The Shellfish official control monitoring programmes for Scotland

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The Shellfish official control monitoring programmes for Scotland

Summary report for 2021

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Contents

Glossary

ASP	Amnesic Shellfish Poisoning
AZA	Azaspiracid
DA	Domoic Acid
DSP	Diarrhetic Shellfish Poisoning
DTX	Dinophysistoxin
dcSTX	decarbamoyl saxitoxin
EC	European Commission
EU	European Union
Fera	Fera Science Limited
FSS	Food Standards Scotland
GTX	Gonyautoxin
HPLC	High Performance Liquid Chromatography
LA	Local Authority
LC-MS/MS	Liquid Chromatography with tandem Mass Spectrometry
LOD	Limit of detection
LOQ	Limit of quantitation
LT(s)	Lipophilic Toxin(s)
MPL	Maximum Permitted Level
ND	Not Detected
NEO	Neosaxitoxin
OA	Okadaic Acid
PAHs	Polycyclic aromatic hydrocarbons
PCB	Ortho-substituted PCB (non planar)
PCDD/F (dioxins)	Polychlorinated dibenzo-*p*-dioxin/ polychlorinated dibenzofuran
PSP	Paralytic Shellfish Poisoning
PTX	Pectenotoxin
PTX2	Pectenotoxin 2
PTX2sa	Pectenotoxin 2 seco-acid
RL	Reporting limit
RMP	Representative Monitoring Point
SRSL	SAMS Research Services Ltd
SSQC	SSQC Ltd
STX	Saxitoxin
YTX	Yessotoxin

1. Introduction

This report describes the results of the Scottish Official Control Monitoring Programmes delivered by the Centre for Environment, Fisheries and Aquaculture Science (Cefas) and partners for the period 1st January to 31st December 2021.

The programmes were delivered on behalf of Food Standards Scotland (FSS), the national competent authority for food safety and were aimed at delivering the testing required for the statutory monitoring of biotoxins, *E.coli* and chemical contaminants in shellfish and for the identification and enumeration of potentially harmful algal species in selected shellfish harvesting areas, as described in European Commission (EC) regulations 2017/625 and 2074/2005.

The co-ordination of the programme, its logistics, toxin analyses and the majority of *E. coli* analyses were conducted by Cefas, whilst phytoplankton analyses were performed by SAMS Research Services Ltd. (SRSL) in Oban, chemical contaminants analyses by Fera Science Ltd (Fera) in York and *E. coli* analyses for Shetland and Orkney (Westray) only by SSQC Ltd in Scalloway. These laboratories were contracted by Cefas under the scope of the 'Shellfish Partnership'.

A summary of these programmes and their results are presented in the following sections of this report:

- Section 1: Toxin and phytoplankton monitoring programme
- Section 2: *E. coli* monitoring programme
- Section 3: Chemical contaminants monitoring programme

A total of 4,206 shellfish samples and 1,312 water samples were collected for the purpose of the 2021 Scottish official control monitoring programmes. Since the 1st of April 2018, sampling officers from Hall Mark Meat Hygiene (HMMH) have collected or arranged collection for all samples from all geographic locations, under a new contract arrangement with Cefas. For the purpose of this report and in line with FSS protocol, a 'verified' shellfish sample is defined as a sample collected from the agreed monitoring point by an authorised sampling officer. Samples 'verified from shore' are defined as samples collected by harvesters under the supervision of the authorised sampling officer. Such arrangements are implemented when sampling officers are unable to accompany the harvester to the location of the monitoring point at the time of collection. The harvester can be witnessed from shore by the sampling officer. Where collection from the shellfish bed cannot be witnessed from the shore by the sampling officer (due to the remoteness of the shellfish bed or the lack of suitable and accessible vantage point), the samples are recorded as 'unverified'.

The delivery of the 2021 monitoring programme continued throughout the Covid-19 pandemic with service maintained and delivered in a COVID secure manner.

Only <0.09% of the biotoxin samples and 2.9% of *E. coli* samples were rejected as unsuitable for analysis on arrival at the laboratories. No water samples were rejected. All chemical contaminants samples were suitable.

All analyses followed the approved methods laid out in national legislation and specified by FSS for the purpose of this programme. All methods were accredited to ISO17025:2017 standards at the testing laboratories. Amnesic shellfish poisoning toxins (ASP) were monitored in 1002 samples, lipophilic toxins (LT) in 2,136 samples and paralytic shellfish poisoning toxins (PSP) in 1,334 samples. 1,895 samples were tested for *E. coli*, 26 for heavy metals (lead, cadmium and mercury), 20 for PAHs and 13 for dioxins and PCBs.

All results were reported to FSS' specifications and met the required FSS turnaround times. Specifically:

- 97.7% of all toxin results were reported within 1 working day of sample receipt, 99.9% within 2 working days, 100% withing 3 working days;
- 100% of phytoplankton results were reported within 3 days of sample receipt;
- 99% of *E. coli* actionable results ('outwith') were reported within 3 working days of onset of analysis;
- 100% *of E. coli* non-actionable results were reported within 5 working days of onset of analysis;
- Draft chemical contaminant report produced by end June 2021.

The results of the monitoring programme are presented in each section of this report. In summary:

- 225 samples breached the maximum permitted limits (MPL) for lipophilic toxins (OA/DTX/PTX group only), 13 samples breached the MPL for PSP toxins and no samples breached the MPL for ASP toxins (see section 1).
- Outwith *E. coli* results were reported in 5.5% of the analyses undertaken in 2021 (see section 2).
- All chemical contaminants results were below the regulatory maximum limits (see section 3).

2. Section 1: Toxin and Phytoplankton summary

This section provides a summary of the toxin and phytoplankton monitoring undertaken in Scottish shellfish under the FSS programme in 2021. The full results of the FSS toxin and phytoplankton monitoring programmes are available on the FSS website. For results for individual RMPs (Representative Monitoring Points), please visit the Scotland's Aquaculture website at the following links:

- Biotoxin monitoring
- Phytoplankton monitoring

A total of 2,220 bivalve shellfish samples from 87 inshore sampling locations (Figure 1) were submitted to Cefas for toxin analyses in 2021. They comprised of; common mussels (1,411), Pacific oysters (525), razors (64), common cockles (142), surf clams (61) and native oysters (17). Three of these samples (representing less than 0.09% of those received) were rejected on arrival at the laboratory. One sample had perished on arrival, one was sent in error and the other sample contained less than 10 individuals. Three samples of processed scallops (all king scallops - all adductor and roe) were also collected from commercial establishments in the Dumfries and Galloway region under the scope of the FSS onshore verification programme and were submitted for toxin analysis in 2021.

A total of 1,312 seawater samples from 43 inshore sampling locations (Figure 2) were submitted to SAMS Enterprise for the identification and enumeration of potentially harmful algal species in 2021.

All results were compared to the maximum permitted levels (MPL) (Table 1) stipulated in retained EC regulation 853/2004. Toxin test results must not exceed these limits in either whole body or any edible part separately. Please note that for ease of reading, in the text of this report, toxin concentrations are shown as mg/kg or µg/kg, without reference to the toxin parent.

Table 1: Maximum permitted limits of toxins in shellfish flesh.

