RISK ASSESSMENT OF THE SCOTTISH MONITORING PROGRAMME FOR MARINE BIOTOXINS IN SHELLFISH HARVESTED FROM CLASSIFIED PRODUCTION AREAS: REVIEW OF THE CURRENT SAMPLING SCHEME TO DEVELOP AN IMPROVED PROGRAMME BASED ON EVIDENCE OF RISK

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Executive summary

The aim of this study was to assess the Scottish inshore monitoring programme for biotoxins in shellfish from classified inshore production areas in Scotland. This programme, conducted by Food Standards Scotland (FSS), aims to determine the prevalence of paralytic shellfish toxin (PST) (responsible for paralytic shellfish poisoning (PSP)), domoic acid (DA) (responsible for amnesic shellfish poisoning (ASP)), and lipophilic toxins (LT) (some of which are responsible for diarrhetic shellfish poisoning (DSP)). These are produced by certain types of phytoplankton, such as *Alexandrium* spp., *Pseudo-nitzschia* spp., *Dinophysis* spp., *Phalacroma rotundatum* (until recently included within the *Dinophysis* genus*), Azadinium* spp. and *Prorocentrum lima*, and these toxins then accumulate in shellfish. Shellfish harvesting areas in Scotland have been assigned to larger groups, called pods. The current FSS monitoring programme (as implemented in 2012) consists of a combination of monthly, fortnightly and weekly monitoring of biotoxin levels in shellfish sampled from these pods. For about half the pods, data on potentially biotoxin-producing phytoplankton are also collected regularly. In this study, the biotoxin patterns observed in shellfish across Scotland throughout the year were established using data collected over a fifteen-year period from April 2001 to September 2015. These data were compared with corresponding phytoplankton data to assess relationships between the biotoxin patterns and abundance of the phytoplankton genera responsible for the biotoxin of interest. The current FSS monitoring programme was assessed for the risk of a toxic event at a particular location being undetected. Alternative schemes that offered a more targeted allocation of resources or an improved level of public health protection were also considered.

The phytoplankton that produce biotoxins are normal members of the water column flora. Increases in their abundance (commonly termed harmful algal blooms- HABs) in Scottish waters are thought to be natural rather than anthropogenically stimulated events and are hence both spatially and temporally variable. As noted above, the harmful phytoplankton of greatest concern in Scottish waters belong to the genera *Alexandrium, Pseudo-nitzschia, Dinophysis, Azadinium* and *Prorocentrum*. Monitoring of *Alexandrium, Pseudo-nitzschia* and *Dinophysis* is conducted at genus level, and *Prorocentrum* at species level, through the enumeration of cell concentrations in the water column by light microscopy. The presence and density of these potentially harmful organisms therefore provides an indication of location and magnitude of likely shellfish toxicity.

Species belonging to the marine diatom *Pseudo-nitzschia* produce the neurotoxin DA, the ingestion of which may lead to ASP. In Scotland, cell counts at or above a threshold level of 50,000 cells/L for *Pseudo-nitzschia* spp. are thought to have the potential to cause an ASP event, should contaminated shellfish be consumed. Species belonging to the dinoflagellate genus *Alexandrium* are associated with the production of PST. In contrast to DA, for which relatively dense blooms of *Pseudo-nitzschia* are required before there is a cause for concern, the potentially high toxicity of some strains of *Alexandrium* means that a density of 40 cells/L is taken as an indication of the potential for a PST event. Other dinoflagellate phytoplankton produce toxins belonging to different LT groups. Okadaic acid (OA) and dinophysistoxins are associated with genera belonging to the family Dinophysiaceae (*Dinophysis* and *Phalacroma*), and also with the benthic dinoflagellate *Prorocentrum lima*. Cell counts at or above a threshold level of 100 cells/L for both *Dinophysis* spp. and *Prorocentrum lima*

may cause an LT event in shellfish. Due to its epiphytic nature, *Prorocentrum lima* is only sporadically recorded in the water column and was therefore not included as part of this analysis. The microflagellate *Azadinium* that produces azaspiracid (AZA) toxins is not currently monitored because its small size and indistinct morphology prevent its rapid enumeration in a monitoring setting. A molecular-based (quantitative polymerase chain reaction (qPCR)) method is in development for this organism.

Phytoplankton data and their associated biotoxins in mussels, collected during 2001-15, show that there was a very apparent seasonality in the threshold (both HAB cell count and mussel-toxin concentration) exceedence; exceedence was higher for all HAB-producing species and their associated toxins during the period spring to autumn. There was a high degree of variability in terms of threshold exceedance between pods. Of the three HAB-producing genera, *Dinophysis* (and associated toxin LT, in mussels) most routinely exceeded the action thresholds, with some pods exceeding thresholds nearly 100% of the time for *Dinophysis* and LT toxins during the summer. *Alexandrium* counts routinely exceeded the action threshold but this was only rarely associated with PST threshold exceedence in mussels, possibly attributable to the presence of non-toxic strains or species of *Alexandrium*. There were numerous occassions where *Dinophysis* counts were below threshold whilst contemporaneous LT concentrations in mussels were above threshold. This asychronicity was likely to be a consequence of the long LT retention-time in mussels (LT concentrations in mussels remain high while *Dinophysis* cell counts drop). *Pseudo-nitzschia* was present for more of the year compared with the other species, being present all year round in some pods, and there was evidence of a spring-autumn bloom in *Pseudo-nitzschia*, unlike the other genera. However, the exceedence-frequency of the *Pseudo-nitzschia* toxin DA (in mussels) was low in all pods.

A range of methodologies has been used to test for biotoxins in shellfish over the last 15 years. These include the mouse bioassay (MBA), liquid chromatography mass spectrometry (LC-MS/MS), and high performance liquid chromatography (HPLC). LT was previously monitored by MBA, which provided a 'yes' or 'no' outcome as to whether the toxin levels exceeded the maximum permitted level (MPL). It is now monitored in more detail with LC-MS/MS for levels of OA, dinophysistoxins and pectenotoxins (these three toxins are combined and reported as OA equivalent), AZA, and yessotoxins (YTX). To allow for compatibility with the earlier MBA data, these more detailed test results were converted to whether or not the MPL was exceeded for any of the LC-MS/MS readings for AZA, OA and YTX.

Biotoxin results are presented for those shellfish that are currently monitored, namely mussels (29,154 samples), Pacific oysters (5,526 samples), cockles (1,223 samples), razors (1,105 samples) and surf clams (344 samples). Test results for the remaining species (King scallops, Queen scallops, native oysters, and clams excluding surf clams) were only available up to 2011 and these have been excluded from this report.

DA levels in shellfish were generally low. Only one (out of 770) cockle samples and nine (out of 14,557) mussel samples exceeded the MPL for DA of 20 mg/kg. When looking at half the MPL, this increased to two cockle samples, 34 mussel samples and one Pacific oyster sample. For PST, 1% of the mussel samples exceeded the MPL of 800 µg/kg, and this increased to 2.1% for samples exceeding half this limit. For the remaining species 0.1 (Pacific oysters), 0.4 (cockles), 0.5 (razors) and

1.6% (surf clams) exceeded the MPL, and this increased to 0.2 – 2.8% of the samples exceeding half this value. For LT, 7.9% of surf clam samples exceeded the MPL and this was 7.6% for mussels, 2.1% for Pacific oysters, and 0.6% for razors. Prevalence of LT was low in cockles, with only one sample (out of 940 samples) exceeding the MPL. AZA exceeded the MPL of 160 µg/kg for 0.2 and 0.6% of the Pacific oyster and mussel samples, respectively. OA was more prevalent, with 13.3% of the surf clams and 9.5% of the mussel samples exceeding the MPL (160 µg/kg). For none of the species was the toxin concentration greater than the MPL for YTX (3.75 mg/kg) observed, and only 0.1% of the mussel samples exceeded half this limit.

To allow for development of statistical models for biotoxin prevalence in shellfish, pods with limited data had to be combined with other pods. Pods were only combined when environmental conditions, hydrography, abundance of phytoplankton genera responsible for biotoxin accumulation in shellfish, and biotoxin prevalence patterns in mussels were sufficiently similar. As a result, 105 mussel pods were combined into 37 groups. Only mussels and Pacific oysters yielded sufficient data for development of statistical models. These describe the chance of a sample exceeding a given toxin level, which was assumed to be a function of month, year, pod group, and a month by pod group interaction (i.e. the pattern over months of the year is specific to each group), where the terms including year or pod group were regarded as random effects. For DA, toxin levels modelled were DA > 5 mg/kg and DA > 0 mg/kg (there were insufficient test results exceeding 10 or 20 mg/kg to allow for statistical modelling). For PST in mussels, models were developed for PST> 0 µg/kg, PST > 400 µg/kg and PST> 800 µg/kg. For Pacific oysters only PST > 0 µg/kg could be modelled due to lack of test results exceeding 400 or 800 µg/kg. LT was modelled according to whether the sample exceeded the MPL. For the more recent AZA, OA and YTX data the time series were too short to allow for effects of year or group-specific toxin patterns over the months of the year. These models therefore contained effects only for month and group. The model results were summarised by pod group and month. Despite the various toxin cut-offs being modelled separately, there was good agreement between the patterns estimated over the 12 months of the year.

The current monitoring scheme is based on sampling frequencies that range from weekly to monthly, depending on the location and time of the year. Its aim is to keep the risk of not detecting biotoxin levels exceeding MPL below 1%. For simplicity it is assumed that with weekly monitoring such an event would always be detected, whereas with fortnightly or monthly monitoring the risk of non-detection increases, depending on the actual biotoxin prevalence. To assess whether the current monitoring frequencies are still sufficient, these were compared against the model-derived biotoxin prevalence, allowing for determination of the risk of non-detection of a toxic event (i.e. biotoxin level exceeding a limit of interest, such as PST > 0 µg/kg or PST > 400 µg/kg) under the current scheme.

For mussels, the assessment of the current monitoring scheme showed the following. The maximum risk of not detecting DA levels exceeding 5 mg/kg was 3.4%, during July. For the vast majority of pod group by month combinations however this risk was less than 1%, as intended. For PST > 800 µg/kg the current scheme exceeded a 1% risk of non-detection for six of the 37 pod groups (maximum risk of 8.4%), all during Apr-Jul. When the risk of not detecting PST > 400 µg/kg was assessed this increased to 13 groups, all between Mar-Sept (maximum risk of 16.1%). For LT, the risk of non-detection was 0% for Mar-Dec (due to weekly monitoring), and was less than 0.5% during Jan-Feb.

Phytoplankton provided a good early warning of toxicity. For example, on some occasions biotoxin levels in mussels changed from negative to exceedance of MPL within a week. However, in almost all these cases where phytoplankton data are available, cell counts would have flagged up the potential for a toxic event.

Alternative monitoring frequencies for mussels were proposed based on a combination of the findings from the risk assessment of the current monitoring scheme, the model-derived biotoxin prevalence estimates, and the maximum biotoxin levels observed in the data. For PST the risk of not detecting samples exceeding half the MPL (400 µg/kg) was taken as starting point, for DA this was 5 mg/kg (due to lack of samples exceeding 10 mg/kg, half the MPL). For LT the MPL was used due to the majority of historical data being available only as below/above field closure. Monitoring of DA in mussels could be reduced to monthly sampling during Oct-Apr. Some refinement of the current scheme is necessary for various pods for the remainder of the year. PST in mussels could be reduced to monthly monitoring for several pod groups throughout the year and monthly monitoring would suffice during Oct-Mar for all groups. LT is prevalent throughout the year for most locations and offering only limited scope for reducing the current monitoring frequency (i.e. weekly sampling would be required for most of the year for all locations). The only exceptions are two areas on the west coast of Scotland where the frequency could be reduced to monthly for most of the year. Overall, these changes would lead to a reduction in the number of mussel sample tested of approximately 15%.

For Pacific oysters, the risk assessment of the current monitoring scheme showed the risk of not detecting DA > 5mg/kg was 2.1% or less, with it being less than 1% for the majority of pod groups. The risk of not detecting PST > 0 µg/kg was 4.9% maximum, but it should be noted that models were not developed for PST > 400 or > 800 µg/kg due to the low number of Pacific oyster samples exceeding these limits. The risk of not detecting LT exceeding MPL was estimated to be 0% due to weekly monitoring throughout the year.

Based on these findings, the monitoring frequencies for DA and PST in Pacific oysters would have to be increased from monthly to weekly during the summer months for all pod groups if the risk of not detecting DA > 5 mg/kg or PST > 0 µg/kg is taken as our starting point. This may be too severe as only one sample (out of 2,682) exceeded half the MPL for DA, with seven samples (out of 3,408) exceeding half the MPL for PST (three of which exceeded the MPL). For LT there may be some scope for reducing the weekly frequency for some locations for part of the year, although no clear pod group related or month-related patterns emerged.

The monitoring frequency required for newly classified pods was also assessed. Model results allow for prediction of biotoxin patterns for new pods that are sensitive to the presence of biotoxin (as we would not want to miss any biotoxin events). These predictions indicate that weekly monitoring throughout the year for all three biotoxins would be necessary to begin with.

A pragmatic approach might consist of weekly monitoring of a new pod for all three biotoxins for one year. After one year, the observed biotoxin levels can be assessed, and, in combination with other information (hydrology, phytoplankton) collected from the same pod, this pod could then be assigned to an existing group of pods and its monitoring frequency adjusted accordingly.

As well as regulatory data on shellfish toxins, end product testing data collected by industry also exists. These data were not available for this study. While the commercial nature of these data raises a range of sensitivities, their inclusion in future risk assessments could help to minimise the risk of shellfish poisoning in humans, although an awareness of the limitations of commercial kits and some form of quality assurance would need to be taken into consideration.

The monitoring programme and its risk assessment are based on many assumptions, ranging from the test results from a small shellfish sample being representative for an entire pod, to the assumption that weekly monitoring is safe. It is therefore important that the monitoring programme should never be seen in isolation. Where possible, information from neighbouring pods, development of biotoxin prevalence during recent weeks, phytoplankton observations etc. should always be included in any decisions with respect to increasing the monitoring frequency and/or closing the field for harvesting.

Contents

Glossary

Abbreviation	Description
AHA	Associated Harvesting Area
ASP	Amnesic Shellfish Poisoning
AZA	Azaspiracid
BioSS	Biomathematics & Statistics Scotland
CEFAS	Centre for Environment, Fisheries and Aquaculture Science
DA	Domoic Acid
DSP	Diarrhetic Shellfish Poisoning
EU	European Union
FSA	Food Standards Agency
FSAS	Food Standards Agency Scotland
FSS	Food Standards Scotland
HAB	Harmful Algal Bloom
HGLM	Hierarchical Generalised Linear Model – used for modelling the biotoxin data
HPLC	High-Performance Liquid Chromatography
JRT	Jellett Rapid Test
LC-MS/MS	Liquid Chromatography Mass Spectrometry
LT	Lipophilic Toxins
MBA	Mouse Bioassay
MPL	Maximum Permitted Level
N	North (used in names for pod groups)
NWC	North West Coast (used in names for pod groups)
OA	Okadaic Acid
PSP	Paralytic Shellfish Poisoning
PST	Paralytic Shellfish Toxins
eq	equivalent
RL	Reporting Limit (minimum detection limit). For simplicity, when a test result falls below the RL it is assigned the value 0, and is referred to as a negative result.
RMP	Representative Monitoring Point
SAMS	Scottish Association for Marine Science
SE	South east (used in names for pod groups)
STX	Saxitoxin
SW	South West (used in names for pod groups)
W	West (used in names for pod groups)
WC	West Coast (used in names for pod groups)
YTX	Yessotoxin

1 Introduction

EU legislation (Regulation (EC) No 854/2004) requires Food Standards Scotland (FSS) to undertake a programme of official control monitoring of shellfish in Scotland. Testing for marine biotoxins forms part of this programme, and covers the biotoxins responsible for paralytic shellfish poisoning (PSP), amnesic shellfish poisoning (ASP) and lipophilic toxins (LT) (some of which are responsible for diarrhetic shellfish poisoning (DSP)). These are produced by certain types of phytoplankton, such as *Alexandrium* spp., *Pseudo-nitzschia* spp., *Dinophysis* spp. *Azadinium* spp. and *Prorocentrum lima*, and these toxins then accumulate in shellfish.

Most potentially harmful phytoplankton in Scottish waters are dinoflagellates, although some species belonging to one genus of marine diatom, *Pseudo-nitzschia*, are also known to be toxic. Not all species of *Pseudo-nitzschia* produce toxin, but those that do produce the neurotoxin domoic acid (DA), the ingestion of which may lead to ASP. Toxin-producing *Pseudo-nitzschia* found in Scottish coastal waters in summer/autumn tend to produce a greater amount of DA per cell than those observed earlier in the year. It is not possible to routinely discriminate between species of *Pseudo-nitzschia* using standard light microscopy and hence determination of *Pseudo-nitzschia* is only carried out to genus level. During an extensive bloom, concentrations may be as high as several million cells per litre. In Scotland, cell counts above a threshold level of 50,000 cells/L for *Pseudo-nitzschia* spp. may be regarded as having the potential to cause a DA event in shellfish.

Species belonging to the dinoflagellate genus *Alexandrium* are associated with the production of paralytic shellfish toxins (PST). As well as producing PST, *Alexandrium ostenfeldii* has been linked to the production of the macrocyclic imine, spirolide, although the significance of spirolide toxins in Scottish waters has yet to be determined. *Alexandrium tamutum* is thought to be a non-toxic species. It is difficult to determine *Alexandrium* to species level in a Lugol's-fixed sample using light microscopy and *Alexandrium* is thus reported to genus level within the monitoring programme. In contrast to DA, for which relatively dense blooms of *Pseudo-nitzschia* are required before there is a cause for concern, *Alexandrium* at a density of 40 cells/L is taken as an indication of the potential for a PST event as the cellular toxicity of this organism can be very high.

Dinoflagellate phytoplankton also produce toxins belonging to different LT groups. Okadaic acid (OA) and dinophysistoxins are associated with genera belonging to the family Dinophysiaceae (*Dinophysis* and *Phalacroma*), and also with the benthic dinoflagellate *Prorocentrum lima*. In addition to these toxins, *Dinophysis acuta* has also been linked with pectenotoxins, although this species is not particularly abundant in Scottish coastal waters. *Dinophysis* are known to form morphotypes, which can confuse taxonomic identification, and *Dinophysis* is reported to genus level within the monitoring programme. Cell counts above a threshold level of 100 cells/L for both *Dinophysis* spp. (including *Phalacroma rotundatum*) and *Prorocentrum lima* may be regarded as having the potential to cause an LT event in shellfish.

Two species of dinoflagellates that are associated with the production of yessotoxins (YTX), *Protoceratium reticulatum* and *Lingulodinium polyedrum*, are not frequently observed in Scottish coastal waters. No threshold level has been applied to these species within the monitoring programme.

Another small dinoflagellate, *Prorocentrum cordatum*, is monitored within the programme and occasionally produces dense blooms. The toxicity of this species around UK waters is currently unknown, and although the majority of *P. cordatum* grown in culture appears to be non-toxic, one strain isolated from the French Mediterranean coast was found to be a neurotoxin producer.

Azaspiracids (AZA) are produced by small dinoflagellates of the genera *Azadinium* and *Amphidoma*. Both are difficult to accurately identify using light microscopy and are not currently monitored as part of the programme.

Consumption of shellfish contaminated with phytoplankton generated biotoxins may result in mild to severe shellfish poisoning with symptoms as indicated by their biotoxin names. There have been isolated cases of toxic samples reaching the consumer market. In June 2006, a DSP outbreak occurred in London, affecting individuals who had eaten Scottish harvested mussels in several restaurants around the city. Onset of illness generally occurred 2-12 hours following eating. Notably, while the restaurants identified 171 cases, only six individuals reported their illness to the relevant local authority, demonstrating the under-reporting of food poisoning incidents. Similar incidents have been recorded in 1997 where 49 people were affected following consumption of UK-sourced mussels (Scoging & Bahl 1998). In 2013 70 people sought medical advice for DSP-related symptoms after consuming mussels from Scottish origin in several restaurants in London (Whyte *et al.* 2014). For PSP there is only one reliable reported case in the UK, when in 1968 78 people fell ill with PSP-related symptoms following consumption of mussels harvested off the North East English coast (Joint *et al.* 1997). Such shellfish toxin outbreaks can also have far-reaching consequences for the shellfish industry, with loss of consumer confidence in shellfish products in general, and can have serious economic impacts on Scotland's economy (Rural Affairs Committee 1999).

When test results for biotoxins in shellfish in commercial harvesting areas exceed maximum permitted levels (MPL, which are as follows: PST > 800 µg/kg, DA: > 20mg/kg, LT: OA > 160 µg/kg, AZA > 160 µg/kg, YTX > 3.75 mg/kg) consumption is regarded unsafe and the harvesting area is closed. In addition, FSS has developed a voluntary traffic light system (Managing shellfish toxin risks, 2014, FSA) to assist shellfish harvesters in identifying high risk periods and the need for increased levels of end product testing. Amber status becomes activated when biotoxins are detected at levels below the MPL. Red status corresponds to exceedance of MPL for the LT toxins, and exceedance of half the MPL for DA and PST toxins. This system also incorporates information from phytoplankton.

Classified shellfish harvesting sites in Scotland have been assigned to larger groups, called pods. Each pod has a Representative Monitoring Point (RMP) and the biotoxin test results from this RMP are assumed to be representative of the entire pod. Currently the frequency of official shellfish biotoxin monitoring ranges from weekly to monthly, depending on time of year, the area concerned (pod) and biotoxin monitored. Mussels are used as indicator species. In areas where mussels are not harvested, the most commercially significant species is used instead. For about half the pods, data on potentially biotoxin producing phytoplankton is also collected regularly by FSS.

EU legislation (Regulation (EC) No 854/2004) requires weekly monitoring of biotoxins in molluscs, although this frequency may be reduced in specific areas, or for specific types of molluscs, if a risk assessment of toxins or phytoplankton occurrence suggests a very low risk of toxic episodes. To investigate the possibility of reduced monitoring whilst safeguarding public health, FSA Scotland (FSAS) commissioned risk assessments to be performed in 2004 (Holtrop & Horgan 2004), 2008

(Holtrop 2008a&b) and 2012 (in-house risk assessment performed by FSA London). These risk assessments summarised biotoxin patterns observed in shellfish data collected from April 2001 onwards, and statistical models were developed to allow for the design of suitable monitoring programmes such that the risk of not detecting a toxic event remains suitably small.

The aim of the current study is to assess the current Scottish inshore monitoring programme for biotoxins conducted by FSS for the risk of a toxic event at a particular location being undetected, based on biotoxin data collected from April 2001 to September 2015. The methodology used is similar to that used in the aforementioned risk assessments. The current study, however, also takes into account the abundance of phytoplankton genera associated with the production of biotoxins. Where necessary, changes to the current monitoring programme are proposed such that it provides sufficient protection against harvesting of contaminated shellfish, whilst being cost-effective. Furthermore, the required monitoring frequencies for recently classified pods or future (as yet unknown) pods are assessed and strategies for dealing with these are proposed.

2 Materials and methods

2.1 Data

All data were supplied by FSS. Biotoxin data from April 2001 to September 2010 were taken from the cleaned data files used for previous risk assessments (project S14036 (Holtrop 2008a&b) and internal risk assessment by FSA statisticians). Biotoxin data from October 2010 to September 2015 were taken from data files provided by CEFAS, who conduct the biotoxin testing under contract from FSS.

During Apr-Sep 2013 an additional 235 mussel and 34 Pacific oyster samples were analysed for PST even though the field was closed for LT. These samples were analysed according to the same quality control standards as the official samples, and will therefore be regarded as part of the official dataset.

Phytoplankton data used in the analysis were collected for FSS by Marine Scotland between April 2000 and March 2005 and then by SAMS from September 2005 to October 2015. No phytoplankton data are available between April and August 2005.

2.1.1 Biotoxins

Over time, various measurement methods have been employed (summarised in Table 1).

- DA is measured by high performance liquid chromatography (HPLC) and reported in mg/kg or below the limit of quantification. The MPL is 20 mg/kg.
- LT was measured as DSP by mouse bioassay (MBA) for all shellfish species until June 2011. From July 2011 liquid chromatography mass spectrometry (LC-MS/MS) was routinely used for mussels, cockles, Pacific oysters and razors. MBA was still used for surf clams and King scallops between July 2011 and April 2012, after which LC-MS/MS was also used for these species and MBA testing ceased. The LC-MS/MS method quantifies the following LT groups: okadaic acid, dinophysistoxins (including their ester forms) and pectenotoxins - reported as µg OA equivalent (eq)/kg shellfish flesh, azaspiracids – reported as µg AZA1 eq/kg and yessotoxins - reported as mg YTX eq/kg. The MPL for these toxins is 160 µg/kg for both OA and AZA, and 3.75 mg/kg for YTX.
- PST test results are based on a mixture of qualitative (Jellett rapid test (JRT) and HPLC screen, both of which report the test results as ‘not detected’ or ‘detected’), semi-quantitative (HPLC with outcome reported as < or > 400 µg/kg), and quantitative methods (MBA with results reported in µg/100g, and quantitative HPLC with results initially reported in µg saxitoxin (STX) eq/100g shellfish flesh, which was later replaced with reporting in µg STX eq/kg shellfish flesh). The testing procedure consists of stages where initially a qualitative method is used, and if this gives a positive outcome it is followed by semi-quantitative analysis. If the semi-quantitative analysis gives ‘> 400 µg/kg’ it is followed by quantitative analysis. The semi-quantitative analysis was introduced in 2014 and this step is missing from earlier data. The MPL for PST is 800 µg STX eq/kg.

If any of the toxins exceed the MPL the field is closed for harvesting until two consecutive results below MPL are obtained which are at least 48 hours apart.

Table 1: Summary of measurement methods used between April 2001 and September 2015 for the various biotoxins.

Biotoxin	Method	Dates	Units reported	Maximum permitted level (MPL)
DA	HPLC	Full period	mg/kg	20 mg/kg
PST	MBA	Until 22/08/11	µg/100g	800 µg/kg
	Jellett JRT	04/04/05 to 30/11/06	Not detected or detected	
	HPLC screen	12/11/06 onwards	Not detected or detected	
	HPLC semi-quantitative	19/05/14 onwards	< or > 400 µg/kg	
	HPLC quantitative	05/05/08 onwards	µg/100g until 03/07/11 µg/kg 04/07/11 onwards	
LT	MBA	Until 22/04/12	Absence or presence of DSP	Presence of DSP
	LC-MS/MS	04/07/11 onwards	OA µg/kg	160 µg/kg
			AZA µg/kg	160 µg/kg
			YTX µg/kg	3.75 mg/kg

2.1.2 Data cleaning

Biotoxin data were checked for consistency. Entries without test results (for example due to insufficient sample material) were removed. A handful of test results collected during late March 2001 were removed. Ten entries for periwinkles were also removed as these are not bivalves and therefore beyond the scope of the current project.

On a few occasions a previously used pod number was reused at some later date for a different location. Where this was the case, the old pod allocation has been given the extension ‘old’.

Where test results have been reported as an actual value supported with a low and a high value, then the high-value result has been used. This is the case for the HPLC quantitative measurement for PST, and the LC-MS/MS measurements for AZA, OA and YTX.

Since 2001 various methods for analysing shellfish for the presence of biotoxins have been employed (summarised in Table 1). These test results have been ‘unified’ as follows:

- For DA the test result is reported as a quantitative value (in mg/kg), or as below the limit of quantification. The latter was replaced with a value of 0.
- For LT, the MBA results for DSP were recorded as ‘not detected’ or ‘detected’ (i.e. MPL exceeded). These were converted into 0 or 1, respectively. The OA, AZA and YTX toxin groups were measured by LC-MS/MS and give a reading (µg/kg for OA and AZA, mg/kg for YTX) or are reported as below the reporting limit (RL). For the latter, a value of 0 was assigned. In addition to working with the actual measured LC-MS/MS values, the LC-MS/MS results for the OA, AZA and YTX toxins were converted into a combined value of 0 or 1 to allow for compatibility with the MBA results. This was done as follows: when one or more of these three toxins exceeded their respective MPL, a value of 1 was assigned. If all three toxins were below their respective

MPL, the sample was assigned a value of 0. This allows for combination with the MBA results to give a continuous recording of LT toxins exceeding MPL for 2001-15.

- For PST, all quantitative test results were converted to µg/kg. If the test result was reported as 'not detected' or as below the reporting limit it was replaced with 0. If more than one test result has been reported (when the qualitative test gave 'detected' it was followed by a test result from the semi-quantitative or quantitative methods), then the reading from the quantitative method was taken as the most appropriate reading. If the semi-quantitative method was the endpoint (note that this was only the case when its reading was '<400 µg/kg') it was replaced by 200 µg/kg.

For presentation purposes as well as development of statistical models, toxin levels have been categorised according to MPL and half these limits as shown in Table 2.

Table 2: Categorisation of toxin levels used for summarising data and development of statistical models.

Biotoxin	Notation	Meaning
DA	0	0 mg/kg
	0-5	0 mg/kg < test result < 5 mg/kg
	5-10	5 mg/kg ≤ test result < 10 mg/kg
	10-20	10 mg/kg ≤ test result < 20 mg/kg
	20+	20 mg/kg ≤ test result
PST	0	0 µg/kg
	0-400	0 µg/kg < test result < 400 µg/kg
	400-800	400 µg/kg ≤ test result < 800 µg/kg
	800+	800 µg/kg ≤ test result
LT	0	Not detected (MBA) or AZA < MPL and OA < MPL and YTX < MPL
	1	Detected (MBA) or any of AZA, OA or YTX > MPL
LT OA and AZA	0	0 µg/kg
	0-80	0 µg/kg < test result < 80 µg/kg
	80-160	80 µg/kg ≤ test result < 160 µg/kg
	160+	160 µg/kg ≤ test result
LT YTX	0	0 mg/kg
	0-1.85	0 mg/kg < test result < 1.85 mg/kg
	1.85-3.75	1.85 mg/kg ≤ test result < 3.75 mg/kg
	3.75+	3.75 mg/kg ≤ test result

2.1.3 Grouping of pods

The 'pod' system for monitoring biotoxins was introduced by FSAS in November 2006. Shellfish harvesting sites were assigned to 'pods', where locations within a pod are thought to be similar hydrographically and environmentally, so that the risk of a toxic event is assumed similar within a pod. For each pod, one of the locations was assigned as RMP, with the remaining locations being assigned Associated Harvesting Area (AHA) status. For each RMP, a representative shellfish species (usually mussels) is sampled according to a set time table, and the test result is assumed to represent the entire pod (i.e. the RMP itself as well as the associated AHA locations). If the test result requires field closure, then the shellfish beds in the entire pod are closed. It is possible for an individual AHA, however, to have samples tested to contest closure of their AHA. Samples from

2001-4 were assigned retrospectively to pods by FSAS (this was done in the beginning of 2008, as part of project S14036 (Holtrop 2008a)).

To allow for statistical investigation of differences between pods, years and months, it was necessary to have 300 samples or more per (group of) pod(s), covering all 12 months of the year. Based on experience it was found that with this number of samples convergence of the estimation routine was achieved and predicted effects for pods, months and years could be obtained. Pods with insufficient data were combined with other pods, where the following factors were considered:

- Proximity;
- Similarity of hydrographical and environmental conditions, specifically patterns observed in the prevalence of the three main phytoplankton genera (*Pseudo-nitzschia* spp., *Alexandrium* spp., *Dinophysis* spp.);
- Similarity in biotoxin profiles in mussels.

Step 1: Initial grouping based on phytoplankton data

The FSAS groupings of pods implemented in 2012 were taken as a starting point. These groupings were analysed using the Bray-Curtis Similarity index in Primer v6 (Clarke & Gorley, 2006) using phytoplankton data (based on the threshold concentrations for the three main phytoplankton genera, *Alexandrium Pseudo-nitzschia* and *Dinophysis*) from 2000-2015. The groups could only be analysed if three or more pods were present in a group and if there was sufficient data to run the analysis. A similarity of 50% or greater (based on the average similarity of all individual pod-pair combinations) was required for the groups to be deemed similar. Of all the groups analysed seven were found to have a similarity > 50% (e.g. Figure 1 examples 1 and 2). Other groups either had insufficient data or had less than three pods within the group resulting in the Bray-Curtis similarity not being able to be undertaken. Some groups were re-analysed with the addition of different pods, or pods removed and were found to generally have a similarity > 50%. There were three groups that still did not result in a similarity > 50% when changes had been made (e.g. Figure 1 example 3). In addition to similarities in phytoplankton prevalence, all groupings were assessed (based on expert knowledge) for proximity and similarity of hydrographical and environmental conditions.

Step 2: Final grouping obtained from the initial grouping in combination with mussel biotoxin profiles

To preserve information on differences in biotoxin patterns between locations, pods were treated as stand-alone where possible (i.e. sufficient data were available to allow for statistical modelling, with at least 1-2 samples per month per year). Pods with insufficient biotoxin data were combined with either pods that had sufficient data or with other pods that also had limited biotoxin data. Where possible, these groupings take into account the similarity in phytoplankton profiles (as described under step 1, but note that not all pods are monitored for phytoplankton). Pods with limited data were only combined with other pods if their biotoxin patterns were similar, as assessed by examination of toxin profile plots. The final groupings were reassessed (based on expert knowledge) for proximity and similarity in hydrographical and environmental conditions.

For mussels the final grouping is shown in Figure 2 and Table 3. To allow for statistical modelling of the Pacific oyster data it was necessary to combine some of the mussel groups, with their grouping

detailed in Table 4. For example, Ayr-LochStriven and Ayr-other had to be combined to form a new group Ayr. The Pacific oyster grouping is preceded by the letters PO to differentiate it from the mussel grouping.

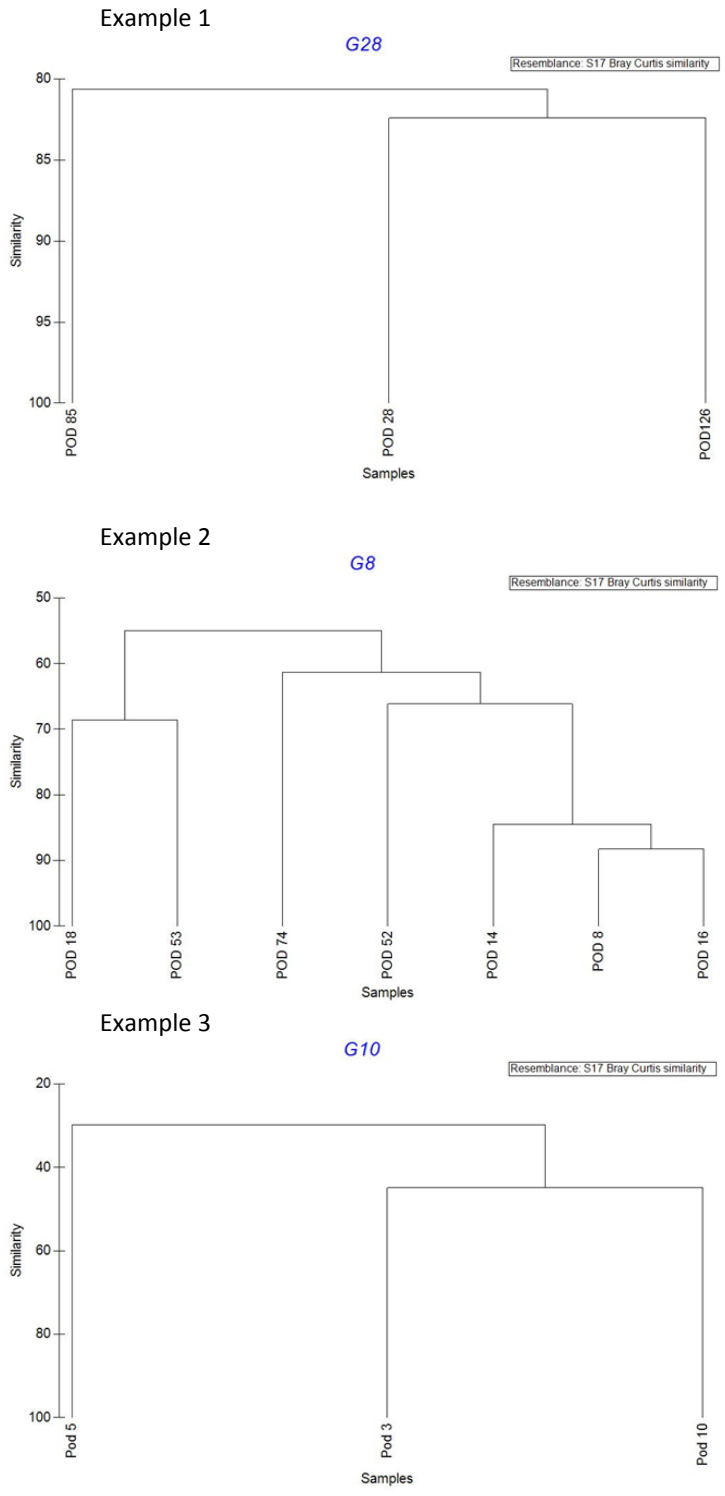

Figure 1: Examples of initial pod groupings based on phytoplankton data.

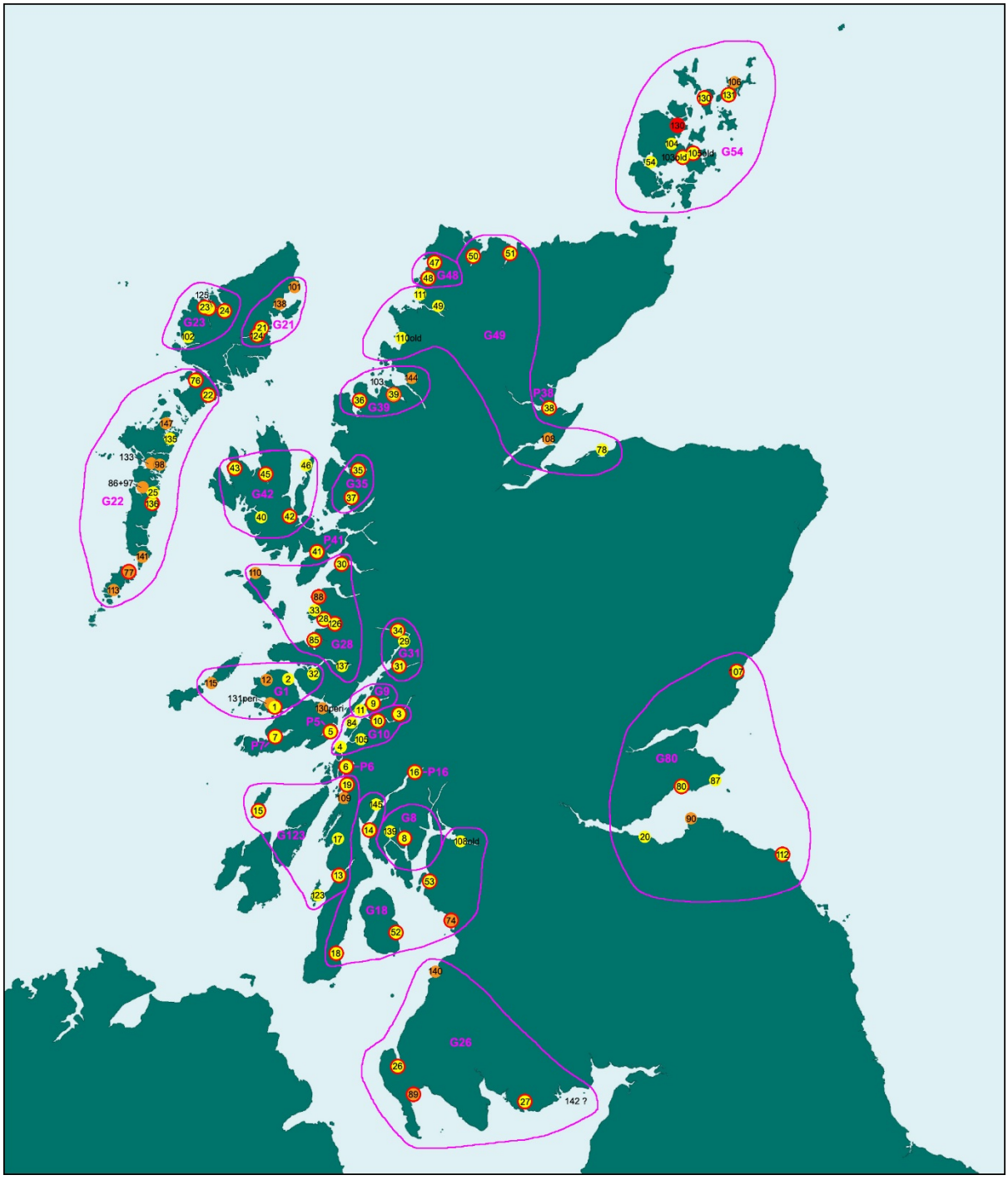

Figure 2a: Grouping of pods. Yellow: pods with mussels, orange: other shellfish species, red and circled in red: phytoplankton monitoring. Purple: grouping of pods and the abbreviation used to refer to each group. Shetland is shown in Figure 2b.

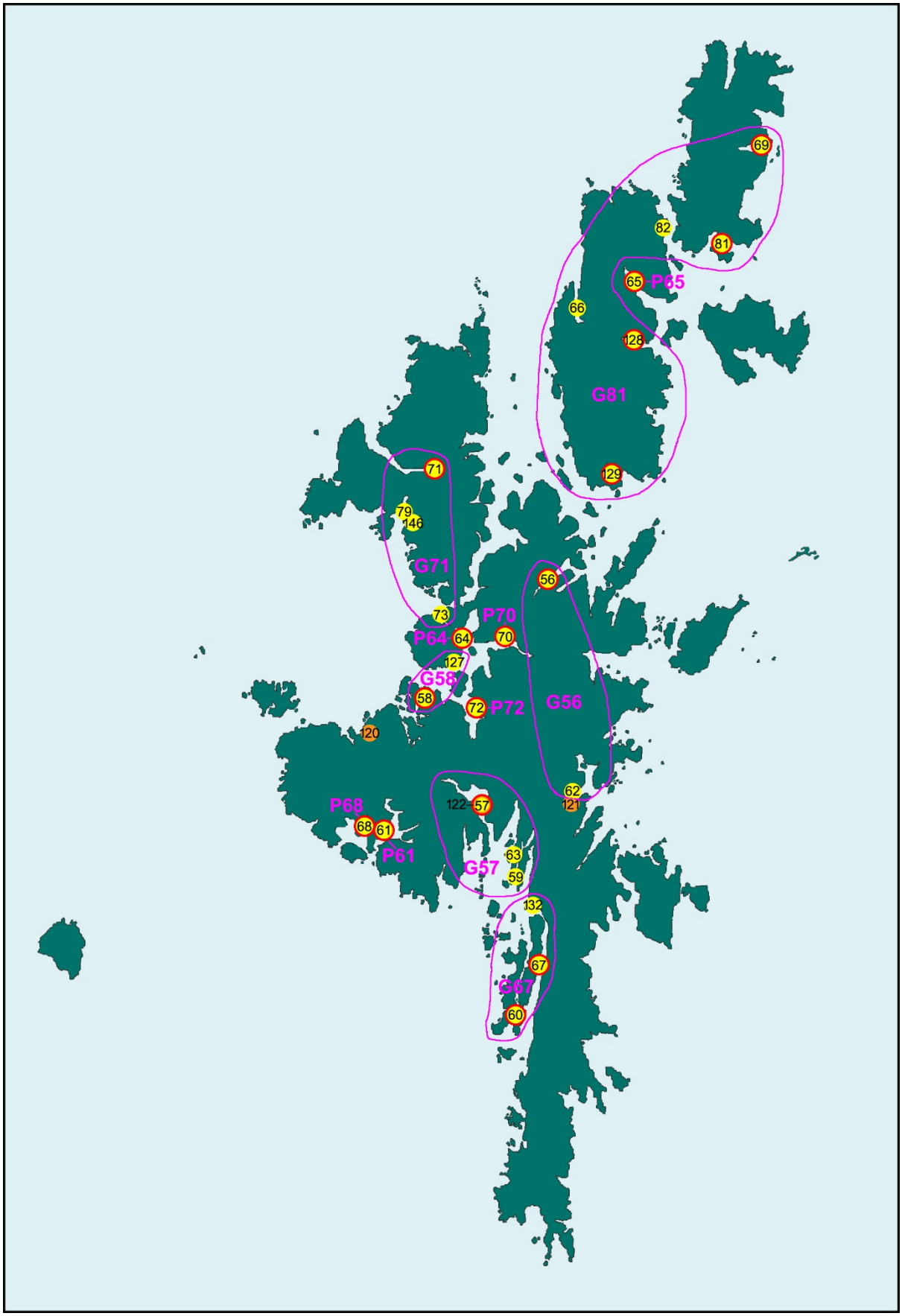

Figure 2b: as Figure 2a, for Shetland.

Table 3: New grouping of pods based on mussel data. Given are the number of samples over all toxins combined for each species and the year range during which the samples were collected. The column Groups 2012 indicates the grouping used by FSAS since 2012.

Groups	Groupname	Groups 2012	Pod	Cockles	Mussels	Pacific oysters	Razors	Surf clams
G80	EastCoast	G80	20		52 (04-10)			
			80	9 (02-03)	144 (01-15)		287 (05-15)	13 (03-08)
			87		15 (13-15)		2 (05-05)	309 (03-15)
			90				78 (08-15)	
			107		24 (01-02)			6 (03-03)
			112		99 (01-06)			
G26	Dumfries	G26	26		405 (01-15)		8 (07-09)	
			27	23 (01-10)	194 (01-10)		12 (15-15)	
			89				90 (08-15)	
			140				20 (13-15)	
			142	5 (13-14)				
G8	Ayr-LochStriven	G8	8		673 (01-15)	11 (02-06)		
			139	15 (13-13)	55 (14-15)			
P16	Ayr-LochFyneArdkinglas	G8	16		623 (01-15)	189 (01-13)		
G18	Ayr-other	G8	14		279 (02-12)	289 (01-15)	22 (03-10)	
			18		300 (07-15)		76 (01-13)	
			52		329 (02-15)		7 (03-07)	
			53		474 (01-14)	170 (01-15)		
			74				161 (07-15)	
			145		41 (14-15)			
			108old		8 (01-03)			
G123	WC-Gigha	G17	13		1 (02-02)	436 (01-11)		
			15		43 (06-07)	534 (01-15)		
			17		29 (11-12)		2 (11-11)	
			19		198 (07-10)			
			123		222 (09-15)	3 (12-12)	42 (09-12)	
P6	WC-LochMelfort	G10	6		468 (01-15)	136 (01-12)		
G10	WC-LochEtive	G10	3		138 (07-10)			
			4		30 (02-06)	611 (02-15)		
			10	3 (14-14)	504 (01-15)			
			84		333 (07-15)			
			105		16 (10-10)			
G9	WC-LochCreranLinnhe	G9	9		473 (01-12)	413 (01-15)		
			11		550 (01-15)	97 (01-07)		
G31	WC-LochLevenEil	G31	29		44 (04-07)			
			31		689 (01-15)			
			34		328 (01-15)			
G28	WC-Lochaber	G28	28		391 (01-15)	119 (01-06)		
			30	3 (05-05)	164 (01-11)		1 (04-04)	
			33		149 (02-10)	300 (04-15)	1 (05-05)	16 (02-06)
			85		262 (07-15)	21 (08-10)		
			88				99 (04-14)	
			110				4 (09-09)	
			126		177 (01-15)	225 (02-15)	6 (04-05)	
			137		58 (13-15)			
P5	Mull-LochSpelve	G10	5		603 (01-15)	2 (02-02)		
P7	Mull-LochScridain	P7	7		631 (01-15)			
G1	Mull-other	G1	1		366 (01-09)	302 (01-15)		
			2		342 (03-13)	37 (01-05)		
			12			591 (01-15)		
			32		58 (01-05)			
			115				2 (09-09)	
P41	Skye-LochEishort	G41	41		704 (01-15)			
G42	Skye-other	G41	40	1 (03-03)	36 (01-07)	507 (01-15)		
			42	20 (01-03)	426 (01-15)	2 (01-01)	1 (03-03)	
			43	3 (07-09)	318 (01-12)			
			45	3 (01-09)	283 (01-10)			
			46		18 (07-07)			
G21	Lewis-LochLeurbostErisort	G21	21		627 (01-15)			
			101				9 (03-03)	
			124		267 (09-15)			
			138				70 (14-15)	
G23	Lewis-LochRoag	G23	23		937 (01-15)			

			24		450 (03-15)		
			102		10 (01-03)		
			125		279 (09-15)		
G22	HarrisUist	G21	22		517 (01-15)		1 (03-03)
			25	7 (02-03)	111 (01-05)	7 (01-04)	
			76	95 (01-14)	335 (01-15)		
			77	479 (02-15)		3 (02-03)	3 (04-04)
			86	312 (08-15)			
			133	181 (11-15)			
			135		96 (13-15)		
			136		100 (13-15)		
			141				20 (13-14)
			147				15 (14-14)
G35	NWC-LochTorridon	G35	35		636 (01-15)		
			37		386 (01-13)	4 (01-01)	
G39	NWC-LochEweBroom	G39	36		491 (01-15)		
			39		410 (01-12)		
			144			52 (14-15)	
G48	NWC-LochLaxfordInchard	G48	47		435 (01-15)		
			48		509 (01-15)		
G49	NWC-other	G48	49		363 (01-15)		
			50		174 (01-12)	115 (01-12)	
			51		196 (01-12)	271 (01-15)	
			78	32 (02-06)	1 (01-01)		
			108	2 (10-10)			
			111		24 (09-10)		
			110old		15 (01-02)	3 (01-01)	
P38	Tain	G48	38		501 (01-15)		
G54	Orkney	G54	54	1 (01-01)	6 (01-04)		
			104		2 (01-01)	10 (01-02)	
			106	5 (02-03)			
			130		40 (11-13)		63 (11-14)
			131		34 (11-12)		3 (11-11)
			103old	3 (01-01)	106 (01-02)		
			105old	21 (01-02)	26 (01-02)		
G67	Shetland-SE-CliftSound	G57	60		360 (06-15)		
			67		444 (01-15)		
			132		23 (11-15)		
G56	Shetland-SE-DalesVoe	G62	56		442 (01-15)		
			62		98 (01-15)		
G57	Shetland-SE-SandsoundWeisdale	G57	57		531 (02-15)		
			59		177 (01-15)		
			63		368 (05-15)		
P61	Shetland-SW-GrutingVoe	P61	61		654 (01-15)		
P68	Shetland-SW-Vaila	P68	68		683 (01-15)		
P72	Shetland-W-AithVoe	G58	72		534 (01-15)		
P64	Shetland-W-BustaVoe	G58	64		628 (01-15)		
P70	Shetland-W-OlnaFirth	G58	70		560 (01-15)		
G58	Shetland-W-VementryVoe	G58	58		616 (01-15)		
			127		97 (09-15)		
G71	Shetland-W-RonasVoe	G58	71		367 (01-15)		
			73		12 (11-15)		
			79		1 (01-01)		
			146		34 (14-15)		
P65	Shetland-N-Basta	G69	65		536 (01-15)		
G81	Shetland-N-Uyea	G69	66		65 (01-15)		
			69		310 (01-15)	62 (03-13)	
			81		342 (01-15)		
			82		17 (02-08)		
			128		234 (01-15)		
			129		170 (04-15)	4 (04-04)	

WC, West Coast; NWC, North West Coast; SE, South East; SW, South West; W, West; N, North

Table 4: Grouping of pods for Pacific oysters. Each group contains at least one pod for which Pacific oysters are used as indicator species.

Groups	GroupName	Pods
PO18	Ayr	8,14,16,53
PO123	WC-Gigha	13,15,123
PO10	WC-LochEtiveMelfort	4,6
PO9	WC-LochCreranLinnhe	9,11
PO28	WC-Lochaber	28,33,85,126
PO1	Mull	1,2,5,12
PO42	SkyeShetland	25,40,42,69,77,104,129
PO49	NWC	37,50,51,144,110old

2.2 Models for estimation of prevalence

2.2.1 Model formulation

Test results were formulated as 0 (below a given limit) or 1 (exceeding a given limit). Models were fitted to the proportion of samples exceeding a given limit, as follows. For a given genus and biotoxin, let p be the probability that a sample is positive (i.e. the toxin level exceeds a given limit). This probability is likely to depend on the time of year (e.g. high values are more likely to occur in summer than in winter) and the location the sample was taken from. There may also be year to year fluctuations with some years showing higher prevalence than others. To investigate such relationships, a Hierarchical Generalised Linear Model (HGLM, see Lee & Nelder (1996, 2001)) was formulated. Let y_{mgt} be the number of samples exceeding a given limit and let n_{mgt} be the total number of samples, for month m at pod group g in year t. Then y is assumed to follow a binomial distribution:

$$y_{mgt} \sim \text{Binomial}(n_{mgt}, p)$$

where the probability p of a sample exceeding a given limit is modelled as a function of month, group (of pods) and year. Let the odds be defined as p/(1-p). The following linear model was formulated for the log-odds:

$$\ln [\, p/(1-p) \,] = \text{constant} + \text{Month}_m + \text{Group}_g + \text{Year}_t \qquad (1)$$

with ln denoting the natural logarithm. This model formed the basis of previous risk assessments (Holtrop & Horgan 2004, Holtrop 2008a&b, in-house risk assessment by FSA in 2012), where Month was regarded as a fixed effect and Group and Year as random effects, i.e. on the log-odds scale, Group and Year effects were assumed to have normal distributions with a mean of zero and unknown between-group or between-year variances of σ_g^2 and σ_t^2, respectively. In addition, interactions between the various terms were also considered and their inclusion in the final models was based on appropriate log-likelihood ratio tests. As a result, a Month by Group interaction term was included in most cases.

The interpretation of the random effects is as follows:

1. Random variation between Years. Toxin levels are thought to vary randomly between years, with some years showing high toxin levels while other years show low levels. It is not known in advance whether toxin levels are going to be high or low in any specific year.
2. Random variation between Groups. Toxin levels are thought to vary randomly between groups of pods, with some groups having a tendency for high toxin levels while other groups have a tendency for low toxin levels. Some of these differences may be explained by hydrographical and local environmental conditions, but even so, we might expect there to be some unexplained variation between locations, even if local conditions are similar.
3. Interaction between Group and Month: Toxin levels are thought to vary between groups of pods, as described under 2, but the effects depend on the time of year. For example, location A may show a tendency for high prevalence in early summer, whereas location B may show high toxin prevalence in autumn.

The first practical consequence of including random effects such as Group is that although the estimated probability of a sample being toxic for a particular group is based on the data obtained from that group of pods, the estimate is slightly shrunk towards the overall mean value. The amount of shrinkage depends on the number of samples from that location and the magnitude of the random variation between locations. Shrinkage towards the overall mean is larger when only a small number of samples are available or the variation between groups is large, i.e. we do not have a great deal of confidence in the limited information available from that particular location. A consequence of shrinkage is that group effects were never estimated to be exactly zero, even if all the samples were clear. This seems sensible as data from only 15 years were available, and the absence of biotoxin at a group of pods during a particular period does not indicate that this location will always be clear.

The second consequence of including random effects such as Group is that it allows us to investigate what toxin pattern might be expected for a new pod (see Section 7). Likewise, a consequence of including Year as a random effect means that the prediction for an extreme year will be somewhat less extreme than the observed data. Again, the amount of shrinkage towards the overall mean will depend on the number of samples, variation between samples within a year, and variation between years (small numbers of samples and large between year variation will increase shrinkage towards the overall mean).

All statistical analyses were conducted using the HGLM routine in Genstat 17th edition, release 17.1 (VSN International Ltd, Hemel Hempstead, Herts., UK). The dispersion parameter was estimated, but if it was less than 1, estimation was repeated with dispersion fixed at 1.

2.2.2 Fitted models for mussels

The final models all contain Month as fixed effect. The random effects included in the model depend on the amount of data available. For the 2001-15 data the following models gave the best results:

- PST > 0, PST > 400, PST > 800 µg/kg, DA > 0, DA > 5 mg/kg, LT (0 or 1, where 1 denotes exceedance of the MPL): fixed effect for Month, and with Group, Year and Group by Month interaction as random effects.

- DA > 10, DA > 20 mg/kg: no models were fitted to these data as the number of samples exceeding these limits were too small for modelling.

For the LT biotoxin data collected with LC-MS/MS during 2011-15, the final models were as follows:

- AZA > 0, AZA > 80, AZA > 160 µg/kg, OA > 0, OA > 80, OA > 160 µg/kg, YTX > 0 mg/kg: Month as a fixed effect and Group as a random effect.
- YTX > 1.85 and YTX > 3.75 mg/kg no models were fitted as the numbers of samples exceeding these limits were too small.

The AZA, OA and YTX data did not allow for inclusion of random variation between years, due to the relatively short time window (June 2011 to September 2015) and incomplete years.

2.2.3 Fitted models for Pacific oysters

For the 2001-15 data the following models gave the best results:

- PST > 0 µg/kg, DA > 0, DA > 5 mg/kg, LT (0 or 1, where 1 denotes exceedance of the MPL) : Month as fixed effect and with random effects for Group and Year
- PST > 400, PST > 800 µg/kg, DA > 10, DA > 20 mg/kg: no models were fitted to these data as the number of samples exceeding these limits were too small for modelling.

Unlike mussels, there was no strong indication of differences in toxin patterns over the months of the year between groups of pods and therefore a Group by Month interaction was not included.

For the LT toxin data collected during 2011-15 the final models were:

- AZA > 0, AZA > 80 µg/kg, OA > 0, OA > 80 µg/kg: Month as fixed effect and Group as random effect.
- AZA> 160 µg/kg, OA > 160 µg/kg, YTX > 0, YTX > 1.85 and YTX > 3.75 mg/kg: no models were fitted to these data as the numbers of samples exceeding these limits were too small.

2.2.4 Cockles, razors and surf clams

The remaining species did not have sufficient test results to allow for statistical modelling. Their findings are based on data summaries.

2.3 Risk assessment of current and alternative monitoring schemes

2.3.1 Current monitoring scheme

Under the present monitoring scheme implemented in 2012 the sampling frequencies are as follows.

- For mussels (Table 5) weekly monitoring for LT takes place between Mar-Dec, whereas for PST and DA this is group-specific.
- For pods which only have Pacific oysters (Table 6), monthly testing takes place for PST and DA, and weekly testing for LT, throughout the year and for all pods.
- For the remaining pods (no Pacific oysters and no mussels, Table 6), testing is the same across all pods, as follows. For DA this is weekly between Jun-Oct, fortnightly in May, and monthly

Nov-Apr. For PST testing is weekly between Apr-Oct and fortnightly Nov-Mar. For LT this is weekly between Apr-Dec, and monthly between Jan-Mar.

- For new pods testing is weekly all year round for all three toxin groups.

If a pod is tested and is discovered to contain toxin levels that exceed the MPL it is closed for harvesting, and it will remain closed until two consecutive samples, taken at least 48h apart, are clear. In practice, for many locations weekly sampling is the maximum testing frequency that is achievable.

2.3.2 Risk assessment approach

The aim of the sampling strategy employed in the monitoring programme is to maximise confidence that a harvesting site is clear (i.e. toxin levels are below a given limit). This is equivalent to minimising the risk that toxin levels at a pod unknowingly exceed a given limit. For the purposes of this study, this will be referred to as the 'risk of non-detection', and can be applied to any of the three biotoxins and any toxin level (limit) of interest. It is defined as follows:

> *Risk of non-detection is defined as the chance that biotoxin levels unknowingly exceed a given limit in a particular week, averaged over the month*

In other words, it looks at the probability that the pod is not sampled while toxin levels exceed a given limit (such as MPL).

The risk of non-detection depends on two factors, namely

a) the chance that the field is toxic (i.e. probability that toxin levels exceed a given limit), and
b) the sampling frequency.

An increase in biotoxin prevalence or a decrease in the sampling frequency lead to an increased risk of non-detection.

The risk of non-detection was calculated as follows. Let the chance that toxin levels exceed a given limit be denoted by p. For each toxin/species combination, the HGLM model (see Section 2.2.1) provides an estimate of p for each group of pods for each of the twelve months of the year. For simplicity, it was assumed that a negative test result (i.e. toxin level below a given limit such as MPL) is valid for one week. This implies that if samples were to be taken every week, the risk of the field unknowingly exceeding a given biotoxin limit is zero. Likewise, if samples were taken every fortnight, the risk is 0.5p (for every four weeks there were two weeks that the risk of non-detection was zero and two weeks that the risk of non-detection was p, so is (0+p+0+p)/4 = 0.5p on average). If samples were taken every four weeks, the average risk of non-detection is 0.75p (for every four weeks there was one week with zero risk of non-detection and three weeks with risk of p, which gives (0 + p + p + p)/4 = 0.75p on average). In other words, our definition of the risk of non-detection is the probability of the biotoxin event going undetected in a particular week, averaged over the month. To summarise:

- Weekly sampling: risk of non-detection is zero
- Fortnightly sampling: risk of non-detection is 0.5p
- Monthly sampling: risk of non-detection is 0.75p.

Table 5: Current sampling frequency for DA, PST and LT in mussels as implemented since 2012, 1 (white) = monthly, 2 (yellow) = fortnightly, 4 (red) = weekly.

		Groups	DA												PST												LT										
GroupsM	GroupNameM	2012	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
G80	EastCoast	G80	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	4	4	4	4	4	4	2	1	1	1	1	4	4	4	4	4	4	4	4	4	4
G26	Dumfries	G26	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4	4	4	4	4	4	4	4	4
G8	Ayr-LochStriven	G8	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	1	1	1	1	1	1	1	4	4	4	4	4	4	4	4	4	4
P16	Ayr-LochFyneArdkinglas	G8	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	1	1	1	1	1	1	1	4	4	4	4	4	4	4	4	4	4
G18	Ayr-other	G8	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	1	1	1	1	1	1	1	4	4	4	4	4	4	4	4	4	4
G123	WC-Gigha	G17	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4	4	4	4	4	4	4	4	4
P6	WC-LochMelfort	G10	1	1	1	2	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4	4	4	4	4	4	4	4	4
G10	WC-LochEtive	G10	1	1	1	2	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4	4	4	4	4	4	4	4	4
G9	WC-LochCreranLinnhe	G9	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4	4	4	4	4	4	4	4	4
G31	WC-LochLevenEil	G31	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4	4	4	4	4	4	4	4	4
G28	WC-Lochaber	G28	1	1	1	1	1	1	1	2	1	1	1	1	1	2	4	4	4	4	4	4	4	2	1	1	1	1	4	4	4	4	4	4	4	4	4	4
P5	Mull-LochSpelve	G10	1	1	1	2	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4	4	4	4	4	4	4	4	4
P7	Mull-LochScridain	P7	1	1	1	1	2	4	2	4	4	2	1	1	1	1	2	4	4	4	4	4	4	4	2	1	1	1	4	4	4	4	4	4	4	4	4	4
G1	Mull-other	G1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	4	4	4	4	4	4	4	4	4	4
P41	Skye-LochEishort	G41	1	1	1	1	1	1	2	2	2	2	1	1	1	1	2	4	4	4	4	4	4	2	1	1	1	1	4	4	4	4	4	4	4	4	4	4
G42	Skye-other	G41	1	1	1	1	1	1	2	2	2	2	1	1	1	1	2	4	4	4	4	4	4	2	1	1	1	1	4	4	4	4	4	4	4	4	4	4
G21	Lewis-LochLeurbostErisort	G21	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4	4	4	4	4	4	4	4	4
G23	Lewis-LochRoag	G23	1	1	1	1	1	2	2	4	4	2	1	1	1	1	1	2	4	4	4	2	1	1	1	1	1	1	4	4	4	4	4	4	4	4	4	4
G22	HarrisUist	G21	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4	4	4	4	4	4	4	4	4
G35	NWC-LochTorridon	G35	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	4	4	2	2	2	1	1	1	1	1	4	4	4	4	4	4	4	4	4	4
G39	NWC-LochEweBroom	G39	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	4	4	4	4	4	4	4	4	4	4
G48	NWC-LochLaxfordInchard	G48	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	4	4	4	4	4	4	2	1	1	1	1	4	4	4	4	4	4	4	4	4	4
G49	NWC-other	G48	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	4	4	4	4	4	4	2	1	1	1	1	4	4	4	4	4	4	4	4	4	4
P38	Tain	G48	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	4	4	4	4	4	4	2	1	1	1	1	4	4	4	4	4	4	4	4	4	4
G54	Orkney	G54	1	1	1	1	1	1	1	1	1	1	1	1	2	2	4	4	4	4	4	4	4	4	2	1	1	1	4	4	4	4	4	4	4	4	4	4
G67	Shetland-SE-CliftSound	G57	1	1	1	1	1	1	1	2	2	2	1	1	2	1	1	2	2	2	2	2	1	1	1	1	1	1	4	4	4	4	4	4	4	4	4	4
G56	Shetland-SE-DalesVoe	G62	1	1	1	1	1	2	4	4	4	2	1	1	1	1	1	2	4	4	2	2	2	1	1	1	1	1	4	4	4	4	4	4	4	4	4	4
G57	Shetland-SE-SandsoundWeisdale	G57	1	1	1	1	1	1	1	2	2	2	1	1	2	1	1	2	2	2	2	2	1	1	1	1	1	1	4	4	4	4	4	4	4	4	4	4
P61	Shetland-SW-GrutingVoe	P61	1	1	1	1	1	1	2	2	4	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4	4	4	4	4	4	4	4	4
P68	Shetland-SW-Vaila	P68	1	1	1	1	1	1	2	4	4	2	1	1	1	1	2	4	4	4	4	4	4	4	2	1	1	1	4	4	4	4	4	4	4	4	4	4
P72	Shetland-W-AithVoe	G58	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	4	4	4	4	4	4	4	2	1	1	1	4	4	4	4	4	4	4	4	4	4
P64	Shetland-W-BustaVoe	G58	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	4	4	4	4	4	4	4	2	1	1	1	4	4	4	4	4	4	4	4	4	4
P70	Shetland-W-OlnaFirth	G58	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	4	4	4	4	4	4	4	2	1	1	1	4	4	4	4	4	4	4	4	4	4
G58	Shetland-W-VementryVoe	G58	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	4	4	4	4	4	4	4	2	1	1	1	4	4	4	4	4	4	4	4	4	4
G71	Shetland-W-RonasVoe	G58	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	4	4	4	4	4	4	4	2	1	1	1	4	4	4	4	4	4	4	4	4	4
P65	Shetland-N-Basta	G69	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	4	4	4	4	4	4	2	1	1	1	1	4	4	4	4	4	4	4	4	4	4
G81	Shetland-N-Uyea	G69	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	4	4	4	4	4	4	2	1	1	1	1	4	4	4	4	4	4	4	4	4	4

Table 6: Current sampling frequency for DA, PST and LT in Pacific oysters and in other species (excluding mussels and Pacific oysters), as implemented since 2012 (1= monthly, 2 = fortnightly, 4 = weekly).

Species	Toxin	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Pacific oysters	DA	1	1	1	1	1	1	1	1	1	1	1	1
	PST	1	1	1	1	1	1	1	1	1	1	1	1
	LT	4	4	4	4	4	4	4	4	4	4	4	4
other species	DA	1	1	1	1	2	4	4	4	4	4	1	1
	PST	2	2	2	4	4	4	4	4	4	4	2	2
	LT	1	1	1	4	4	4	4	4	4	4	4	4

2.3.3 Risk assessment of the current monitoring scheme

For each toxin/species combination, the HGLM model (see Section 2.2.1) provides an estimate of p (the chance that toxin levels exceed the MPL) for each pod group for each of the twelve months of the year. Based on the sampling frequencies employed in the current monitoring scheme, the risk of non-detection was calculated (0 for weekly sampling, 0.5p for fortnightly sampling and 0.75p for monthly sampling) for each group of pods and each month.

2.3.4 Formulation of alternative monitoring schemes for mussels and Pacific oysters

Alternative sampling schemes were developed considering three possible frequencies, namely *once per month* when toxin levels are *unlikely* to exceed a given limit, *once per week* when toxin levels are *likely* to exceed this given limit, and fortnightly otherwise. Let R_{max} be a given maximum acceptable risk of non-detection. Then the most efficient (i.e. requiring the least samples) monitoring scheme is given by monthly sampling for $p < 4/3\ R_{max}$, fortnightly sampling for $4/3\ R_{max} \leq p < 2\ R_{max}$, and weekly sampling for $p \geq 2\ R_{max}$. It was agreed by FSS to set the maximum acceptable risk R_{max} to 1%. Then monthly sampling is sufficient when $p < 1.33\%$, fortnightly sampling when $1.33\% \leq p < 2\%$, and weekly sampling is needed when $p \geq 2\%$.

As a first step, an initial monitoring scheme was formulated based on p obtained from the models. To ensure that any situations are covered where the data suggest more frequent sampling than the model, a second step was implemented which consisted of crosschecking against the observed data. For any situation where the observed prevalence in the data suggests more frequent monitoring than the model, the final recommended monitoring frequency is based on the data.

For DA and PST the intention was to keep the risk of the biotoxin not exceeding half the MPL below 1%. As for DA there were insufficient samples exceeding this cut-off, 5 mg/kg was chosen instead. For LT, as most of the data are based on the MBA which gives a below or above MPL result, the proposed schemes are based on keeping the risk of not detecting LT exceeding MPL below 1%. To summarise, the proposed schemes are based on keeping the risk of not detecting biotoxin exceeding a given limit below 1%, as follows:

- Mussels: DA > 5 mg/kg, PST > 400 µg/kg, LT exceeding MPL
- Pacific oysters: DA > 5 mg/kg, PST > 0 µg/kg, LT exceeding MPL

The reason for PST > 0 µg/kg for Pacific oysters is because that the data did not allow for models to be fitted to PST > 400 µg/kg (not enough samples exceeding this limit).

2.3.5 Risk assessment for cockles, razors and surf clams

No models were developed for cockles, razors and surf clams and therefore the approach outlined above cannot be used. Instead, data summaries were created that show the prevalence of a given biotoxin for each month of the year. Based on these summaries an alternative monitoring frequency is suggested as follows. When the test result is always zero (i.e. below the RL) then monthly sampling is suggested, when the maximum observed test result exceeds half the MPL then weekly sampling

suggested, and when the maximum observed test result is positive but less than half the MPL then fortnightly sampling suggested. To summarise, when the maximum test result exceeds the following limits:

DA

- DA > 10 mg/kg: weekly sampling
- 0 < DA < 10 mg/kg: fortnightly sampling
- DA = 0 mg/kg: monthly sampling

PST

- PST > 400 µg/kg: weekly sampling
- 0 < PST < 400 µg/kg: fortnightly sampling
- PST = 0 µg/kg: monthly sampling

LT

- AZA > 80 µg/kg or OA > 80 µg/kg or YTX > 1.85 mg/kg or MPL exceeded in the past (based on MBA results): weekly sampling
- 0 < AZA < 80 µg/kg or 0 < OA < 80 µg/kg or 0 < YTX < 1.85 mg/kg: fortnightly sampling
- AZA = 0 µg/kg and OA = 0 µg/kg and YTX = 0 mg/kg: monthly sampling

2.4 Estimation of biotoxin prevalence for a new pod

The HGLM models provide an estimate for the random variation between groups (and interaction with month), allowing for estimation toxin prevalence for a new pod, assuming that the pod would be extremely sensitive to the biotoxin of interest. We will look at two levels of severity, namely a pod that is in the top 5% of extreme (groups of) pods (i.e. 1 out of 20), and a pod that is in the top 1%. Let σ^2 denote the variation between locations (sum of variation between groups and interaction terms involving group). Inserting a Group effect of 1.64σ in equation (1) given on page 23 then gives an estimate of the log-odds for such an extreme location. This represents an upper 95% limit on the log-odds, due to variation between locations. Likewise, inserting a Group effect of 2.33σ in equation (1) gives an estimate of the log odds of a pod that is in the top 1% of extreme locations. These log-odds are then back-transformed to obtain the estimated prevalence p.

3 Data summaries

3.1 Grouping of pods

To allow for statistical modelling of the biotoxin data, pods with limited data had to be combined with other pods. With the 2012 FSAS grouping taken as a starting point, these were revised such that pods with large amounts of test results (more than 300 samples in total, covering all months of the year) were regarded as stand-alone pods. The remaining pods were grouped appropriately, taking into account similarities in hydrography, environmental conditions, prevalence of phytoplankton (*Pseudo-nitzschia* spp., *Alexandrium* spp., *Dinophysis* spp.), and biotoxin profiles (DA, PST, LT, AZA, OA, YTX) in mussels. The aim was for each (group of) pod(s) to have mussel data for each year and for each month (but not necessarily for each month for each year). This resulted in 37 groups with at least 450 mussel samples each (see Table 3, Figure 2), except for EastCoast (334 samples) and Orkney (214 samples). Note that although the groupings are similar to those used for the previous risk assessments (Holtrop & Horgan 2004, Holtrop 2008a&b, in-house risk assessment by FSA in 2012), they are not identical. The new groupings tend to have fewer pods so that more detail in variation in toxin patterns between locations is preserved. For example, group G42 used to cover all Skye pods (40, 41, 42, 43), whereas with the new groupings pod 41 (Loch Eishort) has sufficient data to be modelled as a stand-alone pod whilst still leaving enough data for the remaining three pods to form a grouping of their own (Table 3).

In what follows, each stand-alone pod or group of pods will be referred to as a 'Group'. All biotoxin data and model summaries will be based on these groupings, with the exception of the model results for Pacific oysters, for which coarser grouping has been used (details in Table 4). These groups of pods have been given names that are roughly indicative of the area they cover. For example, group G39 is called NWC-LochEweBroom, indicative of the north-west coast of Scotland, and that these pods cover mainly Loch Ewe and Loch Broom. See Table 3 for details.

3.2 Observed phytoplankton patterns

A total of 12,361 phytoplankton samples were analysed between April 2000 and October 2015. The overall patterns are shown in Figures 3 and 4. Data were summarised according to the revised group or stand-alone pod pattern used for the biotoxin analysis. Table 7 shows the number of phytoplankton samples collected for each individual pod and for each group of pods by month, and the total number of samples obtained for each pod between 2000 and 2015. Approximately 80% of the samples were collected between the months of April and September, with fewer than 8% of samples obtained during the winter months (Nov-Feb), as phytoplankton is rarely abundant in Scottish coastal waters over winter due to low light levels. Table 8 shows the number of samples analysed for each year between 2000 and 2015. No phytoplankton data are available between April and August 2005.

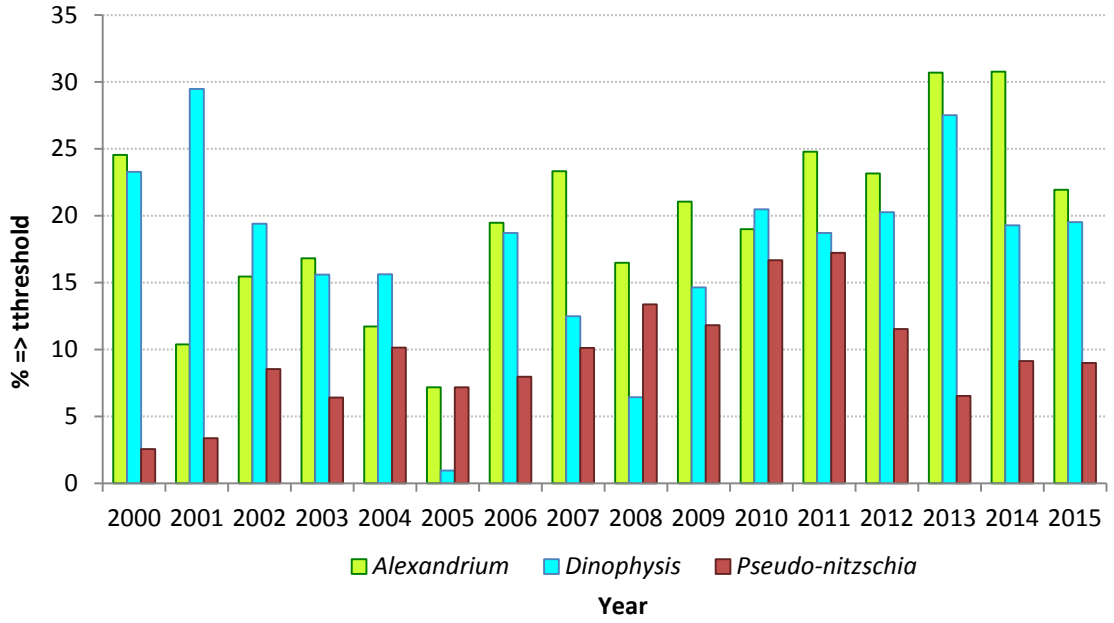

Figure 3: Percentage of samples with phytoplankton genera equal to or exceeding threshold, by year. Based on 12,361 samples collected in 2000-15.

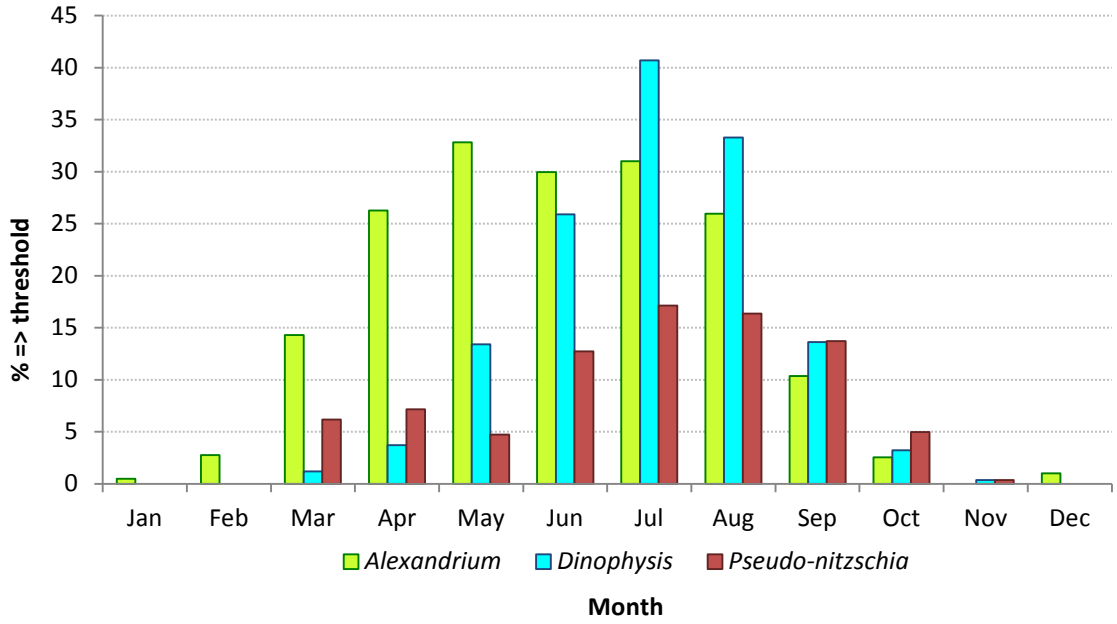

Figure 4: Percentage of samples with phytoplankton genera equal to or exceeding threshold, by month. Based on 12,361 samples collected in 2000-15.

Table 7: Number of samples analysed for toxin-producing phytoplankton by month between 2000 and 2015, for each group and pod.

Groups	Pod	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
G1	**1**			15	23	22	21	22	22	22	7			154
G10	**3**				8	5	5	5	6	5		1		35
	10	9	9	14	28	33	31	31	29	32	25	12	6	259
G123	**13**	8	10	14	29	29	32	33	33	37	28	12	8	273
	15	1	1	18	34	34	41	45	39	44	9	3		269
	19			1										1
G18	**14**	12	10	33	54	56	54	60	54	55	31	18	12	449
	18				1	4	5	4	4	2				20
	52	3	3	10	15	12	13	14	12	14	4	3	3	106
	53	3	3	4	9	12	13	11	12	11	8	5	3	94
	74			5	9	8	9	9	8	10	2			60
G21	**21**			2	13	19	23	21	20	25	12	1		136
	124			13	17	18	17	18	18	18	5			124
G22	**22**	1	1	17	30	36	37	40	36	38	10	1	1	248
	76			5	22	27	29	30	28	30	6			177
	77	1	1	5	9	8	9	9	9	9	2	1	1	64
	136			1	5	4	4	5	4	5	1			29
G23	**23**	6	6	26	43	46	48	49	50	43	33	14	9	373
	24	8	7	19	29	35	40	38	41	41	14	9	9	290
	125	2	4	3	10	18	16	26	19	24	5	4	1	132
G26	**26**	4	4	23	34	36	40	37	33	38	12	6	4	271
	27	3	4	5	5	5	5	5	5	6	3	3	5	54
	89			6	8	8	10	8	8	10	2			60
G28	**28**			3	7	10	14	10	15	11	3			73
	30					2								2
	85	2		2	2	2	1	2			1	3	2	17
	88			5	8	9	8	10	8	9	3			60
	126			13	18	22	22	22	19	16	7			139
G31	**31**	2	2	11	17	18	21	19	18	20	9	2	2	141
	34			4	2									6
G35	**35**	3	3	14	18	16	18	18	15	18	6	3	3	135
	37						1			2	2		1	6
G39	**36**	20	19	43	62	66	64	70	71	65	35	21	24	560
	39	1	2	1	2	6	4	4	3	1	2	1		27
G48	**47**				4	13	13	11	9	10	2			62
	48	4	6	24	46	48	46	50	43	39	18	4	3	331

Table 7 continued.

Groups	Pod	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
G42	**42**			14	13	12	13	19	16	19	5			111
	43								1					1
	45								1					1
G49	**50**				4	6	5	4	2	3				24
	51				15	16	18	16	15	13	6			99
G54	**130**	2	2	11	12	22	20	21	19	19	9		3	140
	131	1	1	2	3				5	5	1	1	1	20
	103old	15	15	32	41	45	44	51	46	43	28	20	15	395
	105old					1	1							2
G56	**56**			14	19	20	22	20	21	21	6			143
G57	**57**	2	3	15	35	37	37	34	37	33	13	2	2	250
G58	**58**			15	33	33	37	37	39	36	9			239
G67	**60**			5	6	1	8	13	6	5	1			45
	67	5	6	24	35	36	31	41	42	46	28	10	7	311
G71	**71**	2	2	8	7	23	30	29	24	17	8	5	3	158
G8	**8**	2	3	18	41	49	43	43	38	44	19	10	3	313
G80	**80**	5	5	15	43	47	48	50	48	48	16	6	6	337
	107				2									2
	112	2	5	3	4	11	12	11	10	8	8	4	1	79
G81	**69**	1	2	3	16	8	7	10	8	8	4	1		68
	81			3	11	19	13	12	14	16	4			92
	128			3	5	4	5	8	12	13	3			53
	129				4	4	1							9
G9	**9**	14	15	37	48	50	47	52	46	47	31	14	11	412
P16	**16**	2	1	22	39	40	42	45	42	46	17	3		299
P38	**38**	4	4	25	35	48	44	42	37	40	24	9	3	315
P41	**41**	15	14	40	65	69	71	71	65	61	22	15	9	517
P5	**5**	2	1	11	25	33	34	35	33	34	14	5	1	228
P6	**6**	4	4	22	39	37	40	40	38	41	18	6	4	293
P61	**61**	1		13	31	33	36	38	36	32	11			231
P64	**64**	9	11	33	40	41	46	48	46	47	28	16	10	375
P65	**65**	2	2	17	42	38	39	41	42	43	17	3	1	287
P68	**68**	17	15	37	64	68	76	77	70	67	40	17	14	562
P7	**7**	9	10	29	48	44	51	49	46	52	30	10	8	386
P70	**70**	2	2	9	22	26	29	29	34	32	12	3	2	202
P72	**72**			1	13	19	19	22	26	19	6			125
Grand Total		**211**	**218**	**840**	**1,481**	**1,627**	**1,683**	**1,744**	**1,656**	**1,668**	**745**	**287**	**201**	**12,361**

Table 8: Number of samples analysed for toxin-producing phytoplankton by year between 2000 and 2015, for each group and pod.

Groups	Pod	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
G1	**1**												28	30	32	32	32	**154**
G10	**3**								26	9								**35**
	10	2	16	11	19	3	18	80	30	26	28	26						**259**
G123	**13**	18	12	16	19	8	15	24	31	37	36	28	29					**273**
	15							18	27	26	25	29	23	27	32	31	31	**269**
	19								1									**1**
G18	**14**	24	28		16	25	17	39	35	35	36	33	33	32	32	32	32	**449**
	18																20	**20**
	52													30	34	36	6	**106**
	53	28	33	4		26	3											**94**
	74															28	32	**60**
G21	**21**	10			1				18	29	25	25	28					**136**
	124													28	32	32	32	**124**
G22	**22**								18	26	25	24	28	32	32	31	32	**248**
	76								18	26	25	24	24			28	32	**177**
	77															30	34	**64**
	136															28	1	**29**
G23	**23**	27	34	30	34	33	4	5		15	11	31	25	28	32	32	32	**373**
	24						3	9	24	32	28	28	31	34	36	31	34	**290**
	125						3	61	30	14	19					5		**132**
G26	**26**	9	8	10	12	3		22	13	13	23	10	25	27	32	32	32	**271**
	27	8	10	11	11	12	2											**54**
	89															28	32	**60**
G28	**28**									7	21	21	24					**73**
	30	2																**2**
	85						3	13	1									**17**
	88															28	32	**60**
	126								11	4				28	32	32	32	**139**
G31	**31**				4	16	3							28	26	32	32	**141**
	34														6			**6**
G35	**35**													30	36	35	34	**135**
	37	5	1															**6**
G39	**36**	23	39	69	56	52	20	34	27	32	31	29	24	28	32	32	32	**560**
	39	15	10	1	1													**27**
G48	**47**	21	15						1								25	**62**
	48	6		21	14	9		15	26	25	34	30	27	28	32	32	32	**331**

Table 8 continued.

Groups	Pod	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
G42	**42**													15	32	32	32	**111**
	43	1																**1**
	45	1																**1**
G49	**50**								18	6								**24**
	51										20	24	27	28				**99**
G54	**130**						3	18	2					24	31	31	31	**140**
	131						1						12	7				**20**
	103old	23	31	49	50	45	20	37	30	28	33	27	22					**395**
	105old	2																**2**
G56	**56**												25	26	28	32	32	**143**
G57	**57**				16	25	2				28	28	27	28	32	32	32	**250**
G58	**58**								18	24	26	21	28	26	32	32	32	**239**
G67	**60**												11	9		18	7	**45**
	67	21					5	35	27	34	36	19	23	15	32	32	32	**311**
G71	**71**						4	38	25	24	13	16	15		18	5		**158**
G8	**8**	30	21	14	1	5	6	36	31	29	29	29	32	12		26	12	**313**
G80	**80**	29	22					13	29	26	29	27	27	29	36	36	34	**337**
	107	2																**2**
	112	23	23	5	3	6	3	13	3									**79**
G81	**69**						1	24	28	5			2		2	6		**68**
	81									20	23	21	11		4	5	8	**92**
	128												14	8	6		25	**53**
	129															9		**9**
G9	**9**						16	82	48	35	36	36	31	32	32	32	32	**412**
P16	**16**						4	26	30	26	30	29	30	28	32	32	32	**299**
P38	**38**	22	9	13	1	3			31	26	32	29	28	27	32	30	32	**315**
P41	**41**	26	27	25	22	18	1	58	55	43	32	34	36	34	36	36	34	**517**
P5	**5**	6	7	4	2	31	8	25	28	29	30	29	29					**228**
P6	**6**						5		27	28	31	30	32	34	36	36	34	**293**
P61	**61**							1	18	25	26	17	22	27	31	32	32	**231**
P64	**64**				4	20	15	39	33	34	36	33	33	32	32	32	32	**375**
P65	**65**				2		5	31	22	27	27	28	24	28	29	32	32	**287**
P68	**68**				17	33	13	99	63	60	59	47	32	33	36	36	34	**562**
P7	**7**	7	10	21	22	11	3	25	33	35	36	37	34	16	32	32	32	**386**
P70	**70**						3	20	27	23	25	28	27			17	32	**202**
P72	**72**								14	21	27	20	21				22	**125**
Grand Total		**391**	**356**	**304**	**327**	**384**	**209**	**940**	**977**	**964**	**1,031**	**947**	**1,004**	**928**	**1,039**	**1,270**	**1,290**	**12,361**

Table 9: Percentage of samples with *Alexandrium* spp. equal to or exceeding 40 cells per litre by month, for each group and pod.

Groups	Pod	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
G1	**1**			20.0	30.4	54.5	47.6	59.1	22.7	9.1	0.0		
G10	**3**				0.0	0.0	0.0	0.0	0.0	0.0		0.0	
	10	0.0	0.0	7.1	7.1	3.0	0.0	6.5	3.4	0.0	0.0	0.0	0.0
G123	**13**	0.0	10.0	0.0	13.8	10.3	9.4	12.1	24.2	24.3	3.6	0.0	0.0
	15	0.0	0.0	0.0	17.6	32.4	22.0	20.0	17.9	6.8	0.0	0.0	
	19			0.0									
G18	**14**	0.0	10.0	21.2	25.9	12.5	13.0	3.3	1.9	1.8	0.0	0.0	8.3
	18				100.0	0.0	0.0	50.0	25.0	0.0			
	52	0.0	0.0	50.0	53.3	58.3	46.2	21.4	0.0	7.1	0.0	0.0	0.0
	53	0.0	0.0	25.0	11.1	8.3	7.7	9.1	0.0	0.0	0.0	0.0	0.0
	74			60.0	55.6	50.0	33.3	11.1	0.0	10.0	0.0		
G21	**21**			0.0	0.0	36.8	21.7	38.1	30.0	20.0	0.0	0.0	
	124			7.7	17.6	44.4	47.1	72.2	50.0	38.9	20.0		
G22	**22**	0.0	0.0	11.8	3.3	13.9	21.6	17.5	30.6	2.6	0.0	0.0	0.0
	76			0.0	9.1	7.4	17.2	23.3	28.6	10.0	0.0		
	77	0.0	0.0	0.0	0.0	12.5	33.3	33.3	55.6	22.2	0.0	0.0	0.0
	136			0.0	0.0	50.0	75.0	40.0	75.0	0.0	0.0		
G23	**23**	0.0	0.0	11.5	14.0	15.2	43.8	34.7	38.0	27.9	3.0	0.0	0.0
	24	0.0	0.0	0.0	10.3	25.7	47.5	63.2	46.3	39.0	0.0	0.0	0.0
	125	0.0	0.0	0.0	10.0	11.1	12.5	23.1	47.4	20.8	0.0	0.0	0.0
G26	**26**	0.0	0.0	13.0	20.6	11.1	20.0	10.8	18.2	31.6	0.0	0.0	0.0
	27	0.0	0.0	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	89			0.0	0.0	0.0	10.0	0.0	0.0	0.0	0.0		
G28	**28**			33.3	28.6	60.0	14.3	20.0	26.7	0.0	0.0		
	30					50.0							
	85	0.0		50.0	50.0	50.0	0.0	100.0			0.0	0.0	0.0
	88			20.0	50.0	77.8	62.5	60.0	25.0	11.1	0.0		
	126			15.4	27.8	36.4	40.9	22.7	31.6	12.5	0.0		
G31	**31**	0.0	0.0	18.2	23.5	0.0	14.3	47.4	44.4	10.0	0.0	0.0	0.0
	34			0.0	0.0								
G35	**35**	0.0		42.9	16.7	25.0	72.2	38.9	6.7	0.0	0.0	0.0	33.3
	37						100.0			0.0	0.0		0.0
G39	**36**	0.0	0.0	14.0	22.6	27.3	37.5	24.3	18.3	0.0	0.0	0.0	0.0
	39	0.0	0.0	0.0	0.0	16.7	25.0	0.0	33.3	0.0	0.0	0.0	
G48	**47**				50.0	38.5	53.8	0.0	22.2	10.0	0.0		
	48	0.0	0.0	0.0	13.0	27.1	34.8	32.0	27.9	10.3	0.0	0.0	0.0

Table 9 continued

Groups	**Pod**	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
G42	**42**			0.0	0.0	25.0	46.2	42.1	18.8	0.0	0.0		
	43								0.0				
	45								0.0				
G49	**50**				0.0	0.0	0.0	0.0	0.0	0.0			
	51				6.7	6.3	0.0	0.0	0.0	0.0	0.0		
G54	**130**	0.0	0.0	0.0	8.3	27.3	20.0	42.9	26.3	0.0	0.0		0.0
	131	0.0	0.0	50.0	33.3				0.0	20.0	0.0	0.0	0.0
	103old	0.0	6.7	31.3	82.9	68.9	45.5	45.1	43.5	16.3	7.1	0.0	0.0
	105old					0.0	0.0						
G56	**56**			7.1	42.1	65.0	50.0	40.0	19.0	0.0	0.0		
G57	**57**	0.0	0.0	20.0	57.1	75.7	59.5	44.1	27.0	9.1	0.0	0.0	0.0
G58	**58**			0.0	27.3	36.4	51.4	51.4	48.7	13.9	0.0		
G67	**60**			0.0	33.3	100.0	100.0	76.9	33.3	0.0	0.0		
	67	0.0	16.7	12.5	31.4	52.8	64.5	78.0	64.3	19.6	21.4	0.0	0.0
G71	**71**	0.0	0.0	0.0	0.0	0.0	13.3	41.4	45.8	5.9	12.5	0.0	0.0
G8	**8**	0.0	0.0	22.2	41.5	30.6	18.6	18.6	2.6	0.0	0.0	0.0	0.0
G80	**80**	0.0	0.0	0.0	32.6	48.9	25.0	10.0	10.4	2.1	0.0	0.0	0.0
	107				100.0								
	112	0.0	20.0	0.0	50.0	63.6	25.0	9.1	20.0	12.5	0.0	0.0	0.0
G81	**69**	0.0	0.0	0.0	37.5	37.5	42.9	40.0	50.0	25.0	0.0	0.0	
	81			0.0	18.2	10.5	15.4	0.0	21.4	6.3	25.0		
	128			0.0	0.0	0.0	0.0	25.0	25.0	0.0	33.3		
	129				25.0	50.0	0.0						
G9	**9**	7.1	0.0	24.3	41.7	32.0	17.0	30.8	41.3	17.0	3.2	0.0	0.0
P16	**16**	0.0	0.0	27.3	23.1	12.5	11.9	11.1	0.0	2.2	0.0	0.0	
P38	**38**	0.0	0.0	4.0	37.1	62.5	18.2	21.4	13.5	5.0	0.0	0.0	0.0
P41	**41**	0.0	0.0	40.0	44.6	34.8	23.9	19.7	12.3	1.6	0.0	0.0	0.0
P5	**5**	0.0	0.0	0.0	4.0	3.0	8.8	2.9	0.0	5.9	0.0	0.0	0.0
P6	**6**	0.0	0.0	27.3	17.9	27.0	20.0	42.5	31.6	4.9	0.0	0.0	0.0
P61	**61**	0.0		7.7	51.6	66.7	75.0	71.1	41.7	9.4	0.0		
P64	**64**	0.0	0.0	9.1	20.0	26.8	19.6	27.1	19.6	14.9	0.0	0.0	0.0
P65	**65**	0.0	0.0	0.0	14.3	26.3	2.6	22.0	23.8	18.6	11.8	0.0	0.0
P68	**68**	0.0	6.7	8.1	26.6	48.5	44.7	67.5	70.0	19.4	5.0	0.0	0.0
P7	**7**	0.0	0.0	17.2	37.5	75.0	47.1	30.6	23.9	1.9	0.0	0.0	0.0
P70	**70**	0.0	0.0	0.0	9.1	42.3	31.0	31.0	8.8	6.3	0.0	0.0	0.0
P72	**72**			0.0	0.0	21.1	31.6	27.3	11.5	10.5	0.0		

Table 10: Percentage of samples with *Alexandrium* spp. equal to or exceeding 40 cells per litre by year between 2000 and 2015, for each group and pod.

Groups	Pod	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
G1	**1**												25.0	23.3	56.3	31.3	31.3
G10	**3**								0.0	0.0							
	10	0.0	0.0	0.0	5.3	0.0	0.0	6.3	0.0	0.0	0.0	3.8					
G123	**13**	5.6	0.0	6.3	5.3	0.0	6.7	8.3	29.0	29.7	2.8	10.7	10.3				
	15							5.6	11.1	34.6	0.0	6.9	17.4	33.3	28.1	12.9	12.9
	19								0.0								
G18	**14**	4.2	10.7		6.3	0.0	5.9	2.6	5.7	0.0	25.0	12.1	9.1	12.5	3.1	9.4	25.0
	18																20.0
	52													30.0	14.7	38.9	33.3
	53	14.3	0.0	0.0		0.0	33.3										
	74															32.1	25.0
G21	**21**	10.0			0.0				33.3	13.8	20.0	20.0	35.7				
	124													53.6	34.4	46.9	28.1
G22	**22**								22.2	11.5	4.0	0.0	3.6	15.6	34.4	19.4	12.5
	76								5.6	15.4	16.0	12.5	12.5			25.0	15.6
	77															33.3	11.8
	136															35.7	0.0
G23	**23**	44.4	26.5	13.3	17.6	6.1	50.0	20.0		6.7	9.1	9.7	20.0	14.3	28.1	43.8	40.6
	24						0.0	44.4	37.5	25.0	46.4	21.4	16.1	5.9	16.7	54.8	58.8
	125						0.0	19.7	23.3	28.6	10.5					0.0	
G26	**26**	11.1	0.0	0.0	16.7	0.0		40.9	7.7	15.4	8.7	0.0	4.0	18.5	12.5	25.0	28.1
	27	12.5	0.0	0.0	0.0	0.0	0.0										
	89															3.6	0.0
G28	**28**									28.6	9.5	33.3	25.0				
	30	50.0															
	85						0.0	38.5	0.0								
	88															53.6	34.4
	126								9.1	0.0				28.6	50.0	15.6	21.9
G31	**31**				0.0	12.5	33.3							3.6	15.4	34.4	28.1
	34														0.0		
G35	**35**													10.0	27.8	37.1	26.5
	37	20.0	0.0														
G39	**36**	26.1	7.7	18.8	14.3	17.3	15.0	14.7	3.7	3.1	3.2	10.3	8.3	10.7	46.9	46.9	12.5
	39	20.0	0.0	0.0	0.0												
G48	**47**	19.0	20.0						0.0								40.0
	48	33.3		19.0	7.1	11.1		20.0	7.7	16.0	8.8	0.0	22.2	17.9	40.6	31.3	40.6

Table 10 continued

Groups	Pod	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
G42	**42**													20.0	31.3	18.8	3.1
	43	0.0															
	45	0.0															
G49	**50**								0.0	0.0							
	51										0.0	4.2	3.7	0.0			
G54	**130**						0.0	22.2	50.0					4.2	16.1	3.2	41.9
	131						0.0						8.3	28.6			
	103old	60.9	19.4	24.5	28.0	20.0	5.0	54.1	63.3	32.1	45.5	40.7	81.8				
	105old	0.0															
G56	**56**												40.0	34.6	35.7	31.3	18.8
G57	**57**				31.3	36.0	0.0				42.9	32.1	37.0	39.3	46.9	56.3	37.5
G58	**58**								61.1	29.2	23.1	33.3	35.7	50.0	34.4	40.6	15.6
G67	**60**												54.5	100.0		44.4	0.0
	67	47.6					0.0	45.7	70.4	64.7	50.0	10.5	39.1	40.0	34.4	43.8	3.1
G71	**71**						25.0	21.1	28.0	4.2	30.8	6.3	6.7		33.3	0.0	
G8	**8**	13.3	0.0	28.6	100.0	0.0	0.0	0.0	9.7	3.4	20.7	31.0	25.0	16.7		38.5	41.7
G80	**80**	31.0	9.1					0.0	20.7	30.8	13.8	18.5	29.6	27.6	16.7	5.6	5.9
	107	100.0															
	112	26.1	30.4	20.0	0.0	0.0	33.3	15.4	0.0								
G81	**69**						0.0	25.0	35.7	40.0			0.0		0.0	66.7	
	81									0.0	4.3	19.0	54.5		0.0	0.0	0.0
	128												35.7	12.5	0.0		0.0
	129															33.3	
G9	**9**						0.0	4.9	6.3	0.0	30.6	36.1	64.5	3.1	56.3	40.6	46.9
P16	**16**						0.0	0.0	3.3	0.0	6.7	3.4	3.3	3.6	12.5	28.1	37.5
P38	**38**	22.7	11.1	7.7	0.0	33.3			19.4	11.5	15.6	27.6	10.7	37.0	37.5	20.0	21.9
P41	**41**	19.2	7.4	20.0	18.2	11.1	0.0	22.4	14.5	18.6	18.8	11.8	33.3	20.6	38.9	22.2	32.4
P5	**5**	33.3	14.3	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	13.8				
P6	**6**						0.0		25.9	10.7	12.9	10.0	9.4	23.5	38.9	27.8	29.4
P61	**61**							0.0	66.7	36.0	57.7	58.8	63.6	40.7	48.4	59.4	18.8
P64	**64**				25.0	0.0	6.7	23.1	39.4	2.9	25.0	24.2	12.1	9.4	9.4	15.6	9.4
P65	**65**				0.0		0.0	25.8	27.3	7.4	11.1	14.3	33.3	25.0	10.3	15.6	0.0
P68	**68**				47.1	27.3	15.4	35.4	47.6	33.3	44.1	29.8	59.4	30.3	30.6	41.7	14.7
P7	**7**	14.3	0.0	9.5	9.1	9.1	0.0	20.0	24.2	8.6	33.3	35.1	32.4	75.0	59.4	37.5	18.8
P70	**70**						0.0	20.0	22.2	21.7	36.0	28.6	3.7			17.6	0.0
P72	**72**								42.9	9.5	18.5	40.0	0.0				0.0

Alexandrium spp.

Tables 9 and 10 show the percentage of samples with *Alexandrium* spp. equal to or exceeding the threshold level of 40 cells/L by month and year, respectively. Although *Alexandrium* may be present in the water column all year round, there is a noticeable increase in samples containing *Alexandrium* above threshold from March through to September. For the period 2000-2015, almost 33% of samples analysed during May contained *Alexandrium* at ≥ 40 cells/L. *Alexandrium* was recorded ≥ 40 cells/L in all pods excluding pods 3, 19, 34, 43, 45, 50 and 105old. In some cases this may be related to the relatively few samples obtained from these locations and the time of year at which they were collected. However, samples were collected from pods 3 and 50 between April and September (although only in 2007 and 2008) and *Alexandrium* ≥ 40 cells/L was not recorded. *Alexandrium* was also rarely observed at levels exceeding threshold in pods 5, 27, 37, 89 and 51. Since 2006 a greater number of phytoplankton samples have been analysed per year (an average of approximately 1000 samples) and it would appear that there is considerable variability by year in terms of *Alexandrium* blooms. In 2008 16.5% of samples had *Alexandrium* ≥ 40 cells/L, whereas in 2013 and 2014 this figure reached almost 31%. In an average year *Alexandrium* at ≥ 40 cells/L might be expected in around 22% of samples.

Dinophysis spp.

Tables 11 and 12 show the percentage of samples with *Dinophysis* spp. equal to or exceeding the threshold level of 100 cells/L by month and year, respectively. *Dinophysis* was only recorded at ≥ 100 cells/L in two pods (14 and 8) during 2005, but this is due to the lack of sampling at all sites over the summer months when this genus is most abundant. *Dinophysis* blooms are most frequently observed between June and August, with approximately 40% of samples above threshold during July. The percentage of samples containing *Dinophysis* ≥ 100 cells/L varies by year. In 2008 less than 7% of samples exceeded threshold, whereas in 2013 this figure was over 27%, mostly due to extensive *Dinophysis* blooms around the Shetland Islands. In a typical year *Dinophysis* ≥ 100 cells/L might be expected in about 19% of samples.

Pseudo-nitzschia spp.

Tables 13 and 14 show the percentage of samples with *Pseudo-nitzschia* spp. equal to or exceeding the threshold level of 50,000 cells/L by month and year, respectively. *Pseudo-nitzschia* is usually present in the water column all year round, but cell abundance often increases in March/April when the spring bloom occurs. Blooms occur most frequently from July to September and between 2000 and 2015, over 17% of all samples analysed during July contained *Pseudo-nitzschia* at ≥ 50,000 cells/L. *Pseudo-nitzschia* ≥ 50,000 cells/L was absent or seldom recorded in about one third of all pods e.g. pod 13, although blooms were observed almost every year in other pods e.g. pod 41. In an average year *Pseudo-nitzschia* blooms could be expected in around 10% of all samples.

Table 11: Percentage of samples with *Dinophysis* spp. equal to or exceeding 100 cells per litre by month, for each group and pod.

Groups	Pod	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
G1	**1**			0.0	0.0	13.6	42.9	50.0	68.2	45.5	0.0		
G10	**3**				12.5	40.0	0.0	0.0	0.0	0.0		0.0	
	10	0.0	0.0	0.0	0.0	9.1	9.7	3.2	3.4	3.1	0.0	0.0	0.0
G123	**13**	0.0	0.0	0.0	0.0	0.0	0.0	12.1	12.1	2.7	3.6	0.0	0.0
	15	0.0	0.0	0.0	0.0	2.9	0.0	2.2	0.0	0.0	0.0	0.0	
	19			0.0									
G18	**14**	0.0	0.0	9.1	11.1	25.0	31.5	25.0	27.8	16.4	16.1	5.6	0.0
	18				0.0	0.0	20.0	75.0	0.0	100.0			
	52	0.0	0.0	20.0	20.0	50.0	69.2	78.6	91.7	50.0	0.0	0.0	0.0
	53	0.0	0.0	0.0	0.0	0.0	15.4	54.5	75.0	81.8	50.0	0.0	0.0
	74			0.0	11.1	37.5	33.3	0.0	25.0	0.0	0.0		
G21	**21**			0.0	0.0	0.0	21.7	4.8	5.0	16.0	8.3	0.0	
	124			0.0	0.0	0.0	29.4	50.0	27.8	5.6	0.0		
G22	**22**	0.0	0.0	0.0	0.0	2.8	21.6	35.0	25.0	18.4	0.0	0.0	0.0
	76			0.0	0.0	0.0	6.9	6.7	17.9	10.0	0.0		
	77	0.0	0.0	0.0	0.0	0.0	0.0	11.1	0.0	0.0	0.0	0.0	0.0
	136			0.0	0.0	0.0	25.0	40.0	25.0	60.0	100.0		
G23	**23**	0.0	0.0	0.0	0.0	10.9	35.4	40.8	38.0	30.2	0.0	0.0	0.0
	24	0.0	0.0	0.0	0.0	22.9	27.5	55.3	48.8	17.1	0.0	0.0	0.0
	125	0.0	0.0	0.0	0.0	0.0	31.3	61.5	57.9	12.5	0.0	0.0	0.0
G26	**26**	0.0	0.0	0.0	0.0	0.0	7.5	13.5	3.0	2.6	0.0	0.0	0.0
	27	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	89			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
G28	**28**			0.0	0.0	40.0	7.1	50.0	73.3	9.1	0.0		
	30					0.0							
	85	0.0		0.0	0.0	0.0	100.0	100.0			0.0	0.0	0.0
	88			0.0	0.0	22.2	75.0	70.0	25.0	22.2	33.3		
	126			0.0	0.0	9.1	18.2	36.4	31.6	6.3	0.0		
G31	**31**	0.0	0.0	0.0	0.0	0.0	4.8	36.8	27.8	0.0	0.0	0.0	0.0
	34			0.0	0.0								
G35	**35**	0.0	0.0	0.0	0.0	18.8	61.1	55.6	66.7	55.6	0.0	0.0	0.0
	37						100.0			50.0	0.0		0.0
G39	**36**	0.0	0.0	2.3	1.6	25.8	39.1	52.9	56.3	23.1	2.9	0.0	0.0
	39	0.0	0.0	0.0	0.0	16.7	50.0	50.0	100.0	0.0	0.0	0.0	
G48	**47**				0.0	7.7	61.5	81.8	88.9	20.0	0.0		
	48	0.0	0.0	0.0	4.3	14.6	41.3	58.0	30.2	7.7	0.0	0.0	0.0

Table 11 continued.

Groups	Pod	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
G42	**42**			0.0	0.0	0.0	53.8	63.2	56.3	0.0	20.0		
	43								0.0				
	45								0.0				
G49	**50**				0.0	0.0	0.0	25.0	50.0	0.0			
	51				0.0	0.0	5.6	0.0	6.7	0.0	0.0		
G54	**130**	0.0	0.0	0.0	0.0	0.0	10.0	38.1	10.5	0.0	0.0		0.0
	131	0.0	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0
	103old	0.0	0.0	0.0	4.9	33.3	34.1	56.9	37.0	32.6	0.0	0.0	0.0
	105old					0.0	0.0						
G56	**56**			0.0	0.0	0.0	22.7	75.0	28.6	0.0	0.0		
G57	**57**	0.0	0.0	0.0	0.0	0.0	16.2	58.8	43.2	3.0	0.0	0.0	0.0
G58	**58**			0.0	0.0	0.0	13.5	48.6	30.8	0.0	0.0		
G67	**60**			0.0	0.0	0.0	0.0	23.1	16.7	0.0	0.0		
	67	0.0	0.0	0.0	0.0	2.8	29.0	53.7	54.8	8.7	0.0	0.0	0.0
G71	**71**	0.0	0.0	0.0	0.0	4.3	40.0	48.3	41.7	11.8	0.0	0.0	0.0
G8	**8**	0.0	0.0	0.0	2.4	34.7	51.2	51.2	34.2	27.3	10.5	0.0	0.0
G80	**80**	0.0	0.0	0.0	2.3	4.3	25.0	26.0	14.6	6.3	0.0	0.0	0.0
	107				0.0								
	112	0.0	0.0	0.0	0.0	0.0	58.3	36.4	90.0	37.5	12.5	0.0	0.0
G81	**69**	0.0	0.0	0.0	0.0	0.0	14.3	40.0	0.0	0.0	0.0	0.0	
	81			0.0	0.0	0.0	15.4	8.3	0.0	0.0	0.0		
	128			0.0	0.0	0.0	0.0	50.0	33.3	7.7	0.0		
	129				0.0	0.0	0.0						
G9	**9**	0.0	0.0	2.7	14.6	14.0	17.0	19.2	37.0	17.0	0.0	0.0	0.0
P16	**16**	0.0	0.0	9.1	25.6	50.0	38.1	31.1	14.3	32.6	17.6	0.0	
P38	**38**	0.0	0.0	0.0	2.9	16.7	31.8	21.4	8.1	5.0	0.0	0.0	0.0
P41	**41**	0.0	0.0	0.0	10.8	39.1	46.5	56.3	52.3	16.4	0.0	0.0	0.0
P5	**5**	0.0	0.0	0.0	0.0	0.0	5.9	2.9	6.1	2.9	0.0	0.0	0.0
P6	**6**	0.0	0.0	0.0	17.9	40.5	35.0	62.5	71.1	43.9	16.7	0.0	0.0
P61	**61**	0.0		0.0	0.0	0.0	22.2	71.1	47.2	6.3	0.0		
P64	**64**	0.0	0.0	0.0	0.0	0.0	13.0	43.8	21.7	8.5	0.0	0.0	0.0
P65	**65**	0.0	0.0	0.0	0.0	2.6	12.8	34.1	19.0	0.0	0.0	0.0	0.0
P68	**68**	0.0	0.0	0.0	0.0	1.5	17.1	68.8	42.9	1.5	0.0	0.0	0.0
P7	**7**	0.0	0.0	3.4	10.4	36.4	47.1	55.1	45.7	15.4	0.0	0.0	0.0
P70	**70**	0.0	0.0	0.0	0.0	7.7	13.8	37.9	20.6	6.3	0.0	0.0	0.0
P72	**72**			0.0	0.0	10.5	15.8	40.9	42.3	0.0	0.0		

Table 12: Percentage of samples with *Dinophysis* spp. equal to or exceeding 100 cells per litre by year between 2000 and 2015, for each group and pod.

