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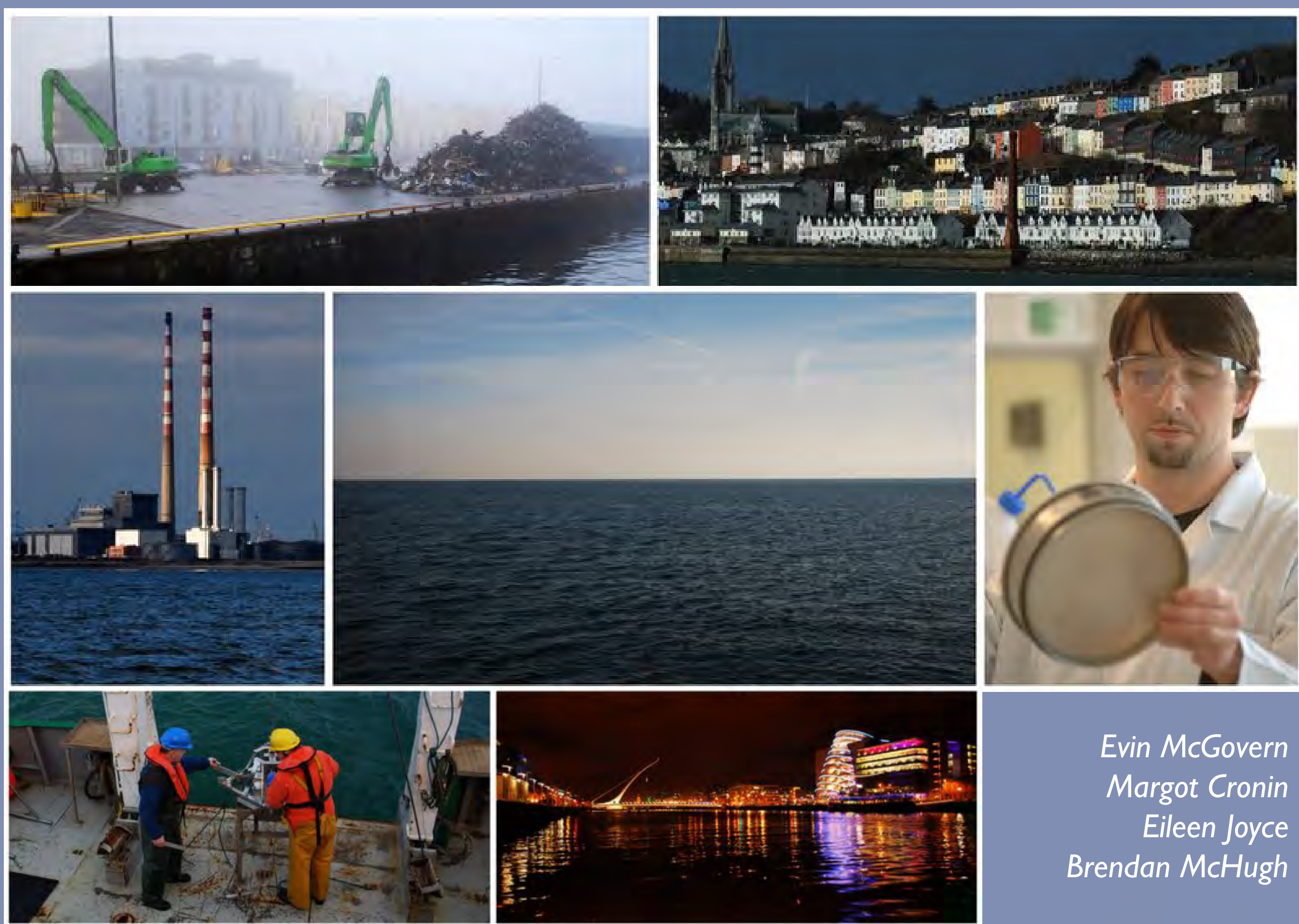
AN ASSESSMENT OF DANGEROUS SUBSTANCES IN WATER FRAMEWORK DIRECTIVE TRANSITIONAL AND COASTAL WATERS 2007-2009



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An Assessment of Dangerous Substances in Water Framework Directive Transitional and Coastal Waters: 2007 - 2009

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Summary

The Water Framework Directive (Directive 2000/60/EC WFD) requires *good ecological and chemical status* to be achieved for all surface water bodies by 2015 and also that *no deterioration* of water body status takes place. The directive requires monitoring of transitional and coastal waters (TCW) to be implemented from 2007 and a classification of the chemical and ecological status of water bodies by 2010, based on the output of the first cycle of monitoring (2007 – 2009). This assessment of hazardous substances (i.e. priority substances and other relevant pollutants) in TCW was prepared by the Marine Institute, on request of the EPA, to contribute to the classification. Data used were collected as part of other related programmes as a dedicated WFD monitoring programme for hazardous substances in Transitional and Coastal Waters (TCW) was not in place for this period. The output of the assessment is presented in this report.

The assessment involved compilation of available datasets relating to concentrations of dangerous substances in various matrices and their effects in the marine environment. A WFD daughter directive (Dir 2008/105/EC) established Environmental Quality Standards (EQS) for many hazardous substances, primarily in water. For data where EQS were not appropriate for comparison, for example where data related to substance-matrix combinations for which there are no EQS, other assessment criteria were identified that could be used as an equivalent to a good-moderate boundary. These included national standards, OSPAR Environmental Assessment Criteria (EACs) and US Effects Level concentrations for sediment. Trend assessments are also reported for selected shellfish and sediment data. A final step included a statement of confidence in the assessment element.

The bulk of the data used were generated under specific monitoring programmes and research activities of the Marine Institute. These monitoring programmes were not originally designed to meet the requirements of the WFD, for which a larger list of target substances are relevant but in total, 1770 seawater, 9338 shellfish and 568 sediment individual contaminant concentration measurements were used for the assessment. These included data from MI shellfish waters monitoring, OSPAR Coordinated Environmental Monitoring Programme, MI research activities as well as certain non-MI data. There are limited water concentration data available in Ireland for hazardous substances in the marine and coastal environment as concentrations in shellfish flesh are preferred as a water quality indicator.

Detection of anthropogenic dangerous substances in the environment is a ubiquitous phenomenon. While such contamination tends to be most prevalent closest to the primary sources (e.g. industry, urban, intensive agriculture) remote areas are also subject to pollution, for example by long-range atmospheric transport of airborne substances. The quality of Irish transitional and coastal waters is generally good. Aggregating the assessments as conservative worst-case scenarios across parameters indicates that few areas are flagged with a *less-than-good* (red) status with other than low confidence assigned. The primary areas of concern tend to be estuaries and bays subject to major urban influence. In some cases, for example for certain metals in seawater, exceedances of assessment criteria may relate to variability associated with natural background concentrations or may be associated with methodological issues. The parameter most frequently exceeding an assessment criterion is CB118 in biota. CB118 is one specific congener that occurs within complex Polychlorinated biphenyl (PCB) mixtures. This particular congener exceeded the OSPAR EAC for mussels/oysters at least once

at a number of locations. Given the very low EAC, these exceedances may reflect residual environmental pollution associated with diffuse historical sources and atmospheric inputs as well as environmental variability and may not be due to local or recent inputs of PCBs. PCBs have been phased out since the 1980s and the EPA has published a management plan to recover and dispose of historical stockpiles.

Only 41 of 256 temporal trend assessments were shown to be significant with 36 of these indicating significant downward trends showing an overall improving picture. 26 of these were for organochlorine substances such as PCBs. Although there are limited recent data, there is evidence of an improvement with respect to TBT-related imposex effects in dogwhelks and concerns are limited to areas around major fishing/shipping ports. Overall, it is clear that the quality of Irish transitional and coastal waters is good with respect to the substances assessed.

1. Introduction

The Water Framework Directive (Directive 2000/60/EC WFD) requires *good status* to be achieved for all surface water bodies by 2015 and also that *no deterioration* of water body status takes place[1]. The directive requires monitoring of coastal and transitional waters to be implemented from 2007 and a classification of the chemical[2] and ecological status of water bodies by 2010, based on the output of the first cycle of monitoring (2007 – 2009). This assessment of hazardous substances (i.e. priority substances and other relevant pollutants) in TCW was prepared by the Marine Institute, on request of the EPA, to contribute to the classification. Data used were collected as part of other related programmes as a dedicated WFD monitoring programme for hazardous substances in Transitional and Coastal Waters (TCW) was not in place for this period. The output of the assessment is presented in this report.

Trend assessment of concentrations in biota and sediment (OSPAR methodology) has been identified as an appropriate tool for assessing compliance against the *no deterioration* objective[3]. Therefore this assessment includes a review of temporal trends assessments for WFD transitional and coastal water bodies carried out within the framework of the OSPAR Coordinated Environmental Monitoring Programme.

2. Methodology

2.1 Overall Approach:

The approach involved, the:

- Review, selection and collation of MI datasets and external data.
- Review and collation of appropriate tools and in particular assessment criteria for classification at the good-moderate boundary.
- Assessment process, consisting of:
  i. Data extraction, binning according to water body, and normalisation where appropriate.
  ii. Classification according to *good status* and *less than good status* for parameter matrix combinations, according to WFD water bodies.
  iii. An assessment of the confidence of this assessment.
  iv. An assessment of *temporal trends* for various parameters.
  v. An expert commentary on the above and considering *inter alia* data available for substances where assessment criteria could not be identified and other information, (such as biological effects data), that sheds light on the pollution status of water bodies.

2.2 Data sources:

The bulk of the data used for this assessment are data generated under specific monitoring programmes and research activities by the Marine Institute. These monitoring programmes were not specifically designed to meet the requirements of the WFD, for which a larger list of target substances are relevant. In total, 1770 seawater, 9338 shellfish and 568 sediment individual contaminant

1 Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy. Article 3.a.(i).
2 Chemical status relates to compliance with EQS for substances where EQS are set at Community level (Directive 2008/105/EC Annex I). EQS, predominantly for water, are set at Community Level for WFD Annex X substances (i.e. priority Substances as defined in Directive 2008/105/EC Annex II) and other substances pertinent to WFD Annex IX.
3 EC (2009) Common Implementation Strategy for the Water framework Directive (2000/60/EC). Guidance Document No. 19. Guidance on Surface Water Chemical Monitoring under the Water Framework Directive. Technical Report – 2009-025

concentration measurements were used for the assessment. The following datasets[4] were included in the assessment.

2.2.1 Shellfish waters directive (Marine Institute):

Seawater concentrations for trace metals and organohalogen substances in 14 shellfish growing waters listed in SI 268 of 2006. This includes concentrations of 9 trace metals, as well as polychlorinated biphenyls (PCBs) and organochlorine pesticides (OCPs) determined in seawater. Seawater data included were from Winter (Nov/Dec) 2006 to Summer 2008 (4 rounds). MI coordinated the programme and sampling was undertaken by BIM field officers and seawater analysis undertaken by NLS (UK).

As an indicator of water quality of shellfish growing waters, the Marine Institute have routinely monitored trace metals, PCBs and OCPs in shellfish flesh from shellfish waters for many years. In 2008 sampling was expanded from 30+ areas to cover 64 designated areas and the frequency was increased from annually to twice per year. Samples are collected by MI officers or by SFPA officers and analysis of target parameters and co-factors (e.g. moisture and lipid) is carried out at MI laboratories

2.2.2 OSPAR Coordinated Environmental Monitoring Programme (CEMP) (MI).

Monitoring for spatial distribution and temporal trends in shellfish is required under the CEMP. A number of stations, including stations selected as indicative of key pressures (urban, river inputs) and some shellfish growing waters, have been designated as spatial and trend sites. Data are collected for trace metals, PCBs, OCPs and, at certain sites, brominated flame retardants (BFRs), polyaromatic hydrocarbons (PAH) and in some cases polyfluorinated compounds (PFCs). Sediment and biota data are reported to the ICES database and used by OSPAR for convention wide assessments (e.g. temporal trend assessments) and for the development of assessment criteria. As well as providing data to contribute to the compliance assessment, the output of the most recent trend assessment (2008) is included in this report.

2.2.3 Non MI data sources:

Bantry Bay - Whiddy Island. A monitoring programme associated with the Bantry Bay terminal in Whiddy Island has been undertaken since 1996. The work is carried out by consultants (Byrne Ó Cleirigh) on behalf of Conoco Philips and is undertaken in accordance with JAMP protocols. Data for 2007-2009 were supplied by the consultants for inclusion in this assessment.

TBT is a substance of specific concern for the marine environment although following IMO /EC[5] measures over the last decade it is anticipated that environmental concentrations should be reducing. TBT biological effects include imposex and intersex in gastropod molluscs and these contaminant-specific biological effects, being more sensitive than chemical detection methods, can be used to assess water quality. The effects are irreversible so may not indicate current status. Marine Organisms Investigations carried out a survey of biological effects of TBT in TCW in 2005. This included a comparison with the output of previous periodic assessments

4 Where the Marine Institute carries out programmes and testing in house, these are carried out in accordance with best practice for marine monitoring as defined by OSPAR JAMP Guidelines and ICES Techniques in Marine Environmental Science (TIMES). MI is accredited to ISO17025 for many parameters and routinely participates in proficiency testing such as QUASIMEME (Quality Assurance for Marine Environmental Monitoring in Europe). Where testing is subcontracted, MI makes every effort to ensure appropriate experience and quality assurance is in place. Where sampling was carried out by other agencies MI cannot guarantee the quality in place. Where data is collected by other organizations MI made efforts to screen data for quality but cannot guarantee quality of such data.

5 International Maritime Organisation (2001) Convention on Control of Harmful Antifouling Systems Convention & EC Regulation 782/2003.

carried out by Fisheries Research Centre (now MI). These data are considered in the assessment as the most recent TBT biological effects data available for some areas.

2.2.4 MI Research data:

The MI deployed silicone rubber passive samplers (PS) in Dublin Bay and Galway Bay, as part of a Europe wide intercalibration organised by ICES. Passive samplers enable the estimation of time integrated dissolved phase water concentrations for Persistent Organic Pollutants (POPs), which often cannot be measured directly in water as methods are inadequate for detection at relevant environmental concentrations. While PS undoubtedly provide a very effective tool for cost-effective monitoring of water quality, a difficulty with WFD compliance monitoring remains that the EQS are set for total water rather than the dissolved phase and that it is not possible to assess compliance with MAC-QS. Nonetheless, this data clearly provides a good picture of water quality for these parameters (PCBs and PAH) overcoming some limitations of traditional monitoring techniques.

Information generated as part of an MI /EPA funded SeaChange project *Biological effects and Chemical Measurements for the Assessment of Pollution in Irish Marine Waters* were used where relevant. This project is a collaboration between TCD, MI, Shannon Aquatic Toxicity Laboratory (SATL) and DIT. This includes recent data on TBT related imposex in Dogwhelks and some additional information on sediment toxicity testing carried out.

Appendix 1 shows a list of parameters and parameter codes for which data is available. Figure 1 shows a map of MI sampling points used in assessment.

Box 1. Monitoring tools for assessing pollution status of marine waters

Analysis of seawater
WFD EQS have been developed for the most part for water as more information is available to develop EQS for water and it provides a measurement of current status. EQS are set for metals in dissolved waters and for other substances for total waters. For many substances of concern for the marine environment, i.e. POPs, water monitoring presents difficulties as, analytical challenges can arise due to salt interference, from contamination or due to the difficulty of detecting many low solubility substances at environmentally relevant concentrations, the variability can be spatially and/or temporally high in tidal waters necessitating high frequency sampling which can be prohibitive in sample acquisition and analytical costs.

Application of "biomonitor" species
Current temporal and spatial contaminant monitoring programmes completed by the Marine Institute primarily focus on the use of biomonitor species, such as bivalve molluscs, to act as a proxy indicator of contaminant levels within the water column. This is because in general, any contaminants accumulated by a biomonitor organism represent the bioavailable fraction present in the sampled medium and many of the pollutants may be highly concentrated in the tissues of such organisms. Such tools are widely used and in line with the OSPAR guidelines.

Analysis of Sediments
The ultimate fate of POPs in an aquatic environment is linked to sediments. It is generally accepted that the world's oceans are the final recipients and the ultimate sink for many contaminants. Hence the analysis of sediments can give a valuable insight into the presence of persistent pollutants in aquatic environments. Inland and coastal waters are subject to long term pollution with waste organic matter from human activities. This organic matter can contain a wide variety of anthropogenic pollutants. Once present in the sediment these contaminants can become a base for transfer of chemicals to benthic biota through ingestion or absorption from sediment particles and the water column. Anthropogenic pollutants deposited in this manner can then biomagnify from benthic species through out the food web. Sediment monitoring must account for critical co-factors that are strongly associated with contaminant concentrations such as grain size and organic carbon.

New tools for monitoring
In the absence of reliable instruments for semi-continuous *in situ* measurement of relevant target contaminants in water, ***passive samplers*** provide a new approach to monitoring that allows estimation of 'time-integrated' dissolved water concentrations at levels generally well below those that can be achieved using spot sampling techniques. The EC CMA[6] recognised passive sampling as a promising complementary technique. ICES and OSPAR are also developing tools for ***integrated chemical and biological effects monitoring*** to facilitate more robust assessments of marine pollution status. Such "integrated" toolsets involving both chemical monitoring of various matrices and biological effects monitoring are regarded as the way forward for monitoring pollution status of the marine environment.[7] Imposex and intersex in gastropod molluscs are examples of very specific biological effects related to TBT contamination. Some information on sediment toxicity assessments are also presented in section 3.4.2. MI are currently active in both of these areas of research.

6 EC (2009) Common Implementation Strategy for the Water framework Directive (2000/60/EC). Guidance Document No. 19. Guidance on Surface Water Chemical Monitoring under the Water Framework Directive. Technical Report – 2009-025
7 Law, R., Hanke, G., Angelidis, M., Batty, J., Bignert, A., Dachs, J., Davies, I., Denga, Y., Duffek, A., Herut, B., Hylland, K., Lepom, P., Leonards, P., Mehtonen, J., Piha, H., Roose, P., Tronczynski, J., Velikova, V., Vethaak, D. (2010) MARINE STRATEGY FRAMEWORK DIRECTIVE Task Group 8 Report Contaminants and pollution effects. Prepared under the Administrative Arrangement between JRC and DG ENV (no 31210 – 2009/2010), the Memorandum of Understanding between the European Commission and ICES managed by DG MARE, and JRC's own Institutional funding. http://www.ices.dk/projects/MSFD/TG8%20Report_Final_vII.pdf

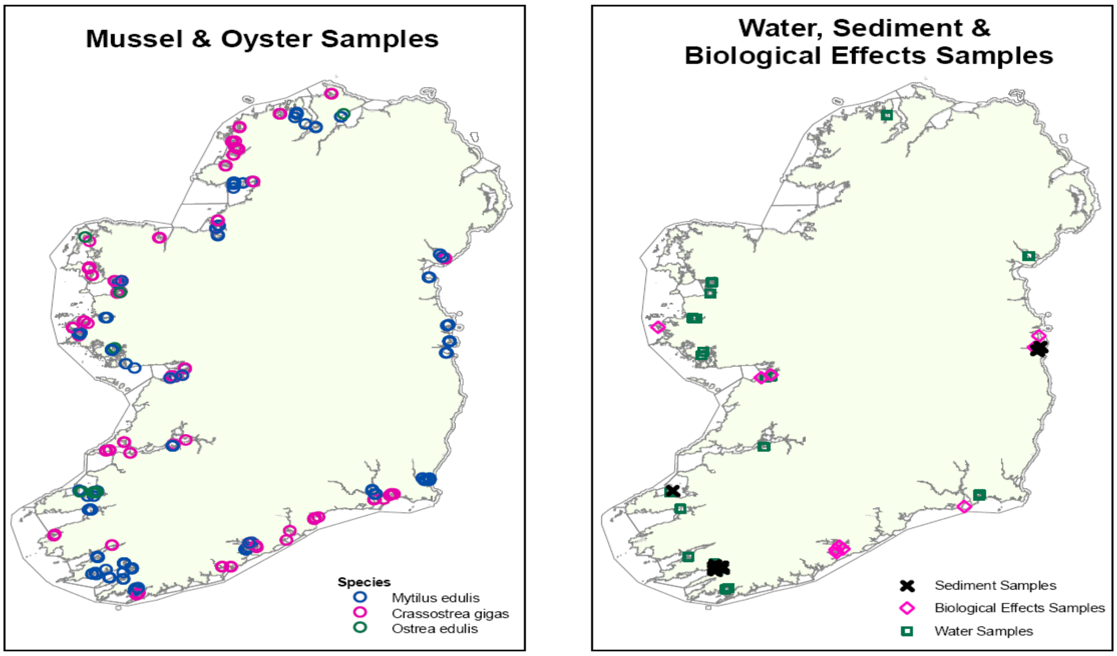

Figure 1: MI sampling points for biota water and sediment data included in the assessment 2007 (Winter 2006 water) – 2009.

2.3 Procedure used for assessment

Data were collated and binned according to relevant WFD Water Body. A 1km buffer zone was applied to capture data points where coordinates lay just outside WFD polygons (e.g. some shoreline shellfish samples). The buffer zone was not applied to contiguous water body boundaries.

2.3.1 Classification Procedure

The assessment process involved assessing aggregated data against relevant available assessment criteria to assign likely good: less than good status, (green/red). In some instances, although criteria were identified there were concerns as to their comparability with the data (exceedances of such a criteria is denoted as orange). The output was also flagged as low confidence, if minimum thresholds indicating sufficient thresholds were not met. The simple output is outlined in Figure 2.

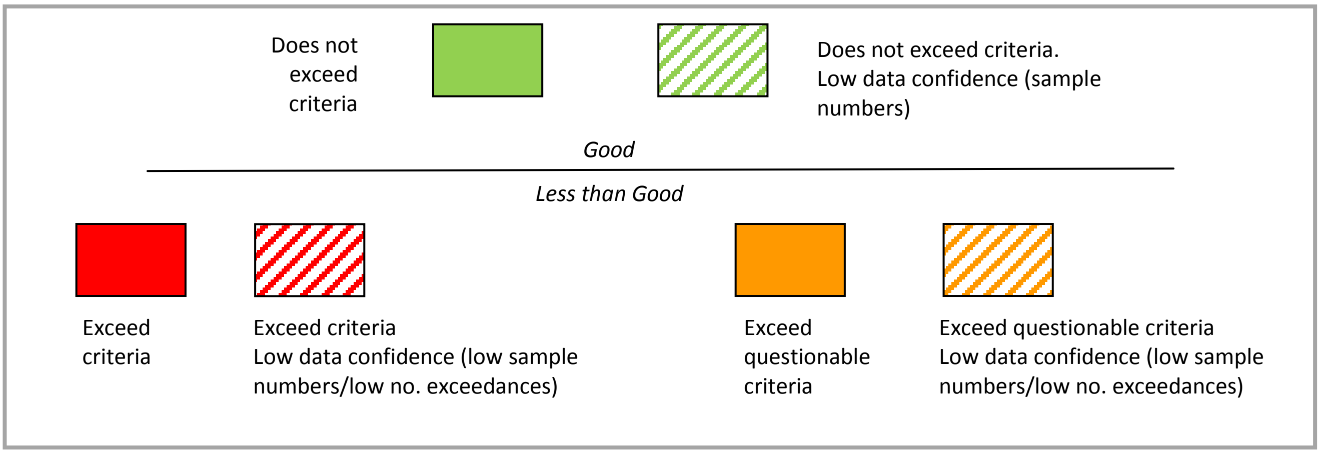

Figure 2: Simple schematic of classification output to define *good: less than good status.*

2.3.1.1 Assessment Criteria:

Selection of appropriate assessment criteria to best represent the *good: less than good* WFD classification boundary is key to the classification process. The Marine Institute considered available assessment criteria and selected the most appropriate criteria for contaminant concentrations in water, biota and sediment to support classification into *good:less than good* status (presented as green/red). These were selected to conform, in so far as possible, to the principles of the WFD and related legislation and guidance. However, the limitations associated with these assessment tools should be understood, such as:

- criteria may not take into account natural variability and local/regional conditions;
- criteria may be applied in a different context than originally intended and there is often limited guidance on how criteria should be use;
- differences in matrix, parameter, analysis method between criteria and monitoring data may affect comparability.

The selection hierarchy (Figure 3) gave precedence to EC EQS as stipulated in Directive 2008/105/EC and EQS for relevant pollutants as set out in SI 272 of 2009. Where these were not available, OSPAR Environmental Assessment Criteria (EACs) or other national standards or proposed standards/guideline values were utilised. While OSPAR has attempted to derive EACs for biota and sediment in accordance with WFD Annex V methodology, in many instances the EACs derived were impractical in that they were well below estimated natural 'background' concentrations. For this reason OSPAR had to identify alternatives to EAC for assessing CEMP data for inclusion in the Quality Status Report 2010[8]. The Assessment criteria for water, biota and sediment used for this assessment are listed in Annex A and associated issues further elaborated. These criteria were either used to assess compliance of mean or maximum concentrations. Mean or maximum concentrations that exceed the appropriate assessment criteria result in red classification indicating less than good determination for that parameter/matrix combination for the water body while those that comply are given a green classification (good).

MI has endeavoured to use the most appropriate/fit for purpose assessment criteria for this assessment. Where there are particular issues with the best available criteria, exceedances are designated with an orange colour. This is the case for chromium (Cr) where a water standard for Cr (VI) is used but measurements are for total chromium. This is also the case for metals, PAH and TBT in sediments where level 1 guideline values for assessing dredge sediments (Cronin *et al*, 2006)[9] are used. These are based on background concentrations (where such data was available) or US ERL (effects range low) concentrations. There are recognised limitations in using ERLs. In some instances these may be exceeded due to underlying local geology and/or natural variability. **Note: An orange classification does NOT represent a continuum between red and green but is an alternative classification for red when there are particular concerns about the robustness of the assessment criteria.**

8 OSPAR (2009) Background Document on CEMP Assessment Criteria for the QSR2010. Monitoring and Assessment Series. OSPAR Commission, London
9 Cronin, M., McGovern, E., McMahon, T., Boelens, R. (2006) "Guidelines for the Assessment of Dredged Material", Marine Environment and Health Series Report, No. 24. Marine Institute, Galway. http://www.marine.ie/NR/rdonlyres/A90B2D44-594E-4BDF-A58A-682F997C921A/0/Assessmentofdredgematerial2006.pdf

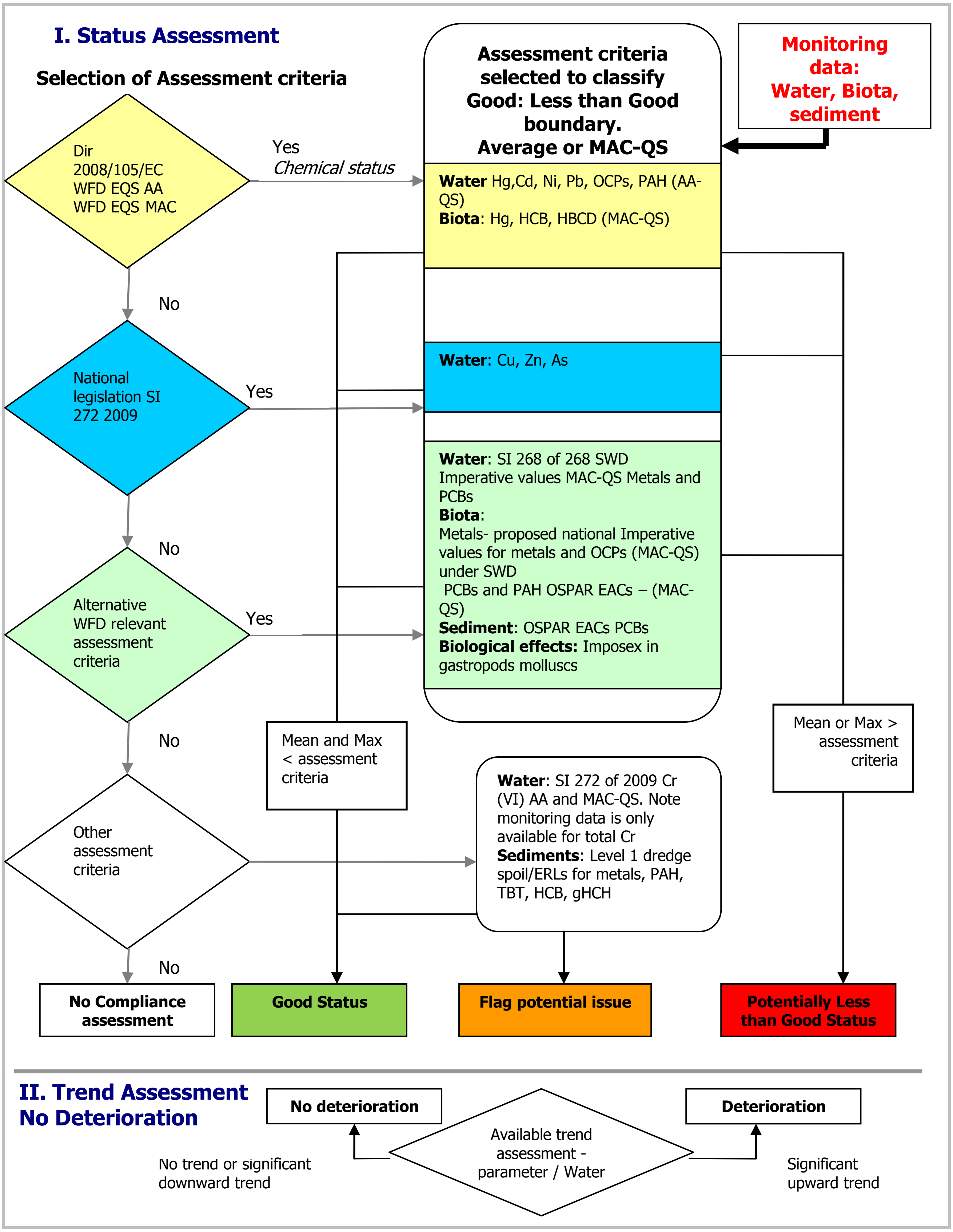

Figure 3: Schematic of assessment process for I. Status assessment including hierarchy for selection of assessment criteria and II. Trend assessment to assess no deterioration objective. Note this does not include the process for estimation of confidence in the assessment (section 2.3.5).

2.3.1.2 Treatment of limits of quantification (LoQs):

Data that were less than the LoQ were treated in accordance with the requirements of Directive 2009/90/EC with 0.5x LoQ used to calculate averages and zero used in calculating sums (e.g. sum of ICES 7 PCBs). Where the LoQ > 0.3 EQS/Assessment criteria the analytical method was flagged as inadequate.

2.3.1.3 Confidence in assessment and risks of misclassification

A risk of mis-classification of a water body (false good or false less than good status) can arise due to inadequate available analytical methodology, contamination during sampling (especially for seawater), natural variation of the population (especially for MAC-QS where the upper end of the distribution is being assessed), spatial/geological variability in background concentrations, and insufficient sampling/data. Given that data were not explicitly collected for WFD it is considered essential to provide some assessment of the confidence in the assessment output. Consequently for each parameter/water body the simple criteria stated in Table 1 were used to indicate low confidence in results. These simple criteria were applied regardless of the size of the water body and do not infer that samples are sufficient for, or representative of, the water body. Assessment outputs that don't meet the criteria below are colour coded with a striped pattern to indicate low confidence due to insufficient data.

Table 1: Criteria for which a parameter/matrix assessment output will be designated low confidence if not met over the course of the data assessment period.

Adequacy of analytical method	**LoQ≤ 0.3 x EQS**
Minimum number of samples required:	
Water*	≥8
Biota	≥3
Sediment	≥3
Exceedance of MAC-QS occurs	≥2 times

*Sediment and biota provide time integrated data. A higher number of water samples are stipulated given the transitory nature of tidal waters. However as the maximum number of samples collected in any water body during this time period was 5, the seawater assessment is considered to be of low confidence for all water bodies.

2.3.1.4 Aggregation across matrices

A summary assessment was carried out on a 'worst-case' scenario for each water body. In aggregating assessments substances were split into WFD Annex X[10] and Annex VIII[11] substances. Overall status per water body was attributed based on the worst case scenario as follows:

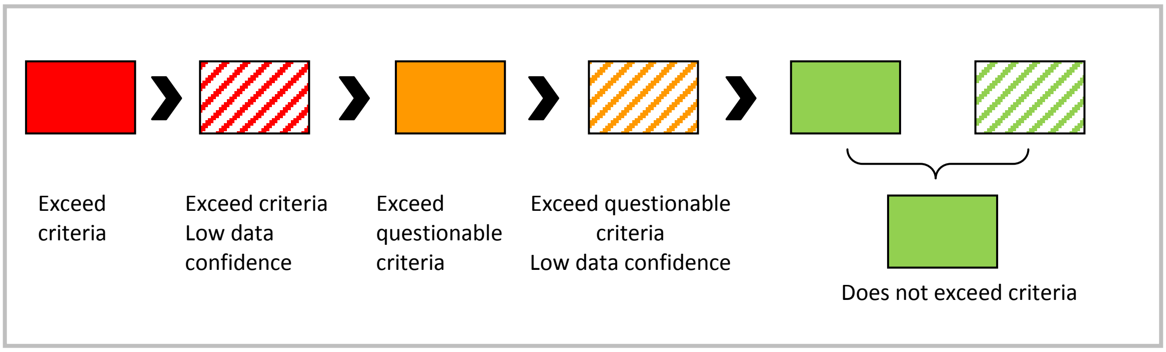

Figure 4: Aggregation priority for summary classification of water bodies.

2.3.2 Assessment of temporal trends

OSPAR temporal trend programmes are continuous programmes designed to detect long-term trends in concentrations or effects of substances in the maritime area with time series data assessed for linear and non-linear trends over selected time intervals using agreed methodologies. This summarises assessments carried out on Irish data at OSPAR MON 2008 for the purposes of QSR 2010. The focus of trends related to changes in contaminant concentration in the previous ten year period (1998-2007).

Concentrations of contaminants in biota (mussels, oysters and sediment) were compiled on a dry weight basis while metals and organic compounds in sediment were normalised to 5% aluminium concentrations and 2.5% organic carbon respectively. Performance in internal and external QC exercises are used to support data confidence and significance levels for assessments and the power of the data series at each station to detect changes in concentration was established. For each time series, the normalised concentrations and their uncertainties were used to construct annual contaminant indices, which were then assessed for trends. Reported data were normalised to an appropriate basis and to a relevant co-factor.

Median log-concentrations in the last year of monitoring were assessed for trends as follows:

- 7 or more years of data: a smoother was fitted to the median log-concentrations
- 5-6 years of data: a linear trend was fitted
- 3-4 years: a mean is fitted

1-2 years: the maximum value was used for graphical purposes only (no statistical tests completed)

10 Annex X substances specified in Directive 2008/105/EC Annex II
11 All other substances assessed

3. Assessment

3.1 Classification status:

Summary statistics for hazardous substance data in various matrices for all TCW water bodies are presented in Annex B.

Where assessment criteria were available classification was carried out according to the methodology set out in Chapter 2. Table 2 presents the output of this classification by parameter/matrix per water body. Table 2 also indicates trend status as determined by the most recent OSPAR assessment where sufficient data were available to assess trends. In total, data were available for 71 TCW water bodies (45 CW and 26 TW). In all 1770 individual seawater, 6539 individual biota and 484 individual sediment contaminant concentration measurements were used for the classification process.

3.2 Temporal trend assessments

Trend station data (≥5 years) were available for 25 water bodies. In total there were 256 trend assessments carried out of which 206 were in shellfish. Of these a total of 41 significant trends were detected with only 5 reported in an upward direction (Cd, Zn and Cu for Dublin Bay, Pb for Inner Tralee Bay and Cu in Bannow Bay, although the latter in particular is questionable and heavily influenced by the final year value). The vast majority of trend assessments for metals showed no significant trends. Where significant trends were detected for POPs they were invariably downward with 26 downward trends determined for OCPs and PCB congeners and 5 for individual PAHs.

Appendix 2 presents geographically-based time series concentrations for OSPAR priority substances with fitted smoothers and confidence limits. Table 2 summarises locations where statistically relevant trends were detected with trends indicated by an upwards or downwards arrow. Where sufficient data were available and no significant trend was detected this is indicated in table 2 by <->. No trend assessment was completed where fewer than 5 values above the limit of quantification were available for individual time series.

Table 2 (below): Summary Classification assessment for each parameter/matrix and temporal trends per water body.

(NOTE: TABLE 2 IS BEST VIEWED BY FOLLOWING THIS LINK http://oar.marine.ie/bitstream/10793/635/15/MEHS38Table2.pdf)

Group	Parameter	Matrix	Sub-matrix	Confidence in Parameter (mean LOQ %age of Criteria)	% <LOQ	Adrigole Harbour	Aran Islands, Galway Bay Connemara (HAs 29;31)	Aughinish Bay	Ballynakill Bay	Ballysadare Estuary	Ballyvaghan Bay	Bannow Bay	Barrow Suir Nore Estuary	Berehaven	Blacksod Bay	Blacksod Bay SW / Achill Sound	Carlingford Lough	Casla Bay	Clifden Bay	Cork Harbour	Cromane	Donegal Bay (Erne)	Dublin Bay *	Dunbulcaun Bay	Dungarvan Harbour	Dungloe Bay	Dunmanus Bay	Glengarriff Harbour	Gweebarra Estuary	Gweedore Estuary	Ilen Estuary	Inner Bantry Bay	Inner Clew Bay	Inner Galway Bay North
Metals and Metalloids	Arsenic	Water	PS																															
	Arsenic	Water	AA	Y (5.00)	15%			P (3)				P (3)					P (4)				P (3)							P (3)				P (4)		
	Arsenic	Water	MAC					0 of 3				0 of 3					0 of 4				0 of 3							0 of 3				0 of 4		
	Arsenic	Biota	Mussel	Y (4.91)		0 of 1	0 of 1	0 of 1		0 of 2	0 of 1		0 of 9	0 of 3			0 of 3	0 of 1	0 of 4	0 of 8	0 of 4	0 of 2	0 of 2	0 of 1			0 of 3	0 of 5				0 of 13	0 of 3	
	Arsenic	Biota	Oyster	Y (6.99)				0 of 6	0 of 4		0 of 1	0 of 4	0 of 3		0 of 2	0 of 6	0 of 3			0 of 4		0 of 2		0 of 2	0 of 4	0 of 3			0 of 3	0 of 3	0 of 2		0 of 2	
	Arsenic	Sediment																										2 of 3				6 of 9		
	Arsenic	Trend	Sediment																															
	Arsenic	Trend	Mussel																															
	Arsenic	Trend	Oyster																															
	Cadmium*	Water	PS																															
	Cadmium*	Water	AA	Y (22.2)	73%			P (4)				P (4)					P (4)				P (4)							P (4)				P (4)		
	Cadmium*	Water	MAC					0 of 4				0 of 4					0 of 4				0 of 4							0 of 4				0 of 4		
	Cadmium*	Biota	Mussel	Y (0.60)		0 of 1	0 of 1	0 of 1		0 of 3	0 of 1		0 of 14	0 of 3			0 of 4	0 of 1	0 of 4	0 of 11	0 of 5	0 of 2	0 of 3	0 of 1			0 of 3	0 of 6				0 of 14	0 of 4	
	Cadmium*	Biota	Oyster	Y (0.60)				0 of 7	0 of 4		0 of 1	0 of 5	0 of 3		0 of 2	0 of 6	0 of 5			0 of 4		0 of 2		0 of 3	0 of 5	0 of 3			0 of 3	0 of 3	0 of 2		0 of 3	
	Cadmium*	Sediment																					0 of 5					0 of 3				0 of 9		
	Cadmium*	Trend	Sediment																				↔ 5 / ↔ 5											
	Cadmium*	Trend	Mussel										↔ 15				↔ 7			↔ 10	↔ 9							↔ 9				↔ 10		
	Cadmium*	Trend	Oyster					↔ 9				↔ 9					↔ 9								↔ 10									
	Chromium	Water	PS																															
	Chromium	Water	AA	N (81.5)	69%			P (4)				P (4)					P (4)				P (4)							P (4)				P (4)		
	Chromium	Water	MAC					0 of 4				0 of 4					0 of 4				0 of 4							0 of 4				0 of 4		
	Chromium	Biota	Mussel	Y (3.25)		0 of 1	0 of 1	0 of 1		0 of 3	0 of 1		1 of 14	0 of 3			0 of 4	0 of 1	0 of 4	0 of 11	0 of 5	0 of 2	0 of 3	0 of 1			0 of 3	0 of 6				2 of 14	0 of 4	
	Chromium	Biota	Oyster	Y (3.88)				0 of 7	0 of 4		0 of 1	0 of 5	0 of 3		0 of 2	0 of 6	0 of 5			0 of 4		0 of 2		0 of 3	0 of 5	0 of 3			0 of 3	0 of 3	0 of 2		0 of 3	
	Chromium	Sediment																					4 of 5					1 of 3				0 of 9		
	Chromium	Trend	Sediment																				↔ 5 / ↔ 5											
	Chromium	Trend	Mussel																															
	Chromium	Trend	Oyster																															
	Copper	Water	PS																															
	Copper	Water	AA	Y (1.00)	0%			P (4)				P (4)					P (4)				P (4)							P (4)				P (4)		
	Copper	Water	MAC					0 of 4				0 of 4					0 of 4				0 of 4							0 of 4				0 of 4		
	Copper	Biota	Mussel	Y (2.60)		0 of 1	0 of 1	0 of 1		0 of 3	0 of 1		0 of 14	0 of 3			0 of 4	0 of 1	0 of 4	0 of 11	0 of 5	0 of 2	0 of 3	0 of 1			0 of 3	0 of 6				0 of 14	0 of 4	
	Copper	Biota	Oyster	Y (0.38)				0 of 7	0 of 4		0 of 1	0 of 5	0 of 3		0 of 2	0 of 6	0 of 5			0 of 4		0 of 2		0 of 3	0 of 5	0 of 3			0 of 3	0 of 3	0 of 2		0 of 3	
	Copper	Sediment																					1 of 5					1 of 3				0 of 9		
	Copper	Trend	Sediment																				↓ 5 / ↔ 5											
	Copper	Trend	Mussel										↔ 15				↔ 7			↔ 10	↔ 9							↔ 9				↔ 10		
	Copper	Trend	Oyster					↔ 9				↑ 9					↓ 9								↔ 10									
	Lead*	Water	PS																															
	Lead*	Water	AA	Y (0.42)	4%			P (4)				P (3)					P (4)				F (4)							P (4)				P (4)		
	Lead*	Water	MAC					0 of 4				0 of 3					0 of 4				0 of 4							0 of 4				0 of 4		
	Lead*	Biota	Mussel	Y (3.47)			0 of 1	0 of 1		0 of 3	0 of 1		0 of 14	0 of 2			0 of 3	0 of 1	0 of 4	3 of 11	0 of 5	0 of 2	0 of 3	0 of 1			0 of 2	0 of 5				0 of 13	0 of 4	
	Lead*	Biota	Oyster	Y (4.13)				0 of 6	0 of 3			0 of 4	0 of 2		0 of 2	0 of 5	0 of 5			0 of 4		0 of 2		0 of 2	0 of 5	0 of 2			0 of 2	0 of 2	0 of 1		0 of 3	
	Lead*	Sediment																					1 of 5					0 of 3				0 of 9		
	Lead*	Trend	Sediment																				↔ 5 / ↔ 5											
	Lead*	Trend	Mussel										↔ 10				↔ 6			↔ 10	↔ 8							↔ 7				↔ 9		
	Lead*	Trend	Oyster					↔ 7				↔ 8					↔ 8								↔ 9									
	Mercury*	Water	PS																															
	Mercury*	Water	AA	Y (19)	100%			P (4)				P (4)					P (4)				P (4)							P (4)				P (4)		
	Mercury*	Water	MAC					0 of 4				0 of 4					0 of 4				0 of 4							0 of 4				0 of 4		
	Mercury*	Biota	Mussel	Y (25.0)		0 of 1	0 of 1	0 of 1		0 of 3	0 of 1		0 of 11	0 of 3			0 of 4	0 of 1	0 of 4	0 of 8	0 of 5	0 of 2	0 of 3	0 of 1			0 of 3	0 of 6				0 of 14	0 of 4	
	Mercury*	Biota	Oyster	Y (30.0)				0 of 7	0 of 4		0 of 1	0 of 5	0 of 3		0 of 2	0 of 6	0 of 5			0 of 4		0 of 2		0 of 3	0 of 5	0 of 3			0 of 3	0 of 3	0 of 2		0 of 3	
	Mercury*	Sediment																					0 of 5					0 of 3				0 of 9		
	Mercury*	Trend	Sediment																				↓ 5 /											
	Mercury*	Trend	Mussel																															
	Mercury*	Trend	Oyster					↔ 8																										
	Nickel*	Water	PS																															
	Nickel*	Water	AA	Y (0.29)	0%			P (4)				P (4)					P (4)				P (4)							P (4)				P (4)		
	Nickel*	Water	MAC					0 of 4				0 of 4					0 of 4				0 of 4							0 of 4				0 of 4		
	Nickel*	Biota	Mussel	Y (13.6)		0 of 1	0 of 1	0 of 1		0 of 3	0 of 1		3 of 14	0 of 3			0 of 4	0 of 1	0 of 4	0 of 11	0 of 5	0 of 2	0 of 3	0 of 1			0 of 3	0 of 5				0 of 11	0 of 4	
	Nickel*	Biota	Oyster	Y (16.2)				0 of 7	0 of 4		0 of 1	0 of 5	0 of 3		0 of 2	0 of 6	0 of 5			0 of 4		0 of 2		0 of 3	0 of 5	0 of 3			0 of 3	0 of 3	0 of 2		0 of 3	
	Nickel*	Sediment																					5 of 5					3 of 3				9 of 9		
	Nickel*	Trend	Sediment																				↓ 5 / ↔ 5											
	Nickel*	Trend	Mussel																															
	Nickel*	Trend	Oyster																															
	Silver	Water	PS																															
	Silver	Water	AA	Y	100%			P (4)				P (4)					P (4)				P (4)							P (4)				P (4)		
	Silver	Water	MAC					0 of 4				0 of 4					0 of 4				0 of 4							0 of 4				0 of 4		
	Silver	Biota	Mussel	Y (6.00)		0 of 1	0 of 1	0 of 1		0 of 3	0 of 1		0 of 14	0 of 3			0 of 4	0 of 1	0 of 4	0 of 11	0 of 5	0 of 2	0 of 3	0 of 1			0 of 3	0 of 5				0 of 5	0 of 4	
	Silver	Biota	Oyster	Y (0.32)				0 of 7	0 of 4		0 of 1	0 of 5	0 of 3		0 of 2	0 of 6	0 of 5			0 of 4		0 of 2		0 of 3	0 of 5	0 of 3			0 of 3	0 of 3	0 of 2		0 of 3	
	Silver	Sediment																																
	Silver	Trend	Sediment																															
	Silver	Trend	Mussel																															
	Silver	Trend	Oyster																															
	Zinc	Water	PS																															
	Zinc	Water	AA	Y (1.00)	0%			P (4)				P (4)					P (4)				P (4)							P (4)				P (4)		
	Zinc	Water	MAC					0 of 4				0 of 4					0 of 4				0 of 4							0 of 4				0 of 4		
	Zinc	Biota	Mussel	Y (2.62)		0 of 1	0 of 1	0 of 1		0 of 3	0 of 1		0 of 14	0 of 3			0 of 4	0 of 1	0 of 4	0 of 11	0 of 5	0 of 2	0 of 3	0 of 1			0 of 3	0 of 6				0 of 14	0 of 4	
	Zinc	Biota	Oyster	Y (0.14)				0 of 7	0 of 4		0 of 1	0 of 5	0 of 3		0 of 2	0 of 6	0 of 5			0 of 4		0 of 2		0 of 3	0 of 5	0 of 3			0 of 3	0 of 3	0 of 2		0 of 3	
	Zinc	Sediment																					0 of 5					0 of 3				0 of 9		
	Zinc	Trend	Sediment																				↔ 5 / ↔ 5											
	Zinc	Trend	Mussel										↔ 15				↔ 7			↔ 10	↔ 9							↔ 9				↔ 10		
	Zinc	Trend	Oyster					↔ 9				↔ 9					↔ 9								↔ 10									
Chlorobiphenyls	CB28	Water	PS																															
	CB28	Water	AA																															
	CB28	Water	MAC																															
	CB28	Biota	Mussel	Y (6.56)		0 of 1	0 of 1				0 of 1		0 of 4	0 of 3			0 of 3	0 of 1	0 of 3	3 of 5	0 of 3	0 of 1	0 of 1				0 of 3	0 of 4				0 of 4	0 of 2	0 of 1
	CB28	Biota	Oyster	Y (10.6)				0 of 4	0 of 4		0 of 1	0 of 3	0 of 3		0 of 2	0 of 6	0 of 1			0 of 4		0 of 2		0 of 2	0 of 3	0 of 3			0 of 3	0 of 3	0 of 2			
	CB28	Sediment																					0 of 2											
	CB28	Trend	Sediment																															
	CB28	Trend	Mussel																↔ 11															
	CB28	Trend	Oyster									↔ 5													↔ 7									
	CB52	Water	PS																															
	CB52	Water	AA																															
	CB52	Water	MAC																															
	CB52	Biota	Mussel	Y (9.44)		0 of 1	0 of 1				0 of 1		0 of 4	0 of 3			0 of 3		0 of 1	3 of 5	0 of 1	0 of 1	0 of 1				0 of 2	0 of 3				0 of 4	0 of 2	0 of 1
	CB52	Biota	Oyster	Y (16.1)				0 of 4	0 of 4		0 of 1	0 of 3	0 of 2		0 of 2	0 of 4	0 of 1			0 of 3		0 of 2		0 of 2	0 of 3	0 of 3			0 of 3	0 of 3	0 of 2			
	CB52	Sediment																					0 of 2											
	CB52	Trend	Sediment																															
	CB52	Trend	Mussel										↔ 9							↔ 11												↓ 7		
	CB52	Trend	Oyster									↔ 5					↓ 7								↓ 7									
	CB101	Water	PS																															
	CB101	Water	AA																															
	CB101	Water	MAC																															
	CB101	Biota	Mussel	Y (2.00)		0 of 1	0 of 1				0 of 1		0 of 4	0 of 3			0 of 3	0 of 1	0 of 3	3 of 5	0 of 3	0 of 2	0 of 1				0 of 2	0 of 4				0 of 4	0 of 2	0 of 1
	CB101	Biota	Oyster	Y (6.00)				0 of 3	0 of 4		0 of 1	0 of 2	0 of 2		0 of 2	0 of 5	0 of 1			0 of 3		0 of 2		0 of 2	0 of 2	0 of 3			0 of 3	0 of 3	0 of 2			
	CB101	Sediment																					0 of 2											
	CB101	Trend	Sediment																															
	CB101	Trend	Mussel																↔ 11													↓ 7		
	CB101	Trend	Oyster									↓ 6					↔ 7								↔ 7									
	CB105	Water	PS																															
	CB105	Water	AA																															
	CB105	Water	MAC																															
	CB105	Biota	Mussel																															
	CB105	Biota	Oyster																															
	CB105	Sediment																																
	CB105	Trend	Sediment																															
	CB105	Trend	Mussel										↔ 7							↔ 9			↔ 8											
	CB105	Trend	Oyster																															
	CB118	Water	PS																															
	CB118	Water	AA																															
	CB118	Water	MAC																															
	CB118	Biota	Mussel	Y (8.33)		0 of 1	0 of 1				0 of 1		3 of 4	1 of 3			1 of 3	0 of 1	0 of 3	3 of 5	1 of 2	0 of 2	0 of 1				0 of 2	0 of 4				0 of 4	0 of 2	0 of 1
	CB118	Biota	Oyster	Y (12.5)				0 of 4	0 of 4		0 of 1	0 of 3	3 of 3		0 of 2	0 of 6	0 of 1			4 of 4		0 of 2		0 of 2	1 of 3	0 of 3			0 of 3	0 of 3	0 of 2			
	CB118	Sediment																					0 of 2											
	CB118	Trend	Sediment																				↔ 5 / ↔ 5											
	CB118	Trend	Mussel										↔ 9							↔ 11												↔ 7		
	CB118	Trend	Oyster					↔ 5				↔ 6					↔ 7								↔ 7									
	CB138	Water	PS																															
	CB138	Water	AA																															
	CB138	Water	MAC																															
	CB138	Biota	Mussel	Y (0.89)		0 of 1	0 of 1				0 of 1		0 of 4	0 of 3			0 of 3	0 of 1	0 of 3	2 of 5	0 of 3	0 of 2	0 of 1				0 of 3	0 of 4				0 of 4	0 of 2	
	CB138	Biota	Oyster	Y (0.57)				0 of 4	0 of 4		0 of 1	0 of 3	0 of 3		0 of 2	0 of 6	0 of 1			0 of 4		0 of 2		0 of 2	0 of 3	0 of 3			0 of 3	0 of 3	0 of 2			
	CB138	Sediment																					0 of 2											
	CB138	Trend	Sediment																				↔ 5 /											
	CB138	Trend	Mussel										↔ 9							↔ 11												↔ 7		
	CB138	Trend	Oyster									↔ 5					↔ 6								↔ 7									
	CB153	Water	PS																															
	CB153	Water	AA																															
	CB153	Water	MAC																															
	CB153	Biota	Mussel	Y (0.18)		0 of 1	0 of 1				0 of 1		0 of 4	0 of 3			0 of 3	0 of 1	0 of 3	0 of 5	0 of 3	0 of 2	0 of 1				0 of 3	0 of 4				0 of 4	0 of 2	0 of 1
	CB153	Biota	Oyster	Y (0.14)				0 of 4	0 of 4		0 of 1	0 of 3	0 of 3		0 of 2	0 of 6	0 of 1			0 of 4		0 of 2		0 of 2	0 of 3	0 of 3			0 of 3	0 of 3	0 of 2			
	CB153	Sediment																					0 of 2											
	CB153	Trend	Sediment																				↔ 5 /											
	CB153	Trend	Mussel										↔ 9							↓ 11												↔ 7		
	CB153	Trend	Oyster					↔ 5				↔ 6					↔ 6								↔ 7									
		Water	PS																															