Toxin groups	Maximum permitted limits (MPL)
Amnesic shellfish poisoning (ASP) toxins	20 mg of Domoic/epi-domoic acid per kg of shellfish flesh
Lipophilic toxins (LTs)	For Diarrhetic shellfish poisoning toxins (DSP) and pectenotoxins (PTX) together: 160 µg of okadaic acid (OA) equivalents per kg of shellfish flesh OR For Yessotoxins (YTX): 3.75 mg of YTX equivalents per kg of shellfish flesh OR For Azaspiracids (AZA): 160 µg of AZA equivalents per kg of shellfish flesh
Paralytic shellfish poisoning (PSP) toxins	800 µg of saxitoxin (STX) equivalents per kg of shellfish flesh

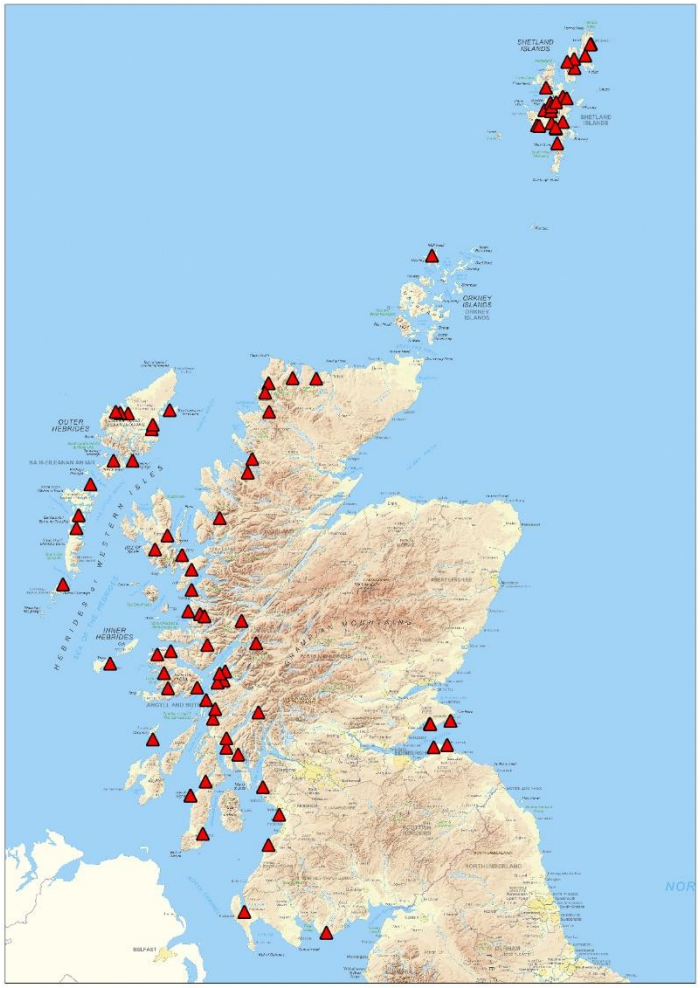

Figure 1. Scottish inshore shellfish sampling locations – Food Standards Scotland biotoxin monitoring programme in 2021

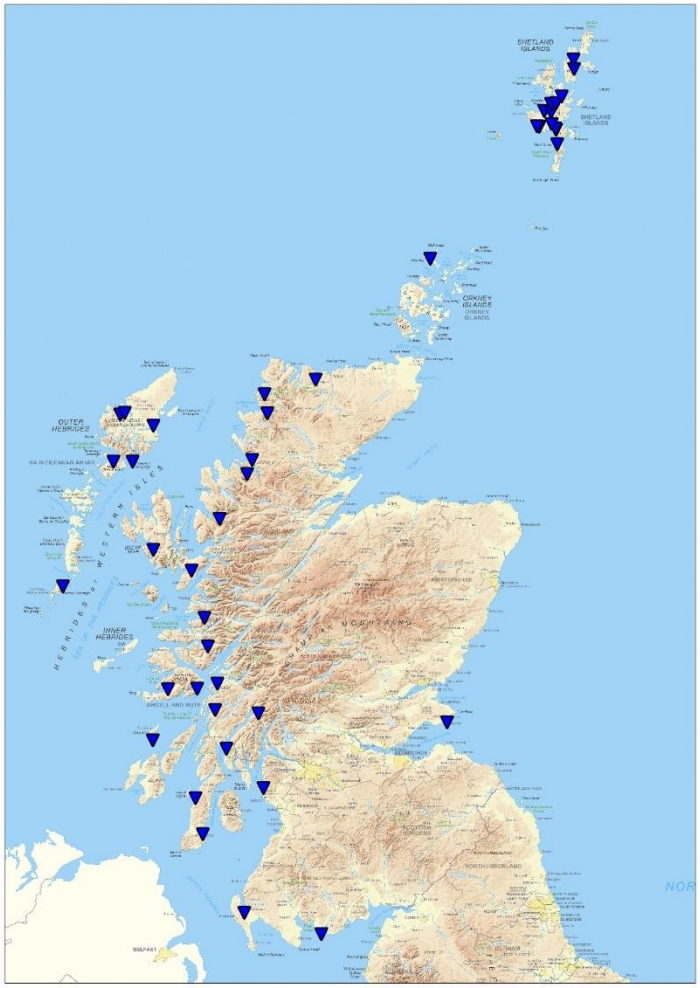

Figure 2. Scottish water sampling locations – Food Standards Scotland phytoplankton monitoring programme in 2021

2.1. lipophilic toxins

In total, lipophilic toxins (LTs) analyses were performed on 2133 inshore samples and 3 verification samples. Monitoring for LTs was conducted using an ISO17025 accredited liquid chromatography with tandem mass spectrometry (LC-MS/MS) method and results are summarised below.

225 inshore samples breached the MPL for lipophilic toxins (Table 1). As highlighted in previous annual reports, where the MPL for lipophilic toxins had been exceeded and sampling had occurred in the previous two to three weeks, the LC-MS/MS method provided an early warning, detecting low toxin levels prior to closure in the majority of cases. This indicates the methods performance and advantage as an early warning mechanism, when applied to risk management practices such as the FSS "traffic light" guidance.

2.1.1. OA/DTX/PTX group

- OA/DTX/PTX group toxins were detected in 870 inshore samples, comprising of mussels (796 samples), surf clams (36), Pacific oysters (30), common cockles (6) and razors (2).
- 225 samples comprising of mussels (212 samples), surf clams (7) and Pacific oysters (6) from 38 sites (Figure 3) recorded results above the MPL in 2021. These results were recorded between June and October 2021.
- The highest level recorded during 2021 was 3035µg OA eq./kg, almost 19 times the regulatory limit, in a sample from Loch Eishort (Highland Council: Skye and Lochalsh) in early August 2021. Levels of OA/DTX/PTX group toxins at this site had started to rise in early May and increased to exceed the regulatory limit in mid June. The site recorded its second consecutive result below the MPL in mid December.
- Elsewhere, OA/DTX/PTX group toxins were detected below the MPL in a further 645 samples from 61 sites (Figure 4), between January and December 2021.
- No OA/DTX/PTX group toxins were detected in the Scallop verification samples received in 2021.

