Centre for Environment Fisheries & Aquaculture Science

Cefas

The Biotoxin and Phytoplankton official control monitoring programmes for England and Wales

Summary report for 2022

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Contents

Glossary

ASP	Amnesic Shellfish Poisoning
AZA	Azaspiracid
Cefas	The Centre for Environment, Fisheries and Aquaculture Sciences
DA	Domoic Acid
DSP	Diarrhetic Shellfish Poisoning
DTX	Dinophysistoxin
FSA	Food Standards Agency
HPLC	High Performance Liquid Chromatography
LC-MS	Liquid Chromatography – Mass Spectrometry
LTs	Lipophilic toxins
MPL	Maximum permitted limit
ND	Not Detected
OA	Okadaic Acid
PSP	Paralytic Shellfish Poisoning
PTX	Pectenotoxin
STX	Saxitoxin
YTX	Yessotoxin

1. Introduction

This report describes the results of the Official Control Biotoxin and Phytoplankton Monitoring Programmes for England and Wales for the period 1st January to 31st December 2022.

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 Retained Regulation (EU) 2017/625 and Retained Regulation (EC) 2074/2005. The delivery of the 2022 monitoring programme by Cefas continued throughout the COVID-19 pandemic with service maintained and delivered in a COVID secure manner.

All results of the FSA monitoring programme were compared to the maximum permitted levels stipulated in Retained Regulation (EC) 853/2004 (Section VII, Chapter V: Health standards for live bivalve molluscs), as summarised in Table 1 below. Toxin test results must not exceed these limits in either whole body or any edible part separately. Please note that for ease of reading, in the text of this report, toxin concentrations are shown as mg/kg or µg/kg, without reference to the toxin parent.

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

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

Fifty six of the 59 classified English and Welsh shellfish production and relaying areas were monitored in 2022. The Liverpool Bay and Chichester Harbour production areas were not monitored in 2022 as the areas were closed by Inshore Fisheries and Conservation Authority (IFCA) byelaw. The Silloth production area was not monitored due to inactivity throughout 2022. The monitoring of the Portland production area (declassified) and the Swansea Bay production area (prohibited) ceased during 2022. The location of the designated shellfish monitoring points is shown in Figure 1 and that of the phytoplankton monitoring points is shown in Figure 2.

A total of 918 shellfish samples and 904 phytoplankton samples were submitted for analysis in 2022.

1.63% of the shellfish samples (n=15) and 4.54% of the water samples (n=41) submitted to the laboratories were rejected in the reporting period. This was due to a variety of reasons (test not required, sample unsuitable for analysis, lab error).

The results of the biotoxin and phytoplankton monitoring programme for the 12 months period are summarised below. Please note that all toxin results stated for Paralytic Shellfish Poisoning toxins and Lipophilic toxins in this report refer to the high value calculated from the method uncertainty. Measurement uncertainty was not applied to ASP or phytoplankton results in 2022.

The full list of FSA monitoring results for 2022 are available at the following links:

- Biotoxin Results – FSA Open Data Catalogue
- Phytoplankton Results – FSA Open Data Catalogue

