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Annual report on the results of the Biotoxin and Phytoplankton Official Control Monitoring Programmes for England & Wales – 2018

March 2019

Annual report on the results of the Biotoxin and Phytoplankton Official Control Monitoring Programmes for England & Wales – 2018

Final report

37 pages

Not to be quoted without prior reference to the authors

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Quality statement: This report is a compilation of the information included on the reports provided daily/weekly to the FSA and showing the results of the phytoplankton and toxin analyses undertaken on samples submitted by local authorities. All results were quality checked and approved prior to release to the FSA and the results compiled in this report have been further checked against a copy of the original reports held on a central database. Information relating to the origin of the samples (place (including co-ordinates), date and time of collection) is as provided by local authority staff and has not undergone verification checks by Cefas.

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The co-ordinates used to depict the location of the monitoring points are the default co-ordinates of the FSA sampling points.

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1 Summary

This report describes the results of the Official Control Biotoxin Monitoring Programme for England and Wales for the period 1st January to 31st December 2018.

The laboratory testing for biotoxins in shellfish and potentially harmful phytoplankton in water samples, the co-ordination of the programme and its logistics were conducted by the Centre for Environment, Fisheries and Aquaculture Science (Cefas) on behalf of the Food Standards Agency (FSA), the central competent authority for food safety. The programme aimed at delivering the testing required for the statutory monitoring of marine biotoxins in shellfish from classified production and relaying areas in England and Wales, and for identification and enumeration of potentially harmful micro-algae in selected shellfish harvesting areas, as required by EC Regulations 854/2004, 882/2004 and 2074/2005. All results are compared to the maximum permitted levels (Table 1.1) as stipulated in EC regulation 853/2004 (Section VII, Chapter V: Health standards for live bivalve molluscs). Toxin test results must not exceed these limits in either whole body or any edible part separately.

Table 1.1 Maximum permitted limits of toxins in shellfish flesh[1]

Toxin	Maximum Permitted Limits (MPL)
ASP	20 mg [Domoic/epi-domoic acid]/kg [shellfish flesh]
LTs	Diarrhetic shellfish poisoning (DSP) toxins and pectenotoxins (PTX) together, exceeding 160µg [okadaic acid (OA) equivalents]/kg [shellfish flesh] or Yessotoxins, 3.75mg [yessotoxin (YTX) equivalents]/kg [shellfish flesh] or Azaspiracids, 160µg [azaspiracid (AZA) equivalents]/kg [shellfish flesh].
PSP	800µg [saxitoxin equivalents (STX di-HCl eq.)]/kg [shellfish flesh]

In the reported period, 55 of the 59 classified English and Welsh harvesting and relaying areas were monitored (directly or indirectly[2]) (Figure 1.2 and Figure 1.1), giving a coverage rate of 93.2 %[3]. The four classified areas which were not monitored in 2018 for toxins and phytoplankton consisted of:

- Salcombe and Three Rivers, which were declassified during 2018 (no samples were collected from these areas in 2018);
- Anglesey – Inland Sea, which is used for shellfish on growing only;
- Bigbury and Avon production area, which only produces shellfish for relaying at another site.

A total of 851 inshore shellfish samples and 875 phytoplankton samples were submitted for analysis by staff from 39 Local Authorities (LAs) (shellfish) 34 LAs for the phytoplankton samples. No samples were submitted in 2018 for the purpose of onshore verification of pectinidae.

[1] Regulation (EC) 853/2004
[2] In this case, the classified production areas were monitored by sampling adjacent areas where appropriate
[3] 3% of the classified production areas were supplying shellfish only for on growing

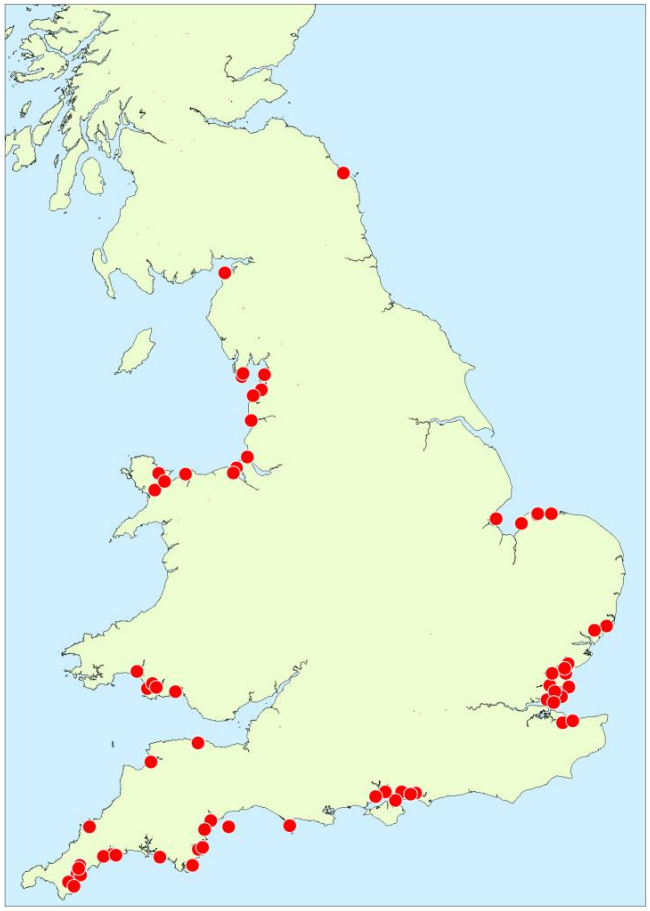

Figure 1.1 English and Welsh flesh sampling locations – 2018 Biotoxin monitoring programme

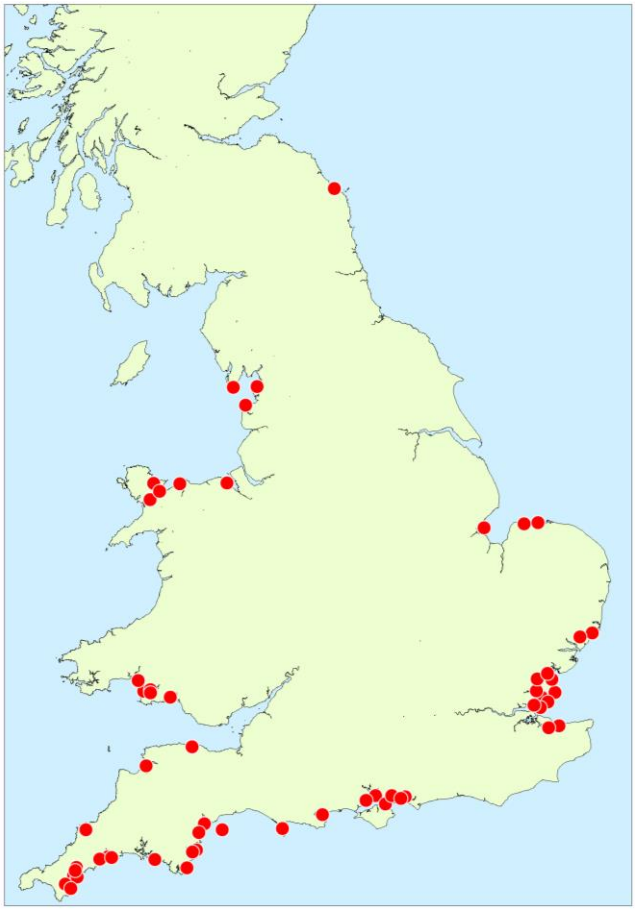

Figure 1.2 English and Welsh water sampling locations – 2018 Biotoxin monitoring programme

Results of the shellfish monitoring programme for the twelve-month period were as follows (all toxin results stated for Paralytic Shellfish Poisoning (PSP) toxins and Lipophilic Toxins (LTs) refer to the high value calculated from method uncertainty):

1.1.1 Amnesic Shellfish Poisoning (ASP) toxins - summary

A total of 652 inshore shellfish samples were tested for ASP toxins using a high-performance liquid chromatography (HPLC) method. ASP toxins were detected in 17 samples from 7 production areas (Figure 1.3). The greatest proportion of samples containing ASP originated from the south west of England (12 samples). The shellfish species affected included mussels (2 samples), Pacific oysters (4 samples), hard clams (1 sample) and surf clams (10 samples). None of the inshore shellfish samples tested for ASP exceeded the maximum permitted level (MPL) of 20 mg/kg in 2018. ASP levels ranged from 1 to 5.4 mg/kg. The highest ASP concentration was recorded in May (5.4 mg/kg) from the North Kent Coast production area, this was the only ASP result recorded in this area during 2018. Also, of note, every sample of surf clam collected from the coast of Devon in 2018 and tested for ASP toxins contained between 3 and 4.9 mg/kg.

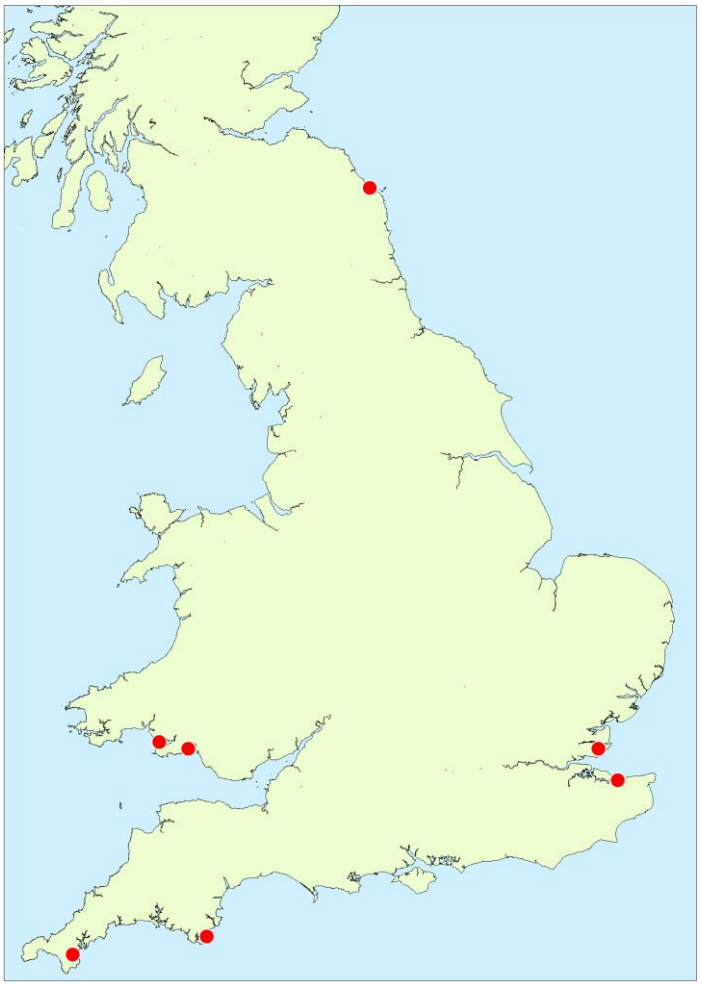

Figure 1.3 Location of classified production and/or relaying areas where ASP toxins were detected in 2018 (all below the MPL (20 mg [domoic+*epi*-domoic acid]/kg [shellfish tissue])

1.2 Paralytic Shellfish Poisoning (PSP) toxins - summary

A total of 734 inshore shellfish samples were screened for PSP toxins using the HPLC semi-quantitative method. Figure 1.4 shows the sampling points where PSP was detected in 2018. No samples exceeded the MPL (800µg STX di-HCl eq.)]/kg). Three pacific oyster samples from Holy Island - Ross Links monitoring point required analysis by the quantitative method. Two of these recorded PSP toxin levels above the trigger level (set at 400µg STX di-HCl eq.)]/kg) recording 456 µg STX di-HCl eq.)]/kg on both occasions (16/05/2018 and 06/06/2018).

