	0.71	<2.98	<0.85	1.24
123478HxCDD	ng/kg	0.37	<1.29	<0.34	<0.50
123678HxCDD	ng/kg	0.66	2.92	<0.51	0.79
123789HxCDD	ng/kg	<0.37	2.50	<0.85	<0.43
1234678HpCDD	ng/kg	5.17	8.34	3.59	4.22
OCDD	ng/kg	25.66	20.85	16.21	29.74
2378TCDF	ng/kg	17.00	16.55	13.07	16.58
12378PeCDF	ng/kg	0.82	<3.38	<0.67	<1.26
23478PeCDF	ng/kg	3.04	6.10	3.20	4.17
123478HxCDF	ng/kg	<0.32	1.91	<0.74	1.17
123678HxCDF	ng/kg	0.32	2.08	<0.59	<0.36
123789HxCDF	ng/kg	<0.11	1.76	<0.91	<0.72
234678HxCDF	ng/kg	1.03	3.25	0.74	1.35
1234678HpCDF	ng/kg	2.69	4.17	<1.33	1.99
1234789HpCDF	ng/kg	<0.18	1.40	<0.51	<0.59
OCDF	ng/kg	2.01	4.94	1.33	<2.48

	<b>FERA LIMS No.</b>	S21-001136
	<b>Species</b>	Razor Clams
	<b>Production Area</b>	Troon South Beach Razors
	<b>Site Name</b>	Troon South Beach Razors
	Units	
PCB 18	µg/kg	<1.46
PCB 28	µg/kg	2.80
PCB 31	µg/kg	3.02
PCB 47	µg/kg	2.09
PCB 49	µg/kg	3.42
PCB 51	µg/kg	0.18
PCB 52	µg/kg	5.67
PCB 99	µg/kg	7.74
PCB 101	µg/kg	15.04
PCB 105	µg/kg	3.81
PCB 114	µg/kg	<0.15
PCB 118	µg/kg	11.03
PCB 123	µg/kg	<0.15
PCB 128	µg/kg	2.16
PCB 138	µg/kg	19.89
PCB 153	µg/kg	24.10
PCB 156	µg/kg	0.71
PCB 157	µg/kg	<0.29
PCB 167	µg/kg	0.44
PCB 180	µg/kg	0.42
PCB 189	µg/kg	<0.13
PCB 77	ng/kg	645.84
PCB 81	ng/kg	31.97
PCB 126	ng/kg	43.04
PCB 169	ng/kg	5.58
2378TCDD	ng/kg	<0.57
12378PeCDD	ng/kg	1.48
123478HxCDD	ng/kg	<0.49
123678HxCDD	ng/kg	0.82
123789HxCDD	ng/kg	0.51
1234678HpCDD	ng/kg	5.01
OCDD	ng/kg	22.05
2378TCDF	ng/kg	16.83
12378PeCDF	ng/kg	<1.28
23478PeCDF	ng/kg	4.43
123478HxCDF	ng/kg	1.21
123678HxCDF	ng/kg	0.66
123789HxCDF	ng/kg	<0.71
234678HxCDF	ng/kg	<0.60
1234678HpCDF	ng/kg	2.32
1234789HpCDF	ng/kg	<0.57
OCDF	ng/kg	<2.43