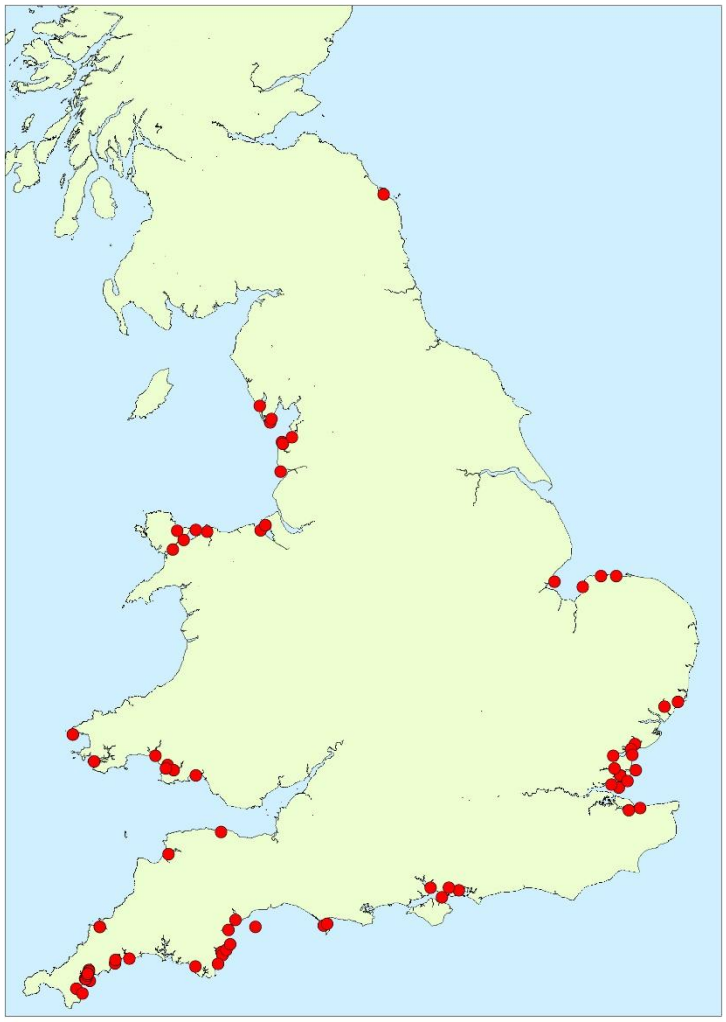

Figure 1: English and Welsh shellfish sampling locations for the 2022 FSA biotoxin monitoring programme.

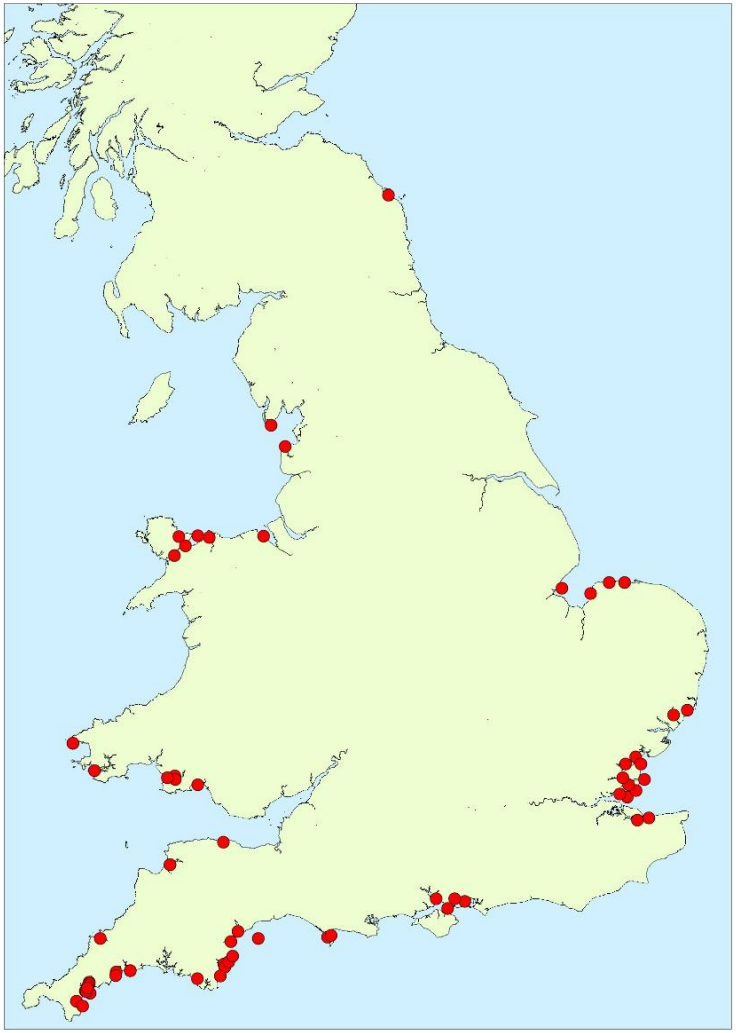

Figure 2: English and Welsh water sampling locations for the 2022 FSA phytoplankton monitoring programme.