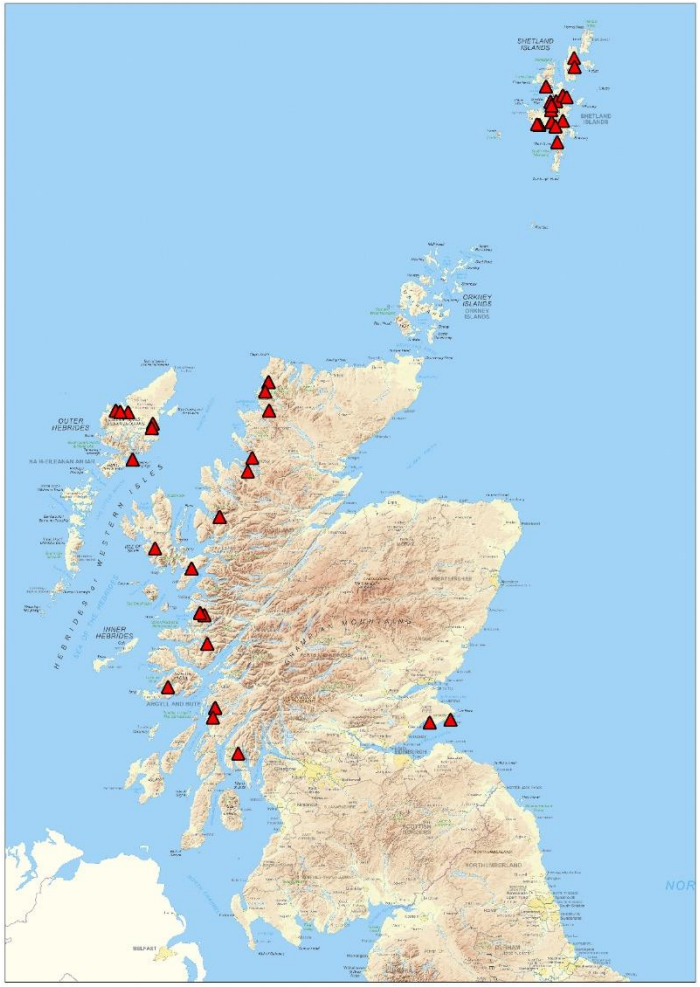

Figure 3. Inshore locations recording OA/DTX/PTX group results above the maximum permitted limit (>160µg OA eq./kg) in 2021

Figure 4. Inshore locations where toxins of OA/DTX/PTX group were detected below the maximum permitted limit (≤160µg OA eq./kg) in 2021

2.1.2. AZA group

AZAs were detected in 1 inshore mussel sample collected from one Shetland site (Weisdale voe - see Figure 5) in October 2021. The level recorded was 105 µg AZA1 eq./kg which is below the MPL.

2.1.3. YTX group

YTXs were detected in 12 inshore cockle samples collected from one site in Argyll and Bute (Loch na Cille—see Figure 5) between July and November. All results were below the MPL (Table 1), with the highest level recorded as 1.8 mg YTXeq/kg in a sample taken on the 18th of July 2021.

Figure 5. Inshore locations where AZA (▲) and YTX (●) group toxins were detected in 2021 (all below the maximum permitted limit levels (160 µg AZA1 eq./kg & 3.75 mg YTX eq./kg))

2.1.4. Phytoplankton associated with the production of lipophilic toxins

- *Dinophysis* species were present in 562 (42.8%) of the 1,312 samples analysed during 2021 and were detected in every month, excluding January. They were observed at or above trigger level (set at 100 cells/L) in 269 samples (20.5%) between March and September. The majority of *Dinophysis* blooms occurred around the Scottish coast from June to August 2021, with 48.7% of the samples collected in July exceeding threshold counts. (Please note that in this report, references to *Dinophysis* species also include *Phalacroma rotundatum* (synonym *Dinophysis rotundata*) and that blooms are denoted as cell counts at or exceeding trigger level, where appropriate for individual species/genera).
- The earliest bloom of *Dinophysis* breaching trigger level was recorded at Kyle of Tongue (Highland: Sutherland) on 24th March.
- The densest bloom observed in 2021 occurred in Loch Kanaird (Highland: Ross & Cromarty) on 6th July at 15,620 cells/L. Relatively dense blooms (greater than 6,000

cells/L) were also recorded at other sites around the Highland region, namely Loch Laxford (Sutherland), Loch Torridon (Ross & Cromarty) and Loch Eishort (Skye & Lochalsh), in late June and early July. Further south in Argyll & Bute, *Dinophysis* was abundant in Loch na Cille and Kilfinichen Bay, with a bloom of 9,440 cells/L detected at the latter site on 6th September. Elsewhere in Scotland, *Dinophysis* blooms were frequently observed around Lewis & Harris from June to August. At this time, it was also abundant around most of the Shetland Islands, except for two sites in the north-east (on Yell) where trigger level was breached only once at each site in July.

- The total percentage of *Dinophysis* at or exceeding trigger level during the 2021 reporting period (20.5%) was slightly higher than in 2020 (19.5%).
- The benthic dinoflagellate *Prorocentrum lima* was present in 320 (24.4%) of the samples analysed. This species is generally detected more often in the sandy sediments of shallow bays where oyster cultivation takes place, although it can also grow epiphytically on substrates such as seaweed. *Prorocentrum lima* was recorded from March to November and was most abundant between May and September. It was reported at or above the trigger level (set at 100 cells/L) between March and October in 78 samples (5.9%). Since 2018, *Prorocentrum lima* has been frequently observed in Basta Voe Cove (Shetland Islands) and the densest bloom of 2021 at 8,280 cells/L was recorded at this site on 2nd August.
- Elsewhere around the coast, *Prorocentrum lima* blooms were noted regularly at several sites in Argyll & Bute and the Highland region, with a cell density of 3,680 cells/L reported from Loch Ailort (Highland: Lochaber) on 31st August.
- The dinoflagellate *Protoceratium reticulatum* was detected in 22 samples (1.7%) between March and September and was most abundant in July and August. It was observed most often in Loch na Cille (Argyll & Bute) and the 2021 maximum bloom density of 220 cells/L was recorded at this site on 11th August. No trigger level has been set for *Protoceratium reticulatum*.
- The dinoflagellate *Lingulodinium polyedra* is rarely abundant in Scottish coastal waters. In 2021 it was found on seven occasions (0.5 % of samples) at two locations, Loch na Cille (Argyll & Bute) and Brighouse Bay (Dumfries & Galloway) between July and September. The 2021 maximum concentration of 320 cells/L was recorded at Loch na Cille on 20th September. No trigger level has been set for *Lingulodinium polyedra*.

2.2. PSP toxins

A total of 1,331 inshore samples and 3 scallop verification samples were tested for paralytic shellfish poisoning (PSP) toxins in 2021. All samples were tested by an ISO17025 accredited high-performance liquid chromatography (HPLC) method and results are summarised below.

- Thirteen samples from seven monitoring sites (Figure 6) were found to contain PSP toxins above the MPL of 800µg STX eq./kg shellfish flesh. These comprised mussels (7 samples), Pacific oysters (2), razors (1) and cockles (3). The results were recorded from throughout June 2021 and were all detected in the north-west of mainland Scotland, the Outer Hebrides and one occurrence on the Orkney Isles.
- The highest level recorded was 2,632 µg/kg recorded in Pod 21 – Loch Leurbost in a sample collected 09/06/21.
- PSP toxins above reporting levels, but below the MPL were detected in a further 11 samples comprising mussels (8 samples), cockles (1), Pacific oysters (1) and razors (1) from 9 separate pods (Figure 7). All occurrences were recorded between end June and mid September 2021.
- A further 15 samples (14 mussels and one cockles) were subjected to full quantitative analysis but returned results below the reporting limit for the test.
- The PSP toxin profiles predominantly consisted of the toxins Saxitoxin (STX), Gonyautoxins (GTX) 2&3, GTX1&4, Neosaxitoxin (NEO) and C toxins 1&2 (data not shown). Lower concentrations of GTX5 and dcSTX were also detected in some shellfish samples. Proportions of each toxin varied considerably, but the profiles were consistent with previous years, and similar to those expected from shellfish contaminated with *Alexandrium* as documented in Turner et al, 2014., with profiles dominated by GTX1&4, GTX2&3, NEO and STX.
- No quantifiable levels of PSP toxins were detected in the scallop verification samples.