Groups	Pod	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
G1	**1**												17.9	30.0	37.5	34.4	34.4
G10	**3**								11.5	0.0							
	10	0.0	12.5	9.1	0.0	0.0	0.0	2.5	0.0	0.0	10.7	3.8					
G123	**13**	16.7	8.3	0.0	5.3	0.0	0.0	0.0	3.2	5.4	0.0	3.6	3.4				
	15							0.0	3.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.2
	19								0.0								
G18	**14**	8.3	39.3		37.5	12.0	5.9	7.7	5.7	2.9	38.9	42.4	24.2	21.9	6.3	9.4	25.0
	18																30.0
	52													60.0	23.5	63.9	0.0
	53	28.6	36.4	0.0		38.5	0.0										
	74															10.7	18.8
G21	**21**	30.0			0.0				0.0	0.0	0.0	20.0	14.3				
	124													17.9	18.8	12.5	15.6
G22	**22**								16.7	7.7	0.0	16.7	17.9	3.1	31.3	25.8	18.8
	76								5.6	0.0	0.0	12.5	12.5			10.7	6.3
	77															3.3	0.0
	136															28.6	0.0
G23	**23**	25.9	17.6	10.0	5.9	9.1	0.0	0.0		0.0	9.1	22.6	24.0	42.9	34.4	25.0	25.0
	24						0.0	22.2	12.5	21.9	3.6	17.9	35.5	41.2	38.9	12.9	17.6
	125						0.0	49.2	3.3	21.4	5.3					0.0	
G26	**26**	0.0	0.0	0.0	8.3	0.0		0.0	0.0	0.0	21.7	0.0	0.0	0.0	3.1	0.0	9.4
	27	0.0	0.0	0.0	0.0	0.0	0.0										
	89															0.0	0.0
G28	**28**									28.6	33.3	38.1	20.8				
	30	0.0															
	85						0.0	23.1	0.0								
	88															46.4	21.9
	126								0.0	0.0				10.7	37.5	6.3	12.5
G31	**31**				0.0	6.3	0.0							10.7	7.7	9.4	12.5
	34														0.0		
G35	**35**													36.7	33.3	25.7	35.3
	37	40.0	0.0														
G39	**36**	30.4	30.8	33.3	26.8	23.1	0.0	20.6	3.7	3.1	3.2	24.1	16.7	17.9	50.0	46.9	34.4
	39	33.3	20.0	0.0	100.0												
G48	**47**	47.6	33.3						0.0								52.0
	48	50.0		14.3	21.4	11.1		20.0	11.5	16.0	8.8	13.3	11.1	21.4	53.1	34.4	28.1

Table 12 continued.

Groups	Pod	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
G42	**42**													26.7	28.1	28.1	21.9
	43	0.0															
	45	0.0															
G49	**50**								11.1	0.0							
	51										5.0	4.2	0.0	0.0			
G54	**130**						0.0	0.0	0.0					0.0	12.9	3.2	22.6
	131						0.0						0.0	0.0			
	103old	43.5	61.3	16.3	6.0	24.4	0.0	24.3	20.0	3.6	24.2	33.3	36.4				
	105old	0.0															
G56	**56**												4.0	15.4	35.7	12.5	21.9
G57	**57**				18.8	16.0	0.0				17.9	0.0	11.1	14.3	25.0	15.6	34.4
G58	**58**								22.2	8.3	3.8	9.5	10.7	15.4	34.4	15.6	9.4
G67	**60**												9.1	22.2		5.6	0.0
	67	23.8					0.0	37.1	33.3	11.8	8.3	5.3	21.7	13.3	21.9	12.5	18.8
G71	**71**						0.0	34.2	32.0	8.3	15.4	25.0	13.3		44.4	0.0	
G8	**8**	26.7	42.9	35.7	100.0	0.0	16.7	16.7	9.7	20.7	41.4	44.8	21.9	33.3		53.8	0.0
G80	**80**	0.0	13.6					23.1	24.1	7.7	17.2	25.9	14.8	6.9	2.8	5.6	5.9
	107	0.0															
	112	34.8	21.7	40.0	33.3	66.7	0.0	30.8	0.0								
G81	**69**						0.0	16.7	3.6	0.0			0.0		0.0	0.0	
	81									0.0	0.0	14.3	0.0		0.0	0.0	0.0
	128												14.3	12.5	0.0		24.0
	129															0.0	
G9	**9**						0.0	0.0	0.0	5.7	30.6	50.0	29.0	0.0	15.6	18.8	21.9
P16	**16**						0.0	0.0	23.3	0.0	56.7	17.2	30.0	42.9	56.3	18.8	37.5
P38	**38**	0.0	22.2	23.1	0.0	66.7			3.2	0.0	9.4	17.2	7.1	29.6	3.1	23.3	9.4
P41	**41**	38.5	37.0	44.0	36.4	11.1	0.0	39.7	12.7	4.7	21.9	38.2	38.9	23.5	41.7	30.6	29.4
P5	**5**	0.0	0.0	0.0	0.0	3.2	0.0	0.0	0.0	0.0	6.7	0.0	10.3				
P6	**6**						0.0		25.9	14.3	29.0	60.0	46.9	32.4	44.4	27.8	55.9
P61	**61**							0.0	22.2	16.0	26.9	29.4	22.7	29.6	32.3	9.4	25.0
P64	**64**				25.0	5.0	0.0	28.2	15.2	0.0	0.0	6.1	12.1	9.4	25.0	15.6	3.1
P65	**65**				0.0		0.0	19.4	4.5	0.0	0.0	3.6	8.3	17.9	31.0	3.1	9.4
P68	**68**				23.5	12.1	0.0	25.3	17.5	3.3	11.9	19.1	34.4	15.2	27.8	11.1	17.6
P7	**7**	0.0	60.0	0.0	4.5	9.1	0.0	16.0	15.2	8.6	36.1	29.7	41.2	43.8	40.6	46.9	28.1
P70	**70**						0.0	25.0	33.3	8.7	4.0	10.7	11.1			17.6	0.0
P72	**72**								42.9	19.0	3.7	25.0	28.6				13.6

Table 13: Percentage of samples with *Pseudo-nitzschia* spp. equal to or exceeding 50,000 cells per litre by month, for each group and pod.

Groups	Pod	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
G1	**1**			0.0	13.0	9.1	0.0	0.0	9.1	13.6	14.3		
G10	**3**				0.0	0.0	0.0	0.0	0.0	0.0		0.0	
	10	0.0	0.0	0.0	0.0	0.0	0.0	3.2	0.0	0.0	0.0	0.0	0.0
G123	**13**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	15	0.0	0.0	0.0	0.0	0.0	0.0	6.7	5.1	4.5	0.0	0.0	
	19			0.0									
G18	**14**	0.0	0.0	0.0	0.0	0.0	9.3	1.7	3.7	5.5	0.0	0.0	0.0
	18				0.0	0.0	0.0	0.0	0.0	0.0			
	52	0.0	0.0	10.0	6.7	25.0	0.0	14.3	0.0	0.0	0.0	0.0	0.0
	53	0.0	0.0	0.0	0.0	0.0	0.0	27.3	8.3	0.0	0.0	0.0	0.0
	74			0.0	0.0	12.5	0.0	0.0	0.0	20.0	0.0		
G21	**21**			0.0	23.1	5.3	13.0	9.5	0.0	4.0	0.0	0.0	
	124			0.0	11.8	5.6	5.9	22.2	0.0	22.2	0.0		
G22	**22**	0.0	0.0	0.0	3.3	13.9	32.4	15.0	8.3	0.0	0.0	0.0	0.0
	76			0.0	4.5	0.0	24.1	0.0	3.6	10.0	0.0		
	77	0.0	0.0	0.0	0.0	0.0	11.1	0.0	0.0	0.0	0.0	0.0	0.0
	136			0.0	20.0	25.0	25.0	0.0	0.0	20.0	0.0		
G23	**23**	0.0	0.0	0.0	2.3	8.7	20.8	6.1	18.0	16.3	15.2	0.0	0.0
	24	0.0	0.0	0.0	0.0	14.3	22.5	5.3	9.8	14.6	7.1	0.0	0.0
	125	0.0	0.0	0.0	0.0	22.2	43.8	19.2	31.6	20.8	0.0	0.0	0.0
G26	**26**	0.0	0.0	0.0	0.0	0.0	0.0	2.7	3.0	0.0	0.0	0.0	0.0
	27	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	89			0.0	25.0	0.0	0.0	0.0	25.0	0.0	0.0		
G28	**28**			0.0	0.0	0.0	7.1	10.0	20.0	9.1	0.0		
	30					0.0							
	85	0.0		0.0	0.0	0.0	0.0	0.0			0.0	0.0	0.0
	88			0.0	12.5	22.2	25.0	0.0	0.0	33.3	0.0		
	126			7.7	5.6	4.5	13.6	18.2	5.3	31.3	14.3		
G31	**31**	0.0	0.0	0.0	5.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	34			0.0	0.0								
G35	**35**	0.0	0.0	0.0	11.1	25.0	5.6	16.7	0.0	5.6	0.0	0.0	0.0
	37						0.0			0.0	0.0		0.0
G39	**36**	0.0	0.0	18.6	14.5	7.6	9.4	1.4	12.7	26.2	0.0	0.0	0.0
	39	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
G48	**47**				0.0	0.0	23.1	9.1	0.0	10.0	50.0		
	48	0.0	0.0	0.0	6.5	6.3	21.7	6.0	2.3	7.7	5.6	0.0	0.0

Table 13 continued.

Groups	Pod	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
G42	**42**			0.0	30.8	33.3	7.7	26.3	12.5	0.0	20.0		
	43								0.0				
	45								0.0				
G49	**50**				25.0	0.0	0.0	0.0	0.0	0.0			
	51				0.0	0.0	0.0	6.3	6.7	0.0	0.0		
G54	**130**	0.0	0.0	0.0	0.0	0.0	10.0	4.8	5.3	10.5	0.0		0.0
	131	0.0	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0
	103old	0.0	0.0	21.9	24.4	20.0	22.7	21.6	10.9	23.3	3.6	0.0	0.0
	105old					0.0	0.0						
G56	**56**			7.1	15.8	0.0	9.1	25.0	38.1	4.8	0.0		
G57	**57**	0.0	0.0	33.3	8.6	0.0	24.3	44.1	32.4	30.3	0.0	0.0	0.0
G58	**58**			0.0	0.0	9.1	16.2	37.8	23.1	11.1	0.0		
G67	**60**			0.0	0.0	0.0	37.5	30.8	16.7	0.0	0.0		
	67	0.0	0.0	8.3	0.0	0.0	25.8	58.5	57.1	47.8	3.6	0.0	0.0
G71	**71**	0.0	0.0	0.0	28.6	13.0	46.7	41.4	45.8	17.6	0.0	0.0	0.0
G8	**8**	0.0	0.0	0.0	0.0	0.0	2.3	0.0	2.6	6.8	5.3	0.0	0.0
G80	**80**	0.0	0.0	0.0	4.7	0.0	0.0	2.0	4.2	2.1	0.0	0.0	0.0
	107				0.0								
	112	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
G81	**69**	0.0	0.0	0.0	12.5	0.0	42.9	10.0	0.0	0.0	0.0	0.0	
	81			0.0	0.0	15.8	23.1	8.3	7.1	0.0	0.0		
	128			0.0	0.0	0.0	0.0	37.5	33.3	7.7	0.0		
	129				0.0	0.0	0.0						
G9	**9**	0.0	0.0	2.7	10.4	4.0	2.1	28.8	23.9	10.6	3.2	0.0	0.0
P16	**16**	0.0	0.0	0.0	0.0	0.0	2.4	4.4	2.4	6.5	0.0	0.0	
P38	**38**	0.0	0.0	44.0	8.6	2.1	4.5	7.1	8.1	7.5	4.2	11.1	0.0
P41	**41**	0.0	0.0	2.5	6.2	4.3	15.5	12.7	7.7	14.8	13.6	0.0	0.0
P5	**5**	0.0	0.0	9.1	32.0	3.0	2.9	31.4	45.5	32.4	21.4	0.0	0.0
P6	**6**	0.0	0.0	4.5	12.8	0.0	12.5	32.5	34.2	46.3	11.1	0.0	0.0
P61	**61**	0.0		15.4	9.7	0.0	19.4	44.7	47.2	18.8	9.1		
P64	**64**	0.0	0.0	24.2	12.5	0.0	23.9	43.8	23.9	17.0	14.3	0.0	0.0
P65	**65**	0.0	0.0	0.0	2.4	7.9	23.1	24.4	33.3	2.3	0.0	0.0	0.0
P68	**68**	0.0	0.0	0.0	9.4	0.0	15.8	39.0	31.4	22.4	7.5	0.0	0.0
P7	**7**	0.0	0.0	3.4	2.1	6.8	5.9	6.1	19.6	23.1	10.0	0.0	0.0
P70	**70**	0.0	0.0	11.1	27.3	0.0	13.8	44.8	35.3	28.1	16.7	0.0	0.0
P72	**72**			0.0	0.0	0.0	15.8	36.4	34.6	15.8	0.0		

Table 14: Percentage of samples with *Pseudo-nitzschia* spp. equal to or exceeding 50,000 cells per litre by year, for each group and pod.

Groups	Pod	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
G1	**1**												7.1	16.7	0.0	0.0	12.5
G10	**3**								0.0	0.0							
	10	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.0	0.0	0.0	0.0					
G123	**13**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
	15							5.6	0.0	3.8	0.0	17.2	0.0	0.0	0.0	0.0	0.0
	19								0.0								
G18	**14**	4.2	0.0		6.3	0.0	0.0	0.0	0.0	0.0	5.6	12.1	0.0	0.0	3.1	6.3	0.0
	18																0.0
	52													0.0	0.0	19.4	0.0
	53	10.7	0.0	0.0		3.8	0.0										
	74															10.7	0.0
G21	**21**	0.0			0.0				5.6	10.3	8.0	12.0	3.6				
	124													0.0	6.3	12.5	18.8
G22	**22**								0.0	19.2	16.0	4.2	10.7	15.6	9.4	12.9	6.3
	76								0.0	3.8	12.0	16.7	4.2			7.1	3.1
	77															0.0	2.9
	136															14.3	0.0
G23	**23**	3.7	14.7	20.0	2.9	18.2	0.0	0.0		6.7	0.0	9.7	4.0	32.1	9.4	3.1	6.3
	24						0.0	22.2	8.3	18.8	10.7	10.7	3.2	23.5	5.6	0.0	0.0
	125						33.3	21.3	16.7	14.3	31.6					0.0	
G26	**26**	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.1	0.0	3.1
	27	0.0	0.0	0.0	0.0	0.0	0.0										
	89															10.7	3.1
G28	**28**									0.0	14.3	4.8	8.3				
	30	0.0															
	85						0.0	0.0	0.0								
	88															10.7	15.6
	126								9.1	0.0				7.1	6.3	3.1	34.4
G31	**31**				0.0	0.0	0.0							3.6	0.0	0.0	0.0
	34														0.0		
G35	**35**													3.3	8.3	17.1	2.9
	37	0.0	0.0														
G39	**36**	0.0	0.0	10.1	3.6	3.8	25.0	17.6	11.1	12.5	32.3	10.3	29.2	3.6	0.0	9.4	6.3
	39	0.0	0.0	0.0	0.0												
G48	**47**	0.0	0.0						0.0								24.0
	48	0.0		4.8	0.0	0.0		13.3	3.8	4.0	11.8	16.7	3.7	0.0	0.0	12.5	15.6

Table 14 continued.

Groups	Pod	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
G42	**42**													20.0	18.8	21.9	3.1
	43	0.0															
	45	0.0															
G49	**50**								0.0	16.7							
	51										0.0	0.0	3.7	3.6			
G54	**130**						0.0	5.6	0.0					0.0	0.0	0.0	16.1
	131						0.0						0.0	0.0			
	103old	0.0	12.9	8.2	16.0	20.0	25.0	35.1	10.0	17.9	15.2	18.5	9.1				
	105old	0.0															
G56	**56**												36.0	23.1	3.6	9.4	3.1
G57	**57**				18.8	4.0	0.0				17.9	25.0	55.6	39.3	12.5	9.4	15.6
G58	**58**								16.7	16.7	11.5	4.8	35.7	23.1	9.4	12.5	6.3
G67	**60**												27.3	44.4		5.6	0.0
	67	19.0					0.0	14.3	25.9	41.2	27.8	26.3	43.5	40.0	18.8	21.9	21.9
G71	**71**						0.0	5.3	36.0	58.3	38.5	37.5	46.7		11.1	0.0	
G8	**8**	0.0	0.0	7.1	0.0	0.0	0.0	0.0	0.0	3.4	0.0	0.0	0.0	0.0		15.4	0.0
G80	**80**	0.0	0.0					0.0	0.0	11.5	0.0	7.4	3.7	0.0	0.0	0.0	0.0
	107	0.0															
	112	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0								
G81	**69**						0.0	4.2	14.3	20.0			0.0		0.0	0.0	
	81									15.0	4.3	14.3	9.1		0.0	0.0	0.0
	128												42.9	0.0	0.0		8.0
	129															0.0	
G9	**9**						0.0	1.2	10.4	17.1	2.8	19.4	19.4	3.1	21.9	15.6	6.3
P16	**16**						0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.1	18.8	0.0
P38	**38**	0.0	0.0	7.7	0.0	0.0			9.7	3.8	9.4	27.6	14.3	0.0	12.5	6.7	6.3
P41	**41**	0.0	7.4	16.0	4.5	5.6	0.0	8.6	7.3	7.0	21.9	17.6	8.3	2.9	5.6	2.8	14.7
P5	**5**	16.7	14.3	25.0	0.0	32.3	0.0	20.0	28.6	24.1	3.3	37.9	20.7				
P6	**6**						60.0		11.1	14.3	9.7	40.0	34.4	2.9	19.4	8.3	32.4
P61	**61**							0.0	33.3	28.0	23.1	17.6	54.5	40.7	0.0	12.5	12.5
P64	**64**				25.0	15.0	6.7	12.8	24.2	14.7	11.1	33.3	24.2	25.0	3.1	21.9	18.8
P65	**65**				0.0		0.0	0.0	4.5	25.9	25.9	35.7	8.3	14.3	10.3	6.3	6.3
P68	**68**				17.6	15.2	0.0	6.1	12.7	18.3	30.5	10.6	40.6	27.3	8.3	11.1	8.8
P7	**7**	0.0	0.0	4.8	4.5	9.1	0.0	8.0	3.0	11.4	5.6	27.0	11.8	18.8	3.1	3.1	12.5
P70	**70**						0.0	20.0	25.9	8.7	12.0	42.9	37.0			29.4	12.5
P72	**72**								42.9	9.5	3.7	10.0	47.6				9.1

3.3 Observed biotoxin patterns for cockles, mussels, Pacific oysters, razors and surf clams

From April 2001 to the end of September 2015, 38,460 bivalve samples were tested (Table 15). Mussels, Pacific oysters, razors, surf clams and cockles were tested over the full period. King scallops were last tested in 2008 and Queen scallops in 2011. Only for mussels and Pacific oysters a large number of test results are available for a large number of pods (69 and 16 pods respectively for which more than 100 test results are available). As no recent data are available (see Table 15) for King scallops, Queen scallops and 'Other' (comprising common otter shell, native oysters and clams except for surf clams), these species will not be considered any further. Results will be discussed for cockles, mussels, Pacific oysters, razors and surf clams.

Table 15: Summaries per shellfish species group.

	#samples	#years	years	#pods	#pods>100 samples over 15 years
Cockles	1,223	15	2001-15	21	3
King scallops whole	315	8	2001-08	15	1
King scallops gonads	235	6	2001-06	10	1
Mussels	29,154	15	2001-15	105	69
Pacific oysters	5,526	15	2001-15	31	16
Queen scallops	463	10	2001-11	5	2
Razors	1,105	14	2001-15	28	2
Surf clams	344	14	2002-15	4	1
Other[1]	85	10	2001-11	8	0
Total samples	38,460				

[1]Other: common otter shell, native oysters, clams excluding surf clams

3.3.1 Observed DA

General patterns

Pacific oysters showed the lowest prevalence of DA (Figures 5, A1[1], A2) with less than 3% of the samples testing positive (Table 16). Pacific oysters (0/2682), razors (0/841) and surf clams (0/207) had no samples exceeding the MPL of 20 mg/kg. Only nine (out of 14,557) mussel samples, taken in 2001-3, 2007-8, 2012, exceeded the MPL. One cockle sample from 2013 also exceeded the MPL (Table 16). These samples were all taken between June and September (Figure A2). DA toxin patterns over the months of the year are similar between the five shellfish species with prevalence gradually building up from March reaching a peak in August and September (Figures 5, A2). The mean DA concentration is lowest in Pacific oysters and tends to be highest in cockles and surf clams (Figure 5).

[1]Figure numbers beginning with 'A' are presented in Appendix A.

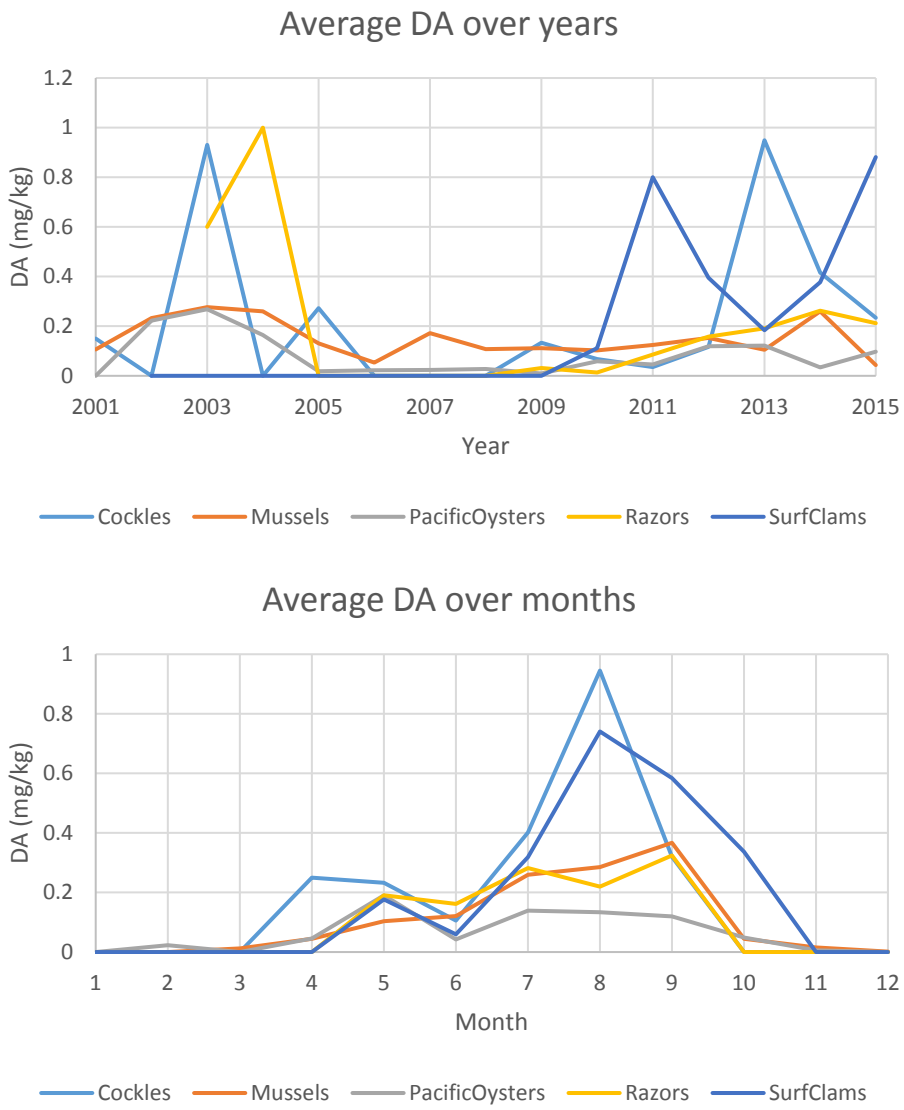

Figure 5: Average DA concentration (mg/kg) over years and months for each of five shellfish species.

Cockles

Cockles are mainly (690/770 samples) harvested on Harris and Uist (Table 17). One positive sample was found on Skye-other[2] (of a total of 13 samples) and one on NWC-other (of a total of 14 samples). Sixty samples tested positive for DA on HarrisUist, one of which had a value of 33 mg/kg and the second highest value was 14mg/kg.

Mussels

Of the total number of mussel samples tested, 4.3% tested positive for DA, the majority of which (3.5% of the total) fell into the 0-5 mg/kg category with only nine samples, i.e. 0.1% of the total,

[2]See Table 3 for details on the name of each pod group and the pods they cover. These group names will be used throughout and can generally be recognised by the lack of spaces in their name (such as HarrisUist). These names usually consist of indicator for area (e.g. North West coast (NWC)) followed by additional detail.

exceeding the MPL of 20 mg/kg (Table 16). These nine samples came from Mull-LochScridain, Mull-LochSpelve, Lewis-LochRoag, Shetland-SE-DalesVoe and Shetland-SE-SandsoundWeisdale. For another 11 groups the maximum DA level observed exceeded 10 mg/kg (see Table 17).

Pacific Oysters

Pacific oysters are sampled mainly at Ayr-other, WC-LochEtive, WC-LochCreranLinnhe, WC-Lochaber, WC-Gigha, Mull-other, Skye-other and NWC-Other (more than 190 samples each, Table 17). Less than 3% of the total number of Pacific oyster samples tested positive for DA (Table 16). The maximum observed level of DA was 10 mg/kg (WC-Lochaber, Table 17).

Razors

Razors are sampled mainly at EastCoast (249 samples), Dumfries (117), and Ayr-other (192) (Table 17). The maximum DA value observed was 8.4 mg/kg at WC-Lochaber.

Surf clams

EastCoast was the main harvesting area for surf clams, with 198 samples harvested (Table 17). Their maximum observed DA level was 7.7 mg/kg (Table 17). Another nine samples were obtained from WC-Lochaber, which all tested negative.

Table 16: Number of samples for each biotoxin category based on data from 2001-15.

	DA number of samples						DA % of total				
	0	0-5	5-10	10-20	20+	Total	0	0-5	5-10	10-20	20+
Cockles	708	51	9	1	1	770	91.9	6.6	1.2	0.1	0.1
Mussels	13,942	503	78	25	9	14,557	95.8	3.5	0.5	0.2	0.1
Pacific oysters	2,603	67	11	1	0	2,682	97.1	2.5	0.4	0.0	0.0
Razors	792	41	8	0	0	841	94.2	4.9	1.0	0.0	0.0
Surf clams	184	22	1	0	0	207	88.9	10.6	0.5	0.0	0.0
	PST number of samples						PST % of total				
	0	0-400	400-800	800+	Total		0	0-400	400-800	800+	
Cockles	962	19	4	4	989		97.3	1.9	0.4	0.4	
Mussels	18,236	386	209	187	19,018		95.9	2.0	1.1	1.0	
Pacific oysters	3,373	28	3	4	3,408		99.0	0.8	0.1	0.1	
Razors	935	28	10	5	978		95.6	2.9	1.0	0.5	
Surf clams	244	5	3	4	256		95.3	2.0	1.2	1.6	
	LT number of samples						LT % of total				
		0	1[1]	Total				0	1		
Cockles		939	1	940				99.9	0.1		
Mussels		19,958	1,634	21,592				92.4	7.6		
Pacific oysters		3,748	81	3,829				97.9	2.1		
Razors		1,004	6	1,010				99.4	0.6		
Surf clams		244	21	265				92.1	7.9		

[1]Corresponds to exceedance of MPL (0 or 1 based on mouse bioassay, or any of AZA> 160 µg/kg, OA > 160 µg/kg, YTX > 3.75 mg/kg).

Table 17: Average and maximum concentration of DA (mg/kg) observed during 2001-15 for each group of pods. Values exceeding MPL of 20 mg/kg are shown in bold.

		Cockles			Mussels			Pacific oysters			Razors			Surf clams		
GroupsM	GroupNameM	Total	Avg	Max	Total	Avg	Max	Total	Avg	Max	Total	Avg	Max	Total	Avg	Max
G80	EastCoast	4	0.00	0.0	173	0.00	0.0				249	0.17	6.0	198	0.28	7.7
G26	Dumfries	16	0.00	0.0	286	0.00	1.0				117	0.05	2.0			
G8	Ayr-LochStriven	15	0.00	0.0	331	0.02	4.0	5	0.00	0.0						
P16	Ayr-LochFyneArdkinglas				277	0.02	5.0	86	0.00	0.0						
G18	Ayr-other				643	0.05	14.0	190	0.01	1.0	192	0.07	6.0			
G123	WC-Gigha				218	0.09	3.0	539	0.02	4.0	39	0.00	0.0			
P6	WC-LochMelfort				243	0.35	13.0	59	0.36	7.0						
G10	WC-LochEtive	3	0.00	0.0	516	0.05	6.0	288	0.11	7.0						
G9	WC-LochCreranLinnhe				499	0.07	5.0	230	0.05	5.0						
G31	WC-LochLevenEil				524	0.00	2.0									
G28	WC-Lochaber	1	0.00	0.0	623	0.14	14.0	306	0.19	10.0	89	0.34	8.4	9	0.00	0.0
P5	Mull-LochSpelve				320	0.38	**27.0**	1	0.00	0.0						
P7	Mull-LochScridain				308	0.24	**27.0**									
G1	Mull-other				384	0.06	9.8	452	0.11	8.7	2	0.00	0.0			
P41	Skye-LochEishort				332	0.04	6.0									
G42	Skye-other	13	0.23	3.0	587	0.29	19.0	239	0.06	5.3	1	0.00	0.0			
G21	Lewis-LochLeurbostErisort				449	0.14	8.4				74	0.09	3.0			
G23	Lewis-LochRoag				864	0.37	**35.0**									
G22	HarrisUist	690	0.30	**33.0**	686	0.15	17.0	4	0.75	3.0	38	0.49	5.6			
G35	NWC-LochTorridon				502	0.08	3.9	2	0.00	0.0						
G39	NWC-LochEweBroom				460	0.13	7.9	52	0.03	1.5						
G48	NWC-LochLaxfordInchard				433	0.19	13.0									
G49	NWC-other	14	0.21	3.0	416	0.09	15.0	190	0.06	2.7						
P38	Tain				258	0.08	3.0									
G54	Orkney	14	0.00	0.0	99	0.02	2.0	5	0.00	0.0	40	0.25	3.2			
G67	Shetland-SE-CliftSound				425	0.21	13.0									
G56	Shetland-SE-DalesVoe				309	0.39	**34.0**									
G57	Shetland-SE-SandsoundWeisdale				540	0.25	**27.0**									
P61	Shetland-SW-GrutingVoe				331	0.26	17.0									
P68	Shetland-SW-Vaila				347	0.19	19.0									
P72	Shetland-W-AithVoe				241	0.08	6.0									
P64	Shetland-W-BustaVoe				296	0.13	6.0									
P70	Shetland-W-OlnaFirth				268	0.12	14.0									
G58	Shetland-W-VementryVoe				332	0.03	2.8									
G71	Shetland-W-RonasVoe				213	0.04	2.0									
P65	Shetland-N-Basta				244	0.10	8.0									
G81	Shetland-N-Uyea				580	0.03	3.0	34	0.00	0.0						

3.3.2 Observed PST

General patterns

Pacific oysters had the lowest prevalence of PST, with only 1% of the samples testing positive (Table 16), of which four (out of 3,408) exceeded the MPL of 800 µg/kg. For mussels, 1% of the samples exceeded the MPL. PST was particularly prevalent in 2006 and 2013-15 (Figures 6, A3). The toxin was most likely to be observed during April through to September, with the pattern being similar between the five species (albeit that prevalence was lower in Pacific oysters, Figures 6, A4).

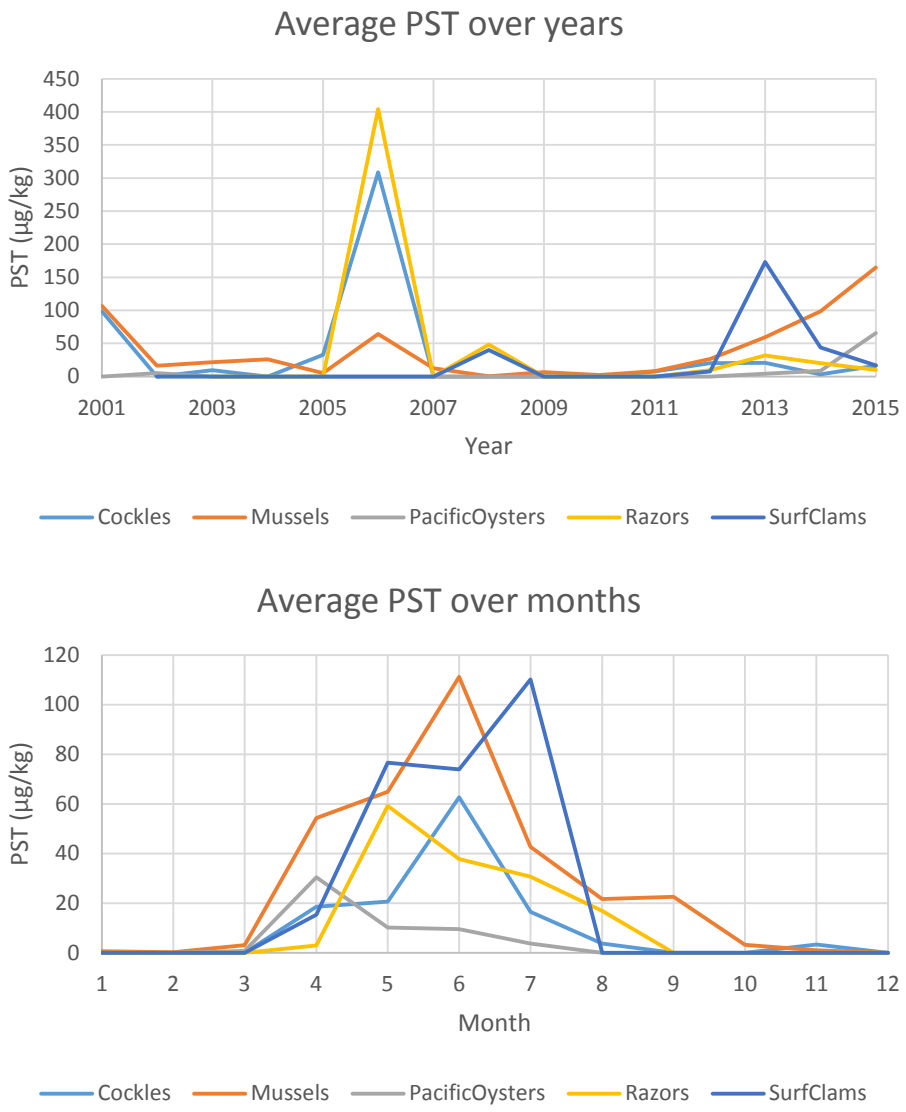

Figure 6: Average PST concentration (µg/kg) over years and months for each of five shellfish species.

Cockles

Cockles are mainly harvested from HarrisUist (899/989, Table 18), and only two of these (0.4%) exceeded the MPL for PST. The remaining positive samples came from HarrisUist (19 between 0-800 µg/kg), NWC-other (four samples, one of which exceeded 800 µg/kg) and Orkney (one sample exceeding 800 µg/kg and one sample between 400-800 µg/kg).

Table 18: Average and maximum concentration of PST (µg/kg) observed during 2001-15 for each group of pods. Values exceeding the MPL of 800 µg/kg are shown in bold.

		Cockles			Mussels			Pacific oysters			Razors			Surf clams		
GroupsM	GroupNameM	Total	Avg	Max	Total	Avg	Max	Total	Avg	Max	Total	Avg	Max	Total	Avg	Max
G80	EastCoast	4	0.0	0	173	27.6	**1420**				312	26.8	**1120**	247	34.5	**2152**
G26	Dumfries	18	0.0	0	319	0.0	0				126	1.6	200			
G8	Ayr-LochStriven	15	0.0	0	412	194.9	**14730**	4	0.0	0						
P16	Ayr-LochFyneArdkinglas				355	24.2	**2256**	89	0.0	0						
G18	Ayr-other				906	159.4	**27822**	229	54.1	**4392**	215	5.1	641			
G123	WC-Gigha				310	31.4	**2422**	666	1.3	280	41	0.0	0			
P6	WC-LochMelfort				322	3.7	200	63	0.0	0						
G10	WC-LochEtive	3	0.0	0	607	0.0	0	359	0.6	200						
G9	WC-LochCreranLinnhe				620	0.0	0	278	0.0	0						
G31	WC-LochLevenEil				612	0.0	0									
G28	WC-Lochaber	1	0.0	0	812	28.4	**2140**	450	2.9	326	105	15.9	435	9	0.0	0
P5	Mull-LochSpelve				333	0.0	0	1	290.0	290						
P7	Mull-LochScridain				421	54.1	**1142**									
G1	Mull-other				483	3.3	560	595	1.6	572	2	0.0	0			
P41	Skye-LochEishort				454	58.4	**1646**									
G42	Skye-other	16	0.0	0	797	24.9	**4050**	279	0.0	0	1	0.0	0			
G21	Lewis-LochLeurbostErisort				529	1.8	400				75	18.7	200			
G23	Lewis-LochRoag				1038	13.4	**1270**									
G22	HarrisUist	899	9.0	**1678**	788	6.3	**1148**	6	0.0	0	37	0.0	0			
G35	NWC-LochTorridon				684	56.8	**4019**	2	0.0	0						
G39	NWC-LochEweBroom				620	2.2	510	52	15.4	200						
G48	NWC-LochLaxfordInchard				628	80.4	**4776**									
G49	NWC-other	19	131.1	**1200**	566	16.5	**1942**	275	4.0	297						
P38	Tain				367	44.1	**2708**									
G54	Orkney	14	140.7	**1520**	126	107.1	**2990**	5	0.0	0	64	67.1	**1571**			
G67	Shetland-SE-CliftSound				581	16.6	**2476**									
G56	Shetland-SE-DalesVoe				367	1.6	200									
G57	Shetland-SE-SandsoundWeisdale				716	12.4	**1257**									
P61	Shetland-SW-GrutingVoe				399	10.4	693									
P68	Shetland-SW-Vaila				455	45.2	**2260**									
P72	Shetland-W-AithVoe				376	23.9	**930**									
P64	Shetland-W-BustaVoe				457	52.0	**4130**									
P70	Shetland-W-OlnaFirth				412	17.2	**1840**									
G58	Shetland-W-VementryVoe				518	34.2	**3210**									
G71	Shetland-W-RonasVoe				288	30.0	**1558**									
P65	Shetland-N-Basta				382	10.5	600									
G81	Shetland-N-Uyea				785	27.4	**1775**	55	0.0	0						

Mussels

Of the total number of mussel samples tested, 4.1% tested positive for PST, with 1% exceeding 800 µg/kg (187 out of 19,018 samples, Table 16). For five pod groups the test result for PST was always negative (Table 18). These were Dumfries, WC-LochEtive, WC-LochCreranLinnhe, WC-LochLevenEil and Mull-LochSpelve. There were another two groups (WC-LochMelfort and Shetland-SE-DalesVoe) where the maximum value was less than half the MPL, and one group (HarrisUist) where the maximum value was at half the MPL. The remaining 29 groups had one or more samples with values exceeding 400 µg/kg, and in most cases these locations also had values exceeding 800 µg/kg.

Pacific oysters

Only four out of 3,408 samples exceeded 800 µg/kg (Table 16). These came all from Ayr-other (out of a total of 229 samples, Table 18). From that same group, another two samples exceeded 400 µg/kg. One sample from Mull-Other (out of 595) had an observed value of 572 µg/kg. There were another 28 samples with positive PST values, the maximum of which was 326 µg/kg (Table 18).

Razors

Of the 978 samples 43 tested positive for PST (Table 16). Sixteen of these came from EastCoast, of which four exceeded 800 µg/kg (Table 18). The remaining positive samples had values of 654 µg/kg or less.

Surf clams

Of the 256 surf clams samples tested, 12 tested positive for PST, of which four exceeded the MPL (Table 16). All of these came from EastCoast (Table 18).

3.3.3 Observed LT - exceeding MPL

General patterns

When LT is expressed as 0/1 data, with 1 denoting the LT level exceeding the MPL, cockles and razors show a prevalence (i.e. levels exceeding MPL) of less than 1% (Table 16). The prevalence was 2.1% in Pacific oysters (81/3829), and was nearly 8% in surf clams (21/265) and mussels (1,634/21,592). Prevalence was fairly consistent over the years and LT was present for most months of the year (Figure 7).

Cockles

One sample (out of 940) exceeded the MPL for LT. This was from HarrisUist (1/866) (Tables 16 and 19).

Mussels

All 37 groups had samples with test results exceeding the MPL. For Ayr-LochStriven and Ayr-other this was the case for over 20% of the samples tested (Table 19). EastCoast, Ayr-LochFyneArdkinglas, WC-Lochaber, Mull-LochScridain, Skye-LochEishort, NWC-LochLaxfordInchard, Orkney, Shetland-SW-

Vaila, Shetland-W-AithVoe and Shetland-W-RonasVoe all had 10% or more of the mussel samples with LT exceeding MPL (Table 19).

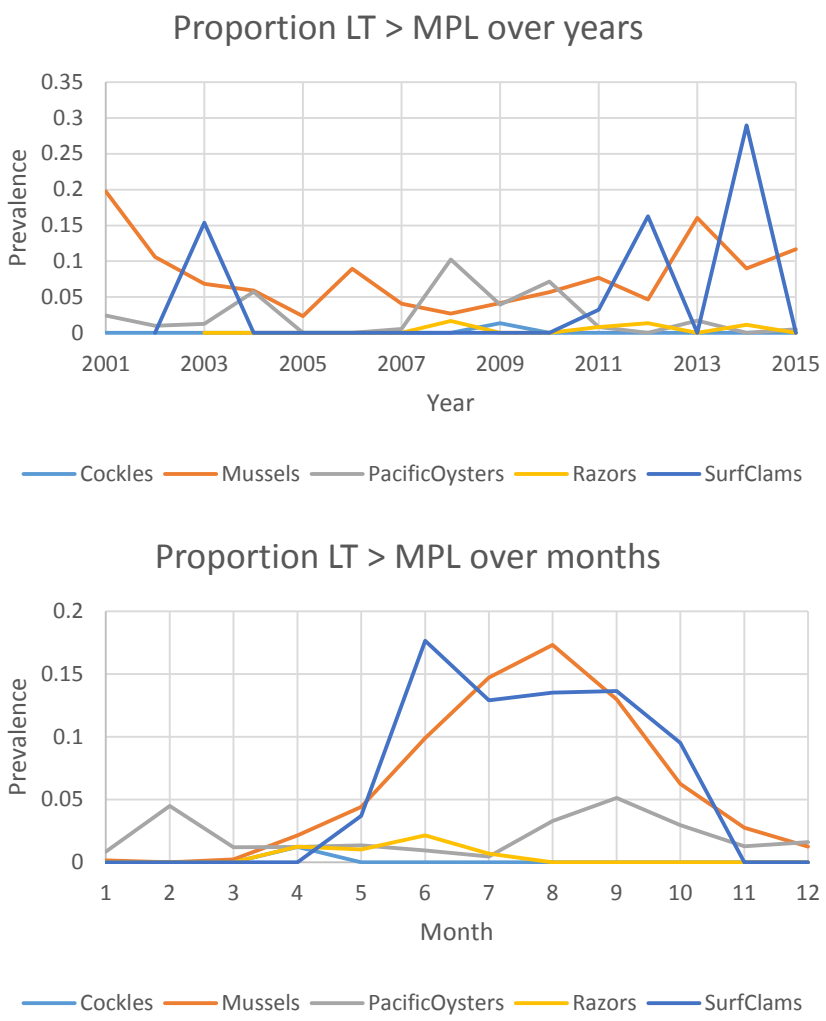

Figure 7: Proportion of samples with LT levels exceeding the MPL, over years and over months, for each of five shellfish species.

Pacific oysters

Eighty-one of the 3,829 samples exceeded the MPL. These came from WC-Gigha (32/629), WC-Lochaber (14/502) and Skye-other (12/347). The remaining 23 samples came from various other locations (Tables 16, 19).

Razors

Six out of 1,010 samples (Table 16) exceeded the MPL, five of which came from EastCoast and one from Ayr-other (Table 19). For the remaining locations all test results were below the MPL (Table 19).

Surf clams

Of the 265 samples tested for LT, three were collected from WC-Lochaber and these were below MPL. Of the remaining 262 samples, all from EastCoast, 21 exceeded the MPL (Tables 16 and 19).

Table 19: Proportion of samples for which LT exceeded MPL. Max is either 0 or 1 depending on whether all samples tested below MPL (0) or at least one sample exceeded MPL (1). Based on data observed during 2001-15 for each group of pods. Entries where samples exceeded MPL limit are shown in bold.

		Cockles			Mussels			Pacific oysters			Razors			Surf clams		
GroupsM	GroupNameM	Total	Avg	Max	Total	Avg	Max	Total	Avg	Max	Total	Avg	Max	Total	Avg	Max
G80	EastCoast	5	0.00	0	201	**0.11**	**1**				315	**0.02**	**1**	262	**0.08**	**1**
G26	Dumfries	18	0.00	0	411	**0.00**	**1**				128	0.00	0			
G8	Ayr-LochStriven	15	0.00	0	514	**0.22**	**1**	5	0.00	0						
P16	Ayr-LochFyneArdkinglas				444	**0.11**	**1**	95	**0.04**	**1**						
G18	Ayr-other				1126	**0.20**	**1**	320	**0.01**	**1**	244	**0.00**	**1**			
G123	WC-Gigha				386	**0.01**	**1**	661	**0.05**	**1**	44	0.00	0			
P6	WC-LochMelfort				379	**0.07**	**1**	58	**0.02**	**1**						
G10	WC-LochEtive	3	0.00	0	680	**0.00**	**1**	418	**0.00**	**1**						
G9	WC-LochCreranLinnhe				722	**0.01**	**1**	307	**0.01**	**1**						
G31	WC-LochLevenEil				747	**0.01**	**1**									
G28	WC-Lochaber	1	0.00	0	896	**0.11**	**1**	502	**0.03**	**1**	100	0.00	0	3	0.00	0
P5	Mull-LochSpelve				437	**0.01**	**1**									
P7	Mull-LochScridain				453	**0.13**	**1**									
G1	Mull-other				478	**0.02**	**1**	677	**0.01**	**1**	2	0.00	0			
P41	Skye-LochEishort				489	**0.11**	**1**									
G42	Skye-other	5	0.00	0	802	**0.05**	**1**	347	**0.03**	**1**	1	0.00	0			
G21	Lewis-LochLeurbostErisort				713	**0.03**	**1**				75	0.00	0			
G23	Lewis-LochRoag				1267	**0.09**	**1**									
G22	HarrisUist	866	**0.00**	**1**	947	**0.01**	**1**	2	0.00	0	37	0.00	0			
G35	NWC-LochTorridon				730	**0.06**	**1**									
G39	NWC-LochEweBroom				660	**0.06**	**1**	52	0.00	0						
G48	NWC-LochLaxfordInchard				723	**0.17**	**1**									
G49	NWC-other	14	0.00	0	566	**0.06**	**1**	322	**0.00**	**1**						
P38	Tain				372	**0.03**	**1**									
G54	Orkney	13	0.00	0	133	**0.10**	**1**	2	0.00	0	64	0.00	0			
G67	Shetland-SE-CliftSound				656	**0.08**	**1**									
G56	Shetland-SE-DalesVoe				439	**0.07**	**1**									
G57	Shetland-SE-SandsoundWeisdale				809	**0.06**	**1**									
P61	Shetland-SW-GrutingVoe				472	**0.09**	**1**									
P68	Shetland-SW-Vaila				484	**0.11**	**1**									
P72	Shetland-W-AithVoe				412	**0.10**	**1**									
P64	Shetland-W-BustaVoe				466	**0.08**	**1**									
P70	Shetland-W-OlnaFirth				420	**0.05**	**1**									
G58	Shetland-W-VementryVoe				545	**0.07**	**1**									
G71	Shetland-W-RonasVoe				301	**0.17**	**1**									
P65	Shetland-N-Basta				412	**0.08**	**1**									
G81	Shetland-N-Uyea				900	**0.06**	**1**	61	**0.03**	**1**						

3.3.4 Observed LT - AZA and OA

General patterns

Testing of specific LT toxins (AZA, OA and YTX) started in 2011. AZA levels tended to be highest in Pacific oysters and surf clams (Figure 8), with 7.1% and 7.9% samples respectively exceeding half the MPL. In mussels, 1% of the samples exceeded half the MPL (Table 20). These samples were mainly collected between May 2012 and June 2013 (Figure A5).

Surf clams and mussels show the highest OA prevalence, with 13% and 10% respectively of the samples exceeding the MPL (Table 20). For cockles, Pacific oysters and razors less than 5% of the samples tested positive (Table 20, Figure A6). Levels tended to be higher during June through to September (Figure 8).

Table 20: Test results obtained during 2011-15 for AZA (µg/kg), OA (µg/kg) and YTX (mg/kg).

	AZA number of samples					AZA % of total			
	0	0-80	80-160	160+	Total	0	0-80	80-160	160+
Cockles	539	28	1	0	568	94.9	4.9	0.2	0.0
Mussels	8,608	154	57	38	8,857	97.2	1.7	0.6	0.4
Pacific oysters	1,726	144	138	5	2,013	85.7	7.2	6.9	0.2
Razors	680	4	0	0	684	99.4	0.6	0.0	0.0
Surf clams	95	23	8	2	128	74.2	18.0	6.3	1.6
	OA number of samples					OA % of total			
	0	0-80	80-160	160+	Total	0	0-80	80-160	160+
Cockles	556	10	2	0	568	97.9	1.8	0.4	0.0
Mussels	5,655	1696	666	840	8,857	63.8	19.1	7.5	9.5
Pacific oysters	1,972	23	13	5	2,013	98.0	1.1	0.6	0.2
Razors	654	14	12	4	684	95.6	2.0	1.8	0.6
Surf clams	48	39	24	17	128	37.5	30.5	18.8	13.3
	YTX number of samples					YTX % of total			
	0	0-1.85	1.85-3.75	3.75+	Total	0	0-1.85	1.85-3.75	3.75+
Cockles	568	0	0	0	568	100.0	0.0	0.0	0.0
Mussels	8,495	353	9	0	8,857	95.9	4.0	0.1	0.0
Pacific oysters	2,013	0	0	0	2,013	100.0	0.0	0.0	0.0
Razors	684	0	0	0	684	100.0	0.0	0.0	0.0
Surf clams	128	0	0	0	128	100.0	0.0	0.0	0.0

Cockles

None of the 568 samples exceeded the AZA and OA MPL of 160 µg/kg. For AZA, one sample (HarrisUist) exceeded half the limit whereas for OA this was the case for two samples (HarrisUist, Ayr-LochStriven, Tables 20 - 22).

Mussels

For AZA, 2.7% (219 out of 8,857) of the samples tested positive, with 38 samples exceeding the MPL (Table 20). Nearly half of these (15 samples) came from Shetland-N-Uyea, whereas the remaining samples came from Shetland-N-Basta (the maximum value observed, 626 µg/kg, came from this location), Skye-other, Lewis-LochLeurbostErisort and Lewis-LochRoag (Table 21).

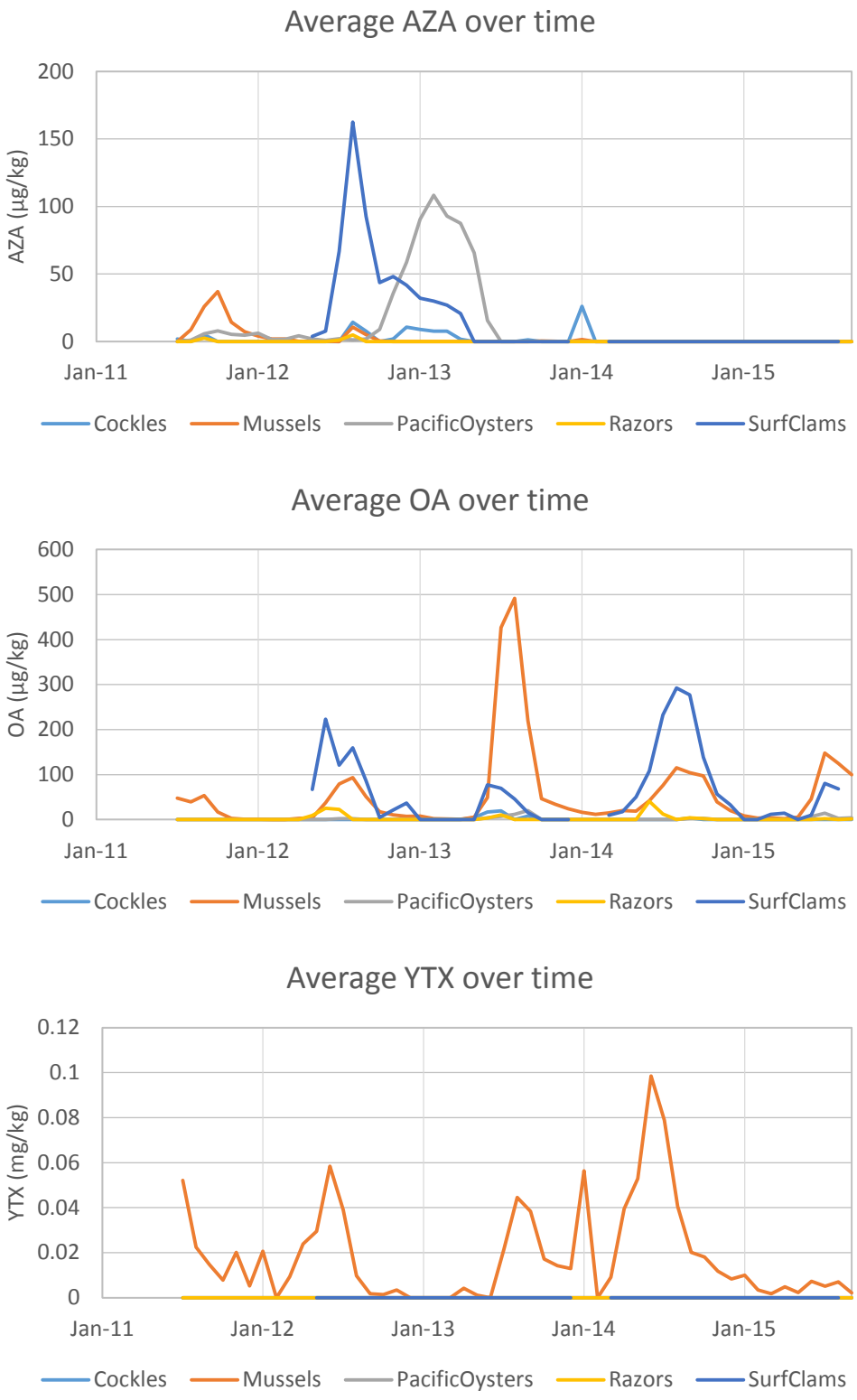

Figure 8: Average concentrations of AZA (µg/kg), OA (µg/kg) and YTX (mg/kg) over time, for each of five species.

Table 21: Average and maximum concentration of AZA (µg/kg) observed during 2011-15 for each group of pods. Values exceeding MPL of 160 µg/kg are shown in bold.

		Cockles			Mussels			Pacific oysters			Razors			Surf clams		
GroupsM	GroupNameM	Total	Avg	Max	Total	Avg	Max	Total	Avg	Max	Total	Avg	Max	Total	Avg	Max
G80	EastCoast				58	0.0	0				191	0.4	26	128	15.8	**209**
G26	Dumfries	5	0.0	0	186	0.0	0				100	0.0	0			
G8	Ayr-LochStriven	15	0.0	0	191	0.0	0									
P16	Ayr-LochFyneArdkinglas				172	0.0	0	18	0.0	0						
G18	Ayr-other				416	0.0	0	226	0.0	0	163	0.0	0			
G123	WC-Gigha				199	0.0	0	212	10.9	119	12	0.0	0			
P6	WC-LochMelfort				189	0.0	0	1	0.0	0						
G10	WC-LochEtive	3	0.0	0	217	0.0	0	196	18.0	**237**						
G9	WC-LochCreranLinnhe				204	0.0	0	181	10.5	130						
G31	WC-LochLevenEil				299	0.3	104									
G28	WC-Lochaber				352	0.6	48	326	8.8	130	53	0.0	0			
P5	Mull-LochSpelve				171	0.0	0									
P7	Mull-LochScridain				172	0.0	0									
G1	Mull-other				74	0.3	25	388	17.8	**172**						
P41	Skye-LochEishort				184	0.7	31									
G42	Skye-other				241	7.4	**595**	172	11.3	123						
G21	Lewis-LochLeurbostErisort				379	8.1	**382**				70	0.0	0			
G23	Lewis-LochRoag				564	5.6	**254**									
G22	HarrisUist	545	1.5	157	564	2.2	148				35	0.0	0			
G35	NWC-LochTorridon				251	0.0	0									
G39	NWC-LochEweBroom				236	0.3	31	52	0.0	0						
G48	NWC-LochLaxfordInchard				354	1.2	103									
G49	NWC-other				179	2.9	108	211	9.0	86						
P38	Tain				142	0.2	22									
G54	Orkney				68	4.7	99				60	0.3	20			
G67	Shetland-SE-CliftSound				295	0.3	23									
G56	Shetland-SE-DalesVoe				205	0.9	55									
G57	Shetland-SE-SandsoundWeisdale				363	0.3	80									
P61	Shetland-SW-GrutingVoe				173	0.0	0									
P68	Shetland-SW-Vaila				180	0.2	30									
P72	Shetland-W-AithVoe				186	0.8	109									
P64	Shetland-W-BustaVoe				191	2.9	138									
P70	Shetland-W-OlnaFirth				191	3.0	153									
G58	Shetland-W-VementryVoe				266	1.4	110									
G71	Shetland-W-RonasVoe				122	3.7	136									
P65	Shetland-N-Basta				186	14.1	**626**									
G81	Shetland-N-Uyea				437	13.4	**507**	30	0.0	0						

Table 22: Average and maximum concentration of OA (µg/kg) observed during 2011-15 for each group of pods. Values exceeding the MPL of 160 µg/kg are shown in bold.

		Cockles			Mussels			Pacific oysters			Razors			Surf clams		
GroupsM	GroupNameM	Total	Avg	Max	Total	Avg	Max	Total	Avg	Max	Total	Avg	Max	Total	Avg	Max
G80	EastCoast				58	98.6	**678**				191	10.4	**231**	128	73.4	**534**
G26	Dumfries	5	0.0	0	186	1.2	57				100	0.3	27			
G8	Ayr-LochStriven	15	9.2	101	191	159.2	**2209**									
P16	Ayr-LochFyneArdkinglas				172	64.8	**1049**	18	72.8	**682**						
G18	Ayr-other				416	149.1	**1815**	226	2.3	**170**	163	2.3	**169**			
G123	WC-Gigha				199	14.7	**225**	212	0.0	0	12	0.0	0			
P6	WC-LochMelfort				189	47.5	**284**	1	0.0	0						
G10	WC-LochEtive	3	0.0	0	217	6.4	106	196	0.0	0						
G9	WC-LochCreranLinnhe				204	4.9	62	181	0.0	0						
G31	WC-LochLevenEil				299	6.2	**247**									
G28	WC-Lochaber				352	95.5	**1762**	326	1.6	156	53	2.9	96			
P5	Mull-LochSpelve				171	8.0	80									
P7	Mull-LochScridain				172	117.5	**1008**									
G1	Mull-other				74	13.6	**275**	388	0.5	107						
P41	Skye-LochEishort				184	84.9	**788**									
G42	Skye-other				241	21.9	**268**	172	2.5	102						
G21	Lewis-LochLeurbostErisort				379	20.0	**310**				70	0.0	0			
G23	Lewis-LochRoag				564	54.1	**696**									
G22	HarrisUist	545	1.1	146	564	14.2	**357**				35	1.9	65			
G35	NWC-LochTorridon				251	60.3	**678**									
G39	NWC-LochEweBroom				236	49.7	**901**	52	3.3	85						
G48	NWC-LochLaxfordInchard				354	126.8	**2009**									
G49	NWC-other				179	48.9	**487**	211	3.2	**226**						
P38	Tain				142	31.7	**338**									
G54	Orkney				68	0.6	43				60	2.1	77			
G67	Shetland-SE-CliftSound				295	64.1	**2558**									
G56	Shetland-SE-DalesVoe				205	63.1	**1181**									
G57	Shetland-SE-SandsoundWeisdale				363	114.5	**4289**									
P61	Shetland-SW-GrutingVoe				173	64.0	**1410**									
P68	Shetland-SW-Vaila				180	61.5	**1302**									
P72	Shetland-W-AithVoe				186	117.1	**3655**									
P64	Shetland-W-BustaVoe				191	80.1	**2284**									
P70	Shetland-W-OlnaFirth				191	36.2	**941**									
G58	Shetland-W-VementryVoe				266	**166.7**	**6950**									
G71	Shetland-W-RonasVoe				122	144.2	**2303**									
P65	Shetland-N-Basta				186	20.9	**561**									
G81	Shetland-N-Uyea				437	48.7	**1791**	30	0.0	0						

A large proportion (36.2%) of the mussel samples tested positive for OA (Table 20), and this occurred across all locations. Nearly 10% exceeded the MPL (Table 20) and this was fairly evenly spread between pod groups. Only for Dumfries, WC-LochCreranLinnhe and Orkney all samples tested below 80 µg/kg (Table 22). For Shetland-W-VementryVoe even the average toxicity (167 µg/kg) was above the MPL. Ayr-LochStriven (159 µg/kg), Ayr-other (149 µg/kg) and Shetland-W-RonasVoe (144 µg/kg) also gave high average test results that were not far off the MPL.

Pacific oysters

Pacific oysters tested positive for AZA for 14.3% of the samples, with five of the 2,013 samples tested exceeding the MPL. These came from WC-LochEtive and Mull-other. The maximum value recorded was 237 µg/kg (Tables 20 and 21). Samples tested positive for OA for 1.9% of the samples, with five samples exceeding the MPL, namely from Ayr-LochFyneArdkinglas (this pod group also had the highest recorded value of 682 µg/kg), Ayr-other and NWC-other (Tables 20 and 22).

Razors

For AZA only four (out of 684) samples tested positive, with a maximum value of 26 µg/kg. For OA 30 samples (4.4%) tested positive, four of which exceeded 160 µg/kg. These samples came from EastCoast (maximum observed value of 231 µg/kg came from this location) and Ayr-other (Tables 20 - 22).

Surf clams

All samples came from EastCoast. Two (out of 128) samples exceeded the AZA MPL of 160 µg/kg, and 17 (13%) exceeded the OA MPL of 160 µg/kg. The maximum observed value was 209 and 534 µg/kg for AZA and OA, respectively (Tables 20 - 22).

Mussels AZA vs mouse bioassay

For pod groups that had AZA levels exceeding MPL during 2011-15 (Table 21) the corresponding LT test results from 2001-15 (expressed as 0 (below MPL) or 1 (above MPL), mainly based on MBA) showed a moderate proportion of samples exceeding MPL (3-9%, Table 19).

Mussels OA vs mouse bioassay

When looking at prevalence patterns across groups of pods we observe that there is generally a good correspondence between OA prevalence observed during 2011-15 (Table 22) and the proportion of mussel samples that exceeded MPL during 2001-15 (Table 19, mainly based on MBA). Generally, when a pod group has an average OA of 95 µg/kg or more, then the corresponding percentage of samples from 2001-15 exceeding MPL is 10% or more. The only exceptions are Shetland-SE-SandsoundWeisdale (6% of samples exceeded MPL during 2001-15 whereas the average OA was 114.5 µg/kg) and Shetland-W-VementryVoe (only 7% of the samples exceeded MPL during 2001-15 whereas the average OA was 167 µg/kg). For Orkney the pattern goes the other way in that OA was almost non-existent whereas 10% of the samples exceeded MPL when based on test results from 2001-15 (mainly based on MBA). It should be noted however that the LC-MS/MS and MBA test methods were not run in parallel (MBA until 2012, LC-MS/MS from 2011 onwards) and it is possible that annual fluctuations in the prevalence of LT toxins may have contributed to such discrepancies.

Table 23: Average and maximum concentration of YTX (mg/kg) observed during 2011-15 for each group of pods. None of the values exceeded the MPL of 3.75 mg/kg, so there are no bold entries.

		Cockles			Mussels			Pacific oysters			Razors			Surf clams		
GroupsM	GroupNameM	Total	Avg	Max	Total	Avg	Max	Total	Avg	Max	Total	Avg	Max	Total	Avg	Max
G80	EastCoast				58	0.00	0.00				191	0.00	0.00	128	0.00	0.00
G26	Dumfries	5	0.00	0.00	186	0.00	0.00				100	0.00	0.00			
G8	Ayr-LochStriven	15	0.00	0.00	191	0.11	2.50									
P16	Ayr-LochFyneArdkinglas				172	0.13	1.50	18	0.00	0.00						
G18	Ayr-other				416	0.16	3.00	226	0.00	0.00	163	0.00	0.00			
G123	WC-Gigha				199	0.01	0.50	212	0.00	0.00	12	0.00	0.00			
P6	WC-LochMelfort				189	0.09	1.30	1	0.00	0.00						
G10	WC-LochEtive	3	0.00	0.00	217	0.02	0.50	196	0.00	0.00						
G9	WC-LochCreranLynnhe				204	0.06	0.90	181	0.00	0.00						
G31	WC-LochLevenEil				299	0.00	0.00									
G28	WC-Lochaber				352	0.00	0.00	326	0.00	0.00	53	0.00	0.00			
P5	Mull-LochSpelve				171	0.00	0.50									
P7	Mull-LochScridain				172	0.01	0.40									
G1	Mull-other				74	0.00	0.00	388	0.00	0.00						
P41	Skye-LochEishort				184	0.01	0.30									
G42	Skye-other				241	0.00	0.30	172	0.00	0.00						
G21	Lewis-LochLeurbostErisort				379	0.00	0.00				70	0.00	0.00			
G23	Lewis-LochRoag				564	0.00	0.30									
G22	HarrisUist	545	0.00	0.00	564	0.00	0.00				35	0.00	0.00			
G35	NWC-LochTorridon				251	0.00	0.30									
G39	NWC-LochEweBroom				236	0.00	0.00	52	0.00	0.00						
G48	NWC-LochLaxfordInchard				354	0.00	0.20									
G49	NWC-other				179	0.00	0.00	211	0.00	0.00						
P38	Tain				142	0.00	0.30									
G54	Orkney				68	0.00	0.00				60	0.00	0.00			
G67	Shetland-SE-CliftSound				295	0.00	0.20									
G56	Shetland-SE-DalesVoe				205	0.01	1.20									
G57	Shetland-SE-SandsoundWeisdale				363	0.01	0.50									
P61	Shetland-SW-GrutingVoe				173	0.06	0.80									
P68	Shetland-SW-Vaila				180	0.01	0.30									
P72	Shetland-W-AithVoe				186	0.00	0.00									
P64	Shetland-W-BustaVoe				191	0.00	0.00									
P70	Shetland-W-OlnaFirth				191	0.00	0.30									
G58	Shetland-W-VementryVoe				266	0.01	0.40									
G71	Shetland-W-RonasVoe				122	0.00	0.00									
P65	Shetland-N-Basta				186	0.01	0.80									
G81	Shetland-N-Uyea				437	0.02	1.40	30	0.00	0.00						

3.3.5 Observed LT - YTX

None of the cockle, mussel, Pacific oyster, razor and surf clam samples tested during 2011-15 exceeded the YTX MPL of 3.75 mg/kg (Table 20). Of the mussel samples, 0.1% (9/8,857) exceeded half the MPL. For cockles, Pacific oysters, razors and surf clams none of the samples exceeded half the limit. YTX was found in mussels in all five years monitored, albeit that the prevalence tended to be low in 2015 (Figures 8, A7).

The nine mussel samples that exceeded half the MPL came from Ayr-LochStriven and Ayr-other (Table 23). Thirteen groups always tested negative, whereas for the remaining 22 groups one or more samples gave positive test values that were less than half the MPL.

3.4 Association between phytoplankton and mussel biotoxin levels

General observations

The relationship between phytoplankton counts and toxin levels was examined for the three harmful algal bloom (HAB) genera of greatest concern, *Alexandrium*, *Dinophysis* and *Pseudo-nitzschia* by month and year for each pod (Figures A8 – A11). For the analysis by year (Figures A9-A11), data were natural logarithm transformed and the cell count for each HAB genus was plotted against the contemporaneous toxin concentration associated with that genus, along with action/regulatory thresholds.

There was a very apparent seasonality in the threshold exceedence; exceedence was higher, for all HAB genera and their associated toxins during the period Spring to Autumn (Figure A8). This is consisent with known patterns of (harmful) phytoplankton growth. However, there was a high degree of variability in terms of threshold exceedance between pods. Some pods were at higher risk from all three HAB genera (e.g. pod 67 and 68) compared to others. Of the three HAB genera, *Dinophysis* (and associated toxin DSP) mostly routinely exceeded the action thresholds. For some pods, during the summer (e.g. August, pod 35, 47, 52) the thresholds were exceeded nearly 100% of the time for *Dinophysis*. There was an apparent lag between the cell count and toxin exceedence for some genera/pod combinations and this is most commonly seen in *Dinophysis* (e.g. pod 8, 48, 52 and 71). Mean *Alexandrium* cell counts commonly exceed the action threshold but this was not always accompanied by toxic events. However, a higher action threshold for *Alexandrium* would not be appropriate because denser blooms of *Alexandrium* do not necessarily equate to higher levels of PST toxins. This is because not all species/strains of *Alexandrium* produce toxins. Changes in the threshold, which initial analysis would suggest, could lead to missed additional PST tests at pods where *Alexandrium* could be highly toxic. Another possible explanation for the lack of relationship between cell counts and toxins is that, for example, if a pod is already shut for DSP, as is frequently the case for many pods, PST testing is not routinely carried out until LT toxins fall below MPL. Thus, *Alexandrium* blooms may be producing toxins that are not being detected. Thresholds exceedence in *Alexandrium* occurred earlier in the season (typically May/June) compared with *Dinophysis* (typically June/July). *Pseudo-nitzchia* cell counts and DA exceed action thresholds less frequently compared with *Alexandrium* and *Dinophysis* and their respective toxins.

There were very clear seasonal patterns for all three HAB genera; blooms occurred between spring and autumn. The cell counts show temporal variability and are characterised by a 'yo-yo-ing' behaviour (changes in cell counts of several orders of magnitude between weeks, Figures A9-A11). The 'interest-events', where the HAB cell count does not exceed the action threshold but where the toxin does (indicated by black filled circles in Figures A9-A11) could indicate a 'missed-toxic-event'. However, most 'interest-events' occur where the bloom has occurred, then declined, but where the toxin remains present in the test organism (mussel) - this would not constitute a 'missed event'. 'Interest-events', as indicated by black circles in Figures A9-A11, indicate a pod/time where further investigation should be made.

Species-specific observations for HAB

Alexandrium spp exceeded thresholds most years, in all pods, but the associated toxin (PST) relatively rarely exceeded the threshold (Figure A9). There were no obvious overall trends in relation to *Alexandrium* counts or PST over the period 2000-15. There were some occasions where PST exceeded threshold but *Alexandrium* count did not, indicated by black circles. Further investigation revealed that in almost all instances, *Alexandrium* had been present in the water column at a concentration of ≥ 40 cells/L in the preceding week, often following an extended bloom period. Three events bear further scrutiny: In pod 18 (June 2015), PST in mussels were reported at > MPL but *Alexandrium* above threshold was not observed either in the concurrent week, or in the preceding two weeks. However PST had been reported in mussels at > 0.5 MPL in the previous four weeks following an exceptional PST event, so it is unlikely that the event would have been missed. In pod 52 (April 2012), PST increased from <RL to > MPL in the space of a week. However, phytoplankton monitoring at this pod did not begin until the same week as the toxic event and it appears that the *Alexandrium* bloom was over by then. This had the potential to be a 'missed-event' as there was no early warning from the toxin testing and no phytoplankton data available. In pod 41 (July 2001), the MBA gave a positive result, with PST from MBA either being 'not detected' or not available in the preceding four weeks. *Alexandrium* was absent from the water column in the same week as the event, but had been present at 20 cells/L in the preceding week (the threshold level for *Alexandrium* until 21st July 2014).

Trends in *Dinophysis* shown in Figure A8 (monthly averages) are confirmed in Figure A10; occasions where *Dinophysis* and LT both exceeded action thresholds were common. Toxin levels are only shown from July 2011 onwards when measurements of LT (including okadaic acid equivalent) began using a properly quantifiable method (superceding the MBA). *Dinophysis* exceeded action thresholds in most pods, most years but there were no obvious trends in relation to change in bloom frequency/intensity occurring over the period 2000 – 2015. 'Interest events' were the most common for *Dinophysis* but these were mostly attributable to retention of LT toxins following a bloom (as per previous comments). This is particularly evident for pods around the Shetland Islands in 2013. In relation to potential 'missed events' there were a number of occasions when *Dinophysis* was present in the water column but at concentrations < 100 cells/L in the weeks, preceding the DSP toxic event. However, in most cases LT had been detected in mussels at > 0.5 MPL in the preceding four weeks. This applies to pod 36 (June 2015), pod 48 (September 2012), pod 65 (September 2013) and pod 8 (September 2011). Phytoplankton sampling did not begin in pod 8 until September 2015, hence the LT toxicity occurring in June was not predicted, although there was an increase in toxins, which were detected at > 0.5 MPL the preceding week. A genuine 'missed-event' occurred in pod 18 in June

2015, when toxin levels rose from < 0.5 MPL to above threshold within a week, but *Dinophysis* was present at below threshold levels in the preceding weeks. Also, the other possible causative oganism, *Prorocentrum lima*, had been detected at low levels not exceeding threshold in the preceding weeks. One possible explanation is that due to the nature of this pod it is never sampled at high tide and had indeed been sampled at low tide in the weeks leading up to the LT event. However, *Dinophysis* blooms were detected from samples collected at low tide in the weeks following the event, so the state of the tide may not have been an issue. Another genuine 'missed-event' occurred in pod 56 (April 2012) when LT levels rose to > MPL, having been <RL in the preceding four weeks. *Dinophysis* was absent in the water in the concurrent week and the preceding two weeks, but no phytoplankton data were available for the period before then. There were also other occasions where LT rose rapidly from low levels to > MPL, notably pod 48 (June 2015), pod 42 (July 2015), pod 6 (August 2014) and pod 22 (October 2014). However, all these events were preceded by *Dinophysis* blooms.

For *Pseudo-nitzschia* a seasonal trend is clear (Figure A11), compared with *Alexandrium* and *Dinophysis*, *Pseudo-nitzschia* appeared to have a longer season (Mar - Sep) and was present more often, but at levels that were usually below thresholds (e.g. pods 22, 23, 24). There is some evidence of a spring and late-summer/autumn bloom, with lower concentrations in early summer and several pods recorded *Pseudo-nitzschia* as being present all year round (e.g. pods 67, 68). As with *Alexandrium* and *Dinophysis*, there were no obvious trends in relation to change in bloom frequency/intensity occurring over the period 2000-15. Perhaps because there are relatively few events where DA toxins exceed the MPL, there appears to be only one occasion when DA levels were above 20 mg/kg in the absence of a *Pseudo-nitzschia* bloom (pod 7, June 2002). DA toxins also exceeded MPL in pod 23 (September 2001), but this followed a *Pseudo-nitzschia* bloom that had occurred two weeks previously. The exercise was repeated with the DA toxin threshold set at 10 mg/kg to identify further potential 'interest-events'. Two others were identified, both occurring in September (pod 22, 2008 and pod 48, 2011) and associated with *Pseudo-nitzschia* blooms at approximately half the regulatory threshold.

4 Estimated biotoxin prevalence and risk assessment for mussels

4.1 Estimated biotoxin prevalence for mussels

For DA models were fitted to DA > 0 mg/kg and DA > 5 mg/kg. Due to very few mussel samples exceeding 10 and 20 mg/kg these cut-off levels could not be modelled. For PST models were fitted to PST > 0, 400 and 800 µg/kg. For LT models were fitted to the number of samples for which LT (either based on the MBA or on more recent LC-MS/MS results) exceeded the MPL. All of these models contain terms for month, group, year, and a month by group interaction (i.e. toxin pattern during the months of the years differs between pod groups). Results are presented over months of the year (Section 4.1.1), over years (Section 4.1.2) and over months of the year broken down by pod group (Section 4.1.3).

4.1.1 Estimated prevalence over months for DA, PST and LT in mussels

Figure 9 shows the predicted proportion of mussel samples exceeding a given limit over the 12 months of the year, for an average year and an average location. The average of the data is also shown. The estimated and observed proportions of samples testing positive for DA are shown in blue, and the estimated and observed proportions of samples for which DA > 5 mg/kg are shown in orange. As expected, the proportion of samples tested positive is higher than the proportion of samples exceeding 5 mg/kg. DA tends to peak in late summer.

For PST the observed and predicted proportion of samples > 0, > 400 and > 800 µg/kg are shown. Again, as expected, the proportion of samples exceeding the MPL is less than the proportion of samples exceeding half the limit, which in turn is less than proportion of samples testing positive. PST tends to peak in early summer.

For LT, the predicted percentage of samples exceeding the MPL is close to 0% for Jan-Mar and then gradually increases to 17% in August, followed by a decrease in subsequent months.

For all three toxins there is good agreement between the model predictions and the data. It is worth pointing out that the estimated toxin pattern shows a gradual increase followed by a gradual decrease over months. This is despite the model not having a smoothness requirement, i.e. the model estimates the prevalence for each month independently of the prevalence during previous or subsequent months. Furthermore, the estimated toxin prevalence pattern is similar for each of the toxin limits modelled. For example, PST peaks in June and tails off in August and September. This pattern is observed in the data and is also predicted for PST > 0, PST > 400 and PST > 800 µg/kg, despite the models being fitted to each of these three datasets independently. The same applies to DA > 0 and DA > 5 mg/kg. This is reassuring in that although our models are ‘crude’ (no allowance for a smooth change in prevalence, no allowance for similar patterns between toxin levels), they do capture the features observed in the data and allow for the development of monitoring frequencies that smoothly increase and then decrease during the year.

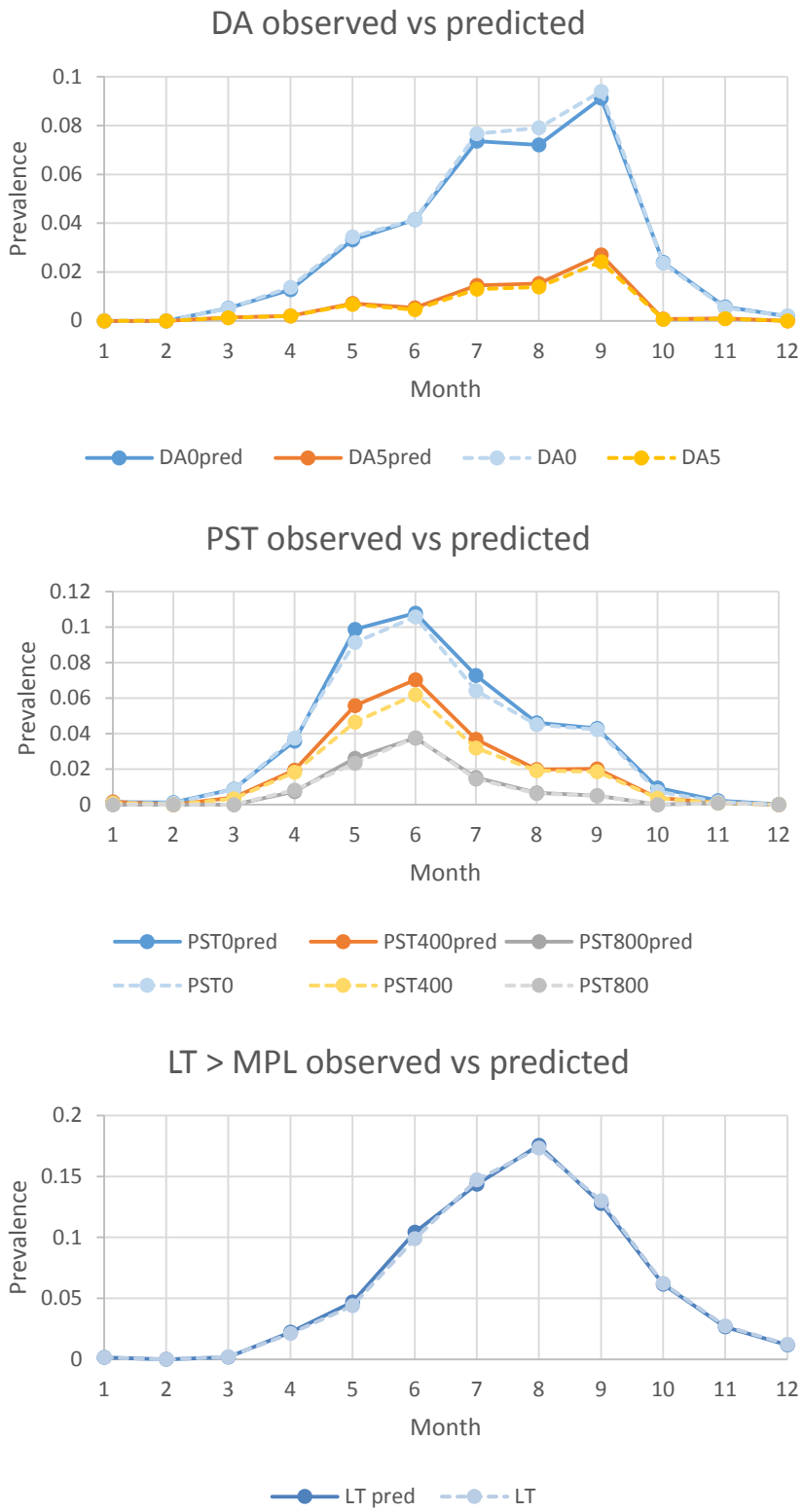

Figure 9: Predicted (solid line) and observed (dashed line) proportion of mussel samples exceeding a given limit, for each month. The prediction is for an average year and an average pod group. Top figure shows the proportion of samples for which DA > 0 mg/kg and DA > 5 mg/kg. Middle figure: proportion of samples for which PST > 0 µg/kg, PST > 400 µg/kg, PST > 800 µg/kg. Bottom figure: proportion of samples for which LT > MPL.

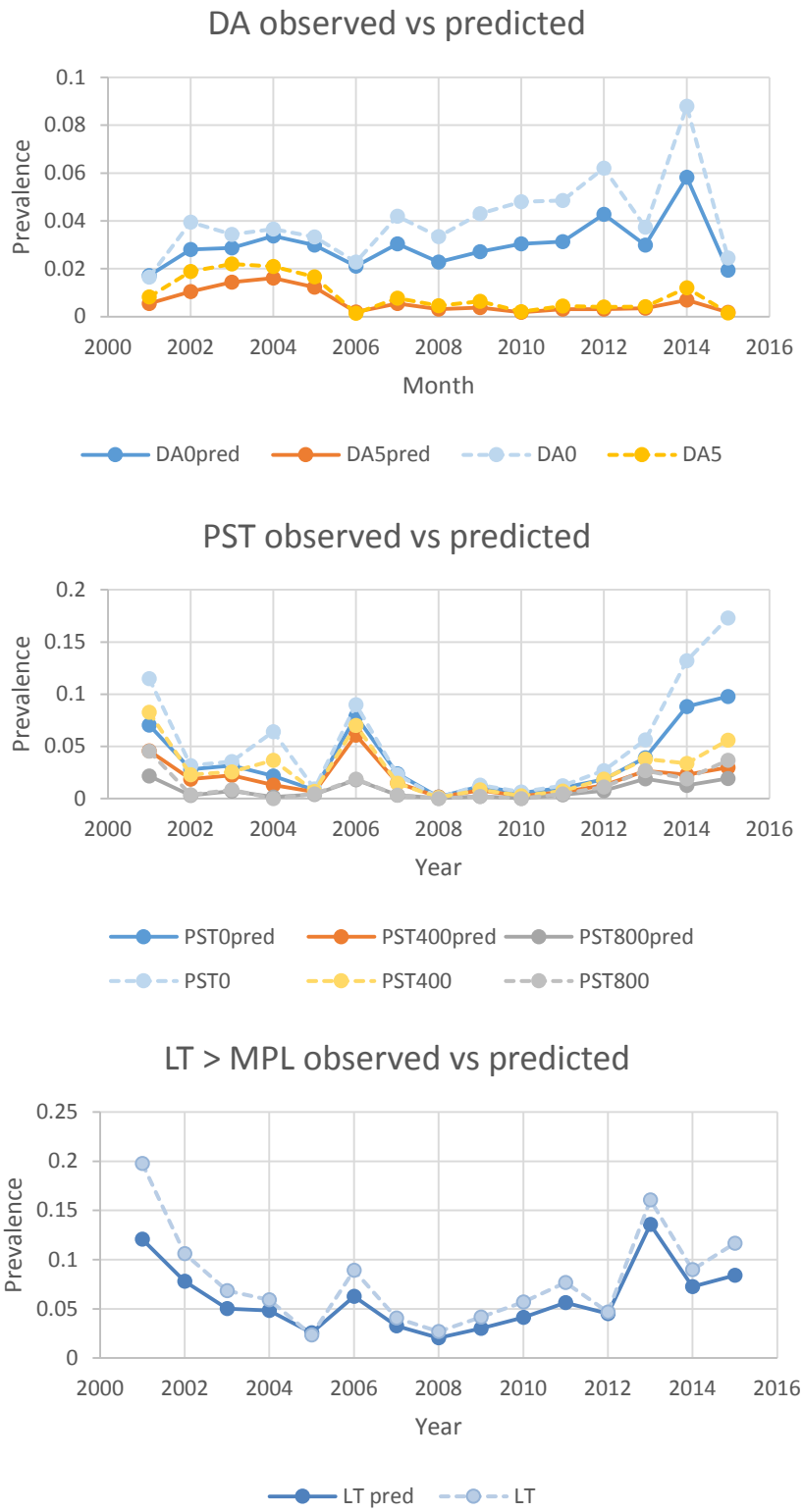

Figure 10: Predicted (solid line) and observed (dashed line) proportion of mussel samples exceeding a given limit, for each year. Top figure shows the proportion of samples for which DA > 0 mg/kg and DA > 5 mg/kg. Middle figure: proportion of samples for which PST > 0 µg/kg, PST > 400 µg/kg, PST > 800 µg/kg. Bottom figure: proportion of samples for which LT > MPL.

4.1.2 Estimated prevalence over years for DA, PST and LT in mussels

Figure 10 shows the predicted prevalence patterns over 2001-15. As was the case for the prevalence for each month of the year, the prevalence of a given biotoxin over years shows a similar pattern for each of the cut-off levels. The only exception is the proportion of mussel samples testing positive for PST. This shows a marked increase in 2013-2015, which is not reflected by the proportion of samples exceeding 400 or 800 µg/kg. A possible explanation may be that the HPLC method is more sensitive in detecting low levels of PST than the MBA, which was abandoned in August 2011. Furthermore, the model tends to give slightly lower predictions than the data. This is partially due to the data being biased (i.e. more frequent sampling during months of the year when toxin levels are high) and is partially due to the model regarding year as a random effect (i.e. some shrinkage towards the overall mean, more fully explained on page 24).

Comparison of toxin patterns between the three biotoxins shows that a 'bad' toxin year does not necessarily apply to all three toxins. This can be seen for 2006 were PST was prevalent whereas DA prevalence was low. This is because the growth of the different causative organisms is promoted by different environmental conditions.

4.1.3 Estimated prevalence per month and group for DA, PST and LT in mussels

DA

Table B34[3] shows the estimated probability of DA in mussels exceeding 5 mg/kg, broken down by group and month. During December, January and February this probability is less than 0.1% for all groups. For four groups (WC-LochLevenEil, NWC-LochTorridon, Shetland-W-VementryVoe and Shetland-N-Uyea) this probability is less than 1% throughout the year. DA is most prevalent in September, particularly in Shetland-SE-DalesVoe (8.6%), Lewis-LochRoag (8%), Shetland-SW-GrutingVoe (6.8%), and WC-LochMelfort (6.4%). These locations also show a high risk of DA in mussels testing positive (Table B35), between 12 and 36% in September.

Groups that show high estimated prevalence for DA correspond to groups with high observed average and maximum DA concentrations in mussels (Table 17).

PST

The estimated probability of PST in mussels exceeding 800 µg/kg, broken down by group and month, is less than 0.01% during October and Dec-Mar, for all groups (Table B36). During November this probability is less than 0.5% for all pod groups. Prevalence is highest during May-Jul. Locations for which more than an estimated 10% of the samples would exceed MPL are Ayr-LochStriven (12.8%), Ayr-other (16.8%), WC-Gigha (10.3%), Skye-LochEishort (11%), NWC-LochTorridon (15.6%), NWC-LochLaxfordInchard (11.4%), Tain (12.4%) and Orkney (14.5%). These same groups also have the highest estimated probability of PST exceeding 400 µg/kg (Table B37), with up to 28% of the samples exceeding this limit during May-Jul. Mull-LochScridain also shows high prevalence (up to 31% of the samples exceeding 0.5 MPL during June). The pattern for PST testing positive (Table B38) is similar to

[3]Table numbers beginning with 'B' are presented in Appendix B.

that for PST > 400 µg/kg. The only pod group that flags up high values in April is Ayr-other. This is consistent for PST > 0, > 400 and > 800 µg/kg.

Pod-groups that show high estimated prevalence for PST correspond to groups with high observed average and maximum PST concentrations in mussels (Table 18).

LT

During January, February and March the estimated probability of LT in mussels exceeding MPL is less than 1% for all groups (Table B39). During May-Oct prevalence exceeds 20% for several locations: EastCoast, Ayr-LochStriven, Ayr-LochFyneArdkinglas, Ayr-other, WC-Lochaber, Mull-LochScridain, Skye-LochEishort, Lewis-LochRoag, NWC-LochLaxfordInchard, Shetland-SW-Vaila, Shetland-W-AithVoe, and Shetland-W-RonasVoe.

Groups that show high estimated prevalence for LT correspond to groups with high observed proportion of mussel samples with LT levels exceeding MPL (Table 19).

4.1.4 Estimated prevalence for AZA, OA and YTX in mussels

Models were fitted to mussel test results from 2011-15 for AZA > 160, 80 and 0 µg/kg, OA > 160, 80 and 0 µg/kg and YTX > 0 mg/kg. These contained effect for month and group. As the time course of these data is relatively short (June 2011 to September 2015) and does not run over a complete set of years, it was not possible to reliably estimate year effects and group-specific patterns of prevalence of the months of the year.

AZA in mussels

Figure 11 shows the predicted patterns and the observed data for AZA exceeding 160, 80 and 0 µg/kg over the 12 months of the year. There is some shrinkage towards the overall mean (more fully explained on page 24) The observed and predicted proportion of the samples exceeding a given limit follows the same pattern for each of the three cut-off levels. AZA peaks during Aug – Nov. From February to July less than 0.01% of the samples are estimated to exceed 160 µg/kg (Table B40) for all pod groups and less than 1% of the samples to exceed 80 µg/kg (Table B41) for all pod groups. During October, the average prevalence of positive AZA is estimated to be 7%, but exceeds 25% for Orkney, Shetland-N-Basta and Shetland-N-Uyea (Table B42). From April to July less than 1% of the samples are estimated to give a positive test result (Table B42), for all pod groups.

Pod groups with the highest estimated prevalence of AZA > 160 µg/kg (Table B40) correspond to groups for which data exceeded 160 µg/kg (Tables 21 and B9). These are Skye-other, Lewis-LochLeurbostErisort, Lewis-LochRoag, Shetland-N-Basta and Shetland-N-Uyea.

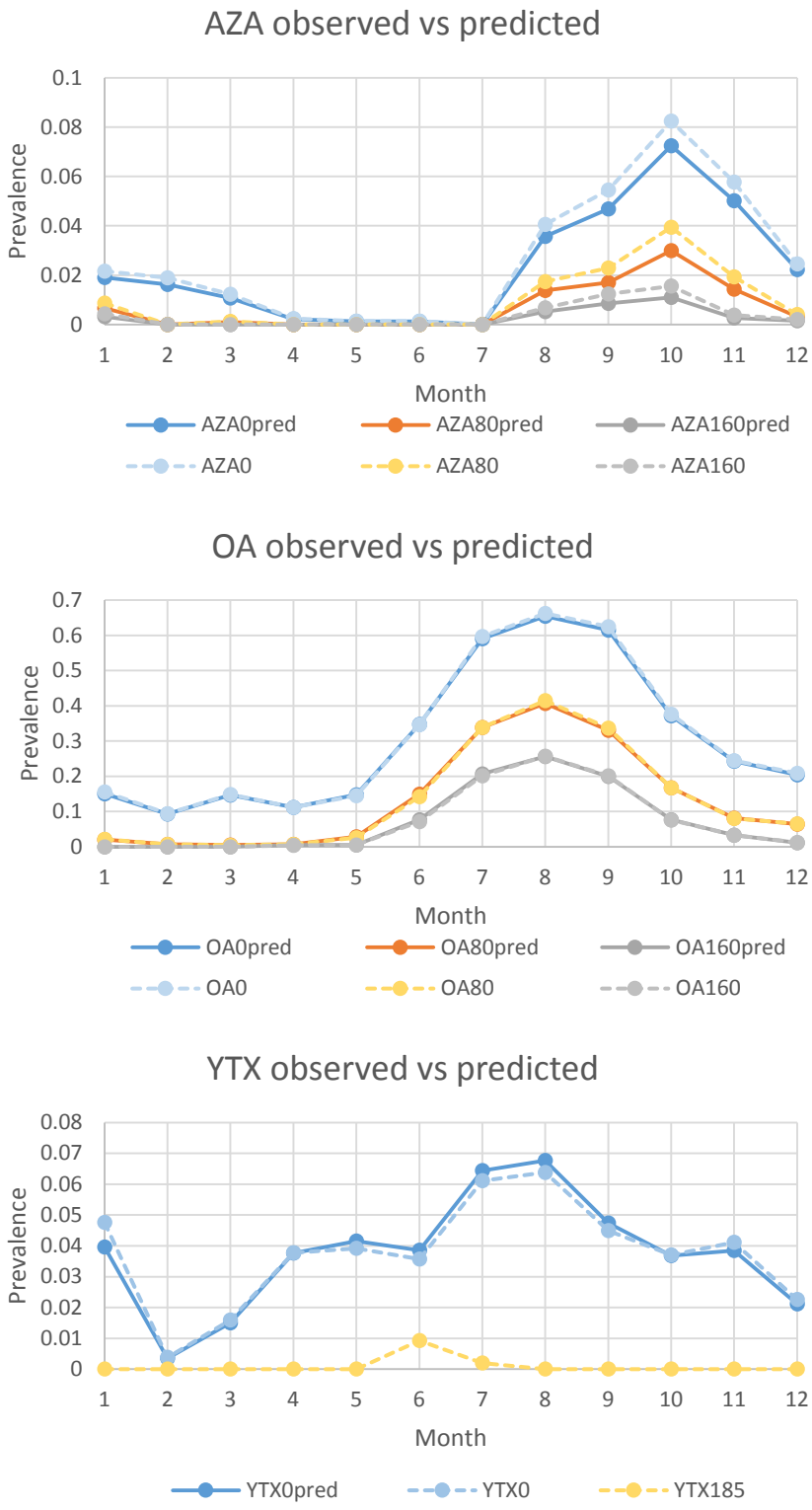

Figure 11: Predicted (solid line) and observed (dashed line) proportion of mussel samples exceeding a given limit, for each year, based on data from 2011-15.Top figure shows the proportion of samples for which AZA > 0, 80 or 160 µg/kg. Middle figure: proportion of samples for which OA > 0, 80 or 160 µg/kg. Bottom figure: proportion of samples for which YTX > 0 or >1.85 mg/kg (no models were fitted to the latter).

OA in mussels

The patterns observed and predicted for OA exceeding 160, 80 and 0 µg/kg over the 12 months of the year are consistent between these cut-offs. OA is most prevalent during July, August and September (Figure 11). During August the chance of mussels containing OA is 65% on average, (Figure 11), and there is still a 25% chance of levels exceeding 160 µg/kg. For individual (groups of) pods the chance of a sample exceeding 160 µg/kg can be as high as 70% (EastCoast and Ayr-LochStriven, see Table B43). During January, February and March however less than 0.02% of the samples are estimated to exceed 160 µg/kg for all groups of pods (Table B43). When looking at half the MPL we see that even during Jan-Mar prevalence exceeds 10% (Table B44). There are only two groups of pods for which the estimated prevalence is relatively low. These are Dumfries and Orkney, but even for those locations the chance of positive OA ranges from 13 to 22% during July, August and September (Table B45).

YTX in mussels

Positive YTX samples are likely to occur all year round, with, on average, a prevalence of 2 to 7% (see Figure 11) between Apr-Jan. The six pod groups for which positive YTX is most prevalent are Ayr-LochStriven, Ayr-LochFyneArdkinglas, Ayr-other, WC-LochMelfort, WC-LochCreranLinnhe, and Shetland-SW-GrutingVoe (Table B46). For these locations the average prevalence is 15% or more and this increases to nearly 37% during August.

It should be noted however, that although YTX is likely to exceed 0 mg/kg, only nine out of 8,875 samples exceeded 1.85 mg/kg (half the MPL). These samples were collected in June and July and came from Ayr-LochStriven and Ayr-LochFyneArdkinglas (Table B15).

4.2 Assessment of the current monitoring scheme for mussels

Table 5 gives the current monitoring frequencies for DA, PST and LT in mussels. These are monthly, fortnightly or weekly. For LT the frequency is weekly all year round for all pods, except during January and February when monthly sampling takes place. For DA and PST the sampling frequencies vary between groups of pods, with some groups sampled monthly throughout the year whereas for other groups the frequency is intensified to fortnightly or weekly for part of the year. Combining these monitoring frequencies with the prevalence estimated from our models allows for determination of the likelihood of missing a toxic event based on the current monitoring frequencies.

4.2.1 DA in mussels

The current monitoring frequencies for DA are pod and month specific (Table 5), with monthly monitoring taking place throughout the year for about half of the groups. For the remaining groups, fortnightly or weekly monitoring occurs during part of the summer months. With these frequencies the risk of missing a toxic event (i.e. DA in mussels exceeding 5 mg/kg) is estimated to be less than 1% during Oct-Apr (Table 24). During the summer months, this risk goes up to 3.4% (WC-LochMelfort) and 3.3% (NWC-LochLaxfordInchard). For all other groups this risk remains below 3%

throughout the year. To keep the risk below 1%, the sampling frequency will need to be increased during the summer months for several locations.

Table 25 shows the risk of not detecting positive DA in mussels with the current monitoring scheme. This risk is estimated to be less than 1% during Nov-Mar, with the exception of WC-LochMelfort (risk of 1.2% for both March and November). During the summer months this risk exceeds 1% for all groups.

It should be noted however that the MPL for DA is 20 mg/kg, well in excess of the 5 mg/kg cut-off that has been looked at here (there were insufficient samples exceeding 20, or even 10, mg/kg to allow for statistical modelling).

4.2.2 PST in mussels

The current monitoring frequencies for PST in mussels are month and pod specific (Table 5). Monthly monitoring throughout the year takes place for about a third of the groups, with the remaining groups being monitored fortnightly or weekly for part of the year. With the current frequencies, the risk of not detecting PST exceeding 800 µg/kg is less than 1% during Aug-Mar (Table 26). During Apr-Jul the risk exceeds 1% for Ayr-LochStriven (6.4%), Ayr-LochFyneArdkinglas (2.3%), Ayr-other (8.4%), WC-Gigha (7.7%), HarrisUist (1.6%) and NWC-LochTorridon (1.5%). For these locations, the risk of not detecting PST > 400 µg/kg (Table 27) increases to 16%, and increases to 20% when looking at the risk of not detecting positive PST samples (Table 28). There are 11 additional groups for which the risk of not detecting positive PST exceeds 1%, with a maximum of 8.4%.

4.2.3 LT in mussels

The current monitoring frequency is the same across all pods, with weekly sampling throughout the year except for January and February were monthly sampling takes place (Table 5). As a consequence, the estimated risk of not detecting LT exceeding MPL is estimated to be zero during Mar-Dec (Table 29). During January and February this risk is estimated to be less than 0.5%. As the LT data (which are expressed as below or above MPL) encompass the AZA, OA and YTX results, a separate risk assessment of these biotoxins has not been performed.

Table 24: Risk (%) of not detecting DA exceeding 5 mg/kg in mussels, based on the current monitoring scheme (as shown in Table 5), for an average year. Risk exceeding 1% is highlighted in orange, risk less than 0.01% shown in grey. The right hand side of the table shows the current sampling frequency (red (4) = weekly, yellow (2) = fortnightly, white (1) = monthly).

		Risk of not detecting DA > 5 mg/kg based on current monitoring scheme												Current monitoring scheme											
Group	GroupName	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J	F	M	A	M	J	J	A	S	O	N	D
G80	EastCoast	0.00	0.00	0.05	0.08	0.27	0.20	0.54	0.56	0.98	0.03	0.04	0.00	1	1	1	1	1	1	1	1	1	1	1	1
G26	Dumfries	0.00	0.00	0.04	0.07	0.24	0.18	0.47	0.49	0.84	0.02	0.03	0.00	1	1	1	1	1	1	1	1	1	1	1	1
G8	Ayr-LochStriven	0.00	0.00	0.04	0.06	0.22	0.16	0.43	0.44	0.76	0.02	0.03	0.00	1	1	1	1	1	1	1	1	1	1	1	1
P16	Ayr-LochFyneArdkinglas	0.00	0.00	0.06	0.09	0.32	0.24	0.64	0.66	1.27	0.03	0.05	0.00	1	1	1	1	1	1	1	1	1	1	1	1
G18	Ayr-other	0.00	0.00	0.07	0.10	0.34	0.26	0.91	0.68	1.15	0.03	0.05	0.00	1	1	1	1	1	1	1	1	1	1	1	1
G123	WC-Gigha	0.00	0.00	0.06	0.08	0.30	0.22	0.59	0.61	1.07	0.03	0.04	0.00	1	1	1	1	1	1	1	1	1	1	1	1
P6	WC-LochMelfort	0.00	0.00	0.27	0.37	1.37	1.02	3.36	1.69	3.24	0.09	0.20	0.00	1	1	1	2	1	1	1	2	2	2	1	1
G10	WC-LochEtive	0.00	0.00	0.06	0.05	0.26	0.20	0.52	0.35	0.59	0.02	0.04	0.00	1	1	1	2	1	1	1	2	2	2	1	1
G9	WC-LochCreranLinnhe	0.00	0.00	0.06	0.09	0.32	0.24	0.74	0.65	1.25	0.03	0.05	0.00	1	1	1	1	1	1	1	1	1	1	1	1
G31	WC-LochLevenEil	0.00	0.00	0.03	0.05	0.18	0.13	0.35	0.36	0.62	0.02	0.03	0.00	1	1	1	1	1	1	1	1	1	1	1	1
G28	WC-Lochaber	0.00	0.00	0.12	0.18	1.00	0.54	1.15	0.86	2.06	0.07	0.09	0.00	1	1	1	1	1	1	1	2	1	1	1	1
P5	Mull-LochSpelve	0.00	0.00	0.15	0.14	0.75	0.56	1.41	1.48	1.91	0.05	0.11	0.00	1	1	1	2	1	1	1	2	2	2	1	1
P7	Mull-LochScridain	0.00	0.00	0.11	0.17	0.38	0.00	0.74	0.00	0.00	0.04	0.08	0.00	1	1	1	1	2	4	2	4	4	2	1	1
G1	Mull-other	0.00	0.00	0.06	0.08	0.29	0.26	0.57	0.60	1.02	0.03	0.04	0.00	1	1	1	1	1	1	1	1	1	1	1	1
P41	Skye-LochEishort	0.00	0.00	0.06	0.09	0.37	0.23	0.40	0.41	0.70	0.02	0.04	0.00	1	1	1	1	1	1	2	2	2	2	1	1
G42	Skye-other	0.00	0.00	0.23	0.34	1.48	1.00	1.61	2.22	2.39	0.08	0.18	0.00	1	1	1	1	1	1	2	2	2	2	1	1
G21	Lewis-LochLeurbostErisort	0.00	0.00	0.09	0.14	0.48	0.36	0.92	0.86	1.19	0.03	0.07	0.00	1	1	1	1	1	1	1	2	2	2	1	1
G23	Lewis-LochRoag	0.00	0.00	0.27	0.39	1.19	0.69	2.17	0.00	0.00	0.11	0.20	0.00	1	1	1	1	1	2	2	4	4	2	1	1
G22	HarrisUist	0.00	0.00	0.10	0.14	0.49	0.37	1.09	0.73	1.46	0.03	0.07	0.00	1	1	1	1	1	1	1	2	2	2	1	1
G35	NWC-LochTorridon	0.00	0.00	0.03	0.05	0.18	0.13	0.35	0.36	0.62	0.02	0.03	0.00	1	1	1	1	1	1	1	1	1	1	1	1
G39	NWC-LochEweBroom	0.00	0.00	0.11	0.16	0.78	0.42	1.08	1.09	2.11	0.06	0.08	0.00	1	1	1	1	1	1	1	1	1	1	1	1
G48	NWC-LochLaxfordInchard	0.00	0.00	0.15	0.23	0.78	0.58	1.88	1.69	3.26	0.08	0.11	0.00	1	1	1	1	1	1	1	1	1	1	1	1
G49	NWC-other	0.00	0.00	0.06	0.09	0.30	0.22	0.69	0.61	1.03	0.03	0.04	0.00	1	1	1	1	1	1	1	1	1	1	1	1
P38	Tain	0.00	0.00	0.05	0.07	0.24	0.18	0.48	0.49	0.85	0.02	0.03	0.00	1	1	1	1	1	1	1	1	1	1	1	1
G54	Orkney	0.00	0.00	0.06	0.09	0.32	0.24	0.65	0.67	1.16	0.03	0.05	0.00	1	1	1	1	1	1	1	1	1	1	1	1
G67	Shetland-SE-CliftSound	0.00	0.00	0.10	0.15	0.54	0.40	1.20	0.83	1.33	0.04	0.08	0.00	1	1	1	1	1	1	1	2	2	2	1	1
G56	Shetland-SE-DalesVoe	0.00	0.00	0.26	0.38	1.30	0.76	0.00	0.00	0.00	0.09	0.19	0.00	1	1	1	1	1	2	4	4	4	2	1	1
G57	Shetland-SE-SandsoundWeisdale	0.00	0.00	0.19	0.27	0.94	0.70	1.99	1.96	2.29	0.06	0.14	0.00	1	1	1	1	1	1	1	2	2	2	1	1
P61	Shetland-SW-GrutingVoe	0.00	0.00	0.16	0.23	0.77	0.59	0.97	0.97	0.00	0.05	0.12	0.00	1	1	1	1	1	1	2	2	4	2	1	1
P68	Shetland-SW-Vaila	0.00	0.00	0.13	0.19	0.66	0.49	1.08	0.00	0.00	0.04	0.10	0.00	1	1	1	1	1	1	2	4	4	2	1	1
P72	Shetland-W-AithVoe	0.00	0.00	0.08	0.11	0.40	0.30	0.78	0.81	1.38	0.04	0.07	0.00	1	1	1	1	1	1	1	1	1	1	1	1
P64	Shetland-W-BustaVoe	0.00	0.00	0.12	0.18	0.63	0.55	1.17	1.23	2.73	0.06	0.09	0.00	1	1	1	1	1	1	1	1	1	1	1	1
P70	Shetland-W-OlnaFirth	0.00	0.00	0.10	0.15	0.54	0.40	1.22	1.24	1.86	0.05	0.08	0.00	1	1	1	1	1	1	1	1	1	1	1	1
G58	Shetland-W-VementryVoe	0.00	0.00	0.04	0.06	0.21	0.16	0.42	0.43	0.73	0.02	0.03	0.00	1	1	1	1	1	1	1	1	1	1	1	1
G71	Shetland-W-RonasVoe	0.00	0.00	0.05	0.07	0.26	0.19	0.52	0.53	0.92	0.03	0.04	0.00	1	1	1	1	1	1	1	1	1	1	1	1
P65	Shetland-N-Basta	0.00	0.00	0.07	0.11	0.39	0.29	0.78	0.80	1.60	0.04	0.06	0.00	1	1	1	1	1	1	1	1	1	1	1	1
G81	Shetland-N-Uyea	0.00	0.00	0.03	0.05	0.18	0.13	0.36	0.36	0.62	0.02	0.03	0.00	1	1	1	1	1	1	1	1	1	1	1	1

Table 25: Risk (%) of not detecting DA exceeding 0 mg/kg in mussels, based on the current monitoring scheme (as shown in Table 5), for an average year. Risk exceeding 1% is highlighted in orange, risk less than 0.01% shown in grey. The right hand side of the table shows the current sampling frequency (red (4) = weekly, yellow (2) = fortnightly, white (1) = monthly).

		Risk of not detecting DA > 0 mg/kg based on current monitoring scheme												Current monitoring scheme											
Group	GroupName	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J	F	M	A	M	J	J	A	S	O	N	D
G80	EastCoast	0.00	0.00	0.26	0.55	1.45	1.87	5.10	2.88	4.76	1.00	0.28	0.09	1	1	1	1	1	1	1	1	1	1	1	1
G26	Dumfries	0.00	0.00	0.14	0.30	0.81	1.34	1.71	1.65	1.91	0.55	0.15	0.05	1	1	1	1	1	1	1	1	1	1	1	1
G8	Ayr-LochStriven	0.00	0.00	0.20	0.40	1.08	1.40	3.69	2.61	2.90	0.72	0.21	0.07	1	1	1	1	1	1	1	1	1	1	1	1
P16	Ayr-LochFyneArdkinglas	0.00	0.00	0.13	0.28	0.75	0.99	1.56	1.50	2.09	0.51	0.14	0.05	1	1	1	1	1	1	1	1	1	1	1	1
G18	Ayr-other	0.00	0.00	0.19	0.37	0.95	1.20	3.68	2.00	3.35	0.63	0.20	0.09	1	1	1	1	1	1	1	1	1	1	1	1
G123	WC-Gigha	0.00	0.00	0.44	1.18	2.21	3.51	5.13	6.50	9.43	1.97	0.47	0.16	1	1	1	1	1	1	1	1	1	1	1	1
P6	WC-LochMelfort	0.00	0.01	1.16	4.81	6.34	7.74	16.94	5.55	17.80	3.74	1.21	0.43	1	1	1	2	1	1	1	2	2	2	1	1
G10	WC-LochEtive	0.00	0.00	0.32	0.31	1.46	1.41	3.15	2.25	2.15	0.53	0.34	0.08	1	1	1	2	1	1	1	2	2	2	1	1
G9	WC-LochCreranLinnhe	0.00	0.00	0.28	0.56	1.72	1.94	8.10	3.42	4.35	0.94	0.30	0.10	1	1	1	1	1	1	1	1	1	1	1	1
G31	WC-LochLevenEil	0.00	0.00	0.10	0.20	0.54	0.89	1.08	1.02	1.16	0.37	0.10	0.03	1	1	1	1	1	1	1	1	1	1	1	1
G28	WC-Lochaber	0.00	0.00	0.34	0.66	5.60	2.41	3.39	3.01	5.74	1.46	0.36	0.13	1	1	1	1	1	1	1	2	1	1	1	1
P5	Mull-LochSpelve	0.00	0.00	0.56	0.69	3.32	4.57	10.36	7.74	6.65	1.16	0.59	0.20	1	1	1	2	1	1	1	2	2	2	1	1
P7	Mull-LochScridain	0.00	0.00	0.45	0.88	3.26	0.00	3.65	0.00	0.00	0.97	0.48	0.16	1	1	1	1	2	4	2	4	4	2	1	1
G1	Mull-other	0.00	0.00	0.28	0.78	1.39	4.39	3.70	3.21	3.68	1.00	0.30	0.10	1	1	1	1	1	1	1	1	1	1	1	1
P41	Skye-LochEishort	0.00	0.00	0.18	0.38	1.33	1.64	1.61	1.21	1.80	0.45	0.20	0.06	1	1	1	1	1	1	2	2	2	2	1	1
G42	Skye-other	0.00	0.00	0.72	1.83	8.22	7.09	6.32	7.63	9.21	1.44	0.74	0.27	1	1	1	1	1	1	2	2	2	2	1	1
G21	Lewis-LochLeurbostErisort	0.00	0.00	0.40	0.81	2.39	4.71	4.25	4.17	5.75	0.84	0.58	0.15	1	1	1	1	1	1	1	2	2	2	1	1
G23	Lewis-LochRoag	0.00	0.00	0.48	0.89	2.19	2.20	4.78	0.00	0.00	1.68	0.50	0.18	1	1	1	1	1	2	2	4	4	2	1	1
G22	HarrisUist	0.00	0.00	0.33	0.65	1.45	2.82	6.01	6.78	3.01	1.09	0.36	0.13	1	1	1	1	1	1	1	2	2	2	1	1
G35	NWC-LochTorridon	0.00	0.00	0.44	0.87	4.56	3.85	6.22	5.32	6.54	1.72	0.64	0.16	1	1	1	1	1	1	1	1	1	1	1	1
G39	NWC-LochEweBroom	0.00	0.00	0.73	2.79	5.63	4.41	3.57	4.00	12.41	1.55	0.54	0.19	1	1	1	1	1	1	1	1	1	1	1	1
G48	NWC-LochLaxfordInchard	0.00	0.00	0.40	1.08	2.45	2.63	5.61	7.10	9.49	1.30	0.43	0.15	1	1	1	1	1	1	1	1	1	1	1	1
G49	NWC-other	0.00	0.00	0.21	0.43	1.12	2.19	4.63	2.39	2.22	0.75	0.22	0.07	1	1	1	1	1	1	1	1	1	1	1	1
P38	Tain	0.00	0.00	0.48	0.98	2.40	2.78	4.86	3.94	5.46	10.33	0.99	0.18	1	1	1	1	1	1	1	1	1	1	1	1
G54	Orkney	0.00	0.00	0.23	0.49	1.37	1.79	2.96	3.51	3.32	0.92	0.25	0.08	1	1	1	1	1	1	1	1	1	1	1	1
G67	Shetland-SE-CliftSound	0.00	0.00	0.76	1.07	2.54	3.40	10.91	6.82	4.70	2.91	0.59	0.21	1	1	1	1	1	1	1	2	2	2	1	1
G56	Shetland-SE-DalesVoe	0.00	0.00	0.48	0.94	2.41	2.63	0.00	0.00	0.00	1.07	0.51	0.17	1	1	1	1	1	2	4	4	4	2	1	1
G57	Shetland-SE-SandsoundWeisdale	0.00	0.00	0.62	1.16	2.68	4.30	11.89	9.26	9.04	2.48	0.63	0.23	1	1	1	1	1	1	1	2	2	2	1	1
P61	Shetland-SW-GrutingVoe	0.00	0.00	0.41	0.80	1.95	2.92	3.70	4.23	0.00	1.19	0.43	0.15	1	1	1	1	1	1	2	2	4	2	1	1
P68	Shetland-SW-Vaila	0.00	0.00	0.36	0.73	1.86	2.75	4.50	0.00	0.00	1.07	0.39	0.13	1	1	1	1	1	1	2	4	4	2	1	1
P72	Shetland-W-AithVoe	0.00	0.00	0.41	0.84	2.90	3.41	4.93	5.46	6.50	1.91	0.60	0.15	1	1	1	1	1	1	1	1	1	1	1	1
P64	Shetland-W-BustaVoe	0.00	0.00	0.45	0.90	3.08	6.85	6.21	3.74	9.48	2.04	0.49	0.17	1	1	1	1	1	1	1	1	1	1	1	1
P70	Shetland-W-OlnaFirth	0.00	0.00	0.33	0.68	1.81	2.73	4.64	4.34	6.66	1.57	0.36	0.12	1	1	1	1	1	1	1	1	1	1	1	1
G58	Shetland-W-VementryVoe	0.00	0.00	0.20	0.43	1.13	1.78	2.80	2.44	2.90	1.01	0.22	0.07	1	1	1	1	1	1	1	1	1	1	1	1
G71	Shetland-W-RonasVoe	0.00	0.00	0.25	0.53	1.37	2.18	3.31	3.95	3.89	0.94	0.27	0.09	1	1	1	1	1	1	1	1	1	1	1	1
P65	Shetland-N-Basta	0.00	0.00	0.36	0.73	3.30	2.96	6.39	5.20	4.25	1.33	0.39	0.13	1	1	1	1	1	1	1	1	1	1	1	1
G81	Shetland-N-Uyea	0.00	0.00	0.28	0.41	1.38	2.09	3.16	1.67	2.27	0.93	0.21	0.07	1	1	1	1	1	1	1	1	1	1	1	1

Table 26: Risk (%) of not detecting PST exceeding 800 µg/kg in mussels, based on the current monitoring scheme (as shown in Table 5), for an average year. Risk exceeding 1% is highlighted in orange, risk less than 0.01% shown in grey. The right hand side of the table shows the current sampling frequency (red (4) = weekly, yellow (2) = fortnightly, white (1) = monthly).