Fewer occurrences of PSP were recorded in 2018, compared to previous years. During 2017 three samples recorded PSP toxin levels above the MPL (800µg STX di-HCl eq.)]/kg and four samples recorded PSP toxin levels above the trigger level (400µg STX di-HCl eq.)]/kg), all from the South West. There has been an overall decline in PSP toxin levels in shellfish flesh since its peak in 2011, with PSP toxin detected in 44 samples.

Figure 1.4 Location of classified production and/or relaying areas where PSP toxins were detected <u>below</u> the MPL of 800 µg [STX equivalent]/kg [shellfish tissue] at quantifiable levels in 2018

1.3 Lipophilic toxins (LTs) - summary

A total of 776 inshore samples were analysed for LTs using the Liquid Chromatography - tandem mass spectrometry (LC-MS/MS) method. The lipophilic toxins are sub-divided into three regulated groups each with a distinct MPL (see table 1.1).

Yessotoxins (YTXs)
Not detected in any samples received in 2018. This is consistent with previous years, having only been detected once in 2014.

Azaspiracid group toxins (AZAs)
Not detected in any samples received in 2018. The detection of this toxin group has varied widely since the LC-MS method was introduced in 2011, with the number of detections ranging from 0 in 2017 & 2018 to 21 in 2015. However, levels have only rarely exceeded the MPL (3 times in 2015).

Okadaic Acid/Dinophysistoxins/Pectenotoxins (OA/DTX/PTX)
Detected in 167 samples from 18 production areas (Figure 1.5). Sixty four mussel samples from six production areas (Lyme Bay, Porthallow Cove, St. Austell Bay, Lantivet Bay, Fowey and the Fal) contained OA/DTX/PTXs above the MPL (set at 160 µg OA eq/kg) (Table 1 & Figure 1.6). This is an increase in concentrations and number of results recorded above the MPL compared to 2017 but occurrence in 2018 is similar to 2016.

Lipophillic toxins were recorded above the MPL during the months of May to October 2018. All results exceeding the MPL were recorded in the South West with all but one sample collected from Cornwall. The peak results recorded at Porthallow, St. Austell Bay, Lantivet Bay and Fowey were all from samples collected in mid to late August.

The first recorded result above the MPL in 2018 was at Lyme Bay on 29/05/2018, 176 µg OA eq/kg. This was the only result above MPL at this location in 2018. This is a reduction in toxin concentrations in shellfish flesh at this location compared to 2017, when 4 consecutive results above the MPL were recorded between July and August with the highest result of 234 µg OA eq/kg.

Figure 1.7 to Figure 1.11 show the Dinophysieae records against the shellfish toxin results taken from Porthallow, St. Austell Bay, Lantivet Bay, Fowey and the Fal production areas during 2018. It is evident that following a peak in the Dinophysieae levels (cells/L), after a short lag time, a peak in the shellfish toxins occurs. Following a result above MPL, the monitoring in the water column is suspended until a first result below the MPL is recorded in the shellfish flesh, therefore there are gaps in the water monitoring results between May and October for areas with prolonged closures for this toxin group.

The Porthallow Cove production area recorded 18 consecutive results above the MPL in samples collected between 14/06/2018 and 30/10/2018. The highest concentration during this event was recorded in a sample collected on 28/08/2018 (2476 µg OA eq/kg). The second consecutive result below the MPL was recorded in a sample

collected on 13/11/2018, however detection of toxins continued through to December 2018. Figure 1.7 displays the Dinophysieae results and OA/DTX/PTX toxin results between May and December 2018. The Dinophysieae counts peaked to 2200 cells/L on the same time (14/06/2018) as the first shellfish sample recorded a result above the MPL.

Ropehaven Outer, St. Austell Bay had 18 consecutive samples above the MPL. These samples were collected between 19/06/2018 and 15/10/2018. Figure 1.8 displays the Dinophysieae counts and OA/DTX/PTX toxin results between May and September 2018. The highest concentration during this event was recorded in a sample collected on 28/08/2018 (3778 µg OA eq/kg). This is the second highest result in England and Wales on record since the LC-MS method was introduced in 2011. This toxin group appeared at a similar time in 2017, however concentrations were significantly lower; with no results above the MPL in 2017.

Sandheap Point, Lantivet Bay had 16 consecutive samples above the MPL collected between 19/06/2018 and 01/10/2018. The highest concentration during this event was recorded in a sample collected on 28/08/2018 (4199 µg OA eq/kg). This is the highest concentration recorded across all locations in 2018 and is the highest result recorded since the LC-MS method was introduced in 2011. This is an increase on the results in 2017 where this production area received one above trigger level result.

At Pont Pill, Fowey 10 mussel results were consecutively recorded above the MPL between 19/07/2018 to 17/09/2018. The highest concentration during this event was recorded in a sample collected on 15/08/2018 (891 µg OA eq/kg). This is an increase from 2017, when no samples above the MPL or trigger level were recorded but is consistent with 2016.

The Fal production area at sample point Mylor Creek recorded one sample above the MPL at 180 µg OA eq/kg during July and 5 samples above trigger level before and after this occurrence. No samples above the MPL or trigger level were recorded for this site in 2017.

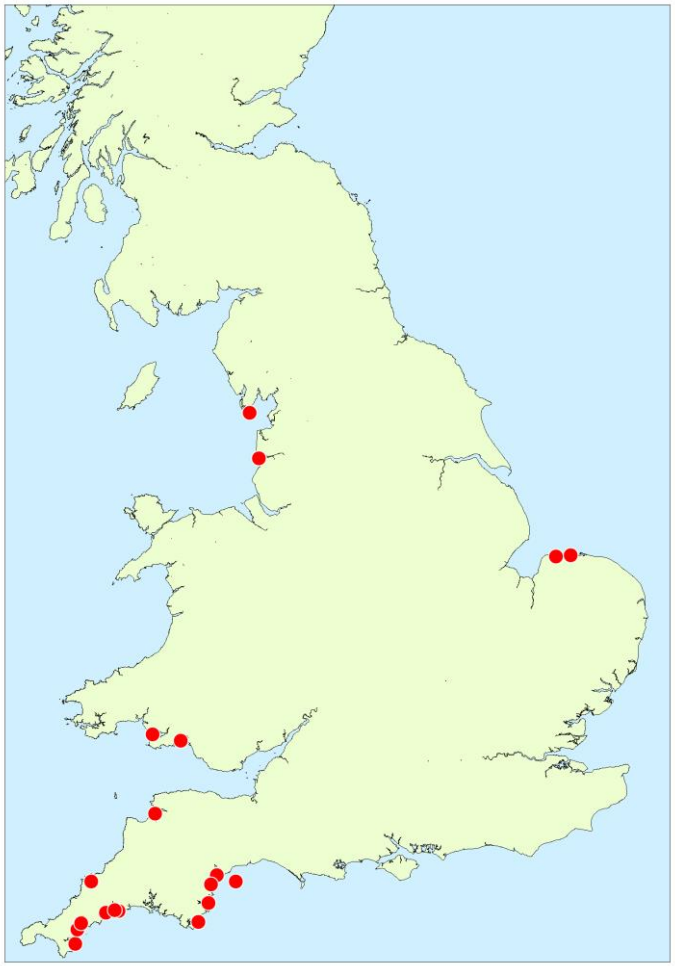

Figure 1.5 Location of classified production and/or relaying areas where OA/DTXs/PTXs group toxins were detected <u>below</u> the MPL of 160 µg [OA equivalent]/kg [shellfish tissue] in 2018

Figure 1.6 Location of classified production and/or relaying areas where OA/DTXs/PTXs group toxins were detected <u>above</u> the MPL of 160 µg [OA equivalent]/kg [shellfish tissue] in 2018

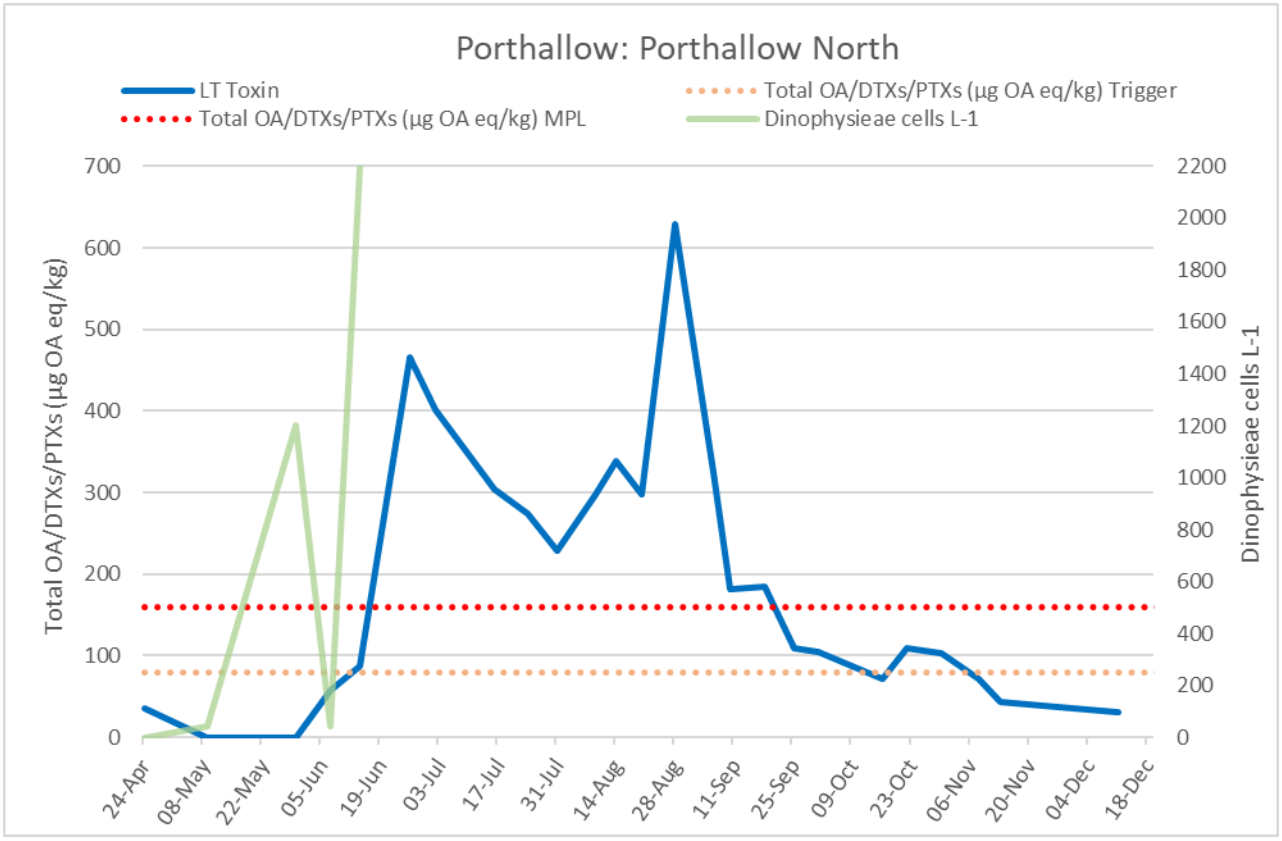

Figure 1.7 Results of LT testing and Dinophysieae enumeration in the Porthallow production area in 2018.

