OSPAR COMMISSION

CEMP assessment report: 2008/2009

Assessment of trends and concentrations of selected hazardous substances in sediments and biota

Monitoring and Assessment Series

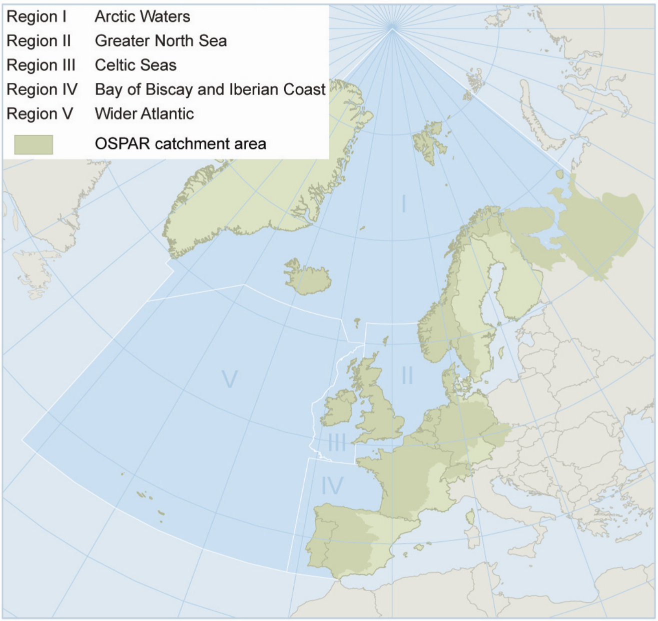
2009

OSPAR Convention

The Convention for the Protection of the Marine Environment of the North-East Atlantic (the "OSPAR Convention") was opened for signature at the Ministerial Meeting of the former Oslo and Paris Commissions in Paris on 22 September 1992. The Convention entered into force on 25 March 1998. It has been ratified by Belgium, Denmark, Finland, France, Germany, Iceland, Ireland, Luxembourg, Netherlands, Norway, Portugal, Sweden, Switzerland and the United Kingdom and approved by the European Community and Spain.

Convention OSPAR

La Convention pour la protection du milieu marin de l'Atlantique du Nord-Est, dite Convention OSPAR, a été ouverte à la signature à la réunion ministérielle des anciennes Commissions d'Oslo et de Paris, à Paris le 22 septembre 1992. La Convention est entrée en vigueur le 25 mars 1998. La Convention a été ratifiée par l'Allemagne, la Belgique, le Danemark, la Finlande, la France, l'Irlande, l'Islande, le Luxembourg, la Norvège, les Pays-Bas, le Portugal, le Royaume-Uni de Grande Bretagne et d'Irlande du Nord, la Suède et la Suisse et approuvée par la Communauté européenne et l'Espagne.



This assessment was initially prepared by the OSPAR Working Group on Monitoring (MON) at its meeting from 24 -28 November 2008 hosted by ICES in Copenhagen. The following participated in the meeting: Dr Ian Davies (Chair), Dr Patrick Roose (Belgium), Dr Martin Mørk Larsen (Denmark), Mr Jean-Yves Quintin (France), Dr Stefan Schmolke (Germany), Ms Anja Duffek (Germany), Mr Brendan McHugh (Ireland), Mr Foppe Smedes (The Netherlands), Ms Andrea Houben-Michalková, Mr Norman Green (Norway), Dr Lucia Viñas Diguez (Spain), Ms Elisabeth Nyberg (Sweden), Dr Rob Fryer (United Kingdom), Mr Thomas Maes (UK), Mr Claus Hagebro (UK), Ms Marilynn Sørensen (ICES), Mr Hans Mose Jensen (ICES), Mr Neil Holdsworth (ICES) supported by Ms Andrea Weiss and Dr Richard Emmerson (OSPAR Secretariat).

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Executive summary

This report presents scientific assessments of OSPAR marine monitoring data on hazardous substances in the marine environment. It covers data on the concentrations of hazardous substances in fish, shellfish and sediments, the biological effects arising from presence of the anti-fouling agent tributyltin (TBT) and, in a preliminary assessment, on the biological effect measurement EROD. The overall conclusion is that while environmental concentrations of monitored substances have generally fallen, concentrations remain above acceptable levels in many coastal areas of Regions II, III and IV. Adverse effects of TBT are still seen in four of the five OSPAR Regions, but are decreasing everywhere, in response to the global ban on its use in ships paints. The majority of measurements, however, show that both naturally occurring and man-made contaminants remain above OSPAR's long-term targets.

Heavy metals contamination in biota is generally decreasing but continued monitoring is needed in some areas to establish clear trends

The first part of the assessment considers data on cadmium, mercury and lead in sediments and biota from the period 1985 to 2007. All three of these heavy metals have been identified by OSPAR as chemicals for priority action. Concentrations of cadmium, mercury and lead in fish, shellfish and sediments have generally fallen since 1990, particularly in Region II, where downward trends are clear at both polluted and less polluted sites. As much of the reduction in inputs of metals occurred before 2000, changes in environmental concentrations have been relatively small since 1998 as concentrations approach, but do not reach, background levels in large parts of the OSPAR area. The picture for mercury and cadmium is more mixed with concentrations in fish and shellfish having fallen in some locations but risen in others (e.g. Dogger Bank and estuarine sites in the UK and on the southern coast of the North Sea). In Region I, where concentrations are generally lower than in the other Regions, downward trends are only found close to pollution sources. Many of the OSPAR data series are currently too short to determine trends as – owing to the large amount of natural variation in the marine environment – trends in concentrations can only be determined using data collected systematically over relatively long periods. Continued monitoring is needed in many areas, especially in Regions III and IV, to extend these datasets so that it is possible to detect trends in future.

Effects of TBT are decreasing but are still of concern in some areas

The presence and effects of the anti-fouling agent TBT in the marine environment continue to cause concern following the bans on its use both within Europe and globally. Since 2003, when monitoring began, the presence of TBT-specific effects on the dogwhelk and other marine snails has clearly reduced in Region II and there are few monitoring sites in the OSPAR area where such effects are increasing. The levels of TBT-effects in Region I were stable between 2003 and 2007, while data for Regions III and IV are mostly insufficient for trend analyses. OSPAR has set an ecological quality objective for the degree of imposex in dogwhelks and other marine snails defining the desired level of environmental quality. This has been defined for the North Sea, but can be applied in other OSPAR regions through consistent assessment criteria. The EcoQO is met at most sites in northern Norway and at some sites on the UK west coast and the coasts of France and Spain. Similarly, a number of sites in Iceland met the EcoQO in 2008. Nevertheless, TBT-specific effects are still found over large parts of the OSPAR area. There is a clear relationship with shipping, with high effect levels near some large harbours (e.g. Rotterdam, Clydeport, Vigo) and lower levels in areas with less large vessel traffic, such as along the west coast of Scotland and northern Norway. But even in these areas, harbours can have a noticeable impact, highlighting the importance of local sources and historic contamination of harbour sediments.

Contamination with PCBS and PAHs is still widespread

Contamination from polychlorinated biphenyls (PCBs) is widespread and there are few areas where concentrations are close to zero. These are mainly along the northern coast of Norway (Region I). However, at many monitoring stations remote from industrial activity concentrations are not yet at levels close to zero,. Further more in region II, III and IV there are widespread locations where the concentrations of at least one PCB congener in fish and shellfish pose a risk of pollution effects. Concentrations have been decreasing over the last ten years at a high proportion of fish and shellfish stations, with a small proportion of stations showing increasing trends. Trends in the concentrations of polycyclic aromatic hydrocarbons (PAHs) in fish and shellfish are predominantly downward, especially in Region III, but are still at levels which pose a risk of pollution effects in many estuaries and urbanised and industrialised locations. The implied decrease in exposure of marine life to PAHs is supported by decreases in some observations of activity of detoxification enzymes (called EROD activity) in fish (dab) liver in Regions II and III However, the failure to achieve background concentrations of PAHs in mussels is evidence of continuing widespread contamination, possibly mediated through atmospheric transport.

Contamination with the pesticide lindane is decreasing

A general reduction in concentrations of lindane in fish and shellfish has been achieved across the OSPAR area as a result of the phase out and banning of its use. Concentrations are close to zero in some areas, for example western and northern Norway, and parts of Ireland, France and Iceland. However, concentrations in some other areas are still at levels with a risk of pollution effects. Particular examples are the Brittany coast, the German Bight, and some northern UK estuaries (Humber, Clyde, Forth, Tay). The localised nature of these hotspots, which may persist for years to come, may reflect historic use nearby

Lessons learnt for future monitoring and assessment

The ocean is a very dynamic medium, and there are strong seasonal patterns of change in both chemical and biological processes. These factors mean that identifying the status and trends of marine pollution requires coordinated monitoring to consistent international standards. The Coordinated Environmental Monitoring Programme (CEMP) has provided well tested, quality assured methodologies and standards for environmental monitoring which are suitable to support evaluation of good environmental status under the Marine Strategy Framework Directive and good chemical status under the Water Framework Directive. One of the challenges is using chemical monitoring data to provide robust conclusions on the overall level of contamination within an OSPAR Region or sub-Region. Approaches for this type of aggregated assessment have been have been trialled in this assessment, but the current spatial coverage limits the confidence that can be given to the conclusions. Future assessment and monitoring under the CEMP need to be supported by extending data sets further offshore beyond highly impacted coastal areas and a coordinated and expanding contaminant coverage of the OSPAR monitoring programmes; improved understanding of the effects of hazardous substances, particularly cumulative effects; and improved information collection on the production, uses and various pathways to the marine environment, especially for substances which are not candidates for environmental monitoring.

Récapitulatif

Ce rapport présente les évaluations scientifiques des données de surveillance marine d'OSPAR sur les substances dangereuses dans l'environnement marin. Il couvre les données sur les concentrations de substances dangereuses dans les poissons, les crustacés et les sédiments, les effets biologiques provenant de la présence de l'agent anti-fouling tributylétain (TBT) et, dans une évaluation préliminaire, la mesure EROD des effets biologiques. La conclusion générale est la suivante : alors que les concentrations ambiantes des substances surveillées ont généralement baissé, les concentrations restent au dessus des niveaux tolérables dans plusieurs zones côtières des Régions II, III et IV. Les effets préjudiciables du TBT sont toujours observés dans quatre des cinq Régions OSPAR, mais ont baissé partout, conséquence de l'interdiction générale de leur utilisation dans les peintures pour navires. La majorité des mesures, cependant, montre que les contaminants présents à l'état naturel et artificiels restent au dessus des objectifs de long terme d'OSPAR.

La contamination par métaux lourds dans le milieu vivant est généralement en baisse mais une surveillance continue est nécessaire dans certaines régions pour établir des tendances nettes.

La première partie de l'évaluation examine les données sur le cadmium, le mercure et le plomb dans le milieu vivant et les sédiments pour la période de 1985 à 2007.Ces 3 métaux lourds ont été identifiés par OSPAR comme produits chimiques nécessitant une action prioritaire. Les concentrations en cadmium, en mercure et en plomb dans les poissons, crustacés et sédiments ont généralement baissé depuis 1990, en particulier dans la Région II, où les tendances à la baisse sont nettes sur les sites pollués et moins pollués. Alors que la réduction des apports en métaux s'est produite avant 2000, les changements dans les concentrations environnementales ont été relativement faibles depuis 1998 ; en effet les concentrations approchent mais n'atteignent pas le niveau ambiant dans de larges parties de la zone OSPAR. La situation pour le mercure et le cadmium est plus variée avec des concentrations dans les poissons et les crustacés ayant baissé à certains endroits mais augmenté dans d'autres (par exemple Dogger Bank, des estuaires au Royaume-Uni et sur les côtes sud de la mer du Nord). Dans la Région I, où les concentrations sont généralement plus faibles que dans les autres régions, les tendances à la baisse ont seulement été identifiées près des sources de pollution. Plusieurs séries de données d'OSPAR sont actuellement trop courtes pour déterminer des tendances car les tendances pour les concentrations peuvent seulement être déterminées en utilisant des données collectées systématiquement sur des périodes relativement longues, en raison de grandes variations naturelles dans l'environnement marin. La surveillance continue est nécessaire dans plusieurs régions, surtout dans les Régions III et IV, pour étendre ces ensembles de données pour qu'il soit possible de détecter les tendances futures.

Les effets du TBT sont en baisse mais sont toujours inquiétants dans certaines zones

La présence et les effets de l'agent anti-fouling TBT dans l'environnement marin continue de causer des inquiétudes après l'interdiction de son utilisation en Europe et dans le monde. Depuis 2003, lorsque la surveillance a débuté, la présence des effets spécifiques du TBT sur le pourpre petit pierre et autres escargots marins a clairement été réduite dans la Région II et il y a peu de sites de surveillance dans la zone OSPAR où ces effets augmentent. Les niveaux des effets du TBT dans la Région I étaient stables entre 2003 et 2007, alors que les données pour les Régions III et IV sont la plupart du temps insuffisantes pour des analyses de tendances. OSPAR a défini un objectif de qualité écologique sur le degré moyen d'imposex dans le pourpre petit pierre et autres escargots marins définissant le niveau souhaité de qualité environnementale. Il a été défini pour la Mer du Nord, mais peut être appliqué dans d'autres Régions OSPAR à l'aide de critères d'évaluation cohérents. L'EcoQO est atteint dans la plupart des sites dans le Nord de la Norvège et dans certains sites sur les côtes ouest du Royaume-Uni et les côtes françaises et espagnoles. De la même façon, un nombre de sites en Islande ont atteint l'EcoQO en 2008. Néanmoins, les effets spécifiques du TBT sont toujours observés dans de grandes parties de la zone OSPAR. Il y a un lien manifeste avec la navigation maritime, avec des niveaux importants d'effets près de grands ports

(Rotterdam, Clydeport, Vigo) et de faibles niveaux dans des régions avec de moindres trafics de navires, comme le long de la côte ouest de l'Ecosse et du nord de la Norvège. Mais même dans ces régions, les ports peuvent avoir un impact visible, soulignant l'importance des sources locales et la contamination historique des sédiments portuaires.

La contamination par les PCB et les HAP est toujours très répandue

La contamination par les polychlorobiphényles (PCB) est très répandue et il y a peu de zones où les concentrations sont proches de zéro. Ces zones sont principalement le long de la côte nord de la Norvège (Région I). Cependant, pour plusieurs stations de surveillance distantes des activités industrielles, les concentrations ne sont pas encore proches du niveau zéro. D'autre part dans les Régions II, III et IV il existe des endroits étendus où les concentrations d'au moins un composé PCB dans les poissons et les crustacés posent un risque d'effets polluants. Les concentrations ont baissé ces dix dernières années dans une grande proportion de stations pour les poissons et les crustacés, avec une petite proportion de stations montrant des tendances à la hausse. Les tendances dans les concentrations d'hydrocarbures aromatiques polycycliques (HAP) dans les poissons et les crustacés sont majoritairement à la baisse, spécialement dans la Région III, mais sont toujours à des niveaux qui posent un risque d'effets polluants dans de nombreux estuaires et espaces urbains et industriels. La baisse résultante de l'exposition de la vie marine aux HAP est soutenue par les baisses dans plusieurs observations de l'activité des enzymes detoxifiantes (appelées activité EROD) dans le foie de poisson (limande) dans les Régions II et III. Toutefois, l'échec dans l'obtention des concentrations ambiantes en HAP dans les moules est une évidence de la contamination répandue incessante, possiblement véhiculée par transport atmosphérique.

La contamination par le pesticide lindane est décroissante

Une réduction générale dans les concentrations en lindane dans les poissons et les crustacés a été atteinte à travers la zone OSPAR, résultat de l'élimination et de l'interdiction de son utilisation. Les concentrations sont proches de zéro dans quelques zones, par exemple l'ouest et l'est de la Norvège, et des parties d'Irlande, de France et d'Islande. Cependant, les concentrations dans certaines régions sont toujours à des niveaux de risque d'effets polluants. Les exemples particuliers sont la côte bretonne, la Baie allemande, et quelques estuaires situés au nord du Royaume-Uni (Humber, Clyde, Forth, Tay). La nature localisée de ces points chauds, qui peuvent persister pendant les années à venir, peuvent refléter une utilisation historique proche.

Les leçons tirées pour la surveillance et l'évaluation futures

L'océan est un vecteur très dynamique, et il existe de forts modèles saisonniers de changement pour les procédés chimiques et biologiques. Ces facteurs signifient que l'identification de l'état et des tendances de la pollution marine nécessitent une surveillance coordonnée pour des normes cohérentes internationales. Le programme coordonné de surveillance de l'environnement (CEMP) a fourni des méthodologies et des normes bien testées et contrôlées pour leur qualité pour la surveillance environnementale qui conviennent pour soutenir l'évaluation du bon état environnemental de la Directive cadre « Stratégie pour le milieu marin » et du bon état chimique de la Directive cadre sur l'eau. Un des défis est d'utiliser les données de surveillance chimique pour fournir des conclusions robustes sur le niveau général de contamination dans les Régions OSPAR ou ses sous-régions. Les approches pour ce type d'évaluation agrégées ont été testées dans cette évaluation, mais la couverture spatiale actuelle limite le niveau de confiance qui peut être donné à ces conclusions. La surveillance et l'évaluation futures sous le CEMP ont besoin d'être soutenues par l'extension des séries de données vers l'offshore au delà des régions côtières hautement impactées et une couverture coordonnée des contaminants et s'étendant aux programmes de surveillance d'OSPAR ; une meilleure compréhension des effets des substances dangereuses, en particulier les effets cumulatifs ; et une meilleure collecte d'informations sur la production, les utilisations et les trajectoires variées vers l'environnement marin, en particulier pour les substances qui ne sont pas candidates pour une surveillance environnementale.

1. Introduction

This report has been prepared under the OSPAR Joint Assessment and Monitoring Programme to evaluate the status and trend of concentrations of hazardous substances in the marine environment for selected hazardous substances which 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). The CEMP is the monitoring under the OSPAR Joint Assessment and Monitoring Programme where the national contributions overlap and are coordinated through adherence to commonly agreed monitoring guidelines, quality assurance tools and assessment tools. It covers temporal trend and spatial monitoring programmes for concentrations of selected chemicals and nutrients, and for biological effects. Monitoring under the CEMP aims to indicate the extent of contamination of fish, shellfish and sediments with hazardous substances and the intensity of their biological effects. The purpose is to support OSPAR's assessments of the effectiveness of measures to reduce releases of hazardous substances to the environment. CEMP monitoring is suitable to track contaminants which accumulate through the food chain in marine organisms but cannot easily be detected in seawater. Therefore, CEMP assessment results may lead to different conclusions about the chemical quality status than water based monitoring under the Water Framework Directive, despite that the scientific basis for deriving CEMP environmental assessment criteria and WFD environmental quality standards is the same.

This assessment presents detailed trend and status information of contaminants measured in sediment and biota in the OSPAR maritime area and its Regions. It provides an important building block for the overall evaluation of the Status and Trends of Marine Pollution (OSPAR 2009a). Together with the overall evaluation, this assessment provides an important contribution to Chapter 5 of the Quality Status Report 2010 synthesis report concerning hazardous substances. Parallel assessments of airborne and waterborne inputs of hazardous substances complement this report and also contribute to Chapter 5 of the QSR.

This CEMP assessment aims to evaluate the progress made since the last overall assessment of the quality status of the OSPAR maritime area in 2000 towards achieving the objective of the Hazardous Substances Strategy for selected priority chemicals. This is to prevent pollution of the maritime area by continuously reducing discharges, emissions and losses of hazardous substances, with the ultimate aim of achieving concentrations in the marine environment near background values for naturally occurring substances and close to zero for man-made synthetic substances. To this end, the report assesses

a. whether the concentrations in the marine environment are at, or approaching, background levels for naturally occurring substances and close to zero for man made substances;

b. whether the concentrations found in the marine environment give concern for unacceptable biological responses or unacceptable levels of such responses;

c. whether progress has been made on reducing concentrations in the period 1998 – 2007.

The assessment builds on experience gained in the first comprehensive trend assessment of CEMP data in 2005 (OSPAR, 2005a), and the annual CEMP assessment undertaken in the period 2006 – 2008 (OSPAR, 2006; OSPAR, 2007a; OSPAR, 2008a). It covers status and temporal trends of concentrations of selected hazardous substances which have been prioritised for action by OSPAR due to their risk for the marine environment and which are monitored under the Coordinated Environmental Monitoring Programme (CEMP).

The assessment of contaminants in marine sediments and biota was initially prepared by the OSPAR Working Group on Monitoring (MON) at its meeting in November 2008 based upon data reported by Contracting Parties to ICES and held in the ICES Environmental databases. The assessment of TBT and its effects was developed intersessionally by members of the MON Intersessional Group. The assessment of EROD was prepared at the 2009 meeting of the ICES/OSPAR Study Group on Integrated Monitoring of Contaminants.

Box 1

Electronic navigator to complementary QSR hazardous assessments related CEMP documentation

Complementary QSR hazardous substances assessments

- ➥ Status and trends of marine chemical pollution (OSPAR, 2009a)
- ➥ Towards the cessation target (OSPAR, 2008a)
- ➥ Trends in atmospheric concentrations and deposition (OSPAR, 2009b)
- ➥ Trends in waterborne inputs (OSPAR, 2009c)

Related CEMP documentation

- ➥ CEMP Programme (OSPAR other agreement 2009-1)
- ➥ OSPAR agreement on CEMP Assessment Criteria for the QSR 2010 (OSPAR other agreement 2009-2)
- ➥ Background document on CEMP Assessment Criteria for the QSR 2010 (OSPAR 2009d)
- ➥ OSPAR agreement on Provisional JAMP Assessment Criteria for TBT – Specific Biological Effects (OSPAR other agreement 2004-15
- ➥ CEMP Assessment Manual (OSPAR, 2008b)
- ➥ CEMP monitoring Manual

Previous CEMP hazardous substances assessments

- ➥ 2007/2008 CEMP Assessment: Trends and concentrations of selected hazardous substances in sediments and trends in TBT-specific biological effects (OSPAR 2008c)
- ➥ 2006/2007 CEMP Assessment: Trends and concentrations of selected hazardous substances in the marine environment (OSPAR 2007a)
- ➥ 2005/2006 CEMP Assessment Trends and concentrations of selected hazardous substances in the marine environment (OSPAR 2006)
- ➥ 2005 Assessment of data collected under the Coordinated Environmental Monitoring Programme (CEMP) (OSPAR 2005)

2. Matrices and Parameters covered in the assessment

This assessment covers the concentrations of selected hazardous substances in marine sediment, fish tissue (muscle and liver) and shellfish tissues.