		Risk of not detecting PST > 800 µg/kg based on current monitoring scheme												Current monitoring scheme									
Group	GroupName	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J	F	M	A	M	J	J	A	S	O	N	D
G80	EastCoast	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	1	1	2	4	4	4	4	4	4	2	1	1
G26	Dumfries	0.00	0.00	0.00	0.19	0.55	0.67	0.37	0.22	0.15	0.00	0.05	0.00	1	1	1	1	1	1	1	1	1	1	1	1
G8	Ayr-LochStriven	0.00	0.00	0.00	1.35	5.88	4.92	6.40	0.61	0.45	0.00	0.18	0.00	1	1	1	2	2	2	2	1	1	1	1	1
P16	Ayr-LochFyneArdkinglas	0.00	0.00	0.00	1.36	2.28	0.69	0.47	0.38	0.26	0.00	0.09	0.00	1	1	1	2	2	2	2	1	1	1	1	1
G18	Ayr-other	0.00	0.00	0.00	4.75	5.77	8.41	0.51	0.53	0.42	0.00	0.16	0.00	1	1	1	2	2	2	2	1	1	1	1	1
G123	WC-Gigha	0.00	0.00	0.00	0.39	1.27	7.71	2.21	0.47	0.32	0.00	0.10	0.00	1	1	1	1	1	1	1	1	1	1	1	1
P6	WC-LochMelfort	0.00	0.00	0.00	0.20	0.65	0.80	0.43	0.23	0.16	0.00	0.05	0.00	1	1	1	1	1	1	1	1	1	1	1	1
G10	WC-LochEtive	0.00	0.00	0.00	0.19	0.53	0.68	0.40	0.22	0.15	0.00	0.05	0.00	1	1	1	1	1	1	1	1	1	1	1	1
G9	WC-LochCreranLinnhe	0.00	0.00	0.00	0.19	0.58	0.65	0.40	0.22	0.15	0.00	0.05	0.00	1	1	1	1	1	1	1	1	1	1	1	1
G31	WC-LochLevenEil	0.00	0.00	0.00	0.17	0.53	0.57	0.30	0.18	0.13	0.00	0.05	0.00	1	1	1	1	1	1	1	1	1	1	1	1
G28	WC-Lochaber	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.00	1	2	4	4	4	4	4	4	4	2	1	1
P5	Mull-LochSpelve	0.00	0.00	0.00	0.21	0.65	0.85	0.44	0.24	0.16	0.00	0.06	0.00	1	1	1	1	1	1	1	1	1	1	1	1
P7	Mull-LochScridain	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	1	1	2	4	4	4	4	4	4	4	2	1
G1	Mull-other	0.00	0.00	0.00	0.21	0.44	0.57	0.28	0.25	0.17	0.00	0.05	0.00	1	1	1	1	2	2	2	1	1	1	1	1
P41	Skye-LochEishort	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.00	1	1	2	4	4	4	4	4	4	2	1	1
G42	Skye-other	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	1	1	2	4	4	4	4	4	4	2	1	1
G21	Lewis-LochLeurbostErisort	0.00	0.00	0.00	0.18	0.52	0.53	0.32	0.19	0.13	0.00	0.05	0.00	1	1	1	1	1	1	1	1	1	1	1	1
G23	Lewis-LochRoag	0.00	0.00	0.00	0.12	0.00	0.00	0.00	0.14	0.14	0.00	0.06	0.00	1	1	1	2	4	4	4	2	1	1	1	1
G22	HarrisUist	0.00	0.00	0.00	0.16	0.46	1.61	0.28	0.18	0.13	0.00	0.05	0.00	1	1	1	1	1	1	1	1	1	1	1	1
G35	NWC-LochTorridon	0.00	0.00	0.00	0.23	0.00	0.00	1.49	0.25	0.18	0.00	0.10	0.00	1	1	1	2	4	4	2	2	2	1	1	1
G39	NWC-LochEweBroom	0.00	0.00	0.00	0.17	0.33	0.40	0.23	0.20	0.14	0.00	0.05	0.00	1	1	1	1	2	2	2	1	1	1	1	1
G48	NWC-LochLaxfordInchard	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	1	1	2	4	4	4	4	4	4	2	1	1
G49	NWC-other	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.00	1	1	2	4	4	4	4	4	4	2	1	1
P38	Tain	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.00	1	1	2	4	4	4	4	4	4	2	1	1
G54	Orkney	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	2	2	4	4	4	4	4	4	4	4	2	1
G67	Shetland-SE-CliftSound	0.00	0.00	0.00	0.14	0.40	0.49	0.25	0.98	0.17	0.00	0.06	0.00	2	1	1	2	2	2	2	2	1	1	1	1
G56	Shetland-SE-DalesVoe	0.00	0.00	0.00	0.12	0.00	0.00	0.24	0.13	0.10	0.00	0.05	0.00	1	1	1	2	4	4	2	2	2	1	1	1
G57	Shetland-SE-SandsoundWeisdale	0.00	0.00	0.00	0.17	0.95	0.49	0.67	0.47	0.60	0.00	0.08	0.00	2	1	1	2	2	2	2	2	1	1	1	1
P61	Shetland-SW-GrutingVoe	0.00	0.00	0.00	0.18	0.53	0.63	0.35	0.20	0.14	0.00	0.05	0.00	1	1	1	1	1	1	1	1	1	1	1	1
P68	Shetland-SW-Vaila	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	1	1	2	4	4	4	4	4	4	4	2	1
P72	Shetland-W-AithVoe	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.21	0.00	1	1	2	4	4	4	4	4	4	4	2	1
P64	Shetland-W-BustaVoe	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	1	1	2	4	4	4	4	4	4	4	2	1
P70	Shetland-W-OlnaFirth	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	1	1	2	4	4	4	4	4	4	4	2	1
G58	Shetland-W-VementryVoe	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	1	1	2	4	4	4	4	4	4	4	2	1
G71	Shetland-W-RonasVoe	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	1	1	2	4	4	4	4	4	4	4	2	1
P65	Shetland-N-Basta	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	1	1	2	4	4	4	4	4	4	2	1	1
G81	Shetland-N-Uyea	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	1	1	2	4	4	4	4	4	4	2	1	1

Table 27: Risk (%) of not detecting PST exceeding 400 µg/kg in mussels, based on the current monitoring scheme (as shown in Table 5), for an average year. Risk exceeding 1% is highlighted in orange, risk less than 0.01% shown in grey. The right hand side of the table shows the current sampling frequency (red (4) = weekly, yellow (2) = fortnightly, white (1) = monthly).

		Risk of not detecting PST > 400 µg/kg based on current monitoring scheme												Current monitoring scheme											
Group	GroupName	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J	F	M	A	M	J	J	A	S	O	N	D
G80	EastCoast	0.08	0.00	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.05	0.00	1	1	2	4	4	4	4	4	4	2	1	1
G26	Dumfries	0.04	0.00	0.08	0.25	0.64	0.74	0.51	0.28	0.28	0.08	0.02	0.00	1	1	1	1	1	1	1	1	1	1	1	1
G8	Ayr-LochStriven	0.20	0.00	0.34	4.54	6.76	6.00	10.00	0.89	0.89	0.32	0.12	0.00	1	1	1	2	2	2	2	1	1	1	1	1
P16	Ayr-LochFyneArdkinglas	0.09	0.00	0.19	3.24	2.86	0.83	0.74	0.52	0.50	0.16	0.06	0.00	1	1	1	2	2	2	2	1	1	1	1	1
G18	Ayr-other	0.22	0.00	1.01	9.39	8.12	11.72	3.39	0.89	0.99	0.35	0.14	0.00	1	1	1	2	2	2	2	1	1	1	1	1
G123	WC-Gigha	0.13	0.00	0.27	0.78	1.97	16.09	7.04	0.93	0.93	0.26	0.08	0.00	1	1	1	1	1	1	1	1	1	1	1	1
P6	WC-LochMelfort	0.05	0.00	0.10	0.31	0.91	1.03	0.70	0.35	0.37	0.09	0.03	0.00	1	1	1	1	1	1	1	1	1	1	1	1
G10	WC-LochEtive	0.04	0.00	0.08	0.23	0.53	0.67	0.50	0.25	0.24	0.07	0.02	0.00	1	1	1	1	1	1	1	1	1	1	1	1
G9	WC-LochCreranLinnhe	0.04	0.00	0.08	0.23	0.60	0.62	0.51	0.25	0.26	0.07	0.02	0.00	1	1	1	1	1	1	1	1	1	1	1	1
G31	WC-LochLevenEil	0.03	0.00	0.07	0.20	0.53	0.53	0.38	0.21	0.22	0.06	0.02	0.00	1	1	1	1	1	1	1	1	1	1	1	1
G28	WC-Lochaber	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.07	0.00	1	2	4	4	4	4	4	4	4	2	1	1
P5	Mull-LochSpelve	0.05	0.00	0.09	0.28	0.74	0.97	0.62	0.32	0.31	0.09	0.03	0.00	1	1	1	1	1	1	1	1	1	1	1	1
P7	Mull-LochScridain	0.15	0.00	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	1	1	2	4	4	4	4	4	4	4	2	1
G1	Mull-other	0.06	0.00	0.12	0.35	2.45	0.70	0.44	0.41	0.40	0.11	0.04	0.00	1	1	1	1	2	2	2	1	1	1	1	1
P41	Skye-LochEishort	0.19	0.00	0.76	0.00	0.00	0.00	0.00	0.00	0.00	0.21	0.12	0.00	1	1	2	4	4	4	4	4	4	2	1	1
G42	Skye-other	0.11	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.07	0.00	1	1	2	4	4	4	4	4	4	2	1	1
G21	Lewis-LochLeurbostErisort	0.05	0.00	0.09	0.29	1.88	0.66	0.52	0.28	0.29	0.09	0.03	0.00	1	1	1	1	1	1	1	1	1	1	1	1
G23	Lewis-LochRoag	0.05	0.00	0.11	0.17	0.00	0.00	0.00	0.18	0.24	0.09	0.03	0.00	1	1	1	2	4	4	4	2	1	1	1	1
G22	HarrisUist	0.04	0.00	0.08	0.22	0.58	2.04	0.40	0.25	0.25	0.08	0.02	0.00	1	1	1	1	1	1	1	1	1	1	1	1
G35	NWC-LochTorridon	0.12	0.00	0.23	0.39	0.00	0.00	4.32	0.37	0.36	0.21	0.07	0.00	1	1	1	2	4	4	2	2	2	1	1	1
G39	NWC-LochEweBroom	0.04	0.00	0.09	0.25	0.42	1.07	0.36	0.28	0.29	0.08	0.03	0.00	1	1	1	1	2	2	2	1	1	1	1	1
G48	NWC-LochLaxfordInchard	0.18	0.00	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.11	0.00	1	1	2	4	4	4	4	4	4	2	1	1
G49	NWC-other	0.10	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.06	0.00	1	1	2	4	4	4	4	4	4	2	1	1
P38	Tain	0.12	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.07	0.00	1	1	2	4	4	4	4	4	4	2	1	1
G54	Orkney	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	2	2	4	4	4	4	4	4	4	4	2	1
G67	Shetland-SE-CliftSound	0.28	0.00	0.17	0.30	0.68	0.73	1.02	2.44	0.49	0.15	0.05	0.00	2	1	1	2	2	2	2	2	1	1	1	1
G56	Shetland-SE-DalesVoe	0.04	0.00	0.09	0.16	0.00	0.00	0.37	0.18	0.20	0.08	0.02	0.00	1	1	1	2	4	4	2	2	2	1	1	1
G57	Shetland-SE-SandsoundWeisdale	0.07	0.00	0.19	0.32	1.38	1.37	2.50	1.87	1.94	0.17	0.06	0.00	2	1	1	2	2	2	2	2	1	1	1	1
P61	Shetland-SW-GrutingVoe	0.07	0.00	0.15	0.40	0.91	1.03	1.64	0.43	3.85	0.13	0.04	0.00	1	1	1	1	1	1	1	1	1	1	1	1
P68	Shetland-SW-Vaila	0.14	0.00	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	1	1	2	4	4	4	4	4	4	4	2	1
P72	Shetland-W-AithVoe	0.18	0.00	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	1	1	2	4	4	4	4	4	4	4	2	1
P64	Shetland-W-BustaVoe	0.19	0.00	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	1	1	2	4	4	4	4	4	4	4	2	1
P70	Shetland-W-OlnaFirth	0.08	0.00	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	1	1	2	4	4	4	4	4	4	4	2	1
G58	Shetland-W-VementryVoe	0.13	0.00	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	1	1	2	4	4	4	4	4	4	4	2	1
G71	Shetland-W-RonasVoe	0.13	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	1	1	2	4	4	4	4	4	4	4	2	1
P65	Shetland-N-Basta	0.08	0.00	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.05	0.00	1	1	2	4	4	4	4	4	4	2	1	1
G81	Shetland-N-Uyea	0.10	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.06	0.00	1	1	2	4	4	4	4	4	4	2	1	1

Table 28: Risk (%) of not detecting PST exceeding 0 µg/kg in mussels, based on the current monitoring scheme (as shown in Table 5), for an average year. Risk exceeding 1% is highlighted in orange, risk less than 0.01% shown in grey. The right hand side of the table shows the current sampling frequency (red (4) = weekly, yellow (2) = fortnightly, white (1) = monthly).

		Risk of not detecting PST > 0 µg/kg based on current monitoring scheme												Current monitoring scheme											
Group	GroupName	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J	F	M	A	M	J	J	A	S	O	N	D
G80	EastCoast	0.07	0.07	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.21	0.10	0.00	1	1	2	4	4	4	4	4	4	2	1	1
G26	Dumfries	0.02	0.02	0.08	0.30	0.83	0.84	0.69	0.37	0.33	0.09	0.02	0.00	1	1	1	1	1	1	1	1	1	1	1	1
G8	Ayr-LochStriven	0.16	0.15	2.07	6.62	8.71	8.49	9.23	1.64	1.49	0.63	0.22	0.01	1	1	1	2	2	2	2	1	1	1	1	1
P16	Ayr-LochFyneArdkinglas	0.07	0.07	0.28	3.88	6.63	1.27	2.38	1.07	0.91	0.32	0.10	0.00	1	1	1	2	2	2	2	1	1	1	1	1
G18	Ayr-other	0.18	0.17	1.76	10.47	9.30	12.51	6.51	2.79	1.80	0.70	0.24	0.01	1	1	1	2	2	2	2	1	1	1	1	1
G123	WC-Gigha	0.15	0.15	0.58	3.99	6.87	20.29	13.84	2.34	4.48	0.73	0.22	0.01	1	1	1	1	1	1	1	1	1	1	1	1
P6	WC-LochMelfort	0.07	0.07	0.27	0.88	4.05	5.56	6.13	1.03	2.57	0.33	0.10	0.00	1	1	1	1	1	1	1	1	1	1	1	1
G10	WC-LochEtive	0.02	0.02	0.07	0.29	0.75	0.79	0.69	0.34	0.30	0.08	0.02	0.00	1	1	1	1	1	1	1	1	1	1	1	1
G9	WC-LochCreranLinnhe	0.02	0.02	0.08	0.31	0.89	0.80	0.75	0.36	0.34	0.09	0.02	0.00	1	1	1	1	1	1	1	1	1	1	1	1
G31	WC-LochLevenEil	0.01	0.01	0.06	0.24	0.71	0.65	0.48	0.26	0.26	0.07	0.02	0.00	1	1	1	1	1	1	1	1	1	1	1	1
G28	WC-Lochaber	0.10	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.27	0.14	0.00	1	2	4	4	4	4	4	4	4	2	1	1
P5	Mull-LochSpelve	0.02	0.02	0.10	0.37	1.10	1.16	0.90	0.45	0.40	0.11	0.03	0.00	1	1	1	1	1	1	1	1	1	1	1	1
P7	Mull-LochScridain	0.15	0.14	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.01	1	1	2	4	4	4	4	4	4	4	2	1
G1	Mull-other	0.05	0.04	0.20	0.73	4.84	2.48	0.93	0.90	0.80	0.23	0.06	0.00	1	1	1	1	2	2	2	1	1	1	1	1
P41	Skye-LochEishort	0.18	0.18	4.66	0.00	0.00	0.00	0.00	0.00	0.00	0.48	0.25	0.01	1	1	2	4	4	4	4	4	4	2	1	1
G42	Skye-other	0.08	0.08	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.11	0.00	1	1	2	4	4	4	4	4	4	2	1	1
G21	Lewis-LochLeurbostErisort	0.03	0.03	0.12	0.47	2.16	1.66	0.82	1.03	0.44	0.14	0.04	0.00	1	1	1	1	1	1	1	1	1	1	1	1
G23	Lewis-LochRoag	0.06	0.19	0.22	0.36	0.00	0.00	0.00	0.73	0.47	0.25	0.08	0.00	1	1	1	2	4	4	4	2	1	1	1	1
G22	HarrisUist	0.03	0.03	0.13	0.42	5.26	5.04	1.14	0.44	0.42	0.16	0.05	0.00	1	1	1	1	1	1	1	1	1	1	1	1
G35	NWC-LochTorridon	0.09	0.09	0.35	0.68	0.00	0.00	8.41	0.73	0.70	0.43	0.13	0.00	1	1	1	2	4	4	2	2	2	1	1	1
G39	NWC-LochEweBroom	0.04	0.03	0.15	0.53	1.49	2.93	1.39	0.61	0.59	0.17	0.05	0.00	1	1	1	1	2	2	2	1	1	1	1	1
G48	NWC-LochLaxfordInchard	0.15	0.14	0.32	0.00	0.00	0.00	0.00	0.00	0.00	0.39	0.21	0.01	1	1	2	4	4	4	4	4	4	2	1	1
G49	NWC-other	0.07	0.07	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.10	0.00	1	1	2	4	4	4	4	4	4	2	1	1
P38	Tain	0.12	0.11	0.32	0.00	0.00	0.00	0.00	0.00	0.00	0.35	0.16	0.01	1	1	2	4	4	4	4	4	4	2	1	1
G54	Orkney	0.08	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.01	2	2	4	4	4	4	4	4	4	4	2	1
G67	Shetland-SE-CliftSound	0.25	0.12	0.43	1.22	2.15	3.53	3.57	6.31	6.85	0.49	0.16	0.01	2	1	1	2	2	2	2	2	1	1	1	1
G56	Shetland-SE-DalesVoe	0.03	0.02	0.11	0.27	0.00	0.00	0.57	0.30	0.31	0.13	0.04	0.00	1	1	1	2	4	4	2	2	2	1	1	1
G57	Shetland-SE-SandsoundWeisdale	0.05	0.08	0.28	0.50	2.28	1.94	4.66	3.58	6.26	0.33	0.11	0.00	2	1	1	2	2	2	2	2	1	1	1	1
P61	Shetland-SW-GrutingVoe	0.08	0.08	0.32	0.91	4.48	2.91	5.05	4.80	4.49	0.37	0.11	0.00	1	1	1	1	1	1	1	1	1	1	1	1
P68	Shetland-SW-Vaila	0.16	0.16	0.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.01	1	1	2	4	4	4	4	4	4	4	2	1
P72	Shetland-W-AithVoe	0.20	0.19	0.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.20	0.01	1	1	2	4	4	4	4	4	4	4	2	1
P64	Shetland-W-BustaVoe	0.20	0.19	0.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.01	1	1	2	4	4	4	4	4	4	4	2	1
P70	Shetland-W-OlnaFirth	0.08	0.08	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	1	1	2	4	4	4	4	4	4	4	2	1
G58	Shetland-W-VementryVoe	0.15	0.15	0.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.01	1	1	2	4	4	4	4	4	4	4	2	1
G71	Shetland-W-RonasVoe	0.13	0.12	0.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.01	1	1	2	4	4	4	4	4	4	4	2	1
P65	Shetland-N-Basta	0.08	0.08	0.21	0.00	0.00	0.00	0.00	0.00	0.00	1.46	0.11	0.00	1	1	2	4	4	4	4	4	4	2	1	1
G81	Shetland-N-Uyea	0.10	0.09	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.14	0.00	1	1	2	4	4	4	4	4	4	2	1	1

Table 29: Risk (%) of not detecting LT exceeding MPL in mussels, based on the current monitoring scheme (as shown in Table 5), for an average year. Risk exceeding 1% is highlighted in orange, risk less than 0.01% shown in grey. The right hand side of the table shows the current sampling frequency (red (4) = weekly, yellow (2) = fortnightly, white (1) = monthly).

		Risk of not detecting LT exceeding MPL based on current monitoring scheme												Current monitoring scheme											
Group	GroupName	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J	F	M	A	M	J	J	A	S	O	N	D
G80	EastCoast	0.15	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1	1	4	4	4	4	4	4	4	4	4	4
G26	Dumfries	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1	1	4	4	4	4	4	4	4	4	4	4
G8	Ayr-LochStriven	0.49	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1	1	4	4	4	4	4	4	4	4	4	4
P16	Ayr-LochFyneArdkinglas	0.19	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1	1	4	4	4	4	4	4	4	4	4	4
G18	Ayr-other	0.47	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1	1	4	4	4	4	4	4	4	4	4	4
G123	WC-Gigha	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1	1	4	4	4	4	4	4	4	4	4	4
P6	WC-LochMelfort	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1	1	4	4	4	4	4	4	4	4	4	4
G10	WC-LochEtive	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1	1	4	4	4	4	4	4	4	4	4	4
G9	WC-LochCreranLinnhe	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1	1	4	4	4	4	4	4	4	4	4	4
G31	WC-LochLevenEil	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1	1	4	4	4	4	4	4	4	4	4	4
G28	WC-Lochaber	0.13	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1	1	4	4	4	4	4	4	4	4	4	4
P5	Mull-LochSpelve	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1	1	4	4	4	4	4	4	4	4	4	4
P7	Mull-LochScridain	0.17	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1	1	4	4	4	4	4	4	4	4	4	4
G1	Mull-other	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1	1	4	4	4	4	4	4	4	4	4	4
P41	Skye-LochEishort	0.15	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1	1	4	4	4	4	4	4	4	4	4	4
G42	Skye-other	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1	1	4	4	4	4	4	4	4	4	4	4
G21	Lewis-LochLeurbostErisort	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1	1	4	4	4	4	4	4	4	4	4	4
G23	Lewis-LochRoag	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1	1	4	4	4	4	4	4	4	4	4	4
G22	HarrisUist	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1	1	4	4	4	4	4	4	4	4	4	4
G35	NWC-LochTorridon	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1	1	4	4	4	4	4	4	4	4	4	4
G39	NWC-LochEweBroom	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1	1	4	4	4	4	4	4	4	4	4	4
G48	NWC-LochLaxfordInchard	0.24	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1	1	4	4	4	4	4	4	4	4	4	4
G49	NWC-other	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1	1	4	4	4	4	4	4	4	4	4	4
P38	Tain	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1	1	4	4	4	4	4	4	4	4	4	4
G54	Orkney	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1	1	4	4	4	4	4	4	4	4	4	4
G67	Shetland-SE-CliftSound	0.13	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1	1	4	4	4	4	4	4	4	4	4	4
G56	Shetland-SE-DalesVoe	0.10	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1	1	4	4	4	4	4	4	4	4	4	4
G57	Shetland-SE-SandsoundWeisdale	0.10	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1	1	4	4	4	4	4	4	4	4	4	4
P61	Shetland-SW-GrutingVoe	0.13	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1	1	4	4	4	4	4	4	4	4	4	4
P68	Shetland-SW-Vaila	0.16	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1	1	4	4	4	4	4	4	4	4	4	4
P72	Shetland-W-AithVoe	0.14	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1	1	4	4	4	4	4	4	4	4	4	4
P64	Shetland-W-BustaVoe	0.11	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1	1	4	4	4	4	4	4	4	4	4	4
P70	Shetland-W-OlnaFirth	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1	1	4	4	4	4	4	4	4	4	4	4
G58	Shetland-W-VementryVoe	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1	1	4	4	4	4	4	4	4	4	4	4
G71	Shetland-W-RonasVoe	0.28	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1	1	4	4	4	4	4	4	4	4	4	4
P65	Shetland-N-Basta	0.13	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1	1	4	4	4	4	4	4	4	4	4	4
G81	Shetland-N-Uyea	0.13	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1	1	4	4	4	4	4	4	4	4	4	4

4.3 Formulation of alternative monitoring schemes for mussels

Although Tables 24 - 29 provide information on where the current monitoring scheme fails, it does not provide us with information on whether sampling frequencies can be reduced for certain groups and/or months of the year. In order to do so we need to go back to the estimated probability of a biotoxin exceeding a given limit, based on the model estimates presented in Tables B34-B39. When this probability is low, less than 1.33%, monthly sampling will suffice, whereas weekly sampling would be needed when this probability exceeds 2%, and with fortnightly sampling needed for probabilities between 1.33 and 2%. This will ensure that the risk of a toxic event (toxin levels exceeding a given limit) going unnoticed remains less than 1%.

In Section 4.3.1 we look at formulation of monitoring schemes based on the estimated prevalences from our models for various toxin levels. This allows us to check for consistency across models for the various cut-offs (PST> 0, > 400, > 800 µg/kg etc.). This preliminary analysis is then followed by Section 4.3.2 where we will compare models and the observed data side-by-side and cross-check that any major toxic events in the data are covered by the proposed sampling schemes. If the data indicate that more frequent monitoring is needed then the proposed scheme will be adjusted accordingly. We will look in detail at schemes based on detection of biotoxin levels exceeding 400 µg/kg (half the MPL) for PST, and exceeding 5 mg/kg for DA (as no models were developed for 10 mg/kg due to limited number of samples exceeding 0.5 MPL). For LT, exceedance of the MPL was taken as our starting point (due to the majority of historical data based on the MBA, i.e. below/above MPL).

4.3.1 Preliminary formulation of alternative monitoring schemes based on models only

DA in mussels

Based on the estimated prevalences presented in Tables B34 and B35, proposed monitoring frequencies have been derived (Table B47) to keep the risk of non-detection below 1% for DA exceeding 5 mg/kg (middle section) or 0 mg/kg (section on right).

To keep the risk of not detecting DA > 5 mg/kg below 1%, models suggest fortnightly to weekly monitoring for about two thirds of the pod groups during May – Sep. If the risk of non-detection of positive DA is taken as starting point, then this would intensify to weekly sampling for nearly all locations from May through to October (Table B47, section on right). Note that, despite models being fitted to the 5 mg and 0 mg cut-offs separately, the proposed frequencies for DA > 0 mg/kg encapsulate those for DA > 5 mg/kg, suggesting a certain robustness and consistency of the data and models.

PST in mussels

For PST in mussels, the estimated prevalences presented in Tables B36 - B38 suggest monitoring frequencies as presented in Table B48. To keep the risk of non-detection of PST in mussels exceeding MPL below 1%, monthly sampling will suffice from October through to March for all pod groups (Table B48, section on left). If we take 0.5 MPL as our cut-off point (Table B48, middle section), then monthly sampling would suffice from November through to February, and if positive PST is taken as

the cut-off point (Table B48, section on right), monthly sampling would still be sufficient during Dec-Feb for all groups of pods.

Again note that, despite that models were fitted to each of the cut-offs separately, the proposed frequencies for PST > 0 µg/kg encompass those for PST > 400 µg/kg, which in turn encompass those for PST > 800 µg/kg. This suggests that the data and models are robust.

LT in mussels

Based on the estimated prevalences presented in Table B39, to keep the risk of non-detection of mussel samples exceeding the MPL for LT below 1%, weekly sampling will be required for most pod groups between Apr-Nov (Table B49). For all groups monthly sampling would be sufficient during Jan-Mar.

4.3.2 Formulation of alternative monitoring schemes based on models and observed data

Although the model results generally agree with the data, we want to avoid any situation where a proposed monitoring frequency derived solely from models would not capture any high toxin levels observed in the actual data. Here we look in more detail at DA > 5mg/kg, PST > 400 µg/kg and LT > MPL, where we compare models and data side-by-side. Adjustments are made to the model-based frequencies such that when data indicate fortnightly or weekly monitoring (i.e. the proportion of samples for which DA > 5 mg/kg or PST > 400 µg/kg or LT > MPL exceeds 2% or 1.33% and hence suggesting weekly or fortnightly monitoring, respectively) whereas the model suggests monthly monitoring, then the frequency is adapted to be that indicated by the data. In a similar manner, to ensure that the prevalence of high biotoxin levels are covered by the monitoring scheme, when historical DA test results exceeded 10 or 20 mg/kg or PST results exceeded 800 µg/kg, then the monitoring frequency is adjusted to be at least fortnightly.

DA in mussels

Table 30 comprises the following information: the estimated (model-derived) percentage of mussel samples for which DA > 5mg/kg (section on left), the observed number and proportion of the mussel samples that exceed 5 mg/kg (section on right). Also indicated are group by month combinations for which one or more samples had test results between 10 and 20 mg/kg (single underline) and combinations for which one or more samples exceeded 20 mg/kg (double underline). Red and yellow shading are used to indicate that weekly and fortnightly monitoring respectively would be required to keep the risk of not detecting DA in mussels exceeding 5 mg/kg below 1% (for the section on the left the colouring is based on the model estimates, and for the section on the right the colouring is based on the data). Discrepancies where the data suggest more frequent sampling than the model are indicated in the panel on the left, as follows. When the data suggest weekly or fortnightly monitoring whereas the model suggests less frequent monitoring then this is indicated by purple and green, respectively. Looking at the most extreme discrepancies (samples > 10 mg/kg whereas the model suggests monthly sampling) we find that this is the case in July where for two groups (Ayr-other and NWC-other) one or more samples exceeded 10 mg/kg, and this was also the case for WC-LochMelfort in April. Furthermore, Mull-LochScridain had one sample taken in June that exceeded 20 mg/kg, whilst the model suggests monthly sampling. Other discrepancies where the data suggest

more frequent monitoring than the model tend to occur at the beginning or the end of periods of more intensive monitoring.

DA summary:

- Although DA tested positive in 4.3% of all mussel samples tested, high levels of DA are a rare event, with less than 0.1% of the samples (nine out of 14557 samples tested during 2001-15) exceeding the MPL of 20 mg/kg (Table 16), and with only an additional 25 samples exceeding half the MPL (Table 16).
- As there were insufficient samples that exceeded 10 mg/kg to allow for statistical modelling, DA > 5 mg/kg was taken as our starting point for developing statistical models and formulation of monitoring frequencies.
- December, January, February: None of the actual test results exceeded 5mg/kg, and both model and data suggest monthly monitoring for all groups of pods.
- October, November, March: For each of these months one sample exceeded 5 mg/kg but this was less than 10 mg/kg in each case. Except for WC-LochEtive in March and Shetland-W-Aithvoe in November, both the data and the model indicate monthly monitoring for October, November and March.
- There are nine groups of pods for which monthly sampling throughout the year would suffice: EastCoast, Dumfries, Ayr-LochStriven, WC-LochLevenEil, NWC-LochTorridon, Tain, Shetland-W-VementryVoe, Shetland-W-RonasVoe, and Shetland-N-Uyea. In addition to the model recommending monthly sampling, these groups had no samples for which DA > 5mg/kg (see Table 17). Furthermore, for WC-LochEtive monthly sampling is suggested throughout, except for March, during which one sample exceeded 5 mg/kg (its actual value was 6 mg/kg, still well below half the MPL).
- For the remaining groups of pods targeted monitoring would be required from April to September.
- Compared to the existing monitoring scheme (Table 5) several groups of pods would require sampling that is more frequent than the current monthly frequency. It should be noted however, that the findings presented above are based on a cut-off of 5 mg/kg, well below the actual MPL of 20 mg/kg. It should also be noted that the proposed monitoring scheme allows for increased monitoring for location by month combinations for which historical test results exceeded half the MPL.
- Some fine tuning will be required by FSS to allow for smooth progression from monthly to weekly sampling and vice versa.

Table 30: Proposed sampling frequency to keep the risk of non-detection of DA in mussels exceeding 5 mg/kg below 1% for an average year. Based on models and data. Shown are the estimated probability of a toxic event for an average year (middle section) and DA prevalence observed in the data (section on right). The minimum sampling frequency required to keep risk of non-detection less than 1% is indicated by red (4) = weekly, yellow (2) = fortnightly, white (1) = monthly.

		Estimated probability (%) of DA>5 mg/kg												Data: # samples DA > 5 mg/kg over total samples											
Groups	GroupName	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
G80	EastCoast	0.00	0.00	0.07	0.10	0.36	0.27	0.72	0.74	1.31	0.04	0.05	0.00	0/11	0/10	0/10	0/12	0/20	0/20	0/19	0/19	0/15	0/21	0/11	0/5
G26	Dumfries	0.00	0.00	0.06	0.09	0.32	0.23	0.63	0.65	1.12	0.03	0.04	0.00	0/17	0/24	0/17	0/24	0/23	0/36	0/29	0/25	0/29	0/26	0/22	0/14
G8	Ayr-LochStriven	0.00	0.00	0.05	0.08	0.29	0.22	0.58	0.59	1.01	0.03	0.04	0.00	0/16	0/24	0/27	0/29	0/27	0/28	0/30	0/33	0/36	0/36	0/29	0/16
P16	Ayr-LochFyneArdkinglas	0.00	0.00	0.08	0.12	0.43	0.32	0.85	0.87	1.70	0.04	0.06	0.00	0/14	0/15	0/16	0/18	0/21	0/21	0/29	0/30	1/45	0/33	0/23	0/12
G18	Ayr-other	0.00	0.00	0.09	0.13	0.46	0.34	1.22	0.90	1.53	0.05	0.07	0.00	0/34	0/39	0/43	0/48	0/48	0/50	2/68	0/72	0/70	0/84	0/63	0/24
G123	WC-Gigha	0.00	0.00	0.07	0.11	0.40	0.29	0.79	0.82	1.42	0.04	0.06	0.00	0/12	0/13	0/10	0/20	0/21	0/21	0/24	0/20	0/25	0/29	0/18	0/5
P6	WC-LochMelfort	0.00	0.00	0.36	0.74	1.82	1.36	4.48	3.37	6.47	0.19	0.27	0.00	0/12	0/10	0/10	2/27	0/16	0/24	2/28	0/33	1/28	0/32	0/16	0/7
G10	WC-LochEtive	0.00	0.00	0.08	0.10	0.35	0.26	0.69	0.70	1.19	0.04	0.05	0.00	0/19	0/19	1/29	0/42	0/54	0/53	0/57	0/67	0/66	0/58	0/37	0/15
G9	WC-LochCreranLinnhe	0.00	0.00	0.08	0.12	0.43	0.32	0.99	0.86	1.66	0.04	0.06	0.00	0/18	0/23	0/20	0/37	0/49	0/62	1/57	0/56	1/60	0/60	0/43	0/14
G31	WC-LochLevenEil	0.00	0.00	0.04	0.07	0.24	0.18	0.47	0.48	0.82	0.02	0.03	0.00	0/25	0/31	0/27	0/35	0/40	0/57	0/59	0/62	0/71	0/52	0/43	0/22
G28	WC-Lochaber	0.00	0.00	0.16	0.24	1.33	0.72	1.54	1.72	2.75	0.09	0.12	0.00	0/29	0/27	0/36	0/44	3/54	1/77	0/70	1/86	1/80	0/51	0/45	0/24
P5	Mull-LochSpelve	0.00	0.00	0.20	0.29	1.00	0.74	1.88	2.97	3.83	0.10	0.15	0.00	0/9	0/14	0/14	0/32	0/27	0/33	0/37	3/41	2/50	0/36	0/19	0/8
P7	Mull-LochScridain	0.00	0.00	0.15	0.22	0.77	0.68	1.48	1.79	2.87	0.08	0.11	0.00	0/13	0/14	0/13	0/24	0/33	1/36	0/36	1/29	1/40	0/40	0/20	0/10
G1	Mull-other	0.00	0.00	0.07	0.11	0.39	0.35	0.76	0.79	1.36	0.04	0.06	0.00	0/17	0/19	0/18	0/30	0/38	1/37	0/51	0/40	0/41	0/41	0/35	0/17
P41	Skye-LochEishort	0.00	0.00	0.08	0.12	0.49	0.30	0.80	0.82	1.41	0.04	0.06	0.00	0/13	0/16	0/20	0/22	1/31	0/35	0/42	0/42	0/42	0/36	0/18	0/15
G42	Skye-other	0.00	0.00	0.31	0.46	1.97	1.33	3.22	4.44	4.79	0.16	0.23	0.00	0/22	0/21	0/26	0/29	2/55	1/60	2/89	4/76	1/74	0/74	0/43	0/18
G21	Lewis-LochLeurbostErisort	0.00	0.00	0.12	0.18	0.64	0.48	1.23	1.73	2.39	0.07	0.09	0.00	0/18	0/25	0/25	0/23	0/34	0/48	0/53	2/65	1/61	0/49	0/33	0/15
G23	Lewis-LochRoag	0.00	0.00	0.35	0.52	1.59	1.37	4.34	4.34	8.03	0.22	0.27	0.00	0/33	0/38	0/44	0/49	0/73	1/103	5/103	5/112	10/131	1/101	0/50	0/27
G22	HarrisUist	0.00	0.00	0.13	0.19	0.66	0.49	1.46	1.45	2.92	0.07	0.10	0.00	0/35	0/47	0/46	0/47	0/54	0/72	1/73	1/83	3/89	0/66	0/46	0/28
G35	NWC-LochTorridon	0.00	0.00	0.04	0.07	0.24	0.18	0.47	0.48	0.82	0.02	0.03	0.00	0/22	0/23	0/23	0/28	0/39	0/58	0/63	0/65	0/67	0/58	0/39	0/17
G39	NWC-LochEweBroom	0.00	0.00	0.14	0.21	1.04	0.55	1.44	1.45	2.82	0.08	0.11	0.00	0/18	0/19	0/18	0/38	2/43	0/50	0/51	0/55	1/57	0/55	0/39	0/17
G48	NWC-LochLaxfordInchard	0.00	0.00	0.20	0.30	1.04	0.77	2.50	2.25	4.35	0.11	0.15	0.00	0/19	0/19	0/21	0/27	0/34	0/49	2/56	1/54	3/56	0/51	0/32	0/15
G49	NWC-other	0.00	0.00	0.08	0.11	0.41	0.30	0.92	0.82	1.38	0.04	0.06	0.00	0/18	0/21	0/17	0/26	0/30	0/45	1/63	0/50	0/53	0/46	0/31	0/16
P38	Tain	0.00	0.00	0.06	0.09	0.32	0.24	0.64	0.66	1.13	0.03	0.05	0.00	0/10	0/12	0/17	0/18	0/21	0/30	0/32	0/30	0/33	0/30	0/17	0/8
G54	Orkney	0.00	0.00	0.08	0.12	0.43	0.32	0.87	0.89	1.55	0.04	0.06	0.00	0/3	0/5	0/1	0/10	0/7	0/9	0/12	0/15	0/14	0/11	0/10	0/2
G67	Shetland-SE-CliftSound	0.00	0.00	0.14	0.21	0.73	0.54	1.60	1.67	2.66	0.07	0.10	0.00	0/18	0/18	0/24	0/30	0/29	0/39	1/60	1/53	1/59	0/53	0/29	0/13
G56	Shetland-SE-DalesVoe	0.00	0.00	0.35	0.50	1.73	1.51	3.55	3.53	8.63	0.18	0.26	0.00	0/9	0/11	0/13	0/25	0/21	1/37	1/45	1/47	5/42	0/31	0/19	0/9
G57	Shetland-SE-SandsoundW	0.00	0.00	0.25	0.37	1.25	0.93	2.65	3.93	4.59	0.13	0.19	0.00	0/26	0/30	0/31	0/34	0/35	0/43	1/50	4/69	2/71	0/79	0/51	0/21
P61	Shetland-SW-GrutingVoe	0.00	0.00	0.21	0.31	1.03	0.78	1.95	1.94	6.81	0.11	0.16	0.00	0/16	0/16	0/15	0/24	0/30	0/35	0/41	0/42	6/44	0/34	0/22	0/12
P68	Shetland-SW-Vaila	0.00	0.00	0.17	0.25	0.88	0.65	2.17	1.64	3.72	0.09	0.13	0.00	0/16	0/17	0/17	0/24	0/26	0/34	2/47	0/46	2/46	0/38	0/25	0/11
P72	Shetland-W-AithVoe	0.00	0.00	0.10	0.15	0.53	0.39	1.04	1.08	1.84	0.05	0.09	0.00	0/14	0/15	0/17	0/17	0/16	0/20	0/24	0/30	0/24	0/28	1/27	0/9
P64	Shetland-W-BustaVoe	0.00	0.00	0.16	0.24	0.84	0.73	1.57	1.64	3.63	0.08	0.12	0.00	0/10	0/16	0/21	0/24	0/20	1/33	0/35	0/34	2/35	0/33	0/26	0/9
P70	Shetland-W-OlnaFirth	0.00	0.00	0.14	0.20	0.72	0.53	1.63	1.65	2.48	0.07	0.10	0.00	0/13	0/11	0/15	0/20	0/17	0/27	1/32	1/39	0/28	0/33	0/25	0/8
G58	Shetland-W-VementryVoe	0.00	0.00	0.05	0.08	0.28	0.21	0.56	0.57	0.98	0.03	0.04	0.00	0/18	0/20	0/21	0/16	0/23	0/34	0/30	0/48	0/42	0/42	0/28	0/10
G71	Shetland-W-RonasVoe	0.00	0.00	0.07	0.10	0.35	0.26	0.69	0.71	1.23	0.03	0.05	0.00	0/8	0/10	0/15	0/8	0/22	0/31	0/29	0/27	0/20	0/19	0/19	0/5
P65	Shetland-N-Basta	0.00	0.00	0.10	0.15	0.52	0.39	1.04	1.07	2.13	0.05	0.07	0.00	0/9	0/11	0/12	0/20	0/19	0/26	0/26	0/27	1/38	0/23	0/22	0/11
G81	Shetland-N-Uyea	0.00	0.00	0.05	0.07	0.24	0.18	0.48	0.48	0.83	0.02	0.03	0.00	0/30	0/41	0/42	0/41	0/43	0/49	0/46	0/73	0/80	0/63	0/48	0/24

Purple, green in middle section: data suggest weekly or fortnightly sampling (observed proportion of samples exceeding limit is greater than 2% (purple) respectively 1.33% (green)) whereas model indicates less frequent monitoring. Underline in section on right: one or more samples for which DA > 10 mg/kg. Double underline in section on right: one or more samples for which DA > 20 mg/kg.

Table 31: Proposed sampling frequency to keep the risk of non-detection of PST in mussels exceeding 400 µg/kg below 1% for an average year. Based on models and data. Shown are the estimated probability of a toxic event for an average year (middle section) and PST prevalence observed in the data (section on right). The minimum sampling frequency required to keep risk of non-detection less than 1% is indicated as red (4) = weekly, yellow (2) = fortnightly, white (1) = monthly.

		Estimated probability (%) of PST>400 µg/kg												Data: # samples PST>400 µg/kg over total samples									
Groups	GroupName	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
G80	EastCoast	0.11	0.00	0.22	0.58	2.88	3.55	5.03	0.67	0.67	0.19	0.07	0.00	0/14	0/11	0/14	0/17	1/21	1/17	2/17	0/15	0/13	0/19	0/7	0/8
G26	Dumfries	0.05	0.00	0.11	0.33	0.85	0.99	0.68	0.37	0.37	0.10	0.03	0.00	0/16	0/23	0/27	0/29	0/35	0/40	0/32	0/24	0/33	0/24	0/23	0/13
G8	Ayr-LochStriven	0.27	0.00	0.46	9.08	13.52	12.00	20.00	1.19	1.19	0.43	0.16	0.00	0/24	0/33	0/41	5/48	6/44	5/37	9/36	0/31	0/34	0/34	0/28	0/22
P16	Ayr-LochFyneArdkinglas	0.12	0.00	0.25	6.48	5.72	1.65	1.49	0.70	0.67	0.22	0.07	0.00	0/25	0/23	0/33	3/40	2/35	0/27	0/29	0/29	0/42	0/31	0/23	0/18
G18	Ayr-other	0.30	0.00	1.35	18.78	16.24	23.44	6.77	1.19	1.32	0.47	0.19	0.00	0/61	0/65	1/91	14/97	11/93	14/79	3/73	0/78	0/73	0/83	0/70	0/43
G123	WC-Gigha	0.18	0.00	0.35	1.04	2.63	21.46	9.38	1.23	1.25	0.34	0.11	0.00	0/28	0/25	0/34	0/34	0/29	5/27	2/26	0/21	0/25	0/29	0/21	0/11
P6	WC-LochMelfort	0.07	0.00	0.14	0.41	1.21	1.38	0.93	0.47	0.50	0.13	0.04	0.00	0/22	0/19	0/33	0/33	0/31	0/32	0/32	0/32	0/28	0/28	0/18	0/14
G10	WC-LochEtive	0.05	0.00	0.10	0.31	0.71	0.89	0.66	0.34	0.32	0.09	0.03	0.00	0/36	0/34	0/57	0/55	0/72	0/61	0/56	0/58	0/63	0/51	0/37	0/27
G9	WC-LochCreranLinnhe	0.05	0.00	0.10	0.31	0.79	0.82	0.68	0.33	0.34	0.09	0.03	0.00	0/40	0/41	0/51	0/59	0/62	0/69	0/53	0/54	0/56	0/57	0/49	0/29
G31	WC-LochLevenEil	0.04	0.00	0.09	0.27	0.71	0.71	0.51	0.28	0.29	0.08	0.03	0.00	0/42	0/45	0/45	0/44	0/46	0/57	0/63	0/70	0/70	0/51	0/47	0/32
G28	WC-Lochaber	0.16	0.00	3.39	0.62	7.90	9.27	5.31	0.61	0.54	0.27	0.10	0.00	0/38	0/42	3/64	0/83	6/84	8/101	4/84	0/85	0/100	0/57	0/48	0/26
P5	Mull-LochSpelve	0.06	0.00	0.13	0.37	0.99	1.30	0.83	0.43	0.42	0.11	0.04	0.00	0/14	0/17	0/29	0/33	0/34	0/34	0/35	0/35	0/41	0/30	0/18	0/13
P7	Mull-LochScridain	0.20	0.00	0.38	0.85	24.60	31.27	2.80	0.95	0.89	0.32	0.12	0.00	0/23	0/22	0/35	0/44	12/49	16/49	1/42	0/32	0/41	0/43	0/26	0/15
G1	Mull-other	0.08	0.00	0.16	0.47	4.90	1.40	0.89	0.54	0.54	0.15	0.05	0.00	0/39	0/38	0/40	0/46	2/51	0/44	0/48	0/35	0/41	0/41	0/34	0/26
P41	Skye-LochEishort	0.26	0.00	1.53	9.59	19.52	16.84	2.76	1.08	0.93	0.42	0.16	0.00	0/24	0/25	1/36	5/47	11/55	9/54	1/48	0/43	0/48	0/36	0/21	0/17
G42	Skye-other	0.15	0.00	0.30	0.69	11.01	12.96	4.49	0.75	0.76	0.26	0.09	0.00	0/43	0/44	0/54	0/71	7/89	8/85	3/98	0/77	0/81	0/70	0/51	0/34
G21	Lewis-LochLeurbostErisort	0.06	0.00	0.12	0.39	2.51	0.88	0.69	0.38	0.39	0.12	0.04	0.00	0/31	0/39	0/41	0/34	1/50	0/63	0/58	0/59	0/54	0/37	0/39	0/24
G23	Lewis-LochRoag	0.07	0.00	0.14	0.34	0.57	4.09	4.86	0.35	0.32	0.12	0.04	0.00	0/54	0/62	0/67	0/86	0/131	5/126	6/129	0/101	0/105	0/80	0/58	0/39
G22	HarrisUist	0.05	0.00	0.11	0.30	0.77	2.72	0.53	0.33	0.33	0.10	0.03	0.00	0/55	0/64	0/71	0/68	0/71	2/80	0/78	0/76	0/82	0/57	0/50	0/36
G35	NWC-LochTorridon	0.16	0.00	0.30	0.78	5.47	21.16	8.63	0.73	0.73	0.28	0.10	0.00	0/37	0/38	0/50	0/58	3/74	16/84	5/71	0/75	0/71	0/56	0/45	0/25
G39	NWC-LochEweBroom	0.06	0.00	0.12	0.34	0.85	2.15	0.72	0.37	0.39	0.11	0.04	0.00	0/40	0/40	0/48	0/56	0/66	1/65	0/61	0/60	0/61	0/55	0/43	0/25
G48	NWC-LochLaxfordInchard	0.24	0.00	0.42	6.06	12.78	20.74	9.69	1.10	0.91	0.38	0.15	0.00	0/33	0/33	0/40	4/68	9/75	15/72	6/69	0/56	0/67	0/55	0/37	0/23
G49	NWC-other	0.14	0.00	0.28	1.93	3.25	4.87	5.41	0.76	0.72	0.24	0.08	0.00	0/28	0/27	0/35	1/64	1/53	2/62	3/75	0/56	0/60	0/52	0/32	0/22
P38	Tain	0.16	0.00	0.33	2.46	28.04	3.87	1.46	0.91	0.86	0.29	0.10	0.00	0/19	0/19	0/24	1/35	11/41	1/44	0/41	0/36	0/41	0/33	0/21	0/13
G54	Orkney	0.17	0.00	0.37	0.90	9.73	26.81	1.65	1.04	0.99	0.32	0.10	0.00	0/5	0/6	0/4	0/13	2/10	7/14	0/15	0/18	0/16	0/10	0/12	0/3
G67	Shetland-SE-CliftSound	0.56	0.00	0.23	0.59	1.37	1.46	2.04	4.87	0.65	0.20	0.07	0.00	1/42	0/36	0/45	0/57	0/53	0/55	1/74	3/60	0/61	0/45	0/32	0/21
G56	Shetland-SE-DalesVoe	0.05	0.00	0.11	0.33	0.85	0.90	0.73	0.36	0.39	0.10	0.03	0.00	0/17	0/16	0/20	0/39	0/44	0/48	0/41	0/44	0/37	0/28	0/21	0/12
G57	Shetland-SE-SandsoundW	0.14	0.00	0.26	0.65	2.75	2.74	5.00	3.75	2.59	0.22	0.08	0.00	0/55	0/51	0/64	0/64	1/62	1/60	3/64	3/74	2/71	0/68	0/54	0/29
P61	Shetland-SW-GrutingVoe	0.10	0.00	0.20	0.54	1.22	1.37	2.19	0.58	5.14	0.18	0.06	0.00	0/25	0/26	0/30	0/36	0/46	0/44	1/43	0/48	3/37	0/28	0/20	0/16
P68	Shetland-SW-Vaila	0.19	0.00	0.35	0.78	1.34	1.66	10.55	6.44	15.76	0.31	0.11	0.00	0/27	0/25	0/35	0/42	0/46	0/46	7/53	4/51	10/49	0/39	0/26	0/16
P72	Shetland-W-AithVoe	0.24	0.00	0.47	1.03	2.26	2.34	8.32	5.64	4.98	1.43	0.65	0.00	0/20	0/21	0/26	0/40	0/39	0/35	3/39	2/38	2/37	1/40	1/29	0/12
P64	Shetland-W-BustaVoe	0.25	0.00	0.47	0.98	3.69	7.60	3.14	8.12	8.47	2.42	0.15	0.00	0/25	0/28	0/35	0/45	1/43	3/45	1/46	4/45	5/50	2/47	0/33	0/15
P70	Shetland-W-OlnaFirth	0.11	0.00	0.21	0.57	1.39	5.43	1.03	0.57	4.55	0.19	0.06	0.00	0/18	0/19	0/33	0/40	0/40	2/40	0/43	0/45	3/45	0/43	0/32	0/14
G58	Shetland-W-VementryVoe	0.17	0.00	0.32	0.75	3.04	1.52	1.20	2.68	6.84	3.05	0.10	0.00	0/28	0/32	0/37	0/44	1/51	0/54	0/50	2/63	6/63	3/51	0/32	0/13
G71	Shetland-W-RonasVoe	0.17	0.00	0.34	1.05	4.02	2.17	3.25	7.00	4.34	0.31	0.10	0.00	0/15	0/19	0/23	0/11	1/33	0/40	1/35	3/32	2/29	0/21	0/21	0/9
P65	Shetland-N-Basta	0.11	0.00	0.22	0.59	3.28	3.52	1.15	0.67	2.90	0.20	0.07	0.00	0/24	0/25	0/31	0/38	1/39	1/38	0/38	0/37	2/47	0/28	0/23	0/14
G81	Shetland-N-Uyea	0.14	0.00	0.25	0.50	3.19	2.77	1.11	15.49	1.65	0.21	0.08	0.00	0/35	0/49	0/65	0/93	2/81	1/56	0/51	15/95	2/111	0/75	0/48	0/26

Purple in middle section: data suggest weekly sampling (observed proportion of samples exceeding limit is greater than 2%) whereas model indicates less frequent monitoring. Underline in section on right: one or more PST samples > 800 µg/kg.

PST in mussels

Table 31 presents model and data side-by-side for PST > 400 µg/kg. Group by month combinations for which one or more samples exceeded 800 µg/kg have been underlined. There are three groups for which the model suggests monthly monitoring whereas the data suggest weekly monitoring. These are Skye-LochEishort (March), Shetland-SE-CliftSound (January) and Shetland-W-AithVoe (November). For the latter, one sample had PST levels exceeding 800 µg/kg. As the Shetland locations are highly connected, these findings indicate that occasionally PST blooms can occur in Shetland waters during Nov-Feb, and are not necessarily restricted to these two locations in Shetland specifically.

PST summary:

- For five groups monthly sampling throughout the year would suffice: these are Dumfries, WC-LochEtive, WC-LochCreranLinnhe, WC-LochLevenEil, and Shetland-SE-DalesVoe. None of these groups had any samples for which PST exceeded 400 µg/kg (see Table 18 and Table 31).
- November to February: the model suggests monthly monitoring for all locations, but note that for January one sample from Shetland-SE-CliftSound exceeded 400 µg/kg, and one sample from Shetland-W-AithVoe exceeded 800 µg/kg during November. Combining these findings from models and data indicates that monthly sampling would be sufficient for all locations from November to February, except perhaps for Shetland, where data indicate that blooms can occur occasionally during this time period.
- For the remaining pods and months more targeted sampling would be required, as outlined in Table 31.
- Some fine tuning will be required by FSS to allow for smooth progression from monthly to weekly sampling and vice versa.

LT in mussels

Table 32 shows the comparison between model and data for LT > MPL. For completeness, also indicated on the right hand side of this table are occasions where AZA or OA test results exceeded half the MPL (underline: AZA > 80 µg/kg, blue: OA > 80 µg/kg) during 2011-15. Note that it is possible for an entry to be underlined or displayed in blue, whilst the number of samples exceeding MPL is zero (i.e. for one or more samples AZA > 80 or OA 80 µg/kg but this was below 160 µg/kg). The proposed monitoring frequencies have not been adjusted for these as the LC-MS/MS time series is relatively recent. Nevertheless, FSS may want to take this information into account when adjusting the proposed monitoring schemes to their needs.

Again there are some discrepancies between the model for LT > MPL and the corresponding data, as shown by the darker shaded cells (green – to indicate that data suggest fortnightly monitoring, purple – to indicate that data suggest weekly monitoring). These are mainly in the months preceding or following a spell of more frequent monitoring. The model suggests monthly sampling during

January, February and March. For these months, there was one sample (out of 662 tested) that exceeded the MPL during January (Shetland-N-Uyea), and there was one group where the data suggest weekly monitoring during March (NWC-other). These were also the only two groups where AZA exceeded 0.5 MPL during Jan-Mar (with the two samples from Shetland-N-Uyea both exceeding MPL). OA > 0.5 MPL was observed at four pod groups (11/1,315 samples tested) during the first three months of the year, but none of these exceeded the MPL. However, *Dinophysis* blooms are thought to be advected and so it may be that these events in January and March were unusual events that the currents took to these locations rather than them being specifically at higher risk. For April through to December weekly monitoring would be required for most pod groups. The only exceptions are WC-LochEtive (only two out of 680 samples exceeding field closure) and WC-LochLevenEil (only four out of 747 samples exceeding field closure), for which the frequency could be monthly for most months of the year. In addition, for these two pod groups none of the OA, AZA and YTX test results exceeded half the MPL between Oct-Jun (Tables 32, B10, B13 and B15). YTX levels have not been explicitly indicated in Table 32, but occasions where YTX > 0.5 MPL (all of which were below MPL) were only observed at Ayr-LochStriven and Ayr-other during June and July. These are already covered by weekly monitoring as suggested by the model.

LT summary:

- Monthly sampling would suffice during Jan-Mar for all locations, except for NWC-other and Shetland-N-Uyea where both previous MBA data and recent AZA data indicate that more frequent monitoring would be required. It should be noted however that there were an additional four locations for which OA exceeded 0.5 MPL during Jan-Mar but none of these exceeded the MPL. The observed toxic events in January and March may have been unusual, however.
- For the remaining months a group-specific sampling frequency would be required (but note the next bullet point). For most groups of pods this would be weekly during April through to November, except perhaps for WC-LochEtive and WC-LochLevenEil, for which the frequency could be monthly for most months of the year. This is confirmed by the more recent LC-MS/MS data, as none of the samples tested by LC-MS/MS exceeded 0.5 MPL for AZA, OA and YTX between Oct-Jun.
- As the differences in recommended frequency between groups are small, it may be simplest to stay with a monitoring scheme that is the same across all groups, except perhaps for a possible reduction in frequency for WC-LochEtive and WC-LochLeven.

Table 32: Proposed sampling frequency to keep the risk of non-detection of LT in mussels exceeding MPL below 1% for an average year. Based on models and data. Shown are the estimated probability of a toxic event for an average year (middle section) and LT prevalence observed in the data (section on right). The minimum sampling frequency required to keep risk of non-detection less than 1% is indicated as red (4) = weekly, yellow (2) = fortnightly, white (1) = monthly.

		Estimated probability (%) of LT > MPL											Data: # samples with LT > MPL over total samples										
	GroupName	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
G80	EastCoast	0.20	0.01	0.23	2.48	4.63	11.61	13.31	24.93	22.39	9.36	3.41	1.69	0/13	0/11	0/14	0/16	0/21	2/19	1/20	6/19	8/20	4/23	1/14	1/11
G26	Dumfries	0.02	0.00	0.02	0.22	0.59	1.12	1.59	2.05	1.40	0.78	0.25	0.12	0/17	0/21	0/35	0/38	1/41	0/44	0/40	0/39	0/43	1/34	0/37	0/22
G8	Ayr-LochStriven	0.66	0.03	0.73	5.84	16.98	35.18	36.41	44.99	37.87	26.22	16.75	4.38	0/17	0/26	0/39	1/49	7/46	17/48	17/48	22/50	22/58	14/52	12/52	1/29
P16	Ayr-LochFyneArdkinglas	0.26	0.01	0.29	4.47	8.25	25.21	27.89	22.23	17.09	6.34	3.58	1.71	0/15	0/17	0/30	3/43	4/43	14/44	13/46	8/45	7/50	1/46	1/41	0/24
G18	Ayr-other	0.63	0.03	0.83	6.72	21.91	39.14	37.09	38.28	39.35	20.03	10.03	5.52	0/37	0/37	1/78	5/102	22/107	40/113	39/118	41/125	41/114	21/118	11/115	4/62
G123	WC-Gigha	0.03	0.00	0.03	0.39	1.25	1.92	2.69	4.10	2.87	1.08	0.44	0.21	0/12	0/14	0/29	0/50	2/45	0/36	0/35	1/34	1/36	0/39	0/39	0/17
P6	WC-LochMelfort	0.13	0.01	0.15	1.95	3.14	7.73	14.16	19.33	14.50	5.40	1.83	0.93	0/13	0/11	0/27	1/40	0/38	2/39	6/41	8/39	7/39	2/38	0/33	0/21
G10	WC-LochEtive	0.01	0.00	0.01	0.17	0.44	1.01	1.21	1.55	1.07	0.47	0.19	0.09	0/19	0/21	0/48	0/68	1/86	1/76	0/72	0/73	0/75	0/64	0/48	0/30
G9	WC-LochCreranLinnhe	0.03	0.00	0.03	0.36	0.74	1.58	3.14	4.97	2.81	0.95	0.39	0.19	0/19	0/26	0/39	0/74	0/81	0/84	2/71	4/73	2/77	0/72	0/70	0/36
G31	WC-LochLevenEil	0.01	0.00	0.02	0.20	0.79	0.95	1.32	1.92	1.18	0.55	0.22	0.10	0/25	0/31	0/45	0/57	3/62	0/78	0/79	1/91	0/94	0/72	0/72	0/41
G28	WC-Lochaber	0.18	0.01	0.20	2.43	3.91	9.86	23.92	27.09	14.96	5.63	3.16	1.20	0/25	0/34	0/58	2/83	2/89	9/101	27/99	33/112	20/116	3/67	3/75	0/37
P5	Mull-LochSpelve	0.02	0.00	0.02	0.31	0.54	1.25	1.75	3.16	1.54	0.70	0.28	0.13	0/8	0/13	0/27	1/49	0/51	0/47	0/50	2/50	0/55	0/42	0/29	0/16
P7	Mull-LochScridain	0.22	0.01	0.26	2.42	5.10	17.22	24.38	36.70	19.65	6.65	2.79	1.53	0/15	0/15	0/27	0/46	1/46	9/47	14/50	20/48	11/52	2/47	0/38	0/22
G1	Mull-other	0.06	0.00	0.06	0.75	1.54	5.33	4.42	8.64	5.60	1.98	1.02	0.40	0/16	0/19	0/25	0/50	0/53	3/51	0/53	3/45	2/48	0/48	1/42	0/28
P41	Skye-LochEishort	0.20	0.01	0.23	2.20	5.33	12.93	22.02	27.26	14.51	8.19	3.54	1.36	0/14	0/16	0/33	0/47	2/51	6/50	14/57	16/55	8/57	4/46	2/37	0/26
G42	Skye-other	0.10	0.00	0.12	1.22	2.54	7.45	11.98	14.07	7.55	4.17	1.91	0.86	0/24	0/23	0/46	0/73	1/92	5/82	11/99	10/84	4/85	3/81	2/71	1/42
G21	Lewis-LochLeurbostErisort	0.05	0.00	0.06	0.68	1.86	3.80	8.87	5.00	5.39	1.71	0.91	0.37	0/19	0/23	0/52	0/61	2/70	3/79	10/81	2/80	5/82	0/62	1/66	0/38
G23	Lewis-LochRoag	0.13	0.01	0.14	1.27	3.37	8.95	22.37	23.51	11.61	3.23	1.44	1.00	0/34	0/38	0/83	0/112	4/137	13/139	36/142	37/147	18/145	2/121	0/104	1/65
G22	HarrisUist	0.02	0.00	0.02	0.27	0.56	1.19	2.35	4.18	1.93	0.87	0.30	0.15	0/35	0/48	0/72	0/89	0/99	0/91	3/100	6/95	2/105	1/80	0/81	0/52
G35	NWC-LochTorridon	0.12	0.01	0.14	1.69	2.56	8.45	10.34	12.92	19.11	5.97	1.52	0.82	0/22	0/24	0/42	1/67	0/73	6/80	6/75	8/80	19/88	5/75	0/69	0/35
G39	NWC-LochEweBroom	0.12	0.01	0.14	1.40	3.08	9.89	10.78	16.63	11.85	7.42	1.57	0.85	0/17	0/20	0/36	0/70	1/71	7/71	6/70	11/70	8/72	7/68	0/63	0/32
G48	NWC-LochLaxfordInchard	0.33	0.02	0.37	2.86	4.60	13.01	36.28	36.20	28.83	17.07	8.14	2.39	0/20	0/19	0/44	0/69	0/71	6/62	32/81	31/84	30/95	16/78	8/66	1/34
G49	NWC-other	0.11	0.01	0.15	1.32	2.55	4.80	13.74	19.53	11.01	4.23	1.48	0.76	0/17	0/17	1/29	0/64	0/54	0/59	9/74	13/64	7/64	2/56	0/45	0/23
P38	Tain	0.05	0.00	0.06	0.71	1.46	6.41	5.40	5.84	4.84	2.26	0.80	0.39	0/10	0/11	0/19	0/35	0/38	5/45	2/45	1/40	2/46	1/38	0/29	0/16
G54	Orkney	0.13	0.01	0.15	1.76	3.58	10.75	8.91	12.80	15.68	6.15	2.28	1.18	0/3	0/5	0/7	0/11	0/10	3/14	0/15	1/17	5/16	2/13	1/17	1/5
G67	Shetland-SE-CliftSound	0.17	0.01	0.20	4.46	7.03	14.34	14.63	19.64	11.59	5.29	2.20	1.19	0/17	0/20	0/41	6/72	6/66	10/68	11/82	13/71	7/74	2/64	0/52	0/29
G56	Shetland-SE-DalesVoe	0.14	0.01	0.16	3.81	4.15	7.68	14.08	13.36	12.10	4.61	2.25	0.96	0/9	0/11	0/26	5/47	2/48	3/51	7/50	6/53	6/49	1/38	1/35	0/22
G57	Shetland-SE-SandsoundW	0.14	0.01	0.16	2.83	5.51	11.50	9.93	14.81	13.06	5.20	1.67	0.93	0/28	0/32	0/57	4/78	5/72	8/67	6/77	12/89	12/94	4/92	0/81	0/42
P61	Shetland-SW-GrutingVoe	0.17	0.01	0.20	2.90	9.52	15.55	14.59	19.46	12.14	4.60	2.30	1.23	0/17	0/17	0/31	2/43	8/56	10/59	7/53	10/57	5/49	0/42	0/31	0/17
P68	Shetland-SW-Vaila	0.21	0.01	0.25	6.01	8.66	15.95	18.21	26.24	11.15	5.95	2.73	1.47	0/17	0/17	0/27	6/45	6/52	9/52	10/57	16/61	3/49	1/46	0/38	0/23
P72	Shetland-W-AithVoe	0.18	0.01	0.21	2.14	5.43	14.73	27.05	22.41	14.78	5.53	2.32	1.28	0/15	0/16	0/28	0/39	2/40	7/42	14/43	10/45	6/40	1/42	0/43	0/19
P64	Shetland-W-BustaVoe	0.14	0.01	0.16	1.69	5.09	10.22	16.36	18.60	12.57	4.47	2.21	1.00	0/11	0/17	0/31	0/44	3/44	5/50	9/49	10/54	7/54	1/46	1/47	0/19
P70	Shetland-W-OlnaFirth	0.10	0.00	0.12	1.27	4.17	7.09	9.68	12.87	10.73	3.66	1.37	0.71	0/13	0/12	0/27	0/39	3/39	3/45	4/44	6/50	6/44	1/43	0/45	0/19
G58	Shetland-W-VementryVoe	0.12	0.01	0.13	1.41	3.11	7.23	12.79	15.34	10.42	5.56	2.24	0.82	0/19	0/23	0/41	0/45	1/53	4/56	9/57	11/67	7/62	4/55	2/46	0/21
G71	Shetland-W-RonasVoe	0.38	0.02	0.43	5.65	10.11	16.45	22.62	38.06	26.98	15.76	6.03	3.72	0/8	0/10	0/21	1/11	3/36	5/43	6/34	16/38	11/35	6/28	2/27	2/10
P65	Shetland-N-Basta	0.17	0.01	0.20	3.98	5.94	9.79	15.44	16.44	10.18	9.83	2.24	1.46	0/10	0/15	0/28	4/41	3/43	3/41	6/40	5/41	3/49	6/41	0/40	1/23
G81	Shetland-N-Uyea	0.17	0.01	0.19	1.93	3.53	7.86	8.88	13.84	12.40	9.85	2.82	0.92	1/32	0/42	1/79	2/96	2/82	3/62	2/58	13/100	16/117	14/100	4/89	0/43

Purple, green in middle section: data suggest weekly or fortnightly sampling (observed proportion of samples exceeding limit is greater than 2% (purple) respectively 1.33% (green)) whereas model indicates less frequent monitoring. Underline in section on right: one or more samples for which AZA > 80 µg/kg. Blue text in section on right: one or more samples for which OA > 80 µg/kg. YTX > 0.5 MPL (but less than MPL) was observed in June and July for Ayr-LochStriven and Ayr-other (not indicated in the Table).

5 Estimated biotoxin prevalence and risk assessment for Pacific oysters

To allow for statistical modelling of the Pacific oyster data some of the groups used for mussels had to be combined. This is detailed in Table 4. Each group contains at least one pod for which Pacific oysters act as indicator species. To differentiate the Pacific oyster grouping from that of mussels, the groups are preceded by the letters 'PO'.

5.1 Estimated biotoxin prevalence for Pacific oysters

For Pacific oysters the models allowed for the estimated prevalence to vary from month to month whilst also incorporating random variation between groups and years. Unlike mussels, there was no strong evidence for group-specific patterns over the months of the year. Models could only be fitted to DA > 0 and > 5 mg/kg, PST > 0 µg/kg and LT > MPL. For the remaining toxin levels there were insufficient test results exceeding the relevant limit to allow for modelling (see also Table 16).

5.1.1 Estimated prevalence over months for DA, PST and LT in Pacific oysters

Figure 12 shows the estimated and observed proportions of Pacific oyster samples exceeding a given limit over 12 months of the year. As expected, the observed and estimated toxin prevalences for DA > 0 and DA > 5 mg/kg show similar patterns, with the prevalence for DA > 0 mg/kg exceeding that of 5 mg/kg (Figure 12). For May, the estimated and observed prevalences appear high, and this is also seen in the raw data summarised per group (Tables B18 and B19). This is mainly driven by positive samples from Mull (10/39, Table B19).

PST tested positive during Mar-Jul (Tables B20 - B22). There is good agreement between the predicted and observed proportions of samples tested positive (Figure 12).

For LT, a peak is seen in February. This is driven by two pod groups having more than 10% of the samples exceeding MPL (WC-Gigha 3/27 and WC-Lochaber 3/26, see Table B23). Toxin prevalence peaks in late summer during August-October (Figure 12).

5.1.2 Estimated prevalence over years for DA, PST and LT in Pacific oysters

Figure 13 shows the predicted prevalence patterns over 2001-15. As with the prevalence of the month of the year, the prevalence of a given biotoxin over years shows a similar pattern for each of the cut-off levels. The proportion of Pacific oyster samples testing positive for PST shows a marked increase in 2013-2015. Unlike mussels, this pattern is reflected by the proportion of samples exceeding 400 or 800 µg/kg. For high toxin years the model estimates tend to be less than the proportion observed in the data, whereas for low toxin years the prediction from the model exceeds the data. This is a consequence of Year being regarded as a random effect, so that estimates for individual years are shrunk somewhat towards the overall mean.

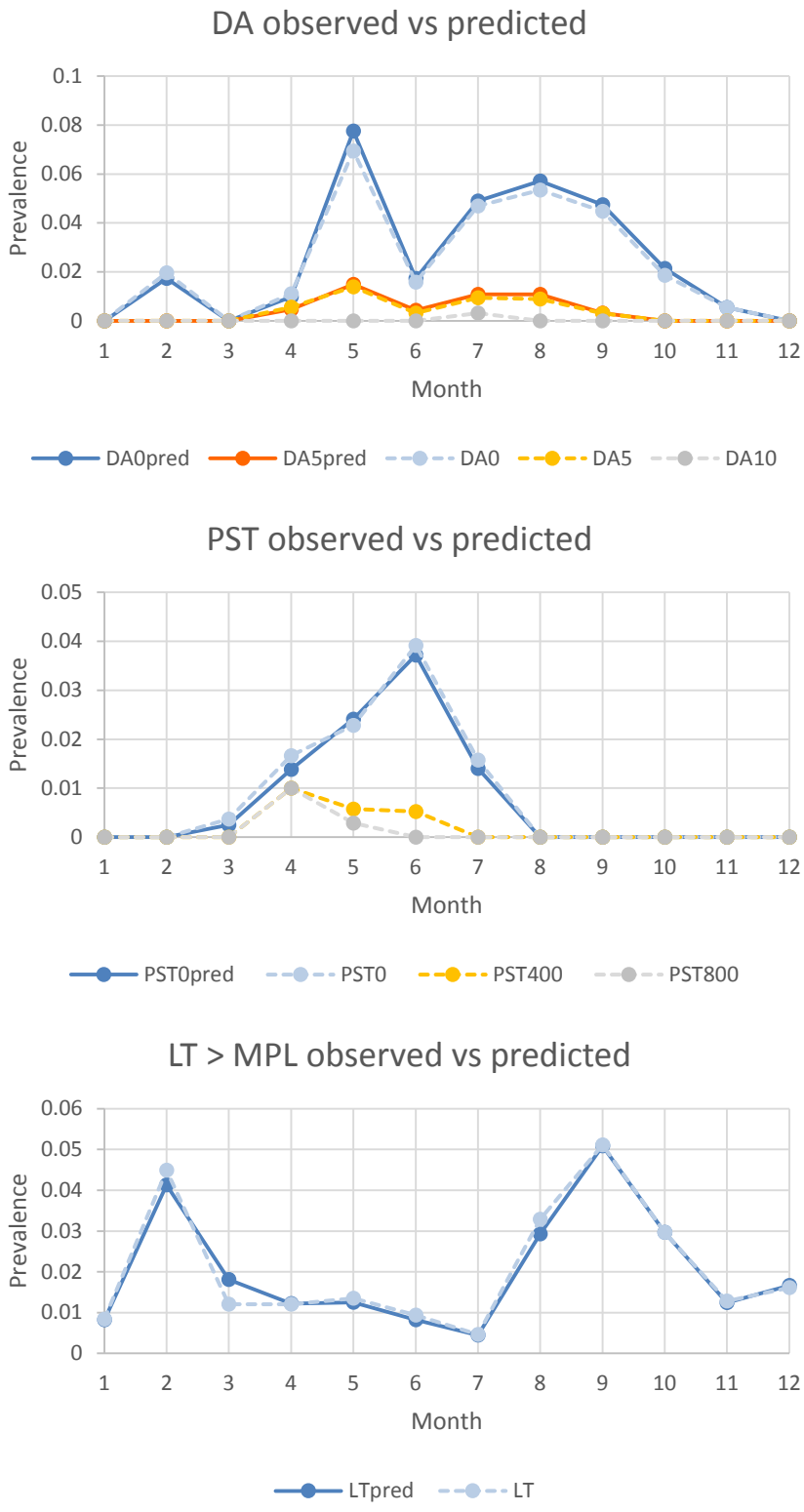

Figure 12: Predicted (solid line) and observed (dashed line) proportion of Pacific oyster samples exceeding a given limit, for each month. The prediction is for an average year and an average location. Top figure: proportion of samples for which DA > 0 mg/kg and DA > 5 mg/kg. Middle figure: proportion of samples for which PST > 0 µg/kg, PST > 400 µg/kg, PST > 800 µg/kg. Bottom figure: proportion of samples for which LT > MPL. No models were fitted to PST > 400 or 800 µg/kg and DA >10 mg/kg.

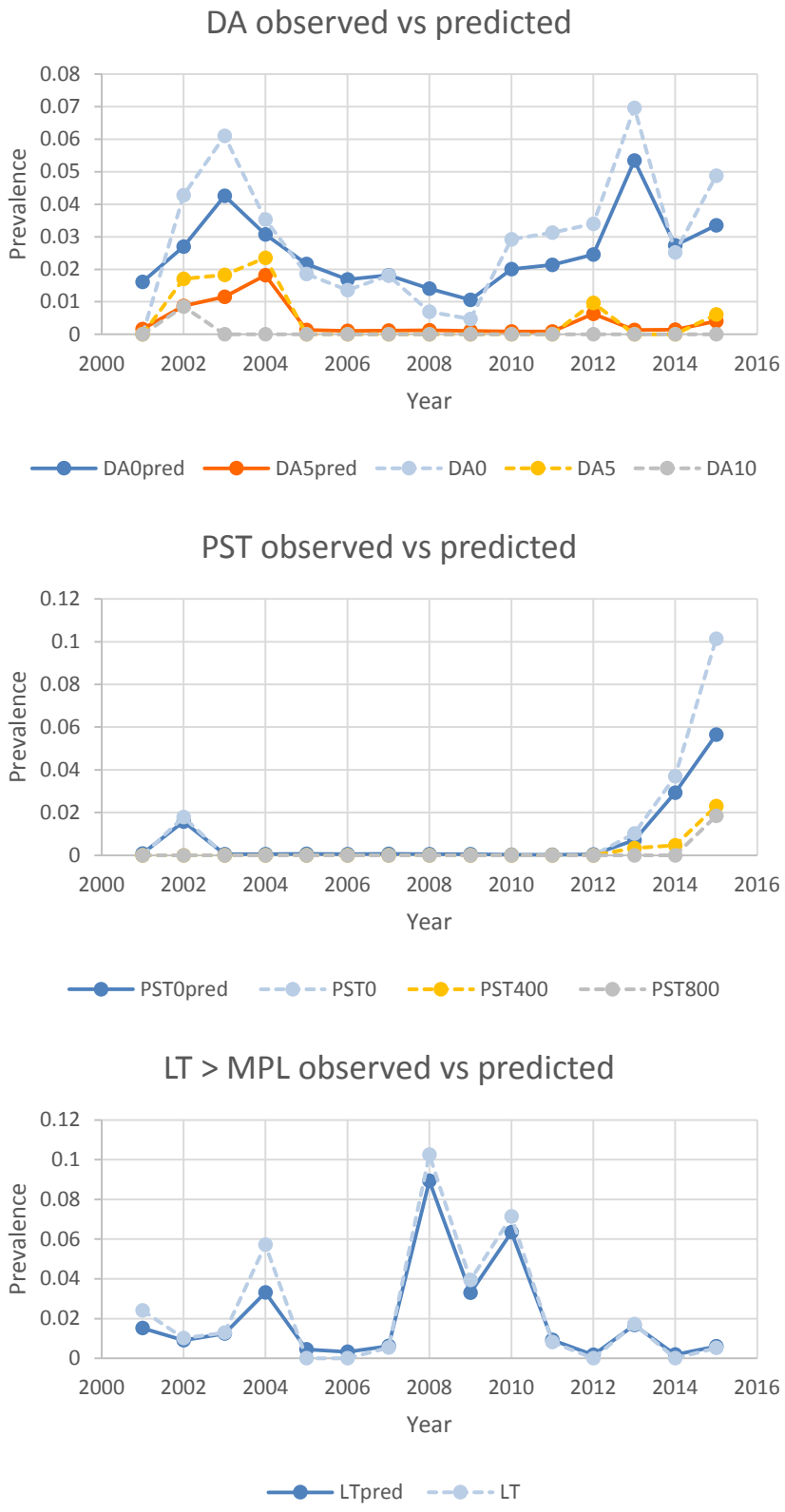

Figure 13: Predicted (solid line) and observed (dashed line) proportion of Pacific oyster samples exceeding a given limit, for an average location, for each year. Top figure shows the proportion of samples for which DA > 0 mg/kg, DA > 5 mg/kg and DA > 10 mg/kg. Middle figure: proportion of samples for which PST > 0 µg/kg, PST > 400 µg/kg, PST > 800 µg/kg. Bottom figure: proportion of samples for which LT > MPL. No models were fitted to PST>400 or 800 µg/kg and DA >10 mg/kg.

5.1.3 Estimated prevalence per month and group for Pacific oysters

DA in Pacific oysters

The estimated prevalence of positive DA samples is less than 0.01% during December and January, and the prevalence of DA samples > 5 mg/kg is less than 0.01% from October through to March (Table B56). WC-LochCreranLinnhe and WC-LochEtiveMelfort show the highest estimated prevalences for both DA > 0 and 5 mg/kg.

PST in Pacific oysters

Models were only fitted to positive PST samples (only 7 samples out of 3,408 exceeded 400 µg/kg, which was not enough to allow for any statistical modelling). The estimated prevalence of positive PST was less than 0.01% in August through to February (Table B56). Ayr and NWC showed the highest prevalence, exceeding 6.5% during June.

LT exceeding MPL in Pacific oysters

Table B56 shows the estimated percentage of samples exceeding the MPL for LT. This exceeds 1% for most pod groups and most months of the year.

5.1.4 Estimated prevalence for AZA, OA and YTX in Pacific oysters

Models were fitted to AZA > 80 µg/kg, AZA > 0 µg/kg, OA > 80 µg/kg and OA > 0 µg/kg. Very few samples exceeded 160 µg/kg for either AZA or OA, and none of the YTX samples tested positive so therefore these were not modelled. These models included terms for month and group. As with mussels, the LC-MS/MS data did not allow for inclusion of an effect of year due to the short time span covered by the data.

AZA in Pacific oysters

The models fitted to AZA > 80 and > 0 µg/kg show a consistency in their estimated prevalence patterns over time (Figure 14). AZA is least prevalent during July, August and September with positive AZA less than 5% and AZA > 80 µg/kg less than 0.01% (Table B57). For the remaining months the prevalence of positive AZA is 9% or more. AZA is most likely to occur during January and February, with an estimated prevalence of AZA > 80 µg/kg of 27% or more, on average. Although the estimated prevalence of AZA > 80 µg/kg exceeds 5% for most locations for most of the year, it should be noted that there were only five (out of 2,013) samples for which the observed test result exceeded the MPL of 160 µg/kg. These were samples taken during Jan-Apr from WC-LochEtiveMelfort and Mull (Table B24). The model results for AZA > 80µg/kg reflect this in that these two locations have the highest estimated prevalence during the first four months of the year (Table B57).

OA in Pacific oysters

Compared to mussels, prevalence of OA in Pacific oysters is low. During Nov-May the estimated prevalence of positive OA is less than 0.01% (Figure 14) for all groups of pods (Table B57). OA is most likely to occur in Ayr and NWC, with estimated prevalence of positive OA ranging from 4 to 13%, and

with the estimated likelihood of OA levels exceeding 80 µg/kg ranging from 1 to nearly 6% (Table B57). Only five (out of 2,013) samples exceeded the MPL of 160 µg/kg, these were taken during Jun-Sep and came from Ayr and NWC (Table B27).

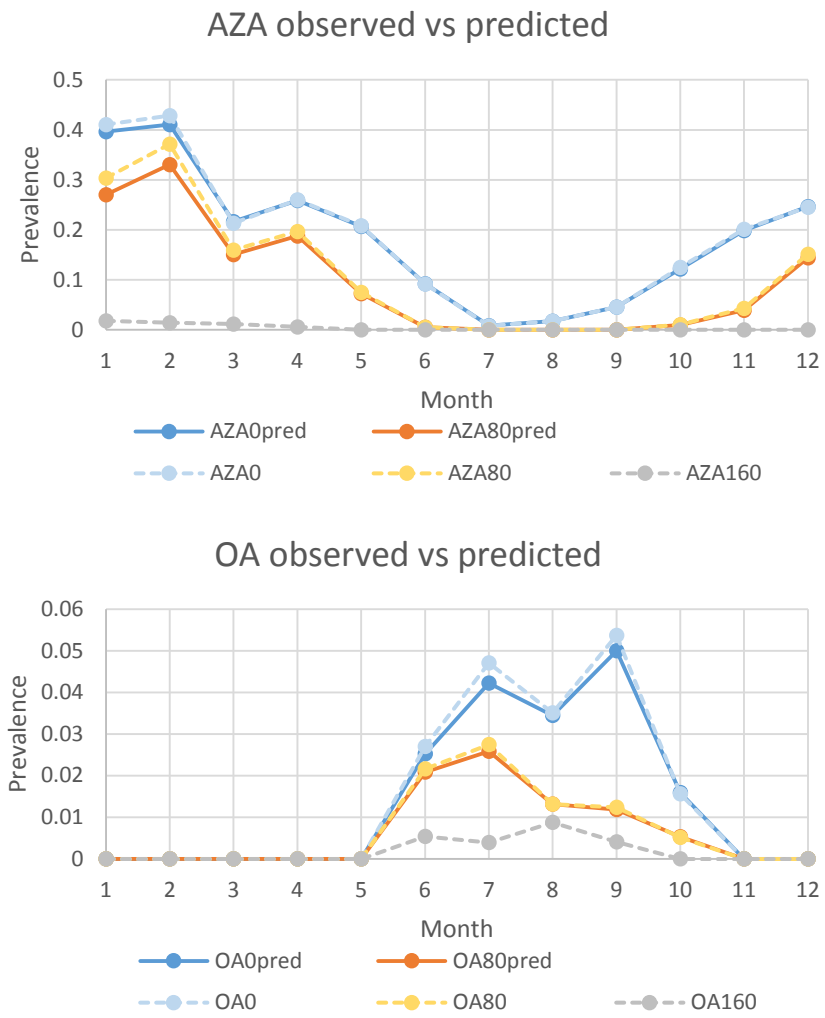

Figure 14: Predicted (solid line) and observed (dashed line) proportion of Pacific oyster samples exceeding a given limit, for each year, for an average location, based on data from 2011-15.Top figure shows the proportion of samples for which AZA > 0, 80 or 160 µg/kg. Bottom figure: proportion of samples for which OA > 0, 80 or 160 µg/kg. No models were fitted to AZA > 160 µg/kg and OA > 160 µg/kg.

5.2 Assessment of the current monitoring scheme for Pacific oysters

The current monitoring frequency is monthly throughout the year for all sites for both DA and PST, and is weekly throughout the year for all sites for LT (Table 6). As with mussels, it is assumed that the aim of the monitoring scheme is to keep the risk of a toxic event going unnoticed below 1%.

DA in Pacific oysters

The risk of not detecting DA > 5 mg/kg is less than 0.01% during Oct-Mar (Table 33). During the summer months, for four pod groups the risk of non-detection exceeds 1%, up to a maximum of 2.1% (WC-LochEtiveMelfort, WC-LochCreranLinnhe, WC-Lochaber and Mull). The risk of not detecting a positive event for DA exceeds 1% for all groups, and increases up to 10% for WC-Lochaber during May (Table 33). During Nov-Jan the risk remains below 1% for all pod groups.

PST in Pacific oysters

The risk of non-detection of a positive PST event is less than 0.01% from August through to February, and remains below 1% during March for all pod groups (Table 33). All pod groups exceed the risk of non-detection of 1% during one or more of the months of Apr-Jul.

LT in Pacific oysters

As monitoring takes place weekly throughout the year for all pod groups, the risk of non-detection is assumed to be zero (see also Table 33).

Table 33: Risk (%) of not detecting a biotoxin exceeding a given limit in Pacific oysters, based on the current monitoring scheme (as shown in Table 6), for an average year. LT based on exceedance of MPL. Risk exceeding 1% is highlighted in orange, risk less than 0.01% shown in grey. The right hand side of the table shows the current sampling frequency (red (4) = weekly, yellow (2) = fortnightly, white (1) = monthly). Grouping is specific to Pacific oysters (see Table 4).

			Risk (%) of not detecting biotoxin exceeding a given limit based on current monitoring scheme												Current monitoring scheme										
Biotoxin	Group	GroupName	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J	F	M	A	M	J	J	A	S	O	N	D
DA > 5 mg/kg	PO18	Ayr	0.00	0.00	0.00	0.21	0.68	0.19	0.49	0.49	0.14	0.00	0.00	0.00	1	1	1	1	1	1	1	1	1	1	1	1
	PO123	WC-Gigha	0.00	0.00	0.00	0.19	0.62	0.18	0.45	0.45	0.13	0.00	0.00	0.00	1	1	1	1	1	1	1	1	1	1	1	1
	PO10	WC-LochEtiveMelfort	0.00	0.00	0.00	0.67	2.12	0.63	1.55	1.55	0.46	0.00	0.00	0.00	1	1	1	1	1	1	1	1	1	1	1	1
	PO9	WC-LochCreranLinnhe	0.00	0.00	0.00	0.31	1.01	0.29	0.73	0.73	0.21	0.00	0.00	0.00	1	1	1	1	1	1	1	1	1	1	1	1
	PO28	WC-Lochaber	0.00	0.00	0.00	0.51	1.61	0.47	1.18	1.18	0.35	0.00	0.00	0.00	1	1	1	1	1	1	1	1	1	1	1	1
	PO1	Mull	0.00	0.00	0.00	0.35	1.13	0.33	0.82	0.82	0.24	0.00	0.00	0.00	1	1	1	1	1	1	1	1	1	1	1	1
	PO42	SkyeShetland	0.00	0.00	0.00	0.30	0.97	0.28	0.70	0.70	0.20	0.00	0.00	0.00	1	1	1	1	1	1	1	1	1	1	1	1
	PO49	NWC	0.00	0.00	0.00	0.24	0.77	0.22	0.56	0.56	0.16	0.00	0.00	0.00	1	1	1	1	1	1	1	1	1	1	1	1
DA > 0 mg/kg	PO18	Ayr	0.00	0.38	0.00	0.21	1.82	0.38	1.11	1.31	1.07	0.47	0.12	0.00	1	1	1	1	1	1	1	1	1	1	1	1
	PO123	WC-Gigha	0.00	0.49	0.00	0.27	2.33	0.48	1.42	1.67	1.38	0.60	0.15	0.00	1	1	1	1	1	1	1	1	1	1	1	1
	PO10	WC-LochEtiveMelfort	0.00	2.11	0.00	1.19	9.20	2.10	5.87	6.83	5.70	2.60	0.66	0.00	1	1	1	1	1	1	1	1	1	1	1	1
	PO9	WC-LochCreranLinnhe	0.00	1.02	0.00	0.57	4.72	1.02	2.93	3.44	2.84	1.26	0.32	0.00	1	1	1	1	1	1	1	1	1	1	1	1
	PO28	WC-Lochaber	0.00	2.33	0.00	1.32	10.02	2.32	6.44	7.48	6.25	2.86	0.73	0.00	1	1	1	1	1	1	1	1	1	1	1	1
	PO1	Mull	0.00	1.87	0.00	1.05	8.23	1.86	5.22	6.09	5.07	2.30	0.58	0.00	1	1	1	1	1	1	1	1	1	1	1	1
	PO42	SkyeShetland	0.00	0.91	0.00	0.51	4.22	0.90	2.61	3.07	2.53	1.12	0.28	0.00	1	1	1	1	1	1	1	1	1	1	1	1
	PO49	NWC	0.00	1.32	0.00	0.74	6.02	1.32	3.77	4.41	3.65	1.63	0.41	0.00	1	1	1	1	1	1	1	1	1	1	1	1
PST > 0 µg/kg	PO18	Ayr	0.00	0.00	0.36	1.96	3.29	4.89	1.97	0.00	0.00	0.00	0.00	0.00	1	1	1	1	1	1	1	1	1	1	1	1
	PO123	WC-Gigha	0.00	0.00	0.13	0.77	1.37	2.18	0.78	0.00	0.00	0.00	0.00	0.00	1	1	1	1	1	1	1	1	1	1	1	1
	PO10	WC-LochEtiveMelfort	0.00	0.00	0.13	0.75	1.34	2.14	0.76	0.00	0.00	0.00	0.00	0.00	1	1	1	1	1	1	1	1	1	1	1	1
	PO9	WC-LochCreranLinnhe	0.00	0.00	0.07	0.42	0.77	1.26	0.43	0.00	0.00	0.00	0.00	0.00	1	1	1	1	1	1	1	1	1	1	1	1
	PO28	WC-Lochaber	0.00	0.00	0.22	1.25	2.17	3.35	1.26	0.00	0.00	0.00	0.00	0.00	1	1	1	1	1	1	1	1	1	1	1	1
	PO1	Mull	0.00	0.00	0.14	0.80	1.43	2.28	0.81	0.00	0.00	0.00	0.00	0.00	1	1	1	1	1	1	1	1	1	1	1	1
	PO42	SkyeShetland	0.00	0.00	0.09	0.56	1.01	1.63	0.56	0.00	0.00	0.00	0.00	0.00	1	1	1	1	1	1	1	1	1	1	1	1
	PO49	NWC	0.00	0.00	0.33	1.82	3.08	4.61	1.84	0.00	0.00	0.00	0.00	0.00	1	1	1	1	1	1	1	1	1	1	1	1
LT > MPL	PO18	Ayr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4	4	4	4	4	4	4	4	4	4	4	4
	PO123	WC-Gigha	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4	4	4	4	4	4	4	4	4	4	4	4
	PO10	WC-LochEtiveMelfort	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4	4	4	4	4	4	4	4	4	4	4	4
	PO9	WC-LochCreranLinnhe	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4	4	4	4	4	4	4	4	4	4	4	4
	PO28	WC-Lochaber	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4	4	4	4	4	4	4	4	4	4	4	4
	PO1	Mull	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4	4	4	4	4	4	4	4	4	4	4	4
	PO42	SkyeShetland	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4	4	4	4	4	4	4	4	4	4	4	4
	PO49	NWC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4	4	4	4	4	4	4	4	4	4	4	4

5.3 Formulation of alternative monitoring schemes for Pacific oysters

As with mussels, the formulation of alternative monitoring schemes will be separated into model-based only (Section 5.3.1) and models in combination with the observed data (Section 5.3.2).

5.3.1 Preliminary formulation of alternative monitoring schemes based on models only

Tables B58 - B60 show alternative monitoring schemes such that the risk of non-detection of a toxin exceeding a given limit does not exceed 1%, based on the estimated prevalence (Table B56) from the models fitted to the Pacific oyster data.

DA in Pacific oysters

Table B58 presents the proposed frequencies (based on model estimates) to keep the risk of not detecting a toxic event below 1% for DA > 5 mg/kg and for DA > 0 mg/kg. For the latter, weekly sampling would be required for most groups during May through to October. If 5 mg/kg is taken as the cut-off level then a sampling frequency of mainly once a month would suffice.

PST in Pacific oysters

Based on the estimated PST prevalences from the models (Table B56), to keep the risk of not detecting positive PST samples below 1%, weekly sampling would be required from April through to July for most groups of pods (Table B59).

LT in Pacific oysters

Table B60 shows that, based on the model estimates for LT (Table B56), weekly sampling would be required for most of the year for most groups of pods.

5.3.2 Formulation of alternative monitoring schemes based on models and observed data

Here the tentative monitoring frequencies derived from the models are combined with the monitoring frequencies suggested by the observed data.

DA in Pacific oysters

When the observed data are combined with the tentative monitoring frequency presented in Table B58, the tentative monitoring frequencies to keep the risk of not detecting DA < 5 mg/kg less than 1% require to be extended somewhat (indicated by the purple cells in Table 34). Nevertheless, there are still three groups of pods for which monthly sampling throughout the year would suffice.

DA summary:

- Although 2.9% of the Pacific oyster samples tested positive, none exceeded the MPL of 20 mg/kg, and only one (out of 2,682) sample, taken in July from WC-Lochaber, exceeded 0.5 MPL.
- Due to lack of samples exceeding 10 mg/kg, a cut-off of 5 mg/kg was taken as our starting point for developing a revised monitoring scheme.
- The model suggests that monthly sampling would be sufficient throughout the year for Ayr, WC-Gigha and NWC in order to keep the risk of not detecting DA > 5 mg/kg less than 1%. This is backed up by the data as for these groups none of the samples tested during 2001-15 exceeded 5 mg/kg.
- The model suggests that monthly monitoring for all locations would suffice from October to March, and this is confirmed by the data as no samples exceeded 5 mg/kg during these months.
- For the remaining groups more targeted sampling would be required from April to September.

PST in Pacific oysters

When the observed data are combined with the tentative monitoring frequencies derived from models (presented in Table B59), the tentative monitoring frequencies require to be extended somewhat (indicated by the green and purple cells in Table 35) to keep the risk of not detecting positive PST below 1%. Weekly sampling would be required for several groups of pods from March through to July (Table 35). From August through to February monthly sampling would suffice based on positive PST as a cut-off.

PST summary:

- Only 1% of the Pacific oyster samples tested positive for PST (37 out of 3,408 samples tested). Four samples exceeded the MPL of 800 µg/kg, and another three samples exceeded half this limit. These samples came from Ayr and Mull and were collected between April and June.
- The statistical models, risk assessment and formulation of revised monitoring schemes are based on PST > 0 µg/kg (as there were insufficient samples exceeding 400 or 800 µg/kg to allow for statistical modelling of these levels). Note that this may result in proposed frequencies that are too strict.
- From August through to February: based on the models monthly sampling would be sufficient for all locations, and this is confirmed by the data as no samples tested positive for PST.
- For the remaining months, a location-specific sampling frequency would be required to keep the risk of not detecting positive PST below 1%.

Table 34: Proposed sampling frequency corresponding to keep the risk of non-detection of DA in Pacific oysters exceeding 5 mg/kg below 1% for an average year. Based on models and data. Shown are the estimated probability of a toxic event for an average year (middle section) and DA prevalence observed in the data (section on right). Colouring is applied to denote the minimum sampling frequency required to keep risk of non-detection less than 1% (red (4) = weekly, yellow (2) = fortnightly, white (1) = monthly). Grouping is specific to Pacific oysters (see Table 4).

		Estimated probability (%) of DA > 5mg/kg												Data: # samples DA > 5 mg/kg over total samples											
Groups	GroupName	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
PO18	Ayr	0.00	0.00	0.00	0.28	0.90	0.26	0.65	0.65	0.19	0.00	0.00	0.00	0/12	0/14	0/21	0/17	0/23	0/40	0/33	0/36	0/37	0/23	0/15	0/10
PO123	WC-Gigha	0.00	0.00	0.00	0.25	0.83	0.24	0.60	0.60	0.17	0.00	0.00	0.00	0/20	0/25	0/28	0/34	0/47	0/61	0/67	0/67	0/74	0/67	0/35	0/14
PO10	WC-LochEtiveMelfort	0.00	0.00	0.00	0.90	2.83	0.84	2.07	2.07	0.61	0.00	0.00	0.00	0/14	0/19	0/19	0/25	2/28	0/37	1/39	2/43	0/42	0/40	0/25	0/16
PO9	WC-LochCreranLinnhe	0.00	0.00	0.00	0.42	1.35	0.39	0.98	0.98	0.28	0.00	0.00	0.00	0/6	0/15	0/17	0/20	0/20	0/20	1/25	0/35	0/29	0/20	0/17	0/6
PO28	WC-Lochaber	0.00	0.00	0.00	0.68	2.15	0.63	1.57	1.57	0.46	0.00	0.00	0.00	0/18	0/25	0/17	0/23	0/21	0/35	1/36	1/38	1/34	0/29	0/21	0/9
PO1	Mull	0.00	0.00	0.00	0.47	1.50	0.44	1.09	1.09	0.32	0.00	0.00	0.00	0/19	0/27	0/21	1/32	1/39	0/53	0/53	0/59	0/57	0/41	0/34	0/18
PO42	SkyeShetland	0.00	0.00	0.00	0.40	1.30	0.37	0.94	0.94	0.27	0.00	0.00	0.00	0/18	0/13	0/21	0/17	0/22	1/35	0/38	0/32	0/30	0/25	0/18	0/13
PO49	NWC	0.00	0.00	0.00	0.32	1.03	0.30	0.75	0.75	0.22	0.00	0.00	0.00	0/11	0/15	0/14	0/13	0/16	0/37	0/29	0/27	0/32	0/24	0/17	0/9

Purple in middle section: data suggest weekly sampling (proportion of samples exceeding limit is greater than 2%) whereas model indicates less frequent sampling. Underline in section on right: one DA sample in 10-20 mg/kg (no samples exceeded 20 mg/kg).

Table 35: Proposed sampling frequency corresponding to keep the risk of non-detection of PST in Pacific oysters exceeding 0 µg/kg below 1% for an average year. Based on models and data. Shown are the estimated probability of a toxic event for an average year (middle section) and PST prevalence observed in the data (section on right). Colouring is applied to denote the minimum sampling frequency required to keep risk of non-detection less than 1% (red (4) = weekly, yellow (2) = fortnightly, white (1) = monthly). Grouping is specific to Pacific oysters (see Table 4).

		Estimated probability (%) of PST>0 µg/kg												Data: # samples PST>0 µg/kg over total samples											
Groups	GroupName	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
PO18	Ayr	0.00	0.00	0.48	2.61	4.39	6.52	2.63	0.00	0.00	0.00	0.00	0.00	0/12	0/16	1/22	3/25	4/33	2/47	1/47	0/45	0/35	0/20	0/11	0/9
PO123	WC-Gigha	0.00	0.00	0.18	1.02	1.83	2.91	1.03	0.00	0.00	0.00	0.00	0.00	0/38	0/39	0/57	0/62	1/67	2/69	1/68	0/69	0/69	0/65	0/39	0/24
PO10	WC-LochEtiveMelfort	0.00	0.00	0.17	1.00	1.79	2.85	1.01	0.00	0.00	0.00	0.00	0.00	0/28	0/34	0/37	0/38	0/45	1/43	0/36	0/40	0/38	0/35	0/27	0/21
PO9	WC-LochCreranLinnhe	0.00	0.00	0.10	0.57	1.03	1.68	0.57	0.00	0.00	0.00	0.00	0.00	0/7	0/22	0/22	0/22	0/29	0/21	0/34	0/43	0/35	0/22	0/15	0/6
PO28	WC-Lochaber	0.00	0.00	0.29	1.66	2.89	4.46	1.68	0.00	0.00	0.00	0.00	0.00	0/22	0/35	0/36	2/42	1/44	2/51	1/52	0/47	0/45	0/40	0/22	0/14
PO1	Mull	0.00	0.00	0.18	1.07	1.91	3.04	1.08	0.00	0.00	0.00	0.00	0.00	0/32	0/40	0/44	0/61	1/64	2/66	1/63	0/64	0/54	0/43	0/38	0/27
PO42	SkyeShetland	0.00	0.00	0.13	0.74	1.34	2.17	0.75	0.00	0.00	0.00	0.00	0.00	0/26	0/19	0/31	0/22	0/33	0/41	0/42	0/36	0/31	0/28	0/21	0/15
PO49	NWC	0.00	0.00	0.45	2.43	4.11	6.14	2.45	0.00	0.00	0.00	0.00	0.00	0/14	0/20	0/20	0/28	1/35	6/45	2/38	0/36	0/38	0/27	0/18	0/10

Purple, green in middle section: data suggest weekly or fortnightly sampling (observed proportion of samples exceeding limit is greater than 2% (purple) respectively 1.33% (green)) whereas model indicates less frequent monitoring. Underline in section on right: one or more samples in 400-800 µg/kg. Double underline in section on right: one or more samples exceeding 800 µg/kg.

Table 36: Proposed sampling frequency corresponding to keep the risk of non-detection of LT in Pacific oysters exceeding MPL below 1% for an average year. Based on models and data. Shown are the estimated probability of a toxic event for an average year (middle section) and LT prevalence observed in the data (section on right). Colouring is applied to denote the minimum sampling frequency required to keep risk of non-detection less than 1% (red (4) = weekly, yellow (2) = fortnightly, white (1) = monthly). Grouping is specific to Pacific oysters (see Table 4).

		Estimated probability (%) of LT > MPL												Data: # samples LT > MPL over total samples											
Groups	GroupName	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
PO18	Ayr	1.10	5.46	2.41	1.62	1.67	1.10	0.59	3.88	6.71	3.93	1.65	2.22	0/9	0/13	0/28	0/32	2/37	1/57	1/55	2/54	1/61	1/33	0/25	0/16
PO123	WC-Gigha	1.43	6.91	3.11	2.11	2.16	1.43	0.78	4.96	8.43	5.02	2.15	2.87	0/20	3/27	0/38	3/61	2/68	2/72	0/73	3/66	8/79	5/67	3/60	3/30
PO10	WC-LochEtiveMelfort	0.33	1.77	0.74	0.49	0.51	0.33	0.18	1.23	2.23	1.24	0.50	0.68	0/17	0/18	1/31	1/45	0/47	0/49	0/46	0/50	0/55	0/49	1/41	0/28
PO9	WC-LochCreranLinnhe	0.60	3.13	1.34	0.89	0.92	0.60	0.32	2.19	3.90	2.22	0.91	1.23	0/8	0/15	0/22	0/22	0/27	0/27	0/35	2/45	0/40	1/32	0/22	0/12
PO28	WC-Lochaber	1.18	5.80	2.57	1.73	1.78	1.18	0.63	4.13	7.11	4.18	1.76	2.37	0/19	3/26	1/38	0/44	1/51	0/53	0/55	2/49	6/50	1/46	0/41	0/30
PO1	Mull	0.40	2.15	0.90	0.60	0.62	0.40	0.22	1.49	2.70	1.51	0.61	0.83	1/21	1/25	1/44	0/64	0/68	0/71	0/75	0/76	1/73	2/65	0/60	0/35
PO42	SkyeShetland	1.19	5.86	2.60	1.76	1.80	1.19	0.64	4.18	7.19	4.23	1.79	2.40	0/15	0/18	0/27	0/31	0/34	1/47	0/49	5/44	7/50	1/40	0/35	0/22
PO49	NWC	0.37	1.95	0.82	0.54	0.56	0.37	0.20	1.35	2.45	1.37	0.55	0.75	0/10	0/14	0/21	0/32	0/38	0/50	1/44	0/42	0/42	0/39	0/29	0/13

Purple, green in middle section: data suggest weekly or fortnightly sampling (observed proportion of samples exceeding field closure is greater than 2% (purple) respectively 1.33% (green)) whereas model indicates less frequent monitoring. Underline in section on right: one or more samples for which AZA > 80 µg/kg. Blue in section right: one or more samples for which OA > 80 µg/kg. None of the samples tested positive for YTX.

LT in Pacific oysters

Currently weekly sampling is applied throughout the year for all pods. Table 36 shows the tentative monitoring frequencies based on the models for LT > MPL combined with the observed data. In addition, occasions where AZA > 0.5 MPL (underline) or OA > 0.5 MPL (blue text) have also been indicated. The proposed monitoring frequencies have not been adjusted to reflect this information as the LC-MS/MS time series is rather short, nevertheless FSS may want to take this information into account when adapting the proposed schemes to their own needs.

Based on LT > MPL, there are several group by month combinations for which the data suggest that monitoring should be more frequent than once a month despite the model suggesting that once a month would be sufficient (Table 36). In addition, AZA > 80 µg/kg is observed for all pod groups throughout the year, with the exception of Ayr where none of the samples tested positive for AZA (Table B26). OA > 0.5 MPL was observed during Jun-Oct for five of the eight pod groups. There are no clear patterns emerging where sampling could be reduced, as LT > MPL is observed during all months of the year, and with all pod groups experiencing one or more occasions where LT > MPL.

LT summary:

- LT exceeding MPL was observed for all groups of pods during 2001-15.
- Pacific oyster samples exceeding the MPL has been observed during all months of the year.
- Although Table 36 indicates that sampling could be relaxed for some of the year (e.g. June and July) for certain groups of pods, no clear patterns emerge for reducing the current weekly sampling frequency for all pods. For practical purposes it may be best to continue with weekly monitoring throughout.

6 Biotoxin patterns and risk assessment for cockles, razors and surf clams

Insufficient samples are available for modelling the toxin prevalence for cockles, razors and surf clams, so the focus will be on data summaries instead. Biotoxin levels in cockles, razors and surf clams are summarised per pod in Tables B30-B33. From these tables there is no obvious indication of differences in prevalence between locations, and therefore we will focus on data summaries per month that are aggregated over pods. Furthermore, as none of the samples tested positive for YTX this biotoxin will not be discussed.

Because of the limited data no formal risk assessment has been conducted. Instead, monitoring frequencies have been proposed based on the maximum historical toxin level observed for each month. If this was zero, then monthly sampling is suggested. If the maximum observed value exceeded 0.5 MPL then weekly sampling is suggested. Finally, if the maximum observed was positive but less than 0.5 MPL then fortnightly sampling is suggested. Note that this is a purely pragmatic approach without any underlying statistical support.

6.1 Cockles

DA

Positive test results for DA have been observed during Apr-Sep (Table 37) for 62 out of 770 samples (8%). Only 3 of these exceeded 10 mg/kg (half the MPL), observed in August and September, with one of these exceeding 20 mg/kg in August. These findings suggest that weekly monitoring is needed during August and September, fortnightly monitoring during April to July, and with monthly monitoring the remainder of the year (Table 37).

PST

Positive PST samples were observed from April to November (Table 38), with eight (out of 989) samples exceeding 400 µg/kg observed from April to July, four of which exceeded 800 µg/kg (observed in April and June). A revised monitoring frequency is suggested in Table 38 with monthly sampling from December through to March, and with weekly sampling from April through to July.

LT

For LT only one out of 940 samples tested exceeded the MPL (Table 39) and this sample was taken in April. When looking at AZA and OA however, positive samples were observed all year round (except October), although none exceeded 160 µg/kg. There were one AZA and two OA test results that fell between 80-160 µg/kg. Based on the AZA and OA test results a mixture of fortnightly and weekly sampling would be required throughout the year.