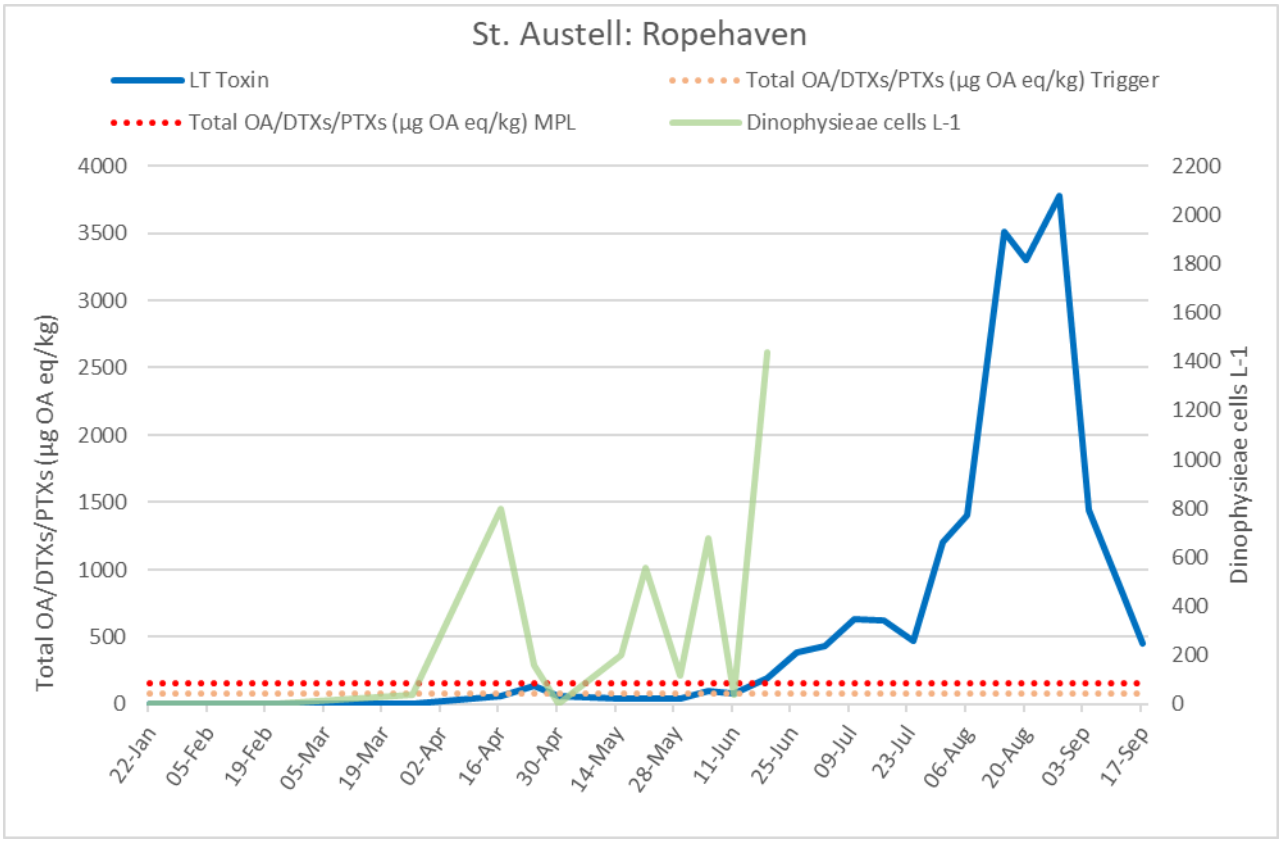

Figure 1.8 Results of LT testing and Dinophysieae enumeration in the St. Austell production area in 2018

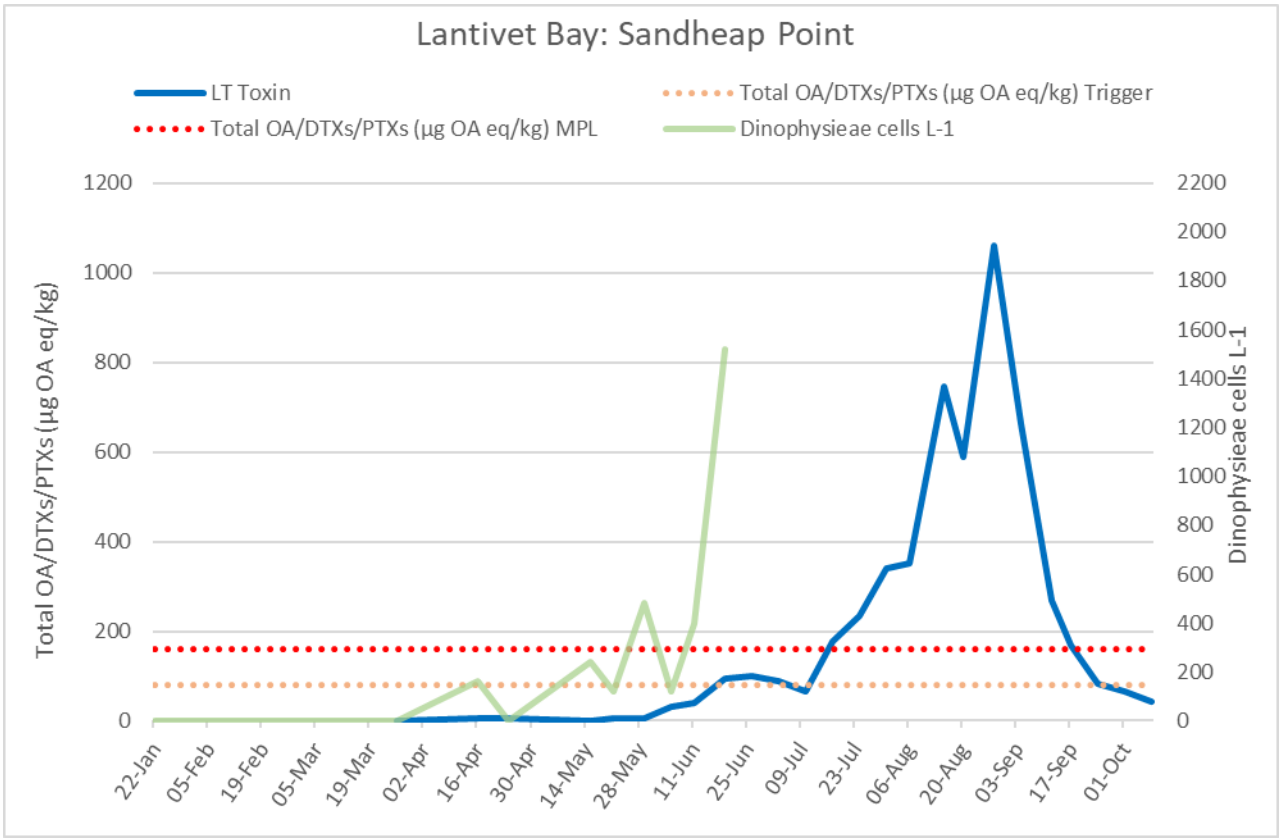

Figure 1.9 Results of LT testing and Dinophysieae enumeration in the Lantivet Bay area in 2018.

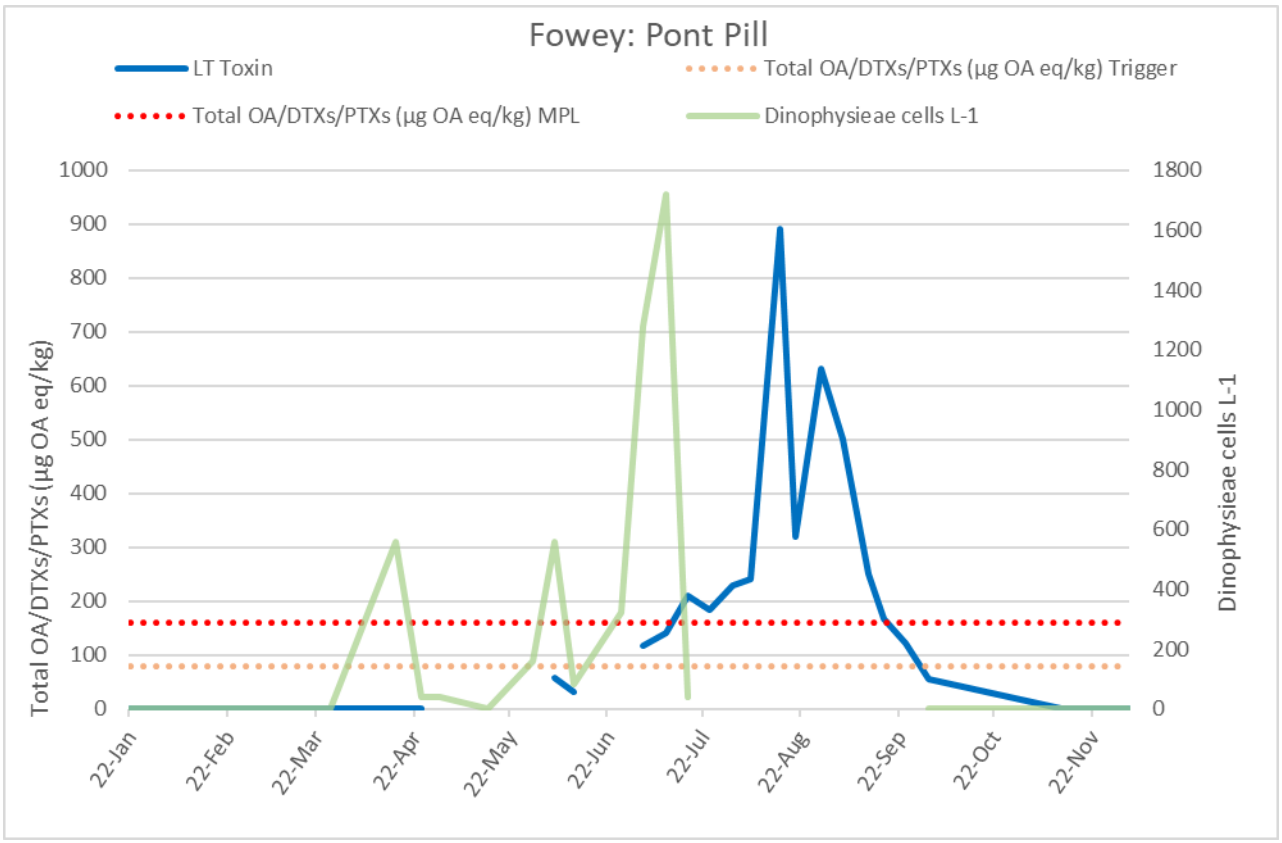

Figure 1.10 Results of LT testing and Dinophysieae enumeration in the Fowey production area in 2018.