The assessment covers the following hazardous substances which are included as mandatory determinands under the CEMP:

a. ***metals*.** Mercury, cadmium and lead are included in the OSPAR List of Chemicals for Priority Action. In addition, the assessment covers nickel (a priority substance under the Water Framework Directive), copper (an indicator for substitution of TBT by copper in antifouling products), zinc (assisting interpretation of trends in cadmium) and chromium and arsenic. All metals occur naturally in the marine environment, at a so-called background level. Of the heavy metals, mercury, cadmium and lead are generally considered to be toxic without having any biological function. Mercury is considered the most toxic, especially due to the ability of some bacteria to form methylmercury, that can transfer across membranes and accumulates in organs with high fat contents. In the CEMP data, total mercury is mainly measured. Mercury interacts with the nervous system of mammals. Cadmium can be found in high concentrations in some marine top predators, especially in liver. Mammals can build cadmium into the bones, which at high concentrations results in fragile bones, known as Itai-Itai disease. Lead is generally not considered to accumulate in food chains. High lead concentrations can inhibit brain development in children. The other metals covered are either micronutrients (zinc and copper) or have other biological functions (arsenosucres, chromium, nickel).

b. ***tributyl tin (TBT) in sediments and TBT-specific biological effects.*** **TBT is included in the group of organic tin compounds on the OSPAR List of Chemicals for Priority Action.** Organotins were introduced as a very effective antifouling agent in ships paints in the 1960's, especially Tributyltin (TBT). Marketing of TBT for use on small vessels was banned in the mid 1980's, as unwanted effects on marine snails and bivalves were discovered, that impacted the reproduction of the more sensitive species (oysters, dogwhelks and other gastropods). The International Convention on the Control of Harmful Anti-fouling Systems on Ships (AFS Convention) adopted on 5 October 2001 bans the application of TBT based antifouling paints by 1 January 2003 and the presence of TBT on ships' hulls by 1 January 2008. The AFS Convention is implemented in EU by EC Regulation 782/2003 on the prohibition or organo tin compounds on ships. Under the CEMP the effects of TBT in dogwhelks and other gastropod species are measured with a view to checking on the effect of these agreements and their implementation.

c. ***polycyclic aromatic hydrocarbons (PAHs).*** PAHs are included as a group of substances on the OSPAR List of Chemicals for Priority Action. Of the PAHs, fluoranthene, benzo[a]pyrene, benzo[ghi]perylene, phenanthrene and anthracene have been selected for detailed presentation. Fluoranthene can be quantified well using the most regularly used analytical methods and was found at relatively high concentrations (compared to other PAHs) in the 2005 CEMP assessment (OSPAR, 2005a). Benzo[a]pyrene has recognised toxicological importance and is generally one of the more abundant PAHs. Benzo[ghi]perylene and phenanthrene are representatives of higher and lower condensed PAHs, respectively, and can be used to study the behaviour of PAHs in the environment. Phenanthrene and anthracene can be used to investigate differences in the pyrogenic or petrogenic origin of PAHs. Some PAH substances are naturally occurring from forest fires and oil seeping out from underground reservoirs. In the marine environment, widespread distribution of PAHs can be attributed to shipping activities (burning of fossil fuels, oil spills from accidents, or rinsing of oil tanks at sea), but long range transport from burning of fossil fuels also occurs.

d. ***polychlorinated biphenyls (PCBs)***. PCBs are included as a group of substances on the OSPAR List of Chemicals for Priority Action. Of the PCBs, CB153 and CB118 have been selected for detailed presentation. CB153 is generally present in the highest concentration and correlates well with other analysed PCBs. CB118 is representative of the more toxicologically relevant mono-ortho/planar PCBs. PCBs are man made substances, which are not naturally occurring. PCBs are highly accumulative in the marine food chain, and in the mid-70's were identified as a major problem for marine mammals and seabird reproduction, due to shell thickening of birds.

The assessment also covers other monitoring parameters, which are either still a voluntary parameter under the CEMP, pending the development of monitoring guidance, quality assurance and assessment criteria, or have not been included in the CEMP since coordinated marine monitoring has not been considered as a priority for judging progress towards the Hazardous Substances Strategy. Additional OSPAR priority chemicals covered by the assessment are:

a. ***lindane.*** The gamma isomer of hexachlorocyclohexane (HCH), which has been used in the past as pesticide. The group of HCH has been included on the OSPAR List of chemicals for priority action but since most isomers are by-products or waste from lindane production with similar hazardous properties, OSPAR has focused on lindane. All uses of lindane in the OSPAR Convention area ceased by June 2002 under the EC Pesticides Directive (91/414/EC). Historic production sites and uses in the OSPAR Convention area can still provide a source for losses to the marine environment. Uses in other parts of the world may contribute to marine concentrations through atmospheric transport and input to the OSPAR maritime area.

b. ***CYP1A (EROD) activity.*** EROD acts as a biomarker of exposure to contaminants that can induce the cytochrome P450 enzyme system. EROD is monitored by Contracting Parties as a voluntary parameter under the pre-CEMP. The cytochrome P450 subfamily CYP1A enzyme system is particularly important in the metabolism of many pollutants, in particular planar molecules, such as some PAHs and chlorobiphenyls (CBs). The induction of cytochrome P450 enzymes in fish liver was first suggested as an indicator of environmental contamination in the 1970s. It has later gained widespread use in the form of EROD (7-Ethoxyresorufin-O-deethylase) activity. Dioxins, planar PCBs and PAHs (benzo[a]pyrene) are categorised as "strong" inducers of EROD.

3. Methods

The assessment was mainly prepared using the methods for data screening, treatment of quality assurance information, temporal trend assessment and assessment against assessment criteria which have been used in previous CEMP assessments (OSPAR, 2005; OSPAR, 2006; OSPAR, 2007a; OSPAR, 2008c) and are described in the CEMP Assessment Manual (OSPAR, 2008b).

The assessment criteria used to assess environmental concentrations of hazardous substances are re-produced at Annex 1 and are set out in more detail in OSPAR agreement on CEMP Assessment Criteria for the QSR 2010 (OSPAR other agreement 2009-2). The derivation of these assessment criteria for hazardous substances is discussed in a Background document on CEMP Assessment Criteria for the QSR 2010 (OSPAR 2010d). The assessment criteria reflect a two stage process in which data are compared to concentrations that are unlikely to give rise to unacceptable biological effects (*c.f.* Environmental Assessment Criteria, EACs) and then against Background Concentrations (BCs) or zero, expressed as Background Assessment Concentrations (BACs). The latter reflects the objective of the OSPAR Hazardous Substances Strategy that concentrations should be at or close to background levels for naturally occurring substances or to zero for man-made substances.

The Assessment criteria used to assess the biological effects of tributyl tin are presented in the sections reporting on those assessments. Assessment criteria for TBT-specific biological effects are set out in detail in the OSPAR agreement on Provisional JAMP Assessment Criteria for TBT – Specific Biological Effects (OSPAR other agreement 2004-15; revised in 2008)

The CEMP Assessment Manual (OSPAR, 2008b), describes the following steps of the assessment process:

a. selection of bases for expressing concentrations and conversion of assessment criteria to preferred bases;

b. methods used for the assessment of Background Concentrations;

c. application of Background Concentrations i.e. the derivation and use of Background Assessment Concentrations (BACs);

d. methods for normalisation of contaminant concentrations in sediments;

e. trend analysis;

f. method used for trend analysis of time series.

4. Criteria for lengths of time series

Time series for the assessment were constructed of normalised concentrations of contaminants in sediment from stations in the ICES Station Dictionary. Metal concentrations were generally normalised to 5% aluminium and organic concentrations were normalised to 2.5% organic carbon. Concentrations of contaminants in sediment from Spain were not normalised.

Time series of concentrations of contaminants in biota were also constructed, utilising the appropriate bases of expression of concentrations (*e.g.* wet weight or dry weight).

Time series were assessed if they had some data reported between 2003 and 2007 and had sufficient number of years of data. Time series with five or more years of data and with few measurements below the limit of detection were assessed for temporal trends. Although all data in the time series were used in the statistical analysis, the focus was on changes in concentration in the last ten years (1998 − 2007). Throughout this report, the term ***trend*** refers to a **linear trend in log concentration in the last ten years (1998 − 2007), significant at the 5% level**.

Time series with three or more years of data and with few measurements below the limit of detection were assessed against the assessment criteria (BAC, EAC etc.). Throughout the report, the phrase ***concentrations are at background*** means that the **upper confidence limit on the fitted concentration in the last year of monitoring is below the BAC**. Time series dominated by less-than measurements and with five or more years of data in the period 1998 − 2007 were also assessed against the assessment criteria.

5. Overview of data

Data available for use in the assessment are shown in Figure 5.1.

The absence of sediment stations for France arises because France monitors only every 6 years on each coast. Trends are assessed retrospectively by analysis of deep cores (see Annex 4). Recent cruises for monitoring of contaminants in sediments have focussed on the French Mediterranean Sea and not the OSPAR area. The only French monitoring of sediments in the OSPAR area during the period 1998 to 2007 was in 2003 (Baie de la Seine).

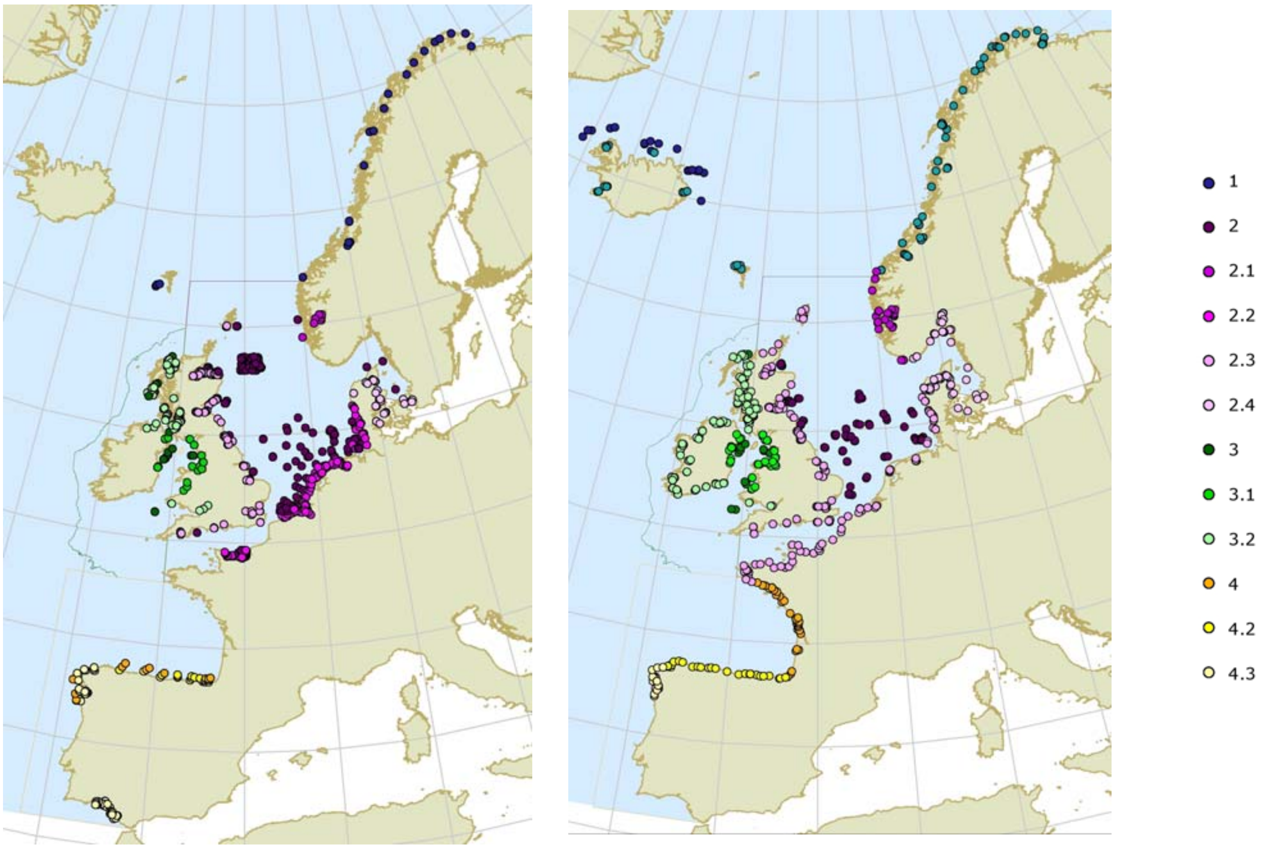

Figure 5.1. Overview of sediment (left) and biota (right) data availability. Colour coding indicates the location of Stations within the regions and sub regions assessed under section 12 of the report.

6. Description of basic outputs from the hazardous substances assessment

The output from this section of the 2008/2009 CEMP Assessment work is presented as a series of maps that records the concentrations of each contaminant at each station in each matrix (sediment, biota). For each contaminant-matrix combination the first map shows information on status according to the comparison with assessment criteria, as described in Annex 1 to this document. Samples collected between 2003 and 2007 that did not form part of a time series were used to provide greater spatial coverage by informally comparing the assessment criteria. Specifically, the upper 95% confidence limits of the normalised concentrations, based on the analytical variability of the measurements – i.e. ignoring any field variability – were compared to the assessment criteria. For biota the annual median log-concentrations were compared to the assessment criteria. The colour indicates the results of assessments of the mean concentration in the final year according to the classification given in Table 6.1.

Table 6.1. Classification of mean concentration in the final year in comparison to the assessment criteria set out in Annex 1.

Colour	Understanding of what the colours mean	Possible types of management activity
RED	**Status is unacceptable** Concentrations of contaminants are at levels such that there is an unacceptable risk of chronic effects occurring in marine species, including the most sensitive species (PAHs and PCBs in biota; PAHs, PCBs and metals in sediment) or are greater than EU dietary limits for fish and shellfish but the extent of risks of pollution effects is uncertain (metals in biota)	Measures in place or under consideration to address the cause. Regular monitoring to determine status and trends.
ORANGE	**Status is uncertain** Concentrations of metals in biota are lower than EU dietary limits for fish and shellfish and above background but the extent of risks of pollution effects is uncertain.	
GREEN	**Status is acceptable** Concentrations of contaminants are at levels where it can be assumed that little or no risks are posed to the environment and its living resources at the population or community level	Measures generally are not necessary to improve status, but may be required if there is a trend towards a deterioration in status. Appropriate monitoring regime to ensure that there is no deterioration.
BLUE	**Status is acceptable** Concentrations are near background for naturally occurring substances (cadmium, mercury, lead, PAHs) or close to zero for man-made substances (PCBs), i.e. the ultimate aim of the OSPAR Strategy for Hazardous Substances has been achieved.	Measures not required. Appropriate monitoring regime to ensure that there is no deterioration.

The second map for each contaminant-matrix combination shows the available information on temporal trends. The symbols on the maps denote:

- a significant upward trend (upward triangle);
- significant downward trends (downward triangle);
- no trend (square);
- insufficient data to assess trends (circle).

The colour denotes the outcome of status according to the comparison with assessment criteria set out at Annex 1 to this document according to the classification at Table 6.1.

A series of more integrated presentations of CEMP data are provided in Section 13.

The data underlying the graphical output from the assessment of hazardous substances reported in sections 7, 9 and 10 are tabulated in Appendices 1 and 2. The tables in these appendices summarise the data for each contaminant and matrix for each station, indicating the colour assessment carried out according to the assessment criteria set out at Annex 1 and the directions of significant temporal trends. The tables also include brief explanatory text and comments, as supplied by Contracting Parties during the completion of this report.

7. Status and trends of heavy metals

The results of the assessment for the heavy metals, cadmium, mercury and lead in sediments and biota are presented in Sections 7.1 – 7.3. In each section the first two maps illustrate the geographical distribution of the concentrations, displayed by station. The colours of the symbols follow the scheme described in Section 6 above and detailed in Table 6.1. The second two maps in each section illustrate temporal trends in the concentrations of heavy metals in sediment and biota. Significant trends detected within the period 1998 – 2007 are shown as upward or downward pointing triangles. The colouring indicates in the last year of monitoring according to the classification set out in Table 6.1. Circles indicated locations where the data available was for too few years to allow trend assessment.

7.1 Cadmium

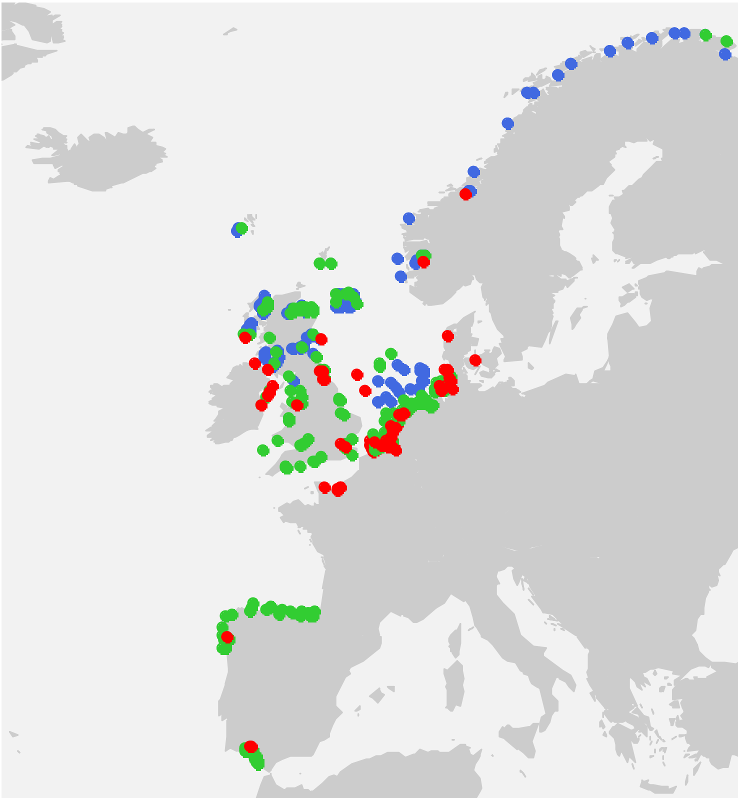

Figure 7.1. Cadmium concentrations in sediments. Status is indicated for the last year of monitoring in the period 2003 – 2007

Concentrations of cadmium in the marine sediments are generally near background on the Norwegian Coast, and also parts of the northern UK and offshore areas of the North Sea. Concentrations above the upper assessment criterion (ERL) are mainly confined to areas in the German Bight, the coast of the Netherlands and Belgium, and the east coast of Ireland. These, and other scattered locations indicate that the elevated concentrations are mainly located around the estuaries of large rivers. Concentrations in sediment elsewhere, such as the UK coast, the coasts of the Netherlands and Germany, and the coast of Spain, are above background. Where significant temporal trends were found, they tend to be downwards on the continental coast, and upwards in the UK.

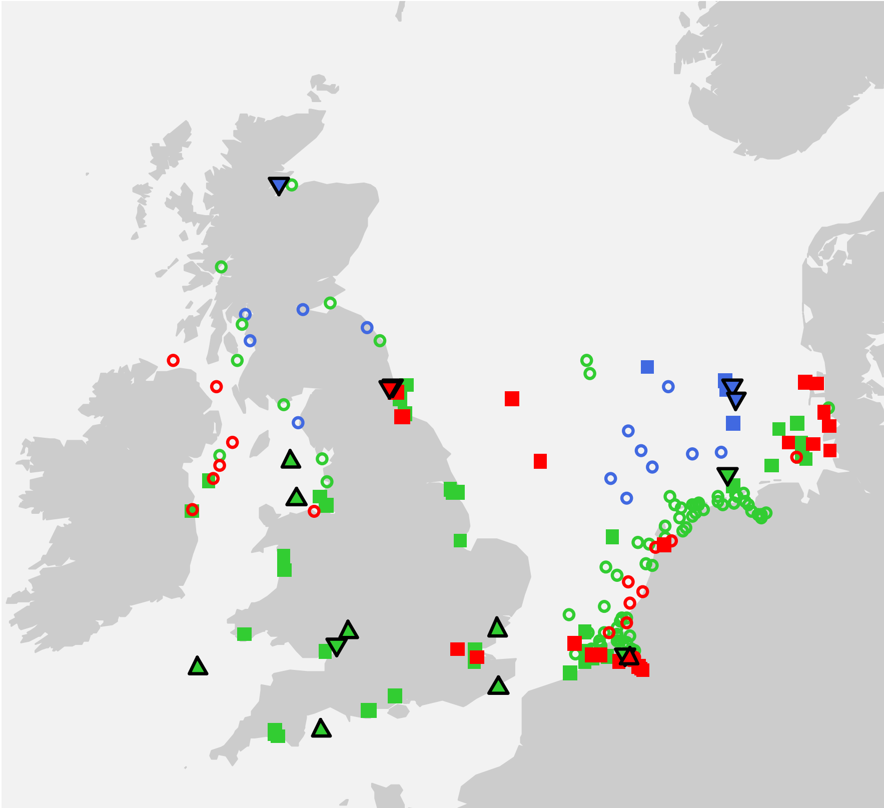

Figure 7.2. Trends of cadmium in sediments. Significant trends detected within the period 1998 – 2007 are shown. Shading indicates status in last year of monitoring. Circles indicate where insufficient data are available to assess trends.