Phytoplankton associated with the production of PSP toxins:

- Dinoflagellates belonging to the genus *Alexandrium* were observed in January and then from March to September. They were detected in 394 (30.0%) of the 1,312 samples analysed during 2021 and recorded at every site monitored for phytoplankton. *Alexandrium* cells were reported at or above the trigger level (set at 40 cells/L) in 271 samples (20.7%). Blooms were most frequently observed between June and August, and 36.7% of the samples analysed in June breached the *Alexandrium* trigger level.
- Similar to 2020, the earliest *Alexandrium* bloom of 2021 occurred at Loch Fyne: Otter Ferry (Argyll & Bute) on 8th March. An early bloom was also detected in Dales Voe (Shetland Islands) on 9th March. The densest *Alexandrium* bloom of 2021 occurred in Loch Laxford (Highland: Sutherland) on 14th June where a concentration of 4,480 cells/L was recorded. Dense blooms were also observed elsewhere around the Highland region in May and June, notably at Loch Glencoul (Sutherland), Loch Harport and Loch Eishort (Skye and Lochalsh), and Loch Sunart (Lochaber). In Lewis & Harris, *Alexandrium* at 2,440 cells/L was recorded in Loch Leurbost on 1st June, and in the Orkney Islands a bloom of 1,900 cells/L was detected on 8th August.

- The percentage of samples with *Alexandrium* counts at or above trigger level in 2021 (20.7%) was slightly higher than in 2020 (19.6%). However, the frequency of bloom detection appeared to be delayed slightly in 2021, with more blooms present between June and August, compared to the May to July peak of bloom abundance more typical of recent years.

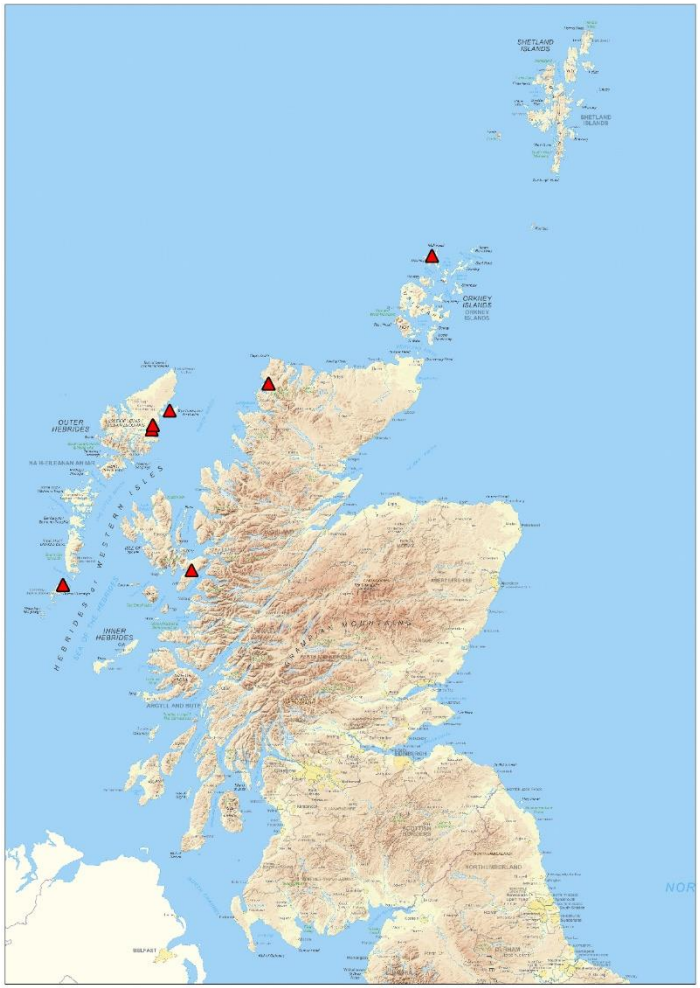

Figure 6. Inshore locations recording PSP toxin results above the maximum permitted limit (>800µg STX eq./kg) in 2021

Figure 7. Inshore locations recording PSP toxin results below the maximum permitted limit (≤800µg STX eq./kg) in 2021

2.3. ASP toxins

Analyses for amnesic shellfish poisoning (ASP) toxin were conducted on 999 inshore samples and 3 scallop verification samples. All samples were analysed by an ISO17025 accredited HPLC method. Results are summarised below.

- ASP toxins were detected in 65 inshore samples comprising of: common mussels (34 samples), Pacific oysters (20), common cockles (6), surf clams (4) and razors (1) (Figure 9). No samples exceeded the MPL in 2021.
- Low concentrations (between 1 and 8 mg/kg) were recorded throughout 2021. The peak period occurred between May & September, during which time ASP was detected in 53 samples.
- ASP toxins were detected in one of the scallop verification samples received in July 2021.

Phytoplankton associated with the production of ASP toxins

- Diatoms belonging to the genus *Pseudo-nitzschia* were detected in every month in 2021 and were present in 1,185 (90.3%) of the 1,312 samples analysed. Blooms (here referred to as cell densities exceeding the trigger level of 50,000 cells/L) were detected between March and September and were most frequently observed between June and September. *Pseudo-nitzschia* counts at or above the trigger level were recorded in 154 samples (11.7%), with 20.6% of the samples analysed in July exceeding this level.
- The earliest blooms of 2021 occurred in Argyll & Bute, with 70,153 cells/L detected in Loch na Cille on 15th March, and 260,971 cells/L in Loch Spelve on 23rd March. *Pseudo-nitzschia* mostly remained at background levels in the Shetland Islands up until late June when dense blooms became widespread for a period of about four weeks, followed by a second bloom period from late August into September. The densest *Pseudo-nitzschia* bloom of 2021 was recorded at Busta Voe (Shetland Islands) on 6th July, where cell counts reached 2,168,794 cells/L.
- Elsewhere around the coast, *Pseudo-nitzschia* in excess of one million cells/L was recorded from Loch Ailort (Highland: Lochaber) on 11th May, and similarly dense blooms were observed in Campbeltown Loch (Argyll & Bute) and at Fairlie (North Ayrshire) in mid July.
- The percentage of samples with *Pseudo-nitzschia* counts at or above trigger level in 2021 (11.7%) was higher than in 2020 (9.8%).

Figure 8. Inshore locations where ASP toxins were detected below the maximum permitted limit (>20mg/kg) in 2021

2.4. Other potentially harmful phytoplankton

The dinoflagellate *Prorocentrum cordatum* was detected in 554 samples (42.2%) analysed in 2021. It was observed from February through to November, and was most frequently recorded between May and June, being present in 71.6% of the May samples. *Prorocentrum cordatum* was widespread around the Scottish coast and found at all sites, but the densest blooms occurred around the Shetland Islands in June, with a maximum cell concentration of 324,460 cells/L recorded in Stream Sound on 23rd June. No trigger level has been set for this species.

The potentially problematic dinoflagellate *Karenia mikimotoi* was found in 254 (19.4%) of the samples analysed. It was present between March and October, but most frequently observed between July and September, being detected in 41.4% of the samples collected in September. This species is not an issue in terms of shellfish harvesting, as it does not produce biotoxins that are harmful to human health, although it may negatively impact aquaculture. It produces ichthyotoxins that can kill finfish, and dense blooms of the order of several million cells/L may result in both fish

and invertebrate mortality due to hypoxia. Cell abundance was much higher than in 2020, with a maximum density of 620,651 cells/L observed in Olna Firth (Shetland Islands) on 21st September.