Parameter	Matrix	Sub-matrix	Inner Tralee Bay	Inver Bay	Irish Sea Dublin (HA 09)	Kilkieran Bay	Killala Bay	Killary Harbour	Kilmakilloge Harbour	Kinvarra Bay	Liffey Estuary Lower	Lough Foyle	Loughros Bay	Lower Bandon Estuary	Lower Blackwater M Estuary / Youghal Harbour	Lower Shannon Estuary	Lower Slaney Estuary	Mannin Bay	McSwines Bay	Mouth of the Shannon (HAs 23;27)	Mulroy Bay Broadwater	Newport Bay	North Bull Island	North Channel Great Island	Outer Bantry Bay	Outer Dundalk Bay	Outer Kenmare River	Outer Tralee Bay	Oysterhaven	Roaring Water Bay	Rogerstown Estuary	Sheephaven Bay	Sligo Bay	Sligo Harbour	Swilly Estuary	Trawbreaga Bay	Trawena Bay	Upper Shannon Estuary	Valencia Harbour	Waterford Harbour Outer	Western Atlantic Seaboard (HAs 32;33;34)	Westport Bay	Wexford Harbour	Youghal Bay
Arsenic	Water	PS																																										
Arsenic	Water	AA				P (1)		P (3)	P (4)	P (3)						P (1)					P (3)	P (3)						P (4)		P (3)												P (3)		
Arsenic	Water	MAC				0 of 1		0 of 3	0 of 4	0 of 3						0 of 1					0 of 3	0 of 3						0 of 4		0 of 3												0 of 3		
Arsenic	Biota	Mussel	0 of 1	0 of 1		0 of 3		0 of 2	0 of 4	0 of 1		0 of 1				0 of 6	0 of 4		0 of 4		0 of 4	0 of 2	0 of 7	0 of 4	0 of 8	0 of 2				0 of 4	0 of 2			0 of 4	0 of 2								0 of 2	
Arsenic	Biota	Oyster	0 of 3			0 of 3	0 of 3			0 of 1		0 of 1	0 of 3	0 of 3	0 of 1	0 of 3		0 of 2		0 of 8		0 of 2		0 of 2			0 of 2	0 of 4	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1	0 of 2		0 of 3	0 of 7		0 of 1
Arsenic	Sediment																								6 of 6																			
Arsenic	Trend	Sediment																																										
Arsenic	Trend	Mussel																																										
Arsenic	Trend	Oyster																																										
Cadmium*	Water	PS																																										
Cadmium*	Water	AA				P (2)		P (4)	P (4)	P (3)						P (1)					P (5)	P (4)						P (4)		P (4)												P (4)		
Cadmium*	Water	MAC				0 of 2		0 of 4	0 of 4	0 of 3						0 of 1					0 of 5	0 of 4						0 of 4		0 of 4												0 of 4		
Cadmium*	Biota	Mussel	1 of 2	0 of 1		0 of 3		0 of 3	0 of 5	0 of 1		0 of 2				0 of 9	0 of 4		0 of 5		0 of 5	0 of 2	0 of 10	0 of 5	0 of 8	0 of 3		0 of 3		0 of 5	0 of 3			0 of 5	0 of 3								0 of 3	
Cadmium*	Biota	Oyster	0 of 4			0 of 4	0 of 3			0 of 1		0 of 1	0 of 3	0 of 3	0 of 1	1 of 4		0 of 2		0 of 8		0 of 2		0 of 2			0 of 2	0 of 6	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1	0 of 2		0 of 3	0 of 8		0 of 1
Cadmium*	Sediment																								0 of 6			0 of 2																
Cadmium*	Trend	Sediment																																										
Cadmium*	Trend	Mussel						↔ 9	↔ 11			↔ 9				↔ 7	↓ 9		↔ 8		↔ 9		↑ 11							↔ 9	↔ 5													
Cadmium*	Trend	Oyster	↔ 9			↔ 7										↔ 8								↔ 5				↔ 5														↔ 5		
Chromium	Water	PS																																										
Chromium	Water	AA				F (2)		P (4)	F (4)	P (3)						P (1)					P (5)	F (4)						P (4)		F (4)												P (4)		
Chromium	Water	MAC				0 of 2		0 of 4	0 of 4	0 of 3						0 of 1					0 of 5	0 of 4						0 of 4		0 of 4												0 of 4		
Chromium	Biota	Mussel	0 of 2	0 of 1		0 of 3		0 of 3	0 of 5	0 of 1		0 of 2				0 of 9	0 of 4		0 of 5		0 of 5	0 of 2	0 of 10	0 of 5	0 of 8	0 of 3		0 of 3		0 of 5	0 of 3			0 of 5	0 of 3								0 of 3	
Chromium	Biota	Oyster	0 of 4			0 of 4	0 of 3			0 of 1		0 of 1	0 of 3	0 of 3	0 of 1	0 of 4		0 of 2		0 of 8		0 of 2		0 of 2			0 of 2	0 of 6	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1	0 of 2		0 of 3	0 of 8		0 of 1
Chromium	Sediment																								0 of 6			0 of 2																
Chromium	Trend	Sediment																																										
Chromium	Trend	Mussel																																										
Chromium	Trend	Oyster																																										
Copper	Water	PS																																										
Copper	Water	AA				P (2)		P (4)	P (4)	P (3)						F (1)					P (5)	P (4)						P (4)		P (4)												P (4)		
Copper	Water	MAC				0 of 2		0 of 4	0 of 4	0 of 3						0 of 1					0 of 5	0 of 4						0 of 4		0 of 4												0 of 4		
Copper	Biota	Mussel	0 of 2	0 of 1		0 of 3		0 of 3	0 of 5	0 of 1		0 of 2				0 of 9	0 of 4		0 of 5		0 of 5	0 of 2	0 of 10	0 of 5	0 of 8	0 of 3		0 of 3		0 of 5	0 of 3			0 of 5	0 of 3								0 of 3	
Copper	Biota	Oyster	0 of 4			0 of 4	0 of 3			0 of 1		0 of 1	0 of 3	0 of 3	0 of 1	0 of 4		0 of 2		0 of 8		0 of 2		0 of 2			0 of 2	0 of 6	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1	1 of 2		0 of 3	0 of 8		0 of 1
Copper	Sediment																								0 of 6			0 of 2																
Copper	Trend	Sediment																																										
Copper	Trend	Mussel						↔ 9	↔ 11			↔ 9				↔ 7	↔ 9		↔ 8		↔ 9		↑ 11							↔ 9	↔ 5													
Copper	Trend	Oyster	↔ 9			↔ 7										↔ 8								↔ 5				↔ 5														↔ 5		
Lead*	Water	PS																																										
Lead*	Water	AA				P (1)		P (4)	P (4)	P (3)						P (1)					F (5)	P (4)						P (4)		P (4)												P (4)		
Lead*	Water	MAC				0 of 1		0 of 4	0 of 4	0 of 3						0 of 1					1 of 5	0 of 4						0 of 4		0 of 4												0 of 4		
Lead*	Biota	Mussel	0 of 2	0 of 1		0 of 2		0 of 2	0 of 4	0 of 1		0 of 2				0 of 9	0 of 4		0 of 5		0 of 5	0 of 2	0 of 10	0 of 4	0 of 7	0 of 3		0 of 3		0 of 4	0 of 3			0 of 5	0 of 3								0 of 2	
Lead*	Biota	Oyster	0 of 4			0 of 3	0 of 2			0 of 1		0 of 1	0 of 2	0 of 2		0 of 4		0 of 2		0 of 5		0 of 2		0 of 2			0 of 1	0 of 5	0 of 2	0 of 1		0 of 3	0 of 2			0 of 2	0 of 2	0 of 1	0 of 1		0 of 2	0 of 8		0 of 1
Lead*	Sediment																								0 of 6			0 of 2																
Lead*	Trend	Sediment																																										
Lead*	Trend	Mussel										↔ 8				↔ 7	↔ 8						↔ 11							↔ 8														
Lead*	Trend	Oyster	↑ 8			↔ 5										↔ 7								↔ 5																				
Mercury*	Water	PS																																										
Mercury*	Water	AA				P (2)		P (4)	P (4)	P (3)						P (1)					P (4)	P (4)						P (3)		P (3)												P (4)		
Mercury*	Water	MAC				0 of 2		0 of 4	0 of 4	0 of 3						0 of 1					0 of 4	0 of 4						0 of 3		0 of 3												0 of 4		
Mercury*	Biota	Mussel	0 of 2	0 of 1		0 of 3		0 of 3	0 of 5	0 of 1		0 of 2				0 of 6	0 of 4		0 of 5		0 of 5	0 of 2	0 of 7	0 of 5	0 of 8	0 of 3		0 of 3		0 of 5	0 of 3			0 of 5	0 of 3								0 of 3	
Mercury*	Biota	Oyster	0 of 4			0 of 4	0 of 3			0 of 1		0 of 1	0 of 3	0 of 3	0 of 1	0 of 4		0 of 2		0 of 8		0 of 2		0 of 2			0 of 2	0 of 6	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1	0 of 2		0 of 3	0 of 8		0 of 1
Mercury*	Sediment																								0 of 6			0 of 2																
Mercury*	Trend	Sediment																																										
Mercury*	Trend	Mussel																													↔ 5													
Mercury*	Trend	Oyster				↔ 6																																						
Nickel*	Water	PS																																										
Nickel*	Water	AA				P (1)		P (3)	P (4)	P (3)						P (1)					P (5)	P (3)						P (4)		P (4)												P (4)		
Nickel*	Water	MAC				0 of 1		0 of 3	0 of 4	0 of 3						0 of 1					1 of 5	0 of 3						0 of 4		0 of 4												0 of 4		
Nickel*	Biota	Mussel	0 of 2	0 of 1		0 of 3		0 of 3	0 of 5	0 of 1		0 of 2				0 of 9	0 of 4		0 of 5		0 of 5	0 of 2	0 of 10	0 of 5	0 of 4	0 of 3		1 of 3		0 of 5	0 of 3			0 of 5	0 of 3								0 of 3	
Nickel*	Biota	Oyster	0 of 4			0 of 4	0 of 3			0 of 1		0 of 1	0 of 3	0 of 3	0 of 1	0 of 4		0 of 2		0 of 8		0 of 2		0 of 2			0 of 2	0 of 6	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1	0 of 2		0 of 3	0 of 8		0 of 1
Nickel*	Sediment																								6 of 6			2 of 2																
Nickel*	Trend	Sediment																																										
Nickel*	Trend	Mussel																																										
Nickel*	Trend	Oyster																																										
Silver	Water	PS																																										
Silver	Water	AA				P (2)		P (4)	P (4)	P (3)						P (1)					P (5)	P (4)						P (4)		P (4)												P (4)		
Silver	Water	MAC				0 of 2		0 of 4	0 of 4	0 of 3						0 of 1					0 of 5	0 of 4						0 of 4		0 of 4												0 of 4		
Silver	Biota	Mussel	0 of 2	0 of 1		0 of 3		0 of 3	0 of 5	0 of 1		0 of 2				0 of 9	0 of 4		0 of 5		0 of 5	0 of 2	0 of 10	0 of 5	0 of 2	0 of 3		0 of 3		0 of 5	0 of 3			0 of 5	0 of 3								0 of 3	
Silver	Biota	Oyster	0 of 4			0 of 4	0 of 3			0 of 1		0 of 1	0 of 3	0 of 3	0 of 1	0 of 4		0 of 2		0 of 8		0 of 2		0 of 2			0 of 2	0 of 6	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1	0 of 2		0 of 3	0 of 8		0 of 1
Silver	Sediment																																											
Silver	Trend	Sediment																																										
Silver	Trend	Mussel																																										
Silver	Trend	Oyster																																										
Zinc	Water	PS																																										
Zinc	Water	AA				P (2)		P (4)	P (4)	P (3)						P (1)					P (5)	P (4)						P (4)		P (4)												P (4)		
Zinc	Water	MAC				0 of 2		0 of 4	0 of 4	0 of 3						0 of 1					1 of 5	0 of 4						0 of 4		0 of 4												0 of 4		
Zinc	Biota	Mussel	0 of 2	0 of 1		0 of 3		0 of 3	0 of 5	0 of 1		0 of 2				0 of 9	0 of 4		0 of 5		0 of 5	0 of 2	0 of 10	0 of 5	0 of 8	0 of 3		0 of 3		0 of 5	0 of 3			0 of 5	0 of 3								0 of 3	
Zinc	Biota	Oyster	0 of 4			0 of 4	0 of 3			0 of 1		0 of 1	0 of 3	0 of 3	0 of 1	0 of 4		0 of 2		0 of 8		0 of 2		0 of 2			0 of 2	0 of 6	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1	0 of 2		0 of 3	0 of 8		0 of 1
Zinc	Sediment																								1 of 6			0 of 2																
Zinc	Trend	Sediment																																										
Zinc	Trend	Mussel						↔ 9	↔ 11			↔ 9				↔ 7	↔ 9		↔ 8		↔ 9		↑ 11							↓ 8	↔ 5													
Zinc	Trend	Oyster	↔ 9			↔ 7										↔ 8								↔ 5				↔ 5														↔ 5		
CB28	Water	PS																																										
CB28	Water	AA																																										
CB28	Water	MAC																																										
CB28	Biota	Mussel		0 of 1		0 of 3		0 of 1	0 of 3	0 of 1	0 of 2	0 of 1				0 of 5	0 of 4		0 of 4		0 of 3	0 of 2	0 of 5	0 of 4	0 of 2	0 of 1				0 of 4				0 of 2	0 of 1								0 of 1	
CB28	Biota	Oyster	0 of 2			0 of 3	0 of 3			0 of 1			0 of 3	0 of 3	0 of 1	0 of 2		0 of 2		0 of 7		0 of 2		0 of 2			0 of 2	0 of 3	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1	0 of 2		0 of 3	0 of 3		0 of 1
CB28	Sediment																																											
CB28	Trend	Sediment																																										
CB28	Trend	Mussel															↔ 5																											
CB28	Trend	Oyster																																										
CB52	Water	PS																																										
CB52	Water	AA																																										
CB52	Water	MAC																																										
CB52	Biota	Mussel				0 of 3		0 of 1	0 of 2	0 of 1	0 of 2	0 of 1				0 of 5	0 of 4		0 of 3		0 of 3	0 of 1	0 of 5	0 of 4	0 of 2	0 of 1				0 of 4				0 of 2	0 of 1								0 of 1	
CB52	Biota	Oyster	0 of 1			0 of 3	0 of 3			0 of 1			0 of 3	0 of 2	0 of 1	0 of 2		0 of 2		0 of 7		0 of 2		0 of 2			0 of 1	0 of 3	0 of 2	0 of 1		0 of 2	0 of 3	0 of 1		0 of 1	0 of 3	0 of 1	0 of 2		0 of 3	0 of 2		0 of 1
CB52	Sediment																																											
CB52	Trend	Sediment																																										
CB52	Trend	Mussel										↓ 7					↓ 5						↔ 9							↓ 5														
CB52	Trend	Oyster														↔ 5																												
CB101	Water	PS																																										
CB101	Water	AA																																										
CB101	Water	MAC																																										
CB101	Biota	Mussel		0 of 1		0 of 2		0 of 1	0 of 3		0 of 2	0 of 1				0 of 5	0 of 4		0 of 4		0 of 3	0 of 2	0 of 5	0 of 4	0 of 2	0 of 1				0 of 2				0 of 2	0 of 1								0 of 1	
CB101	Biota	Oyster	0 of 1			0 of 3	0 of 3			0 of 1			0 of 3	0 of 2	0 of 1	0 of 2		0 of 2		0 of 6				1 of 2			0 of 2	0 of 3	0 of 3	0 of 1		0 of 2	0 of 3	0 of 1		0 of 2	0 of 3	0 of 1	0 of 2		0 of 3	0 of 3		0 of 1
CB101	Sediment																																											
CB101	Trend	Sediment																																										
CB101	Trend	Mussel							↔ 5			↔ 7					↓ 7													↓ 5														
CB101	Trend	Oyster														↔ 5																												
CB105	Water	PS																																										
CB105	Water	AA																																										
CB105	Water	MAC																																										
CB105	Biota	Mussel																																										
CB105	Biota	Oyster																																										
CB105	Sediment																																											
CB105	Trend	Sediment																																										
CB105	Trend	Mussel										↔ 5					↔ 6																											
CB105	Trend	Oyster																																										
CB118	Water	PS																																										
CB118	Water	AA																																										
CB118	Water	MAC																																										
CB118	Biota	Mussel		0 of 1		0 of 3		0 of 1	0 of 3	0 of 1	2 of 2	0 of 1				0 of 5	1 of 4		0 of 4		1 of 3	0 of 2	5 of 5	1 of 4	0 of 2	0 of 1				1 of 3				0 of 2	0 of 1								0 of 1	
CB118	Biota	Oyster	0 of 2			0 of 3	0 of 3			0 of 1			0 of 3	3 of 3	1 of 1	0 of 2		0 of 2		1 of 7		0 of 2		2 of 2			0 of 2	0 of 3	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1	0 of 2		0 of 3	0 of 3		0 of 1
CB118	Sediment																																											
CB118	Trend	Sediment																																										
CB118	Trend	Mussel						↓ 5	↓ 5			↔ 7					↔ 7						↔ 9							↔ 5														
CB118	Trend	Oyster														↔ 5																												
CB138	Water	PS																																										
CB138	Water	AA																																										
CB138	Water	MAC																																										
CB138	Biota	Mussel		0 of 1		0 of 3		0 of 1	0 of 3	0 of 1		0 of 1				0 of 5	0 of 4		0 of 4		0 of 3	0 of 2	0 of 5	0 of 4	0 of 2	0 of 1				0 of 4				0 of 2	0 of 1								0 of 1	
CB138	Biota	Oyster	0 of 2			0 of 3	0 of 3			0 of 1			0 of 3	0 of 3	0 of 1	0 of 2		0 of 2		0 of 7		0 of 2		0 of 2			0 of 2	0 of 3	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1	0 of 2		0 of 2	0 of 3		0 of 1
CB138	Sediment																																											
CB138	Trend	Sediment																																										
CB138	Trend	Mussel							↓ 5			↔ 7					↔ 7						↔ 9							↔ 5														
CB138	Trend	Oyster														↔ 5																												
CB153	Water	PS																																										
CB153	Water	AA																																										
CB153	Water	MAC																																										
CB153	Biota	Mussel		0 of 1		0 of 3		0 of 1	0 of 3	0 of 1	0 of 2	0 of 1				0 of 5	0 of 4		0 of 4		0 of 3	0 of 2	0 of 5	0 of 4	0 of 2	0 of 1				0 of 4				0 of 2	0 of 1								0 of 1	
CB153	Biota	Oyster	0 of 2			0 of 3	0 of 3			0 of 1			0 of 3	0 of 3	0 of 1	0 of 2		0 of 2		0 of 7		0 of 2		0 of 2			0 of 2	0 of 3	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1	0 of 2		0 of 3	0 of 3		0 of 1
CB153	Sediment																																											
CB153	Trend	Sediment																																										
CB153	Trend	Mussel						↓ 5	↔ 5			↔ 7					↔ 7						↔ 9							↔ 5														
CB153	Trend	Oyster														↔ 5																												
	Water	PS																																										

Group	Parameter	Matrix	Type	Confidence in Parameter (mean LOQ %age of Criteria)	% <LOQ	Adrigole Harbour	Aran Islands, Galway Bay, Connemara (HAs 29;31)	Aughinish Bay	Ballynakill Bay	Ballysadare Estuary	Ballyvaghan Bay	Bannow Bay	Barrow Suir Nore Estuary	Berehaven	Blacksod Bay	Blacksod Bay SW / Achill Sound	Carlingford Lough	Casla Bay	Clifden Bay	Cork Harbour	Cromane	Donegal Bay (Erne)	Dublin Bay* (two sediment trend sites)	Dunbulcaun Bay	Dungarvan Harbour	Dungloe Bay	Dunmanus Bay	Glengarriff Harbour	Gweebarra Estuary	Gweedore Estuary	Ilen Estuary	Inner Bantry Bay	Inner Clew Bay	Inner Galway Bay North	Inner Tralee Bay	Inver Bay	Irish Sea Dublin (HA 09)	Kilkieran Bay	Killala Bay	Killary Harbour	Kilmakilloge Harbour	Kinvarra Bay	Liffey Estuary Lower	Lough Foyle	Loughros Bay	Lower Bandon Estuary	Lower Blackwater M Estuary / Youghal Harbour	Lower Shannon Estuary	Lower Slaney Estuary	Mannin Bay	McSwines Bay	Mouth of the Shannon (HAs 23;27)	Mulroy Bay Broadwater	Newport Bay	North Bull Island	North Channel Great Island	Outer Bantry Bay	Outer Dundalk Bay	Outer Kenmare River	Outer Tralee Bay	Oysterhaven	Roaring Water Bay	Rogerstown Estuary	Sheephaven Bay	Sligo Bay	Sligo Harbour	Swilly Estuary	Trawbreaga Bay	Trawena Bay	Upper Shannon Estuary	Valencia Harbour	Waterford Harbour Outer	Western Atlantic Seaboard (HAs 32;33;34)	Westport Bay	Wexford Harbour	Youghal Bay
Metals and Metalloids	Arsenic	Water	PS																																																																										
		Water	AA	Y (5.00)	15%			P (3)				P (3)					P (4)				P (3)							P (3)				P (4)						P (1)		P (3)	P (4)	P (3)						P (1)					P (3)	P (3)						P (4)		P (3)												P (3)		
		Water	MAC					0 of 3				0 of 3					0 of 4				0 of 3							0 of 3				0 of 4						0 of 1		0 of 3	0 of 4	0 of 3						0 of 1					0 of 3	0 of 3						0 of 4		0 of 3												0 of 3		
		Biota	Mussel	Y (4.91)		0 of 1	0 of 1	0 of 1		0 of 2	0 of 1		0 of 9	0 of 3			0 of 3	0 of 1	0 of 4	0 of 8	0 of 4	0 of 2	0 of 2	0 of 1			0 of 3	0 of 5				0 of 13	0 of 3		0 of 1	0 of 1		0 of 3		0 of 2	0 of 4	0 of 1		0 of 1				0 of 6	0 of 4		0 of 4		0 of 4	0 of 2	0 of 7	0 of 4	0 of 8	0 of 2				0 of 4	0 of 2			0 of 4	0 of 2								0 of 2	
		Biota	Oyster	Y (6.99)				0 of 6	0 of 4		0 of 1	0 of 4	0 of 3		0 of 2	0 of 6	0 of 3			0 of 4		0 of 2		0 of 2	0 of 4	0 of 3			0 of 3	0 of 3	0 of 2		0 of 2		0 of 3			0 of 3	0 of 3			0 of 1		0 of 1	0 of 3	0 of 3	0 of 1	0 of 3		0 of 2		0 of 8		0 of 2		0 of 2			0 of 2	0 of 4	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1	0 of 2		0 of 3	0 of 7		0 of 1
		Sediment																										2 of 3				6 of 9																										6 of 6																				
		Trend	Sediment																																																																											
		Trend	Mussel																																																																											
		Trend	Oyster																																																																											
	Cadmium*	Water	PS																																																																										
		Water	AA	Y (22.2)	73%			P (4)				P (4)					P (4)				P (4)							P (4)				P (4)						P (2)		P (4)	P (4)	P (3)						P (1)					P (5)	P (4)						P (4)		P (4)												P (4)		
		Water	MAC					0 of 4				0 of 4					0 of 4				0 of 4							0 of 4				0 of 4						0 of 2		0 of 4	0 of 4	0 of 3						0 of 1					0 of 5	0 of 4						0 of 4		0 of 4												0 of 4		
		Biota	Mussel	Y (0.60)		0 of 1	0 of 1	0 of 1		0 of 3	0 of 1		0 of 14	0 of 3			0 of 4	0 of 1	0 of 4	0 of 11	0 of 5	0 of 2	0 of 3	0 of 1			0 of 3	0 of 6				0 of 14	0 of 4		1 of 2	0 of 1		0 of 3		0 of 3	0 of 5	0 of 1		0 of 2				0 of 9	0 of 4		0 of 5		0 of 5	0 of 2	0 of 10	0 of 5	0 of 8	0 of 3		0 of 3		0 of 5	0 of 3			0 of 5	0 of 3								0 of 3	
		Biota	Oyster	Y (0.60)				0 of 7	0 of 4		0 of 1	0 of 5	0 of 3		0 of 2	0 of 6	0 of 5			0 of 4		0 of 2		0 of 3	0 of 5	0 of 3			0 of 3	0 of 3	0 of 2		0 of 3		0 of 4			0 of 4	0 of 3			0 of 1		0 of 1	0 of 3	0 of 3	0 of 1	1 of 4		0 of 2		0 of 8		0 of 2		0 of 2			0 of 2	0 of 6	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1	0 of 2		0 of 3	0 of 8		0 of 1
		Sediment																					0 of 5					0 of 3				0 of 9																										0 of 6			0 of 2																	
		Trend	Sediment																				↔ 5 / ↔ 5																																																											
		Trend	Mussel										↔ 15				↔ 7			↔ 10	↔ 9							↔ 9				↔ 10								↔ 9	↔ 11			↔ 9				↔ 7	↓ 9		↔ 8		↔ 9		↑ 11							↔ 9	↔ 5													
		Trend	Oyster					↔ 9				↔ 9					↔ 9								↔ 10										↔ 9			↔ 7										↔ 8								↔ 5				↔ 5														↔ 5		
	Chromium	Water	PS																																																																										
		Water	AA	N (81.5)	69%			P (4)				P (4)					P (4)				P (4)							P (4)				P (4)						F (2)		P (4)	F (4)	P (3)						P (1)					P (5)	F (4)						P (4)		F (4)												P (4)		
		Water	MAC					0 of 4				0 of 4					0 of 4				0 of 4							0 of 4				0 of 4						0 of 2		0 of 4	0 of 4	0 of 3						0 of 1					0 of 5	0 of 4						0 of 4		0 of 4												0 of 4		
		Biota	Mussel	Y (3.25)		0 of 1	0 of 1	0 of 1		0 of 3	0 of 1		1 of 14	0 of 3			0 of 4	0 of 1	0 of 4	0 of 11	0 of 5	0 of 2	0 of 3	0 of 1			0 of 3	0 of 6				2 of 14	0 of 4		0 of 2	0 of 1		0 of 3		0 of 3	0 of 5	0 of 1		0 of 2				0 of 9	0 of 4		0 of 5		0 of 5	0 of 2	0 of 10	0 of 5	0 of 8	0 of 3		0 of 3		0 of 5	0 of 3			0 of 5	0 of 3								0 of 3	
		Biota	Oyster	Y (3.88)				0 of 7	0 of 4		0 of 1	0 of 5	0 of 3		0 of 2	0 of 6	0 of 5			0 of 4		0 of 2		0 of 3	0 of 5	0 of 3			0 of 3	0 of 3	0 of 2		0 of 3		0 of 4			0 of 4	0 of 3			0 of 1		0 of 1	0 of 3	0 of 3	0 of 1	0 of 4		0 of 2		0 of 8		0 of 2		0 of 2			0 of 2	0 of 6	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1	0 of 2		0 of 3	0 of 8		0 of 1
		Sediment																					4 of 5					1 of 3				0 of 9																										0 of 6			0 of 2																	
		Trend	Sediment																				↔ 5 / ↔ 5																																																										
		Trend	Mussel																																																																											
		Trend	Oyster																																																																											
	Copper	Water	PS																																																																											
		Water	AA	Y (1.00)	0%			P (4)				P (4)					P (4)				P (4)							P (4)				P (4)						P (2)		P (4)	P (4)	P (3)						F (1)					P (5)	P (4)						P (4)		P (4)												P (4)		
		Water	MAC					0 of 4				0 of 4					0 of 4				0 of 4							0 of 4				0 of 4						0 of 2		0 of 4	0 of 4	0 of 3						0 of 1					0 of 5	0 of 4						0 of 4		0 of 4												0 of 4		
		Biota	Mussel	Y (2.60)		0 of 1	0 of 1	0 of 1		0 of 3	0 of 1		0 of 14	0 of 3			0 of 4	0 of 1	0 of 4	0 of 11	0 of 5	0 of 2	0 of 3	0 of 1			0 of 3	0 of 6				0 of 14	0 of 4		0 of 2	0 of 1		0 of 3		0 of 3	0 of 5	0 of 1		0 of 2				0 of 9	0 of 4		0 of 5		0 of 5	0 of 2	0 of 10	0 of 5	0 of 8	0 of 3		0 of 3		0 of 5	0 of 3			0 of 5	0 of 3								0 of 3	
		Biota	Oyster	Y (0.38)				0 of 7	0 of 4		0 of 1	0 of 5	0 of 3		0 of 2	0 of 6	0 of 5			0 of 4		0 of 2		0 of 3	0 of 5	0 of 3			0 of 3	0 of 3	0 of 2		0 of 3		0 of 4			0 of 4	0 of 3			0 of 1		0 of 1	0 of 3	0 of 3	0 of 1	0 of 4		0 of 2		0 of 8		0 of 2		0 of 2			0 of 2	0 of 6	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1	1 of 2		0 of 3	0 of 8		0 of 1
		Sediment																					1 of 5					1 of 3				0 of 9																										0 of 6			0 of 2																	
		Trend	Sediment																				↓ 5 / ↔ 5																																																										
		Trend	Mussel										↔ 15				↔ 7			↔ 10	↔ 9							↔ 9				↔ 10								↔ 9	↔ 11			↔ 9				↔ 7	↔ 9		↔ 8		↔ 9		↑ 11							↔ 9	↔ 5													
		Trend	Oyster					↔ 9				↑ 9					↓ 9								↔ 10										↔ 9			↔ 7										↔ 8								↔ 5				↔ 5														↔ 5		
	Lead*	Water	PS																																																																										
		Water	AA	Y (0.42)	4%			P (4)				P (3)					P (4)				F (4)							P (4)				P (4)						P (1)		P (4)	P (4)	P (3)						P (1)					F (5)	P (4)						P (4)		P (4)												P (4)		
		Water	MAC					0 of 4				0 of 3					0 of 4				0 of 4							0 of 4				0 of 4						0 of 1		0 of 4	0 of 4	0 of 3						0 of 1					1 of 5	0 of 4						0 of 4		0 of 4												0 of 4		
		Biota	Mussel	Y (3.47)			0 of 1	0 of 1		0 of 3	0 of 1		0 of 14	0 of 2			0 of 3	0 of 1	0 of 4	3 of 11	0 of 5	0 of 2	0 of 3	0 of 1			0 of 2	0 of 5				0 of 13	0 of 4		0 of 2	0 of 1		0 of 2		0 of 2	0 of 4	0 of 1		0 of 2				0 of 9	0 of 4		0 of 5		0 of 5	0 of 2	0 of 10	0 of 4	0 of 7	0 of 3		0 of 3		0 of 4	0 of 3			0 of 5	0 of 3								0 of 2	
		Biota	Oyster	Y (4.13)				0 of 6	0 of 3			0 of 4	0 of 2		0 of 2	0 of 5	0 of 5			0 of 4		0 of 2		0 of 2	0 of 5	0 of 2			0 of 2	0 of 2	0 of 1		0 of 3		0 of 4			0 of 3	0 of 2			0 of 1		0 of 1	0 of 2	0 of 2		0 of 4		0 of 2		0 of 5		0 of 2		0 of 2			0 of 1	0 of 5	0 of 2	0 of 1		0 of 3	0 of 2			0 of 2	0 of 2	0 of 1	0 of 1		0 of 2	0 of 8		0 of 1
		Sediment																					1 of 5					0 of 3				0 of 9																										0 of 6			0 of 2																	
		Trend	Sediment																				↔ 5 / ↔ 5																																																										
		Trend	Mussel										↔ 10				↔ 6			↔ 10	↔ 8							↔ 7				↔ 9												↔ 8				↔ 7	↔ 8						↔ 11							↔ 8														
		Trend	Oyster					↔ 7				↔ 8					↔ 8								↔ 9										↑ 8			↔ 5										↔ 7								↔ 5																				
	Mercury*	Water	PS																																																																											
		Water	AA	Y (19)	100%			P (4)				P (4)					P (4)				P (4)							P (4)				P (4)						P (2)		P (4)	P (4)	P (3)						P (1)					P (4)	P (4)						P (3)		P (3)												P (4)		
		Water	MAC					0 of 4				0 of 4					0 of 4				0 of 4							0 of 4				0 of 4						0 of 2		0 of 4	0 of 4	0 of 3						0 of 1					0 of 4	0 of 4						0 of 3		0 of 3												0 of 4		
		Biota	Mussel	Y (25.0)		0 of 1	0 of 1	0 of 1		0 of 3	0 of 1		0 of 11	0 of 3			0 of 4	0 of 1	0 of 4	0 of 8	0 of 5	0 of 2	0 of 3	0 of 1			0 of 3	0 of 6				0 of 14	0 of 4		0 of 2	0 of 1		0 of 3		0 of 3	0 of 5	0 of 1		0 of 2				0 of 6	0 of 4		0 of 5		0 of 5	0 of 2	0 of 7	0 of 5	0 of 8	0 of 3		0 of 3		0 of 5	0 of 3			0 of 5	0 of 3								0 of 3	
		Biota	Oyster	Y (30.0)				0 of 7	0 of 4		0 of 1	0 of 5	0 of 3		0 of 2	0 of 6	0 of 5			0 of 4		0 of 2		0 of 3	0 of 5	0 of 3			0 of 3	0 of 3	0 of 2		0 of 3		0 of 4			0 of 4	0 of 3			0 of 1		0 of 1	0 of 3	0 of 3	0 of 1	0 of 4		0 of 2		0 of 8		0 of 2		0 of 2			0 of 2	0 of 6	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1	0 of 2		0 of 3	0 of 8		0 of 1
		Sediment																					0 of 5					0 of 3				0 of 9																										0 of 6			0 of 2																	
		Trend	Sediment																				↓ 5 /																																																									
		Trend	Mussel																																																								↔ 5													
		Trend	Oyster					↔ 8																														↔ 6																																						
	Nickel*	Water	PS																																																																										
		Water	AA	Y (0.29)	0%			P (4)				P (4)					P (4)				P (4)							P (4)				P (4)						P (1)		P (3)	P (4)	P (3)						P (1)					P (5)	P (3)						P (4)		P (4)												P (4)		
		Water	MAC					0 of 4				0 of 4					0 of 4				0 of 4							0 of 4				0 of 4						0 of 1		0 of 3	0 of 4	0 of 3						0 of 1					1 of 5	0 of 3						0 of 4		0 of 4												0 of 4		
		Biota	Mussel	Y (13.6)		0 of 1	0 of 1	0 of 1		0 of 3	0 of 1		3 of 14	0 of 3			0 of 4	0 of 1	0 of 4	0 of 11	0 of 5	0 of 2	0 of 3	0 of 1			0 of 3	0 of 5				0 of 11	0 of 4		0 of 2	0 of 1		0 of 3		0 of 3	0 of 5	0 of 1		0 of 2				0 of 9	0 of 4		0 of 5		0 of 5	0 of 2	0 of 10	0 of 5	0 of 4	0 of 3		1 of 3		0 of 5	0 of 3			0 of 5	0 of 3								0 of 3	
		Biota	Oyster	Y (16.2)				0 of 7	0 of 4		0 of 1	0 of 5	0 of 3		0 of 2	0 of 6	0 of 5			0 of 4		0 of 2		0 of 3	0 of 5	0 of 3			0 of 3	0 of 3	0 of 2		0 of 3		0 of 4			0 of 4	0 of 3			0 of 1		0 of 1	0 of 3	0 of 3	0 of 1	0 of 4		0 of 2		0 of 8		0 of 2		0 of 2			0 of 2	0 of 6	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1	0 of 2		0 of 3	0 of 8		0 of 1
		Sediment																					5 of 5					3 of 3				9 of 9																										6 of 6			2 of 2																	
		Trend	Sediment																				↓ 5 / ↔ 5																																																											
		Trend	Mussel																																																																											
		Trend	Oyster																																																																											
	Silver	Water	PS																																																																											
		Water	AA	Y	100%			P (4)				P (4)					P (4)				P (4)							P (4)				P (4)						P (2)		P (4)	P (4)	P (3)						P (1)					P (5)	P (4)						P (4)		P (4)												P (4)		
		Water	MAC					0 of 4				0 of 4					0 of 4				0 of 4							0 of 4				0 of 4						0 of 2		0 of 4	0 of 4	0 of 3						0 of 1					0 of 5	0 of 4						0 of 4		0 of 4												0 of 4		
		Biota	Mussel	Y (6.00)		0 of 1	0 of 1	0 of 1		0 of 3	0 of 1		0 of 14	0 of 3			0 of 4	0 of 1	0 of 4	0 of 11	0 of 5	0 of 2	0 of 3	0 of 1			0 of 3	0 of 5				0 of 5	0 of 4		0 of 2	0 of 1		0 of 3		0 of 3	0 of 5	0 of 1		0 of 2				0 of 9	0 of 4		0 of 5		0 of 5	0 of 2	0 of 10	0 of 5	0 of 2	0 of 3		0 of 3		0 of 5	0 of 3			0 of 5	0 of 3								0 of 3	
		Biota	Oyster	Y (0.32)				0 of 7	0 of 4		0 of 1	0 of 5	0 of 3		0 of 2	0 of 6	0 of 5			0 of 4		0 of 2		0 of 3	0 of 5	0 of 3			0 of 3	0 of 3	0 of 2		0 of 3		0 of 4			0 of 4	0 of 3			0 of 1		0 of 1	0 of 3	0 of 3	0 of 1	0 of 4		0 of 2		0 of 8		0 of 2		0 of 2			0 of 2	0 of 6	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1	0 of 2		0 of 3	0 of 8		0 of 1
		Sediment																																																																													
		Trend	Sediment																																																																											
		Trend	Mussel																																																																											
		Trend	Oyster																																																																											
	Zinc	Water	PS																																																																											
		Water	AA	Y (1.00)	0%			P (4)				P (4)					P (4)				P (4)							P (4)				P (4)						P (2)		P (4)	P (4)	P (3)						P (1)					P (5)	P (4)						P (4)		P (4)												P (4)		
		Water	MAC					0 of 4				0 of 4					0 of 4				0 of 4							0 of 4				0 of 4						0 of 2		0 of 4	0 of 4	0 of 3						0 of 1					1 of 5	0 of 4						0 of 4		0 of 4												0 of 4		
		Biota	Mussel	Y (2.62)		0 of 1	0 of 1	0 of 1		0 of 3	0 of 1		0 of 14	0 of 3			0 of 4	0 of 1	0 of 4	0 of 11	0 of 5	0 of 2	0 of 3	0 of 1			0 of 3	0 of 6				0 of 14	0 of 4		0 of 2	0 of 1		0 of 3		0 of 3	0 of 5	0 of 1		0 of 2				0 of 9	0 of 4		0 of 5		0 of 5	0 of 2	0 of 10	0 of 5	0 of 8	0 of 3		0 of 3		0 of 5	0 of 3			0 of 5	0 of 3								0 of 3	
		Biota	Oyster	Y (0.14)				0 of 7	0 of 4		0 of 1	0 of 5	0 of 3		0 of 2	0 of 6	0 of 5			0 of 4		0 of 2		0 of 3	0 of 5	0 of 3			0 of 3	0 of 3	0 of 2		0 of 3		0 of 4			0 of 4	0 of 3			0 of 1		0 of 1	0 of 3	0 of 3	0 of 1	0 of 4		0 of 2		0 of 8		0 of 2		0 of 2			0 of 2	0 of 6	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1	0 of 2		0 of 3	0 of 8		0 of 1
		Sediment																					0 of 5					0 of 3				0 of 9																										1 of 6			0 of 2																	
		Trend	Sediment																				↔ 5 / ↔ 5																																																												
		Trend	Mussel										↔ 15				↔ 7			↔ 10	↔ 9							↔ 9				↔ 10								↔ 9	↔ 11			↔ 9				↔ 7	↔ 9		↔ 8		↔ 9		↑ 11							↓ 8	↔ 5													
		Trend	Oyster					↔ 9				↔ 9					↔ 9								↔ 10										↔ 9			↔ 7										↔ 8								↔ 5				↔ 5														↔ 5		
Chlorobiphenyls	CB28	Water	PS																																																																											
		Water	AA																																																																											
		Water	MAC																																																																											
		Biota	Mussel	Y (6.56)		0 of 1	0 of 1				0 of 1		0 of 4	0 of 3			0 of 3	0 of 1	0 of 3	3 of 5	0 of 3	0 of 1	0 of 1				0 of 3	0 of 4				0 of 4	0 of 2	0 of 1		0 of 1		0 of 3		0 of 1	0 of 3	0 of 1	0 of 2	0 of 1				0 of 5	0 of 4		0 of 4		0 of 3	0 of 2	0 of 5	0 of 4	0 of 2	0 of 1				0 of 4				0 of 2	0 of 1								0 of 1	
		Biota	Oyster	Y (10.6)				0 of 4	0 of 4		0 of 1	0 of 3	0 of 3		0 of 2	0 of 6	0 of 1			0 of 4		0 of 2		0 of 2	0 of 3	0 of 3			0 of 3	0 of 3	0 of 2				0 of 2			0 of 3	0 of 3			0 of 1			0 of 3	0 of 3	0 of 1	0 of 2		0 of 2		0 of 7		0 of 2		0 of 2			0 of 2	0 of 3	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1	0 of 2		0 of 3	0 of 3		0 of 1
		Sediment																					0 of 2																																																									
		Trend	Sediment																																																																											
		Trend	Mussel															↔ 11																													↔ 5																											
		Trend	Oyster									↔ 5													↔ 7																																																					
	CB52	Water	PS																																																																											
		Water	AA																																																																											
		Water	MAC																																																																											
		Biota	Mussel	Y (9.44)		0 of 1	0 of 1				0 of 1		0 of 4	0 of 3			0 of 3		0 of 1	3 of 5	0 of 1	0 of 1	0 of 1				0 of 2	0 of 3				0 of 4	0 of 2	0 of 1				0 of 3		0 of 1	0 of 2	0 of 1	0 of 2	0 of 1				0 of 5	0 of 4		0 of 3		0 of 3	0 of 1	0 of 5	0 of 4	0 of 2	0 of 1				0 of 4				0 of 2	0 of 1								0 of 1	
		Biota	Oyster	Y (16.1)				0 of 4	0 of 4		0 of 1	0 of 3	0 of 2		0 of 2	0 of 4	0 of 1			0 of 3		0 of 2		0 of 2	0 of 3	0 of 3			0 of 3	0 of 3	0 of 2				0 of 1			0 of 3	0 of 3			0 of 1			0 of 3	0 of 2	0 of 1	0 of 2		0 of 2		0 of 7		0 of 2		0 of 2			0 of 1	0 of 3	0 of 2	0 of 1		0 of 2	0 of 3	0 of 1		0 of 1	0 of 3	0 of 1	0 of 2		0 of 3	0 of 2		0 of 1
		Sediment																					0 of 2																																																									
		Trend	Sediment																																																																											
		Trend	Mussel										↔ 9							↔ 11												↓ 7												↓ 7					↓ 5						↔ 9							↓ 5														
		Trend	Oyster									↔ 5					↓ 7								↓ 7																							↔ 5																												
	CB101	Water	PS																																																																											
		Water	AA																																																																											
		Water	MAC																																																																											
		Biota	Mussel	Y (2.00)		0 of 1	0 of 1				0 of 1		0 of 4	0 of 3			0 of 3	0 of 1	0 of 3	3 of 5	0 of 3	0 of 2	0 of 1				0 of 2	0 of 4				0 of 4	0 of 2	0 of 1		0 of 1		0 of 2		0 of 1	0 of 3		0 of 2	0 of 1				0 of 5	0 of 4		0 of 4		0 of 3	0 of 2	0 of 5	0 of 4	0 of 2	0 of 1				0 of 2				0 of 2	0 of 1								0 of 1	
		Biota	Oyster	Y (6.00)				0 of 3	0 of 4		0 of 1	0 of 2	0 of 2		0 of 2	0 of 5	0 of 1			0 of 3		0 of 2		0 of 2	0 of 2	0 of 3			0 of 3	0 of 3	0 of 2				0 of 1			0 of 3	0 of 3			0 of 1			0 of 3	0 of 2	0 of 1	0 of 2		0 of 2		0 of 6				1 of 2			0 of 2	0 of 3	0 of 3	0 of 1		0 of 2	0 of 3	0 of 1		0 of 2	0 of 3	0 of 1	0 of 2		0 of 3	0 of 3		0 of 1
		Sediment																					0 of 2																																																									
		Trend	Sediment																																																																											
		Trend	Mussel															↔ 11												↓ 7									↔ 5			↔ 7					↓ 7													↓ 5														
		Trend	Oyster									↓ 6					↔ 7								↔ 7																							↔ 5																												
	CB105	Water	PS																																																																											
		Water	AA																																																																											
		Water	MAC																																																																											
		Biota	Mussel																																																																											
		Biota	Oyster																																																																											
		Sediment																																																																												
		Trend	Sediment																																																																											
		Trend	Mussel										↔ 7							↔ 9			↔ 8																					↔ 5					↔ 6																											
		Trend	Oyster																																																																											
	CB118	Water	PS																																																																											
		Water	AA																																																																											
		Water	MAC																																																																											
		Biota	Mussel	Y (8.33)		0 of 1	0 of 1				0 of 1		3 of 4	1 of 3			1 of 3	0 of 1	0 of 3	3 of 5	1 of 2	0 of 2	0 of 1				0 of 2	0 of 4				0 of 4	0 of 2	0 of 1		0 of 1		0 of 3		0 of 1	0 of 3	0 of 1	2 of 2	0 of 1				0 of 5	1 of 4		0 of 4		1 of 3	0 of 2	5 of 5	1 of 4	0 of 2	0 of 1				1 of 3				0 of 2	0 of 1								0 of 1	
		Biota	Oyster	Y (12.5)				0 of 4	0 of 4		0 of 1	0 of 3	3 of 3		0 of 2	0 of 6	0 of 1			4 of 4		0 of 2		0 of 2	1 of 3	0 of 3			0 of 3	0 of 3	0 of 2				0 of 2			0 of 3	0 of 3			0 of 1			0 of 3	3 of 3	1 of 1	0 of 2		0 of 2		1 of 7		0 of 2		2 of 2			0 of 2	0 of 3	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1	0 of 2		0 of 3	0 of 3		0 of 1
		Sediment																					0 of 2																																																									
		Trend	Sediment																				↔ 5 / ↔ 5																																																											
		Trend	Mussel										↔ 9							↔ 11												↔ 7								↓ 5	↓ 5								↔ 7						↔ 9							↔ 5														
		Trend	Oyster					↔ 5				↔ 6					↔ 7								↔ 7																							↔ 5																												
	CB138	Water	PS																																																																											
		Water	AA																																																																											
		Water	MAC																																																																											
		Biota	Mussel	Y (0.89)		0 of 1	0 of 1				0 of 1		0 of 4	0 of 3			0 of 3	0 of 1	0 of 3	2 of 5	0 of 3	0 of 2	0 of 1				0 of 3	0 of 4				0 of 4	0 of 2			0 of 1		0 of 3		0 of 1	0 of 3	0 of 1		0 of 1				0 of 5	0 of 4		0 of 4		0 of 3	0 of 2	0 of 5	0 of 4	0 of 2	0 of 1				0 of 4				0 of 2	0 of 1								0 of 1	
		Biota	Oyster	Y (0.57)				0 of 4	0 of 4		0 of 1	0 of 3	0 of 3		0 of 2	0 of 6	0 of 1			0 of 4		0 of 2		0 of 2	0 of 3	0 of 3			0 of 3	0 of 3	0 of 2				0 of 2			0 of 3	0 of 3			0 of 1			0 of 3	0 of 3	0 of 1	0 of 2		0 of 2		0 of 7		0 of 2		0 of 2			0 of 2	0 of 3	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1	0 of 2		0 of 2	0 of 3		0 of 1
		Sediment																					0 of 2																																																									
		Trend	Sediment																				↔ 5 /																																																											
		Trend	Mussel										↔ 9							↔ 11												↔ 7									↓ 5			↔ 7					↔ 7						↔ 9							↔ 5														
		Trend	Oyster									↔ 5					↔ 6								↔ 7																							↔ 5																												
	CB153	Water	PS																																																																											
		Water	AA																																																																											
		Water	MAC																																																																											
		Biota	Mussel	Y (0.18)		0 of 1	0 of 1				0 of 1		0 of 4	0 of 3			0 of 3	0 of 1	0 of 3	0 of 5	0 of 3	0 of 2	0 of 1				0 of 3	0 of 4				0 of 4	0 of 2	0 of 1		0 of 1		0 of 3		0 of 1	0 of 3	0 of 1	0 of 2	0 of 1				0 of 5	0 of 4		0 of 4		0 of 3	0 of 2	0 of 5	0 of 4	0 of 2	0 of 1				0 of 4				0 of 2	0 of 1								0 of 1	
		Biota	Oyster	Y (0.14)				0 of 4	0 of 4		0 of 1	0 of 3	0 of 3		0 of 2	0 of 6	0 of 1			0 of 4		0 of 2		0 of 2	0 of 3	0 of 3			0 of 3	0 of 3	0 of 2				0 of 2			0 of 3	0 of 3			0 of 1			0 of 3	0 of 3	0 of 1	0 of 2		0 of 2		0 of 7		0 of 2		0 of 2			0 of 2	0 of 3	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1	0 of 2		0 of 3	0 of 3		0 of 1
		Sediment																					0 of 2																																																									
		Trend	Sediment																				↔ 5 /																																																											
		Trend	Mussel										↔ 9							↓ 11												↔ 7								↓ 5	↔ 5			↔ 7					↔ 7						↔ 9							↔ 5														
		Trend	Oyster					↔ 5				↔ 6					↔ 6								↔ 7																							↔ 5																												
		Water	PS																																																																											