Table 37: Number and percentage of cockle samples that exceeded a given limit for DA (mg/kg) based on data from 2001-15. Entries for which none of the samples exceeded a given limit are shown in grey. Current and proposed monitoring frequency is indicated as 4 (red) = weekly, 2 (yellow) = fortnightly, 1 (white) = monthly.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	*Total*
Total samples exceeding limit													
DA>0	0	0	0	3	6	3	19	18	13	0	0	0	*62*
DA>5	0	0	0	0	0	0	2	8	1	0	0	0	*11*
DA>10	0	0	0	0	0	0	0	1	1	0	0	0	*2*
DA>20	0	0	0	0	0	0	0	1	0	0	0	0	*1*
Total samples tested	*24*	*36*	*33*	*28*	*59*	*90*	*108*	*111*	*117*	*94*	*45*	*25*	*770*
% samples exceeding limit													
DA>0	0.0	0.0	0.0	10.7	10.2	3.3	17.6	16.2	11.1	0.0	0.0	0.0	*8.1*
DA>5	0.0	0.0	0.0	0.0	0.0	0.0	1.9	7.2	0.9	0.0	0.0	0.0	*1.4*
DA>10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.9	0.0	0.0	0.0	*0.3*
DA>20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.0	*0.1*
Current monitoring frequency	1	1	1	1	2	4	4	4	4	4	1	1	
Proposed monitoring frequency	1	1	1	2	2	2	2	4	4	1	1	1	

Table 38: Number and percentage of cockle samples that exceeded a given limit for PST (µg/kg) based on data from 2001-15. Entries for which none of the samples exceeded a given limit are shown in grey. Current and proposed monitoring frequency is indicated as 4 (red) = weekly, 2 (yellow) = fortnightly, 1 (white) = monthly.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	*Total*
Total samples exceeding limit													
PST>0	0	0	0	3	7	9	5	2	0	0	1	0	*27*
PST>400	0	0	0	1	2	4	1	0	0	0	0	0	*8*
PST>800	0	0	0	1	0	3	0	0	0	0	0	0	*4*
Total samples tested	*47*	*62*	*65*	*86*	*101*	*104*	*107*	*109*	*116*	*92*	*61*	*39*	*989*
% samples exceeding limit													
PST>0	0.0	0.0	0.0	3.5	6.9	8.7	4.7	1.8	0.0	0.0	1.6	0.0	*2.7*
PST>400	0.0	0.0	0.0	1.2	2.0	3.8	0.9	0.0	0.0	0.0	0.0	0.0	*0.8*
PST>800	0.0	0.0	0.0	1.2	0.0	2.9	0.0	0.0	0.0	0.0	0.0	0.0	*0.4*
Current monitoring frequency	2	2	2	4	4	4	4	4	4	4	2	2	
Proposed monitoring frequency	1	1	1	4	4	4	4	2	1	1	2	1	

Table 39: Number and percentage of cockle samples that exceeded the MPL for LT based on data from 2001-15. Cockle samples that exceeded a given limit for AZA (µg/kg) or OA (µg/kg) are based on data from 2011-15. None of the samples exceeded 160 µg/kg AZA or 160 µg/kg OA. Entries for which none of the samples exceeded a given limit are shown in grey. Current and proposed monitoring frequency is indicated as 4 (red) = weekly, 2 (yellow) = fortnightly, 1 (white) = monthly.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	*Total*
Total samples exceeding limit													
LT > MPL	0	0	0	1	0	0	0	0	0	0	0	0	*1*
Tota samples tested l	*23*	*32*	*70*	*82*	*93*	*98*	*107*	*100*	*110*	*93*	*88*	*44*	*940*
AZA>0	2	1	4	1	0	0	1	8	8	0	1	3	*29*
AZA>80	1	0	0	0	0	0	0	0	0	0	0	0	*1*
Total samples tested	*15*	*16*	*52*	*52*	*51*	*48*	*67*	*64*	*71*	*56*	*50*	*26*	*568*
OA>0	0	0	0	0	1	4	4	0	3	0	0	0	*12*
OA>80	0	0	0	0	0	0	1	0	1	0	0	0	*2*
Total samples tested	*15*	*16*	*52*	*52*	*51*	*48*	*67*	*64*	*71*	*56*	*50*	*26*	*568*
% samples exceeding limit													
LT > MPL	0.0	0.0	0.0	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*0.1*
AZA>0	13.3	6.3	7.7	1.9	0.0	0.0	1.5	12.5	11.3	0.0	2.0	11.5	*5.1*
AZA>80	6.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*0.2*
OA>0	0.0	0.0	0.0	0.0	2.0	8.3	6.0	0.0	4.2	0.0	0.0	0.0	*2.1*
OA>80	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0	1.4	0.0	0.0	0.0	*0.4*
Current monitoring frequency	1	1	1	4	4	4	4	4	4	4	4	4	
Proposed monitoring frequency	4	2	2	4	2	2	4	2	4	1	2	2	

6.2 Razors

DA

None of the 841 samples tested exceeded 10 mg/kg for DA (Table 40). Forty-nine (6%) of the samples tested positive, taken during May-Sep, and only eight of these at levels between 5-10 mg/kg. This suggests that fortnightly monitoring would be required from May through to September, with monthly monitoring during the remainder of the year.

PST

For PST (Table 41) 4% of the samples tested positive (43 out of 978), all taken between April and August. Fifteen of these exceeded 400 µg/kg (May-Aug). Five samples exceeded the MPL and these were taken between May and July. These observations suggest that monthly monitoring suffices from September through to March, with weekly monitoring from April or May through to August.

LT

For LT less than 1% (6 out of 1,010) of the samples exceeded the MPL limit (Table 42), and these were all observed from April to July. For AZA four samples tested positive (Jul-Sep) but these were all below 80 µg/kg. For OA 4% (30 out of 684) of the samples tested positive (May-Oct), four of which exceeded the MPL of 160 µg/kg (taken in June and July). None of the samples tested positive between Nov-Mar so that monthly monitoring would be sufficient during this period. Based on the AZA and OA results, a mixture of weekly (Apr-Jul) and fortnightly (Aug-Oct) monitoring would be required for the remainder of the year.

Table 40: Number and percentage of razor samples that exceeded a given limit for DA (mg/kg) based on data from 2001-15. None of the samples exceeded DA > 10 mg/kg. Entries for which none of the samples exceeded a given limit are shown in grey. Current and proposed monitoring frequency is indicated as 4 (red) = weekly, 2 (yellow) = fortnightly, 1 (white) = monthly.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	*Total*
Total samples exceeding limit													
DA>0	0	0	0	0	5	10	14	8	12	0	0	0	*49*
DA>5	0	0	0	0	1	1	2	2	2	0	0	0	*8*
Total samples tested	*31*	*32*	*47*	*49*	*67*	*124*	*143*	*93*	*103*	*61*	*50*	*41*	*841*
% samples exceeding limit													
DA>0	0.0	0.0	0.0	0.0	7.5	8.1	9.8	8.6	11.7	0.0	0.0	0.0	*5.8*
DA>5	0.0	0.0	0.0	0.0	1.5	0.8	1.4	2.2	1.9	0.0	0.0	0.0	*1.0*
Current monitoring frequency	1	1	1	1	2	4	4	4	4	4	1	1	
Proposed monitoring frequency	1	1	1	1	2	2	2	2	2	1	1	1	

Table 41: Number and percentage of razor samples that exceeded a given limit for PST (µg/kg) based on data from 2001-15. Entries for which none of the samples exceeded a given limit are shown in grey. Current and proposed monitoring frequency is indicated as 4 (red) = weekly, 2 (yellow) = fortnightly, 1 (white) = monthly.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	*Total*
Total samples exceeding limit													
PST>0	0	0	0	1	13	11	12	6	0	0	0	0	*43*
PST>400	0	0	0	0	5	6	3	1	0	0	0	0	*15*
PST>800	0	0	0	0	2	2	1	0	0	0	0	0	*5*
Total samples tested	*38*	*46*	*66*	*76*	*95*	*134*	*147*	*97*	*103*	*64*	*64*	*48*	*978*
% samples exceeding limit													
PST>0	0.0	0.0	0.0	1.3	13.7	8.2	8.2	6.2	0.0	0.0	0.0	0.0	*4.4*
PST>400	0.0	0.0	0.0	0.0	5.3	4.5	2.0	1.0	0.0	0.0	0.0	0.0	*1.5*
PST>800	0.0	0.0	0.0	0.0	2.1	1.5	0.7	0.0	0.0	0.0	0.0	0.0	*0.5*
Current monitoring frequency	2	2	2	4	4	4	4	4	4	4	2	2	
Proposed monitoring frequency	1	1	1	2	4	4	4	4	1	1	1	1	

Table 42: Number and percentage of razor samples that exceeded the MPL for LT based on data from 2001-15. Razor samples that exceeded a given limit for AZA (µg/kg) or OA (µg/kg) are based on data from 2011-15. Entries for which none of the samples exceeded a given limit are shown in grey. Current and proposed monitoring frequency is indicated as 4 (red) = weekly, 2 (yellow) = fortnightly, 1 (white) = monthly.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	*Total*
Total samples exceeding limit													
LT > MPL	0	0	0	1	1	3	1	0	0	0	0	0	*6*
Total samples tested	*31*	*34*	*69*	*80*	*99*	*141*	*149*	*102*	*106*	*69*	*78*	*52*	*1010*
AZA>0	0	0	0	0	0	0	1	2	1	0	0	0	*4*
Total samples tested	*16*	*16*	*49*	*58*	*69*	*74*	*116*	*76*	*78*	*50*	*52*	*30*	*684*
OA>0	0	0	0	0	2	11	14	0	2	1	0	0	*30*
OA>80	0	0	0	0	2	8	6	0	0	0	0	0	*16*
OA>160	0	0	0	0	0	3	1	0	0	0	0	0	*4*
Total samples tested	*16*	*16*	*49*	*58*	*69*	*74*	*116*	*76*	*78*	*50*	*52*	*30*	*684*
% samples exceeding limit													
LT > MPL	0.0	0.0	0.0	1.3	1.0	2.1	0.7	0.0	0.0	0.0	0.0	0.0	*0.6*
AZA>0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	2.6	1.3	0.0	0.0	0.0	*0.6*
OA>0	0.0	0.0	0.0	0.0	2.9	14.9	12.1	0.0	2.6	2.0	0.0	0.0	*4.4*
OA>80	0.0	0.0	0.0	0.0	2.9	10.8	5.2	0.0	0.0	0.0	0.0	0.0	*2.3*
OA>160	0.0	0.0	0.0	0.0	0.0	4.1	0.9	0.0	0.0	0.0	0.0	0.0	*0.6*
Current monitoring frequency	1	1	1	4	4	4	4	4	4	4	4	4	
Proposed monitoring frequency	1	1	1	4	4	4	4	2	2	2	1	1	

6.3 Surf clams

DA

Of 207 samples tested, 11% were positive for DA (Table 43), all taken between May and October. All of the samples were less than 5 mg/kg except for one sample taken in August, which had levels between 5-10 mg/kg. This suggests that monthly monitoring would suffice from November to April, with fortnightly sampling required for the remainder of the year.

PST

PST was found to exceed the MPL for four out of 256 samples (Table 44), taken in May-Jul. Positive samples were observed from April through to July. Monthly monitoring would be sufficient from August to March, with weekly monitoring required between May and July, and with fortnightly monitoring during April.

LT

For 8% of the samples LT levels exceeded MPL (Table 45), all collected between May and October. AZA > 160 µg/kg was observed in August, and OA > 160 µg/kg was observed from June to October. Samples tested positive for AZA or OA throughout the year. This suggests that fortnightly monitoring is required as a minimum, with weekly monitoring needed from May to October.

Table 43: Number and percentage of surf clam samples that exceeded a given limit for DA (mg/kg) based on data from 2001-15. None of the samples exceeded DA > 10 mg/kg. Entries for which none of the samples exceeded a given limit are shown in grey. Current and proposed monitoring frequency is indicated as 4 (red) = weekly, 2 (yellow) = fortnightly, 1 (white) = monthly.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	*Total*
Total samples exceeding limit													
DA>0	0	0	0	0	1	1	5	8	6	2	0	0	*23*
DA>5	0	0	0	0	0	0	0	1	0	0	0	0	*1*
Total samples tested	*8*	*11*	*14*	*12*	*21*	*32*	*27*	*32*	*19*	*19*	*8*	*4*	*207*
% samples exceeding limit													
DA>0	0.0	0.0	0.0	0.0	4.8	3.1	18.5	25.0	31.6	10.5	0.0	0.0	*11.1*
DA>5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.1	0.0	0.0	0.0	0.0	*0.5*
Current monitoring frequency	1	1	1	1	2	4	4	4	4	4	1	1	
Proposed monitoring frequency	1	1	1	1	2	2	2	2	2	2	1	1	

Table 44: Number and percentage of surf clam samples that exceeded a given limit for PST (µg/kg) based on data from 2001-15. Entries for which none of the samples exceeded a given limit are shown in grey. Current and proposed monitoring frequency is indicated as 4 (red) = weekly, 2 (yellow) = fortnightly, 1 (white) = monthly.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	*Total*
Total samples exceeding limit													
PST>0	0	0	0	2	5	2	3	0	0	0	0	0	*12*
PST>400	0	0	0	0	2	2	3	0	0	0	0	0	*7*
PST>800	0	0	0	0	1	1	2	0	0	0	0	0	*4*
Total samples tested	*12*	*15*	*23*	*26*	*29*	*35*	*30*	*32*	*19*	*17*	*12*	*6*	*256*
% samples exceeding limit													
PST>0	0.0	0.0	0.0	7.7	17.2	5.7	10.0	0.0	0.0	0.0	0.0	0.0	*4.7*
PST>400	0.0	0.0	0.0	0.0	6.9	5.7	10.0	0.0	0.0	0.0	0.0	0.0	*2.7*
PST>800	0.0	0.0	0.0	0.0	3.4	2.9	6.7	0.0	0.0	0.0	0.0	0.0	*1.6*
Current monitoring frequency	2	2	2	4	4	4	4	4	4	4	2	2	
Proposed monitoring frequency	1	1	1	2	4	4	4	1	1	1	1	1	

Table 45: Number and percentage of surf clam samples that exceeded the MPL for LT based on data from 2001-15. Surf clam samples that exceeded a given limit for AZA (µg/kg) or OA (µg/kg) are based on data from 2011-15. Entries for which none of the samples exceeded a given limit are shown in grey. Current and proposed monitoring frequency is indicated as 4 (red) = weekly, 2 (yellow) = fortnightly, 1 (white) = monthly.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	*Total*
Total samples exceeding limit													
LT > MPL	0	0	0	0	1	6	4	5	3	2	0	0	*21*
Total samples tested	*8*	*11*	*22*	*26*	*27*	*34*	*31*	*37*	*22*	*21*	*17*	*9*	*265*
AZA>0	1	1	1	4	1	1	5	4	3	5	4	3	*33*
AZA>80	0	0	0	0	0	0	3	4	2	1	0	0	*10*
AZA>160	0	0	0	0	0	0	0	2	0	0	0	0	*2*
Total samples tested	*2*	*2*	*9*	*12*	*14*	*17*	*16*	*15*	*12*	*12*	*11*	*6*	*128*
OA>0	0	0	2	3	8	13	14	14	10	5	6	5	*80*
OA>80	0	0	0	0	3	8	11	10	6	3	0	0	*41*
OA>160	0	0	0	0	0	4	4	4	3	2	0	0	*17*
Total samples tested	*2*	*2*	*9*	*12*	*14*	*17*	*16*	*15*	*12*	*12*	*11*	*6*	*128*
% samples exceeding limit													
LT > MPL	0.0	0.0	0.0	0.0	3.7	17.6	12.9	13.5	13.6	9.5	0.0	0.0	*7.9*
AZA>0	50.0	50.0	11.1	33.3	7.1	5.9	31.3	26.7	25.0	41.7	36.4	50.0	*25.8*
AZA>80	0.0	0.0	0.0	0.0	0.0	0.0	18.8	26.7	16.7	8.3	0.0	0.0	*7.8*
AZA>160	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.3	0.0	0.0	0.0	0.0	*1.6*
OA>0	0.0	0.0	22.2	25.0	57.1	76.5	87.5	93.3	83.3	41.7	54.5	83.3	*62.5*
OA>80	0.0	0.0	0.0	0.0	21.4	47.1	68.8	66.7	50.0	25.0	0.0	0.0	*32.0*
OA>160	0.0	0.0	0.0	0.0	0.0	23.5	25.0	26.7	25.0	16.7	0.0	0.0	*13.3*
Current monitoring frequency	1	1	1	4	4	4	4	4	4	4	4	4	
Proposed monitoring frequency	2	2	2	2	4	4	4	4	4	4	2	2	

7 Monitoring frequency for recent and future pods

The current approach is to monitor a new pod on a weekly basis. FSS has no clear strategy when or how to reduce this frequency. In this Section we will look at the required monitoring frequency for new locations in more detail.

Recent pods for which monitoring has been introduced since 2011 are listed in Table 46. For cockles there are two pods with test results for 2013 and 2014. For razors five new pods were introduced during 2013-2015. There was one new pod for Pacific oysters and there were eight new pods for mussels. The biotoxin levels observed that these pods are summarised in Tables 47 and 48. High levels of biotoxins were only observed for mussels, with DA > 10 mg/kg (one out of 396 samples), PST > 800 µg/kg (nine out of 408 samples) and OA > 160 µg/kg (27 out of 419 samples).

The remainder of this section we will focus on mussels and Pacific oysters. The statistical models that were developed for these species allow us to predict the expected biotoxin patterns over the months of the year for a new pod with unknown biotoxin prevalence. In Section 7.1 we will look at the predicted biotoxin prevalence for an unknown new pod, and in Section 7.2 we will look at data from recent pods and assess whether weekly monitoring is still required.

Table 46: Number of samples per year for recently classified pods.

Species	Groups	GroupName	Pod	2011	2012	2013	2014	2015
Cockles	G26	Dumfries	142			1	4	
	G8	Ayr-LochStriven	139			15		
Mussels	G8	Ayr-LochStriven	139				18	37
	G18	Ayr-other	145				6	35
	G28	WC-Lochaber	137			12	28	18
	G22	HarrisUist	135			45	47	4
	G22	HarrisUist	136			45	47	8
	G67	Shetland-SE-CliftSound	132	7			10	6
	G71	Shetland-W-RonasVoe	146				19	15
	G81	Shetland-N-Uyea	66		9			16
Pacific oysters	G39	NWC-LochEweBroom	144				15	37
Razors	G21	Lewis-LochLeurbostErisort	138				37	33
	G26	Dumfries	27					12
	G26	Dumfries	140			2	8	10
	G22	HarrisUist	141			2	18	
	G22	HarrisUist	147				15	

Table 47: Biotoxin levels of DA, PST and LT in various species for recently (2011 onwards) classified pods.

				DA (mg/kg)					PST (µg/kg)					LT[1]		
Species	Groups	GroupName	Pod	0	0-5	5-10	10-20	*Total*	0	0-400	400-800	800+	*Total*	0	1	*Total*
Cockles	G26	Dumfries	142	5				*5*	5				*5*	5		*5*
	G8	Ayr-LochStriven	139	15				*15*	15				*15*	15		*15*
Mussels	G8	Ayr-LochStriven	139	44	3			*47*	45	1	1		*47*	47	8	*55*
	G18	Ayr-other	145	19				*19*	18		1	9	*28*	18	14	*32*
	G28	WC-Lochaber	137	53				*53*	52	4			*56*	53	5	*58*
	G22	HarrisUist	135	89	7			*96*	94	2			*96*	96		*96*
	G22	HarrisUist	136	95	5			*100*	98	2			*100*	100		*100*
	G67	Shetland-SE-CliftSound	132	16	5		1	*22*	13	8	1		*22*	19		*19*
	G71	Shetland-W-RonasVoe	146	33	1			*34*	29	5			*34*	34		*34*
	G81	Shetland-N-Uyea	66	24	1			*25*	22	3			*25*	25		*25*
Pacific oysters	G39	NWC-LochEweBroom	144	51	1			*52*	48	4			*52*	52		*52*
Razors	G26	Dumfries	27	11				*11*	11	1			*12*	12		*12*
	G26	Dumfries	140	19	1			*20*	20				*20*	20		*20*
	G21	Lewis-LochLeurbostErisort	138	66	4			*70*	63	7			*70*	70		*70*
	G22	HarrisUist	141	16	3	1		*20*	20				*20*	20		*20*
	G22	HarrisUist	147	15				*15*	15				*15*	15		*15*

[1]LT levels < MPL (0) or > MPL (1)

Table 48: Biotoxin levels of AZA, OA and YTX in various species for recently (2011 onwards) classified pods.

				AZA (µg/kg)			OA (µg/kg)					YTX (mg/kg)		
Species	Groups	GroupName	Pod	0	0-80	*Total*	0	0-80	80-160	160+	*Total*	0	0-1.85	*Total*
Cockles	G26	Dumfries	142	5		*5*	5				*5*	5		*5*
	G8	Ayr-LochStriven	139	15		*15*	13	1	1		*15*	15		*15*
Mussels	G8	Ayr-LochStriven	139	55		*55*	25	14	8	8	*55*	55		*55*
	G18	Ayr-other	145	32		*32*	14	4		14	*32*	30	2	*32*
	G28	WC-Lochaber	137	58		*58*	24	22	7	5	*58*	58		*58*
	G22	HarrisUist	135	95	1	*96*	80	16			*96*	96		*96*
	G22	HarrisUist	136	100		*100*	83	16	1		*100*	100		*100*
	G67	Shetland-SE-CliftSound	132	19		*19*	5	11	3		*19*	19		*19*
	G71	Shetland-W-RonasVoe	146	34		*34*	20	14			*34*	34		*34*
	G81	Shetland-N-Uyea	66	24	1	*25*	21	4			*25*	25		*25*
Pacific oysters	G39	NWC-LochEweBroom	144	52		*52*	46	5	1		*52*	52		*52*
Razors	G26	Dumfries	27	12		*12*	12				*12*	12		*12*
	G26	Dumfries	140	20		*20*	20				*20*	20		*20*
	G21	Lewis-LochLeurbostErisort	138	70		*70*	70				*70*	70		*70*
	G22	HarrisUist	141	20		*20*	20				*20*	20		*20*
	G22	HarrisUist	147	15		*15*	14	1			*15*	15		*15*

7.1 Expected biotoxin patterns for a new pod based on models

Our best estimate for the expected biotoxin pattern for an unknown new pod would be to assume that it behaves like an average pod (i.e. its expected biotoxin pattern would be like the pattern one might expect for an average pod in Scotland). From a risk assessment point of view however, this is unsatisfactory as we want to ensure that our monitoring scheme is unlikely to miss any toxic events. Hence we are interested in the predicted biotoxin pattern for a new pod that is sensitive to biotoxin prevalence. Because the models allow for random variation between locations we can look at the predicted biotoxin pattern for a location that is in the top 5% of extreme locations (i.e. only 1 out of 20 locations have a prevalence as high as this). As the risk assessment is based on keeping the probability of not detecting a toxic event less than 1%, we will also look at the predicted biotoxin pattern for a location in the top 1% of extreme locations.

7.1.1 Mussels

Table 49 gives a summary of the estimated probability of DA > 5 mg/kg for a new pod with an average toxin pattern, a new pod that is in the top 5% of extreme locations, and a new pod that is in the top 1% of extreme locations. The estimated probability of DA exceeding 5 mg/kg is less than 1% from October to February, even if the new pod is in the top 1% of extreme locations. The data however indicate that for one or more locations the estimated prevalence was at least 3% in March and November (Table 49).

For PST, presented in Table 50, positive samples would be likely to occur all year round for a pod in the top 1% of extreme locations, and levels exceeding 400 µg/kg would also be likely to occur for most of the year.

Table 51 shows the findings for LT. The prevalence is estimated to be 2% or more (i.e. requiring weekly monitoring to keep the risk of not detecting LT exceeding MPL below 1%) for most of the year, even for an average new location.

The findings presented in Tables 49 - 51 suggest that for a new location, for DA and PST weekly monitoring (as the estimated prevalence exceeds 2%) is needed for most of the year to ensure that, if the new location happens to be sensitive to the presence of biotoxin, the risk of not detecting positive DA or PST samples stays below 1%. Likewise, for LT weekly monitoring would be required throughout the year.

Table 49: Estimated probability (%) of DA in mussels exceeding 5 mg/kg or 0 mg/kg for an average toxin year for an extreme new pod (this is a pod for which toxin levels are generally high and such a pattern would be expected in no more than in 1 out of 20 or 1 out of 100 new pods). Also shown is the estimated probability (%) for a new pod showing an average toxin pattern. The maximum estimated prevalence is the maximum of the model estimates over the 37 existing pod groups. Likewise, the maximum prevalence observed in the data is the maximum observed prevalence over the 37 existing pod groups. Colouring denotes the minimum sampling frequency required to keep risk of non-detection less than 1% (red= weekly, yellow = fortnightly, white= monthly).

DA > 5 mg/kg	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Prediction for extreme new pod (1 out of 20 pods)	0.0	0.0	0.6	1.0	3.4	2.5	6.7	7.0	11.9	0.3	0.5	0.0
Prediction for extreme new pod (1 out of 100 pods)	0.0	0.0	1.2	1.9	6.3	4.8	12.1	12.6	20.6	0.7	0.9	0.0
Prediction for average new pod	0.0	0.0	0.1	0.2	0.7	0.5	1.5	1.5	2.7	0.1	0.1	0.0
Max estimated prevalence	0.0	0.0	0.4	0.7	2.0	1.5	4.5	4.4	8.6	0.2	0.3	0.0
Data, average prevalence per pod group	0.0	0.0	0.1	0.2	0.7	0.5	1.3	1.4	2.4	0.1	0.1	0.0
Data, max prevalence	0.0	0.0	3.4	7.4	5.6	3.0	7.1	7.3	13.6	1.0	3.7	0.0
Data, samples DA > 5 mg/kg out of total samples	(0/644)	(0/744)	(1/791)	(2/1022)	(8/1193)	(7/1522)	(22/1696)	(25/1795)	(45/1862)	(1/1652)	(1/1123)	(0/513)
DA > 0 mg/kg	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Prediction for extreme new pod (1 out of 20 pods)	0.0	0.0	2.1	5.1	12.6	15.3	25.0	24.6	29.6	9.3	2.3	0.8
Prediction for extreme new pod (1 out of 100 pods)	0.0	0.0	3.8	8.9	20.7	24.7	37.6	37.1	43.3	15.7	4.1	1.4
Prediction for average new pod	0.0	0.0	0.5	1.3	3.3	4.1	7.4	7.2	9.1	2.4	0.6	0.2
Max estimated prevalence	0.0	0.0	1.5	9.6	11.0	10.3	22.6	18.5	35.6	13.8	1.6	0.6
Data, average prevalence per pod group	0.0	0.0	0.5	1.4	3.4	4.1	7.7	7.9	9.4	2.4	0.5	0.2
Data, max prevalence	0.0	0.0	5.6	22.2	14.5	15.2	25.0	21.7	42.9	30.0	11.8	4.2
Data, samples DA > 0 mg/kg out of total samples	(0/644)	(0/744)	(4/791)	(14/1022)	(41/1193)	(63/1522)	(130/1696)	(142/1795)	(175/1862)	(39/1652)	(6/1123)	(1/513)

Table 50: Estimated probability (%) of PST in mussels exceeding 800 µg/kg, 400 µg/kg or 0 µg/kg for an average toxin year for an extreme new pod (this is a pod for which toxin levels are generally high and such a pattern would be expected in no more than in 1 out of 20 or 1 out of 100 new pods). Also shown is the estimated probability (%) for a new pod showing an average toxin pattern. The maximum estimated prevalence is the maximum of the model estimates over the 37 existing pod groups. Likewise, the maximum prevalence observed in the data is the maximum observed prevalence over the 37 existing pod groups. Colouring denotes the minimum sampling frequency required to keep risk of non-detection less than 1% (red= weekly, yellow = fortnightly, white= monthly).

PST > 800 µg/kg	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Prediction for extreme new pod (1 out of 20 pods)	0.0	0.0	0.0	6.9	21.0	27.9	13.3	6.2	4.9	0.0	1.1	0.0
Prediction for extreme new pod (1 out of 100 pods)	0.0	0.0	0.0	16.0	40.8	50.0	28.3	14.6	11.7	0.0	2.8	0.0
Prediction for average new pod	0.0	0.0	0.0	0.7	2.6	3.7	1.5	0.7	0.5	0.0	0.1	0.0
Max estimated prevalence	0.0	0.0	0.0	9.5	12.4	16.8	12.8	3.9	6.0	0.0	0.4	0.0
Data, average prevalence per pod group	0.0	0.0	0.0	0.8	2.3	3.8	1.4	0.6	0.5	0.0	0.1	0.0
Data, max prevalence	0.0	0.0	0.0	9.3	14.6	35.7	19.4	6.3	10.0	0.0	3.4	0.0
Data, samples PST > 800 µg/kg out of total samples	(0/1122)	(0/1182)	(0/1508)	(15/1811)	(46/1978)	(75/1984)	(28/1946)	(12/1888)	(10/1983)	(0/1632)	(1/1229)	(0/755)
PST > 400 µg/kg	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Prediction for extreme new pod (1 out of 20 pods)	1.9	0.0	5.0	20.8	43.9	50.1	33.7	21.1	21.5	4.9	1.3	0.0
Prediction for extreme new pod (1 out of 100 pods)	5.4	0.1	13.4	43.4	69.6	74.6	59.7	43.9	44.4	13.2	3.6	0.1
Prediction for average new pod	0.1	0.0	0.4	1.9	5.6	7.0	3.7	2.0	2.0	0.4	0.1	0.0
Max estimated prevalence	0.6	0.0	3.4	18.8	28.0	31.3	20.0	15.5	15.8	3.0	0.7	0.0
Data, average prevalence per pod group	0.1	0.0	0.3	1.8	4.7	6.2	3.2	1.9	1.9	0.4	0.1	0.0
Data, max prevalence	2.4	0.0	4.7	14.4	26.8	50.0	25.0	15.8	20.4	5.9	3.4	0.0
Data, samples PST > 400 µg/kg out of total samples	(1/1122)	(0/1182)	(5/1508)	(33/1811)	(92/1978)	(123/1984)	(62/1946)	(36/1888)	(37/1983)	(6/1632)	(1/1229)	(0/755)
PST > 0 µg/kg	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Prediction for extreme new pod (1 out of 20 pods)	1.6	1.5	9.6	30.9	57.0	59.4	48.7	36.8	35.1	10.2	2.7	0.1
Prediction for extreme new pod (1 out of 100 pods)	4.3	4.1	23.0	55.7	78.8	80.4	72.7	62.1	60.3	24.3	7.1	0.2
Prediction for average new pod	0.1	0.1	0.9	3.6	9.9	10.8	7.3	4.6	4.3	0.9	0.2	0.0
Max estimated prevalence	0.5	0.3	9.3	20.9	36.1	39.2	18.5	20.3	24.6	7.2	2.4	0.0
Data, average prevalence per pod group	0.1	0.1	0.9	3.8	9.2	10.6	6.4	4.5	4.2	0.7	0.2	0.0
Data, max prevalence	2.4	1.6	13.9	18.6	36.7	57.1	25.0	25.0	30.6	9.8	6.9	0.0
Data, samples PST > 0 µg/kg out of total samples	(1/1122)	(1/1182)	(13/1508)	(68/1811)	(181/1978)	(210/1984)	(125/1946)	(85/1888)	(84/1983)	(12/1632)	(2/1229)	(0/755)

Table 51: Estimated probability (%) of LT in mussels exceeding MPL for an average toxin year for an extreme new pod (this is a pod for which toxin levels are generally high and such a pattern would be expected in no more than in 1 out of 20 or 1 out of 100 new pods). Also shown is the estimated probability (%) for a new pod showing an average toxin pattern. The maximum estimated prevalence is the maximum of the model estimates over the 37 existing pod groups. Likewise, the maximum prevalence observed in the data is the maximum observed prevalence over the 37 existing pod groups. Colouring denotes the minimum sampling frequency required to keep risk of non-detection less than 1% (red= weekly, yellow = fortnightly, white= monthly).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Prediction for extreme new pod (1 out of 20 pods)	1.1	0.1	1.3	14.0	26.1	45.5	54.6	60.5	51.3	32.0	16.4	8.0
Prediction for extreme new pod (1 out of 100 pods)	2.5	0.1	2.9	27.0	44.5	65.4	73.1	77.6	70.4	51.6	30.8	16.4
Prediction for average new pod	0.2	0.0	0.2	2.2	4.7	10.4	14.3	17.5	12.8	6.2	2.7	1.2
Max estimated prevalence	0.7	0.0	0.8	6.7	21.9	39.1	37.1	45.0	39.4	26.2	16.8	5.5
Data, average prevalence per pod group	0.2	0.0	0.2	2.1	4.4	9.9	14.7	17.3	13.0	6.2	2.8	1.2
Data, max prevalence	3.1	0.0	3.4	13.3	20.6	35.4	39.5	44.0	40.0	26.9	23.1	20.0
Data, samples LT > MPL out of total samples	(1/662)	(0/772)	(3/1421)	(44/2063)	(97/2206)	(221/2235)	(339/2305)	(413/2385)	(318/2448)	(132/2117)	(53/1927)	(13/1051)

7.1.2 Pacific oysters

Table 52 shows findings for a new pod with Pacific oysters as indicator species. The estimated prevalence of DA > 5mg/kg is estimated to be close to 0% from October through to March, even for a new pod that would be extremely sensitive to DA. This is also supported by the Pacific oyster data, as none of the samples tested exceeded 5 mg/kg during these months. When looking at positive DA, however, prevalence exceeds 2% (i.e. requiring weekly monitoring to keep the risk of not detecting positive DA below 1%) for most of the year, even for an average new pod.

As models could not be developed for PST > 400 µg/kg or PST > 800 µg/kg, only results for positive PST are presented. It shows that from August to February the predicted prevalence of positive PST is close to 0% (Table 52). Again, data supports this is all of the samples tested during these months (over 2001-15) gave a negative result.

The likelihood of any of the LT toxins exceeding MPL is predicted to be sufficiently high to require weekly sampling throughout the year (Table 52).

In summary, these findings suggest that for a new Pacific oyster pod that is sensitive to the presence of biotoxins weekly monitoring would be required for most of the year for DA to ensure that the risk of not detecting the presence of DA stays below 1%. For LT weekly monitoring would be required all year round. To keep the risk of not detecting positive PST below 1%, it would be sufficient to monitor weekly from March through to July, with monthly monitoring for the remainder of the year.

7.1.3 Conclusion

Not knowing what biotoxin behaviour to expect for a new pod, we want to err on the side of caution and therefore work from a worst-case scenario where the new pod is sensitive to the presence of biotoxin. Models and existing data suggest that weekly monitoring would be required throughout the year for mussels and Pacific oysters, with perhaps reduced monitoring for PST during part of the year for Pacific oysters.

Table 52: Estimated probability (%) of biotoxin in Pacific oysters exceeding a given limit for an average toxin year for an extreme new pod (this is a pod for which toxin levels are generally high and such a pattern would be expected in no more than 1 out of 20 or 1 out of 100 new pods). Also shown is the estimated probability (%) for a new pod showing an average toxin pattern. The maximum estimated prevalence is the maximum of the model estimates over the eight existing pod groups. Likewise, the maximum prevalence observed in the data is the maximum observed prevalence over the eight existing pod groups. Colouring denotes the minimum sampling frequency required to keep the risk of non-detection less than 1% (red = weekly, yellow = fortnightly, white = monthly).

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
DA > 5	Prediction for extreme new pod (1 out of 20 pods)	0.0	0.0	0.0	1.4	4.5	1.3	3.3	3.3	1.0	0.0	0.0	0.0
	Prediction for extreme new pod (1 out of 100 pods)	0.0	0.0	0.0	2.3	7.0	2.1	5.1	5.1	1.5	0.0	0.0	0.0
	Prediction for average new pod	0.0	0.0	0.0	0.5	1.5	0.4	1.1	1.1	0.3	0.0	0.0	0.0
	Max estimated prevalence	0.0	0.0	0.0	0.9	2.8	0.8	2.1	2.1	0.6	0.0	0.0	0.0
	Data, average prevalence per pod	0.0	0.0	0.0	0.6	1.4	0.3	0.9	0.9	0.3	0.0	0.0	0.0
	Data, max prevalence	0.0	0.0	0.0	3.1	7.1	2.9	4.0	4.7	2.9	0.0	0.0	0.0
	Data, samples DA > 5 mg/kg out of total samples	(0/118)	(0/153)	(0/158)	(1/181)	(3/216)	(1/318)	(3/320)	(3/337)	(1/335)	(0/269)	(0/182)	(0/95)
DA > 0	Prediction for extreme new pod (1 out of 20 pods)	0.0	6.1	0.0	3.5	23.6	6.1	15.9	18.2	15.5	7.4	2.0	0.0
	Prediction for extreme new pod (1 out of 100 pods)	0.0	10.0	0.0	5.9	34.7	10.0	24.5	27.6	23.9	12.1	3.3	0.0
	Prediction for average new pod	0.0	1.7	0.0	1.0	7.8	1.7	4.9	5.7	4.7	2.1	0.5	0.0
	Max estimated prevalence	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Data, average prevalence per pod	0.0	2.0	0.0	1.1	6.9	1.6	4.7	5.3	4.5	1.9	0.5	0.0
	Data, max prevalence	0.0	8.0	0.0	6.3	25.6	5.4	16.0	16.3	11.8	6.9	2.9	0.0
	Data, samples DA > 0 mg/kg out of total samples	(0/118)	(3/153)	(0/158)	(2/181)	(15/216)	(5/318)	(15/320)	(18/337)	(15/335)	(5/269)	(1/182)	(0/95)
PST>0	Prediction for extreme new pod (1 out of 20 pods)	0.0	0.0	0.9	4.8	8.1	12.2	4.8	0.0	0.0	0.0	0.0	0.0
	Prediction for extreme new pod (1 out of 100 pods)	0.0	0.0	1.5	7.9	13.1	19.0	8.0	0.0	0.0	0.0	0.0	0.0
	Prediction for average new pod	0.0	0.0	0.2	1.4	2.4	3.7	1.4	0.0	0.0	0.0	0.0	0.0
	Max estimated prevalence	0.0	0.0	0.5	2.6	4.4	6.5	2.6	0.0	0.0	0.0	0.0	0.0
	Data, average prevalence per pod	0.0	0.0	0.4	1.7	2.3	3.9	1.6	0.0	0.0	0.0	0.0	0.0
	Data, max prevalence	0.0	0.0	4.5	12.0	12.1	13.3	5.3	0.0	0.0	0.0	0.0	0.0
	Data, samples PST > 0 µg/kg out of total samples	(0/179)	(0/225)	(1/269)	(5/300)	(8/350)	(15/383)	(6/380)	(0/380)	(0/345)	(0/280)	(0/191)	(0/126)
LT>MPL	Prediction for extreme new pod (1 out of 20 pods)	2.7	12.7	5.9	4.0	4.1	2.7	1.5	9.3	15.4	9.4	4.1	5.4
	Prediction for extreme new pod (1 out of 100 pods)	4.5	19.5	9.4	6.5	6.6	4.5	2.5	14.5	23.2	14.7	6.6	8.7
	Prediction for average new pod	0.8	4.1	1.8	1.2	1.3	0.8	0.4	2.9	5.1	3.0	1.2	1.7
	Max estimated prevalence	1.4	6.9	3.1	2.1	2.2	1.4	0.8	5.0	8.4	5.0	2.1	2.9
	Data, average prevalence per pod	0.8	4.5	1.2	1.2	1.4	0.9	0.5	3.3	5.1	3.0	1.3	1.6
	Data, max prevalence	4.8	11.5	3.2	4.9	5.4	2.8	2.3	11.4	14.0	7.5	5.0	10.0
	Data, samples LT > MPL out of total	(1/119)	(7/156)	(3/249)	(4/331)	(5/370)	(4/426)	(2/432)	(14/426)	(23/450)	(11/371)	(4/313)	(3/186)

7.2 Proposed monitoring approach

Having concluded that it is sensible to initially monitor new pods on a weekly basis, the next issue to address is for how long this should continue. From a statistical point of view, to be confident that the new pod is 'safe', at least 150[4] samples would be needed, all of which have to test negative, to be confident that the prevalence at this pod is less than 2%, so that weekly sampling could be reduced to fortnightly sampling. This would increase to 225[5] samples, all negative, to be confident that the biotoxin prevalence at this pod is less than 1.33% and hence monthly sampling would suffice. The need for weekly monitoring for 3 to 4.5 years seems rather severe and ignores any hydrological and environmental knowledge that may become available over time.

A more pragmatic approach may be the following:

1. Monitor a new pod weekly for one year, so that data on biotoxin prevalence for each month of the year will be available.
2. Collect hydrological and environmental knowledge about this location, including phytoplankton monitoring data.
3. After one year, use the combined information on hydrology, environment and biotoxin patterns to decide whether this new pod can be combined with an existing group of pods. Then adapt the monitoring frequency accordingly.

7.2.1 Application to recent pods for mussels and Pacific oysters

Based on phytoplankton data, environmental and hydrographical knowledge, and observed biotoxin patterns, recent pods (introduced since 2011) were assigned to pod groups. Tables B50 - B55 compare the observed test results with the estimated prevalence obtained from our models for each corresponding group (although this approach is slightly incestuous as the underlying data for the estimated prevalence include these recent pods, it does however give some idea of how the pragmatic approach outlined above might work). What we are looking for here is whether months for which data from a recent pod exceed a given level correspond with a high estimated prevalence from our models. Tables B50 - B55 show good agreement, suggesting that combining these recent pods with existing pods was done in an appropriate manner.

Results for Pacific oysters (one new pod only) are summarised in Table B61, and here the data also show good agreement with the models (i.e. when observed toxin levels exceed a given limit then the corresponding estimated prevalence from our models is high).

[4]With 150 samples, all negative, the 95% confidence interval for p, based on the binomial distribution, is [0%,2%].
[5]With 225 samples, all negative, the 99% confidence interval for p, based on the binomial distribution, is [0%, 1.33%].

8 Discussion

8.1 Assumptions regarding data, model and risk assessment

Many assumptions regarding the data, statistical model and risk assessment had to be made. Here we list and discuss the various assumptions and their implications.

Data assumptions

1. It is assumed that the test result gives a true representation of the biotoxin levels in the shellfish sample.

2. It is assumed that the biotoxin levels observed in the (small) sample tested are representative of biotoxin levels in shellfish across the entire harvesting site.

3. It is assumed that harvesting sites within the same pod all follow the same pattern of biotoxin prevalence.

From these three assumptions it follows that

4. It is assumed that the test result from the sample is representative of the biotoxin status of the entire pod.

If biotoxin levels anywhere in the pod exceed the MPL then it is assumed that the test result reflects this. Likewise, if the test result falls below the MPL then it is assumed that this is a reflection of biotoxin levels being 'safe' across the entire pod. It is obvious that the above assumptions are extremely severe and that, as a consequence, all model outcomes and risk assessment findings should never be seen in isolation. They should always be combined with other available information such as phytoplankton abundance, development of toxin patterns over the previous weeks at the same pod or neighbouring pods, etc.

Model assumptions

At first sight it seems that a large amount of data is available, with over 21,000 test results for LT for example (Table 16). However, when this is broken down into 15 years, 12 months per year, for 37 pod groups, then we only have an average of three samples per month per group per year. This limits what can be achieved modelling-wise and therefore assumptions had to be made.

5. It is assumed that biotoxin patterns are similar for pods that have been grouped together

To allow for statistical modelling, several of the individual pods had to be grouped due to limited data. Care has been taken, however, to ensure that groupings take into account similarities in location, environmental conditions, hydrography, and the abundance of the phytoplankton genera responsible for biotoxins in shellfish (but note that phytoplankton is not monitored at all pods). The groupings also take into account similarities in biotoxin patterns in shellfish (but note that this is based on limited biotoxin data as this was the very reason for the grouping). Compared to previous

risk assessments however, within the current project more pods could be regarded as individual pods, allowing for more targeted development of suitable monitoring schemes.

6. It is assumed that toxin prevalence is constant during a month and then jumps to a new level at the beginning of the following month.

This is obviously unrealistic but given the limitations within which we have to work (a small shellfish sample representing an entire pod, small numbers of samples, incomplete time series) the results from our models are reassuring. For example, despite the models not explicitly taking into account toxin levels from the preceding month, there is generally a smooth progression in the estimated prevalence over the months of the year (see for example Figure 9). Furthermore, the models developed for different toxin cut-offs (PST > 0, PST > 400 and PST >800 µg/kg for example) show a consistency in prevalence patterns over the months of the year (see Figure 9). This suggests a certain robustness of the models and data and enhances our confidence in the model outcomes. For Pacific oysters the progression from month to month is not quite as smooth, as can be seen from a peak in May for DA (Figure 12), and a peak in February for LT (Figure 12). Data are more limited than for mussels, and the aforementioned peaks are driven by 10/39 samples from Mull testing positive for DA in May, and with 3/27 (from WC-Gigha) and 3/26 (WC-Lochaber) having LT test results exceeding the MPL. Modelling of smooth trends over time would avoid such jumps. Such models are rather more complex than the ones used here and would require considerable effort to develop.

7. Models are restricted to modelling the likelihood of exceeding a given limit of interest.

The models do not describe the development of actual toxin levels over time. Instead, the data have been simplified into below/above a given level. Modelling of actual levels (e.g. PST in µg/kg) is more informative but does require data to be collected regularly. Such a model would consist of two components, namely modelling the probability of toxin being absent (e.g. PST = 0 µg/kg, i.e. below the limit of detection) or present (e.g. PST > 0 µg/kg), and then, when the latter holds, to model what the actual toxin level would be. Again, such models are rather more complex than the ones used here and would require considerable effort to develop. This was not feasible given the short duration of the current project. Nevertheless, to get an impression of the prevalence of low, intermediate or high toxin levels, models were developed for various cut-offs, such as PST > 800 µg/kg, PST > 400 µg/kg and PST > 0 µg/kg. Although test results for a given pod may not have exceeded 800 µg/kg, it may be that 400 µg/kg was exceeded on several occasions, indicating that monitoring should be intensified accordingly. As noted earlier, despite models being developed for the various toxin level cut-offs independently, the predicted prevalence patterns are consistent across these cut-offs (see for example Figure 9).

Risk assessment assumptions

Based on the predicted prevalence per pod group for each month of the year, the current monitoring scheme was assessed for the risk of not detecting a toxic event (i.e. biotoxin levels exceed a given limit of interest). Alternative monitoring frequencies have been proposed such that the risk of non-detection is kept below 1%. The following assumptions were made:

8. It is assumed that the test result is valid for one week, i.e. if the test result indicates that the toxin level falls below a given cut-off then it is assumed that this will remain so for one week.

The implication of this assumption is that weekly monitoring is safe, i.e. with weekly monitoring we would always detect biotoxin levels exceeding the MPL. There have been occasions however where toxin levels increased rapidly in the space of a week. Despite weekly Official Control sampling, the rapid increase of LT in mussels that caused the DSP food poisoning outbreak in 2013 (Whyte *et al.* 2014) was not detected in time. Inspection of the data reveals several occasions where toxin levels changed from negative to exceedance of MPL within a week. These are listed in Table 53 and show that this is a relatively rare event. However, in almost all these cases where phytoplankton data are available, cell counts would have flagged up the potential for a toxic event. Mussel PST test results changing from 0 to > 800 µg within seven days happened 13 times (out of 19,018 samples tested) during 2001-15, and AZA or OA changing from 0 to > 160 µg/kg within seven days happened 12 times (out of 8,857 samples tested) in mussels during 2011-15.

9. Monitoring schemes have been formulated based on keeping the risk of non-detection below 1%

A new monitoring programme has been suggested based on keeping the risk of non-detection below 1%. This is a nominal figure as it assumes that the small sample sent off for testing is representative of the entire harvesting area, that test results are valid for one week, and that all other assumptions listed above hold. It does however give an indication of how (groups of) pod(s) compare and how biotoxin prevalence varies from month to month. As such it is informative in identifying locations and months that require more frequent sampling compared to locations or months that require less frequent sampling. Furthermore, the proposed monitoring programme errs on the safe side as it is based around half the MPL for PST (i.e. the proposed programme aims to keep the risk of PST > 400 µg/kg not being detected below 1%), and for DA it based around a quarter of the MPL (i.e. the proposed programme aims to keep the risk of DA > 5 mg/kg not being detected below 1%).

<u>Safeguards</u>

The following safeguards have been put in place:

- Data summaries, model development and risk assessment are all based on the upper limit of the reported test result, where such limits are available.
- Development of alternative monitoring schemes is based on controlling the risk of not detecting biotoxin levels in mussels exceeding only half the regulation limit for PST, and a quarter of the regulation limit for DA.
- Shellfish farmers and the regulatory body have at their disposal not only the current biotoxin test result, but also the biotoxin test results from the preceding weeks, biotoxin test results from neighbouring pods, and phytoplankton test results. Many harvesters also follow the so-called traffic light system (FSAS 2014). All of these provide information that allows for a proactive approach in preventing contaminated shellfish being harvested in the first place.
- The FSS biotoxin monitoring programme is only a first step in ensuring that shellfish reaching the consumer market is safe to eat. Further testing (end product testing) is required before the product is allowed to enter the consumer market. This is the responsibility of Food Business Operators.

Table 53: Occasions where toxin level went from not detected to exceedance of MPL in seven days or less, for cockles, mussels, Pacific oysters, razors and surf clams. There were no occasions where DA changed from 0 to > 20 mg/kg within seven days.

Biotoxin	Species	Groups	GroupName	Pod	date	Conc (µg/kg)
PST	Cockles	G22	HarrisUist	86	05/06/2012	0
		G22	HarrisUist	86	12/06/2012	1678
	Mussels	G8	Ayr-LochStriven	8	20/05/2014	0
		G8	Ayr-LochStriven	8	27/05/2014	1747
		G8	Ayr-LochStriven	8	14/04/2015	0
		G8	Ayr-LochStriven	8	21/04/2015	2711
		G18	Ayr-other	52	26/03/2012	0
		G18	Ayr-other	52	02/04/2012	1109
		G18	Ayr-other	53	07/06/2011	0
		G18	Ayr-other	53	14/06/2011	1390
		G18	Ayr-other	145	16/04/2015	0
		G18	Ayr-other	145	20/04/2015	2313
		P41	Skye-LochEishort	41	06/06/2011	0
		P41	Skye-LochEishort	41	13/06/2011	1370
		P41	Skye-LochEishort	41	13/05/2013	0
		P41	Skye-LochEishort	41	20/05/2013	814
		G23	Lewis-LochRoag	125	23/06/2015	0
		G23	Lewis-LochRoag	125	30/06/2015	1228
		G23	Lewis-LochRoag	125	14/07/2015	0
		G23	Lewis-LochRoag	125	21/07/2015	968
		G22	HarrisUist	22	13/06/2012	0
		G22	HarrisUist	22	19/06/2012	1143
		G48	NWC-LochLaxfordInchard	48	04/06/2013	0
		G48	NWC-LochLaxfordInchard	48	11/06/2013	1316
		G48	NWC-LochLaxfordInchard	48	26/05/2015	0
		G48	NWC-LochLaxfordInchard	48	02/06/2015	1097
		G67	Shetland-SE-CliftSound	67	14/08/2013	0
		G67	Shetland-SE-CliftSound	67	21/08/2013	1135
	Pacific oysters	G18	Ayr-other	14	14/04/2015	0
		G18	Ayr-other	14	21/04/2015	2921
AZA	Mussels	P65	Shetland-N-Basta	65	29/11/2011	0
		P65	Shetland-N-Basta	65	06/12/2011	222
		G81	Shetland-N-Uyea	81	13/09/2011	0
		G81	Shetland-N-Uyea	81	20/09/2011	169
OA	Mussels	G8	Ayr-LochStriven	8	11/10/2011	0
		G8	Ayr-LochStriven	8	18/10/2011	177
		G123	WC-Gigha	123	27/08/2012	0
		G123	WC-Gigha	123	03/09/2012	225
		P7	Mull-LochScridain	7	15/09/2011	0
		P7	Mull-LochScridain	7	20/09/2011	191
		G23	Lewis-LochRoag	125	03/09/2012	0
		G23	Lewis-LochRoag	125	10/09/2012	175
		G22	HarrisUist	76	17/07/2012	0
		G22	HarrisUist	76	24/07/2012	173
		G22	HarrisUist	76	14/08/2012	0
		G22	HarrisUist	76	21/08/2012	178
		G22	HarrisUist	76	16/07/2013	0
		G22	HarrisUist	76	23/07/2013	357
		G48	NWC-LochLaxfordInchard	48	16/06/2015	0
		G48	NWC-LochLaxfordInchard	48	23/06/2015	250
		G56	Shetland-SE-DalesVoe	56	09/04/2012	0
		G56	Shetland-SE-DalesVoe	56	16/04/2012	164
		G81	Shetland-N-Uyea	128	10/07/2012	0
		G81	Shetland-N-Uyea	128	17/07/2012	194
	Pacific oysters	G18	Ayr-other	53	02/06/2015	0
		G18	Ayr-other	53	09/06/2015	170
	Surf clams	G80	EastCoast	87	17/07/2014	0
		G80	EastCoast	87	22/07/2014	226

8.2 Other aspects

Models allow for addressing bias in data summaries

Although biotoxin data summaries are useful, it should also be kept in mind that such summaries may be biased, and therefore somewhat misleading. This may be due to, amongst others, the following:

- Sampling frequencies are irregular, with more frequent sampling during summer for some locations but not others. This may lead to overestimation of average annual toxin levels for the more frequently sampled pods (as it is likely that the samples collected during summer contain higher biotoxin levels) and would make comparisons between locations flawed when based on data aggregated over time.
- When the field is closed based on LT levels say, monitoring of DA and PST stops. If this happens during a period with high DA or PST prevalence, then the mean levels of these biotoxins will be underestimated (as samples that would have had high DA or PST are now missing).

In statistical terms this problem is referred to as bias due to data not-missing-at-random. As long as there is information available from other locations where sampling was not halted, the statistical models fitted will allow for such factors to be taken into account appropriately. For example, data may suggest low toxin prevalence for a given pod as due to field closure no samples with potentially high levels are sent off for analysis. By looking at toxin prevalence data obtained during the same month from other pods the model allows for appropriate corrections (obviously this does require data availability for that particular month from at least one pod group, and this approach would break down if no samples were available at all). Another example is when a given pod was not monitored during high prevalence year and therefore the apparent abundance of biotoxin appears to be relatively low, then the model will account for this by taking into account information from locations that did have test data during that particular year. As a consequence, model predictions will give a more accurate picture of underlying toxin patterns than data summaries as they gain strength from pooling information over pods, years and months.

No models for higher toxin levels

The mussel and Pacific oyster data were insufficient to formulate statistical models for DA exceeding half the MPL. Likewise, it was not possible to formulate statistical models for PST exceeding half the MPL for Pacific oysters. This is due to there being insufficient samples exceeding these limits. Instead, we have taken models based around lower cut-offs (DA 5 > mg/kg for mussels and Pacific oysters, PST > 0 µg/kg for Pacific oysters) as a starting point for assessing the current and developing alternative monitoring schemes. These lower cut-offs offer a guide as to where and when these biotoxins are likely to develop in mussels and Pacific oysters, even if their levels are usually below 0.5 MPL, and as such can inform us which locations during which month of the year should be sampled more intensively. It should be kept in mind that the criterion used for developing proposed monitoring schemes for DA in mussels and Pacific oysters, namely to keep the risk of not detecting events with DA exceeding 5 mg/kg below 1%, and the proposed monitoring scheme for PST in Pacific oysters, namely to keep the risk of not detecting events with PST > 0 µg/kg below 1%, may be too strict. This errs on the side of caution and therefore FSS may want to consider relaxing the proposed frequencies for DA in mussels and Pacific oysters and PST in Pacific oysters.

Modelling of individual pods allows for more targeted sampling

Where possible (i.e. when data were sufficient) pods have been treated as stand-alone. This allows for more targeted monitoring frequencies. For example, group G48, as used by FSS since 2012, has now been separated into P38 (Tain), G48 (NWC-LochLaxfordInchard) and G49 (NWC-other) (see Table 3). As a consequence, monthly monitoring for DA in mussels would suffice for Tain, whereas NWC-LochLaxfordInchard and NWC-other require fortnightly or weekly sampling during the summer months (Table 30). Another example are Shetland pods/groups P72, P64, P70, G71 and G58. Previously combined, they are now treated separately and this allows for reduced DA sampling for G58 and G71 whereas more frequent sampling would be required for the other three pods (Table 30). Previously combined but now treated separately, G10 (WC-LochEtive) and P6 (WC-LochMelfort) allows for monthly monitoring for LT for most of the year for the former, whereas weekly monitoring would be required for the latter for most of the year (Table 32).

Alternative monitoring schemes were formulated based on a combination of models and data

Although models were taken as our starting point for formulating alternative monitoring frequencies (i.e. suggest weekly monitoring when the estimated prevalence p exceeds 2%, monthly monitoring when $p < 1.33\%$ and fortnightly monitoring otherwise), this was then cross-checked against the observed historical prevalence. If the latter exceeded 2%, indicative of the need for weekly monitoring, but the model suggested less frequent monitoring, then the data overruled the model. It should be noted however, that to some extent this is driven by small numbers of samples (if there were less than 50 samples in total, and only one sample exceeded the limit of interest, then this automatically implies weekly sampling). This approach may be overly cautious, especially in isolated cases such as for Shetland-W-AithVoe in Table 30, where although the data indicate fortnightly sampling (based on one out of 27 samples exceeding 5 mg DA/kg) for November, both data and model indicate that monthly sampling would be sufficient for the preceding and following month. A pragmatic way forward may be to ignore such isolated instances and let the data overrule the model only in those instances where those data exceedances are in months adjacent to where the model suggests increased monitoring.

Risk assessment of cockles, razors and surf clams

Data for these species were too limited to allow for model development and formal risk assessment of the monitoring scheme. Toxin levels observed for individual pods did not suggest strong pod-specific patterns. Therefore data were combined over pods and summarised by month. These summaries formed the basis for suggesting alternative monitoring frequencies, where it was assumed that if all test results for the biotoxin of interest were negative then monthly monitoring would be sufficient, and if one or more samples exceeded half the MPL then weekly sampling would be required (with fortnightly sampling for situations where the maximum observed toxin level was positive but less than 0.5 MPL). As the data for these three species are limited, especially for surf clams where the number of samples for each month range from only four to 37, these proposed schemes should be seen as a starting point from which FSS can then decide on final frequencies.

Uninterrupted sampling for a new pod

When testing for biotoxin is halted because the MPL has been exceeded, there is the potential for bias in the time series data. This is especially relevant for new pods. To build up a reliable picture of prevalence of biotoxins throughout the year for a new pod, it is important that during the first year of monitoring uninterrupted weekly testing takes place for all three groups of biotoxins. This implies that when the MPL is exceeded for one of the biotoxins, monitoring of all three groups of biotoxins should continue nonetheless.

LT toxins – future assessments

Up until summer 2011 the LT test results were based on the MBA, which only gives a yes or no result with respect to levels exceeding MPL. From summer 2011 onwards more detailed monitoring for AZA, OA, and YTX has been taking place. To allow for a continuous time series from 2001 to 2015, the LC-MS/MS results for the three toxins have been translated into 0 or 1, with a value of 1 assigned when any of the AZA, OA or YTX exceeded the MPL. In future, when more data become available for these three biotoxins, it will be possible to perform a risk assessment based on the likelihood of a sample exceeding half the MPL, i.e. AZA or OA > 80 µg/kg or YTX > 1.85 mg/kg. Likewise, it would be possible to look in more detail at monitoring schemes that keep the risk of positive AZA, OA or YTX going unnoticed below 1%. How useful this would be remains to be seen as OA is very prevalent, and any prevalence exceeding 2% would require weekly monitoring. From Table B44 it can be seen that this would be the case for most locations for most months of the year. Also, based on the potentially less frequent monitoring programme needed to control the risk of LT exceeding MPL we already find that weekly monitoring would be needed nearly all year round for nearly all locations.

Patterns of toxins over years not consistent across the three toxins

Comparison of toxin patterns between the three biotoxins shows that a 'bad' toxin year does not necessarily apply to all three toxins. This can be seen for e.g. 2006 were PST was prevalent whereas DA prevalence was low. This can be explained as follows:

Although pronounced seasonal changes in density occur, the diatom *Pseudo-nitzschia* can be present all year round in Scottish waters and spring and summer blooms may be prolonged, on a scale of weeks. Because they are not motile, they rely on turbulence to maintain them in the water column and therefore tend to thrive in areas where the water column is well-mixed, for example, by ocean currents or wind. Unlike dinoflagellates, diatoms contain silica within the walls of the cell, and tend to out-compete other phytoplankton groups if it is available for uptake. Thus *Pseudo-nitzschia* is often observed at dense concentrations during the spring bloom.

Dinoflagellate species are generally more abundant during the summer months, and tend to thrive in calmer conditions when the water column becomes stratified. Dinoflagellates differ to diatoms in that they do not require silicon to form cell walls, and they also motile, possessing two flagella that allow them to swim. *Dinophysis* blooms tend to occur in the summer and can either arise locally, or may be advected in from offshore waters.

Alexandrium cells have a complicated life cycle and exhibit a motile phase that is evident within the water column. However, when conditions are not conducive for growth, they may also enter a

resting cyst phase. Cysts may settle to the benthos and become concentrated in the sediment. When conditions are suitable, the cysts may be mixed into the surface layers and germinate, giving rise to new populations of *Alexandrium*. Cyst beds appear to be widespread around the Scottish coast, leading to *Alexandrium* "hot-spots".

Relationship of phytoplankton with biotoxins

The relationship between algal biotoxins and their causative organisms is not always apparent for a number of reasons:

Toxin production varies between *Pseudo-nitzschia* species and strains. Species such as *Pseudo-nitzschia australis* and *Pseudo-nitzschia seriata* are often more abundant from mid to late summer in Scottish coastal waters, and these are thought to produce a greater amount of DA per cell than *Pseudo-nitzschia* species present earlier in the year. Thus dense spring blooms of several million cells/L of *Pseudo-nitzschia* may result in relatively low levels of DA in shellfish, or often none at all, whereas blooms of relatively low density composed of the more toxic species may result in higher values of DA in shellfish. Toxin production is not continuous and may vary with photoperiod and the availability of nutrients.

Four *Alexandrium* species have been reported from around Scotland: *Alexandrium tamarense* species complex, *Alexandrium minutum*, *Alexandrium ostenfeldii* and *Alexandrium tamutum*, with the *Alexandrium tamarense* species complex being by far the most commonly recorded. Both toxic and non-toxic strains of *Alexandrium tamarense* have been found in Scottish waters, with longer day length and warmer water temperatures of summer thought to promote the growth of the benign strain. (Note: A re-naming of this group has been proposed based on molecular rather than morphological classification, such that toxic *A. tamarense* would be referred to as *Alexandrium fundyense*, and non-toxic *A. tamarense* would keep the same name (John *et al.*, 2014) – this has not yet been globally accepted). *Alexandrium tamutum* is thought to be a non-toxic species and appears to be widespread around Scotland, with cells identified (from examination of the thecal plates that form the cell wall) from Argyll & Bute and around the Shetland Islands. The presence of *Alexandrium tamutum* has been conformed in pod 9 (WC-LochCreranLinnhe) and pod 56 (Shetland-SE-DalesVoe), where analysis of PST toxins indicate that a reduced testing frequency might be appropriate. However, both toxic and non-toxic *Alexandrium* species can be found in the same sample, so a precautionary approach should be taken when a bloom is present.

Maximum LT concentrations for the Dinophysiaceae family have been reported as being variable by species and field studies indicate that cellular toxin levels vary greatly during blooms of a given species. Toxin levels also appear to vary among regionally separated populations although the mechanism of production is difficult to determine. The dinoflagellate *Phalacroma rotundatum* (formerly *Dinophysis rotundata*), which belongs to the same family as *Dinophysis*, may act as a vector for LT rather than itself being a producer, and this species is also included in the monitoring results, reported as *Dinophysis* spp. Frequently there appears to be a lag between the presence of *Dinophysis* blooms and the accumulation of LT in shellfish. This is useful in terms of "early warning" for a toxic event.

Prorocentrum lima is often associated with sandy sediments, it can also grow on surfaces such as aquaculture long lines and macroalgae. Due to the epiphytic nature of this species it is unlikely that

abundance in the water column is a true reflection of actual abundance, although it may occur in the pelagic environment if the sediment is disturbed, particularly after stormy weather.

The accumulation of toxins in shellfish may also depend on the abundance of other harmless phytoplankton species in the water column. Shellfish filtering a greater proportion of non-toxic species compared to toxic species may accumulate less of a toxin burden.

Monitoring frequency for a new pod

Currently the monitoring frequency for a new pod is weekly all year round. FSS does not have a strategy in place how to assess for how long this should be implemented. The models that were developed incorporate random variation between pod groups, and this allows us to predict what biotoxin pattern to expect if the new pod were extremely sensitive to the biotoxin of interest being present. This analysis revealed that weekly monitoring would be needed to be confident that the presence of biotoxin would not be missed if the new pod were to be extremely susceptible to this biotoxin. This confirms that weekly monitoring, to begin with at least, is necessary.

The question then arises for how long weekly monitoring should continue. Based on statistical theory alone, we would need to monitor weekly for 3 to 4.5 years. If during this period all samples tested negative we would be confident that it would be safe to reduce the frequency to fortnightly or monthly monitoring. This approach seems rather severe and ignores any other knowledge such as hydrography and phytoplankton prevalence that may become available over time. We therefore propose to monitor weekly for one year (so that information on the presence of biotoxins throughout the year will be available), and then assess, in combination with information on e.g. phytoplankton if this new pod can be assigned to an existing group of pods. The monitoring frequency can then be changed to that of the group it has been assigned to.

Comparison of monitoring schemes across species

Tables 54 - 56 summarise the maximum observed monthly biotoxin level for each species, the current monitoring frequencies and the proposed sampling frequencies. For mussels, the monitoring frequencies can be refined and reallocated with little change in the total number of samples to be tested. Based on the number of active pods in 2015, the current scheme would require 880 samples to be tested for DA, which would increase by 11% to 975 samples (Table B47, based on keeping the risk of not detecting DA > 5mg/kg below 1%). For PST (Table B48, based on keeping the risk of not detecting PST > 400 µg/kg below 1%), a reduction of 14% would be achieved, reducing the number of samples from 1,472 to 1,269. For LT, if the scheme were to be made pod-specific as proposed in Table B49, the reduction would be 25%, from 2,604 down to 1,961 samples. Overall there would be a net reduction of 15%, from 4,956 to 4,205 samples. It should be kept in mind that this calculation is rather crude as no efforts have been made to allow for smooth progression of frequencies from monthly to weekly and vice versa. It also does not take into account the impact of monitoring being ceased for one biotoxin due to field closure based on one of the other biotoxins.

For Pacific oysters, monitoring would need to be increased for DA and PST (but note that the latter is based on keeping the risk of not detecting positive PST events below 1%, which is rather more severe than half the MPL used for mussels). For cockles, razors and surf clams the monitoring frequency for DA can be reduced (Table 54). For these same species PST monitoring could be reduced also (Table 55). For LT there is less scope for reducing the monitoring frequencies (Table 56).

Table 54: Maximum value observed for DA (mg/kg), based on data from 2001-15. Zero values are shown in grey. Entries exceeding MPL are shown in bold. Current and proposed monitoring frequencies are indicated as 4 (red) = weekly, 2 (yellow) = fortnightly, 1 (white) = monthly. For group-specific frequencies (indicated as 1,2 or 1,2,4) the colouring is based on the most intensive frequency.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Max level												
Mussels	0	0	<10	<20	<10	**20+**	**20+**	**20+**	**20+**	<10	<10	<5
Pacific oysters	0	<5	0	<10	<10	<10	<20	<10	<10	<5	<5	0
Cockles	0	0	0	<5	<5	<5	<10	**20+**	<20	0	0	0
Razors	0	0	0	0	<10	<10	<10	<10	<10	0	0	0
Surf clams	0	0	0	0	<5	<5	<5	<10	<5	<5	0	0
Current monitoring freq												
Mussels	1	1	1	1,2	1,2	1,2,4	1,2,4	1,2,4	1,2,4	1,2	1	1
Pacific oysters	1	1	1	1	1	1	1	1	1	1	1	1
Cockles	1	1	1	1	2	4	4	4	4	4	1	1
Razors	1	1	1	1	2	4	4	4	4	4	1	1
Surf clams	1	1	1	1	2	4	4	4	4	4	1	1
Proposed monitoring freq												
Mussels	1	1	1,2,4	1,2,4	1,2,4	1,2,4	1,2,4	1,2,4	1,2,4	1	1,2,4	1
Pacific oysters	1	1	1	1,2,4	1,2,4	1,2,4	1,2,4	1,2,4	1,2,4	1	1	1
Cockles	1	1	1	2	2	2	2	4	4	1	1	1
Razors	1	1	1	1	2	2	2	2	1	1	1	1
Surf clams	1	1	1	1	2	2	2	2	2	1	1	1

Table 55: Maximum value observed for PST (µg/kg), based on data from 2001-15. Zero values are shown in grey. Entries exceeding MPL are shown in bold. Current and proposed monitoring frequencies are indicated as 4 (red) = weekly, 2 (yellow) = fortnightly, 1 (white) = monthly. For group-specific frequencies (indicated as 1,2 or 1,2,4) the colouring is based on the most intensive frequency.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Max level												
Mussels	<800	<400	<800	**800+**	**800+**	**800+**	**800+**	**800+**	**800+**	<800	**800+**	0
Pacific oysters	0	0	<400	**800+**	**800+**	<800	<400	0	0	0	0	0
Cockles	0	0	0	**800+**	<800	**800+**	<800	<400	0	0	<400	0
Razors	0	0	0	<400	**800+**	**800+**	**800+**	<800	0	0	0	0
Surf clams	0	0	0	<400	**800+**	**800+**	**800+**	0	0	0	0	0
Current monitoring freq												
Mussels	1,2	1,2	1,2,4	1,2,4	1,2,4	1,2,4	1,2,4	1,2,4	1,2,4	1,2,4	1,2	1
Pacific oysters	1	1	1	1	1	1	1	1	1	1	1	1
Cockles	2	2	2	4	4	4	4	4	4	4	2	2
Razors	2	2	2	4	4	4	4	4	4	4	2	2
Surf clams	2	2	2	4	4	4	4	4	4	4	2	2
Proposed monitoring freq												
Mussels	1,2,4	1	1,2,4	1,2,4	1,2,4	1,2,4	1,2,4	1,2,4	1,2,4	1,2,4	1,2,4	1
Pacific oysters	1	1	1,2,4	1,2,4	1,2,4	2,4	1,2,4	1	1	1	1	1
Cockles	1	1	1	4	4	4	4	2	1	1	2	1
Razors	1	1	1	2	4	4	4	4	1	1	1	1
Surf clams	1	1	1	2	4	4	4	1	1	1	1	1

Table 56: Maximum value observed for LT (1: exceedance of MPL, based on data 2001-15), AZA (µg/kg), OA (µg/kg) and YTX (mg/kg), based on data from 2011-15. Zero values are shown in grey. Entries exceeding MPL are shown in bold. Current and proposed monitoring frequency is indicated as 4 (red) = weekly, 2 (yellow) = fortnightly, 1 (white) = monthly. For group-specific frequencies (indicated as 2,4 or 1,2,4) the colouring is based on the most intensive frequency.

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mussels	LT	**1**	0	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
	AZA	**160+**	<80	<160	<80	<80	<80	0	**160+**	**160+**	**160+**	**160+**	**160+**
	OA	<160	<160	<160	**160+**	**160+**	**160+**	**160+**	**160+**	**160+**	**160+**	**160+**	**160+**
	YTX	<1.85	<1.85	<1.85	<1.85	<1.85	<3.75	<3.75	<1.85	<1.85	<1.85	<1.85	<1.85
Current freq		1	1	4	4	4	4	4	4	4	4	4	4
Proposed freq		1,2,4	1	1,2,4	1,2,4	1,2,4	1,2,4	1,2,4	2,4	1,2,4	1,2,4	1,2,4	1,2,4
Pacific oysters	LT	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
	AZA	**160+**	**160+**	**160+**	**160+**	<160	<160	<80	<80	<80	<160	<160	<160
	OA	0	0	0	0	0	**160+**	**160+**	**160+**	**160+**	<160	0	0
	YTX	0	0	0	0	0	0	0	0	0	0	0	0
Current freq		4	4	4	4	4	4	4	4	4	4	4	4
Proposed freq		1,2,4	1,2,4	1,2,4	1,2,4	1,2,4	1,2,4	1,2,4	1,2,4	1,2,4	1,2,4	1,2,4	1,2,4
Cockles	LT	0	0	0	**1**	0	0	0	0	0	0	0	0
	AZA	<160	<80	<80	<80	0	0	<80	<80	<80	0	<80	<80
	OA	0	0	0	0	<80	<80	<160	0	<160	0	0	0
	YTX	0	0	0	0	0	0	0	0	0	0	0	0
Current freq		1	1	1	4	4	4	4	4	4	4	4	4
Proposed freq		4	2	2	4	2	2	4	2	4	1	2	2
Razors	LT	0	0	0	**1**	**1**	**1**	**1**	0	0	0	0	0
	AZA	0	0	0	0	0	0	<80	<80	<80	0	0	0
	OA	0	0	0	0	<160	**160+**	**160+**	0	<80	<80	0	0
	YTX	0	0	0	0	0	0	0	0	0	0	0	0
Current freq		1	1	1	4	4	4	4	4	4	4	4	4
Proposed freq		1	1	1	4	4	4	4	2	2	2	1	1
Surf clams	LT	0	0	0	0	**1**	**1**	**1**	**1**	**1**	**1**	0	0
	AZA	<80	<80	<80	<80	<80	<80	<160	**160+**	<160	<80	<160	<80
	OA	0	0	<80	<80	<160	**160+**	**160+**	**160+**	**160+**	**160+**	<80	<80
	YTX	0	0	0	0	0	0	0	0	0	0	0	0
Current freq		1	1	1	4	4	4	4	4	4	4	4	4
Proposed freq		2	2	2	2	4	4	4	4	4	4	2	2

Biotoxin monitoring programme should not be seen in isolation

It is clear from the many issues raised above that the biotoxin monitoring scheme should never be seen in isolation. Where possible, information from other sources (phytoplankton, development of biotoxin patterns over recent weeks for pod of interest and neighbouring pods, etc.) should be incorporated in any decision-making process with regard to increasing the monitoring frequency and/or field closure.

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Appendix A: Figures of biotoxin and phytoplankton prevalence

A1 Biotoxin prevalence

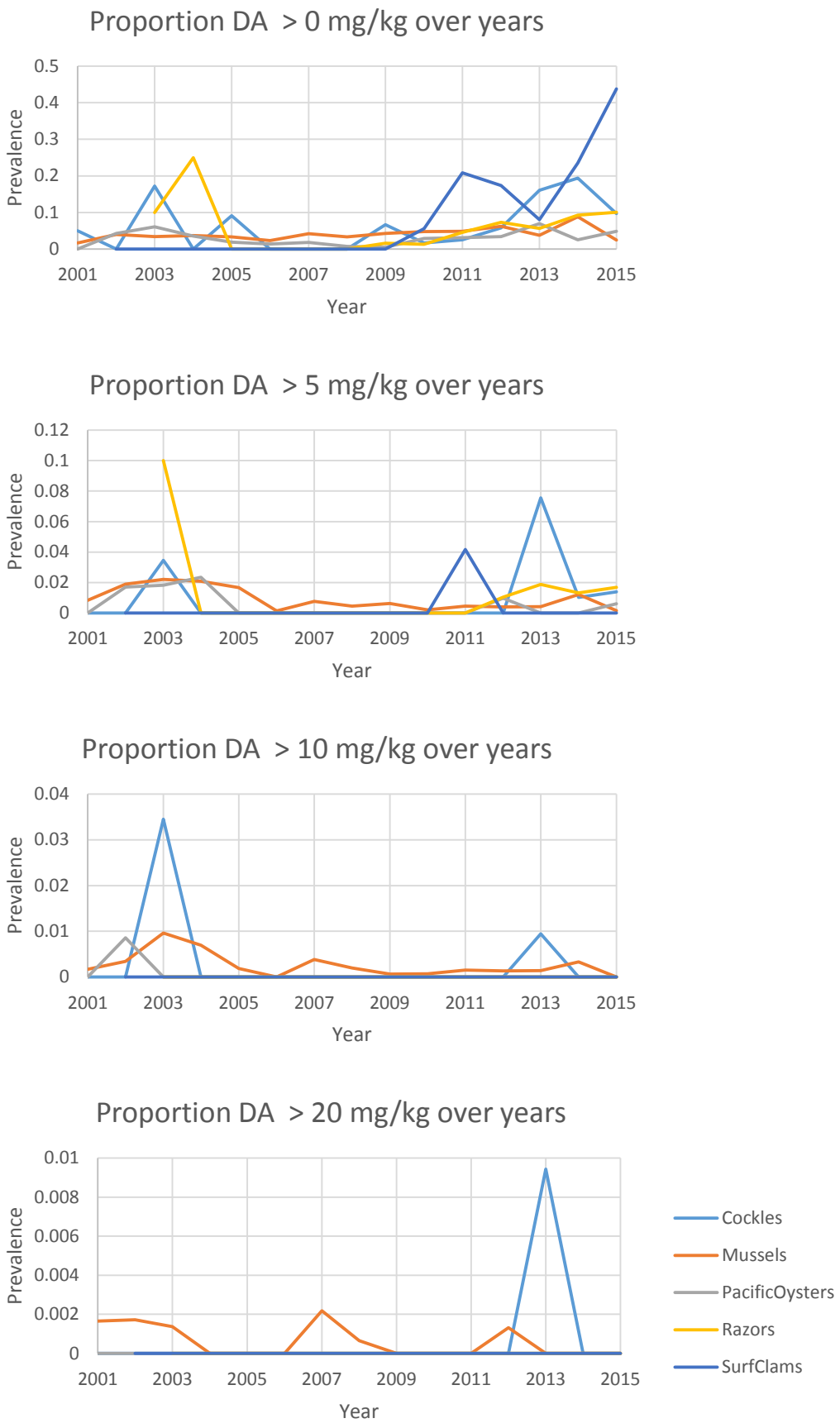

Figure A1: Proportion of samples that tested positive for DA, DA > 5 mg/kg, DA >10 mg/kg or DA > MPL, over years, for each of five shellfish species.

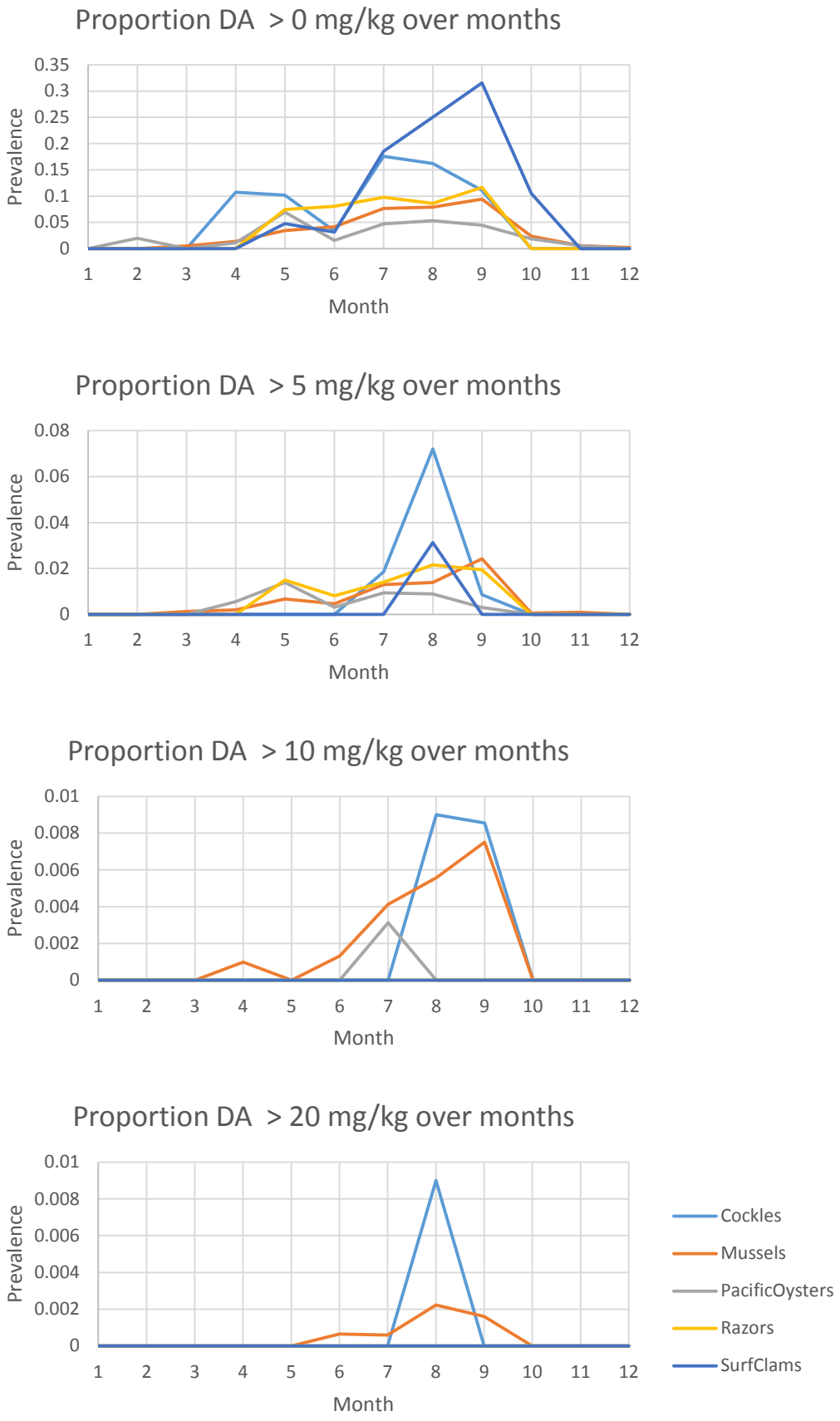

Figure A2: Proportion of samples that tested positive for DA, DA > 5 mg/kg, DA >10 mg/kg, or DA > MPL, over months, for each of five shellfish species.

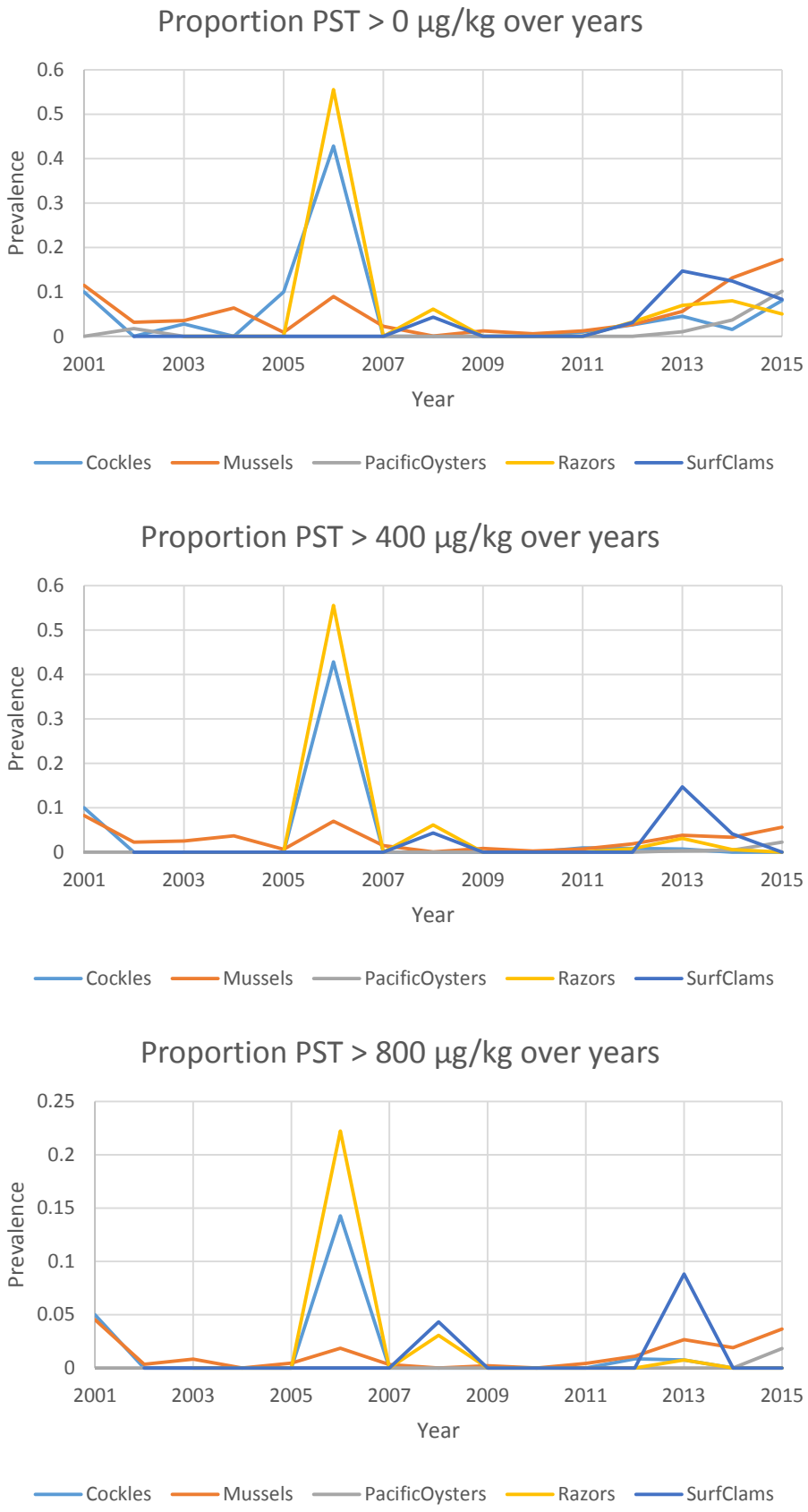

Figure A3: Proportion of PST samples tested positive, >400 µg/kg or exceeding MPL, over years, for each of five shellfish species.

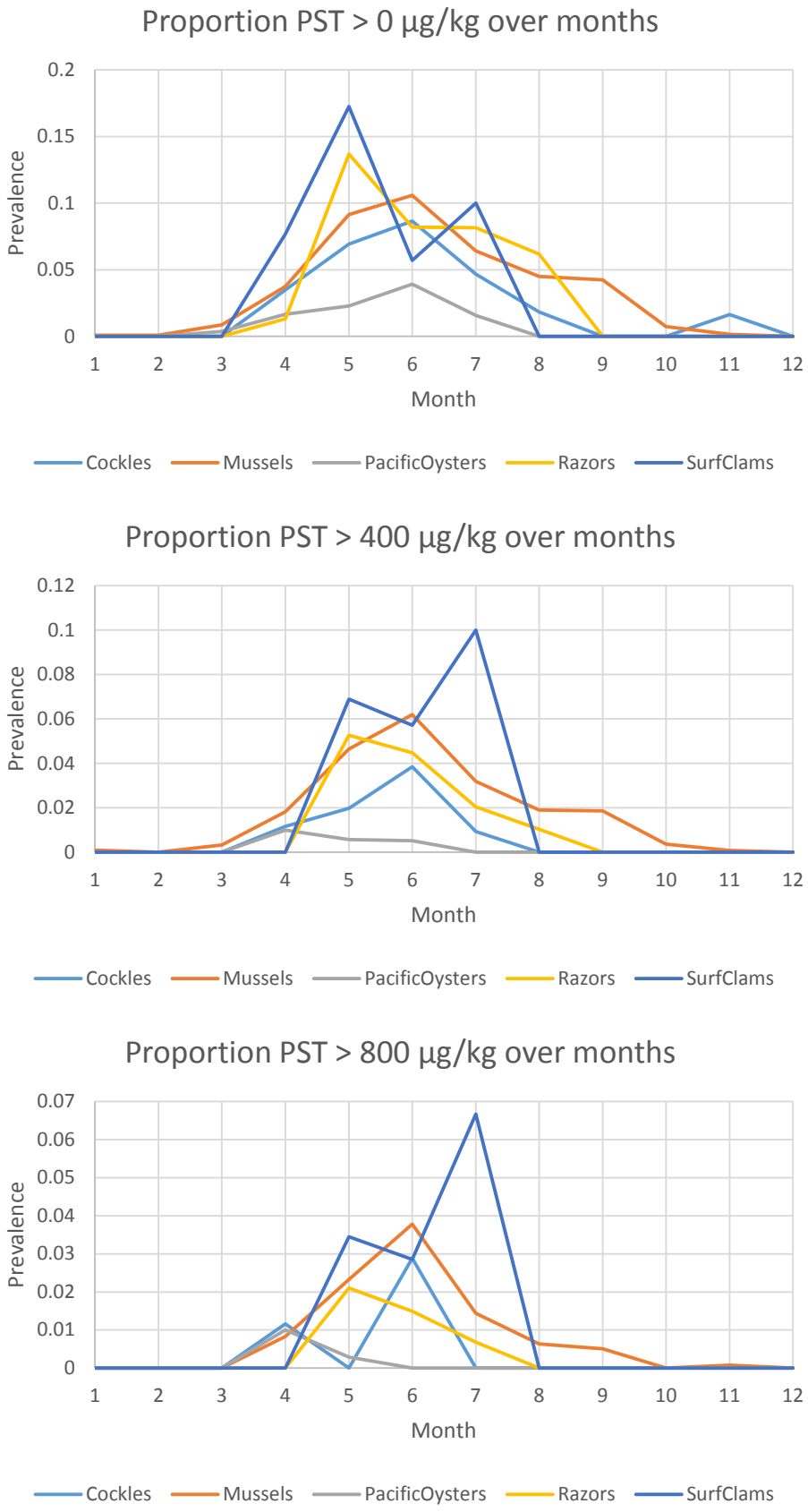

Figure A4: Proportion of PST samples tested positive, >400 µg/kg or exceeding MPL, over months, for each of five shellfish species.

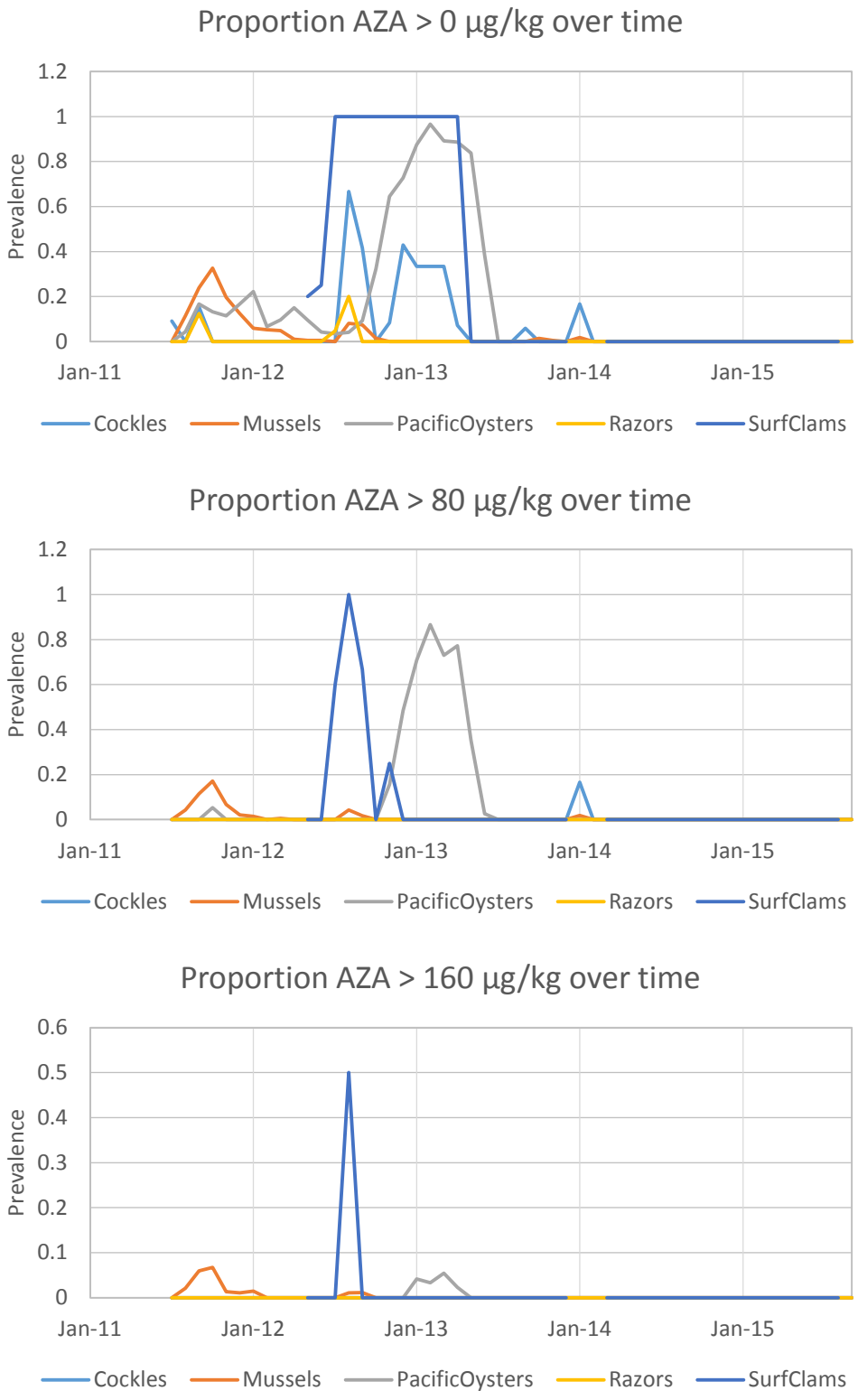

Figure A5: Proportion of samples tested positive for AZA, exceeding 80 µg/kg or exceeding MPL over time, for each of five species.

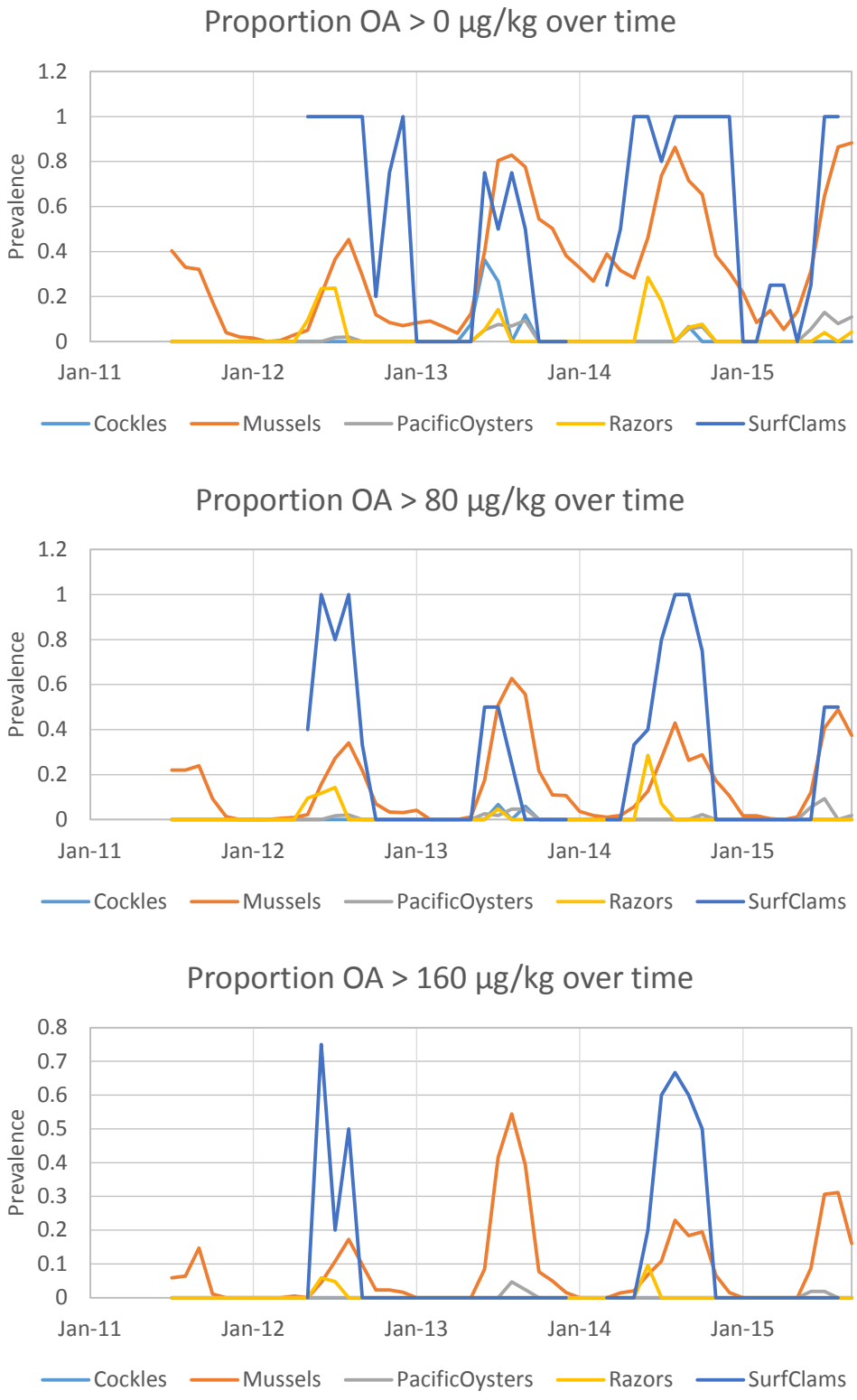

Figure A6: Proportion of samples tested positive for OA, exceeding 80 µg/kg or exceeding MPL over time, for each of five species.

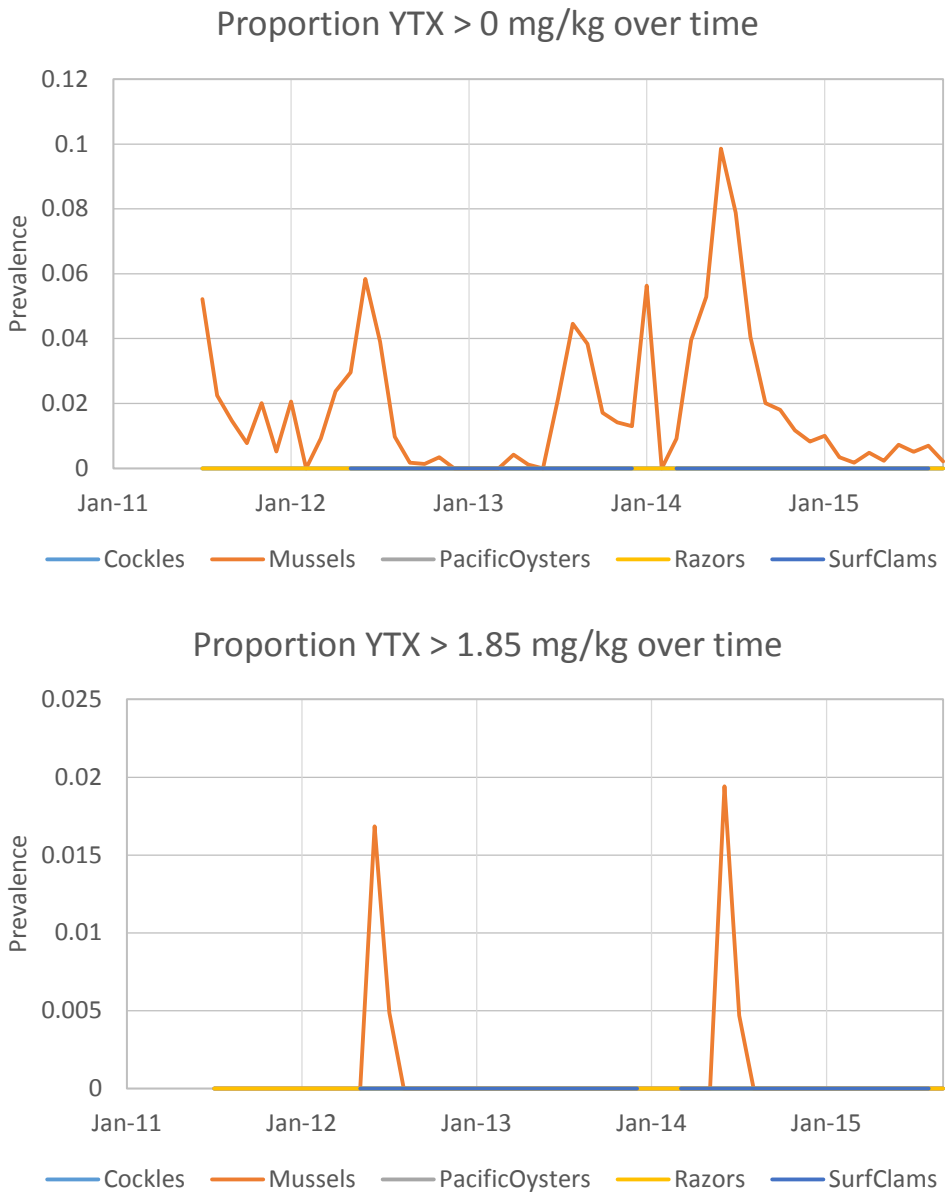

Figure A7: Proportion of samples tested positive for YTX or exceeding 1.85 mg/kg over time, for each of five species.

A2 Phytoplankton prevalence

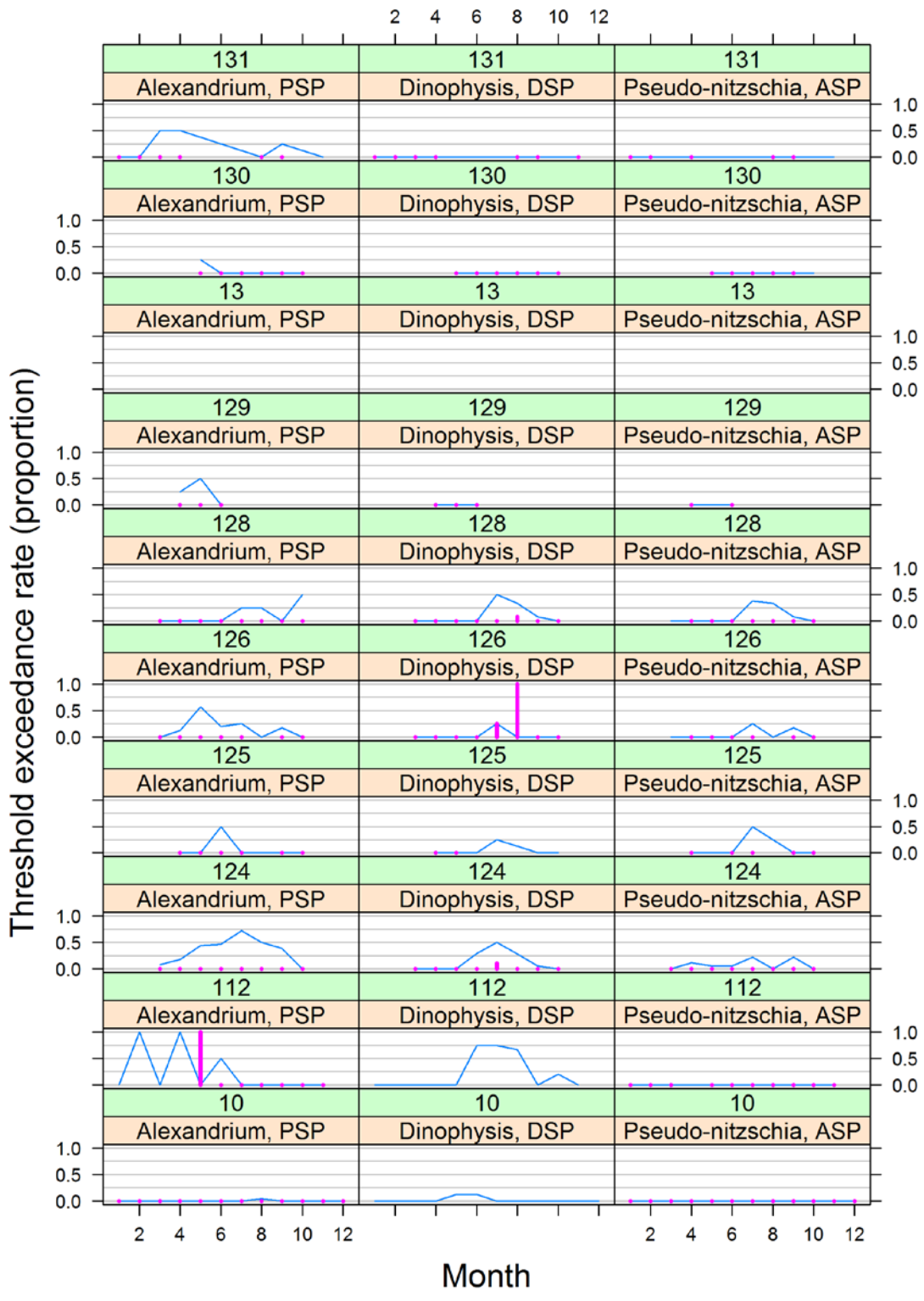

Figure A8a: The monthly mean threshold exceedence rate (as a proportion) for each harmful phytoplankton genus (*Alexandrium, Dinophysis and Pseudo-nitzchia*, blue line) and their associated toxins (PSP, DSP and ASP toxins respectively, magenta bars) in mussels, shown over the months of the year, for each pod.