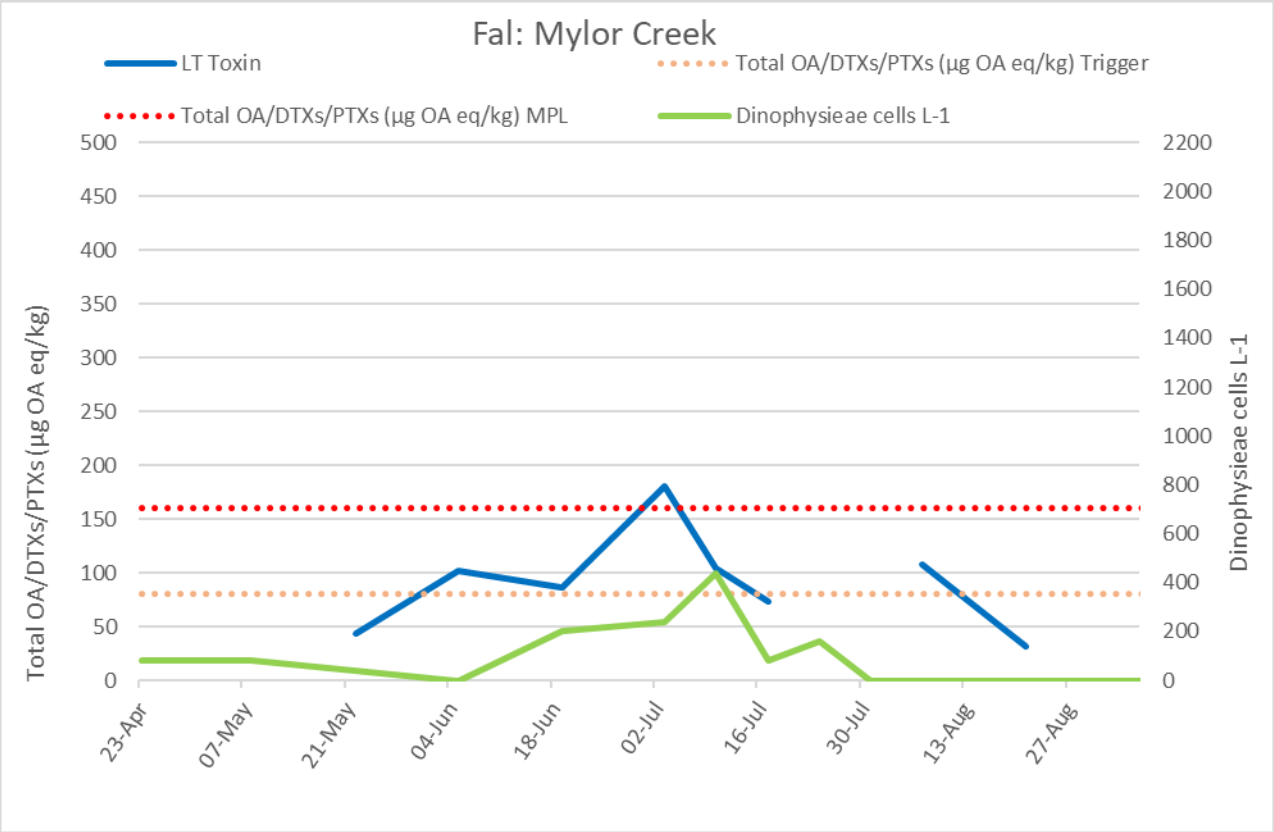

Figure 1.11 Results of LT testing and Dinophysieae enumeration in the Fal production area in 2018.

Table 1.2 Summary of sites where either ASP, PSP or lipophilic toxins were detected above the maximum permitted limits in 2018.

Toxin	**Samples where toxin levels exceeded the maximum permitted level** **(ASP: > 20 mg [domoic +*epi*-domoic acid]/kg [shellfish flesh]; OA/DTXs/PTXs: >160 µg [OA eq.]/kg [shellfish flesh]; AZAs: >160 µg [AZA1 eq.]/kg [shellfish flesh]; YTXs: >3.75 mg [YTX eq.]/kg [shellfish flesh]; PSP: > 800 µg [STX eq.]/kg [shellfish flesh])**			
	Local Authority	**Production area & site**	**Date samples collected**	**Highest value reported (Shellfish species)**
ASP	None	None	None	None
OA/DTXs/PTXs	Torbay BC	Lyme Bay: Site 1	29/05/2018	176 µg/kg (Mussels)
	Cornwall PHA	Mylor Creek	17/07/2018	180 µg/kg (Mussels)
		Pont Pill	17/07/2018 to 17/09/2018: 10 samples	891 µg/kg (Mussels)
		Porthallow North	14/06/2018 to 30/10/2018: 18 samples	2476 µg/kg (Mussels)
		Ropehaven Outer	19/06/2018 to 15/10/2018: 18 samples	3778 µg/kg (Mussels)
		Sandheap Point	19/06/2018 to 01/10/2018: 16 samples	4199 µg/kg (Mussels)
AZAs	None	None	None	None
YTXs	None	None	None	None
PSP	None	None	None	None

1.4 Insufficient/unsuitable samples

Six shellfish samples (0.7% of all samples submitted) were rejected in the reporting period:

- three were rejected on the grounds of being unsuitable (<10 live shellfish on arrival);
- one was taken in error and
- two were submitted after the Easter cut-off date.

2 Phytoplankton monitoring - summary

The results of the phytoplankton monitoring of classified production and relaying areas in England and Wales for 2018 are summarised below. Where the stated trigger levels (see Appendix 2, Table 7.1) were exceeded, additional flesh and water samples were requested the following week.

- *Pseudo-nitzschia* species (ASP toxin producer) were recorded in 452 samples from 46 production areas. The trigger level (set at 150,000 cells/L) was exceeded on 7 occasions from 6 production areas (Table 2.1, Figure 2.2). The highest cell density was recorded in a sample from Brancaster: Loose J collected on 9 July (3,507,000 cells/L). The number of samples which exceed the trigger level for *Pseudo-nitzschia* species has fluctuated from year to year. There has been a decrease in the number of breaches compared to 2017.

- *Alexandrium* species (PSP toxins producers) were recorded in 46 samples from 19 production areas (Table 2.1 Figure 2.1), representing a slight decrease in the occurrence of this genus compared to last year. Recorded maximum cell density was also less than last year, with a density of 600 cells/L recorded from Fal: Ruan Pontoon/Tregothnan on 03/07/18. These levels are comparable to those recorded over the period 2013 to 2015, when annual recorded occurrences did not exceed 55 samples, however maximum cell density is lower. This is in sharp contrast to 2016 when annual recorded occurrences were from 107 samples, and maximum recorded cell densities was 13,617,000 cells/L.

- Dinophysiaceae (lipophilic toxins producers) were recorded in 158 samples from 24 production areas. The trigger level (set at 100 cells/L) was exceeded by 78 samples from 21 production areas (Table 2.1, Figure 2.3). This is a notable increase (271%) in the number of Dinophysiaceae trigger level breaches compared to 2017. The maximum cell density recorded in 2018 was 2,200 cells/L from Porthallow Cove: Porthallow Cove North in Cornwall on 14/06/2018.

- *Prorocentrum lima* (lipophilic toxins producers) were detected in 13 samples from 10 production areas (Table 2.1, Figure 2.4. The trigger level (set at 100 cells/L) was exceeded by 6 samples from 5 production areas. The highest cell density was 120 cells/L in 3 samples, one from Holy Island: Ross Links on 28/05/18 and two from Burry Inlet: Machynys on 05/09/18 and 04/10/18. *Prorocentrum lima* is considered an epi-benthic species, and it is likely that its detection in the water column is associated with sediment disturbance.

Table 2.1 Summary of Phytoplankton taxa with trigger levels

Taxa with trigger levels (cells/L)	2018 Occurrences	2018 Breaches	% change in breach numbers compared to 2017	2018 max. recorded density (cells/L)
Alexandrium (presence)	46	46	-8%	600
Pseudo-nitzschia (150,000)	452	7	-42%	3,507,000
Dinophysiaceae (100)	158	78	+271%	2,200
Prorocentrum lima (100)	13	6	+200%	120

- *Prorocentrum cordatum* were recorded in 116 samples from 34 production areas. These figures show a decrease in occurrence, but cell densities have increased peaking in August at 68,280 cells/L, compared to 4,000 cells/L in 2017, also in August.
- *Lingulodinium polyedrum* was recorded in 1 sample from Brancaster: Loose J on 01/10/18 with a maximum recorded cell density of 40 cells/L.
- *Protoceratium reticulatum* were recorded in 2 samples: one from Holy Island: Ross Links on 28/05/18 and the other from Brixham: Fishcombe Cove SW Corner on 03/07/18 both at just 40 cells/L. Both *P. reticulatum* and *L. polyedrum* have typically been recorded at relatively low frequencies and densities in samples from English and Welsh shellfish production areas over the last twelve years.

Of the 875 phytoplankton samples submitted in 2018, 16 (1.83%) were rejected for analysis, 10 due to high sediment. This is an increase of 0.5% in the number of high sediment samples compared to 2017. A further 5 samples were not analysed due to incorrect frequency of submission, and 1 sample was not analysed because the bottle had split in transit. The sample had leaked out into the special delivery bag and was not suitable for analysis.

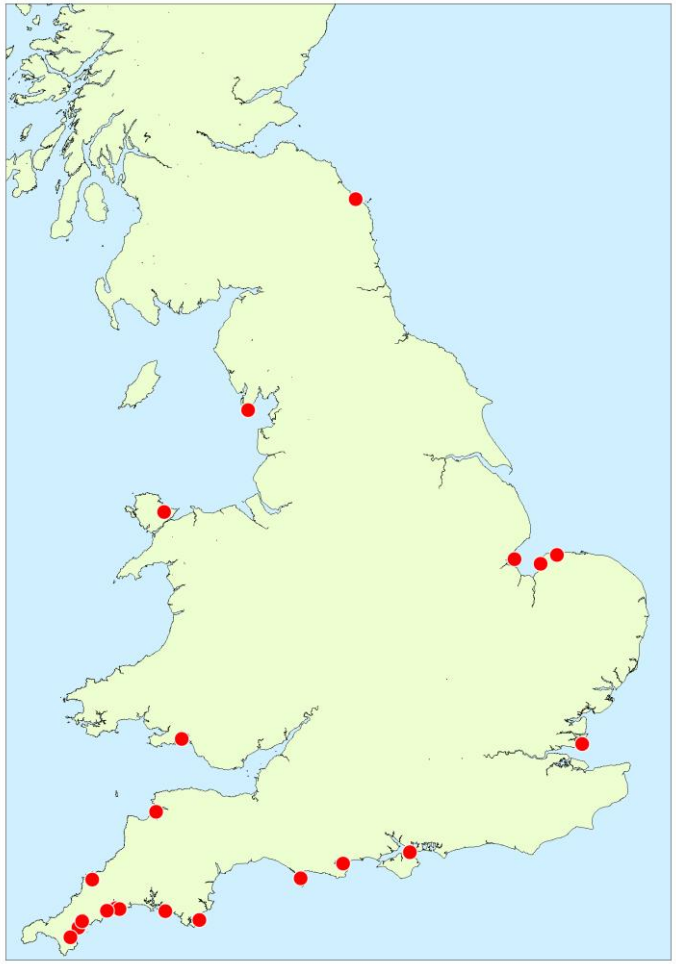

Figure 2.1 Locations of sites where *Alexandrium* species were detected above trigger level in 2018