				Confidence in Parameter (mean LOQ %age of Criteria)	% <LOQ	Adrigole Harbour	Aran Islands, Galway Bay Connemara (HAs 29;31)	Aughinish Bay	Ballynakill Bay	Ballysadare Estuary	Ballyvaghan Bay	Bannow Bay	Barrow Suir Nore Estuary	Berehaven	Blacksod Bay	Blacksod Bay SW / Achill Sound	Carlingford Lough	Casla Bay	Clifden Bay	Cork Harbour	Cromane	Donegal Bay (Erne)	Dublin Bay *	Dunbulcaun Bay	Dungarvan Harbour	Dungloe Bay	Dunmanus Bay	Glengarriff Harbour	Gweebarra Estuary	Gweedore Estuary	Ilen Estuary	Inner Bantry Bay	Inner Clew Bay	Inner Galway Bay North	Inner Tralee Bay	Inver Bay	Irish Sea Dublin (HA 09)	Kilkieran Bay	Killala Bay	Killary Harbour	Kilmakilloge Harbour	Kinvarra Bay	Liffey Estuary Lower	Lough Foyle	Loughros Bay	Lower Bandon Estuary	Lower Blackwater M Estuary / Youghal Harbour	Lower Shannon Estuary	Lower Slaney Estuary	Mannin Bay	McSwines Bay	Mouth of the Shannon (HAs 23;27)	Mulroy Bay Broadwater	Newport Bay	North Bull Island	North Channel Great Island	Outer Bantry Bay	Outer Dundalk Bay	Outer Kenmare River	Outer Tralee Bay	Oysterhaven	Roaring Water Bay	Rogerstown Estuary	Sheephaven Bay	Sligo Bay	Sligo Harbour	Swilly Estuary	Trawbreaga Bay	Trawena Bay	Upper Shannon Estuary	Valencia Harbour	Waterford Harbour Outer	Western Atlantic Seaboard (HAs 32;33;34)	Westport Bay	Wexford Harbour	Youghal Bay
	CB156	Water	AA																																																																												
		Water	MAC																																																																												
		Biota	Mussel																																																																													
		Biota	Oyster																																																																													
		Sediment																																																																														
		Trend	Sediment																																																																													
		Trend	Mussel										↔ 5								↓ 9																																							↔ 7																					
		Trend	Oyster																																																																													
	CB180	Water	PS																																																																													
		Water	AA																																																																													
		Water	MAC																																																																													
		Biota	Mussel	Y (0.38)		0 of 1	0 of 1				0 of 1		0 of 4	0 of 3			0 of 3	0 of 1	0 of 3	0 of 5	0 of 3	0 of 2	0 of 1				0 of 3	0 of 4				0 of 4	0 of 2	0 of 1		0 of 1		0 of 3		0 of 1	0 of 3	0 of 1	0 of 2	0 of 1				0 of 5	0 of 4		0 of 4		0 of 3	0 of 2	0 of 5	0 of 4	0 of 2	0 of 1				0 of 4				0 of 2	0 of 1								0 of 1	
		Biota	Oyster	Y (0.75)				0 of 4	0 of 4		0 of 1	0 of 3	0 of 3		0 of 2	0 of 6	0 of 1			0 of 4		0 of 2		0 of 2	0 of 3	0 of 3			0 of 3	0 of 3	0 of 2				0 of 2			0 of 3	0 of 3			0 of 1			0 of 3	0 of 3	0 of 1	0 of 2		0 of 2		0 of 7		0 of 2		0 of 2			0 of 2	0 of 3	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1	0 of 2		0 of 3	0 of 3		0 of 1
		Sediment																					0 of 2																																																								
		Trend	Sediment																				↔ 5 / ↔ 5																																																								
		Trend	Mussel																													↔ 7												↔ 6						↔ 6																												
		Trend	Oyster																↔ 6																																																													
	SCB7	Water	PS																															P (1)												P (1)																																					
		Water	AA	Y	100%			P (4)				P (4)					P (4)				P (3)							P (4)				P (4)						P (2)		P (4)	P (3)	P (3)						P (1)					P (2)	P (4)						P (4)		P (4)												P (4)		
		Water	MAC					0 of 4				0 of 4					0 of 4				0 of 3							0 of 4				0 of 4						0 of 2		0 of 4	0 of 3	0 of 3						0 of 1					0 of 2	0 of 4						0 of 4		0 of 4												0 of 4		
		Biota	Mussel	Y (0.94)		0 of 1	0 of 1				0 of 1		0 of 4	0 of 3			0 of 3		0 of 1	0 of 5	0 of 1		0 of 1				0 of 2	0 of 3				0 of 4	0 of 2	0 of 1				0 of 2		0 of 1	0 of 2	0 of 1	0 of 2	0 of 1				0 of 5	0 of 4		0 of 3		0 of 3	0 of 1	0 of 5	0 of 4	0 of 2	0 of 1				0 of 2				0 of 2	0 of 1								0 of 1	
		Biota	Oyster	Y (1.50)				0 of 3	0 of 4		0 of 1	0 of 2	0 of 2		0 of 2	0 of 3	0 of 1			0 of 2		0 of 2		0 of 2	0 of 2	0 of 3			0 of 3	0 of 3	0 of 2				0 of 1			0 of 3	0 of 3			0 of 1			0 of 3	0 of 1	0 of 1	0 of 2		0 of 2		0 of 6				0 of 2			0 of 1	0 of 3	0 of 2	0 of 1		0 of 1	0 of 3	0 of 1			0 of 3	0 of 1	0 of 2		0 of 2	0 of 3		0 of 1
		Sediment																																																																														
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		Trend	Mussel																																																																													
		Trend	Oyster																																																																													
Cyclodienes	Dieldrin	Water	PS																																																																													
		Water	AA																																																																													
		Water	MAC																																																																													
		Biota	Mussel	Y (0.18)		0 of 1	0 of 1				0 of 1		0 of 3	0 of 3			0 of 3	0 of 1	0 of 3	0 of 4	0 of 2	0 of 1	0 of 1				0 of 3	0 of 4				0 of 3	0 of 1					0 of 3		0 of 1	0 of 3	0 of 1		0 of 1				0 of 3	0 of 4		0 of 3		0 of 2	0 of 2	0 of 3	0 of 3	0 of 2	0 of 1				0 of 4				0 of 2	0 of 1								0 of 1	
		Biota	Oyster	Y (0.12)				0 of 4	0 of 4		0 of 1	0 of 3	0 of 3		0 of 2	0 of 6	0 of 1			0 of 4		0 of 2		0 of 2	0 of 3	0 of 3			0 of 3	0 of 3	0 of 2				0 of 2			0 of 2	0 of 3			0 of 1			0 of 3	0 of 3	0 of 1	0 of 2		0 of 2		0 of 7		0 of 2		0 of 2			0 of 2	0 of 3	0 of 3	0 of 1		0 of 1	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1	0 of 2		0 of 3	0 of 2		0 of 1
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		Trend	Oyster																																																																													
	Sum of Drins	Water	PS																																																																													
		Water	AA	N (153)	100%			P (4)				P (4)					P (4)				P (3)							P (4)				P (4)						P (2)		P (4)	P (3)	P (3)						P (1)					P (2)	P (4)						P (4)		P (4)												P (4)		
		Water	MAC																																																																													
		Biota	Mussel																																																																														
		Biota	Oyster																																																																													
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		Trend	Mussel																																																																													
		Trend	Oyster																																																																													
DDTs	DDE p,p'	Water	PS																																																																													
		Water	AA																																																																													
		Water	MAC																																																																													
		Biota	Mussel	Y (0.23)		0 of 1	0 of 1				0 of 1		0 of 3	0 of 3			0 of 3	0 of 1	0 of 3	0 of 4	0 of 3	0 of 2	0 of 1				0 of 3	0 of 4				0 of 4	0 of 2			0 of 1		0 of 3		0 of 1	0 of 3	0 of 1		0 of 1				0 of 3	0 of 4		0 of 4		0 of 3	0 of 2	0 of 3	0 of 4	0 of 2	0 of 1				0 of 4				0 of 2	0 of 1								0 of 1	
		Biota	Oyster	Y (0.23)				0 of 4	0 of 4		0 of 1	0 of 3	0 of 3		0 of 1	0 of 6	0 of 1			0 of 4		0 of 2		0 of 2	0 of 3	0 of 3			0 of 3	0 of 3	0 of 2				0 of 2			0 of 3	0 of 3			0 of 1			0 of 3	0 of 3	0 of 1	0 of 2		0 of 2		0 of 7		0 of 2		0 of 2			0 of 2	0 of 3	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1	0 of 2		0 of 3	0 of 2		0 of 1
		Sediment																																																																															
		Trend	Sediment																				↔ 5 / ↔ 5																																																								
		Trend	Mussel										↔ 8								↓ 9													↔ 6								↔ 5	↔ 5			↔ 7				↔ 5	↔ 7						↓ 9							↔ 5														
		Trend	Oyster					↔ 5				↔ 6					↔ 7								↔ 7																								↔ 5																														
	DDT p,p'	Water	PS																																																																													
		Water	AA	Y (12)	100%			P (4)				P (4)					P (4)				P (3)							P (4)				P (4)						P (2)		P (4)	P (3)	P (3)						P (1)					P (2)	P (4)						P (4)		P (4)												P (4)		
		Water	MAC																																																																													
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		Trend	Oyster																																																																													
	Sum of DDTs	Water	PS																																																																													
		Water	AA	Y (18.4)	100%			P (4)				P (4)					P (4)				P (3)							P (4)				P (4)						P (2)		P (4)	P (3)	P (3)						P (1)					P (2)	P (4)						P (4)		P (4)												P (4)		
		Water	MAC																																																																														
		Biota	Mussel																																																																													
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		Trend	Sediment																																																																													
		Trend	Mussel																																																																													
		Trend	Oyster																																																																													
Hexachlorocyclohexanes	**α-hexachlorocyclohexane***	Water	PS																																																																													
		Water	AA																																																																													
		Water	MAC																																																																													
		Biota	Mussel																																																																													
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		Trend	Mussel										↔ 5								↓ 5																																																												
		Trend	Oyster																																																																													
	Lindane*	Water	PS																																																																													
		Water	AA	N (151)	100%																																																																												
		Water	MAC																																																																													
		Biota	Mussel	Y (0.22)		0 of 1	0 of 1				0 of 1		0 of 3	0 of 3			0 of 3	0 of 1	0 of 3	0 of 4	0 of 3	0 of 2	0 of 1				0 of 3	0 of 4				0 of 4	0 of 2			0 of 1		0 of 3		0 of 1	0 of 3	0 of 1		0 of 1				0 of 3	0 of 4		0 of 4		0 of 3	0 of 2	0 of 3	0 of 4	0 of 2	0 of 1				0 of 4				0 of 2	0 of 1								0 of 1	
		Biota	Oyster	Y (0.18)				0 of 4	0 of 4		0 of 1	0 of 3	0 of 3		0 of 2	0 of 6	0 of 1			0 of 4		0 of 2		0 of 2	0 of 3	0 of 3			0 of 3	0 of 3	0 of 2				0 of 2			0 of 3	0 of 3			0 of 1			0 of 3	0 of 3	0 of 1	0 of 2		0 of 2		0 of 7		0 of 2		0 of 2			0 of 2	0 of 3	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1	0 of 2		0 of 3	0 of 3		0 of 1
		Sediment																					0 of 2																																																									
		Trend	Sediment																																																																													
		Trend	Mussel										↔ 7								↓ 10																														↔ 6	↔ 6						↓ 9																					
		Trend	Oyster									↔ 5					↔ 5								↔ 7																																																							
	Sum of HCH*	Water	PS																																																																													
		Water	AA	N (438)	98%			P (4)				F (4)					P (4)				P (3)							P (4)				P (4)						P (2)		P (4)	P (3)	P (3)						P (1)					F (2)	P (4)						P (4)		P (4)												P (4)		
		Water	MAC					0 of 4				0 of 4					0 of 4				0 of 3							0 of 4				0 of 4						0 of 2		0 of 4	0 of 3	0 of 3						0 of 1					1 of 2	0 of 4						0 of 4		0 of 4												0 of 4		
		Biota	Mussel																																																																														
		Biota	Oyster																																																																													
		Sediment																																																																															
		Trend	Sediment																																																																													
		Trend	Mussel																																																																													
		Trend	Oyster																																																																													
Organochlorines	**HCB***	Water	PS																																																																													
		Water	AA	Y (12.0)	100%			P (4)				P (4)					P (4)				P (3)							P (4)				P (4)						P (2)		P (4)	P (3)	P (3)						P (1)					P (2)	P (4)						P (4)		P (4)												P (4)		
		Water	MAC					0 of 4				0 of 4					0 of 4				0 of 3							0 of 4				0 of 4						0 of 2		0 of 4	0 of 3	0 of 3						0 of 1					0 of 2	0 of 4						0 of 4		0 of 4												0 of 4		
		Biota	Mussel	Y (0.14)		0 of 1	0 of 1				0 of 1		0 of 3	0 of 3			0 of 3	0 of 1	0 of 3	0 of 4	0 of 3	0 of 2	0 of 1				0 of 3	0 of 4				0 of 4	0 of 2			0 of 1		0 of 3		0 of 1	0 of 3	0 of 1		0 of 1				0 of 3	0 of 4		0 of 4		0 of 3	0 of 2	0 of 3	0 of 4	0 of 2	0 of 1				0 of 4				0 of 2	0 of 1								0 of 1	
		Biota	Oyster	Y (0.14)				0 of 4	0 of 4		0 of 1	0 of 3	0 of 3		0 of 2	0 of 6	0 of 1			0 of 4		0 of 2		0 of 2	0 of 2	0 of 3			0 of 3	0 of 3	0 of 2				0 of 2			0 of 3	0 of 3			0 of 1			0 of 3	0 of 3	0 of 1	0 of 2		0 of 2		0 of 7		0 of 2		0 of 2			0 of 2	0 of 3	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1		0 of 3	0 of 3	0 of 1	0 of 2		0 of 3	0 of 3		0 of 1
		Sediment																					0 of 2																																																										
		Trend	Sediment																				↔ 5 /																																																									
		Trend	Mussel										↔ 9								↓ 11													↓ 6												↓ 7				↔ 7	↓ 7						↔ 9																					
		Trend	Oyster																								↓ 6																																																							
	Anthracene*	Water	PS																															P (1)												P (1)																																					
		Water	AA																																																																													
		Water	MAC																																																																													
		Biota	Mussel	Y (0.16)									0 of 2							0 of 3								0 of 2				0 of 12		0 of 1									0 of 2					0 of 3							0 of 3		0 of 6																					
		Biota	Oyster																																																																														
		Sediment																					0 of 2					0 of 3				1 of 13																														1 of 6																				
		Trend	Sediment																				↔ 5 / ↔ 5																																																								
		Trend	Mussel																																																																													
		Trend	Oyster																																																																													
	Benzo[a]anthracene	Water	PS																																																																													
		Water	AA																																																																													
		Water	MAC																																																																													
		Biota	Mussel	Y (0.59)									0 of 2							0 of 3								0 of 2				0 of 12		0 of 1									0 of 2					0 of 3							0 of 3		0 of 6																					
		Biota	Oyster																																																																													
		Sediment																					0 of 2					0 of 3				1 of 15																														1 of 6																				
		Trend	Sediment																				↔ 5 / ↔ 5																																																								
		Trend	Mussel										↓ 5																																				↓ 5							↓ 5																					
		Trend	Oyster																																																																													
	Benzo[bkj]fluorathene*	Water	PS																															P (1)												P (1)																																					
		Water	AA																																																																													
		Water	MAC																																																																													
		Biota	Mussel																																																																													
		Biota	Oyster																																																																													
		Sediment																																																																														
		Trend	Sediment																																																																													
		Trend	Mussel																																																																													
		Trend	Oyster																																																																													
	Benzo[ghi]perylene*	Water	PS																																																																													
		Water	AA																																																																													
		Water	MAC																																																																													
		Biota	Mussel										0 of 2							0 of 3								0 of 1				0 of 6		0 of 1									0 of 2					0 of 3							0 of 3		0 of 3																					
		Biota	Oyster																																																																													
		Sediment																					0 of 2					1 of 3				3 of 15																														2 of 6																				
		Trend	Sediment																				↔ 5 / ↔ 5																																																								
		Trend	Mussel										↔ 5																																				↔ 5							↔ 5																					
		Trend	Oyster																																																																													
		Water	PS																															P (1)												P (1)																																					
		Water	AA																																																																													

3.3 Parameter group based commentary:

Note: Occasional anomalous results for metals in seawater must be treated with caution as they may reflect natural variability or may be sampling artefacts. Assessment criteria are less well developed for other matrices although concentrations in shellfish provide a good indicator of water quality.

Mercury: Mercury concentrations were generally low and all seawater monitoring complied with WFD EQS as set in Dir 2008/105/EC[12]. The mercury standard set for biota in the same directive is close to both the background limit for mussels and oysters and indeed the method LoQ. All shellfish samples complied when this standard was applied taking background levels into account as allowed for in the directive. Only one downward trend was detected; this was for a sediment station in Dublin Bay over 5 years.

Cadmium: All seawater monitoring indicated compliance. One oyster sample in the lower Shannon estuary exceeded the proposed limit for shellfish waters and likewise one mussel sample in inner Tralee Bay. Shellfish testing of inner Tralee Bay has indicated elevated cadmium repeatedly over the years although the levels often approach but remain within the limits. An upward trend was detected at OSPAR mussel trend site at North Bull Island, although a downward trend was detected for the Lower Slaney estuary. No other significant trends were evident.

Lead: Lead in water exceeded the AA-EQS (although limited samples were available) at two locations – Cromane (marginal) and Mulroy Bay. In particular one sample from Mulroy Bay gave high results for Pb, Ni and Zn. High, albeit variable, concentrations of lead have been evident in mussels from Paddy's Point trend station in Cork Harbour for many years. It is noted that while high concentrations were again detected in 2007, this was not the case in 2008/9 at the Paddy's Point site or at other sites in the harbour. Only one significant trend was detected for lead: an upward trend for lead in oysters in Inner Tralee Bay.

Nickel: No water bodies exceeded the AA-QS and only one water sample exceeded the MAC-QS for nickel. This sample from Mulroy Bay failed the MAC-QS for a number of elements. 3 of 14 mussel samples from Barrow/Suir/Nore estuary exceeded the proposed Imperative value for the SWD as did 1 of 8 samples from outer Tralee Bay. All sediments exceed the level 1 dredge spoil value indicating that the value is probably too low to account for natural sediment concentrations in Irish coastal sediments and should be revised. A significant downward trend was detected for 1 of 2 sediment trend stations in Dublin Bay albeit for only 5 years data.

Copper: Copper is generally compliant with best available assessment criteria for water and biota. One water body (lower Shannon Estuary) exceeds the SI 272 of 2009[13] AA-QS for copper in seawater but on the basis of only a single sample and thus has a very low confidence. The sample complied with the SWD MAC-QS. 1 of 3 samples from Glengarriff Harbour and 1 of 5 samples from Dublin Bay exceeded the level 1 dredge criteria. Significant upward trends were reported for oyster in Bannow Bay and mussel in North Bull Island. Significant downward trends were reported for oyster (but not mussel) in Carlingford Lough and for one of two sediment stations in Dublin Bay.

Zinc: A single water sample from Mulroy Bay exceeded the MAC assessment criteria (sample also elevated for nickel and lead) but all others were compliant. A single sediment sample of 6 in outer Bantry Bay exceeded the level 1 dredge assessment criteria. Only two significant trends were detected for biota/sediment; a significant upward trend in recent years for zinc in mussels from North Bull Island and a significant downward trend for zinc in mussels in Roaring Water Bay.

[12] Directive 2008/105/EC of the European Parliament and of the Council on environmental quality standards in the field of water policy

[13] EUROPEAN Communities Environmental Objectives (Surface Waters) Regulations 2009

Arsenic: No water or biota samples exceeded the assessment criteria for arsenic. Most sediment samples (only available for Bantry Bay) for arsenic however exceeded the sediment level 1 dredge value (9mg kg^{-1} dw). This assessment criterion was based on a rounded US ERL did not take into account background concentrations due to the absence of Irish background sediment concentration data when criteria were initially proposed. Cronin *et al*. (2006) notes that the US ERM/Level 2 dredge arsenic assessment criteria of 70 mg kg^{-1} dw is likely to be exceeded at some locations due to natural levels of arsenic in sediment. Consequently it is not evident that there is an issue with elevated arsenic in this area or any other area.

Chromium: 4 water bodies exceed the average-QS for chromium and are given an amber flag. This is due to the test results for total Cr not being directly comparable with the quality standard for CrVI leading to a conservative assessment. It is noted that the analytical method does not meet the sensitivity requirement. Only 3 biota samples exceed the proposed I value for the SWD, 1 of 14 in the Barrow/Nore/ Suir and 2 out of 14 samples in Inner Bantry Bay. The latter 2 samples are external data collected under the Bantry Bay Terminal monitoring programme. One chromium result for sediment is flagged for Glengarriff Harbour and 4 of 5 sediment samples from Dublin Bay.

Silver: Concentrations of silver in water and biota were within the selected assessment criteria. No information is available for sediments.

Organochorine pesticides: With the exception of two single detections (one each of αHCH and βHCH), HCHs, DDTs, HCB, 'drins have not been detected in water above the laboratories reporting limit. The analytical method does not achieve the required sensitivity for the very low AA-EQS set for HCH in TCW. Many OCPs have high log Kow and so their detection in water would not be anticipated. OCPs are generally detected in biota but levels are low and within assessment criteria. Where trends are detected, such as for *p,p'*-DDE, lindane and HCB in mussels at Paddy's Point trend station in Cork Harbour, they are downwards and this downward trend would be expected to continue for these long regulated substances. However, due to environmental reservoirs (e.g. in sediments) and their persistence, their detection in the marine environment can be expected for many years to come.

PCBs: In general PCB concentrations are low in Irish waters. As anticipated, PCBs were not detected in seawater samples. In shellfish PCB concentrations are typically found to be higher close to urban/developed areas. OSPAR EACs have been developed for individual indicator CB congeners in mussel/oyster. In general CB congener concentrations do not exceed the EACs with the exception of Cork Harbour where a number of congeners exceed the EAC for *ca*.3 of 5 samples. CB118 as a planar ('dioxin-like') CB has the lowest EAC for the 7 indicator CBs and is exceeded at least once in a number of water bodies. Where significant temporal trends have been detected for CBs they are invariably downwards and the outlook would be for these trends to continue, although given the environmental persistence of these substances they are likely to be detected for years to come.

PAH: Time integrated water concentrations calculated from deployment of passive samplers in Liffey Estuary lower and Inner Galway Bay North exhibit dissolved concentrations below the WFD AA-QS for various PAH. PAH concentrations in biota, albeit for a limited number of water bodies, show OSPAR EACs are not exceeded, with the exception of two samples of mussel for naphthalene from outer Bantry Bay. However, there were a number of sediment samples that exceeded US-ERLs for sediment and consequently are flagged as amber.

TBT and Imposex related effects:

TBT is toxic to marine species at low concentrations with the irreversible condition of imposex i.e. the imposition of male genital organs (penis and vas deferens) on female gastropods and reproductive failure strongly associated with organotin exposure. Monitoring and research activities measuring imposex effects at Irish coastal locations are reported below.

OSPAR recommend two-year coastal sampling to evaluate recent status of specific areas however such a short time interval may become problematic in that snails live for periods that exceed two years and in heavily impacted localities insufficient numbers of dogwhelks may remain for analysis at this frequency of sampling.

This majority of data presented (1999 and 2005) are derived from the monitoring process set by the OSPAR Program in 1987 to visit certain marine regions every six years to monitor TBT contamination. This is further supplemented by recent research studies completed in 2007 and 2009. It should be noted that the 2 stations for 2007 (Dunmore East and North Bank Lighthouse – Liffey Estuary) relate to transplanted mussels. Furthermore the Dunmore East site is within the harbour walls, close to the synchrolift; a known source of TBT contamination within the harbour. Consequently this sample could be considered as worst case and certainly not representative of the Waterford Harbour outer water body.

The EcoQO set for TBT specific effects for the North Sea and as applied to the wider OSPAR area for the 2010 QSR assessment was used to assess the imposex status evident in *Nucella lapillus* from Irish waters (see table 3). The EcoQO was deemed to be met where the VDSI in *Nucella* was not found to exceed 2.0.

Following the ban on TBT in structures and small vessels (<25m) in 1987 the remaining centres of contamination occur in port regions. With IMO action and EC legislation phasing out TBT, levels of organotin are likely to decline further in Irish coastal areas. The expected consequence is a further reduction of biological effects such as imposex in dogwhelks, intersex in periwinkles and shell thickening of Pacific oysters.

TBT in water is also monitored in water and sediment as part of the Bantry Bay terminal monitoring programme and all seawater and sediment measurements were below the LoQ for the period assessed. Sediment concentrations are within the level 1 dredge guideline values. However, current analytical methods are not adequately sensitive to achieve the very low WFD EQS and therefore an assessment cannot be made using water data.

Recent data (2007 – 2009: i.e. MI research Imposex data and data from Bantry Bay monitoring programme) are included in table 2 overall assessment. Information of imposex status as measured since late 1990s is presented in Table 3.

Table 3: Imposex (VDSI) in *Nucella lapillus* at selected Irish marine locations.

	Locality	Survey Year	VDSI	EcoQO status	Survey Year	VDSI	EcoQO status	Survey Year	VDSI	EcoQO status	Comment
Carlingford	Ballagan shore	2000	4.04	Fail	2005	3.28	Fail				Improvement
	Greenore	2000	4.09	Fail	2005	3.68	Fail				Improvement
	Carlingford Pier	2000	4.06	Fail	2005	3.75	Fail				Improvement
Dublin Bay	Dun Laoghaire south	1999	4.00	Fail	2005	3.91	Fail				Improvement
	Dun Laoghaire end pier	1996	4.07	Fail	2005	3.56	Fail				Improvement
	Blackrock	1996	4.07	Fail	2005	2.65	Fail				Improvement
	South Bull	1999	4.00	Fail	2005	3.82	Fail				Improvement
	Poolbeg	1996	4.00	Fail	2005	3.37	Fail				Improvement
	North Bull	1999	4.25	Fail	2005	4.00	Fail				Improvement
	Sutton	1999	4.19	Fail	2005	4.00	Fail				Improvement
	Howth	1999	4.10	Fail	2005	3.94	Fail				Improvement
	Portmarnock							2009[2]	2.67	Fail	
	North Bank Lighthouse							2007[3]	0.25	Pass	
Kilmore Quay	West of St Patrick's Bridge	1997	4.33	Fail	2005	3.7	Fail				Improvement
	End of pier				2005	4.12	Fail				
	West shore	1997	3.00	Fail	2005	3.92	Fail				Similar
Waterford HBR	Dunmore East Harbour	1999	5.00	Fail	2005	4.21	Fail				Improvement
	Dunmore Strand	2000	4.13	Fail	2005	3.90	Fail				Improvement
	Woodstown Strand	2000	4.09	Fail	2005	4.15	Fail				Similar
	South of Ferry	2000	4.11	Fail	2005	4.00	Fail				Improvement
Cork HBR	Ahanesk Pier	2000	4.08	Fail	2005	4.04	Fail				Improvement
	Gold Point	2000	4.11	Fail	2005	4.00	Fail				Improvement
	Aghada	1999	4.40	Fail	2005	4.00	Fail	2009[2]	2.17	Fail	Improvement
	Cuskinny	1999	4.42	Fail	2005	4.10	Fail	2009[2]	1.86	Pass	Improvement
	Ringaskiddy East	1999	4.13	Fail	2005	4.19	Fail	2009[2]	1.59	Pass	Recovery
	Currabinny	1999	4.00	Fail	2005	4.00	Fail	2009[2]	0.81	Pass	Recovery
Castletown bere	Carne south	1996	4.75	Fail	2005	4.33	Fail				Similar
	Dinish south	1996	4.27	Fail	2005	4.50	Fail				Similar
	Dinish west	1996	5.00	Fail	2005	4.57	Fail				Similar
	Dinish east[1]	1996	4.00	Fail	2005	absent	Fail				No recovery
Tralee Bay	East of Fenit	2000	2.77	Fail	2005	3.78	Fail				Deterioration
	Pierhead	2000	3.86	Fail	2005	4.05	Fail				Deterioration
	Near to Spa	2000	2.38	Fail	2005	3.13	Fail				Deterioration
	Peninsula	2000	2.81	Fail	2005	3.37	Fail				Deterioration
	Pier, at land	2000	3.72	Fail	2005	3.96	Fail				Deterioration
Killybegs	Walkers Bay	1999	absent		2005	absent	Fail				No recovery
	Carntullagh	1999	absent		2005	absent	Fail				No recovery
	Green Island	1999	6.00	Fail	2005	absent	Fail				No recovery
	Port Rushin	1994	5.60	Fail	2005	absent	Fail				No recovery
	Lighthouse Point	1999	4.75	Fail	2005	4.00	Fail				Improvement
	Richies Bay	1994	5.57	Fail	2005	3.94	Fail				Improvement
	Cross Harbour	1994	3.80	Fail	2005	4.00	Fail				Similar
	Muckross Point	1997	1.75	Pass	2005	2.43	Fail				Similar
Other	Omey Island							2007[3]	0.00	Pass	
	Kinvara							2009[2]	0.04	Pass	
	Dunmore East							2007[3]	3.25	Fail	
	New Quay (Clare)							2009[2]		Pass	

[1] Dinish Island relatively heavily contaminated and dogwhelks have not repopulated this area (2005). Note that since this survey was completed there has been substantial development at Dinish. As part of that contaminated sediments were removed from the area and disposed of as hazardous waste.

[2] Unpublished Marine Institute Data

[3] 2007 survey results from Dunmore East and Northbank Lighthouse based on transplanted (t=18 weeks) *Nucella lapillus* (with original VDSI 0.0)

environment, such as brominated flame retardants (PBDEs and HBCD), dioxins, polychlorinated naphthalenes and polyfluorinated compounds. There are no suitable assessment criteria in biota or sediment for these parameters although OSPAR have proposed putting in place a mechanism to develop EACs for them.

Polybrominated diphenylethers: PBDEs – Three commercial formulations of PBDEs (PentaBDE, OctaBDE and DecaBDE) have been widely used brominated flame retardants. The PentaBDE formulation is classed as a priority hazardous substance under Annex X of the WFD and three commercial formulations are detected in mussel samples from Irish coastal waters (n=11, samples from North Bull Island (Dublin Bay), Cork Harbour, Barrow/Nore/Suir estuary, Shannon Estuary). BDE congeners 47, 49, 99, 100 and 209 are among the highest concentrations detected. The detection of the deca-congener (BDE 209) suggests input of DecaBDE technical mix. The maximum value for BDE 209 was 5.62 µg kg^{-1}dw (n=11). The range for the sum of BDE congeners 28, 47, 99, 100, 153, 154 (congeners stipulated for seawater EQS in Dir 2008/105/EC) is 0.45 – 33.7 µg kg^{-1} dw (mean 8.52; median 6.0 µg kg^{-1} dw). Both maximum and minimum values derive from samples from the Paddy's Point station in Cork Harbour.

Hexabromocyclododecane HBCD –is also a brominated flame retardant detected in mussels at four OSPAR trend stations. Concentration ranges from 3 – 58 µg kg^{-1}dw (mean = 21 µg kg^{-1}dw, n=11) were detected. No assessment criteria have been developed for HBCD in mussels and sediments although as a substance included in the CEMP this is on the OSPAR work plan.

Dioxins (PCDD/Fs) and dioxin like (co-planar) PCBs (DL-PCBs) – PCDD/Fs are ubiquitous contaminants and detected in shellfish in areas tested. There are no specific OSPAR EACs for PCDD/Fs and WHO-PCBs. However the maximum value for sum total PCDD/Fs and PCDD/Fs/WHO-PCBs expressed as WHO 1998 Toxic Equivalents (TEQs) is well within the maximum food safety limit. OSPAR have initiated a process to develop EACs for PCDD/F and WHO-PCBs.

Perfluorinated compounds (PFCs) – There are no EACs for PFCs at present although OSPAR propose developing an EAC for PFOS. PFOS and PFOA concentrations in 4 mussel samples from the OSPAR trend stations were below the limits of quantification for the analytical method. Five oyster samples from shellfish growing waters sampled in 2007 also showed all PFC concentrations including PFOA and PFOS to be below the limit of quantification

Polychlorinated naphthalenes (PCN) - as part of a broader survey of PCNs in foodstuffs, PCNs were determined in oysters sampled from five shellfish growing areas in 2007. Concentrations were low and below the detection limits for most congeners. Co-eluting PCN congeners 52/60 were the most abundant. The range of concentrations for the five samples was 0.9 – 1.8 µg kg^{-1} dw (PCN congeners 52/6, 53, 66/67, 68, 69, 71/72, 73, 74, 75) .

3.4 Other supporting information and complementary techniques

3.4.1 Passive sampling

The MI is currently active in the area of the application of PS to environmental monitoring and has a number of research initiatives focused on primarily on the measurement of hydrophobic contaminants (e.g. PCBs/OCPs and PAHs).

Measurement of dissolved contaminant levels in water can often only provide a limited representative picture regarding seasonal variations and point source discharges of contaminants. Passive sampling techniques potentially offer significant "time-integrated" advantages over conventional spot analysis. Silicone rubber passive samplers (PS) in tandem with co-deployed transplanted blue mussels (*Mytilus edulis*) as a bio-indicator species, were deployed in 2006 to monitor dissolved water concentrations (C_w) of PCBs and PAHs at the North Bank lighthouse in Dublin Bay and at Rinville in Galway Bay. Passive sampler derived calculated water concentrations for PAHs and PCBs were measured at a level down to picograms per litre and assessed against WFD AA-QS. These data are incorporated in Table 2. PAHs and PCB dissolved water concentrations were generally low and within AA-EQS where available in both water and mussels at both sites, with the higher concentrations observed at the Dublin site. Overall it has been demonstrated that silicone rubber PS provides a promising method for the time integrated monitoring of dissolved phase PAH/PCB concentrations in Irish marine waters.

3.4.2 Sediment Toxicity Bioassays

Internationally, tests such as those using the amphipod *Corophium volutator* and the polychaete *Arenicola marina* are regularly used within marine monitoring programmes to assess the acute toxicity of marine sediments. As part of a SeaChange funded project entitled "Biological Effects And Chemical Measurements For The Assessment Of Pollution In Irish Marine Waters" a number of whole sediment toxicity end points have been completed at 8 sites around Ireland and results of this initial pilot study are discussed.

A.marina ingests sediment while *C.volutator* grazes on sediment particles and in both bioassays, the animals are exposed under controlled conditions to collected whole sediments, and mortality is measured after 10 days with feeding behaviour of *A. marina* also measured. For both methods the end point is mortality. A secondary endpoint in the *Arenicola* assay is a sub-lethal physiological response based on the rate of production of faecal casts on the sediment surface. While no standardised assessment criteria are available for these whole sediment assays, a classification scheme based on recommendations by ICES has been adopted.

Table 4: a) Preliminary background levels and assessment tools for bioassay biological effects techniques as proposed by ICES (2009)[14]

Effect level (mortality %)	*Corophium volutator*	*Arenicola marina*
Background range	0- <30	0 - <10
Elevated response range	>30- <60	>10- <50
High - cause for concern	>60e	>50

b) Percentage mortality in *Corophium* and mortality and inhibition in *Arenicola* . Whole sediment collected at selected Irish marine locations.

Location	Water Body	*C. volutator* (% mortality)	*A. marina* (% mortality)	*A. marina*[1] (% inhibition)
Lettermullen	Kilkieran Bay	**7**	**21.4**	**0**
Bantry	Inner Bantry Bay	**3.3**	**13.3**	**0**
Newquay	Aughinish Bay	**0**	**0**	**0**
Clontarf	Tolka Estuary	**3.3**	**20**	**0**
Tralee	Inner Tralee Bay	**28**	**0**	**0**
Kinvara	Kinvara Bay	**10**	**7**	**0**
Wexford	Lower Slaney Estuary	**6.7**	**73**	**87**
Ringaskiddy	Cork Harbour	**1.7**	**13.3**	**27**

[1] Percentage mortality effect criteria applied to *A. marina* inhibition bioassay.

Overall the quality of tested sediments was found to be good, high percentage mortalities and inhibition were observed using *A.marina* for the Wexford sample, however the same sample exhibited good status using the *C.volutator* bioassay. The Wexford site is currently subject to further sediment testing in addition to extensive multi trophic level battery of biological effects and chemical monitoring testing will be completed in late 2010.

4. Conclusions and implications for ongoing monitoring

4.1 Aggregated summary assessment and conclusions

Table 5 provides a summary of overall status for Annex X substances per water body based on 'worst-case' scenario approach (see 2.3.5). Table 6a provides a summary of overall status for all other (Annex VIII) substances per water body. Colour coded status of water bodies by matrix and parameter group are also presented as maps in Figure 5. This includes separation into Annex X and Annex VIII substances (Figures 5b, 5c and 5d). In general the status of hazardous substances in Irish TCW with respect to the substances measured tends to be good with the conservative worst case scenario across parameters and matrices suggesting a bleaker picture than is actually the case. Few areas are flagged with a *less-than good* (red) status with other than low confidence. The parameter most frequently exceeding an assessment criterion is CB118 in biota. As one of the co-planar ('dioxin-like') PCBs the OSPAR EAC set for this parameter is very low and OSPAR-wide assessments indicate that this is a widespread concern throughout European coastal waters. The Annex VIII overall status table and relevant figures are also reiterated excluding CB118 in biota

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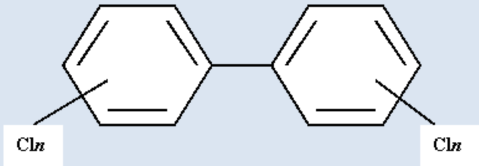
(Table 6b and Figures 5d and 5f). Figures 5g and 5h present the aggregated assessments Annex X and VIII substances in water and sediment, respectively.

See Box 2 for more information on sources of PCBs and measures in place to mitigate PCB contamination of the environment.

Box 2: Case Study: Polychlorinated biphenyls (PCBs) and CB 118:

PCBs are man-made substances with a molecular structure comprising of a chlorinated biphenyl ring. There are 209 molecular configurations or 'congeners' reflecting the number of chlorine atoms (1 to 10) and their positioning on the biphenyl ring. PCBs were widely used for a variety of purposes, most notably as dieletrics in electrical equipment such as transformers and capacitors. Restrictions on their use in USA and Europe were introduced in the 1970s with use in closed systems such as transformers not permitted since the 1980s in Europe. They are listed as a Persistent Organic Pollutant under the Stockholm Convention (2001). Nonetheless, the EPA has estimated 522,081 litres PCB holdings in Ireland[15] which are a potential source to the aquatic environment, for instance if improper waste disposal practices occur. Indeed use of PCB-contaminated recycled oil in drying ovens for animal feed precipitated the Irish Pork Dioxin Crisis in 2008.



PCBs are persistent semi-volatile substances. Their detection in the aquatic environment does not necessarily infer recent or indeed local inputs. Sediments are long term sinks for PCBs and they tend to bioaccumulate in aquatic organisms. Long-range atmospheric transport is an important distribution mechanism that has resulted in PCB being detected in remote areas of the world.

Commercial PCB formulations are used as complex 'technical mixtures' but selected individual congeners, such as CBs 28, 52, 101, 118, 138,153 and 180 (ICES CB7), are usually monitored in environmental matrices. Different congeners exhibit different toxicities and consequently OSPAR has established Environmental Assessment Criteria (EACs) for individual CB congeners. Moreover, some of the CB congeners, specifically mono-ortho and non-ortho CBs, exhibit a 'dioxin-like' mode of toxicity. This is the case for CB118 and consequently a very low EAC in shellfish has been established by OSPAR for CB118. This EAC was exceeded in a number of samples in the Marine Institute's assessment of hazardous substances in transitional and coastal waters (2007-2009), although other measured congeners tended not to exceed relevant EACs. Given the very low EAC, these exceedances may reflect residual environmental pollution associated with diffuse historical sources and atmospheric inputs as well as environmental variability and may not be due to local or recent inputs of PCBs. Indeed, where temporal trends are detected for PCBs in the Irish Marine Environment these are invariably downwards. Therefore exceeding the EAC for CB118 should not automatically trigger local measures without broader consideration of the issues. The EPA[16] published a management plan for PCBs in 2008 addressing requirements of Council Directive 96/59/EC on PCBs and PCTs and national legislation (SI No 163 of 198)[17]. This put in place a plan with a view to removing large PCB holdings by 2010 and early disposal of small holdings. Given the relatively low levels and downward trends of PCBs in the Irish marine environment this may be a sufficient measure to address PCB contamination if fully implemented. Nonetheless their persistence will mean their continued detection in environmental matrices for many years if not decades to come.