2. Amnesic shellfish poisoning (ASP) toxins summary

A total of 737 shellfish samples were tested for ASP toxins using a high-performance liquid chromatography (HPLC) method. ASP toxins were detected below the MPL in 52 samples from 17 production areas. ASP toxins above the MPL were detected in one sample of King scallops from the Car Y Mor production area in west Wales collected in April 2022. This species has been subsequently declassified in this production area.

The location of the production areas where ASP toxins were detected in 2022 is shown in Figure 3.

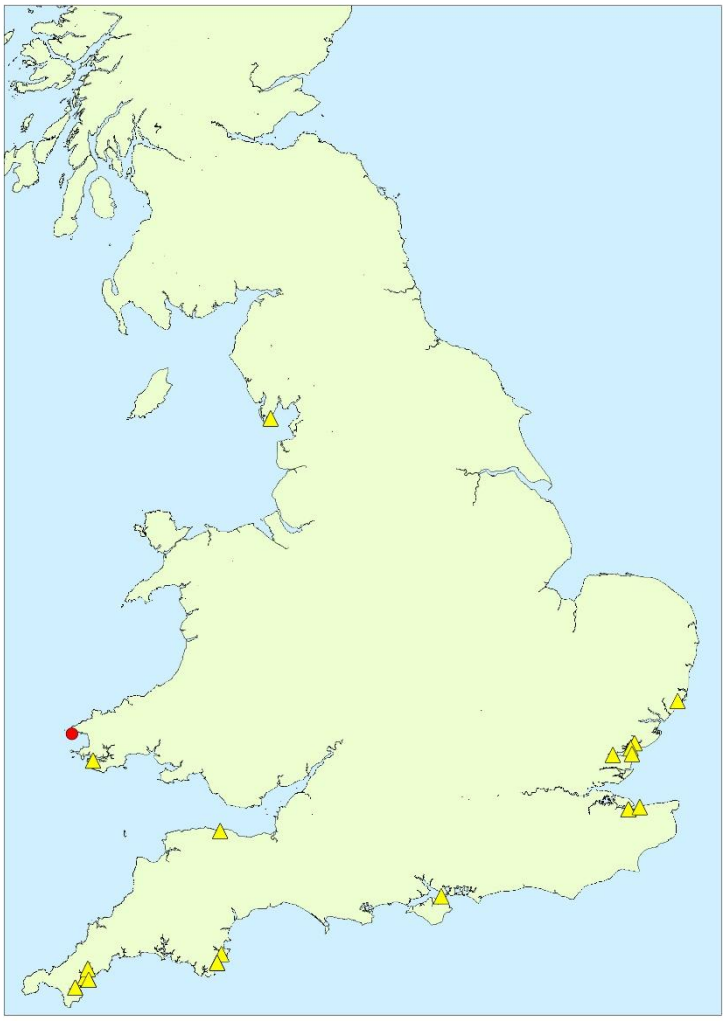

Figure 3: Location of classified production and relaying areas where ASP toxins were detected below the MPL (△) and above the MPL (●) in 2022.

The greatest proportion of samples containing ASP toxins originated from the south-west of England (31 samples).

ASP toxins were recorded in pacific oysters (27 samples), native oysters (11 samples) surf clams (14 samples) and in the single sample of King scallops noted above.

In 2022, ASP toxin levels predominantly ranged from 1 to 7 mg/kg, only the sample of King scallops exceeded this range (20.2 mg/kg). Of note, 14 out of the 15 surf clams collected from Start Bay on the coast of Devon in 2022 and tested for ASP toxins were found to contain ASP toxins (ranging from 2 to 7 mg/kg).

ASP toxin occurrence in 2022 was slightly higher than in 2021 when 31 samples from 18 production areas were found to contain ASP toxins (1 to 4 mg/kg), with the greatest proportion of samples also originating from the south-west of England.