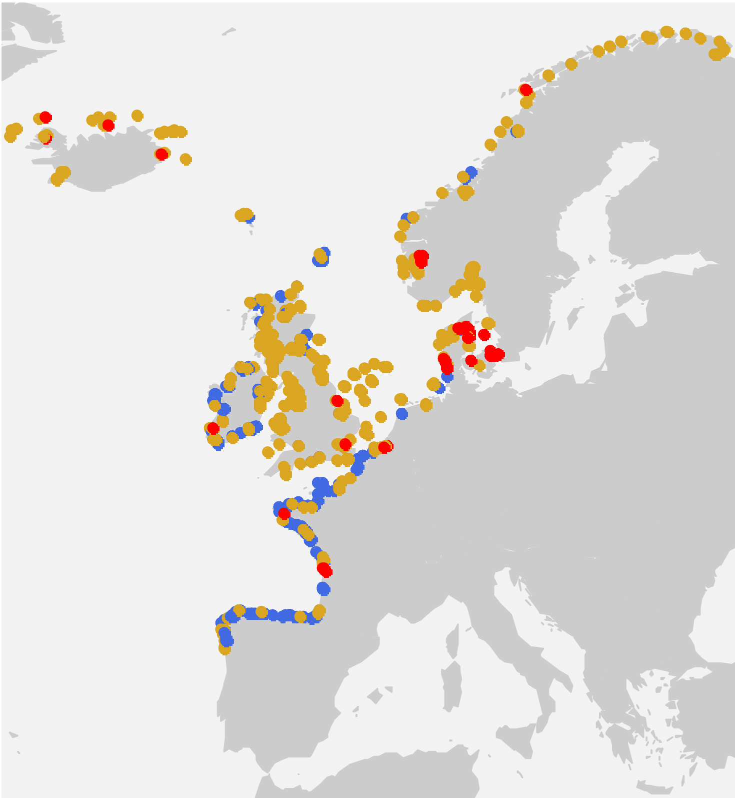

Figure 7.3. Cadmium concentrations in biota. Status is indicated for the last year of monitoring in the period 2003 – 2007

Cadmium concentrations in fish and shellfish are only occasionally above the upper assessment criterion (EC food standards). The high concentrations are mainly found around the coasts of Denmark, and at occasional locations in the UK, France, and also in Iceland and Norway where geological factors are likely to increase concentrations locally. Concentrations in biota and sediment in north-west Spain may be influenced by the transport of cadmium to surface coastal waters through localized upwelling of deep oceanic waters. Concentrations in fish and shellfish are at or below background at a good proportion of sites in northern Spain, the Bay of Biscay, the Channel coast of France and parts of Ireland and Scotland. Elsewhere, concentrations are above background. Temporal trends in concentrations are found, but are not consistently upwards or downwards. Monitoring data from OSPAR region V are scarce.

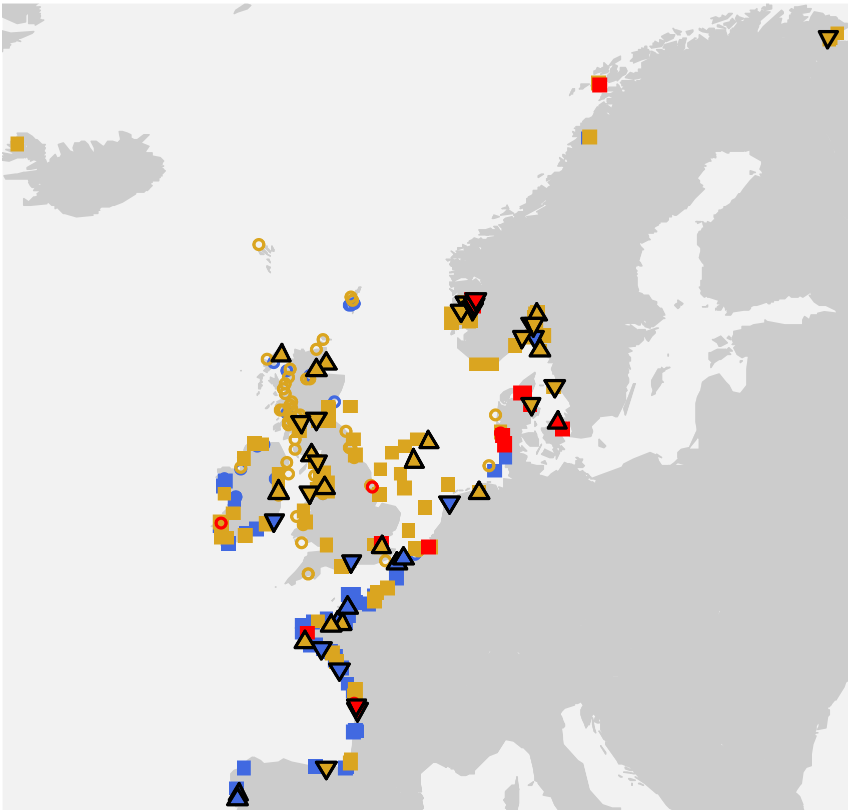

Figure 7.4. Trends of cadmium in biota. Significant trends detected within the period 1998 – 2007 are shown. Shading indicates status in last year of monitoring. Circles indicate where insufficient data are available to assess trends.

7.2 Lead

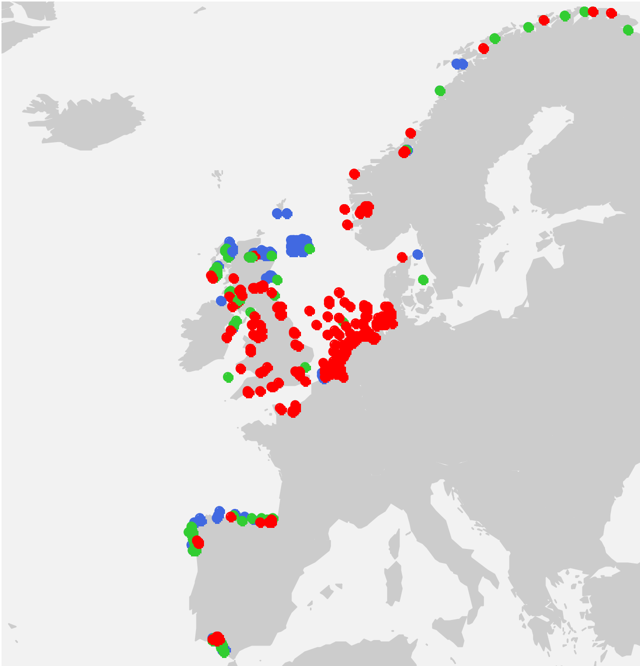

Figure 7.5. Lead concentrations in sediments. Status is indicated for the last year of monitoring in the period 2003 – 2007

Concentrations of lead in the marine sediments in the southern bight of the North Sea, and in the southern parts of the UK are generally above the upper assessment criterion (ERL) for lead in sediment, implying some potential for adverse biological effects in these areas. Scattered high concentrations are also found along the coast of Norway, and Spain. However, concentrations in the northern UK, northern Norway and northern Spain are generally below the upper assessment criterion, and in some cases are at background. Temporal trends in lead concentrations are not common but where they occur, are generally downward, indicating a tendency for environmental status to improve.

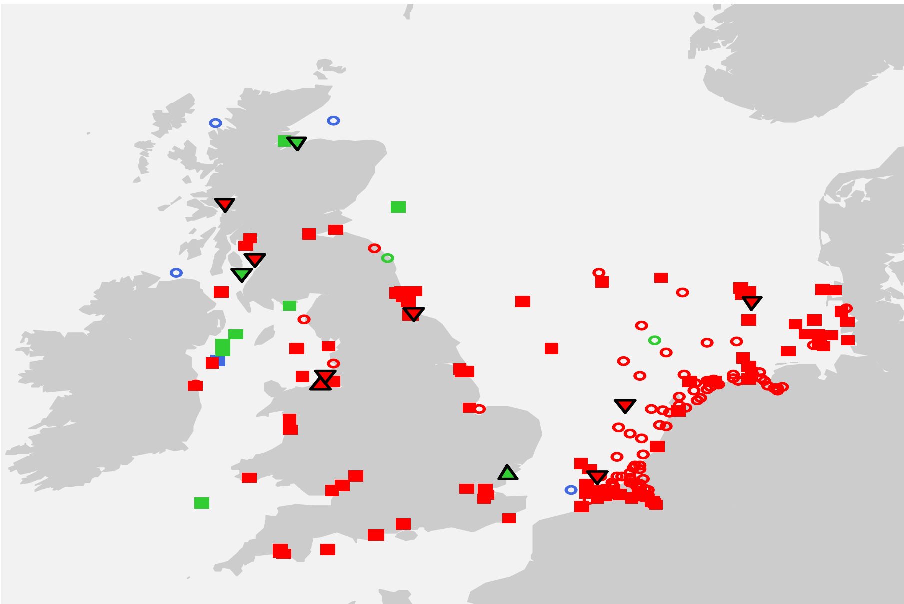

Figure 7.6. Trends of lead in sediments. Significant trends detected within the period 1998 – 2007 are shown. Shading indicates status in last year of monitoring. Circles indicate where insufficient data are available to assess trends.

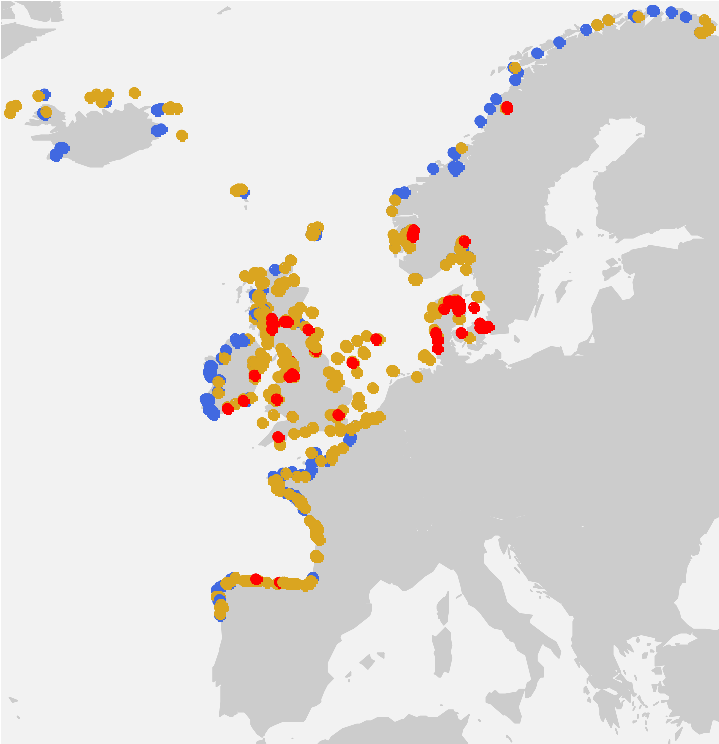

Figure 7.7. Lead concentrations in biota. Status is indicated for the last year of monitoring in the period 2003 – 2007.

Lead concentrations in fish and shellfish are at background at a significant proportion of stations on the north-west coast of Norway, the west of Ireland, and some stations in Iceland, northern Spain and the Channel coast of France. Elsewhere concentrations are higher and exceed the upper assessment criterion (EC food standard) at some stations in Denmark, the UK, Ireland and a few in northern Spain. Surprisingly, concentrations are similarly elevated at two stations in an offshore area around the Dogger Bank. Where they are found, temporal trends in lead concentrations in fish and shellfish are almost invariably downwards, particularly along the coasts of the Channel and in the Bay of Biscay.

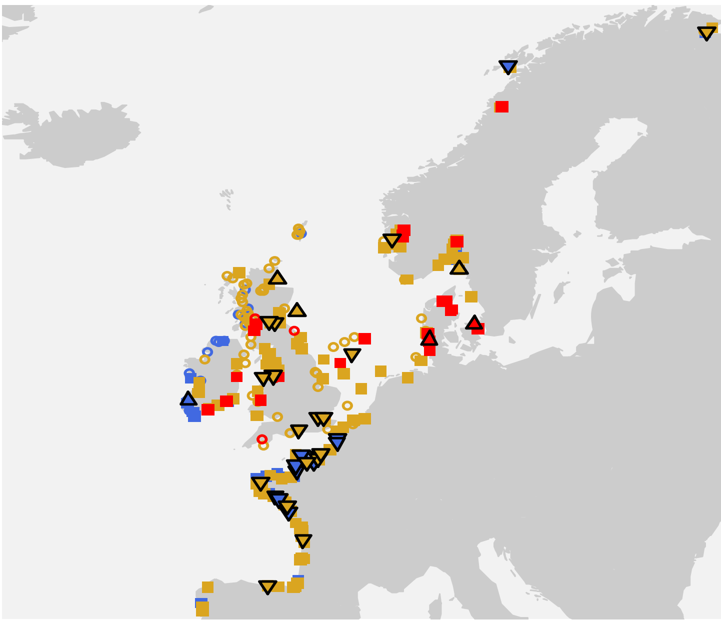

Figure 7.8. Trends of lead in biota. Significant trends detected within the period 1998 – 2007 are shown. Shading indicates status in last year of monitoring. Circles indicate where insufficient data are available to assess trends.

7.3 Mercury

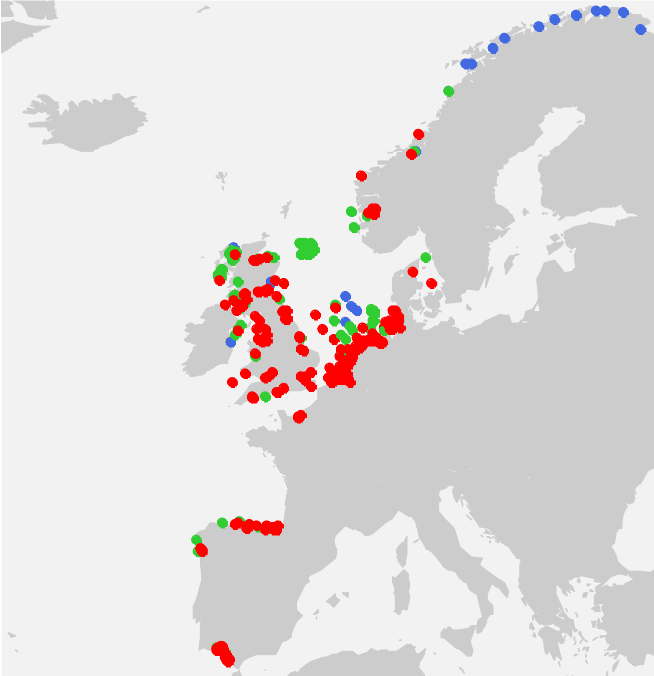

Figure 7.9. Mercury concentrations in sediment. Status is indicated for the last year of monitoring in the period 2003 – 2007

Concentrations of mercury in the marine sediments in the southern bight of the North Sea, and in most of the UK are generally above the upper assessment criterion (ERL) for mercury in sediment, implying some potential for adverse biological effects. High concentrations are also found in parts of the western coast of Norway, and in Spain. Concentrations around the Dogger Bank are also high, but elsewhere in offshore areas of the North Sea are lower, and at background in some locations. Background concentrations also occur in parts of northern Scotland and in northern Norway. Almost all temporal trends in mercury concentrations in sediments are downwards.

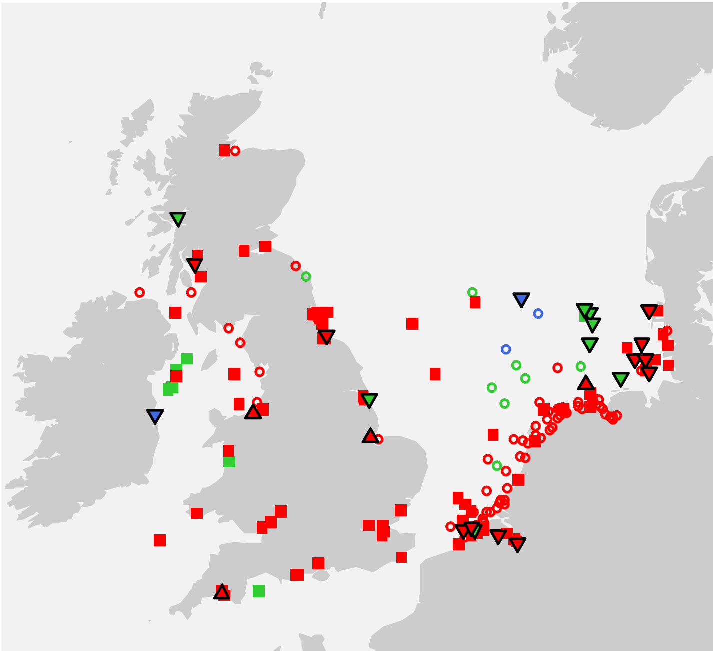

Figure 7.10. Trends of mercury in sediment. Significant trends detected within the period 1998 – 2007 are shown. Shading indicates status in last year of monitoring. Circles indicate where insufficient data are available to assess trends.

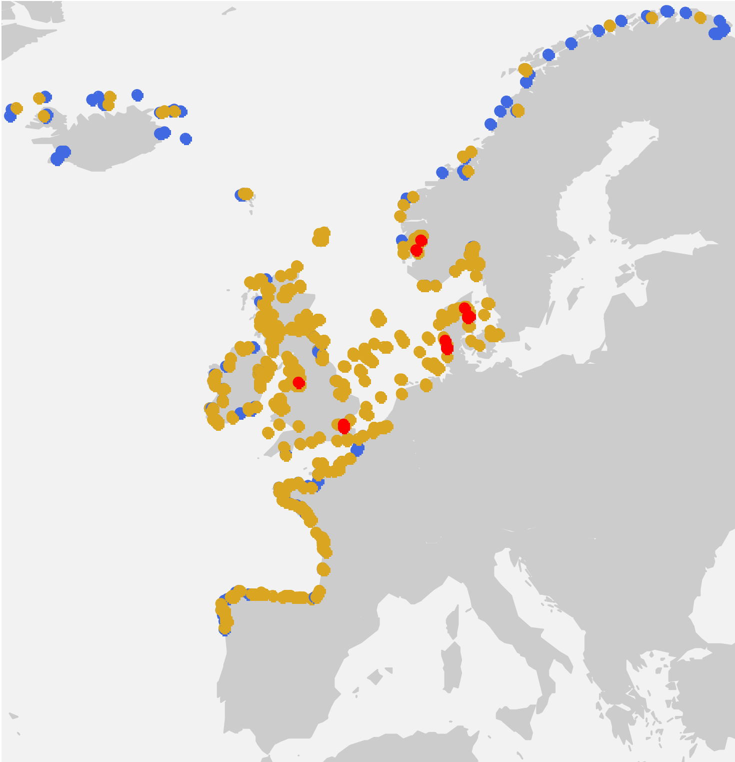

Figure 7.11. Mercury concentrations in biota. Status is indicated for the last year of monitoring in the period 2003 – 2007

Mercury concentrations in fish and shellfish are at background at a large proportion of stations on the Channel coast of France, and the French and Spanish coasts of the Bay of Biscay. Background concentrations are also found at some stations in Ireland, Scotland, and western Norway. Concentrations above the upper assessment criterion (EC food standards) occur mainly around Denmark, and at occasional scattered locations elsewhere. In some of these cases (*e.g.* around Iceland), the high concentrations may be a consequence of geological conditions. Both upward and downward temporal trends occur, with a grouping of generally upward trends in southern Norway.

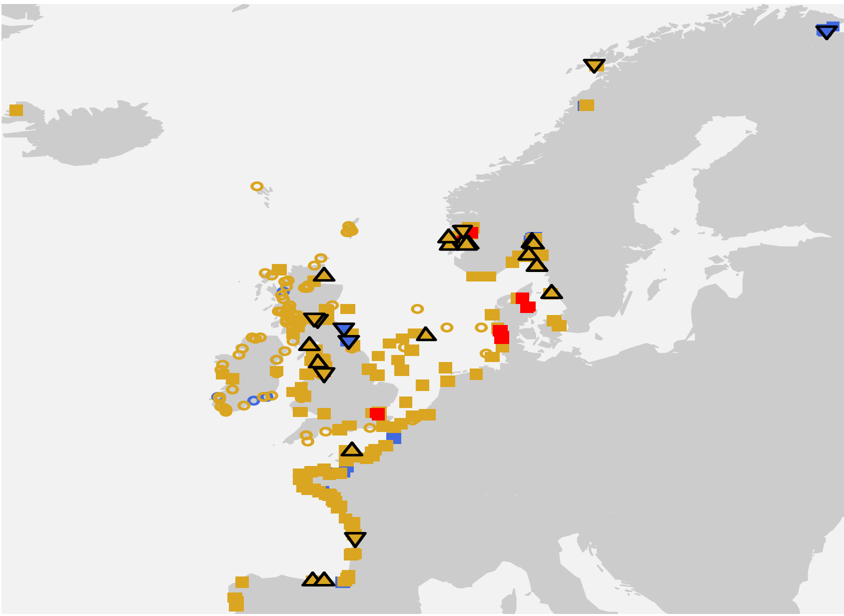

Figure 7.12. Trends of mercury in biota. Significant trends detected within the period 1998 – 2007 are shown. Shading indicates status in last year of monitoring. Circles indicate where insufficient data are available to assess trends.

8. Effects of Tributyl Tin

The assessment of Vas Deferens Sequence Index used the methodology developed by Fryer & Gubbins (2007) for *Nucella lapillus* and Fryer & Gubbins (2006) for other species, the only difference being that Penis Classification Index in *Buccinum* was scaled to lie between 0 and 1 by dividing by 3.5, and ISI in *Littorina* and VDSI in *Neptunea* and *Nassarius* were scaled to lie between 0 and 1 by dividing by 4. Essentially, each time series was modelled as a linear logistic function of time, the significance of the trend was assessed; and the upper one-sided 95% confidence limit on the fitted line in the final year of the time series was used to make a precautionary classification of the data using the provisional JAMP assessment criteria for TBT specific biological effects in OSPAR Agreement 2004-15. Only time series with at least four years of data were assessed for temporal trends.