Exceeding the assessment criteria for trace metals is the most common reason for an overall classification of *less than good*. In particular water testing leads to a relatively high incidence of *less than good* status and this may in part be due to difficulties in monitoring seawater. Furthermore, it seems clear that the assessment criteria for some metals in sediment, especially

[15] EPA (2010) National Large PCB Holdings Inventory Updated March 2010 and National Small PCB Holdings Inventory Updated January 2010 http://www.epa.ie/downloads/pubs/waste/haz/
[16] EPA (2008). Management Plan for Polychlorinated Biphenyls (PCBs) in Ireland: Including a Cod of Practice for the in-use Management of PCBs and PCB Containing Equipment. Environmental Protection Agency, Wexford, August 2008. http://www.epa.ie/downloads/pubs/waste/haz/pcb%20management%20plan.pdf
[17] S.I. No. 163/1998 — Waste Management (Hazardous Waste) Regulations, 1998

nickel and arsenic are over-conservative. Appropriate assessment criteria for sediments that facilitate normalisation, for instance to take grain size into account, are urgently required.

Where trends occur for OCPs and PCBs they tend to be downward and it is anticipated that this will continue. The OCPs included in monitoring are at levels indicative of good status or better.

Although there are limited recent data, there is evidence of an improvement with respect to TBT-related imposex effects in dogwhelks although concerns are limited to areas around major fishing/shipping ports. It is expected that the situation will continue to improve following IMO/EC measures implemented to phase out use of TBT as an anti-fouling agent.

In general PAH in biota and water were not found at levels considered to be of concern although US ERLs were frequently exceeded for sediments.

Compounds such as PBDEs and HBCD were detected in mussels although assessment criteria are not yet developed. In particular detection of BDE 209 suggests inputs of DecaBDE.

In general results indicate the primary areas of concern to be estuaries and bays subject to major urban influence such as Dublin Bay, Cork Harbour and Barrow/Nore/Suir Estuary. Other areas of potential concern include Tralee Bay where there is some indication of trace metal (cadmium) pollution. The trend station at North Bull Island also indicates significant upward trends for certain trace metals (cadmium, copper and zinc) in recent years.

4.2 Future monitoring

Chemical monitoring should be continued for trace metals, PCBs, PAH, PBDEs and HBCD. There is little evidence from many years of monitoring of recent inputs of organochlorine pesticides. TBT monitoring should include a survey of imposex at shipping areas/main ports in 2011 to continue the long term trend assessment undertaken since 1987. For high log Kow substances with limited water solubility, passive sampling and biota monitoring offer cost effective alternatives for monitoring to water monitoring. However, more work is required internationally to develop practical assessment criteria for biota and especially sediments that are WFD compliant, have appropriate guidance for use and are comparable with monitoring data, and take background concentrations and variability into account. OSPAR have initiated this task to fill key gaps in assessment criteria.

Monitoring for the second WFD monitoring cycle (2010 – 2015) should be implemented on the basis of the plan proposed by the Marine Institute in 2006 but taking the findings of this assessment and the monitoring data from WFD freshwater monitoring in the 2007 – 2009 cycle.

Table 5: Overall status per water body: Annex X substances

		Annex X									
WFD Area	**Class**	**Overall Status**	**Biota**	**Water**	**Sediment**	**Biological Effects (Imposex)**	**Metals**	**Organochlorines**	**Hexachlorocylohexanes**	**PAHs**	**TBT**
Adrigole Harbour	TW										
Aran Islands, Galway Bay, Connemara (HAs 29;31)	CW										
Aughinish Bay	CW										
Ballynakill Bay	CW										
Ballysadare Estuary	TW										
Ballyvaghan Bay	CW										
Bannow Bay	CW										
Barrow Suir Nore Estuary	TW										
Berehaven	CW										
Blacksod Bay	CW										
Blacksod Bay SW / Achill Sound	CW										
Carlingford Lough	CW										
Casla Bay	CW										
Clifden Bay	TW										
Cork Harbour	CW										
Cromane	TW										
Donegal Bay (Erne)	CW										
Dublin Bay	CW										
Dunbulcaun Bay	TW										
Dungarvan Harbour	CW										
Dungloe Bay	CW										
Dunmanus Bay	CW										
Glengarriff Harbour	TW										
Gweebarra Estuary	TW										
Gweedore Estuary	TW										
Ilen Estuary	TW										
Inner Bantry Bay	TW										
Inner Clew Bay	CW										
Inner Galway Bay North	CW										
Inner Tralee Bay	CW										
Inver Bay	CW										
Irish Sea Dublin (HA 09)	CW										
Kilkieran Bay	CW										
Killala Bay	CW										
Killary Harbour	CW										
Kilmakilloge Harbour	TW										
Kinvarra Bay	TW										
Liffey Estuary Lower	TW										
Lough Foyle	CW										
Loughros Bay	CW										
Lower Bandon Estuary	TW										
Lower Blackwater M Estuary / Youghal Harbour	TW										
Lower Shannon Estuary	TW										
Lower Slaney Estuary	TW										
Mannin Bay	CW										
McSwines Bay	CW										
Mouth of the Shannon (HAs 23;27)	CW										
Mulroy Bay Broadwater	CW										
Newport Bay	TW										
North Bull Island	TW										
North Channel Great Island	TW										
Outer Bantry Bay	CW										
Outer Dundalk Bay	CW										
Outer Kenmare River	CW										
Outer Tralee Bay	CW										
Oysterhaven	TW										
Roaring Water Bay	CW										
Rogerstown Estuary	TW										
Sheephaven Bay	CW										
Sligo Bay	CW										
Sligo Harbour	CW										
Swilly Estuary	TW										
Trawbreaga Bay	CW										
Trawena Bay	CW										
Upper Shannon Estuary	TW										
Valencia Harbour	CW										
Waterford Harbour Outer	CW										
Western Atlantic Seaboard (HAs 32;33;34)	CW										
Westport Bay	TW										
Wexford Harbour	CW										
Youghal Bay	CW										

TW - Transitional Waters CW - Coastal Waters

Table 6a: Overall status per water body for Annex VIII substances including CB118

Annex VIII											
WFD Area	**Class**	**Overall Status**	**Biota**	**Water**	**Sediment**	**Metals**	**Chlorobiphenyls**	**DDTs**	**Cyclodienes**	**PAHs**
Adrigole Harbour	TW									
Aran Islands, Galway Bay, Connemara (HAs 29;31)	CW									
Aughinish Bay	CW									
Ballynakill Bay	CW									
Ballysadare Estuary	TW									
Ballyvaghan Bay	CW									
Bannow Bay	CW									
Barrow Suir Nore Estuary	TW									
Berehaven	CW									
Blacksod Bay	CW									
Blacksod Bay SW / Achill Sound	CW									
Carlingford Lough	CW									
Casla Bay	CW									
Clifden Bay	TW									
Cork Harbour	CW									
Cromane	TW									
Donegal Bay (Erne)	CW									
Dublin Bay	CW									
Dunbulcaun Bay	TW									
Dungarvan Harbour	CW									
Dungloe Bay	CW									
Dunmanus Bay	CW									
Glengarriff Harbour	TW									
Gweebarra Estuary	TW									
Gweedore Estuary	TW									
Ilen Estuary	TW									
Inner Bantry Bay	TW									
Inner Clew Bay	CW									
Inner Galway Bay North	CW									
Inner Tralee Bay	CW									
Inver Bay	CW									
Kilkieran Bay	CW									
Killala Bay	CW									
Killary Harbour	CW									
Kilmakilloge Harbour	TW									
Kinvarra Bay	TW									
Liffey Estuary Lower	TW									
Lough Foyle	CW									
Loughros Bay	CW									
Lower Bandon Estuary	TW									
Lower Blackwater M Estuary / Youghal Harbour	TW									
Lower Shannon Estuary	TW									
Lower Slaney Estuary	TW									
Mannin Bay	CW									
McSwines Bay	CW									
Mouth of the Shannon (HAs 23;27)	CW									
Mulroy Bay Broadwater	CW									
Newport Bay	TW									
North Bull Island	TW									
North Channel Great Island	TW									
Outer Bantry Bay	CW									
Outer Dundalk Bay	CW									
Outer Kenmare River	CW									
Outer Tralee Bay	CW									
Oysterhaven	TW									
Roaring Water Bay	CW									
Rogerstown Estuary	TW									
Sheephaven Bay	CW									
Sligo Bay	CW									
Sligo Harbour	CW									
Swilly Estuary	TW									
Trawbreaga Bay	CW									
Trawena Bay	CW									
Upper Shannon Estuary	TW									
Valencia Harbour	CW									
Western Atlantic Seaboard (HAs 32;33;34)	CW									
Westport Bay	TW									
Wexford Harbour	CW									
Youghal Bay	CW									

TW - Transitional Waters CW - Coastal Waters

Table 6b: Overall status per water body for Annex VIII substances excluding CB118

Annex VIII (without CB118)										
WFD Area	**Class**	**Overall Status**	**Biota**	**Water**	**Sediment**	**Metals**	**Chlorobiphenyls**	**DDTs**	**Cyclodienes**	**PAHs**
Adrigole Harbour	TW									
Aran Islands, Galway Bay, Connemara (HAs 29;31)	CW									
Aughinish Bay	CW									
Ballynakill Bay	CW									
Ballysadare Estuary	TW									
Ballyvaghan Bay	CW									
Bannow Bay	CW									
Barrow Suir Nore Estuary	TW									
Berehaven	CW									
Blacksod Bay	CW									
Blacksod Bay SW / Achill Sound	CW									
Carlingford Lough	CW									
Casla Bay	CW									
Clifden Bay	TW									
Cork Harbour	CW									
Cromane	TW									
Donegal Bay (Erne)	CW									
Dublin Bay	CW									
Dunbulcaun Bay	TW									
Dungarvan Harbour	CW									
Dungloe Bay	CW									
Dunmanus Bay	CW									
Glengarriff Harbour	TW									
Gweebarra Estuary	TW									
Gweedore Estuary	TW									
Ilen Estuary	TW									
Inner Bantry Bay	TW									
Inner Clew Bay	CW									
Inner Galway Bay North	CW									
Inner Tralee Bay	CW									
Inver Bay	CW									
Kilkieran Bay	CW									
Killala Bay	CW									
Killary Harbour	CW									
Kilmakilloge Harbour	TW									
Kinvarra Bay	TW									
Liffey Estuary Lower	TW									
Lough Foyle	CW									
Loughros Bay	CW									
Lower Bandon Estuary	TW									
Lower Blackwater M Estuary / Youghal Harbour	TW									
Lower Shannon Estuary	TW									
Lower Slaney Estuary	TW									
Mannin Bay	CW									
McSwines Bay	CW									
Mouth of the Shannon (HAs 23;27)	CW									
Mulroy Bay Broadwater	CW									
Newport Bay	TW									
North Bull Island	TW									
North Channel Great Island	TW									
Outer Bantry Bay	CW									
Outer Dundalk Bay	CW									
Outer Kenmare River	CW									
Outer Tralee Bay	CW									
Oysterhaven	TW									
Roaring Water Bay	CW									
Rogerstown Estuary	TW									
Sheephaven Bay	CW									
Sligo Bay	CW									
Sligo Harbour	CW									
Swilly Estuary	TW									
Trawbreaga Bay	CW									
Trawena Bay	CW									
Upper Shannon Estuary	TW									
Valencia Harbour	CW									
Western Atlantic Seaboard (HAs 32;33;34)	CW									
Westport Bay	TW									
Wexford Harbour	CW									
Youghal Bay	CW									

TW - Transitional Waters CW - Coastal Water

Figure 5: Maps of aggregated classification status

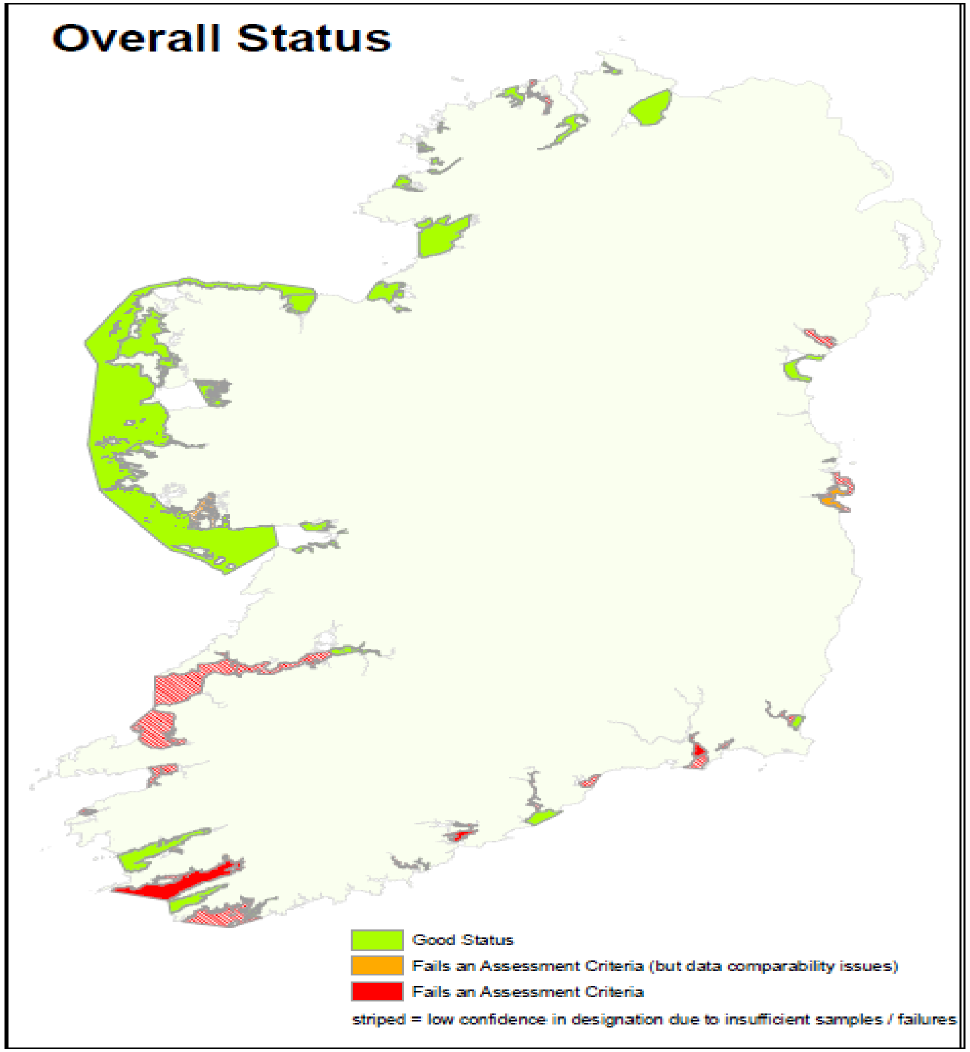


Figure 5a: Overall aggregated assessment Annex X and VIII substances

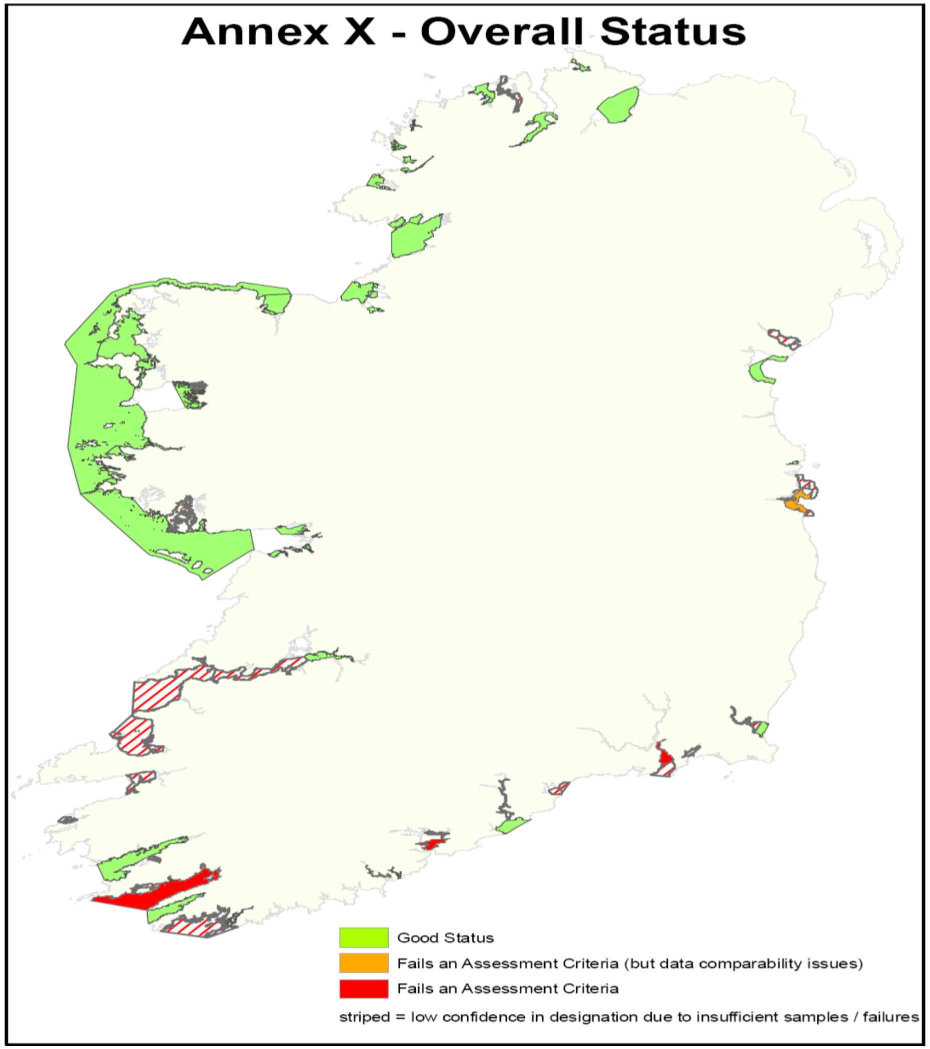


Figure 5b: Overall aggregated assessment Annex X Substances

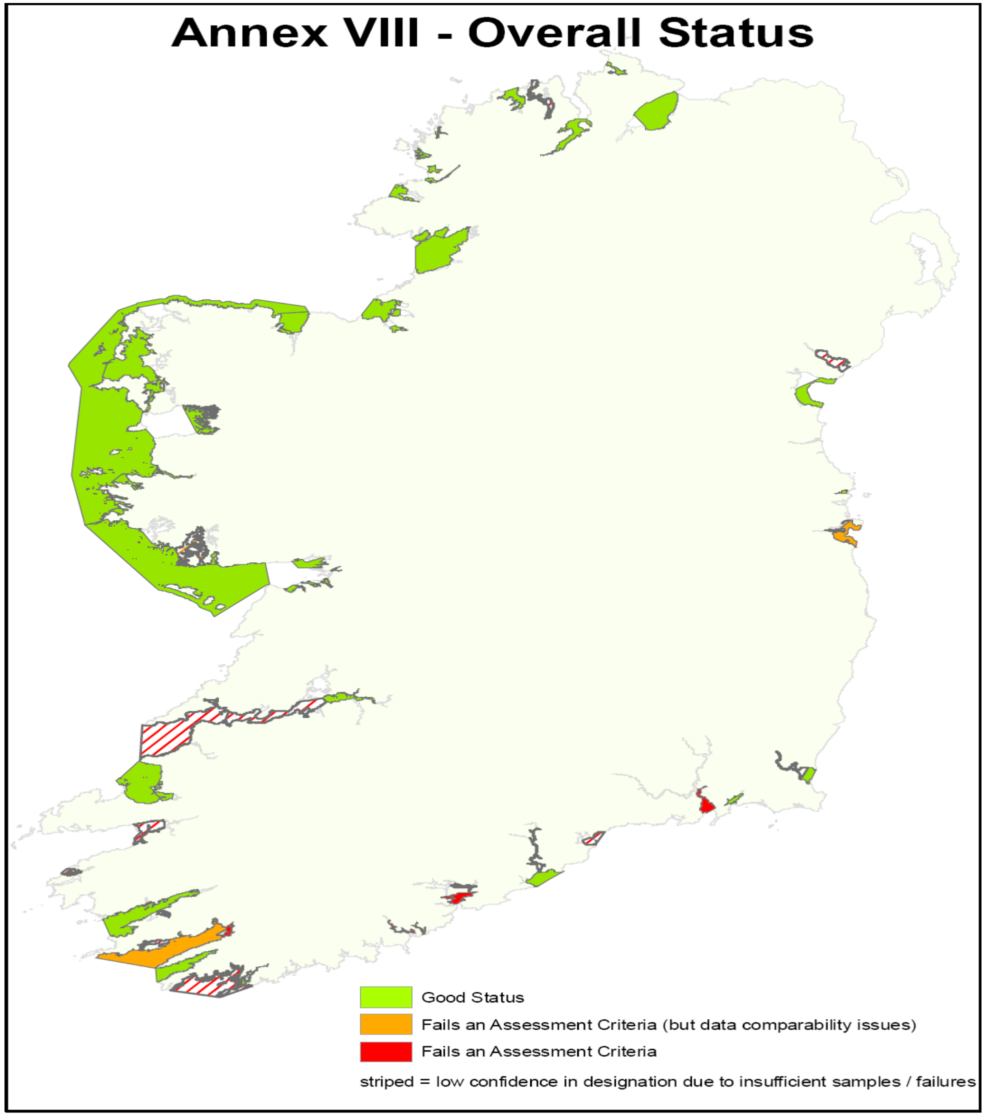


Figure 5c: Overall aggregated assessment Annex VIII Substances

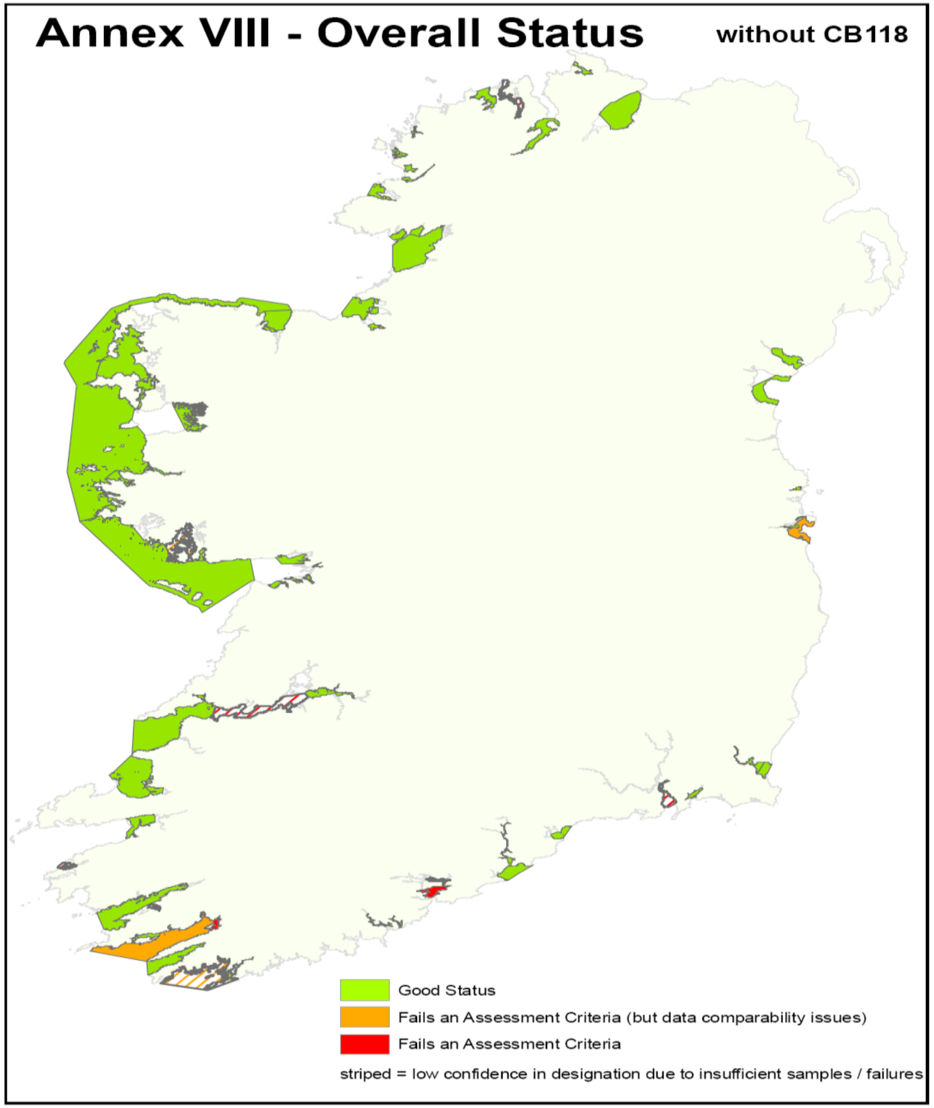


Figure 5d: Overall aggregated assessment Annex VIII Substances without CB118

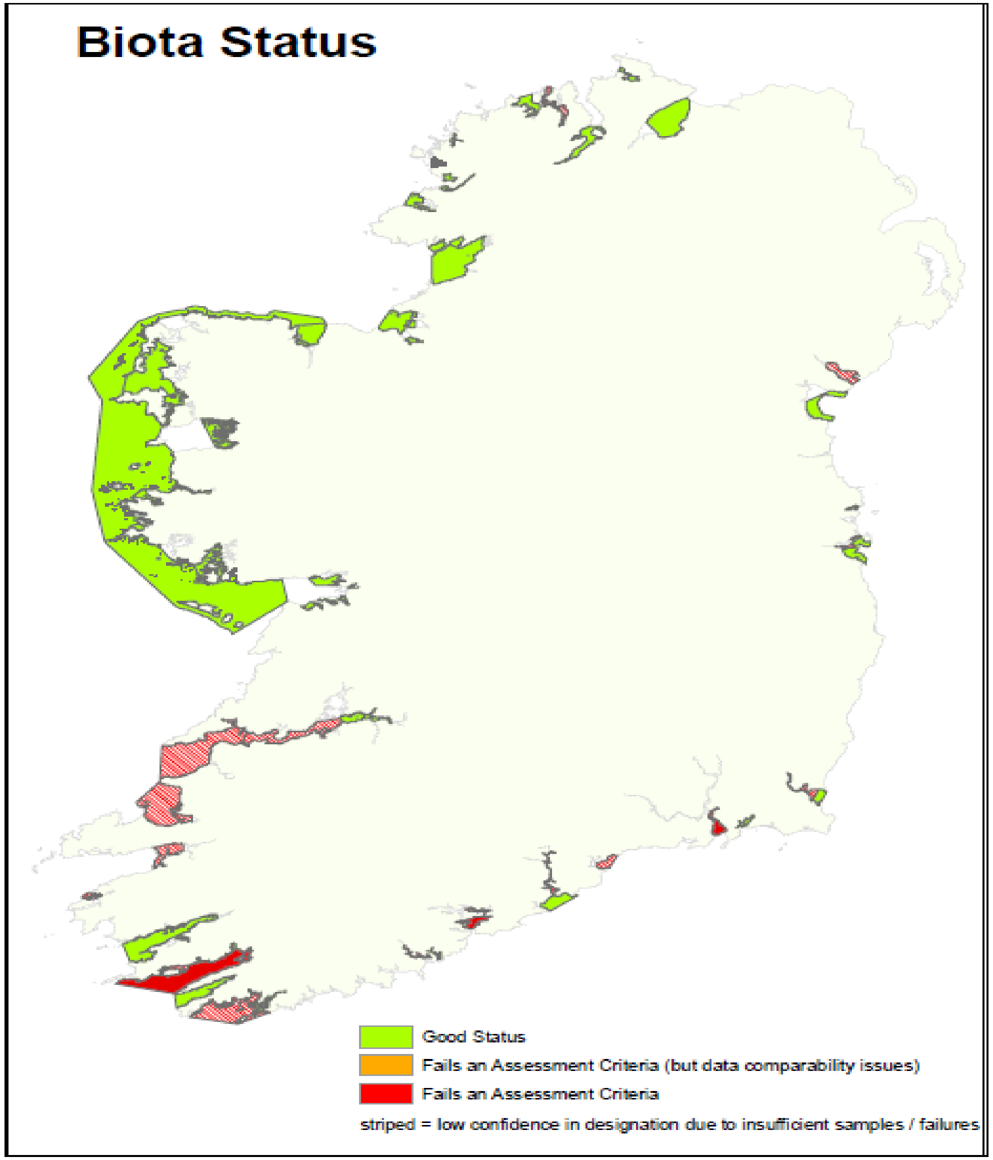


Figure 5e: Aggregated biota assessment Annex X and VIII substances

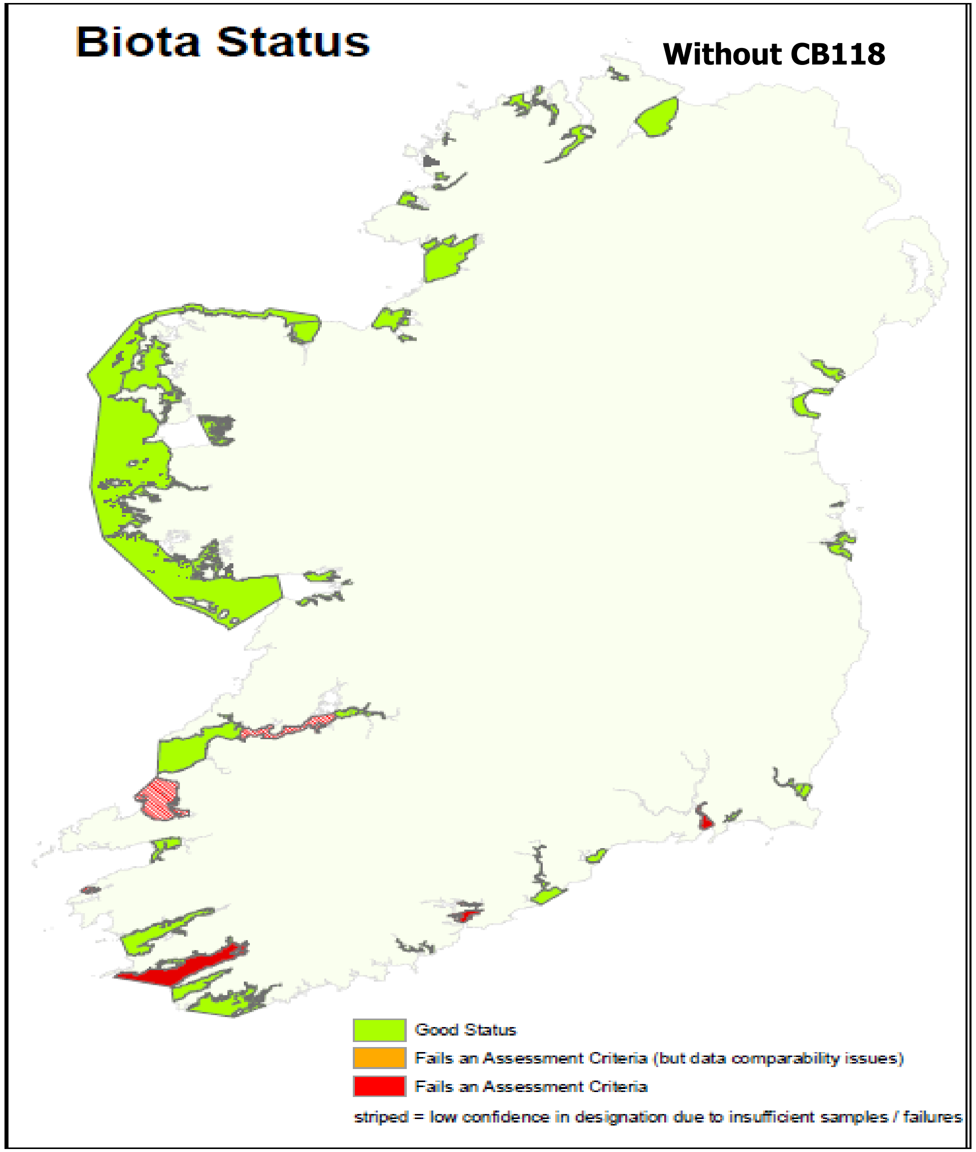


Figure 5f: Aggregated biota assessment without CB118 Annex X and VIII substances

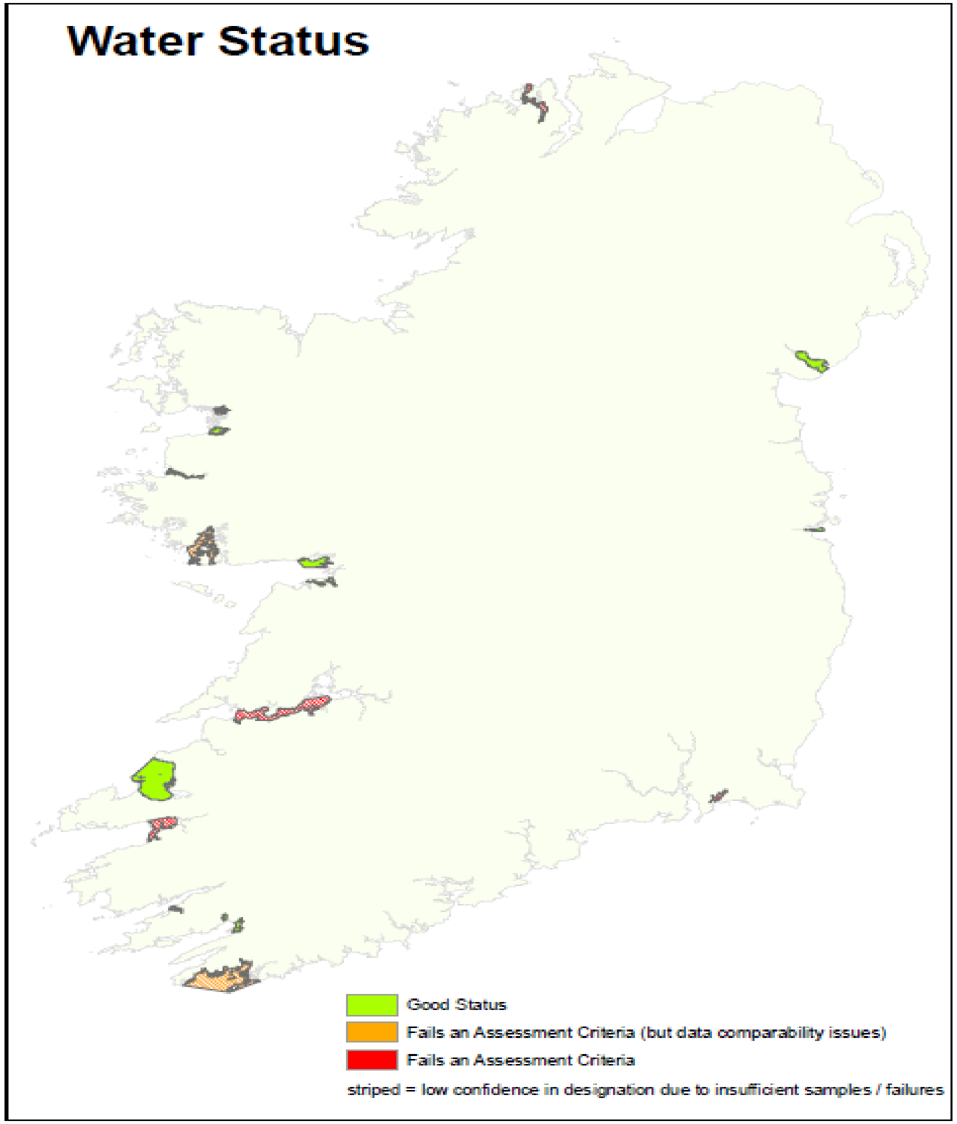


Figure 5g: Aggregated water assessment Annex X and VIII substances

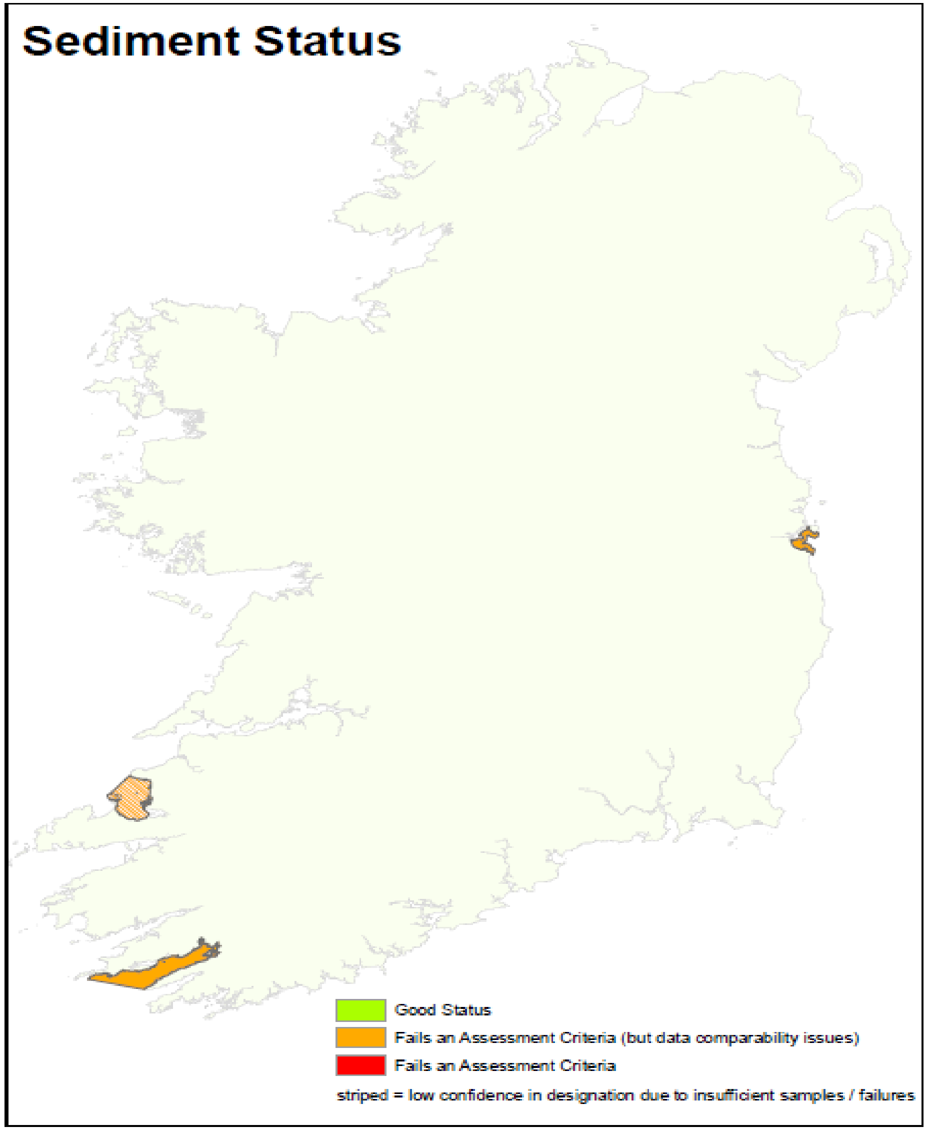


Figure 5h: Aggregated sediment assessment Annex X and VIII substances

Annex A: Assessment criteria used in this report

Assessment Criteria – Water:

Selected assessment criteria for seawater are set out in table A.1. Where available Directive 2008/56/EC[18] & S.I. 272 of 2009 water standards are applied. However shellfish waters Imperative values (as MAC-QS) are also used where there are gaps. Monitoring data is available for total Cr but SI 272 of 2009 only sets standards for Cr(VI) and Cr (III). The standard for Cr (VI) is preferred to compare with total chromium data as Cr (VI) is anticipated to be the more abundant form. However, this is recognised as a conservative approach and consequently values that exceed the standard are flagged as amber rather than red.

Table A 1: Assessment criteria for hazardous substances in seawater used to classify good and less than good status of water bodies. Annual average (AA) and maximum allowable concentrations – (MAC)

All µg l^{-1}	AA-EQS	MAC-EQS
Metals (dissolved)		
Mercury	**0.05**	**0.07**
Cadmium	**0.2**	**5**
Lead	**7.2**	**20**
Nickel	**20**	**50**
Copper	5	10
Zinc	40	200
Chromium*	0.6	32
Silver		10
Arsenic	20	40
Organochlorines		
HCHs	**0.002**	**0.02**
HCB	**0.01**	**0.05**
DDT total (Sum opDDT, ppDDT, ppDDE, pp DDD)	**0.025**	**n/a**
Sum 'drins	**0.005**	**n/a**
PCBICES7		0.3
Others		
TBT	**0.0002**	**0.0015**

Key	Colour
WFD Priority substance AA/MAC-QS Dir 2008/105/EC	red
Shellfish waters Imperative values (MAC-QS) SI 268 of 2006[19]	green
WFD Relevant pollutant .AA/MAC-QS SI 272 of 2009	purple

*No standard for total chromium, Standard given is that for Cr (VI) in SI 272 of 2009. AA-EQS value is stricter than that set for Cr (III) but Cr (VI) expected to be dominant form in seawater

[18] Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive)

[19] S.I No. 268 of 2006 E*uropean Communities (Quality of Shellfish Waters) Regulations 2006*

Assessment Criteria – Biota:

Selected assessment criteria for mussels and oyster to best represent the *good:less than good* boundary are given in Table A.2. SWD proposed[20] imperative values require 100% compliance. OSPAR EACs tend to be assessed against upper confidence intervals e.g. in trend assessments. Therefore in this case and for consistency of approach they are used as MAC-QS standards

Table A.2: Assessment Criteria for hazardous substances in bivalve molluscs selected as most appropriate to denote *good:less than good* status (standards used as MAC-QS).

Trace metals		**MAC mg kg^{-1} dw**	**MAC mg kg^{-1} ww**
Ag	Mussel	1.0	0.2
	Oyster	25.0	5.0
As	Mussel & oyster	70.0	14.0
Cd	Mussel	5.0	1.0
	Oyster	5.0	1.0
Cu	Mussel	40.0	8.0
	Oyster	330.0	66.0
Cr	Mussel & oyster	8.0	1.6
Hg	Mussel & oyster	0.4*	0.08*
Ni	Mussel & oyster	5.0	1.0
Pb	Mussel & oyster	7.5	1.5
Zn	Mussel	320.0	64.0
	Oyster	7070.0	1414.0
PCBs		**µg kg^{-1} dw**	**µg kg^{-1} ww**
PCBs- Sum ICES 7 CBs	Mussel & Oyster	140.0**	28.0**
CB28	Mussel & Oyster	3.2	0.6
CB52	Mussel & Oyster	5.4	1.1
CB101	Mussel & Oyster	6.0	1.2
CB118	Mussel & Oyster	1.2	0.2
CB138	Mussel & Oyster	15.8	3.2
CB153	Mussel & Oyster	80.0	16.0
CB180	Mussel & Oyster	24.0	4.8
Organochlorines Pesticides		**MAC µg kg^{-1} dw**	**MAC µg kg^{-1} ww**
Dieldrin	Mussel & oyster	50.0	10.0
DDE-pp'	Mussel & oyster	30.0	6.0
HCB	Mussel & oyster	50	10.0
Lindane (gHCH)	Mussel & oyster	45.0	9.0
HBCD	Mussel & oyster	275	55.0
Dioxins and WHO-PCBs		**MAC ng WHO TEQ kg^{-1} ww**	
PCDD/F			4
PCDD/F & WHO PCBs			8
WFD Priority Substance	EC-EQS for biota. Dir 2008/105/EC		
	New proposed Imperative values for biota for SWD		
	OSPAR EAC-passive PCBs		
	EC Food safety limit. Reg 1881/2006/EC		

* EC standard set in Dir 2008/105/EC 20µg kg^{-1} is at or close to background concentration for bivalve molluscs in unimpacted coastal areas. As directive allows for background concentration to be taken into account a modelled 99% background concentration was determined. The MAC-QS is calculated based on background concentration + EC-QS

** sum of the OSPAR EACs for ICES 7 CBs

20 These are proposals and have no legislative basis at present. They take into account background concentrations (concentrations for areas with few known pressures)

Assessment Criteria – Sediment:

Assessment criteria for sediment are set out in table A.3. Despite ongoing work by OSPAR/ICES, practical EACs have only been derived for PCBs in sediments. While OSPAR have used US-ERLs (effects range low, Long et al 1998[21]) as provisional basis for QSR 2010 assessments to fill gaps, it is recognised that this approach has significant limitations[22.] Long defines ERLs as concentrations representing "a minimal –effects range…in which effects would be rarely observed". Irish lower category dredge spoil guidelines are based on ERLs but also account for background concentrations where such data was available to show that ERLs where lower than background. However, the ERL values are generally conservative. Furthermore, factors such as organic carbon content and grain size distribution strongly influence contaminant concentrations so normalisation is preferred for spatial /temporal comparisons of sediment concentrations. Bearing in mind the influence of grain size, MI analyse the <63 µm sediment fraction in accordance with OSPAR guidelines. However, the ERLs/dredge values are set for total sediments do not readily allow for normalisation and are used directly. The frequency of exceedances of ERLs is expected to increase with increasing fine material and this has indeed been observed[11]. Consequently exceedances of these values are given an amber flag and should be treated with caution. A further confounding factor in assessing metals concentrations in mixed sediment datasets is that different digestion procedures (total/ strong partial etc.) may have been used further compromising comparability.

Table A.3: Assessment Criteria for hazardous substances in sediment. [normalisation factors e.g. CBs others not normalised]

Trace metals	µg kg^{-1} dw
Mercury	**0.2**
Cadmium	**1**
Lead	**60**
Copper	**40**
Zinc	**160**
Arsenic	**9**
Chromium	**120**
Nickel	**21**
PCBs*	
CB28	**1.7**
CB52	**2.7**
CB101	**3**
CB118	**0.6**
CB138	**7.9**
CB153	**40**
CB180	**12**
Sum ICES 7 CBs	**68****
OCPs	
g – HCH (Lindane)	0.3
HCB	0.3
PAH23	
Naphthalene	**160**
Phenanthrene	**240**
Anthracene	**85**
Fluoranthene	**600**
Pyrene	**665**
Benzo-[a]-anthracene	**261**
Chrysene /triphenylene	**384**
Benzo-[a]-pyrene	**430**
Benzo-[ghi]-perylene	**85**
Indeno (1,2,3-cd)-Pyrene	**240**
TBT	
Sum TBT/DBT	0.1

Level 1 Dredge assessment/ERLs	(orange)
OSPAR EACs	(blue)

*PCB EACs- normalise to 2.5% organic carbon. **sum of individual ICES 7 CBs EACs

21 Long, E.R., Field, L.J., and MacDonald, DD. (1998). Predicting toxicity in marine sediments with numerical sediment quality guidelines. Environmental Toxicology and Chemistry, Vol. 17, No. 4,pp 714 – 727.

22 O'Connor, T.P (2004) The sediment quality guideline is not a chemical concentration at the threshold of sediment toxicity Marine Pollution Bulletin. 49, 383-385

Assessment Criteria – Biological effects of TBT – Imposex in gastropod molluscs

TBT is often measured in sediment, biota and water although the EQS in water is lower than can be achieved with the best available methods used in routine monitoring. The effect of imposex in dogwhelk, *Nucella lapillus*, is specific to TBT contamination and is sensitive to very low concentrations of TBT. Consequently using imposex in *Nucella* to assess TBT contamination provides a measure based on real effects, that is more sensitive than chemical determination. OSPAR have set assessment criteria for imposex in *Nucella*. The OSPAR Ecological Quality Objective of VDSI<2 is appropriate for delineation of the *good:moderate* boundary. Imposex in *Nucella* is irreversible.

Table A.4: OSPAR criteria for the assessment of imposex effects in *Nucella lapillus*.