NOTE: where shown *i* = indicative

**Table 5: PAH concentrations ( $\mu\text{g}/\text{kg}$  Whole weight)**

FERA LIMS No.	S21-000622	S21-013305	S21-012479	S21-001396	S21-000391
Species	Pullet Carpet Shell	Common Cockles	Pacific Oysters	Cockles	Common Mussels
Production Area	Eilean Gainimh	Loch na Cille	Loch Na Keal West	Loch Riddon Cockles	Loch Erisort: Gob Glas
Site Name	Eilean Gainimh	Loch Na Cille Cockles	Eilean Casach	Loch Riddon Cockles	Gob Glas
acenaphthylene	0.14	<0.13	0.22	0.14	0.22
acenaphthene	<0.27	<0.39	<0.4	<0.31	<0.36
fluorene	0.34	<0.5	<0.51	<0.34	<0.46
phenanthrene	2.15	<0.78	1.01	<0.48	<0.73
anthracene	0.31	0.07	0.13	0.17	0.11
fluoranthene	2.24	0.73	1.73	0.76	0.66
benzo[c]fluorene	0.12	0.02	0.05	<0.01	0.03
pyrene	1.66	<0.59	0.9	0.85	0.62
benzo[ghi]fluoranthene	0.48	0.18	0.55	0.36	0.36
<b>benzo[a]anthracene</b>	<b>1.47</b>	<b>0.18</b>	<b>0.29</b>	<b>0.35</b>	<b>0.21</b>
benzo[b]naphtho[2,1-d]thiophene	0.17	0.05	0.08	0.08	0.04
cyclopenta[cd]pyrene	0.03	<0.01	<0.01	0.02	0.04
<b>chrysene</b>	<b>1.31</b>	<b>0.42</b>	<b>0.71</b>	<b>0.48</b>	<b>0.27</b>
5-methylchrysene	<0.01	0.01	<0.02	<0.03	<0.01
<b>benzo[b]fluoranthene</b>	<b>1.01</b>	<b>0.48</b>	<b>1.09</b>	<b>0.65</b>	<b>0.48</b>
benzo[j]fluoranthene	0.28	0.24	0.27	0.38	0.19
benzo[k]fluoranthene	0.24	0.21	0.42	0.4	0.18
benzo[e]pyrene	0.75	0.76	1.26	0.91	0.76
<b>benzo[a]pyrene</b>	<b>0.19</b>	<b>0.22</b>	<b>0.19</b>	<b>0.34</b>	<b>0.15</b>
indeno[1,2,3-cd]pyrene	0.23	0.33	0.17	0.32	0.19
dibenz[a,h]anthracene	<0.09	0.09	<0.09	<0.1	<0.08
benzo[ghi]perylene	0.26	0.34	0.19	0.38	0.28
anthanthrene	<0.1	<0.1	<0.1	<0.1	<0.1
dibenzo[a,l]pyrene	<0.14	<0.17	<0.17	<0.12	<0.15
dibenzo[a,e]pyrene	<0.2	<0.27	<0.28	<0.17	<0.25
dibenzo[a,i]pyrene	<0.19	<0.23	<0.24	<0.1	<0.21
dibenzo[a,h]pyrene	<0.24	<0.31	<0.32	<0.18	<0.29
coronene	<0.1	0.15	<0.1	<0.1	<0.1
<b>PAH 4 Sum lb</b>	<b>3.98</b>	<b>1.30</b>	<b>2.28</b>	<b>1.82</b>	<b>1.11</b>
<b>PAH 4 Sum ub</b>	<b>3.98</b>	<b>1.30</b>	<b>2.28</b>	<b>1.82</b>	<b>1.11</b>

NOTE: where shown *i=* indicative

FERA LIMS No.	S21-011746	S21-002247	S21-011782	S21-011783
Species	Common Mussels	Native Oysters	Razor Clams	Razor Clams
Production Area	Loch Roag: Eilean Chearstaigh	Loch Ryan	Elie Razors	Forth Estuary: Largo Bay
Site Name	Eilean Scarastaigh	Leffnoll Point	Elie Razors	Largo Bay
acenaphthylene	<0.12	0.35	0.18	0.38
acenaphthene	<0.42	<0.34	<0.41	<0.35
fluorene	<0.47	<0.43	0.53	<0.45
phenanthrene	<0.76	2.35	1.34	1.78
anthracene	0.05	0.31	<0.29	0.45
fluoranthene	<0.5	4.88	3.15	4.18
benzo[c]fluorene	0.01	0.18	0.13	0.2
pyrene	<0.6	2.94	2.85	3.24
benzo[ghi]fluoranthene	0.12	1.32	1.06	1.26
<b>benzo[a]anthracene</b>	<b>0.07</b>	<b>1.4</b>	<b>1.66</b>	<b>1.66</b>
benzo[b]naphtho[2,1-d]thiophene	0.04	<0.08	<0.19	<0.1
cyclopenta[cd]pyrene	<0.01	0.02	0.03	0.02
<b>chrysene</b>	<b>0.2</b>	<b>1.7</b>	<b>1.33</b>	<b>1.47</b>
5-methylchrysene	<0.04	<0.07	<0.02	<0.06
<b>benzo[b]fluoranthene</b>	<b>0.26</b>	<b>3.18</b>	<b>1.56</b>	<b>2.07</b>
benzo[j]fluoranthene	0.1	1.33	0.63	0.96
benzo[k]fluoranthene	0.11	3.11	0.74	1.09
benzo[e]pyrene	0.33	3.22	2.59	3.81
<b>benzo[a]pyrene</b>	<b>&lt;0.14</b>	<b>0.92</b>	<b>1.03</b>	<b>1.25</b>
indeno[1,2,3-cd]pyrene	0.14	1.14	0.73	0.72
dibenzo[ah]anthracene	<0.12	0.26	0.14	0.17
benzo[ghi]perylene	0.14	1.08	0.89	0.93
anthanthrene	<0.1	<0.1	<0.1	<0.1
dibenzo[a,l]pyrene	<0.22	<0.14	<0.26	<0.15
dibenzo[a,e]pyrene	<0.31	<0.24	<0.38	<0.25
dibenzo[a,i]pyrene	<0.12	<0.2	<0.29	<0.21
dibenzo[a,h]pyrene	<0.34	<0.27	<0.4	<0.28
coronene	<0.1	0.23	<0.21	0.31
<b>PAH 4 Sum lb</b>	<b>0.53</b>	<b>7.20</b>	<b>5.58</b>	<b>6.45</b>
<b>PAH 4 Sum ub</b>	<b>0.67</b>	<b>7.20</b>	<b>5.58</b>	<b>6.45</b>