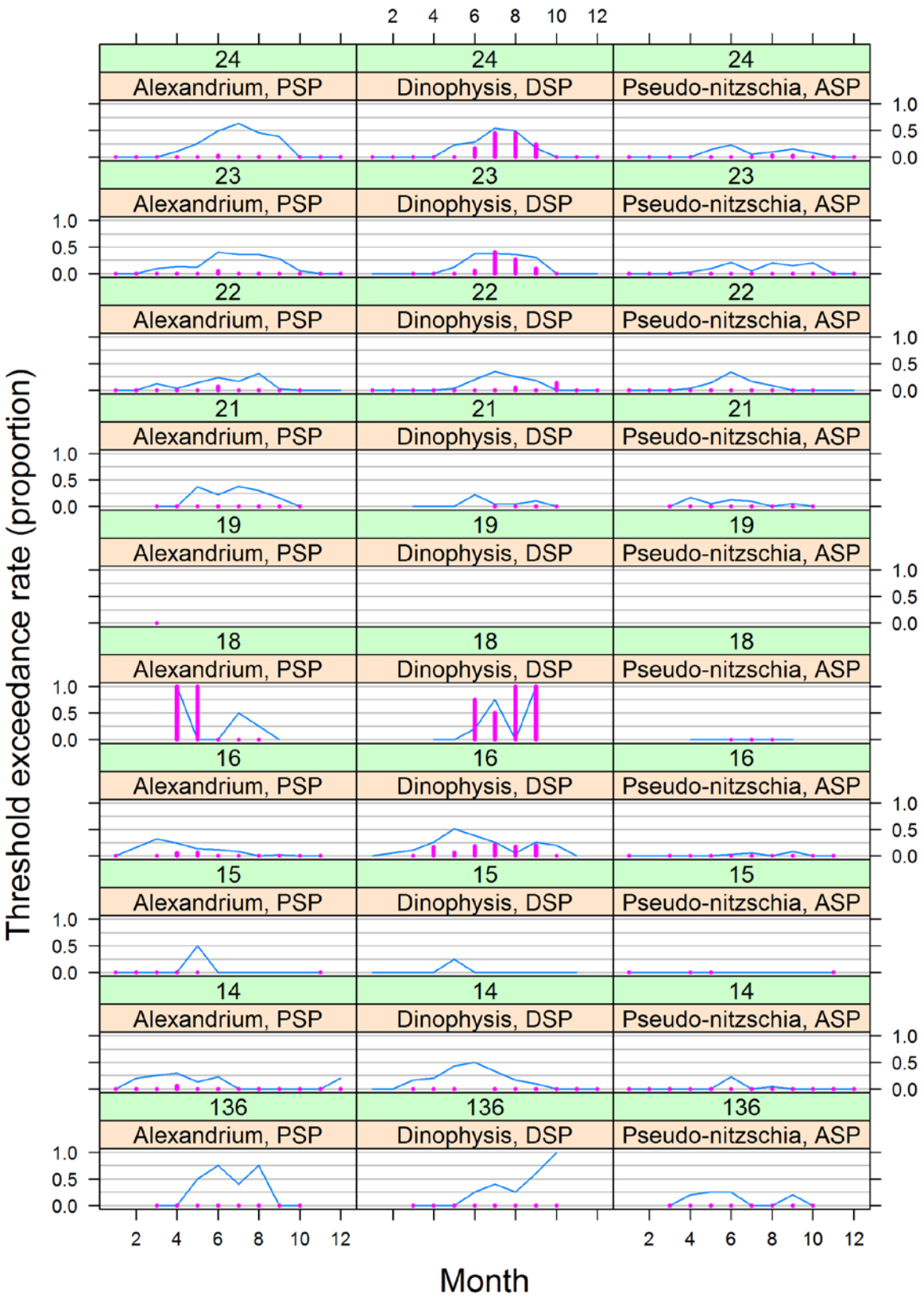

Figure A8b: continuation of A8

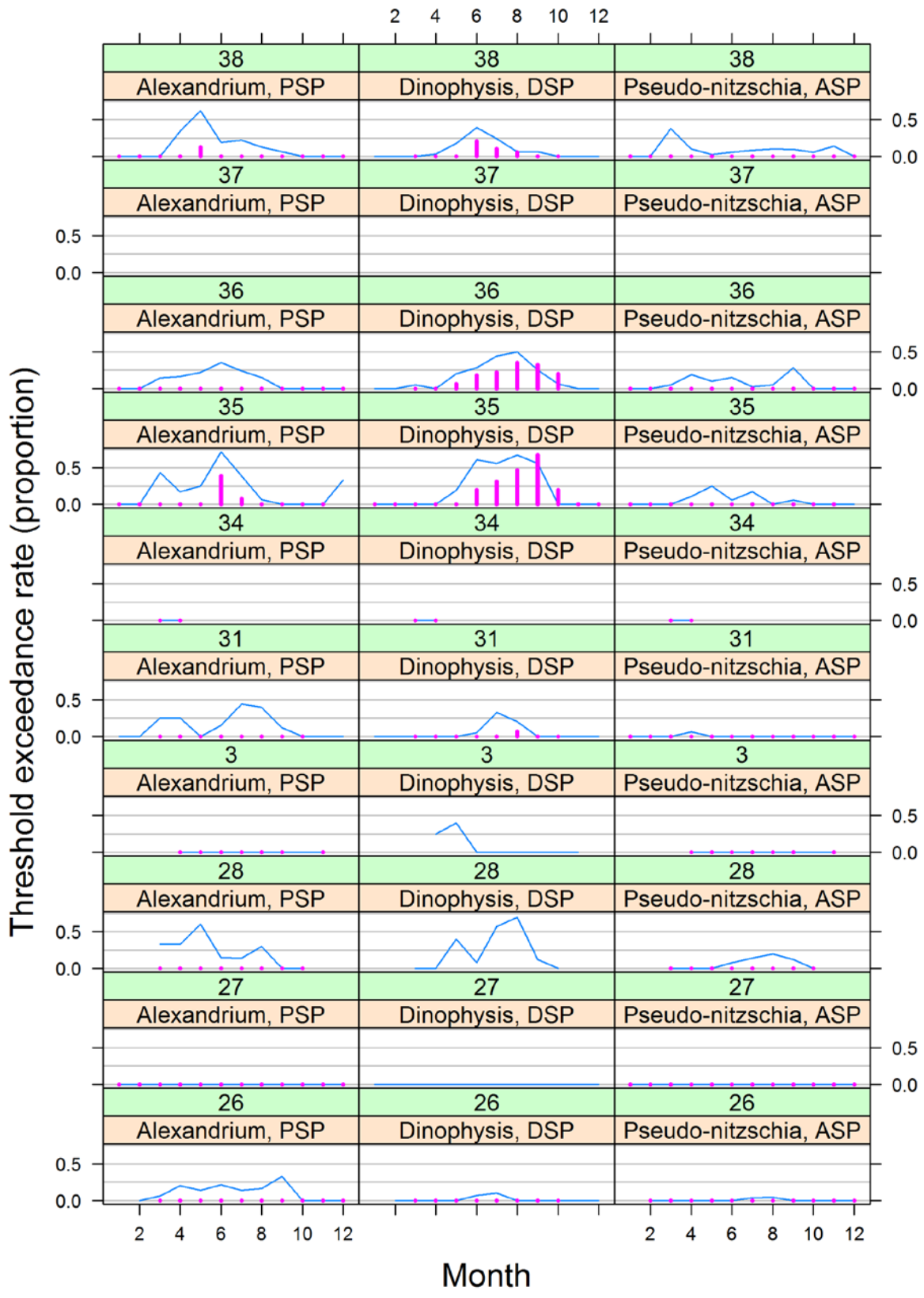

Figure A8c: continuation of A8

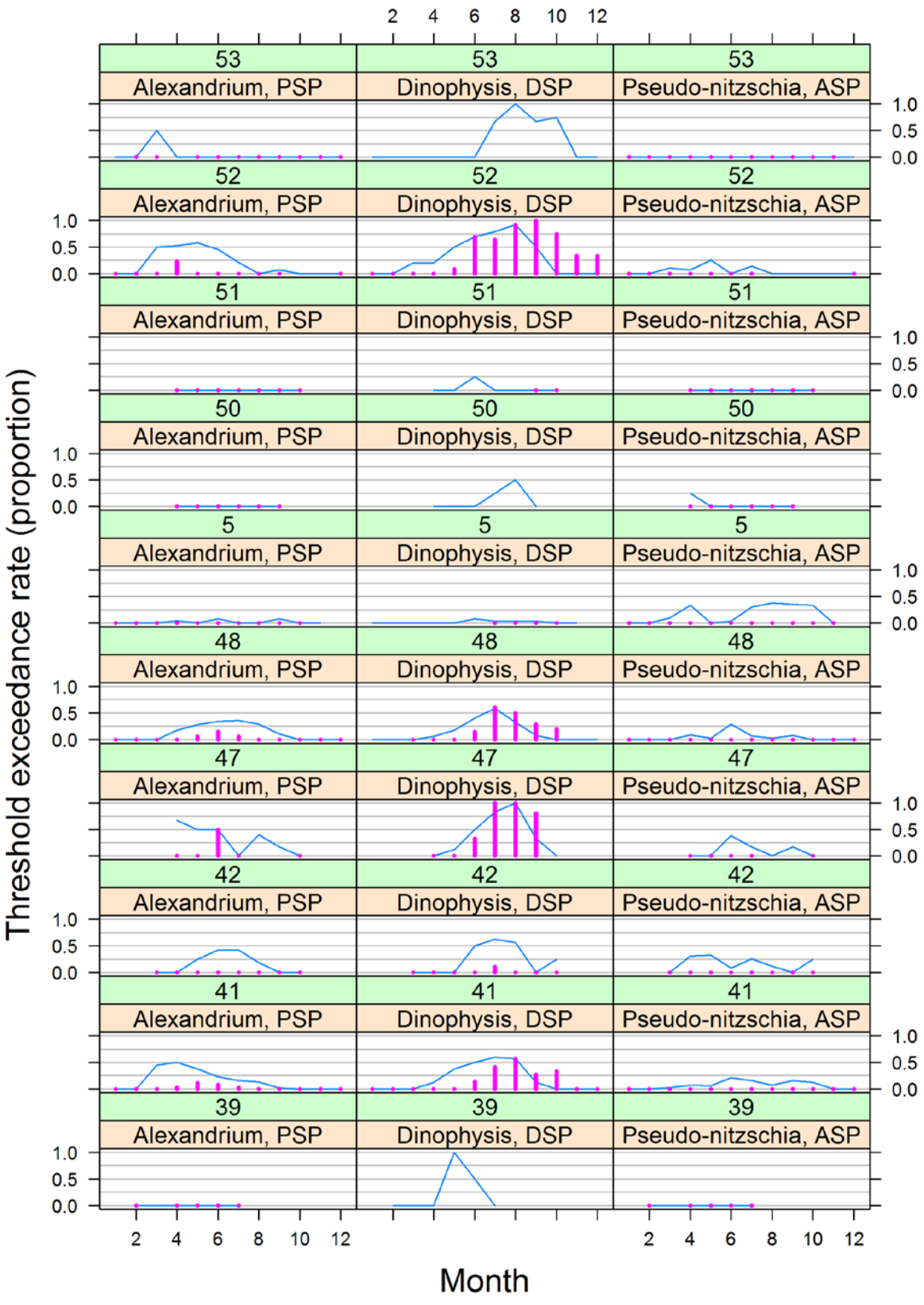

Figure A8d: continuation of A8

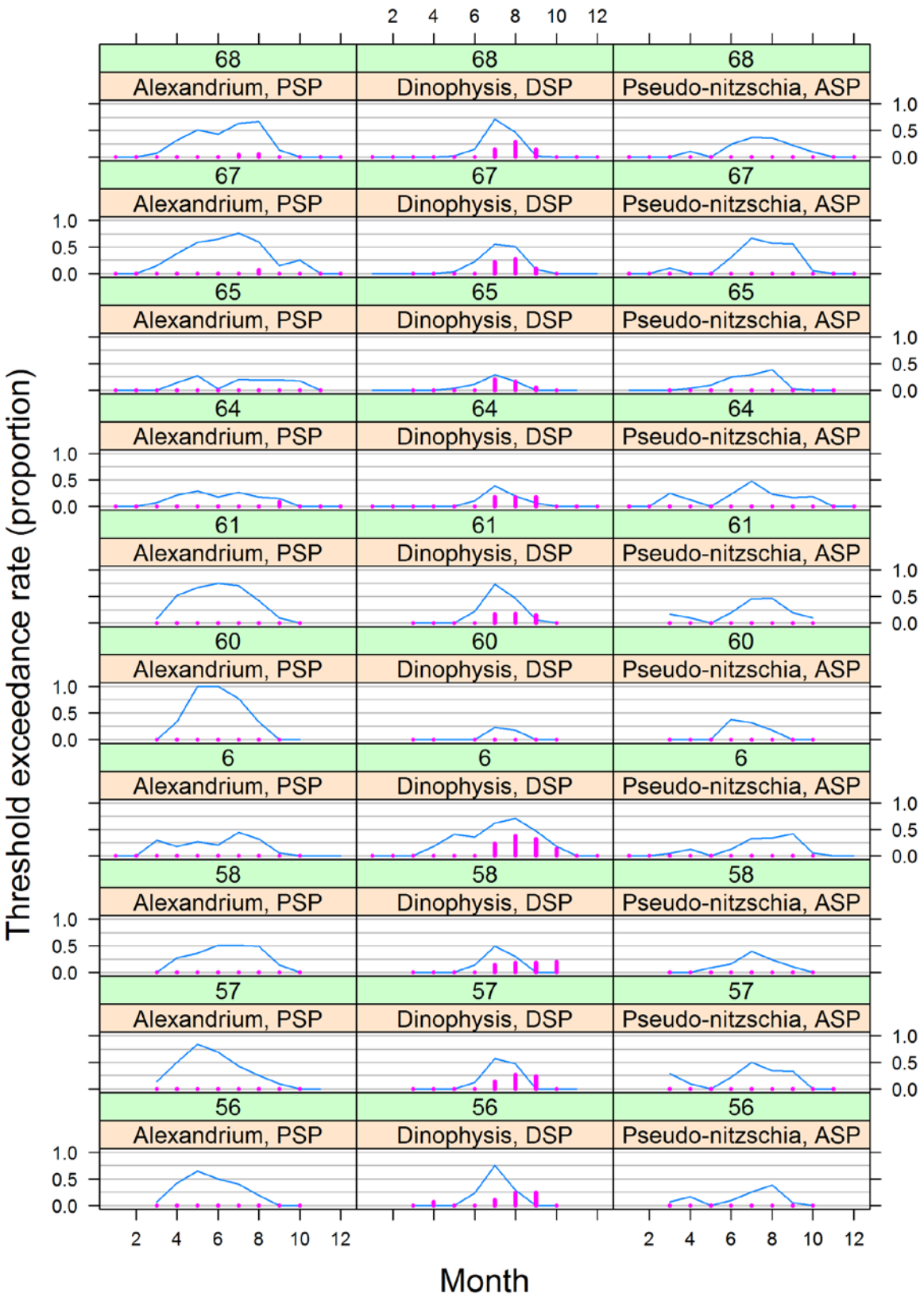

Figure A8e: continuation of A8

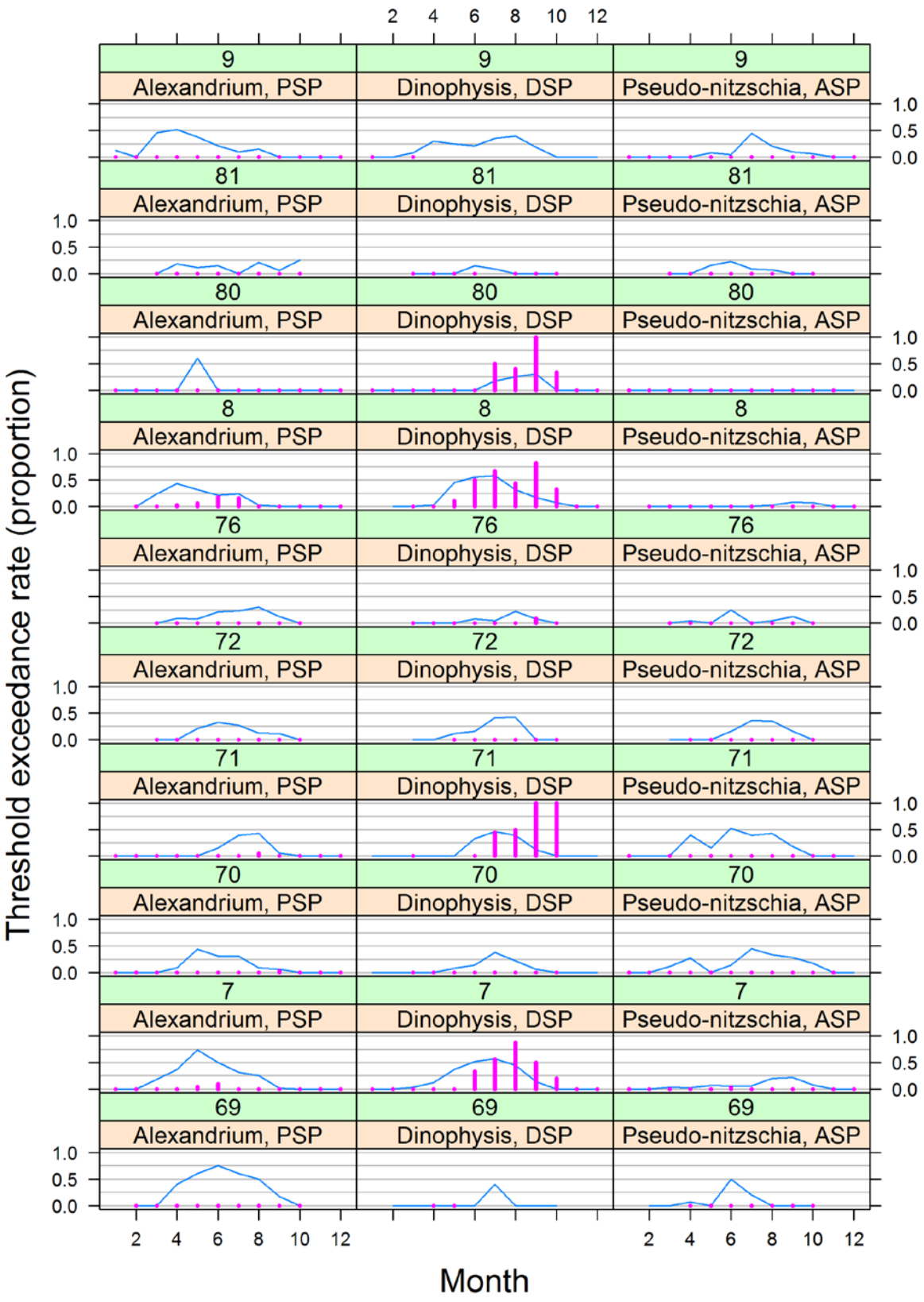

Figure A8f: continuation of A8

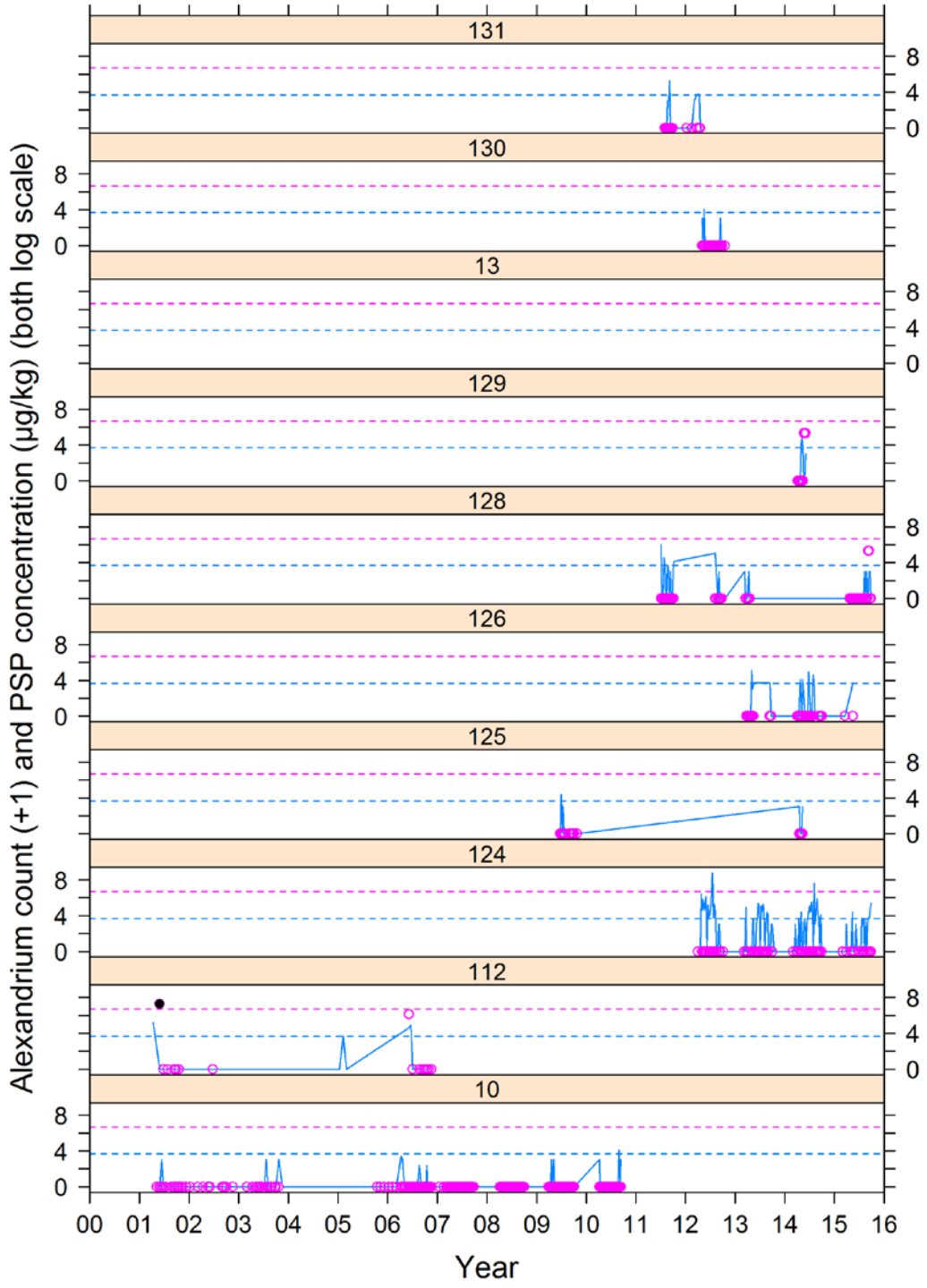

Figure A9a: Recorded *Alexandrium* cell count (cells per litre, ln+1 transformed, blue line) and contemporaneous PSP biotoxin concentration in mussels (µg/kg, ln+1 transformed, magenta open circles) by pod over time (2000 – 2015). The action/regulatory thresholds are shown by the horizontal blue dashed line (for HAB cell count) and magenta dashed line (for toxin concentration). Events where the HAB cell count is below the action threshold but the HAB-corresponding toxin is above threshold are of interest and should be further examined. These 'interest-events' are indicated by black circles. See main text for details and possible explanations.

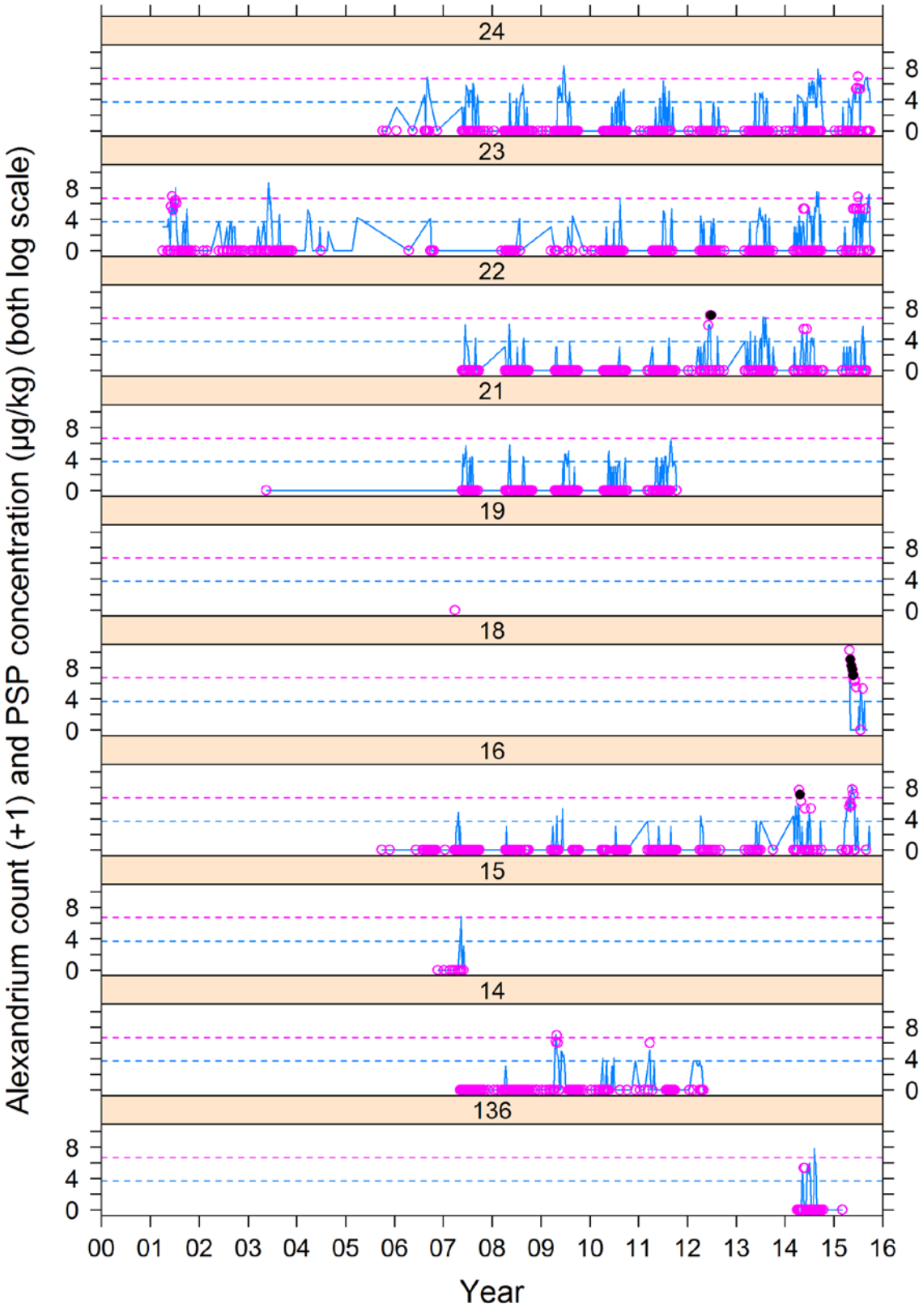

Figure A9b: continuation of A9

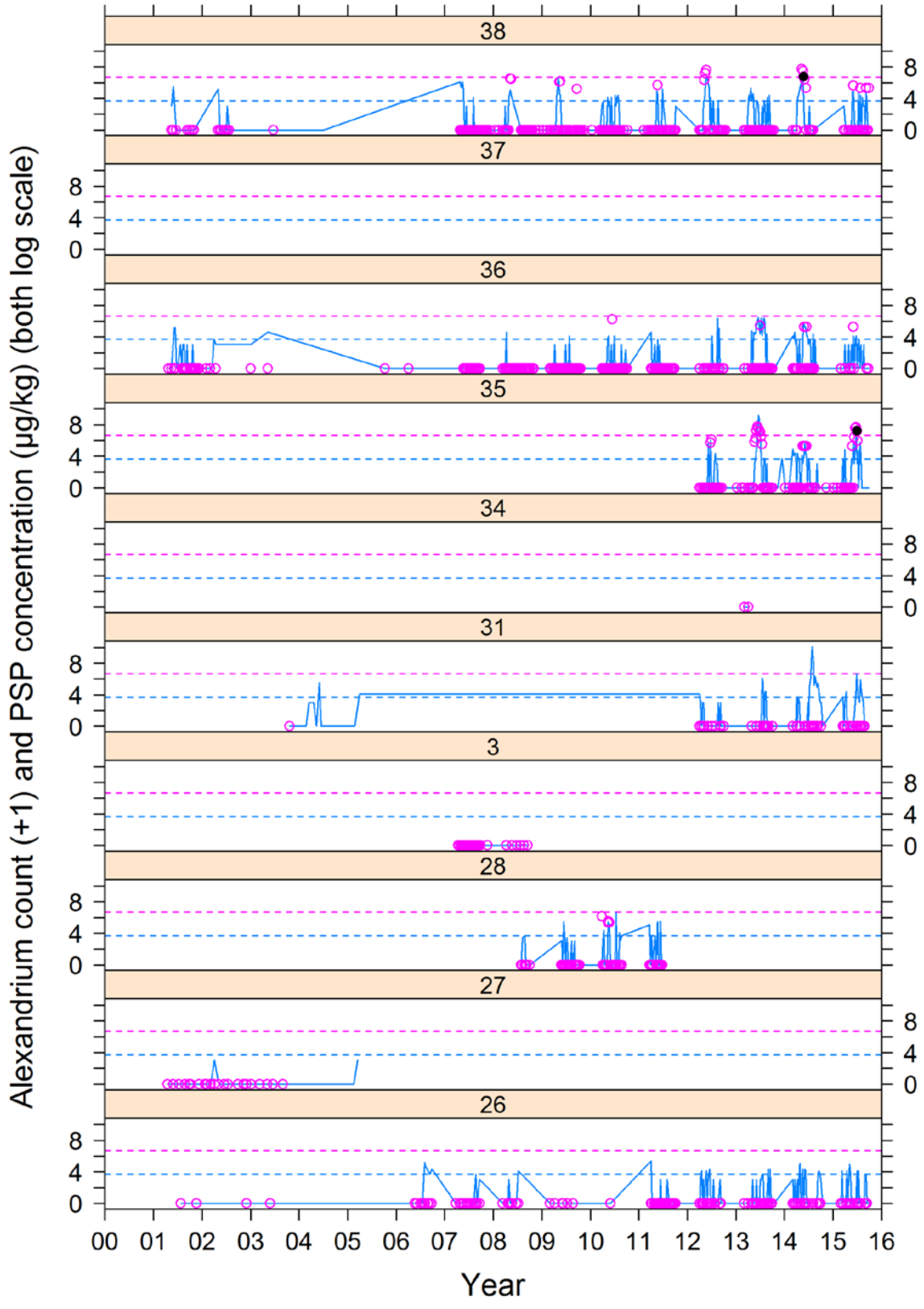

Figure A9c: continuation of A9

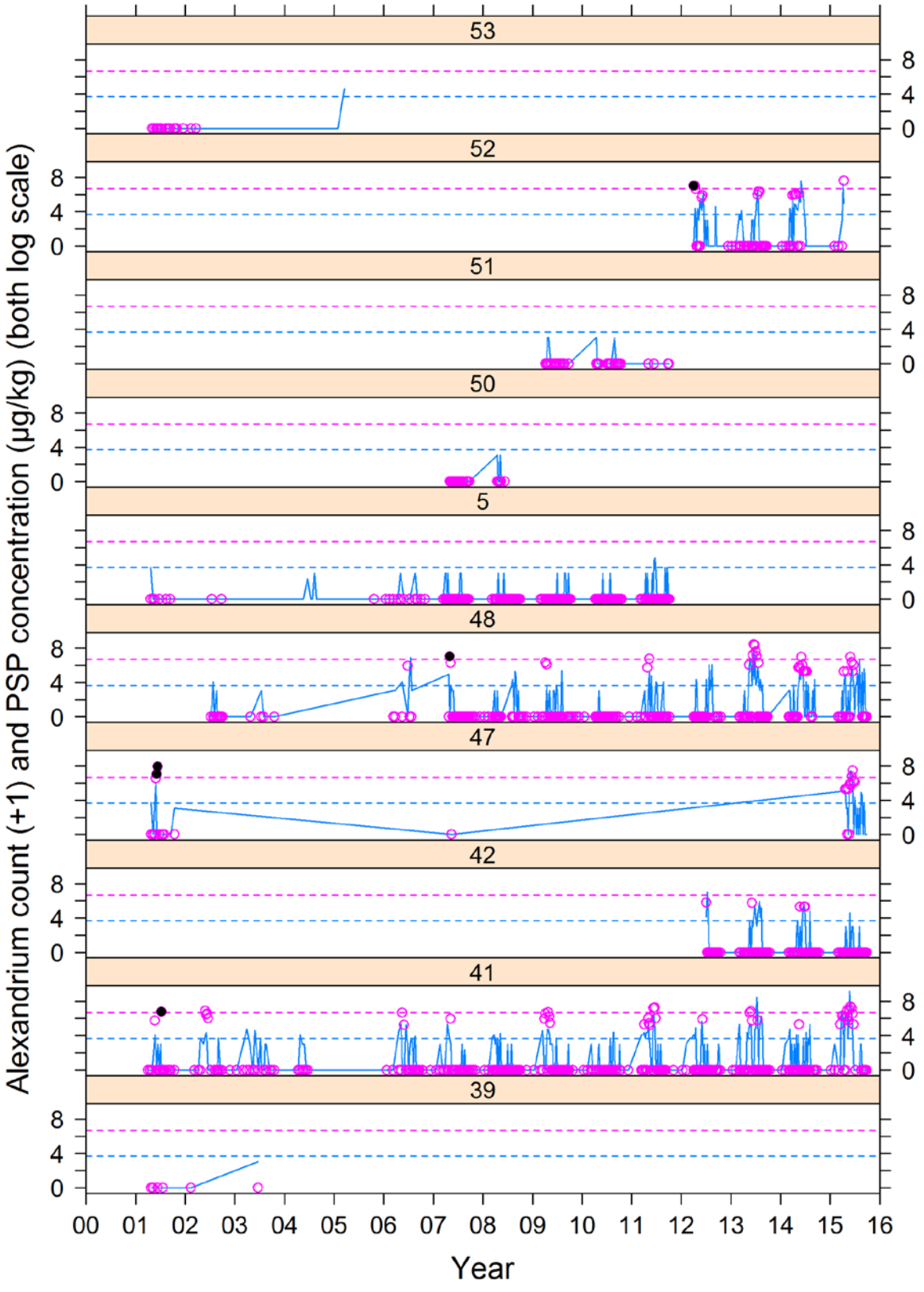

Figure A9d: continuation of A9

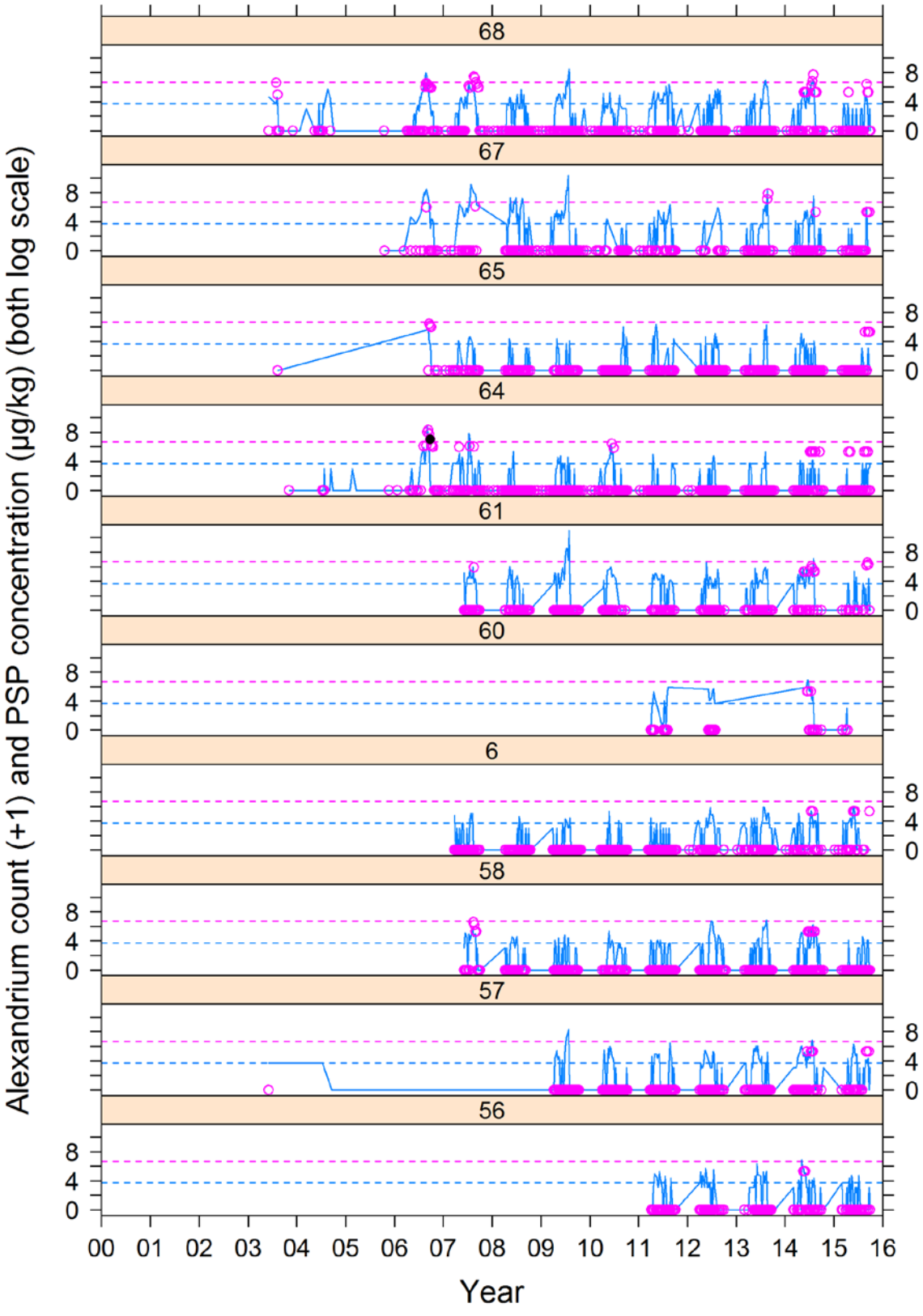

Figure A9e: continuation of A9

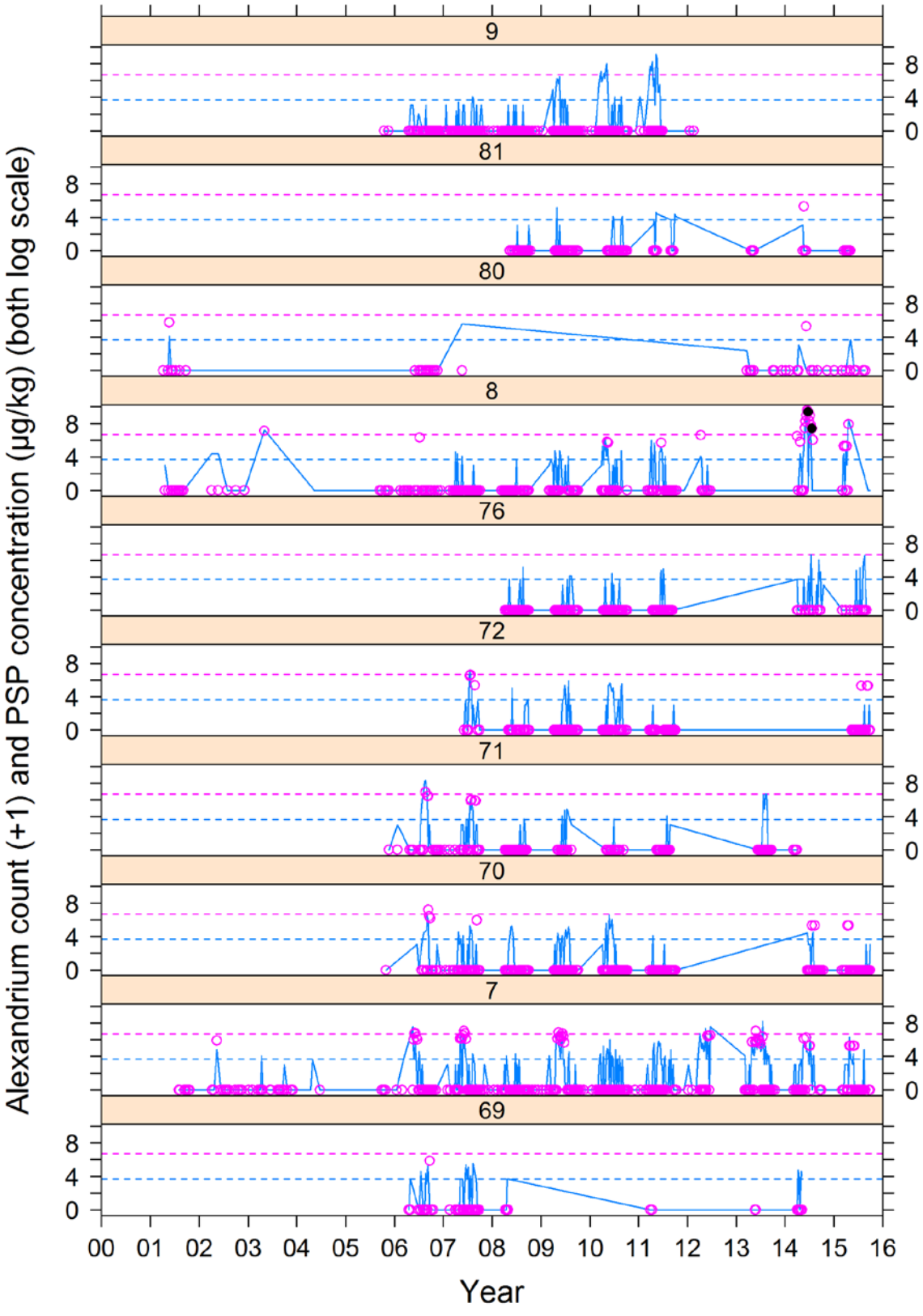

Figure A9f: continuation of A9

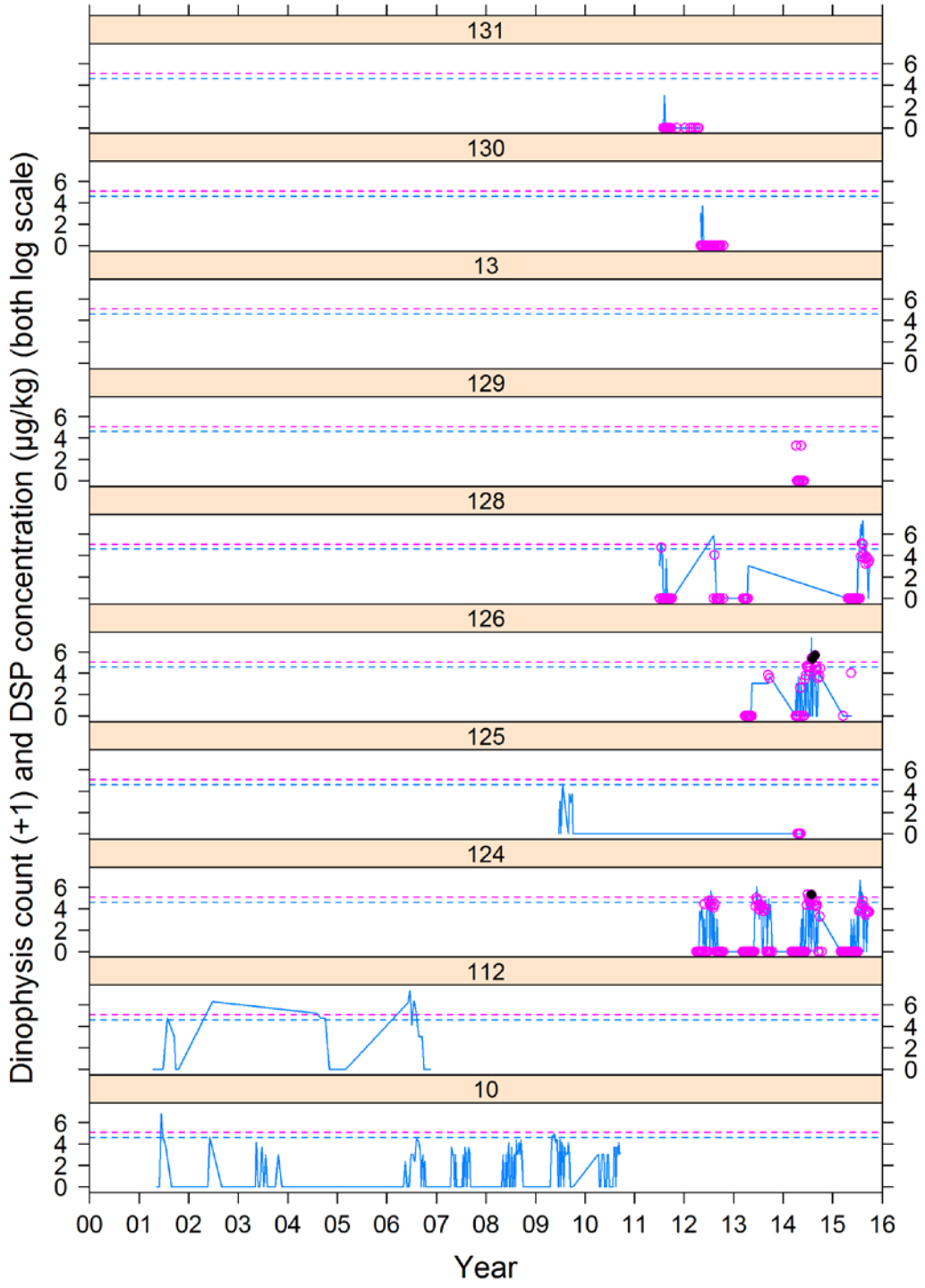

Figure A10a: Recorded *Dinophysis* cell count (cells per litre, ln+1 transformed, blue line) and contemporaneous DSP biotoxin concentration in mussels (µg/kg, ln+1 transformed, magenta open circles) by pod over time (2000 – 2015). The action/regulatory thresholds are shown by the horizontal blue dashed line (for HAB cell count) and magenta dashed line (for toxin concentration). Events where the HAB cell count is below the action threshold but the HA-corresponding toxin is above threshold are of interest and should be further examined. These 'interest-events' are indicated by black circles. See main text for details and possible explanations.

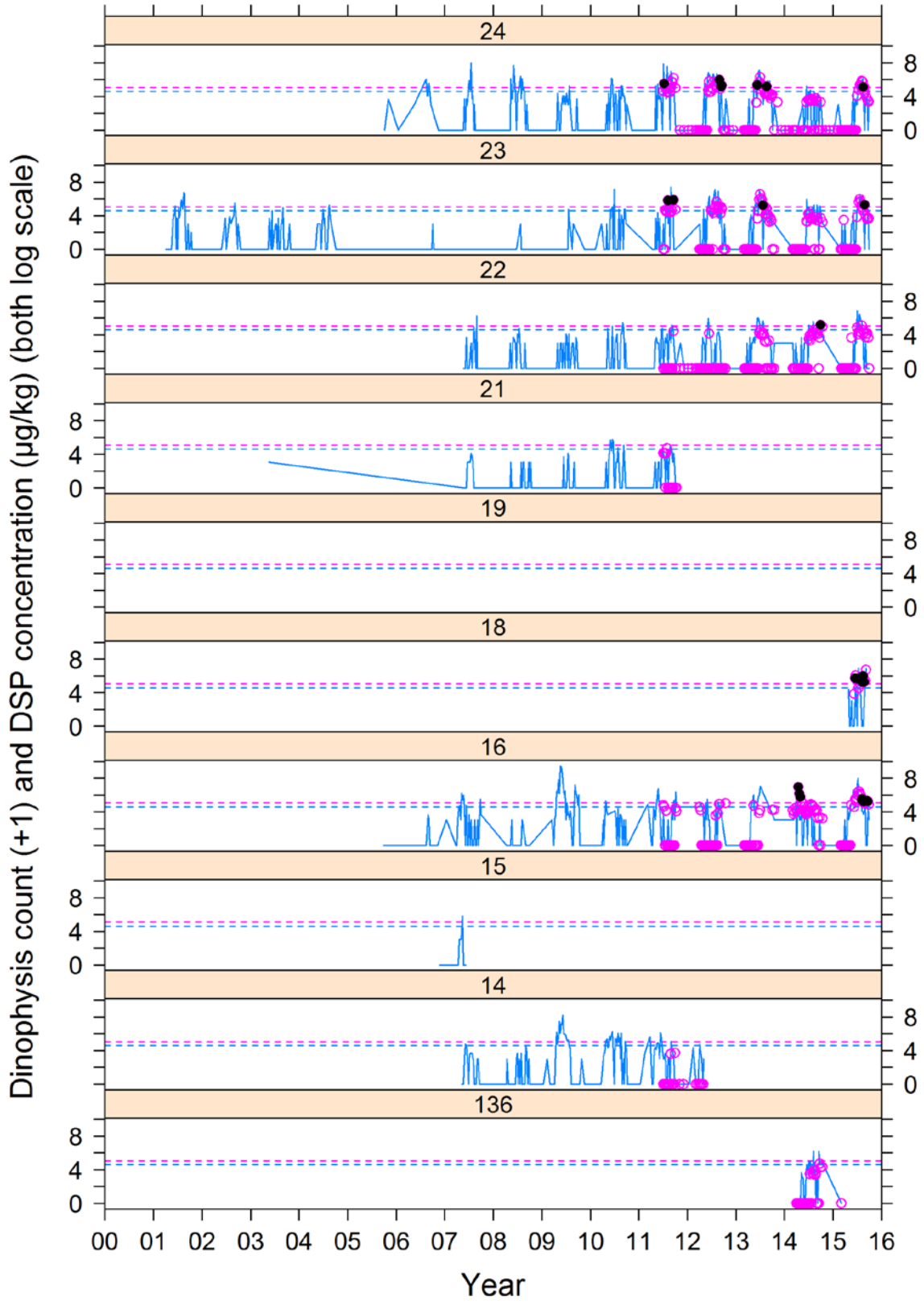

Figure A10b: continuation of A10

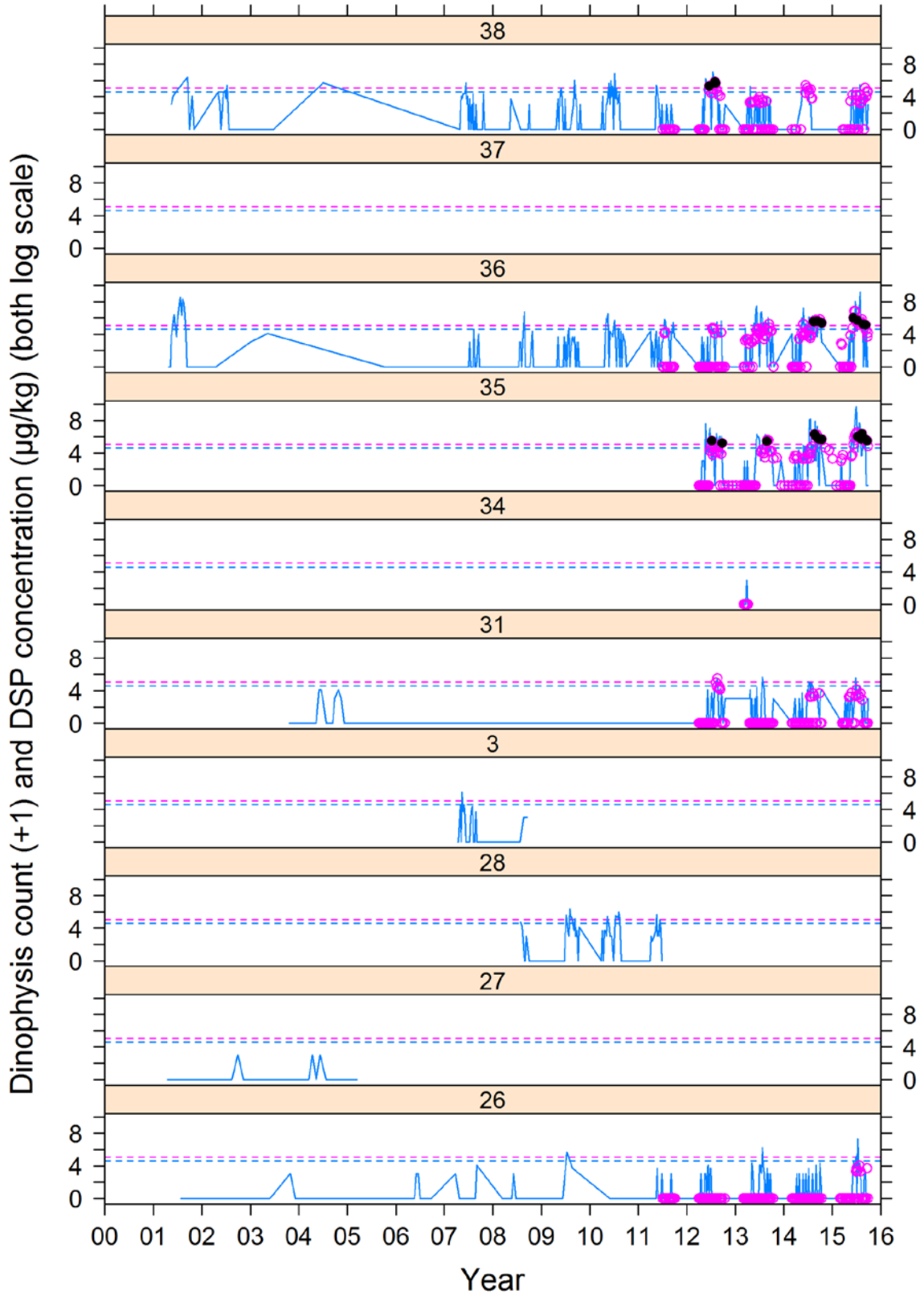

Figure A10c: continuation of A10

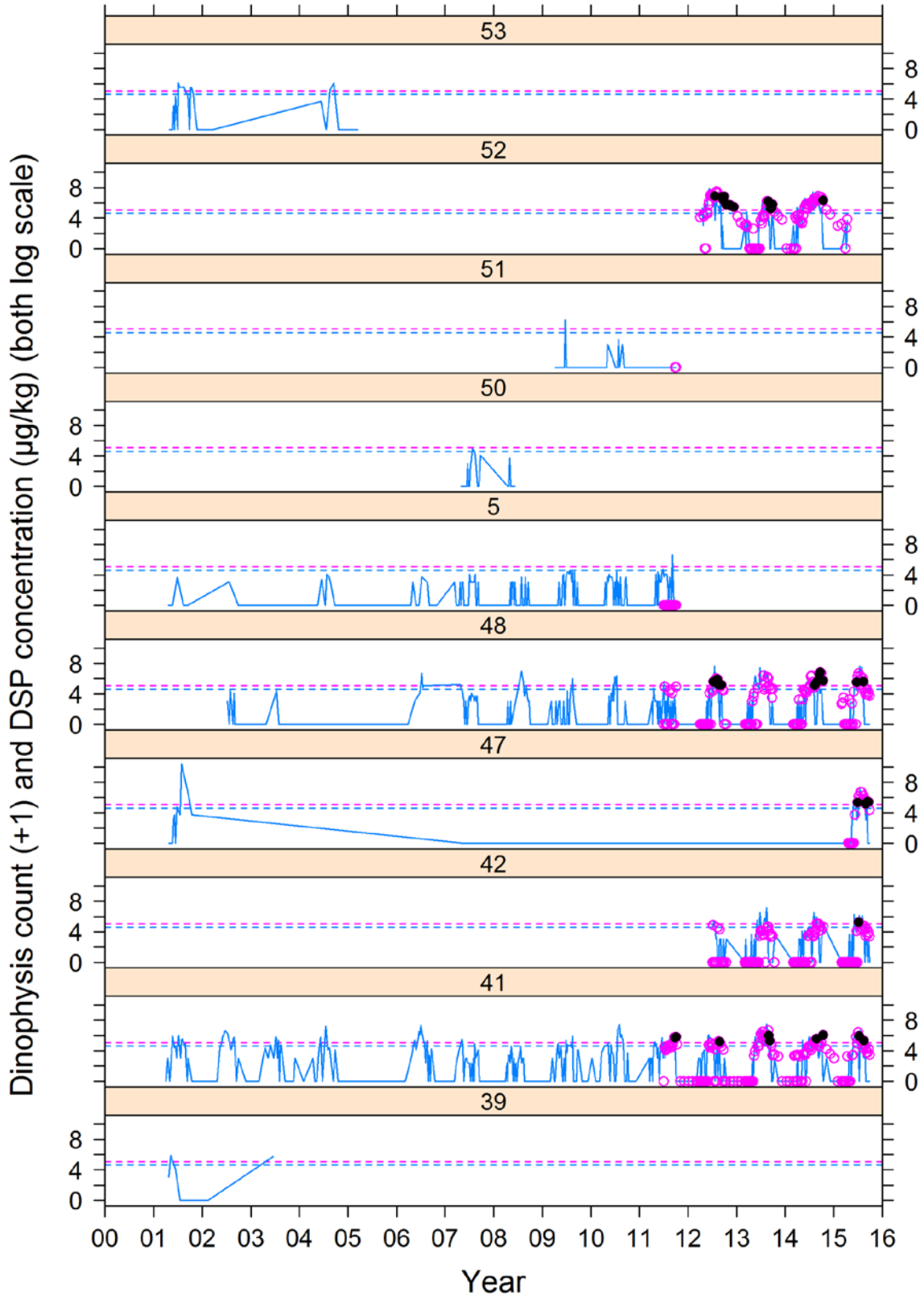

Figure A10d: continuation of A10

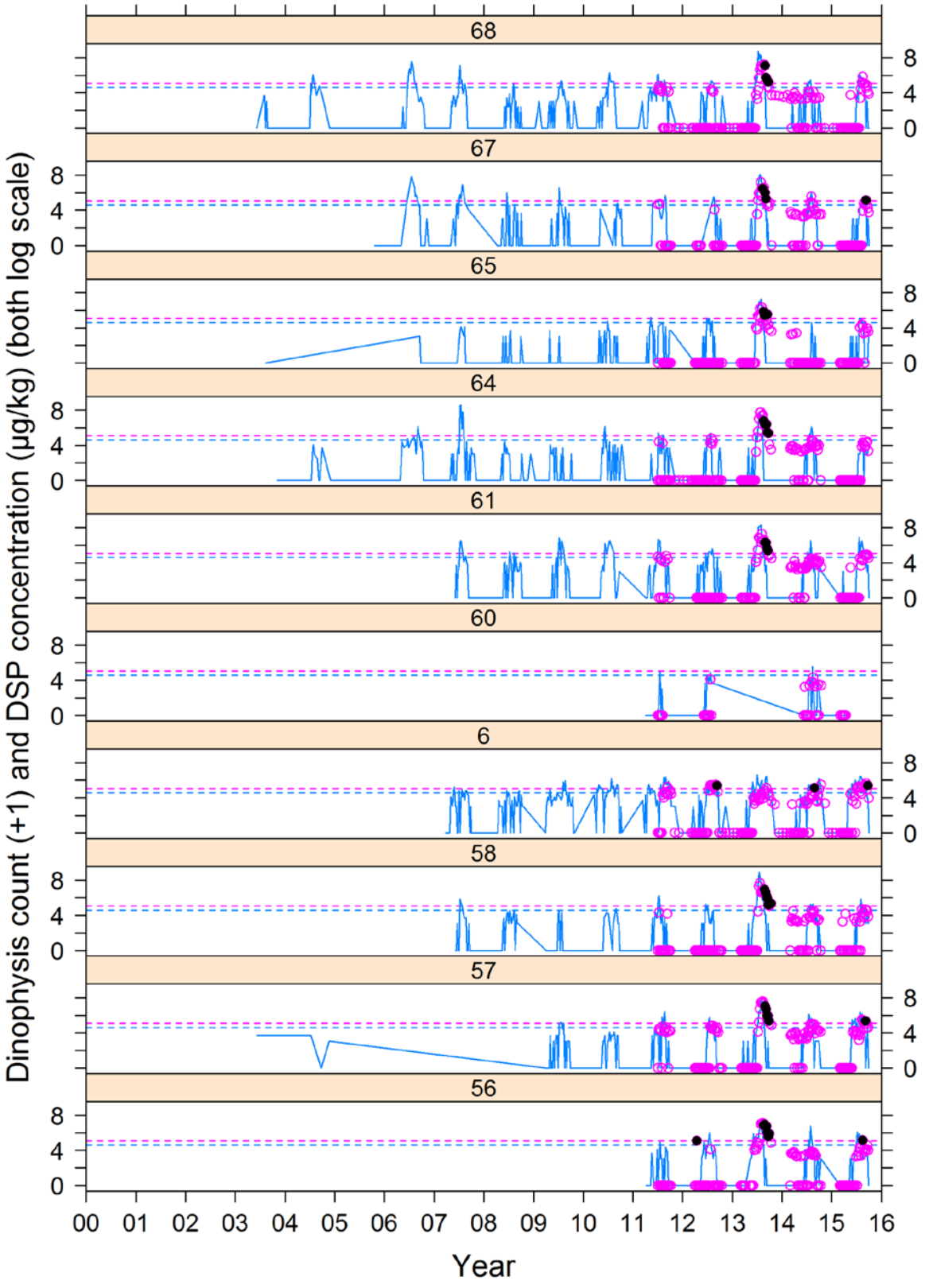

Figure A10e: continuation of A10

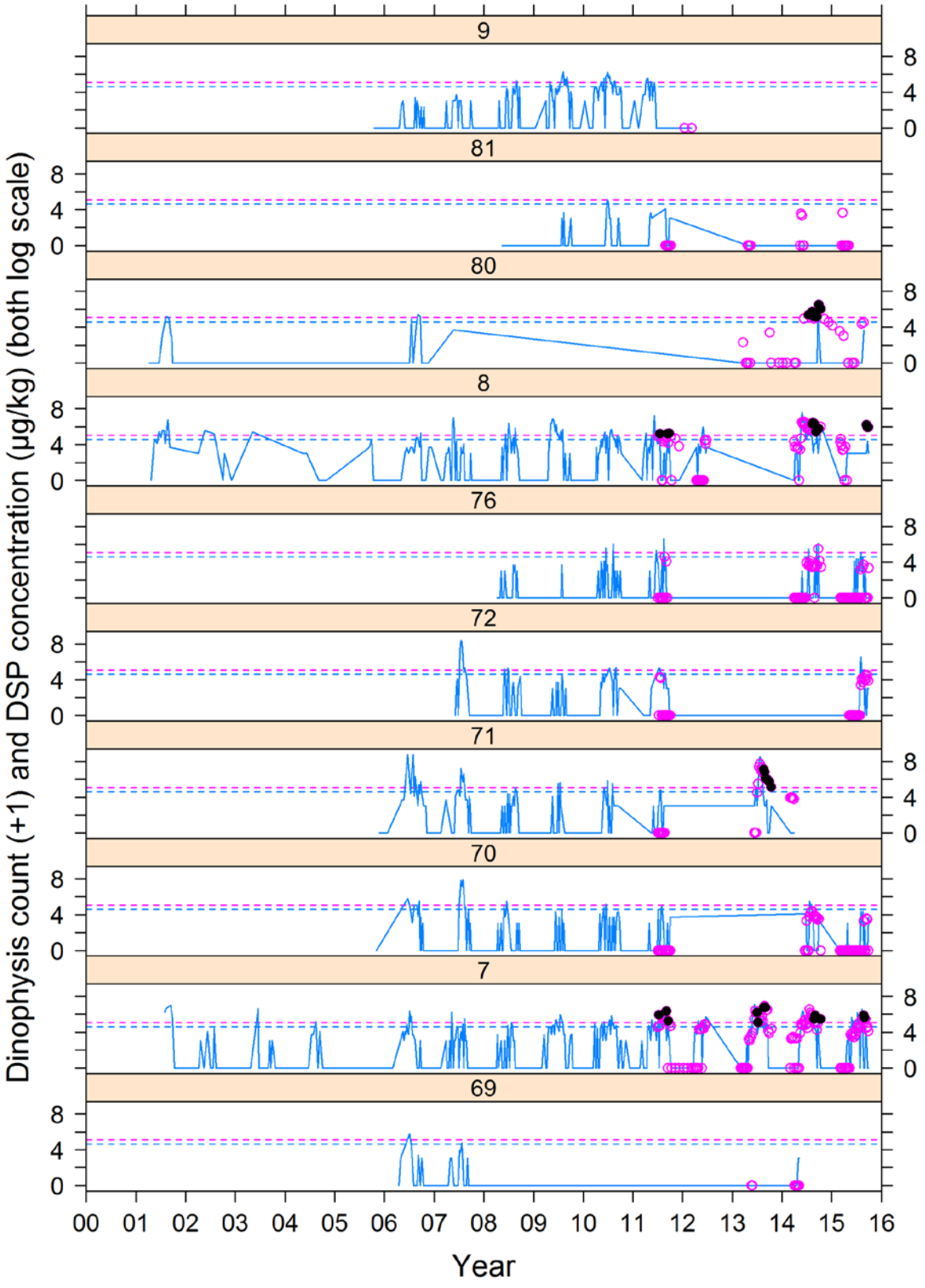

Figure A10f: continuation of A10

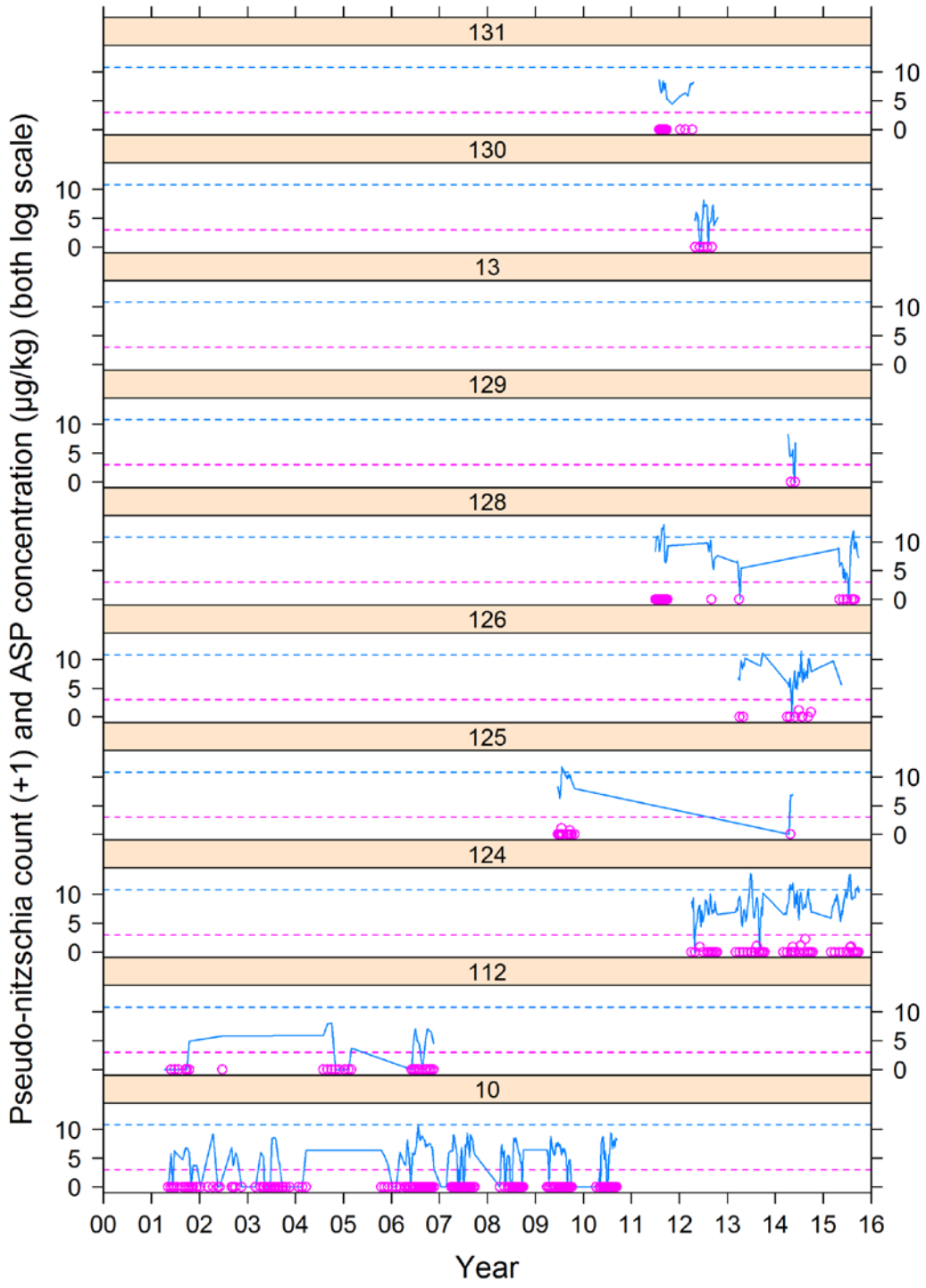

Figure A11a: Recorded *Pseudo-nitzschia* cell count (cells per litre, ln+1 transformed, blue line) and contemporaneous ASP biotoxin concentration in mussels (µg/kg, ln+1 transformed, magenta open circles) by pod over time (2000 – 2015). The action/regulatory thresholds are shown by the horizontal blue dashed line (for HAB cell count) and magenta dashed line (for toxin concentration). Events where the HAB cell count is below the action threshold but the HAB-corresponding toxin is above threshold are of interest and should be further examined. These 'interest-events' are indicated by black circles. See main text for details and possible explanations.

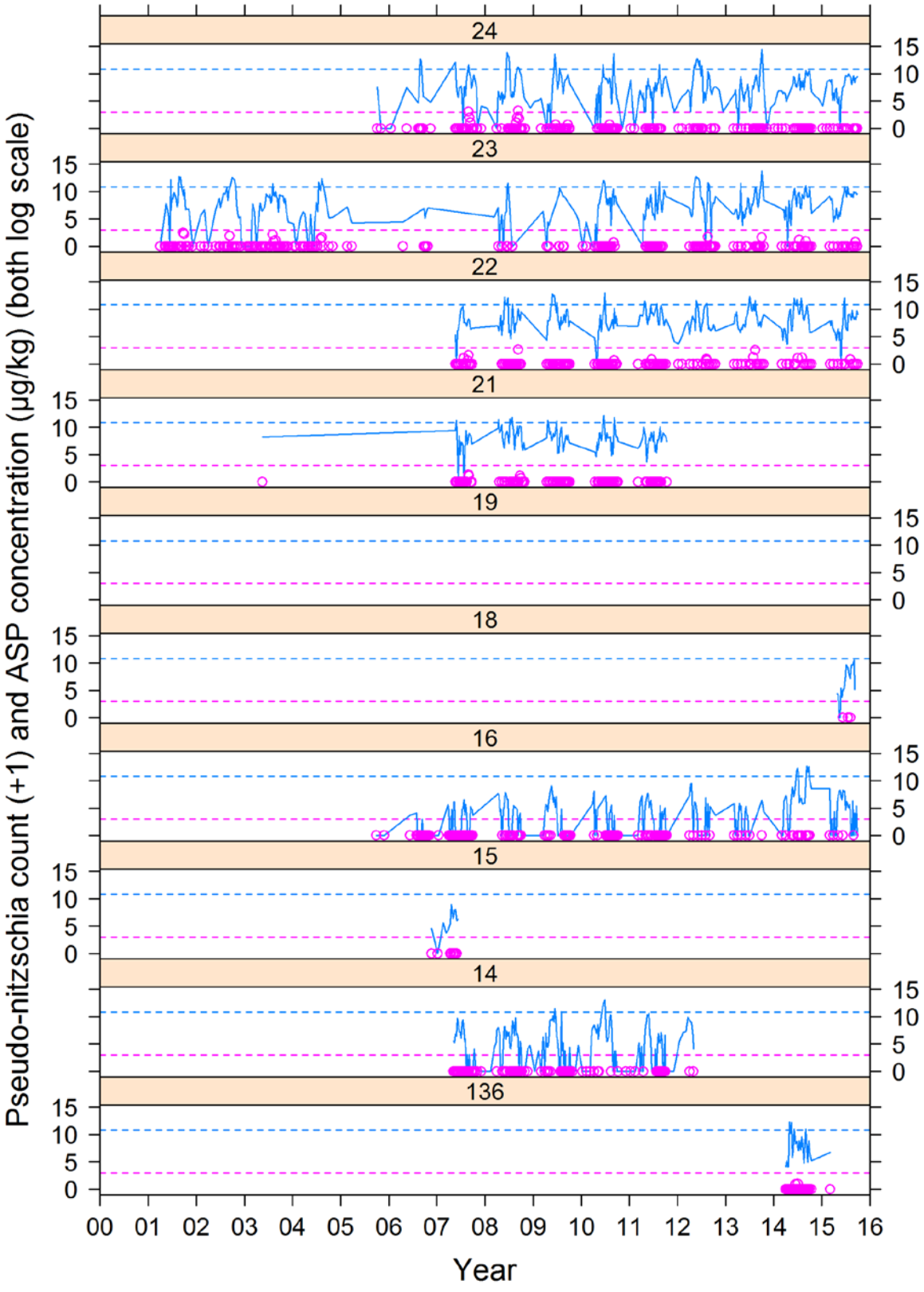

Figure A11b: continuation of A11

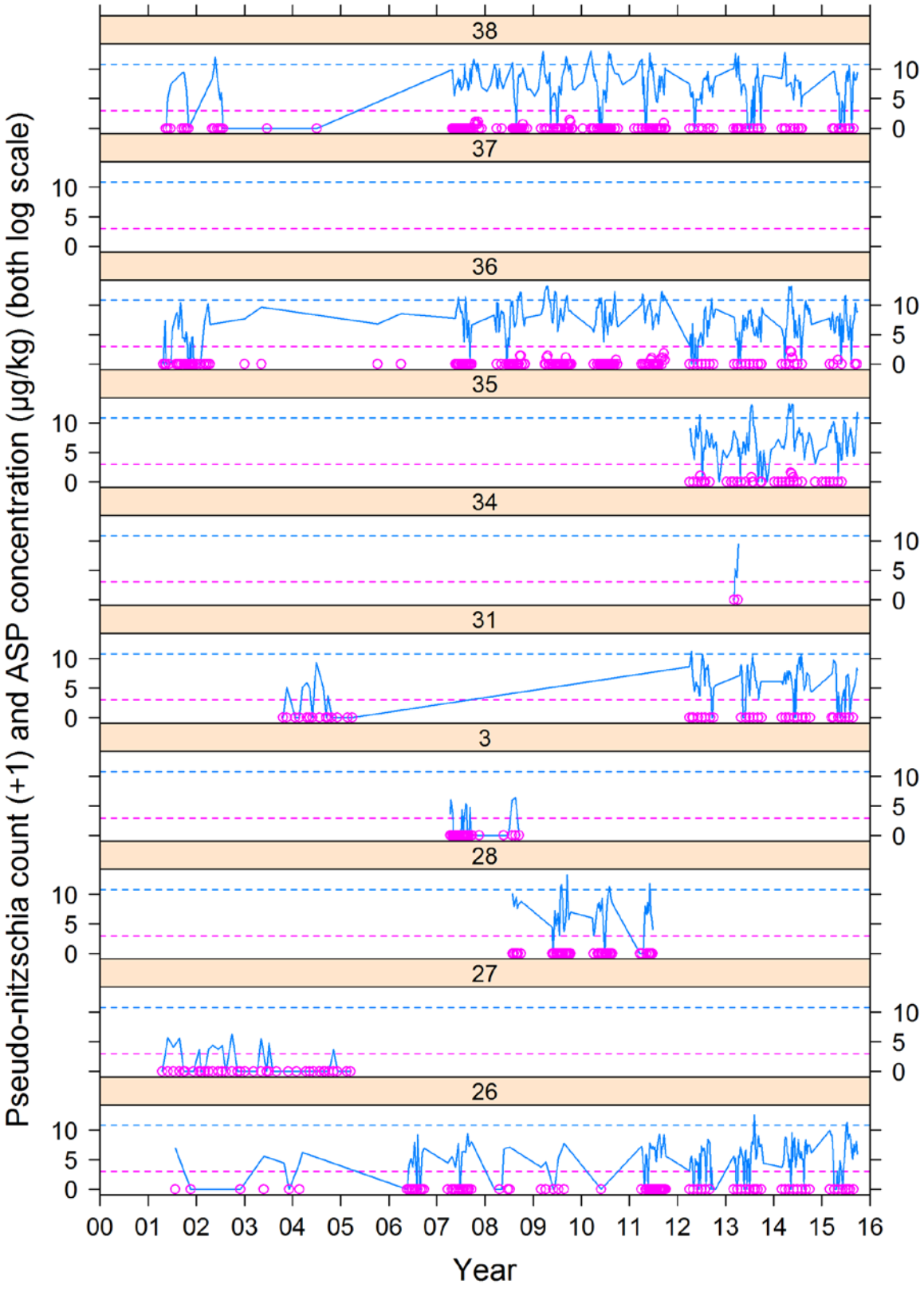

Figure A11c: continuation of A11

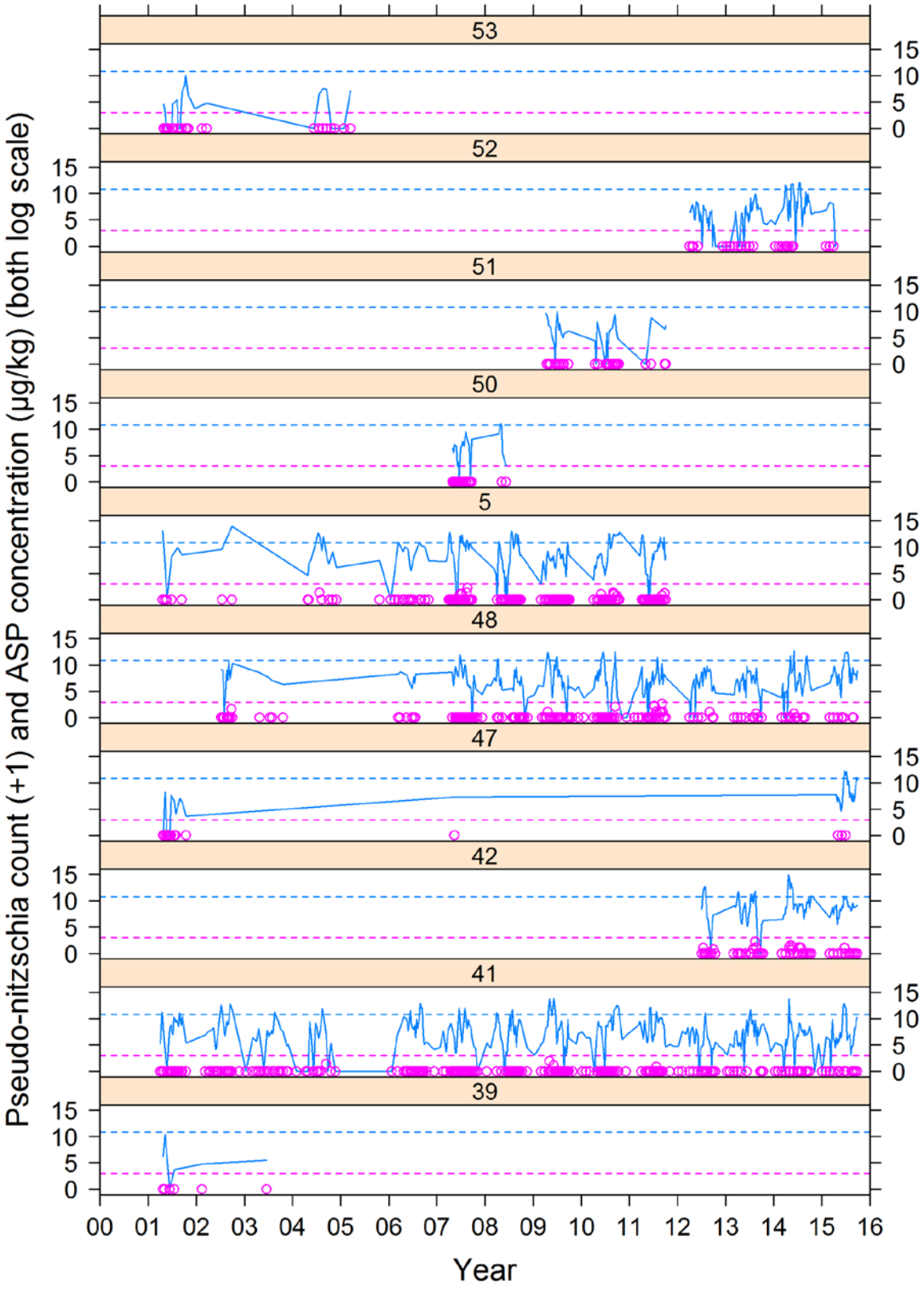

Figure A11d: continuation of A11

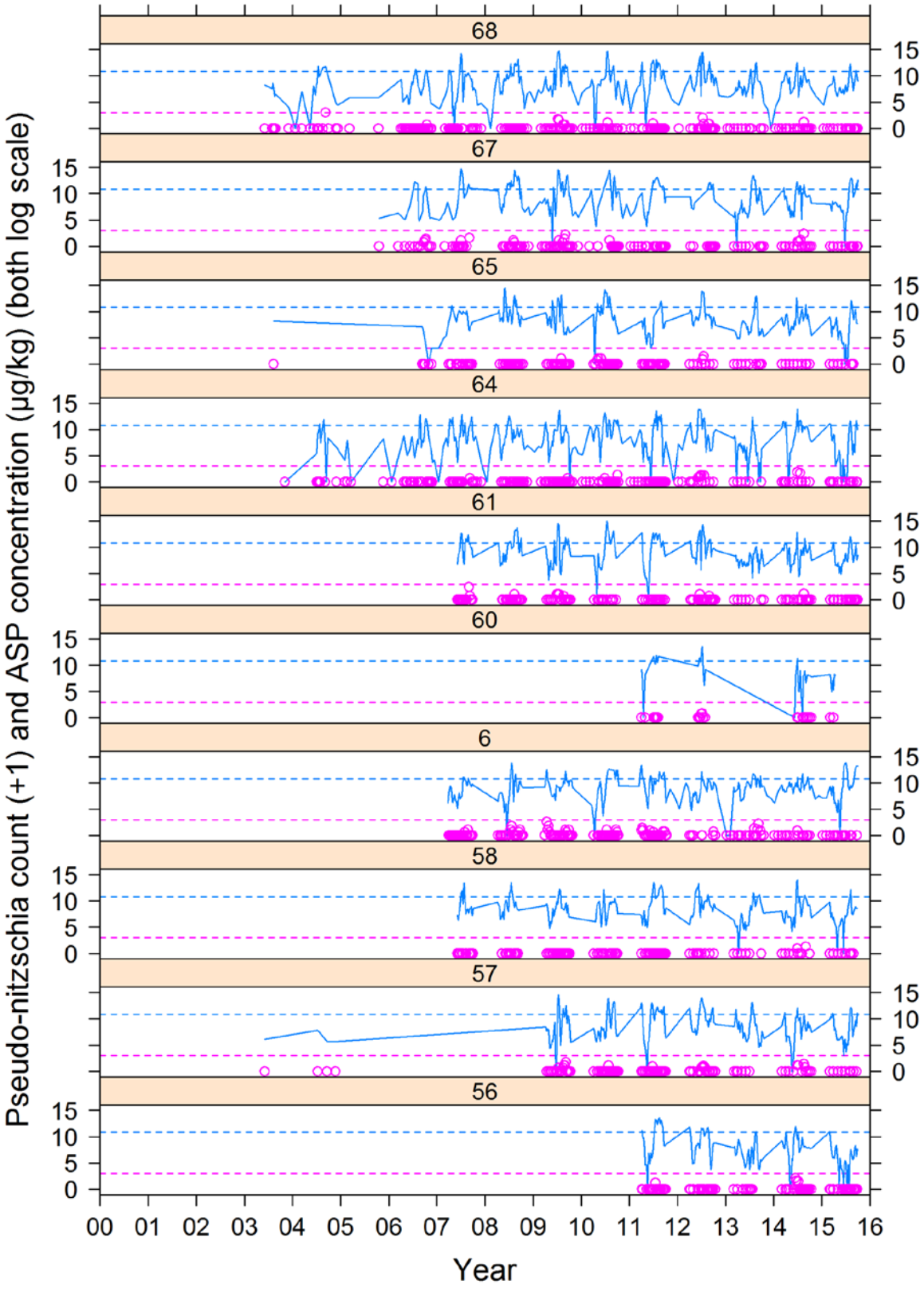

Figure A11e: continuation of A11

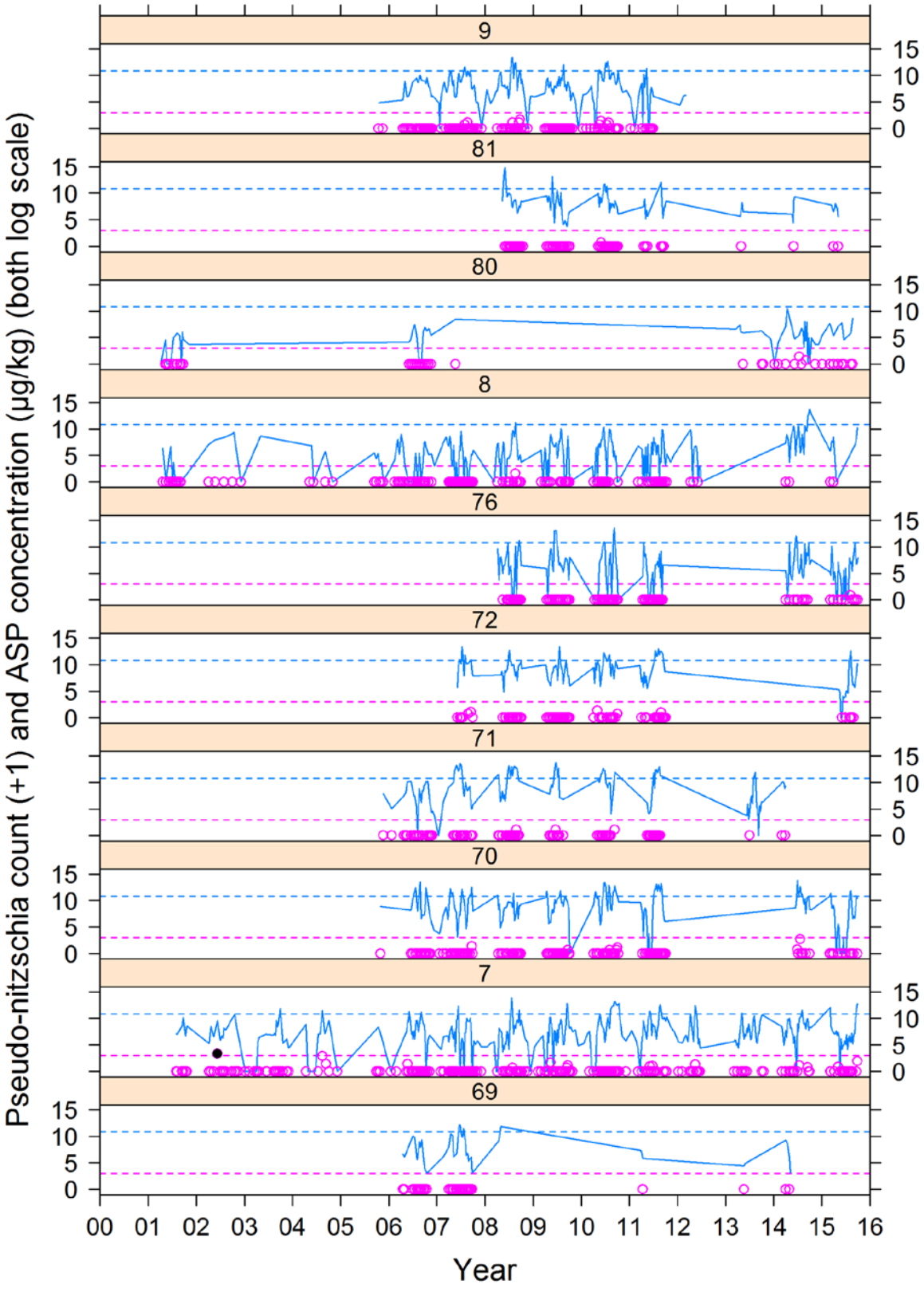

Figure A11f: continuation of A11

Appendix B: Tables with biotoxin data for mussels and Pacific oysters by group and month

B1 Biotoxin data for mussels

Table B1: Percentage of mussel samples for which DA exceeds 20 mg/kg, per group and month, based on data from 2001-15. In brackets: number of samples exceeding 20 mg/kg over total number of samples.

Groups	GroupNameM	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	*Total*
G80	EastCoast	0 (0/11)	0 (0/10)	0 (0/10)	0 (0/12)	0 (0/20)	0 (0/20)	0 (0/19)	0 (0/19)	0 (0/15)	0 (0/21)	0 (0/11)	0 (0/5)	*0 (0/173)*
G26	Dumfries	0 (0/17)	0 (0/24)	0 (0/17)	0 (0/24)	0 (0/23)	0 (0/36)	0 (0/29)	0 (0/25)	0 (0/29)	0 (0/26)	0 (0/22)	0 (0/14)	*0 (0/286)*
G8	Ayr-LochStriven	0 (0/16)	0 (0/24)	0 (0/27)	0 (0/29)	0 (0/27)	0 (0/28)	0 (0/30)	0 (0/33)	0 (0/36)	0 (0/36)	0 (0/29)	0 (0/16)	*0 (0/331)*
P16	Ayr-LochFyneArdkinglas	0 (0/14)	0 (0/15)	0 (0/16)	0 (0/18)	0 (0/21)	0 (0/21)	0 (0/29)	0 (0/30)	0 (0/45)	0 (0/33)	0 (0/23)	0 (0/12)	*0 (0/277)*
G18	Ayr-other	0 (0/34)	0 (0/39)	0 (0/43)	0 (0/48)	0 (0/48)	0 (0/50)	0 (0/68)	0 (0/72)	0 (0/70)	0 (0/84)	0 (0/63)	0 (0/24)	*0 (0/643)*
G123	WC-Gigha	0 (0/12)	0 (0/13)	0 (0/10)	0 (0/20)	0 (0/21)	0 (0/21)	0 (0/24)	0 (0/20)	0 (0/25)	0 (0/29)	0 (0/18)	0 (0/5)	*0 (0/218)*
P6	WC-LochMelfort	0 (0/12)	0 (0/10)	0 (0/10)	0 (0/27)	0 (0/16)	0 (0/24)	0 (0/28)	0 (0/33)	0 (0/28)	0 (0/32)	0 (0/16)	0 (0/7)	*0 (0/243)*
G10	WC-LochEtive	0 (0/19)	0 (0/19)	0 (0/29)	0 (0/42)	0 (0/54)	0 (0/53)	0 (0/57)	0 (0/67)	0 (0/66)	0 (0/58)	0 (0/37)	0 (0/15)	*0 (0/516)*
G9	WC-LochCreranLinnhe	0 (0/18)	0 (0/23)	0 (0/20)	0 (0/37)	0 (0/49)	0 (0/62)	0 (0/57)	0 (0/56)	0 (0/60)	0 (0/60)	0 (0/43)	0 (0/14)	*0 (0/499)*
G31	WC-LochLevenEil	0 (0/25)	0 (0/31)	0 (0/27)	0 (0/35)	0 (0/40)	0 (0/57)	0 (0/59)	0 (0/62)	0 (0/71)	0 (0/52)	0 (0/43)	0 (0/22)	*0 (0/524)*
G28	WC-Lochaber	0 (0/29)	0 (0/27)	0 (0/36)	0 (0/44)	0 (0/54)	0 (0/77)	0 (0/70)	0 (0/86)	0 (0/80)	0 (0/51)	0 (0/45)	0 (0/24)	*0 (0/623)*
P5	Mull-LochSpelve	0 (0/9)	0 (0/14)	0 (0/14)	0 (0/32)	0 (0/27)	0 (0/33)	0 (0/37)	2.4 (1/41)	2 (1/50)	0 (0/36)	0 (0/19)	0 (0/8)	*0.6 (2/320)*
P7	Mull-LochScridain	0 (0/13)	0 (0/14)	0 (0/13)	0 (0/24)	0 (0/33)	2.8 (1/36)	0 (0/36)	0 (0/29)	0 (0/40)	0 (0/40)	0 (0/20)	0 (0/10)	*0.3 (1/308)*
G1	Mull-other	0 (0/17)	0 (0/19)	0 (0/18)	0 (0/30)	0 (0/38)	0 (0/37)	0 (0/51)	0 (0/40)	0 (0/41)	0 (0/41)	0 (0/35)	0 (0/17)	*0 (0/384)*
P41	Skye-LochEishort	0 (0/13)	0 (0/16)	0 (0/20)	0 (0/22)	0 (0/31)	0 (0/35)	0 (0/42)	0 (0/42)	0 (0/42)	0 (0/36)	0 (0/18)	0 (0/15)	*0 (0/332)*
G42	Skye-other	0 (0/22)	0 (0/21)	0 (0/26)	0 (0/29)	0 (0/55)	0 (0/60)	0 (0/89)	0 (0/76)	0 (0/74)	0 (0/74)	0 (0/43)	0 (0/18)	*0 (0/587)*
G21	Lewis-LochLeurbostErisort	0 (0/18)	0 (0/25)	0 (0/25)	0 (0/23)	0 (0/34)	0 (0/48)	0 (0/53)	0 (0/65)	0 (0/61)	0 (0/49)	0 (0/33)	0 (0/15)	*0 (0/449)*
G23	Lewis-LochRoag	0 (0/33)	0 (0/38)	0 (0/44)	0 (0/49)	0 (0/73)	0 (0/103)	0 (0/103)	1.8 (2/112)	1.5 (2/131)	0 (0/101)	0 (0/50)	0 (0/27)	*0.5 (4/864)*
G22	HarrisUist	0 (0/35)	0 (0/47)	0 (0/46)	0 (0/47)	0 (0/54)	0 (0/72)	0 (0/73)	0 (0/83)	0 (0/89)	0 (0/66)	0 (0/46)	0 (0/28)	*0 (0/686)*
G35	NWC-LochTorridon	0 (0/22)	0 (0/23)	0 (0/23)	0 (0/28)	0 (0/39)	0 (0/58)	0 (0/63)	0 (0/65)	0 (0/67)	0 (0/58)	0 (0/39)	0 (0/17)	*0 (0/502)*
G39	NWC-LochEweBroom	0 (0/18)	0 (0/19)	0 (0/18)	0 (0/38)	0 (0/43)	0 (0/50)	0 (0/51)	0 (0/55)	0 (0/57)	0 (0/55)	0 (0/39)	0 (0/17)	*0 (0/460)*
G48	NWC-LochLaxfordInchard	0 (0/19)	0 (0/19)	0 (0/21)	0 (0/27)	0 (0/34)	0 (0/49)	0 (0/56)	0 (0/54)	0 (0/56)	0 (0/51)	0 (0/32)	0 (0/15)	*0 (0/433)*
G49	NWC-other	0 (0/18)	0 (0/21)	0 (0/17)	0 (0/26)	0 (0/30)	0 (0/45)	0 (0/63)	0 (0/50)	0 (0/53)	0 (0/46)	0 (0/31)	0 (0/16)	*0 (0/416)*
P38	Tain	0 (0/10)	0 (0/12)	0 (0/17)	0 (0/18)	0 (0/21)	0 (0/30)	0 (0/32)	0 (0/30)	0 (0/33)	0 (0/30)	0 (0/17)	0 (0/8)	*0 (0/258)*
G54	Orkney	0 (0/3)	0 (0/5)	0 (0/1)	0 (0/10)	0 (0/7)	0 (0/9)	0 (0/12)	0 (0/15)	0 (0/14)	0 (0/11)	0 (0/10)	0 (0/2)	*0 (0/99)*
G67	Shetland-SE-CliftSound	0 (0/18)	0 (0/18)	0 (0/24)	0 (0/30)	0 (0/29)	0 (0/39)	0 (0/60)	0 (0/53)	0 (0/59)	0 (0/53)	0 (0/29)	0 (0/13)	*0 (0/425)*
G56	Shetland-SE-DalesVoe	0 (0/9)	0 (0/11)	0 (0/13)	0 (0/25)	0 (0/21)	0 (0/37)	2.2 (1/45)	0 (0/47)	0 (0/42)	0 (0/31)	0 (0/19)	0 (0/9)	*0.3 (1/309)*
G57	Shetland-SE-SandsoundWeisdale	0 (0/26)	0 (0/30)	0 (0/31)	0 (0/34)	0 (0/35)	0 (0/43)	0 (0/50)	1.4 (1/69)	0 (0/71)	0 (0/79)	0 (0/51)	0 (0/21)	*0.2 (1/540)*
P61	Shetland-SW-GrutingVoe	0 (0/16)	0 (0/16)	0 (0/15)	0 (0/24)	0 (0/30)	0 (0/35)	0 (0/41)	0 (0/42)	0 (0/44)	0 (0/34)	0 (0/22)	0 (0/12)	*0 (0/331)*
P68	Shetland-SW-Vaila	0 (0/16)	0 (0/17)	0 (0/17)	0 (0/24)	0 (0/26)	0 (0/34)	0 (0/47)	0 (0/46)	0 (0/46)	0 (0/38)	0 (0/25)	0 (0/11)	*0 (0/347)*
P72	Shetland-W-AithVoe	0 (0/14)	0 (0/15)	0 (0/17)	0 (0/17)	0 (0/16)	0 (0/20)	0 (0/24)	0 (0/30)	0 (0/24)	0 (0/28)	0 (0/27)	0 (0/9)	*0 (0/241)*
P64	Shetland-W-BustaVoe	0 (0/10)	0 (0/16)	0 (0/21)	0 (0/24)	0 (0/20)	0 (0/33)	0 (0/35)	0 (0/34)	0 (0/35)	0 (0/33)	0 (0/26)	0 (0/9)	*0 (0/296)*
P70	Shetland-W-OlnaFirth	0 (0/13)	0 (0/11)	0 (0/15)	0 (0/20)	0 (0/17)	0 (0/27)	0 (0/32)	0 (0/39)	0 (0/28)	0 (0/33)	0 (0/25)	0 (0/8)	*0 (0/268)*
G58	Shetland-W-VementryVoe	0 (0/18)	0 (0/20)	0 (0/21)	0 (0/16)	0 (0/23)	0 (0/34)	0 (0/30)	0 (0/48)	0 (0/42)	0 (0/42)	0 (0/28)	0 (0/10)	*0 (0/332)*
G71	Shetland-W-RonasVoe	0 (0/8)	0 (0/10)	0 (0/15)	0 (0/8)	0 (0/22)	0 (0/31)	0 (0/29)	0 (0/27)	0 (0/20)	0 (0/19)	0 (0/19)	0 (0/5)	*0 (0/213)*
P65	Shetland-N-Basta	0 (0/9)	0 (0/11)	0 (0/12)	0 (0/20)	0 (0/19)	0 (0/26)	0 (0/26)	0 (0/27)	0 (0/38)	0 (0/23)	0 (0/22)	0 (0/11)	*0 (0/244)*
G81	Shetland-N-Uyea	0 (0/30)	0 (0/41)	0 (0/42)	0 (0/41)	0 (0/43)	0 (0/49)	0 (0/46)	0 (0/73)	0 (0/80)	0 (0/63)	0 (0/48)	0 (0/24)	*0 (0/580)*
	Total	*0 (0/644)*	*0 (0/744)*	*0 (0/791)*	*0 (0/1022)*	*0 (0/1193)*	*0.1 (1/1522)*	*0.1 (1/1696)*	*0.2 (4/1795)*	*0.2 (3/1862)*	*0 (0/1652)*	*0 (0/1123)*	*0 (0/513)*	*0.1 (9/14557)*

Table B2: Percentage of mussel samples for which DA exceeds 10 mg/kg, per group and month, based on data from 2001-15. In brackets: number of samples exceeding 10 mg/kg over total number of samples.

GroupsM	GroupNameM	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	*Total*
G80	EastCoast	0 (0/11)	0 (0/10)	0 (0/10)	0 (0/12)	0 (0/20)	0 (0/20)	0 (0/19)	0 (0/19)	0 (0/15)	0 (0/21)	0 (0/11)	0 (0/5)	*0 (0/173)*
G26	Dumfries	0 (0/17)	0 (0/24)	0 (0/17)	0 (0/24)	0 (0/23)	0 (0/36)	0 (0/29)	0 (0/25)	0 (0/29)	0 (0/26)	0 (0/22)	0 (0/14)	*0 (0/286)*
G8	Ayr-LochStriven	0 (0/16)	0 (0/24)	0 (0/27)	0 (0/29)	0 (0/27)	0 (0/28)	0 (0/30)	0 (0/33)	0 (0/36)	0 (0/36)	0 (0/29)	0 (0/16)	*0 (0/331)*
P16	Ayr-LochFyneArdkinglas	0 (0/14)	0 (0/15)	0 (0/16)	0 (0/18)	0 (0/21)	0 (0/21)	0 (0/29)	0 (0/30)	0 (0/45)	0 (0/33)	0 (0/23)	0 (0/12)	*0 (0/277)*
G18	Ayr-other	0 (0/34)	0 (0/39)	0 (0/43)	0 (0/48)	0 (0/48)	0 (0/50)	1.5 (1/68)	0 (0/72)	0 (0/70)	0 (0/84)	0 (0/63)	0 (0/24)	*0.2 (1/643)*
G123	WC-Gigha	0 (0/12)	0 (0/13)	0 (0/10)	0 (0/20)	0 (0/21)	0 (0/21)	0 (0/24)	0 (0/20)	0 (0/25)	0 (0/29)	0 (0/18)	0 (0/5)	*0 (0/218)*
P6	WC-LochMelfort	0 (0/12)	0 (0/10)	0 (0/10)	3.7 (1/27)	0 (0/16)	0 (0/24)	0 (0/28)	0 (0/33)	0 (0/28)	0 (0/32)	0 (0/16)	0 (0/7)	*0.4 (1/243)*
G10	WC-LochEtive	0 (0/19)	0 (0/19)	0 (0/29)	0 (0/42)	0 (0/54)	0 (0/53)	0 (0/57)	0 (0/67)	0 (0/66)	0 (0/58)	0 (0/37)	0 (0/15)	*0 (0/516)*
G9	WC-LochCreranLinnhe	0 (0/18)	0 (0/23)	0 (0/20)	0 (0/37)	0 (0/49)	0 (0/62)	0 (0/57)	0 (0/56)	0 (0/60)	0 (0/60)	0 (0/43)	0 (0/14)	*0 (0/499)*
G31	WC-LochLevenEil	0 (0/25)	0 (0/31)	0 (0/27)	0 (0/35)	0 (0/40)	0 (0/57)	0 (0/59)	0 (0/62)	0 (0/71)	0 (0/52)	0 (0/43)	0 (0/22)	*0 (0/524)*
G28	WC-Lochaber	0 (0/29)	0 (0/27)	0 (0/36)	0 (0/44)	0 (0/54)	0 (0/77)	0 (0/70)	1.2 (1/86)	0 (0/80)	0 (0/51)	0 (0/45)	0 (0/24)	*0.2 (1/623)*
P5	Mull-LochSpelve	0 (0/9)	0 (0/14)	0 (0/14)	0 (0/32)	0 (0/27)	0 (0/33)	0 (0/37)	4.9 (2/41)	2 (1/50)	0 (0/36)	0 (0/19)	0 (0/8)	*0.9 (3/320)*
P7	Mull-LochScridain	0 (0/13)	0 (0/14)	0 (0/13)	0 (0/24)	0 (0/33)	2.8 (1/36)	0 (0/36)	3.4 (1/29)	0 (0/40)	0 (0/40)	0 (0/20)	0 (0/10)	*0.6 (2/308)*
G1	Mull-other	0 (0/17)	0 (0/19)	0 (0/18)	0 (0/30)	0 (0/38)	0 (0/37)	0 (0/51)	0 (0/40)	0 (0/41)	0 (0/41)	0 (0/35)	0 (0/17)	*0 (0/384)*
P41	Skye-LochEishort	0 (0/13)	0 (0/16)	0 (0/20)	0 (0/22)	0 (0/31)	0 (0/35)	0 (0/42)	0 (0/42)	0 (0/42)	0 (0/36)	0 (0/18)	0 (0/15)	*0 (0/332)*
G42	Skye-other	0 (0/22)	0 (0/21)	0 (0/26)	0 (0/29)	0 (0/55)	0 (0/60)	2.2 (2/89)	0 (0/76)	0 (0/74)	0 (0/74)	0 (0/43)	0 (0/18)	*0.3 (2/587)*
G21	Lewis-LochLeurbostErisort	0 (0/18)	0 (0/25)	0 (0/25)	0 (0/23)	0 (0/34)	0 (0/48)	0 (0/53)	0 (0/65)	0 (0/61)	0 (0/49)	0 (0/33)	0 (0/15)	*0 (0/449)*
G23	Lewis-LochRoag	0 (0/33)	0 (0/38)	0 (0/44)	0 (0/49)	0 (0/73)	1 (1/103)	0 (0/103)	2.7 (3/112)	2.3 (3/131)	0 (0/101)	0 (0/50)	0 (0/27)	*0.8 (7/864)*
G22	HarrisUist	0 (0/35)	0 (0/47)	0 (0/46)	0 (0/47)	0 (0/54)	0 (0/72)	0 (0/73)	1.2 (1/83)	2.2 (2/89)	0 (0/66)	0 (0/46)	0 (0/28)	*0.4 (3/686)*
G35	NWC-LochTorridon	0 (0/22)	0 (0/23)	0 (0/23)	0 (0/28)	0 (0/39)	0 (0/58)	0 (0/63)	0 (0/65)	0 (0/67)	0 (0/58)	0 (0/39)	0 (0/17)	*0 (0/502)*
G39	NWC-LochEweBroom	0 (0/18)	0 (0/19)	0 (0/18)	0 (0/38)	0 (0/43)	0 (0/50)	0 (0/51)	0 (0/55)	0 (0/57)	0 (0/55)	0 (0/39)	0 (0/17)	*0 (0/460)*
G48	NWC-LochLaxfordInchard	0 (0/19)	0 (0/19)	0 (0/21)	0 (0/27)	0 (0/34)	0 (0/49)	0 (0/56)	0 (0/54)	1.8 (1/56)	0 (0/51)	0 (0/32)	0 (0/15)	*0.2 (1/433)*
G49	NWC-other	0 (0/18)	0 (0/21)	0 (0/17)	0 (0/26)	0 (0/30)	0 (0/45)	1.6 (1/63)	0 (0/50)	0 (0/53)	0 (0/46)	0 (0/31)	0 (0/16)	*0.2 (1/416)*
P38	Tain	0 (0/10)	0 (0/12)	0 (0/17)	0 (0/18)	0 (0/21)	0 (0/30)	0 (0/32)	0 (0/30)	0 (0/33)	0 (0/30)	0 (0/17)	0 (0/8)	*0 (0/258)*
G54	Orkney	0 (0/3)	0 (0/5)	0 (0/1)	0 (0/10)	0 (0/7)	0 (0/9)	0 (0/12)	0 (0/15)	0 (0/14)	0 (0/11)	0 (0/10)	0 (0/2)	*0 (0/99)*
G67	Shetland-SE-CliftSound	0 (0/18)	0 (0/18)	0 (0/24)	0 (0/30)	0 (0/29)	0 (0/39)	1.7 (1/60)	0 (0/53)	0 (0/59)	0 (0/53)	0 (0/29)	0 (0/13)	*0.2 (1/425)*
G56	Shetland-SE-DalesVoe	0 (0/9)	0 (0/11)	0 (0/13)	0 (0/25)	0 (0/21)	0 (0/37)	2.2 (1/45)	0 (0/47)	4.8 (2/42)	0 (0/31)	0 (0/19)	0 (0/9)	*1 (3/309)*
G57	Shetland-SE-SandsoundWeisdale	0 (0/26)	0 (0/30)	0 (0/31)	0 (0/34)	0 (0/35)	0 (0/43)	0 (0/50)	2.9 (2/69)	1.4 (1/71)	0 (0/79)	0 (0/51)	0 (0/21)	*0.6 (3/540)*
P61	Shetland-SW-GrutingVoe	0 (0/16)	0 (0/16)	0 (0/15)	0 (0/24)	0 (0/30)	0 (0/35)	0 (0/41)	0 (0/42)	4.5 (2/44)	0 (0/34)	0 (0/22)	0 (0/12)	*0.6 (2/331)*
P68	Shetland-SW-Vaila	0 (0/16)	0 (0/17)	0 (0/17)	0 (0/24)	0 (0/26)	0 (0/34)	0 (0/47)	0 (0/46)	4.3 (2/46)	0 (0/38)	0 (0/25)	0 (0/11)	*0.6 (2/347)*
P72	Shetland-W-AithVoe	0 (0/14)	0 (0/15)	0 (0/17)	0 (0/17)	0 (0/16)	0 (0/20)	0 (0/24)	0 (0/30)	0 (0/24)	0 (0/28)	0 (0/27)	0 (0/9)	*0 (0/241)*
P64	Shetland-W-BustaVoe	0 (0/10)	0 (0/16)	0 (0/21)	0 (0/24)	0 (0/20)	0 (0/33)	0 (0/35)	0 (0/34)	0 (0/35)	0 (0/33)	0 (0/26)	0 (0/9)	*0 (0/296)*
P70	Shetland-W-OlnaFirth	0 (0/13)	0 (0/11)	0 (0/15)	0 (0/20)	0 (0/17)	0 (0/27)	3.1 (1/32)	0 (0/39)	0 (0/28)	0 (0/33)	0 (0/25)	0 (0/8)	*0.4 (1/268)*
G58	Shetland-W-VementryVoe	0 (0/18)	0 (0/20)	0 (0/21)	0 (0/16)	0 (0/23)	0 (0/34)	0 (0/30)	0 (0/48)	0 (0/42)	0 (0/42)	0 (0/28)	0 (0/10)	*0 (0/332)*
G71	Shetland-W-RonasVoe	0 (0/8)	0 (0/10)	0 (0/15)	0 (0/8)	0 (0/22)	0 (0/31)	0 (0/29)	0 (0/27)	0 (0/20)	0 (0/19)	0 (0/19)	0 (0/5)	*0 (0/213)*
P65	Shetland-N-Basta	0 (0/9)	0 (0/11)	0 (0/12)	0 (0/20)	0 (0/19)	0 (0/26)	0 (0/26)	0 (0/27)	0 (0/38)	0 (0/23)	0 (0/22)	0 (0/11)	*0 (0/244)*
G81	Shetland-N-Uyea	0 (0/30)	0 (0/41)	0 (0/42)	0 (0/41)	0 (0/43)	0 (0/49)	0 (0/46)	0 (0/73)	0 (0/80)	0 (0/63)	0 (0/48)	0 (0/24)	*0 (0/580)*
			0	*0*					*0.6*	*0.8*		*0*	*0*	*0.2*
	Total	*0 (0/644)*	*(0/744)*	*(0/791)*	*0.1 (1/1022)*	*0 (0/1193)*	*0.1 (2/1522)*	*0.4 (7/1696)*	*(10/1795)*	*(14/1862)*	*0 (0/1652)*	*(0/1123)*	*(0/513)*	*(34/14557)*

Table B3: Percentage of mussel samples for which DA exceeds 5 mg/kg, per group and month, based on data from 2001-15. In brackets: number of samples exceeding 5 mg/kg over total number of samples.

Groups	GroupNameM	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	*Total*
G80	EastCoast	0 (0/11)	0 (0/10)	0 (0/10)	0 (0/12)	0 (0/20)	0 (0/20)	0 (0/19)	0 (0/19)	0 (0/15)	0 (0/21)	0 (0/11)	0 (0/5)	*0 (0/173)*
G26	Dumfries	0 (0/17)	0 (0/24)	0 (0/17)	0 (0/24)	0 (0/23)	0 (0/36)	0 (0/29)	0 (0/25)	0 (0/29)	0 (0/26)	0 (0/22)	0 (0/14)	*0 (0/286)*
G8	Ayr-LochStriven	0 (0/16)	0 (0/24)	0 (0/27)	0 (0/29)	0 (0/27)	0 (0/28)	0 (0/30)	0 (0/33)	0 (0/36)	0 (0/36)	0 (0/29)	0 (0/16)	*0 (0/331)*
P16	Ayr-LochFyneArdkinglas	0 (0/14)	0 (0/15)	0 (0/16)	0 (0/18)	0 (0/21)	0 (0/21)	0 (0/29)	0 (0/30)	2.2 (1/45)	0 (0/33)	0 (0/23)	0 (0/12)	*0.4 (1/277)*
G18	Ayr-other	0 (0/34)	0 (0/39)	0 (0/43)	0 (0/48)	0 (0/48)	0 (0/50)	2.9 (2/68)	0 (0/72)	0 (0/70)	0 (0/84)	0 (0/63)	0 (0/24)	*0.3 (2/643)*
G123	WC-Gigha	0 (0/12)	0 (0/13)	0 (0/10)	0 (0/20)	0 (0/21)	0 (0/21)	0 (0/24)	0 (0/20)	0 (0/25)	0 (0/29)	0 (0/18)	0 (0/5)	*0 (0/218)*
P6	WC-LochMelfort	0 (0/12)	0 (0/10)	0 (0/10)	7.4 (2/27)	0 (0/16)	0 (0/24)	7.1 (2/28)	0 (0/33)	3.6 (1/28)	0 (0/32)	0 (0/16)	0 (0/7)	*2.1 (5/243)*
G10	WC-LochEtive	0 (0/19)	0 (0/19)	3.4 (1/29)	0 (0/42)	0 (0/54)	0 (0/53)	0 (0/57)	0 (0/67)	0 (0/66)	0 (0/58)	0 (0/37)	0 (0/15)	*0.2 (1/516)*
G9	WC-LochCreranLinnhe	0 (0/18)	0 (0/23)	0 (0/20)	0 (0/37)	0 (0/49)	0 (0/62)	1.8 (1/57)	0 (0/56)	1.7 (1/60)	0 (0/60)	0 (0/43)	0 (0/14)	*0.4 (2/499)*
G31	WC-LochLevenEil	0 (0/25)	0 (0/31)	0 (0/27)	0 (0/35)	0 (0/40)	0 (0/57)	0 (0/59)	0 (0/62)	0 (0/71)	0 (0/52)	0 (0/43)	0 (0/22)	*0 (0/524)*
G28	WC-Lochaber	0 (0/29)	0 (0/27)	0 (0/36)	0 (0/44)	5.6 (3/54)	1.3 (1/77)	0 (0/70)	1.2 (1/86)	1.3 (1/80)	0 (0/51)	0 (0/45)	0 (0/24)	*1 (6/623)*
P5	Mull-LochSpelve	0 (0/9)	0 (0/14)	0 (0/14)	0 (0/32)	0 (0/27)	0 (0/33)	0 (0/37)	7.3 (3/41)	4 (2/50)	0 (0/36)	0 (0/19)	0 (0/8)	*1.6 (5/320)*
P7	Mull-LochScridain	0 (0/13)	0 (0/14)	0 (0/13)	0 (0/24)	0 (0/33)	2.8 (1/36)	0 (0/36)	3.4 (1/29)	2.5 (1/40)	0 (0/40)	0 (0/20)	0 (0/10)	*1 (3/308)*
G1	Mull-other	0 (0/17)	0 (0/19)	0 (0/18)	0 (0/30)	0 (0/38)	2.7 (1/37)	0 (0/51)	0 (0/40)	0 (0/41)	0 (0/41)	0 (0/35)	0 (0/17)	*0.3 (1/384)*
P41	Skye-LochEishort	0 (0/13)	0 (0/16)	0 (0/20)	0 (0/22)	3.2 (1/31)	0 (0/35)	0 (0/42)	0 (0/42)	0 (0/42)	0 (0/36)	0 (0/18)	0 (0/15)	*0.3 (1/332)*
G42	Skye-other	0 (0/22)	0 (0/21)	0 (0/26)	0 (0/29)	3.6 (2/55)	1.7 (1/60)	2.2 (2/89)	5.3 (4/76)	1.4 (1/74)	0 (0/74)	0 (0/43)	0 (0/18)	*1.7 (10/587)*
G21	Lewis-LochLeurbostErisort	0 (0/18)	0 (0/25)	0 (0/25)	0 (0/23)	0 (0/34)	0 (0/48)	0 (0/53)	3.1 (2/65)	1.6 (1/61)	0 (0/49)	0 (0/33)	0 (0/15)	*0.7 (3/449)*
G23	Lewis-LochRoag	0 (0/33)	0 (0/38)	0 (0/44)	0 (0/49)	0 (0/73)	1 (1/103)	4.9 (5/103)	4.5 (5/112)	7.6 (10/131)	1 (1/101)	0 (0/50)	0 (0/27)	*2.5 (22/864)*
G22	HarrisUist	0 (0/35)	0 (0/47)	0 (0/46)	0 (0/47)	0 (0/54)	0 (0/72)	1.4 (1/73)	1.2 (1/83)	3.4 (3/89)	0 (0/66)	0 (0/46)	0 (0/28)	*0.7 (5/686)*
G35	NWC-LochTorridon	0 (0/22)	0 (0/23)	0 (0/23)	0 (0/28)	0 (0/39)	0 (0/58)	0 (0/63)	0 (0/65)	0 (0/67)	0 (0/58)	0 (0/39)	0 (0/17)	*0 (0/502)*
G39	NWC-LochEweBroom	0 (0/18)	0 (0/19)	0 (0/18)	0 (0/38)	4.7 (2/43)	0 (0/50)	0 (0/51)	0 (0/55)	1.8 (1/57)	0 (0/55)	0 (0/39)	0 (0/17)	*0.7 (3/460)*
G48	NWC-LochLaxfordInchard	0 (0/19)	0 (0/19)	0 (0/21)	0 (0/27)	0 (0/34)	0 (0/49)	3.6 (2/56)	1.9 (1/54)	5.4 (3/56)	0 (0/51)	0 (0/32)	0 (0/15)	*1.4 (6/433)*
G49	NWC-other	0 (0/18)	0 (0/21)	0 (0/17)	0 (0/26)	0 (0/30)	0 (0/45)	1.6 (1/63)	0 (0/50)	0 (0/53)	0 (0/46)	0 (0/31)	0 (0/16)	*0.2 (1/416)*
P38	Tain	0 (0/10)	0 (0/12)	0 (0/17)	0 (0/18)	0 (0/21)	0 (0/30)	0 (0/32)	0 (0/30)	0 (0/33)	0 (0/30)	0 (0/17)	0 (0/8)	*0 (0/258)*
G54	Orkney	0 (0/3)	0 (0/5)	0 (0/1)	0 (0/10)	0 (0/7)	0 (0/9)	0 (0/12)	0 (0/15)	0 (0/14)	0 (0/11)	0 (0/10)	0 (0/2)	*0 (0/99)*
G67	Shetland-SE-CliftSound	0 (0/18)	0 (0/18)	0 (0/24)	0 (0/30)	0 (0/29)	0 (0/39)	1.7 (1/60)	1.9 (1/53)	1.7 (1/59)	0 (0/53)	0 (0/29)	0 (0/13)	*0.7 (3/425)*
G56	Shetland-SE-DalesVoe	0 (0/9)	0 (0/11)	0 (0/13)	0 (0/25)	0 (0/21)	2.7 (1/37)	2.2 (1/45)	2.1 (1/47)	11.9 (5/42)	0 (0/31)	0 (0/19)	0 (0/9)	*2.6 (8/309)*
G57	Shetland-SE-SandsoundWeisdale	0 (0/26)	0 (0/30)	0 (0/31)	0 (0/34)	0 (0/35)	0 (0/43)	2 (1/50)	5.8 (4/69)	2.8 (2/71)	0 (0/79)	0 (0/51)	0 (0/21)	*1.3 (7/540)*
P61	Shetland-SW-GrutingVoe	0 (0/16)	0 (0/16)	0 (0/15)	0 (0/24)	0 (0/30)	0 (0/35)	0 (0/41)	0 (0/42)	13.6 (6/44)	0 (0/34)	0 (0/22)	0 (0/12)	*1.8 (6/331)*
P68	Shetland-SW-Vaila	0 (0/16)	0 (0/17)	0 (0/17)	0 (0/24)	0 (0/26)	0 (0/34)	4.3 (2/47)	0 (0/46)	4.3 (2/46)	0 (0/38)	0 (0/25)	0 (0/11)	*1.2 (4/347)*
P72	Shetland-W-AithVoe	0 (0/14)	0 (0/15)	0 (0/17)	0 (0/17)	0 (0/16)	0 (0/20)	0 (0/24)	0 (0/30)	0 (0/24)	0 (0/28)	3.7 (1/27)	0 (0/9)	*0.4 (1/241)*
P64	Shetland-W-BustaVoe	0 (0/10)	0 (0/16)	0 (0/21)	0 (0/24)	0 (0/20)	3 (1/33)	0 (0/35)	0 (0/34)	5.7 (2/35)	0 (0/33)	0 (0/26)	0 (0/9)	*1 (3/296)*
P70	Shetland-W-OlnaFirth	0 (0/13)	0 (0/11)	0 (0/15)	0 (0/20)	0 (0/17)	0 (0/27)	3.1 (1/32)	2.6 (1/39)	0 (0/28)	0 (0/33)	0 (0/25)	0 (0/8)	*0.7 (2/268)*
G58	Shetland-W-VementryVoe	0 (0/18)	0 (0/20)	0 (0/21)	0 (0/16)	0 (0/23)	0 (0/34)	0 (0/30)	0 (0/48)	0 (0/42)	0 (0/42)	0 (0/28)	0 (0/10)	*0 (0/332)*
G71	Shetland-W-RonasVoe	0 (0/8)	0 (0/10)	0 (0/15)	0 (0/8)	0 (0/22)	0 (0/31)	0 (0/29)	0 (0/27)	0 (0/20)	0 (0/19)	0 (0/19)	0 (0/5)	*0 (0/213)*
P65	Shetland-N-Basta	0 (0/9)	0 (0/11)	0 (0/12)	0 (0/20)	0 (0/19)	0 (0/26)	0 (0/26)	0 (0/27)	2.6 (1/38)	0 (0/23)	0 (0/22)	0 (0/11)	*0.4 (1/244)*
G81	Shetland-N-Uyea	0 (0/30)	0 (0/41)	0 (0/42)	0 (0/41)	0 (0/43)	0 (0/49)	0 (0/46)	0 (0/73)	0 (0/80)	0 (0/63)	0 (0/48)	0 (0/24)	*0 (0/580)*
	Total	*0 (0/644)*	*0 (0/744)*	*0.1 (1/791)*	*0.2 (2/1022)*	*0.7 (8/1193)*	*0.5 (7/1522)*	*1.3 (22/1696)*	*1.4 (25/1795)*	*2.4 (45/1862)*	*0.1 (1/1652)*	*0.1 (1/1123)*	*0 (0/513)*	*0.8 (112/14557)*

Table B4: Percentage of mussel samples for which DA exceeds 0 mg/kg, per group and month, based on data from 2001-15. In brackets: number of samples exceeding 0 mg/kg over total number of samples.