EcoQO status	Assessment Class	Effect	VDSI Nucella
EcoQO met	A	Level of imposex is close to zero	<0.3
EcoQO met	B	Level of imposex (~30-~100% of the females have imposex) to derived for TBTTBT concentrations below the EAC indicates exposure	0.3 - <2.0
EcoQO not met	C	Level of imposex indicates exposure to TBT concentrations higher than the EAC derived for TBT	2.0 - <4.0
EcoQO not met	D	Reproductive capacity in the gastropod populations is affected as a result of the presence of sterile females, but some reproductively capable females remain	4.0 – 5.0
EcoQO not met	E	Populations are unable to reproduce. The majority, if not all females within the population have been sterilised	5.0 – 6.0
EcoQO not met	F	Populations are absent/expired	-

Annex B: Overall Summary Statistics for Biota, Sediment and Seawater Analysis 2007-2009

Table B.1: Summary statistics for trace metals in seawater: Winter 2006 – Summer 2008. Concentrations are µg l^{-1} dissolved metals. Organochlorine concentrations in seawater are below the limit of quantification and so summary statistics are not presented.

	Hg	Cd	Pb	Ni	Cu	Zn	Cr	Ag	As
n	56	59	57	56	59	59	59	59	48
Mean	<0.009	0.063	3.6	5.7	2.3	34.2	0.78	<1.0	1.10
median	<0.009	<0.044	1.6	1.6	1.4	12.8	<0.49	<1.0	1.14
75%ile	<0.009	0.055	4.2	5.8	3.5	34.9	<0.49	<1.0	1.27
90%ile	<0.009	0.12	7.2	12.3	5.6	98.9	0.784	<1.0	1.36
95%ile	0.013	0.25	13.1	20.2	7.1	124	2.89	<1.0	1.45
Max	0.020	0.68	45.2	72.4	8.2	278	17.6	<1.0	1.78
Mean LoQs	0.009	0.044	0.030	0.058	0.050	0.40	0.49	1.0	1.0

n=numbers sampled

Values less than LoQ are calculated as 0.5 x LoQ for calculation of means. This is reported as <LoQ if the calculated mean is <LoQ.

Table B.2: Summary statistics for available sediment data 2007 – 2009 (MI and Bantry Bay terminal monitoring)

Sediments - all samples	LoD	LoQ	Count	Max	Min	Median	90 percentile	95 percentile	Units dw
Arsenic		0.10	18	17.9	4.40	11.6	13.9	14.8	mg kg^{-1}
Aluminium		0.40	22	72404	5.00	49240	64484	70311	mg kg^{-1}
Cadmium		0.01	22	0.90	0.03	0.18	0.57	0.60	mg kg^{-1}
Chromium		0.05	22	433	30.7	80.8	131	146	mg kg^{-1}
Copper		0.05	22	98.0	9.90	23.7	89.8	97.5	mg kg^{-1}
Lead		0.20	22	63.2	10.4	26.0	36.1	55.3	mg kg^{-1}
Lithium	0.10		2	52.3	36.4	44.4	50.7	51.5	mg kg^{-1}
Mercury		0.001	22	0.06	0.02	0.04	0.05	0.06	mg kg^{-1}
Nickel		0.30	22	53.5	14.8	33.3	43.3	45.3	mg kg^{-1}
Zinc		0.20	22	190	34.8	82.3	129	139	mg kg^{-1}
TBT	0.006		16	0.01	0.00	0.01	0.01	0.01	mg kg^{-1}
Organic carbon		0.40	26	14.9	0.70	2.58	2.93	3.21	%
Acenaphthene		0.50	2	3.20	3.17	3.19	3.20	3.20	ug kg^{-1}
Acenaphthylene		0.50	2	4.35	0.55	2.45	3.97	4.16	ug kg^{-1}
Anthracene		2.00	24	1478	0.91	5.00	13.4	192	ug kg^{-1}
Benzo-a-anthracene		0.50	26	1309	1.81	11.4	34.0	442	ug kg^{-1}
Benzo-a-pyrene		2.00	24	1123	1.53	10.4	42.2	435	ug kg^{-1}
Benzo (b,j,k) fluoranthene	1.05		2	139	66.8	103	132	135	ug kg^{-1}
Benzo (ghi) perylene		10.0	26	703	8.18	17.3	53.2	341	ug kg^{-1}
Chrysene & triphenylene		2.00	25	1397	3.25	12.0	53.9	721	ug kg^{-1}
Dibenzo (AH) anthracene	1.15		2	15.2	9.99	12.6	14.7	14.9	ug kg^{-1}
Fluoranthene		2.00	26	3098	6.68	30.2	93.3	857	ug kg^{-1}
Fluorene	11.0		2	13.9	11.0	12.5	13.6	13.8	ug kg^{-1}
Indeno (123-cd) pyrene		10.0	26	754	9.35	23.4	60.1	303	ug kg^{-1}
Naphthalene		10.0	19	227	4.22	64.9	154	178	ug kg^{-1}
Phenanthrene		10.0	26	1971	8.30	21.8	53.5	546	ug kg^{-1}
Pyrene		2.00	26	2290	4.41	20.9	68.8	867	ug kg^{-1}
Aldrin	0.13		2	0.13	0.13	0.13	0.13	0.13	ug kg^{-1}
Dieldrin	0.12		2	0.12	0.12	0.12	0.12	0.12	ug kg^{-1}
Endrin	0.04		2	0.04	0.04	0.04	0.04	0.04	ug kg^{-1}
Hexachloro-benzene	0.05		2	0.12	0.05	0.09	0.11	0.12	ug kg^{-1}
***alpha* - HCH**	0.03		2	0.03	0.03	0.03	0.03	0.03	ug kg^{-1}
***beta*- HCH**	0.08		2	0.08	0.03	0.05	0.07	0.07	ug kg^{-1}
***delta* - HCH**	0.35		2	0.35	0.35	0.35	0.35	0.35	ug kg^{-1}
***gamma* - HCH**	0.04		2	0.04	0.04	0.04	0.04	0.04	ug kg^{-1}
DDE *o,p*	5.60		2	5.60	5.60	5.60	5.60	5.60	ug kg^{-1}
DDE *p,p*	9.30		2	0.21	0.20	0.21	0.21	0.21	ug kg^{-1}

Sediments - all samples	LoD	LoQ	Count	Max	Min	Median	90 percentile	95 percentile	Units dw
DDT *o,p*	5.60		2	5.60	0.01	2.81	5.04	5.32	ug kg^{-1}
DDT *p,p*	9.30		2	9.30	0.04	4.67	8.37	8.84	ug kg^{-1}
TDE *o,p*	0.01		2	0.07	0.06	0.07	0.07	0.07	ug kg^{-1}
TDE *p,p*	0.02		2	0.28	0.25	0.27	0.28	0.28	ug kg^{-1}
TNONC	0.03		2	0.03	0.03	0.03	0.03	0.03	ug kg^{-1}
***cis*-Chlordane**	0.02		2	0.02	0.02	0.02	0.02	0.02	ug kg^{-1}
***trans* - Chlordane**	0.02		2	0.02	0.02	0.02	0.02	0.02	ug kg^{-1}
***alpha* - Endosulphan**	0.15		2	0.15	0.15	0.15	0.15	0.15	ug kg^{-1}
***beta*- Endosulphan**	1.30		2	1.30	1.30	1.30	1.30	1.30	ug kg^{-1}
Endosulphan sulphate	0.15		2	0.15	0.15	0.15	0.15	0.15	ug kg^{-1}
***cis*-Heptachlor-epoxide**	0.03		2	0.03	0.03	0.03	0.03	0.03	ug kg^{-1}
***trans* - Heptachlor-epoxide**	0.15		2	0.15	0.15	0.15	0.15	0.15	ug kg^{-1}
Heptachlor	0.13		2	0.13	0.13	0.13	0.13	0.13	ug kg^{-1}
Oxychlordane	0.10		2	0.10	0.10	0.10	0.10	0.10	ug kg^{-1}
Octachlorostyrene	0.02		2	0.02	0.02	0.02	0.02	0.02	ug kg^{-1}
Toxaphene	0.10		2	0.10	0.10	0.10	0.10	0.10	ug kg^{-1}
Toxaphene	0.15		2	0.15	0.15	0.15	0.15	0.15	ug kg^{-1}
Toxaphene	0.35		2	0.35	0.35	0.35	0.35	0.35	ug kg^{-1}
Pentachloro-benzene	0.05		2	0.06	0.05	0.06	0.06	0.06	ug kg^{-1}
CB28	0.50		2	0.50	0.46	0.48	0.50	0.50	ug kg^{-1}
CB52	0.25		2	0.25	0.25	0.25	0.25	0.25	ug kg^{-1}
CB101	0.11		2	0.15	0.11	0.13	0.15	0.15	ug kg^{-1}
CB118	0.06		2	0.27	0.07	0.17	0.25	0.26	ug kg^{-1}
CB138	0.20		2	0.25	0.20	0.23	0.25	0.25	ug kg^{-1}
CB153	0.25		2	0.30	0.25	0.28	0.30	0.30	ug kg^{-1}
CB180	0.06		2	0.12	0.11	0.12	0.12	0.12	ug kg^{-1}

dw - dry weight

Table B.3: Biota Monitoring. Overall Summary statistics 2007 – 2009

Parameter Group	Units (dw)	Parameter	Mussels n	Mussels min	Mussels max	Mussels mean	Mussels median	Mussels 90%ile	Mussels 95%ile	Mussels mean LOQ*	Oysters n	Oysters min	Oysters max	Oysters mean	Oysters median	Oysters 90%ile	Oysters 95%ile	Oysters mean LOQ*
Metals and metalloids	$mg\ kg^{-1}$	Ag	156	0.01	0.64	0.08	0.04	0.20	0.31	0.06	139	0.48	17.2	3.71	2.69	8	9.87	0.08
		As	119	3.90	23.9	11.9	10.7	17.6	18.7	3.44	126	4.74	33.9	14.7	14	23.1	25.4	4.89
		Cd	156	0.20	5.60	0.72	0.59	1.11	1.28	0.03	139	0.43	5.48	1.59	1.42	2.62	3.36	0.03
		Cr	156	0.32	8.86	1.37	1.04	2.33	2.79	0.26	139	0.12	4	0.71	0.55	1.23	1.53	0.31
		Cu	156	3.62	34.5	9.60	8.09	14.8	17.7	1.04	139	13.2	364	62.7	47.4	123	150	1.24
		Hg	144	0.03	0.26	0.09	0.06	0.17	0.19	0.10	139	0.03	0.27	0.11	0.09	0.19	0.24	0.12
		Ni	156	0.24	8.61	1.33	1.13	2.24	2.80	0.68	139	0.15	1.89	0.54	0.39	1.06	1.28	0.81
		Pb	143	0.11	39.4	2.34	1.13	4.43	5.97	0.26	111	0.13	1.72	0.6	0.49	1.11	1.36	0.31
		Zn	156	44.8	179	90.4	87.7	121	132	8.39	139	433	2887	1345	1214	2260	2431	10.0
Chlorobiphenyls	$mg\ kg^{-1}$	CB101	84	0.01	25.2	1.39	0.45	1.67	2.27	0.12	96	0.005	6.91	0.52	0.38	0.94	1.33	0.36
		CB105	64	0.005	0.94	0.26	0.22	0.52	0.73	0.13	101	0.005	1.72	0.28	0.14	0.7	0.85	0.24
		CB114	6	0.005	0.03	0.02	0.01	0.02	0.03	0.001								
		CB118	86	0.01	20.2	1.28	0.53	1.71	1.80	0.10	109	0.01	5.2	0.66	0.34	1.66	2.64	0.15
		CB123	6	0.007	0.04	0.02	0.02	0.03	0.04	0.001								
		CB126	6	0.003	0.01	0.006	0.005	0.01	0.01	0.001								
		CB138	89	0.06	16.4	1.61	0.75	3.20	4.12	0.13	108	0.04	5.48	0.73	0.51	1.76	2.3	0.08
		CB149	8	0.006	0.43	0.18	0.05	0.43	0.43	0.02	12	0.006	0.41	0.09	0.03	0.32	0.37	0.02
		CB153	89	0.2	11.7	2	1.36	4.19	5.71	0.14	109	0.14	9.02	1.47	0.94	3.42	5.29	0.11
		CB156	68	0.006	0.47	0.14	0.11	0.32	0.42	0.06	102	0.006	0.64	0.18	0.14	0.37	0.48	0.10
		CB157	6	0.007	0.05	0.03	0.04	0.05	0.05	0.002								
		CB167	6	0.02	0.13	0.07	0.07	0.12	0.12	0.002								
		CB169	6	0.001	0.00	0.002	0.002	0.00	0.00	0.004								
		CB170	20	0.004	1.60	0.25	0.02	1.27	1.33	0.23	44	0.004	1.86	0.35	0.03	1.44	1.53	0.35
		CB18	10	0.01	0.28	0.07	0.03	0.15	0.21	0.01	18	0.01	0.51	0.12	0.05	0.3	0.33	0.02
		CB180	89	0.005	1.09	0.24	0.2	0.48	0.69	0.09	109	0.006	1.57	0.27	0.17	0.61	0.8	0.18
		CB189	6	0.002	0.02	0.01	0.01	0.02	0.02	0.002								
		CB194	24	0.004	0.16	0.04	0.02	0.11	0.12	0.02	53	0.004	0.33	0.04	0.02	0.08	0.1	0.02
		CB209	8	0.005	0.85	0.46	0.56	0.85	0.85	0.45	15	0.005	0.99	0.33	0.07	0.84	0.91	0.32
		CB28	88	0.005	32.8	1.29	0.26	0.83	1.27	0.21	109	0.005	1.88	0.38	0.22	0.93	1.18	0.34
		CB31	42	0.03	2.16	0.59	0.38	1.43	1.86	0.26	77	0.006	3.35	0.41	0.23	0.98	1.18	0.32
		CB44	2	0.04	0.04	0.04	0.04	0.04	0.04	0.04	8	0.04	0.12	0.06	0.06	0.09	0.1	0.08
		CB52	77	0.04	26.4	1.57	0.46	1.77	2.14	0.51	97	0.04	3.12	0.72	0.57	1.54	1.91	0.87
		CB77	6	0.02	0.09	0.04	0.04	0.07	0.08	0.003								
		CB81	6	0.001	0.00	0.003	0.002	0.00	0.00	0.0005								
		ΣCB6E	73	0.34	112	8.6	4.02	10.2	14.9		86	0.45	20.5	3.06	2.15	5.32	9.2	
		ΣCB7	72	1.12	133	11	5.38	13.7	16.7		84	1.54	23.7	5.12	4.08	9.28	12.6	
		ΣCB7E	73	0.39	133	9.99	4.38	11.9	16.7		86	0.45	23.7	3.54	2.4	6.74	10.6	
		ΣCBI	89	0.79	133	9.4	4.55	12.0	15.8		109	1.42	23.7	5.43	4.25	10.1	13.9	
		ΣCBIE	89	0.39	133	8.55	3.64	11.9	15.8		109	0.45	23.7	3.73	2.41	7.59	11.4	
		TESCBW05E	6	0.0003	0.001	0.0007	0.0005	0.001	0.001									
		TESCBW05I	6	0.0004	0.001	0.0008	0.0007	0.001	0.001									
		TESCBW98E	6	0.0004	0.001	0.0008	0.0007	0.001	0.001									
		TESCBW98I	6	0.0005	0.002	0.0009	0.0007	0.001	0.002									
Organobromines	$mg\ kg^{-1}$	ΣBDE	11	0.70	33.7	8.55	6.00	12.2	22.9									
		ΣBDEE	11	0.45	33.7	8.52	6.00	12.2	22.9									
		BD100	11	0.06	4.01	1.19	0.87	1.97	2.99	0.04								
		BD116	3	0.004	0.05	0.02	0.009	0.04	0.04	0.02								
		BD119	11	0.002	0.04	0.02	0.02	0.04	0.04	0.04								
		BD126	11	0.002	0.04	0.02	0.01	0.03	0.03	0.03								
		BD138	11	0.005	0.12	0.04	0.04	0.07	0.09	0.06								

Parameter Group	Units (dw)	Parameter	Mussels n	Mussels min	Mussels max	Mussels mean	Mussels median	Mussels 90%ile	Mussels 95%ile	Mussels mean LOQ*	Oysters n	Oysters min	Oysters max	Oysters mean	Oysters median	Oysters 90%ile	Oysters 95%ile	Oysters mean LOQ*
		BD140	3	0.05	0.08	0.06	0.05	0.07	0.07	0.006								
		BD153	11	0.06	0.82	0.19	0.12	0.27	0.54	0.07								
		BD154	11	0.06	0.94	0.31	0.26	0.70	0.82	0.07								
		BD155	3	0.19	0.59	0.34	0.23	0.52	0.56	0.004								
		BD156	11	0.008	0.09	0.04	0.02	0.07	0.08	0.06								
		BD181	3	0.05	0.08	0.06	0.05	0.07	0.07	0.01								
		BD183	11	0.01	0.27	0.07	0.06	0.09	0.18	0.07								
		BD184	8	0.02	0.09	0.05	0.06	0.08	0.08	0.11								
		BD191	8	0.02	0.07	0.05	0.05	0.07	0.07	0.1								
		BD196	8	0.04	0.18	0.11	0.12	0.17	0.17	0.22								
		BD197	11	0.02	0.18	0.09	0.09	0.16	0.17	0.17								
		BD203	3	0.02	0.05	0.04	0.04	0.04	0.04	0.01								
		BD206	8	0.09	0.40	0.21	0.21	0.34	0.37	0.43								
		BD207	11	0.09	0.40	0.19	0.17	0.32	0.36	0.32								
		BD209	11	0.33	5.62	1.95	1.32	3.88	4.75	1.56								
		BDE1	3	0.16	1.77	0.72	0.23	1.46	1.62	0.72								
		BDE10	3	0.002	0.01	0.008	0.009	0.01	0.01	0.004								
		BDE13	3	0.003	0.02	0.008	0.005	0.01	0.01	0.002								
		BDE15	3	0.005	0.04	0.02	0.005	0.03	0.04	0.002								
		BDE17	11	0.01	1.87	0.28	0.13	0.26	1.06	0.04								
		BDE2	3	0.08	1.00	0.42	0.18	0.84	0.92	0.42								
		BDE25	3	0.02	0.16	0.07	0.05	0.13	0.14	0.009								
		BDE28	11	0.01	0.54	0.12	0.09	0.13	0.34	0.05								
		BDE3	3	0.04	0.55	0.23	0.09	0.45	0.50	0.23								
		BDE35	3	0.004	0.05	0.02	0.009	0.04	0.04	0.02								
		BDE47	11	0.25	13.90	3.83	2.77	6.11	10.00	0.04								
		BDE49	11	0.03	2.10	0.82	0.75	1.21	1.66	0.04								
		BDE66	11	0.03	0.62	0.2	0.15	0.26	0.44	0.04								
		BDE7	3	0.001	0.08	0.04	0.05	0.07	0.07	0.004								
		BDE71	11	0.0008	0.04	0.02	0.01	0.03	0.03	0.03								
		BDE75	3	0.09	0.16	0.13	0.14	0.15	0.15	0.002								
		BDE77	11	0.0008	0.04	0.02	0.01	0.03	0.03	0.03								
		BDE85	11	0.03	0.70	0.16	0.13	0.20	0.45	0.04								
		BDE99	11	0.13	13.70	2.88	1.91	3.49	8.59	0.04								
		HBCD	8	3.06	57.3	21	13.9	39.7	48.5	1.11								
		HXBDE	8	0.18	1.14	0.48	0.35	0.74	0.94	0.51								
		TEBDE	8	0.25	7.42	3.79	3.44	6.37	6.90									
		TRBDE	8	0.12	0.39	0.21	0.17	0.31	0.35	0.05								
Organofluorines	mg kg^{-1}	PFDOA	4	0.42	0.59	0.47	0.44	0.54	0.57	0.94	5	2.53	2.53	2.53	2.53	2.53	2.53	5.06
		PFDS	4	0.42	0.59	0.47	0.44	0.54	0.57	0.94	5							
		PFOA	4	0.42	0.59	0.47	0.44	0.54	0.57	0.94	5	2.53	2.53	2.53	2.53	2.53	2.53	5.06
		PFOS	4	0.42	0.59	0.47	0.44	0.54	0.57	0.94	5	2.53	2.53	2.53	2.53	2.53	2.53	5.06
		SPFCI	4	9.32	12.90	10.4	9.65	12.00	12.50	10.4	5							
		SPFOSOAI	4	1.69	2.35	1.89	1.75	2.18	2.26	1.89	5							
Organochlorines	mg kg^{-1}	ENDA	64	0.004	0.32	0.11	0.06	0.25	0.26	0.14	70	0.004	0.48	0.07	0.05	0.17	0.24	0.10
		ENDB	83	0.004	15.50	1.17	0.02	4.12	4.40	1.20	104	0.004	10.5	0.28	0.02	0.12	0.21	0.30
		HCB	83	0.04	1.23	0.18	0.17	0.32	0.37	0.07	108	0.005	1.4	0.16	0.08	0.36	0.44	0.07
		HCEPC	21	0.04	0.13	0.08	0.08	0.12	0.13	0.05	3	0.06	0.17	0.11	0.1	0.16	0.17	0.05
		HCEPT	61	0.007	0.32	0.12	0.10	0.24	0.26	0.10	73	0.007	0.29	0.05	0.02	0.14	0.16	0.03
		HCEPX	20	0.004	0.16	0.06	0.05	0.12	0.12	0.04	32	0.004	0.28	0.12	0.11	0.24	0.27	0.09
		HEPC	78	0.01	0.52	0.16	0.16	0.30	0.32	0.10	99	0.004	0.58	0.16	0.13	0.33	0.4	0.05
		MIREX	21	0.04	0.06	0.05	0.05	0.06	0.06	0.05	3	0.04	0.06	0.05	0.05	0.06	0.06	0.05
		OCS	21	0.04	0.06	0.05	0.05	0.06	0.06	0.05	3	0.04	0.06	0.05	0.05	0.06	0.06	0.05

Parameter Group	Units (dw)	Parameter	Mussels n	Mussels min	Mussels max	Mussels mean	Mussels median	Mussels 90%ile	Mussels 95%ile	Mussels mean LOQ*	Oysters n	Oysters min	Oysters max	Oysters mean	Oysters median	Oysters 90%ile	Oysters 95%ile	Oysters mean LOQ*
		QCB	21	0.04	0.12	0.05	0.05	0.06	0.06	0.05	3	0.05	0.09	0.07	0.06	0.08	0.08	0.05
Pesticides	mg kg^{-1}	ENDS	74	0.004	0.52	0.15	0.1	0.39	0.42	0.15	90	0.005	0.58	0.11	0.05	0.34	0.42	0.12
Dichloro-diphenyl-trichloroethane	mg kg^{-1}	DDEOP	44	0.005	0.25	0.06	0.04	0.15	0.17	0.07	51	0.005	0.66	0.07	0.03	0.15	0.22	0.05
		DDEPP	83	0.10	9.76	1.50	0.88	3.41	4.68	0.07	107	0.02	8.12	1.64	1	4.15	5.57	0.07
		DDTOP	78	0.004	0.54	0.12	0.09	0.28	0.37	0.07	97	0.004	1.1	0.21	0.14	0.49	0.63	0.20
		DDTPP	81	0.005	1.19	0.26	0.14	0.65	0.90	0.10	105	0.005	1.91	0.21	0.05	0.51	0.64	0.09
		∑DDT	40	0.47	13.90	2.62	2.11	5.69	7.15		32	0.3	8.43	2.86	2.86	4.22	6.09	
		∑DDTE	40	0.26	12.00	2.41	1.88	5.22	7.15		33	0.29	8.37	2.47	2.55	4.09	5.18	
		∑DDTM	83	0.47	13.90	2.63	1.8	5.61	7.37		109	0.15	11.2	2.89	2.29	6.16	7.83	
		∑DDTME	83	0.26	13.40	2.47	1.48	5.31	7.37		109	0	10.3	2.55	1.94	5.01	7.83	
		TDEOP	61	0.004	0.68	0.14	0.06	0.42	0.52	0.03	74	0.005	1.42	0.18	0.08	0.51	0.58	0.04
		TDEPP	77	0.006	4.88	0.6	0.38	1.29	1.99	0.08	88	0.007	2.88	0.74	0.51	1.53	2.16	0.14
Dioxins	pg kg^{-1}	CDD1N	6	41.5	370	156	101	321	345	94.3								
		CDD4X	6	55.2	407	216	200	388	398	120								
		CDD6P	6	829	5867	3411	3415	5849	5858	328								
		CDD6X	6	166	634	374	353	588	611	104								
		CDD9X	6	55.2	476	256	245	464	470	120								
		CDDO	6	5359	43458	19672	17358	35629	39544	9466								
		CDF2N	6	331	634	475	466	566	600	87.5								
		CDF2T	6	608	1946	1335	1287	1924	1935	112								
		CDF4X	6	62.2	131	95.8	96.1	121	126	132								
		CDF6P	6	169	724	383	276	679	702	228								
		CDF6X	6	27.6	102	65.7	70.8	96	99	113								
		CDF9P	6	45.2	136	81.7	74.2	121	128	163								
		CDF9X	6	45.2	102	71.6	72.3	92	97	143								
		CDFDX	6	32.7	181	94.6	90.5	146	163	120								
		CDFO	6	304	1533	820	622	1490	1512	826								
		CDFP2	6	62.2	211	125	121	174	192	113								
		TCDD	6	27.6	159	77.3	54.6	147	153	68.8								
		TESCDCFW05E	6	271	1147	620	569	1008	1077									
		TESCDCFW05I	6	365	1210	750	715	1103	1157									
		TESCDCFW98E	6	337	1279	714	659	1124	1201									
		TESCDCFW98I	6	425	1342	843	808	1214	1278									
Dioxins	ng kg^{-1}	TESCBCDCFW05E	6	0.61	2.22	1.32	1.07	2.15	2.19									
		TESCBCDCFW05I	6	0.77	2.43	1.56	1.44	2.28	2.36									
		TESCBCDCFW98E	6	0.77	2.59	1.59	1.30	2.52	2.55									
		TESCBCDCFW98I	6	0.94	2.70	1.76	1.52	2.59	2.64									
Cyclodienes	mg kg^{-1}	ALD	83	0.004	0.32	0.10	0.05	0.25	0.28	0.11	106	0.005	0.39	0.07	0.03	0.2	0.25	0.06
		CCDAN	83	0.006	1.05	0.20	0.13	0.42	0.58	0.04	104	0.005	1.81	0.37	0.24	0.86	0.97	0.05
		DIELD	75	0.02	4.66	1.32	1.13	2.23	2.73	0.09	105	0.02	4.58	1.18	1.05	2.08	2.49	0.06
		EDAN	38	0.21	1.76	0.65	0.43	1.35	1.50		26	0.29	2.94	1.33	1.37	2.09	2.16	
		END	82	0.005	1.36	0.18	0.06	0.46	0.89	0.17	106	0.004	1.74	0.09	0.05	0.23	0.25	0.08
		OCDAN	81	0.004	0.47	0.07	0.05	0.16	0.19	0.06	99	0.005	0.43	0.07	0.04	0.12	0.33	0.06
		∑DRINM	83	0.06	4.66	1.49	1.44	2.78	3.48		109	0.08	4.75	1.34	1.17	2.32	2.78	
		∑DRINME	83	0	4.66	1.23	1.07	2.32	2.65		109	0	4.75	1.21	1.05	2.23	2.59	
		TCDAN	75	0.006	0.68	0.18	0.06	0.49	0.52	0.09	106	0.006	1.66	0.27	0.17	0.61	0.83	0.15
		TNONC	82	0.005	1.12	0.22	0.14	0.56	0.65	0.04	107	0.005	1.19	0.28	0.22	0.65	0.78	0.05
Polycyclic aromatic hydrocarbons	mg kg^{-1}	21BNT	11	0.89	7.03	2.94	1.36	5.95	6.49	0.47								
		ANT	11	1.5	6.62	3.62	2.41	6.27	6.45	0.47								
		ANTH	11	0.39	0.65	0.49	0.46	0.63	0.64	0.47								
		BAA	11	2.58	18.2	7.21	4.01	11.5	14.9	0.47								
		BAP	11	1.47	9.23	3.70	1.87	6.59	7.91	0.47								
		BBJKF	11	7.79	42.1	21.5	10.1	39.9	41.0	0.47								

			Mussels								Oysters							
Parameter Group	**Units (dw)**	**Parameter**	**n**	**min**	**max**	**mean**	**median**	**90%ile**	**95%ile**	**mean LOQ***	**n**	**min**	**max**	**mean**	**median**	**90%ile**	**95%ile**	**mean LOQ***
		BEP	11	6.76	30.1	16.3	10.5	25.4	27.8	0.47								
		BGHIF	11	2.30	11.9	5.81	4.06	9.76	10.80	0.47								
		BGHIP	11	3.29	15.2	7.97	5.41	13.0	14.1	0.47								
		CHRM5	11	0.45	2.34	1.11	1.17	1.95	2.15	1.11								
		CHRTR	11	6.01	38.2	16.7	9.46	32.9	35.6	0.47								
		COR	11	1.95	3.23	2.38	2.30	2.92	3.07	2.37								
		DBAHA	11	0.43	2.70	1.14	0.51	2.10	2.40	0.47								
		DBPAE	11	3.89	6.45	4.75	4.57	5.85	6.15	4.75								
		DBPAH	11	3.89	6.45	4.75	4.57	5.85	6.15	4.75								
		DBPAI	11	3.89	6.45	4.75	4.57	5.85	6.15	4.75								
		DBPAL	11	3.89	6.45	4.75	4.57	5.85	6.15	4.75								
		FLU	11	13.1	57.2	29.9	22.1	51.4	54.3	0.47								
		ICDP	11	1.67	9.32	3.97	1.98	7.56	8.44	0.47								
		PA	11	9.48	60.4	25.6	13.0	56.1	58.2	0.47								
		PABC	11	1.55	7.07	3.55	2.45	5.45	6.26	0.47								
		PYR	11	14.8	62.6	31.6	21.3	57.7	60.2	0.47								
		PYRCPCD	11	0.39	10.8	2.73	0.47	7.77	9.29	0.47								
Hexachlorocyclohexanes	mg kg^{-1}	HCHA	82	0.005	0.55	0.12	0.09	0.24	0.34	0.04	106	0.004	0.55	0.18	0.14	0.42	0.49	0.05
		HCHB	80	0.004	0.91	0.10	0.04	0.30	0.55	0.12	102	0.004	0.69	0.11	0.05	0.3	0.5	0.09
		HCHD	21	0.04	0.06	0.05	0.05	0.06	0.06	0.05	3	0.05	0.13	0.08	0.06	0.12	0.12	0.05
		HCHG	83	0.005	0.60	0.18	0.18	0.34	0.44	0.1	109	0.005	0.78	0.24	0.21	0.48	0.57	0.08
Polychlorinated Naphtalenes	ng kg^{-1}	PCN 52/60									5	0.51	8.147	3.81	3.14	7.44	7.79	
		PCN 53									5	0.025	3.289	1.43	1.27	2.92	3.11	
		PCN 66/67									5	0.025	0.025	0.025	0.03	0.03	0.03	0.051
		PCN 68									5	0.025	0.051	0.035	0.03	0.05	0.05	
		PCN 69									5	0.025	0.152	0.066	0.03	0.13	0.14	
		PCN 71/72									5	0.025	0.101	0.04	0.03	0.07	0.09	
		PCN 73									5	0.025	0.025	0.025	0.03	0.03	0.03	0.051
		PCN 74									5	0.025	0.025	0.025	0.03	0.03	0.03	0.051
		PCN 75									5	0.025	0.025	0.025	0.03	0.03	0.03	0.051

Numbers calculated with <LOQ values multiplied by 0.5 *** mean LOQ values calcuated with full value**

n= number sampled

Table B4: List of dangerous substances and other substances monitored in marine matrices (biota and sediment) during the period 2007 – 2011.

	Chlorobiphenyls
CB101	2,2',4,5,5'-Pentachlorobiphenyl
CB105	2,3,3',4,4'-Pentachlorobiphenyl
CB114	2,3,4,4',5-Pentachlorobiphenyl
CB118	2,3',4,4',5-Pentachlorobiphenyl
CB123	1,1'-Biphenyl, 2,3',4,4',5'-pentachloro-
CB126	3,3',4,4',5-Pentachlorobiphenyl
CB138	2,2',3,4,4',5'-Hexachlorobiphenyl
CB149	2,2',3,4',5',6-Hexachlorobiphenyl
CB153	2,2',4,4',5,5'-Hexachlorobiphenyl
CB156	2,3,3',4,4',5-Hexachlorobiphenyl
CB157	2,3,4,3',4',5'-Hexachlorobiphenyl
CB167	2',3,4,4',5,5'-Hexachlorobiphenyl
CB169	3,3',4,4',5,5'-Hexachlorobiphenyl
CB170	2,2',3,3',4,4',5-Heptachlorobiphenyl
CB18	2,2',5-Trichlorobiphenyl
CB180	2,2',3,4,4',5,5'-Heptachlorobiphenyl
CB189	2,3,3',4,4',5,5'-Heptachlorobiphenyl
CB194	2,2',3,3',4,4',5,5'-Octachlorobiphenyl
CB209	2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl
CB28	2,4,4'-Trichlorobiphenyl
CB31	2,4',5-Trichlorobiphenyl
CB44	2,2',3,5'-Tetrachlorobiphenyl
CB52	2,2',5,5'-Tetrachlorobiphenyl
CB77	3,3',4,4'-Tetrachlorobiphenyl
CB81	3,4,4',5-Tetrachlorobiphenyl
ΣCB	sum of CBs.- Specify in method data (METDC)
ΣCB6	sum of CBs.- Sum of (CB28, CB52, CB101, CB138, CB153, CB180)
ΣCB6E	sum of CBs.- Sum of (CB28, CB52, CB101, CB138, CB153, CB180) with <LOQ set to 0
ΣCB7	sum of CBs.- Sum of (CB28, CB52, CB101, CB118, CB138, CB153, CB180)
ΣCB7E	sum of CBs.- Sum of (CB28, CB52, CB101, CB118, CB138, CB153, CB180) with <LOQ set to 0
ΣCBI	Sum of available SCB7 (CB28, CB52, CB101, CB118, CB138, CB153, CB180)
ΣCBIE	Sum of available SCB7 (CB28, CB52, CB101, CB118, CB138, CB153, CB180) with <LOQ set to 0
TESCBW05E	WHO(2005)-PCB TEQ excl. LOQ
TESCBW05I	WHO(2005)-PCB TEQ incl. LOQ
TESCBW98E	WHO(1998)-PCB TEQ excl. LOQ
TESCBW98I	WHO(1998)-PCB TEQ incl. LOQ
	Cyclodienes
ALD	Aldrin
CCDAN	*cis*-Chlordane (*alpha*-chlordane)
DIELD	Dieldrin
EDAN	Sum of danes (CCDAN, TCDAN, OCDAN)
END	Endrin
OCDAN	Oxychlordane
ΣDRINM	Sum of available drins (aldrin, endrin, dieldrin, isodrin)
ΣDRINME	Sum of available drins (aldrin, endrin, dieldrin, isodrin) with <LOQ = 0
TCDAN	*trans*-Chlordane (*gamma*-chlordane)
TNONC	*trans*-Nonachlor
	Dichloro-diphenyl-trichloroethane (DDTs)
DDEOP	DDE (*o,p'*)
DDEPP	DDE (*p,p'*)
DDTOP	DDT (*o,p'*)
DDTPP	DDT (*p,p'*)
ΣDDT	Sum of (DDT (*p,p'*), DDE (*p,p'*), DDD (*p,p'*), DDT (*o,p'*), DDE (*o,p'*), DDD (*o,p'*))
ΣDDTE	Sum of (DDT (*p,p'*), DDE (*p,p'*), DDD (*p,p'*), DDT (*o,p'*), DDE (*o,p'*), DDD (*o,p'*)) with <LOQ set to 0
ΣDDTM	Sum of available DDTs (DDT (*p,p'*), DDE (*p,p'*), DDD (*p,p'*), DDT (*o,p'*), DDE (*o,p'*), DDD (*o,p'*))
ΣDDTME	Sum of available DDTs (DDT (*p,p'*), DDE (*p,p'*), DDD (*p,p'*), DDT (*o,p'*), DDE (*o,p'*), DDD (*o,p'*)) with <LOQ set

	to 0
TDEOP	TDE (*o,p'*) = DDD (*o,p'*)
TDEPP	TDE (*p,p'*) = DDD (*p,p'*)
	Dioxins
CDD1N	1,2,3,7,8-Pentachlorodibenzo-*p*-dioxin
CDD4X	1,2,3,4,7,8-Hexachlorodibenzo-*p*-dioxin
CDD6P	1,2,3,4,6,7,8-Heptachlorodibenzo-*p*-dioxin
CDD6X	1,2,3,6,7,8-Hexachlorodibenzo-*p*-dioxin
CDD9X	1,2,3,7,8,9-Hexachlorodibenzo-*p*-dioxin
CDDO	1,2,3,4,6,7,8,9-Octachlorodibenzo-*p*-dioxin
CDF2N	2,3,4,7,8-Pentachlorodibenzofuran
CDF2T	2,3,7,8-tetrachloro-dibenzofuran
CDF4X	2,3,4,6,7,8-Hexachlorodibenzofuran
CDF6P	1,2,3,4,6,7,8-Heptachlorodibenzofuran
CDF6X	1,2,3,6,7,8-Hexachlorodibenzofuran
CDF9P	1,2,3,4,7,8,9-Heptachlorodibenzofuran
CDF9X	1,2,3,7,8,9-Hexachlorodibenzofuran
CDFDX	1,2,3,4,7,8/1,2,3,4,7,9-Hexachloro-dibenzofuran
CDFO	Octachloro-dibenzofuran
CDFP2	1,2,3,7,8-Pentachlorodibenzofuran
TCDD	2,3,7,8-Tetrachloro-dibenzo[b,e][1,4]dioxin
TESCBCDCFW05E	WHO(2005)-PCDD/F+PCB TEQ with <LOQ set to 0
TESCBCDCFW05I	WHO(2005)-PCDD/F+PCB TEQ incl. LOQ
TESCBCDCFW98E	WHO(1998)-PCDD/F+PCB TEQ with <LOQ set to 0
TESCBCDCFW98I	WHO(1998)-PCDD/F+PCB TEQ incl. LOQ
TESCDCFW05E	WHO(2005)-PCDD/F TEQ with <LOQ set to 0
TESCDCFW05I	WHO(2005)-PCDD/F TEQ incl. LOQ
TESCDCFW98E	WHO(1998)-PCDD/F TEQ with <LOQ set to 0
TESCDCFW98I	WHO(1998)-PCDD/F TEQ incl. LOQ
	Hexachlorocyclohexanes
HCHA	α-HCH (*alpha*-Hexachlorocyclohexane)
HCHB	β-HCH (*beta*-Hexachlorocyclohexane)
HCHD	δ-HCH (*delta*-Hexachlorocyclohexane)
HCHG	γ-HCH (*gamma*-Hexachlorocyclohexane) [Lindane]
	Metals and metalloids
Ag	Silver
As	Arsenic
Cd	Cadmium
Cr	Chromium
Cu	Copper
Hg	Mercury
Ni	Nickel
Pb	Lead
Zn	Zinc
	Organobromines
BD100	2,2',4,4',6-Pentabromodiphenyl ether (PBDE100)
BD116	Benzene, pentabromophenoxy- (PBDE116)
BD119	2,3',4,4',6-Pentabromodiphenyl ether (PBDE119)
BD126	3,3',4,4',5-Pentabromodiphenyl ether (PBDE126)
BD138	2,2',3,4,4',5'-Hexabromodiphenyl ether (PBDE138)
BD140	2,2',3,4,4',6'-Hexabromodiphenyl ether (PBDE140)
BD153	2,2',4,4',5,5'-Hexabromodiphenyl ether (PBDE153)
BD154	2,2',4,4',5,6'-Hexabromodiphenyl ether (PBDE154)
BD155	2,2',4,4',6,6'-Hexabromodiphenyl ether (PBDE155)
BD156	Benzene, 1,2,3,4-tetrabromo-5-(3,4-dibromophenoxy)- (PBDE156)
BD181	2,2',3,4,4',5,6-Heptabromodiphenyl ether (PBDE181)
BD183	2,2',3,4,4',5',6-Heptabromodiphenyl ether (PBDE183)
BD184	2,2',3,4,4',5',6-Heptabromodiphenyl ether (PBDE183)
BD191	2,3,3',4,4',5,6-Heptabromodiphenyl ether (PBDE190)
BD196	2,3,3',4,4',5,6-Heptabromodiphenyl ether (PBDE190)
BD197	Benzene, 1,1'-oxybis[2,3,4,6-tetrabromo-(PBDE197)

BD203	Benzene, pentabromo(2,4,5-tribromophenoxy)- (PBDE 203)
BD206	(PBDE206)
BD207	Benzene, pentabromo(2,3,4,6-tetrabromophenoxy)- (PBDE 207)
BD209	Decabromodiphenyl ether (PBDE209)
BDE1	Benzene, 1-bromo-2-phenoxy- (PBDE1)
BDE10	Benzene, 1,3-dibromo-2-phenoxy- (PBDE10)
BDE13	Benzene, 1-bromo-3-(4-bromophenoxy)- (PBDE13)
BDE15	4,4'-Dibromodiphenyl ether (PBDE15)
BDE17	2,2',4-Tribromodiphenyl ether (PBDE17)
BDE2	Benzene, 1-bromo-3-phenoxy- (PBDE2)
BDE25	2,3',4-Tribromodiphenyl ether (PBDE25)
BDE28	2,4,4'-Tribromodiphenyl ether (PBDE28)
BDE3	Benzene, 1-bromo-4-phenoxy-
BDE35	3,3',4-Tribromodiphenyl ether (PBDE35)
BDE47	2,2',4,4'-Tetrabromodiphenyl ether (PBDE47)
BDE49	2,2',4,5'-Tetrabromodiphenyl ether (PBDE49)
BDE66	2,3',4,4'-Tetrabromodiphenyl ether (PBDE66)
BDE7	Benzene, 2,4-dibromo-1-phenoxy- (PBDE 7)
BDE71	2,3',4',6-Tetrabromodiphenyl ether (PBDE71)
BDE75	2,4,4',6-Tetrabromodiphenyl ether (PBDE75)
BDE77	3,3',4,4'-Tetrabromodiphenyl ether (PBDE77)
BDE85	2,2',3,4,4'-Pentabromodiphenyl ether (PBDE85)
BDE99	2,2',4,4',5-Pentabromodiphenyl ether (PBDE99)
HBCD	1,2,5,6,9,10-Hexabromocyclododecane
HPBDE	hepta-Bromodiphenyl ether (sum of congeners)
HXBDE	hexa-Bromodiphenyl ether (sum of congeners)
NBDE	Nonabromodiphenyl ether (sum of congeners)
OBDE	Octa-bromodiphenyl ether (sum of congeners)
ΣBDE	Sum of BDEs (28, 47, 99, 100, 153, 154)
ΣBDEE	Sum of BDEs (28, 47, 99, 100, 153, 154) with <LOQ set to 0
TEBDE	tetra-Bromodiphenyl ether (sum of congeners)
TRBDE	tri-Bromodiphenyl ether (sum of congeners)
	Organochlorines (general)
ENDA	*alpha*-Endosulfan
ENDB	*beta*-Endosulfan
HCB	Hexachlorobenzene
HCEPC	*cis*-Heptachlorepoxide "(*alpha*)"
HCEPT	*trans*-Heptachlorepoxide "(*beta*)"
HCEPX	Heptachlor epoxide
HEPC	Heptachlor
MIREX	Mirex
OCS	Octachlorostyrene
QCB	Pentachlorobenzene
	Organofluorines
PFDOA	Perfluorodecane acid (PFDoA)
PFDS	Perfluorodecanoic acid
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctanyl sulphonic acid
SPFCE	Total PFC compounds with <LOQ set to 0
SPFCI	Total PFC compounds inc. LOQ
SPFOSOAE	Total PFOS/PFOA with <LOQ set to 0
SPFOSOAI	Total PFOS/PFOA incl. LOQ
	Pesticides (general)
ENDS	Endosulfan sulfate
	Polycyclic aromatic hydrocarbons (PAHs)
21BNT	Benzo[b]naphtho[2,1-d]thiophene
ANT	Anthracene
ANTH	Anthanthrene
BAA	Benzo[a]anthracene
BAP	Benzo[a]pyrene
BBJKF	Benzo[b+j,k]fluoranthene
BEP	Benzo[e]pyrene

BGHIF	Benzo[ghi]fluoranthene
BGHIP	Benzo[ghi]perylene
CHRM5	Chrysene, 5-methyl-
CHRTR	Chrysene + triphenylene
COR	Coronene
DBAHA	Dibenz[a,h]anthracene
DBPAE	Dibenzo[a,e]pyrene
DBPAH	Dibenzo[a,h]pyrene
DBPAI	Dibenzo[a,i]pyrene
DBPAL	Dibenzo[a,l]pyrene
FLU	Fluoranthene
ICDP	Indeno[1,2,3-cd]pyrene
PA	Phenanthrene
PABC	Benzo[c]phenanthrene
PYR	Pyrene
PYRCPCD	Cyclopenta[cd]pyrene

Appendix 1

OSPAR Coordinated Environmental Monitoring Programme & Trend Assessment

Ireland is a contracting party to the Oslo Paris Commission (OSPAR) Joint Assessment and Monitoring Programme (JAMP) to evaluate the status and trend of concentrations of hazardous substances in the marine environment. OSPAR works under its Hazardous Substances Strategy to identify which substances are hazardous for the marine environment, to prevent, reduce and ultimately eliminate pollution with these substances, and to monitor the effectiveness of measures to achieve this. OSPAR ultimately seeks to move towards the cessation of discharges, emissions and losses of hazardous substances by 2020 with the ultimate aim to achieve concentrations of hazardous substances in the marine environment near background values for naturally occurring substances and close to zero for man-made substances.

A variety of hazardous substances have been prioritised for action by OSPAR due to their risk for the marine environment and which are being monitored under the Coordinated Environmental Monitoring Programme (CEMP). CEMP monitoring is mainly focused on coastal areas because, in many cases, the response of the ecosystem to pollution control measures can best be assessed at locations close to discharge and emission sources. Increasing attention is being paid to monitoring in offshore areas, where a number of human activities (e.g. oil and gas production, shipping) take place and as awareness of the significance of long-range transport of contaminants has increased. CEMP monitoring does not extend to deeper waters.

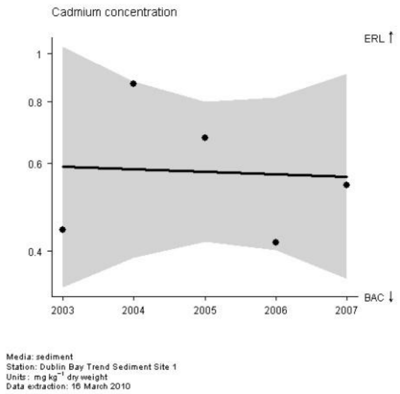
The CEMP is underpinned by an emphasis on commonly agreed monitoring guidelines and quality assurance procedures and is currently being extended to include brominated flame retardants, dioxins and PFOS. Contamination by cadmium, mercury, lead and selected PAHs and PCBs is assessed by monitoring concentrations in fish, shellfish and sediments.

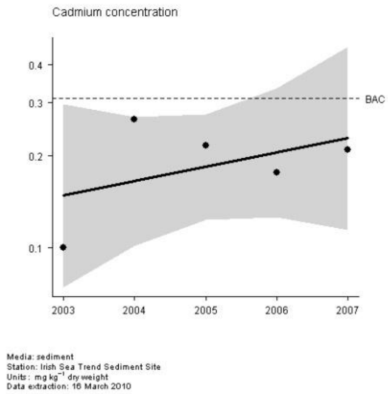
CEMP monitoring is designed to track contaminants which accumulate in the marine environment and through the food chain but which cannot necessarily be detected in seawater. Therefore CEMP assessment results may lead to different conclusions about chemical quality status than water-based monitoring under the EU Water Framework Directive. The OSPAR CEMP provides tested, quality assured methodologies for environmental monitoring that can contribute to the evaluation of good environmental status under the EU Marine Strategy Framework Directive and good chemical status under the Water Framework Directive.