3. Paralytic shellfish poisoning (PSP) toxins summary

A total of 752 shellfish samples were screened for PSP toxins using the HPLC semi-quantitative method. None of shellfish samples tested for PSP in 2022 exceeded the MPL of 800 µg/kg.

No quantifiable concentrations of PSP toxins were recorded in any samples during 2022. This continues a decline in PSP occurrence, overall, there has been a decline in PSP occurrence since its peak in 2011, when PSP toxins were detected in 44 samples.

4. Lipophilic toxins (LTs) summary

A total of 884 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, as described in Table 1.

4.1. Okadaic Acid (OA), Dinophysistoxins (DTX) and Pectenotoxins (PTX)

This group of toxins were detected in 151 samples from 16 production areas in England and Wales. The location of these production areas is shown in Figure 4 & 5.

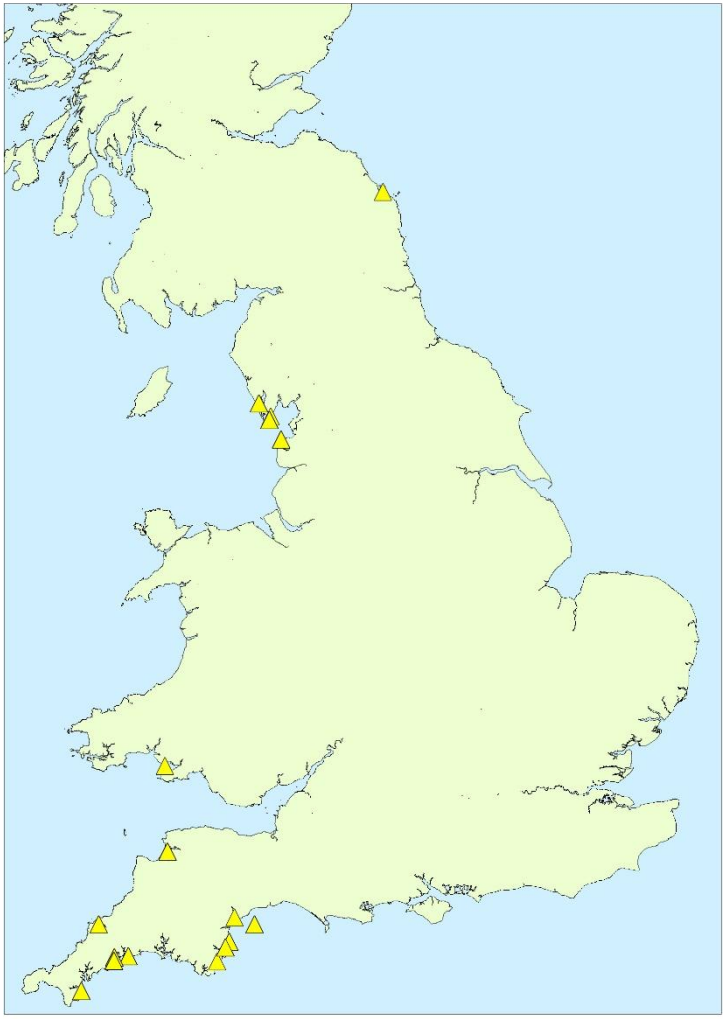

Figure 4: Location of classified production and relaying areas where lipophilic toxins (OA, DTX and PTX group) were detected below the MPL in 2022.