Groups	GroupNameM	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	*Total*
G80	EastCoast	0 (0/11)	0 (0/10)	0 (0/10)	0 (0/12)	0 (0/20)	0 (0/20)	10.5 (2/19)	0 (0/19)	6.7 (1/15)	0 (0/21)	0 (0/11)	0 (0/5)	*1.7 (3/173)*
G26	Dumfries	0 (0/17)	0 (0/24)	0 (0/17)	0 (0/24)	0 (0/23)	2.8 (1/36)	0 (0/29)	0 (0/25)	0 (0/29)	0 (0/26)	0 (0/22)	0 (0/14)	*0.3 (1/286)*
G8	Ayr-LochStriven	0 (0/16)	0 (0/24)	0 (0/27)	0 (0/29)	0 (0/27)	0 (0/28)	6.7 (2/30)	3 (1/33)	2.8 (1/36)	0 (0/36)	0 (0/29)	0 (0/16)	*1.2 (4/331)*
P16	Ayr-LochFyneArdkinglas	0 (0/14)	0 (0/15)	0 (0/16)	0 (0/18)	0 (0/21)	0 (0/21)	0 (0/29)	0 (0/30)	2.2 (1/45)	0 (0/33)	0 (0/23)	0 (0/12)	*0.4 (1/277)*
G18	Ayr-other	0 (0/34)	0 (0/39)	0 (0/43)	0 (0/48)	0 (0/48)	0 (0/50)	5.9 (4/68)	1.4 (1/72)	4.3 (3/70)	0 (0/84)	0 (0/63)	4.2 (1/24)	*1.4 (9/643)*
G123	WC-Gigha	0 (0/12)	0 (0/13)	0 (0/10)	5 (1/20)	0 (0/21)	4.8 (1/21)	4.2 (1/24)	10 (2/20)	16 (4/25)	3.4 (1/29)	0 (0/18)	0 (0/5)	*4.6 (10/218)*
P6	WC-LochMelfort	0 (0/12)	0 (0/10)	0 (0/10)	22.2 (6/27)	6.3 (1/16)	8.3 (2/24)	25 (7/28)	6.1 (2/33)	42.9 (12/28)	9.4 (3/32)	0 (0/16)	0 (0/7)	*13.6 (33/243)*
G10	WC-LochEtive	0 (0/19)	0 (0/19)	3.4 (1/29)	0 (0/42)	1.9 (1/54)	0 (0/53)	3.5 (2/57)	4.5 (3/67)	3 (2/66)	0 (0/58)	2.7 (1/37)	0 (0/15)	*1.9 (10/516)*
G9	WC-LochCreranLinnhe	0 (0/18)	0 (0/23)	0 (0/20)	0 (0/37)	2 (1/49)	1.6 (1/62)	14 (8/57)	3.6 (2/56)	5 (3/60)	0 (0/60)	0 (0/43)	0 (0/14)	*3 (15/499)*
G31	WC-LochLevenEil	0 (0/25)	0 (0/31)	0 (0/27)	0 (0/35)	0 (0/40)	1.8 (1/57)	0 (0/59)	0 (0/62)	0 (0/71)	0 (0/52)	0 (0/43)	0 (0/22)	*0.2 (1/524)*
G28	WC-Lochaber	0 (0/29)	0 (0/27)	0 (0/36)	0 (0/44)	13 (7/54)	2.6 (2/77)	2.9 (2/70)	5.8 (5/86)	7.5 (6/80)	2 (1/51)	0 (0/45)	0 (0/24)	*3.7 (23/623)*
P5	Mull-LochSpelve	0 (0/9)	0 (0/14)	0 (0/14)	0 (0/32)	3.7 (1/27)	6.1 (2/33)	16.2 (6/37)	19.5 (8/41)	14 (7/50)	0 (0/36)	0 (0/19)	0 (0/8)	*7.5 (24/320)*
P7	Mull-LochScridain	0 (0/13)	0 (0/14)	0 (0/13)	0 (0/24)	12.1 (4/33)	8.3 (3/36)	5.6 (2/36)	3.4 (1/29)	12.5 (5/40)	0 (0/40)	0 (0/20)	0 (0/10)	*4.9 (15/308)*
G1	Mull-other	0 (0/17)	0 (0/19)	0 (0/18)	3.3 (1/30)	0 (0/38)	10.8 (4/37)	3.9 (2/51)	2.5 (1/40)	2.4 (1/41)	0 (0/41)	0 (0/35)	0 (0/17)	*2.3 (9/384)*
P41	Skye-LochEishort	0 (0/13)	0 (0/16)	0 (0/20)	0 (0/22)	3.2 (1/31)	2.9 (1/35)	2.4 (1/42)	0 (0/42)	2.4 (1/42)	0 (0/36)	0 (0/18)	0 (0/15)	*1.2 (4/332)*
G42	Skye-other	0 (0/22)	0 (0/21)	0 (0/26)	3.4 (1/29)	14.5 (8/55)	10 (6/60)	12.4 (11/89)	15.8 (12/76)	18.9 (14/74)	1.4 (1/74)	0 (0/43)	0 (0/18)	*9 (53/587)*
G21	Lewis-LochLeurbostErisort	0 (0/18)	0 (0/25)	0 (0/25)	0 (0/23)	2.9 (1/34)	8.3 (4/48)	3.8 (2/53)	9.2 (6/65)	13.1 (8/61)	0 (0/49)	3 (1/33)	0 (0/15)	*4.9 (22/449)*
G23	Lewis-LochRoag	0 (0/33)	0 (0/38)	0 (0/44)	0 (0/49)	1.4 (1/73)	3.9 (4/103)	9.7 (10/103)	16.1 (18/112)	21.4 (28/131)	4 (4/101)	0 (0/50)	0 (0/27)	*7.5 (65/864)*
G22	HarrisUist	0 (0/35)	0 (0/47)	0 (0/46)	0 (0/47)	0 (0/54)	4.2 (3/72)	9.6 (7/73)	18.1 (15/83)	5.6 (5/89)	3 (2/66)	0 (0/46)	0 (0/28)	*4.7 (32/686)*
G35	NWC-LochTorridon	0 (0/22)	0 (0/23)	0 (0/23)	0 (0/28)	10.3 (4/39)	5.2 (3/58)	7.9 (5/63)	6.2 (4/65)	7.5 (5/67)	1.7 (1/58)	2.6 (1/39)	0 (0/17)	*4.6 (23/502)*
G39	NWC-LochEweBroom	0 (0/18)	0 (0/19)	5.6 (1/18)	10.5 (4/38)	11.6 (5/43)	6 (3/50)	0 (0/51)	1.8 (1/55)	17.5 (10/57)	0 (0/55)	0 (0/39)	0 (0/17)	*5.2 (24/460)*
G48	NWC-LochLaxfordInchard	0 (0/19)	0 (0/19)	0 (0/21)	3.7 (1/27)	2.9 (1/34)	2 (1/49)	7.1 (4/56)	11.1 (6/54)	14.3 (8/56)	0 (0/51)	0 (0/32)	0 (0/15)	*4.8 (21/433)*
G49	NWC-other	0 (0/18)	0 (0/21)	0 (0/17)	0 (0/26)	0 (0/30)	4.4 (2/45)	7.9 (5/63)	2 (1/50)	0 (0/53)	0 (0/46)	0 (0/31)	0 (0/16)	*1.9 (8/416)*
P38	Tain	0 (0/10)	0 (0/12)	0 (0/17)	0 (0/18)	0 (0/21)	0 (0/30)	3.1 (1/32)	0 (0/30)	3 (1/33)	30 (9/30)	11.8 (2/17)	0 (0/8)	*5 (13/258)*
G54	Orkney	0 (0/3)	0 (0/5)	0 (0/1)	0 (0/10)	0 (0/7)	0 (0/9)	0 (0/12)	6.7 (1/15)	0 (0/14)	0 (0/11)	0 (0/10)	0 (0/2)	*1 (1/99)*
G67	Shetland-SE-CliftSound	0 (0/18)	0 (0/18)	4.2 (1/24)	0 (0/30)	0 (0/29)	2.6 (1/39)	18.3 (11/60)	17 (9/53)	8.5 (5/59)	9.4 (5/53)	0 (0/29)	0 (0/13)	*7.5 (32/425)*
G56	Shetland-SE-DalesVoe	0 (0/9)	0 (0/11)	0 (0/13)	0 (0/25)	0 (0/21)	5.4 (2/37)	11.1 (5/45)	19.1 (9/47)	14.3 (6/42)	0 (0/31)	0 (0/19)	0 (0/9)	*7.1 (22/309)*
G57	Shetland-SE-SandsoundWeisdale	0 (0/26)	0 (0/30)	0 (0/31)	0 (0/34)	0 (0/35)	4.7 (2/43)	18 (9/50)	21.7 (15/69)	19.7 (14/71)	6.3 (5/79)	0 (0/51)	0 (0/21)	*8.3 (45/540)*
P61	Shetland-SW-GrutingVoe	0 (0/16)	0 (0/16)	0 (0/15)	0 (0/24)	0 (0/30)	2.9 (1/35)	7.3 (3/41)	9.5 (4/42)	18.2 (8/44)	2.9 (1/34)	0 (0/22)	0 (0/12)	*5.1 (17/331)*
P68	Shetland-SW-Vaila	0 (0/16)	0 (0/17)	0 (0/17)	0 (0/24)	0 (0/26)	2.9 (1/34)	10.6 (5/47)	13 (6/46)	4.3 (2/46)	2.6 (1/38)	0 (0/25)	0 (0/11)	*4.3 (15/347)*
P72	Shetland-W-AithVoe	0 (0/14)	0 (0/15)	0 (0/17)	0 (0/17)	6.3 (1/16)	5 (1/20)	4.2 (1/24)	6.7 (2/30)	8.3 (2/24)	3.6 (1/28)	3.7 (1/27)	0 (0/9)	*3.7 (9/241)*
P64	Shetland-W-BustaVoe	0 (0/10)	0 (0/16)	0 (0/21)	0 (0/24)	5 (1/20)	15.2 (5/33)	8.6 (3/35)	0 (0/34)	14.3 (5/35)	3 (1/33)	0 (0/26)	0 (0/9)	*5.1 (15/296)*
P70	Shetland-W-OlnaFirth	0 (0/13)	0 (0/11)	0 (0/15)	0 (0/20)	0 (0/17)	3.7 (1/27)	6.3 (2/32)	5.1 (2/39)	10.7 (3/28)	3 (1/33)	0 (0/25)	0 (0/8)	*3.4 (9/268)*
G58	Shetland-W-VementryVoe	0 (0/18)	0 (0/20)	0 (0/21)	0 (0/16)	0 (0/23)	2.9 (1/34)	3.3 (1/30)	2.1 (1/48)	2.4 (1/42)	2.4 (1/42)	0 (0/28)	0 (0/10)	*1.5 (5/332)*
G71	Shetland-W-RonasVoe	0 (0/8)	0 (0/10)	0 (0/15)	0 (0/8)	0 (0/22)	3.2 (1/31)	3.4 (1/29)	7.4 (2/27)	5 (1/20)	0 (0/19)	0 (0/19)	0 (0/5)	*2.3 (5/213)*
P65	Shetland-N-Basta	0 (0/9)	0 (0/11)	0 (0/12)	0 (0/20)	10.5 (2/19)	3.8 (1/26)	11.5 (3/26)	7.4 (2/27)	2.6 (1/38)	0 (0/23)	0 (0/22)	0 (0/11)	*3.7 (9/244)*
G81	Shetland-N-Uyea	0 (0/30)	0 (0/41)	2.4 (1/42)	0 (0/41)	2.3 (1/43)	4.1 (2/49)	4.3 (2/46)	0 (0/73)	1.3 (1/80)	1.6 (1/63)	0 (0/48)	0 (0/24)	*1.4 (8/580)*
			0	*0.5*	*1.4*	*3.4*	*4.1*	*7.7*		*9.4*	*2.4*			*4.2*
	Total	*0 (0/644)*	*(0/744)*	*(4/791)*	*(14/1022)*	*(41/1193)*	*(63/1522)*	*(130/1696)*	*7.9 (142/1795)*	*(175/1862)*	*(39/1652)*	*0.5 (6/1123)*	*0.2 (1/513)*	*(615/14557)*

Table B5: Percentage of mussel samples for which PST exceeds 800 µg/kg, per group and month, based on data from 2001-15. In brackets: number of samples exceeding 800 µg/kg over total number of samples.

Groups	GroupNameM	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	*Total*
G80	EastCoast	0 (0/14)	0 (0/11)	0 (0/14)	0 (0/17)	4.8 (1/21)	0 (0/17)	0 (0/17)	0 (0/15)	0 (0/13)	0 (0/19)	0 (0/7)	0 (0/8)	*0.6 (1/173)*
G26	Dumfries	0 (0/16)	0 (0/23)	0 (0/27)	0 (0/29)	0 (0/35)	0 (0/40)	0 (0/32)	0 (0/24)	0 (0/33)	0 (0/24)	0 (0/23)	0 (0/13)	*0 (0/319)*
G8	Ayr-LochStriven	0 (0/24)	0 (0/33)	0 (0/41)	4.2 (2/48)	13.6 (6/44)	13.5 (5/37)	19.4 (7/36)	0 (0/31)	0 (0/34)	0 (0/34)	0 (0/28)	0 (0/22)	*4.9 (20/412)*
P16	Ayr-LochFyneArdkinglas	0 (0/25)	0 (0/23)	0 (0/33)	5 (2/40)	5.7 (2/35)	0 (0/27)	0 (0/29)	0 (0/29)	0 (0/42)	0 (0/31)	0 (0/23)	0 (0/18)	*1.1 (4/355)*
G18	Ayr-other	0 (0/61)	0 (0/65)	0 (0/91)	9.3 (9/97)	9.7 (9/93)	13.9 (11/79)	0 (0/73)	0 (0/78)	0 (0/73)	0 (0/83)	0 (0/70)	0 (0/43)	*3.2 (29/906)*
G123	WC-Gigha	0 (0/28)	0 (0/25)	0 (0/34)	0 (0/34)	0 (0/29)	11.1 (3/27)	3.8 (1/26)	0 (0/21)	0 (0/25)	0 (0/29)	0 (0/21)	0 (0/11)	*1.3 (4/310)*
P6	WC-LochMelfort	0 (0/22)	0 (0/19)	0 (0/33)	0 (0/33)	0 (0/31)	0 (0/32)	0 (0/32)	0 (0/32)	0 (0/28)	0 (0/28)	0 (0/18)	0 (0/14)	*0 (0/322)*
G10	WC-LochEtive	0 (0/36)	0 (0/34)	0 (0/57)	0 (0/55)	0 (0/72)	0 (0/61)	0 (0/56)	0 (0/58)	0 (0/63)	0 (0/51)	0 (0/37)	0 (0/27)	*0 (0/607)*
G9	WC-LochCreranLinnhe	0 (0/40)	0 (0/41)	0 (0/51)	0 (0/59)	0 (0/62)	0 (0/69)	0 (0/53)	0 (0/54)	0 (0/56)	0 (0/57)	0 (0/49)	0 (0/29)	*0 (0/620)*
G31	WC-LochLevenEil	0 (0/42)	0 (0/45)	0 (0/45)	0 (0/44)	0 (0/46)	0 (0/57)	0 (0/63)	0 (0/70)	0 (0/70)	0 (0/51)	0 (0/47)	0 (0/32)	*0 (0/612)*
G28	WC-Lochaber	0 (0/38)	0 (0/42)	0 (0/64)	0 (0/83)	2.4 (2/84)	5 (5/101)	2.4 (2/84)	0 (0/85)	0 (0/100)	0 (0/57)	0 (0/48)	0 (0/26)	*1.1 (9/812)*
P5	Mull-LochSpelve	0 (0/14)	0 (0/17)	0 (0/29)	0 (0/33)	0 (0/34)	0 (0/34)	0 (0/35)	0 (0/35)	0 (0/41)	0 (0/30)	0 (0/18)	0 (0/13)	*0 (0/333)*
P7	Mull-LochScridain	0 (0/23)	0 (0/22)	0 (0/35)	0 (0/44)	6.1 (3/49)	8.2 (4/49)	0 (0/42)	0 (0/32)	0 (0/41)	0 (0/43)	0 (0/26)	0 (0/15)	*1.7 (7/421)*
G1	Mull-other	0 (0/39)	0 (0/38)	0 (0/40)	0 (0/46)	0 (0/51)	0 (0/44)	0 (0/48)	0 (0/35)	0 (0/41)	0 (0/41)	0 (0/34)	0 (0/26)	*0 (0/483)*
P41	Skye-LochEishort	0 (0/24)	0 (0/25)	0 (0/36)	2.1 (1/47)	12.7 (7/55)	7.4 (4/54)	2.1 (1/48)	0 (0/43)	0 (0/48)	0 (0/36)	0 (0/21)	0 (0/17)	*2.9 (13/454)*
G42	Skye-other	0 (0/43)	0 (0/44)	0 (0/54)	0 (0/71)	0 (0/89)	5.9 (5/85)	0 (0/98)	0 (0/77)	0 (0/81)	0 (0/70)	0 (0/51)	0 (0/34)	*0.6 (5/797)*
G21	Lewis-LochLeurbostErisort	0 (0/31)	0 (0/39)	0 (0/41)	0 (0/34)	0 (0/50)	0 (0/63)	0 (0/58)	0 (0/59)	0 (0/54)	0 (0/37)	0 (0/39)	0 (0/24)	*0 (0/529)*
G23	Lewis-LochRoag	0 (0/54)	0 (0/62)	0 (0/67)	0 (0/86)	0 (0/131)	3.2 (4/126)	2.3 (3/129)	0 (0/101)	0 (0/105)	0 (0/80)	0 (0/58)	0 (0/39)	*0.7 (7/1038)*
G22	HarrisUist	0 (0/55)	0 (0/64)	0 (0/71)	0 (0/68)	0 (0/71)	2.5 (2/80)	0 (0/78)	0 (0/76)	0 (0/82)	0 (0/57)	0 (0/50)	0 (0/36)	*0.3 (2/788)*
G35	NWC-LochTorridon	0 (0/37)	0 (0/38)	0 (0/50)	0 (0/58)	1.4 (1/74)	15.5 (13/84)	2.8 (2/71)	0 (0/75)	0 (0/71)	0 (0/56)	0 (0/45)	0 (0/25)	*2.3 (16/684)*
G39	NWC-LochEweBroom	0 (0/40)	0 (0/40)	0 (0/48)	0 (0/56)	0 (0/66)	0 (0/65)	0 (0/61)	0 (0/60)	0 (0/61)	0 (0/55)	0 (0/43)	0 (0/25)	*0 (0/620)*
G48	NWC-LochLaxfordInchard	0 (0/33)	0 (0/33)	0 (0/40)	1.5 (1/68)	4 (3/75)	13.9 (10/72)	7.2 (5/69)	0 (0/56)	0 (0/67)	0 (0/55)	0 (0/37)	0 (0/23)	*3 (19/628)*
G49	NWC-other	0 (0/28)	0 (0/27)	0 (0/35)	0 (0/64)	0 (0/53)	3.2 (2/62)	2.7 (2/75)	0 (0/56)	0 (0/60)	0 (0/52)	0 (0/32)	0 (0/22)	*0.7 (4/566)*
P38	Tain	0 (0/19)	0 (0/19)	0 (0/24)	0 (0/35)	14.6 (6/41)	0 (0/44)	0 (0/41)	0 (0/36)	0 (0/41)	0 (0/33)	0 (0/21)	0 (0/13)	*1.6 (6/367)*
G54	Orkney	0 (0/5)	0 (0/6)	0 (0/4)	0 (0/13)	10 (1/10)	35.7 (5/14)	0 (0/15)	0 (0/18)	0 (0/16)	0 (0/10)	0 (0/12)	0 (0/3)	*4.8 (6/126)*
G67	Shetland-SE-CliftSound	0 (0/42)	0 (0/36)	0 (0/45)	0 (0/57)	0 (0/53)	0 (0/55)	0 (0/74)	3.3 (2/60)	0 (0/61)	0 (0/45)	0 (0/32)	0 (0/21)	*0.3 (2/581)*
G56	Shetland-SE-DalesVoe	0 (0/17)	0 (0/16)	0 (0/20)	0 (0/39)	0 (0/44)	0 (0/48)	0 (0/41)	0 (0/44)	0 (0/37)	0 (0/28)	0 (0/21)	0 (0/12)	*0 (0/367)*
G57	Shetland-SE-SandsoundWeisdale	0 (0/55)	0 (0/51)	0 (0/64)	0 (0/64)	1.6 (1/62)	0 (0/60)	1.6 (1/64)	1.4 (1/74)	1.4 (1/71)	0 (0/68)	0 (0/54)	0 (0/29)	*0.6 (4/716)*
P61	Shetland-SW-GrutingVoe	0 (0/25)	0 (0/26)	0 (0/30)	0 (0/36)	0 (0/46)	0 (0/44)	0 (0/43)	0 (0/48)	0 (0/37)	0 (0/28)	0 (0/20)	0 (0/16)	*0 (0/399)*
P68	Shetland-SW-Vaila	0 (0/27)	0 (0/25)	0 (0/35)	0 (0/42)	0 (0/46)	0 (0/46)	5.7 (3/53)	3.9 (2/51)	0 (0/49)	0 (0/39)	0 (0/26)	0 (0/16)	*1.1 (5/455)*
P72	Shetland-W-AithVoe	0 (0/20)	0 (0/21)	0 (0/26)	0 (0/40)	0 (0/39)	0 (0/35)	2.6 (1/39)	0 (0/38)	0 (0/37)	0 (0/40)	3.4 (1/29)	0 (0/12)	*0.5 (2/376)*
P64	Shetland-W-BustaVoe	0 (0/25)	0 (0/28)	0 (0/35)	0 (0/45)	2.3 (1/43)	2.2 (1/45)	0 (0/46)	0 (0/45)	10 (5/50)	0 (0/47)	0 (0/33)	0 (0/15)	*1.5 (7/457)*
P70	Shetland-W-OlnaFirth	0 (0/18)	0 (0/19)	0 (0/33)	0 (0/40)	0 (0/40)	2.5 (1/40)	0 (0/43)	0 (0/45)	2.2 (1/45)	0 (0/43)	0 (0/32)	0 (0/14)	*0.5 (2/412)*
G58	Shetland-W-VementryVoe	0 (0/28)	0 (0/32)	0 (0/37)	0 (0/44)	2 (1/51)	0 (0/54)	0 (0/50)	0 (0/63)	4.8 (3/63)	0 (0/51)	0 (0/32)	0 (0/13)	*0.8 (4/518)*
G71	Shetland-W-RonasVoe	0 (0/15)	0 (0/19)	0 (0/23)	0 (0/11)	3 (1/33)	0 (0/40)	0 (0/35)	6.3 (2/32)	0 (0/29)	0 (0/21)	0 (0/21)	0 (0/9)	*1 (3/288)*
P65	Shetland-N-Basta	0 (0/24)	0 (0/25)	0 (0/31)	0 (0/38)	0 (0/39)	0 (0/38)	0 (0/38)	0 (0/37)	0 (0/47)	0 (0/28)	0 (0/23)	0 (0/14)	*0 (0/382)*
G81	Shetland-N-Uyea	0 (0/35)	0 (0/49)	0 (0/65)	0 (0/93)	1.2 (1/81)	0 (0/56)	0 (0/51)	5.3 (5/95)	0 (0/111)	0 (0/75)	0 (0/48)	0 (0/26)	*0.8 (6/785)*
	Total	*0 (0/1122)*	*0 (0/1182)*	*0 (0/1508)*	*0.8 (15/1811)*	*2.3 (46/1978)*	*3.8 (75/1984)*	*1.4 (28/1946)*	*0.6 (12/1888)*	*0.5 (10/1983)*	*0 (0/1632)*	*0.1 (1/1229)*	*0 (0/755)*	*1 (187/19018)*

Table B6: Percentage of mussel samples for which PST exceeds 400 µg/kg, per group and month, based on data from 2001-15. In brackets: number of samples exceeding 400 µg/kg over total number of samples.

Groups	GroupNameM	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	*Total*
G80	EastCoast	0 (0/14)	0 (0/11)	0 (0/14)	0 (0/17)	4.8 (1/21)	5.9 (1/17)	11.8 (2/17)	0 (0/15)	0 (0/13)	0 (0/19)	0 (0/7)	0 (0/8)	*2.3 (4/173)*
G26	Dumfries	0 (0/16)	0 (0/23)	0 (0/27)	0 (0/29)	0 (0/35)	0 (0/40)	0 (0/32)	0 (0/24)	0 (0/33)	0 (0/24)	0 (0/23)	0 (0/13)	*0 (0/319)*
G8	Ayr-LochStriven	0 (0/24)	0 (0/33)	0 (0/41)	10.4 (5/48)	13.6 (6/44)	13.5 (5/37)	25 (9/36)	0 (0/31)	0 (0/34)	0 (0/34)	0 (0/28)	0 (0/22)	*6.1 (25/412)*
P16	Ayr-LochFyneArdkinglas	0 (0/25)	0 (0/23)	0 (0/33)	7.5 (3/40)	5.7 (2/35)	0 (0/27)	0 (0/29)	0 (0/29)	0 (0/42)	0 (0/31)	0 (0/23)	0 (0/18)	*1.4 (5/355)*
G18	Ayr-other	0 (0/61)	0 (0/65)	1.1 (1/91)	14.4 (14/97)	11.8 (11/93)	17.7 (14/79)	4.1 (3/73)	0 (0/78)	0 (0/73)	0 (0/83)	0 (0/70)	0 (0/43)	*4.7 (43/906)*
G123	WC-Gigha	0 (0/28)	0 (0/25)	0 (0/34)	0 (0/34)	0 (0/29)	18.5 (5/27)	7.7 (2/26)	0 (0/21)	0 (0/25)	0 (0/29)	0 (0/21)	0 (0/11)	*2.3 (7/310)*
P6	WC-LochMelfort	0 (0/22)	0 (0/19)	0 (0/33)	0 (0/33)	0 (0/31)	0 (0/32)	0 (0/32)	0 (0/32)	0 (0/28)	0 (0/28)	0 (0/18)	0 (0/14)	*0 (0/322)*
G10	WC-LochEtive	0 (0/36)	0 (0/34)	0 (0/57)	0 (0/55)	0 (0/72)	0 (0/61)	0 (0/56)	0 (0/58)	0 (0/63)	0 (0/51)	0 (0/37)	0 (0/27)	*0 (0/607)*
G9	WC-LochCreranLinnhe	0 (0/40)	0 (0/41)	0 (0/51)	0 (0/59)	0 (0/62)	0 (0/69)	0 (0/53)	0 (0/54)	0 (0/56)	0 (0/57)	0 (0/49)	0 (0/29)	*0 (0/620)*
G31	WC-LochLevenEil	0 (0/42)	0 (0/45)	0 (0/45)	0 (0/44)	0 (0/46)	0 (0/57)	0 (0/63)	0 (0/70)	0 (0/70)	0 (0/51)	0 (0/47)	0 (0/32)	*0 (0/612)*
G28	WC-Lochaber	0 (0/38)	0 (0/42)	4.7 (3/64)	0 (0/83)	7.1 (6/84)	7.9 (8/101)	4.8 (4/84)	0 (0/85)	0 (0/100)	0 (0/57)	0 (0/48)	0 (0/26)	*2.6 (21/812)*
P5	Mull-LochSpelve	0 (0/14)	0 (0/17)	0 (0/29)	0 (0/33)	0 (0/34)	0 (0/34)	0 (0/35)	0 (0/35)	0 (0/41)	0 (0/30)	0 (0/18)	0 (0/13)	*0 (0/333)*
P7	Mull-LochScridain	0 (0/23)	0 (0/22)	0 (0/35)	0 (0/44)	24.5 (12/49)	32.7 (16/49)	2.4 (1/42)	0 (0/32)	0 (0/41)	0 (0/43)	0 (0/26)	0 (0/15)	*6.9 (29/421)*
G1	Mull-other	0 (0/39)	0 (0/38)	0 (0/40)	0 (0/46)	3.9 (2/51)	0 (0/44)	0 (0/48)	0 (0/35)	0 (0/41)	0 (0/41)	0 (0/34)	0 (0/26)	*0.4 (2/483)*
P41	Skye-LochEishort	0 (0/24)	0 (0/25)	2.8 (1/36)	10.6 (5/47)	20 (11/55)	16.7 (9/54)	2.1 (1/48)	0 (0/43)	0 (0/48)	0 (0/36)	0 (0/21)	0 (0/17)	*5.9 (27/454)*
G42	Skye-other	0 (0/43)	0 (0/44)	0 (0/54)	0 (0/71)	7.9 (7/89)	9.4 (8/85)	3.1 (3/98)	0 (0/77)	0 (0/81)	0 (0/70)	0 (0/51)	0 (0/34)	*2.3 (18/797)*
G21	Lewis-LochLeurbostErisort	0 (0/31)	0 (0/39)	0 (0/41)	0 (0/34)	2 (1/50)	0 (0/63)	0 (0/58)	0 (0/59)	0 (0/54)	0 (0/37)	0 (0/39)	0 (0/24)	*0.2 (1/529)*
G23	Lewis-LochRoag	0 (0/54)	0 (0/62)	0 (0/67)	0 (0/86)	0 (0/131)	4 (5/126)	4.7 (6/129)	0 (0/101)	0 (0/105)	0 (0/80)	0 (0/58)	0 (0/39)	*1.1 (11/1038)*
G22	HarrisUist	0 (0/55)	0 (0/64)	0 (0/71)	0 (0/68)	0 (0/71)	2.5 (2/80)	0 (0/78)	0 (0/76)	0 (0/82)	0 (0/57)	0 (0/50)	0 (0/36)	*0.3 (2/788)*
G35	NWC-LochTorridon	0 (0/37)	0 (0/38)	0 (0/50)	0 (0/58)	4.1 (3/74)	19 (16/84)	7 (5/71)	0 (0/75)	0 (0/71)	0 (0/56)	0 (0/45)	0 (0/25)	*3.5 (24/684)*
G39	NWC-LochEweBroom	0 (0/40)	0 (0/40)	0 (0/48)	0 (0/56)	0 (0/66)	1.5 (1/65)	0 (0/61)	0 (0/60)	0 (0/61)	0 (0/55)	0 (0/43)	0 (0/25)	*0.2 (1/620)*
G48	NWC-LochLaxfordInchard	0 (0/33)	0 (0/33)	0 (0/40)	5.9 (4/68)	12 (9/75)	20.8 (15/72)	8.7 (6/69)	0 (0/56)	0 (0/67)	0 (0/55)	0 (0/37)	0 (0/23)	*5.4 (34/628)*
G49	NWC-other	0 (0/28)	0 (0/27)	0 (0/35)	1.6 (1/64)	1.9 (1/53)	3.2 (2/62)	4 (3/75)	0 (0/56)	0 (0/60)	0 (0/52)	0 (0/32)	0 (0/22)	*1.2 (7/566)*
P38	Tain	0 (0/19)	0 (0/19)	0 (0/24)	2.9 (1/35)	26.8 (11/41)	2.3 (1/44)	0 (0/41)	0 (0/36)	0 (0/41)	0 (0/33)	0 (0/21)	0 (0/13)	*3.5 (13/367)*
G54	Orkney	0 (0/5)	0 (0/6)	0 (0/4)	0 (0/13)	20 (2/10)	50 (7/14)	0 (0/15)	0 (0/18)	0 (0/16)	0 (0/10)	0 (0/12)	0 (0/3)	*7.1 (9/126)*
G67	Shetland-SE-CliftSound	2.4 (1/42)	0 (0/36)	0 (0/45)	0 (0/57)	0 (0/53)	0 (0/55)	1.4 (1/74)	5 (3/60)	0 (0/61)	0 (0/45)	0 (0/32)	0 (0/21)	*0.9 (5/581)*
G56	Shetland-SE-DalesVoe	0 (0/17)	0 (0/16)	0 (0/20)	0 (0/39)	0 (0/44)	0 (0/48)	0 (0/41)	0 (0/44)	0 (0/37)	0 (0/28)	0 (0/21)	0 (0/12)	*0 (0/367)*
G57	Shetland-SE-SandsoundWeisdale	0 (0/55)	0 (0/51)	0 (0/64)	0 (0/64)	1.6 (1/62)	1.7 (1/60)	4.7 (3/64)	4.1 (3/74)	2.8 (2/71)	0 (0/68)	0 (0/54)	0 (0/29)	*1.4 (10/716)*
P61	Shetland-SW-GrutingVoe	0 (0/25)	0 (0/26)	0 (0/30)	0 (0/36)	0 (0/46)	0 (0/44)	2.3 (1/43)	0 (0/48)	8.1 (3/37)	0 (0/28)	0 (0/20)	0 (0/16)	*1 (4/399)*
P68	Shetland-SW-Vaila	0 (0/27)	0 (0/25)	0 (0/35)	0 (0/42)	0 (0/46)	0 (0/46)	13.2 (7/53)	7.8 (4/51)	20.4 (10/49)	0 (0/39)	0 (0/26)	0 (0/16)	*4.6 (21/455)*
P72	Shetland-W-AithVoe	0 (0/20)	0 (0/21)	0 (0/26)	0 (0/40)	0 (0/39)	0 (0/35)	7.7 (3/39)	5.3 (2/38)	5.4 (2/37)	2.5 (1/40)	3.4 (1/29)	0 (0/12)	*2.4 (9/376)*
P64	Shetland-W-BustaVoe	0 (0/25)	0 (0/28)	0 (0/35)	0 (0/45)	2.3 (1/43)	6.7 (3/45)	2.2 (1/46)	8.9 (4/45)	10 (5/50)	4.3 (2/47)	0 (0/33)	0 (0/15)	*3.5 (16/457)*
P70	Shetland-W-OlnaFirth	0 (0/18)	0 (0/19)	0 (0/33)	0 (0/40)	0 (0/40)	5 (2/40)	0 (0/43)	0 (0/45)	6.7 (3/45)	0 (0/43)	0 (0/32)	0 (0/14)	*1.2 (5/412)*
G58	Shetland-W-VementryVoe	0 (0/28)	0 (0/32)	0 (0/37)	0 (0/44)	2 (1/51)	0 (0/54)	0 (0/50)	3.2 (2/63)	9.5 (6/63)	5.9 (3/51)	0 (0/32)	0 (0/13)	*2.3 (12/518)*
G71	Shetland-W-RonasVoe	0 (0/15)	0 (0/19)	0 (0/23)	0 (0/11)	3 (1/33)	0 (0/40)	2.9 (1/35)	9.4 (3/32)	6.9 (2/29)	0 (0/21)	0 (0/21)	0 (0/9)	*2.4 (7/288)*
P65	Shetland-N-Basta	0 (0/24)	0 (0/25)	0 (0/31)	0 (0/38)	2.6 (1/39)	2.6 (1/38)	0 (0/38)	0 (0/37)	4.3 (2/47)	0 (0/28)	0 (0/23)	0 (0/14)	*1 (4/382)*
G81	Shetland-N-Uyea	0 (0/35)	0 (0/49)	0 (0/65)	0 (0/93)	2.5 (2/81)	1.8 (1/56)	0 (0/51)	15.8 (15/95)	1.8 (2/111)	0 (0/75)	0 (0/48)	0 (0/26)	*2.5 (20/785)*
		0.1	*0*	*0.3*	*1.8*	*4.7*	*6.2*	*3.2*	*1.9*	*1.9*	*0.4*	*0.1*		*2.1*
	Total	*(1/1122)*	*(0/1182)*	*(5/1508)*	*(33/1811)*	*(92/1978)*	*(123/1984)*	*(62/1946)*	*(36/1888)*	*(37/1983)*	*(6/1632)*	*(1/1229)*	*0 (0/755)*	*(396/19018)*

Table B7: Percentage of mussel samples for which PST exceeds 0 µg/kg, per group and month, based on data from 2001-15. In brackets: number of samples exceeding 0 µg/kg over total number of samples.

Groups	GroupNameM	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	*Total*
G80	EastCoast	0 (0/14)	0 (0/11)	0 (0/14)	0 (0/17)	19 (4/21)	17.6 (3/17)	11.8 (2/17)	0 (0/15)	0 (0/13)	0 (0/19)	0 (0/7)	0 (0/8)	*5.2 (9/173)*
G26	Dumfries	0 (0/16)	0 (0/23)	0 (0/27)	0 (0/29)	0 (0/35)	0 (0/40)	0 (0/32)	0 (0/24)	0 (0/33)	0 (0/24)	0 (0/23)	0 (0/13)	*0 (0/319)*
G8	Ayr-LochStriven	0 (0/24)	0 (0/33)	4.9 (2/41)	16.7 (8/48)	18.2 (8/44)	21.6 (8/37)	25 (9/36)	0 (0/31)	0 (0/34)	0 (0/34)	0 (0/28)	0 (0/22)	*8.5 (35/412)*
P16	Ayr-LochFyneArdkinglas	0 (0/25)	0 (0/23)	0 (0/33)	10 (4/40)	14.3 (5/35)	0 (0/27)	3.4 (1/29)	0 (0/29)	0 (0/42)	0 (0/31)	0 (0/23)	0 (0/18)	*2.8 (10/355)*
G18	Ayr-other	0 (0/61)	0 (0/65)	2.2 (2/91)	18.6 (18/97)	15.1 (14/93)	20.3 (16/79)	8.2 (6/73)	1.3 (1/78)	0 (0/73)	0 (0/83)	0 (0/70)	0 (0/43)	*6.3 (57/906)*
G123	WC-Gigha	0 (0/28)	0 (0/25)	0 (0/34)	2.9 (1/34)	3.4 (1/29)	25.9 (7/27)	15.4 (4/26)	0 (0/21)	4 (1/25)	0 (0/29)	0 (0/21)	0 (0/11)	*4.5 (14/310)*
P6	WC-LochMelfort	0 (0/22)	0 (0/19)	0 (0/33)	0 (0/33)	3.2 (1/31)	6.3 (2/32)	6.3 (2/32)	0 (0/32)	3.6 (1/28)	0 (0/28)	0 (0/18)	0 (0/14)	*1.9 (6/322)*
G10	WC-LochEtive	0 (0/36)	0 (0/34)	0 (0/57)	0 (0/55)	0 (0/72)	0 (0/61)	0 (0/56)	0 (0/58)	0 (0/63)	0 (0/51)	0 (0/37)	0 (0/27)	*0 (0/607)*
G9	WC-LochCreranLinnhe	0 (0/40)	0 (0/41)	0 (0/51)	0 (0/59)	0 (0/62)	0 (0/69)	0 (0/53)	0 (0/54)	0 (0/56)	0 (0/57)	0 (0/49)	0 (0/29)	*0 (0/620)*
G31	WC-LochLevenEil	0 (0/42)	0 (0/45)	0 (0/45)	0 (0/44)	0 (0/46)	0 (0/57)	0 (0/63)	0 (0/70)	0 (0/70)	0 (0/51)	0 (0/47)	0 (0/32)	*0 (0/612)*
G28	WC-Lochaber	0 (0/38)	0 (0/42)	6.3 (4/64)	4.8 (4/83)	14.3 (12/84)	13.9 (14/101)	10.7 (9/84)	0 (0/85)	0 (0/100)	0 (0/57)	0 (0/48)	0 (0/26)	*5.3 (43/812)*
P5	Mull-LochSpelve	0 (0/14)	0 (0/17)	0 (0/29)	0 (0/33)	0 (0/34)	0 (0/34)	0 (0/35)	0 (0/35)	0 (0/41)	0 (0/30)	0 (0/18)	0 (0/13)	*0 (0/333)*
P7	Mull-LochScridain	0 (0/23)	0 (0/22)	0 (0/35)	4.5 (2/44)	36.7 (18/49)	40.8 (20/49)	9.5 (4/42)	0 (0/32)	0 (0/41)	0 (0/43)	0 (0/26)	0 (0/15)	*10.5 (44/421)*
G1	Mull-other	0 (0/39)	0 (0/38)	0 (0/40)	0 (0/46)	5.9 (3/51)	2.3 (1/44)	0 (0/48)	0 (0/35)	0 (0/41)	0 (0/41)	0 (0/34)	0 (0/26)	*0.8 (4/483)*
P41	Skye-LochEishort	0 (0/24)	0 (0/25)	13.9 (5/36)	12.8 (6/47)	32.7 (18/55)	22.2 (12/54)	4.2 (2/48)	0 (0/43)	0 (0/48)	0 (0/36)	0 (0/21)	0 (0/17)	*9.5 (43/454)*
G42	Skye-other	0 (0/43)	0 (0/44)	0 (0/54)	0 (0/71)	13.5 (12/89)	16.5 (14/85)	5.1 (5/98)	0 (0/77)	0 (0/81)	0 (0/70)	0 (0/51)	0 (0/34)	*3.9 (31/797)*
G21	Lewis-LochLeurbostErisort	0 (0/31)	0 (0/39)	0 (0/41)	0 (0/34)	2 (1/50)	1.6 (1/63)	0 (0/58)	1.7 (1/59)	0 (0/54)	0 (0/37)	0 (0/39)	0 (0/24)	*0.6 (3/529)*
G23	Lewis-LochRoag	0 (0/54)	1.6 (1/62)	0 (0/67)	0 (0/86)	4.6 (6/131)	11.9 (15/126)	7.8 (10/129)	1 (1/101)	0 (0/105)	0 (0/80)	0 (0/58)	0 (0/39)	*3.2 (33/1038)*
G22	HarrisUist	0 (0/55)	0 (0/64)	0 (0/71)	0 (0/68)	7 (5/71)	7.5 (6/80)	1.3 (1/78)	0 (0/76)	0 (0/82)	0 (0/57)	0 (0/50)	0 (0/36)	*1.5 (12/788)*
G35	NWC-LochTorridon	0 (0/37)	0 (0/38)	0 (0/50)	0 (0/58)	9.5 (7/74)	25 (21/84)	12.7 (9/71)	0 (0/75)	0 (0/71)	0 (0/56)	0 (0/45)	0 (0/25)	*5.4 (37/684)*
G39	NWC-LochEweBroom	0 (0/40)	0 (0/40)	0 (0/48)	0 (0/56)	1.5 (1/66)	4.6 (3/65)	1.6 (1/61)	0 (0/60)	0 (0/61)	0 (0/55)	0 (0/43)	0 (0/25)	*0.8 (5/620)*
G48	NWC-LochLaxfordInchard	0 (0/33)	0 (0/33)	0 (0/40)	14.7 (10/68)	25.3 (19/75)	31.9 (23/72)	13 (9/69)	0 (0/56)	0 (0/67)	0 (0/55)	0 (0/37)	0 (0/23)	*9.7 (61/628)*
G49	NWC-other	0 (0/28)	0 (0/27)	0 (0/35)	3.1 (2/64)	5.7 (3/53)	9.7 (6/62)	4 (3/75)	0 (0/56)	0 (0/60)	0 (0/52)	0 (0/32)	0 (0/22)	*2.5 (14/566)*
P38	Tain	0 (0/19)	0 (0/19)	0 (0/24)	2.9 (1/35)	29.3 (12/41)	9.1 (4/44)	2.4 (1/41)	0 (0/36)	7.3 (3/41)	0 (0/33)	0 (0/21)	0 (0/13)	*5.7 (21/367)*
G54	Orkney	0 (0/5)	0 (0/6)	0 (0/4)	0 (0/13)	20 (2/10)	57.1 (8/14)	13.3 (2/15)	0 (0/18)	0 (0/16)	0 (0/10)	0 (0/12)	0 (0/3)	*9.5 (12/126)*
G67	Shetland-SE-CliftSound	2.4 (1/42)	0 (0/36)	0 (0/45)	1.8 (1/57)	1.9 (1/53)	5.5 (3/55)	6.8 (5/74)	13.3 (8/60)	8.2 (5/61)	0 (0/45)	0 (0/32)	0 (0/21)	*4.1 (24/581)*
G56	Shetland-SE-DalesVoe	0 (0/17)	0 (0/16)	0 (0/20)	0 (0/39)	4.5 (2/44)	2.1 (1/48)	0 (0/41)	0 (0/44)	0 (0/37)	0 (0/28)	0 (0/21)	0 (0/12)	*0.8 (3/367)*
G57	Shetland-SE-SandsoundWeisdale	0 (0/55)	0 (0/51)	0 (0/64)	0 (0/64)	3.2 (2/62)	3.3 (2/60)	9.4 (6/64)	8.1 (6/74)	8.5 (6/71)	0 (0/68)	0 (0/54)	0 (0/29)	*3.1 (22/716)*
P61	Shetland-SW-GrutingVoe	0 (0/25)	0 (0/26)	0 (0/30)	0 (0/36)	4.3 (2/46)	2.3 (1/44)	7 (3/43)	6.3 (3/48)	8.1 (3/37)	0 (0/28)	0 (0/20)	0 (0/16)	*3 (12/399)*
P68	Shetland-SW-Vaila	0 (0/27)	0 (0/25)	0 (0/35)	2.4 (1/42)	6.5 (3/46)	4.3 (2/46)	15.1 (8/53)	17.6 (9/51)	30.6 (15/49)	2.6 (1/39)	0 (0/26)	0 (0/16)	*8.6 (39/455)*
P72	Shetland-W-AithVoe	0 (0/20)	0 (0/21)	0 (0/26)	2.5 (1/40)	2.6 (1/39)	8.6 (3/35)	17.9 (7/39)	15.8 (6/38)	10.8 (4/37)	2.5 (1/40)	6.9 (2/29)	0 (0/12)	*6.6 (25/376)*
P64	Shetland-W-BustaVoe	0 (0/25)	0 (0/28)	0 (0/35)	6.7 (3/45)	9.3 (4/43)	8.9 (4/45)	10.9 (5/46)	17.8 (8/45)	14 (7/50)	6.4 (3/47)	0 (0/33)	0 (0/15)	*7.4 (34/457)*
P70	Shetland-W-OlnaFirth	0 (0/18)	0 (0/19)	0 (0/33)	7.5 (3/40)	0 (0/40)	5 (2/40)	2.3 (1/43)	6.7 (3/45)	8.9 (4/45)	0 (0/43)	0 (0/32)	0 (0/14)	*3.2 (13/412)*
G58	Shetland-W-VementryVoe	0 (0/28)	0 (0/32)	0 (0/37)	6.8 (3/44)	5.9 (3/51)	3.7 (2/54)	8 (4/50)	15.9 (10/63)	14.3 (9/63)	9.8 (5/51)	0 (0/32)	0 (0/13)	*6.9 (36/518)*
G71	Shetland-W-RonasVoe	0 (0/15)	0 (0/19)	0 (0/23)	0 (0/11)	3 (1/33)	0 (0/40)	11.4 (4/35)	25 (8/32)	24.1 (7/29)	0 (0/21)	0 (0/21)	0 (0/9)	*6.9 (20/288)*
P65	Shetland-N-Basta	0 (0/24)	0 (0/25)	0 (0/31)	0 (0/38)	2.6 (1/39)	2.6 (1/38)	2.6 (1/38)	2.7 (1/37)	10.6 (5/47)	7.1 (2/28)	0 (0/23)	0 (0/14)	*2.9 (11/382)*
G81	Shetland-N-Uyea	0 (0/35)	0 (0/49)	0 (0/65)	0 (0/93)	11.1 (9/81)	8.9 (5/56)	2 (1/51)	21.1 (20/95)	12.6 (14/111)	0 (0/75)	0 (0/48)	0 (0/26)	*6.2 (49/785)*
		0.1	*0.1*	*0.9*		*9.2*	*10.6*	*6.4*	*4.5*		*0.7*	*0.2*	*0*	*4.1*
	Total	*(1/1122)*	*(1/1182)*	*(13/1508)*	*3.8 (68/1811)*	*(181/1978)*	*(210/1984)*	*(125/1946)*	*(85/1888)*	*4.2 (84/1983)*	*(12/1632)*	*(2/1229)*	*(0/755)*	*(782/19018)*

Table B8: Percentage of mussel samples for which LT exceeds the MPL, per group and month, based on data from 2001-15. In brackets: number of samples exceeding the MPL over total number of samples.

Groups	GroupNameM	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	*Total*
G80	EastCoast	0 (0/13)	0 (0/11)	0 (0/14)	0 (0/16)	0 (0/21)	10.5 (2/19)	5 (1/20)	31.6 (6/19)	40 (8/20)	17.4 (4/23)	7.1 (1/14)	9.1 (1/11)	*11.4 (23/201)*
G26	Dumfries	0 (0/17)	0 (0/21)	0 (0/35)	0 (0/38)	2.4 (1/41)	0 (0/44)	0 (0/40)	0 (0/39)	0 (0/43)	2.9 (1/34)	0 (0/37)	0 (0/22)	*0.5 (2/411)*
G8	Ayr-LochStriven	0 (0/17)	0 (0/26)	0 (0/39)	2 (1/49)	15.2 (7/46)	35.4 (17/48)	35.4 (17/48)	44 (22/50)	37.9 (22/58)	26.9 (14/52)	23.1 (12/52)	3.4 (1/29)	*22 (113/514)*
P16	Ayr-LochFyneArdkinglas	0 (0/15)	0 (0/17)	0 (0/30)	7 (3/43)	9.3 (4/43)	31.8 (14/44)	28.3 (13/46)	17.8 (8/45)	14 (7/50)	2.2 (1/46)	2.4 (1/41)	0 (0/24)	*11.5 (51/444)*
G18	Ayr-other	0 (0/37)	0 (0/37)	1.3 (1/78)	4.9 (5/102)	20.6 (22/107)	35.4 (40/113)	33.1 (39/118)	32.8 (41/125)	36 (41/114)	17.8 (21/118)	9.6 (11/115)	6.5 (4/62)	*20 (225/1126)*
G123	WC-Gigha	0 (0/12)	0 (0/14)	0 (0/29)	0 (0/50)	4.4 (2/45)	0 (0/36)	0 (0/35)	2.9 (1/34)	2.8 (1/36)	0 (0/39)	0 (0/39)	0 (0/17)	*1 (4/386)*
P6	WC-LochMelfort	0 (0/13)	0 (0/11)	0 (0/27)	2.5 (1/40)	0 (0/38)	5.1 (2/39)	14.6 (6/41)	20.5 (8/39)	17.9 (7/39)	5.3 (2/38)	0 (0/33)	0 (0/21)	*6.9 (26/379)*
G10	WC-LochEtive	0 (0/19)	0 (0/21)	0 (0/48)	0 (0/68)	1.2 (1/86)	1.3 (1/76)	0 (0/72)	0 (0/73)	0 (0/75)	0 (0/64)	0 (0/48)	0 (0/30)	*0.3 (2/680)*
G9	WC-LochCreranLinnhe	0 (0/19)	0 (0/26)	0 (0/39)	0 (0/74)	0 (0/81)	0 (0/84)	2.8 (2/71)	5.5 (4/73)	2.6 (2/77)	0 (0/72)	0 (0/70)	0 (0/36)	*1.1 (8/722)*
G31	WC-LochLevenEil	0 (0/25)	0 (0/31)	0 (0/45)	0 (0/57)	4.8 (3/62)	0 (0/78)	0 (0/79)	1.1 (1/91)	0 (0/94)	0 (0/72)	0 (0/72)	0 (0/41)	*0.5 (4/747)*
G28	WC-Lochaber	0 (0/25)	0 (0/34)	0 (0/58)	2.4 (2/83)	2.2 (2/89)	8.9 (9/101)	27.3 (27/99)	29.5 (33/112)	17.2 (20/116)	4.5 (3/67)	4 (3/75)	0 (0/37)	*11 (99/896)*
P5	Mull-LochSpelve	0 (0/8)	0 (0/13)	0 (0/27)	2 (1/49)	0 (0/51)	0 (0/47)	0 (0/50)	4 (2/50)	0 (0/55)	0 (0/42)	0 (0/29)	0 (0/16)	*0.7 (3/437)*
P7	Mull-LochScridain	0 (0/15)	0 (0/15)	0 (0/27)	0 (0/46)	2.2 (1/46)	19.1 (9/47)	28 (14/50)	41.7 (20/48)	21.2 (11/52)	4.3 (2/47)	0 (0/38)	0 (0/22)	*12.6 (57/453)*
G1	Mull-other	0 (0/16)	0 (0/19)	0 (0/25)	0 (0/50)	0 (0/53)	5.9 (3/51)	0 (0/53)	6.7 (3/45)	4.2 (2/48)	0 (0/48)	2.4 (1/42)	0 (0/28)	*1.9 (9/478)*
P41	Skye-LochEishort	0 (0/14)	0 (0/16)	0 (0/33)	0 (0/47)	3.9 (2/51)	12 (6/50)	24.6 (14/57)	29.1 (16/55)	14 (8/57)	8.7 (4/46)	5.4 (2/37)	0 (0/26)	*10.6 (52/489)*
G42	Skye-other	0 (0/24)	0 (0/23)	0 (0/46)	0 (0/73)	1.1 (1/92)	6.1 (5/82)	11.1 (11/99)	11.9 (10/84)	4.7 (4/85)	3.7 (3/81)	2.8 (2/71)	2.4 (1/42)	*4.6 (37/802)*
G21	Lewis-LochLeurbostErisort	0 (0/19)	0 (0/23)	0 (0/52)	0 (0/61)	2.9 (2/70)	3.8 (3/79)	12.3 (10/81)	2.5 (2/80)	6.1 (5/82)	0 (0/62)	1.5 (1/66)	0 (0/38)	*3.2 (23/713)*
G23	Lewis-LochRoag	0 (0/34)	0 (0/38)	0 (0/83)	0 (0/112)	2.9 (4/137)	9.4 (13/139)	25.4 (36/142)	25.2 (37/147)	12.4 (18/145)	1.7 (2/121)	0 (0/104)	1.5 (1/65)	*8.8 (111/1267)*
G22	HarrisUist	0 (0/35)	0 (0/48)	0 (0/72)	0 (0/89)	0 (0/99)	0 (0/91)	3 (3/100)	6.3 (6/95)	1.9 (2/105)	1.3 (1/80)	0 (0/81)	0 (0/52)	*1.3 (12/947)*
G35	NWC-LochTorridon	0 (0/22)	0 (0/24)	0 (0/42)	1.5 (1/67)	0 (0/73)	7.5 (6/80)	8 (6/75)	10 (8/80)	21.6 (19/88)	6.7 (5/75)	0 (0/69)	0 (0/35)	*6.2 (45/730)*
G39	NWC-LochEweBroom	0 (0/17)	0 (0/20)	0 (0/36)	0 (0/70)	1.4 (1/71)	9.9 (7/71)	8.6 (6/70)	15.7 (11/70)	11.1 (8/72)	10.3 (7/68)	0 (0/63)	0 (0/32)	*6.1 (40/660)*
G48	NWC-LochLaxfordInchard	0 (0/20)	0 (0/19)	0 (0/44)	0 (0/69)	0 (0/71)	9.7 (6/62)	39.5 (32/81)	36.9 (31/84)	31.6 (30/95)	20.5 (16/78)	12.1 (8/66)	2.9 (1/34)	*17.2 (124/723)*
G49	NWC-other	0 (0/17)	0 (0/17)	3.4 (1/29)	0 (0/64)	0 (0/54)	0 (0/59)	12.2 (9/74)	20.3 (13/64)	10.9 (7/64)	3.6 (2/56)	0 (0/45)	0 (0/23)	*5.7 (32/566)*
P38	Tain	0 (0/10)	0 (0/11)	0 (0/19)	0 (0/35)	0 (0/38)	11.1 (5/45)	4.4 (2/45)	2.5 (1/40)	4.3 (2/46)	2.6 (1/38)	0 (0/29)	0 (0/16)	*3 (11/372)*
G54	Orkney	0 (0/3)	0 (0/5)	0 (0/7)	0 (0/11)	0 (0/10)	21.4 (3/14)	0 (0/15)	5.9 (1/17)	31.3 (5/16)	15.4 (2/13)	5.9 (1/17)	20 (1/5)	*9.8 (13/133)*
G67	Shetland-SE-CliftSound	0 (0/17)	0 (0/20)	0 (0/41)	8.3 (6/72)	9.1 (6/66)	14.7 (10/68)	13.4 (11/82)	18.3 (13/71)	9.5 (7/74)	3.1 (2/64)	0 (0/52)	0 (0/29)	*8.4 (55/656)*
G56	Shetland-SE-DalesVoe	0 (0/9)	0 (0/11)	0 (0/26)	10.6 (5/47)	4.2 (2/48)	5.9 (3/51)	14 (7/50)	11.3 (6/53)	12.2 (6/49)	2.6 (1/38)	2.9 (1/35)	0 (0/22)	*7.1 (31/439)*
G57	Shetland-SE-SandsoundWeisdale	0 (0/28)	0 (0/32)	0 (0/57)	5.1 (4/78)	6.9 (5/72)	11.9 (8/67)	7.8 (6/77)	13.5 (12/89)	12.8 (12/94)	4.3 (4/92)	0 (0/81)	0 (0/42)	*6.3 (51/809)*
P61	Shetland-SW-GrutingVoe	0 (0/17)	0 (0/17)	0 (0/31)	4.7 (2/43)	14.3 (8/56)	16.9 (10/59)	13.2 (7/53)	17.5 (10/57)	10.2 (5/49)	0 (0/42)	0 (0/31)	0 (0/17)	*8.9 (42/472)*
P68	Shetland-SW-Vaila	0 (0/17)	0 (0/17)	0 (0/27)	13.3 (6/45)	11.5 (6/52)	17.3 (9/52)	17.5 (10/57)	26.2 (16/61)	6.1 (3/49)	2.2 (1/46)	0 (0/38)	0 (0/23)	*10.5 (51/484)*
P72	Shetland-W-AithVoe	0 (0/15)	0 (0/16)	0 (0/28)	0 (0/39)	5 (2/40)	16.7 (7/42)	32.6 (14/43)	22.2 (10/45)	15 (6/40)	2.4 (1/42)	0 (0/43)	0 (0/19)	*9.7 (40/412)*
P64	Shetland-W-BustaVoe	0 (0/11)	0 (0/17)	0 (0/31)	0 (0/44)	6.8 (3/44)	10 (5/50)	18.4 (9/49)	18.5 (10/54)	13 (7/54)	2.2 (1/46)	2.1 (1/47)	0 (0/19)	*7.7 (36/466)*
P70	Shetland-W-OlnaFirth	0 (0/13)	0 (0/12)	0 (0/27)	0 (0/39)	7.7 (3/39)	6.7 (3/45)	9.1 (4/44)	12 (6/50)	13.6 (6/44)	2.3 (1/43)	0 (0/45)	0 (0/19)	*5.5 (23/420)*
G58	Shetland-W-VementryVoe	0 (0/19)	0 (0/23)	0 (0/41)	0 (0/45)	1.9 (1/53)	7.1 (4/56)	15.8 (9/57)	16.4 (11/67)	11.3 (7/62)	7.3 (4/55)	4.3 (2/46)	0 (0/21)	*7 (38/545)*
G71	Shetland-W-RonasVoe	0 (0/8)	0 (0/10)	0 (0/21)	9.1 (1/11)	8.3 (3/36)	11.6 (5/43)	17.6 (6/34)	42.1 (16/38)	31.4 (11/35)	21.4 (6/28)	7.4 (2/27)	20 (2/10)	*17.3 (52/301)*
P65	Shetland-N-Basta	0 (0/10)	0 (0/15)	0 (0/28)	9.8 (4/41)	7 (3/43)	7.3 (3/41)	15 (6/40)	12.2 (5/41)	6.1 (3/49)	14.6 (6/41)	0 (0/40)	4.3 (1/23)	*7.5 (31/412)*
G81	Shetland-N-Uyea	3.1 (1/32)	0 (0/42)	1.3 (1/79)	2.1 (2/96)	2.4 (2/82)	4.8 (3/62)	3.4 (2/58)	13 (13/100)	13.7 (16/117)	14 (14/100)	4.5 (4/89)	0 (0/43)	*6.4 (58/900)*
			0		*2.1*			*14.7*	*17.3*	*13*		*2.8*	*1.2*	*7.6*
	Total	*0.2 (1/662)*	*(0/772)*	*0.2 (3/1421)*	*(44/2063)*	*4.4 (97/2206)*	*9.9 (221/2235)*	*(339/2305)*	*(413/2385)*	*(318/2448)*	*6.2 (132/2117)*	*(53/1927)*	*(13/1051)*	*(1634/21592)*

Table B9: Percentage of mussel samples for which AZA exceeds 160 µg/kg, per group and month, based on data from 2011-15. In brackets: number of samples exceeding 160 µg/kg over total number of samples.

GroupsM	GroupNameM	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	*Total*
G80	EastCoast	0 (0/4)	0 (0/2)	0 (0/5)	0 (0/6)	0 (0/4)	0 (0/4)	0 (0/2)	0 (0/6)	0 (0/5)	0 (0/9)	0 (0/4)	0 (0/7)	*0 (0/58)*
G26	Dumfries	0 (0/4)	0 (0/5)	0 (0/17)	0 (0/18)	0 (0/16)	0 (0/17)	0 (0/22)	0 (0/21)	0 (0/23)	0 (0/16)	0 (0/16)	0 (0/11)	*0 (0/186)*
G8	Ayr-LochStriven	0 (0/6)	0 (0/9)	0 (0/19)	0 (0/19)	0 (0/15)	0 (0/16)	0 (0/20)	0 (0/20)	0 (0/25)	0 (0/14)	0 (0/17)	0 (0/11)	*0 (0/191)*
P16	Ayr-LochFyneArdkinglas	0 (0/4)	0 (0/5)	0 (0/17)	0 (0/18)	0 (0/16)	0 (0/16)	0 (0/19)	0 (0/17)	0 (0/15)	0 (0/17)	0 (0/17)	0 (0/11)	*0 (0/172)*
G18	Ayr-other	0 (0/17)	0 (0/16)	0 (0/43)	0 (0/36)	0 (0/26)	0 (0/25)	0 (0/47)	0 (0/48)	0 (0/45)	0 (0/42)	0 (0/44)	0 (0/27)	*0 (0/416)*
G123	WC-Gigha	0 (0/6)	0 (0/6)	0 (0/20)	0 (0/23)	0 (0/21)	0 (0/17)	0 (0/17)	0 (0/15)	0 (0/21)	0 (0/23)	0 (0/20)	0 (0/10)	*0 (0/199)*
P6	WC-LochMelfort	0 (0/5)	0 (0/4)	0 (0/18)	0 (0/18)	0 (0/16)	0 (0/17)	0 (0/22)	0 (0/21)	0 (0/22)	0 (0/19)	0 (0/16)	0 (0/11)	*0 (0/189)*
G10	WC-LochEtive	0 (0/5)	0 (0/4)	0 (0/21)	0 (0/25)	0 (0/24)	0 (0/22)	0 (0/23)	0 (0/21)	0 (0/21)	0 (0/19)	0 (0/18)	0 (0/14)	*0 (0/217)*
G9	WC-LochCreranLinnhe	0 (0/7)	0 (0/7)	0 (0/19)	0 (0/17)	0 (0/18)	0 (0/18)	0 (0/22)	0 (0/21)	0 (0/21)	0 (0/19)	0 (0/22)	0 (0/13)	*0 (0/204)*
G31	WC-LochLevenEil	0 (0/6)	0 (0/6)	0 (0/21)	0 (0/24)	0 (0/19)	0 (0/24)	0 (0/42)	0 (0/43)	0 (0/38)	0 (0/29)	0 (0/28)	0 (0/19)	*0 (0/299)*
G28	WC-Lochaber	0 (0/6)	0 (0/7)	0 (0/28)	0 (0/30)	0 (0/26)	0 (0/32)	0 (0/51)	0 (0/51)	0 (0/55)	0 (0/28)	0 (0/26)	0 (0/12)	*0 (0/352)*
P5	Mull-LochSpelve	0 (0/2)	0 (0/5)	0 (0/15)	0 (0/18)	0 (0/17)	0 (0/17)	0 (0/23)	0 (0/21)	0 (0/21)	0 (0/17)	0 (0/10)	0 (0/5)	*0 (0/171)*
P7	Mull-LochScridain	0 (0/4)	0 (0/5)	0 (0/16)	0 (0/18)	0 (0/17)	0 (0/15)	0 (0/18)	0 (0/17)	0 (0/18)	0 (0/17)	0 (0/17)	0 (0/10)	*0 (0/172)*
G1	Mull-other	0 (0/2)	0 (0/3)	0 (0/8)	0 (0/4)	0 (0/5)	0 (0/4)	0 (0/9)	0 (0/9)	0 (0/7)	0 (0/9)	0 (0/9)	0 (0/5)	*0 (0/74)*
P41	Skye-LochEishort	0 (0/4)	0 (0/5)	0 (0/18)	0 (0/18)	0 (0/14)	0 (0/14)	0 (0/22)	0 (0/21)	0 (0/23)	0 (0/18)	0 (0/16)	0 (0/11)	*0 (0/184)*
G42	Skye-other	0 (0/5)	0 (0/7)	0 (0/22)	0 (0/21)	0 (0/21)	0 (0/19)	0 (0/31)	6.7 (2/30)	6.5 (2/31)	0 (0/19)	0 (0/22)	0 (0/13)	*1.7 (4/241)*
G21	Lewis-LochLeurbostErisort	0 (0/8)	0 (0/10)	0 (0/34)	0 (0/34)	0 (0/36)	0 (0/34)	0 (0/44)	4.3 (2/46)	11.4 (5/44)	0 (0/34)	0 (0/33)	0 (0/22)	*1.8 (7/379)*
G23	Lewis-LochRoag	0 (0/12)	0 (0/15)	0 (0/51)	0 (0/52)	0 (0/50)	0 (0/55)	0 (0/60)	4.6 (3/65)	4.5 (3/66)	0 (0/55)	0 (0/50)	0 (0/33)	*1.1 (6/564)*
G22	HarrisUist	0 (0/22)	0 (0/29)	0 (0/53)	0 (0/53)	0 (0/50)	0 (0/47)	0 (0/65)	0 (0/58)	0 (0/58)	0 (0/50)	0 (0/49)	0 (0/30)	*0 (0/564)*
G35	NWC-LochTorridon	0 (0/6)	0 (0/8)	0 (0/23)	0 (0/23)	0 (0/20)	0 (0/17)	0 (0/27)	0 (0/29)	0 (0/30)	0 (0/29)	0 (0/24)	0 (0/15)	*0 (0/251)*
G39	NWC-LochEweBroom	0 (0/5)	0 (0/7)	0 (0/21)	0 (0/22)	0 (0/22)	0 (0/21)	0 (0/30)	0 (0/26)	0 (0/26)	0 (0/22)	0 (0/22)	0 (0/12)	*0 (0/236)*
G48	NWC-LochLaxfordInchard	0 (0/10)	0 (0/8)	0 (0/33)	0 (0/35)	0 (0/33)	0 (0/25)	0 (0/40)	0 (0/41)	0 (0/43)	0 (0/33)	0 (0/32)	0 (0/21)	*0 (0/354)*
G49	NWC-other	0 (0/5)	0 (0/5)	0 (0/18)	0 (0/16)	0 (0/16)	0 (0/16)	0 (0/19)	0 (0/22)	0 (0/22)	0 (0/18)	0 (0/13)	0 (0/9)	*0 (0/179)*
P38	Tain	0 (0/4)	0 (0/5)	0 (0/10)	0 (0/13)	0 (0/11)	0 (0/14)	0 (0/20)	0 (0/18)	0 (0/17)	0 (0/11)	0 (0/11)	0 (0/8)	*0 (0/142)*
G54	Orkney	0 (0/2)	0 (0/3)	0 (0/6)	0 (0/4)	0 (0/4)	0 (0/4)	0 (0/7)	0 (0/13)	0 (0/8)	0 (0/6)	0 (0/9)	0 (0/2)	*0 (0/68)*
G67	Shetland-SE-CliftSound	0 (0/6)	0 (0/8)	0 (0/27)	0 (0/31)	0 (0/29)	0 (0/25)	0 (0/47)	0 (0/35)	0 (0/33)	0 (0/24)	0 (0/16)	0 (0/14)	*0 (0/295)*
G56	Shetland-SE-DalesVoe	0 (0/4)	0 (0/5)	0 (0/18)	0 (0/17)	0 (0/19)	0 (0/23)	0 (0/26)	0 (0/26)	0 (0/22)	0 (0/17)	0 (0/17)	0 (0/11)	*0 (0/205)*
G57	Shetland-SE-SandsoundWeisdale	0 (0/8)	0 (0/10)	0 (0/33)	0 (0/35)	0 (0/31)	0 (0/32)	0 (0/39)	0 (0/44)	0 (0/43)	0 (0/35)	0 (0/32)	0 (0/21)	*0 (0/363)*
P61	Shetland-SW-GrutingVoe	0 (0/5)	0 (0/4)	0 (0/16)	0 (0/15)	0 (0/18)	0 (0/16)	0 (0/23)	0 (0/22)	0 (0/20)	0 (0/15)	0 (0/12)	0 (0/7)	*0 (0/173)*
P68	Shetland-SW-Vaila	0 (0/5)	0 (0/4)	0 (0/15)	0 (0/16)	0 (0/18)	0 (0/16)	0 (0/22)	0 (0/21)	0 (0/22)	0 (0/17)	0 (0/15)	0 (0/9)	*0 (0/180)*
P72	Shetland-W-AithVoe	0 (0/4)	0 (0/5)	0 (0/17)	0 (0/18)	0 (0/16)	0 (0/18)	0 (0/21)	0 (0/22)	0 (0/22)	0 (0/17)	0 (0/16)	0 (0/10)	*0 (0/186)*
P64	Shetland-W-BustaVoe	0 (0/5)	0 (0/5)	0 (0/18)	0 (0/18)	0 (0/16)	0 (0/18)	0 (0/22)	0 (0/22)	0 (0/22)	0 (0/19)	0 (0/16)	0 (0/10)	*0 (0/191)*
P70	Shetland-W-OlnaFirth	0 (0/5)	0 (0/4)	0 (0/18)	0 (0/18)	0 (0/16)	0 (0/18)	0 (0/22)	0 (0/21)	0 (0/24)	0 (0/18)	0 (0/16)	0 (0/11)	*0 (0/191)*
G58	Shetland-W-VementryVoe	0 (0/7)	0 (0/9)	0 (0/26)	0 (0/23)	0 (0/24)	0 (0/31)	0 (0/35)	0 (0/33)	0 (0/28)	0 (0/21)	0 (0/18)	0 (0/11)	*0 (0/266)*
G71	Shetland-W-RonasVoe	0 (0/1)	0 (0/4)	0 (0/12)	0 (0/2)	0 (0/10)	0 (0/13)	0 (0/13)	0 (0/20)	0 (0/18)	0 (0/12)	0 (0/11)	0 (0/6)	*0 (0/122)*
P65	Shetland-N-Basta	0 (0/5)	0 (0/5)	0 (0/17)	0 (0/17)	0 (0/15)	0 (0/17)	0 (0/20)	0 (0/20)	4.3 (1/23)	22.2 (4/18)	0 (0/17)	8.3 (1/12)	*3.2 (6/186)*
G81	Shetland-N-Uyea	6.7 (1/15)	0 (0/16)	0 (0/46)	0 (0/47)	0 (0/36)	0 (0/20)	0 (0/22)	0 (0/48)	3.1 (2/64)	17.6 (9/51)	6.3 (3/48)	0 (0/24)	*3.4 (15/437)*
		0.4							*0.7*	*1.2*		*0.4*	*0.2*	
	Total	*(1/231)*	*0 (0/265)*	*0 (0/819)*	*0 (0/822)*	*0 (0/765)*	*0 (0/757)*	*0 (0/1014)*	*(7/1034)*	*(13/1046)*	*1.6 (13/837)*	*(3/779)*	*(1/488)*	*0.4 (38/8857)*

Table B10: Percentage of mussel samples for which AZA exceeds 80 µg/kg, per group and month, based on data from 2011-15. In brackets: number of samples exceeding 80 µg/kg over total number of samples.

GroupsM	GroupNameM	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	*Total*
G80	EastCoast	0 (0/4)	0 (0/2)	0 (0/5)	0 (0/6)	0 (0/4)	0 (0/4)	0 (0/2)	0 (0/6)	0 (0/5)	0 (0/9)	0 (0/4)	0 (0/7)	*0 (0/58)*
G26	Dumfries	0 (0/4)	0 (0/5)	0 (0/17)	0 (0/18)	0 (0/16)	0 (0/17)	0 (0/22)	0 (0/21)	0 (0/23)	0 (0/16)	0 (0/16)	0 (0/11)	*0 (0/186)*
G8	Ayr-LochStriven	0 (0/6)	0 (0/9)	0 (0/19)	0 (0/19)	0 (0/15)	0 (0/16)	0 (0/20)	0 (0/20)	0 (0/25)	0 (0/14)	0 (0/17)	0 (0/11)	*0 (0/191)*
P16	Ayr-LochFyneArdkinglas	0 (0/4)	0 (0/5)	0 (0/17)	0 (0/18)	0 (0/16)	0 (0/16)	0 (0/19)	0 (0/17)	0 (0/15)	0 (0/17)	0 (0/17)	0 (0/11)	*0 (0/172)*
G18	Ayr-other	0 (0/17)	0 (0/16)	0 (0/43)	0 (0/36)	0 (0/26)	0 (0/25)	0 (0/47)	0 (0/48)	0 (0/45)	0 (0/42)	0 (0/44)	0 (0/27)	*0 (0/416)*
G123	WC-Gigha	0 (0/6)	0 (0/6)	0 (0/20)	0 (0/23)	0 (0/21)	0 (0/17)	0 (0/17)	0 (0/15)	0 (0/21)	0 (0/23)	0 (0/20)	0 (0/10)	*0 (0/199)*
P6	WC-LochMelfort	0 (0/5)	0 (0/4)	0 (0/18)	0 (0/18)	0 (0/16)	0 (0/17)	0 (0/22)	0 (0/21)	0 (0/22)	0 (0/19)	0 (0/16)	0 (0/11)	*0 (0/189)*
G10	WC-LochEtive	0 (0/5)	0 (0/4)	0 (0/21)	0 (0/25)	0 (0/24)	0 (0/22)	0 (0/23)	0 (0/21)	0 (0/21)	0 (0/19)	0 (0/18)	0 (0/14)	*0 (0/217)*
G9	WC-LochCreranLinnhe	0 (0/7)	0 (0/7)	0 (0/19)	0 (0/17)	0 (0/18)	0 (0/18)	0 (0/22)	0 (0/21)	0 (0/21)	0 (0/19)	0 (0/22)	0 (0/13)	*0 (0/204)*
G31	WC-LochLevenEil	0 (0/6)	0 (0/6)	0 (0/21)	0 (0/24)	0 (0/19)	0 (0/24)	0 (0/42)	0 (0/43)	2.6 (1/38)	0 (0/29)	0 (0/28)	0 (0/19)	*0.3 (1/299)*
G28	WC-Lochaber	0 (0/6)	0 (0/7)	0 (0/28)	0 (0/30)	0 (0/26)	0 (0/32)	0 (0/51)	0 (0/51)	0 (0/55)	0 (0/28)	0 (0/26)	0 (0/12)	*0 (0/352)*
P5	Mull-LochSpelve	0 (0/2)	0 (0/5)	0 (0/15)	0 (0/18)	0 (0/17)	0 (0/17)	0 (0/23)	0 (0/21)	0 (0/21)	0 (0/17)	0 (0/10)	0 (0/5)	*0 (0/171)*
P7	Mull-LochScridain	0 (0/4)	0 (0/5)	0 (0/16)	0 (0/18)	0 (0/17)	0 (0/15)	0 (0/18)	0 (0/17)	0 (0/18)	0 (0/17)	0 (0/17)	0 (0/10)	*0 (0/172)*
G1	Mull-other	0 (0/2)	0 (0/3)	0 (0/8)	0 (0/4)	0 (0/5)	0 (0/4)	0 (0/9)	0 (0/9)	0 (0/7)	0 (0/9)	0 (0/9)	0 (0/5)	*0 (0/74)*
P41	Skye-LochEishort	0 (0/4)	0 (0/5)	0 (0/18)	0 (0/18)	0 (0/14)	0 (0/14)	0 (0/22)	0 (0/21)	0 (0/23)	0 (0/18)	0 (0/16)	0 (0/11)	*0 (0/184)*
G42	Skye-other	0 (0/5)	0 (0/7)	0 (0/22)	0 (0/21)	0 (0/21)	0 (0/19)	0 (0/31)	6.7 (2/30)	9.7 (3/31)	0 (0/19)	0 (0/22)	0 (0/13)	*2.1 (5/241)*
G21	Lewis-LochLeurbostErisort	0 (0/8)	0 (0/10)	0 (0/34)	0 (0/34)	0 (0/36)	0 (0/34)	0 (0/44)	4.3 (2/46)	13.6 (6/44)	8.8 (3/34)	0 (0/33)	4.5 (1/22)	*3.2 (12/379)*
G23	Lewis-LochRoag	0 (0/12)	0 (0/15)	0 (0/51)	0 (0/52)	0 (0/50)	0 (0/55)	0 (0/60)	16.9 (11/65)	12.1 (8/66)	0 (0/55)	0 (0/50)	0 (0/33)	*3.4 (19/564)*
G22	HarrisUist	0 (0/22)	0 (0/29)	0 (0/53)	0 (0/53)	0 (0/50)	0 (0/47)	0 (0/65)	5.2 (3/58)	1.7 (1/58)	2 (1/50)	0 (0/49)	0 (0/30)	*0.9 (5/564)*
G35	NWC-LochTorridon	0 (0/6)	0 (0/8)	0 (0/23)	0 (0/23)	0 (0/20)	0 (0/17)	0 (0/27)	0 (0/29)	0 (0/30)	0 (0/29)	0 (0/24)	0 (0/15)	*0 (0/251)*
G39	NWC-LochEweBroom	0 (0/5)	0 (0/7)	0 (0/21)	0 (0/22)	0 (0/22)	0 (0/21)	0 (0/30)	0 (0/26)	0 (0/26)	0 (0/22)	0 (0/22)	0 (0/12)	*0 (0/236)*
G48	NWC-LochLaxfordInchard	0 (0/10)	0 (0/8)	0 (0/33)	0 (0/35)	0 (0/33)	0 (0/25)	0 (0/40)	0 (0/41)	2.3 (1/43)	3 (1/33)	0 (0/32)	0 (0/21)	*0.6 (2/354)*
G49	NWC-other	20 (1/5)	0 (0/5)	0 (0/18)	0 (0/16)	0 (0/16)	0 (0/16)	0 (0/19)	0 (0/22)	0 (0/22)	5.6 (1/18)	0 (0/13)	0 (0/9)	*1.1 (2/179)*
P38	Tain	0 (0/4)	0 (0/5)	0 (0/10)	0 (0/13)	0 (0/11)	0 (0/14)	0 (0/20)	0 (0/18)	0 (0/17)	0 (0/11)	0 (0/11)	0 (0/8)	*0 (0/142)*
G54	Orkney	0 (0/2)	0 (0/3)	0 (0/6)	0 (0/4)	0 (0/4)	0 (0/4)	0 (0/7)	0 (0/13)	0 (0/8)	16.7 (1/6)	0 (0/9)	0 (0/2)	*1.5 (1/68)*
G67	Shetland-SE-CliftSound	0 (0/6)	0 (0/8)	0 (0/27)	0 (0/31)	0 (0/29)	0 (0/25)	0 (0/47)	0 (0/35)	0 (0/33)	0 (0/24)	0 (0/16)	0 (0/14)	*0 (0/295)*
G56	Shetland-SE-DalesVoe	0 (0/4)	0 (0/5)	0 (0/18)	0 (0/17)	0 (0/19)	0 (0/23)	0 (0/26)	0 (0/26)	0 (0/22)	0 (0/17)	0 (0/17)	0 (0/11)	*0 (0/205)*
G57	Shetland-SE-SandsoundWeisdale	0 (0/8)	0 (0/10)	0 (0/33)	0 (0/35)	0 (0/31)	0 (0/32)	0 (0/39)	0 (0/44)	0 (0/43)	0 (0/35)	3.1 (1/32)	0 (0/21)	*0.3 (1/363)*
P61	Shetland-SW-GrutingVoe	0 (0/5)	0 (0/4)	0 (0/16)	0 (0/15)	0 (0/18)	0 (0/16)	0 (0/23)	0 (0/22)	0 (0/20)	0 (0/15)	0 (0/12)	0 (0/7)	*0 (0/173)*
P68	Shetland-SW-Vaila	0 (0/5)	0 (0/4)	0 (0/15)	0 (0/16)	0 (0/18)	0 (0/16)	0 (0/22)	0 (0/21)	0 (0/22)	0 (0/17)	0 (0/15)	0 (0/9)	*0 (0/180)*
P72	Shetland-W-AithVoe	0 (0/4)	0 (0/5)	0 (0/17)	0 (0/18)	0 (0/16)	0 (0/18)	0 (0/21)	0 (0/22)	0 (0/22)	5.9 (1/17)	0 (0/16)	0 (0/10)	*0.5 (1/186)*
P64	Shetland-W-BustaVoe	0 (0/5)	0 (0/5)	0 (0/18)	0 (0/18)	0 (0/16)	0 (0/18)	0 (0/22)	0 (0/22)	0 (0/22)	10.5 (2/19)	0 (0/16)	0 (0/10)	*1 (2/191)*
P70	Shetland-W-OlnaFirth	0 (0/5)	0 (0/4)	0 (0/18)	0 (0/18)	0 (0/16)	0 (0/18)	0 (0/22)	0 (0/21)	0 (0/24)	16.7 (3/18)	6.3 (1/16)	0 (0/11)	*2.1 (4/191)*
G58	Shetland-W-VementryVoe	0 (0/7)	0 (0/9)	0 (0/26)	0 (0/23)	0 (0/24)	0 (0/31)	0 (0/35)	0 (0/33)	0 (0/28)	4.8 (1/21)	0 (0/18)	0 (0/11)	*0.4 (1/266)*
G71	Shetland-W-RonasVoe	0 (0/1)	0 (0/4)	0 (0/12)	0 (0/2)	0 (0/10)	0 (0/13)	0 (0/13)	0 (0/20)	0 (0/18)	16.7 (2/12)	9.1 (1/11)	0 (0/6)	*2.5 (3/122)*
P65	Shetland-N-Basta	0 (0/5)	0 (0/5)	0 (0/17)	0 (0/17)	0 (0/15)	0 (0/17)	0 (0/20)	0 (0/20)	8.7 (2/23)	22.2 (4/18)	11.8 (2/17)	8.3 (1/12)	*4.8 (9/186)*
G81	Shetland-N-Uyea	6.7 (1/15)	0 (0/16)	2.2 (1/46)	0 (0/47)	0 (0/36)	0 (0/20)	0 (0/22)	0 (0/48)	3.1 (2/64)	25.5 (13/51)	20.8 (10/48)	0 (0/24)	*6.2 (27/437)*
		0.9		*0.1*						*2.3*			*0.4*	
	Total	*(2/231)*	*0 (0/265)*	*(1/819)*	*0 (0/822)*	*0 (0/765)*	*0 (0/757)*	*0 (0/1014)*	*1.7 (18/1034)*	*(24/1046)*	*3.9 (33/837)*	*1.9 (15/779)*	*(2/488)*	*1.1 (95/8857)*

Table B11: Percentage of mussel samples for which AZA exceeds 0 µg/kg, per group and month, based on data from 2011-15. In brackets: number of samples exceeding 0 µg/kg over total number of samples.

GroupsM	GroupNameM	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	*Total*
G80	EastCoast	0 (0/4)	0 (0/2)	0 (0/5)	0 (0/6)	0 (0/4)	0 (0/4)	0 (0/2)	0 (0/6)	0 (0/5)	0 (0/9)	0 (0/4)	0 (0/7)	*0 (0/58)*
G26	Dumfries	0 (0/4)	0 (0/5)	0 (0/17)	0 (0/18)	0 (0/16)	0 (0/17)	0 (0/22)	0 (0/21)	0 (0/23)	0 (0/16)	0 (0/16)	0 (0/11)	*0 (0/186)*
G8	Ayr-LochStriven	0 (0/6)	0 (0/9)	0 (0/19)	0 (0/19)	0 (0/15)	0 (0/16)	0 (0/20)	0 (0/20)	0 (0/25)	0 (0/14)	0 (0/17)	0 (0/11)	*0 (0/191)*
P16	Ayr-LochFyneArdkinglas	0 (0/4)	0 (0/5)	0 (0/17)	0 (0/18)	0 (0/16)	0 (0/16)	0 (0/19)	0 (0/17)	0 (0/15)	0 (0/17)	0 (0/17)	0 (0/11)	*0 (0/172)*
G18	Ayr-other	0 (0/17)	0 (0/16)	0 (0/43)	0 (0/36)	0 (0/26)	0 (0/25)	0 (0/47)	0 (0/48)	0 (0/45)	0 (0/42)	0 (0/44)	0 (0/27)	*0 (0/416)*
G123	WC-Gigha	0 (0/6)	0 (0/6)	0 (0/20)	0 (0/23)	0 (0/21)	0 (0/17)	0 (0/17)	0 (0/15)	0 (0/21)	0 (0/23)	0 (0/20)	0 (0/10)	*0 (0/199)*
P6	WC-LochMelfort	0 (0/5)	0 (0/4)	0 (0/18)	0 (0/18)	0 (0/16)	0 (0/17)	0 (0/22)	0 (0/21)	0 (0/22)	0 (0/19)	0 (0/16)	0 (0/11)	*0 (0/189)*
G10	WC-LochEtive	0 (0/5)	0 (0/4)	0 (0/21)	0 (0/25)	0 (0/24)	0 (0/22)	0 (0/23)	0 (0/21)	0 (0/21)	0 (0/19)	0 (0/18)	0 (0/14)	*0 (0/217)*
G9	WC-LochCreranLinnhe	0 (0/7)	0 (0/7)	0 (0/19)	0 (0/17)	0 (0/18)	0 (0/18)	0 (0/22)	0 (0/21)	0 (0/21)	0 (0/19)	0 (0/22)	0 (0/13)	*0 (0/204)*
G31	WC-LochLevenEil	0 (0/6)	0 (0/6)	0 (0/21)	0 (0/24)	0 (0/19)	0 (0/24)	0 (0/42)	0 (0/43)	2.6 (1/38)	0 (0/29)	0 (0/28)	0 (0/19)	*0.3 (1/299)*
G28	WC-Lochaber	0 (0/6)	0 (0/7)	0 (0/28)	0 (0/30)	0 (0/26)	0 (0/32)	0 (0/51)	0 (0/51)	3.6 (2/55)	14.3 (4/28)	3.8 (1/26)	0 (0/12)	*2 (7/352)*
P5	Mull-LochSpelve	0 (0/2)	0 (0/5)	0 (0/15)	0 (0/18)	0 (0/17)	0 (0/17)	0 (0/23)	0 (0/21)	0 (0/21)	0 (0/17)	0 (0/10)	0 (0/5)	*0 (0/171)*
P7	Mull-LochScridain	0 (0/4)	0 (0/5)	0 (0/16)	0 (0/18)	0 (0/17)	0 (0/15)	0 (0/18)	0 (0/17)	0 (0/18)	0 (0/17)	0 (0/17)	0 (0/10)	*0 (0/172)*
G1	Mull-other	0 (0/2)	0 (0/3)	0 (0/8)	0 (0/4)	0 (0/5)	0 (0/4)	0 (0/9)	0 (0/9)	14.3 (1/7)	0 (0/9)	0 (0/9)	0 (0/5)	*1.4 (1/74)*
P41	Skye-LochEishort	0 (0/4)	0 (0/5)	0 (0/18)	0 (0/18)	0 (0/14)	0 (0/14)	0 (0/22)	14.3 (3/21)	8.7 (2/23)	0 (0/18)	0 (0/16)	0 (0/11)	*2.7 (5/184)*
G42	Skye-other	0 (0/5)	0 (0/7)	0 (0/22)	0 (0/21)	0 (0/21)	0 (0/19)	0 (0/31)	13.3 (4/30)	9.7 (3/31)	0 (0/19)	0 (0/22)	0 (0/13)	*2.9 (7/241)*
G21	Lewis-LochLeurbostErisort	0 (0/8)	10 (1/10)	0 (0/34)	0 (0/34)	0 (0/36)	0 (0/34)	0 (0/44)	13 (6/46)	15.9 (7/44)	17.6 (6/34)	12.1 (4/33)	13.6 (3/22)	*7.1 (27/379)*
G23	Lewis-LochRoag	0 (0/12)	0 (0/15)	0 (0/51)	1.9 (1/52)	0 (0/50)	0 (0/55)	0 (0/60)	23.1 (15/65)	22.7 (15/66)	10.9 (6/55)	0 (0/50)	0 (0/33)	*6.6 (37/564)*
G22	HarrisUist	0 (0/22)	0 (0/29)	0 (0/53)	0 (0/53)	0 (0/50)	0 (0/47)	0 (0/65)	10.3 (6/58)	12.1 (7/58)	8 (4/50)	4.1 (2/49)	6.7 (2/30)	*3.7 (21/564)*
G35	NWC-LochTorridon	0 (0/6)	0 (0/8)	0 (0/23)	0 (0/23)	0 (0/20)	0 (0/17)	0 (0/27)	0 (0/29)	0 (0/30)	0 (0/29)	0 (0/24)	0 (0/15)	*0 (0/251)*
G39	NWC-LochEweBroom	0 (0/5)	0 (0/7)	0 (0/21)	0 (0/22)	0 (0/22)	0 (0/21)	0 (0/30)	7.7 (2/26)	0 (0/26)	0 (0/22)	0 (0/22)	0 (0/12)	*0.8 (2/236)*
G48	NWC-LochLaxfordInchard	0 (0/10)	0 (0/8)	0 (0/33)	0 (0/35)	0 (0/33)	0 (0/25)	0 (0/40)	7.3 (3/41)	9.3 (4/43)	6.1 (2/33)	3.1 (1/32)	0 (0/21)	*2.8 (10/354)*
G49	NWC-other	20 (1/5)	0 (0/5)	11.1 (2/18)	0 (0/16)	0 (0/16)	0 (0/16)	0 (0/19)	0 (0/22)	13.6 (3/22)	16.7 (3/18)	0 (0/13)	0 (0/9)	*5 (9/179)*
P38	Tain	0 (0/4)	0 (0/5)	0 (0/10)	0 (0/13)	0 (0/11)	7.1 (1/14)	0 (0/20)	0 (0/18)	0 (0/17)	0 (0/11)	0 (0/11)	0 (0/8)	*0.7 (1/142)*
G54	Orkney	0 (0/2)	0 (0/3)	16.7 (1/6)	0 (0/4)	25 (1/4)	0 (0/4)	0 (0/7)	0 (0/13)	12.5 (1/8)	50 (3/6)	22.2 (2/9)	50 (1/2)	*13.2 (9/68)*
G67	Shetland-SE-CliftSound	0 (0/6)	0 (0/8)	0 (0/27)	0 (0/31)	0 (0/29)	0 (0/25)	0 (0/47)	0 (0/35)	3 (1/33)	12.5 (3/24)	0 (0/16)	0 (0/14)	*1.4 (4/295)*
G56	Shetland-SE-DalesVoe	0 (0/4)	0 (0/5)	0 (0/18)	0 (0/17)	0 (0/19)	0 (0/23)	0 (0/26)	0 (0/26)	0 (0/22)	11.8 (2/17)	11.8 (2/17)	0 (0/11)	*2 (4/205)*
G57	Shetland-SE-SandsoundWeisdale	0 (0/8)	0 (0/10)	0 (0/33)	0 (0/35)	0 (0/31)	0 (0/32)	0 (0/39)	0 (0/44)	2.3 (1/43)	0 (0/35)	3.1 (1/32)	0 (0/21)	*0.6 (2/363)*
P61	Shetland-SW-GrutingVoe	0 (0/5)	0 (0/4)	0 (0/16)	0 (0/15)	0 (0/18)	0 (0/16)	0 (0/23)	0 (0/22)	0 (0/20)	0 (0/15)	0 (0/12)	0 (0/7)	*0 (0/173)*
P68	Shetland-SW-Vaila	0 (0/5)	0 (0/4)	0 (0/15)	0 (0/16)	0 (0/18)	0 (0/16)	0 (0/22)	0 (0/21)	0 (0/22)	5.9 (1/17)	0 (0/15)	0 (0/9)	*0.6 (1/180)*
P72	Shetland-W-AithVoe	0 (0/4)	0 (0/5)	0 (0/17)	0 (0/18)	0 (0/16)	0 (0/18)	0 (0/21)	4.5 (1/22)	0 (0/22)	11.8 (2/17)	0 (0/16)	0 (0/10)	*1.6 (3/186)*
P64	Shetland-W-BustaVoe	20 (1/5)	0 (0/5)	0 (0/18)	0 (0/18)	0 (0/16)	0 (0/18)	0 (0/22)	0 (0/22)	4.5 (1/22)	26.3 (5/19)	18.8 (3/16)	10 (1/10)	*5.8 (11/191)*
P70	Shetland-W-OlnaFirth	0 (0/5)	0 (0/4)	0 (0/18)	0 (0/18)	0 (0/16)	0 (0/18)	0 (0/22)	0 (0/21)	0 (0/24)	22.2 (4/18)	12.5 (2/16)	0 (0/11)	*3.1 (6/191)*
G58	Shetland-W-VementryVoe	0 (0/7)	22.2 (2/9)	3.8 (1/26)	0 (0/23)	0 (0/24)	0 (0/31)	0 (0/35)	0 (0/33)	3.6 (1/28)	19 (4/21)	11.1 (2/18)	0 (0/11)	*3.8 (10/266)*
G71	Shetland-W-RonasVoe	0 (0/1)	0 (0/4)	0 (0/12)	0 (0/2)	0 (0/10)	0 (0/13)	0 (0/13)	0 (0/20)	0 (0/18)	16.7 (2/12)	27.3 (3/11)	16.7 (1/6)	*4.9 (6/122)*
P65	Shetland-N-Basta	40 (2/5)	20 (1/5)	5.9 (1/17)	5.9 (1/17)	0 (0/15)	0 (0/17)	0 (0/20)	5 (1/20)	8.7 (2/23)	22.2 (4/18)	23.5 (4/17)	25 (3/12)	*10.2 (19/186)*
G81	Shetland-N-Uyea	6.7 (1/15)	6.3 (1/16)	10.9 (5/46)	0 (0/47)	0 (0/36)	0 (0/20)	0 (0/22)	2.1 (1/48)	7.8 (5/64)	27.5 (14/51)	37.5 (18/48)	4.2 (1/24)	*10.5 (46/437)*
		2.2	*1.9*		*0.2*	*0.1*	*0.1*		*4.1*					*2.8*
	Total	*(5/231)*	*(5/265)*	*1.2 (10/819)*	*(2/822)*	*(1/765)*	*(1/757)*	*0 (0/1014)*	*(42/1034)*	*5.4 (57/1046)*	*8.2 (69/837)*	*5.8 (45/779)*	*2.5 (12/488)*	*(249/8857)*

Table B12: Percentage of mussel samples for which OA exceeds 160 µg/kg, per group and month, based on data from 2011-15. In brackets: number of samples exceeding 160 µg/kg over total number of samples.

GroupsM	GroupNameM	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	*Total*
G80	EastCoast	0 (0/4)	0 (0/2)	0 (0/5)	0 (0/6)	0 (0/4)	0 (0/4)	50 (1/2)	50 (3/6)	100 (5/5)	44.4 (4/9)	25 (1/4)	14.3 (1/7)	*25.9 (15/58)*
G26	Dumfries	0 (0/4)	0 (0/5)	0 (0/17)	0 (0/18)	0 (0/16)	0 (0/17)	0 (0/22)	0 (0/21)	0 (0/23)	0 (0/16)	0 (0/16)	0 (0/11)	*0 (0/186)*
G8	Ayr-LochStriven	0 (0/6)	0 (0/9)	0 (0/19)	0 (0/19)	6.7 (1/15)	43.8 (7/16)	45 (9/20)	60 (12/20)	64 (16/25)	50 (7/14)	41.2 (7/17)	0 (0/11)	*30.9 (59/191)*
P16	Ayr-LochFyneArdkinglas	0 (0/4)	0 (0/5)	0 (0/17)	16.7 (3/18)	6.3 (1/16)	18.8 (3/16)	21.1 (4/19)	17.6 (3/17)	26.7 (4/15)	0 (0/17)	0 (0/17)	0 (0/11)	*10.5 (18/172)*
G18	Ayr-other	0 (0/17)	0 (0/16)	0 (0/43)	0 (0/36)	3.8 (1/26)	44 (11/25)	42.6 (20/47)	56.3 (27/48)	68.9 (31/45)	35.7 (15/42)	13.6 (6/44)	7.4 (2/27)	*27.2 (113/416)*
G123	WC-Gigha	0 (0/6)	0 (0/6)	0 (0/20)	0 (0/23)	0 (0/21)	0 (0/17)	0 (0/17)	0 (0/15)	4.8 (1/21)	0 (0/23)	0 (0/20)	0 (0/10)	*0.5 (1/199)*
P6	WC-LochMelfort	0 (0/5)	0 (0/4)	0 (0/18)	0 (0/18)	0 (0/16)	0 (0/17)	22.7 (5/22)	38.1 (8/21)	31.8 (7/22)	10.5 (2/19)	0 (0/16)	0 (0/11)	*11.6 (22/189)*
G10	WC-LochEtive	0 (0/5)	0 (0/4)	0 (0/21)	0 (0/25)	0 (0/24)	0 (0/22)	0 (0/23)	0 (0/21)	0 (0/21)	0 (0/19)	0 (0/18)	0 (0/14)	*0 (0/217)*
G9	WC-LochCreranLinnhe	0 (0/7)	0 (0/7)	0 (0/19)	0 (0/17)	0 (0/18)	0 (0/18)	0 (0/22)	0 (0/21)	0 (0/21)	0 (0/19)	0 (0/22)	0 (0/13)	*0 (0/204)*
G31	WC-LochLevenEil	0 (0/6)	0 (0/6)	0 (0/21)	0 (0/24)	0 (0/19)	0 (0/24)	0 (0/42)	2.3 (1/43)	0 (0/38)	0 (0/29)	0 (0/28)	0 (0/19)	*0.3 (1/299)*
G28	WC-Lochaber	0 (0/6)	0 (0/7)	0 (0/28)	0 (0/30)	0 (0/26)	3.1 (1/32)	41.2 (21/51)	52.9 (27/51)	18.2 (10/55)	0 (0/28)	0 (0/26)	0 (0/12)	*16.8 (59/352)*
P5	Mull-LochSpelve	0 (0/2)	0 (0/5)	0 (0/15)	0 (0/18)	0 (0/17)	0 (0/17)	0 (0/23)	0 (0/21)	0 (0/21)	0 (0/17)	0 (0/10)	0 (0/5)	*0 (0/171)*
P7	Mull-LochScridain	0 (0/4)	0 (0/5)	0 (0/16)	0 (0/18)	0 (0/17)	33.3 (5/15)	55.6 (10/18)	88.2 (15/17)	50 (9/18)	11.8 (2/17)	0 (0/17)	0 (0/10)	*23.8 (41/172)*
G1	Mull-other	0 (0/2)	0 (0/3)	0 (0/8)	0 (0/4)	0 (0/5)	0 (0/4)	0 (0/9)	11.1 (1/9)	28.6 (2/7)	0 (0/9)	0 (0/9)	0 (0/5)	*4.1 (3/74)*
P41	Skye-LochEishort	0 (0/4)	0 (0/5)	0 (0/18)	0 (0/18)	0 (0/14)	14.3 (2/14)	40.9 (9/22)	57.1 (12/21)	26.1 (6/23)	16.7 (3/18)	0 (0/16)	0 (0/11)	*17.4 (32/184)*
G42	Skye-other	0 (0/5)	0 (0/7)	0 (0/22)	0 (0/21)	0 (0/21)	5.3 (1/19)	9.7 (3/31)	0 (0/30)	0 (0/31)	0 (0/19)	0 (0/22)	0 (0/13)	*1.7 (4/241)*
G21	Lewis-LochLeurbostErisort	0 (0/8)	0 (0/10)	0 (0/34)	0 (0/34)	0 (0/36)	0 (0/34)	13.6 (6/44)	0 (0/46)	0 (0/44)	0 (0/34)	0 (0/33)	0 (0/22)	*1.6 (6/379)*
G23	Lewis-LochRoag	0 (0/12)	0 (0/15)	0 (0/51)	0 (0/52)	0 (0/50)	14.5 (8/55)	38.3 (23/60)	38.5 (25/65)	19.7 (13/66)	0 (0/55)	0 (0/50)	0 (0/33)	*12.2 (69/564)*
G22	HarrisUist	0 (0/22)	0 (0/29)	0 (0/53)	0 (0/53)	0 (0/50)	0 (0/47)	3.1 (2/65)	3.4 (2/58)	1.7 (1/58)	2 (1/50)	0 (0/49)	0 (0/30)	*1.1 (6/564)*
G35	NWC-LochTorridon	0 (0/6)	0 (0/8)	0 (0/23)	0 (0/23)	0 (0/20)	17.6 (3/17)	18.5 (5/27)	24.1 (7/29)	40 (12/30)	13.8 (4/29)	0 (0/24)	0 (0/15)	*12.4 (31/251)*
G39	NWC-LochEweBroom	0 (0/5)	0 (0/7)	0 (0/21)	0 (0/22)	4.5 (1/22)	14.3 (3/21)	16.7 (5/30)	26.9 (7/26)	26.9 (7/26)	13.6 (3/22)	0 (0/22)	0 (0/12)	*11 (26/236)*
G48	NWC-LochLaxfordInchard	0 (0/10)	0 (0/8)	0 (0/33)	0 (0/35)	0 (0/33)	24 (6/25)	60 (24/40)	56.1 (23/41)	44.2 (19/43)	24.2 (8/33)	18.8 (6/32)	4.8 (1/21)	*24.6 (87/354)*
G49	NWC-other	0 (0/5)	0 (0/5)	0 (0/18)	0 (0/16)	0 (0/16)	0 (0/16)	31.6 (6/19)	40.9 (9/22)	22.7 (5/22)	5.6 (1/18)	0 (0/13)	0 (0/9)	*11.7 (21/179)*
P38	Tain	0 (0/4)	0 (0/5)	0 (0/10)	0 (0/13)	0 (0/11)	28.6 (4/14)	10 (2/20)	5.6 (1/18)	0 (0/17)	0 (0/11)	0 (0/11)	0 (0/8)	*4.9 (7/142)*
G54	Orkney	0 (0/2)	0 (0/3)	0 (0/6)	0 (0/4)	0 (0/4)	0 (0/4)	0 (0/7)	0 (0/13)	0 (0/8)	0 (0/6)	0 (0/9)	0 (0/2)	*0 (0/68)*
G67	Shetland-SE-CliftSound	0 (0/6)	0 (0/8)	0 (0/27)	0 (0/31)	0 (0/29)	0 (0/25)	17 (8/47)	25.7 (9/35)	15.2 (5/33)	0 (0/24)	0 (0/16)	0 (0/14)	*7.5 (22/295)*
G56	Shetland-SE-DalesVoe	0 (0/4)	0 (0/5)	0 (0/18)	5.9 (1/17)	0 (0/19)	0 (0/23)	11.5 (3/26)	19.2 (5/26)	22.7 (5/22)	5.9 (1/17)	5.9 (1/17)	0 (0/11)	*7.8 (16/205)*
G57	Shetland-SE-SandsoundWeisdale	0 (0/8)	0 (0/10)	0 (0/33)	0 (0/35)	0 (0/31)	0 (0/32)	12.8 (5/39)	27.3 (12/44)	23.3 (10/43)	11.4 (4/35)	0 (0/32)	0 (0/21)	*8.5 (31/363)*
P61	Shetland-SW-GrutingVoe	0 (0/5)	0 (0/4)	0 (0/16)	0 (0/15)	0 (0/18)	0 (0/16)	17.4 (4/23)	18.2 (4/22)	15 (3/20)	0 (0/15)	0 (0/12)	0 (0/7)	*6.4 (11/173)*
P68	Shetland-SW-Vaila	0 (0/5)	0 (0/4)	0 (0/15)	0 (0/16)	0 (0/18)	0 (0/16)	13.6 (3/22)	28.6 (6/21)	13.6 (3/22)	0 (0/17)	0 (0/15)	0 (0/9)	*6.7 (12/180)*
P72	Shetland-W-AithVoe	0 (0/4)	0 (0/5)	0 (0/17)	0 (0/18)	0 (0/16)	0 (0/18)	23.8 (5/21)	18.2 (4/22)	18.2 (4/22)	0 (0/17)	0 (0/16)	0 (0/10)	*7 (13/186)*
P64	Shetland-W-BustaVoe	0 (0/5)	0 (0/5)	0 (0/18)	0 (0/18)	0 (0/16)	0 (0/18)	18.2 (4/22)	18.2 (4/22)	18.2 (4/22)	0 (0/19)	0 (0/16)	0 (0/10)	*6.3 (12/191)*
P70	Shetland-W-OlnaFirth	0 (0/5)	0 (0/4)	0 (0/18)	0 (0/18)	0 (0/16)	0 (0/18)	9.1 (2/22)	19 (4/21)	20.8 (5/24)	0 (0/18)	0 (0/16)	0 (0/11)	*5.8 (11/191)*
G58	Shetland-W-VementryVoe	0 (0/7)	0 (0/9)	0 (0/26)	0 (0/23)	0 (0/24)	0 (0/31)	20 (7/35)	24.2 (8/33)	21.4 (6/28)	19 (4/21)	11.1 (2/18)	0 (0/11)	*10.2 (27/266)*
G71	Shetland-W-RonasVoe	0 (0/1)	0 (0/4)	0 (0/12)	0 (0/2)	0 (0/10)	0 (0/13)	30.8 (4/13)	55 (11/20)	27.8 (5/18)	25 (3/12)	18.2 (2/11)	33.3 (2/6)	*22.1 (27/122)*
P65	Shetland-N-Basta	0 (0/5)	0 (0/5)	0 (0/17)	0 (0/17)	0 (0/15)	0 (0/17)	20 (4/20)	15 (3/20)	4.3 (1/23)	0 (0/18)	0 (0/17)	0 (0/12)	*4.3 (8/186)*
G81	Shetland-N-Uyea	0 (0/15)	0 (0/16)	0 (0/46)	0 (0/47)	0 (0/36)	0 (0/20)	4.5 (1/22)	27.1 (13/48)	18.8 (12/64)	3.9 (2/51)	2.1 (1/48)	0 (0/24)	*6.6 (29/437)*
		0				*0.5*		*20.2*	*25.7*	*20.2*			*1.2*	
	Total	*(0/231)*	*0 (0/265)*	*0 (0/819)*	*0.5 (4/822)*	*(4/765)*	*7.1 (54/757)*	*(205/1014)*	*(266/1034)*	*(211/1046)*	*7.6 (64/837)*	*3.3 (26/779)*	*(6/488)*	*9.5 (840/8857)*

Table B13: Percentage of mussel samples for which OA exceeds 80 µg/kg, per group and month, based on data from 2011-15. In brackets: number of samples exceeding 80 µg/kg over total number of samples.