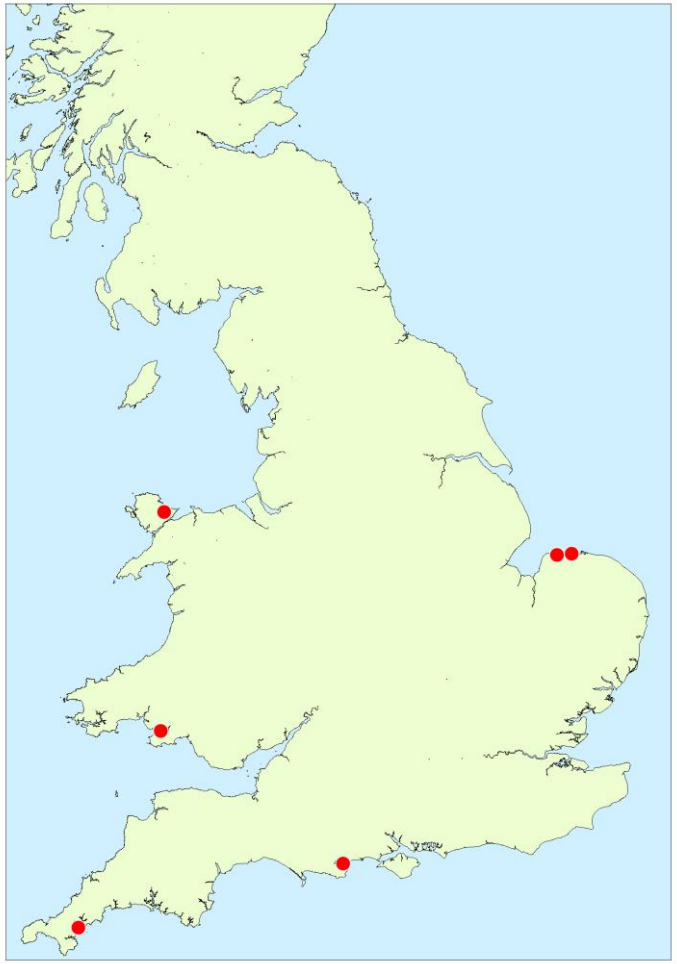

Figure 2.2. Locations of sites where *Pseudo – nitzschia* species were detected above trigger level in 2018

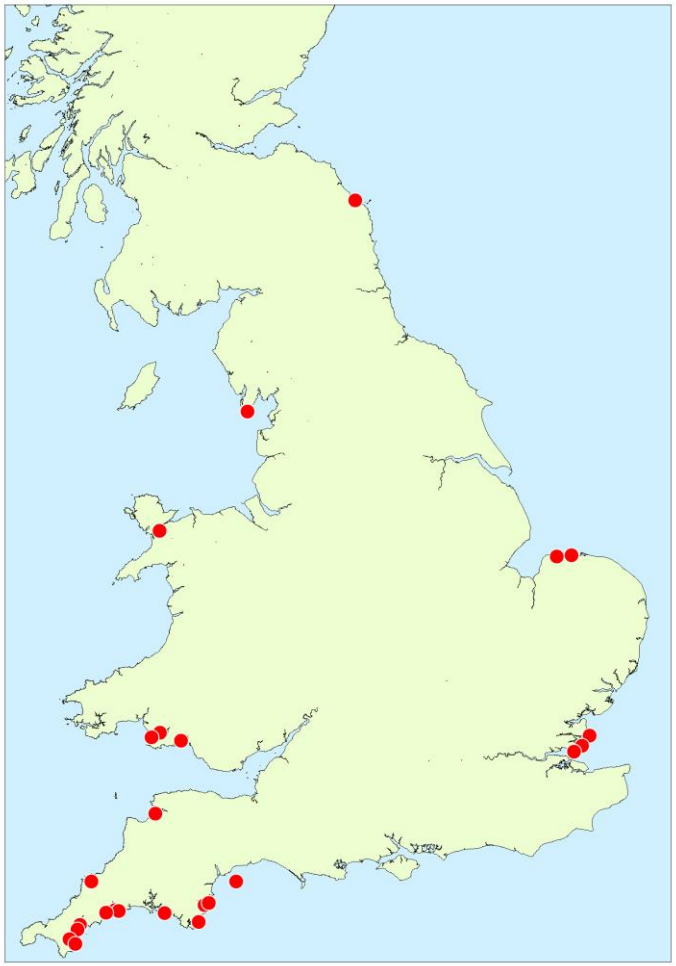

Figure 2.3 Locations of sites where *Dinophysiaceae* were detected above trigger level in 2018

Figure 2.4 Locations of sites where *Prorocentrum lima* was detected above trigger level in 2018

3 Biotoxin sample results in 2018

3.1 Amnesic Shellfish Poisoning (ASP) and Pseudo-nitzschia species

No samples recorded ASP toxins above the trigger level of 10µg/g.

Table 3.1 Summary of *Pseudo-nitzschia* species detected above the trigger level of 150,000 cells/L. **Results ordered by Local Authority.**

Production Area	Bed ID	Local Authority	Sampling Point	Date Sample Collected	*Pseudo-nitzschia* spp. cells/L
Burry Inlet	B038D	Carmarthenshire CC	Machynys	06/06/2018	484,000
Fal	B33AN	Cornwall PHA	Mylor Creek	26/06/2018	156,000
Brancaster	B005F	Kings Lynn & W Norfolk BC	Loose J	02/07/2018	186,000
Brancaster	B005F	Kings Lynn & W Norfolk BC	Loose J	09/07/2018	3,507,000
Blakeney	B006R	North Norfolk DC	Wells - The Pool	03/07/2018	241,000
Poole	B54CL	Poole BC	West Brownsea 1	05/06/2018	684,000
Anglesey - Red Wharf Bay	B057J	Ynys Mon CC	Nodwydd	02/07/2018	165,000

Table colour coding: Green (above causative algae trigger level)

3.2 Paralytic Shellfish Poisoning (PSP) and Alexandrium species

Table 3.2 Summary of PSP toxins and *Alexandrium* spp. detected above the trigger levels of 400 µg STXeq/kg and 40 cells/L respectively during 2018. **Results ordered by Local Authority.**

Production Area	Bed ID	Local Authority	Sampling Point	Date Sample Collected	High value calculated from method uncertainty	*Alexandrium* spp. cells/L
Morecambe Bay - Barrow	B077Q	Barrow-in-Furness BC	Roa Island	08/05/2018		40
The Wash	B003V	Boston BC	Toft	11/06/2018		40
Camel	B35AE	Cornwall CC	Porthilly Rock B	11/07/2018		40
St Austell Bay	B70AE	Cornwall PHA	Ropehaven Outer	16/04/2018		40
Lantivet Bay	B70AI	Cornwall PHA	Sandheap Point	29/05/2018		40
St Austell Bay	B70AE	Cornwall PHA	Ropehaven Outer	29/05/2018		40
Fal	B33BD	Cornwall PHA	Trelissick Pontoon	05/06/2018		40
St Austell Bay	B70AE	Cornwall PHA	Ropehaven Outer	11/06/2018		80
Fal	B33BD	Cornwall PHA	Trelissick Pontoon	19/06/2018		40
Fal	B33AN	Cornwall PHA	Mylor Creek	26/06/2018		40
Fal	B33BD	Cornwall PHA	Trelissick Pontoon	26/06/2018		40

Table 3.2 continued

Production Area	Bed ID	Local Authority	Sampling Point	Date Sample Collected	High value calculated from method uncertainty	*Alexandrium* spp. cells/L
Helford	B034W	Cornwall PHA	Porth Navas Quay	02/07/2018		200
Fal	B33AN	Cornwall PHA	Mylor Creek	03/07/2018		40
Fal	B033Y	Cornwall PHA	Ruan Pontoon/Tregothnan	03/07/2018		600
Fal	B33BD	Cornwall PHA	Trelissick Pontoon	03/07/2018		200
Fowey	B70AB	Cornwall PHA	Pont Pill	03/07/2018		40
Helford	B034W	Cornwall PHA	Porth Navas Quay	09/07/2018		300
Fal	B33AN	Cornwall PHA	Mylor Creek	10/07/2018		160
Fal	B033Y	Cornwall PHA	Ruan Pontoon/Tregothnan	10/07/2018		80
Fal	B33AN	Cornwall PHA	Mylor Creek	17/07/2018		40
Fal	B033Y	Cornwall PHA	Ruan Pontoon/Tregothnan	17/07/2018		300
Fal	B33BD	Cornwall PHA	Trelissick Pontoon	17/07/2018		40
Fal	B33BD	Cornwall PHA	Trelissick Pontoon	24/07/2018		80
Helford	B034W	Cornwall PHA	Porth Navas Quay	06/08/2018		40
Fal	B33BD	Cornwall PHA	Trelissick Pontoon	07/08/2018		40
Fal	B33BD	Cornwall PHA	Trelissick Pontoon	14/08/2018		40
Fal	B33AN	Cornwall PHA	Mylor Creek	04/09/2018		200
The Wash	B04AP	Kings Lynn & W Norfolk BC	Stubborn Sand	16/04/2018		100
Brancaster	B005F	Kings Lynn & W Norfolk BC	Loose J	25/06/2018		100
Brancaster	B005F	Kings Lynn & W Norfolk BC	Loose J	14/11/2018		40
The Thames	B16CM	London PHA	East of Havengore Creek	25/07/2018		80
Holy Island-Ross Links	B001M	Northumberland CC	Ross Links	29/04/2018		40
Holy Island-Ross Links	B001M	Northumberland CC	Ross Links	07/05/2018	<RL	
Holy Island-Ross Links	B001M	Northumberland CC	Ross Links	14/05/2018	456	
Holy Island-Ross Links	B001M	Northumberland CC	Ross Links	28/05/2018		40
Holy Island-Ross Links	B001M	Northumberland CC	Ross Links	03/06/2018	456	
Yealm	B031J	Plymouth PHA	Thorn	02/05/2018		100
Yealm	B031J	Plymouth PHA	Thorn	22/08/2018		440
Yealm	B031J	Plymouth PHA	Thorn	29/08/2018		80
Yealm	B031J	Plymouth PHA	Thorn	11/09/2018		40
Poole	B54CL	Poole BC	West Brownsea 1	19/06/2018		40
Start Bay	B087J	South Hams DC	Off Torcross	13/06/2018		40
Solent	B24BK	Southampton PHA	Browndown	09/07/2018		40
Swansea	B037U	Swansea PHA	Queens Dock	02/07/2018		40
Taw/Torridge	B36AB	Torridge DC	Spratt Ridge East	08/05/2018		40
Taw/Torridge	B36AB	Torridge DC	Spratt Ridge East	28/06/2018		40

Table 3.2 continued

Production Area	Bed ID	Local Authority	Sampling Point	Date Sample Collected	High value calculated from method uncertainty	*Alexandrium* spp. cells/L
The Fleet	B25AI	Weymouth PHA	Fleet Oysters	20/06/2018		80
The Fleet	B25AI	Weymouth PHA	Fleet Oysters	26/06/2018		40
Anglesey - Red Wharf Bay	B057J	Ynys Mon CC	Nodwydd	25/06/2018		120

Table colour coding: Red (above toxin MPL), Green (above primary causative algal species trigger level), Grey (above secondary causative algal species trigger level)

3.3 Lipophilic Toxins, Dinophysiaceae and Prorocentrum lima

Table 3.3 Summary of results for samples recording Lipophilic toxins; Okadaic acid (OA), Dinophysistoxins (DTXs) and Pectenotoxins (PTXs), above the trigger level of 80 µg OA eq/kg. The table also includes samples recording the LTs causative algal species (Dinophysiaceae and *Prorocentrum lima*), above the trigger level of 100 cells/L. **Results ordered by Local Authority**. (Please note; toxin and algal results are only shown when the trigger levels have been breached).