2.5. Programme review & recommendations

2.5.1. Toxin monitoring

Sampling and testing frequencies for toxin and phytoplankton monitoring are defined by FSS, as the competent authority, based on the results of risk assessments which FSS commissioned in 2004 (Holtrop & Horgan), 2008 (Holtrop) and 2016 (Holtrop et al.). The recommendations of the 2019 risk assessment led to testing frequencies been defined and implemented for each site separately. The aim of the review conducted for this report was to look at toxin occurrence over the last couple of years (based on the results of the FSS official monitoring alone as industry data was not available) and identify sites where the set testing frequency may need adjustment, as a result of a recent change to toxin incidence and levels at these sites.

During 2021, the detection rates of toxins was broadly similar to 2020 and levels detected prior to 2019. Areas listed below are recommended for review:

Pod 19: Loch Craignish Cockles: Trigger levels exceeded for LTs in October

Pod 21: Loch Leurbost: MPL exceeded for PSP in June

Pod 22: East Loch Tarbert: MPL exceeded for LTs in September/October

Pod 40: Loch Harport Inner: MPL exceeded for LTs in July

Pod 51: Kyle of Tongue: MPL exceeded for LTs in July

Pod 77: Traigh Mhor: MPL exceeded for PSP in June

Pod 138: Broad Bay Aiginish: MPL exceeded for PSP in June

Pod 157: Bay of Skaill: MPL exceeded for PSP in June

2.5.2. Phytoplankton monitoring

The phytoplankton monitoring points used in 2021 were reviewed and suggested changes are outlined in Table 2 below, alongside FSS decision.

Table 2. Recommended changes to phytoplankton monitoring RMPs

2020 phytoplankton RMP	Recommended phytoplankton RMP for 2021	FSS decision (notes)
Pod 14: Loch Fyne: Otter Ferry	Pod139 Loch Riddon	Rejected – ongoing algal bloom present in Pod 14 at time of publishing

3. Section 2: *E.coli* summary

This section provides a summary of the microbiological monitoring undertaken in Scottish shellfish under the FSS programme in 2021. All data generated under the Scottish shellfish harvesting classification programme is available on the Cefas website. *E.coli* results are also available on the Scotland's Aquaculture website and on the FSS' website.

3.1. Sample collections and analyses

A total of 1,952 bivalve shellfish samples from 180 RMPs were submitted for microbiological analyses in 2021. 6.4% of the samples received were of unverified origin. The sampling locations covered classified production areas within 10 Local Authority regions (16 regional offices). The samples comprised of the species identified in Table 3.

Table 3. Number of samples collected for the FSS microbiological monitoring programme, by bivalve species in 2021

Common name	Latin name	No. samples received in 2021	% of total
Common mussels	*Mytilus* spp	930	47.6
Pacific oysters	*Crassostrea gigas* (*Magallana gigas*)	454	23.3
Common cockles	*Cerastoderma edule*	312	16.0
Razor clams	*Ensis* spp	200	10.2
Surf clams	*Spisula solida*	33	1.7
Native oysters	*Ostrea edulis*	10	0.5
Pullet carpet shell	*Venerupis corrugata*	12	0.6
Carpet clams	*Venerupis pullastra*	1	0.1

The majority of samples (94.7%) arrived at the laboratory within 48h of sample collection. When delays occurred, these were generally attributed to the time at which the samples were collected, thus missing the routine post office collection deadline, or to other events outside of the laboratory or sampling officers' control, such as inclement weather or transport network problems.

2.9% (*n*=57) of the samples received at the laboratories were rejected on arrival. The majority of rejections (n=54) were due to exceedance of the time/temperature criteria set out in FSS protocols.

All analyses were initiated within 48h of sample collection. Samples were analysed using the FSS specified method for enumeration of *E. coli* in shellfish (ISO 16649-3:2015 (ISO 2015)). Initial preparation of shellfish samples followed ISO 6887-3 (ISO 2003) and derivation of MPN results ISO 7218 (ISO 2007). Methods are accredited to ISO17025 standard. A total of 1,895 tests were undertaken in 2021.

All results were compared to the classification categories are set out in Table 4.

Table 4. Criteria for the classification of bivalve shellfish harvesting areas

Classification category	Microbiological standard[1]
Class A	Samples of live bivalve molluscs from these areas must not exceed, in 80% of samples collected during the review period, 230 *E. coli* per 100 g of flesh and intra-valvular liquid The remaining 20% of samples must not exceed 700 *E. coli* per 100 g of flesh and intra-valvular liquid[2]
Class B	Live bivalve molluscs from these areas must not exceed, in 90% of the samples, 4 600 MPN *E. coli* per 100 g of flesh and intra-valvular liquid. In the remaining 10% of samples, live bivalve molluscs must not exceed 46 000 MPN *E. coli* per 100 g of flesh and intra-valvular liquid[3]
Class C	Live bivalve molluscs from these areas must not exceed 46 000 *E. coli* MPN per 100 g of flesh and intra-valvular liquid[4]

3.2. Results by local authority region

Summaries of samples received, rejected and providing results outwith of their classification are shown in Tables 5 to 18 for each classified production area in each local authority region.

3.2.1. Argyll & Bute

[1] The reference method for analysis of *E. coli* is the detection and Most Probably Number (MPN) technique specified in EN/ISO 16649-3. Alternative methods may be used if they are validated against this reference method in accordance with the criteria in EN/ISO 16140 (Regulation (EC) 854/2004 as amended by Regulation (EC) 2285/2015).
[2] Regulation (EC) 854/2004 as amended by Regulation (EC) 2285/2015.
[3] Regulation (EC) 854/2004 as amended by Regulation (EC) 1021/2008
[4] Regulation (EC) 854/2004

Table 5. *E. coli* samples received from Argyll & Bute Council area

Production Area	Site Name	Site	Sample Species	Samples received	Outwiths	Rejected samples
Ardencaple	Ardencaple cockles	AB 818 2146 04	Common cockles	13	4	0
Campbeltown Loch	Kildalloig Bay	AB 029 008 04	Common cockles	12	3	0
Castle Stalker	Port Appin	AB 492 909 04	Common cockles	12	2	0
Coll Razors	Crossapol Bay	AB 837 2246 16	Razors	2	0	0
Colonsay	The Strand (East)	AB 041 1199 13	Pacific oysters	12	1	1
Colonsay	The Strand (West)	AB 041 009 13	Pacific oysters	1	0	0
Colonsay East of the Strand	Islands of Colonsay and Oransay	AB 774 1987 16	Razors	10	0	0
Dunstaffnage Cockles	Dunstaffnage Bay	AB 696 1511 04	Common cockles	12	0	0
East Tarbert Bay	Isle of Gigha	AB 541 972 13	Pacific oysters	10	2	0
Eilean an Atha	Eilean an Atha	AB 877 2390 13	Pacific Oyster	17	1	0
Eilean Gainimh	Eilean Gainimh	AB 870 2379 24	Pullet Carpet Shell	12	0	1
Eriska Shoal	Eriska Shoal Cockles	AB 490 907 04	Common cockles	12	2	0
Eriska Shoal Carpet Clams	Eriska Shoal Carpet Clams	AB 547 1006 02	Carpet Clams	1	0	0
Ganavan Cockles	Ganavan	AB 697 1512 04	Common cockles	12	1	0
Islay	Loch Gruinart Craigens	AB 094 011 13	Pacific oysters	12	4	2
Kerrera East	Ardantrive	AB 697 1513 04	Common cockles	12	0	0
Kerrera West	Oitir Mhor	AB 697 1514 04	Common cockles	12	1	0
Kilfinichen Bay	Kilfinichen Bay	AB 695 1507 04	Common cockles	12	1	0