GroupsM	GroupNameM	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	*Total*
G80	EastCoast	0 (0/4)	0 (0/2)	0 (0/5)	0 (0/6)	0 (0/4)	25 (1/4)	100 (2/2)	83.3 (5/6)	100 (5/5)	44.4 (4/9)	100 (4/4)	42.9 (3/7)	*41.4 (24/58)*
G26	Dumfries	0 (0/4)	0 (0/5)	0 (0/17)	0 (0/18)	0 (0/16)	0 (0/17)	0 (0/22)	0 (0/21)	0 (0/23)	0 (0/16)	0 (0/16)	0 (0/11)	*0 (0/186)*
G8	Ayr-LochStriven	16.7 (1/6)	11.1 (1/9)	5.3 (1/19)	0 (0/19)	13.3 (2/15)	62.5 (10/16)	75 (15/20)	85 (17/20)	76 (19/25)	57.1 (8/14)	58.8 (10/17)	45.5 (5/11)	*46.6 (89/191)*
P16	Ayr-LochFyneArdkinglas	0 (0/4)	0 (0/5)	11.8 (2/17)	22.2 (4/18)	31.3 (5/16)	25 (4/16)	42.1 (8/19)	35.3 (6/17)	40 (6/15)	17.6 (3/17)	5.9 (1/17)	0 (0/11)	*22.7 (39/172)*
G18	Ayr-other	11.8 (2/17)	0 (0/16)	0 (0/43)	2.8 (1/36)	11.5 (3/26)	44 (11/25)	51.1 (24/47)	64.6 (31/48)	75.6 (34/45)	52.4 (22/42)	29.5 (13/44)	29.6 (8/27)	*35.8 (149/416)*
G123	WC-Gigha	0 (0/6)	0 (0/6)	0 (0/20)	0 (0/23)	0 (0/21)	0 (0/17)	11.8 (2/17)	6.7 (1/15)	14.3 (3/21)	13 (3/23)	5 (1/20)	0 (0/10)	*5 (10/199)*
P6	WC-LochMelfort	0 (0/5)	0 (0/4)	0 (0/18)	0 (0/18)	6.3 (1/16)	0 (0/17)	45.5 (10/22)	61.9 (13/21)	72.7 (16/22)	36.8 (7/19)	0 (0/16)	0 (0/11)	*24.9 (47/189)*
G10	WC-LochEtive	0 (0/5)	0 (0/4)	0 (0/21)	0 (0/25)	0 (0/24)	0 (0/22)	4.3 (1/23)	4.8 (1/21)	0 (0/21)	0 (0/19)	0 (0/18)	0 (0/14)	*0.9 (2/217)*
G9	WC-LochCreranLinnhe	0 (0/7)	0 (0/7)	0 (0/19)	0 (0/17)	0 (0/18)	0 (0/18)	0 (0/22)	0 (0/21)	0 (0/21)	0 (0/19)	0 (0/22)	0 (0/13)	*0 (0/204)*
G31	WC-LochLevenEil	0 (0/6)	0 (0/6)	0 (0/21)	0 (0/24)	0 (0/19)	0 (0/24)	4.8 (2/42)	7 (3/43)	2.6 (1/38)	0 (0/29)	0 (0/28)	0 (0/19)	*2 (6/299)*
G28	WC-Lochaber	0 (0/6)	0 (0/7)	0 (0/28)	0 (0/30)	0 (0/26)	21.9 (7/32)	60.8 (31/51)	68.6 (35/51)	34.5 (19/55)	21.4 (6/28)	0 (0/26)	0 (0/12)	*27.8 (98/352)*
P5	Mull-LochSpelve	0 (0/2)	0 (0/5)	0 (0/15)	0 (0/18)	5.9 (1/17)	0 (0/17)	0 (0/23)	0 (0/21)	0 (0/21)	0 (0/17)	0 (0/10)	0 (0/5)	*0.6 (1/171)*
P7	Mull-LochScridain	0 (0/4)	0 (0/5)	0 (0/16)	0 (0/18)	17.6 (3/17)	66.7 (10/15)	100 (18/18)	100 (17/17)	77.8 (14/18)	29.4 (5/17)	5.9 (1/17)	0 (0/10)	*39.5 (68/172)*
G1	Mull-other	0 (0/2)	0 (0/3)	0 (0/8)	0 (0/4)	0 (0/5)	0 (0/4)	0 (0/9)	33.3 (3/9)	28.6 (2/7)	0 (0/9)	0 (0/9)	0 (0/5)	*6.8 (5/74)*
P41	Skye-LochEishort	0 (0/4)	0 (0/5)	0 (0/18)	0 (0/18)	0 (0/14)	78.6 (11/14)	68.2 (15/22)	81 (17/21)	65.2 (15/23)	33.3 (6/18)	12.5 (2/16)	0 (0/11)	*35.9 (66/184)*
G42	Skye-other	0 (0/5)	0 (0/7)	0 (0/22)	0 (0/21)	0 (0/21)	5.3 (1/19)	16.1 (5/31)	33.3 (10/30)	16.1 (5/31)	10.5 (2/19)	4.5 (1/22)	0 (0/13)	*10 (24/241)*
G21	Lewis-LochLeurbostErisort	0 (0/8)	0 (0/10)	0 (0/34)	0 (0/34)	2.8 (1/36)	17.6 (6/34)	36.4 (16/44)	26.1 (12/46)	0 (0/44)	0 (0/34)	0 (0/33)	0 (0/22)	*9.2 (35/379)*
G23	Lewis-LochRoag	0 (0/12)	0 (0/15)	0 (0/51)	0 (0/52)	0 (0/50)	30.9 (17/55)	68.3 (41/60)	73.8 (48/65)	33.3 (22/66)	9.1 (5/55)	0 (0/50)	0 (0/33)	*23.6 (133/564)*
G22	HarrisUist	0 (0/22)	0 (0/29)	0 (0/53)	0 (0/53)	0 (0/50)	0 (0/47)	10.8 (7/65)	13.8 (8/58)	12.1 (7/58)	10 (5/50)	2 (1/49)	0 (0/30)	*5 (28/564)*
G35	NWC-LochTorridon	0 (0/6)	0 (0/8)	0 (0/23)	0 (0/23)	0 (0/20)	23.5 (4/17)	37 (10/27)	48.3 (14/29)	43.3 (13/30)	17.2 (5/29)	16.7 (4/24)	0 (0/15)	*19.9 (50/251)*
G39	NWC-LochEweBroom	0 (0/5)	0 (0/7)	0 (0/21)	0 (0/22)	4.5 (1/22)	38.1 (8/21)	30 (9/30)	34.6 (9/26)	46.2 (12/26)	18.2 (4/22)	4.5 (1/22)	0 (0/12)	*18.6 (44/236)*
G48	NWC-LochLaxfordInchard	0 (0/10)	0 (0/8)	0 (0/33)	0 (0/35)	6.1 (2/33)	44 (11/25)	77.5 (31/40)	82.9 (34/41)	69.8 (30/43)	36.4 (12/33)	25 (8/32)	19 (4/21)	*37.3 (132/354)*
G49	NWC-other	0 (0/5)	0 (0/5)	0 (0/18)	0 (0/16)	0 (0/16)	6.3 (1/16)	36.8 (7/19)	54.5 (12/22)	50 (11/22)	27.8 (5/18)	0 (0/13)	0 (0/9)	*20.1 (36/179)*
P38	Tain	0 (0/4)	0 (0/5)	0 (0/10)	0 (0/13)	0 (0/11)	42.9 (6/14)	35 (7/20)	16.7 (3/18)	17.6 (3/17)	0 (0/11)	9.1 (1/11)	0 (0/8)	*14.1 (20/142)*
G54	Orkney	0 (0/2)	0 (0/3)	0 (0/6)	0 (0/4)	0 (0/4)	0 (0/4)	0 (0/7)	0 (0/13)	0 (0/8)	0 (0/6)	0 (0/9)	0 (0/2)	*0 (0/68)*
G67	Shetland-SE-CliftSound	0 (0/6)	0 (0/8)	0 (0/27)	0 (0/31)	0 (0/29)	0 (0/25)	29.8 (14/47)	37.1 (13/35)	39.4 (13/33)	8.3 (2/24)	0 (0/16)	0 (0/14)	*14.2 (42/295)*
G56	Shetland-SE-DalesVoe	0 (0/4)	0 (0/5)	0 (0/18)	5.9 (1/17)	0 (0/19)	0 (0/23)	23.1 (6/26)	23.1 (6/26)	27.3 (6/22)	23.5 (4/17)	17.6 (3/17)	0 (0/11)	*12.7 (26/205)*
G57	Shetland-SE-SandsoundWeisdale	0 (0/8)	10 (1/10)	0 (0/33)	0 (0/35)	0 (0/31)	0 (0/32)	33.3 (13/39)	63.6 (28/44)	46.5 (20/43)	20 (7/35)	12.5 (4/32)	4.8 (1/21)	*20.4 (74/363)*
P61	Shetland-SW-GrutingVoe	0 (0/5)	0 (0/4)	0 (0/16)	0 (0/15)	0 (0/18)	0 (0/16)	34.8 (8/23)	36.4 (8/22)	55 (11/20)	20 (3/15)	0 (0/12)	0 (0/7)	*17.3 (30/173)*
P68	Shetland-SW-Vaila	0 (0/5)	0 (0/4)	0 (0/15)	0 (0/16)	0 (0/18)	0 (0/16)	22.7 (5/22)	42.9 (9/21)	36.4 (8/22)	5.9 (1/17)	0 (0/15)	0 (0/9)	*12.8 (23/180)*
P72	Shetland-W-AithVoe	0 (0/4)	0 (0/5)	0 (0/17)	0 (0/18)	0 (0/16)	0 (0/18)	38.1 (8/21)	36.4 (8/22)	27.3 (6/22)	0 (0/17)	0 (0/16)	20 (2/10)	*12.9 (24/186)*
P64	Shetland-W-BustaVoe	0 (0/5)	0 (0/5)	0 (0/18)	0 (0/18)	0 (0/16)	0 (0/18)	27.3 (6/22)	36.4 (8/22)	18.2 (4/22)	5.3 (1/19)	0 (0/16)	30 (3/10)	*11.5 (22/191)*
P70	Shetland-W-OlnaFirth	0 (0/5)	0 (0/4)	0 (0/18)	0 (0/18)	0 (0/16)	0 (0/18)	9.1 (2/22)	23.8 (5/21)	29.2 (7/24)	0 (0/18)	0 (0/16)	27.3 (3/11)	*8.9 (17/191)*
G58	Shetland-W-VementryVoe	28.6 (2/7)	0 (0/9)	3.8 (1/26)	0 (0/23)	4.2 (1/24)	0 (0/31)	25.7 (9/35)	39.4 (13/33)	42.9 (12/28)	28.6 (6/21)	27.8 (5/18)	0 (0/11)	*18.4 (49/266)*
G71	Shetland-W-RonasVoe	0 (0/1)	0 (0/4)	0 (0/12)	0 (0/2)	0 (0/10)	0 (0/13)	38.5 (5/13)	60 (12/20)	50 (9/18)	41.7 (5/12)	18.2 (2/11)	33.3 (2/6)	*28.7 (35/122)*
P65	Shetland-N-Basta	0 (0/5)	0 (0/5)	0 (0/17)	0 (0/17)	0 (0/15)	0 (0/17)	20 (4/20)	20 (4/20)	13 (3/23)	0 (0/18)	0 (0/17)	0 (0/12)	*5.9 (11/186)*
G81	Shetland-N-Uyea	0 (0/15)	0 (0/16)	0 (0/46)	0 (0/47)	0 (0/36)	0 (0/20)	13.6 (3/22)	33.3 (16/48)	26.6 (17/64)	17.6 (9/51)	2.1 (1/48)	4.2 (1/24)	*10.8 (47/437)*
			0.8				*14.3*	*33.9*	*41.5*	*33.7*	*16.7*			
	Total	*2.2 (5/231)*	*(2/265)*	*0.5 (4/819)*	*0.7 (6/822)*	*2.6 (20/765)*	*(108/757)*	*(344/1014)*	*(429/1034)*	*(353/1046)*	*(140/837)*	*8.1 (63/779)*	*6.6 (32/488)*	*17 (1506/8857)*

Table B14: Percentage of mussel samples for which OA exceeds 0 µg/kg, per group and month, based on data from 2011-15. In brackets: number of samples exceeding 0 µg/kg over total number of samples.

GroupsM	GroupNameM	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	*Total*
G80	EastCoast	50 (2/4)	0 (0/2)	80 (4/5)	0 (0/6)	25 (1/4)	50 (2/4)	100 (2/2)	100 (6/6)	100 (5/5)	55.6 (5/9)	100 (4/4)	42.9 (3/7)	*58.6 (34/58)*
G26	Dumfries	0 (0/4)	0 (0/5)	0 (0/17)	0 (0/18)	0 (0/16)	5.9 (1/17)	13.6 (3/22)	4.8 (1/21)	4.3 (1/23)	0 (0/16)	0 (0/16)	0 (0/11)	*3.2 (6/186)*
G8	Ayr-LochStriven	33.3 (2/6)	33.3 (3/9)	47.4 (9/19)	26.3 (5/19)	26.7 (4/15)	75 (12/16)	90 (18/20)	90 (18/20)	92 (23/25)	85.7 (12/14)	88.2 (15/17)	81.8 (9/11)	*68.1 (130/191)*
P16	Ayr-LochFyneArdkinglas	50 (2/4)	20 (1/5)	29.4 (5/17)	38.9 (7/18)	37.5 (6/16)	56.3 (9/16)	73.7 (14/19)	58.8 (10/17)	60 (9/15)	76.5 (13/17)	64.7 (11/17)	36.4 (4/11)	*52.9 (91/172)*
G18	Ayr-other	35.3 (6/17)	25 (4/16)	32.6 (14/43)	38.9 (14/36)	30.8 (8/26)	52 (13/25)	74.5 (35/47)	83.3 (40/48)	86.7 (39/45)	69 (29/42)	54.5 (24/44)	59.3 (16/27)	*58.2 (242/416)*
G123	WC-Gigha	0 (0/6)	16.7 (1/6)	35 (7/20)	17.4 (4/23)	14.3 (3/21)	23.5 (4/17)	47.1 (8/17)	26.7 (4/15)	52.4 (11/21)	39.1 (9/23)	40 (8/20)	30 (3/10)	*31.2 (62/199)*
P6	WC-LochMelfort	0 (0/5)	0 (0/4)	5.6 (1/18)	0 (0/18)	12.5 (2/16)	58.8 (10/17)	68.2 (15/22)	95.2 (20/21)	95.5 (21/22)	63.2 (12/19)	37.5 (6/16)	9.1 (1/11)	*46.6 (88/189)*
G10	WC-LochEtive	0 (0/5)	0 (0/4)	0 (0/21)	4 (1/25)	4.2 (1/24)	13.6 (3/22)	21.7 (5/23)	57.1 (12/21)	47.6 (10/21)	15.8 (3/19)	5.6 (1/18)	0 (0/14)	*16.6 (36/217)*
G9	WC-LochCreranLinnhe	0 (0/7)	0 (0/7)	5.3 (1/19)	5.9 (1/17)	5.6 (1/18)	0 (0/18)	22.7 (5/22)	33.3 (7/21)	52.4 (11/21)	10.5 (2/19)	0 (0/22)	0 (0/13)	*13.7 (28/204)*
G31	WC-LochLevenEil	0 (0/6)	0 (0/6)	0 (0/21)	0 (0/24)	15.8 (3/19)	4.2 (1/24)	23.8 (10/42)	30.2 (13/43)	15.8 (6/38)	10.3 (3/29)	0 (0/28)	0 (0/19)	*12 (36/299)*
G28	WC-Lochaber	16.7 (1/6)	0 (0/7)	7.1 (2/28)	3.3 (1/30)	26.9 (7/26)	59.4 (19/32)	74.5 (38/51)	88.2 (45/51)	81.8 (45/55)	46.4 (13/28)	15.4 (4/26)	0 (0/12)	*49.7 (175/352)*
P5	Mull-LochSpelve	0 (0/2)	0 (0/5)	0 (0/15)	0 (0/18)	11.8 (2/17)	23.5 (4/17)	34.8 (8/23)	57.1 (12/21)	28.6 (6/21)	0 (0/17)	0 (0/10)	0 (0/5)	*18.7 (32/171)*
P7	Mull-LochScridain	0 (0/4)	0 (0/5)	18.8 (3/16)	16.7 (3/18)	76.5 (13/17)	100 (15/15)	100 (18/18)	100 (17/17)	94.4 (17/18)	58.8 (10/17)	35.3 (6/17)	10 (1/10)	*59.9 (103/172)*
G1	Mull-other	0 (0/2)	0 (0/3)	0 (0/8)	0 (0/4)	0 (0/5)	0 (0/4)	11.1 (1/9)	33.3 (3/9)	42.9 (3/7)	0 (0/9)	0 (0/9)	0 (0/5)	*9.5 (7/74)*
P41	Skye-LochEishort	25 (1/4)	0 (0/5)	16.7 (3/18)	16.7 (3/18)	42.9 (6/14)	92.9 (13/14)	86.4 (19/22)	95.2 (20/21)	95.7 (22/23)	61.1 (11/18)	43.8 (7/16)	27.3 (3/11)	*58.7 (108/184)*
G42	Skye-other	20 (1/5)	0 (0/7)	0 (0/22)	0 (0/21)	4.8 (1/21)	21.1 (4/19)	58.1 (18/31)	60 (18/30)	61.3 (19/31)	21.1 (4/19)	18.2 (4/22)	23.1 (3/13)	*29.9 (72/241)*
G21	Lewis-LochLeurbostErisort	0 (0/8)	0 (0/10)	0 (0/34)	0 (0/34)	5.6 (2/36)	29.4 (10/34)	86.4 (38/44)	63 (29/46)	31.8 (14/44)	5.9 (2/34)	0 (0/33)	0 (0/22)	*25.1 (95/379)*
G23	Lewis-LochRoag	0 (0/12)	0 (0/15)	2 (1/51)	0 (0/52)	4 (2/50)	54.5 (30/55)	93.3 (56/60)	93.8 (61/65)	86.4 (57/66)	30.9 (17/55)	8 (4/50)	0 (0/33)	*40.4 (228/564)*
G22	HarrisUist	0 (0/22)	0 (0/29)	0 (0/53)	0 (0/53)	2 (1/50)	17 (8/47)	55.4 (36/65)	60.3 (35/58)	43.1 (25/58)	32 (16/50)	10.2 (5/49)	6.7 (2/30)	*22.7 (128/564)*
G35	NWC-LochTorridon	16.7 (1/6)	0 (0/8)	21.7 (5/23)	8.7 (2/23)	10 (2/20)	52.9 (9/17)	81.5 (22/27)	65.5 (19/29)	60 (18/30)	31 (9/29)	25 (6/24)	13.3 (2/15)	*37.8 (95/251)*
G39	NWC-LochEweBroom	20 (1/5)	0 (0/7)	19 (4/21)	18.2 (4/22)	31.8 (7/22)	57.1 (12/21)	66.7 (20/30)	46.2 (12/26)	57.7 (15/26)	36.4 (8/22)	31.8 (7/22)	8.3 (1/12)	*38.6 (91/236)*
G48	NWC-LochLaxfordInchard	20 (2/10)	12.5 (1/8)	30.3 (10/33)	14.3 (5/35)	33.3 (11/33)	80 (20/25)	92.5 (37/40)	95.1 (39/41)	90.7 (39/43)	54.5 (18/33)	31.3 (10/32)	28.6 (6/21)	*55.9 (198/354)*
G49	NWC-other	0 (0/5)	0 (0/5)	0 (0/18)	0 (0/16)	6.3 (1/16)	50 (8/16)	52.6 (10/19)	63.6 (14/22)	72.7 (16/22)	38.9 (7/18)	30.8 (4/13)	33.3 (3/9)	*35.2 (63/179)*
P38	Tain	0 (0/4)	20 (1/5)	0 (0/10)	15.4 (2/13)	27.3 (3/11)	71.4 (10/14)	75 (15/20)	55.6 (10/18)	29.4 (5/17)	0 (0/11)	36.4 (4/11)	50 (4/8)	*38 (54/142)*
G54	Orkney	0 (0/2)	0 (0/3)	0 (0/6)	0 (0/4)	0 (0/4)	0 (0/4)	14.3 (1/7)	0 (0/13)	0 (0/8)	0 (0/6)	0 (0/9)	0 (0/2)	*1.5 (1/68)*
G67	Shetland-SE-CliftSound	16.7 (1/6)	0 (0/8)	7.4 (2/27)	9.7 (3/31)	3.4 (1/29)	16 (4/25)	59.6 (28/47)	68.6 (24/35)	60.6 (20/33)	37.5 (9/24)	6.3 (1/16)	14.3 (2/14)	*32.2 (95/295)*
G56	Shetland-SE-DalesVoe	25 (1/4)	20 (1/5)	22.2 (4/18)	23.5 (4/17)	5.3 (1/19)	21.7 (5/23)	46.2 (12/26)	61.5 (16/26)	54.5 (12/22)	29.4 (5/17)	23.5 (4/17)	27.3 (3/11)	*33.2 (68/205)*
G57	Shetland-SE-SandsoundWeisdale	37.5 (3/8)	30 (3/10)	27.3 (9/33)	22.9 (8/35)	19.4 (6/31)	40.6 (13/32)	59 (23/39)	88.6 (39/44)	83.7 (36/43)	51.4 (18/35)	31.3 (10/32)	23.8 (5/21)	*47.7 (173/363)*
P61	Shetland-SW-GrutingVoe	20 (1/5)	25 (1/4)	18.8 (3/16)	26.7 (4/15)	22.2 (4/18)	18.8 (3/16)	56.5 (13/23)	68.2 (15/22)	75 (15/20)	60 (9/15)	33.3 (4/12)	28.6 (2/7)	*42.8 (74/173)*
P68	Shetland-SW-Vaila	20 (1/5)	25 (1/4)	20 (3/15)	18.8 (3/16)	11.1 (2/18)	12.5 (2/16)	59.1 (13/22)	76.2 (16/21)	59.1 (13/22)	35.3 (6/17)	26.7 (4/15)	44.4 (4/9)	*37.8 (68/180)*
P72	Shetland-W-AithVoe	25 (1/4)	20 (1/5)	29.4 (5/17)	16.7 (3/18)	6.3 (1/16)	22.2 (4/18)	52.4 (11/21)	68.2 (15/22)	68.2 (15/22)	52.9 (9/17)	31.3 (5/16)	20 (2/10)	*38.7 (72/186)*
P64	Shetland-W-BustaVoe	20 (1/5)	20 (1/5)	22.2 (4/18)	16.7 (3/18)	12.5 (2/16)	22.2 (4/18)	45.5 (10/22)	68.2 (15/22)	63.6 (14/22)	42.1 (8/19)	25 (4/16)	30 (3/10)	*36.1 (69/191)*
P70	Shetland-W-OlnaFirth	20 (1/5)	25 (1/4)	22.2 (4/18)	16.7 (3/18)	0 (0/16)	11.1 (2/18)	31.8 (7/22)	42.9 (9/21)	58.3 (14/24)	27.8 (5/18)	18.8 (3/16)	27.3 (3/11)	*27.2 (52/191)*
G58	Shetland-W-VementryVoe	28.6 (2/7)	22.2 (2/9)	19.2 (5/26)	26.1 (6/23)	16.7 (4/24)	25.8 (8/31)	51.4 (18/35)	69.7 (23/33)	71.4 (20/28)	52.4 (11/21)	38.9 (7/18)	27.3 (3/11)	*41 (109/266)*
G71	Shetland-W-RonasVoe	100 (1/1)	25 (1/4)	41.7 (5/12)	0 (0/2)	0 (0/10)	0 (0/13)	53.8 (7/13)	80 (16/20)	100 (18/18)	83.3 (10/12)	27.3 (3/11)	50 (3/6)	*52.5 (64/122)*
P65	Shetland-N-Basta	20 (1/5)	0 (0/5)	11.8 (2/17)	5.9 (1/17)	0 (0/15)	5.9 (1/17)	30 (6/20)	35 (7/20)	39.1 (9/23)	27.8 (5/18)	23.5 (4/17)	16.7 (2/12)	*20.4 (38/186)*
G81	Shetland-N-Uyea	20 (3/15)	12.5 (2/16)	15.2 (7/46)	4.3 (2/47)	8.3 (3/36)	0 (0/20)	27.3 (6/22)	52.1 (25/48)	48.4 (31/64)	33.3 (17/51)	25 (12/48)	37.5 (9/24)	*26.8 (117/437)*
						14.5	*34.7*	*59.8*	*66.2*	*62.5*	*37.6*	*24.5*	*20.9*	
	Total	*15.6 (36/231)*	*9.4 (25/265)*	*14.9 (122/819)*	*11.2 (92/822)*	*(111/765)*	*(263/757)*	*(606/1014)*	*(685/1034)*	*(654/1046)*	*(315/837)*	*(191/779)*	*(102/488)*	*36.2 (3202/8857)*

Table B15: Percentage of mussel samples for which YTX exceeds 1.85 mg/kg, per group and month, based on data from 2011-15. In brackets: number of samples exceeding 1.85 mg/kg over total number of samples. Note: no mussel samples exceeded the MPL of 3.75 mg/kg.

GroupsM	GroupNameM	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	*Total*
G80	EastCoast	0 (0/4)	0 (0/2)	0 (0/5)	0 (0/6)	0 (0/4)	0 (0/4)	0 (0/2)	0 (0/6)	0 (0/5)	0 (0/9)	0 (0/4)	0 (0/7)	*0 (0/58)*
G26	Dumfries	0 (0/4)	0 (0/5)	0 (0/17)	0 (0/18)	0 (0/16)	0 (0/17)	0 (0/22)	0 (0/21)	0 (0/23)	0 (0/16)	0 (0/16)	0 (0/11)	*0 (0/186)*
G8	Ayr-LochStriven	0 (0/6)	0 (0/9)	0 (0/19)	0 (0/19)	0 (0/15)	12.5 (2/16)	5 (1/20)	0 (0/20)	0 (0/25)	0 (0/14)	0 (0/17)	0 (0/11)	*1.6 (3/191)*
P16	Ayr-LochFyneArdkinglas	0 (0/4)	0 (0/5)	0 (0/17)	0 (0/18)	0 (0/16)	0 (0/16)	0 (0/19)	0 (0/17)	0 (0/15)	0 (0/17)	0 (0/17)	0 (0/11)	*0 (0/172)*
G18	Ayr-other	0 (0/17)	0 (0/16)	0 (0/43)	0 (0/36)	0 (0/26)	20 (5/25)	2.1 (1/47)	0 (0/48)	0 (0/45)	0 (0/42)	0 (0/44)	0 (0/27)	*1.4 (6/416)*
G123	WC-Gigha	0 (0/6)	0 (0/6)	0 (0/20)	0 (0/23)	0 (0/21)	0 (0/17)	0 (0/17)	0 (0/15)	0 (0/21)	0 (0/23)	0 (0/20)	0 (0/10)	*0 (0/199)*
P6	WC-LochMelfort	0 (0/5)	0 (0/4)	0 (0/18)	0 (0/18)	0 (0/16)	0 (0/17)	0 (0/22)	0 (0/21)	0 (0/22)	0 (0/19)	0 (0/16)	0 (0/11)	*0 (0/189)*
G10	WC-LochEtive	0 (0/5)	0 (0/4)	0 (0/21)	0 (0/25)	0 (0/24)	0 (0/22)	0 (0/23)	0 (0/21)	0 (0/21)	0 (0/19)	0 (0/18)	0 (0/14)	*0 (0/217)*
G9	WC-LochCreranLinnhe	0 (0/7)	0 (0/7)	0 (0/19)	0 (0/17)	0 (0/18)	0 (0/18)	0 (0/22)	0 (0/21)	0 (0/21)	0 (0/19)	0 (0/22)	0 (0/13)	*0 (0/204)*
G31	WC-LochLevenEil	0 (0/6)	0 (0/6)	0 (0/21)	0 (0/24)	0 (0/19)	0 (0/24)	0 (0/42)	0 (0/43)	0 (0/38)	0 (0/29)	0 (0/28)	0 (0/19)	*0 (0/299)*
G28	WC-Lochaber	0 (0/6)	0 (0/7)	0 (0/28)	0 (0/30)	0 (0/26)	0 (0/32)	0 (0/51)	0 (0/51)	0 (0/55)	0 (0/28)	0 (0/26)	0 (0/12)	*0 (0/352)*
P5	Mull-LochSpelve	0 (0/2)	0 (0/5)	0 (0/15)	0 (0/18)	0 (0/17)	0 (0/17)	0 (0/23)	0 (0/21)	0 (0/21)	0 (0/17)	0 (0/10)	0 (0/5)	*0 (0/171)*
P7	Mull-LochScridain	0 (0/4)	0 (0/5)	0 (0/16)	0 (0/18)	0 (0/17)	0 (0/15)	0 (0/18)	0 (0/17)	0 (0/18)	0 (0/17)	0 (0/17)	0 (0/10)	*0 (0/172)*
G1	Mull-other	0 (0/2)	0 (0/3)	0 (0/8)	0 (0/4)	0 (0/5)	0 (0/4)	0 (0/9)	0 (0/9)	0 (0/7)	0 (0/9)	0 (0/9)	0 (0/5)	*0 (0/74)*
P41	Skye-LochEishort	0 (0/4)	0 (0/5)	0 (0/18)	0 (0/18)	0 (0/14)	0 (0/14)	0 (0/22)	0 (0/21)	0 (0/23)	0 (0/18)	0 (0/16)	0 (0/11)	*0 (0/184)*
G42	Skye-other	0 (0/5)	0 (0/7)	0 (0/22)	0 (0/21)	0 (0/21)	0 (0/19)	0 (0/31)	0 (0/30)	0 (0/31)	0 (0/19)	0 (0/22)	0 (0/13)	*0 (0/241)*
G21	Lewis-LochLeurbostErisort	0 (0/8)	0 (0/10)	0 (0/34)	0 (0/34)	0 (0/36)	0 (0/34)	0 (0/44)	0 (0/46)	0 (0/44)	0 (0/34)	0 (0/33)	0 (0/22)	*0 (0/379)*
G23	Lewis-LochRoag	0 (0/12)	0 (0/15)	0 (0/51)	0 (0/52)	0 (0/50)	0 (0/55)	0 (0/60)	0 (0/65)	0 (0/66)	0 (0/55)	0 (0/50)	0 (0/33)	*0 (0/564)*
G22	HarrisUist	0 (0/22)	0 (0/29)	0 (0/53)	0 (0/53)	0 (0/50)	0 (0/47)	0 (0/65)	0 (0/58)	0 (0/58)	0 (0/50)	0 (0/49)	0 (0/30)	*0 (0/564)*
G35	NWC-LochTorridon	0 (0/6)	0 (0/8)	0 (0/23)	0 (0/23)	0 (0/20)	0 (0/17)	0 (0/27)	0 (0/29)	0 (0/30)	0 (0/29)	0 (0/24)	0 (0/15)	*0 (0/251)*
G39	NWC-LochEweBroom	0 (0/5)	0 (0/7)	0 (0/21)	0 (0/22)	0 (0/22)	0 (0/21)	0 (0/30)	0 (0/26)	0 (0/26)	0 (0/22)	0 (0/22)	0 (0/12)	*0 (0/236)*
G48	NWC-LochLaxfordInchard	0 (0/10)	0 (0/8)	0 (0/33)	0 (0/35)	0 (0/33)	0 (0/25)	0 (0/40)	0 (0/41)	0 (0/43)	0 (0/33)	0 (0/32)	0 (0/21)	*0 (0/354)*
G49	NWC-other	0 (0/5)	0 (0/5)	0 (0/18)	0 (0/16)	0 (0/16)	0 (0/16)	0 (0/19)	0 (0/22)	0 (0/22)	0 (0/18)	0 (0/13)	0 (0/9)	*0 (0/179)*
P38	Tain	0 (0/4)	0 (0/5)	0 (0/10)	0 (0/13)	0 (0/11)	0 (0/14)	0 (0/20)	0 (0/18)	0 (0/17)	0 (0/11)	0 (0/11)	0 (0/8)	*0 (0/142)*
G54	Orkney	0 (0/2)	0 (0/3)	0 (0/6)	0 (0/4)	0 (0/4)	0 (0/4)	0 (0/7)	0 (0/13)	0 (0/8)	0 (0/6)	0 (0/9)	0 (0/2)	*0 (0/68)*
G67	Shetland-SE-CliftSound	0 (0/6)	0 (0/8)	0 (0/27)	0 (0/31)	0 (0/29)	0 (0/25)	0 (0/47)	0 (0/35)	0 (0/33)	0 (0/24)	0 (0/16)	0 (0/14)	*0 (0/295)*
G56	Shetland-SE-DalesVoe	0 (0/4)	0 (0/5)	0 (0/18)	0 (0/17)	0 (0/19)	0 (0/23)	0 (0/26)	0 (0/26)	0 (0/22)	0 (0/17)	0 (0/17)	0 (0/11)	*0 (0/205)*
G57	Shetland-SE-SandsoundWeisdale	0 (0/8)	0 (0/10)	0 (0/33)	0 (0/35)	0 (0/31)	0 (0/32)	0 (0/39)	0 (0/44)	0 (0/43)	0 (0/35)	0 (0/32)	0 (0/21)	*0 (0/363)*
P61	Shetland-SW-GrutingVoe	0 (0/5)	0 (0/4)	0 (0/16)	0 (0/15)	0 (0/18)	0 (0/16)	0 (0/23)	0 (0/22)	0 (0/20)	0 (0/15)	0 (0/12)	0 (0/7)	*0 (0/173)*
P68	Shetland-SW-Vaila	0 (0/5)	0 (0/4)	0 (0/15)	0 (0/16)	0 (0/18)	0 (0/16)	0 (0/22)	0 (0/21)	0 (0/22)	0 (0/17)	0 (0/15)	0 (0/9)	*0 (0/180)*
P72	Shetland-W-AithVoe	0 (0/4)	0 (0/5)	0 (0/17)	0 (0/18)	0 (0/16)	0 (0/18)	0 (0/21)	0 (0/22)	0 (0/22)	0 (0/17)	0 (0/16)	0 (0/10)	*0 (0/186)*
P64	Shetland-W-BustaVoe	0 (0/5)	0 (0/5)	0 (0/18)	0 (0/18)	0 (0/16)	0 (0/18)	0 (0/22)	0 (0/22)	0 (0/22)	0 (0/19)	0 (0/16)	0 (0/10)	*0 (0/191)*
P70	Shetland-W-OlnaFirth	0 (0/5)	0 (0/4)	0 (0/18)	0 (0/18)	0 (0/16)	0 (0/18)	0 (0/22)	0 (0/21)	0 (0/24)	0 (0/18)	0 (0/16)	0 (0/11)	*0 (0/191)*
G58	Shetland-W-VementryVoe	0 (0/7)	0 (0/9)	0 (0/26)	0 (0/23)	0 (0/24)	0 (0/31)	0 (0/35)	0 (0/33)	0 (0/28)	0 (0/21)	0 (0/18)	0 (0/11)	*0 (0/266)*
G71	Shetland-W-RonasVoe	0 (0/1)	0 (0/4)	0 (0/12)	0 (0/2)	0 (0/10)	0 (0/13)	0 (0/13)	0 (0/20)	0 (0/18)	0 (0/12)	0 (0/11)	0 (0/6)	*0 (0/122)*
P65	Shetland-N-Basta	0 (0/5)	0 (0/5)	0 (0/17)	0 (0/17)	0 (0/15)	0 (0/17)	0 (0/20)	0 (0/20)	0 (0/23)	0 (0/18)	0 (0/17)	0 (0/12)	*0 (0/186)*
G81	Shetland-N-Uyea	0 (0/15)	0 (0/16)	0 (0/46)	0 (0/47)	0 (0/36)	0 (0/20)	0 (0/22)	0 (0/48)	0 (0/64)	0 (0/51)	0 (0/48)	0 (0/24)	*0 (0/437)*
	Total	*0 (0/231)*	*0 (0/265)*	*0 (0/819)*	*0 (0/822)*	*0 (0/765)*	*0.9 (7/757)*	*0.2 (2/1014)*	*0 (0/1034)*	*0 (0/1046)*	*0 (0/837)*	*0 (0/779)*	*0 (0/488)*	*0.1 (9/8857)*

Table B16: Percentage of mussel samples for which YTX exceeds 0 mg/kg, per group and month, based on data from 2011-15. In brackets: number of samples exceeding 0 mg/kg over total number of samples.

GroupsM	GroupNameM	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	*Total*
G80	EastCoast	0 (0/4)	0 (0/2)	0 (0/5)	0 (0/6)	0 (0/4)	0 (0/4)	0 (0/2)	0 (0/6)	0 (0/5)	0 (0/9)	0 (0/4)	0 (0/7)	*0 (0/58)*
G26	Dumfries	0 (0/4)	0 (0/5)	0 (0/17)	0 (0/18)	0 (0/16)	0 (0/17)	0 (0/22)	0 (0/21)	0 (0/23)	0 (0/16)	0 (0/16)	0 (0/11)	*0 (0/186)*
G8	Ayr-LochStriven	16.7 (1/6)	0 (0/9)	10.5 (2/19)	21.1 (4/19)	6.7 (1/15)	25 (4/16)	40 (8/20)	20 (4/20)	12 (3/25)	28.6 (4/14)	17.6 (3/17)	9.1 (1/11)	*18.3 (35/191)*
P16	Ayr-LochFyneArdkinglas	0 (0/4)	0 (0/5)	0 (0/17)	16.7 (3/18)	37.5 (6/16)	31.3 (5/16)	47.4 (9/19)	47.1 (8/17)	0 (0/15)	0 (0/17)	0 (0/17)	0 (0/11)	*18 (31/172)*
G18	Ayr-other	5.9 (1/17)	0 (0/16)	9.3 (4/43)	47.2 (17/36)	38.5 (10/26)	52 (13/25)	51.1 (24/47)	35.4 (17/48)	11.1 (5/45)	4.8 (2/42)	9.1 (4/44)	3.7 (1/27)	*23.6 (98/416)*
G123	WC-Gigha	0 (0/6)	0 (0/6)	0 (0/20)	0 (0/23)	0 (0/21)	5.9 (1/17)	5.9 (1/17)	0 (0/15)	0 (0/21)	4.3 (1/23)	0 (0/20)	0 (0/10)	*1.5 (3/199)*
P6	WC-LochMelfort	20 (1/5)	25 (1/4)	0 (0/18)	0 (0/18)	0 (0/16)	0 (0/17)	36.4 (8/22)	81 (17/21)	40.9 (9/22)	5.3 (1/19)	12.5 (2/16)	27.3 (3/11)	*22.2 (42/189)*
G10	WC-LochEtive	0 (0/5)	0 (0/4)	0 (0/21)	0 (0/25)	0 (0/24)	0 (0/22)	0 (0/23)	0 (0/21)	19 (4/21)	31.6 (6/19)	22.2 (4/18)	7.1 (1/14)	*6.9 (15/217)*
G9	WC-LochCreranLinnhe	57.1 (4/7)	0 (0/7)	10.5 (2/19)	0 (0/17)	16.7 (3/18)	5.6 (1/18)	4.5 (1/22)	4.8 (1/21)	23.8 (5/21)	26.3 (5/19)	40.9 (9/22)	15.4 (2/13)	*16.2 (33/204)*
G31	WC-LochLevenEil	0 (0/6)	0 (0/6)	0 (0/21)	0 (0/24)	0 (0/19)	0 (0/24)	0 (0/42)	0 (0/43)	0 (0/38)	0 (0/29)	0 (0/28)	0 (0/19)	*0 (0/299)*
G28	WC-Lochaber	0 (0/6)	0 (0/7)	0 (0/28)	0 (0/30)	0 (0/26)	0 (0/32)	0 (0/51)	0 (0/51)	0 (0/55)	0 (0/28)	0 (0/26)	0 (0/12)	*0 (0/352)*
P5	Mull-LochSpelve	0 (0/2)	0 (0/5)	0 (0/15)	0 (0/18)	5.9 (1/17)	0 (0/17)	0 (0/23)	0 (0/21)	0 (0/21)	0 (0/17)	0 (0/10)	0 (0/5)	*0.6 (1/171)*
P7	Mull-LochScridain	0 (0/4)	0 (0/5)	0 (0/16)	0 (0/18)	17.6 (3/17)	6.7 (1/15)	0 (0/18)	0 (0/17)	0 (0/18)	0 (0/17)	0 (0/17)	0 (0/10)	*2.3 (4/172)*
G1	Mull-other	0 (0/2)	0 (0/3)	0 (0/8)	0 (0/4)	0 (0/5)	0 (0/4)	0 (0/9)	0 (0/9)	0 (0/7)	0 (0/9)	0 (0/9)	0 (0/5)	*0 (0/74)*
P41	Skye-LochEishort	0 (0/4)	0 (0/5)	0 (0/18)	0 (0/18)	0 (0/14)	0 (0/14)	18.2 (4/22)	9.5 (2/21)	0 (0/23)	0 (0/18)	0 (0/16)	0 (0/11)	*3.3 (6/184)*
G42	Skye-other	0 (0/5)	0 (0/7)	0 (0/22)	0 (0/21)	0 (0/21)	0 (0/19)	3.2 (1/31)	0 (0/30)	0 (0/31)	0 (0/19)	0 (0/22)	0 (0/13)	*0.4 (1/241)*
G21	Lewis-LochLeurbostErisort	0 (0/8)	0 (0/10)	0 (0/34)	0 (0/34)	0 (0/36)	0 (0/34)	0 (0/44)	0 (0/46)	0 (0/44)	0 (0/34)	0 (0/33)	0 (0/22)	*0 (0/379)*
G23	Lewis-LochRoag	0 (0/12)	0 (0/15)	0 (0/51)	0 (0/52)	0 (0/50)	0 (0/55)	0 (0/60)	0 (0/65)	3 (2/66)	0 (0/55)	0 (0/50)	0 (0/33)	*0.4 (2/564)*
G22	HarrisUist	0 (0/22)	0 (0/29)	0 (0/53)	0 (0/53)	0 (0/50)	0 (0/47)	0 (0/65)	0 (0/58)	0 (0/58)	0 (0/50)	0 (0/49)	0 (0/30)	*0 (0/564)*
G35	NWC-LochTorridon	0 (0/6)	0 (0/8)	0 (0/23)	0 (0/23)	0 (0/20)	0 (0/17)	3.7 (1/27)	3.4 (1/29)	0 (0/30)	0 (0/29)	0 (0/24)	0 (0/15)	*0.8 (2/251)*
G39	NWC-LochEweBroom	0 (0/5)	0 (0/7)	0 (0/21)	0 (0/22)	0 (0/22)	0 (0/21)	0 (0/30)	0 (0/26)	0 (0/26)	0 (0/22)	0 (0/22)	0 (0/12)	*0 (0/236)*
G48	NWC-LochLaxfordInchard	0 (0/10)	0 (0/8)	0 (0/33)	0 (0/35)	0 (0/33)	0 (0/25)	2.5 (1/40)	0 (0/41)	0 (0/43)	0 (0/33)	0 (0/32)	0 (0/21)	*0.3 (1/354)*
G49	NWC-other	0 (0/5)	0 (0/5)	0 (0/18)	0 (0/16)	0 (0/16)	0 (0/16)	0 (0/19)	0 (0/22)	0 (0/22)	0 (0/18)	0 (0/13)	0 (0/9)	*0 (0/179)*
P38	Tain	0 (0/4)	0 (0/5)	0 (0/10)	0 (0/13)	9.1 (1/11)	0 (0/14)	0 (0/20)	0 (0/18)	0 (0/17)	0 (0/11)	0 (0/11)	0 (0/8)	*0.7 (1/142)*
G54	Orkney	0 (0/2)	0 (0/3)	0 (0/6)	0 (0/4)	0 (0/4)	0 (0/4)	0 (0/7)	0 (0/13)	0 (0/8)	0 (0/6)	0 (0/9)	0 (0/2)	*0 (0/68)*
G67	Shetland-SE-CliftSound	0 (0/6)	0 (0/8)	0 (0/27)	0 (0/31)	0 (0/29)	0 (0/25)	0 (0/47)	2.9 (1/35)	0 (0/33)	0 (0/24)	0 (0/16)	0 (0/14)	*0.3 (1/295)*
G56	Shetland-SE-DalesVoe	0 (0/4)	0 (0/5)	0 (0/18)	5.9 (1/17)	0 (0/19)	0 (0/23)	0 (0/26)	0 (0/26)	0 (0/22)	0 (0/17)	0 (0/17)	0 (0/11)	*0.5 (1/205)*
G57	Shetland-SE-SandsoundWeisdale	0 (0/8)	0 (0/10)	6.1 (2/33)	11.4 (4/35)	6.5 (2/31)	0 (0/32)	0 (0/39)	0 (0/44)	0 (0/43)	2.9 (1/35)	0 (0/32)	0 (0/21)	*2.5 (9/363)*
P61	Shetland-SW-GrutingVoe	20 (1/5)	0 (0/4)	18.8 (3/16)	13.3 (2/15)	16.7 (3/18)	12.5 (2/16)	4.3 (1/23)	18.2 (4/22)	25 (5/20)	26.7 (4/15)	33.3 (4/12)	28.6 (2/7)	*17.9 (31/173)*
P68	Shetland-SW-Vaila	0 (0/5)	0 (0/4)	0 (0/15)	0 (0/16)	0 (0/18)	0 (0/16)	0 (0/22)	0 (0/21)	13.6 (3/22)	5.9 (1/17)	13.3 (2/15)	0 (0/9)	*3.3 (6/180)*
P72	Shetland-W-AithVoe	0 (0/4)	0 (0/5)	0 (0/17)	0 (0/18)	0 (0/16)	0 (0/18)	0 (0/21)	0 (0/22)	0 (0/22)	0 (0/17)	0 (0/16)	0 (0/10)	*0 (0/186)*
P64	Shetland-W-BustaVoe	0 (0/5)	0 (0/5)	0 (0/18)	0 (0/18)	0 (0/16)	0 (0/18)	0 (0/22)	0 (0/22)	0 (0/22)	0 (0/19)	0 (0/16)	0 (0/10)	*0 (0/191)*
P70	Shetland-W-OlnaFirth	0 (0/5)	0 (0/4)	0 (0/18)	0 (0/18)	0 (0/16)	0 (0/18)	0 (0/22)	0 (0/21)	0 (0/24)	0 (0/18)	0 (0/16)	9.1 (1/11)	*0.5 (1/191)*
G58	Shetland-W-VementryVoe	0 (0/7)	0 (0/9)	0 (0/26)	0 (0/23)	0 (0/24)	0 (0/31)	8.6 (3/35)	12.1 (4/33)	3.6 (1/28)	4.8 (1/21)	11.1 (2/18)	0 (0/11)	*4.1 (11/266)*
G71	Shetland-W-RonasVoe	0 (0/1)	0 (0/4)	0 (0/12)	0 (0/2)	0 (0/10)	0 (0/13)	0 (0/13)	0 (0/20)	0 (0/18)	0 (0/12)	0 (0/11)	0 (0/6)	*0 (0/122)*
P65	Shetland-N-Basta	20 (1/5)	0 (0/5)	0 (0/17)	0 (0/17)	0 (0/15)	0 (0/17)	0 (0/20)	0 (0/20)	8.7 (2/23)	11.1 (2/18)	0 (0/17)	0 (0/12)	*2.7 (5/186)*
G81	Shetland-N-Uyea	13.3 (2/15)	0 (0/16)	0 (0/46)	0 (0/47)	0 (0/36)	0 (0/20)	0 (0/22)	14.6 (7/48)	12.5 (8/64)	5.9 (3/51)	4.2 (2/48)	0 (0/24)	*5 (22/437)*
			0.4				*3.6*		*6.4*	*4.5*		*4.1*		
	Total	*4.8 (11/231)*	*(1/265)*	*1.6 (13/819)*	*3.8 (31/822)*	*3.9 (30/765)*	*(27/757)*	*6.1 (62/1014)*	*(66/1034)*	*(47/1046)*	*3.7 (31/837)*	*(32/779)*	*2.3 (11/488)*	*4.1 (362/8857)*

B2 Biotoxin data for Pacific oysters

Table B17: Percentage of Pacific oyster samples for which DA exceeds 10 mg/kg, per group and month, based on data from 2001-15. In brackets: number of samples exceeding 10 mg/kg over total number of samples. Note: no samples exceeded 20 mg/kg.

GroupsPO	GroupNamePO	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	*Total*
PO18	Ayr	0 (0/12)	0 (0/14)	0 (0/21)	0 (0/17)	0 (0/23)	0 (0/40)	0 (0/33)	0 (0/36)	0 (0/37)	0 (0/23)	0 (0/15)	0 (0/10)	*0 (0/281)*
PO123	WC-Gigha	0 (0/20)	0 (0/25)	0 (0/28)	0 (0/34)	0 (0/47)	0 (0/61)	0 (0/67)	0 (0/67)	0 (0/74)	0 (0/67)	0 (0/35)	0 (0/14)	*0 (0/539)*
PO10	WC-LochEtiveMelfort	0 (0/14)	0 (0/19)	0 (0/19)	0 (0/25)	0 (0/28)	0 (0/37)	0 (0/39)	0 (0/43)	0 (0/42)	0 (0/40)	0 (0/25)	0 (0/16)	*0 (0/347)*
PO9	WC-LochCreranLinnhe	0 (0/6)	0 (0/15)	0 (0/17)	0 (0/20)	0 (0/20)	0 (0/20)	0 (0/25)	0 (0/35)	0 (0/29)	0 (0/20)	0 (0/17)	0 (0/6)	*0 (0/230)*
PO28	WC-Lochaber	0 (0/18)	0 (0/25)	0 (0/17)	0 (0/23)	0 (0/21)	0 (0/35)	2.8 (1/36)	0 (0/38)	0 (0/34)	0 (0/29)	0 (0/21)	0 (0/9)	*0.3 (1/306)*
PO1	Mull	0 (0/19)	0 (0/27)	0 (0/21)	0 (0/32)	0 (0/39)	0 (0/53)	0 (0/53)	0 (0/59)	0 (0/57)	0 (0/41)	0 (0/34)	0 (0/18)	*0 (0/453)*
PO42	SkyeShetland	0 (0/18)	0 (0/13)	0 (0/21)	0 (0/17)	0 (0/22)	0 (0/35)	0 (0/38)	0 (0/32)	0 (0/30)	0 (0/25)	0 (0/18)	0 (0/13)	*0 (0/282)*
PO49	NWC	0 (0/11)	0 (0/15)	0 (0/14)	0 (0/13)	0 (0/16)	0 (0/37)	0 (0/29)	0 (0/27)	0 (0/32)	0 (0/24)	0 (0/17)	0 (0/9)	*0 (0/244)*
	Total	*0 (0/118)*	*0 (0/153)*	*0 (0/158)*	*0 (0/181)*	*0 (0/216)*	*0 (0/318)*	*0.3 (1/320)*	*0 (0/337)*	*0 (0/335)*	*0 (0/269)*	*0 (0/182)*	*0 (0/95)*	*0 (1/2682)*

Table B18: Percentage of Pacific oyster samples for which DA exceeds 5 mg/kg, per group and month, based on data from 2001-15. In brackets: number of samples exceeding 5 mg/kg over total number of samples.

GroupsPO	GroupNamePO	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	*Total*
PO18	Ayr	0 (0/12)	0 (0/14)	0 (0/21)	0 (0/17)	0 (0/23)	0 (0/40)	0 (0/33)	0 (0/36)	0 (0/37)	0 (0/23)	0 (0/15)	0 (0/10)	*0 (0/281)*
PO123	WC-Gigha	0 (0/20)	0 (0/25)	0 (0/28)	0 (0/34)	0 (0/47)	0 (0/61)	0 (0/67)	0 (0/67)	0 (0/74)	0 (0/67)	0 (0/35)	0 (0/14)	*0 (0/539)*
PO10	WC-LochEtiveMelfort	0 (0/14)	0 (0/19)	0 (0/19)	0 (0/25)	7.1 (2/28)	0 (0/37)	2.6 (1/39)	4.7 (2/43)	0 (0/42)	0 (0/40)	0 (0/25)	0 (0/16)	*1.4 (5/347)*
PO9	WC-LochCreranLinnhe	0 (0/6)	0 (0/15)	0 (0/17)	0 (0/20)	0 (0/20)	0 (0/20)	4 (1/25)	0 (0/35)	0 (0/29)	0 (0/20)	0 (0/17)	0 (0/6)	*0.4 (1/230)*
PO28	WC-Lochaber	0 (0/18)	0 (0/25)	0 (0/17)	0 (0/23)	0 (0/21)	0 (0/35)	2.8 (1/36)	2.6 (1/38)	2.9 (1/34)	0 (0/29)	0 (0/21)	0 (0/9)	*1 (3/306)*
PO1	Mull	0 (0/19)	0 (0/27)	0 (0/21)	3.1 (1/32)	2.6 (1/39)	0 (0/53)	0 (0/53)	0 (0/59)	0 (0/57)	0 (0/41)	0 (0/34)	0 (0/18)	*0.4 (2/453)*
PO42	SkyeShetland	0 (0/18)	0 (0/13)	0 (0/21)	0 (0/17)	0 (0/22)	2.9 (1/35)	0 (0/38)	0 (0/32)	0 (0/30)	0 (0/25)	0 (0/18)	0 (0/13)	*0.4 (1/282)*
PO49	NWC	0 (0/11)	0 (0/15)	0 (0/14)	0 (0/13)	0 (0/16)	0 (0/37)	0 (0/29)	0 (0/27)	0 (0/32)	0 (0/24)	0 (0/17)	0 (0/9)	*0 (0/244)*
	Total	*0 (0/118)*	*0 (0/153)*	*0 (0/158)*	*0.6 (1/181)*	*1.4 (3/216)*	*0.3 (1/318)*	*0.9 (3/320)*	*0.9 (3/337)*	*0.3 (1/335)*	*0 (0/269)*	*0 (0/182)*	*0 (0/95)*	*0.4 (12/2682)*

Table B19: Percentage of Pacific oyster samples for which DA exceeds 0 mg/kg, per group and month, based on data from 2001-15. In brackets: number of samples exceeding 0 mg/kg over total number of samples.

GroupsPO	GroupNamePO	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	*Total*
PO18	Ayr	0 (0/12)	0 (0/14)	0 (0/21)	0 (0/17)	0 (0/23)	0 (0/40)	0 (0/33)	2.8 (1/36)	0 (0/37)	0 (0/23)	0 (0/15)	0 (0/10)	*0.4 (1/281)*
PO123	WC-Gigha	0 (0/20)	4 (1/25)	0 (0/28)	0 (0/34)	0 (0/47)	0 (0/61)	1.5 (1/67)	1.5 (1/67)	1.4 (1/74)	1.5 (1/67)	0 (0/35)	0 (0/14)	*0.9 (5/539)*
PO10	WC-LochEtiveMelfort	0 (0/14)	0 (0/19)	0 (0/19)	0 (0/25)	7.1 (2/28)	2.7 (1/37)	12.8 (5/39)	16.3 (7/43)	4.8 (2/42)	0 (0/40)	0 (0/25)	0 (0/16)	*4.9 (17/347)*
PO9	WC-LochCreranLinnhe	0 (0/6)	0 (0/15)	0 (0/17)	0 (0/20)	0 (0/20)	0 (0/20)	16 (4/25)	5.7 (2/35)	0 (0/29)	0 (0/20)	0 (0/17)	0 (0/6)	*2.6 (6/230)*
PO28	WC-Lochaber	0 (0/18)	8 (2/25)	0 (0/17)	0 (0/23)	14.3 (3/21)	0 (0/35)	8.3 (3/36)	10.5 (4/38)	11.8 (4/34)	6.9 (2/29)	0 (0/21)	0 (0/9)	*5.9 (18/306)*
PO1	Mull	0 (0/19)	0 (0/27)	0 (0/21)	6.3 (2/32)	25.6 (10/39)	1.9 (1/53)	0 (0/53)	1.7 (1/59)	5.3 (3/57)	2.4 (1/41)	2.9 (1/34)	0 (0/18)	*4.2 (19/453)*
PO42	SkyeShetland	0 (0/18)	0 (0/13)	0 (0/21)	0 (0/17)	0 (0/22)	2.9 (1/35)	0 (0/38)	0 (0/32)	10 (3/30)	4 (1/25)	0 (0/18)	0 (0/13)	*1.8 (5/282)*
PO49	NWC	0 (0/11)	0 (0/15)	0 (0/14)	0 (0/13)	0 (0/16)	5.4 (2/37)	6.9 (2/29)	7.4 (2/27)	6.3 (2/32)	0 (0/24)	0 (0/17)	0 (0/9)	*3.3 (8/244)*
					1.1		*1.6*				*1.9*	*0.5*		
	Total	*0 (0/118)*	*2 (3/153)*	*0 (0/158)*	*(2/181)*	*6.9 (15/216)*	*(5/318)*	*4.7 (15/320)*	*5.3 (18/337)*	*4.5 (15/335)*	*(5/269)*	*(1/182)*	*0 (0/95)*	*2.9 (79/2682)*

Table B20: Percentage of Pacific oyster samples for which PST exceeds 800 µg/kg, per group and month, based on data from 2001-15. In brackets: number of samples exceeding 800 µg/kg over total number of samples.

GroupsPO	GroupNamePO	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	*Total*
PO18	Ayr	0 (0/12)	0 (0/16)	0 (0/22)	12 (3/25)	3 (1/33)	0 (0/47)	0 (0/47)	0 (0/45)	0 (0/35)	0 (0/20)	0 (0/11)	0 (0/9)	*1.2 (4/322)*
PO123	WC-Gigha	0 (0/38)	0 (0/39)	0 (0/57)	0 (0/62)	0 (0/67)	0 (0/69)	0 (0/68)	0 (0/69)	0 (0/69)	0 (0/65)	0 (0/39)	0 (0/24)	*0 (0/666)*
PO10	WC-LochEtiveMelfort	0 (0/28)	0 (0/34)	0 (0/37)	0 (0/38)	0 (0/45)	0 (0/43)	0 (0/36)	0 (0/40)	0 (0/38)	0 (0/35)	0 (0/27)	0 (0/21)	*0 (0/422)*
PO9	WC-LochCreranLinnhe	0 (0/7)	0 (0/22)	0 (0/22)	0 (0/22)	0 (0/29)	0 (0/21)	0 (0/34)	0 (0/43)	0 (0/35)	0 (0/22)	0 (0/15)	0 (0/6)	*0 (0/278)*
PO28	WC-Lochaber	0 (0/22)	0 (0/35)	0 (0/36)	0 (0/42)	0 (0/44)	0 (0/51)	0 (0/52)	0 (0/47)	0 (0/45)	0 (0/40)	0 (0/22)	0 (0/14)	*0 (0/450)*
PO1	Mull	0 (0/32)	0 (0/40)	0 (0/44)	0 (0/61)	0 (0/64)	0 (0/66)	0 (0/63)	0 (0/64)	0 (0/54)	0 (0/43)	0 (0/38)	0 (0/27)	*0 (0/596)*
PO42	SkyeShetland	0 (0/26)	0 (0/19)	0 (0/31)	0 (0/22)	0 (0/33)	0 (0/41)	0 (0/42)	0 (0/36)	0 (0/31)	0 (0/28)	0 (0/21)	0 (0/15)	*0 (0/345)*
PO49	NWC	0 (0/14)	0 (0/20)	0 (0/20)	0 (0/28)	0 (0/35)	0 (0/45)	0 (0/38)	0 (0/36)	0 (0/38)	0 (0/27)	0 (0/18)	0 (0/10)	*0 (0/329)*
	Total	*0 (0/179)*	*0 (0/225)*	*0 (0/269)*	*1 (3/300)*	*0.3 (1/350)*	*0 (0/383)*	*0 (0/380)*	*0 (0/380)*	*0 (0/345)*	*0 (0/280)*	*0 (0/191)*	*0 (0/126)*	*0.1 (4/3408)*

Table B21: Percentage of Pacific oyster samples for which PST exceeds 400 µg/kg, per group and month, based on data from 2001-15. In brackets: number of samples exceeding 400 µg/kg over total number of samples.

GroupsPO	GroupNamePO	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	*Total*
PO18	Ayr	0 (0/12)	0 (0/16)	0 (0/22)	12 (3/25)	6.1 (2/33)	2.1 (1/47)	0 (0/47)	0 (0/45)	0 (0/35)	0 (0/20)	0 (0/11)	0 (0/9)	*1.9 (6/322)*
PO123	WC-Gigha	0 (0/38)	0 (0/39)	0 (0/57)	0 (0/62)	0 (0/67)	0 (0/69)	0 (0/68)	0 (0/69)	0 (0/69)	0 (0/65)	0 (0/39)	0 (0/24)	*0 (0/666)*
PO10	WC-LochEtiveMelfort	0 (0/28)	0 (0/34)	0 (0/37)	0 (0/38)	0 (0/45)	0 (0/43)	0 (0/36)	0 (0/40)	0 (0/38)	0 (0/35)	0 (0/27)	0 (0/21)	*0 (0/422)*
PO9	WC-LochCreranLinnhe	0 (0/7)	0 (0/22)	0 (0/22)	0 (0/22)	0 (0/29)	0 (0/21)	0 (0/34)	0 (0/43)	0 (0/35)	0 (0/22)	0 (0/15)	0 (0/6)	*0 (0/278)*
PO28	WC-Lochaber	0 (0/22)	0 (0/35)	0 (0/36)	0 (0/42)	0 (0/44)	0 (0/51)	0 (0/52)	0 (0/47)	0 (0/45)	0 (0/40)	0 (0/22)	0 (0/14)	*0 (0/450)*
PO1	Mull	0 (0/32)	0 (0/40)	0 (0/44)	0 (0/61)	0 (0/64)	1.5 (1/66)	0 (0/63)	0 (0/64)	0 (0/54)	0 (0/43)	0 (0/38)	0 (0/27)	*0.2 (1/596)*
PO42	SkyeShetland	0 (0/26)	0 (0/19)	0 (0/31)	0 (0/22)	0 (0/33)	0 (0/41)	0 (0/42)	0 (0/36)	0 (0/31)	0 (0/28)	0 (0/21)	0 (0/15)	*0 (0/345)*
PO49	NWC	0 (0/14)	0 (0/20)	0 (0/20)	0 (0/28)	0 (0/35)	0 (0/45)	0 (0/38)	0 (0/36)	0 (0/38)	0 (0/27)	0 (0/18)	0 (0/10)	*0 (0/329)*
	Total	*0 (0/179)*	*0 (0/225)*	*0 (0/269)*	*1 (3/300)*	*0.6 (2/350)*	*0.5 (2/383)*	*0 (0/380)*	*0 (0/380)*	*0 (0/345)*	*0 (0/280)*	*0 (0/191)*	*0 (0/126)*	*0.2 (7/3408)*

Table B22: Percentage of Pacific oyster samples for which PST exceeds 0 µg/kg, per group and month, based on data from 2001-15. In brackets: number of samples exceeding 0 µg/kg over total number of samples.

GroupsPO	GroupNamePO	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	*Total*
PO18	Ayr	0 (0/12)	0 (0/16)	4.5 (1/22)	12 (3/25)	12.1 (4/33)	4.3 (2/47)	2.1 (1/47)	0 (0/45)	0 (0/35)	0 (0/20)	0 (0/11)	0 (0/9)	*3.4 (11/322)*
PO123	WC-Gigha	0 (0/38)	0 (0/39)	0 (0/57)	0 (0/62)	1.5 (1/67)	2.9 (2/69)	1.5 (1/68)	0 (0/69)	0 (0/69)	0 (0/65)	0 (0/39)	0 (0/24)	*0.6 (4/666)*
PO10	WC-LochEtiveMelfort	0 (0/28)	0 (0/34)	0 (0/37)	0 (0/38)	0 (0/45)	2.3 (1/43)	0 (0/36)	0 (0/40)	0 (0/38)	0 (0/35)	0 (0/27)	0 (0/21)	*0.2 (1/422)*
PO9	WC-LochCreranLinnhe	0 (0/7)	0 (0/22)	0 (0/22)	0 (0/22)	0 (0/29)	0 (0/21)	0 (0/34)	0 (0/43)	0 (0/35)	0 (0/22)	0 (0/15)	0 (0/6)	*0 (0/278)*
PO28	WC-Lochaber	0 (0/22)	0 (0/35)	0 (0/36)	4.8 (2/42)	2.3 (1/44)	3.9 (2/51)	1.9 (1/52)	0 (0/47)	0 (0/45)	0 (0/40)	0 (0/22)	0 (0/14)	*1.3 (6/450)*
PO1	Mull	0 (0/32)	0 (0/40)	0 (0/44)	0 (0/61)	1.6 (1/64)	3 (2/66)	1.6 (1/63)	0 (0/64)	0 (0/54)	0 (0/43)	0 (0/38)	0 (0/27)	*0.7 (4/596)*
PO42	SkyeShetland	0 (0/26)	0 (0/19)	0 (0/31)	0 (0/22)	0 (0/33)	0 (0/41)	0 (0/42)	0 (0/36)	0 (0/31)	0 (0/28)	0 (0/21)	0 (0/15)	*0 (0/345)*
PO49	NWC	0 (0/14)	0 (0/20)	0 (0/20)	0 (0/28)	2.9 (1/35)	13.3 (6/45)	5.3 (2/38)	0 (0/36)	0 (0/38)	0 (0/27)	0 (0/18)	0 (0/10)	*2.7 (9/329)*
	Total	*0 (0/179)*	*0 (0/225)*	*0.4 (1/269)*	*1.7 (5/300)*	*2.3 (8/350)*	*3.9 (15/383)*	*1.6 (6/380)*	*0 (0/380)*	*0 (0/345)*	*0 (0/280)*	*0 (0/191)*	*0 (0/126)*	*1 (35/3408)*

Table B23: Percentage of Pacific oyster samples for which LT exceeds MPL, per group and month, based on data from 2001-15. In brackets: number of samples exceeding MPL over total number of samples.

GroupsPO	GroupNamePO	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	*Total*
PO18	Ayr	0 (0/9)	0 (0/13)	0 (0/28)	0 (0/32)	5.4 (2/37)	1.8 (1/57)	1.8 (1/55)	3.7 (2/54)	1.6 (1/61)	3 (1/33)	0 (0/25)	0 (0/16)	*1.9 (8/420)*
PO123	WC-Gigha	0 (0/20)	11.1 (3/27)	0 (0/38)	4.9 (3/61)	2.9 (2/68)	2.8 (2/72)	0 (0/73)	4.5 (3/66)	10.1 (8/79)	7.5 (5/67)	5 (3/60)	10 (3/30)	*4.8 (32/661)*
PO10	WC-LochEtiveMelfort	0 (0/17)	0 (0/18)	3.2 (1/31)	2.2 (1/45)	0 (0/47)	0 (0/49)	0 (0/46)	0 (0/50)	0 (0/55)	0 (0/49)	2.4 (1/41)	0 (0/28)	*0.6 (3/476)*
PO9	WC-LochCreranLinnhe	0 (0/8)	0 (0/15)	0 (0/22)	0 (0/22)	0 (0/27)	0 (0/27)	0 (0/35)	4.4 (2/45)	0 (0/40)	3.1 (1/32)	0 (0/22)	0 (0/12)	*1 (3/307)*
PO28	WC-Lochaber	0 (0/19)	11.5 (3/26)	2.6 (1/38)	0 (0/44)	2 (1/51)	0 (0/53)	0 (0/55)	4.1 (2/49)	12 (6/50)	2.2 (1/46)	0 (0/41)	0 (0/30)	*2.8 (14/502)*
PO1	Mull	4.8 (1/21)	4 (1/25)	2.3 (1/44)	0 (0/64)	0 (0/68)	0 (0/71)	0 (0/75)	0 (0/76)	1.4 (1/73)	3.1 (2/65)	0 (0/60)	0 (0/35)	*0.9 (6/677)*
PO42	SkyeShetland	0 (0/15)	0 (0/18)	0 (0/27)	0 (0/31)	0 (0/34)	2.1 (1/47)	0 (0/49)	11.4 (5/44)	14 (7/50)	2.5 (1/40)	0 (0/35)	0 (0/22)	*3.4 (14/412)*
PO49	NWC	0 (0/10)	0 (0/14)	0 (0/21)	0 (0/32)	0 (0/38)	0 (0/50)	2.3 (1/44)	0 (0/42)	0 (0/42)	0 (0/39)	0 (0/29)	0 (0/13)	*0.3 (1/374)*
		0.8		*1.2*	*1.2*	*1.4*	*0.9*	*0.5*		*5.1*		*1.3*	*1.6*	
	Total	*(1/119)*	*4.5 (7/156)*	*(3/249)*	*(4/331)*	*(5/370)*	*(4/426)*	*(2/432)*	*3.3 (14/426)*	*(23/450)*	*3 (11/371)*	*(4/313)*	*(3/186)*	*2.1 (81/3829)*

Table B24: Percentage of Pacific oyster samples for which AZA exceeds 160 µg/kg, per group and month, based on data from 2011-15. In brackets: number of samples exceeding 160 µg/kg over total number of samples.

GroupsPO	GroupNamePO	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	*Total*
PO18	Ayr	0 (0/4)	0 (0/4)	0 (0/21)	0 (0/21)	0 (0/21)	0 (0/25)	0 (0/39)	0 (0/28)	0 (0/35)	0 (0/18)	0 (0/16)	0 (0/12)	*0 (0/244)*
PO123	WC-Gigha	0 (0/5)	0 (0/8)	0 (0/18)	0 (0/17)	0 (0/16)	0 (0/17)	0 (0/26)	0 (0/27)	0 (0/29)	0 (0/21)	0 (0/17)	0 (0/11)	*0 (0/212)*
PO10	WC-LochEtiveMelfort	0 (0/7)	0 (0/8)	5.6 (1/18)	5.9 (1/17)	0 (0/17)	0 (0/18)	0 (0/22)	0 (0/22)	0 (0/22)	0 (0/19)	0 (0/16)	0 (0/11)	*1 (2/197)*
PO9	WC-LochCreranLinnhe	0 (0/3)	0 (0/6)	0 (0/16)	0 (0/17)	0 (0/17)	0 (0/17)	0 (0/23)	0 (0/22)	0 (0/21)	0 (0/18)	0 (0/12)	0 (0/9)	*0 (0/181)*
PO28	WC-Lochaber	0 (0/11)	0 (0/13)	0 (0/32)	0 (0/26)	0 (0/27)	0 (0/28)	0 (0/40)	0 (0/32)	0 (0/33)	0 (0/32)	0 (0/32)	0 (0/20)	*0 (0/326)*
PO1	Mull	7.1 (1/14)	5.9 (1/17)	3.1 (1/32)	0 (0/36)	0 (0/34)	0 (0/34)	0 (0/44)	0 (0/44)	0 (0/44)	0 (0/36)	0 (0/34)	0 (0/19)	*0.8 (3/388)*
PO42	SkyeShetland	0 (0/5)	0 (0/5)	0 (0/15)	0 (0/17)	0 (0/17)	0 (0/21)	0 (0/25)	0 (0/21)	0 (0/24)	0 (0/21)	0 (0/18)	0 (0/13)	*0 (0/202)*
PO49	NWC	0 (0/7)	0 (0/9)	0 (0/17)	0 (0/22)	0 (0/24)	0 (0/25)	0 (0/36)	0 (0/32)	0 (0/34)	0 (0/27)	0 (0/19)	0 (0/11)	*0 (0/263)*
	Total	*1.8 (1/56)*	*1.4 (1/70)*	*1.2 (2/169)*	*0.6 (1/173)*	*0 (0/173)*	*0 (0/185)*	*0 (0/255)*	*0 (0/228)*	*0 (0/242)*	*0 (0/192)*	*0 (0/164)*	*0 (0/106)*	*0.2 (5/2013)*

Table B25: Percentage of Pacific oyster samples for which AZA exceeds 80 µg/kg, per group and month, based on data from 2011-15. In brackets: number of samples exceeding 80 µg/kg over total number of samples.

GroupsPO	GroupNamePO	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	*Total*
PO18	Ayr	0 (0/4)	0 (0/4)	0 (0/21)	0 (0/21)	0 (0/21)	0 (0/25)	0 (0/39)	0 (0/28)	0 (0/35)	0 (0/18)	0 (0/16)	0 (0/12)	*0 (0/244)*
PO123	WC-Gigha	20 (1/5)	50 (4/8)	22.2 (4/18)	23.5 (4/17)	12.5 (2/16)	0 (0/17)	0 (0/26)	0 (0/27)	0 (0/29)	0 (0/21)	0 (0/17)	18.2 (2/11)	*8 (17/212)*
PO10	WC-LochEtiveMelfort	57.1 (4/7)	50 (4/8)	16.7 (3/18)	29.4 (5/17)	17.6 (3/17)	0 (0/18)	0 (0/22)	0 (0/22)	0 (0/22)	0 (0/19)	18.8 (3/16)	27.3 (3/11)	*12.7 (25/197)*
PO9	WC-LochCreranLinnhe	0 (0/3)	66.7 (4/6)	18.8 (3/16)	29.4 (5/17)	0 (0/17)	0 (0/17)	0 (0/23)	0 (0/22)	0 (0/21)	0 (0/18)	0 (0/12)	11.1 (1/9)	*7.2 (13/181)*
PO28	WC-Lochaber	36.4 (4/11)	30.8 (4/13)	15.6 (5/32)	19.2 (5/26)	3.7 (1/27)	0 (0/28)	0 (0/40)	0 (0/32)	0 (0/33)	0 (0/32)	3.1 (1/32)	15 (3/20)	*7.1 (23/326)*
PO1	Mull	57.1 (8/14)	52.9 (9/17)	25 (8/32)	27.8 (10/36)	20.6 (7/34)	2.9 (1/34)	0 (0/44)	0 (0/44)	0 (0/44)	0 (0/36)	8.8 (3/34)	31.6 (6/19)	*13.4 (52/388)*
PO42	SkyeShetland	0 (0/5)	20 (1/5)	20 (3/15)	29.4 (5/17)	0 (0/17)	0 (0/21)	0 (0/25)	0 (0/21)	0 (0/24)	0 (0/21)	0 (0/18)	7.7 (1/13)	*5 (10/202)*
PO49	NWC	0 (0/7)	0 (0/9)	5.9 (1/17)	0 (0/22)	0 (0/24)	0 (0/25)	0 (0/36)	0 (0/32)	0 (0/34)	7.4 (2/27)	0 (0/19)	0 (0/11)	*1.1 (3/263)*
	Total	*30.4 (17/56)*	*37.1 (26/70)*	*16 (27/169)*	*19.7 (34/173)*	*7.5 (13/173)*	*0.5 (1/185)*	*0 (0/255)*	*0 (0/228)*	*0 (0/242)*	*1 (2/192)*	*4.3 (7/164)*	*15.1 (16/106)*	*7.1 (143/2013)*

Table B26: Percentage of Pacific oyster samples for which AZA exceeds 0 µg/kg, per group and month, based on data from 2011-15. In brackets: number of samples exceeding 0 µg/kg over total number of samples.

GroupsPO	GroupNamePO	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	*Total*
PO18	Ayr	0 (0/4)	0 (0/4)	0 (0/21)	0 (0/21)	0 (0/21)	0 (0/25)	0 (0/39)	0 (0/28)	0 (0/35)	0 (0/18)	0 (0/16)	0 (0/12)	*0 (0/244)*
PO123	WC-Gigha	40 (2/5)	50 (4/8)	22.2 (4/18)	29.4 (5/17)	18.8 (3/16)	17.6 (3/17)	0 (0/26)	0 (0/27)	0 (0/29)	19 (4/21)	23.5 (4/17)	27.3 (3/11)	*15.1 (32/212)*
PO10	WC-LochEtiveMelfort	57.1 (4/7)	50 (4/8)	22.2 (4/18)	29.4 (5/17)	23.5 (4/17)	22.2 (4/18)	0 (0/22)	0 (0/22)	0 (0/22)	21.1 (4/19)	25 (4/16)	27.3 (3/11)	*18.3 (36/197)*
PO9	WC-LochCreranLinnhe	33.3 (1/3)	66.7 (4/6)	25 (4/16)	29.4 (5/17)	23.5 (4/17)	0 (0/17)	0 (0/23)	0 (0/22)	0 (0/21)	5.6 (1/18)	25 (3/12)	33.3 (3/9)	*13.8 (25/181)*
PO28	WC-Lochaber	45.5 (5/11)	38.5 (5/13)	21.9 (7/32)	19.2 (5/26)	18.5 (5/27)	3.6 (1/28)	0 (0/40)	0 (0/32)	0 (0/33)	0 (0/32)	18.8 (6/32)	25 (5/20)	*12 (39/326)*
PO1	Mull	57.1 (8/14)	52.9 (9/17)	25 (8/32)	27.8 (10/36)	23.5 (8/34)	14.7 (5/34)	0 (0/44)	0 (0/44)	2.3 (1/44)	22.2 (8/36)	23.5 (8/34)	31.6 (6/19)	*18.3 (71/388)*
PO42	SkyeShetland	20 (1/5)	40 (2/5)	26.7 (4/15)	29.4 (5/17)	23.5 (4/17)	9.5 (2/21)	0 (0/25)	9.5 (2/21)	16.7 (4/24)	9.5 (2/21)	22.2 (4/18)	23.1 (3/13)	*16.3 (33/202)*
PO49	NWC	28.6 (2/7)	22.2 (2/9)	29.4 (5/17)	45.5 (10/22)	33.3 (8/24)	8 (2/25)	5.6 (2/36)	6.3 (2/32)	17.6 (6/34)	18.5 (5/27)	21.1 (4/19)	27.3 (3/11)	*19.4 (51/263)*
		41.1				*20.8*		*0.8*	*1.8*			*20.1*		*14.3*
	Total	*(23/56)*	*42.9 (30/70)*	*21.3 (36/169)*	*26 (45/173)*	*(36/173)*	*9.2 (17/185)*	*(2/255)*	*(4/228)*	*4.5 (11/242)*	*12.5 (24/192)*	*(33/164)*	*24.5 (26/106)*	*(287/2013)*

Table B27: Percentage of Pacific oyster samples for which OA exceeds 160 µg/kg, per group and month, based on data from 2011-15. In brackets: number of samples exceeding 160 µg/kg over total number of samples.

GroupsPO	GroupNamePO	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	*Total*
PO18	Ayr	0 (0/4)	0 (0/4)	0 (0/21)	0 (0/21)	0 (0/21)	4 (1/25)	0 (0/39)	7.1 (2/28)	2.9 (1/35)	0 (0/18)	0 (0/16)	0 (0/12)	*1.6 (4/244)*
PO123	WC-Gigha	0 (0/5)	0 (0/8)	0 (0/18)	0 (0/17)	0 (0/16)	0 (0/17)	0 (0/26)	0 (0/27)	0 (0/29)	0 (0/21)	0 (0/17)	0 (0/11)	*0 (0/212)*
PO10	WC-LochEtiveMelfort	0 (0/7)	0 (0/8)	0 (0/18)	0 (0/17)	0 (0/17)	0 (0/18)	0 (0/22)	0 (0/22)	0 (0/22)	0 (0/19)	0 (0/16)	0 (0/11)	*0 (0/197)*
PO9	WC-LochCreranLinnhe	0 (0/3)	0 (0/6)	0 (0/16)	0 (0/17)	0 (0/17)	0 (0/17)	0 (0/23)	0 (0/22)	0 (0/21)	0 (0/18)	0 (0/12)	0 (0/9)	*0 (0/181)*
PO28	WC-Lochaber	0 (0/11)	0 (0/13)	0 (0/32)	0 (0/26)	0 (0/27)	0 (0/28)	0 (0/40)	0 (0/32)	0 (0/33)	0 (0/32)	0 (0/32)	0 (0/20)	*0 (0/326)*
PO1	Mull	0 (0/14)	0 (0/17)	0 (0/32)	0 (0/36)	0 (0/34)	0 (0/34)	0 (0/44)	0 (0/44)	0 (0/44)	0 (0/36)	0 (0/34)	0 (0/19)	*0 (0/388)*
PO42	SkyeShetland	0 (0/5)	0 (0/5)	0 (0/15)	0 (0/17)	0 (0/17)	0 (0/21)	0 (0/25)	0 (0/21)	0 (0/24)	0 (0/21)	0 (0/18)	0 (0/13)	*0 (0/202)*
PO49	NWC	0 (0/7)	0 (0/9)	0 (0/17)	0 (0/22)	0 (0/24)	0 (0/25)	2.8 (1/36)	0 (0/32)	0 (0/34)	0 (0/27)	0 (0/19)	0 (0/11)	*0.4 (1/263)*
							0.5	*0.4*	*0.9*	*0.4*				
	Total	*0 (0/56)*	*0 (0/70)*	*0 (0/169)*	*0 (0/173)*	*0 (0/173)*	*(1/185)*	*(1/255)*	*(2/228)*	*(1/242)*	*0 (0/192)*	*0 (0/164)*	*0 (0/106)*	*0.2 (5/2013)*

Table B28: Percentage of Pacific oyster samples for which OA exceeds 80 µg/kg, per group and month, based on data from 2011-15. In brackets: number of samples exceeding 80 µg/kg over total number of samples.

GroupsPO	GroupNamePO	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	*Total*
PO18	Ayr	0 (0/4)	0 (0/4)	0 (0/21)	0 (0/21)	0 (0/21)	8 (2/25)	0 (0/39)	7.1 (2/28)	8.6 (3/35)	0 (0/18)	0 (0/16)	0 (0/12)	*2.9 (7/244)*
PO123	WC-Gigha	0 (0/5)	0 (0/8)	0 (0/18)	0 (0/17)	0 (0/16)	0 (0/17)	0 (0/26)	0 (0/27)	0 (0/29)	0 (0/21)	0 (0/17)	0 (0/11)	*0 (0/212)*
PO10	WC-LochEtiveMelfort	0 (0/7)	0 (0/8)	0 (0/18)	0 (0/17)	0 (0/17)	0 (0/18)	0 (0/22)	0 (0/22)	0 (0/22)	0 (0/19)	0 (0/16)	0 (0/11)	*0 (0/197)*
PO9	WC-LochCreranLinnhe	0 (0/3)	0 (0/6)	0 (0/16)	0 (0/17)	0 (0/17)	0 (0/17)	0 (0/23)	0 (0/22)	0 (0/21)	0 (0/18)	0 (0/12)	0 (0/9)	*0 (0/181)*
PO28	WC-Lochaber	0 (0/11)	0 (0/13)	0 (0/32)	0 (0/26)	0 (0/27)	3.6 (1/28)	2.5 (1/40)	0 (0/32)	0 (0/33)	0 (0/32)	0 (0/32)	0 (0/20)	*0.6 (2/326)*
PO1	Mull	0 (0/14)	0 (0/17)	0 (0/32)	0 (0/36)	0 (0/34)	0 (0/34)	2.3 (1/44)	2.3 (1/44)	0 (0/44)	0 (0/36)	0 (0/34)	0 (0/19)	*0.5 (2/388)*
PO42	SkyeShetland	0 (0/5)	0 (0/5)	0 (0/15)	0 (0/17)	0 (0/17)	4.8 (1/21)	8 (2/25)	0 (0/21)	0 (0/24)	0 (0/21)	0 (0/18)	0 (0/13)	*1.5 (3/202)*
PO49	NWC	0 (0/7)	0 (0/9)	0 (0/17)	0 (0/22)	0 (0/24)	0 (0/25)	8.3 (3/36)	0 (0/32)	0 (0/34)	3.7 (1/27)	0 (0/19)	0 (0/11)	*1.5 (4/263)*
							2.2	*2.7*	*1.3*	*1.2*	*0.5*			
	Total	*0 (0/56)*	*0 (0/70)*	*0 (0/169)*	*0 (0/173)*	*0 (0/173)*	*(4/185)*	*(7/255)*	*(3/228)*	*(3/242)*	*(1/192)*	*0 (0/164)*	*0 (0/106)*	*0.9 (18/2013)*

Table B29: Percentage of Pacific oyster samples for which OA exceeds 0 µg/kg, per group and month, based on data from 2011-15. In brackets: number of samples exceeding 0 µg/kg over total number of samples.

	GroupNamePO	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	*Total*
PO18	Ayr	0 (0/4)	0 (0/4)	0 (0/21)	0 (0/21)	0 (0/21)	8 (2/25)	0 (0/39)	14.3 (4/28)	25.7 (9/35)	0 (0/18)	0 (0/16)	0 (0/12)	*6.1 (15/244)*
PO123	WC-Gigha	0 (0/5)	0 (0/8)	0 (0/18)	0 (0/17)	0 (0/16)	0 (0/17)	0 (0/26)	0 (0/27)	0 (0/29)	0 (0/21)	0 (0/17)	0 (0/11)	*0 (0/212)*
PO10	WC-LochEtiveMelfort	0 (0/7)	0 (0/8)	0 (0/18)	0 (0/17)	0 (0/17)	0 (0/18)	0 (0/22)	0 (0/22)	0 (0/22)	0 (0/19)	0 (0/16)	0 (0/11)	*0 (0/197)*
PO9	WC-LochCreranLinnhe	0 (0/3)	0 (0/6)	0 (0/16)	0 (0/17)	0 (0/17)	0 (0/17)	0 (0/23)	0 (0/22)	0 (0/21)	0 (0/18)	0 (0/12)	0 (0/9)	*0 (0/181)*
PO28	WC-Lochaber	0 (0/11)	0 (0/13)	0 (0/32)	0 (0/26)	0 (0/27)	3.6 (1/28)	10 (4/40)	3.1 (1/32)	0 (0/33)	0 (0/32)	0 (0/32)	0 (0/20)	*1.8 (6/326)*
PO1	Mull	0 (0/14)	0 (0/17)	0 (0/32)	0 (0/36)	0 (0/34)	0 (0/34)	2.3 (1/44)	2.3 (1/44)	0 (0/44)	0 (0/36)	0 (0/34)	0 (0/19)	*0.5 (2/388)*
PO42	SkyeShetland	0 (0/5)	0 (0/5)	0 (0/15)	0 (0/17)	0 (0/17)	4.8 (1/21)	12 (3/25)	0 (0/21)	4.2 (1/24)	0 (0/21)	0 (0/18)	0 (0/13)	*2.5 (5/202)*
PO49	NWC	0 (0/7)	0 (0/9)	0 (0/17)	0 (0/22)	0 (0/24)	4 (1/25)	11.1 (4/36)	6.3 (2/32)	8.8 (3/34)	11.1 (3/27)	0 (0/19)	0 (0/11)	*4.9 (13/263)*
	Total	*0 (0/56)*	*0 (0/70)*	*0 (0/169)*	*0 (0/173)*	*0 (0/173)*	*2.7 (5/185)*	*4.7 (12/255)*	*3.5 (8/228)*	*5.4 (13/242)*	*1.6 (3/192)*	*0 (0/164)*	*0 (0/106)*	*2 (41/2013)*

B3 Biotoxin data for cockles, razors and surf clams

Table B30: Biotoxin levels in cockles, data from 2001-15.

				DA (mg/kg)						PST (µg/kg)					LT[2]		
GroupsM	GroupNameM	Pod	RMP[1]	0	0-5	5-10	10-20	20+	*Total*	0	0-400	400-800	800+	*Total*	0	1	*Total*
G80	EastCoast	80		4					*4*	4				*4*	5		*5*
G26	Dumfries	27		11					*11*	13				*13*	13		*13*
		142		5					*5*	5				*5*	5		*5*
G8	Ayr-LochStriven	139		15					*15*	15				*15*	15		*15*
G10	WC-LochEtive	10	y	3					*3*	3				*3*	3		*3*
G28	WC-Lochaber	30		1					*1*	1				*1*	1		*1*
G42	Skye-other	40		1					*1*	1				*1*			
		42		9	1				*10*	11				*11*	3		*3*
		43		1					*1*	2				*2*	1		*1*
		45		1					*1*	2				*2*	1		*1*
G22	HarrisUist	25		2			1		*3*	5				*5*	1		*1*
		76	y	45	3				*48*	46	1			*47*	31		*31*
		77	y	272	18	2			*292*	380	10	1	1	*392*	368	1	*369*
		86	y	196	20	4		1	*221*	289	1		1	*291*	291		*291*
		133	y	115	8	3			*126*	158	6			*164*	174		*174*
G49	NWC-other	78		11	1				*12*	13	1	2	1	*17*	12		*12*
		108		2					*2*	2				*2*	2		*2*
G54	Orkney	54		1					*1*	1				*1*	1		*1*
		106		2					*2*	2				*2*	2		*2*
		103old		1					*1*	1				*1*	1		*1*
		105old		10					*10*	8		1	1	*10*	9		*9*
	Total			*708*	*51*	*9*	*1*	*1*	*770*	*962*	*19*	*4*	*4*	*989*	*939*	*1*	*940*

[1]RMP for cockles indicated with 'y'

[2]LT levels < MPL (0) or > MPL (1).

Table B31: Biotoxin levels in razors, data from 2001-15.

				DA (mg/kg)						PST (µg/kg)					LT[2]		
GroupsM	GroupNameM	Pod	RMP[1]	0	0-5	5-10	10-20	20+	*Total*	0	0-400	400-800	800+	*Total*	0	1	*Total*
G80	EastCoast	80	y	175	10	2			*187*	226	6	5	3	*240*	234	4	*238*
		87		1					*1*						1		*1*
		90	y	55	5	1			*61*	70	1		1	*72*	75	1	*76*
G26	Dumfries	26		4					*4*	5				*5*	6		*6*
		27	y	11					*11*	11	1			*12*	12		*12*
		89	y	80	2				*82*	89				*89*	90		*90*
		140	y	19	1				*20*	20				*20*	20		*20*
G18	Ayr-other	14		17		1			*18*	18				*18*	21		*21*
		18	y	37					*37*	47				*47*	74	1	*75*
		52		6					*6*	4				*4*	5		*5*
		74	y	126	5				*131*	143	2	1		*146*	143		*143*
G123	WC-Gigha	17		2					*2*	2				*2*	2		*2*
		123		37					*37*	39				*39*	42		*42*
G28	WC-Lochaber	30		1					*1*	1				*1*	1		*1*
		33		1					*1*								
		88	y	71	5	3			*79*	91	5	1		*97*	91		*91*
		110		4					*4*	4				*4*	4		*4*
		126		4					*4*	3				*3*	4		*4*
G1	Mull-other	115		2					*2*	2				*2*	2		*2*
G42	Skye-other	42		1					*1*	1				*1*	1		*1*
G21	Lewis-LochLeurbostErisort	101		4					*4*	5				*5*	5		*5*
		138		66	4				*70*	63	7			*70*	70		*70*
G22	HarrisUist	22		1					*1*	1				*1*	1		*1*
		77			2				*2*	1				*1*	1		*1*
		141	y	16	3	1			*20*	20				*20*	20		*20*
		147	y	15					*15*	15				*15*	15		*15*
G54	Orkney	130		33	4				*37*	51	6	3	1	*61*	61		*61*
		131		3					*3*	3				*3*	3		*3*
	Total			*792*	*41*	*8*			*841*	*935*	*28*	*10*	*5*	*978*	*1004*	*6*	*1010*

[1]RMP for razors indicated with 'y'

[2]LT levels < MPL (0) or > MPL (1)

Table B32: Biotoxin levels in surf clams, data from 2001-15.

				DA (mg/kg)				PST (µg/kg)					LT[2]		
GroupsM	GroupNameM	Pod	RMP[1]	0	0-5	5-10	*Total*	0	0-400	400-800	800+	*Total*	0	1	*Total*
G80	EastCoast	80		7			*7*	8				*8*	7		*7*
		87	Y	164	22	1	*187*	223	5	3	4	*235*	231	20	*251*
		107		4			*4*	4				*4*	3	1	*4*
G28	WC-Lochaber	33		9			*9*	9				*9*	3		*3*
	Total			*184*	*22*	*1*	*207*	*244*	*5*	*3*	*4*	*256*	*244*	*21*	*265*

[1]RMP for surf clams indicated with 'y'

[2]LT levels < MPL (0) or > MPL (1).

Table B33: AZA and OA levels in cockles, razors and surf clams, data from 2011-15.

					AZA (µg/kg)					OA (µg/kg)				
Species	GroupsM	GroupNameM	Pod	RMP[1]	0	0-80	80-160	160+	*Total*	0	0-80	80-160	160+	*Total*
Cockles	G26	Dumfries	142		5				*5*	5				*5*
	G8	Ayr-LochStriven	139		15				*15*	13	1	1		*15*
	G10	WC-LochEtive	10	y	3				*3*	3				*3*
	G22	HarrisUist	76	y	4	2			*6*	6				*6*
			77	y	169	15	1		*185*	182	2	1		*185*
			86	y	171	9			*180*	176	4			*180*
			133	y	172	2			*174*	171	3			*174*
		Total			*539*	*28*	*1*		*568*	*556*	*10*	*2*		*568*
Razors	G80	EastCoast	80	y	127	3			*130*	118	3	7	2	*130*
			90	y	61				*61*	55	1	4	1	*61*
	G26	Dumfries	27	y	12				*12*	12				*12*
			89	y	68				*68*	67	1			*68*
			140	y	20				*20*	20				*20*
	G18	Ayr-other	18	y	71				*71*	66	4		1	*71*
			74	y	92				*92*	91	1			*92*
	G123	WC-Gigha	17		2				*2*	2				*2*
			123		10				*10*	10				*10*
	G28	WC-Lochaber	88	y	53				*53*	51	1	1		*53*
	G21	Lewis-LochLeurbostErisort	138		70				*70*	70				*70*
	G22	HarrisUist	141	y	20				*20*	20				*20*
			147	y	15				*15*	14	1			*15*
	G54	Orkney	130		58	1			*59*	57	2			*59*
			131		1				*1*	1				*1*
		Total			*680*	*4*			*684*	*654*	*14*	*12*	*4*	*684*
Surf clams	G80	EastCoast	87	y	95	23	8	2	*128*	48	39	24	17	*128*

[1]RMP for respective species indicated with 'y'

B4 Model estimates for mussels

Table B34: Estimated probability (%) of DA in mussels exceeding 5 mg/kg, for an average year. Values less than 0.01% are shown in grey.

Group	GroupName	*avg group*[1]	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
G80	EastCoast	*0.31*	0.00	0.00	0.07	0.10	0.36	0.27	0.72	0.74	1.31	0.04	0.05	0.00
G26	Dumfries	*0.27*	0.00	0.00	0.06	0.09	0.32	0.23	0.63	0.65	1.12	0.03	0.04	0.00
G8	Ayr-LochStriven	*0.24*	0.00	0.00	0.05	0.08	0.29	0.22	0.58	0.59	1.01	0.03	0.04	0.00
P16	Ayr-LochFyneArdkinglas	*0.37*	0.00	0.00	0.08	0.12	0.43	0.32	0.85	0.87	1.70	0.04	0.06	0.00
G18	Ayr-other	*0.40*	0.00	0.00	0.09	0.13	0.46	0.34	1.22	0.90	1.53	0.05	0.07	0.00
G123	WC-Gigha	*0.33*	0.00	0.00	0.07	0.11	0.40	0.29	0.79	0.82	1.42	0.04	0.06	0.00
P6	WC-LochMelfort	*1.59*	0.00	0.00	0.36	0.74	1.82	1.36	4.48	3.37	6.47	0.19	0.27	0.00
G10	WC-LochEtive	*0.29*	0.00	0.00	0.08	0.10	0.35	0.26	0.69	0.70	1.19	0.04	0.05	0.00
G9	WC-LochCreranLinnhe	*0.38*	0.00	0.00	0.08	0.12	0.43	0.32	0.99	0.86	1.66	0.04	0.06	0.00
G31	WC-LochLevenEil	*0.20*	0.00	0.00	0.04	0.07	0.24	0.18	0.47	0.48	0.82	0.02	0.03	0.00
G28	WC-Lochaber	*0.72*	0.00	0.00	0.16	0.24	1.33	0.72	1.54	1.72	2.75	0.09	0.12	0.00
P5	Mull-LochSpelve	*0.93*	0.00	0.00	0.20	0.29	1.00	0.74	1.88	2.97	3.83	0.10	0.15	0.00
P7	Mull-LochScridain	*0.68*	0.00	0.00	0.15	0.22	0.77	0.68	1.48	1.79	2.87	0.08	0.11	0.00
G1	Mull-other	*0.33*	0.00	0.00	0.07	0.11	0.39	0.35	0.76	0.79	1.36	0.04	0.06	0.00
P41	Skye-LochEishort	*0.34*	0.00	0.00	0.08	0.12	0.49	0.30	0.80	0.82	1.41	0.04	0.06	0.00
G42	Skye-other	*1.41*	0.00	0.00	0.31	0.46	1.97	1.33	3.22	4.44	4.79	0.16	0.23	0.00
G21	Lewis-LochLeurbostErisort	*0.58*	0.00	0.00	0.12	0.18	0.64	0.48	1.23	1.73	2.39	0.07	0.09	0.00
G23	Lewis-LochRoag	*1.75*	0.00	0.00	0.35	0.52	1.59	1.37	4.34	4.34	8.03	0.22	0.27	0.00
G22	HarrisUist	*0.62*	0.00	0.00	0.13	0.19	0.66	0.49	1.46	1.45	2.92	0.07	0.10	0.00
G35	NWC-LochTorridon	*0.20*	0.00	0.00	0.04	0.07	0.24	0.18	0.47	0.48	0.82	0.02	0.03	0.00
G39	NWC-LochEweBroom	*0.65*	0.00	0.00	0.14	0.21	1.04	0.55	1.44	1.45	2.82	0.08	0.11	0.00
G48	NWC-LochLaxfordInchard	*0.97*	0.00	0.00	0.20	0.30	1.04	0.77	2.50	2.25	4.35	0.11	0.15	0.00
G49	NWC-other	*0.34*	0.00	0.00	0.08	0.11	0.41	0.30	0.92	0.82	1.38	0.04	0.06	0.00
P38	Tain	*0.27*	0.00	0.00	0.06	0.09	0.32	0.24	0.64	0.66	1.13	0.03	0.05	0.00
G54	Orkney	*0.36*	0.00	0.00	0.08	0.12	0.43	0.32	0.87	0.89	1.55	0.04	0.06	0.00
G67	Shetland-SE-CliftSound	*0.64*	0.00	0.00	0.14	0.21	0.73	0.54	1.60	1.67	2.66	0.07	0.10	0.00
G56	Shetland-SE-DalesVoe	*1.69*	0.00	0.00	0.35	0.50	1.73	1.51	3.55	3.53	8.63	0.18	0.26	0.00
G57	Shetland-SE-SandsoundWeisdale	*1.19*	0.00	0.00	0.25	0.37	1.25	0.93	2.65	3.93	4.59	0.13	0.19	0.00
P61	Shetland-SW-GrutingVoe	*1.11*	0.00	0.00	0.21	0.31	1.03	0.78	1.95	1.94	6.81	0.11	0.16	0.00
P68	Shetland-SW-Vaila	*0.81*	0.00	0.00	0.17	0.25	0.88	0.65	2.17	1.64	3.72	0.09	0.13	0.00
P72	Shetland-W-AithVoe	*0.44*	0.00	0.00	0.10	0.15	0.53	0.39	1.04	1.08	1.84	0.05	0.09	0.00
P64	Shetland-W-BustaVoe	*0.75*	0.00	0.00	0.16	0.24	0.84	0.73	1.57	1.64	3.63	0.08	0.12	0.00
P70	Shetland-W-OlnaFirth	*0.63*	0.00	0.00	0.14	0.20	0.72	0.53	1.63	1.65	2.48	0.07	0.10	0.00
G58	Shetland-W-VementryVoe	*0.23*	0.00	0.00	0.05	0.08	0.28	0.21	0.56	0.57	0.98	0.03	0.04	0.00
G71	Shetland-W-RonasVoe	*0.29*	0.00	0.00	0.07	0.10	0.35	0.26	0.69	0.71	1.23	0.03	0.05	0.00
P65	Shetland-N-Basta	*0.46*	0.00	0.00	0.10	0.15	0.52	0.39	1.04	1.07	2.13	0.05	0.07	0.00
G81	Shetland-N-Uyea	*0.20*	0.00	0.00	0.05	0.07	0.24	0.18	0.48	0.48	0.83	0.02	0.03	0.00
	Average per month[2]	*0.62*	*0.00*	*0.00*	*0.13*	*0.20*	*0.72*	*0.53*	*1.46*	*1.53*	*2.71*	*0.07*	*0.10*	*0.00*

[1]Average over all months for a given pod group

[2]Average over all pod groups for a given month

Table B35: Estimated probability (%) of DA in mussels exceeding 0 mg/kg, for an average year. Values less than 0.01% are shown in grey.

Group	GroupName	*avg group*[1]	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
G80	EastCoast	*2.03*	0.00	0.00	0.35	0.73	1.93	2.49	6.80	3.83	6.35	1.33	0.38	0.12
G26	Dumfries	*0.96*	0.00	0.00	0.19	0.40	1.09	1.78	2.29	2.19	2.55	0.74	0.20	0.07
G8	Ayr-LochStriven	*1.48*	0.00	0.00	0.26	0.54	1.44	1.86	4.92	3.48	3.86	0.96	0.28	0.09
P16	Ayr-LochFyneArdkinglas	*0.89*	0.00	0.00	0.18	0.37	1.01	1.32	2.08	2.00	2.79	0.68	0.19	0.06
G18	Ayr-other	*1.41*	0.00	0.00	0.25	0.50	1.27	1.60	4.91	2.67	4.47	0.84	0.26	0.13
G123	WC-Gigha	*3.44*	0.00	0.00	0.59	1.58	2.95	4.67	6.84	8.66	12.57	2.63	0.63	0.21
P6	WC-LochMelfort	*9.08*	0.01	0.01	1.55	9.62	8.46	10.33	22.59	11.10	35.61	7.47	1.62	0.57
G10	WC-LochEtive	*1.63*	0.00	0.00	0.43	0.62	1.95	1.88	4.21	4.50	4.30	1.06	0.46	0.11
G9	WC-LochCreranLinnhe	*2.41*	0.00	0.00	0.38	0.75	2.29	2.58	10.80	4.56	5.80	1.25	0.40	0.14
G31	WC-LochLevenEil	*0.61*	0.00	0.00	0.13	0.27	0.72	1.19	1.44	1.36	1.55	0.49	0.14	0.05
G28	WC-Lochaber	*2.73*	0.00	0.00	0.45	0.88	7.47	3.21	4.51	6.02	7.65	1.95	0.48	0.17
P5	Mull-LochSpelve	*4.89*	0.00	0.00	0.74	1.39	4.42	6.10	13.81	15.49	13.30	2.32	0.79	0.27
P7	Mull-LochScridain	*3.57*	0.00	0.00	0.60	1.18	6.52	6.27	7.30	6.44	11.68	1.94	0.64	0.22
G1	Mull-other	*2.09*	0.00	0.00	0.38	1.04	1.86	5.86	4.93	4.28	4.91	1.33	0.40	0.14
P41	Skye-LochEishort	*1.27*	0.00	0.00	0.24	0.50	1.77	2.19	3.21	2.42	3.61	0.90	0.26	0.09
G42	Skye-other	*6.20*	0.00	0.00	0.96	2.43	10.96	9.46	12.64	15.26	18.43	2.88	0.98	0.36
G21	Lewis-LochLeurbostErisort	*3.27*	0.00	0.00	0.54	1.08	3.19	6.27	5.66	8.34	11.50	1.68	0.78	0.20
G23	Lewis-LochRoag	*4.71*	0.00	0.00	0.63	1.19	2.91	4.39	9.55	13.95	19.62	3.36	0.67	0.24
G22	HarrisUist	*3.12*	0.00	0.00	0.44	0.86	1.94	3.77	8.01	13.56	6.01	2.18	0.48	0.17
G35	NWC-LochTorridon	*3.37*	0.00	0.00	0.59	1.17	6.09	5.14	8.29	7.09	8.73	2.29	0.85	0.22
G39	NWC-LochEweBroom	*3.98*	0.00	0.00	0.97	3.72	7.51	5.88	4.76	5.34	16.54	2.07	0.72	0.26
G48	NWC-LochLaxfordInchard	*3.40*	0.00	0.00	0.54	1.43	3.27	3.51	7.48	9.47	12.66	1.73	0.57	0.20
G49	NWC-other	*1.58*	0.00	0.00	0.28	0.57	1.49	2.92	6.18	3.19	2.96	1.00	0.30	0.10
P38	Tain	*3.60*	0.00	0.00	0.64	1.31	3.21	3.71	6.48	5.26	7.28	13.77	1.33	0.24
G54	Orkney	*1.66*	0.00	0.00	0.31	0.65	1.82	2.38	3.94	4.68	4.42	1.22	0.33	0.11
G67	Shetland-SE-CliftSound	*4.57*	0.00	0.00	1.02	1.43	3.39	4.53	14.55	13.65	9.40	5.82	0.79	0.28
G56	Shetland-SE-DalesVoe	*4.23*	0.00	0.00	0.64	1.26	3.21	5.25	10.02	15.04	12.31	2.14	0.69	0.23
G57	Shetland-SE-SandsoundWeisdale	*5.85*	0.00	0.00	0.82	1.55	3.58	5.74	15.85	18.52	18.08	4.96	0.84	0.31
P61	Shetland-SW-GrutingVoe	*3.45*	0.00	0.00	0.54	1.07	2.60	3.89	7.40	8.46	14.33	2.38	0.58	0.20
P68	Shetland-SW-Vaila	*2.98*	0.00	0.00	0.49	0.97	2.47	3.66	9.00	10.07	6.20	2.14	0.52	0.18
P72	Shetland-W-AithVoe	*3.01*	0.00	0.00	0.55	1.12	3.86	4.55	6.58	7.28	8.67	2.54	0.80	0.20
P64	Shetland-W-BustaVoe	*3.71*	0.00	0.00	0.60	1.21	4.11	9.14	8.28	4.99	12.64	2.71	0.65	0.22
P70	Shetland-W-OlnaFirth	*2.58*	0.00	0.00	0.44	0.90	2.41	3.64	6.18	5.79	8.88	2.09	0.47	0.16
G58	Shetland-W-VementryVoe	*1.44*	0.00	0.00	0.27	0.57	1.50	2.37	3.73	3.25	3.87	1.35	0.29	0.10
G71	Shetland-W-RonasVoe	*1.87*	0.00	0.00	0.33	0.71	1.83	2.91	4.41	5.27	5.19	1.26	0.36	0.12
P65	Shetland-N-Basta	*2.78*	0.00	0.00	0.48	0.98	4.40	3.94	8.52	6.93	5.66	1.78	0.52	0.17
G81	Shetland-N-Uyea	*1.39*	0.00	0.00	0.37	0.54	1.84	2.78	4.21	2.23	3.03	1.24	0.29	0.10
	Average per month[2]	*3.01*	*0.00*	*0.00*	*0.52*	*1.27*	*3.32*	*4.14*	*7.36*	*7.21*	*9.12*	*2.39*	*0.57*	*0.18*

[1]Average over all months for a given pod group

[2]Average over all pod groups for a given month

Table B36: Estimated probability (%) of PST in mussels exceeding 800 µg/kg, for an average year. Values less than 0.01% are shown in grey.

Group	GroupName	*avg group*[1]	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
G80	EastCoast	*0.41*	0.00	0.00	0.00	0.31	2.20	1.12	0.64	0.36	0.25	0.00	0.08	0.00
G26	Dumfries	*0.24*	0.00	0.00	0.00	0.25	0.74	0.89	0.49	0.29	0.19	0.00	0.07	0.00
G8	Ayr-LochStriven	*3.23*	0.00	0.00	0.00	2.70	11.76	9.84	12.79	0.81	0.61	0.00	0.24	0.00
P16	Ayr-LochFyneArdkinglas	*0.88*	0.00	0.00	0.00	2.72	4.55	1.39	0.94	0.51	0.35	0.00	0.13	0.00
G18	Ayr-other	*3.36*	0.00	0.00	0.00	9.51	11.53	16.82	1.02	0.71	0.56	0.00	0.21	0.00
G123	WC-Gigha	*1.39*	0.00	0.00	0.00	0.52	1.69	10.28	2.95	0.63	0.42	0.00	0.14	0.00
P6	WC-LochMelfort	*0.28*	0.00	0.00	0.00	0.27	0.86	1.07	0.57	0.31	0.22	0.00	0.07	0.00
G10	WC-LochEtive	*0.25*	0.00	0.00	0.00	0.26	0.70	0.90	0.53	0.29	0.19	0.00	0.07	0.00
G9	WC-LochCreranLinnhe	*0.25*	0.00	0.00	0.00	0.26	0.77	0.86	0.54	0.29	0.20	0.00	0.07	0.00
G31	WC-LochLevenEil	*0.21*	0.00	0.00	0.00	0.22	0.70	0.76	0.41	0.24	0.18	0.00	0.06	0.00
G28	WC-Lochaber	*0.83*	0.00	0.00	0.00	0.31	2.30	4.73	1.95	0.34	0.22	0.00	0.10	0.00
P5	Mull-LochSpelve	*0.29*	0.00	0.00	0.00	0.27	0.86	1.14	0.58	0.33	0.22	0.00	0.07	0.00
P7	Mull-LochScridain	*1.14*	0.00	0.00	0.00	0.38	5.02	6.70	0.71	0.46	0.32	0.00	0.12	0.00
G1	Mull-other	*0.29*	0.00	0.00	0.00	0.28	0.88	1.14	0.57	0.34	0.23	0.00	0.07	0.00
P41	Skye-LochEishort	*1.82*	0.00	0.00	0.00	1.26	10.98	6.69	1.79	0.58	0.38	0.00	0.16	0.00
G42	Skye-other	*0.76*	0.00	0.00	0.00	0.29	0.73	6.98	0.52	0.33	0.24	0.00	0.09	0.00
G21	Lewis-LochLeurbostErisort	*0.21*	0.00	0.00	0.00	0.24	0.69	0.70	0.43	0.25	0.18	0.00	0.06	0.00
G23	Lewis-LochRoag	*0.49*	0.00	0.00	0.00	0.24	0.47	2.68	1.88	0.27	0.19	0.00	0.08	0.00
G22	HarrisUist	*0.32*	0.00	0.00	0.00	0.22	0.61	2.15	0.37	0.24	0.18	0.00	0.06	0.00
G35	NWC-LochTorridon	*1.83*	0.00	0.00	0.00	0.46	1.94	15.64	2.98	0.49	0.36	0.00	0.14	0.00
G39	NWC-LochEweBroom	*0.22*	0.00	0.00	0.00	0.23	0.66	0.79	0.47	0.26	0.19	0.00	0.06	0.00
G48	NWC-LochLaxfordInchard	*2.00*	0.00	0.00	0.00	1.05	3.52	11.44	6.84	0.62	0.40	0.00	0.17	0.00
G49	NWC-other	*0.74*	0.00	0.00	0.00	0.36	0.98	3.80	2.89	0.44	0.29	0.00	0.11	0.00
P38	Tain	*1.29*	0.00	0.00	0.00	0.38	12.40	1.22	0.71	0.43	0.30	0.00	0.11	0.00
G54	Orkney	*1.72*	0.00	0.00	0.00	0.49	3.71	14.50	0.91	0.56	0.38	0.00	0.13	0.00
G67	Shetland-SE-CliftSound	*0.40*	0.00	0.00	0.00	0.28	0.81	0.98	0.49	1.97	0.23	0.00	0.08	0.00
G56	Shetland-SE-DalesVoe	*0.22*	0.00	0.00	0.00	0.23	0.64	0.73	0.47	0.26	0.19	0.00	0.06	0.00
G57	Shetland-SE-SandsoundWeisdale	*0.53*	0.00	0.00	0.00	0.34	1.89	0.98	1.33	0.94	0.81	0.00	0.10	0.00
P61	Shetland-SW-GrutingVoe	*0.23*	0.00	0.00	0.00	0.24	0.71	0.84	0.46	0.27	0.19	0.00	0.07	0.00
P68	Shetland-SW-Vaila	*0.70*	0.00	0.00	0.00	0.36	0.86	1.08	3.49	2.17	0.28	0.00	0.11	0.00
P72	Shetland-W-AithVoe	*0.43*	0.00	0.00	0.00	0.34	0.98	1.14	1.66	0.41	0.28	0.00	0.41	0.00
P64	Shetland-W-BustaVoe	*1.04*	0.00	0.00	0.00	0.41	2.28	2.43	0.74	0.47	6.04	0.00	0.13	0.00
P70	Shetland-W-OlnaFirth	*0.44*	0.00	0.00	0.00	0.31	0.89	2.26	0.59	0.35	0.76	0.00	0.09	0.00
G58	Shetland-W-VementryVoe	*0.51*	0.00	0.00	0.00	0.31	1.74	0.86	0.54	0.33	2.21	0.00	0.09	0.00
G71	Shetland-W-RonasVoe	*0.69*	0.00	0.00	0.00	0.44	2.60	1.27	0.76	2.76	0.31	0.00	0.11	0.00
P65	Shetland-N-Basta	*0.24*	0.00	0.00	0.00	0.24	0.73	0.87	0.48	0.28	0.18	0.00	0.07	0.00
G81	Shetland-N-Uyea	*0.62*	0.00	0.00	0.00	0.26	1.36	0.96	0.60	3.92	0.21	0.00	0.09	0.00
	Average per month[2]	*0.83*	*0.00*	*0.00*	*0.00*	*0.74*	*2.61*	*3.75*	*1.52*	*0.66*	*0.51*	*0.00*	*0.11*	*0.00*

[1]Average over all months for a given pod group

[2]Average over all pod groups for a given month

Table B37: Estimated probability (%) of PST in mussels exceeding 400 µg/kg, for an average year. Values less than 0.01% are shown in grey.

Group	GroupName	*avg group*[1]	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
G80	EastCoast	*1.16*	0.11	0.00	0.22	0.58	2.88	3.55	5.03	0.67	0.67	0.19	0.07	0.00
G26	Dumfries	*0.32*	0.05	0.00	0.11	0.33	0.85	0.99	0.68	0.37	0.37	0.10	0.03	0.00
G8	Ayr-LochStriven	*4.86*	0.27	0.00	0.46	9.08	13.52	12.00	20.00	1.19	1.19	0.43	0.16	0.00
P16	Ayr-LochFyneArdkinglas	*1.45*	0.12	0.00	0.25	6.48	5.72	1.65	1.49	0.70	0.67	0.22	0.07	0.00
G18	Ayr-other	*5.84*	0.30	0.00	1.35	18.78	16.24	23.44	6.77	1.19	1.32	0.47	0.19	0.00
G123	WC-Gigha	*3.16*	0.18	0.00	0.35	1.04	2.63	21.46	9.38	1.23	1.25	0.34	0.11	0.00
P6	WC-LochMelfort	*0.44*	0.07	0.00	0.14	0.41	1.21	1.38	0.93	0.47	0.50	0.13	0.04	0.00
G10	WC-LochEtive	*0.29*	0.05	0.00	0.10	0.31	0.71	0.89	0.66	0.34	0.32	0.09	0.03	0.00
G9	WC-LochCreranLinnhe	*0.30*	0.05	0.00	0.10	0.31	0.79	0.82	0.68	0.33	0.34	0.09	0.03	0.00
G31	WC-LochLevenEil	*0.25*	0.04	0.00	0.09	0.27	0.71	0.71	0.51	0.28	0.29	0.08	0.03	0.00
G28	WC-Lochaber	*2.35*	0.16	0.00	3.39	0.62	7.90	9.27	5.31	0.61	0.54	0.27	0.10	0.00
P5	Mull-LochSpelve	*0.39*	0.06	0.00	0.13	0.37	0.99	1.30	0.83	0.43	0.42	0.11	0.04	0.00
P7	Mull-LochScridain	*5.20*	0.20	0.00	0.38	0.85	24.60	31.27	2.80	0.95	0.89	0.32	0.12	0.00
G1	Mull-other	*0.76*	0.08	0.00	0.16	0.47	4.90	1.40	0.89	0.54	0.54	0.15	0.05	0.00
P41	Skye-LochEishort	*4.42*	0.26	0.00	1.53	9.59	19.52	16.84	2.76	1.08	0.93	0.42	0.16	0.00
G42	Skye-other	*2.62*	0.15	0.00	0.30	0.69	11.01	12.96	4.49	0.75	0.76	0.26	0.09	0.00
G21	Lewis-LochLeurbostErisort	*0.46*	0.06	0.00	0.12	0.39	2.51	0.88	0.69	0.38	0.39	0.12	0.04	0.00
G23	Lewis-LochRoag	*0.91*	0.07	0.00	0.14	0.34	0.57	4.09	4.86	0.35	0.32	0.12	0.04	0.00
G22	HarrisUist	*0.44*	0.05	0.00	0.11	0.30	0.77	2.72	0.53	0.33	0.33	0.10	0.03	0.00
G35	NWC-LochTorridon	*3.20*	0.16	0.00	0.30	0.78	5.47	21.16	8.63	0.73	0.73	0.28	0.10	0.00
G39	NWC-LochEweBroom	*0.43*	0.06	0.00	0.12	0.34	0.85	2.15	0.72	0.37	0.39	0.11	0.04	0.00
G48	NWC-LochLaxfordInchard	*4.37*	0.24	0.00	0.42	6.06	12.78	20.74	9.69	1.10	0.91	0.38	0.15	0.00
G49	NWC-other	*1.47*	0.14	0.00	0.28	1.93	3.25	4.87	5.41	0.76	0.72	0.24	0.08	0.00
P38	Tain	*3.21*	0.16	0.00	0.33	2.46	28.04	3.87	1.46	0.91	0.86	0.29	0.10	0.00
G54	Orkney	*3.51*	0.17	0.00	0.37	0.90	9.73	26.81	1.65	1.04	0.99	0.32	0.10	0.00
G67	Shetland-SE-CliftSound	*1.00*	0.56	0.00	0.23	0.59	1.37	1.46	2.04	4.87	0.65	0.20	0.07	0.00
G56	Shetland-SE-DalesVoe	*0.32*	0.05	0.00	0.11	0.33	0.85	0.90	0.73	0.36	0.39	0.10	0.03	0.00
G57	Shetland-SE-SandsoundWeisdale	*1.51*	0.14	0.00	0.26	0.65	2.75	2.74	5.00	3.75	2.59	0.22	0.08	0.00
P61	Shetland-SW-GrutingVoe	*0.96*	0.10	0.00	0.20	0.54	1.22	1.37	2.19	0.58	5.14	0.18	0.06	0.00
P68	Shetland-SW-Vaila	*3.12*	0.19	0.00	0.35	0.78	1.34	1.66	10.55	6.44	15.76	0.31	0.11	0.00
P72	Shetland-W-AithVoe	*2.28*	0.24	0.00	0.47	1.03	2.26	2.34	8.32	5.64	4.98	1.43	0.65	0.00
P64	Shetland-W-BustaVoe	*2.94*	0.25	0.00	0.47	0.98	3.69	7.60	3.14	8.12	8.47	2.42	0.15	0.00
P70	Shetland-W-OlnaFirth	*1.18*	0.11	0.00	0.21	0.57	1.39	5.43	1.03	0.57	4.55	0.19	0.06	0.00
G58	Shetland-W-VementryVoe	*1.64*	0.17	0.00	0.32	0.75	3.04	1.52	1.20	2.68	6.84	3.05	0.10	0.00
G71	Shetland-W-RonasVoe	*1.90*	0.17	0.00	0.34	1.05	4.02	2.17	3.25	7.00	4.34	0.31	0.10	0.00
P65	Shetland-N-Basta	*1.06*	0.11	0.00	0.22	0.59	3.28	3.52	1.15	0.67	2.90	0.20	0.07	0.00
G81	Shetland-N-Uyea	*2.12*	0.14	0.00	0.25	0.50	3.19	2.77	1.11	15.49	1.65	0.21	0.08	0.00
	Average per month[2]	*1.94*	*0.15*	*0.00*	*0.40*	*1.95*	*5.58*	*7.05*	*3.69*	*1.98*	*2.02*	*0.39*	*0.10*	*0.00*

[1]Average over all months for a given pod group

[2]Average over all pod groups for a given month

Table B38: Estimated probability (%) of PST in mussels exceeding 0 µg/kg, for an average year. Values less than 0.01% are shown in grey.