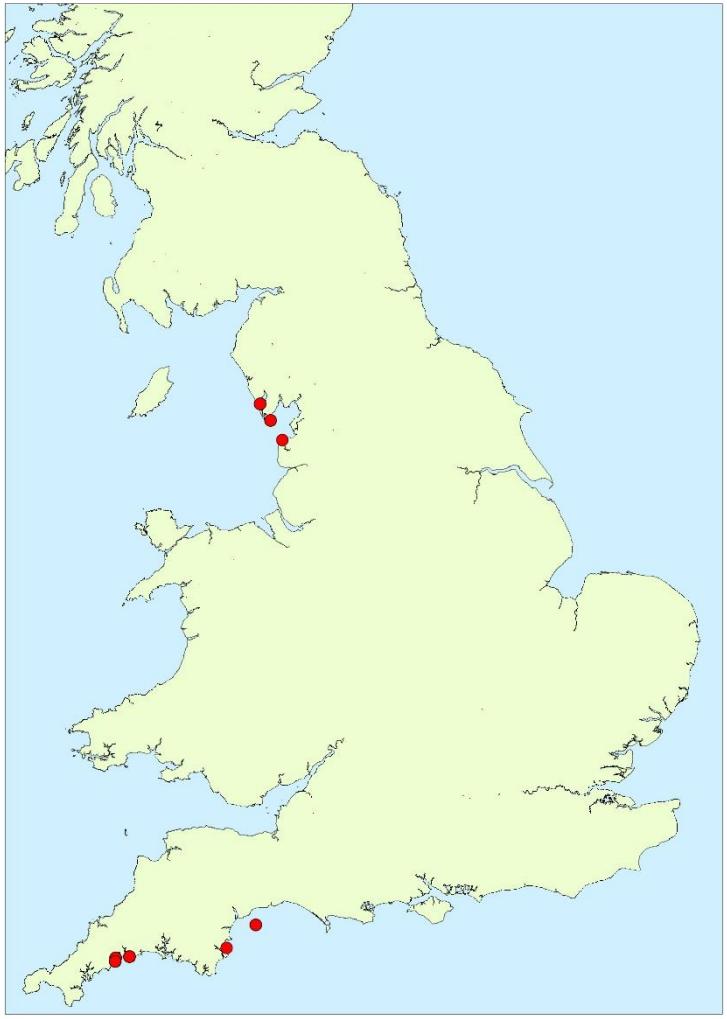

Figure 5: Location of classified production and relaying areas where lipophilic toxins (OA, DTX and PTX group) were detected above the MPL in 2022.

Fifty mussel samples returned results exceeding the MPL in 2022. All these samples originated from 8 RMPs within 8 production areas, mainly in south Cornwall but also in the north-west of England. Figure 6 displays the toxin results recorded in the samples collected from these 8 RMPs in 2022.

OA group toxins were detected during the months of April to October 2022. Whilst most occurrences affected samples of mussels, two Pacific oyster and one surf clam samples were also found to contain these toxins (albeit at levels below the MPL). Results ranged from 16 to 657 µg OA eq./kg, with the highest result recorded at Mevagissey Bay, South Mevagissey Bottom in May 2022.