Loch A Chumhainn: Inner Deep Site	Inner Deep Site	AB 112 017 13	Pacific oysters	12	0	0
Loch A Chumhainn: Outer	Outer	AB 113 018 13	Pacific oysters	12	0	0
Loch Craignish Cockles	Ardfern	AB 786 2028 04	Common cockles	12	0	0
Loch Creran Cockles	Loch Creran Cockles	AB 729 1685 04	Common cockles	13	2	0
Loch Creran Upper Oysters	East - Barrington	AB 129 021 13	Pacific oysters	12	1	0
Loch Creran: Rubha Mor	Rubha Mor	AB 130 022 13	Pacific oysters	12	2	0
Loch Fyne: Ardkinglas Oysters	The Shore	AB 147 036 13	Pacific oysters	12	2	0
Loch Fyne: Otter Ferry	Balliemore	AB 151 039 13	Pacific oysters	12	0	0
Loch Fyne: Otter Point	Otter Point	AB 714 1659 04	Common cockles	12	0	0
Loch Fyne: Stonefield Oysters	North Bay Oysters	AB 435 840 13	Pacific oysters	7	1	0
Loch Gair	Loch Gair Common Cockles	AB 863 2347 04	Common cockles	12	1	0
Loch Linnhe	Loch Linnhe	AB 172 047 13	Pacific oysters	14	1	2
Loch na Cille	Loch na Cille Cockles	AB 617 1204 04	Common cockles	12	0	0
Loch Na Keal	Eilean Liath	AB 284 080 13	Pacific oysters	11	0	0
Loch Na Keal West	Eilean Casach	AB 286 082 13	Pacific oysters	12	0	0
Loch Riddon Cockles	Loch Riddon Cockles	AB 656 1409 04	Common cockles	12	0	0
Loch Spelve Cockles	North West Spelve	AB 767 1963 04	Common cockles	12	2	0
Loch Spelve Croggan Pier	Croggan Pier	AB 199 055 13	Pacific oysters	12	4	0
Loch Spelve North	Ardura	AB 200 1915 08	Common mussels	12	0	0
Lynn of Lorn Sgeir Liath	Sgeir Liath	AB 318 068 13	Pacific oysters	13	0	1

North Connel Cockles	Ledaig Point Cockles	AB 758 1909 04	Common cockles	12	0	0
Oitir Mhor Bay	Oitir Mhor	AB 308 701 13	Pacific oysters	12	0	0
Porte Na Coite	Porte Na Coite	AB 876 2389 13	Pacific oysters	17	7	0
Seil Point	Poll a' Bhrochain (Cyster)	AB 245 070 13	Pacific oysters	12	0	0
Seil Sound East	East of Balvicar	AB 247 703 08	Common mussels	9	2	0
Seil Sound North	Balvicar North	AB 247 735 13	Pacific oysters	8	2	0
Sound of Gigha	Sound Of Gigha Razors 2	AB 515 1250 16	Razors	6	0	0
Tiree North	Gott Bay	AB 835 2244 16	Razors	2	0	0
West Jura Razors	Jura	AB 482 805 16	Razors	13	0	2
West Loch Tarbert	Loup Bay	AB 299 084 13	Pacific oysters	10	0	0

3.2.2. Comhairle Nan Eilean Siar - Lewis & Harris

Table 6. *E. coli* samples received from Comhairle Nan Eilean Siar - Lewis & Harris

Production Area	Site Name	Site	Sample Species	Samples received	Outwiths	Rejected samples
Broad Bay Aiginish	Aiginish	LH 743 1740 16	Razors	12	0	2
East Loch Tarbert	Sound of Scalpay	LH 057 106 08	Common mussels	13	0	1
Loch Erisort: Garbh Eilean	Garbh Eilean	LH 357 747 08	Common mussels	12	3	0
Loch Erisort: Gob Glas	Gob Glas	LH 357 711 08	Common mussels	12	4	0
Loch Leurbost	Eilean Mhiabhaig	LH 168 732 08	Common mussels	12	3	0
Loch Leurbost: Crosbost	Site 1 Crosbost	LH 339 795 13	Pacific oysters	13	0	1
Loch Roag - Gob Sgrithir	Gob Sgrithir	LH 829 2215 08	Common mussels	12	0	0

Loch Roag: Barraglom	Loch Barraglom	LH 185 120 08	Common mussels	12	0	0
Loch Roag: Ceabhagh	Keava	LH 381 772 08	Common mussels	12	0	0
Loch Roag: Drovinish	Loch Drovinish	LH 186 121 08	Common mussels	12	0	0
Loch Roag: Eilean Chearstaigh	Eilean Scarastaigh	LH 344 697 08	Common mussels	12	0	0
Loch Roag: Eilean Teinish	Eilean Teinish	LH 338 720 08	Common mussels	11	0	0
Loch Roag: Linngeam	Cliatasay	LH 187 699 08	Common mussels	12	0	0
Loch Roag: Miavaig	Miavaig	LH 188 123 08	Common mussels	12	0	0
Loch Roag: Torranish	Loch Torranish	LH 189 124 08	Common mussels	12	1	0
Loch Seaforth	Loch Seaforth	LH 193 126 08	Common mussels	13	0	1
Seilebost	Seilebost	LH 249 129 04	Common cockles	14	1	2

3.2.3. Comhairle Nan Eilean Siar - Uist & Barra

Table 7. *E. coli* samples received from Comhairle Nan Eilean Siar - Uist & Barra

Production Area	Site Name	Site	Sample Species	Samples received	Outwiths	Rejected samples
Ardmhor	Ardmhor	UB 874 2385 13	Pacific oysters	17	0	4
Caolas Bhearnaraigh	Caolas Bhearnaraigh	UB 735 1706 16	Razors	2	0	1
Cidhe Eolaigearraidh	Sound Of Barra: Pacific Oysters	UB 427 830 13	Pacific oysters	12	0	0
Garbh Lingeigh	Garbh Lingeigh	UB 713 1622 13	Pacific oysters	1	0	0
North Ford	Oitir Mhor	UB 493 852 04	Common cockles	12	1	0
South Ford	South Ford	UB 259 162 04	Common cockles	12	4	0

Traigh Cille Bharra Cockles	Traigh Cille Bharra Cockles	UB 392 790 04	Common cockles	13	0	1
Traigh Mhor	Traigh Mhor	UB 282 165 04	Common cockles	16	0	4

3.2.4. Dumfries & Galloway

Table 8. *E. coli* samples received from Dumfries & Galloway Council area

Production Area	Site Name	Site	Sample Species	Samples received	Outwiths	Rejected samples
Kirkcudbright Bay Razors	Kirkcudbright Bay Razors	DG 809 2132 16	Razors	10	1	0
Loch Ryan	Leffnoll Point	DG 191 174 12	Native oysters	10	0	0
Wigtown Bay: Islands of Fleet	Wigtown Bay	DG 305 182 16	Razors	10	0	0

3.2.5. East Lothian

Table 9. *E. coli* samples received from East Lothian Council area

Production Area	Site Name	Site	Sample Species	Samples received	Outwiths	Rejected samples
Gullane Point North	Gullane North	EL 601 1087 16	Razors	10	1	0
Gullane Point South	Gullane South	EL 703 1525 16	Razors	10	0	0
North Berwick Razors	North Berwick Razors	EL 736 1707 16	Razors	11	1	0