The levels of imposex in the 5 key gastropod species monitored in the OSPAR/ICES area are related to a 6-class assessment scheme A-F. For colour presentation in the maps the colour code below is suggested for the different classes. In this scheme, green also means that the OSPAR EcoQO on imposex in dogwhelks and other related gastropods is met. All other colours mean that the EcoQO is not met. It should be taken into account that the EcoQO only applies to the species in the white columns.

Table 8.1. Six class assessment scheme for TBT-specific biological effects in dogwhelks and other gastropods

<table>
<tr><th>Assessment class</th><th>Nucella
VDSI</th><th>Nassarius
VDSI</th><th>Buccinum
PCI</th><th>Neptunea
VDSI</th><th>Littorina
ISI</th></tr>
<tr><td>A</td><td>< 0.3</td><td rowspan="2">< 0.3[1]</td><td rowspan="2">< 0.3[1]</td><td>< 0.3</td><td rowspan="3">< 0.3[2]</td></tr>
<tr><td>B</td><td>0.3 - <2.0</td><td>0.3 - <2.0</td></tr>
<tr><td>C</td><td>2.0 - < 4.0</td><td>0.3 - <2.0</td><td>0.3 - <2.0</td><td>2.0 - <4.0[3]</td></tr>
<tr><td>D</td><td>4.0 - 5.0</td><td>2.0 – 3.5</td><td>2.0 - <4.0</td><td></td><td>0.3 - < 0.5</td></tr>
<tr><td>E</td><td>>5.0[4]</td><td>> 3.5[4]</td><td>4.0[4]</td><td></td><td>0.5 - 1.2</td></tr>
<tr><td>F</td><td></td><td></td><td></td><td></td><td>> 1.2</td></tr>
</table>

[1] This species cannot be used to distinguish between class A and class B. The assessment class is therefore by definition B.

[2] This species cannot be used to distinguish between classes A, B and C. The assessment class is therefore by definition C.

[3] This species cannot be used to distinguish between class C and higher classes. If a VSDI of 4.0 is reached, additional observations are required to determine the assessment class *e.g*. by using another species. If a VDSI of 4.0 is observed, the assessment class is by definition F.

[4] These species cannot be used to distinguish between classes E and F. Therefore, additional observations are required to determine the assessment class *e.g*. by using another species. If the VDSI (*Nassarius*) or the PCI (*Buccinum*) is >3.5, the assessment class is therefore by definition F.

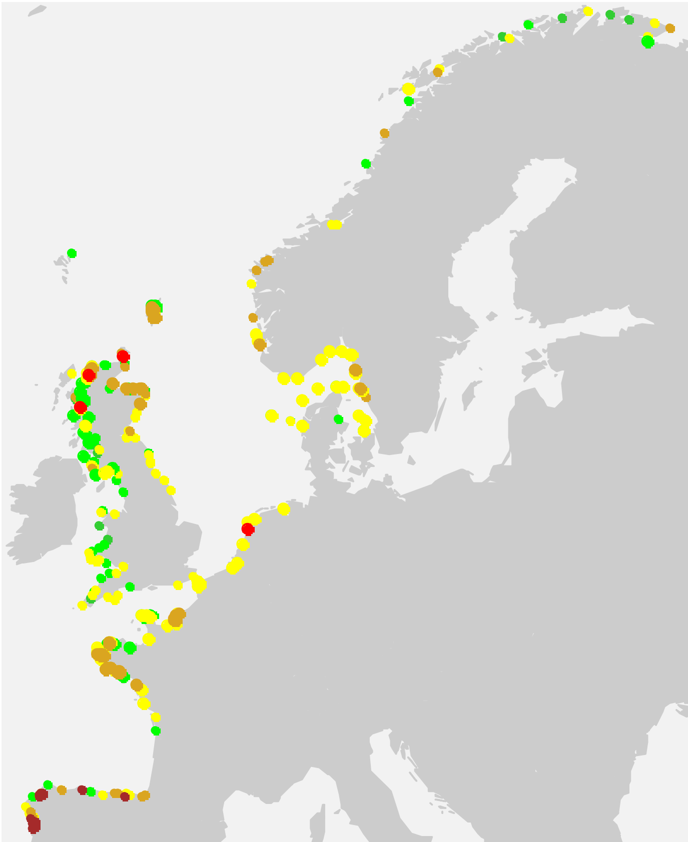

Figure 8.1. Status of imposex measurements. Large symbols = 3 or more years of data. Smaller symbols = 1 or 2 years of data

Imposex data were available from the coastline of continental Europe from the north of Norway to Galicia (northern Spain), and round the coast of the UK. In most cases, the gastropod populations at the sampling stations showed imposex in assessment classes A, B or C. Scattered examples of higher assessment classes, including those which indicated that reproduction of sensitive gastropods would be inhibited, occurred, and are generally associated with recognised point sources of TBT, such as contaminated sediment in harbours and marinas. Although inputs of "fresh" TBT from antifouling coatings on vessels should no longer be occurring, TBT degrades only slowly in sediment (particularly anaeroboic sediment), and historically contaminated sediment have the potential to act as a continuing (but declining) source of TBT to the overlying water and to various species of gastropods.

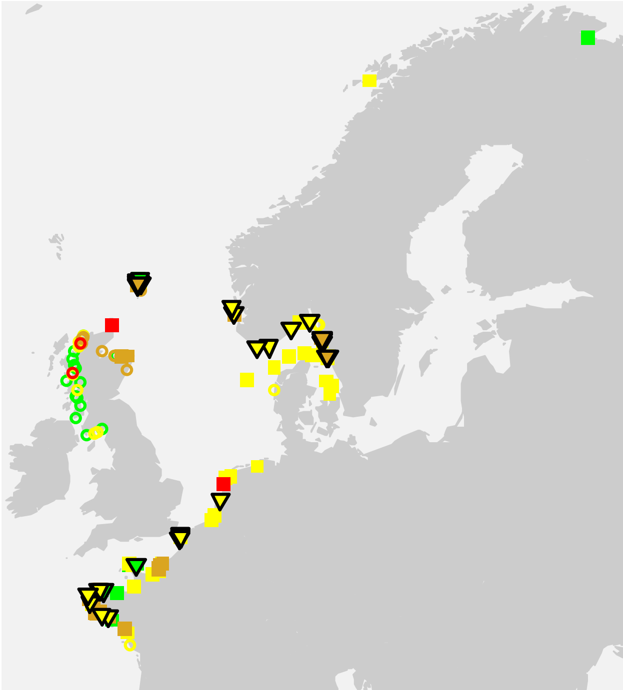

Figure 8.2. Trends in TBT-specific biological effects over the period 1997−2008. Circles indicate insufficient data to assess trends.

Imposex is becoming more widely established as a monitoring parameter, and the number of stations for which it is possible to undertake assessment of temporal trends is increasing. This pattern is likely to continue, as monitoring programmes under Water Framework Directive in some countries includes imposex.

Time series with at least four years of data were used for the trend assessment, which meant that the number of time series for biological effects which were available for assessment came down to 134 time series; this includes monitoring data from Denmark, France, the Netherlands, Norway, Sweden and the United Kingdom. For 24 of these time series there is a significant downward trend. Only 4 have a significant upward trend, two of which are in *Littorina* in the Netherlands, where ISI increased from 0 to 0.04 and to 0.08 respectively over a four year period. In 84 of the remaining 106 time series, the estimated trend was downwards, albeit non-significant. It is clear from Figure 8.2 that there are a considerable number of significant temporal trends and that all of these trends are downwards. This is consistent with progressive reduction in the inputs of TBT to coastal waters from shipping and historically contaminated sediment.

As described in the 2007− 2008 Assessment of CEMP Monitoring Data (OSPAR, 2008a), it is possible to integrate the assessment of imposex/intersex with concentrations of TBT in sediment (and potentially biota), as shown in the table below. Few data were available for TBT concentrations in biota, but sufficient data for TBT in sediment were available for an assessment to be made.

Table 8.2. Integrated assessment classes linking TBT effects in gastropod species with concentrations of TBT in water and sediment, and comparisons with EACs and EQSs in biota and water.

Assessment class	*Nucella*	*Nassarius*	*Buccinum*	*Neptunea*	*Littorina*	*TBT Water*	*TBT mussel*	*TBT sediment*	*EAC water*	*EAC mussel*	*EAC sediment*	*EQS (water)*	
												AA	*MAC*
	VDSI	VDSI	PCI	VDSI	ISI	(ng TBT/l)	(µg TBT /kg dw)	(µg TBT/ kg dw)	(ng TBT/l)	(µg TBT/ kg dw)	(µg TBT/ kg dw)	(ng TBT/l)	(ng TBT/l)
A	< 0.3	< 0.3[1]	< 0.3[1]	< 0.3	< 0.3[2]	<0.025	< 3	n.d.			0.01		
B	0.3 - <2.0			0.3 - <2.0		0.025-0.25	3-30	< 2	0.1	12		0.2	
C	2.0 - < 4.0	0.3 - <2.0	0.3 - <2.0	2.0 - 4.0[3]		0.25-5	30 - <600	2 - <50					1.5
D	4.0 - 5.0	2.0 – 3.5	2.0 - 3.5		0.3 - < 0.5	5-7.5	600 - < 900	50-<200					
E	>5.0[4]	> 3.5[4]	>3.5[4]		0.5 - 1.2	7.5-37.5	900 - 4200	200 -500					
F					> 1.2	>37.5	>4200	>500					

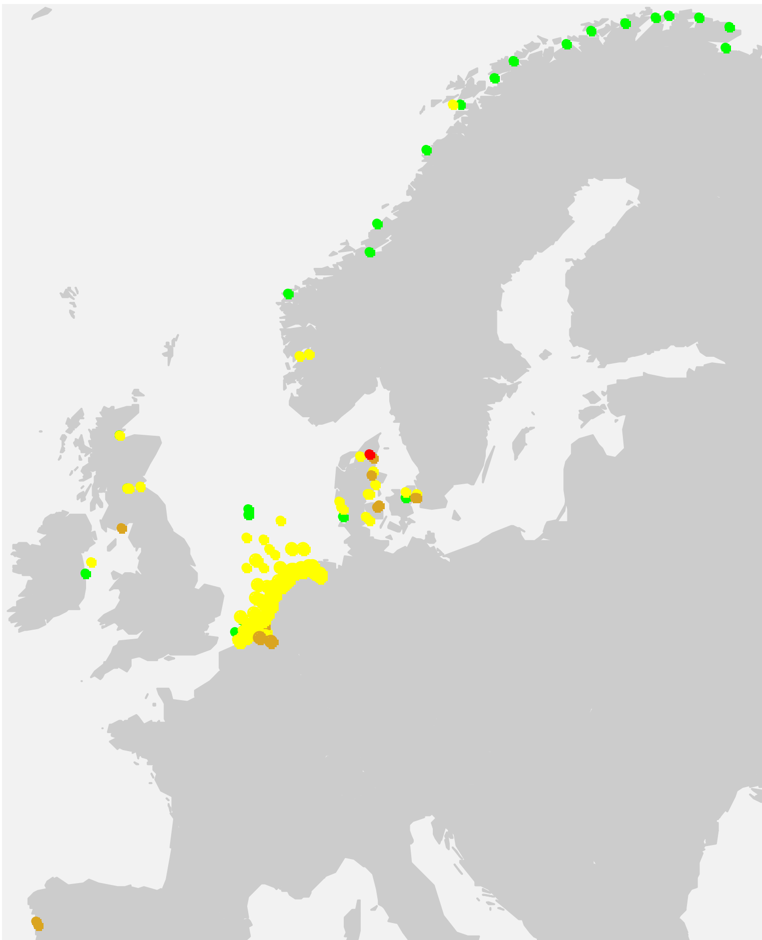

Figure 8.3. Integrated assessment of TBT-specific biological effects and TBT in sediments. The fitted TBTIN concentration in the final monitoring year is coloured according to the classification system presented in last year's assessment report.

The potential role of historically contaminated sediment to act as a source of TBT for sensitive gastropod species has been mentioned above. Data on the concentrations of TBT in sediment are available from both coastal and offshore locations, particularly in the southern bight of the North Sea. The large majority of the concentrations fall into assessment classes B and C, and would not be expected to affect the reproductive capability of sensitive gastropod species. This is consistent with the imposex results, as are the scattered occurrences of concentrations in higher assessment classes.

9. Polychlorinated biphenyls (PCBs)

Figures 9.1 − 9.4 show the assessment results for the aggregated group of PCBs *i.e.* the ICES 7 CBs (CB congeners 28, 52, 101, 118, 138, 153, 180). Stations are coloured red if two or more of the congeners show concentrations above the EAC, blue if all (or all but one) of the CB congeners are significantly below the BAC, and green otherwise. A trend is indicated where the majority of significant trends within the six congeners are in one direction. This represents an initial level of aggregation of data, in that the presentation integrates across CB congeners within station. Maps showing the assessment results for each of the individual CBs congeners in this group are at Annex 2.

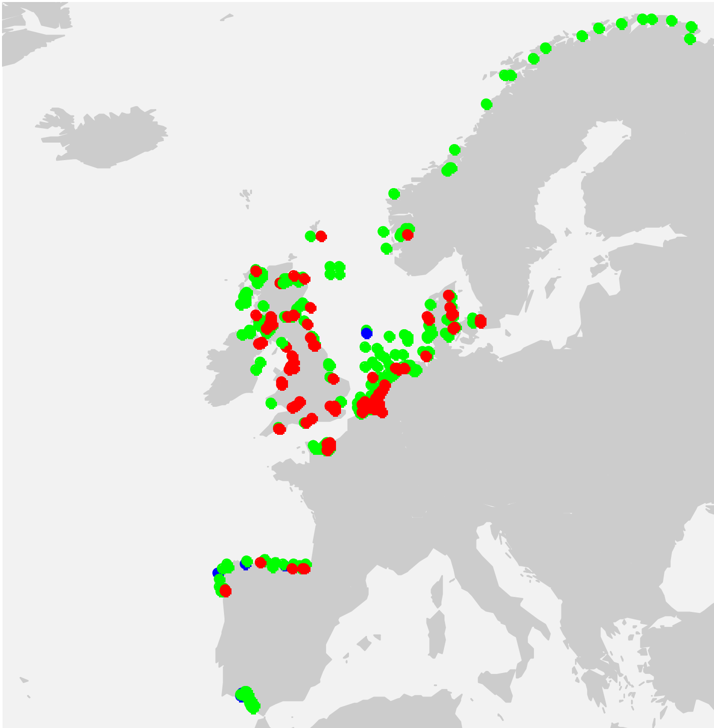

Figure 9.1. PCB concentrations in sediment. Status is indicated for the last year of monitoring in the period 2003 – 2007

It is widely recognised that CBs are ubiquitous contaminants of the marine environment. The Background Concentrations of these synthetic contaminants are, by definition, zero, and stations where the concentrations of target CB congeners in sediment are close to background are rare. Stations where the concentrations of CB congeners are not at background but less than the EAC are mainly confined to areas remote from industrial activity (*e.g.* parts of northern Norway and Scotland, the north coast of Spain, and most offshore locations in the North Sea. The concentrations of one or more congeners exceed the EAC at many stations round the UK, the Channel coast of France, and the Belgian and southern Netherlands coasts.

The concentrations in sediment showed fewer significant temporal trends. Approximately 70% of these were downwards, suggesting that concentrations in sediment are also tending to decrease, but at a lesser rate and on a less widespread basis than those in biota.

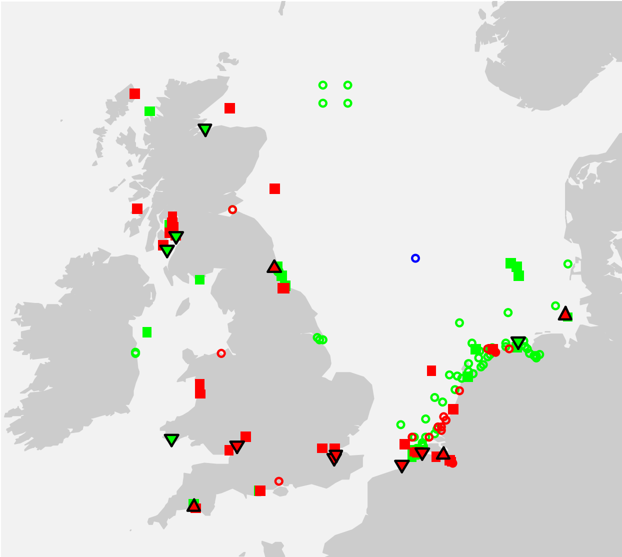

Figure 9.2. Trends of PCBs in sediments. Significant trends detected within the period 1998 – 2007 are shown. Shading indicates status in last year of monitoring. Circles indicated where insufficient data are available to assess trends.

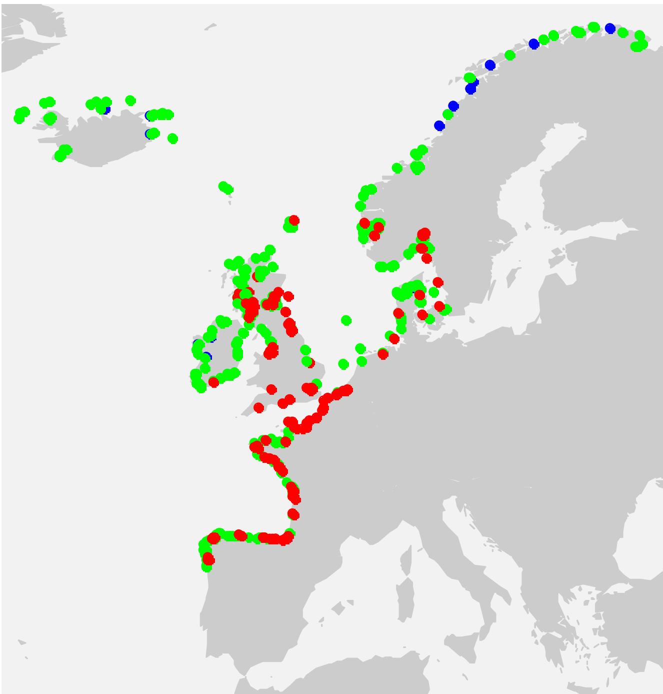

Figure 9.3. PCB concentrations in biota. Status is indicated for the last year of monitoring in the period 2003 – 2007

The assessment of concentrations of CBs in biota is similar to that for concentrations in sediment. Stations where the concentrations of the target CB congeners in biota are close to background are rare and confined to northern Norway. Stations where the concentrations of CB congeners in biota are above background but are less than the EAC are common in the relatively remote areas of Iceland, northern Scotland and Ireland. Concentrations above the EAC are widespread, particularly in the Bay of Biscay, central and southern UK and in southern Norway.

The use of PCB formulations has been prohibited in the OSPAR area for many years, It would therefore be expected that concentrations in biota and sediment would tend to be decreasing towards background. A high proportion of the biota stations showed significant temporal trends in concentrations, particularly along the continental coast of the North Sea, the west of the UK, and Ireland. A small number of stations showed increasing trends, and these were located in northern Spain and few other scattered locations.

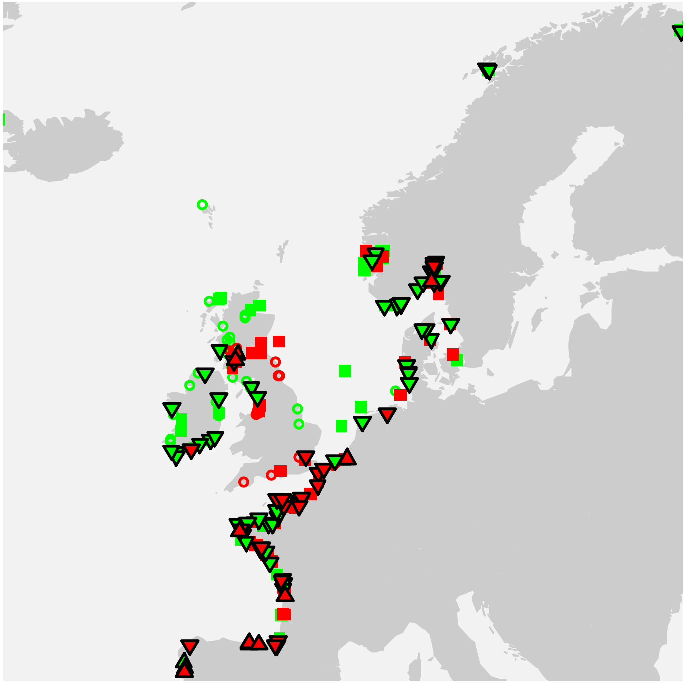

Figure 9.4. Trends of PCBs in biota. Significant trends detected within the period 1998 – 2007 are shown. Shading indicates status in last year of monitoring. Circles indicated where insufficient data are available to assess trends.

10. PAHs

Figures 10.1 – 10.4 show the assessment results for the aggregated group of PAHs monitored under the CEMP for which a complete set of assessment criteria exist; i.e benz*[a]*anthracene; benzo*[ghi]*perylene; benzo*[a]*pyrene; fluoranthene; pyrene; phenanthrene.

Stations are coloured blue if all the PAH compounds are significantly below the BAC, green if two or more, but not all are significantly below the ERL (sediment) or EAC (biota); and red otherwise. A trend is indicated where the majority of significant trends within the six congeners are in one direction. As with the CB congeners, this represents an initial level of aggregation of data, in that the presentation integrates across PAH compounds within station. Maps showing the assessment results for each of the individual PAH compounds in this group are at Annex 3.