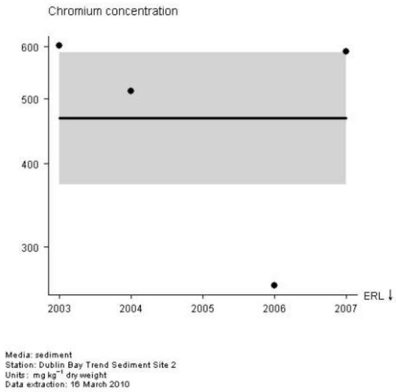
Outputs for trend assessments for sediment and biota up to 2007 are shown below.

OSPAR Trend Assessments for Contaminants in Sediments

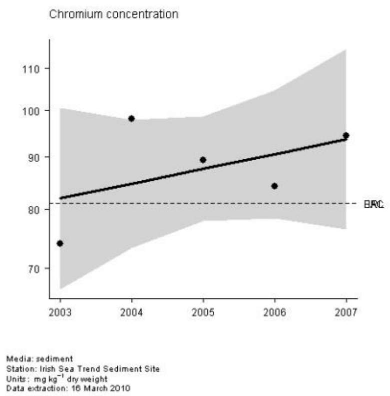
Cadmium in Sediment

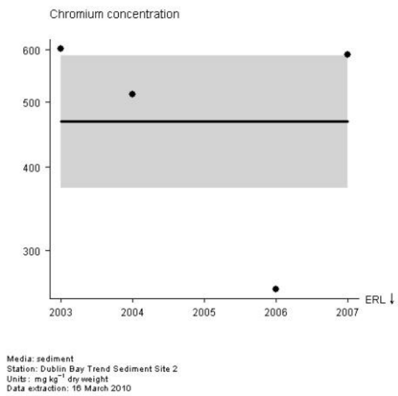


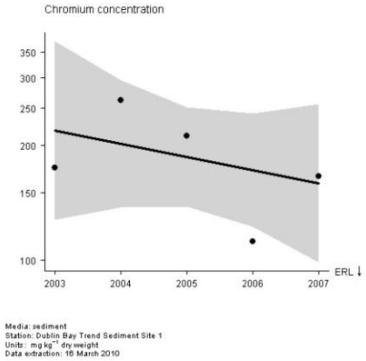




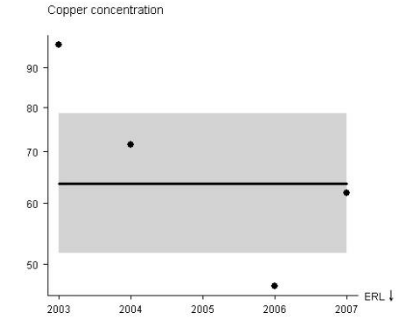
Chromium in Sediment



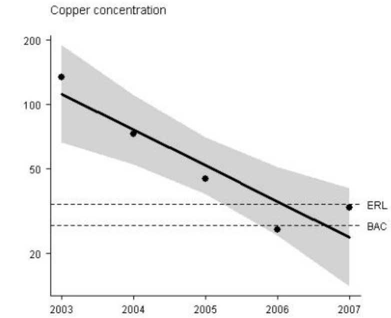




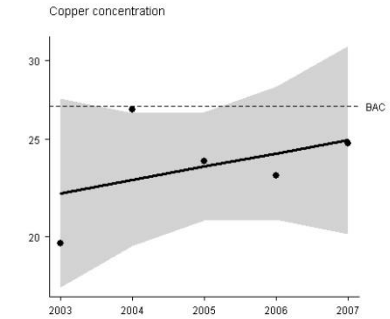
Copper in Sediment



Media: sediment
Station: Dublin Bay Trend Sediment Site 2
Units: mg kg^{-1} dry weight
Data extraction: 16 March 2010

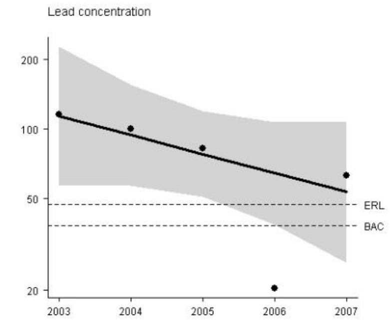


Media: sediment
Station: Dublin Bay Trend Sediment Site 1
Units: mg kg^{-1} dry weight
Data extraction: 16 March 2010

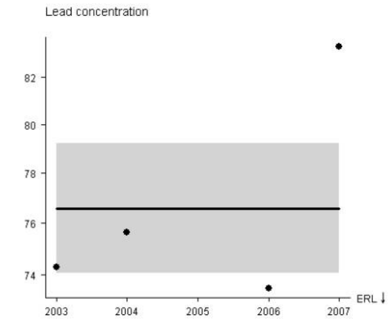


Media: sediment
Station: Irish Sea Trend Sediment Site
Units: mg kg^{-1} dry weight
Data extraction: 16 March 2010

Lead in Sediment



Media: sediment
Station: Dublin Bay Trend Sediment Site 1
Units: mg kg^{-1} dry weight
Data extraction: 16 March 2010



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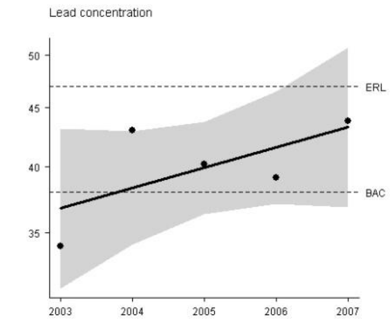
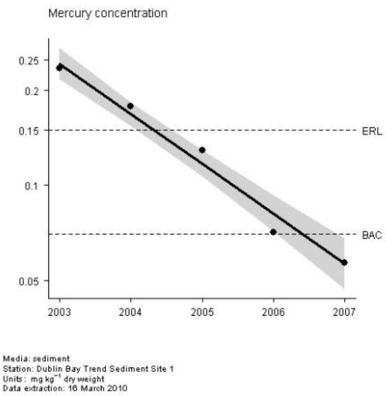
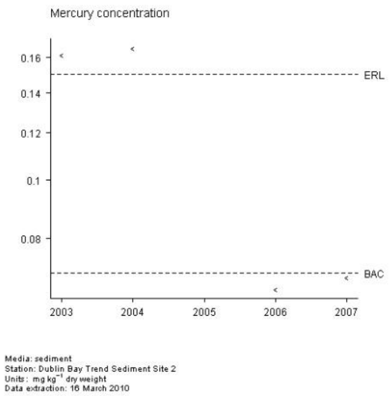
Station: Dublin Bay Trend Sediment Site 2
Units: mg kg^{-1} dry weight
Data extraction: 16 March 2010

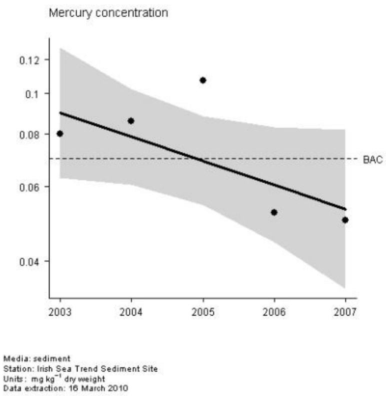


Media: sediment
Station: Irish Sea Trend Sediment Site
Units: mg kg^{-1} dry weight
Data extraction: 16 March 2010

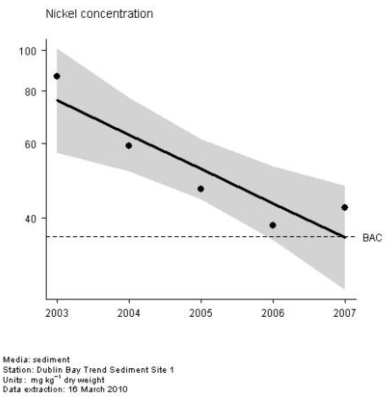
Mercury in Sediment

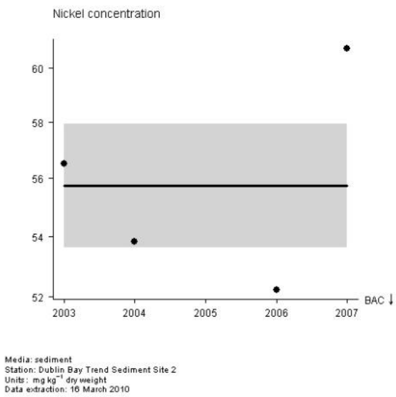


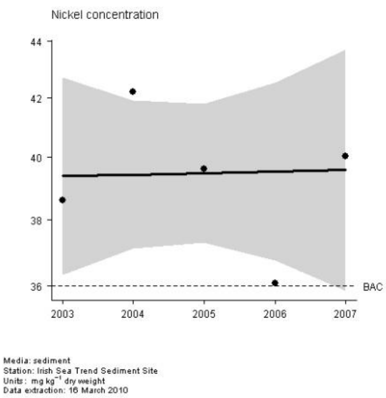




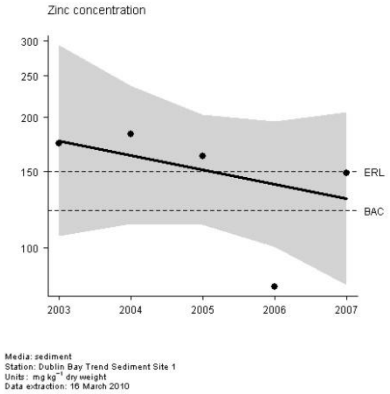
Nickel in Sediment

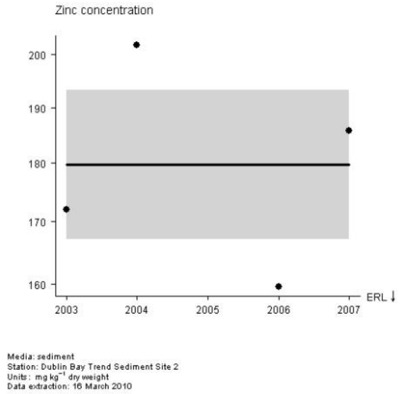


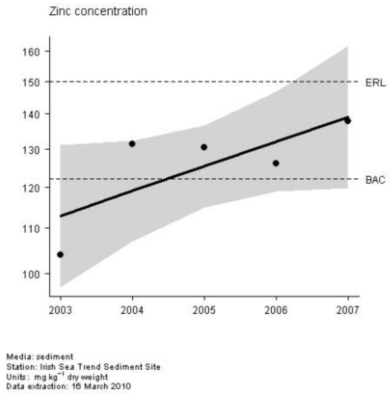




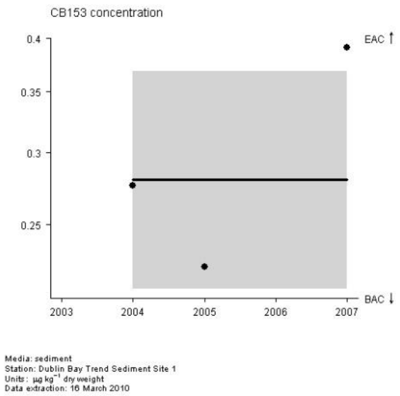
Zinc in Sediment

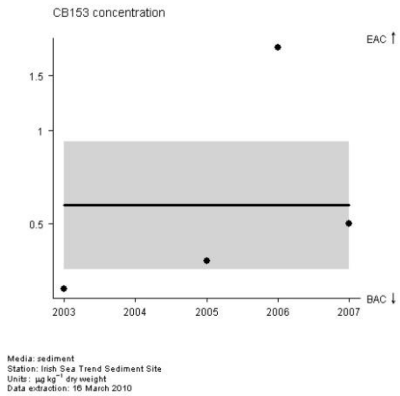




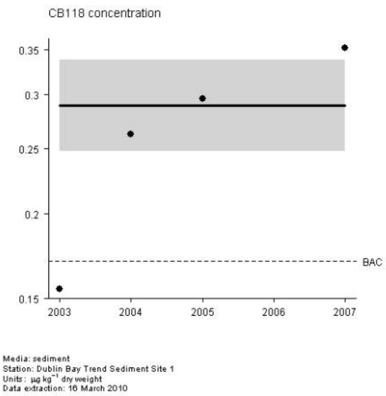


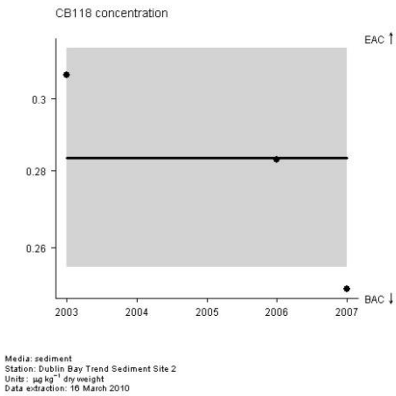
CB153 in sediment

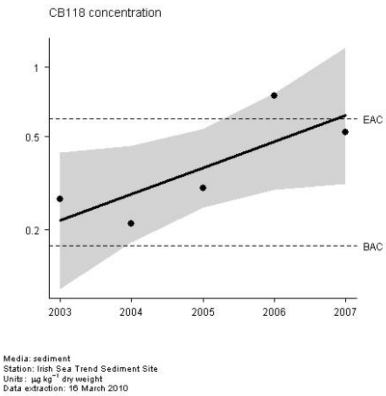




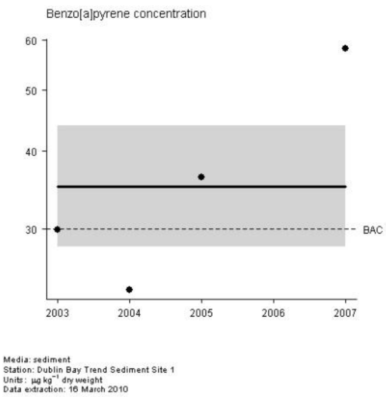
CB118 in sediment

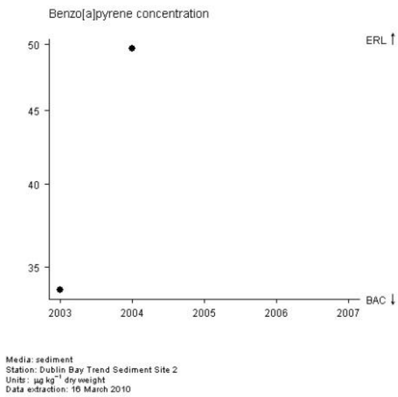


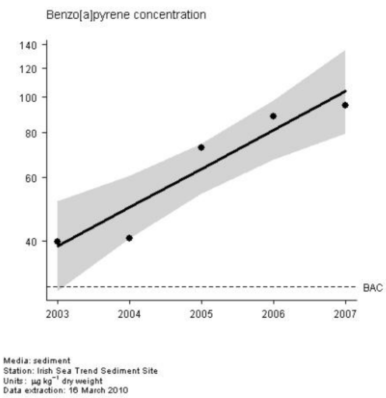




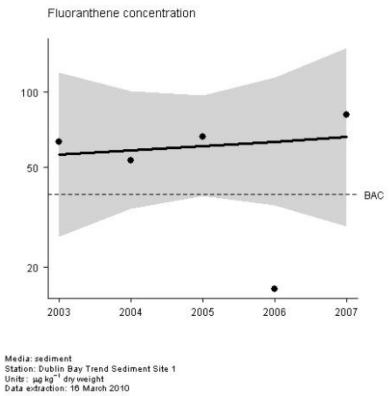
BaP in sediment

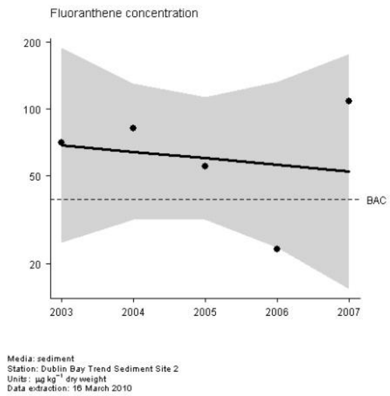


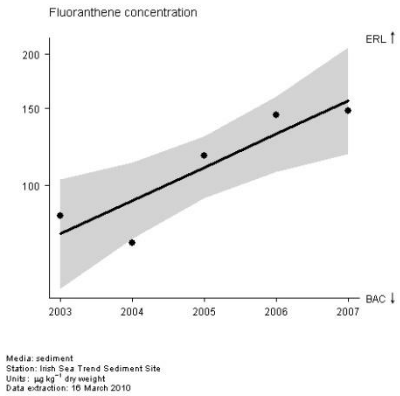




Fluoranthene in sediment





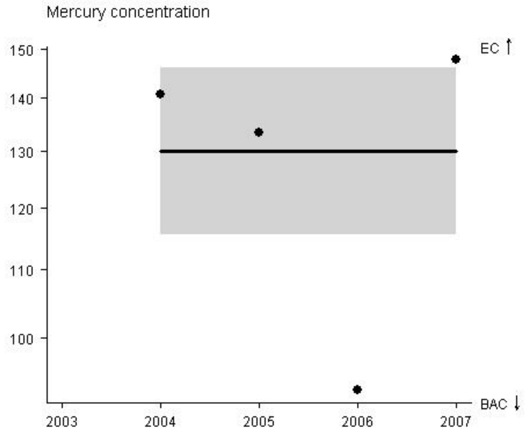


OSPAR Trend Assessments for Contaminants in Biota

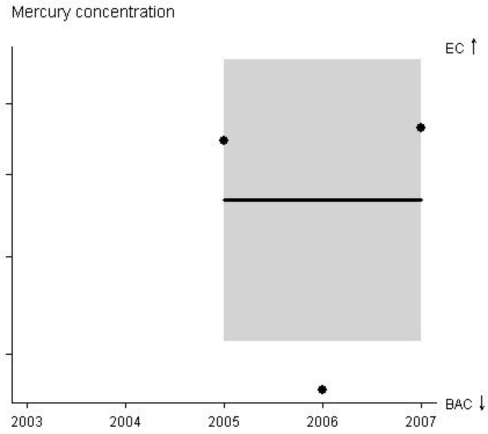
Table A2.1: Biota trend stations

MI OSPAR "TREND" locations	SPECIES	WFD Water Body
Annagasan	*Mytilus edulis*	Outer Dundalk Bay
Arthurstown	*Mytilus edulis*	Barrow Suir Nore Estuary
Aughinish Bay Galway 1	*Crassostrea gigas*	Aughinish Bay
Ballysadare Bay	*Mytilus edulis*	Ballysadare Estuary
Ballysadare Bay - Rosse's Point	*Mytilus edulis*	Sligo Harbour
Carlingford Lough	*Mytilus edulis*	Carlingford Lough
Castlegregory	*Ostrea edulis*	Outer Tralee Bay
Cheekpoint	*Mytilus edulis*	Barrow Suir Nore Estuary
Clarenbridge	*Crassostrea gigas*	Dunbulcaun Bay
Clarenbridge	*Ostrea edulis*	Dunbulcaun Bay
Clew Bay North Stn 1	*Crassostrea gigas*	Inner Clew Bay
Clew Bay North Stn 1	*Mytilus edulis*	Inner Clew Bay
Clew Bay South Stn 1	*Crassostrea gigas*	Westport Bay
Cork Harbour - N & E Channels	*Crassostrea gigas*	North Channel Great Island
Cromane Stn 1	*Mytilus edulis*	Cromane
Glengariff Stn 1	*Mytilus edulis*	Glengarriff Harbour
Inner Bannow Bay Stn 1	*Crassostrea gigas*	Bannow Bay
Inner Bantry Bay Stn 1	*Mytilus edulis*	Inner Bantry Bay
Inner Killary Harbour Stn 1	*Mytilus edulis*	Killary Harbour
Inner Lough Foyle - Quigley's Point	*Mytilus edulis*	Lough Foyle
Inner Lough Swilly	*Mytilus edulis*	Swilly Estuary
Inner McSwynes Bay - Bruckless	*Mytilus edulis*	McSwynes Bay
Inner Roaringwater Bay Stn 1	*Mytilus edulis*	Roaring Water Bay
Inner Rogerstown	*Mytilus edulis*	Rogerstown Estuary
Inner Shannon Estuary - Aughinish	*Crassostrea gigas*	Lower Shannon Estuary
Inner Shannon Estuary - Aughinish	*Mytilus edulis*	Lower Shannon Estuary
Inner Tralee Bay - Fenit	*Mytilus edulis*	Inner Tralee Bay
Inner Tralee Bay - Fenit	*Ostrea edulis*	Inner Tralee Bay
Kilkieran North Stn 1	*Ostrea edulis*	Kilkieran Bay
Kilmakilloge Stn 1	*Mytilus edulis*	Kilmakilloge Harbour
Lough Foyle	*Mytilus edulis*	Lough Foyle
Mulroy Bay - Broadwater Stn 1	*Mytilus edulis*	Mulroy Bay Broadwater
North Dublin Bay - Sutton	*Mytilus edulis*	Dublin Bay
Outer Carlingford Lough	*Crassostrea gigas*	Carlingford Lough
Outer Carlingford Lough	*Mytilus edulis*	Carlingford Lough
Outer Dungarvan Bay	*Crassostrea gigas*	Dungarvan Harbour
Outer Wexford Harbour	*Mytilus edulis*	Lower Slaney Estuary
Ringaskiddy	*Mytilus edulis*	Cork Harbour
Sea Point	*Mytilus edulis*	Dublin Bay

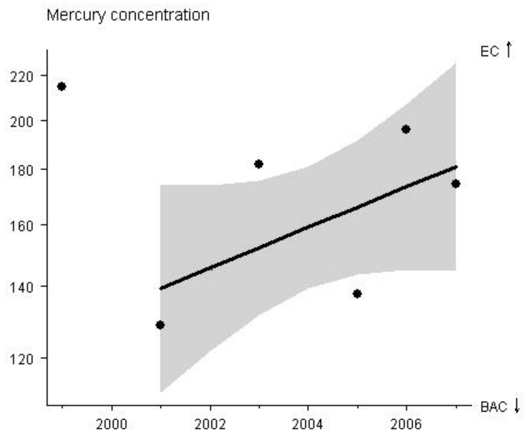
OSPAR Trend assessments for Mercury in shellfish



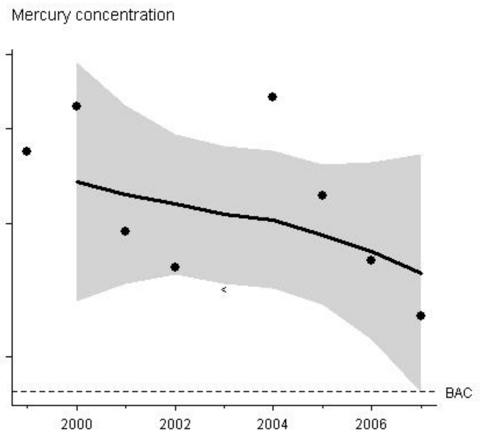
Media: biota (Mytilus edulis)
Station: Inner Lough Swilly
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010



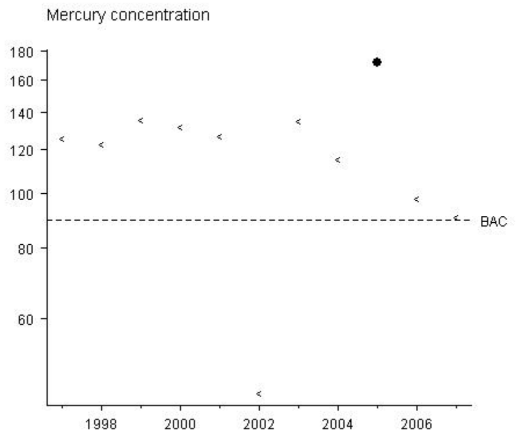
Media: biota (Mytilus edulis)
Station: Ballysadare Bay - Rosse's Point
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010



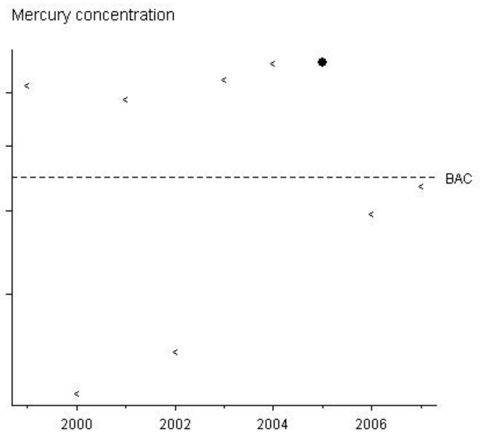
Media: biota (Ostrea edulis)
Station: Kilkieran North Stn 1
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010



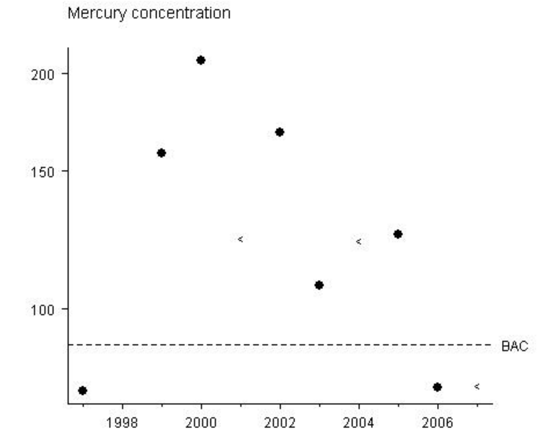
Media: biota (Crassostrea gigas)
Station: Aughinish Bay Galway 1
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010



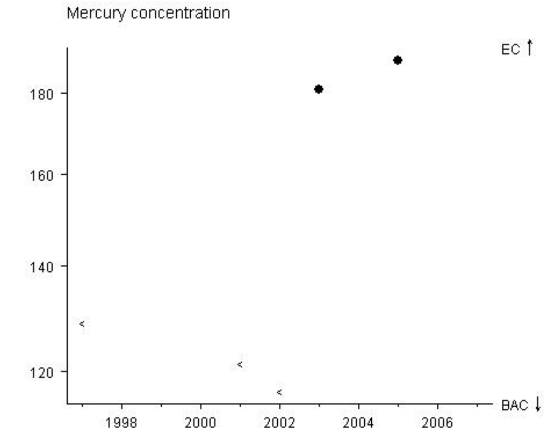
Media: biota (Mytilus edulis)
Station: Kilmakilloge Stn 1
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010



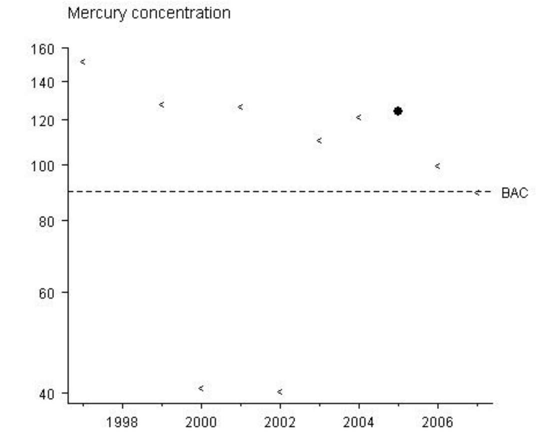
Media: biota (Mytilus edulis)
Station: Glengariff Stn 1
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010



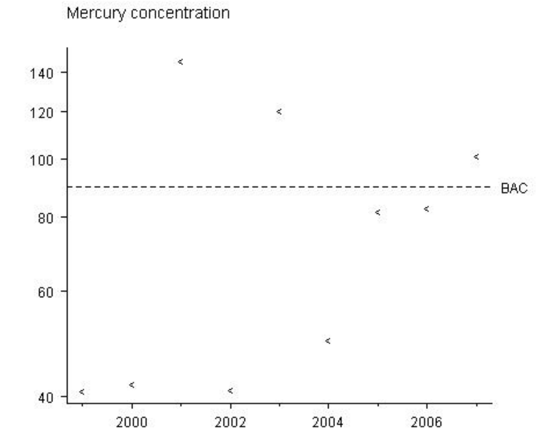
Media: biota (Mytilus edulis)
Station: Ringaskiddy
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010



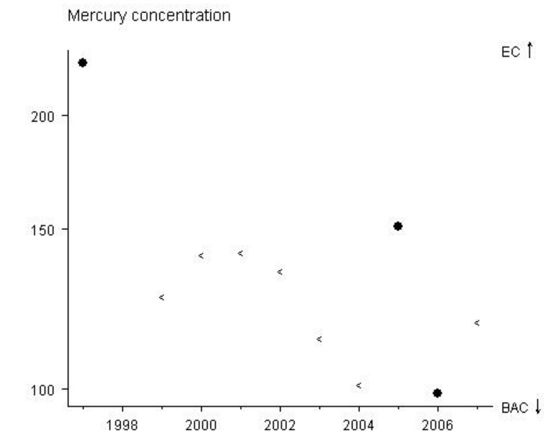
Media: biota (Crassostrea gigas)
Station: Cork Harbour - N & E Channels
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010



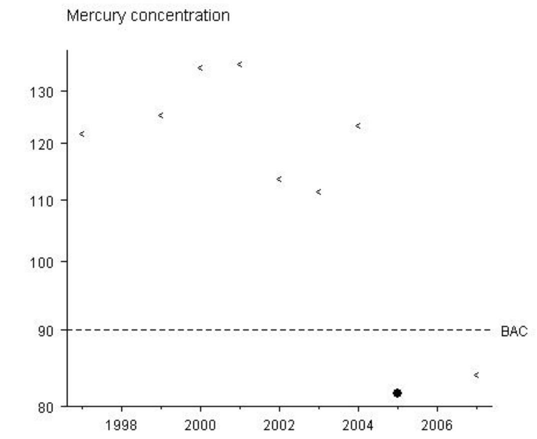
Media: biota (Crassostrea gigas)
Station: Outer Dungarvan Bay
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010



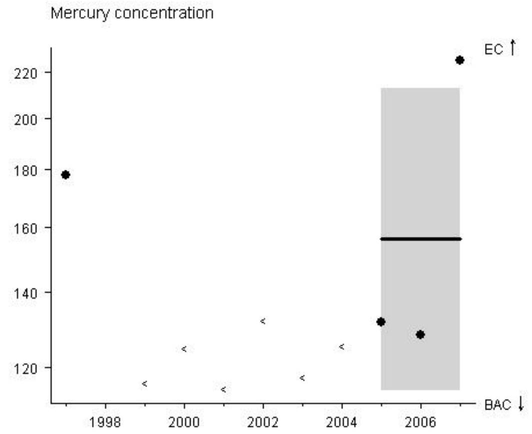
Media: biota (Crassostrea gigas)
Station: Inner Bannow Bay Stn 1
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010



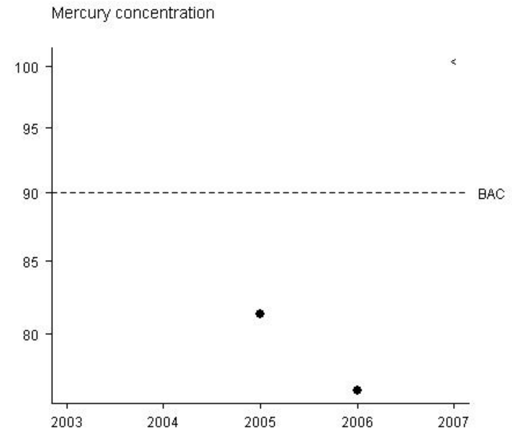
Media: biota (Mytilus edulis)
Station: Arthurstown
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010



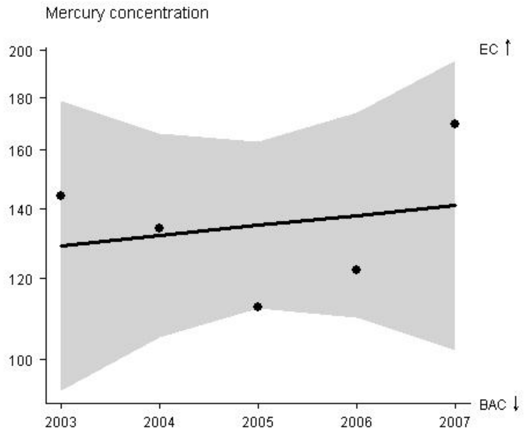
Media: biota (Mytilus edulis)
Station: Outer Wexford Harbour
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010



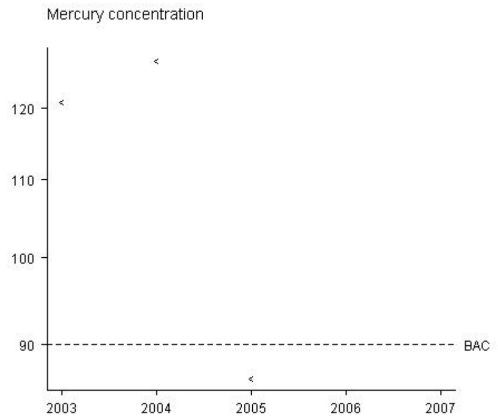
Media: biota (Mytilus edulis)
Station: North Dublin Bay - Sutton
Units: $\mu g\ kg^{-1}$ wet weight
Data extraction: 16 March 2010



Media: biota (Mytilus edulis)
Station: Sea Point
Units: $\mu g\ kg^{-1}$ wet weight
Data extraction: 16 March 2010

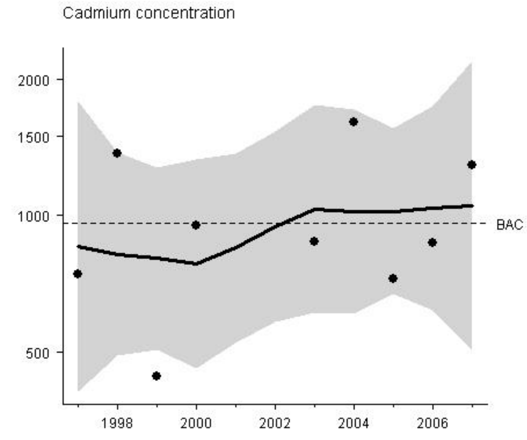


Media: biota (Mytilus edulis)
Station: Inner Rogerstown
Units: $\mu g\ kg^{-1}$ wet weight
Data extraction: 16 March 2010

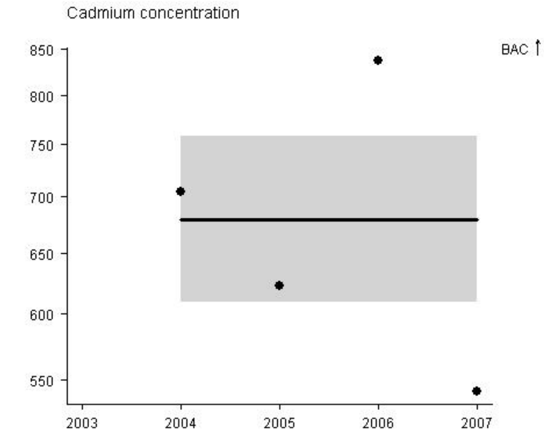


Media: biota (Mytilus edulis)
Station: Carlingford Lough
Units: $\mu g\ kg^{-1}$ wet weight
Data extraction: 16 March 2010

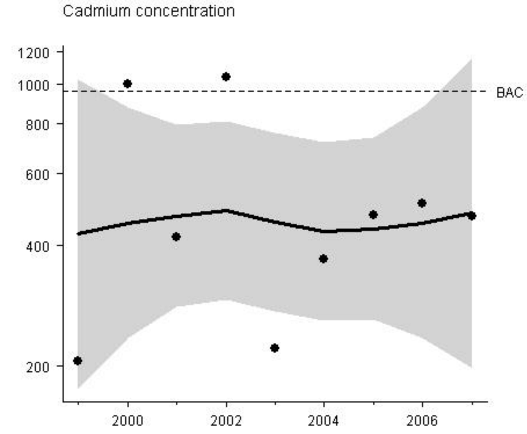
OSPAR trend assessments for cadmium in shellfish



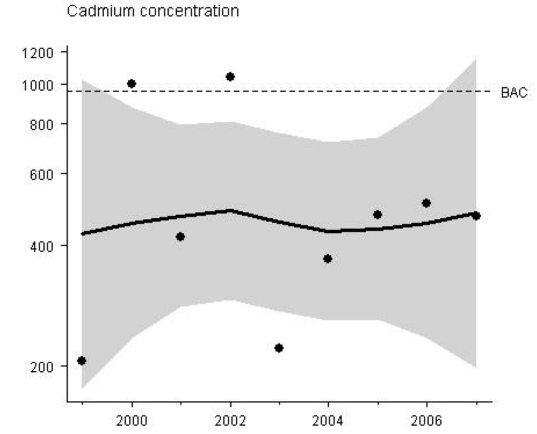
Media: biota (Mytilus edulis)
Station: Inner Lough Foyle - Quigley's Point
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010



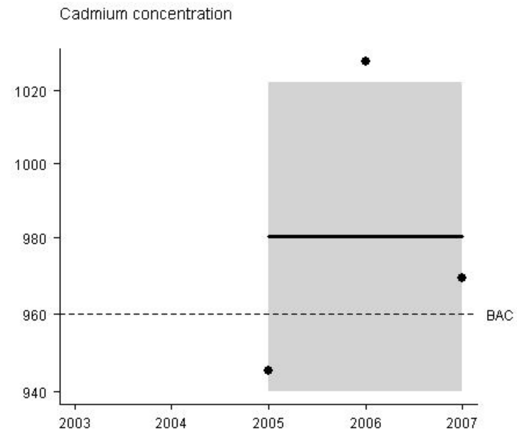
Media: biota (Mytilus edulis)
Station: Inner Lough Swilly
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010



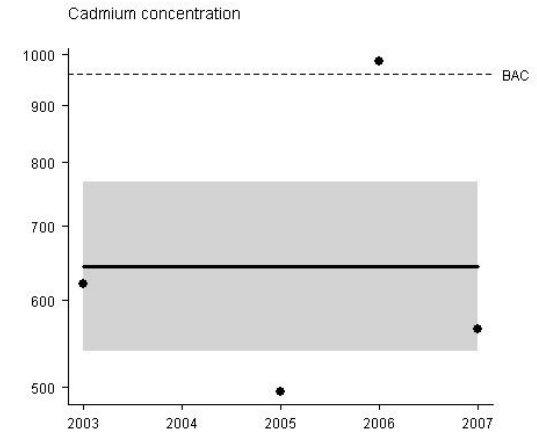
Media: biota (Mytilus edulis)
Station: Mulroy Bay - Broadwater Stn 1
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010



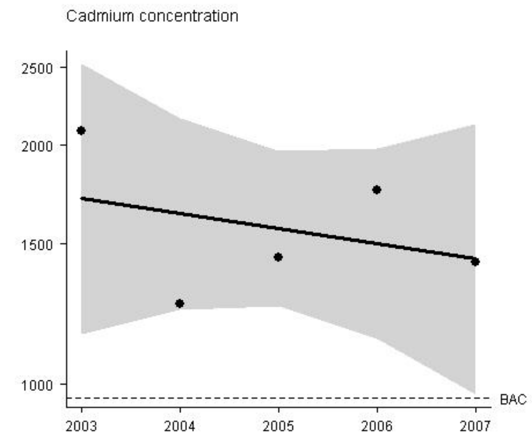
Media: biota (Mytilus edulis)
Station: Mulroy Bay - Broadwater Stn 1
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010



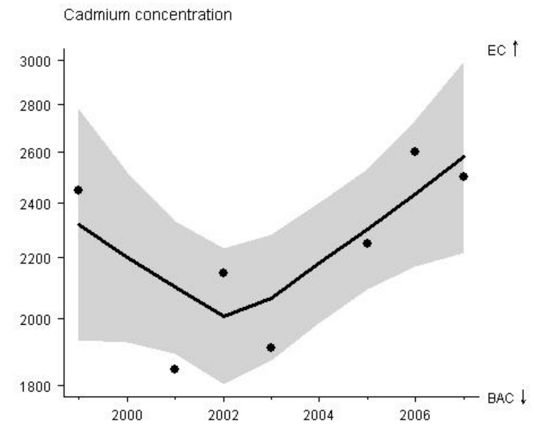
Media: biota (Mytilus edulis)
Station: Ballysadare Bay - Rosse's Point
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010



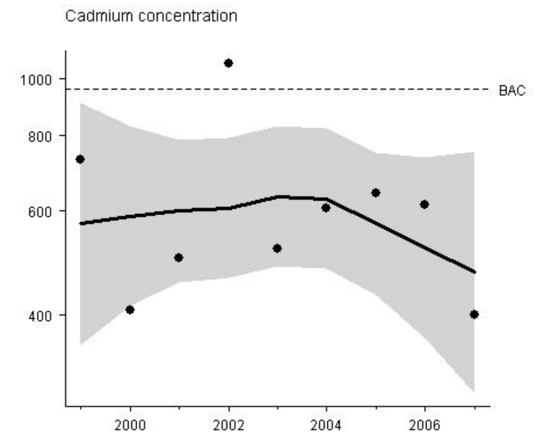
Media: biota (Mytilus edulis)
Station: Ballysadare Bay
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010



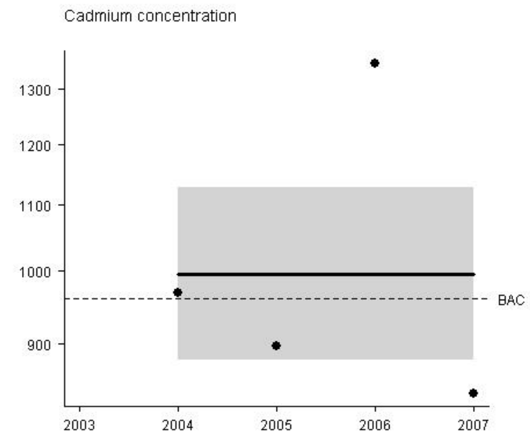
Media: biota (Crassostrea gigas)
Station: Clew Bay South Stn 1
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010



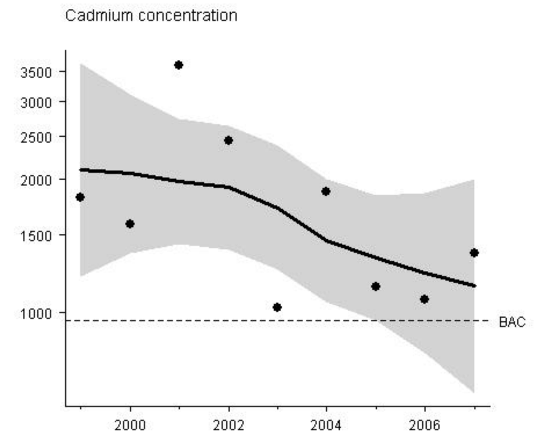
Media: biota (Ostrea edulis)
Station: Kilkieran North Stn 1
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010



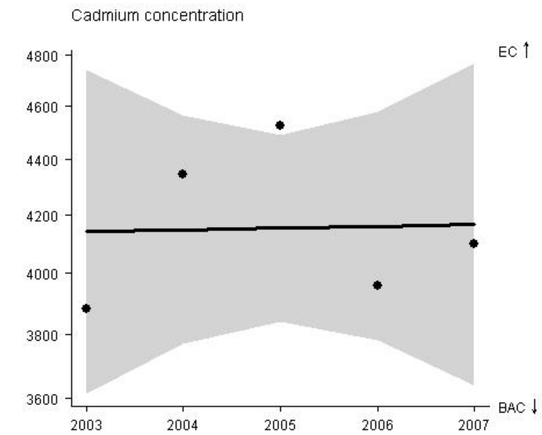
Media: biota (Mytilus edulis)
Station: Inner Killary Harbour Stn 1
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010



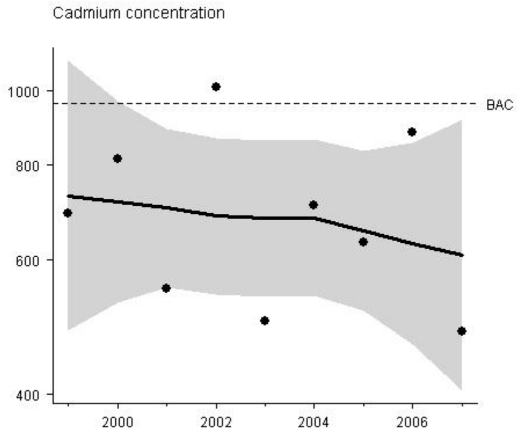
Media: biota (Crassostrea gigas)
Station: Clarenbridge
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010



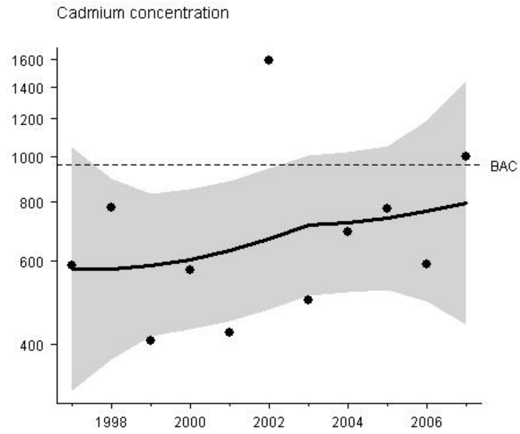
Media: biota (Crassostrea gigas)
Station: Aughinish Bay Galway 1
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010



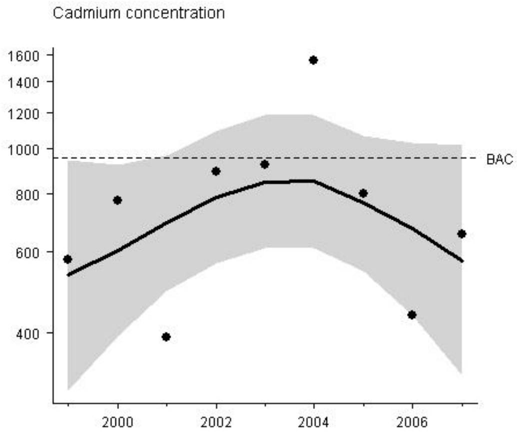
Media: biota (Ostrea edulis)
Station: Castlegregory
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010



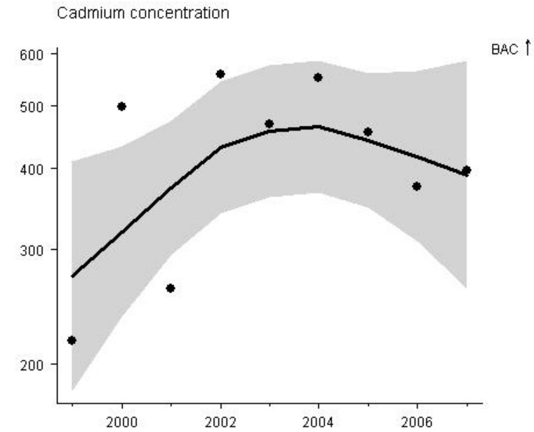
Media: biota (Mytilus edulis)
Station: Cromane Stn 1
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010



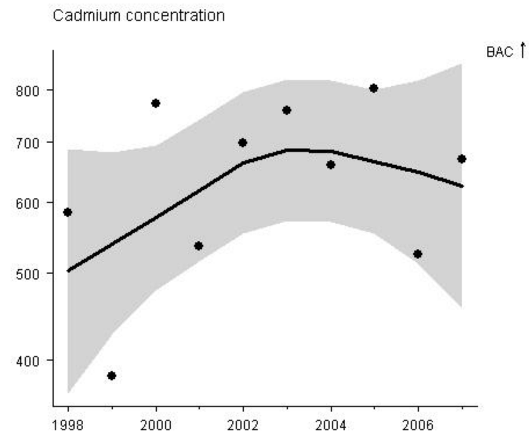
Media: biota (Mytilus edulis)
Station: Kilmakilloge Stn 1
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010



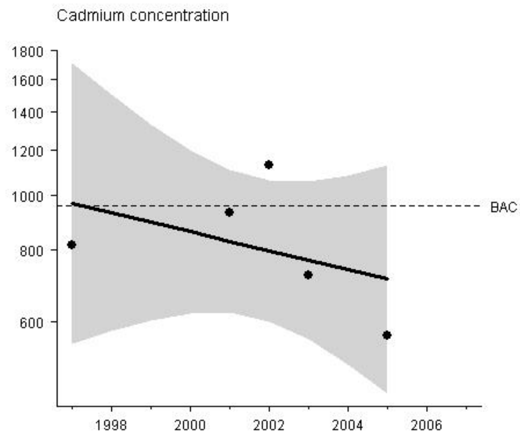
Media: biota (Mytilus edulis)
Station: Glengariff Stn 1
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010