3.2.6. Fife

Table 10. *E. coli* samples received from Fife Council area

Production Area	Site Name	Site	Sample Species	Samples received	Outwiths	Rejected samples
Elie Razors	Elie Razors	FF 868 2365 16	Razors	11	1	0
Fife Ness Surf Clams	Kingsbarns	FF 771 1974 19	Surf Clams	11	0	0
Firth of Forth: North	Anstruther	FF 068 184 19	Surf Clams	11	0	0
Forth Estuary Surf Clams	Shell Bay	FF 772 1975 19	Surf Clams	11	0	0
Forth Estuary: Largo Bay	Largo Bay	FF 072 188 16	Razors	11	1	0

3.2.7. Highland - Lochaber

Table 11. *E. coli* samples received from Highland Council: Lochaber area

Production Area	Site Name	Site	Sample Species	Samples received	Outwiths	Rejected samples
Arisaig	Sgeirean Buidhe	HL 004 202 13	Pacific oysters	13	1	1
Camas a Chuilinn: Loch Linnhe	Camas a Chuilinn: Loch Linnhe	HL 875 2386 08	Common mussels	17	0	2
Kildonan Oysters	Kildonan Bay	HL 796 2082 13	Pacific oysters	12	0	0
Loch Ailort	Eilean Dubh	HL 114 937 08	Common mussels	12	0	1
Loch Ailort 1	Loch Ailort 1	HL 114 214 08	Common mussels	12	0	1
Loch Ailort 3	Camus Driseach	HL 114 207 13	Pacific oysters	13	1	1
Loch Beag	Ardnambuth	HL 118 215 08	Common mussels	12	1	1
Loch Eil	Duisky	HL 134 216 08	Common mussels	13	1	1
Loch Eil: Fassfern	Fassfern	HL 136 219 08	Common mussels	14	0	2

Loch Leven: Lower	Lower	HL 170 222 08	Common mussels	12	0	0
Loch Leven: Upper	Upper	HL 171 223 08	Common mussels	12	0	0
Loch Moidart	South Channel	HL 179 227 13	Pacific oysters	12	0	0
Loch Sunart	Liddisdale	HL 206 1237 08	Common mussels	12	0	1

3.2.8. Highland- Ross and Cromarty

Table 12. *E. coli* samples received from Highland Council: Ross and Cromarty area

Production Area	Site Name	Site	Sample Species	Samples received	Outwiths	Rejected samples
Inner Loch Torridon	Dubh Aird	RC 090 1616 08	Common mussels	13	0	1
Little Loch Broom	Little Loch Broom	RC 805 2122 13	Pacific oysters	14	0	3
Loch Kanaird	Ardmair	RC 625 1233 13	Pacific oysters	13	3	1

3.2.9. Highland - Skye and Lochalsh

Table 13. *E. coli* samples received from Highland Council: Skye and Lochalsh area

Production Area	Site Name	Site	Sample Species	Samples received	Outwiths	Rejected samples
Kyles of Scalpay	Kyles of Scalpay Cockles	SL 864 2348 04	Common cocles	12	2	0
Loch Eishort	Drumfearn	SL 137 281 08	Common mussels	13	0	1
Loch Harport Inner Cockles	Carbost	SL 159 286 04	Common cockles	13	0	1
Loch Harport: Inner	Carbost	SL 159 286 13	Pacific oysters	13	0	1
Loch Portree Cockles	Loch Portree Cockles	SL 880 2405 04	Cockles	14	2	0
Sound of Sleat	Gleneig Bay	SL 833 2242 16	Razors	3	0	1

3.2.10. Highland - Sutherland

Table 14. *E. coli* samples received from Highland Council: Sutherland area

Production Area	Site Name	Site	Sample Species	Samples received	Outwiths	Rejected samples
Kyle of Durness	Keoldale	HS 773 1984 13	Pacific oysters	13	0	1
Kyle of Tongue	Kyle of Tongue	HS 103 303 13	Pacific oysters	13	0	1
Loch Glencoul	Kylesku	HS 157 310 08	Common mussels	12	1	0
Loch Inchard	Loch Inchard - Site 1 - D. Ross	HS 162 311 08	Common mussels	12	1	0
Loch Laxford	Weavers Bay	HS 167 320 08	Common mussels	12	2	0

3.2.11. North Ayrshire

Table 15. *E. coli* samples received from North Ayrshire Council area

Production Area	Site Name	Site	Sample Species	Samples received	Outwiths	Rejected samples
Fairlie	Southannan Sands	NA 065 332 13	Pacific oysters	12	0	0
Stevenston Sands Razors	Stevenston Sands Razors	NA 825 2169 16	Razors	11	2	0

3.2.12. Orkney Islands

Table 16. *E. coli* samples received from Orkney Islands Council area

Production Area	Site Name	Site	Sample Species	Samples received	Outwiths	Rejected samples
Bay of Skaill	Westray	OI 871 2380 13	Pacific oysters	21	2	4
North Bay Oysters	Hoy	OI 865 234913	Pacific oysters	4	0	0

3.2.13. Shetland Islands

Table 17. *E. coli* samples received from the Shetland Islands Council area

Production Area	Site Name	Site	Sample Species	Samples received	Outwiths	Rejected samples
Aith Voe Sletta	Slyde	SI 326 733 08	Common mussels	10	0	0
Baltasound Mussels	Baltasound Harbour	SI 010 395 08	Common mussels	9	2	0
Baltasound Mussels	Baltasound Mussels South	SI 010 2417 08	Common mussels	4	2	1
Basta Voe Cove	Inner - Site 1 - Thomason	SI 324 399 08	Common mussels	10	0	0
Basta Voe Cove	Inner-Site 2- Nisbet	SI 324 400 08	Common mussels	1	0	0
Basta Voe Outer	Outer	SI 323 403 08	Common mussels	11	0	0
Brindister Voe	Brindister Voe	SI 023 406 08	Common mussels	11	0	0
Busta Voe Lee North	Hevden Ness	SI 327 755 08	Common mussels	10	0	0
Busta Voe Lee South	Linga	SI 328 411 08	Common mussels	10	0	0
Catfirth	Catfirth	SI 032 412 08	Common mussels	10	0	0
Catfirth Mussels 1	East of Little Holm	SI 816 2144 08	Common mussels	10	0	0
Catfirth Mussels 2	East of Brunt Hamarsland	SI 817 2147 08	Common mussels	10	1	0
Clift Sound Houss	Clift Sound Houss	SI 633 1270 08	Common mussels	10	0	0
Clift Sound: Booth	Booth	SI 036 413 08	Common mussels	11	0	0
Clift Sound: Stream Sound	East Hogaland	SI 035 414 08	Common mussels	10	0	0
Clift Sound: Whal Wick	Wester Quarff	SI 038 1522 08	Common mussels	11	0	0
Colla Firth	Colla Firth	SI 040 417 08	Common mussels	10	0	0
Dales Voe - Fora Ness	West Taing	SI 502 869 08	Common mussels	12	0	0