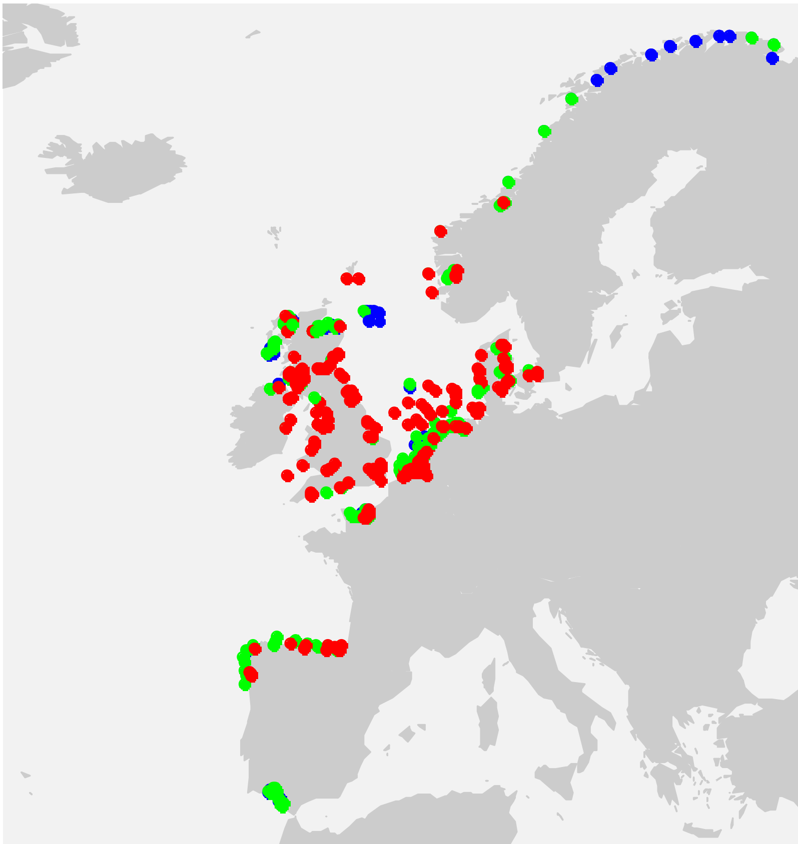

Figure 10.1. PAH concentrations in sediment. Status is indicated for the last year of monitoring in the period 2003 – 2007

PAHs in the marine environment have both natural and anthropogenic sources. The Background Concentrations of these contaminants take into account the natural sources. Stations where the concentrations of PAH compounds in sediment are close to background are confined to remote coastal areas of northern Norway, and to some offshore locations in the central North Sea. Stations where the concentrations of PAHs are less than the ERL are scattered, and include some locations in northern Scotland, and on the coasts of Norway, Spain and the southern bight of the North Sea. At the majority of stations round the UK, in the southern North Sea and at some stations in northern Spain, the concentrations of PAHs exceed the upper assessment criterion (ERL) and so the stations are coloured red suggesting that there may be some potential for adverse biological effects.

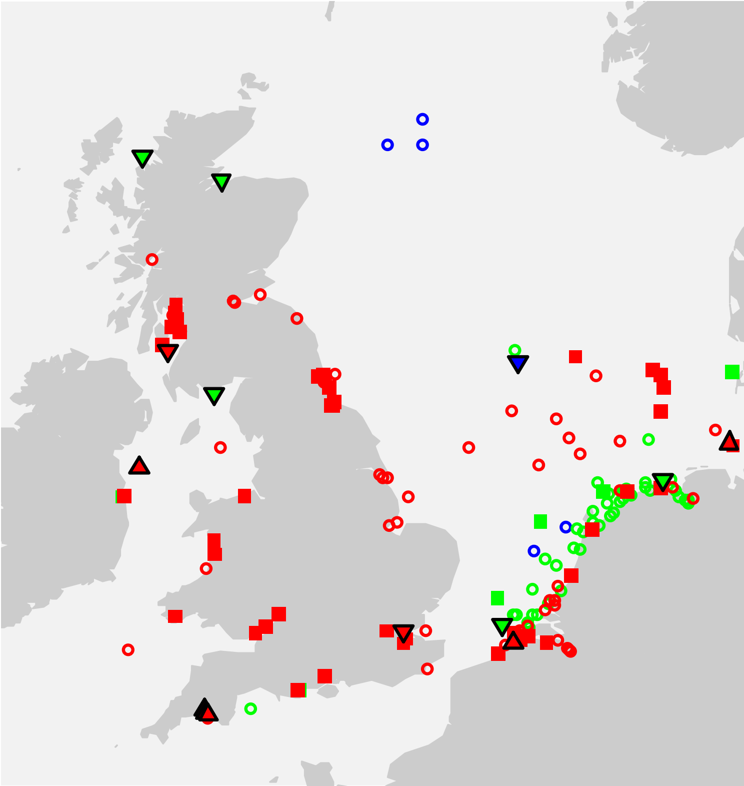

Figure 10.2. Trends of PAHs in sediment. Significant trends detected within the period 1998 – 2007 are shown. Shading indicates status in last year of monitoring. Circles indicated where insufficient data are available to assess trends.

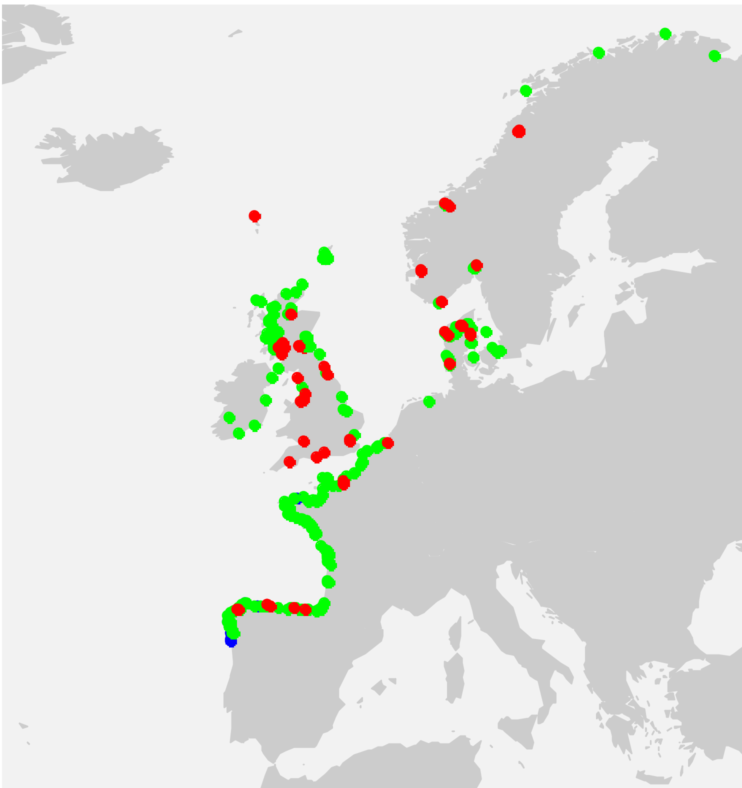

Figure 10.3. PAH concentrations in biota. Status is indicated for the last year of monitoring in the period 2003 – 2007

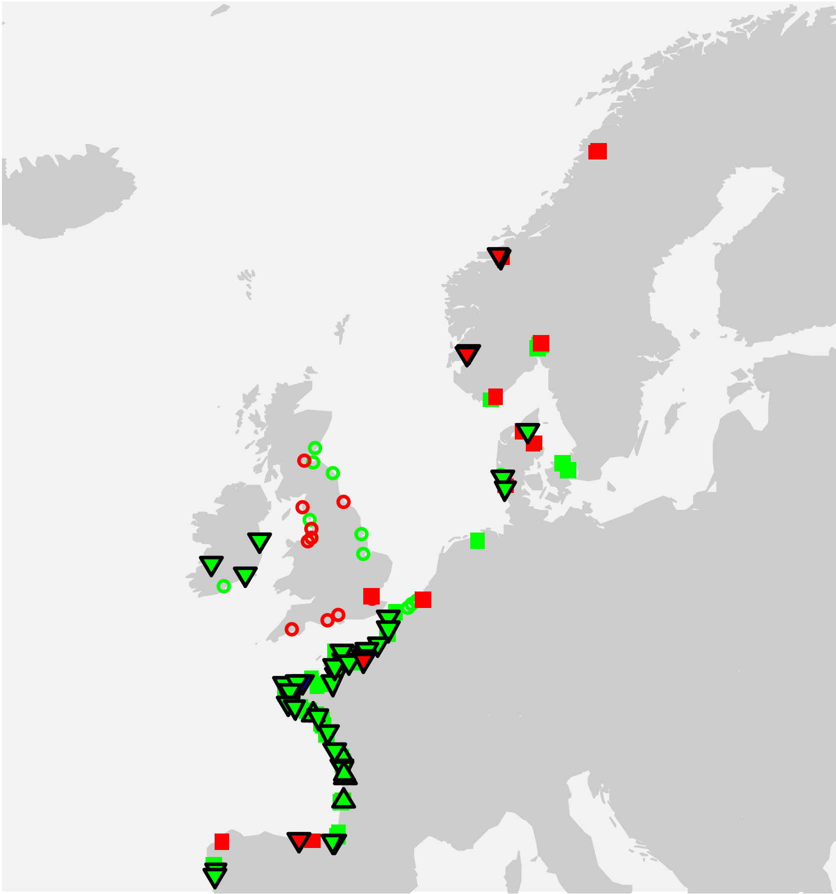

Figure 10.4. Trends of PAHs in biota. Significant trends detected within the period 1998 – 2007 are shown. Shading indicates status in last year of monitoring. Circles indicated where insufficient data are available to assess trends

Stations where the concentrations of PAH compounds in biota are close to background are confined to a few locations in northern Spain. Stations where the concentrations of PAHs are above background but less than the ERL are common along the continental European coasts and around the UK. Stations where the concentrations of PAHs exceed the upper assessment criterion (ERL), and so are coloured red, are scattered through most of the assessment area, and may reflect the consequences of localised inputs of PAHs, for example from industrial sources or harbours.

Various measures have been taken to increase awareness of the significance of waste disposal practices for hydrocarbon inputs to the sea, and in these have been accompanied by improvements in the quality of waste streams entering the sea. It would therefore be expected that concentrations in biota and sediment would tend to be decreasing towards background. A high proportion of the biota stations that had sufficiently long time series of data showed significant downward temporal trends in concentrations. These are particularly evident along the coasts of France, Denmark, Spain and Ireland. Significant upward trends are relatively rare, although there is a small grouping on the south-eastern coast of the Bay of Biscay.

The concentrations in sediment showed fewer significant temporal trends. Many of the monitoring stations had only short time series of data. Both upward and downward trends occur, but they represent a rather small proportion of the total number of stations and there appear to be no general widespread trends in PAH concentrations in sediment.

11. EROD Activity

The OSPAR Background document on CYP1A (EROD) notes that the cytochrome P450 system is a superfamily of enzymes with several hundred forms comprising more than 250 different families, further divided into subfamilies (OSPAR, 2007b). The CYP system is highly diversified and is found in bacteria, plants, lower eukaryotes and in animals. Members of the P450 subfamily CYP1A are particularly important in the metabolism of many pollutants. In the case of planar molecules, such as some polycyclic aromatic hydrocarbons (PAHs) and chlorobiphenyls (CBs), isoenzymes of CYP1A are responsible for the insertion of oxygen into the molecule, which is the first oxidative step in the biotransformation process (termed 'Phase I'). The induction of cytochrome P450 enzymes in fish liver was first suggested as an indicator of environmental contamination in the 1970s. It has later gained widespread use.

In addition to being substrates for biotransformation, planar organic compounds, can also interact with cytochrome P450 1A as inducers, by binding to the cytosolic Ah (aryl hydrocarbon)-receptor. EROD is a tool used to quantify the induction of cytochrome P450 enzymes. EROD (7-Ethoxyresorufin-O-deethylase) is a cytochrome P450 catalysed reaction with ethoxyresorufin as the substrate. Cytochrome P450 1A catalyse the deethylation of 7-ethoxyresorufin to resorufin.

EROD activity in fish liver can be induced by a range of planar organic contaminants. Dioxins, planar PCBs and PAHs (benzo[a]pyrene) are categorised as "strong" inducers. A wide range of factors have been shown to affect hepatic EROD, both endogenous and exogenous. The most important endogenous factors for most fish species are developmental stage (juvenile-mature), gender, reproductive status and age, all of which can be controlled through sampling design. In addition, environmental temperature has been shown to affect EROD.

EROD therefore acts as a biomarker of exposure to contaminants that can induce the cytochrome P450 enzyme system. EROD activities above background levels indicate exposure to increased concentrations of planar organic contaminants, such as PAHs, CBs, or dioxins.

EROD is monitored by Contracting Parties as a voluntary parameter under the pre-CEMP. Based upon the data reported to ICES, assessments were made of temporal trends in EROD activity in male and female fish separately and comparisons were made with background activities, where they were available.

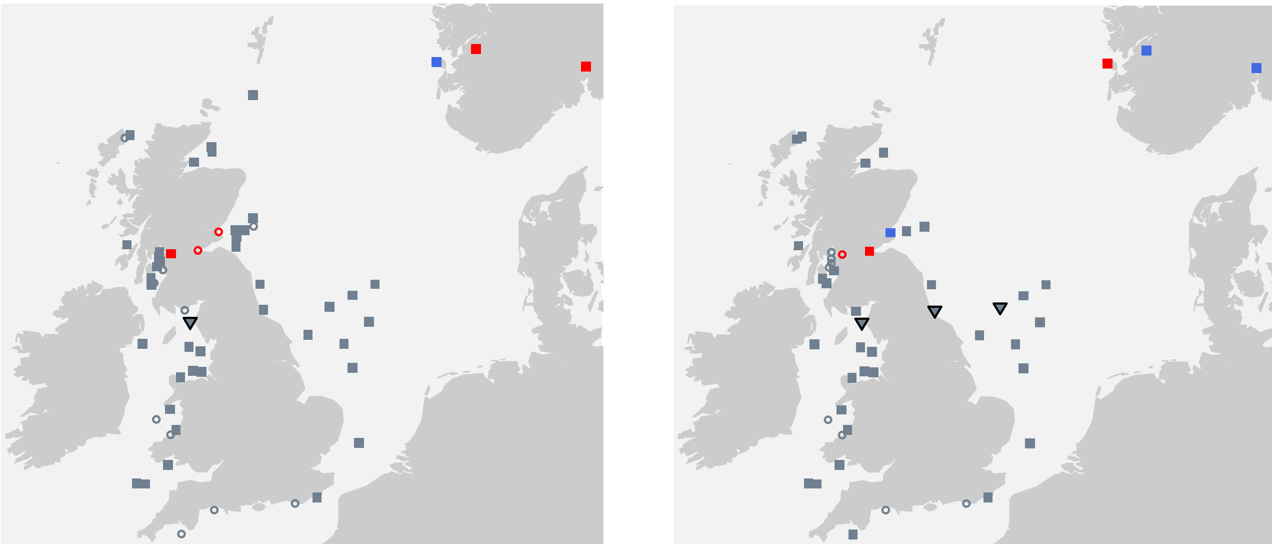

Figure 11.1. EROD activity in male fish (left) and female (right) fish. Significant temporal trends are shown as upward/downward pointing triangles. In most cases, comparisons could not be made with Background Activities, although red symbols indicate where activities exceeded background.

The data available for trend assessment consisted of recent data from Norway (cod) and the UK (dab, plaice and flounder). There were only three significant temporal trends in EROD activity in the data examined, all downwards. The gradients of many other trends were also negative, although not sufficiently so as to be statistically significant.

Only data for cod (Norway) and flounder (Scotland) could be compared with the background activity assessment criteria. Activities in male flounder were not below background, although female flounder at one site were below background. EROD activity in males at one of the three cod sites was below background. The opposite pattern was shown by females.

EROD activity in liver of male and female dab collected around the UK suggested that mean EROD activities are greater in North Sea coastal regions (*e.g.* South-East Scotland and North-East England) than in adjacent areas to the east in the mid part of the North Sea. Activities may also tend to be greater in the eastern Irish Sea (*e.g.* Liverpool Bay) than in some other coastal areas such as inner Cardigan Bay and the south coast of England.

Figure 11.2. LEFT: EROD activity in male dab in June/July; RIGHT: EROD activity in female dab in June/July.

(The position of symbols on the maps indicate location of capture, and increasing EROD activity classes shown by increasing sizes of symbols. The smallest circles indicate activities <40 pmol min-1 mg protein-1, the largest symbols activities >160 pmol min-1 mg protein-1, and the intermediate size symbols activities 40 – 80 pmol min-1 mg protein-1 and 80 – 160 pmol min-1 mg protein-1)

A further data assessment covered a range of data on EROD activity in dab liver, mainly from the North Sea area, for the period 1996 – 2005. The assessment made use of data from all times of the year, and identified the proportions of fish within samples (typically of ~20 individuals) which exhibited EROD activity greater than estimated monthly background activity (EROD score).

Table 11.1. Assessment of EROD activity in dab liver (EROD scores) for the period 1996 − 2000

		EROD assessment	
		Number of samples	EROD score
Size Class	Subregion		
>14 cm	Irish Sea	8	0.2538
	Scottish coast	2	0.3750
	East English coast	4	0.7000
	Dogger Bank	5	0.1724
	Northern Dutch, German, Danish coast	24	0.1762
	Southern Dutch, Belgium, Channel	14	0.2347
	South English coast, Channel	1	0.0000

Table 11.2. Assessment of EROD activity in dab liver (EROD scores) for the period 2001 − 2005

		EROD assessment	
		Number of samples	EROD score
SizeClass	Subregion		
>14 cm	Irish Sea	14	0.1057
	Scottish coast	12	0.1695
	East English coast	9	0.1323
	Dogger Bank	8	0.1087
	Northern Dutch, German, Danish coast	9	0.2675
	Southern Dutch, Belgium, Channel	1	0.0000
	South English coast, Channel	2	0.0100

The data for 1996 – 2000 (Table 11.1) found differences between assessment areas. Only one area (East English coast) fell into the red (high exposure) assessment category. Data from three other areas (Irish Sea, Scottish coast, and southern Dutch, Belgium, Channel) were assessed as indicating intermediate levels of exposure (yellow), although there are very few data for the Scottish coast. All other areas showed little indication of exposure, although there were few data from the Irish Sea and from the south English coast.

The data for 2001 – 2006 found no areas in the red category. Only one area (northern Dutch, German, Danish coast) was assessed as indicating intermediate levels of exposure, and all other areas showed little indication of exposure.

There was, therefore a general decrease in EROD activity (expressed as EROD score) in dab liver between 1996 – 2000 and 2001 – 2006. This suggests a reduction in exposure to chemicals with the potential to induce EROD. These include planar organic contaminants such as PAHs and some CBs. This is consistent with the predominance of downward temporal trends in the concentrations of the groups of contaminants in biota of the last decade.

Conclusions:

a. There comparisons with assessment criteria could be made, EROD activities in liver of male and female cod and flounder are generally around or above background levels, indicating some exposure to planar organic contaminants.

b. There are few significant temporal trends in EROD activity in fish liver. Those that were found were downward, and the temporal trend analysis found a widespread tendency for decreasing EROD activity in fish level although generally not to a statistically significant degree.

c. There is a suggestion that EROD activity in dab in higher in some coastal areas (*e.g.* south-east Scotland, north-east England, east Irish Sea) than in some other coastal and offshore areas.

d. There was a general decrease in EROD activity (expressed as EROD score) in dab liver in the North Sea between 1996 − 2000 and 2001 − 2006.

e. Assessment criteria are not available to determine whether the observed levels of EROD activity are indicative of unintended or unacceptable biological effects.

12. Lindane (γ-HCH)

The use of lindane is no longer permitted in the OSPAR area, and concentrations should be expected to be decreasing towards the background concentration of zero for this synthetic compound.

Data on the concentrations of lindane in sediment are relatively sparse compared to the data for metals, CBs, or PAHs. Where data exist, concentrations are generally not close to background. Concentrations in northern France and the Netherlands are less than the upper assessment criterion (ERL). Some concentrations around Denmark are above the ERL implying some potential for adverse environmental effects. There are insufficient time series of data to make any statements on temporal trends on lindane in sediments in the OSPAR area.

The monitoring data show a wide range of concentrations of lindane in biota. In some areas, for example western and northern Norway, parts of Ireland, France and Iceland concentrations are close to zero (*i.e.* close to background). The scattered occurrence of concentrations above the upper assessment criterion (EAC), for example in western Brittany, parts of Germany, Denmark, the UK and Ireland, may reflect localised historical use.

Where time series are sufficiently long for assessment, concentrations in biota are generally decreasing, even at stations where concentrations are at background levels. In some areas, such as North-West France, concentrations are above the EAC and are not showing significant downward trends.