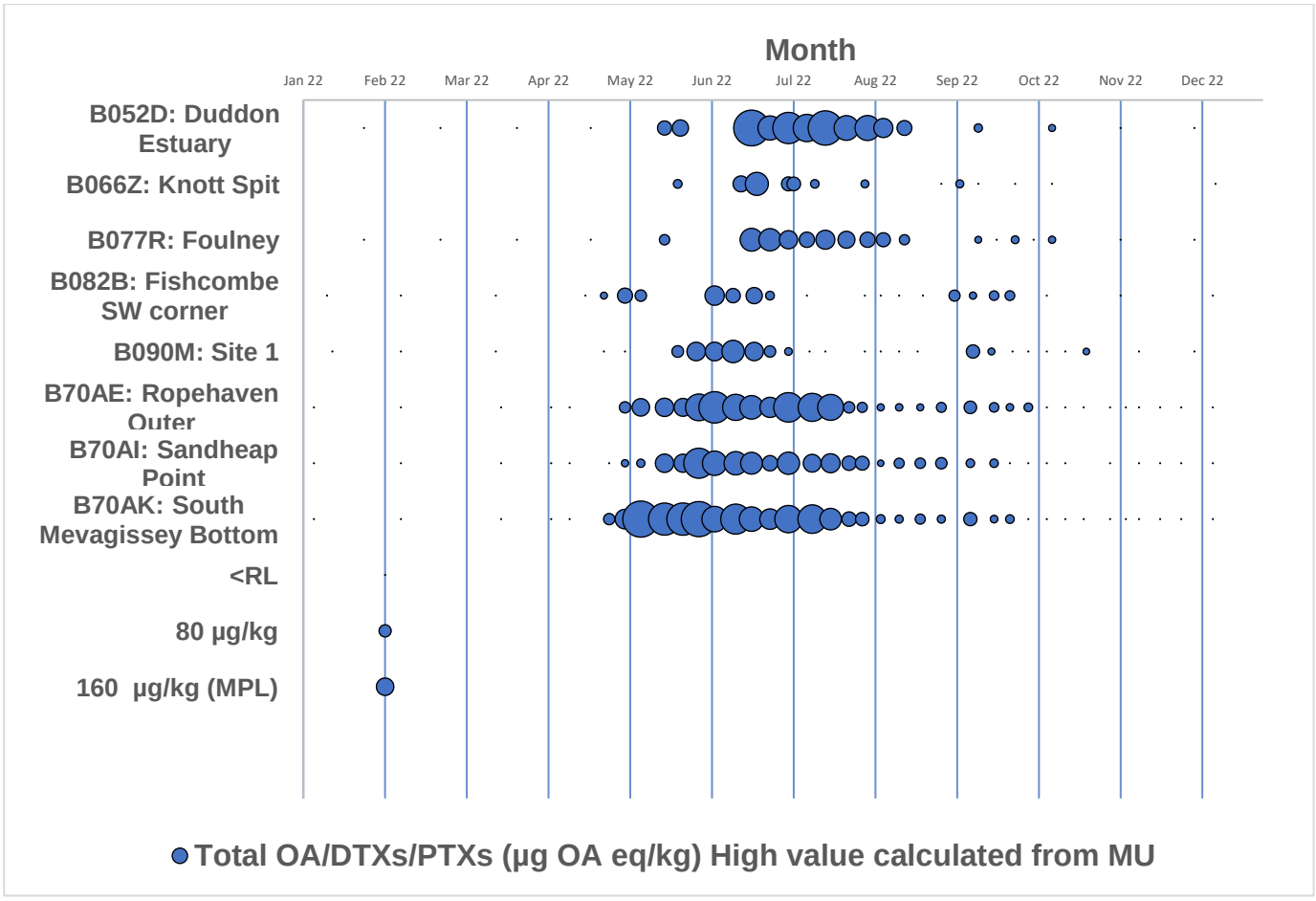

Figure 6: Levels of lipophilic toxins (OA/DTX/PTX group) recorded at the 8 RMPs where toxins were found to exceed the MPL in 2022

4.2. The annual occurrence of OA/DTX/PTX events is showing to be highly variable, ranging from 4 samples exceeding the MPL in 2017 to 64 samples in 2018 Yessotoxins (YTXs)

YTXs were not detected in samples received in 2022. This is consistent with previous years, these toxins having only been detected once (in September 2014) since implementation of the LC-MS/MS method in 2011.

4.3. Azaspiracid group toxins (AZAs)

AZAs were not detected in samples received in 2022. The detection of this toxin group has varied widely since the LC-MS/MS method was introduced in 2011, with the number of detections ranging from not detected in 2017, 2018 & 2019 to being detected in 21 samples in 2015. However, levels have only rarely exceeded the MPL (3 times in 2015).

5. Phytoplankton monitoring summary

The results of the phytoplankton monitoring of classified production and relaying areas in England and Wales for 2022 are summarised below. Where the set trigger levels (Table 2) were exceeded, additional flesh and water samples were requested the following week.

Table 2: Trigger values for harmful algae monitoring.

Species	Species linked to	Trigger value (cells/Litre)	Number of samples exceeding trigger levels in 2022
***Alexandrium* species**	PSP	40 (presence)	16
Dinophysiaceae	LTs	100	56
Prorocentrum lima	LTs	100	4
***Pseudo-nitzschia* species**	ASP	150,000	2

Alexandrium species were recorded in 16 samples from 11 production areas (see Figure 7). This is a reduction of 58.9% from 2021, when 39 samples from 18 production areas recorded results above the trigger value.