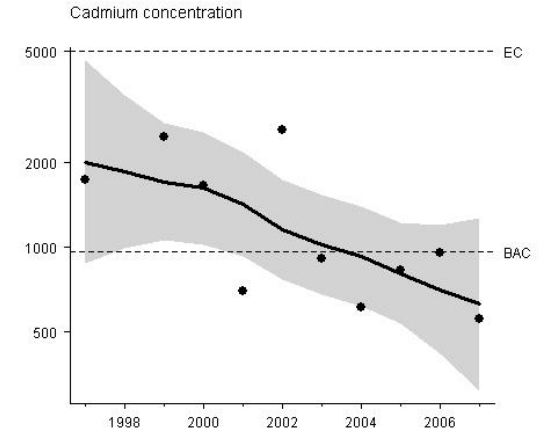
Media: biota (Mytilus edulis)
Station: Inner Roaringwater Bay Stn 1
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010



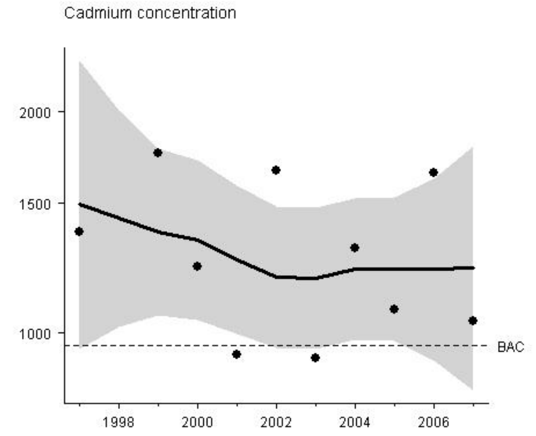
Media: biota (Mytilus edulis)
Station: Inner Bantry Bay Stn 1
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010



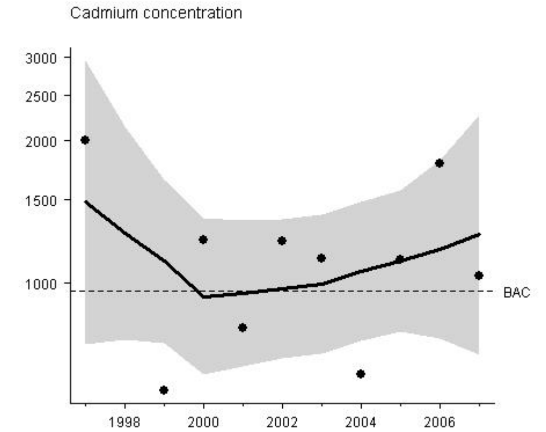
Media: biota (Crassostrea gigas)
Station: Cork Harbour - N & E Channels
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010



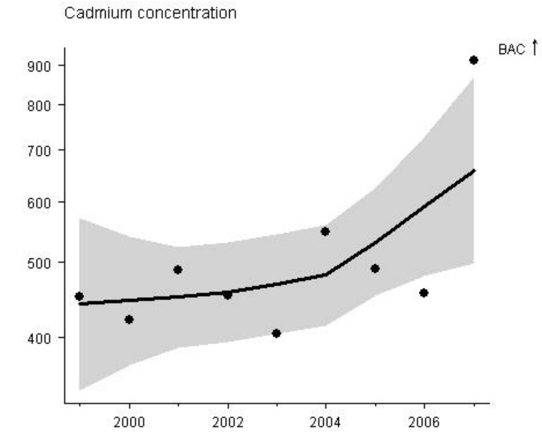
Media: biota (Mytilus edulis)
Station: Ringaskiddy
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010



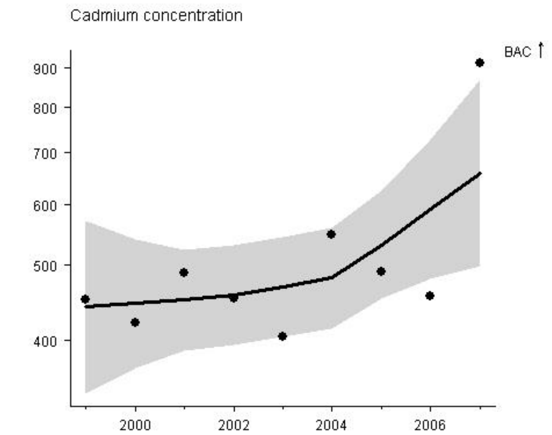
Media: biota (Crassostrea gigas)
Station: Outer Dungarvan Bay
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010



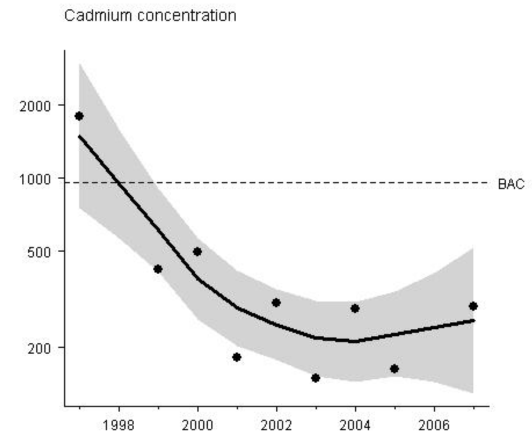
Media: biota (Mytilus edulis)
Station: Arthurstown
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010



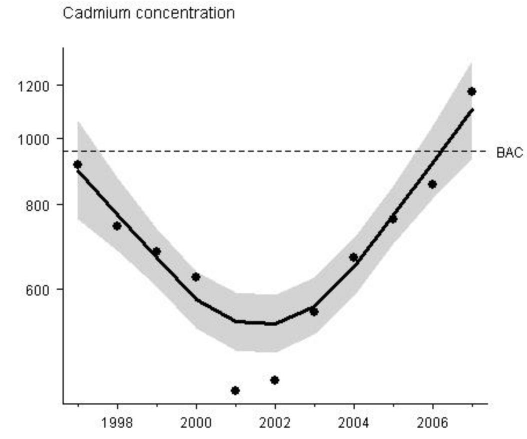
Media: biota (Crassostrea gigas)
Station: Inner Bannow Bay Stn 1
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010



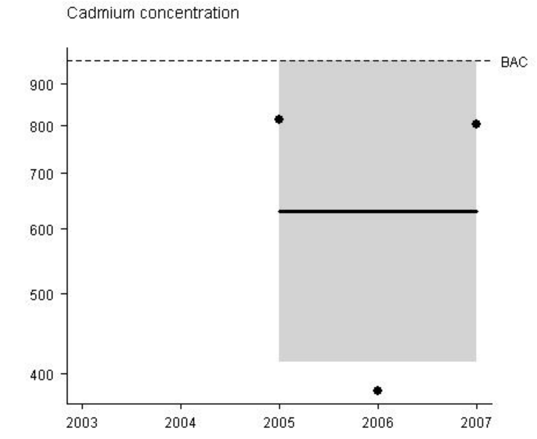
Media: biota (Crassostrea gigas)
Station: Inner Bannow Bay Stn 1
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010



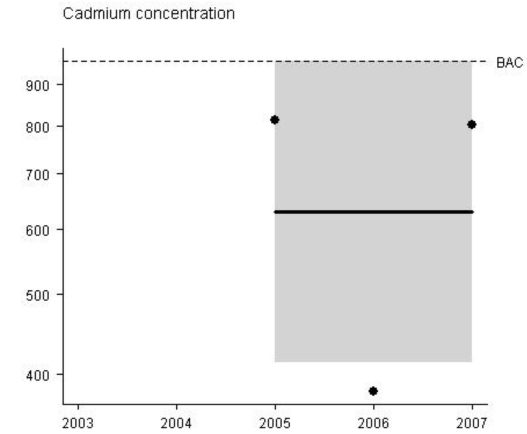
Media: biota (Mytilus edulis)
Station: Outer Wexford Harbour
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010



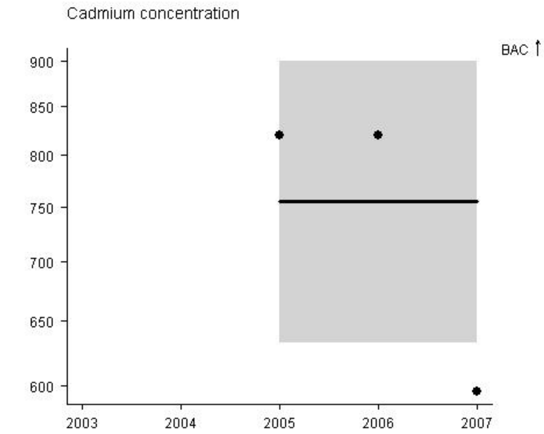
Media: biota (Mytilus edulis)
Station: North Dublin Bay - Sutton
Units: $\mu g\ kg^{-1}$ wet weight
Data extraction: 16 March 2010



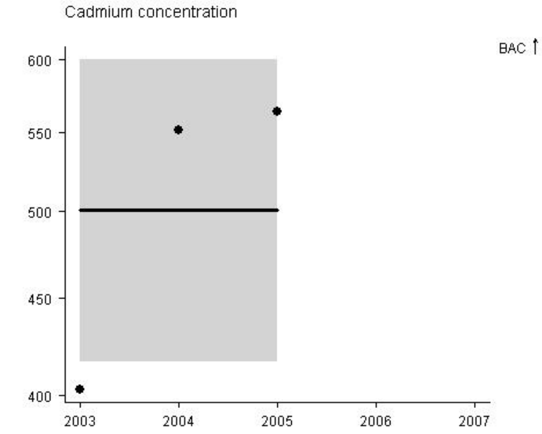
Media: biota (Mytilus edulis)
Station: Sea Point
Units: $\mu g\ kg^{-1}$ wet weight
Data extraction: 16 March 2010



Media: biota (Mytilus edulis)
Station: Sea Point
Units: $\mu g\ kg^{-1}$ wet weight
Data extraction: 16 March 2010

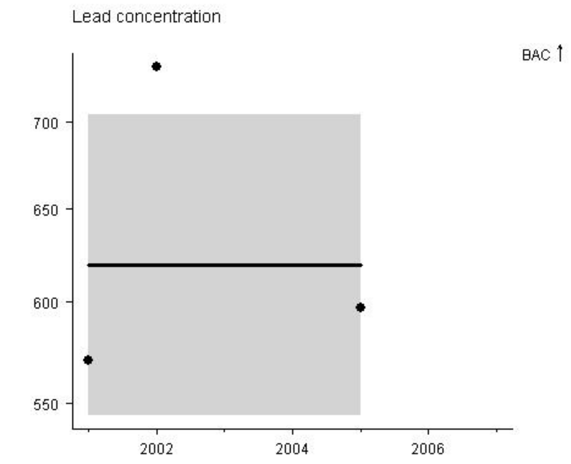


Media: biota (Mytilus edulis)
Station: Annagasan
Units: $\mu g\ kg^{-1}$ wet weight
Data extraction: 16 March 2010

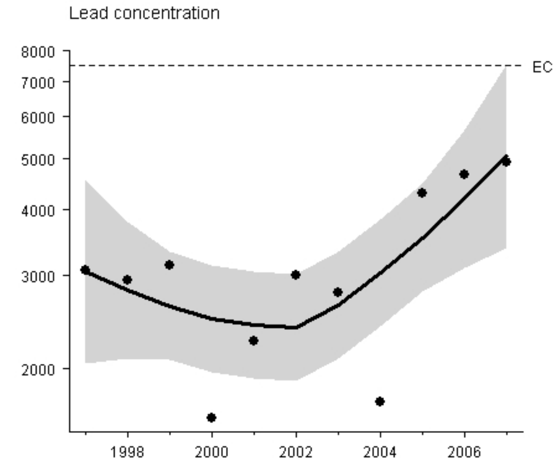


Media: biota (Mytilus edulis)
Station: Carlingford Lough
Units: $\mu g\ kg^{-1}$ wet weight
Data extraction: 16 March 2010

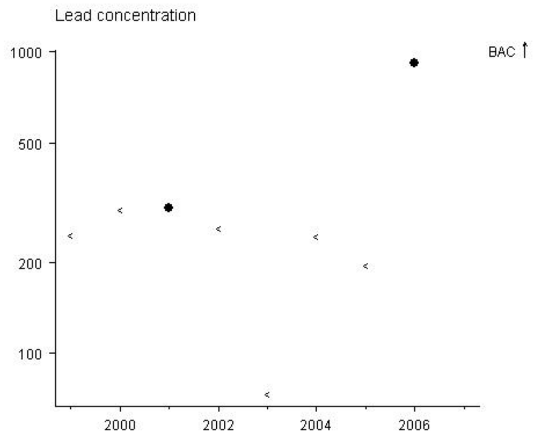
OSPAR trend assessments for lead in shellfish



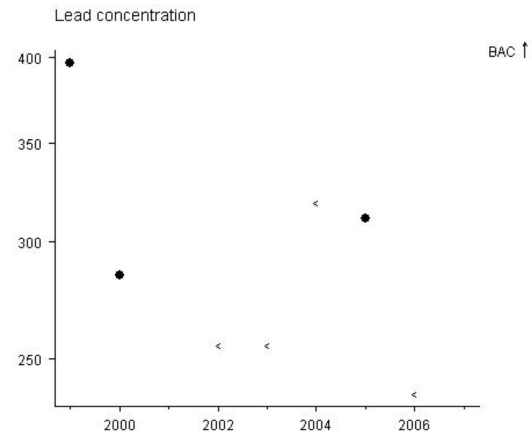
Media: biota (Mytilus edulis)
Station: Lough Foyle
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010



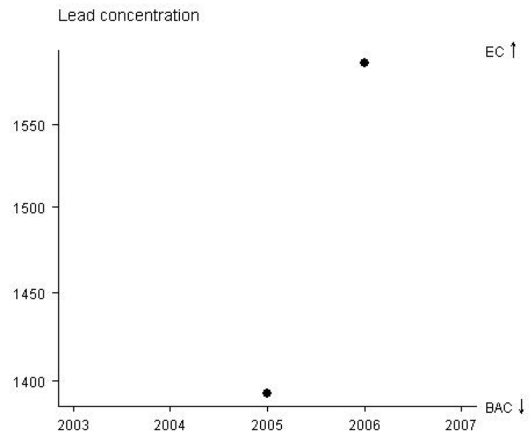
Media: biota (Mytilus edulis)
Station: North Dublin Bay - Sutton
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010



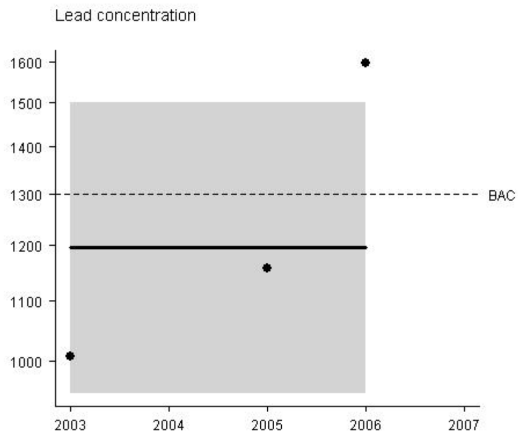
Media: biota (Mytilus edulis)
Station: Mulroy Bay - Broadwater Stn 1
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010



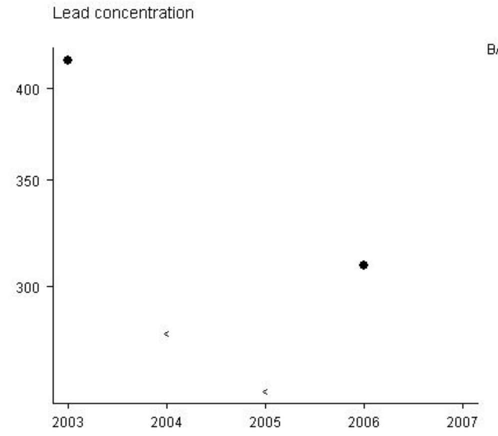
Media: biota (Mytilus edulis)
Station: Inner McSwynes Bay - Bruckless
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010



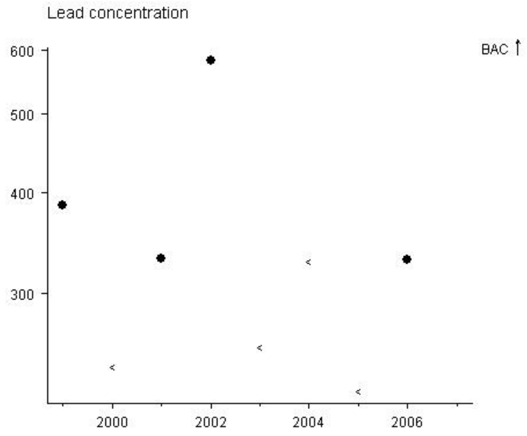
Media: biota (Mytilus edulis)
Station: Ballysadare Bay - Rosse's Point
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010



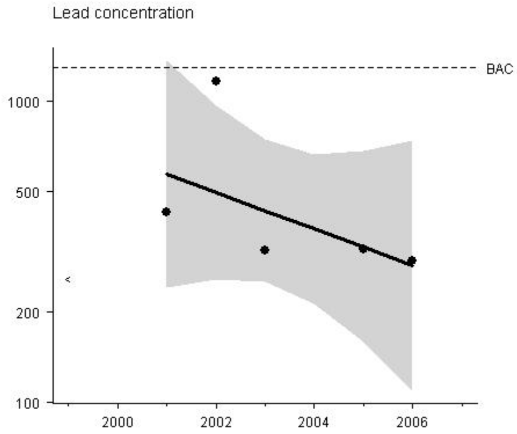
Media: biota (Mytilus edulis)
Station: Ballysadare Bay
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010



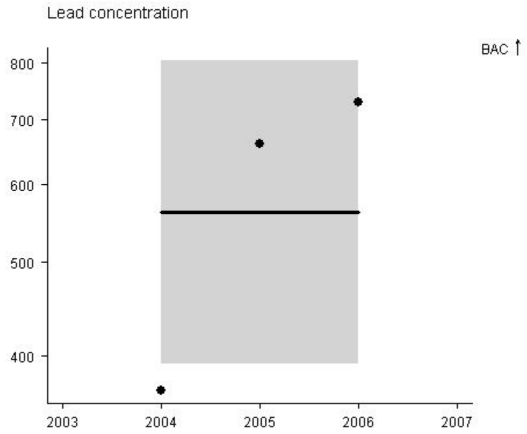
Media: biota (Crassostrea gigas)
Station: Clew Bay South Stn 1
Units: $\mu g\ kg^{-1}$ wet weight
Data extraction: 16 March 2010



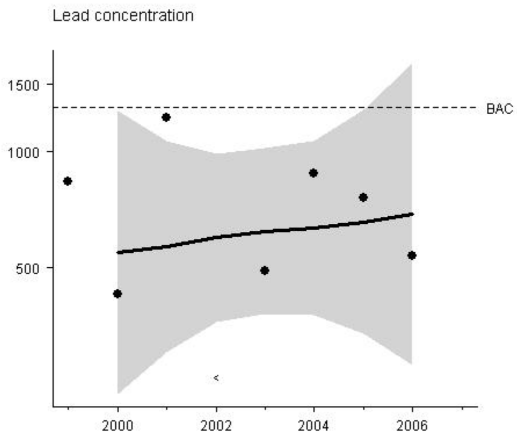
Media: biota (Mytilus edulis)
Station: Inner Killary Harbour Stn 1
Units: $\mu g\ kg^{-1}$ wet weight
Data extraction: 16 March 2010



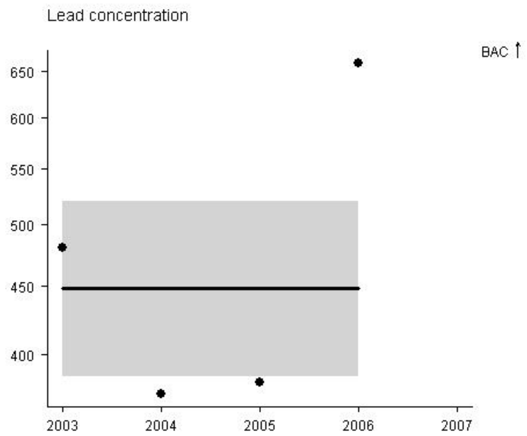
Media: biota (Ostrea edulis)
Station: Kilkieran North Stn 1
Units: $\mu g\ kg^{-1}$ wet weight
Data extraction: 16 March 2010



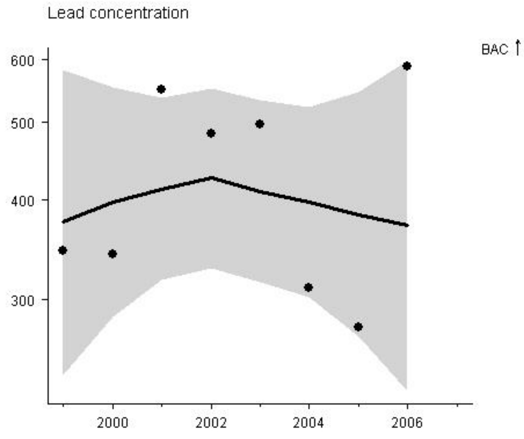
Media: biota (Crassostrea gigas)
Station: Clarenbridge
Units: $\mu g\ kg^{-1}$ wet weight
Data extraction: 16 March 2010



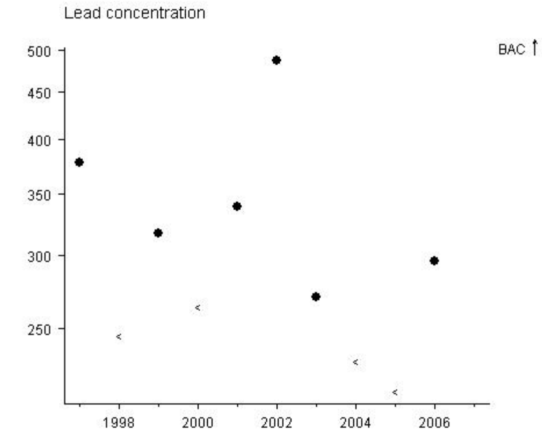
Media: biota (Crassostrea gigas)
Station: Aughinish Bay Galway 1
Units: $\mu g\ kg^{-1}$ wet weight
Data extraction: 16 March 2010



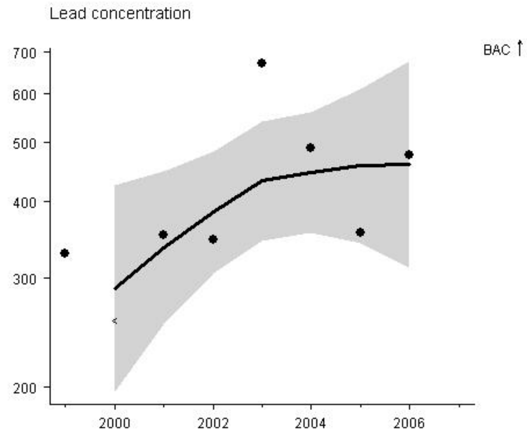
Media: biota (Ostrea edulis)
Station: Castlegregory
Units: $\mu g\ kg^{-1}$ wet weight
Data extraction: 16 March 2010



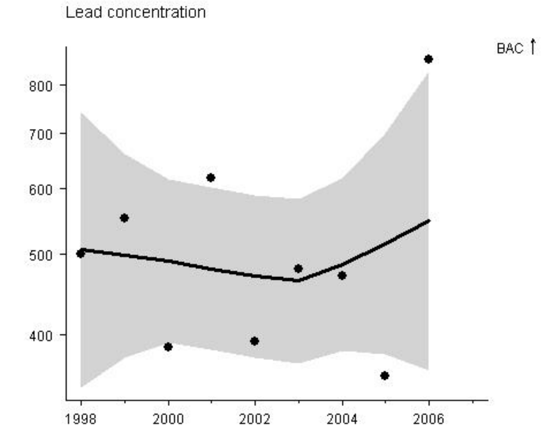
Media: biota (Mytilus edulis)
Station: Cromane Stn 1
Units: $\mu g\ kg^{-1}$ wet weight
Data extraction: 16 March 2010



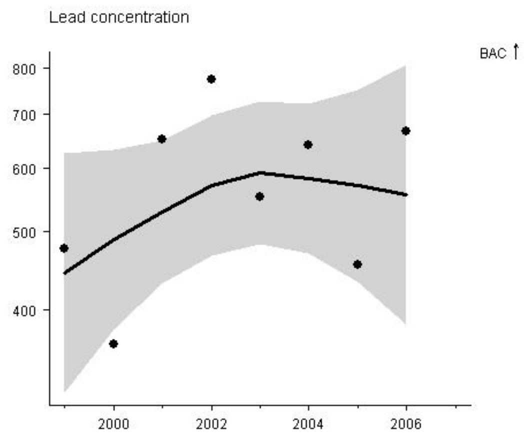
Media: biota (Mytilus edulis)
Station: Kilmakilloge Stn 1
Units: $\mu g\ kg^{-1}$ wet weight
Data extraction: 16 March 2010



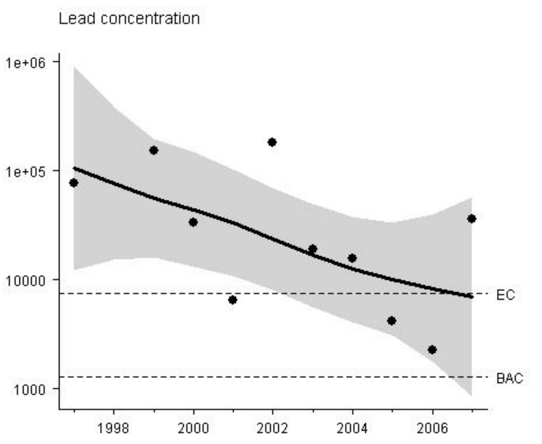
Media: biota (Mytilus edulis)
Station: Glengariff Stn 1
Units: $\mu g\ kg^{-1}$ wet weight
Data extraction: 16 March 2010



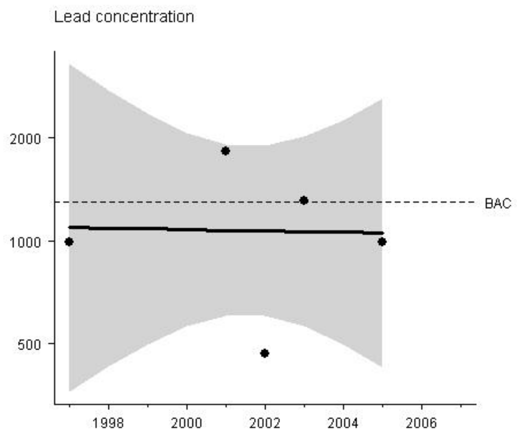
Media: biota (Mytilus edulis)
Station: Inner Bantry Bay Stn 1
Units: $\mu g\ kg^{-1}$ wet weight
Data extraction: 16 March 2010



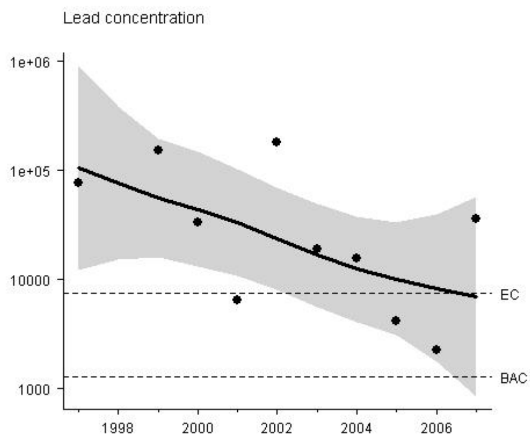
Media: biota (Mytilus edulis)
Station: Inner Roaringwater Bay Stn 1
Units: $\mu g\ kg^{-1}$ wet weight
Data extraction: 16 March 2010



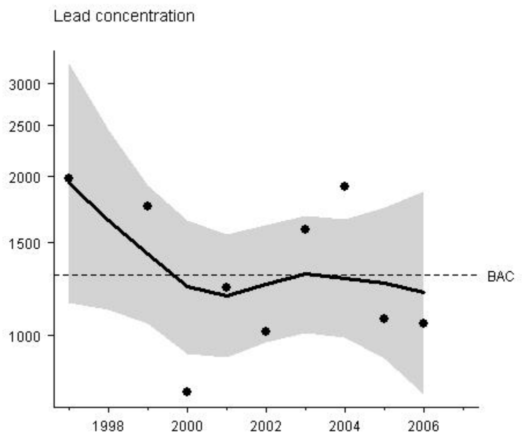
Media: biota (Mytilus edulis)
Station: Ringaskiddy
Units: $\mu g\ kg^{-1}$ wet weight
Data extraction: 16 March 2010



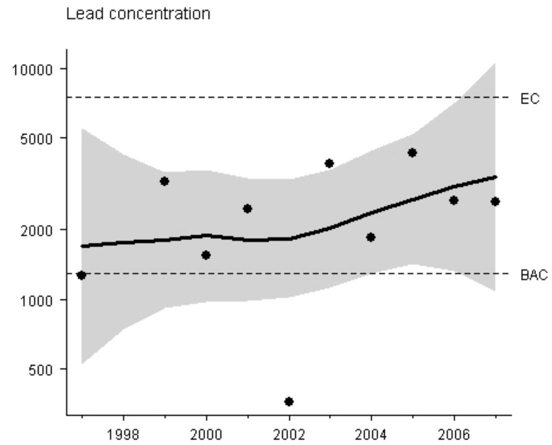
Media: biota (Crassostrea gigas)
Station: Cork Harbour - N & E Channels
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010



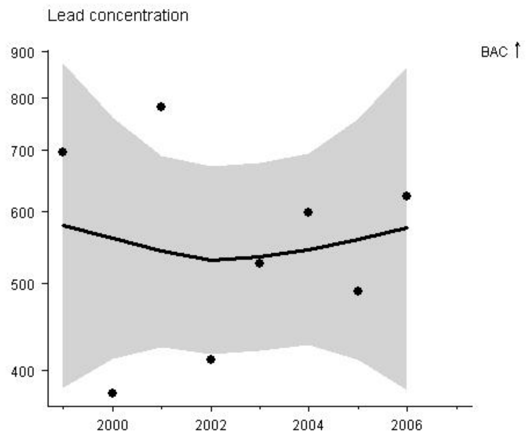
Media: biota (Mytilus edulis)
Station: Ringaskiddy
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010



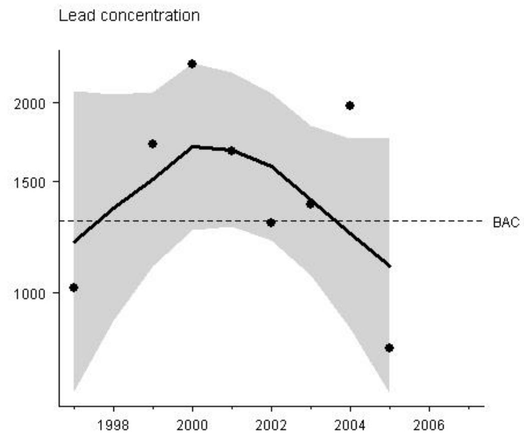
Media: biota (Crassostrea gigas)
Station: Outer Dungarvan Bay
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010



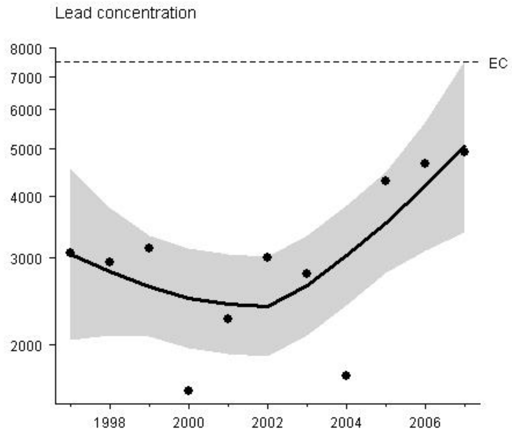
Media: biota (Mytilus edulis)
Station: Arthurstown
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010



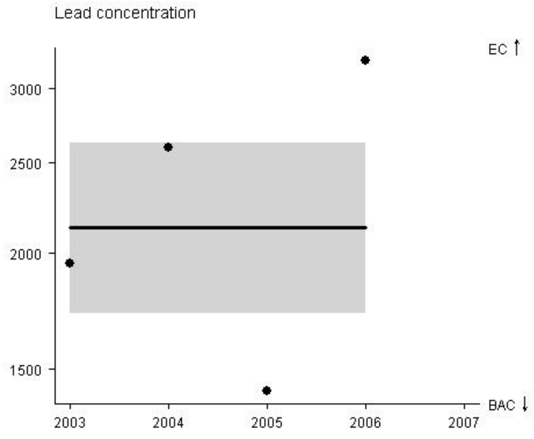
Media: biota (Crassostrea gigas)
Station: Inner Bannow Bay Stn 1
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010



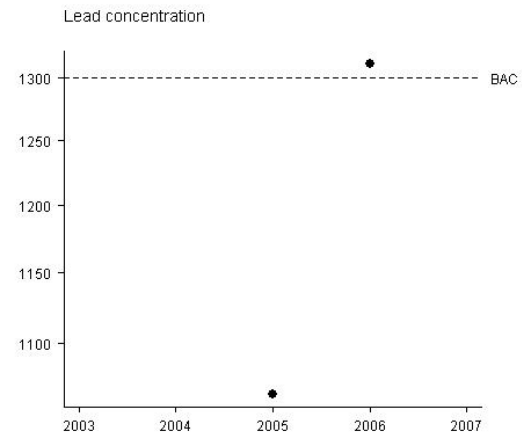
Media: biota (Mytilus edulis)
Station: Outer Wexford Harbour
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010



Media: biota (Mytilus edulis)
Station: North Dublin Bay - Sutton
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010

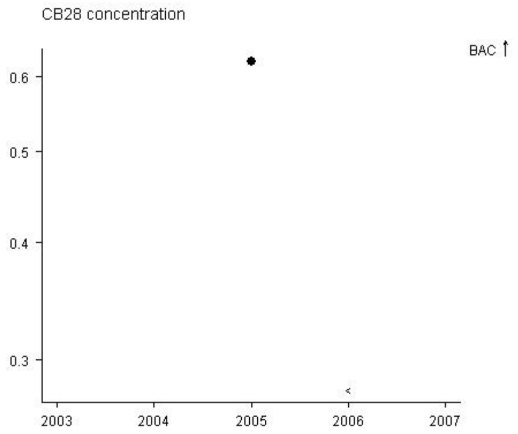


Media: biota (Mytilus edulis)
Station: Inner Rogerstown
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010

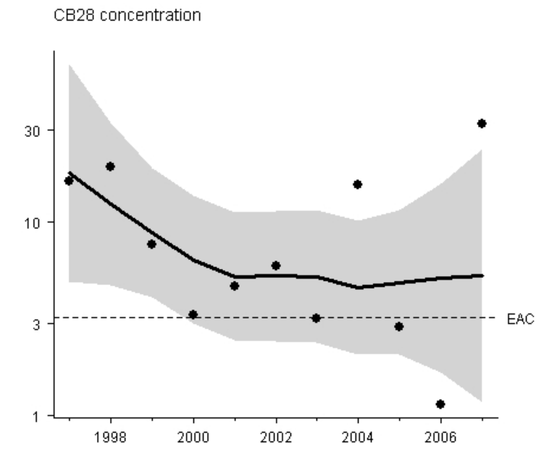


Media: biota (Mytilus edulis)
Station: Annagasan
Units: µg kg^{-1} wet weight
Data extraction: 16 March 2010

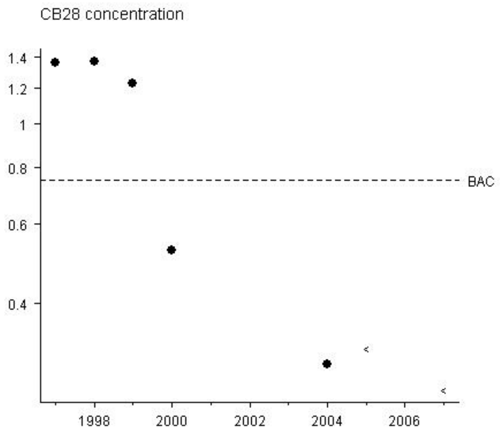
OSPAR trend assessments for PCB28 in shellfish



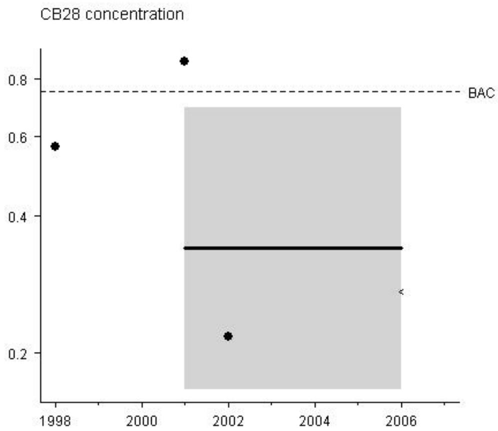
Media: biota (Mytilus edulis)
Station: Inner Lough Swilly
Units: µg kg^{-1} lipid weight
Data extraction: 16 March 2010



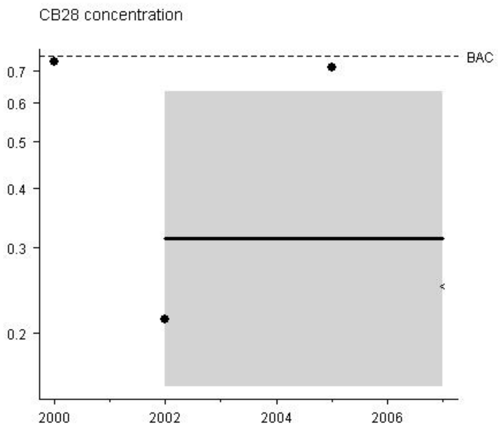
Media: biota (Mytilus edulis)
Station: Ringaskiddy
Units: µg kg^{-1} lipid weight
Data extraction: 16 March 2010



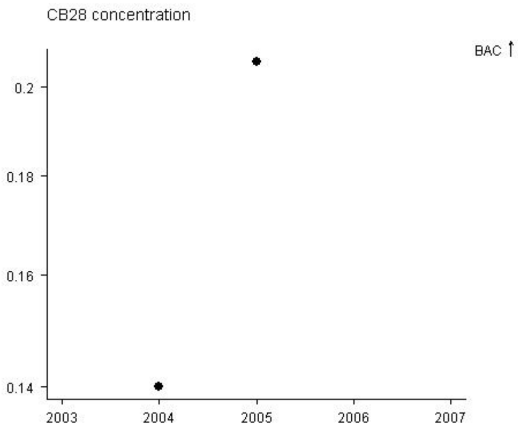
Media: biota (Mytilus edulis)
Station: Inner Lough Foyle - Quigley's Point
Units: µg kg^{-1} lipid weight
Data extraction: 16 March 2010



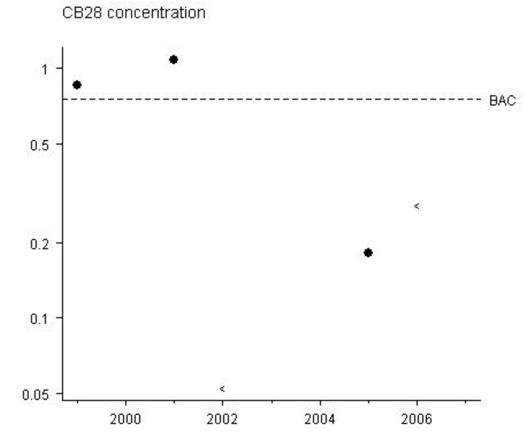
Media: biota (Mytilus edulis)
Station: Mulroy Bay - Broadwater Stn 1
Units: µg kg^{-1} lipid weight
Data extraction: 16 March 2010



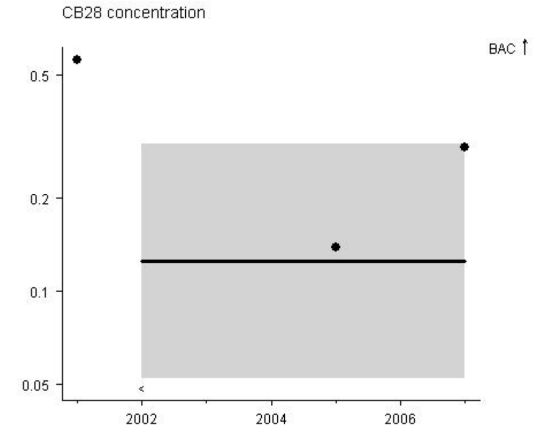
Media: biota (Mytilus edulis)
Station: Inner McSwynes Bay - Bruckless
Units: µg kg^{-1} lipid weight
Data extraction: 16 March 2010



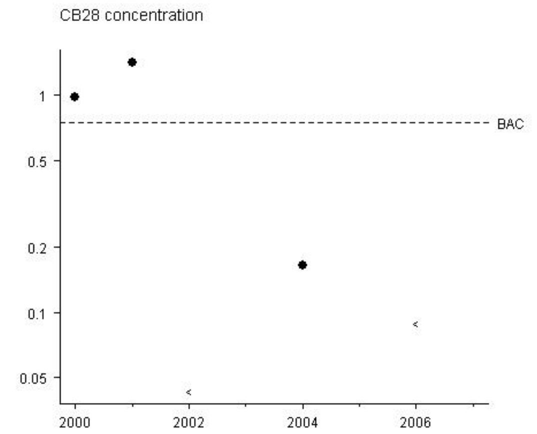
Media: biota (Crassostrea gigas)
Station: Clew Bay South Stn 1
Units: µg kg^{-1} lipid weight
Data extraction: 16 March 2010



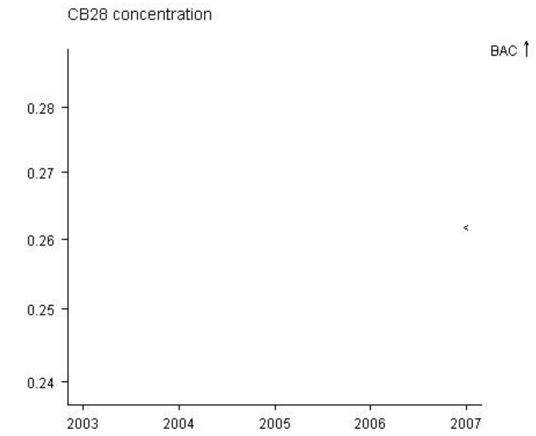
Media: biota (Mytilus edulis)
Station: Inner Killary Harbour Stn 1
Units: µg kg^{-1} lipid weight
Data extraction: 16 March 2010



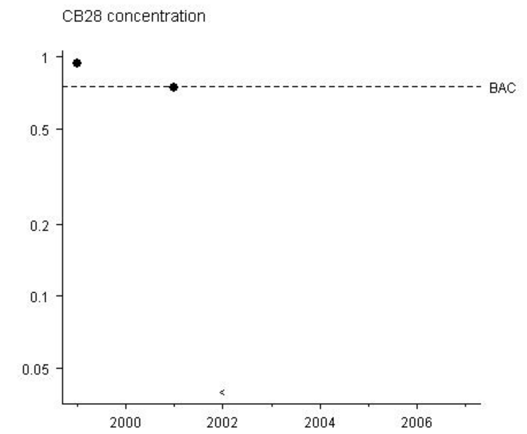
Media: biota (Ostrea edulis)
Station: Kilkieran North Stn 1
Units: µg kg^{-1} lipid weight
Data extraction: 16 March 2010



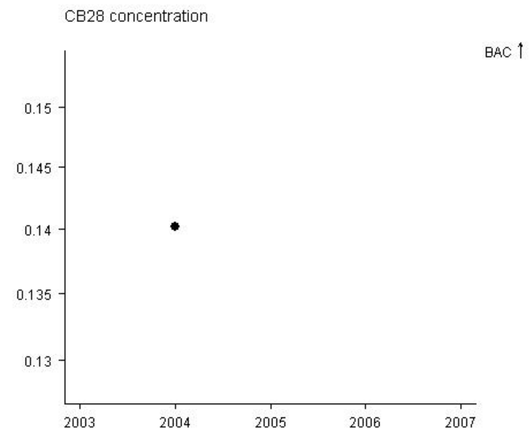
Media: biota (Crassostrea gigas)
Station: Aughinish Bay Galway 1
Units: µg kg^{-1} lipid weight
Data extraction: 16 March 2010



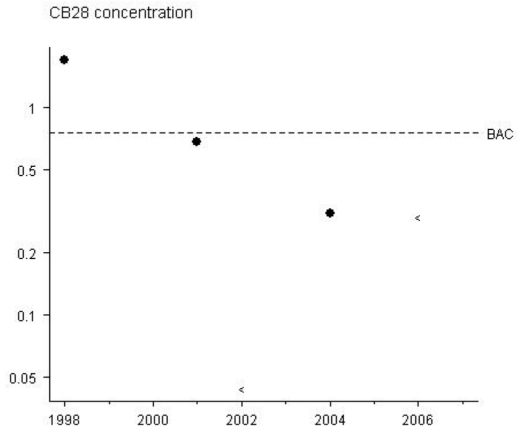
Media: biota (Crassostrea gigas)
Station: Clarenbridge
Units: µg kg^{-1} lipid weight
Data extraction: 16 March 2010



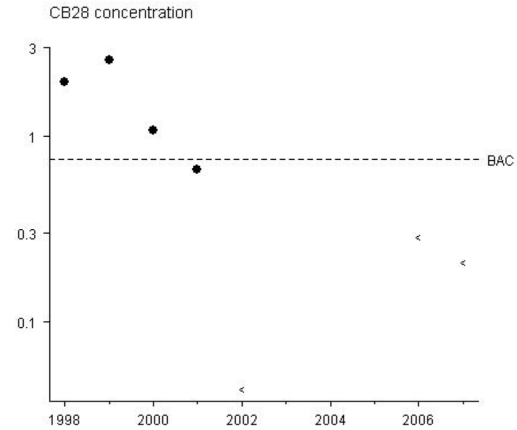
Media: biota (Mytilus edulis)
Station: Cromane Stn 1
Units: µg kg^{-1} lipid weight
Data extraction: 16 March 2010



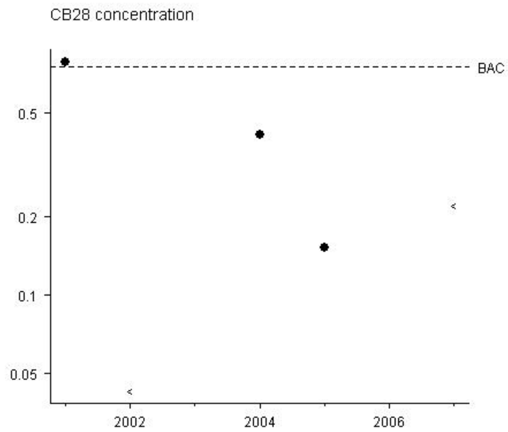
Media: biota (Ostrea edulis)
Station: Castlegregory
Units: µg kg^{-1} lipid weight
Data extraction: 16 March 2010



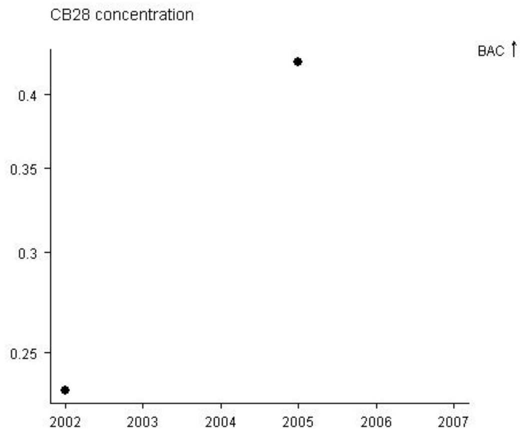
Media: biota (Mytilus edulis)
Station: Kilmakilloge Stn 1
Units: µg kg^{-1} lipid weight
Data extraction: 16 March 2010



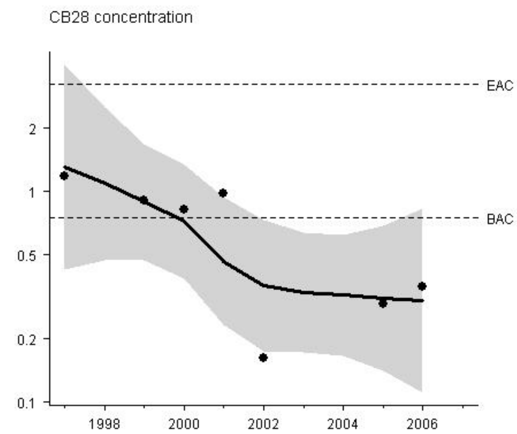
Media: biota (Mytilus edulis)
Station: Inner Bantry Bay Stn 1
Units: µg kg^{-1} lipid weight
Data extraction: 16 March 2010