Production Area	Bed ID	Local Authority	Sampling Point	Date Sample Collected	Total OA/DTXs/PTXs (µg OA eq/kg) High value calculated from MU	Dinophysieae cells/L	*Prorocentrum lima* cells/L
Morecambe Bay - Barrow	B077Q	Barrow-in-Furness BC	Roa Island	24/04/2018		200	
Morecambe Bay - Barrow	B077Q	Barrow-in-Furness BC	Roa Island	01/05/2018		360	
Morecambe Bay - Barrow	B077Q	Barrow-in-Furness BC	Roa Island	08/05/2018		120	
Morecambe Bay - Barrow	B077Q	Barrow-in-Furness BC	Roa Island	30/05/2018		760	
Morecambe Bay - Barrow	B077Q	Barrow-in-Furness BC	Roa Island	05/06/2018		120	
Burry Inlet	B038D	Carmarthenshire CC	Machynys	31/05/2018		160	
Burry Inlet	B038D	Carmarthenshire CC	Machynys	05/09/2018		320	120
Burry Inlet	B038D	Carmarthenshire CC	Machynys	04/10/2018			120
Camel	B35AE	Cornwall CC	Porthilly Rock B	03/07/2018		240	
Camel	B35AE	Cornwall CC	Porthilly Rock B	11/07/2018		600	
Camel	B35AE	Cornwall CC	Porthilly Rock B	16/07/2018		120	
Camel	B35AE	Cornwall CC	Porthilly Rock B	16/10/2018		100	100
Fal	B33AN	Cornwall PHA	Mylor Creek	19/06/2018		200	
Fal	B33AN	Cornwall PHA	Mylor Creek	26/06/2018		240	
Fal	B33AN	Cornwall PHA	Mylor Creek	03/07/2018		440	
Fal	B33AN	Cornwall PHA	Mylor Creek	17/07/2018	180	160	
Fowey	B70AB	Cornwall PHA	Pont Pill	16/04/2018		560	
Fowey	B70AB	Cornwall PHA	Pont Pill	29/05/2018		160	
Fowey	B70AB	Cornwall PHA	Pont Pill	05/06/2018		560	

Table 3.3 continued

Production Area	Bed ID	Local Authority	Sampling Point	Date Sample Collected	Total OA/DTXs/PTXs (µg OA eq/kg) High value calculated from MU	Dinophysieae cells/L	*Prorocentrum lima* cells/L
Fowey	B70AB	Cornwall PHA	Pont Pill	26/06/2018		320	
Fowey	B70AB	Cornwall PHA	Pont Pill	03/07/2018		1,280	
Fowey	B70AB	Cornwall PHA	Pont Pill	10/07/2018		1,720	
Fowey	B70AB	Cornwall PHA	Pont Pill	17/07/2018	209		
Fowey	B70AB	Cornwall PHA	Pont Pill	24/07/2018	184		
Fowey	B70AB	Cornwall PHA	Pont Pill	31/07/2018	229		
Fowey	B70AB	Cornwall PHA	Pont Pill	06/08/2018	242		
Fowey	B70AB	Cornwall PHA	Pont Pill	15/08/2018	891		
Fowey	B70AB	Cornwall PHA	Pont Pill	20/08/2018	319		
Fowey	B70AB	Cornwall PHA	Pont Pill	28/08/2018	631		
Fowey	B70AB	Cornwall PHA	Pont Pill	04/09/2018	500		
Fowey	B70AB	Cornwall PHA	Pont Pill	12/09/2018	250		
Fowey	B70AB	Cornwall PHA	Pont Pill	17/09/2018	166		
Helford	B034W	Cornwall PHA	Porth Navas Quay	26/06/2018		100	
Helford	B034W	Cornwall PHA	Porth Navas Quay	09/07/2018		200	
Porthallow Cove	B34AA	Cornwall PHA	Porthallow Cove North	30/05/2018		1,200	
Porthallow Cove	B34AA	Cornwall PHA	Porthallow Cove North	14/06/2018	316	2,200	
Porthallow Cove	B34AA	Cornwall PHA	Porthallow North	26/06/2018	1180		
Porthallow Cove	B34AA	Cornwall PHA	Porthallow North	02/07/2018	1547		
Porthallow Cove	B34AA	Cornwall PHA	Porthallow North	16/07/2018	1189		
Porthallow Cove	B34AA	Cornwall PHA	Porthallow North	24/07/2018	1110		
Porthallow Cove	B34AA	Cornwall PHA	Porthallow North	31/07/2018	590		
Porthallow Cove	B34AA	Cornwall PHA	Porthallow North	09/08/2018	1172		
Porthallow Cove	B34AA	Cornwall PHA	Porthallow North	14/08/2018	1333		
Porthallow Cove	B34AA	Cornwall PHA	Porthallow North	20/08/2018	1204		
Porthallow Cove	B34AA	Cornwall PHA	Porthallow North	28/08/2018	2476		
Porthallow Cove	B34AA	Cornwall PHA	Porthallow North	06/09/2018	1221		
Porthallow Cove	B34AA	Cornwall PHA	Porthallow North	10/09/2018	669		
Porthallow Cove	B34AA	Cornwall PHA	Porthallow North	18/09/2018	650		
Porthallow Cove	B34AA	Cornwall PHA	Porthallow North	25/09/2018	352		
Porthallow Cove	B34AA	Cornwall PHA	Porthallow North	01/10/2018	323		
Porthallow Cove	B34AA	Cornwall PHA	Porthallow North	16/10/2018	176		
Porthallow Cove	B34AA	Cornwall PHA	Porthallow North	22/10/2018	242		
Porthallow Cove	B34AA	Cornwall PHA	Porthallow North	30/10/2018	231		
St Austell Bay	B70AE	Cornwall PHA	Ropehaven Outer	16/04/2018		800	
St Austell Bay	B70AE	Cornwall PHA	Ropehaven Outer	24/04/2018		160	
St Austell Bay	B70AE	Cornwall PHA	Ropehaven Outer	15/05/2018		200	
St Austell Bay	B70AE	Cornwall PHA	Ropehaven Outer	21/05/2018		560	
St Austell Bay	B70AE	Cornwall PHA	Ropehaven Outer	29/05/2018		120	
St Austell Bay	B70AE	Cornwall PHA	Ropehaven Outer	05/06/2018		680	
St Austell Bay	B70AE	Cornwall PHA	Ropehaven Outer	19/06/2018	196	1,440	
St. Austell Bay	B70AE	Cornwall PHA	Ropehaven Outer	26/06/2018	385		
St. Austell Bay	B70AE	Cornwall PHA	Ropehaven Outer	03/07/2018	437		
St. Austell Bay	B70AE	Cornwall PHA	Ropehaven Outer	10/07/2018	634		

Table 3.3 continued

Production Area	Bed ID	Local Authority	Sampling Point	Date Sample Collected	Total OA/DTXs/PTXs (µg OA eq/kg) High value calculated from MU	Dinophysieae cells/L	*Prorocentrum lima* cells/L
St. Austell Bay	B70AE	Cornwall PHA	Ropehaven Outer	17/07/2018	625		
St. Austell Bay	B70AE	Cornwall PHA	Ropehaven Outer	24/07/2018	472		
St. Austell Bay	B70AE	Cornwall PHA	Ropehaven Outer	31/07/2018	1202		
St. Austell Bay	B70AE	Cornwall PHA	Ropehaven Outer	06/08/2018	1401		
St. Austell Bay	B70AE	Cornwall PHA	Ropehaven Outer	15/08/2018	3513		
St. Austell Bay	B70AE	Cornwall PHA	Ropehaven Outer	20/08/2018	3300		
St. Austell Bay	B70AE	Cornwall PHA	Ropehaven Outer	28/08/2018	3778		
St. Austell Bay	B70AE	Cornwall PHA	Ropehaven Outer	04/09/2018	1445		
St. Austell Bay	B70AE	Cornwall PHA	Ropehaven Outer	12/09/2018	836		
St. Austell Bay	B70AE	Cornwall PHA	Ropehaven Outer	17/09/2018	451		
St. Austell Bay	B70AE	Cornwall PHA	Ropehaven Outer	24/09/2018	303		
St. Austell Bay	B70AE	Cornwall PHA	Ropehaven Outer	01/10/2018	178		
St. Austell Bay	B70AE	Cornwall PHA	Ropehaven Outer	08/10/2018	161		
St. Austell Bay	B70AE	Cornwall PHA	Ropehaven Outer	15/10/2018	173		
Lantivet Bay	B70AH	Cornwall PHA	Sandheap Point	16/04/2018		160	
Lantivet Bay	B70AH	Cornwall PHA	Sandheap Point	15/05/2018		240	
Lantivet Bay	B70AI	Cornwall PHA	Sandheap Point	21/05/2018		120	
Lantivet Bay	B70AI	Cornwall PHA	Sandheap Point	29/05/2018		480	
Lantivet Bay	B70AI	Cornwall PHA	Sandheap Point	05/06/2018		120	
Lantivet Bay	B70AI	Cornwall PHA	Sandheap Point	11/06/2018		400	
Lantivet Bay	B70AI	Cornwall PHA	Sandheap Point	19/06/2018	253	1,520	
Lantivet Bay	B70AI	Cornwall PHA	Sandheap Point	26/06/2018	251		
Lantivet Bay	B70AI	Cornwall PHA	Sandheap Point	03/07/2018	362		
Lantivet Bay	B70AI	Cornwall PHA	Sandheap Point	10/07/2018	265		
Lantivet Bay	B70AI	Cornwall PHA	Sandheap Point	17/07/2018	718		
Lantivet Bay	B70AI	Cornwall PHA	Sandheap Point	24/07/2018	925		
Lantivet Bay	B70AI	Cornwall PHA	Sandheap Point	31/07/2018	904		
Lantivet Bay	B70AI	Cornwall PHA	Sandheap Point	06/08/2018	938		
Lantivet Bay	B70AI	Cornwall PHA	Sandheap Point	15/08/2018	3024		
Lantivet Bay	B70AI	Cornwall PHA	Sandheap Point	20/08/2018	2389		
Lantivet Bay	B70AI	Cornwall PHA	Sandheap Point	28/08/2018	4199		
Lantivet Bay	B70AI	Cornwall PHA	Sandheap Point	04/09/2018	2612		
Lantivet Bay	B70AI	Cornwall PHA	Sandheap Point	12/09/2018	990		
Lantivet Bay	B70AI	Cornwall PHA	Sandheap Point	17/09/2018	585		
Lantivet Bay	B70AI	Cornwall PHA	Sandheap Point	24/09/2018	270		
Lantivet Bay	B70AI	Cornwall PHA	Sandheap Point	01/10/2018	215		
Fal	B33BD	Cornwall PHA	Trelissick Pontoon	19/06/2018		240	
Menai Strait West	B042O	Gwynedd CC	Area 11 East	29/05/2018		100	
Brancaster	B005F	Kings Lynn & W Norfolk BC	Loose J	25/06/2018		600	
Brancaster	B005F	Kings Lynn & W Norfolk BC	Loose J	02/07/2018		160	
Brancaster	B005F	Kings Lynn & W Norfolk BC	Loose J	09/07/2018		100	