Recorded maximum cell density was lower than last year, with a density of 200 cells/L recorded in a sample collected from Southampton Water: Hamble Estuary on 27 April 2022, and a sample collected from Teign: Gas Works East on 16 November 2022. This is also in sharp contrast to 2016 when 107 occurrences were recorded, and maximum recorded cell densities was 13,617,000 cells/L.

Samples exceeding the trigger value were predominantly recorded from mid-April to the end of July (14 samples), although one exceedance was recorded in September and one in mid-November.

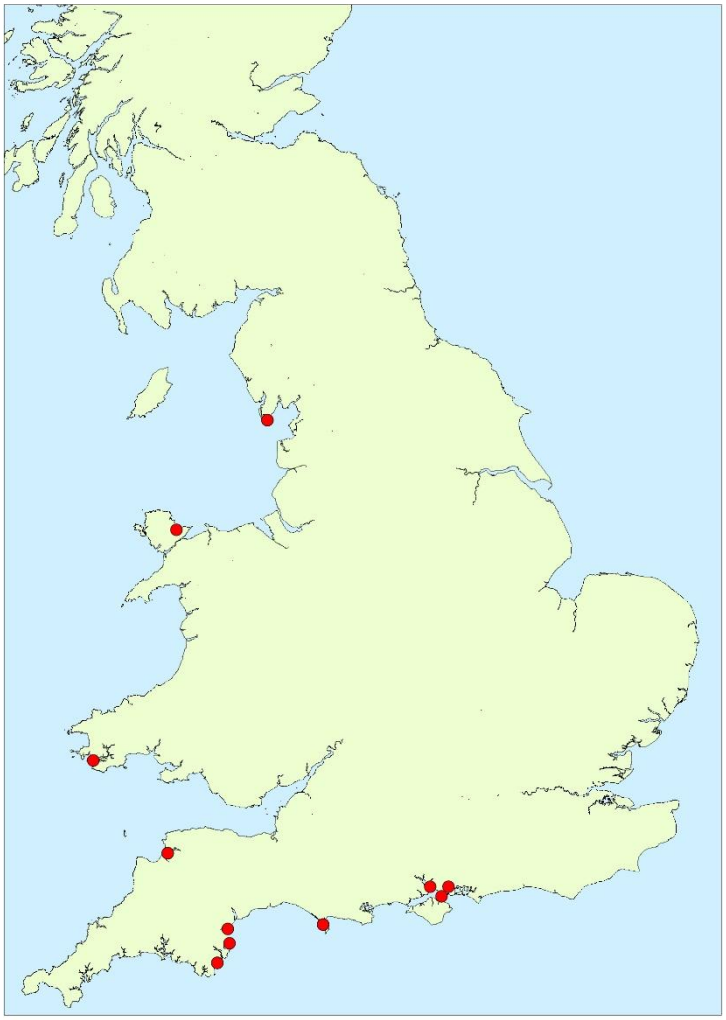

Figure 7: Location of classified production and relaying areas where *Alexandrium* species were detected above the trigger level in 2022.

Pseudo-nitzschia species were recorded in 374 samples from 47 production areas. The trigger level (set at 150,000 cells/L) was exceeded on 2 occasions from 2 production areas (Exe and Mevagissey bay) (see Figure 8). The number of samples which exceed the trigger level for *Pseudo-nitzschia* species has fluctuated from year to year. There was a decrease of 80% in the number of samples exceeding the trigger level compared to 2021.

The highest cell density was recorded in a sample collected from Exe: Cockwood Harbour collected on 8 June 2022 (358,000 cells/L). The Mevagissey bay sample was collected on 20 September and recorded a cell concentration of 156,000 cells/L.

Figure 8: Location of classified production and relaying areas where *Pseudo-nitzschia* species were detected above the trigger level in 2022.

Dinophysiaceae were recorded in 97 samples from 21 production areas between April and December 2022.

The trigger level (set at 100 cells/L) was exceeded by 56 samples from 18 production areas (See Figure 9). This is a 9.8% increase in comparison to 2021.