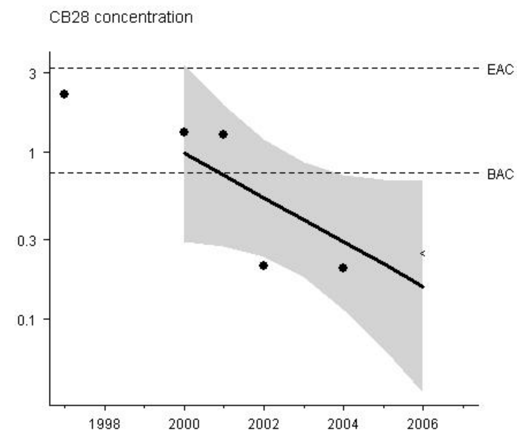
Media: biota (Mytilus edulis)
Station: Inner Roaringwater Bay Stn 1
Units: µg kg^{-1} lipid weight
Data extraction: 16 March 2010



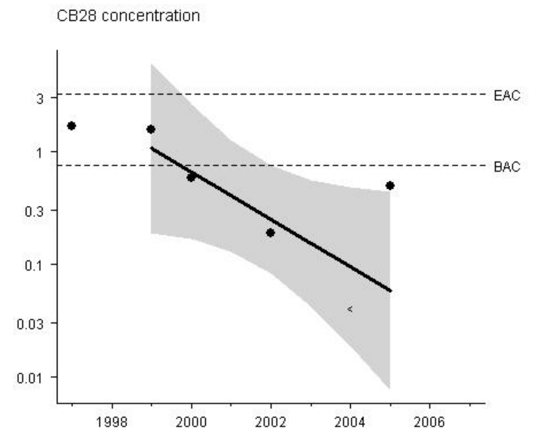
Media: biota (Crassostrea gigas)
Station: Cork Harbour - N & E Channels
Units: µg kg^{-1} lipid weight
Data extraction: 16 March 2010



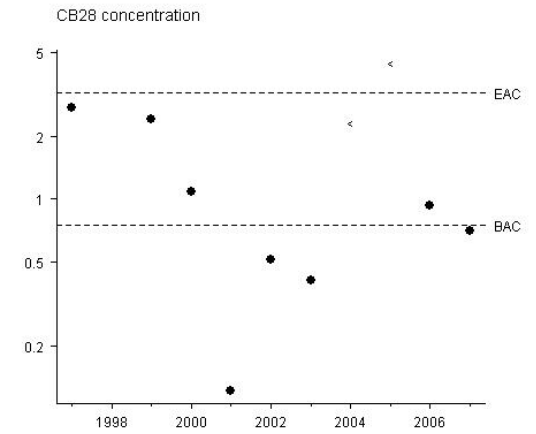
Media: biota (Crassostrea gigas)
Station: Outer Dungarvan Bay
Units: µg kg^{-1} lipid weight
Data extraction: 16 March 2010



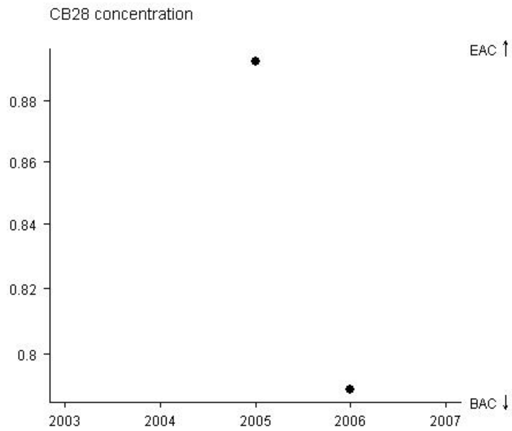
Media: biota (Crassostrea gigas)
Station: Inner Bannow Bay Stn 1
Units: µg kg^{-1} lipid weight
Data extraction: 16 March 2010



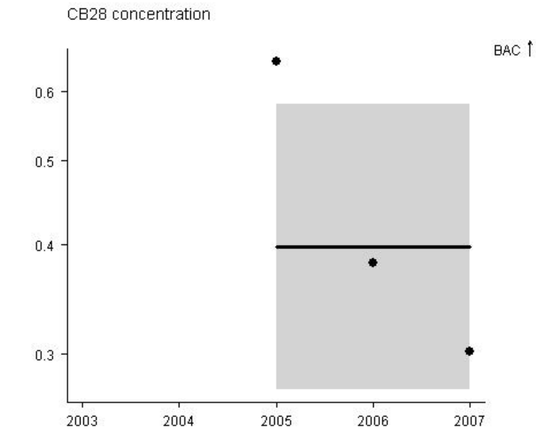
Media: biota (Mytilus edulis)
Station: Outer Wexford Harbour
Units: µg kg^{-1} lipid weight
Data extraction: 16 March 2010



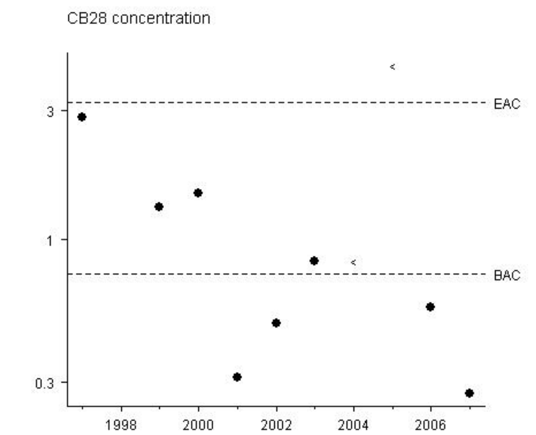
Media: biota (Mytilus edulis)
Station: Arthurstown
Units: µg kg^{-1} lipid weight
Data extraction: 16 March 2010



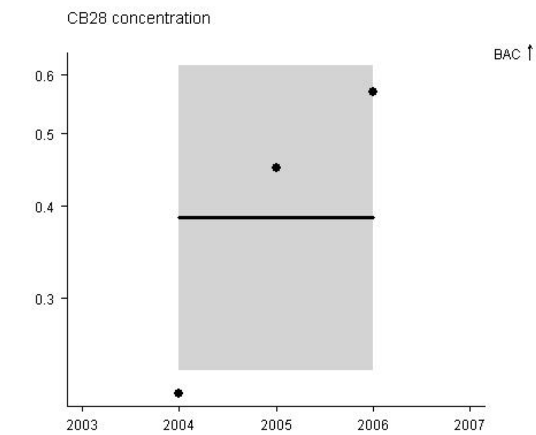
Media: biota (Mytilus edulis)
Station: Cheekpoint
Units: µg kg^{-1} lipid weight
Data extraction: 16 March 2010



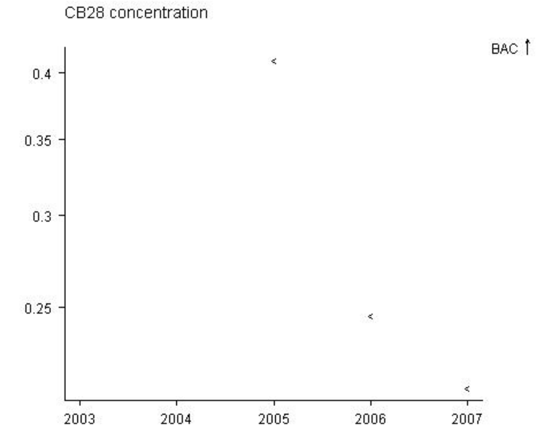
Media: biota (Mytilus edulis)
Station: Sea Point
Units: µg kg^{-1} lipid weight
Data extraction: 16 March 2010



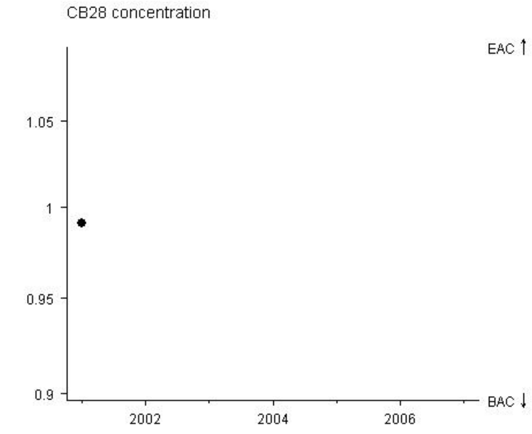
Media: biota (Mytilus edulis)
Station: North Dublin Bay - Sutton
Units: µg kg^{-1} lipid weight
Data extraction: 16 March 2010



Media: biota (Mytilus edulis)
Station: Inner Rogerstown
Units: µg kg^{-1} lipid weight
Data extraction: 16 March 2010

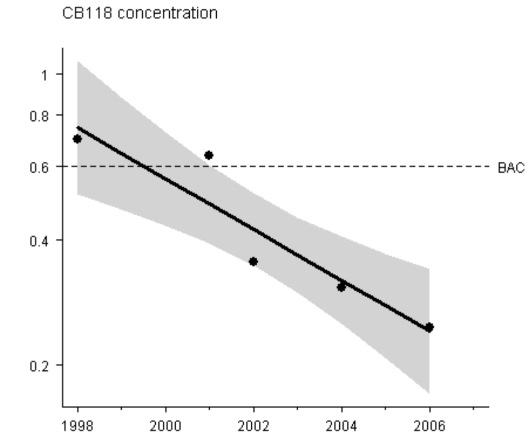


Media: biota (Mytilus edulis)
Station: Annagasan
Units: µg kg⁻¹ lipid weight
Data extraction: 16 March 2010

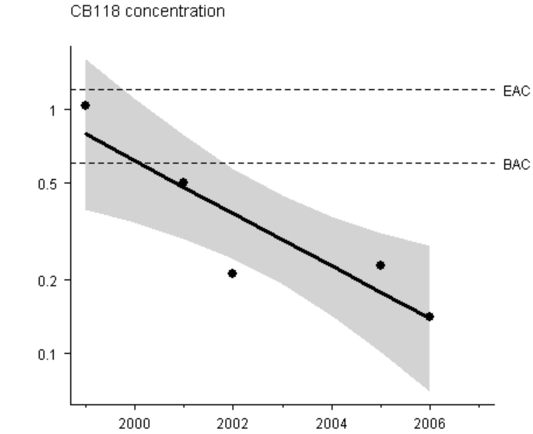


Media: biota (Mytilus edulis)
Station: Carlingford Lough
Units: µg kg⁻¹ lipid weight
Data extraction: 16 March 2010

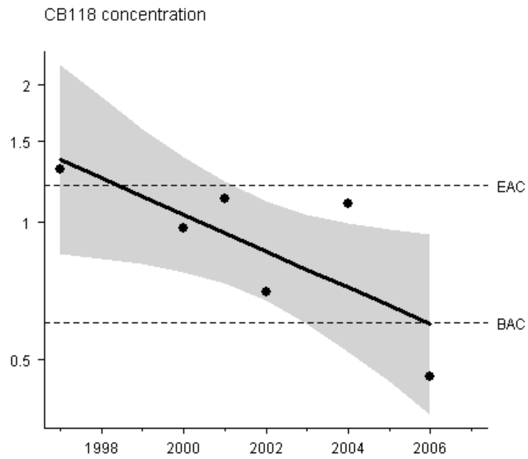
OSPAR trend assessments for PCB118 in shellfish



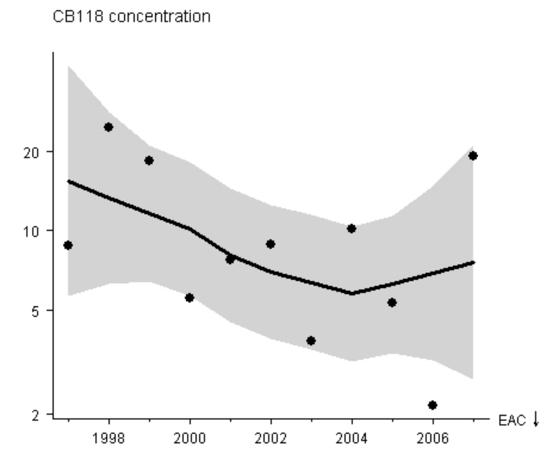
Media: biota (Mytilus edulis)
Station: Kilmakilloge Stn 1
Units : µg kg^{-1} lipid weight
Data extraction: 16 March 2010



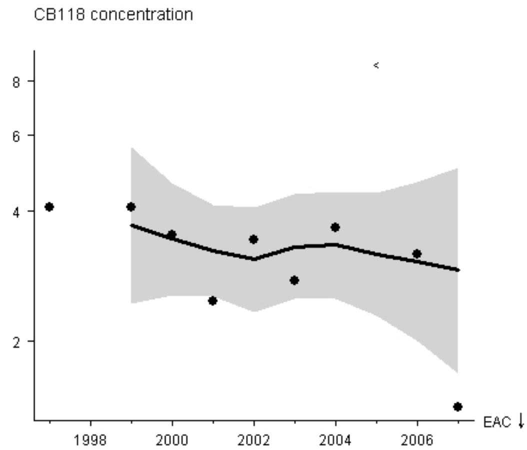
Media: biota (Mytilus edulis)
Station: Inner Killary Harbour Stn 1
Units : µg kg^{-1} lipid weight
Data extraction: 16 March 2010



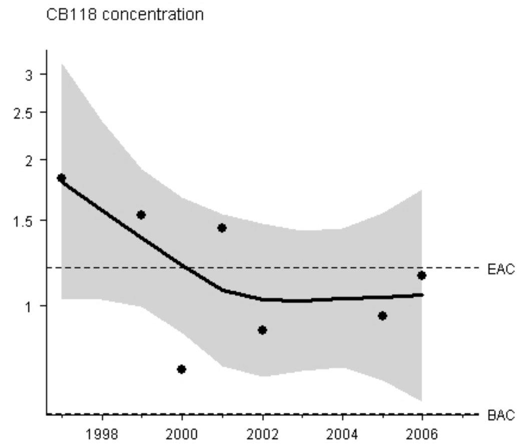
Media: biota (Crassostrea gigas)
Station: Inner Bannow Bay Stn 1
Units : µg kg^{-1} lipid weight
Data extraction: 16 March 2010



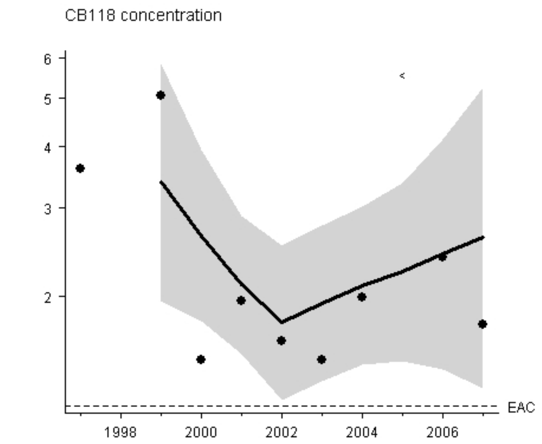
Media: biota (Mytilus edulis)
Station: Ringaskiddy
Units : µg kg^{-1} lipid weight
Data extraction: 16 March 2010



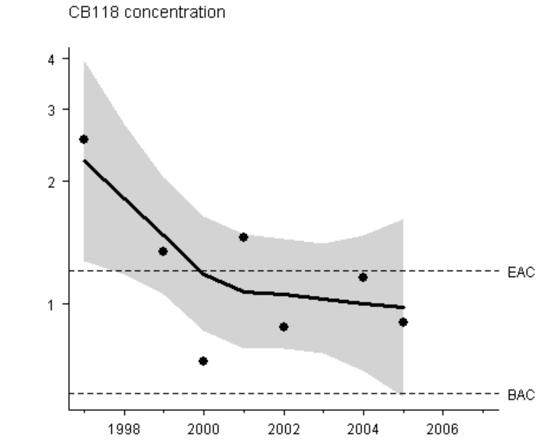
Media: biota (Mytilus edulis)
Station: North Dublin Bay - Sutton
Units : µg kg^{-1} lipid weight
Data extraction: 16 March 2010



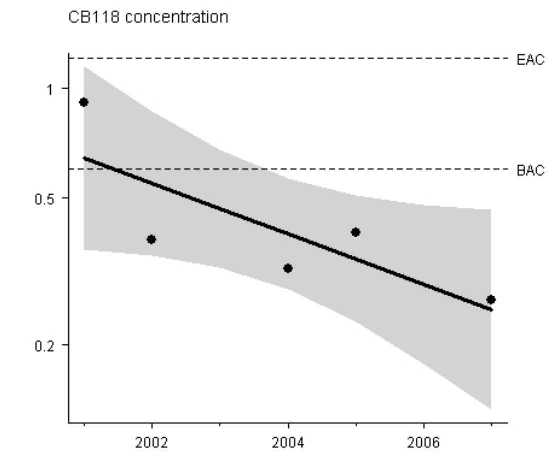
Media: biota (Crassostrea gigas)
Station: Outer Dungarvan Bay
Units : µg kg^{-1} lipid weight
Data extraction: 16 March 2010



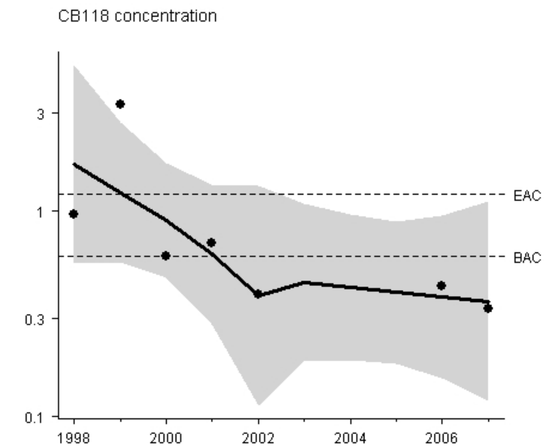
Media: biota (Mytilus edulis)
Station: Arthurstown
Units: µg kg⁻¹ lipid weight
Data extraction: 16 March 2010



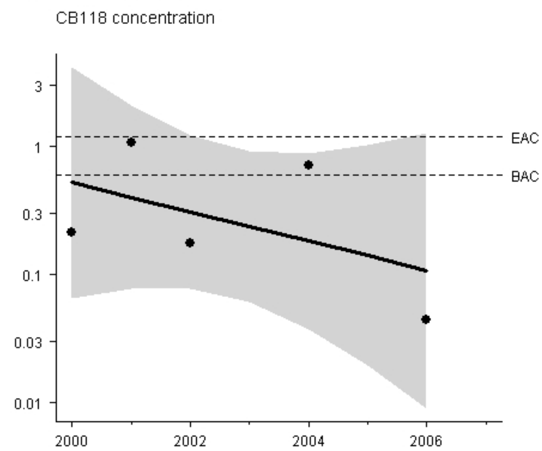
Media: biota (Mytilus edulis)
Station: Outer Wexford Harbour
Units: µg kg⁻¹ lipid weight
Data extraction: 16 March 2010



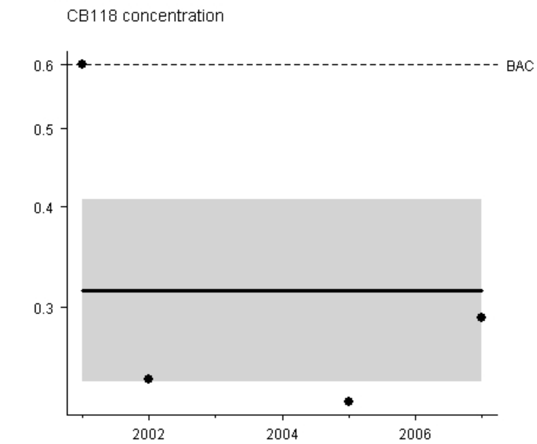
Media: biota (Mytilus edulis)
Station: Inner Roaringwater Bay Stn 1
Units: µg kg⁻¹ lipid weight
Data extraction: 16 March 2010



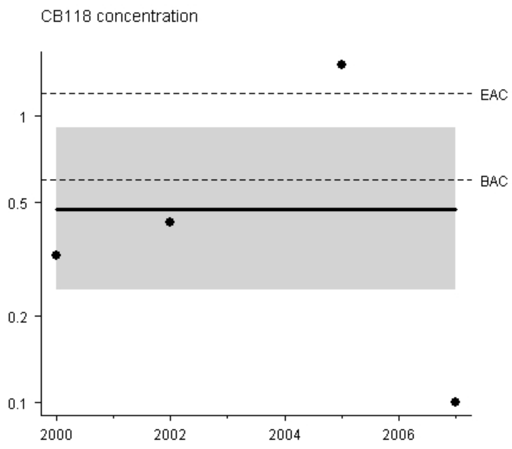
Media: biota (Mytilus edulis)
Station: Inner Bantry Bay Stn 1
Units: µg kg⁻¹ lipid weight
Data extraction: 16 March 2010



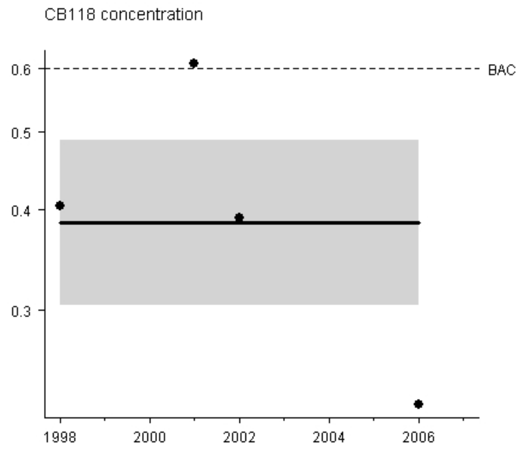
Media: biota (Crassostrea gigas)
Station: Aughinish Bay Galway 1
Units: µg kg⁻¹ lipid weight
Data extraction: 16 March 2010



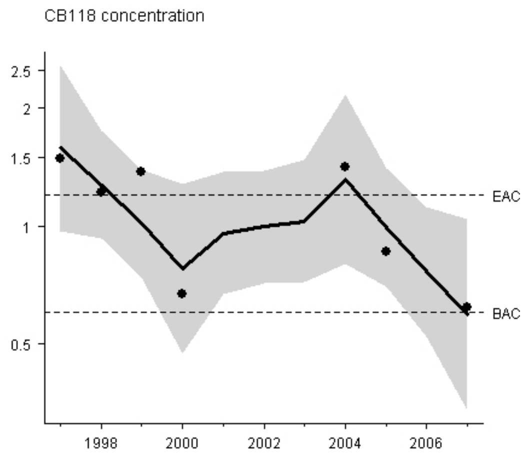
Media: biota (Ostrea edulis)
Station: Kilkieran North Stn 1
Units: µg kg⁻¹ lipid weight
Data extraction: 16 March 2010



Media: biota (Mytilus edulis)
Station: Inner McSwynes Bay - Bruckless
Units: μg kg^{-1} lipid weight
Data extraction: 16 March 2010

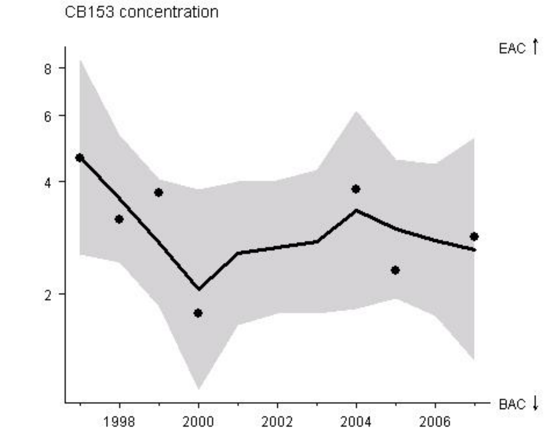


Media: biota (Mytilus edulis)
Station: Mulroy Bay - Broadwater Stn 1
Units: μg kg^{-1} lipid weight
Data extraction: 16 March 2010

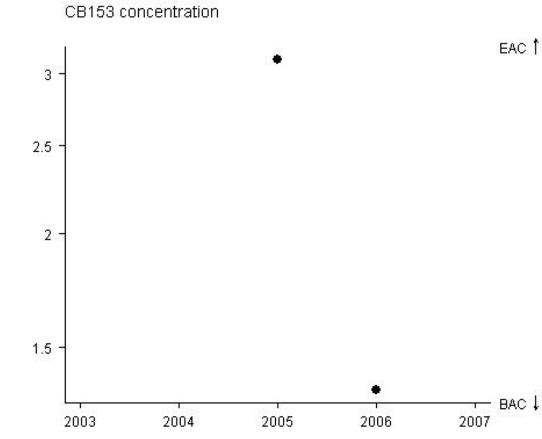


Media: biota (Mytilus edulis)
Station: Inner Lough Foyle - Quigley's Point
Units: μg kg^{-1} lipid weight
Data extraction: 16 March 2010

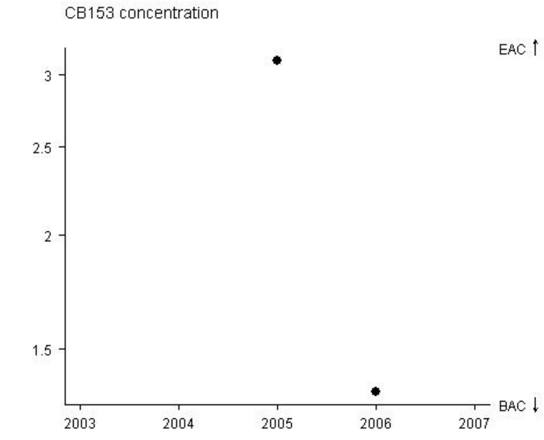
OSPAR trend assessments for PCB153 in shellfish



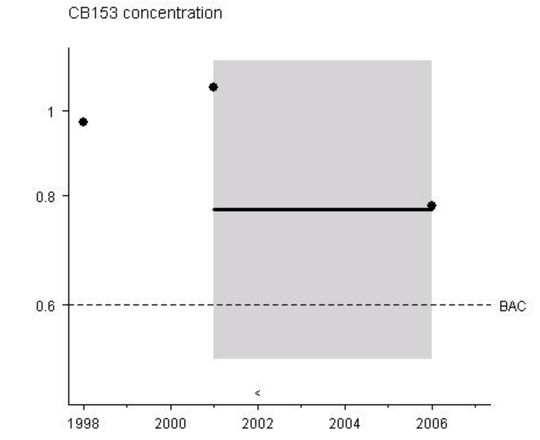
Media: biota (Mytilus edulis)
Station: Inner Lough Foyle - Quigley's Point
Units: $\mu g\ kg^{-1}$ lipid weight
Data extraction: 16 March 2010



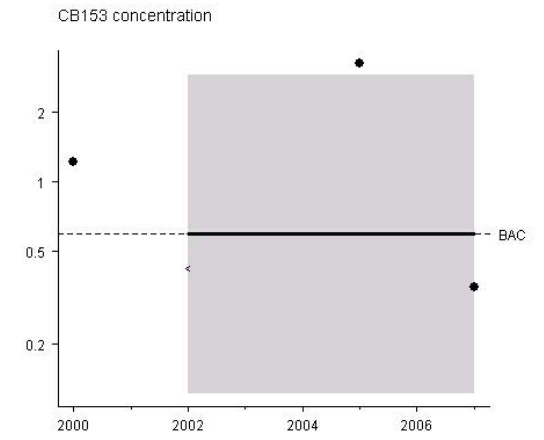
Media: biota (Mytilus edulis)
Station: Inner Lough Swilly
Units: $\mu g\ kg^{-1}$ lipid weight
Data extraction: 16 March 2010



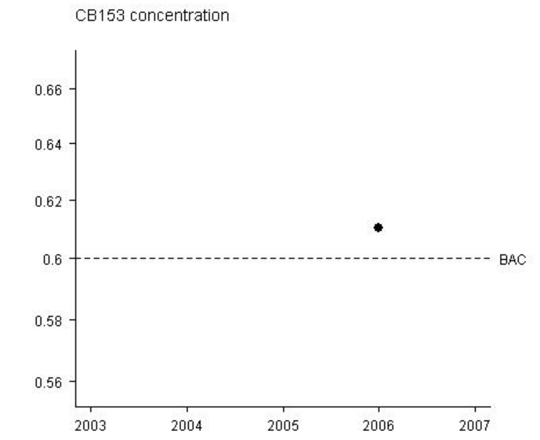
Media: biota (Mytilus edulis)
Station: Inner Lough Swilly
Units: $\mu g\ kg^{-1}$ lipid weight
Data extraction: 16 March 2010



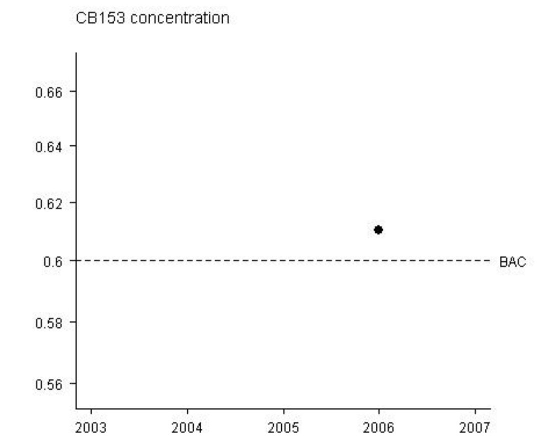
Media: biota (Mytilus edulis)
Station: Mulroy Bay - Broadwater Stn 1
Units: $\mu g\ kg^{-1}$ lipid weight
Data extraction: 16 March 2010



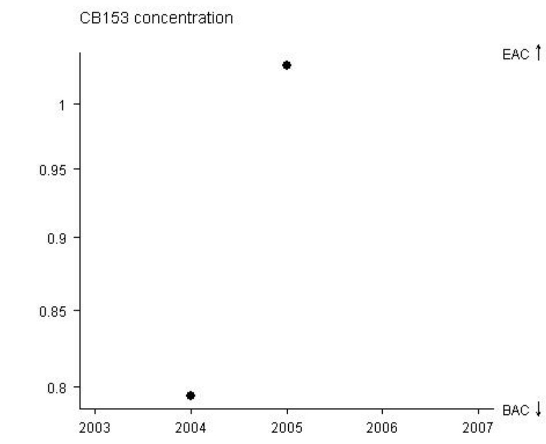
Media: biota (Mytilus edulis)
Station: Inner McSwynes Bay - Bruckless
Units: $\mu g\ kg^{-1}$ lipid weight
Data extraction: 16 March 2010



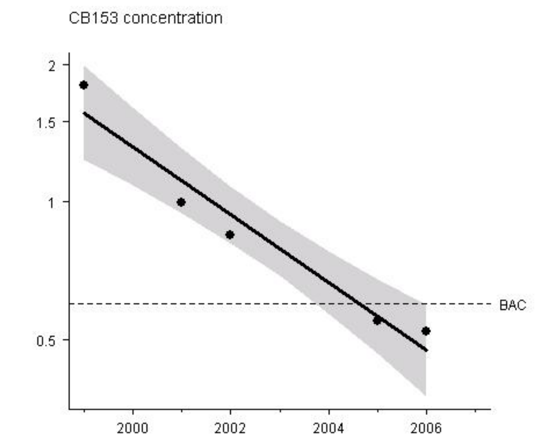
Media: biota (Mytilus edulis)
Station: Ballysadare Bay
Units: $\mu g\ kg^{-1}$ lipid weight
Data extraction: 16 March 2010



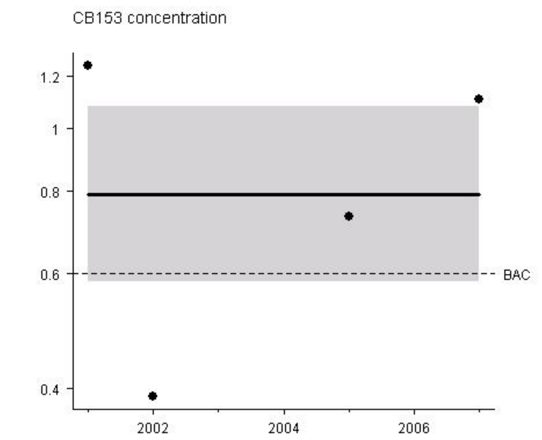
Media: biota (Mytilus edulis)
Station: Ballysadare Bay
Units: µg kg^{-1} lipid weight
Data extraction: 16 March 2010



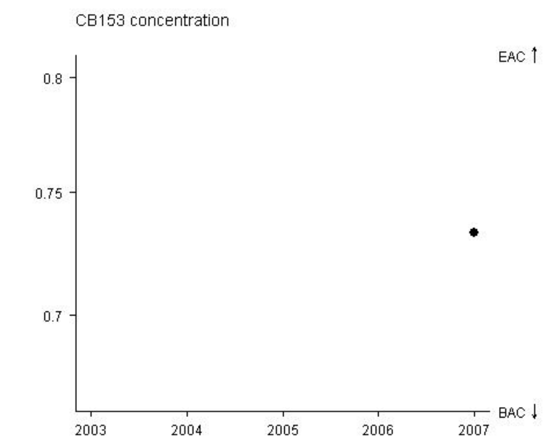
Media: biota (Crassostrea gigas)
Station: Clew Bay South Stn 1
Units: µg kg^{-1} lipid weight
Data extraction: 16 March 2010



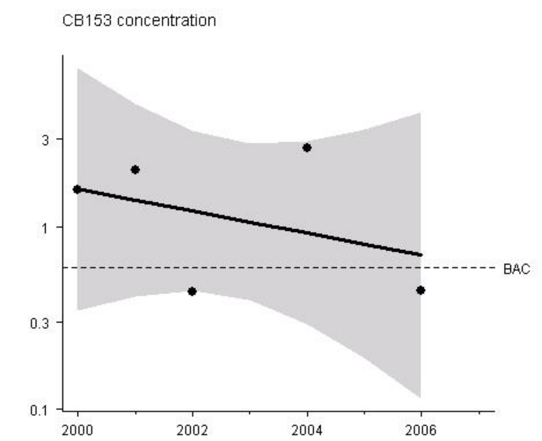
Media: biota (Mytilus edulis)
Station: Inner Killary Harbour Stn 1
Units: µg kg^{-1} lipid weight
Data extraction: 16 March 2010



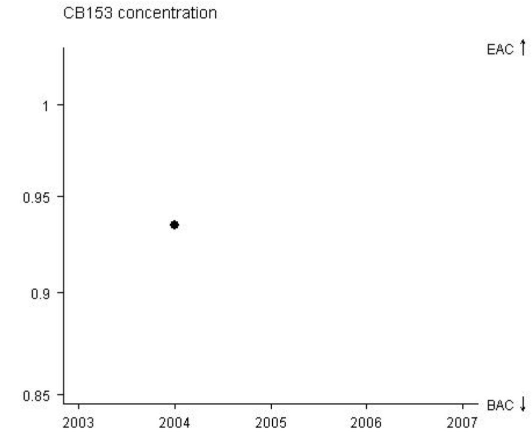
Media: biota (Ostrea edulis)
Station: Kilkieran North Stn 1
Units: µg kg^{-1} lipid weight
Data extraction: 16 March 2010



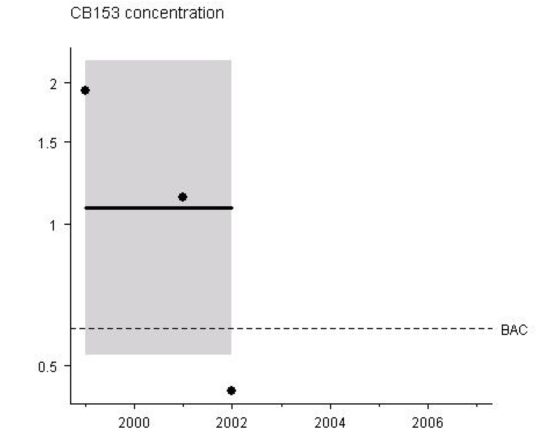
Media: biota (Crassostrea gigas)
Station: Clarenbridge
Units: µg kg^{-1} lipid weight
Data extraction: 16 March 2010



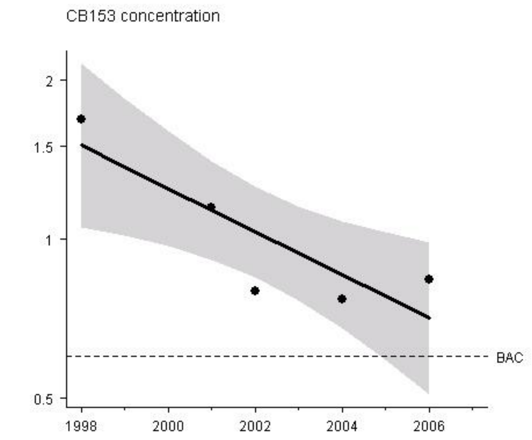
Media: biota (Crassostrea gigas)
Station: Aughinish Bay Galway 1
Units: µg kg^{-1} lipid weight
Data extraction: 16 March 2010



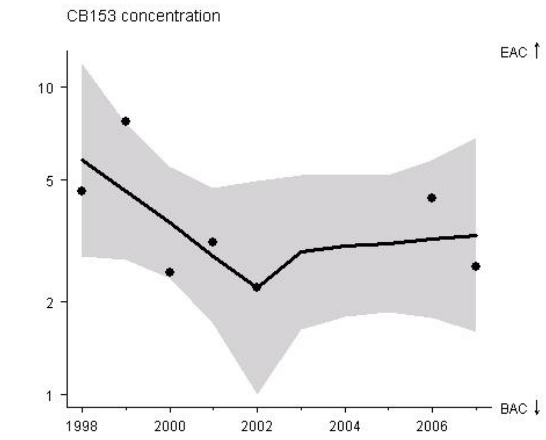
Media: biota (Ostrea edulis)
Station: Castlegregory
Units: $\mu g\ kg^{-1}$ lipid weight
Data extraction: 16 March 2010



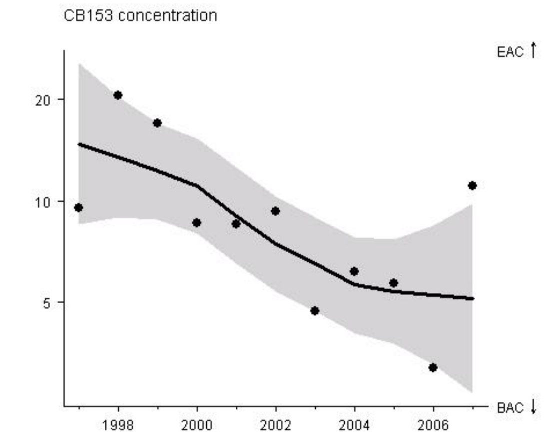
Media: biota (Mytilus edulis)
Station: Cromane Stn 1
Units: $\mu g\ kg^{-1}$ lipid weight
Data extraction: 16 March 2010



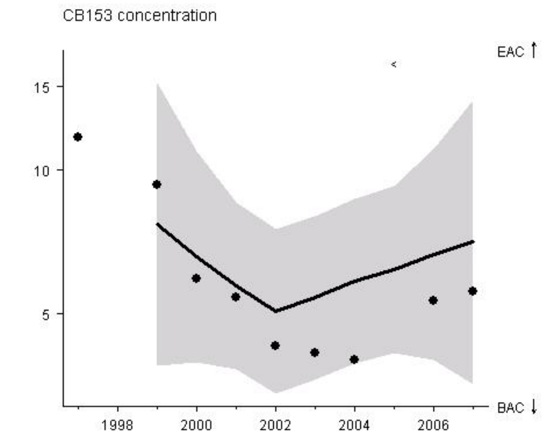
Media: biota (Mytilus edulis)
Station: Kilmakilloge Stn 1
Units: $\mu g\ kg^{-1}$ lipid weight
Data extraction: 16 March 2010



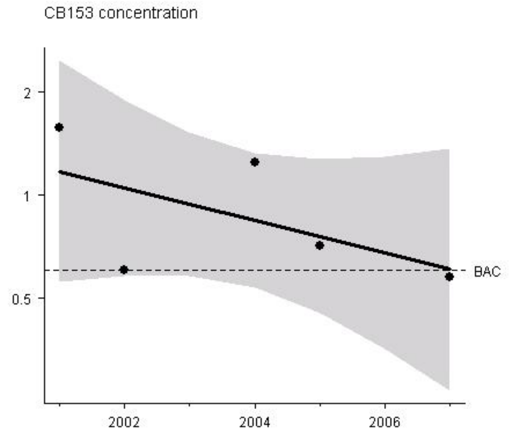
Media: biota (Mytilus edulis)
Station: Inner Bantry Bay Stn 1
Units: $\mu g\ kg^{-1}$ lipid weight
Data extraction: 16 March 2010



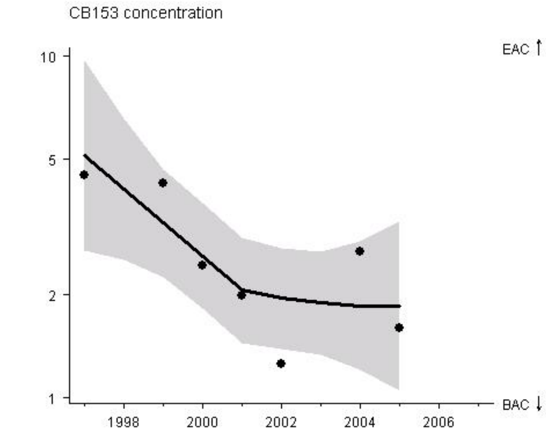
Media: biota (Mytilus edulis)
Station: Ringaskiddy
Units: $\mu g\ kg^{-1}$ lipid weight
Data extraction: 16 March 2010



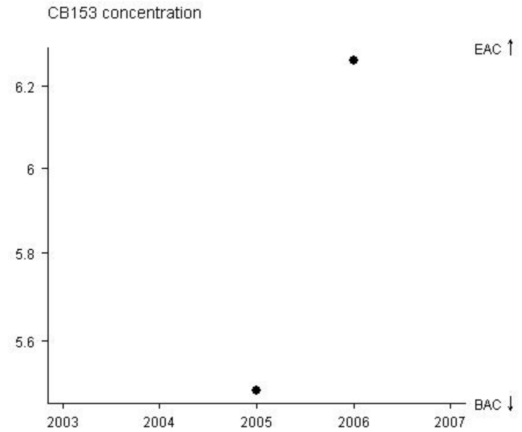
Media: biota (Mytilus edulis)
Station: Arthurstown
Units: $\mu g\ kg^{-1}$ lipid weight
Data extraction: 16 March 2010



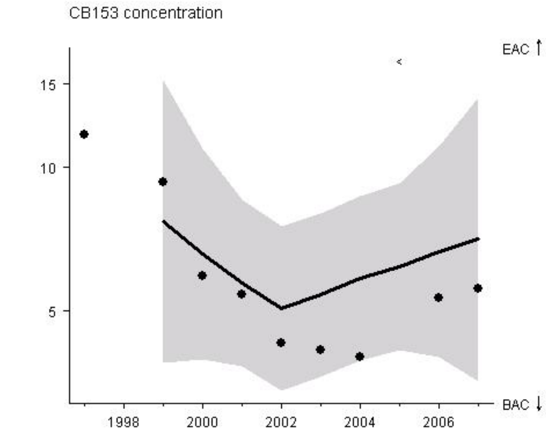
Media: biota (Mytilus edulis)
Station: Inner Roaringwater Bay Stn 1
Units: µg kg⁻¹ lipid weight
Data extraction: 16 March 2010



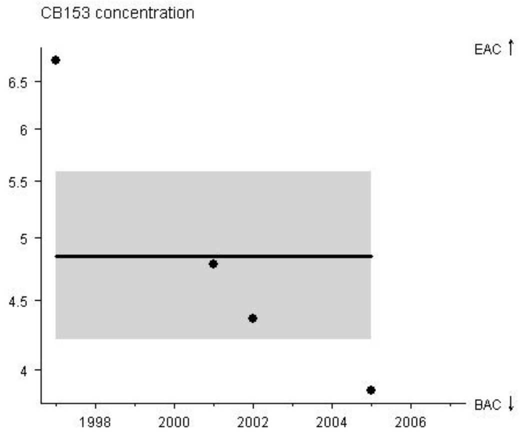
Media: biota (Mytilus edulis)
Station: Outer Wexford Harbour
Units: µg kg⁻¹ lipid weight
Data extraction: 16 March 2010



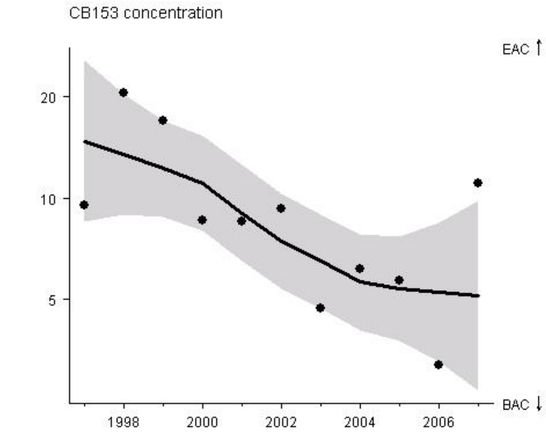
Media: biota (Mytilus edulis)
Station: Cheekpoint
Units: µg kg⁻¹ lipid weight
Data extraction: 16 March 2010



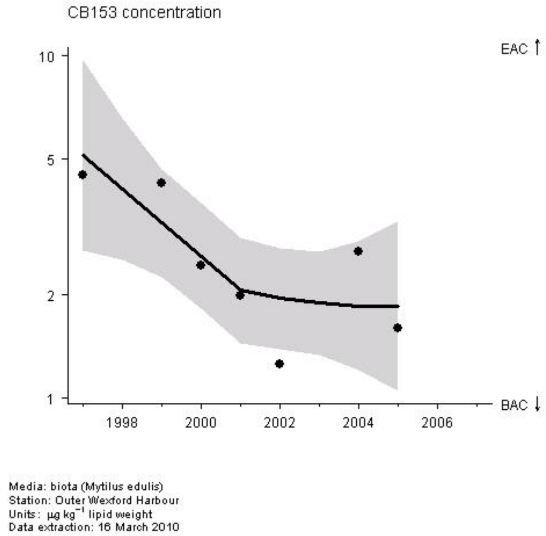
Media: biota (Mytilus edulis)
Station: Arthurstown
Units: µg kg⁻¹ lipid weight
Data extraction: 16 March 2010

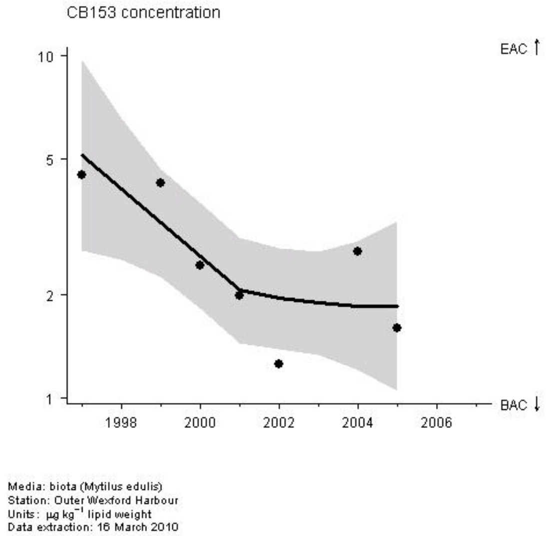


Media: biota (Crassostrea gigas)
Station: Cork Harbour - N & E Channels
Units: µg kg⁻¹ lipid weight
Data extraction: 16 March 2010



Media: biota (Mytilus edulis)
Station: Ringaskiddy
Units: µg kg⁻¹ lipid weight
Data extraction: 16 March 2010


CB153 concentration
EAC
BAC
10
5
2
1
1998
2000
2002
2004
2006
Media: biota (Mytilus edulis)
Station: Outer Wexford Harbour
Units: µg kg⁻¹ lipid weight
Data extraction: 16 March 2010


CB153 concentration
EAC
BAC
10
5
2
1
1998
2000
2002
2004
2006
Media: biota (Mytilus edulis)
Station: Outer Wexford Harbour
Units: µg kg⁻¹ lipid weight
Data extraction: 16 March 2010

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