FERA LIMS No.	S21-011747	S21-001802	S21-001751	S21-000371
Species	Common Cockles	Common Mussels	Common Mussels	Common Mussels
Production Area	Kyles of Scalpay	Loch Leven: Lower	Loch Leven: Upper	Loch Inchard
Site Name	Kyles of Scalpay Cockles	Lower	Upper	Loch Inchard- Site 1-D. Ross
acenaphthylene	<0.12	<0.09	0.28	0.15
acenaphthene	<0.41	<0.43	<0.42	<0.26
fluorene	<0.47	<0.48	<0.47	<0.31
phenanthrene	<0.76	0.81	0.81	0.77
anthracene	<0.04	0.09	0.28	0.2
fluoranthene	<0.5	1.22	1.16	0.68
benzo[c]fluorene	0.01	0.11	0.09	0.03
pyrene	<0.59	1.53	1.5	0.7
benzo[ghi]fluoranthene	0.12	0.65	0.65	0.27
<b>benzo[a]anthracene</b>	<b>0.15</b>	<b>0.75</b>	<b>0.7</b>	<b>0.17</b>
benzo[b]naphtho[2,1-d]thiophene	0.05	0.23	0.24	0.04
cyclopenta[cd]pyrene	<0.01	<0.01	0.01	0.01
<b>chrysene</b>	<b>0.26</b>	<b>1.34</b>	<b>1.19</b>	<b>0.18</b>
5-methylchrysene	<0.01	<0.04	<0.05	<0.01
<b>benzo[b]fluoranthene</b>	<b>0.37</b>	<b>6.59</b>	<b>6.39</b>	<b>0.52</b>
benzo[j]fluoranthene	0.21	1.69	1.66	0.2
benzo[k]fluoranthene	0.21	2.98	2.78	0.2
benzo[e]pyrene	0.43	8.25	7.44	0.72
<b>benzo[a]pyrene</b>	<b>0.2</b>	<b>2.03</b>	<b>1.93</b>	<b>0.15</b>
indeno[1,2,3-cd]pyrene	0.34	2.28	2.09	<0.21
dibenzo[ah]anthracene	<0.12	0.5	0.48	<0.08
benzo[ghi]perylene	0.29	3.06	2.92	0.29
anthanthrene	<0.1	<0.1	<0.1	<0.1
dibenzo[a,l]pyrene	<0.22	<0.27	<0.27	<0.13
dibenzo[a,e]pyrene	<0.31	<0.4	<0.39	<0.19
dibenzo[a,i]pyrene	<0.12	<0.31	<0.3	<0.18
dibenzo[a,h]pyrene	<0.33	<0.42	<0.41	<0.23
coronene	<0.1	0.62	0.41	<0.1
<b>PAH 4 Sum lb</b>	<b>0.98</b>	<b>10.71</b>	<b>10.21</b>	<b>1.02</b>
<b>PAH 4 Sum ub</b>	<b>0.98</b>	<b>10.71</b>	<b>10.21</b>	<b>1.02</b>