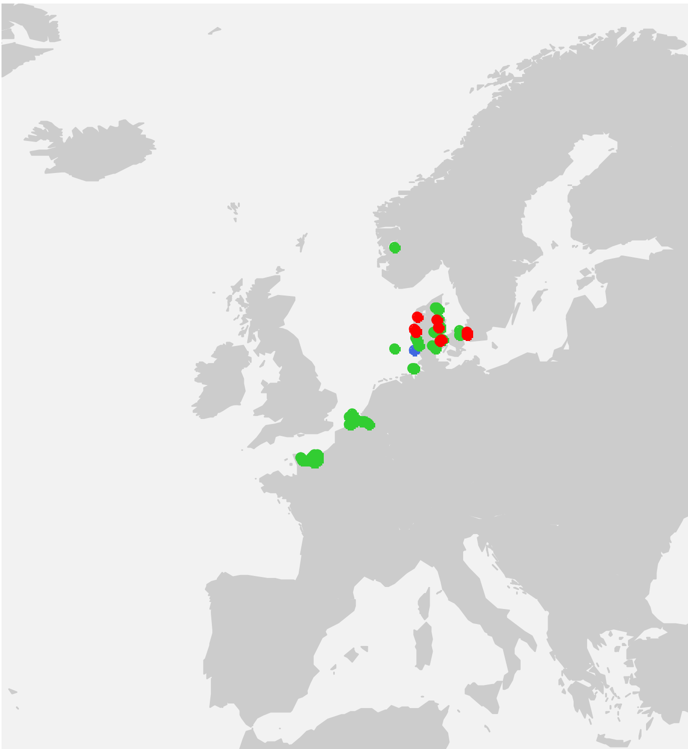

Figure 12.1. Lindane concentrations in sediments. Status is indicated for the last year of monitoring in the period 2003 – 2007

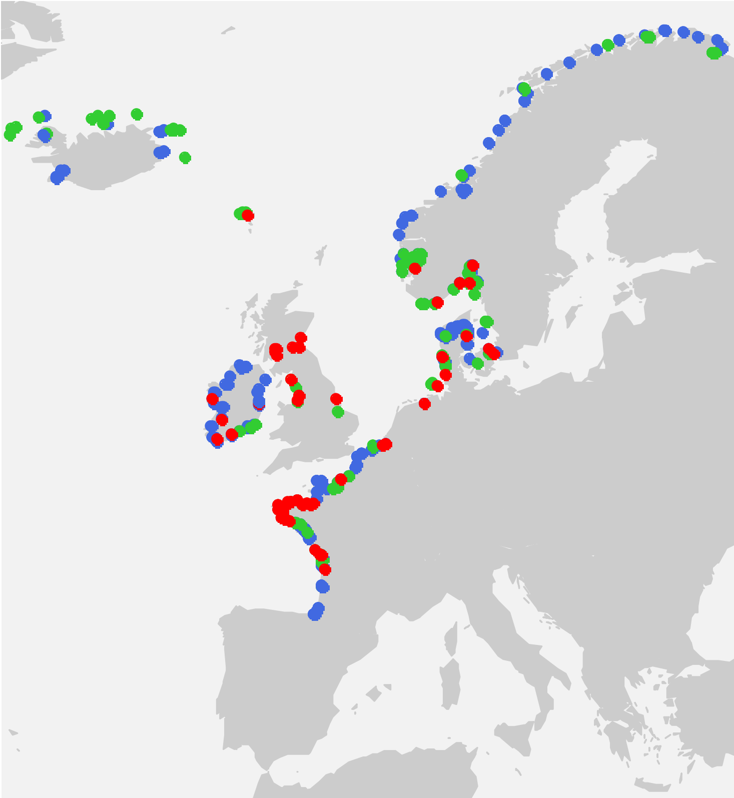

Figure 12.2. Lindane concentrations in biota. Status is indicated for the last year of monitoring in the period 2003 – 2007

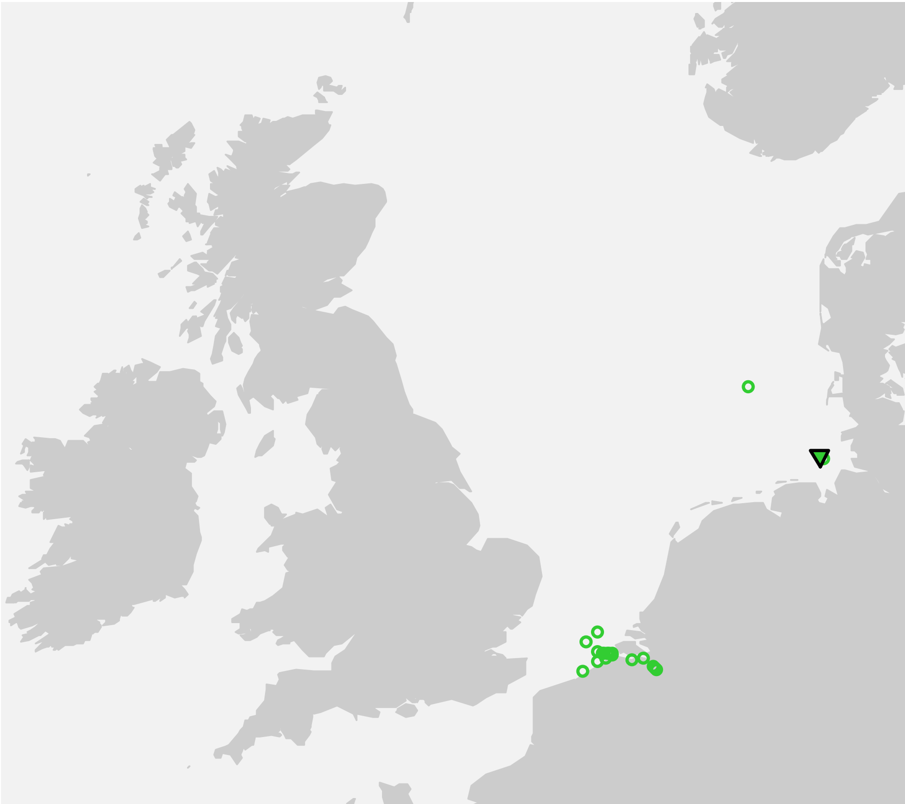

Figure 12.3. Trends of lindane in sediments. Significant trends detected within the period 1998 – 2007 are shown. Shading indicates status in last year of monitoring. Circles indicate where insufficient data are available to assess trends.

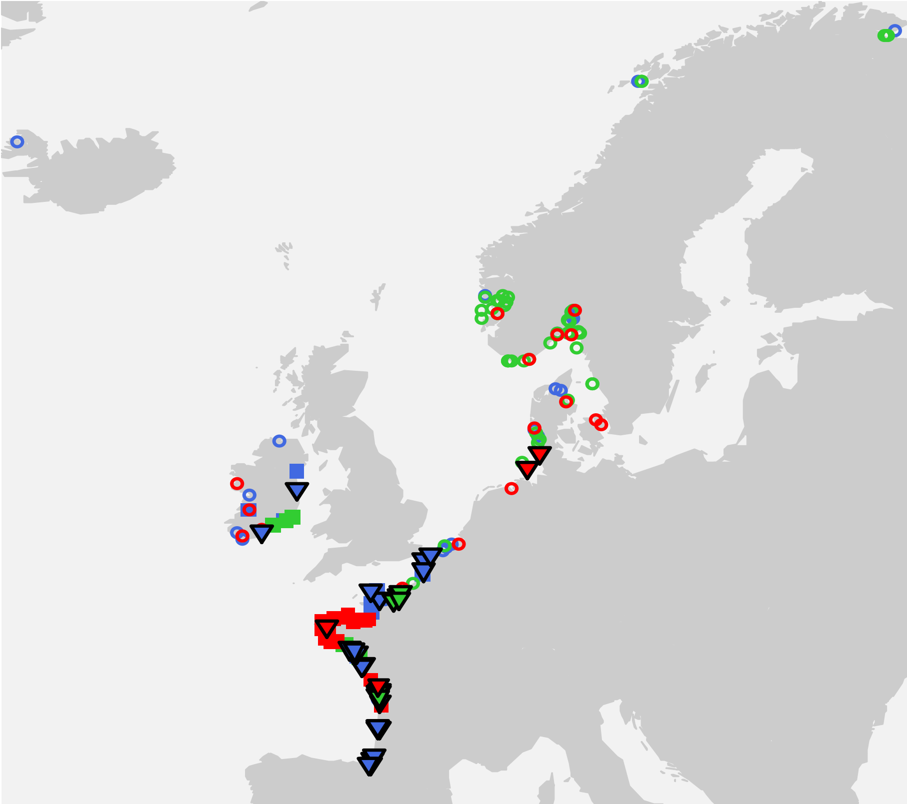

Figure 12.4. Trends of lindane in biota. Significant trends detected within the period 1998 – 2007 are shown. Shading indicates status in last year of monitoring. Circles indicate where insufficient data are available to assess trends.

13. Aggregated assessment of quality status in relation to hazardous substances

In this section of the report the results of the CEMP assessment are presented in a more aggregated form than the station by station maps shown in the preceding assessment sections. The presentation methods have been developed specifically for the purpose of the JAMP HA-6 assessment on the development of the quality status of the marine environment and with the intention of providing an accessible synthesis of the CEMP assessment results for use in Chapter 5 of the Quality Status Report 2010.

In developing a strategy for that allows a more aggregated presentation of assessment results, the following principles have been taken into account:

a. the ultimate aim of the OSPAR Hazardous Substances Strategy *i.e.* “to prevent pollution of the maritime area by continuously reducing discharges, emissions, and losses of hazardous substances with the ultimate aim of achieving concentrations in the marine environment near background values for naturally occurring substances and close to zero for man-made synthetic substances”. The timeframe for the cessation of discharges, emissions and losses of hazardous substances is by the year 2020.” (OSPAR Hazardous Substances Strategy (OSPAR agreement 2003-21).

b. that when implementing the OSPAR Hazardous Substances strategy, OSPAR will be guided by the precautionary principle, by virtue of which preventive measures are to be taken when there are reasonable grounds for concern that substances introduced directly or indirectly, into the marine environment may bring about hazards to human health, harm living resources and marine ecosystems, damage amenities or interfere with other legitimate uses of the sea, even when there is no conclusive evidence of a causal relationship between the inputs and the effects.

Assessment results were aggregated for the following substances (and groups of substances): lead, mercury, cadmium, CBs and PAH. This selection is partly based on their inclusion in OSPAR’s list of priority substances and availability of quality assured and consistent CEMP monitoring data for many years. These substances are monitored in three matrices: sediment, shellfish and fish.

The 5 OSPAR Regions were used for the initial division of the OSPAR area. Each OSPAR Region was then subdivided into “coastal” (<12nm) and “offshore” (> 12nm) subregions to group stations that are likely to be more affected by land-based inputs of contaminants (coastal stations) than others (offshore stations). Within the “coastal” subregion of each Region, further divisions have been made where appropriate, as set out in Table 13.1.

The BACs and EACs etc. set out at Annex 1 were used to classify the concentration of each hazardous substance in each indicator medium for the latest year of monitoring, following the procedures described in the CEMP Assessment Manual (OSPAR, 2008b), and the Background Document on CEMP assessment criteria for the QSR 2010 (OSPAR 2010d).

13.1 Four levels of aggregation

Level 0 aggregation – aggregation to contaminant groups for PAHS and PCBs

The initial assessment of CB congeners and PAH compounds was carried out on data for individual substances. Results for these groups of compounds were then aggregated to give a single assessment of CB at each station for each matrix, and a single assessment of PAHs at each station for each matrix. In order to reduce the possibility of these aggregated assessments being unduly influenced by unusual or outlying data points, the data were aggregated on a “two out all out” basis. The overall assessment was “red” if two or more individual congeners/compounds had been assessed as red. The overall assessment was “blue” if all substance was assessed as blue, or if one was green and all the rest were blue. The results of this aggregation were used to prepare maps showing the aggregated results for the two groups of substances in each matrix (sediment, shellfish and fish) on a station by station basis. This resulted in 6 maps, showing data by station in which each matrix–contaminant group combination was defaulted to the worst classification for any individual congener or compound.

The results of this initial aggregation across the CB and PAH groups were carried forward into higher levels of aggregation.

Table 13.1. Regions and subregions of coasts (<12nm) and offshore ($\geq$12nm) from coast.

ICES Region	ID	Subregion
I – Arctic	1	Offshore (no CEMP monitoring data)
	1.1	Coasts of Norway and Iceland
II – North Sea	2	Offshore
	2.1	North Sea coast of Norway west of ca.7°E
	2.2	North Seas Coasts of France (north of 48°N), Belgium, Netherlands, Germany and Denmark (south of Hanstholm)
	2.3	East coast of UK from Cape Wrath to the Lizard
	2.4	Coasts of the Skagerrak and Kattegat,
		With a western boundary from Lindesnes area (Norway – ca.7°E) to Hanstholm (Denmark – ca.8°E)
III – Celtic Seas	3	Offshore
	3.1	Coasts of Irish Sea
		Bordered in the North by a line from Larne to Corsewall Point (ca. 55°N) and in the south by a line from Wexford to St David’s Head (ca. 52°N)
	3.2	Atlantic coasts of UK Ireland
		Coast of UK from the Lizard to St David’s Head, Atlantic coast of Ireland from Wexford to Larne and Coast of UK from Corsewall Point to Cape Wrath
IV – Bay of Biscay	4	Offshore
	4.1	Biscay Coast of France, (south of ca.48°N – Brest to Hendaye)
	4.2	North coast of Spain (Irun to Cabo Ortegal)
	4.3	West Coasts of Spain and Portugal
V – Wider Atlantic	5	No CEMP Monitoring Data

Level 1 aggregation – aggregation of matrices

The next level of aggregation, Level 1, sought to aggregate information on each of the 5 contaminants (Hg. Cd, Pb, CBs, and PAHs) across the three monitoring matrices (fish, shellfish and sediment). Station counts within subregions were made for each of the three classes (blue, amber/green, and red) for each matrix based on upper confidence limit for the fitted value in the last year of the time series with three or more years. This classification scheme was applied to data from assessed time series and also to all other data (*i.e.* stations with less than three years of data). Fitted values in the last year of a time series were given double the weight in the aggregation as a single year’s monitoring data. Frequency distributions were then calculated for these sums; also for each matrix and averaged for all matrices. These percentages were represented in a coloured bar on maps indicated by the colours red (status is unacceptable), green (status is acceptable, concentrations are above background) and blue (status is acceptable, concentrations at or close to background). An example for lead is shown in Table 13.2.

In addition, the numbers of statistically significant upward/downward trends were counted for each class and matrix. This was totalled across matrices, and the dominant trend for each class was indicated in the coloured bar. The dominant trend was determined using a sign test to assess whether there were significantly more upwards or downwards trends in each Region (or subregion). A significant result was taken to mean that concentrations were broadly increasing or decreasing throughout the Region.

Five maps were generated with coloured bars (and indication of trend). Each map had a coloured bar for each of the 13 subregions with data.

Table 13.2. Level 1 aggregtation – Station counts and proportion for each of three classes and trend (TS) counts for three matrices (example: lead, subregion 2.2).

	Blue	Green	Red	Blue down	Blue up	Green down	Green up	Red down	Red up	All down	All up
TS ≥3 yr											
Fish	0	0	3	0	0	0	0	0	0		
Shellfish	10	0	28	5	0	4	0	0	1	9	1
Sediment	0	0	91	0	0	0	0	0	0		
TS ≥ yr weight											
Fish	0	0	6								
Shellfish	20	0	36								
Sediment	0	0	182								
Totals - weighted	20	52	192								
TS <3 yr											
Fish	0	0	0								
Shellfish	0	0	0								
Sediment	7	1	47								
Totals	7	1	47								
Totals											
Fish	0	0	6								
Shellfish	20	0	56								
Sediment	7	1	229								
Totals	27	1	291								
ca. %	*8*	*0*	*91*								
ca. %											
Fish	*0*	*0*	*100*								
Shellfish	*26*	*0*	*74*								
Sediment	*3*	*0*	*97*								
Average	*10*	*0*	*90*	inconclusive		inconclusive		inconclusive		down	

This aggregation process was repeated for data on Hg, Cd, CBs, and PAHs.

Level 2 aggregation

The next step in the aggregation process (Level 2) aggregated data for single contaminants across subregions, as exemplified in Table 13.3 for lead in OSPAR Region II. The aggregation process utilised the percentages from Table 13.2 and averaged them across subregions (Table 13.3). The output is 5 maps, with one coloured bar per Region or subregion, *i.e.* 4 or 13 bars on each map. Histograms were added to show contributions of each matrix to each class. The output maps also include indications of significant general trends, as described for Level 1 above. This Level 2 aggregation was repeated for Hg, Cd, CBs, and PAHs.

Table 13.3. Level 2 aggregation – Percents and trend conclusions from Table 13.2 (example: lead, for the 5 subregions of OSPAR Region II).

Subregion	Blue %	Green %	Red %	Blue down	Blue up	Green down	Green up	Red down	Red up	All down	All up
2.0	*13*	*3*	*84*			1	2	3		4	2
2.1	*8*	*2*	*90*								
2.2	*8*	*0*	*91*	5		4			1	9	1
2.3	*18*	*5*	*77*			6	1	1		7	1
2.4	*5*	*0*	*95*						1		1
Sum				5	0	11	3	4	2	20	5
Average	*11*	*2*	*87*	inconclusive		inconclusive		inconclusive		down	

Level 3 aggregation

The Level 3 aggregation utilised the data from level 2, and averaged them across contaminants, at both a subregional (Table 13.4) and Regional level (Table 13.5). This lead to 2 maps with one coloured bar per subregion or Region, *i.e.* 13 subregional maps and the 4 bars on the regional map. Histograms were added below each bar to show contributions of contaminants to each of the three classes. An assessment for general temporal trends was carried out as described for Level 1. Table 13.4 exemplifies the aggregation process for subregion 2.2. The aggregation was repeated for all subregions across all contaminants.

Table 13.4. Level 3 aggregation – Percents and trend conclusions from Table 13.3 (example: lead, cadmium, mercury, PCBs and PAHs for subregion 2.2).

Subregion	Blue %	Green %	Red %	Blue down	Blue up	Green down	Green up	Red down	Red up	All down	All up
Cd	*14*	*48*	*38*	1	4	1	3	0	1	2	8
Pb	*8*	*0*	*91*	5	0	4	0	0	1	9	1
Hg	*4*	*1*	*95*	0	0	1	1	6	0	7	1
CB	*0*	*9*	*91*	0	0	1	0	26	3	27	3
PAH	*3*	*56*	*41*	0	0	19	0	2	1	21	1
Sum				6	4	26	4	34	6	66	14
Average	*6*	*23*	*71*	inconclusive		inconclusive		down		down	

Level 4 aggregation

The final process in the data aggregation, Level 4, was to combine data for all contaminants within each region. The process utilised the outputs from level 3, as exemplified in Table 13.5 below for Region II. The process was repeated for the other OSPAR Regions.

Table 13.5. Level 4 aggregation – Percents and trend conclusions from Table 13.4 (showing lead, cadmium, mercury, PCBs and PAHs for OSPAR Region II).

Region	Blue %	Green %	Red %	Blue down	Blue up	Green down	Green up	Red down	Red up	All down	All up
Cd	*21*	*25*	*54*	5	4	8	12	5	2	18	18
Pb	*11*	*2*	*87*	5	0	11	3	4	2	20	5
Hg	*7*	*9*	*84*	3	0	10	8	10	3	23	11
CB	*1*	*28*	*71*	0	0	4	0	41	6	45	6
PAH	*6*	*39*	*55*	1	0	22	0	4	5	27	5
Sum				14	4	55	23	64	18	133	45
Average	*9*	*20*	*70*	down		inconclusive		down		down	

13.2 Explanation of aggregated presentation

The following sections of the report (sections 13.3 to 13.6 and Figure 14.1) set out an overview of the aggregated assessment results for the sub-regions set out in Table 13.1.

For each sub-region or region a bar plot is presented as a continuous bar and a set of histograms as follows:

a) bars are presented in the following colours: red (status is unacceptable), green (status is acceptable, concentrations are above background) and blue (status is acceptable, near background).

b) bars are presented under each class (blue, green, red) for cadmium, lead, mercury, PCBs and PAHs, respectively. In order to accommodate the assessments of metals in biota that were initially expressed on a blue/amber/green assessment scale, amber assessments were incorporated into the red category when integrated with sediment assessments.

c) the length of the coloured parts of each continuous bar represents the % of the combinations of contaminants and matrices in each subregion or region that are classified as each colour and thus the width of the “hanging” histograms is scaled according to this criteria.

d) The supporting histograms indicate the contribution of each contaminant to the overall classification shown by the continuous bars.

13.3 Overview of Quality Status in relation to hazardous substances in subregions of OSPAR Region 1 (Arctic waters)

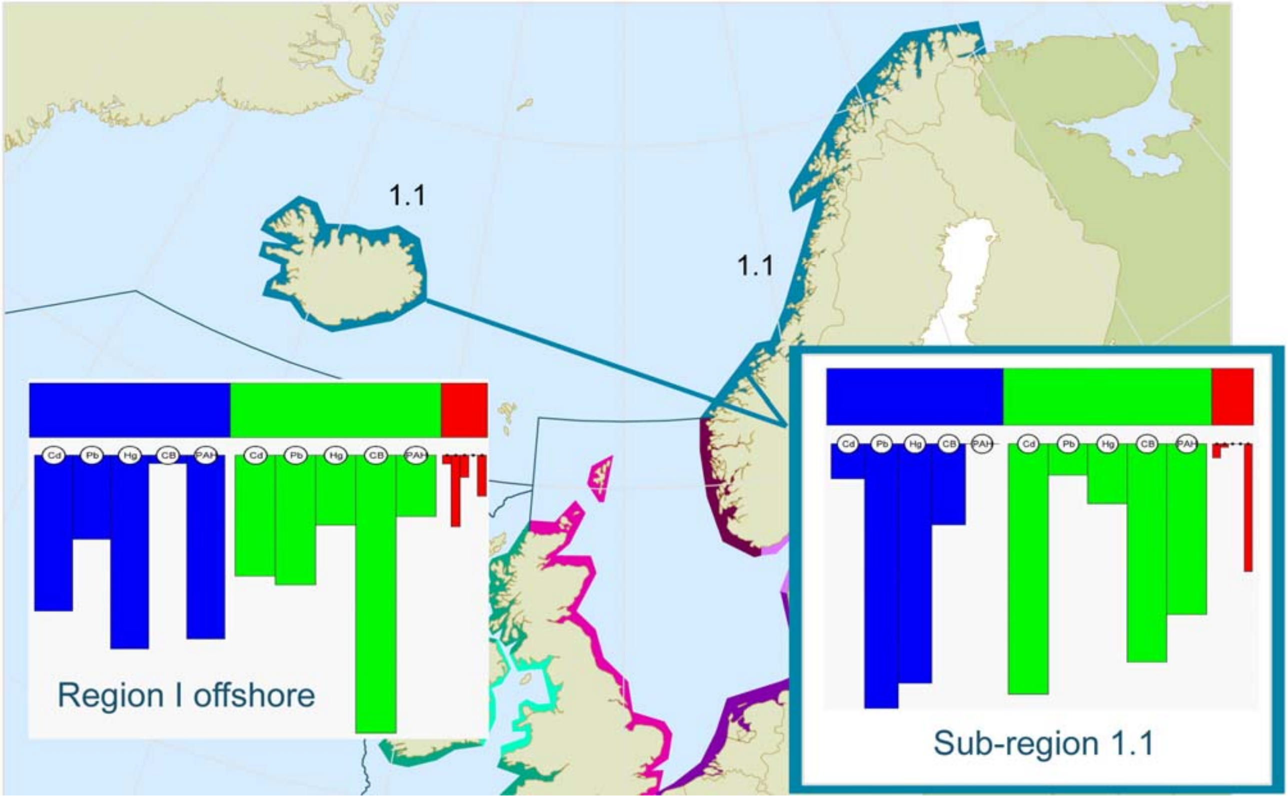

Figure 13.1. Quality status in relation to hazardous substances in Arctic Waters: OSPAR Region I (offshore sub-region) and sub-region 1.1 (Norwegian and Icelandic coastal waters) (see section 13.2 for explanation).