Table 3.3 continued

Production Area	Bed ID	Local Authority	Sampling Point	Date Sample Collected	Total OA/DTXs/PTXs (µg OA eq/kg) High value calculated from MU	Dinophysieae cells/L	*Prorocentrum lima* cells/L
Brancaster	B005F	Kings Lynn & W Norfolk BC	Loose J	16/07/2018		160	
The Thames	B16CN	London PHA	Crouch Approach	29/05/2018		120	
The Thames	B16CM	London PHA	East of Havengore Creek	29/05/2018		200	
The Thames	B16CM	London PHA	East of Havengore Creek	13/06/2018		100	
The Thames	B16BR	London PHA	Phoenix	13/06/2018		320	
Blakeney	B006R	North Norfolk DC	Wells - The Pool	03/07/2018		120	
Holy Island-Ross Links	B001M	Northumberland CC	Ross Links	28/05/2018			120
Holy Island-Ross Links	B001M	Northumberland CC	Ross Links	02/07/2018		120	
Yealm	B031J	Plymouth PHA	Thorn	12/06/2018		160	
Yealm	B031J	Plymouth PHA	Thorn	18/06/2018		120	
Yealm	B031J	Plymouth PHA	Thorn	22/08/2018		280	
Dart	B028B	South Hams DC	Waddeton	11/06/2018		120	
Start Bay	B087J	South Hams DC	Off Torcross	10/09/2018		200	
Swansea	B037U	Swansea PHA	Queens Dock	11/07/2018		200	
Swansea	B037U	Swansea PHA	Queens Dock	01/08/2018		120	
Brixham	B082B	Torbay BC	Fishcombe SW Corner	14/05/2018		360	
Brixham	B082B	Torbay BC	Fishcombe SW Corner	29/05/2018		680	
Brixham	B082B	Torbay BC	Fishcombe SW Corner	06/06/2018		240	
Brixham	B082B	Torbay BC	Fishcombe SW Corner	19/06/2018		160	
Lyme Bay	B090M	Torbay BC	Site 1	24/04/2018		320	
Lyme Bay	B090M	Torbay BC	Site 1	30/04/2018		360	
Lyme Bay	B090M	Torbay BC	Site 1	15/05/2018		440	
Lyme Bay	B090M	Torbay BC	Site 1	22/05/2018		360	
Lyme Bay	B090M	Torbay BC	Site 1	29/05/2018	176	280	
Lyme Bay	B090M	Torbay BC	Site 1	05/06/2018		160	
Lyme Bay	B090M	Torbay BC	Site 1	26/06/2018		120	
Lyme Bay	B090M	Torbay BC	Site 1	31/07/2018		120	
Lyme Bay	B090M	Torbay BC	Site 1	28/08/2018		120	
Lyme Bay	B090M	Torbay BC	Site 1	03/09/2018		600	
Lyme Bay	B090M	Torbay BC	Site 1	10/09/2018		160	
Taw/Torridge	B36AB	Torridge DC	Spratt Ridge East	21/06/2018		480	
Taw/Torridge	B36AB	Torridge DC	Spratt Ridge East	28/06/2018		200	
Taw/Torridge	B36AB	Torridge DC	Spratt Ridge East	03/07/2018		360	

Table 3.3 continued

Production Area	Bed ID	Local Authority	Sampling Point	Date Sample Collected	Total OA/DTXs/PTXs (µg OA eq/kg) High value calculated from MU	Dinophysieae cells/L	Prorocentrum lima cells/L
Taw/Torridge	B36AB	Torridge DC	Spratt Ridge East	01/08/2018		400	
Taw/Torridge	B36AB	Torridge DC	Spratt Ridge East	15/08/2018		100	
Lune	BO66Z	Wyre BC	Knott Spit	10/10/2018			100
Anglesey - Red Wharf Bay	B057J	Ynys Mon CC	Nodwydd	24/05/2018			100

Table colour coding: Red (above toxin MPL), Green (above primary causative algal species trigger level), Grey (above secondary causative algal species trigger level)

No samples contained Azaspiracids (AZAs) above the trigger level of 80 µg AZA1 eq/kg during 2018.

No samples contained Yessotoxins (YTXs) above the trigger level of 1.875 mg YTX eq/kg during 2018.

4 Glossary

AOAC	AOAC International
ASP	Amnesic Shellfish Poisoning
AZA	Azaspiracid
AZP	Azaspiracid Poisoning
Cefas	The Centre for Environment, Fisheries and Aquaculture Sciences
DA	Domoic Acid
DSP	Diarrhetic Shellfish Poisoning
DTX	Dinophysistoxin
dcSTX	decarbomoyl Saxitoxin
EC	European Commission
EU	European Union
EURL	European Union Reference Laboratory for Marine Biotoxins
EHO	Environmental Health Officer
FSA	Food Standards Agency
GTX	Gonyautoxin
HPLC	High Performance Liquid Chromatography
LA(s)	Local Food Authority(ies)
LC-MS	Liquid Chromatography – Mass Spectrometry
LTs	Lipophilic toxins
MPL	Maximum permitted limit
N/A (na)	Not Applicable
ND	Not Detected
OC	Official Controls
OA	Okadaic Acid
PSP	Paralytic Shellfish Poisoning
PST	Paralytic Shellfish Toxins
PTX	Pectenotoxin
PTX2sa	Pectenotoxin 2 seco acid
7-*epi* PTX2sa	7-epi-Pectenotoxin 2 seco acid
RL (<RL)	Reporting Limit
SOP(s)	Standard Operating Procedure(s)
STX	Saxitoxin
UKNRL	UK National Reference Laboratory for Marine Biotoxins
YTX	Yessotoxin

5 References

European Communities (2004). Regulation (EC) 854/2004 of the European Parliament and of the Council of 29 April 2004 laying down specific rules for the organisation of official controls on products of animal origin intended for human consumption.

European Communities (2005). Regulation (EC) 2074/2005 of the European Parliament and of the Council of 5th December 2005 which lays down the implementing measures for certain products under Regulation (EC) 853/2004 and for the organisation of official controls under Regulation (EC) 854/2004 and 882/2004, derogating from Regulation (EC) No 852/2004 and amending Regulations (EC) Nos 853/2004 and 854/2004.

European Communities (2004). Regulation (EC) 882/2004 of the European Parliament and of the Council of 29th April 2004, which prescribes requirements for Official Controls performed to ensure the verification of compliance with feed and food law.

European Communities (2004). Regulation (EC) 853/2004 of the European Parliament and of the Council of 29th April 2004 laying down the specific hygiene rules for the hygiene of foodstuffs.

6 Appendix 1 – Methodology for official control monitoring of toxins in shellfish

6.1 Shellfish collection and transport

In 2018, 39 local authorities (LAs) contributed to the sampling of shellfish from 69 sampling points (Figure 6.1).

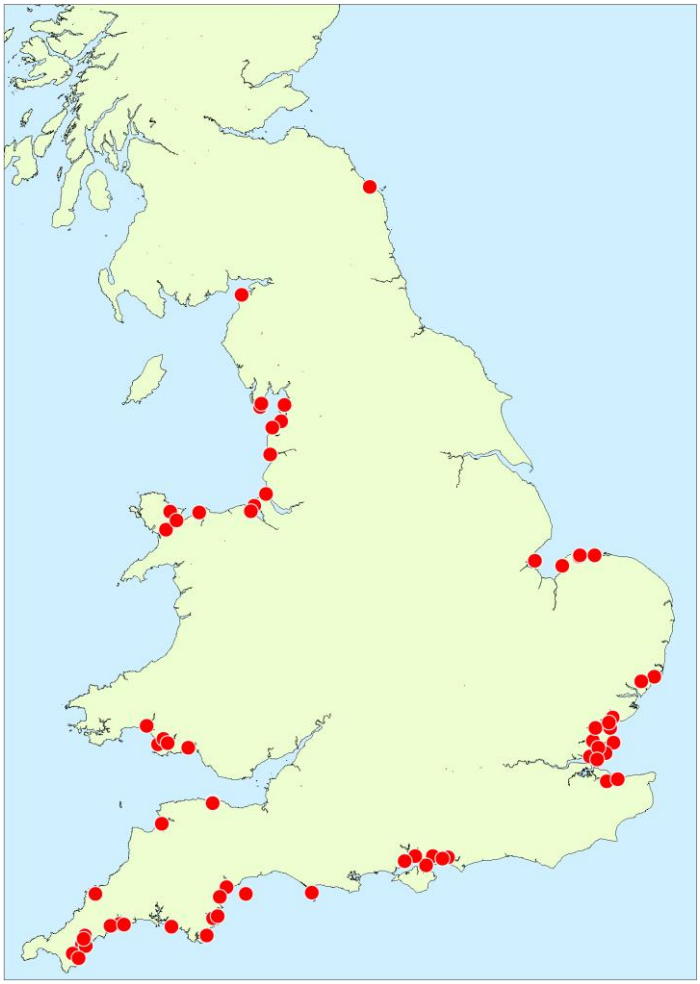

Figure 6.1 English and Welsh flesh sampling locations - Biotoxin monitoring programme 1st January to 31st December 2018

In total, 851 shellfish samples were submitted from classified production and relaying areas. Samples were submitted for amnesic shellfish poisoning (ASP) toxins, paralytic shellfish poisoning (PSP) toxins and/or lipophilic toxins (LTs) testing. Environmental Health Officers (EHOs) from Local Authorities (LAs) collected or supervised the collection of shellfish samples from designated monitoring points within classified shellfish production or relaying areas. The samples received from classified production and relaying areas comprised mainly of mussels (*Mytilus* spp.), native oysters (*Ostrea edulis)*, common cockles (*Cerastoderma edule)* and Pacific oysters (*Crassostrea gigas)* (Table 6.1). The remainder of the samples consisted of surf clams (*Spisula solida*), manila clams (*Tapes philipinarum)* and hard clams (*Mercenaria mercenaria*).

Shellfish samples reached Cefas between 1 and 72 hours post collection, with 90% of samples reaching the laboratory within 1 working day, 9.5% 2 working days post collection and 0.5% 3 working days post collection.

Shellfish samples were transported to the testing laboratory using a validated chilled transport system (Coleman 16 Qrt coolboxes). 91% of the samples transported in these boxes arrived at the laboratory within the recommended temperature range (2-10°C). Seventy-seven samples recorded temperatures above 10°C. However, upon inspection, all these samples met the criteria set by the UK Marine Biotoxins National Reference Laboratory (UKNRL) for testing.

6.2 Shellfish sample assessment

Unsuitable samples

On arrival at the laboratory, samples were assigned a unique laboratory number and their temperature recorded before they were assessed for their suitability for analysis, in accordance with UKNRL SOPs. Shellfish which failed to respond to a percussion test and/or did not exhibit organoleptic characteristics associated with freshness were excluded from testing and reported as unsuitable for analysis.

Samples were assessed on the basis of their compliance with the requirement of the monitoring programme (namely; shellfish species submitted, frequency of submission and geographical origin of the sample). Samples taken from non-active sites or unclassified species were queried with the LA. If no suitable reason was provided, then the sample was rejected. One sample was rejected on the grounds of being submitted outside the scheduled testing frequency. Two samples were rejected as they were received after the Easter cut-off date. Three were rejected on the grounds that less than 10 live shellfish were available on arrival either due to some being dead, empty shells or the sample contained less than 10 shellfish.

Insufficient samples

Samples which were assessed as suitable for analysis were then prepared for ASP, PSP and/or lipophilic toxins analyses as required. In accordance with agreed procedures, should the amount of shellfish available provide insufficient material for all required tests, prioritisation of analyses is based on the historic prevalence of toxin group or lack of previous monitoring results for any toxin group at each site. Where no information is available, or prioritisation cannot be ascertained on the above criteria, PSP toxin analyses are prioritised over LT and ASP analyses. No samples were found to be insufficient for the required tests in 2018.

Table 6.1 Summary of samples received and found insufficient/unsuitable for ASP, PSP or lipophilic toxins analyses, by species, in 2018.