Dales Voe: Scarvar Ayre	Scarvar Ayre	SI 050 420 08	Common mussels	11	0	0
Dales Voe: Scarvar Ayre	South Side	SI 050 868 08	Common mussels	1	0	0
Gon Firth	Cole Deep	SI 076 1338 08	Common mussels	10	0	0
Gruting Voe: Braewick Voe	Braewick Voe	SI 080 424 08	Common mussels	11	0	0
Gruting Voe: Browland Voe	Browland Voe	SI 081 425 08	Common mussels	11	0	0
Gruting Voe: Quilse	Quilse	SI 083 427 08	Common mussels	11	0	0
Gruting Voe: Seli Voe	Seli Voe	SI 084 428 08	Common mussels	12	0	0
Hamar Voe	Hamar Voe	SI 655 1404 08	Common mussels	10	0	0
Hamnavoe	Copister	SI 348 736 08	Common mussels	10	0	0
Lang Sound	Lang Sound	SI 107 429 08	Common mussels	11	0	0
Lee of Vollister	Whale Firth	SI 760 1920 08	Common mussels	12	0	0
Mid Noost Pacific Oysters	Mid Noost Pacific Oysters	SI 882 2408 13	Pacific oysters	6	0	1
Mid Yell Voe	Seafield	SI 216 432 08	Common mussels	11	0	0
Mid Yell Voe East	Bunya Sands	SI 797 2083 08	Common mussels	11	0	0
Muckle Roe	Pobies Geo	SI 221 433 08	Common mussels	10	0	0
North Uyea	North	SI 230 453 08	Common mussels	12	2	0
Olna Firth Inner	Inner	SI 232 435 08	Common mussels	10	0	0
Olna Firth Outer	Foula Wick	SI 232 434 08	Common mussels	10	0	0
Papa Little Voe	Millburn	SI 235 1350 08	Common mussels	10	0	0
Point of Hamna Ayre	Point of Hamna Ayre	SI 374 763 08	Common mussels	10	0	0

Sandsound Voe	Sandsound Voe	SI 242 443 08	Common mussels	10	0	0
South of Houss Holm	South of Houss Holm	SI 261 444 08	Common mussels	12	2	0
South Voe Mussels	South Voe Mussels	SI 421 825 08	Common mussels	12	2	0
Stream Sound: Ux Ness	Easterdale	SI 373 1096 08	Common mussels	11	0	0
Stromness Voe	Burra Holm	SI 273 467 08	Common mussels	10	0	0
Swining Voe	North West of Cul Houb	SI 820 2156 08	Common mussels	10	0	0
The Rona	Aith Ness	SI 517 944 08	Common mussels	10	0	0
Uyea Sound	Cow Head	SI 441 845 08	Common mussels	12	1	0
Vaila Sound - East Ward	Brandy Ayre	SI 858 2312 08	Common mussels	12	0	0
Vaila Sound Linga	Linga	SI 288 457 08	Common mussels	12	0	1
Vaila Sound: East of Linga and Galtaskerry	Whitesness	SI 288 1061 08	Common mussels	11	0	0
Vaila Sound: Riskaness	Riskaness	SI 289 458 08	Common mussels	11	0	0
Vementry North	Suthra Voe West	SI 322 464 08	Common mussels	11	0	0
Vementry South	Clousta Voe - Noonsbrough	SI 321 459 08	Common mussels	11	0	0
Wadbister Voe	Wadbister Voe	SI 294 466 08	Common mussels	11	0	1
Weisdale Voe	North Flotta	SI 297 469 08	Common mussels	11	2	0
Weisdale Voe Upper	Olligarth	SI 378 1521 08	Common mussels	11	0	0
West of Lunna	Cul Ness	SI 380 770 08	Common mussels	10	1	0

3.2.14. South Ayrshire

Table 18. *E. coli* samples received from South Ayrshire Council area

Production Area	Site Name	Site	Sample Species	Samples received	Outwiths	Rejected samples
Ayr Bay	Ayr Bay Razors	SA 841 2263 16	Razors	11	0	0
Ayrshire Coast South	Ayrshire Coast South Razors	SA 867 2363 16	Razors	1	0	0
Croy Bay	Culzean Bay	SA 681 1482 16	Razors	5	0	0
Croy Bay South	Girvan Mains	SA 872 2381 16	Razors	4	0	0
Girvan South Razors	Girvan South Razors	SA 778 1997 16	Razors	2	0	0
Heads of Ayre	Heads of Ayre Razors	SA 866 2362 16	Razors	11	0	1
North Bay	Barassie	SA 337 719 16	Razors	11	0	0
Prestwick Shore	Prestwick Shore Razors	SA 840 2262 16	Razors	10	0	0
Troon South Beach	Troon South Beach Razors	SA 843 2267 16	Razors	11	1	0

3.3. Outwith results in 2021

The number of outwith results (i.e. those which exceeded the upper *E. coli* MPN/100g for the extant classification status) are reported for all classified production areas by local authority in Table 19.

Table 19. Outwith results reported in 2021

Local Authority	No. valid results reported	No. Ooutwith results	% outwith
Argyll and Bute Council	516	49	9.5%
Comhairle nan Eilean Siar: Lewis & Harris	201	11	5.5%
Comhairle nan Eilean Siar: Uist & Barra	75	6	8%
Dumfries and Galloway Council	30	1	3.3%
East Lothian	31	2	6.5%

Fife Council	55	2	3.6%
Highland Council: Lochaber	155	3	1.9%
Highland Council: Ross & Cromarty	35	3	8.6%
Highland Council: Skye & Lochalsh	64	4	6.3%
Highland Council: Sutherland	60	4	6.7%
North Ayrshire Council	23	2	8.7%
Orkney Islands Council	21	2	9.5%
Shetland Islands Council	564	15	2.7%
South Ayrshire Council	65	1	1.5%
Total	1895	105	5.5%

4. Section 3: Chemical contaminants summary

This section provides a summary of the chemical contaminants monitoring undertaken in Scottish shellfish under the FSS programme between January and March 2021. A full copy of the report produced by Fera and published in June 2021 is available on FSS' website.

Thirty-one samples of shellfish, including species of common mussels (8 samples), Pacific oysters (5), common cockles (5), surf clams (2), native oysters (1), pullet carpet shells (1) and razor clams (9). The sampling schedule was timed to coincide with the period before annual spawning. This point in the annual cycle contaminant levels would likely be at their highest for optimum detection.

This study on chemical contaminants in shellfish from Scottish classified shellfish production areas, fulfils part of the requirements of EU member states (EU Regulations (EC) 1881/2006 and (EC) 854/2004) to adopt appropriate monitoring measures and carry out compliance checks on shellfish produced for human consumption. In comparison to earlier years, the scope of this study was widened to include production areas that had not been tested before. Marine shellfish bio-accumulate environmental contaminants because of their inability to metabolise these during feeding. 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.

Thirteen samples were analysed for polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/Fs, dioxins), polychlorinated biphenyls (PCBs). Twenty samples were tested for polycyclic aromatic hydrocarbons (PAHs) and 26 samples for heavy metals/trace elements. The methodologies used for the analyses were UKAS accredited to ISO 17025 standard and followed 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.

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We are the government's marine and freshwater science experts. We help keep our seas, oceans and rivers healthy and productive and our seafood safe and sustainable by providing data and advice to the UK Government and our overseas partners. We are passionate about what we do because our work helps tackle the serious global problems of climate change, marine litter, over-fishing and pollution in support of the UK's commitments to a better future (for example the UN Sustainable Development Goals and Defra's 25 year Environment Plan).

We work in partnership with our colleagues in Defra and across UK government, and with international governments, business, maritime and fishing industry, non-governmental organisations, research institutes, universities, civil society and schools to collate and share knowledge. Together we can understand and value our seas to secure a sustainable blue future for us all and help create a greater place for living.

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