OSPAR Region 1 (Arctic waters) is divided into two sub-regions; the coastal waters around Iceland and northern Norway (subregion 1.1) and the open waters outside these areas. Data are relatively sparse for this part of the OSPAR area, and so the assessment has lower confidence than assessment for other regions. In this area, the assessment indicates generally similar overall status of inshore and offshore waters. 90% of the assessments fall approximately equally into the blue and green categories. Concentrations were considered to be at background in more than 50% of the assessments for Cd, Hg, and PAH in offshore waters, and for PB and Hg in coastal waters. Only 10% of the assessments indicate unacceptable (red) conditions. In offshore waters, concentrations of Pb and PAHs make the largest contributions the unacceptable assessments, while in coastal waters almost all the red assessments are due to PAH concentrations. No CB assessments fell into the red category. There are no general temporal trends in concentrations across all contaminant groups.

13.4 Overview of Quality Status in relation to hazardous substances in subregions of the Greater North Sea (OSPAR Region II)

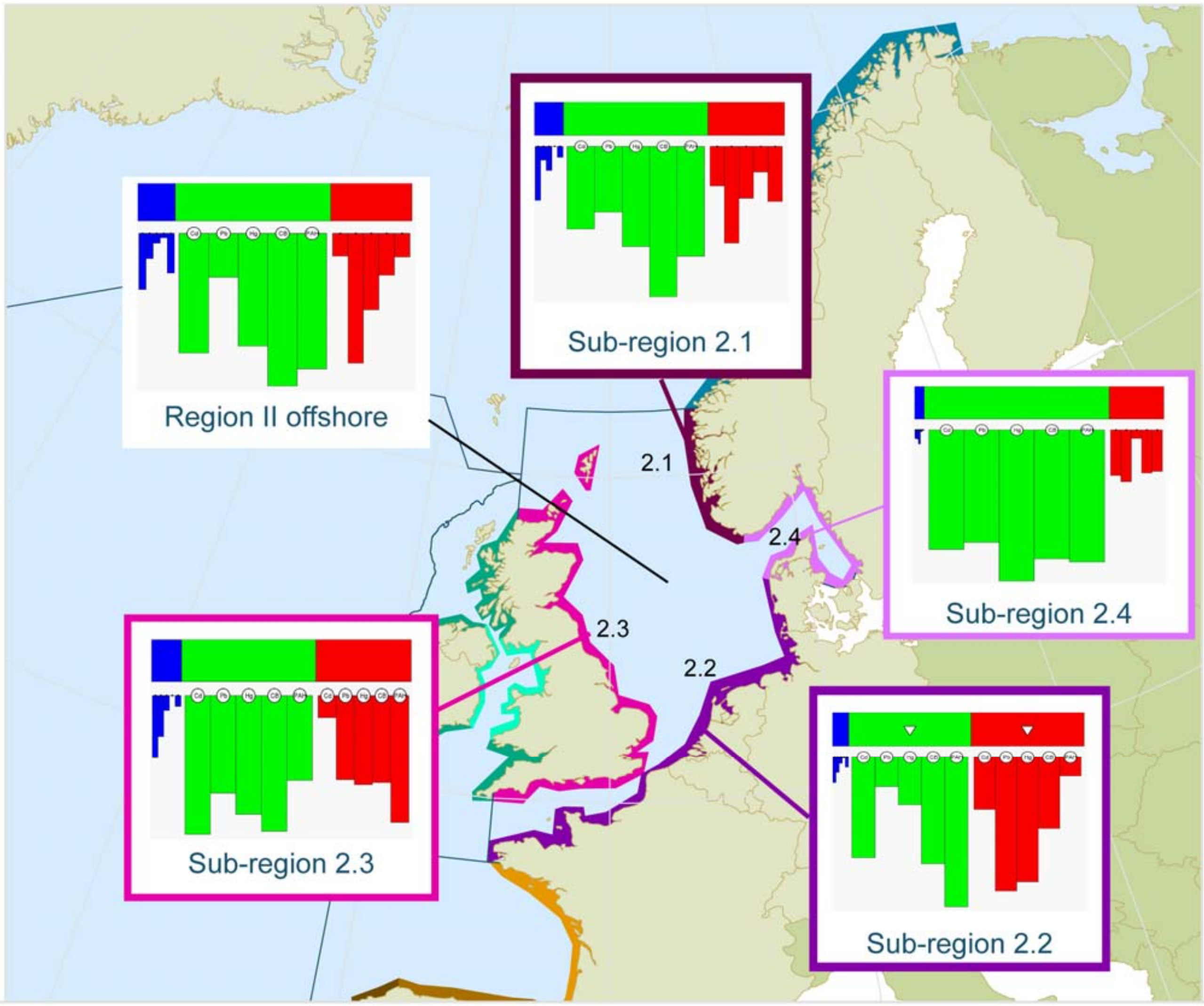

Figure 13.2. Quality status in relation to hazardous substances in the Greater North Sea. OSPAR Region II (offshore sub-region), sub-region 2.1 (Norwegian North Sea coast), sub-region 2.2 (North Sea coasts of France, Belgium, The Netherlands, Germany and Denmark), sub-region 2.3 (UK east coast), sub-region 2.4 (Skagerrak and Kattegat) (see section 13.2 for explanation).

OSPAR Region II (the North Sea) is divided into an offshore area and four coastal areas. The assessment pattern in the offshore part of the North Sea shows a higher proportion of unacceptable (red) assessments than in Region I. Red assessments make up 30 − 45% of the total, with the lowest proportion being found in sub-region 2.4 (Skagerrak and Kattegat), and the highest in the North Sea coastal areas of France, Belgium, The Netherlands, Germany and Denmark (subregion 2.2).

Background concentrations (blue) are only achieved in 6 − 14% of the assessments, with the highest proportion being found in the Skagerrak and Kattegat, and the least good in the coastal waters of sub-region 2.2. The greatest proportions of background assessments were generally found for Cd, but background has rarely been achieved for CBs. The relatively low proportion of background concentrations in the Norwegian coastal area may reflect a bias in monitoring stations towards potentially contaminated locations.

High proportions of red assessments are associated with Hg and Pb in all sub-regions except 2.4 (Skagerrak and Kattegat) where mercury concentrations are less elevated. High proportions of red assessments for CBs were found for all coastal areas except the Norwegian coast (sub-region 2.1). In addition, high proportions of red assessments for PAH were found in sub-regions 2.1 and 2.4, and for Cd in sub-region 2.4.

Significant general patterns of decreasing concentrations with time were found in red and green assessment categories in the Southern Bight.

13.5 Overview of Quality Status in relation to hazardous substances in subregions of the Celtic Seas (OSPAR Region III)

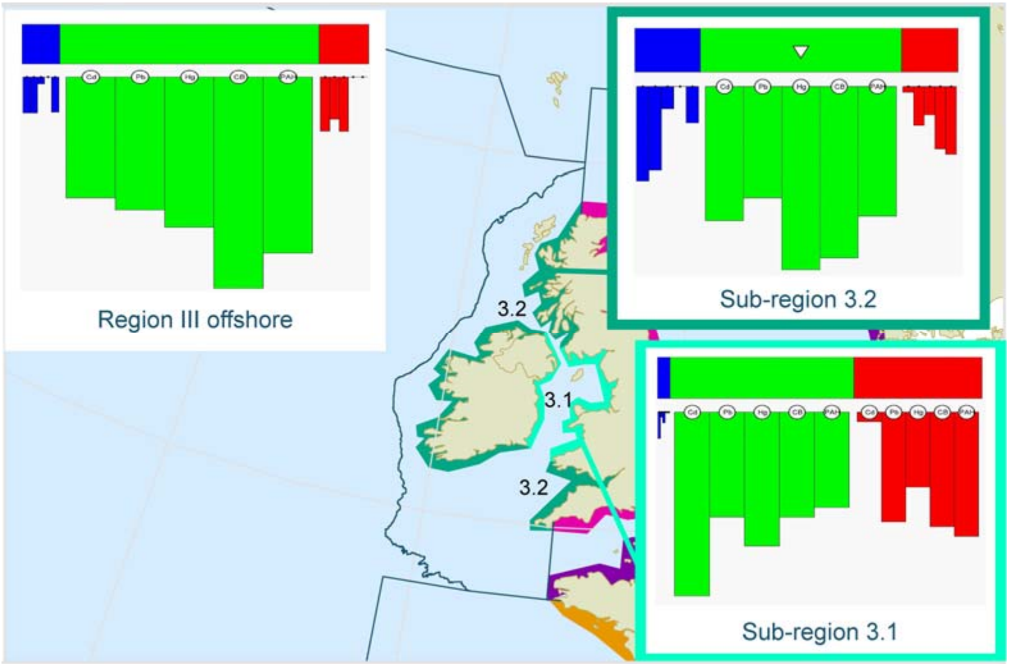

Figure 13.3. Quality status in relation to hazardous substances in the Celtic Seas. OSPAR Region III (offshore sub-region), sub-region 3.1 (Irish Sea coastal waters), sub-region 3.2 (Atlantic coasts of UK and Ireland (see section 13.2 for explanation).

OSPAR Region III (the Irish Sea) is divided into three sub-regions: the offshore areas, coastal waters of the Irish Sea (sub-region 3.1), and west facing coasts of Scotland, Ireland and the south-west of Wales and England (sub-region 3.2). The offshore stations are mainly located in the Irish Sea.

Data for the coastal waters of the Irish Sea (3.1) indicate a higher proportion of red assessments than in the adjacent offshore waters. Conditions in the coastal waters of the Irish Sea similar to those in the coastal waters to the east of the UK, and only demonstrate <5% of assessments achieving background concentrations, and 39% of assessments as unacceptable (red).

By contrast, data for offshore areas and west facing coastal areas show 11 – 20% of assessments indicate background conditions, and only 14 – 17% indicating unacceptable (red) assessments. In the offshore area (sub-region 3) the red assessments are derived almost equally from the metals Cd, Pb and Hg, whereas no red assessments were made of data for the organic contaminants CBs and PAHs. The coastal area of the Irish Sea showed high proportions of red assessments for CBs, PAHs, Pb and (to a lesser degree) Hg, while only 4% of Cd assessments were red. The red assessments for the west facing coasts of subregion 3.2 were derived predominantly from CBs and PAHs, with relatively small contributions from Cd. Pb and Hg. The broad range of environmental quality on west facing coasts (sub-region 3.2) is reflected in the moderate proportions of both red and blue assessments.

Background concentrations of CBs were not achieved at any location in Region III. Generally, the highest proportion of background concentrations were achieved for Cd, Pb and PAH, although only a small proportion of blue (background) assessments were made for sub-region 3.1 (coastal waters of the Irish Sea).

Statistically significant general decreasing temporal trends in concentrations were found for green assessments in the coastal waters of the Irish Sea.

13.6 Overview of Quality Status in relation to hazardous substances in subregions of the Bay of Biscay and Iberian shelf (OSPAR Region IV)

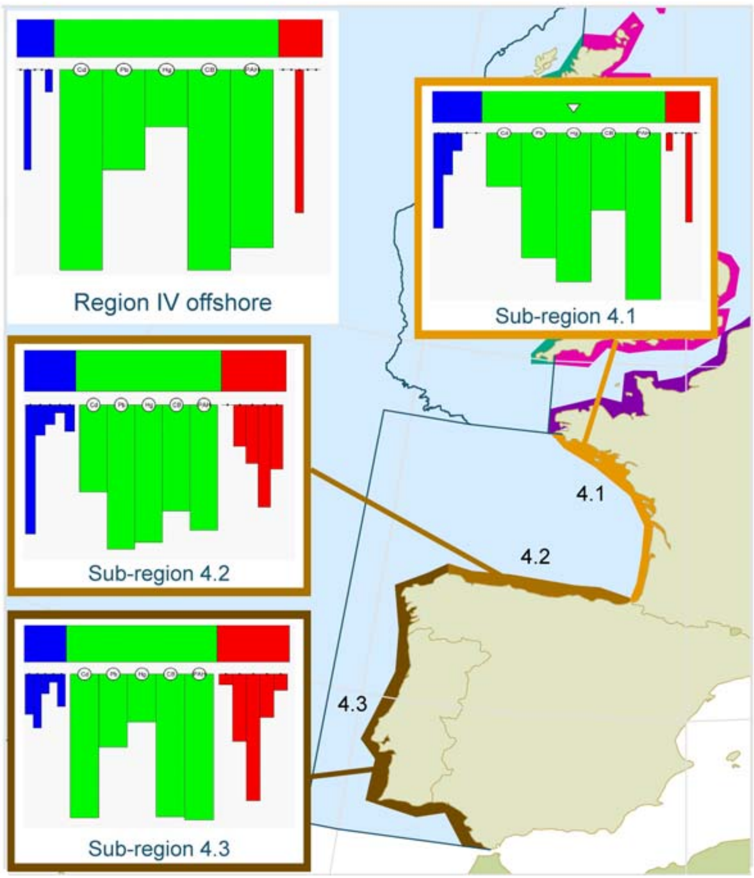

Figure 13.4. Quality status in relation to hazardous substances in the Bay of Biscay and Iberian Shelf. OSPAR Region IV (offshore sub-region), sub-region 4.1 (Biscay coast of France), sub-region 4.2 (north coast of Spain), sub-region 4.3 (west coasts of Spain and Portugal) (see section 13.2 for explanation).

OSPAR Region IV (the Iberian area and Bay of Biscay) is divided into four sub-regions: the offshore areas, French coastal waters of the Bay of Biscay (4.1), Spanish coastal waters of the Bay of Biscay (4.2), and west and south-west coasts of Spain and Portugal (4.3).

The offshore waters of Region IV show a high proportion of acceptable concentrations, and 12% of assessments indicated background concentrations. All the unacceptable (red) assessments in the offshore waters are derived from the data for mercury. However, there are generally very few data from this sub-region and all assessments have low confidence.

Conditions in the coastal waters generally deteriorate slightly southwards, and the lowest proportion of blue (background) assessments (16%) and the highest proportion of red assessments (27%) occur in sub-region 4.3 (west and south-west coasts of Spain and Portugal).

The highest proportion of unacceptable concentrations (red assessments) in sub-region 4.1 (Bay of Biscay) is found in the CB data, while there are no red assessments for Pb, Hg or PAH. The red assessments in sub-region 4.2 are mainly for CBs, PAHs, and Hg, and in the southerly sub-region 4.3 for Hg, PB and CBs.

Background concentrations were most commonly encountered in coastal areas for Cd and Pb. CB concentrations were assessed as background for only a very small proportion of the data.

There is a statistically significant general downward trend in the French coastal waters in the Bay of Biscay in concentrations assessed as green.

14. Conclusions: Overview of Quality Status in relation to hazardous substances in the Regions I to IV of the OSPAR maritime area

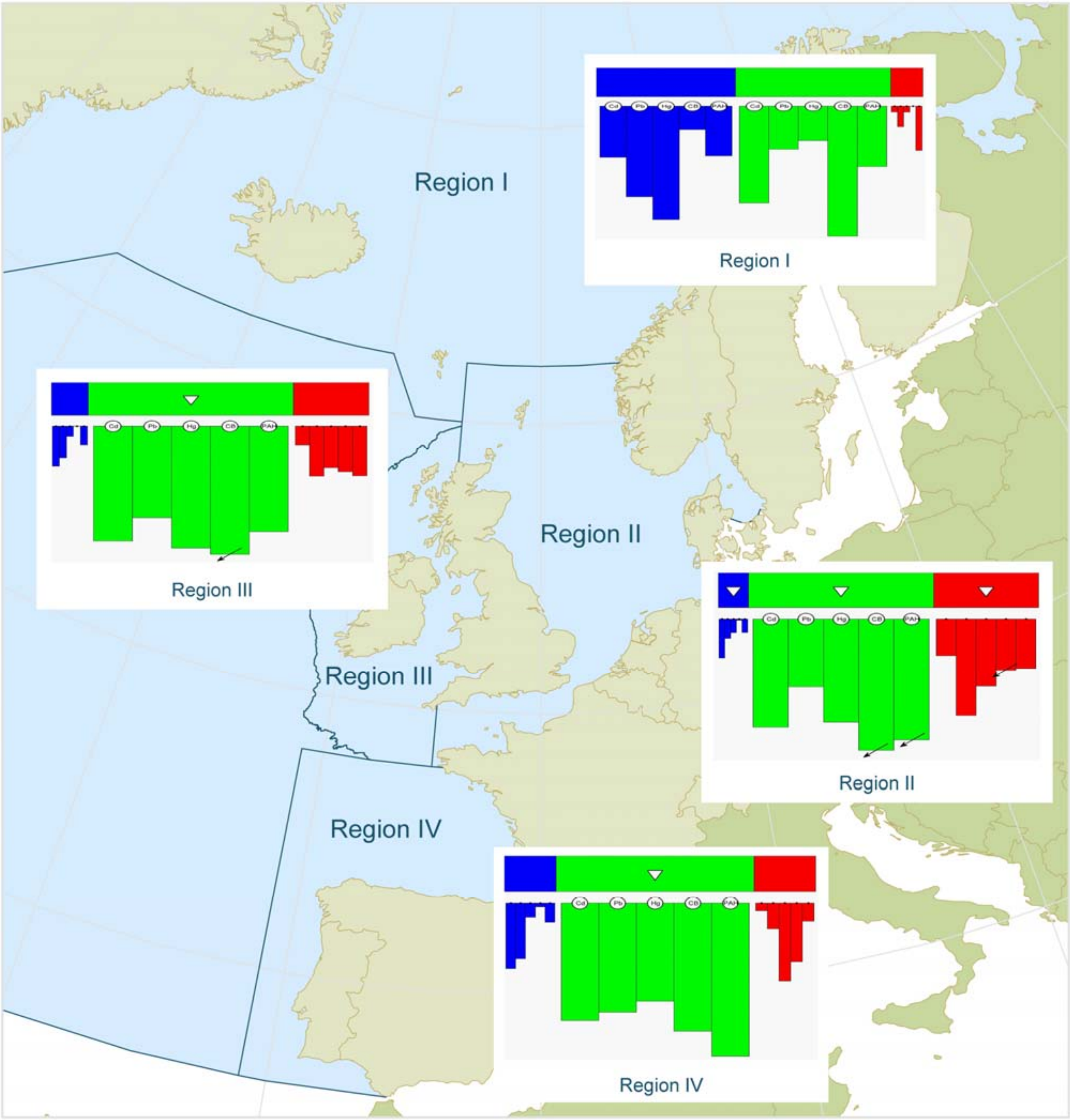

Figure 14.1. Quality status in relation to hazardous substances. Overall summary assessment by Region. (see section 13.2 for explanation).

The overall summary assessment, by Region (Figure 14.1) demonstrates that a proportion of red (unacceptable) assessments are still found in all OSPAR Regions. The most frequent occurrences of unacceptable (red) assessments are for the organic contaminants CBs and PAHs. Lower frequencies were found for the metals Cd, Pb and Hg, but there are considerable differences between regions and sub-regions.