Species	Total no. of samples submitted for analysis	No. of samples found insufficient for any of the required tests	No. of samples found unsuitable	No. of samples found unsuitable due to location or frequency	Percentage of samples found insufficient/unsuitable for the required tests (%)
Mussels	454	0	0	1	0.22
Pacific oysters	211	0	2	1	1.36
Native oysters	44	0	0	0	0
Common cockles	93	0	0	1	1.07
Surf clams	12	0	0	0	0
Manila clams	12	0	0	0	0
Hard clams	25	0	1	0	4
TOTAL	*851*	*0*	*3*	*3*	

6.3 Methodology of shellfish analysis

The methods used for routine toxin analysis of shellfish were those specified by the FSA and involved the application of a range of analytical methods. These included liquid chromatography (LC) with Ultra-violet (UV) or fluorescence (FLD) detection or LC with tandem mass spectrometry (MS/MS) for either, a semi-quantitative screen or full toxin quantitation of samples. The methods used for toxin testing were as follows:

ASP testing

- Shellfish species received in the reporting period were tested by LC-UV analysis following extraction with 50% aqueous methanol and filtration of the crude extracts. The quantitative method was applied to all shellfish species and is based on the method of Quilliam et al., 1995.
- ASP results are reported as mg/kg of domoic and epi-domoic acid combined.

PSP testing

- Shellfish species received in the reporting period have all been validated at Cefas for the use of a refined LC-FLD method based on AOAC 2005.06. Samples were all extracted with 1% acetic acid and forwarded for semi-quantitation by LC-FLD. Any samples returning a semi-quantitative total toxicity of >400 µg STX eq/kg were then forwarded for full quantitation by LC-FLD.
- Screen positive samples under this limit were reported as <400 µg STX eq/kg.
- Quantitation was conducted following the fully quantitative AOAC 2005.06 method, with final results reported as total toxicities in µg STX eq/kg.

Lipophilic toxins testing

- All shellfish species were analysed by LC-MS/MS for the quantitation of all EU regulated lipophilic toxins. The method used was validated at Cefas and conforms

to the performance characteristics and conditions stipulated by the EU Reference Laboratory (EU RL) for Marine Biotoxins.
- Results are reported as total toxicities in µg eq/kg for the OA, AZA and YTX groups separately.

Table 6.2 summarises the methods of analysis used throughout this reporting period together with a summary of the current UKAS accreditation status of each method to ISO 17025:2005 standard.

Table 6.2 List of analytical methods used, by species, in 2018

Toxin group	Methods employed	Species tested	Dates	Accreditation status (as of 31st December 2018) to ISO 17025:2005 standard
ASP	LC-UV	All species	1st January to 31st December 2018	Accredited
PSP	LC-FLD (semi-quantitative screen & full quantitation)	All species	1st January to 31st December 2018	Accredited
Lipophilic toxins	LC-MS/MS	All species	1st January to 31st December 2018	Accredited

Test outcome

Samples were considered as positive if they were found to breach the maximum permitted limits (MPL) for marine toxins specified in EC regulation 853/2004 (Table 6.3).

Where these levels were exceeded, recommendations were for temporary harvesting restrictions to be put in place for all shellfish species classified in the affected area until two consecutive negative or below action level (action level equals MPL) results were achieved for the toxin which was the cause of the closure, and at least one further negative or below action level result for the toxin groups which had not exceeded the MPL.

Routine flesh testing frequencies were defined by the FSA and followed one of the following set plans:

1. **Areas with a historic risk of PSP toxins occurrence AND/OR have insufficient historic data**.
   Fortnightly from 1st of April to 30th of September
   Four weekly from 1st of October to 31st of March

2. **Areas with no historic risk of PSP toxins AND historic data**
   Four weekly throughout the year

In addition, requests were made for weekly shellfish monitoring to be instigated when set trigger levels, indicative of heightened toxicity risk were breached. The trigger levels used in the 2018 reporting period are summarised in Table 6.3.

Table 6.3 Flesh trigger levels

Toxin group	Levels of toxin or cell concentrations triggering additional monitoring if breached
ASP	≥10mg domoic/epi-domoic acid/kg shellfish flesh
LTs	OA/DTX/PTX group: ≥80 µg OA eq./kg shellfish flesh AZA group: ≥80 µg AZA1 eq./kg shellfish flesh YTX group: ≥1.8 mg YTX eq./kg shellfish flesh
PSP	≥400µg STX eq./kg shellfish flesh

6.4 Reporting of results

Upon completion of the required analyses, the results were collated and quality controlled prior to submission to FSA. Results were reported on a daily basis. A summary of results turnaround times, from day of receipt to completion of each analysis for 2018 is given in Table 6.4. For reference, the turnaround times agreed with the FSA and required from Cefas during the reporting period are given in Table 6.5.

Table 6.4 Turnaround times, by test carried out, for samples received from classified production and relay areas in 2018

Territory	No. of tests performed	No. of completed results reported within one working day of receipt of sample	No. of completed results reported two working days post receipt of sample	No. of completed results reported three working days post receipt of sample
ASP by HPLC	652	646 (99%)	6 (1%)	0
Lipophilic toxins by LC-MS	776	758 (98%)	18 (2%)	0
PSP by HPLC (screen)	734	726 (99%)	8 (1%)	0
PSP by HPLC (quantitation)	3	0	3 (100%)	0
Totals	**2165**	**2130 (98%)**	**35 (2%)**	**0**

Table 6.5 Sample turnaround times (from sample receipt) specified by FSA

Toxin and analysis method	FSA specified targets
ASP by HPLC	90% within 1 working day 98% within 3 working days
Lipophilic toxins by LC-MS	90% within 1 working day 98% within 3 working days
PSP by HPLC (screen/semi-quantitation)	90% within 1 working day 98% within 3 working days
PSP by HPLC (quantitation)	90% within 2 working days 98% within 4 working days

Required turnaround times were therefore all met and for all analyses, delivery by the laboratory exceeded the targets agreed with FSA.

In addition to the daily reporting schedule, all results from samples received between Monday and Friday the previous week were collated and reported in a weekly results sheet to FSA, released the following week.

7 Appendix 2 – Methodology for official control monitoring of toxic phytoplankton in classified shellfish production areas

7.1 Phytoplankton sample collection and transport

875 phytoplankton samples were collected by environmental health officers from 49 classified production or relaying areas around the coast of England and Wales (Figure 7.1)

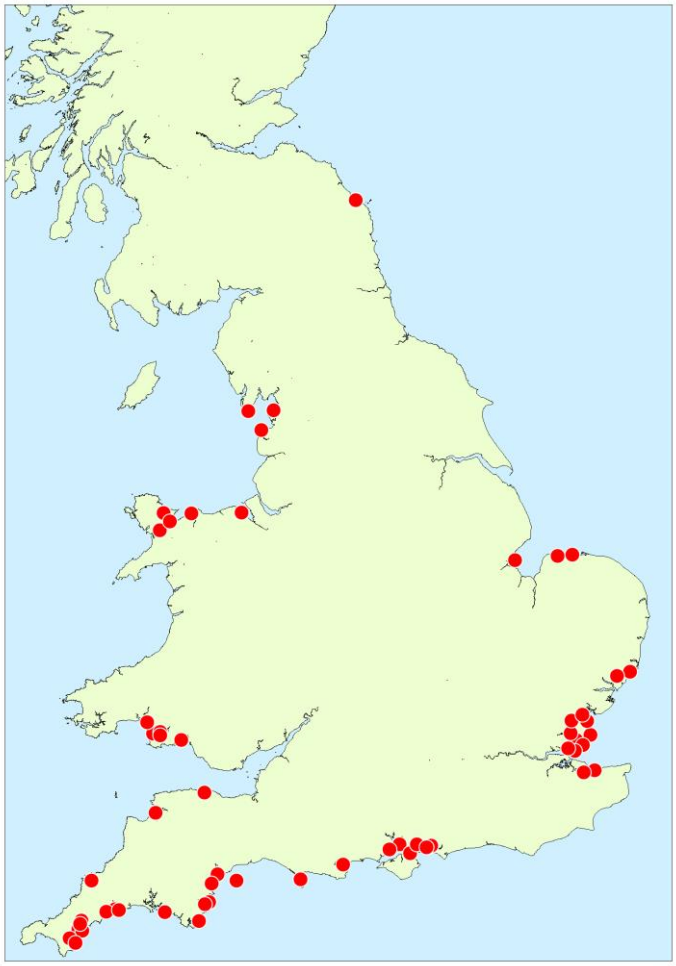

Figure 7.1 English and Welsh water sampling locations – 2018 Biotoxin monitoring programme

Sample collectors were requested to take depth integrated water samples from above the harvesting areas, at high water when possible. Tube samplers were provided to local authority staff who had access to boats, or where piers and jetties were sufficiently close to the flesh sampling points to allow a depth integrated sample to be taken. However, it was recognised that their use was not always practical in shallow, coastal areas and a homogenised sample, collected from three depths (near bottom, midwater and near surface) using a pole sampler, was recommended as a preferential alternative to sampling surface water with a bucket.

A 500 mL nalgene bottle was filled with water from each sample collection, which was preserved with the addition of 2 mL of acidified Lugol's Iodine. Preserved samples were then posted in pre-paid special delivery bags, together with a completed sample collection form, to the Cefas plankton laboratory for analysis.

7.2 Assessment of sample suitability

On arrival at the laboratory, samples were assigned a unique laboratory number. Sub-samples were then set up in 25mL Utermöhl chambers and allowed to settle. After three hours each sample was given a preliminary examination. If the viewing area contained too much sediment or too much overlapping plankton, then an additional sub-sample was set up in a 10mL or 5mL Utermöhl chamber. All samples were allowed to settle for a minimum of 12 hours before the final suitability assessment was made. If after 12 hours, the viewing area of the smaller chamber was also obscured by sediment then these samples were reported as "unable to analyse" in the weekly results sheet.

A total of 16 samples (1.83%) were rejected, of these 10 (1.4%) were due to high sediment concentrations in the water. This is an increase on the previous year's figures, of 6 (0.6%) which were rejected due to high sediment concentrations. Five other samples were rejected which were submitted outside of the routine testing frequency, and one sample was rejected because the sample had leaked out of the sample bottle into the delivery bag and was not suitable for analysis.

7.3 Water sample analysis

Water analyses followed the standard operating procedures drawn up by the UK national reference laboratory for marine biotoxins. Phytoplankton analyses are accredited to ISO 17025:2005 standard.

Test outcome

'Trigger levels' remained at the same cell concentrations as in previous years (Table 7.1). When these levels were breached, the FSA was immediately contacted and requests were made for additional water and shellfish samples to be collected. These were submitted for analysis the following week. When shellfish flesh samples breached trigger levels the water sampling was suspended until such time as toxin levels in the flesh fell below the trigger level.

Table 7.1 Trigger levels for toxin producing algae

Toxin	Toxin producing algae (trigger Level)
ASP	*Pseudo-nitzschia spp.* (150,000 cells/L)
LTs	*Dinophysiaceae* (100 cells/L) *Prorocentrum lima* (100 cells/L)
PSP	*Alexandrium spp.* (Presence)

7.4 Reporting of results

Upon completion of analyses, the results were collated, and quality control checked prior to submission to the FSA. During 2018, Cefas was able to report all results within one working day of sample receipt. This turnaround time is in full compliance with the targets specified by the FSA which is set at 98% of results reported within 3 working days of sample receipt. In addition to the daily reporting schedule, all results from samples received the previous week were collated and reported in a weekly results sheet which was released to the FSA by the following week.