

History of the biotoxin monitoring programme in England and Wales:

Regular monitoring of shellfish flesh for algal biotoxins has taken place in England since 1968, following an incident when 78 people became ill with Paralytic Shellfish Poisoning (PSP) after consuming mussels originating from the north east coast. This instigated a programme of sampling covering shellfish beds in the NE for PSP. In 1991 the Shellfish Hygiene Directive 91/492/EEC was put into force. This legislation requires EU member states to monitor for the possible presence of toxin producing plankton in production and relaying areas, and biotoxins in live bivalve molluscs. It was therefore necessary to review the current monitoring programme to include testing for Diarrhetic Shellfish Poisoning (DSP) and instigate a water monitoring programme. However the programme was still restricted to the NE coast.

During 1995 a visible bloom of *Alexandrium* spp. was observed in Milford Haven and the Fal Estuary. Shellfish from these areas were found to contain PSP in excess of the action level. In response to this a new 4 year rolling programme of sampling was introduced in 1996. The shellfish production areas selected (shown in Figure 1) were divided between the flesh and water monitoring so that the whole of the country would be covered by one or other of the programmes within 2 years, and after 4 years every site would have been covered by both. In 1999 monitoring for Amnesic shellfish poisoning (ASP) was included in this rolling programme as a result of an amendment to Directive EC 97/611/EC which required monitoring for this biotoxin.

After a large scale DSP incident in the Solent in 2000 it was realised that a zoned approach separating shellfish beds would allow easier control of spatially large shellfish production areas. Two locations were deemed suitable for zoning in addition to the Solent, these were the Thames and West Mersea. In 2002 following the incidence of atypical DSP positives, the Wash and the Burry Inlet were also zoned (Figure 1).

The rolling programmes continued until 2000. After which the number of shellfish production areas monitored for the flesh programme was increased so that by 2001 all active shellfish production areas were being monitored. This revised programme resulted in a five-fold increase in the coverage.

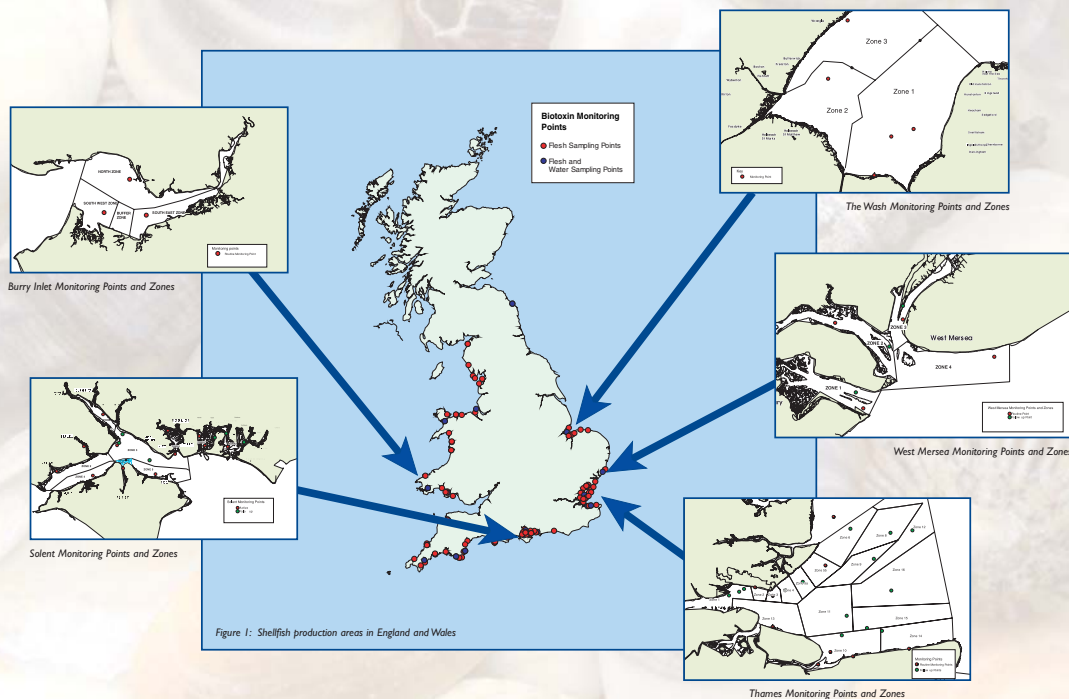


Figure 1: Shellfish production areas in England and Wales

Incidence of Toxicity in Shellfish in England and Wales.

PSP has been prevalent along large parts of the NE coast since monitoring began in 1968, and has been sporadically identified in shellfish from other coastal areas. The highest prevalence outside the northeast has been in the southwest at Fowey and Falmouth, and on the Welsh coast at Milford Haven and the Menai Straits.