FERA LIMS No.	S21-001292	S21-011784	S21-001803	S21-000425
Species	Pacific Oysters	Razor Clams	Common Mussels	Razor Clams
Production Area	Fairlie	Stevenston Sands Razors	Wadbister Voe	Croy Bay South
Site Name	Southannan Sands	Stevenston Sands Razors	Wadbister Voe	Girvan Mains
acenaphthylene	0.89	2	<0.05	0.3
acenaphthene	<0.31	<0.39	<0.26	<0.27
fluorene	0.37	0.7	0.32	0.41
phenanthrene	1.7	3.24	0.59	1.34
anthracene	1.4	1.59	0.05	0.45
fluoranthene	5.47	7.17	0.49	2.8
benzo[c]fluorene	<0.01	0.33	0.02	0.12
pyrene	6.12	6.57	0.41	2.65
benzo[ghi]fluoranthene	1.99	2.15	0.22	0.75
<b>benzo[a]anthracene</b>	<b>2.13</b>	<b>4.01</b>	<b>0.15</b>	<b>0.84</b>
benzo[b]naphtho[2,1-d]thiophene	0.38	0.6	0.02	0.14
cyclopenta[cd]pyrene	0.09	0.06	0.02	0.02
<b>chrysene</b>	<b>2.55</b>	<b>4.06</b>	<b>0.27</b>	<b>0.89</b>
5-methylchrysene	0.13	<0.14	<0.01	0.03
<b>benzo[b]fluoranthene</b>	<b>4.46</b>	<b>4.15</b>	<b>0.46</b>	<b>1.24</b>
benzo[j]fluoranthene	1.31	1.85	0.18	0.56
benzo[k]fluoranthene	2.18	2.2	0.18	0.58
benzo[e]pyrene	5.39	7.12	0.56	1.48
<b>benzo[a]pyrene</b>	<b>1.36</b>	<b>2.99</b>	<b>0.13</b>	<b>0.56</b>
indeno[1,2,3-cd]pyrene	0.69	0.98	0.26	0.38
dibenzo[ah]anthracene	0.27	0.25	<0.08	0.09
benzo[ghi]perylene	1.14	1.21	0.27	0.41
anthanthrene	<0.1	<0.1	<0.1	<0.1
dibenzo[a,l]pyrene	<0.13	<0.17	<0.13	<0.13
dibenzo[a,e]pyrene	<0.17	<0.27	<0.2	<0.2
dibenzo[a,i]pyrene	<0.1	<0.23	<0.19	<0.19
dibenzo[a,h]pyrene	<0.18	<0.32	<0.23	<0.23
coronene	<0.1	0.21	<0.1	<0.1
<b>PAH 4 Sum lb</b>	<b>10.5</b>	<b>15.21</b>	<b>1.01</b>	<b>3.53</b>
<b>PAH 4 Sum ub</b>	<b>10.5</b>	<b>15.21</b>	<b>1.01</b>	<b>3.53</b>

FERA LIMS No.	S21-001138	S21-001137	S21-001136
Species	Razor Clams	Razor Clams	Razor Clams
Production Area	North Bay	Prestwick Shore	Troon South Beach Razors
Site Name	Barassie	Prestwick Shore Razors	Troon South Beach Razors
acenaphthylene	0.78	1.15	0.82
acenaphthene	<0.31	<0.4	<0.27
fluorene	0.68	<0.51	0.58
phenanthrene	2.84	3.08	2.87
anthracene	1.25	1.19	1.22
fluoranthene	7.53	7.68	7.46
benzo[c]fluorene	0.01	0.34	0.32
pyrene	7.03	7.57	6.33
benzo[ghi]fluoranthene	1.94	1.99	1.98
<b>benzo[a]anthracene</b>	<b>3.22</b>	<b>3.33</b>	<b>3.25</b>
benzo[b]naphtho[2,1-d]thiophene	0.5	0.44	0.4
cyclopenta[cd]pyrene	0.11	0.04	0.08
<b>chrysene</b>	<b>3.26</b>	<b>3.16</b>	<b>3.23</b>
5-methylchrysene	<0.13	<0.09	0.12
<b>benzo[b]fluoranthene</b>	<b>3.68</b>	<b>3.46</b>	<b>3.54</b>
benzo[j]fluoranthene	1.75	1.6	1.69
benzo[k]fluoranthene	1.79	1.68	1.85
benzo[e]pyrene	3.9	5.46	4.74
<b>benzo[a]pyrene</b>	<b>1.95</b>	<b>2.25</b>	<b>2.31</b>
indeno[1,2,3-cd]pyrene	0.88	0.88	0.94
dibenzo[ah]anthracene	0.23	0.25	0.24
benzo[ghi]perylene	1.15	1.07	1.1
anthanthrene	<0.1	<0.1	<0.1
dibenzo[a,l]pyrene	<0.15	<0.17	<0.13
dibenzo[a,e]pyrene	<0.17	<0.28	<0.2
dibenzo[a,i]pyrene	<0.1	<0.23	<0.19
dibenzo[a,h]pyrene	<0.18	<0.32	<0.23
coronene	0.15	0.16	0.17
<b>PAH 4 Sum lb</b>	<b>12.11</b>	<b>12.2</b>	<b>12.33</b>
<b>PAH 4 Sum ub</b>	<b>12.11</b>	<b>12.2</b>	<b>12.33</b>