The maximum cell density recorded in 2022 was 1,680 cells/L in a sample collected from Lantivet Bay: Sandheap Point on 18 May 2022.

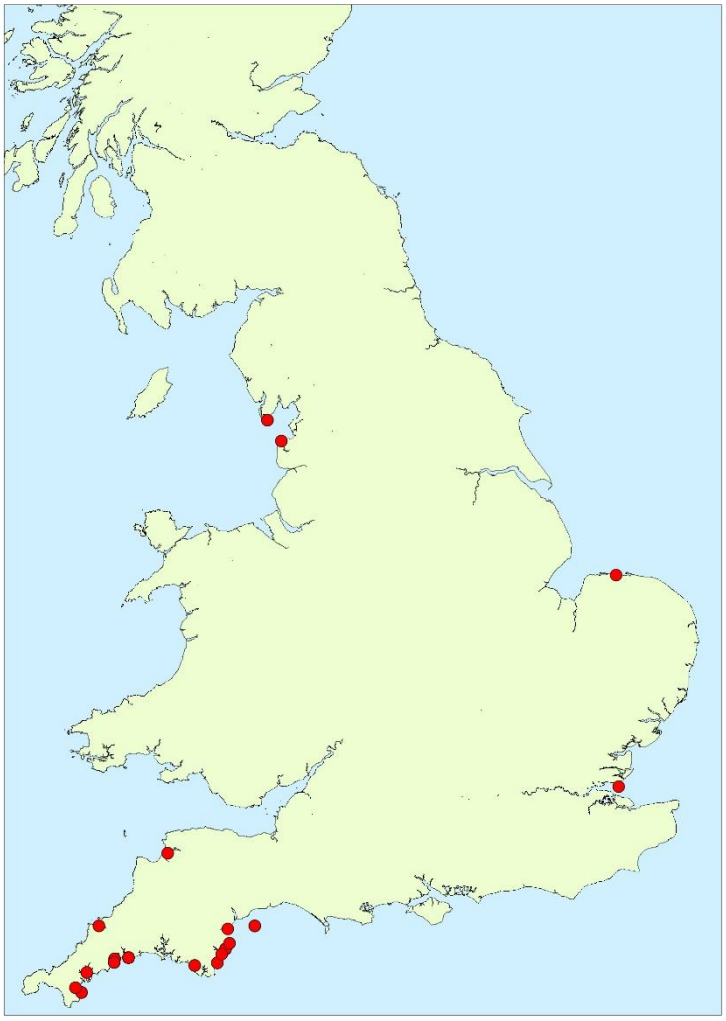

Figure 9: Location of classified production and relaying areas where *Dinophysiaceae* were detected above the trigger level in 2022.

Prorocentrum lima were detected in 7 samples from 3 production areas between February and July 2022. Most samples (6 out of 7) had been collected between April and July.

The trigger level (set at 100 cells/L) was exceeded by 4 of these samples, all from the Burry Inlet production area (see Figure 10).

The highest cell density was 4,360 cells/L in a sample collected from Burry Inlet: Machynys on 26 April 2022. These are much lower breach values compared to 2021 (18,520 cells/L) but not as low as 2020 (200 cells/L). *Prorocentrum lima* is considered an epi-benthic species, and it is likely that its detection in the water column is associated with sediment disturbance.

Figure 10: Location of classified production and relaying areas where *Prorocentrum lima* were detected above the trigger level in 2022.

Other species monitored through the Official Control programme that do not have trigger levels:

- *Prorocentrum cordatum* were recorded in 48 samples from 26 production areas. This is a 25% decrease on last year's occurrences. The peak concentration was recorded at 700 cells/L, in a sample collected from The Fleet: Fleet Oysters on 24 May 2022.
- *Lingulodinium polyedrum* was recorded in 2 samples from 2 production areas in 2022. Levels recorded did not exceed 400 cells/L. *Protoceratium reticulatum* were recorded in only 1 sample in 2022 (40 cells/L). Both are typically recorded at low frequencies and densities in samples from English and Welsh shellfish production areas.

Centre for Environment Fisheries & Aquaculture Science

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

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

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