Group	GroupName	*avg group*[1]	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
G80	EastCoast	*2.78*	0.09	0.09	0.39	1.20	11.51	9.63	7.14	1.42	1.38	0.43	0.13	0.00
G26	Dumfries	*0.40*	0.02	0.02	0.10	0.40	1.11	1.12	0.92	0.50	0.43	0.12	0.03	0.00
G8	Ayr-LochStriven	*6.22*	0.21	0.20	2.76	13.25	17.43	16.97	18.47	2.18	1.98	0.84	0.29	0.01
P16	Ayr-LochFyneArdkinglas	*2.67*	0.09	0.09	0.38	7.76	13.25	2.53	4.76	1.42	1.21	0.43	0.13	0.00
G18	Ayr-other	*7.31*	0.24	0.23	2.34	20.93	18.59	25.01	13.02	3.72	2.40	0.93	0.32	0.01
G123	WC-Gigha	*5.96*	0.20	0.20	0.78	5.32	9.16	27.05	18.46	3.12	5.97	0.97	0.29	0.01
P6	WC-LochMelfort	*2.34*	0.09	0.09	0.36	1.18	5.40	7.41	8.18	1.37	3.43	0.45	0.13	0.00
G10	WC-LochEtive	*0.37*	0.02	0.02	0.10	0.39	1.00	1.05	0.92	0.45	0.41	0.11	0.03	0.00
G9	WC-LochCreranLinnhe	*0.41*	0.02	0.02	0.10	0.41	1.18	1.07	1.01	0.48	0.45	0.12	0.03	0.00
G31	WC-LochLevenEil	*0.31*	0.02	0.02	0.08	0.32	0.95	0.87	0.63	0.34	0.34	0.10	0.03	0.00
G28	WC-Lochaber	*4.14*	0.14	0.13	3.82	4.44	14.96	13.33	10.19	1.09	0.83	0.55	0.19	0.01
P5	Mull-LochSpelve	*0.52*	0.03	0.03	0.13	0.49	1.46	1.55	1.20	0.60	0.54	0.15	0.04	0.00
P7	Mull-LochScridain	*7.89*	0.19	0.19	0.71	4.27	36.12	39.21	9.14	2.07	1.74	0.78	0.27	0.01
G1	Mull-other	*1.71*	0.06	0.06	0.27	0.98	9.69	4.96	1.86	1.20	1.07	0.30	0.09	0.00
P41	Skye-LochEishort	*7.16*	0.24	0.24	9.32	11.29	31.98	21.82	5.71	2.31	1.63	0.96	0.33	0.01
G42	Skye-other	*4.36*	0.11	0.10	0.42	1.10	18.39	21.62	7.67	1.22	1.13	0.47	0.15	0.00
G21	Lewis-LochLeurbostErisort	*0.77*	0.04	0.04	0.16	0.63	2.88	2.21	1.10	1.37	0.58	0.19	0.05	0.00
G23	Lewis-LochRoag	*2.22*	0.08	0.25	0.29	0.72	4.58	10.43	7.76	1.46	0.62	0.33	0.11	0.00
G22	HarrisUist	*1.46*	0.04	0.04	0.17	0.56	7.01	6.72	1.51	0.59	0.56	0.21	0.06	0.00
G35	NWC-LochTorridon	*5.17*	0.13	0.12	0.46	1.37	12.15	27.35	16.82	1.46	1.41	0.57	0.17	0.01
G39	NWC-LochEweBroom	*1.21*	0.05	0.05	0.20	0.71	2.99	5.86	2.77	0.82	0.78	0.23	0.07	0.00
G48	NWC-LochLaxfordInchard	*7.10*	0.20	0.19	0.63	12.30	23.70	28.72	14.94	1.92	1.55	0.79	0.27	0.01
G49	NWC-other	*2.71*	0.10	0.09	0.40	3.58	7.32	11.65	6.19	1.41	1.19	0.45	0.14	0.00
P38	Tain	*4.90*	0.15	0.15	0.63	3.44	29.94	10.91	4.05	1.84	6.80	0.71	0.22	0.01
G54	Orkney	*5.57*	0.16	0.16	0.73	2.06	13.72	34.60	9.77	2.47	2.14	0.78	0.22	0.01
G67	Shetland-SE-CliftSound	*3.73*	0.50	0.15	0.57	2.45	4.30	7.07	7.15	12.61	9.13	0.66	0.22	0.01
G56	Shetland-SE-DalesVoe	*0.74*	0.03	0.03	0.15	0.54	3.51	1.99	1.14	0.60	0.62	0.18	0.05	0.00
G57	Shetland-SE-SandsoundWeisdale	*2.95*	0.10	0.10	0.38	1.01	4.56	3.88	9.32	7.15	8.34	0.44	0.14	0.00
P61	Shetland-SW-GrutingVoe	*2.62*	0.11	0.10	0.43	1.21	5.97	3.88	6.74	6.41	5.98	0.50	0.15	0.00
P68	Shetland-SW-Vaila	*6.04*	0.22	0.21	0.74	2.78	6.67	5.76	12.66	16.57	24.64	1.91	0.30	0.01
P72	Shetland-W-AithVoe	*5.44*	0.27	0.26	0.92	3.40	5.52	8.72	17.42	14.95	9.09	2.27	2.41	0.01
P64	Shetland-W-BustaVoe	*6.03*	0.27	0.26	0.88	6.42	10.54	9.51	11.23	15.95	11.99	4.90	0.35	0.01
P70	Shetland-W-OlnaFirth	*2.46*	0.11	0.10	0.42	5.74	2.46	5.39	3.29	5.09	6.37	0.47	0.14	0.00
G58	Shetland-W-VementryVoe	*4.46*	0.20	0.19	0.68	5.17	6.08	4.13	6.62	12.43	10.51	7.24	0.27	0.01
G71	Shetland-W-RonasVoe	*4.95*	0.17	0.16	0.61	2.49	5.76	3.51	13.15	18.76	13.80	0.70	0.23	0.01
P65	Shetland-N-Basta	*2.24*	0.11	0.10	0.43	1.20	4.11	4.01	3.47	2.80	7.62	2.92	0.15	0.00
G81	Shetland-N-Uyea	*4.45*	0.13	0.12	0.44	0.83	9.78	8.06	3.02	20.27	10.06	0.50	0.18	0.01
	Average per month[2]	*3.56*	*0.13*	*0.12*	*0.88*	*3.58*	*9.88*	*10.80*	*7.28*	*4.61*	*4.29*	*0.94*	*0.23*	*0.01*

[1]Average over all months for a given pod group

[2]Average over all pod groups for a given month

Table B39: Estimated probability (%) of LT in mussels exceeding MPL, for an average year. Values less than 0.01% are shown in grey.

Group	GroupName	*avg group*[1]	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
G80	EastCoast	*7.85*	0.20	0.01	0.23	2.48	4.63	11.61	13.31	24.93	22.39	9.36	3.41	1.69
G26	Dumfries	*0.68*	0.02	0.00	0.02	0.22	0.59	1.12	1.59	2.05	1.40	0.78	0.25	0.12
G8	Ayr-LochStriven	*18.84*	0.66	0.03	0.73	5.84	16.98	35.18	36.41	44.99	37.87	26.22	16.75	4.38
P16	Ayr-LochFyneArdkinglas	*9.78*	0.26	0.01	0.29	4.47	8.25	25.21	27.89	22.23	17.09	6.34	3.58	1.71
G18	Ayr-other	*18.30*	0.63	0.03	0.83	6.72	21.91	39.14	37.09	38.28	39.35	20.03	10.03	5.52
G123	WC-Gigha	*1.25*	0.03	0.00	0.03	0.39	1.25	1.92	2.69	4.10	2.87	1.08	0.44	0.21
P6	WC-LochMelfort	*5.77*	0.13	0.01	0.15	1.95	3.14	7.73	14.16	19.33	14.50	5.40	1.83	0.93
G10	WC-LochEtive	*0.52*	0.01	0.00	0.01	0.17	0.44	1.01	1.21	1.55	1.07	0.47	0.19	0.09
G9	WC-LochCreranLinnhe	*1.27*	0.03	0.00	0.03	0.36	0.74	1.58	3.14	4.97	2.81	0.95	0.39	0.19
G31	WC-LochLevenEil	*0.61*	0.01	0.00	0.02	0.20	0.79	0.95	1.32	1.92	1.18	0.55	0.22	0.10
G28	WC-Lochaber	*7.71*	0.18	0.01	0.20	2.43	3.91	9.86	23.92	27.09	14.96	5.63	3.16	1.20
P5	Mull-LochSpelve	*0.81*	0.02	0.00	0.02	0.31	0.54	1.25	1.75	3.16	1.54	0.70	0.28	0.13
P7	Mull-LochScridain	*9.74*	0.22	0.01	0.26	2.42	5.10	17.22	24.38	36.70	19.65	6.65	2.79	1.53
G1	Mull-other	*2.48*	0.06	0.00	0.06	0.75	1.54	5.33	4.42	8.64	5.60	1.98	1.02	0.40
P41	Skye-LochEishort	*8.15*	0.20	0.01	0.23	2.20	5.33	12.93	22.02	27.26	14.51	8.19	3.54	1.36
G42	Skye-other	*4.33*	0.10	0.00	0.12	1.22	2.54	7.45	11.98	14.07	7.55	4.17	1.91	0.86
G21	Lewis-LochLeurbostErisort	*2.39*	0.05	0.00	0.06	0.68	1.86	3.80	8.87	5.00	5.39	1.71	0.91	0.37
G23	Lewis-LochRoag	*6.42*	0.13	0.01	0.14	1.27	3.37	8.95	22.37	23.51	11.61	3.23	1.44	1.00
G22	HarrisUist	*0.99*	0.02	0.00	0.02	0.27	0.56	1.19	2.35	4.18	1.93	0.87	0.30	0.15
G35	NWC-LochTorridon	*5.30*	0.12	0.01	0.14	1.69	2.56	8.45	10.34	12.92	19.11	5.97	1.52	0.82
G39	NWC-LochEweBroom	*5.31*	0.12	0.01	0.14	1.40	3.08	9.89	10.78	16.63	11.85	7.42	1.57	0.85
G48	NWC-LochLaxfordInchard	*12.51*	0.33	0.02	0.37	2.86	4.60	13.01	36.28	36.20	28.83	17.07	8.14	2.39
G49	NWC-other	*4.97*	0.11	0.01	0.15	1.32	2.55	4.80	13.74	19.53	11.01	4.23	1.48	0.76
P38	Tain	*2.35*	0.05	0.00	0.06	0.71	1.46	6.41	5.40	5.84	4.84	2.26	0.80	0.39
G54	Orkney	*5.28*	0.13	0.01	0.15	1.76	3.58	10.75	8.91	12.80	15.68	6.15	2.28	1.18
G67	Shetland-SE-CliftSound	*6.73*	0.17	0.01	0.20	4.46	7.03	14.34	14.63	19.64	11.59	5.29	2.20	1.19
G56	Shetland-SE-DalesVoe	*5.28*	0.14	0.01	0.16	3.81	4.15	7.68	14.08	13.36	12.10	4.61	2.25	0.96
G57	Shetland-SE-SandsoundWeisdale	*5.48*	0.14	0.01	0.16	2.83	5.51	11.50	9.93	14.81	13.06	5.20	1.67	0.93
P61	Shetland-SW-GrutingVoe	*6.89*	0.17	0.01	0.20	2.90	9.52	15.55	14.59	19.46	12.14	4.60	2.30	1.23
P68	Shetland-SW-Vaila	*8.07*	0.21	0.01	0.25	6.01	8.66	15.95	18.21	26.24	11.15	5.95	2.73	1.47
P72	Shetland-W-AithVoe	*8.01*	0.18	0.01	0.21	2.14	5.43	14.73	27.05	22.41	14.78	5.53	2.32	1.28
P64	Shetland-W-BustaVoe	*6.04*	0.14	0.01	0.16	1.69	5.09	10.22	16.36	18.60	12.57	4.47	2.21	1.00
P70	Shetland-W-OlnaFirth	*4.31*	0.10	0.00	0.12	1.27	4.17	7.09	9.68	12.87	10.73	3.66	1.37	0.71
G58	Shetland-W-VementryVoe	*4.93*	0.12	0.01	0.13	1.41	3.11	7.23	12.79	15.34	10.42	5.56	2.24	0.82
G71	Shetland-W-RonasVoe	*12.18*	0.38	0.02	0.43	5.65	10.11	16.45	22.62	38.06	26.98	15.76	6.03	3.72
P65	Shetland-N-Basta	*6.31*	0.17	0.01	0.20	3.98	5.94	9.79	15.44	16.44	10.18	9.83	2.24	1.46
G81	Shetland-N-Uyea	*5.20*	0.17	0.01	0.19	1.93	3.53	7.86	8.88	13.84	12.40	9.85	2.82	0.92
	Average per month[2]	*6.03*	*0.16*	*0.01*	*0.19*	*2.22*	*4.69*	*10.41*	*14.34*	*17.54*	*12.78*	*6.15*	*2.67*	*1.19*

[1]Average over all months for a given pod group

[2]Average over all pod groups for a given month

Table B40: Estimated probability (%) of AZA in mussels exceeding 160 µg/kg. Values less than 0.01% are shown in grey.

Group	GroupName	*avg group*[1]	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
G80	EastCoast	*0.05*	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.16	0.21	0.05	0.03
G26	Dumfries	*0.04*	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.13	0.17	0.04	0.02
G8	Ayr-LochStriven	*0.04*	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.13	0.17	0.04	0.02
P16	Ayr-LochFyneArdkinglas	*0.04*	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.13	0.18	0.04	0.02
G18	Ayr-other	*0.03*	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.09	0.12	0.03	0.02
G123	WC-Gigha	*0.04*	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.13	0.16	0.04	0.02
P6	WC-LochMelfort	*0.04*	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.13	0.17	0.04	0.02
G10	WC-LochEtive	*0.04*	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.13	0.17	0.04	0.02
G9	WC-LochCreranLinnhe	*0.04*	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.13	0.16	0.04	0.02
G31	WC-LochLevenEil	*0.03*	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.10	0.14	0.03	0.02
G28	WC-Lochaber	*0.03*	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.10	0.13	0.03	0.02
P5	Mull-LochSpelve	*0.04*	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.13	0.17	0.04	0.02
P7	Mull-LochScridain	*0.04*	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.13	0.17	0.04	0.02
G1	Mull-other	*0.05*	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.16	0.21	0.05	0.03
P41	Skye-LochEishort	*0.04*	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.13	0.17	0.04	0.02
G42	Skye-other	*1.28*	1.50	0.00	0.00	0.00	0.00	0.00	0.00	2.47	4.10	5.29	1.26	0.70
G21	Lewis-LochLeurbostErisort	*1.51*	1.78	0.00	0.00	0.00	0.00	0.00	0.00	2.94	4.86	6.25	1.49	0.83
G23	Lewis-LochRoag	*0.85*	0.99	0.00	0.00	0.00	0.00	0.00	0.00	1.65	2.75	3.56	0.83	0.46
G22	HarrisUist	*0.03*	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.08	0.11	0.03	0.01
G35	NWC-LochTorridon	*0.03*	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.11	0.15	0.03	0.02
G39	NWC-LochEweBroom	*0.04*	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.12	0.16	0.04	0.02
G48	NWC-LochLaxfordInchard	*0.03*	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.10	0.13	0.03	0.02
G49	NWC-other	*0.04*	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.13	0.17	0.04	0.02
P38	Tain	*0.04*	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.14	0.18	0.04	0.02
G54	Orkney	*0.05*	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.16	0.21	0.05	0.03
G67	Shetland-SE-CliftSound	*0.03*	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.11	0.15	0.03	0.02
G56	Shetland-SE-DalesVoe	*0.04*	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.13	0.17	0.04	0.02
G57	Shetland-SE-SandsoundWeisdale	*0.03*	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.10	0.13	0.03	0.02
P61	Shetland-SW-GrutingVoe	*0.04*	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.13	0.17	0.04	0.02
P68	Shetland-SW-Vaila	*0.04*	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.13	0.17	0.04	0.02
P72	Shetland-W-AithVoe	*0.04*	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.13	0.17	0.04	0.02
P64	Shetland-W-BustaVoe	*0.04*	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.13	0.16	0.04	0.02
P70	Shetland-W-OlnaFirth	*0.04*	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.13	0.16	0.04	0.02
G58	Shetland-W-VementryVoe	*0.04*	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.12	0.15	0.03	0.02
G71	Shetland-W-RonasVoe	*0.04*	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.14	0.18	0.04	0.02
P65	Shetland-N-Basta	*2.47*	2.96	0.00	0.00	0.00	0.00	0.00	0.00	4.84	7.91	10.08	2.49	1.39
G81	Shetland-N-Uyea	*2.45*	2.93	0.00	0.00	0.00	0.00	0.00	0.00	4.79	7.82	9.98	2.46	1.38
	Average per month[2]	*0.26*	*0.31*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.51*	*0.85*	*1.09*	*0.26*	*0.15*

[1]Average over all months for a given pod group

[2]Average over all pod groups for a given month

Table B41: Estimated probability (%) of AZA in mussels exceeding 80 µg/kg. Values less than 0.01% are shown in grey.

Group	GroupName	*avg group*[1]	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
G80	EastCoast	*0.22*	0.20	0.00	0.03	0.00	0.00	0.00	0.00	0.42	0.52	0.95	0.43	0.09
G26	Dumfries	*0.15*	0.14	0.00	0.02	0.00	0.00	0.00	0.00	0.29	0.36	0.66	0.30	0.06
G8	Ayr-LochStriven	*0.15*	0.14	0.00	0.02	0.00	0.00	0.00	0.00	0.29	0.36	0.66	0.30	0.06
P16	Ayr-LochFyneArdkinglas	*0.16*	0.14	0.00	0.02	0.00	0.00	0.00	0.00	0.30	0.38	0.69	0.31	0.07
G18	Ayr-other	*0.10*	0.09	0.00	0.01	0.00	0.00	0.00	0.00	0.19	0.23	0.42	0.19	0.04
G123	WC-Gigha	*0.14*	0.13	0.00	0.02	0.00	0.00	0.00	0.00	0.28	0.34	0.63	0.29	0.06
P6	WC-LochMelfort	*0.15*	0.13	0.00	0.02	0.00	0.00	0.00	0.00	0.28	0.35	0.64	0.29	0.06
G10	WC-LochEtive	*0.15*	0.13	0.00	0.02	0.00	0.00	0.00	0.00	0.28	0.35	0.64	0.29	0.06
G9	WC-LochCreranLinnhe	*0.14*	0.13	0.00	0.02	0.00	0.00	0.00	0.00	0.28	0.34	0.63	0.29	0.06
G31	WC-LochLevenEil	*0.29*	0.26	0.00	0.04	0.00	0.00	0.00	0.00	0.55	0.69	1.25	0.57	0.12
G28	WC-Lochaber	*0.11*	0.10	0.00	0.01	0.00	0.00	0.00	0.00	0.20	0.26	0.47	0.21	0.04
P5	Mull-LochSpelve	*0.16*	0.14	0.00	0.02	0.00	0.00	0.00	0.00	0.30	0.37	0.68	0.31	0.07
P7	Mull-LochScridain	*0.16*	0.14	0.00	0.02	0.00	0.00	0.00	0.00	0.30	0.37	0.68	0.31	0.07
G1	Mull-other	*0.21*	0.18	0.00	0.03	0.00	0.00	0.00	0.00	0.39	0.49	0.89	0.41	0.09
P41	Skye-LochEishort	*0.15*	0.13	0.00	0.02	0.00	0.00	0.00	0.00	0.28	0.35	0.65	0.29	0.06
G42	Skye-other	*1.63*	1.50	0.00	0.21	0.00	0.00	0.00	0.00	3.15	3.89	6.90	3.25	0.70
G21	Lewis-LochLeurbostErisort	*2.64*	2.48	0.00	0.35	0.00	0.00	0.00	0.00	5.13	6.31	10.98	5.30	1.17
G23	Lewis-LochRoag	*2.82*	2.65	0.00	0.37	0.00	0.00	0.00	0.00	5.48	6.73	11.67	5.65	1.25
G22	HarrisUist	*0.78*	0.71	0.00	0.10	0.00	0.00	0.00	0.00	1.49	1.85	3.35	1.55	0.33
G35	NWC-LochTorridon	*0.12*	0.11	0.00	0.02	0.00	0.00	0.00	0.00	0.24	0.29	0.54	0.24	0.05
G39	NWC-LochEweBroom	*0.14*	0.12	0.00	0.02	0.00	0.00	0.00	0.00	0.26	0.32	0.59	0.27	0.06
G48	NWC-LochLaxfordInchard	*0.46*	0.42	0.00	0.06	0.00	0.00	0.00	0.00	0.88	1.10	1.99	0.91	0.19
G49	NWC-other	*0.80*	0.73	0.00	0.10	0.00	0.00	0.00	0.00	1.54	1.91	3.44	1.59	0.34
P38	Tain	*0.17*	0.16	0.00	0.02	0.00	0.00	0.00	0.00	0.33	0.41	0.75	0.34	0.07
G54	Orkney	*0.76*	0.69	0.00	0.09	0.00	0.00	0.00	0.00	1.45	1.80	3.26	1.50	0.32
G67	Shetland-SE-CliftSound	*0.13*	0.11	0.00	0.02	0.00	0.00	0.00	0.00	0.24	0.30	0.56	0.25	0.05
G56	Shetland-SE-DalesVoe	*0.15*	0.13	0.00	0.02	0.00	0.00	0.00	0.00	0.28	0.35	0.64	0.29	0.06
G57	Shetland-SE-SandsoundWeisdale	*0.26*	0.24	0.00	0.03	0.00	0.00	0.00	0.00	0.50	0.62	1.13	0.52	0.11
P61	Shetland-SW-GrutingVoe	*0.16*	0.14	0.00	0.02	0.00	0.00	0.00	0.00	0.30	0.38	0.69	0.31	0.07
P68	Shetland-SW-Vaila	*0.15*	0.14	0.00	0.02	0.00	0.00	0.00	0.00	0.29	0.36	0.66	0.30	0.06
P72	Shetland-W-AithVoe	*0.43*	0.39	0.00	0.05	0.00	0.00	0.00	0.00	0.83	1.03	1.87	0.86	0.18
P64	Shetland-W-BustaVoe	*0.77*	0.70	0.00	0.10	0.00	0.00	0.00	0.00	1.48	1.83	3.30	1.53	0.33
P70	Shetland-W-OlnaFirth	*1.57*	1.44	0.00	0.20	0.00	0.00	0.00	0.00	3.02	3.73	6.63	3.12	0.67
G58	Shetland-W-VementryVoe	*0.36*	0.33	0.00	0.04	0.00	0.00	0.00	0.00	0.69	0.86	1.56	0.72	0.15
G71	Shetland-W-RonasVoe	*1.52*	1.40	0.00	0.19	0.00	0.00	0.00	0.00	2.92	3.61	6.43	3.02	0.65
P65	Shetland-N-Basta	*3.75*	3.59	0.00	0.51	0.00	0.00	0.00	0.00	7.34	8.98	15.31	7.58	1.70
G81	Shetland-N-Uyea	*4.45*	4.32	0.00	0.61	0.00	0.00	0.00	0.00	8.76	10.68	17.98	9.04	2.05
	Average per month[2]	*0.72*	*0.67*	*0.00*	*0.09*	*0.00*	*0.00*	*0.00*	*0.00*	*1.38*	*1.71*	*2.99*	*1.43*	*0.31*

[1]Average over all months for a given pod group

[2]Average over all pod groups for a given month

Table B42: Estimated probability (%) of AZA in mussels exceeding 0 µg/kg. Values less than 0.01% are shown in grey.

Group	GroupName	*Avg group*[1]	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
G80	EastCoast	*0.47*	0.36	0.31	0.20	0.04	0.02	0.02	0.00	0.71	0.95	1.57	1.03	0.43
G26	Dumfries	*0.28*	0.21	0.18	0.12	0.02	0.01	0.01	0.00	0.42	0.56	0.93	0.61	0.25
G8	Ayr-LochStriven	*0.27*	0.21	0.18	0.12	0.02	0.01	0.01	0.00	0.41	0.56	0.92	0.60	0.25
P16	Ayr-LochFyneArdkinglas	*0.29*	0.22	0.19	0.12	0.02	0.01	0.01	0.00	0.44	0.59	0.98	0.64	0.27
G18	Ayr-other	*0.16*	0.12	0.10	0.07	0.01	0.01	0.01	0.00	0.24	0.32	0.53	0.35	0.14
G123	WC-Gigha	*0.26*	0.20	0.17	0.11	0.02	0.01	0.01	0.00	0.39	0.53	0.87	0.57	0.24
P6	WC-LochMelfort	*0.27*	0.21	0.18	0.11	0.02	0.01	0.01	0.00	0.41	0.55	0.90	0.59	0.25
G10	WC-LochEtive	*0.26*	0.20	0.17	0.11	0.02	0.01	0.01	0.00	0.40	0.54	0.88	0.58	0.24
G9	WC-LochCreranLinnhe	*0.26*	0.20	0.17	0.11	0.02	0.01	0.01	0.00	0.39	0.52	0.86	0.56	0.23
G31	WC-LochLevenEil	*0.41*	0.32	0.27	0.17	0.04	0.02	0.02	0.00	0.62	0.83	1.37	0.90	0.37
G28	WC-Lochaber	*1.82*	1.43	1.21	0.79	0.16	0.09	0.09	0.00	2.76	3.69	5.95	3.97	1.68
P5	Mull-LochSpelve	*0.30*	0.23	0.19	0.13	0.03	0.01	0.01	0.00	0.45	0.60	0.99	0.65	0.27
P7	Mull-LochScridain	*0.29*	0.22	0.19	0.12	0.02	0.01	0.01	0.00	0.43	0.58	0.96	0.63	0.26
G1	Mull-other	*1.12*	0.87	0.74	0.48	0.10	0.05	0.05	0.00	1.70	2.28	3.72	2.46	1.03
P41	Skye-LochEishort	*2.36*	1.87	1.58	1.04	0.21	0.11	0.12	0.00	3.60	4.80	7.69	5.16	2.20
G42	Skye-other	*2.64*	2.10	1.78	1.17	0.24	0.13	0.13	0.00	4.03	5.36	8.57	5.76	2.46
G21	Lewis-LochLeurbostErisort	*6.67*	5.56	4.74	3.15	0.65	0.35	0.36	0.00	10.35	13.48	20.49	14.40	6.50
G23	Lewis-LochRoag	*6.06*	5.02	4.27	2.83	0.58	0.31	0.32	0.00	9.39	12.27	18.78	13.11	5.87
G22	HarrisUist	*3.59*	2.88	2.45	1.61	0.33	0.18	0.18	0.00	5.50	7.28	11.50	7.82	3.38
G35	NWC-LochTorridon	*0.22*	0.17	0.14	0.09	0.02	0.01	0.01	0.00	0.33	0.44	0.72	0.47	0.20
G39	NWC-LochEweBroom	*0.86*	0.67	0.56	0.37	0.07	0.04	0.04	0.00	1.30	1.74	2.85	1.88	0.78
G48	NWC-LochLaxfordInchard	*2.55*	2.02	1.71	1.13	0.23	0.12	0.13	0.00	3.89	5.17	8.28	5.56	2.37
G49	NWC-other	*4.44*	3.60	3.06	2.02	0.41	0.22	0.23	0.00	6.82	8.99	14.04	9.63	4.22
P38	Tain	*0.80*	0.62	0.52	0.34	0.07	0.04	0.04	0.00	1.20	1.62	2.65	1.75	0.73
G54	Orkney	*9.76*	8.46	7.24	4.85	1.01	0.54	0.56	0.01	15.34	19.65	28.79	20.88	9.83
G67	Shetland-SE-CliftSound	*1.43*	1.12	0.95	0.62	0.12	0.07	0.07	0.00	2.17	2.90	4.71	3.12	1.31
G56	Shetland-SE-DalesVoe	*1.86*	1.46	1.24	0.81	0.16	0.09	0.09	0.00	2.83	3.78	6.09	4.06	1.72
G57	Shetland-SE-SandsoundWeisdale	*0.58*	0.45	0.38	0.25	0.05	0.03	0.03	0.00	0.87	1.17	1.92	1.26	0.52
P61	Shetland-SW-GrutingVoe	*0.30*	0.23	0.19	0.13	0.03	0.01	0.01	0.00	0.45	0.60	0.99	0.65	0.27
P68	Shetland-SW-Vaila	*0.64*	0.50	0.42	0.27	0.06	0.03	0.03	0.00	0.97	1.30	2.14	1.41	0.59
P72	Shetland-W-AithVoe	*1.49*	1.16	0.98	0.64	0.13	0.07	0.07	0.00	2.25	3.02	4.89	3.25	1.37
P64	Shetland-W-BustaVoe	*5.16*	4.22	3.59	2.38	0.49	0.26	0.27	0.00	7.96	10.45	16.18	11.19	4.95
P70	Shetland-W-OlnaFirth	*2.80*	2.22	1.89	1.24	0.25	0.13	0.14	0.00	4.27	5.68	9.05	6.10	2.61
G58	Shetland-W-VementryVoe	*3.78*	3.04	2.58	1.70	0.35	0.18	0.19	0.00	5.79	7.66	12.06	8.22	3.57
G71	Shetland-W-RonasVoe	*3.81*	3.06	2.60	1.71	0.35	0.19	0.19	0.00	5.83	7.72	12.15	8.28	3.59
P65	Shetland-N-Basta	*9.10*	7.82	6.69	4.48	0.93	0.50	0.52	0.01	14.27	18.34	27.08	19.51	9.10
G81	Shetland-N-Uyea	*8.39*	7.15	6.11	4.08	0.84	0.45	0.47	0.01	13.11	16.92	25.19	18.02	8.32
	Average per month[2]	*2.32*	*1.90*	*1.62*	*1.07*	*0.22*	*0.12*	*0.12*	*0.00*	*3.57*	*4.69*	*7.25*	*5.02*	*2.23*

[1]Average over all months for a given pod group

[2]Average over all pod groups for a given month

Table B43: Estimated probability (%) of OA in mussels exceeding 160 µg/kg. Values less than 0.01% are shown in grey.

Group	GroupName	*avg group*[1]	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
G80	EastCoast	*23.53*	0.02	0.02	0.02	2.33	2.63	30.69	63.15	70.93	61.92	30.67	14.53	5.41
G26	Dumfries	*0.48*	0.00	0.00	0.00	0.02	0.02	0.37	1.42	2.01	1.35	0.37	0.14	0.05
G8	Ayr-LochStriven	*24.59*	0.02	0.02	0.02	2.56	2.89	32.76	65.35	72.87	64.15	32.74	15.76	5.92
P16	Ayr-LochFyneArdkinglas	*8.70*	0.00	0.00	0.00	0.47	0.54	8.12	25.48	32.75	24.50	8.11	3.28	1.13
G18	Ayr-other	*21.57*	0.02	0.02	0.02	1.95	2.21	27.02	58.89	67.11	57.62	26.99	12.45	4.57
G123	WC-Gigha	*0.89*	0.00	0.00	0.00	0.04	0.04	0.69	2.63	3.71	2.50	0.69	0.27	0.09
P6	WC-LochMelfort	*8.70*	0.00	0.00	0.00	0.47	0.54	8.12	25.48	32.75	24.50	8.11	3.28	1.13
G10	WC-LochEtive	*0.47*	0.00	0.00	0.00	0.02	0.02	0.37	1.40	1.98	1.33	0.36	0.14	0.05
G9	WC-LochCreranLinnhe	*0.48*	0.00	0.00	0.00	0.02	0.02	0.37	1.42	2.01	1.35	0.37	0.14	0.05
G31	WC-LochLevenEil	*0.47*	0.00	0.00	0.00	0.02	0.02	0.37	1.41	1.99	1.34	0.37	0.14	0.05
G28	WC-Lochaber	*10.37*	0.01	0.01	0.01	0.60	0.68	10.06	30.21	38.13	29.11	10.05	4.12	1.42
P5	Mull-LochSpelve	*0.48*	0.00	0.00	0.00	0.02	0.02	0.37	1.44	2.03	1.36	0.37	0.14	0.05
P7	Mull-LochScridain	*19.44*	0.01	0.01	0.01	1.60	1.82	23.24	53.95	62.53	52.65	23.22	10.42	3.77
G1	Mull-other	*3.28*	0.00	0.00	0.00	0.15	0.17	2.70	9.70	13.27	9.26	2.70	1.06	0.36
P41	Skye-LochEishort	*12.75*	0.01	0.01	0.01	0.80	0.91	13.08	36.81	45.34	35.60	13.07	5.46	1.91
G42	Skye-other	*1.36*	0.00	0.00	0.00	0.06	0.07	1.07	4.02	5.63	3.83	1.07	0.41	0.14
G21	Lewis-LochLeurbostErisort	*1.30*	0.00	0.00	0.00	0.06	0.06	1.02	3.85	5.40	3.66	1.02	0.40	0.13
G23	Lewis-LochRoag	*9.30*	0.00	0.00	0.00	0.52	0.59	8.80	27.19	34.71	26.16	8.79	3.57	1.23
G22	HarrisUist	*0.98*	0.00	0.00	0.00	0.04	0.05	0.77	2.91	4.09	2.76	0.77	0.30	0.10
G35	NWC-LochTorridon	*9.30*	0.00	0.00	0.00	0.52	0.59	8.80	27.18	34.71	26.16	8.79	3.57	1.23
G39	NWC-LochEweBroom	*8.23*	0.00	0.00	0.00	0.44	0.50	7.60	24.14	31.18	23.19	7.59	3.06	1.05
G48	NWC-LochLaxfordInchard	*18.84*	0.01	0.01	0.01	1.52	1.72	22.24	52.53	61.18	51.22	22.22	9.89	3.56
G49	NWC-other	*8.59*	0.00	0.00	0.00	0.47	0.53	7.99	25.16	32.38	24.19	7.99	3.23	1.11
P38	Tain	*3.48*	0.00	0.00	0.00	0.16	0.18	2.88	10.28	14.03	9.81	2.87	1.12	0.38
G54	Orkney	*0.84*	0.00	0.00	0.00	0.04	0.04	0.66	2.49	3.51	2.37	0.66	0.25	0.09
G67	Shetland-SE-CliftSound	*5.19*	0.00	0.00	0.00	0.25	0.28	4.47	15.33	20.50	14.66	4.46	1.76	0.60
G56	Shetland-SE-DalesVoe	*5.58*	0.00	0.00	0.00	0.27	0.31	4.85	16.47	21.92	15.76	4.84	1.92	0.65
G57	Shetland-SE-SandsoundWeisdale	*6.37*	0.00	0.00	0.00	0.32	0.36	5.63	18.76	24.75	17.98	5.63	2.24	0.77
P61	Shetland-SW-GrutingVoe	*4.50*	0.00	0.00	0.00	0.21	0.24	3.81	13.30	17.93	12.71	3.81	1.50	0.51
P68	Shetland-SW-Vaila	*4.86*	0.00	0.00	0.00	0.23	0.26	4.15	14.35	19.27	13.72	4.15	1.64	0.56
P72	Shetland-W-AithVoe	*5.19*	0.00	0.00	0.00	0.25	0.28	4.46	15.31	20.47	14.64	4.46	1.76	0.60
P64	Shetland-W-BustaVoe	*4.72*	0.00	0.00	0.00	0.22	0.25	4.01	13.93	18.74	13.32	4.01	1.58	0.54
P70	Shetland-W-OlnaFirth	*4.33*	0.00	0.00	0.00	0.20	0.23	3.65	12.78	17.27	12.21	3.65	1.43	0.49
G58	Shetland-W-VementryVoe	*7.30*	0.00	0.00	0.00	0.38	0.43	6.60	21.47	28.03	20.60	6.59	2.64	0.90
G71	Shetland-W-RonasVoe	*13.80*	0.01	0.01	0.01	0.91	1.03	14.51	39.65	48.34	38.41	14.50	6.12	2.15
P65	Shetland-N-Basta	*3.38*	0.00	0.00	0.00	0.15	0.17	2.79	9.99	13.65	9.53	2.79	1.09	0.37
G81	Shetland-N-Uyea	*5.56*	0.00	0.00	0.00	0.27	0.31	4.83	16.41	21.85	15.71	4.82	1.91	0.65
	Average per month[2]	*7.28*	*0.00*	*0.00*	*0.00*	*0.50*	*0.57*	*7.67*	*20.71*	*25.65*	*20.03*	*7.67*	*3.32*	*1.18*

[1]Average over all months for a given pod group

[2]Average over all pod groups for a given month

Table B44: Estimated probability (%) of OA in mussels exceeding 80 µg/kg. Values less than 0.01% are shown in grey.

Group	GroupName	*avg group*[1]	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
G80	EastCoast	*36.85*	9.32	3.49	2.33	3.50	12.54	51.39	80.26	85.73	79.55	55.39	32.38	26.35
G26	Dumfries	*0.87*	0.06	0.02	0.01	0.02	0.09	0.64	2.43	3.55	2.33	0.76	0.29	0.22
G8	Ayr-LochStriven	*39.81*	11.30	4.29	2.87	4.30	15.11	56.74	83.45	88.17	82.83	60.63	37.27	30.74
P16	Ayr-LochFyneArdkinglas	*19.31*	2.51	0.90	0.59	0.90	3.47	20.92	50.44	60.06	49.33	23.71	10.70	8.22
G18	Ayr-other	*29.61*	5.64	2.06	1.37	2.07	7.71	38.10	70.30	77.76	69.36	41.95	21.80	17.24
G123	WC-Gigha	*5.05*	0.41	0.15	0.10	0.15	0.57	4.09	14.07	19.49	13.55	4.76	1.89	1.42
P6	WC-LochMelfort	*19.33*	2.51	0.90	0.59	0.90	3.47	20.94	50.47	60.09	49.36	23.73	10.72	8.23
G10	WC-LochEtive	*1.47*	0.11	0.04	0.03	0.04	0.15	1.10	4.12	5.97	3.95	1.29	0.50	0.38
G9	WC-LochCreranLinnhe	*0.87*	0.06	0.02	0.01	0.02	0.09	0.64	2.43	3.54	2.32	0.75	0.29	0.22
G31	WC-LochLevenEil	*1.67*	0.12	0.04	0.03	0.04	0.17	1.26	4.68	6.77	4.49	1.48	0.58	0.43
G28	WC-Lochaber	*18.32*	2.30	0.82	0.54	0.82	3.18	19.48	48.20	57.89	47.09	22.12	9.88	7.57
P5	Mull-LochSpelve	*1.20*	0.09	0.03	0.02	0.03	0.12	0.89	3.35	4.87	3.21	1.05	0.41	0.30
P7	Mull-LochScridain	*33.62*	7.49	2.77	1.85	2.78	10.15	45.44	76.21	82.56	75.39	49.45	27.40	21.99
G1	Mull-other	*5.79*	0.48	0.17	0.11	0.17	0.67	4.75	16.09	22.08	15.50	5.53	2.21	1.66
P41	Skye-LochEishort	*28.01*	5.02	1.83	1.21	1.83	6.87	35.22	67.64	75.55	66.66	38.96	19.76	15.54
G42	Skye-other	*7.32*	0.64	0.23	0.15	0.23	0.89	6.20	20.28	27.32	19.57	7.21	2.91	2.19
G21	Lewis-LochLeurbostErisort	*7.06*	0.61	0.22	0.14	0.22	0.85	5.96	19.59	26.47	18.90	6.92	2.79	2.10
G23	Lewis-LochRoag	*18.57*	2.35	0.84	0.56	0.84	3.25	19.83	48.75	58.43	47.64	22.51	10.08	7.73
G22	HarrisUist	*4.22*	0.34	0.12	0.08	0.12	0.47	3.35	11.76	16.46	11.31	3.91	1.55	1.16
G35	NWC-LochTorridon	*15.47*	1.76	0.63	0.41	0.63	2.44	15.55	41.45	51.13	40.38	17.78	7.70	5.87
G39	NWC-LochEweBroom	*14.43*	1.58	0.56	0.37	0.56	2.19	14.19	38.87	48.45	37.82	16.26	6.97	5.30
G48	NWC-LochLaxfordInchard	*30.21*	5.89	2.16	1.43	2.16	8.04	39.17	71.24	78.54	70.32	43.06	22.59	17.90
G49	NWC-other	*15.32*	1.73	0.62	0.41	0.62	2.40	15.34	41.06	50.73	39.99	17.54	7.58	5.78
P38	Tain	*10.07*	0.96	0.34	0.22	0.34	1.33	9.05	27.68	36.13	26.80	10.46	4.31	3.26
G54	Orkney	*1.57*	0.12	0.04	0.03	0.04	0.16	1.18	4.39	6.35	4.20	1.38	0.54	0.40
G67	Shetland-SE-CliftSound	*10.31*	0.99	0.35	0.23	0.35	1.37	9.31	28.31	36.84	27.41	10.76	4.44	3.36
G56	Shetland-SE-DalesVoe	*9.42*	0.88	0.31	0.21	0.31	1.22	8.35	25.96	34.12	25.11	9.67	3.97	2.99
G57	Shetland-SE-SandsoundWeisdale	*15.76*	1.81	0.64	0.43	0.65	2.51	15.93	42.15	51.84	41.07	18.20	7.90	6.03
P61	Shetland-SW-GrutingVoe	*12.67*	1.31	0.47	0.31	0.47	1.82	12.02	34.45	43.71	33.46	13.83	5.83	4.42
P68	Shetland-SW-Vaila	*9.62*	0.90	0.32	0.21	0.32	1.25	8.56	26.48	34.73	25.62	9.91	4.07	3.07
P72	Shetland-W-AithVoe	*9.90*	0.94	0.33	0.22	0.33	1.30	8.86	27.22	35.59	26.35	10.25	4.22	3.19
P64	Shetland-W-BustaVoe	*8.92*	0.82	0.29	0.19	0.29	1.14	7.83	24.62	32.55	23.80	9.07	3.70	2.79
P70	Shetland-W-OlnaFirth	*6.96*	0.60	0.21	0.14	0.21	0.84	5.86	19.31	26.12	18.62	6.81	2.74	2.06
G58	Shetland-W-VementryVoe	*13.82*	1.48	0.53	0.35	0.53	2.06	13.42	37.34	46.83	36.31	15.40	6.56	4.98
G71	Shetland-W-RonasVoe	*18.79*	2.39	0.86	0.57	0.86	3.31	20.15	49.26	58.92	48.15	22.86	10.26	7.87
P65	Shetland-N-Basta	*4.92*	0.40	0.14	0.09	0.14	0.56	3.96	13.70	19.00	13.18	4.62	1.84	1.38
G81	Shetland-N-Uyea	*9.20*	0.85	0.30	0.20	0.30	1.18	8.12	25.36	33.42	24.52	9.40	3.85	2.90
	Average per month[2]	*13.41*	*2.07*	*0.76*	*0.50*	*0.76*	*2.84*	*14.97*	*33.87*	*40.75*	*33.12*	*16.74*	*8.18*	*6.41*

[1]Average over all months for a given pod group

[2]Average over all pod groups for a given month

Table B45: Estimated probability (%) of OA in mussels exceeding 0 µg/kg. Values less than 0.01% are shown in grey.

Group	GroupName	*avg group*[1]	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
G80	EastCoast	*51.21*	32.07	20.80	31.40	24.56	31.56	62.01	84.20	88.03	85.71	64.87	47.73	41.59
G26	Dumfries	*5.34*	1.31	0.74	1.27	0.91	1.28	4.40	13.07	17.19	14.47	4.95	2.51	1.97
G8	Ayr-LochStriven	*61.30*	44.33	30.70	43.56	35.44	43.75	73.35	89.99	92.54	91.00	75.69	60.63	54.57
P16	Ayr-LochFyneArdkinglas	*47.35*	27.86	17.68	27.23	21.02	27.38	57.17	81.33	85.75	83.06	60.16	42.75	36.80
G18	Ayr-other	*52.10*	33.08	21.57	32.39	25.42	32.56	63.08	84.80	88.51	86.26	65.91	48.88	42.71
G123	WC-Gigha	*29.38*	12.27	7.22	11.94	8.79	12.02	32.58	61.21	68.54	63.98	35.35	21.29	17.42
P6	WC-LochMelfort	*39.39*	20.11	12.28	19.61	14.78	19.73	46.52	73.96	79.68	76.17	49.60	32.74	27.51
G10	WC-LochEtive	*15.85*	4.92	2.80	4.78	3.44	4.81	15.17	36.87	44.64	39.66	16.83	9.10	7.24
G9	WC-LochCreranLinnhe	*13.22*	3.87	2.19	3.76	2.70	3.78	12.22	31.24	38.55	33.83	13.60	7.22	5.72
G31	WC-LochLevenEil	*9.64*	2.61	1.47	2.53	1.81	2.55	8.47	23.20	29.44	25.38	9.48	4.92	3.88
G28	WC-Lochaber	*38.14*	19.01	11.55	18.53	13.93	18.65	44.79	72.59	78.53	74.88	47.86	31.22	26.14
P5	Mull-LochSpelve	*15.63*	4.83	2.74	4.68	3.38	4.72	14.91	36.39	44.13	39.17	16.55	8.93	7.10
P7	Mull-LochScridain	*53.46*	34.65	22.78	33.95	26.77	34.12	64.70	85.68	89.20	87.07	67.47	50.63	44.44
G1	Mull-other	*11.91*	3.38	1.91	3.28	2.36	3.31	10.80	28.33	35.31	30.79	12.05	6.34	5.02
P41	Skye-LochEishort	*50.32*	31.07	20.05	30.41	23.71	30.57	60.91	83.57	87.54	85.13	63.80	46.57	40.47
G42	Skye-other	*24.07*	8.96	5.19	8.71	6.35	8.77	25.39	52.62	60.53	55.56	27.79	15.99	12.93
G21	Lewis-LochLeurbostErisort	*20.72*	7.17	4.12	6.96	5.05	7.01	21.06	46.55	54.60	49.50	23.19	12.99	10.43
G23	Lewis-LochRoag	*34.40*	15.93	9.53	15.51	11.55	15.61	39.57	68.13	74.69	70.64	42.55	26.81	22.22
G22	HarrisUist	*19.99*	6.81	3.90	6.61	4.79	6.66	20.15	45.17	53.22	48.12	22.21	12.37	9.92
G35	NWC-LochTorridon	*31.90*	14.04	8.33	13.66	10.12	13.75	36.08	64.82	71.79	67.47	38.97	24.00	19.76
G39	NWC-LochEweBroom	*32.48*	14.47	8.60	14.09	10.44	14.18	36.90	65.62	72.50	68.24	39.81	24.65	20.33
G48	NWC-LochLaxfordInchard	*49.14*	29.77	19.08	29.12	22.62	29.28	59.44	82.71	86.85	84.34	62.38	45.05	39.00
G49	NWC-other	*29.26*	12.19	7.17	11.86	8.73	11.94	32.42	61.03	68.38	63.80	35.18	21.16	17.31
P38	Tain	*30.38*	12.95	7.64	12.60	9.30	12.69	33.96	62.67	69.86	65.39	36.78	22.34	18.32
G54	Orkney	*6.93*	1.77	0.99	1.71	1.22	1.73	5.85	16.87	21.89	18.59	6.57	3.36	2.64
G67	Shetland-SE-CliftSound	*25.87*	10.02	5.83	9.74	7.13	9.81	27.80	55.69	63.44	58.58	30.34	17.72	14.38
G56	Shetland-SE-DalesVoe	*27.07*	10.76	6.28	10.46	7.67	10.53	29.42	57.64	65.26	60.50	32.04	18.91	15.39
G57	Shetland-SE-SandsoundWeisdale	*40.80*	21.38	13.14	20.86	15.79	20.99	48.45	75.42	80.91	77.55	51.54	34.47	29.09
P61	Shetland-SW-GrutingVoe	*34.95*	16.36	9.81	15.94	11.88	16.04	40.34	68.82	75.30	71.30	43.34	27.45	22.78
P68	Shetland-SW-Vaila	*31.11*	13.47	7.97	13.11	9.69	13.19	34.98	63.71	70.80	66.40	37.83	23.13	19.01
P72	Shetland-W-AithVoe	*32.33*	14.35	8.53	13.97	10.36	14.07	36.68	65.41	72.31	68.04	39.59	24.48	20.18
P64	Shetland-W-BustaVoe	*30.23*	12.85	7.58	12.50	9.22	12.58	33.75	62.45	69.67	65.18	36.56	22.18	18.19
P70	Shetland-W-OlnaFirth	*22.79*	8.25	4.76	8.02	5.84	8.07	23.72	50.37	58.36	53.32	26.02	14.82	11.94
G58	Shetland-W-VementryVoe	*34.02*	15.63	9.34	15.22	11.32	15.32	39.04	67.64	74.27	70.18	42.01	26.38	21.84
G71	Shetland-W-RonasVoe	*39.65*	20.34	12.44	19.84	14.97	19.96	46.88	74.23	79.91	76.43	49.96	33.06	27.80
P65	Shetland-N-Basta	*17.83*	5.78	3.30	5.61	4.06	5.65	17.50	40.91	48.88	43.80	19.35	10.61	8.47
G81	Shetland-N-Uyea	*23.93*	8.89	5.15	8.64	6.30	8.70	25.21	52.39	60.31	55.33	27.61	15.87	12.82
	Average per month[2]	*30.65*	*15.07*	*9.33*	*14.70*	*11.17*	*14.79*	*34.75*	*59.12*	*65.44*	*61.48*	*37.18*	*24.30*	*20.47*

[1]Average over all months for a given pod group

[2]Average over all pod groups for a given month

Table B46: Estimated probability (%) of YTX in mussels exceeding 0 mg/kg. Values less than 0.01% are shown in grey.

Group	GroupName	*avg group*[1]	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
G80	EastCoast	*0.35*	0.36	0.03	0.12	0.34	0.38	0.35	0.65	0.69	0.44	0.33	0.35	0.18
G26	Dumfries	*0.17*	0.17	0.01	0.06	0.16	0.18	0.17	0.31	0.33	0.21	0.16	0.17	0.08
G8	Ayr-LochStriven	*16.75*	17.70	1.60	6.82	16.87	18.57	17.29	28.20	29.53	21.07	16.53	17.25	9.58
P16	Ayr-LochFyneArdkinglas	*16.38*	17.30	1.55	6.65	16.48	18.15	16.89	27.64	28.96	20.61	16.15	16.85	9.34
G18	Ayr-other	*21.68*	23.12	2.22	9.29	22.10	24.17	22.61	35.45	36.94	27.18	21.69	22.56	12.90
G123	WC-Gigha	*1.39*	1.42	0.11	0.49	1.35	1.51	1.39	2.57	2.74	1.76	1.31	1.38	0.71
P6	WC-LochMelfort	*19.76*	21.00	1.96	8.30	20.05	21.98	20.52	32.68	34.12	24.80	19.66	20.48	11.57
G10	WC-LochEtive	*6.16*	6.36	0.51	2.26	6.02	6.72	6.19	11.04	11.69	7.78	5.89	6.18	3.24
G9	WC-LochCreranLinnhe	*14.66*	15.43	1.36	5.85	14.69	16.21	15.06	25.00	26.23	18.46	14.39	15.02	8.24
G31	WC-LochLevenEil	*0.12*	0.12	0.01	0.04	0.11	0.13	0.12	0.22	0.23	0.15	0.11	0.12	0.06
G28	WC-Lochaber	*0.10*	0.11	0.01	0.04	0.10	0.11	0.10	0.19	0.21	0.13	0.10	0.10	0.05
P5	Mull-LochSpelve	*0.56*	0.57	0.04	0.19	0.53	0.60	0.55	1.03	1.10	0.70	0.52	0.55	0.28
P7	Mull-LochScridain	*2.04*	2.09	0.16	0.72	1.98	2.21	2.03	3.75	4.00	2.58	1.93	2.03	1.04
G1	Mull-other	*0.29*	0.30	0.02	0.10	0.28	0.32	0.29	0.54	0.58	0.37	0.27	0.29	0.15
P41	Skye-LochEishort	*2.80*	2.87	0.22	1.00	2.71	3.04	2.79	5.12	5.45	3.54	2.65	2.78	1.43
G42	Skye-other	*0.42*	0.43	0.03	0.15	0.40	0.45	0.42	0.78	0.83	0.53	0.39	0.42	0.21
G21	Lewis-LochLeurbostErisort	*0.10*	0.11	0.01	0.04	0.10	0.11	0.10	0.19	0.21	0.13	0.10	0.10	0.05
G23	Lewis-LochRoag	*0.35*	0.36	0.03	0.12	0.34	0.38	0.35	0.65	0.69	0.44	0.33	0.34	0.18
G22	HarrisUist	*0.08*	0.08	0.01	0.03	0.08	0.09	0.08	0.15	0.16	0.10	0.08	0.08	0.04
G35	NWC-LochTorridon	*0.74*	0.75	0.06	0.26	0.71	0.79	0.73	1.36	1.45	0.93	0.69	0.73	0.37
G39	NWC-LochEweBroom	*0.14*	0.15	0.01	0.05	0.14	0.15	0.14	0.27	0.28	0.18	0.13	0.14	0.07
G48	NWC-LochLaxfordInchard	*0.31*	0.31	0.02	0.11	0.30	0.33	0.30	0.57	0.61	0.39	0.29	0.30	0.15
G49	NWC-other	*0.17*	0.18	0.01	0.06	0.17	0.19	0.17	0.32	0.34	0.22	0.16	0.17	0.09
P38	Tain	*0.65*	0.66	0.05	0.23	0.63	0.70	0.64	1.20	1.28	0.82	0.61	0.64	0.33
G54	Orkney	*0.29*	0.30	0.02	0.10	0.28	0.32	0.29	0.55	0.58	0.37	0.28	0.29	0.15
G67	Shetland-SE-CliftSound	*0.35*	0.35	0.03	0.12	0.33	0.38	0.34	0.65	0.69	0.44	0.33	0.34	0.17
G56	Shetland-SE-DalesVoe	*0.48*	0.49	0.04	0.17	0.46	0.52	0.48	0.89	0.95	0.61	0.45	0.48	0.24
G57	Shetland-SE-SandsoundWeisdale	*2.17*	2.22	0.17	0.77	2.10	2.35	2.16	3.98	4.23	2.74	2.05	2.15	1.10
P61	Shetland-SW-GrutingVoe	*15.36*	16.19	1.44	6.17	15.41	16.99	15.80	26.07	27.34	19.33	15.10	15.76	8.68
P68	Shetland-SW-Vaila	*2.80*	2.87	0.22	1.00	2.71	3.04	2.79	5.12	5.44	3.54	2.65	2.78	1.43
P72	Shetland-W-AithVoe	*0.17*	0.17	0.01	0.06	0.16	0.18	0.17	0.31	0.33	0.21	0.16	0.17	0.08
P64	Shetland-W-BustaVoe	*0.16*	0.17	0.01	0.06	0.16	0.18	0.16	0.31	0.33	0.21	0.15	0.16	0.08
P70	Shetland-W-OlnaFirth	*0.52*	0.53	0.04	0.18	0.50	0.56	0.52	0.97	1.03	0.66	0.49	0.52	0.26
G58	Shetland-W-VementryVoe	*3.54*	3.63	0.28	1.27	3.44	3.84	3.54	6.44	6.85	4.47	3.36	3.53	1.82
G71	Shetland-W-RonasVoe	*0.21*	0.22	0.02	0.07	0.20	0.23	0.21	0.39	0.42	0.27	0.20	0.21	0.11
P65	Shetland-N-Basta	*2.34*	2.39	0.18	0.83	2.26	2.53	2.33	4.29	4.56	2.95	2.21	2.32	1.19
G81	Shetland-N-Uyea	*4.71*	4.85	0.38	1.71	4.59	5.12	4.72	8.51	9.03	5.95	4.48	4.70	2.45
	Average per month[2]	*3.76*	*3.95*	*0.35*	*1.50*	*3.76*	*4.15*	*3.86*	*6.44*	*6.77*	*4.74*	*3.69*	*3.85*	*2.11*

[1]Average over all months for a given pod group

[2]Average over all pod groups for a given month

Table B47: Proposed sampling frequency to keep the risk of non-detection of DA in mussels exceeding 5 mg/kg below 1% (middle section) or to keep the risk of non-detection of DA in mussels exceeding 0 mg/kg below 1% (section on right). Based on models only. Colouring is applied to denote the minimum sampling frequency required to keep risk of non-detection less than 1% (red (4) = weekly, yellow (2) = fortnightly, white (1) = monthly).

			Proposed sampling frequency based on model for DA>5 mg/kg												Proposed sampling frequency based on model for DA> 0 mg/kg											
Groups	GroupName	Groups 2012	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
G80	EastCoast	G80	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	4	4	4	4	1	1	1
G26	Dumfries	G26	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	4	4	4	1	1	1
G8	Ayr-LochStriven	G8	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	4	4	4	1	1	1
P16	Ayr-LochFyneArdkinglas	G8	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	4	2	4	1	1	1
G18	Ayr-other	G8	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	2	4	4	4	1	1	1
G123	WC-Gigha	G17	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	2	4	4	4	4	4	4	1	1
P6	WC-LochMelfort	G10	1	1	1	1	2	2	4	4	4	1	1	1	1	1	2	4	4	4	4	4	4	4	2	1
G10	WC-LochEtive	G10	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	4	4	4	1	1	1
G9	WC-LochCreranLinnhe	G9	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	4	4	4	4	4	1	1	1
G31	WC-LochLevenEil	G31	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	1	1	1
G28	WC-Lochaber	G28	1	1	1	1	1	1	2	2	4	1	1	1	1	1	1	1	4	4	4	4	4	2	1	1
P5	Mull-LochSpelve	G10	1	1	1	1	1	1	2	4	4	1	1	1	1	1	1	2	4	4	4	4	4	4	1	1
P7	Mull-LochScridain	P7	1	1	1	1	1	1	2	2	4	1	1	1	1	1	1	1	4	4	4	4	4	2	1	1
G1	Mull-other	G1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	2	4	4	4	4	1	1	1
P41	Skye-LochEishort	G41	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	2	4	4	4	4	1	1	1
G42	Skye-other	G41	1	1	1	1	2	1	4	4	4	1	1	1	1	1	1	4	4	4	4	4	4	4	1	1
G21	Lewis-LochLeurbostErisort	G21	1	1	1	1	1	1	1	2	4	1	1	1	1	1	1	1	4	4	4	4	4	2	1	1
G23	Lewis-LochRoag	G23	1	1	1	1	2	2	4	4	4	1	1	1	1	1	1	1	4	4	4	4	4	4	1	1
G22	HarrisUist	G21	1	1	1	1	1	1	2	2	4	1	1	1	1	1	1	1	2	4	4	4	4	4	1	1
G35	NWC-LochTorridon	G35	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4	4	4	4	4	1	1
G39	NWC-LochEweBroom	G39	1	1	1	1	1	1	2	2	4	1	1	1	1	1	1	4	4	4	4	4	4	4	1	1
G48	NWC-LochLaxfordInchard	G48	1	1	1	1	1	1	4	4	4	1	1	1	1	1	1	2	4	4	4	4	4	2	1	1
G49	NWC-other	G48	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	2	4	4	4	4	1	1	1
P38	Tain	G48	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4	4	4	4	4	1	1
G54	Orkney	G54	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	2	4	4	4	4	1	1	1
G67	Shetland-SE-CliftSound	G57	1	1	1	1	1	1	2	2	4	1	1	1	1	1	1	2	4	4	4	4	4	4	1	1
G56	Shetland-SE-DalesVoe	G62	1	1	1	1	2	2	4	4	4	1	1	1	1	1	1	1	4	4	4	4	4	4	1	1
G57	Shetland-SE-SandsoundWeisdale	G57	1	1	1	1	1	1	4	4	4	1	1	1	1	1	1	2	4	4	4	4	4	4	1	1
P61	Shetland-SW-GrutingVoe	P61	1	1	1	1	1	1	2	2	4	1	1	1	1	1	1	1	4	4	4	4	4	4	1	1
P68	Shetland-SW-Vaila	P68	1	1	1	1	1	1	4	2	4	1	1	1	1	1	1	1	4	4	4	4	4	4	1	1
P72	Shetland-W-AithVoe	G58	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	4	4	4	4	4	4	1	1
P64	Shetland-W-BustaVoe	G58	1	1	1	1	1	1	2	2	4	1	1	1	1	1	1	1	4	4	4	4	4	4	1	1
P70	Shetland-W-OlnaFirth	G58	1	1	1	1	1	1	2	2	4	1	1	1	1	1	1	1	4	4	4	4	4	4	1	1
G58	Shetland-W-VementryVoe	G58	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	4	4	4	4	2	1	1
G71	Shetland-W-RonasVoe	G58	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	4	4	4	4	1	1	1
P65	Shetland-N-Basta	G69	1	1	1	1	1	1	1	1	4	1	1	1	1	1	1	1	4	4	4	4	4	2	1	1
G81	Shetland-N-Uyea	G69	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	4	4	4	4	1	1	1

Table B48: Proposed sampling frequency to keep the risk of non-detection of PST in mussels exceeding 800 µg/kg below 1% (section on left), to keep the risk of non-detection of PST in mussels exceeding 400 µg/kg below 1% (middle section), or to keep the risk of non-detection of PST in mussels exceeding 0 µg/kg below 1% (section on right). Based on models only. Colouring is applied to denote the minimum sampling frequency required to keep risk of non-detection less than 1% (red (4) = weekly, yellow (2) = fortnightly, white (1) = monthly).

			Proposed sampling frequency, model PST>800 µg/kg												Proposed sampling frequency, model PST>400 µg/kg												Proposed sampling frequency, model PST>0 µg/kg											
Groups	GroupName	Groups 2012	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
G80	EastCoast	G80	1	1	1	1	4	1	1	1	1	1	1	1	1	1	1	1	4	4	4	1	1	1	1	1	1	1	1	1	4	4	4	2	2	1	1	1
G26	Dumfries	G26	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
G8	Ayr-LochStriven	G8	1	1	1	4	4	4	4	1	1	1	1	1	1	1	1	4	4	4	4	1	1	1	1	1	1	1	4	4	4	4	4	4	2	1	1	1
P16	Ayr-LochFyneArdkinglas	G8	1	1	1	4	4	2	1	1	1	1	1	1	1	1	1	4	4	2	2	1	1	1	1	1	1	1	1	4	4	4	4	2	1	1	1	1
G18	Ayr-other	G8	1	1	1	4	4	4	1	1	1	1	1	1	1	1	2	4	4	4	4	1	1	1	1	1	1	1	4	4	4	4	4	4	4	1	1	1
G123	WC-Gigha	G17	1	1	1	1	2	4	4	1	1	1	1	1	1	1	1	1	4	4	4	1	1	1	1	1	1	1	1	4	4	4	4	4	4	1	1	1
P6	WC-LochMelfort	G10	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	4	4	4	2	4	1	1	1
G10	WC-LochEtive	G10	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
G9	WC-LochCreranLinnhe	G9	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
G31	WC-LochLevenEil	G31	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
G28	WC-Lochaber	G28	1	1	1	1	4	4	2	1	1	1	1	1	1	1	4	1	4	4	4	1	1	1	1	1	1	1	4	4	4	4	4	1	1	1	1	1
P5	Mull-LochSpelve	G10	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1	1	1	1	1
P7	Mull-LochScridain	P7	1	1	1	1	4	4	1	1	1	1	1	1	1	1	1	1	4	4	4	1	1	1	1	1	1	1	1	4	4	4	4	4	2	1	1	1
G1	Mull-other	G1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	2	1	1	1	1	1	1	1	1	1	1	4	4	2	1	1	1	1	1
P41	Skye-LochEishort	G41	1	1	1	1	4	4	2	1	1	1	1	1	1	1	2	4	4	4	4	1	1	1	1	1	1	1	4	4	4	4	4	4	2	1	1	1
G42	Skye-other	G41	1	1	1	1	1	4	1	1	1	1	1	1	1	1	1	1	4	4	4	1	1	1	1	1	1	1	1	1	4	4	4	1	1	1	1	1
G21	Lewis-LochLeurbostErisort	G21	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	1	1	1	1	1	1	1	1	1	1	1	4	4	1	2	1	1	1	1
G23	Lewis-LochRoag	G23	1	1	1	1	1	4	2	1	1	1	1	1	1	1	1	1	1	4	4	1	1	1	1	1	1	1	1	1	4	4	4	2	1	1	1	1
G22	HarrisUist	G21	1	1	1	1	1	4	1	1	1	1	1	1	1	1	1	1	1	4	1	1	1	1	1	1	1	1	1	1	4	4	2	1	1	1	1	1
G35	NWC-LochTorridon	G35	1	1	1	1	2	4	4	1	1	1	1	1	1	1	1	1	4	4	4	1	1	1	1	1	1	1	1	2	4	4	4	2	2	1	1	1
G39	NWC-LochEweBroom	G39	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	1	1	1	1	1	1	1	1	1	1	4	4	4	1	1	1	1	1
G48	NWC-LochLaxfordInchard	G48	1	1	1	1	4	4	4	1	1	1	1	1	1	1	1	4	4	4	4	1	1	1	1	1	1	1	1	4	4	4	4	2	2	1	1	1
G49	NWC-other	G48	1	1	1	1	1	4	4	1	1	1	1	1	1	1	1	2	4	4	4	1	1	1	1	1	1	1	1	4	4	4	4	2	1	1	1	1
P38	Tain	G48	1	1	1	1	4	1	1	1	1	1	1	1	1	1	1	4	4	4	2	1	1	1	1	1	1	1	1	4	4	4	4	2	4	1	1	1
G54	Orkney	G54	1	1	1	1	4	4	1	1	1	1	1	1	1	1	1	1	4	4	2	1	1	1	1	1	1	1	1	4	4	4	4	4	4	1	1	1
G67	Shetland-SE-CliftSound	G57	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	2	2	4	4	1	1	1	1	1	1	1	4	4	4	4	4	4	1	1	1
G56	Shetland-SE-DalesVoe	G62	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	2	1	1	1	1	1
G57	Shetland-SE-SandsoundWeisdale	G57	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	4	4	4	4	4	1	1	1	1	1	1	1	4	4	4	4	4	1	1	1
P61	Shetland-SW-GrutingVoe	P61	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	4	1	1	1	1	1	1	1	4	4	4	4	4	1	1	1
P68	Shetland-SW-Vaila	P68	1	1	1	1	1	1	4	4	1	1	1	1	1	1	1	1	2	2	4	4	4	1	1	1	1	1	1	4	4	4	4	4	4	2	1	1
P72	Shetland-W-AithVoe	G58	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	4	4	4	4	4	2	1	1	1	1	1	4	4	4	4	4	4	4	4	1
P64	Shetland-W-BustaVoe	G58	1	1	1	1	4	4	1	1	4	1	1	1	1	1	1	1	4	4	4	4	4	4	1	1	1	1	1	4	4	4	4	4	4	4	1	1
P70	Shetland-W-OlnaFirth	G58	1	1	1	1	1	4	1	1	1	1	1	1	1	1	1	1	2	4	1	1	4	1	1	1	1	1	1	4	4	4	4	4	4	1	1	1
G58	Shetland-W-VementryVoe	G58	1	1	1	1	2	1	1	1	4	1	1	1	1	1	1	1	4	2	1	4	4	4	1	1	1	1	1	4	4	4	4	4	4	4	1	1
G71	Shetland-W-RonasVoe	G58	1	1	1	1	4	1	1	4	1	1	1	1	1	1	1	1	4	4	4	4	4	1	1	1	1	1	1	4	4	4	4	4	4	1	1	1
P65	Shetland-N-Basta	G69	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4	1	1	4	1	1	1	1	1	1	1	4	4	4	4	4	4	1	1
G81	Shetland-N-Uyea	G69	1	1	1	1	2	1	1	4	1	1	1	1	1	1	1	1	4	4	1	4	2	1	1	1	1	1	1	1	4	4	4	4	4	1	1	1

Table B49: Proposed sampling frequency to keep the risk of non-detection of LT in mussels exceeding the MPL below 1%. Based on models only. Colouring is applied to denote the minimum sampling frequency required to keep risk of non-detection less than 1% (red (4) = weekly, yellow (2) = fortnightly, white (1) = monthly).

		Groups	Proposed sampling frequency based on model for LT > MPL											
Groups	GroupName	2012	J	F	M	A	M	J	J	A	S	O	N	D
G80	EastCoast	G80	1	1	1	4	4	4	4	4	4	4	4	2
G26	Dumfries	G26	1	1	1	1	1	1	2	4	2	1	1	1
G8	Ayr-LochStriven	G8	1	1	1	4	4	4	4	4	4	4	4	4
P16	Ayr-LochFyneArdkinglas	G8	1	1	1	4	4	4	4	4	4	4	4	2
G18	Ayr-other	G8	1	1	1	4	4	4	4	4	4	4	4	4
G123	WC-Gigha	G17	1	1	1	1	1	2	4	4	4	1	1	1
P6	WC-LochMelfort	G10	1	1	1	2	4	4	4	4	4	4	2	1
G10	WC-LochEtive	G10	1	1	1	1	1	1	1	2	1	1	1	1
G9	WC-LochCreranLinnhe	G9	1	1	1	1	1	2	4	4	4	1	1	1
G31	WC-LochLevenEil	G31	1	1	1	1	1	1	1	2	1	1	1	1
G28	WC-Lochaber	G28	1	1	1	4	4	4	4	4	4	4	4	1
P5	Mull-LochSpelve	G10	1	1	1	1	1	1	2	4	2	1	1	1
P7	Mull-LochScridain	P7	1	1	1	4	4	4	4	4	4	4	4	2
G1	Mull-other	G1	1	1	1	1	2	4	4	4	4	2	1	1
P41	Skye-LochEishort	G41	1	1	1	4	4	4	4	4	4	4	4	2
G42	Skye-other	G41	1	1	1	1	4	4	4	4	4	4	2	1
G21	Lewis-LochLeurbostErisort	G21	1	1	1	1	2	4	4	4	4	2	1	1
G23	Lewis-LochRoag	G23	1	1	1	1	4	4	4	4	4	4	2	1
G22	HarrisUist	G21	1	1	1	1	1	1	4	4	2	1	1	1
G35	NWC-LochTorridon	G35	1	1	1	2	4	4	4	4	4	4	2	1
G39	NWC-LochEweBroom	G39	1	1	1	2	4	4	4	4	4	4	2	1
G48	NWC-LochLaxfordInchard	G48	1	1	1	4	4	4	4	4	4	4	4	4
G49	NWC-other	G48	1	1	1	1	4	4	4	4	4	4	2	1
P38	Tain	G48	1	1	1	1	2	4	4	4	4	4	1	1
G54	Orkney	G54	1	1	1	2	4	4	4	4	4	4	4	1
G67	Shetland-SE-CliftSound	G57	1	1	1	4	4	4	4	4	4	4	4	1
G56	Shetland-SE-DalesVoe	G62	1	1	1	4	4	4	4	4	4	4	4	1
G57	Shetland-SE-SandsoundWeisdale	G57	1	1	1	4	4	4	4	4	4	4	2	1
P61	Shetland-SW-GrutingVoe	P61	1	1	1	4	4	4	4	4	4	4	4	1
P68	Shetland-SW-Vaila	P68	1	1	1	4	4	4	4	4	4	4	4	2
P72	Shetland-W-AithVoe	G58	1	1	1	4	4	4	4	4	4	4	4	1
P64	Shetland-W-BustaVoe	G58	1	1	1	2	4	4	4	4	4	4	4	1
P70	Shetland-W-OlnaFirth	G58	1	1	1	1	4	4	4	4	4	4	2	1
G58	Shetland-W-VementryVoe	G58	1	1	1	2	4	4	4	4	4	4	4	1
G71	Shetland-W-RonasVoe	G58	1	1	1	4	4	4	4	4	4	4	4	4
P65	Shetland-N-Basta	G69	1	1	1	4	4	4	4	4	4	4	4	2
G81	Shetland-N-Uyea	G69	1	1	1	2	4	4	4	4	4	4	4	1

Table B50: Observed prevalence of DA > 5 mg/kg in mussels for recently classified pods and the estimated prevalence for the group it is thought to be closest to (extracted from Table B34).

			Data, % (# samples exceeding limit/total samples)												
Group	GroupNameM	Pod	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
G8	Ayr-LochStriven	139	0 (0/3)	0 (0/4)	0 (0/4)	0 (0/4)	0 (0/4)	0 (0/3)	0 (0/4)	0 (0/4)	0 (0/6)	0 (0/4)	0 (0/4)	0 (0/3)	0 (0/47)
G18	Ayr-other	145	0 (0/2)	0 (0/3)	0 (0/4)	0 (0/3)			0 (0/1)				0 (0/3)	0 (0/3)	0 (0/19)
G28	WC-Lochaber	137			0 (0/3)	0 (0/3)	0 (0/4)	0 (0/10)	0 (0/8)	0 (0/11)	0 (0/11)	0 (0/3)			0 (0/53)
G22	HarrisUist	135	0 (0/7)	0 (0/8)	0 (0/9)	0 (0/9)	0 (0/8)	0 (0/8)	0 (0/10)	0 (0/8)	0 (0/9)	0 (0/8)	0 (0/8)	0 (0/4)	0 (0/96)
G22	HarrisUist	136	0 (0/7)	0 (0/11)	0 (0/10)	0 (0/9)	0 (0/8)	0 (0/8)	0 (0/10)	0 (0/8)	0 (0/9)	0 (0/8)	0 (0/8)	0 (0/4)	0 (0/100)
G67	Shetland-SE-CliftSound	132			0 (0/1)	0 (0/4)	0 (0/2)	0 (0/2)	12.5 (1/8)	0 (0/4)	0 (0/1)				4.5 (1/22)
G71	Shetland-W-RonasVoe	146		0 (0/2)	0 (0/3)	0 (0/1)	0 (0/4)	0 (0/5)	0 (0/2)	0 (0/4)	0 (0/4)	0 (0/4)	0 (0/4)	0 (0/1)	0 (0/34)
G81	Shetland-N-Uyea	66		0 (0/3)	0 (0/4)	0 (0/2)	0 (0/4)	0 (0/4)	0 (0/3)	0 (0/1)	0 (0/4)				0 (0/25)
			Estimated prevalence % from models												
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
G8	Ayr-LochStriven	139	0.00	0.00	0.05	0.08	0.29	0.22	0.58	0.59	1.01	0.03	0.04	0.00	
G18	Ayr-other	145	0.00	0.00	0.09	0.13	0.46	0.34	1.22	0.90	1.53	0.05	0.07	0.00	
G28	WC-Lochaber	137	0.00	0.00	0.16	0.24	1.33	0.72	1.54	1.72	2.75	0.09	0.12	0.00	
G22	HarrisUist	135	0.00	0.00	0.13	0.19	0.66	0.49	1.46	1.45	2.92	0.07	0.10	0.00	
G22	HarrisUist	136	0.00	0.00	0.13	0.19	0.66	0.49	1.46	1.45	2.92	0.07	0.10	0.00	
G67	Shetland-SE-CliftSound	132	0.00	0.00	0.14	0.21	0.73	0.54	1.60	1.67	2.66	0.07	0.10	0.00	
G71	Shetland-W-RonasVoe	146	0.00	0.00	0.07	0.10	0.35	0.26	0.69	0.71	1.23	0.03	0.05	0.00	
G81	Shetland-N-Uyea	66	0.00	0.00	0.05	0.07	0.24	0.18	0.48	0.48	0.83	0.02	0.03	0.00	

Table B51: Observed prevalence of DA > 0 mg/kg in mussels for recently classified pods and the estimated prevalence for the group it is thought to be closest to (extracted from Table B35).

			Data, % (# samples exceeding limit/total samples)												
Group	GroupNameM	Pod	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
G8	Ayr-LochStriven	139	0 (0/3)	0 (0/4)	0 (0/4)	0 (0/4)	0 (0/4)	0 (0/3)	50 (2/4)	0 (0/4)	16.7 (1/6)	0 (0/4)	0 (0/4)	0 (0/3)	6.4 (3/47)
G18	Ayr-other	145	0 (0/2)	0 (0/3)	0 (0/4)	0 (0/3)			0 (0/1)				0 (0/3)	0 (0/3)	0 (0/19)
G28	WC-Lochaber	137			0 (0/3)	0 (0/3)	0 (0/4)	0 (0/10)	0 (0/8)	0 (0/11)	0 (0/11)	0 (0/3)			0 (0/53)
G22	HarrisUist	135	0 (0/7)	0 (0/8)	0 (0/9)	0 (0/9)	0 (0/8)	12.5 (1/8)	20 (2/10)	50 (4/8)	0 (0/9)	0 (0/8)	0 (0/8)	0 (0/4)	7.3 (7/96)
G22	HarrisUist	136	0 (0/7)	0 (0/11)	0 (0/10)	0 (0/9)	0 (0/8)	12.5 (1/8)	10 (1/10)	37.5 (3/8)	0 (0/9)	0 (0/8)	0 (0/8)	0 (0/4)	5 (5/100)
G67	Shetland-SE-CliftSound	132			0 (0/1)	0 (0/4)	0 (0/2)	0 (0/2)	37.5 (3/8)	50 (2/4)	100 (1/1)				27.3 (6/22)
G71	Shetland-W-RonasVoe	146		0 (0/2)	0 (0/3)	0 (0/1)	0 (0/4)	0 (0/5)	50 (1/2)	0 (0/4)	0 (0/4)	0 (0/4)	0 (0/4)	0 (0/1)	2.9 (1/34)
G81	Shetland-N-Uyea	66		0 (0/3)	0 (0/4)	0 (0/2)	0 (0/4)	0 (0/4)	33.3 (1/3)	0 (0/1)	0 (0/4)				4 (1/25)
			Estimated prevalence % from models												
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
G8	Ayr-LochStriven	139	0.00	0.00	0.26	0.54	1.44	1.86	4.92	3.48	3.86	0.96	0.28	0.09	
G18	Ayr-other	145	0.00	0.00	0.25	0.50	1.27	1.60	4.91	2.67	4.47	0.84	0.26	0.13	
G28	WC-Lochaber	137	0.00	0.00	0.45	0.88	7.47	3.21	4.51	6.02	7.65	1.95	0.48	0.17	
G22	HarrisUist	135	0.00	0.00	0.44	0.86	1.94	3.77	8.01	13.56	6.01	2.18	0.48	0.17	
G22	HarrisUist	136	0.00	0.00	0.44	0.86	1.94	3.77	8.01	13.56	6.01	2.18	0.48	0.17	
G67	Shetland-SE-CliftSound	132	0.00	0.00	1.02	1.43	3.39	4.53	14.55	13.65	9.40	5.82	0.79	0.28	
G71	Shetland-W-RonasVoe	146	0.00	0.00	0.33	0.71	1.83	2.91	4.41	5.27	5.19	1.26	0.36	0.12	
G81	Shetland-N-Uyea	66	0.00	0.00	0.37	0.54	1.84	2.78	4.21	2.23	3.03	1.24	0.29	0.10	

Table B52: Observed prevalence of PST > 800 µg/kg in mussels for recently classified pods and the estimated prevalence for the group it is thought to be closest to (extracted from Table B36).

			Data, % (# samples exceeding limit/total samples)												
Group	GroupNameM	Pod	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
G8	Ayr-LochStriven	139	0 (0/3)	0 (0/4)	0 (0/4)	0 (0/4)	0 (0/4)	0 (0/3)	0 (0/4)	0 (0/4)	0 (0/6)	0 (0/4)	0 (0/4)	0 (0/3)	0 (0/47)
G18	Ayr-other	145	0 (0/2)	0 (0/3)	0 (0/4)	50 (2/4)	100 (4/4)	75 (3/4)	0 (0/1)				0 (0/3)	0 (0/3)	32.1 (9/28)
G28	WC-Lochaber	137			0 (0/3)	0 (0/3)	0 (0/4)	0 (0/10)	0 (0/8)	0 (0/12)	0 (0/13)	0 (0/3)			0 (0/56)
G22	HarrisUist	135	0 (0/7)	0 (0/8)	0 (0/9)	0 (0/9)	0 (0/8)	0 (0/8)	0 (0/10)	0 (0/8)	0 (0/9)	0 (0/8)	0 (0/8)	0 (0/4)	0 (0/96)
G22	HarrisUist	136	0 (0/7)	0 (0/11)	0 (0/10)	0 (0/9)	0 (0/8)	0 (0/8)	0 (0/10)	0 (0/8)	0 (0/9)	0 (0/8)	0 (0/8)	0 (0/4)	0 (0/100)
G67	Shetland-SE-CliftSound	132			0 (0/1)	0 (0/4)	0 (0/2)	0 (0/2)	0 (0/8)	0 (0/4)	0 (0/1)				0 (0/22)
G71	Shetland-W-RonasVoe	146		0 (0/2)	0 (0/3)	0 (0/1)	0 (0/4)	0 (0/5)	0 (0/2)	0 (0/4)	0 (0/4)	0 (0/4)	0 (0/4)	0 (0/1)	0 (0/34)
G81	Shetland-N-Uyea	66		0 (0/3)	0 (0/4)	0 (0/2)	0 (0/4)	0 (0/4)	0 (0/3)	0 (0/1)	0 (0/4)				0 (0/25)
			Estimated prevalence % from models												
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
G8	Ayr-LochStriven	139	0.00	0.00	0.00	2.70	11.76	9.84	12.79	0.81	0.61	0.00	0.24	0.00	
G18	Ayr-other	145	0.00	0.00	0.00	9.51	11.53	16.82	1.02	0.71	0.56	0.00	0.21	0.00	
G28	WC-Lochaber	137	0.00	0.00	0.00	0.31	2.30	4.73	1.95	0.34	0.22	0.00	0.10	0.00	
G22	HarrisUist	135	0.00	0.00	0.00	0.22	0.61	2.15	0.37	0.24	0.18	0.00	0.06	0.00	
G22	HarrisUist	136	0.00	0.00	0.00	0.22	0.61	2.15	0.37	0.24	0.18	0.00	0.06	0.00	
G67	Shetland-SE-CliftSound	132	0.00	0.00	0.00	0.28	0.81	0.98	0.49	1.97	0.23	0.00	0.08	0.00	
G71	Shetland-W-RonasVoe	146	0.00	0.00	0.00	0.44	2.60	1.27	0.76	2.76	0.31	0.00	0.11	0.00	
G81	Shetland-N-Uyea	66	0.00	0.00	0.00	0.26	1.36	0.96	0.60	3.92	0.21	0.00	0.09	0.00	

Table B53: Observed prevalence of PST > 400 µg/kg in mussels for recently classified pods and the estimated prevalence for the group it is thought to be closest to (extracted from Table B37).

			Data, % (# samples exceeding limit/total samples)												
Group	GroupNameM	Pod	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
G8	Ayr-LochStriven	139	0 (0/3)	0 (0/4)	0 (0/4)	25 (1/4)	0 (0/4)	0 (0/3)	0 (0/4)	0 (0/4)	0 (0/6)	0 (0/4)	0 (0/4)	0 (0/3)	2.1 (1/47)
G18	Ayr-other	145	0 (0/2)	0 (0/3)	0 (0/4)	50 (2/4)	100 (4/4)	100 (4/4)	0 (0/1)				0 (0/3)	0 (0/3)	35.7 (10/28)
G28	WC-Lochaber	137			0 (0/3)	0 (0/3)	0 (0/4)	0 (0/10)	0 (0/8)	0 (0/12)	0 (0/13)	0 (0/3)			0 (0/56)
G22	HarrisUist	135	0 (0/7)	0 (0/8)	0 (0/9)	0 (0/9)	0 (0/8)	0 (0/8)	0 (0/10)	0 (0/8)	0 (0/9)	0 (0/8)	0 (0/8)	0 (0/4)	0 (0/96)
G22	HarrisUist	136	0 (0/7)	0 (0/11)	0 (0/10)	0 (0/9)	0 (0/8)	0 (0/8)	0 (0/10)	0 (0/8)	0 (0/9)	0 (0/8)	0 (0/8)	0 (0/4)	0 (0/100)
G67	Shetland-SE-CliftSound	132			0 (0/1)	0 (0/4)	0 (0/2)	0 (0/2)	12.5 (1/8)	0 (0/4)	0 (0/1)				4.5 (1/22)
G71	Shetland-W-RonasVoe	146		0 (0/2)	0 (0/3)	0 (0/1)	0 (0/4)	0 (0/5)	0 (0/2)	0 (0/4)	0 (0/4)	0 (0/4)	0 (0/4)	0 (0/1)	0 (0/34)
G81	Shetland-N-Uyea	66		0 (0/3)	0 (0/4)	0 (0/2)	0 (0/4)	0 (0/4)	0 (0/3)	0 (0/1)	0 (0/4)				0 (0/25)
			Estimated prevalence % from models												
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
G8	Ayr-LochStriven	139	0.27	0.00	0.46	9.08	13.52	12.00	20.00	1.19	1.19	0.43	0.16	0.00	
G18	Ayr-other	145	0.30	0.00	1.35	18.78	16.24	23.44	6.77	1.19	1.32	0.47	0.19	0.00	
G28	WC-Lochaber	137	0.16	0.00	3.39	0.62	7.90	9.27	5.31	0.61	0.54	0.27	0.10	0.00	
G22	HarrisUist	135	0.05	0.00	0.11	0.30	0.77	2.72	0.53	0.33	0.33	0.10	0.03	0.00	
G22	HarrisUist	136	0.05	0.00	0.11	0.30	0.77	2.72	0.53	0.33	0.33	0.10	0.03	0.00	
G67	Shetland-SE-CliftSound	132	0.56	0.00	0.23	0.59	1.37	1.46	2.04	4.87	0.65	0.20	0.07	0.00	
G71	Shetland-W-RonasVoe	146	0.17	0.00	0.34	1.05	4.02	2.17	3.25	7.00	4.34	0.31	0.10	0.00	
G81	Shetland-N-Uyea	66	0.14	0.00	0.25	0.50	3.19	2.77	1.11	15.49	1.65	0.21	0.08	0.00	

Table B54: Observed prevalence of PST > 0 µg/kg in mussels for recently classified pods and the estimated prevalence for the group it is thought to be closest to (extracted from Table B38).

			Data, % (# samples exceeding limit/total samples)												
Group	GroupNameM	Pod	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
G8	Ayr-LochStriven	139	0 (0/3)	0 (0/4)	0 (0/4)	50 (2/4)	0 (0/4)	0 (0/3)	0 (0/4)	0 (0/4)	0 (0/6)	0 (0/4)	0 (0/4)	0 (0/3)	4.3 (2/47)
G18	Ayr-other	145	0 (0/2)	0 (0/3)	0 (0/4)	50 (2/4)	100 (4/4)	100 (4/4)	0 (0/1)				0 (0/3)	0 (0/3)	35.7 (10/28)
G28	WC-Lochaber	137			0 (0/3)	0 (0/3)	0 (0/4)	30 (3/10)	12.5 (1/8)	0 (0/12)	0 (0/13)	0 (0/3)			7.1 (4/56)
G22	HarrisUist	135	0 (0/7)	0 (0/8)	0 (0/9)	0 (0/9)	25 (2/8)	0 (0/8)	0 (0/10)	0 (0/8)	0 (0/9)	0 (0/8)	0 (0/8)	0 (0/4)	2.1 (2/96)
G22	HarrisUist	136	0 (0/7)	0 (0/11)	0 (0/10)	0 (0/9)	25 (2/8)	0 (0/8)	0 (0/10)	0 (0/8)	0 (0/9)	0 (0/8)	0 (0/8)	0 (0/4)	2 (2/100)
G67	Shetland-SE-CliftSound	132			0 (0/1)	25 (1/4)	0 (0/2)	0 (0/2)	50 (4/8)	75 (3/4)	100 (1/1)				40.9 (9/22)
G71	Shetland-W-RonasVoe	146		0 (0/2)	0 (0/3)	0 (0/1)	0 (0/4)	0 (0/5)	100 (2/2)	50 (2/4)	25 (1/4)	0 (0/4)	0 (0/4)	0 (0/1)	14.7 (5/34)
G81	Shetland-N-Uyea	66		0 (0/3)	0 (0/4)	0 (0/2)	50 (2/4)	0 (0/4)	0 (0/3)	0 (0/1)	25 (1/4)				12 (3/25)
			Estimated prevalence % from models												
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
G8	Ayr-LochStriven	139	0.21	0.20	2.76	13.25	17.43	16.97	18.47	2.18	1.98	0.84	0.29	0.01	
G18	Ayr-other	145	0.24	0.23	2.34	20.93	18.59	25.01	13.02	3.72	2.40	0.93	0.32	0.01	
G28	WC-Lochaber	137	0.14	0.13	3.82	4.44	14.96	13.33	10.19	1.09	0.83	0.55	0.19	0.01	
G22	HarrisUist	135	0.04	0.04	0.17	0.56	7.01	6.72	1.51	0.59	0.56	0.21	0.06	0.00	
G22	HarrisUist	136	0.04	0.04	0.17	0.56	7.01	6.72	1.51	0.59	0.56	0.21	0.06	0.00	
G67	Shetland-SE-CliftSound	132	0.50	0.15	0.57	2.45	4.30	7.07	7.15	12.61	9.13	0.66	0.22	0.01	
G71	Shetland-W-RonasVoe	146	0.17	0.16	0.61	2.49	5.76	3.51	13.15	18.76	13.80	0.70	0.23	0.01	
G81	Shetland-N-Uyea	66	0.13	0.12	0.44	0.83	9.78	8.06	3.02	20.27	10.06	0.50	0.18	0.01	

Table B55: Observed prevalence of LT > MPL in mussels for recently classified pods and the estimated prevalence for the group it is thought to be closest to (extracted from Table B39).

			Data, % (# samples exceeding limit/total samples)												
Group	GroupNameM	Pod	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
G8	Ayr-LochStriven	139	0 (0/3)	0 (0/4)	0 (0/4)	0 (0/4)	0 (0/4)	50 (2/4)	0 (0/5)	50 (3/6)	30 (3/10)	0 (0/4)	0 (0/4)	0 (0/3)	14.5 (8/55)
G18	Ayr-other	145	0 (0/2)	0 (0/3)	0 (0/4)	0 (0/3)			100 (5/5)	100 (5/5)	100 (4/4)		0 (0/3)	0 (0/3)	43.8 (14/32)
G28	WC-Lochaber	137			0 (0/3)	0 (0/3)	0 (0/4)	0 (0/10)	0 (0/8)	23.1 (3/13)	14.3 (2/14)	0 (0/3)			8.6 (5/58)
G22	HarrisUist	135	0 (0/7)	0 (0/8)	0 (0/9)	0 (0/9)	0 (0/8)	0 (0/8)	0 (0/10)	0 (0/8)	0 (0/9)	0 (0/8)	0 (0/8)	0 (0/4)	0 (0/96)
G22	HarrisUist	136	0 (0/7)	0 (0/11)	0 (0/10)	0 (0/9)	0 (0/8)	0 (0/8)	0 (0/10)	0 (0/8)	0 (0/9)	0 (0/8)	0 (0/8)	0 (0/4)	0 (0/100)
G67	Shetland-SE-CliftSound	132			0 (0/1)	0 (0/4)	0 (0/1)		0 (0/8)	0 (0/4)	0 (0/1)				0 (0/19)
G71	Shetland-W-RonasVoe	146		0 (0/2)	0 (0/3)	0 (0/1)	0 (0/4)	0 (0/5)	0 (0/2)	0 (0/4)	0 (0/4)	0 (0/4)	0 (0/4)	0 (0/1)	0 (0/34)
G81	Shetland-N-Uyea	66		0 (0/3)	0 (0/4)	0 (0/2)	0 (0/4)	0 (0/4)	0 (0/3)	0 (0/1)	0 (0/4)				0 (0/25)
			Estimated prevalence % from models												
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
G8	Ayr-LochStriven	139	0.66	0.03	0.73	5.84	16.98	35.18	36.41	44.99	37.87	26.22	16.75	4.38	
G18	Ayr-other	145	0.63	0.03	0.83	6.72	21.91	39.14	37.09	38.28	39.35	20.03	10.03	5.52	
G28	WC-Lochaber	137	0.18	0.01	0.20	2.43	3.91	9.86	23.92	27.09	14.96	5.63	3.16	1.20	
G22	HarrisUist	135	0.02	0.00	0.02	0.27	0.56	1.19	2.35	4.18	1.93	0.87	0.30	0.15	
G22	HarrisUist	136	0.02	0.00	0.02	0.27	0.56	1.19	2.35	4.18	1.93	0.87	0.30	0.15	
G67	Shetland-SE-CliftSound	132	0.17	0.01	0.20	4.46	7.03	14.34	14.63	19.64	11.59	5.29	2.20	1.19	
G71	Shetland-W-RonasVoe	146	0.38	0.02	0.43	5.65	10.11	16.45	22.62	38.06	26.98	15.76	6.03	3.72	
G81	Shetland-N-Uyea	66	0.17	0.01	0.19	1.93	3.53	7.86	8.88	13.84	12.40	9.85	2.82	0.92	

B5 Model estimates for Pacific oysters

Table B56: Estimated probability (%) of biotoxin levels in Pacific oysters exceeding a given limit, for an average year. Values less than 0.01% are shown in grey. Grouping is specific to Pacific oysters (see Table 4). LT based on exceedance of MPL.

Biotoxin	Group	GroupName	avg group[1]	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
DA > 5 mg/kg	PO18	Ayr	*0.24*	0.00	0.00	0.00	0.28	0.90	0.26	0.65	0.65	0.19	0.00	0.00	0.00
	PO123	WC-Gigha	*0.22*	0.00	0.00	0.00	0.25	0.83	0.24	0.60	0.60	0.17	0.00	0.00	0.00
	PO10	WC-LochEtiveMelfort	*0.78*	0.00	0.00	0.00	0.90	2.83	0.84	2.07	2.07	0.61	0.00	0.00	0.00
	PO9	WC-LochCreranLinnhe	*0.37*	0.00	0.00	0.00	0.42	1.35	0.39	0.98	0.98	0.28	0.00	0.00	0.00
	PO28	WC-Lochaber	*0.59*	0.00	0.00	0.00	0.68	2.15	0.63	1.57	1.57	0.46	0.00	0.00	0.00
	PO1	Mull	*0.41*	0.00	0.00	0.00	0.47	1.50	0.44	1.09	1.09	0.32	0.00	0.00	0.00
	PO42	SkyeShetland	*0.35*	0.00	0.00	0.00	0.40	1.30	0.37	0.94	0.94	0.27	0.00	0.00	0.00
	PO49	NWC	*0.28*	0.00	0.00	0.00	0.32	1.03	0.30	0.75	0.75	0.22	0.00	0.00	0.00
		Average per month[2]	*0.41*	*0.00*	*0.00*	*0.00*	*0.46*	*1.49*	*0.43*	*1.08*	*1.08*	*0.32*	*0.00*	*0.00*	*0.00*
DA > 0 mg/kg	PO18	Ayr	*0.76*	0.00	0.51	0.00	0.28	2.43	0.50	1.48	1.74	1.43	0.63	0.16	0.00
	PO123	WC-Gigha	*0.98*	0.00	0.65	0.00	0.36	3.10	0.65	1.90	2.23	1.84	0.80	0.20	0.00
	PO10	WC-LochEtiveMelfort	*4.03*	0.00	2.82	0.00	1.59	12.26	2.80	7.83	9.11	7.60	3.47	0.88	0.00
	PO9	WC-LochCreranLinnhe	*2.01*	0.00	1.36	0.00	0.76	6.29	1.36	3.91	4.58	3.79	1.68	0.42	0.00
	PO28	WC-Lochaber	*4.42*	0.00	3.11	0.00	1.76	13.37	3.09	8.58	9.97	8.33	3.82	0.98	0.00
	PO1	Mull	*3.59*	0.00	2.49	0.00	1.40	10.97	2.48	6.96	8.12	6.76	3.06	0.78	0.00
	PO42	SkyeShetland	*1.80*	0.00	1.21	0.00	0.68	5.63	1.20	3.48	4.09	3.38	1.50	0.37	0.00
	PO49	NWC	*2.59*	0.00	1.77	0.00	0.99	8.02	1.76	5.02	5.88	4.87	2.18	0.55	0.00
		Average per month	*2.52*	*0.00*	*1.74*	*0.00*	*0.98*	*7.76*	*1.73*	*4.90*	*5.71*	*4.75*	*2.14*	*0.54*	*0.00*
PST > 0 µg/kg	PO18	Ayr	*1.39*	0.00	0.00	0.48	2.61	4.39	6.52	2.63	0.00	0.00	0.00	0.00	0.00
	PO123	WC-Gigha	*0.58*	0.00	0.00	0.18	1.02	1.83	2.91	1.03	0.00	0.00	0.00	0.00	0.00
	PO10	WC-LochEtiveMelfort	*0.57*	0.00	0.00	0.17	1.00	1.79	2.85	1.01	0.00	0.00	0.00	0.00	0.00
	PO9	WC-LochCreranLinnhe	*0.33*	0.00	0.00	0.10	0.57	1.03	1.68	0.57	0.00	0.00	0.00	0.00	0.00
	PO28	WC-Lochaber	*0.92*	0.00	0.00	0.29	1.66	2.89	4.46	1.68	0.00	0.00	0.00	0.00	0.00
	PO1	Mull	*0.61*	0.00	0.00	0.18	1.07	1.91	3.04	1.08	0.00	0.00	0.00	0.00	0.00
	PO42	SkyeShetland	*0.43*	0.00	0.00	0.13	0.74	1.34	2.17	0.75	0.00	0.00	0.00	0.00	0.00
	PO49	NWC	*1.30*	0.00	0.00	0.45	2.43	4.11	6.14	2.45	0.00	0.00	0.00	0.00	0.00
		Average per month	*0.76*	*0.00*	*0.00*	*0.25*	*1.39*	*2.41*	*3.72*	*1.40*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
LT	PO18	Ayr	*2.70*	1.10	5.46	2.41	1.62	1.67	1.10	0.59	3.88	6.71	3.93	1.65	2.22
	PO123	WC-Gigha	*3.45*	1.43	6.91	3.11	2.11	2.16	1.43	0.78	4.96	8.43	5.02	2.15	2.87
	PO10	WC-LochEtiveMelfort	*0.85*	0.33	1.77	0.74	0.49	0.51	0.33	0.18	1.23	2.23	1.24	0.50	0.68
	PO9	WC-LochCreranLinnhe	*1.52*	0.60	3.13	1.34	0.89	0.92	0.60	0.32	2.19	3.90	2.22	0.91	1.23
	PO28	WC-Lochaber	*2.87*	1.18	5.80	2.57	1.73	1.78	1.18	0.63	4.13	7.11	4.18	1.76	2.37
	PO1	Mull	*1.04*	0.40	2.15	0.90	0.60	0.62	0.40	0.22	1.49	2.70	1.51	0.61	0.83
	PO42	SkyeShetland	*2.90*	1.19	5.86	2.60	1.76	1.80	1.19	0.64	4.18	7.19	4.23	1.79	2.40
	PO49	NWC	*0.94*	0.37	1.95	0.82	0.54	0.56	0.37	0.20	1.35	2.45	1.37	0.55	0.75
		Average per month	*2.03*	*0.83*	*4.13*	*1.81*	*1.22*	*1.25*	*0.83*	*0.44*	*2.93*	*5.09*	*2.96*	*1.24*	*1.67*

[1]Average over all months for a given pod group

[2]Average over all pod groups for a given month

Table B57: Estimated probability (%) of LT biotoxins in Pacific oysters exceeding a given limit. Values less than 0.01% are shown in grey. Grouping is specific to Pacific oysters (see Table 4).

Biotoxin	Group	GroupName	*avg group*[1]	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
AZA > 80 µg/kg	PO18	Ayr	*1.66*	4.74	6.44	2.20	2.89	0.94	0.06	0.00	0.00	0.00	0.12	0.49	2.08
	PO123	WC-Gigha	*12.23*	32.98	40.50	18.16	22.72	8.60	0.62	0.00	0.00	0.00	1.16	4.64	17.33
	PO10	WC-LochEtiveMelfort	*16.77*	43.80	51.87	26.00	31.76	12.97	0.98	0.00	0.00	0.00	1.82	7.16	24.92
	PO9	WC-LochCreranLinnhe	*11.01*	29.94	37.15	16.16	20.34	7.55	0.54	0.00	0.00	0.00	1.00	4.06	15.40
	PO28	WC-Lochaber	*9.89*	27.08	33.93	14.34	18.15	6.63	0.47	0.00	0.00	0.00	0.87	3.54	13.66
	PO1	Mull	*17.95*	46.44	54.52	28.10	34.12	14.22	1.09	0.00	0.00	0.00	2.02	7.90	26.97
	PO42	SkyeShetland	*8.27*	22.85	29.06	11.78	15.03	5.36	0.38	0.00	0.00	0.00	0.70	2.85	11.20
	PO49	NWC	*2.90*	8.21	11.01	3.88	5.07	1.68	0.11	0.00	0.00	0.00	0.21	0.88	3.67
		Average per month[2]	*10.08*	*27.01*	*33.06*	*15.08*	*18.76*	*7.24*	*0.53*	*0.00*	*0.00*	*0.00*	*0.99*	*3.94*	*14.41*
AZA > 0 µg/kg	PO18	Ayr	*6.49*	15.71	16.54	7.08	8.83	6.70	2.68	0.22	0.47	1.28	3.64	6.40	8.31
	PO123	WC-Gigha	*19.63*	42.16	43.66	22.94	27.48	21.93	9.73	0.85	1.82	4.81	12.88	21.09	26.16
	PO10	WC-LochEtiveMelfort	*21.30*	45.04	46.56	25.08	29.87	24.00	10.81	0.95	2.05	5.38	14.25	23.10	28.49
	PO9	WC-LochCreranLinnhe	*18.37*	39.92	41.40	21.35	25.67	20.39	8.95	0.77	1.66	4.41	11.88	19.59	24.41
	PO28	WC-Lochaber	*15.46*	34.52	35.92	17.72	21.51	16.89	7.23	0.61	1.33	3.53	9.66	16.20	20.40
	PO1	Mull	*21.80*	45.89	47.42	25.73	30.59	24.63	11.15	0.98	2.12	5.56	14.68	23.72	29.19
	PO42	SkyeShetland	*20.53*	43.73	45.25	24.10	28.77	23.05	10.31	0.90	1.94	5.12	13.62	22.17	27.42
	PO49	NWC	*24.36*	50.05	51.59	29.04	34.25	27.86	12.91	1.16	2.49	6.50	16.89	26.87	32.76
		Average per month	*18.49*	*39.63*	*41.04*	*21.63*	*25.87*	*20.68*	*9.22*	*0.81*	*1.73*	*4.57*	*12.19*	*19.89*	*24.64*
OA > 80 µg/kg	PO18	Ayr	*1.46*	0.00	0.00	0.00	0.00	0.00	4.73	5.85	3.01	2.72	1.24	0.00	0.00
	PO123	WC-Gigha	*0.31*	0.00	0.00	0.00	0.00	0.00	1.01	1.26	0.63	0.57	0.26	0.00	0.00
	PO10	WC-LochEtiveMelfort	*0.33*	0.00	0.00	0.00	0.00	0.00	1.06	1.33	0.67	0.60	0.27	0.00	0.00
	PO9	WC-LochCreranLinnhe	*0.33*	0.00	0.00	0.00	0.00	0.00	1.07	1.33	0.67	0.60	0.27	0.00	0.00
	PO28	WC-Lochaber	*0.52*	0.00	0.00	0.00	0.00	0.00	1.68	2.10	1.06	0.96	0.43	0.00	0.00
	PO1	Mull	*0.46*	0.00	0.00	0.00	0.00	0.00	1.51	1.88	0.95	0.86	0.39	0.00	0.00
	PO42	SkyeShetland	*0.85*	0.00	0.00	0.00	0.00	0.00	2.76	3.43	1.74	1.58	0.71	0.00	0.00
	PO49	NWC	*0.87*	0.00	0.00	0.00	0.00	0.00	2.83	3.52	1.79	1.62	0.73	0.00	0.00
		Average per month	*0.64*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*2.08*	*2.59*	*1.31*	*1.19*	*0.54*	*0.00*	*0.00*
OA > 0 µg/kg	PO18	Ayr	*3.81*	0.00	0.00	0.00	0.00	0.00	6.95	11.45	9.41	13.45	4.41	0.00	0.00
	PO123	WC-Gigha	*0.18*	0.00	0.00	0.00	0.00	0.00	0.32	0.56	0.45	0.67	0.20	0.00	0.00
	PO10	WC-LochEtiveMelfort	*0.20*	0.00	0.00	0.00	0.00	0.00	0.36	0.62	0.50	0.75	0.22	0.00	0.00
	PO9	WC-LochCreranLinnhe	*0.21*	0.00	0.00	0.00	0.00	0.00	0.36	0.63	0.50	0.75	0.22	0.00	0.00
	PO28	WC-Lochaber	*1.42*	0.00	0.00	0.00	0.00	0.00	2.54	4.31	3.49	5.14	1.58	0.00	0.00
	PO1	Mull	*0.44*	0.00	0.00	0.00	0.00	0.00	0.78	1.34	1.08	1.61	0.48	0.00	0.00
	PO42	SkyeShetland	*1.70*	0.00	0.00	0.00	0.00	0.00	3.05	5.16	4.19	6.13	1.90	0.00	0.00
	PO49	NWC	*3.23*	0.00	0.00	0.00	0.00	0.00	5.86	9.73	7.97	11.47	3.70	0.00	0.00
		Average per month	*1.40*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*2.53*	*4.23*	*3.45*	*5.00*	*1.59*	*0.00*	*0.00*

[1]Average over all months for a given pod group

[2]Average over all pod groups for a given month

Table B58: Proposed sampling frequency corresponding to keep the risk of non-detection of DA in Pacific oysters exceeding 5 mg/kg below 1% (middle section) or to keep the risk of non-detection of DA in mussels exceeding 0 mg/kg below 1% (section on right). Based on models only. Colouring is applied to denote the minimum sampling frequency required to keep risk of non-detection less than 1% (red (4) = weekly, yellow (2) = fortnightly, white (1) = monthly). Grouping is specific to Pacific oysters (see Table 4).

		Proposed sampling frequency based on model for DA>5 mg/kg												Proposed sampling frequency based on model for DA>0 mg/kg											
Groups	GroupName[1]	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
PO18	Ayr	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	1	2	2	2	1	1	1
PO123	WC-Gigha	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	1	2	4	2	1	1	1
PO10	WC-LochEtiveMelfort	1	1	1	1	4	1	4	4	1	1	1	1	1	4	1	2	4	4	4	4	4	4	1	1
PO9	WC-LochCreranLinnhe	1	1	1	1	2	1	1	1	1	1	1	1	1	2	1	1	4	2	4	4	4	2	1	1
PO28	WC-Lochaber	1	1	1	1	4	1	2	2	1	1	1	1	1	4	1	2	4	4	4	4	4	4	1	1
PO1	Mull	1	1	1	1	2	1	1	1	1	1	1	1	1	4	1	2	4	4	4	4	4	4	1	1
PO42	SkyeShetland	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	1	4	4	4	2	1	1
PO49	NWC	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	4	2	4	4	4	4	1	1

Table B59: Proposed sampling frequency corresponding to keep the risk of non-detection of PST in Pacific oysters exceeding 0 µg/kg below 1%. Based on models only. Colouring is applied to denote the minimum sampling frequency required to keep risk of non-detection less than 1% (red (4) = weekly, yellow (2) = fortnightly, white (1) = monthly). Grouping is specific to Pacific oysters (see Table 4).

		Proposed sampling frequency based on model for PST>0 µg/kg											
Groups	GroupName[1]	1	2	3	4	5	6	7	8	9	10	11	12
PO18	Ayr	1	1	1	4	4	4	4	1	1	1	1	1
PO123	WC-Gigha	1	1	1	1	2	4	1	1	1	1	1	1
PO10	WC-LochEtiveMelfort	1	1	1	1	2	4	1	1	1	1	1	1
PO9	WC-LochCreranLinnhe	1	1	1	1	1	2	1	1	1	1	1	1
PO28	WC-Lochaber	1	1	1	2	4	4	2	1	1	1	1	1
PO1	Mull	1	1	1	1	2	4	1	1	1	1	1	1
PO42	SkyeShetland	1	1	1	1	2	4	1	1	1	1	1	1
PO49	NWC	1	1	1	4	4	4	4	1	1	1	1	1

Table B60: Proposed sampling frequency corresponding to keep the risk of non-detection of LT in Pacific oysters exceeding the MPL below 1%. Based on models only. Colouring is applied to denote the minimum sampling frequency required to keep risk of non-detection less than 1% (red (4) = weekly, yellow (2) = fortnightly, white (1) = monthly). Grouping is specific to Pacific oysters (see Table 4).

		Proposed sampling frequency based on model for LT > MPL											
Groups	GroupName[1]	1	2	3	4	5	6	7	8	9	10	11	12
PO18	Ayr	1	4	4	2	2	1	1	4	4	4	2	4
PO123	WC-Gigha	2	4	4	4	4	2	1	4	4	4	4	4
PO10	WC-LochEtiveMelfort	1	2	1	1	1	1	1	1	4	1	1	1
PO9	WC-LochCreranLinnhe	1	4	2	1	1	1	1	4	4	4	1	1
PO28	WC-Lochaber	1	4	4	2	2	1	1	4	4	4	2	4
PO1	Mull	1	4	1	1	1	1	1	2	4	2	1	1
PO42	SkyeShetland	1	4	4	2	2	1	1	4	4	4	2	4
PO49	NWC	1	2	1	1	1	1	1	2	4	2	1	1

Table B61: Observed prevalence of biotoxins exceeding given limits in Pacific oysters for recently classified pods and the estimated prevalence for the group it is thought to be closest to (extracted from Table B56).

	Group	GroupName	Pod	Data, % (# samples exceeding limit/total samples)												
				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
DA>0	PO49	NWC-LochEweBroom	144	0 (0/2)	0 (0/4)	0 (0/5)	0 (0/4)	0 (0/4)	20 (1/5)	0 (0/4)	0 (0/5)	0 (0/8)	0 (0/5)	0 (0/4)	0 (0/2)	1.9 (1/52)
DA>5	PO49	NWC-LochEweBroom	144	0 (0/2)	0 (0/4)	0 (0/5)	0 (0/4)	0 (0/4)	0 (0/5)	0 (0/4)	0 (0/5)	0 (0/8)	0 (0/5)	0 (0/4)	0 (0/2)	0 (0/52)
PST>0	PO49	NWC-LochEweBroom	144	0 (0/2)	0 (0/4)	0 (0/5)	0 (0/4)	0 (0/4)	80 (4/5)	0 (0/4)	0 (0/5)	0 (0/8)	0 (0/5)	0 (0/4)	0 (0/2)	7.7 (4/52)
LT[1]	PO49	NWC-LochEweBroom	144	0 (0/2)	0 (0/4)	0 (0/5)	0 (0/4)	0 (0/4)	0 (0/5)	0 (0/4)	0 (0/5)	0 (0/8)	0 (0/5)	0 (0/4)	0 (0/2)	0 (0/52)
				Estimated prevalence % from models												
				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
DA>0	PO49	NWC-LochEweBroom	144	0.00	1.77	0.00	0.99	8.02	1.76	5.02	5.88	4.87	2.18	0.55	0.00	
DA>5	PO49	NWC-LochEweBroom	144	0.00	0.00	0.00	0.32	1.03	0.30	0.75	0.75	0.22	0.00	0.00	0.00	
PST>0	PO49	NWC-LochEweBroom	144	0.00	0.00	0.45	2.43	4.11	6.14	2.45	0.00	0.00	0.00	0.00	0.00	
LT[1]	PO49	NWC-LochEweBroom	144	0.37	1.95	0.82	0.54	0.56	0.37	0.20	1.35	2.45	1.37	0.55	0.75	

[1]LT exceeding MPL (i.e. AZA > 160 µg/kg or OA > 160 µg/kg or YTX > 3.75 mg/kg