**Table 6: Trace Element Concentrations (mg/kg whole weight)**

<b>FERA LIMS No.</b>	S21-002033	S21-000622	S21-013305	S21-012479	S21-002033
<b>Species</b>	Common Cockles	Pullet Carpet Shell	Common Cockles	Pacific Oysters	Common Cockles
<b>Production Area</b>	Dunstaffnage Cockles	Eilean Gainimh	Loch na Cille	Loch Na Keal West	Dunstaffnage Cockles
<b>Site Name</b>	Dunstaffnage Bay	Eilean Gainimh	Loch Na Cille Cockles	Eilean Casach	Dunstaffnage Bay
Chromium	0.10	<0.10	<0.10	<0.10	0.10
Manganese	2.84	0.98	1.12	1.56	2.84
Cobalt	0.15	0.19	0.19	0.02	0.15
Nickel	1.40	1.20	2.50	<0.10	1.40
Copper	0.40	0.80	0.50	7.40	0.40
Zinc	5.20	8.50	6.60	145.00	5.20
Arsenic	1.34	5.34	1.26	1.57	1.34
Selenium	0.22	0.98	0.28	0.18	0.22
Silver	<0.01	1.14	<0.01	0.41	<0.01
Cadmium	0.03	0.10	0.03	0.14	0.03
Mercury	<0.01	0.02	0.01	0.01	<0.01
Lead	0.05	0.03	0.06	0.03	0.05

<b>FERA LIMS No.</b>	S21-001396	S21-000390	S21-000391	S21-002247	S21-001396
<b>Species</b>	Common Cockles	Common Cockles	Common Mussels	Native Oysters	Common Cockles
<b>Production Area</b>	Loch Riddon Cockles	North Connel Cockles	Loch Erisort: Gob Glas	Loch Ryan	Loch Riddon Cockles
<b>Site Name</b>	Loch Riddon Cockles	Ledaig Point Cockles	Gob Glas	Leffnoll Point	Loch Riddon Cockles
Chromium	0.10	<0.10	<0.10	0.10	0.10
Manganese	1.97	0.96	1.15	4.80	1.97
Cobalt	0.14	0.09	0.02	0.04	0.14
Nickel	1.40	1.60	<0.10	0.10	1.40
Copper	0.40	0.50	0.70	14.70	0.40
Zinc	5.00	4.60	7.40	229.00	5.00
Arsenic	1.35	0.67	1.41	1.18	1.35
Selenium	0.23	0.13	0.34	0.36	0.23
Silver	<0.01	0.03	<0.01	1.46	<0.01
Cadmium	0.03	0.02	0.05	0.34	0.03
Mercury	<0.01	<0.01	<0.01	0.01	<0.01
Lead	0.05	0.05	0.05	0.07	0.05

<b>FERA LIMS No.</b>	S21-012478	S21-011782	S21-011781	S21-011780
<b>Species</b>	Razor Clams	Razor Clams	Surf Clams	Surf Clams
<b>Production Area</b>	Gullane Point North	Elie Razors	Fife Ness Surf Clams	Firth of Forth: North
<b>Site Name</b>	Gullane North	Elie Razors	Kingsbarns	Anstruther

Chromium	0.20	0.20	0.10	0.10
Manganese	1.76	1.27	2.04	1.51
Cobalt	0.08	0.09	0.11	0.09
Nickel	<0.10	<0.10	0.20	0.20
Copper	1.20	1.00	0.80	0.90
Zinc	13.20	12.80	6.80	6.90
Arsenic	1.21	1.44	1.20	1.23
Selenium	0.28	0.24	0.29	0.30
Silver	0.26	0.17	0.15	0.16
Cadmium	0.02	0.02	0.07	0.06
Mercury	0.03	0.02	0.01	0.01
Lead	0.13	0.09	0.08	0.08