DSP is again prevalent on the northeast coast and has been found in most harvesting areas on the south coast. During 2000 DSP within the Thames and Solent resulted in the widespread closure of shellfisheries within these areas. The loss of revenue experienced in these significant harvesting areas resulted in the introduction of zoning at these sites in order to mitigate such losses in the event of future toxic events. In 2001 and 2002 widespread closures as a result of an atypical DSP have been in place for many months at three commercial areas, the Wash, the Thames Estuary and the Burry Inlet.

ASP toxicity has occurred along the south and southeast coast inshore shellfisheries, and in offshore scallop sites off southwest England and in the Irish sea.

Summary of the current monitoring programme:

The current flesh monitoring programme includes all areas in England and Wales where commercial harvesting takes place. Samples are collected on a monthly basis except in areas with a historic occurrence of algal biotoxins or toxic algae. In these areas samples are collected fortnightly during weeks 14 - 39 (April 1 to September 28). The analysis of samples for PSP toxins is carried out by the method described by AOAC 1990. The analysis for DSP toxins is by a modified method described by Yasumoto *et al.* (1984). The HPLC analysis of ASP toxins is carried out by the method described by Quilliam *et al.* (1995). The water monitoring continues as a rolling programme where monthly samples are collected from 20 sites selected each year (including those sites with a history of toxic algae).

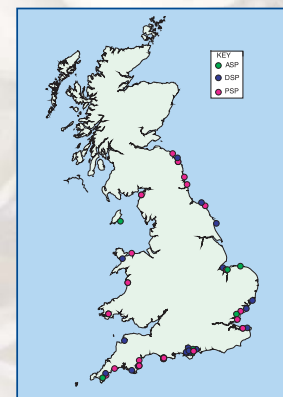


Figure 2 Occurrences of algal biotoxins in shellfish in England and Wales

Enforcement:

The Food Standards Agency (FSA) has overall responsibility for ensuring that the monitoring programme is effectively carried out, and the CEFAS Weymouth Laboratory is responsible for identifying the sampling areas and co-ordinating the programme. The regional Food Authorities are responsible for collecting the water and shellfish samples from the designated sites, which are then sent to the CEFAS Lowestoft laboratory for water analysis and the CEFAS Weymouth laboratory for flesh analysis. On detection of algal cell concentrations in excess of the MPL (Table 1) shellfish samples are collected from the affected area for biotoxin flesh testing. On the detection of algal biotoxins at levels exceeding the maximum permitted levels (MPL) the affected sites are tested on a weekly basis until two consecutive clear tests (negatives for DSP or below the MPL for PSP and ASP) are obtained. Where biotoxin action limits are exceeded, the FSA determines the necessary course of action, and the appropriate Local Authority carries out this action.

Advice regarding any enforcement action necessary in the event detection of biotoxins in shellfish is co-ordinated by the Local Authority Enforcement Support Division (LAESD). In general, protection of potential casual gatherers is undertaken by placing warning notices on the shore in the area of the biotoxin occurrence. Control of commercial harvesting is best approached by seeking the co-operation of the industry. The preferred course of action is to seek a Voluntary Closure Agreement (VCA) and this can often be obtained with shellfish farmers who usually have exclusive rights to cultivate shellfish in certain areas. Where this cannot be achieved, for example in public beaches, then the Food Authority can place a temporary prohibition order (TPO) under the Food Fishery Products and Live Shellfish (Hygiene) Regulations 1998, or the Minister can make an order under the Food and Environmental Protection Act 1985. The latter action is the most stringent measure. However, it enables a wider range of controls to be applied, in particular it enables controls to be placed on species which would not be covered by a TPO and also covers non-commercial gathering. It may be the case that explicit action, other than perhaps the posting of warning notices, will not be required if the area is not subject to commercial harvesting at the time.

Table 1: Maximum Permitted Levels for the Biotoxin Monitoring Programme

Water	Algal Group	Maximum Permitted Level (cells/l)
	<i>Alexandrium</i> spp.	Presence
	<i>Dinophysis/Prorocentrum</i> spp.	100
	<i>Pseudo-nitzschia</i> spp.	150,000
Shellfish Flesh	Toxin	Maximum Permitted Level
	PSP	80µg per 100g
	DSP	Presence
	ASP	20µg per g

References:

- AOAC (1990) Paralytic Shellfish Poison. Biological method. Final action. In: Helrich, K. (eds), *Official Methods of Analysis*. 15th Edition, pp. 881-882, see 959. (B). Association of Official Analytical Chemists, Arlington, Virginia, USA.
- Quilliam, M. A., Xie, H. and Harcourt, W. R. (1995). Rapid extraction and clean-up for liquid chromatography determination of domoic acid in unshelled scallop. *J. AOAC International* 78, (2), 343-354. (on file ASP30)
- Yasumoto, T., Murata, M., Ohshima, Y., Matsunoto, K., & Clardy, J. (1984). Diarrhetic Shellfish Poisoning. In: Rigler, F. P. (ed.), *Seafood Toxins, ACS Symposium Series*, 362, pp. 307-314. American Chemical Society, Washington, D. C.