<b>FERA LIMS No.</b>	S21-011747	S21-002032	S21-001291	S21-001622
<b>Species</b>	Common Cockles	Pacific Oysters	Razor Clams	Common Mussels
<b>Production Area</b>	Kyles of Scalpay	Loch Harport: Inner	Sound of Sleat	Loch Ailort
<b>Site Name</b>	Kyles of Scalpay Cockles	Carbost	Glenelg Bay	Eilean Dubh

Chromium	0.10	0.10	0.10	<0.10
Manganese	0.79	2.66	1.40	2.24
Cobalt	0.07	0.04	0.06	0.03
Nickel	1.50	0.10	<0.10	<0.10
Copper	0.40	11.80	0.80	0.80
Zinc	3.60	109.00	12.20	7.20
Arsenic	1.00	1.27	1.65	1.64
Selenium	0.14	0.19	0.32	0.33
Silver	<0.01	0.20	0.08	<0.01
Cadmium	0.04	0.14	0.12	0.05
Mercury	<0.01	0.01	0.02	0.01
Lead	0.04	0.03	0.05	0.06

<b>FERA LIMS No.</b>	S21-002071	S21-000370	S21-000369	S21-011784
<b>Species</b>	Common Mussels	Pacific Oysters	Pacific Oysters	Razor Clams
<b>Production Area</b>	Loch Sunart	Little Loch Broom Pacific Oysters	Loch Kanaird	Stevenston Sands Razors
<b>Site Name</b>	Liddesdale	Little Loch Broom Pacific Oysters	Ardmair	Stevenston Sands Razors

Chromium	0.10	<0.10	<0.10	0.10
Manganese	5.27	2.21	1.65	1.44
Cobalt	0.03	0.02	0.02	0.08
Nickel	0.10	<0.10	<0.10	<0.10
Copper	0.70	2.70	2.90	1.10
Zinc	7.50	81.90	100.00	15.10
Arsenic	1.58	1.35	1.25	1.51
Selenium	0.35	0.25	0.17	0.27
Silver	<0.01	0.22	0.19	0.14
Cadmium	0.06	0.20	0.17	0.03
Mercury	0.01	<0.01	0.01	0.01
Lead	0.77	0.02	0.02	0.07

<b>FERA LIMS No.</b>	S21-001803	S21-000425	S21-001138	S21-001137	S21-001136
<b>Species</b>	Common Mussels	Razor Clams	Razor Clams	Razor Clams	Razor Clams
<b>Production Area</b>	Wadbister Voe	Croy Bay South	North Bay	Prestwick Shore	Troon South Beach Razors
<b>Site Name</b>	Wadbister Voe	Girvan Mains	Barassie	Prestwick Shore Razors	Troon South Beach Razors

Chromium	<0.10	0.10	0.10	0.10	0.10
Manganese	1.15	1.50	1.61	1.34	1.35
Cobalt	0.02	0.06	0.06	0.07	0.06
Nickel	0.10	0.10	<0.10	<0.10	<0.10
Copper	0.70	1.20	1.20	1.00	1.00
Zinc	12.60	12.10	12.50	13.50	13.30
Arsenic	1.17	1.25	1.20	1.41	1.26
Selenium	0.27	0.38	0.21	0.23	0.23
Silver	<0.01	0.06	0.08	0.10	0.09
Cadmium	0.13	0.02	0.02	0.03	0.03
Mercury	<0.01	<0.01	0.01	0.01	0.01
Lead	0.11	0.05	0.07	0.05	0.06

<b>FERA LIMS No.</b>	S21-011747	S21-002032	S21-001291	S21-001622
<b>Species</b>	Common Cockles	Pacific Oysters	Razor Clams	Common Mussels
<b>Production Area</b>	Kyles of Scalpay	Loch Harport: Inner	Sound of Sleat	Loch Ailort
<b>Site Name</b>	Kyles of Scalpay Cockles	Carbost	Glenelg Bay	Eilean Dubh
Chromium	0.10	0.10	0.10	<0.10
Manganese	0.79	2.66	1.40	2.24
Cobalt	0.07	0.04	0.06	0.03
Nickel	1.50	0.10	<0.10	<0.10
Copper	0.40	11.80	0.80	0.80
Zinc	3.60	109.00	12.20	7.20
Arsenic	1.00	1.27	1.65	1.64
Selenium	0.14	0.19	0.32	0.33
Silver	<0.01	0.20	0.08	<0.01
Cadmium	0.04	0.14	0.12	0.05
Mercury	<0.01	0.01	0.02	0.01
Lead	0.04	0.03	0.05	0.06

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