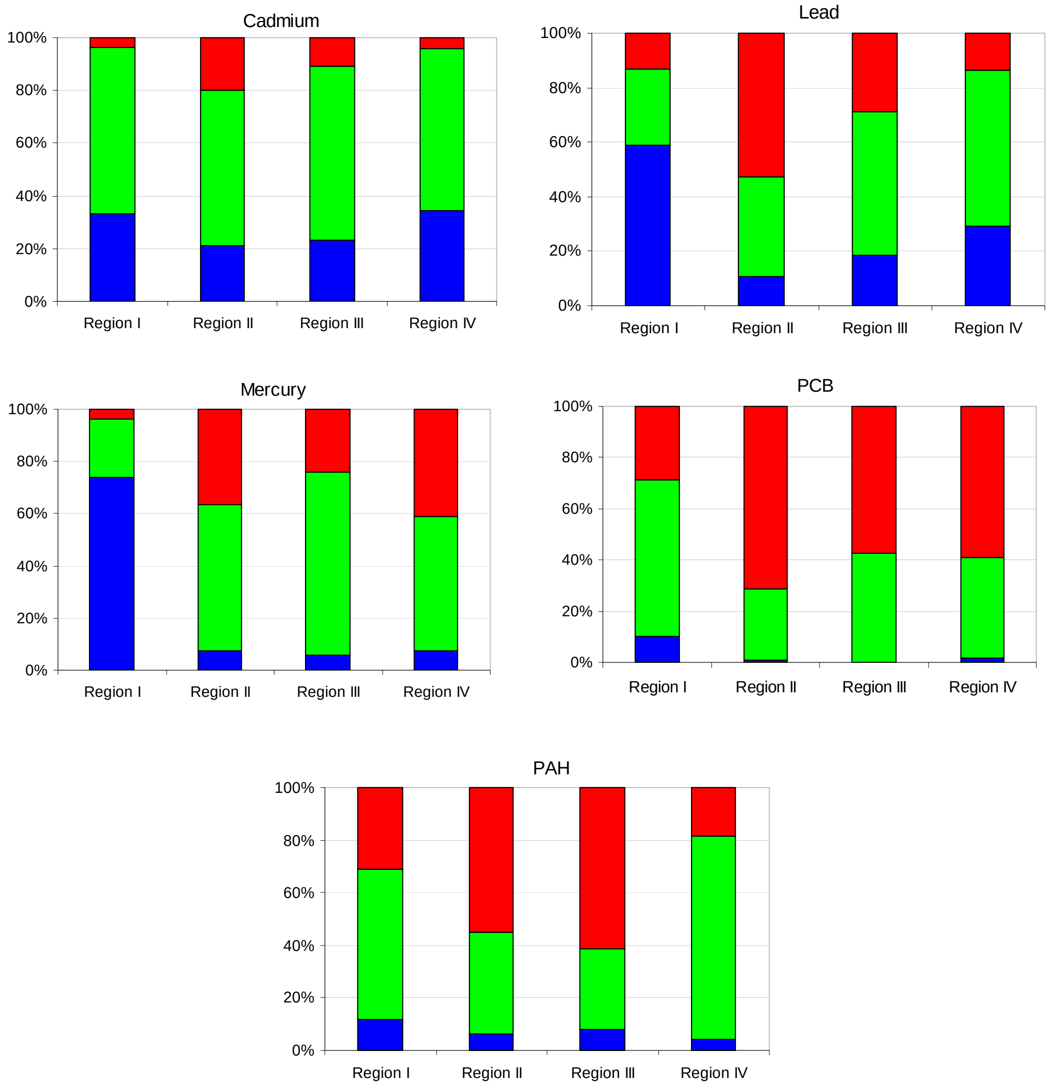

Figure 14.2. Percentage of monitored sites within each Region in each of the assessment classes: unacceptable, acceptable, background. Assessment results have been aggregated according to the Level 0 and Level 1 aggregation steps described in section 13.1

Figure 14.2 shows the percentage of CEMP monitoring stations in each Region classified as each colour for each of the main contaminants. CEMP assessment results have been aggregated according to the Level 0 and Level 1 aggregation steps described in section 13.1.

Figures 14.1 and 14.2 both show that the highest proportions of acceptable assessments are found in the Arctic area, where 38% of the assessments indicated that concentrations were at background values. The data indicate that conditions in waters to the west of the UK (Region III) and particularly in the North Sea (Region II) are less good than in Regions I and IV. Where statistically significant regional-level trends exist (Regions III, IV, and particularly in Region II) they are all downwards, indicating patterns of progressive improvement in conditions in most parts of the Convention area.

The most frequent occurrences of background concentrations are for the metals, particularly for Cd and Pb. Generally, very few examples can be found of areas where the organic contaminant groups (CBs, and PAHs) have achieved background concentrations. There are clear indications of downward trends in the concentrations of these substances in biota, but rather less so in sediment. It is likely that fish and shellfish will respond more rapidly than seabed sediments to regulatory measures.

15. References

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Annex 1

Assessment criteria used in the assessment

Assessment criteria used in the CEMP data assessment

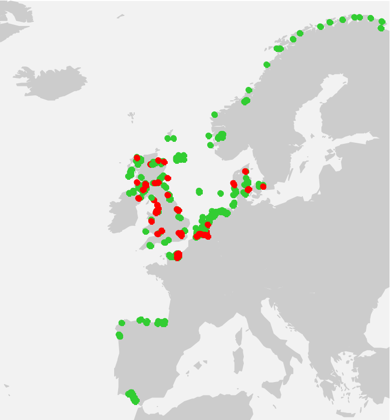
Group	Substance	SEDIMENT (µg/kg dry weight)						MUSSELS (M) AND OYSTERS (O) (µg/kg dry weight)				FISH (µg/kg wet weight, except: EAC[passive] for CB: lipid weight (lw))			
		Background/low concentrations		Blue (T_0)		Green (T_1)			Blue (T_0)	Green (T_1)			Blue (T_0)	Green (T_1)	Amber (T_1)
		BC	LC Spain	< BAC	< BAC Spain	< EAC	< ERL	BC/LC	< BAC	< EAC	< EC	BC/LC	< BAC	< EAC passive	< EC max. food limit
Metals	Cd	200	86	310	129		1200	M-600 O-1800	M-960 O-3000		M-5000 O-5000	a	26		1000 (bivalve. tissue)
	Hg	50	53	70	91		150	M-50 O-100	M-90 O-180		M-2500 O-2500	a	35		500
	Pb	25000	15500	38000	22400		47000	M-800 O-800	M-1300 O-1300		M-7500 O-7500	a	26		1500 (bivalve. tissue)
	As	15000		25000			---								
	Cr	60000		81000			81000								
	Cu	20000		27000			34000								
	Ni	30000		36000			---								
	Zn	90000		122000			150000								
	TBT	---		---		---		1.0	5.0	12.0					
PAHs	Naphthalene	5	---	8	---		160	---	---	340					
	Phenanthrene	17	4.0	32	7.3		240	4.0	11.0	1700					
	Anthracene	3	1.0	5	1.8		85	---	---	290					
	DBT	0.6	---	---	---		190	---	---	---					
	Fluoranthene	20	7.5	39	14.4		600	5.5	12.2	110					
	Pyrene	13	6.0	24	11.3		665	4.0	9.0	100					
	Benz[a]anthracene	9	3.5	16	7.1		261	1.0	2.5	80					
	Chrysene (Triphenylene)	11	4.0	20	8.0		384	4.0	8.1	---					
	Benzo[a]pyrene	15	4.0	30	8.2		430	0.5	1.4	600					
	Benzo[ghi]perylene	45	3.5	80	6.9		85	1.5	2.5	110					
	Indeno[1,2,3-cd]pyrene	50	4.0	103	8.3		240	1.0	2.4	---					
PCBs	CB28	0.0/0.05		0.22		1.7		0.0/0.25	0.75	3.2		0.0/0.05	0.10	64 lw	
	CB52	0.0/0.05		0.12		2.7		0.0/0.25	0.75	5.4		0.0/0.05	0.08	108 lw	
	CB101	0.0/0.05		0.14		3.0		0.0/0.25	0.70	6.0		0.0/0.05	0.08	120 lw	
	CB105	---		---		---		0.0/0.25	0.75	---		0.0/0.05	0.08	---	
	CB118	0.0/0.05		0.17		0.6		0.0/0.25	0.60	1.2		0.0/0.05	0.10	24 lw	
	CB138	0.0/0.05		0.15		7.9		0.0/0.25	0.60	15.8		0.0/0.05	0.09	316 lw	
	CB153	0.0/0.05		0.19		40		0.0/0.25	0.60	80		0.0/0.05	0.10	1600 lw	
	CB156	---		---		---		0.0/0.25	0.60	---		0.0/0.05	0.08	---	
	CB180	0.0/0.05		0.10		12		0.0/0.25	0.60	24		0.0/0.05	0.11	480 lw	
Pesticide	γ-HCH	0.0/0.05	0.13				3.0	0.0/0.25	0.97	1.45	---	---	---	11[b]	
	α-HCH	---	---				---	0.0/0.25	0.64	---	---	---	---	---	
	DDE (p,p’)	0.0/0.05	0.09				2.2	0.0/0.25	0.63	---	---	0.0/0.05	0.10	---	
	Hexachlorobenzene	0.0/0.05	0.16				20.0	0.0/0.25	0.63	---	---	0.0/0.05	0.09	---	
	Dieldrin	0.0/0.05	0.19				2.0	---	---	---	---	---	---	---	

[a] datasets too limited to allow recommendation for BCs for metals in fish; [b] EAC for fish liver derived by applying a conversion factor of 10 on EAC for whole fish

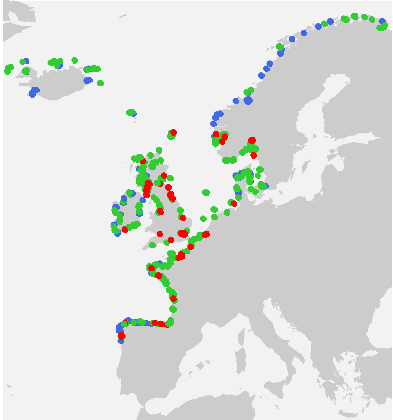
Annex 2

Assessment results for individual PCB congeners

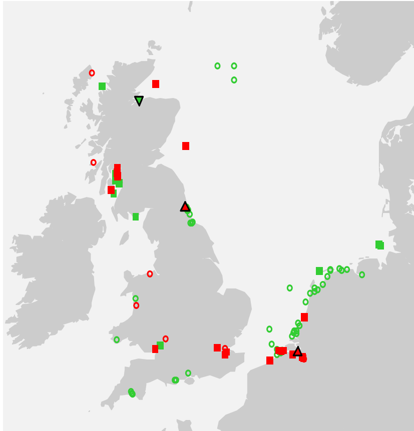
CB 52



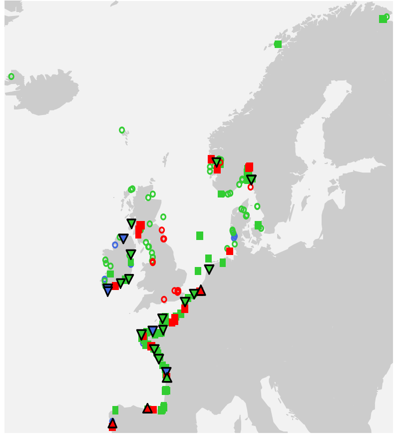
A. CB52 Sediment concentrations



B. CB52 Biota concentrations



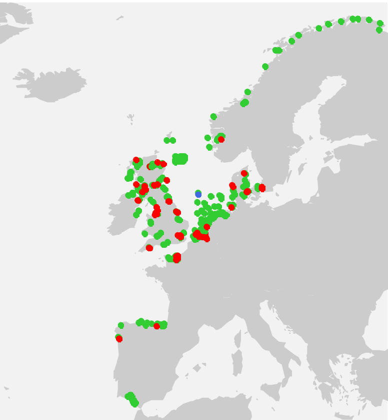
C. CB52 Sediment trends



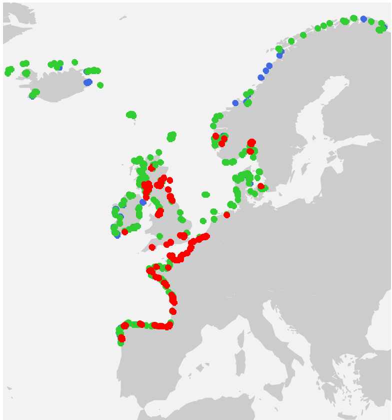
D. CB52 Biota trends

Figure A and B: Concentrations of CB52 in sediments (A) and biota (B) based on last year of monitoring in the period 2003 – 2007. Temporal trends of CB52 in sediments (C) and biota (D) based on time series within the period 1998 – 2007

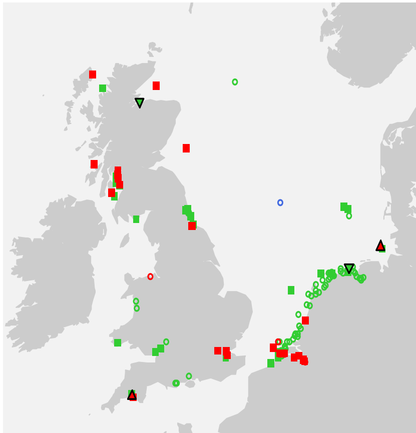
CB 101



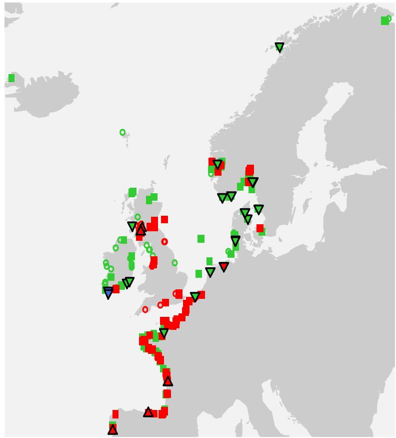
A. CB101Sediment concentrations



B. CB101Biota concentrations



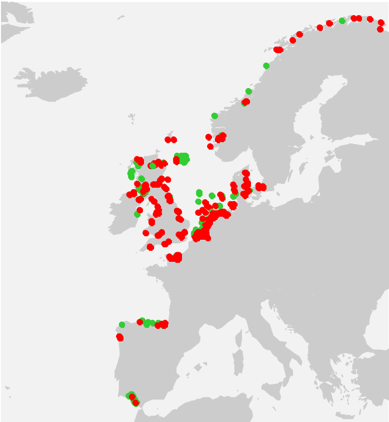
C. CB101Sediment trends



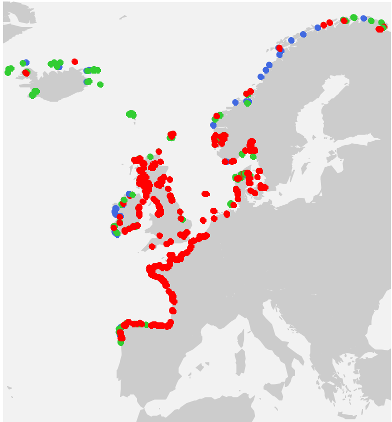
D. CB101Biota trends

Figure A and B: Concentrations of CB101 in sediments (A) and biota (B) based on last year of monitoring in the period 2003 – 2007. Temporal trends of CB101 in sediments (C) and biota (D) based on time series within the period 1998 – 2007

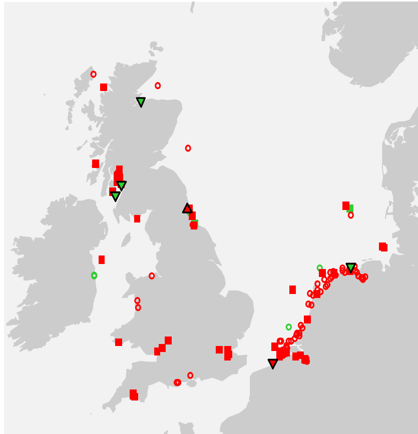
CB 118



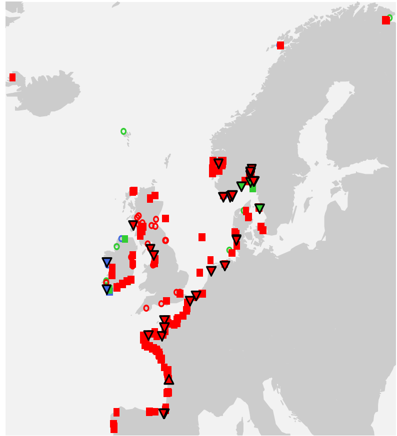
A. CB118 Sediment concentrations



B. CB118 Biota concentrations



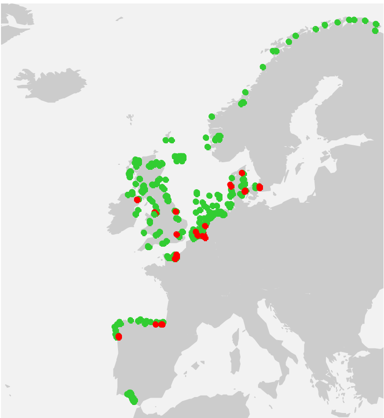
C. CB118 Sediment trends



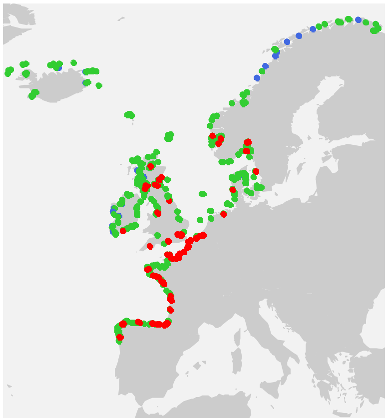
D. CB118 Biota trends

Figure A and B: Concentrations of CB118 in sediments (A) and biota (B) based on last year of monitoring in the period 2003 – 2007. Temporal trends of CB118 in sediments (C) and biota (D) based on time series within the period 1998 – 2007

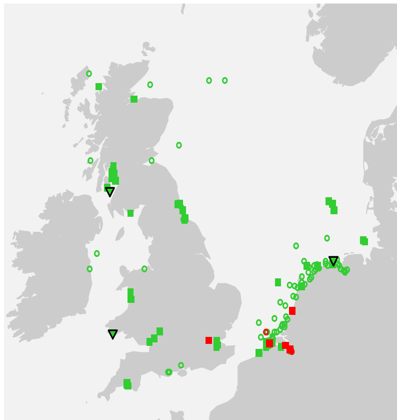
CB 138



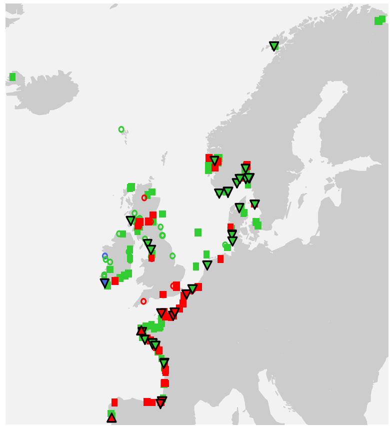
A. CB138 Sediment concentrations



B. CB138 Biota concentrations



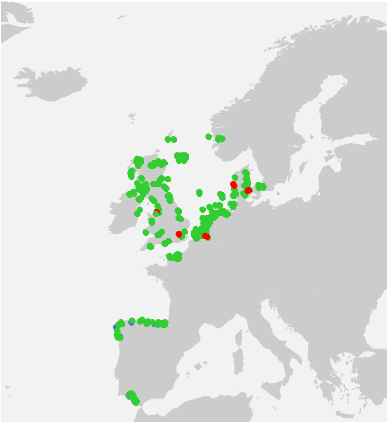
C. CB138 Sediment trends

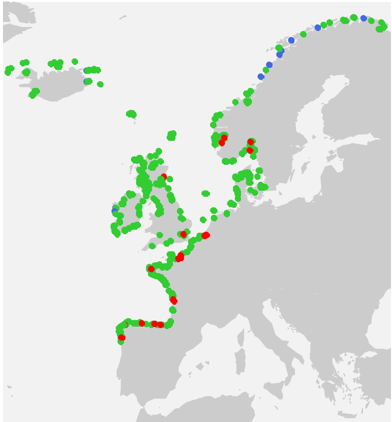


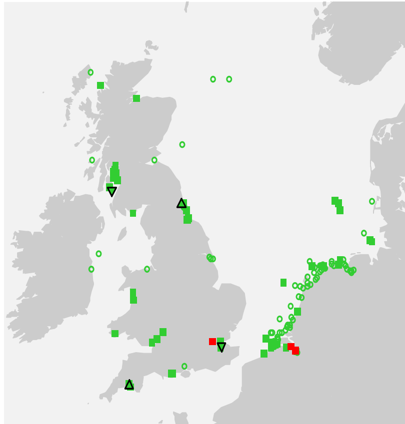
D. CB138 Biota trends

Figure A and B: Concentrations of CB138 in sediments (A) and biota (B) based on last year of monitoring in the period 2003 – 2007. Temporal trends of CB138 in sediments (C) and biota (D) based on time series within the period 1998 – 2007

CB 153


A. CB153 Sediment concentrations


B. CB153 Biota concentrations


C. CB153 Sediment trends

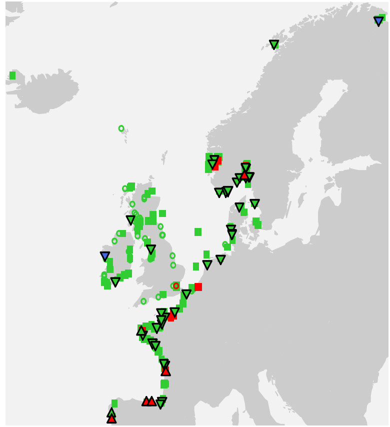
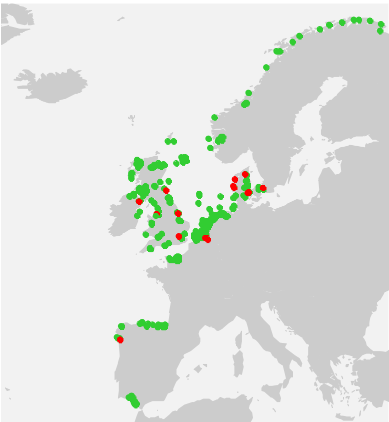
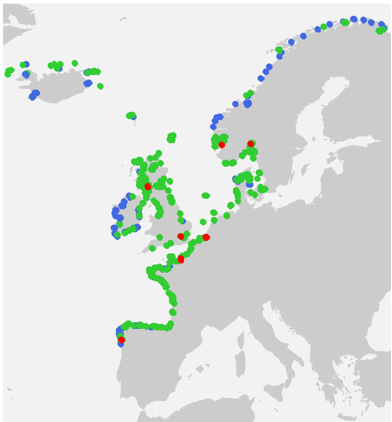
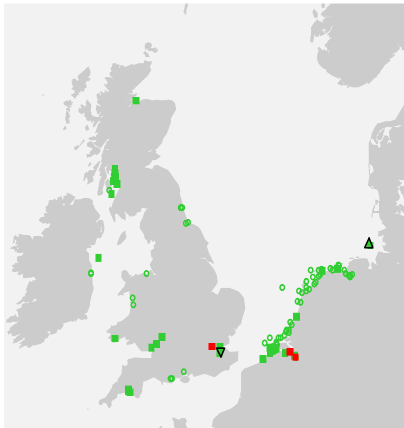

D. CB153 Biota trends

Figure A and B: Concentrations of CB153 in sediments (A) and biota (B) based on last year of monitoring in the period 2003 – 2007. Temporal trends of CB153 in sediments (C) and biota (D) based on time series within the period 1998 – 2007

CB180


A. CB180 Sediment concentrations


B. CB180 Biota concentrations


C. CB180 Sediment trends

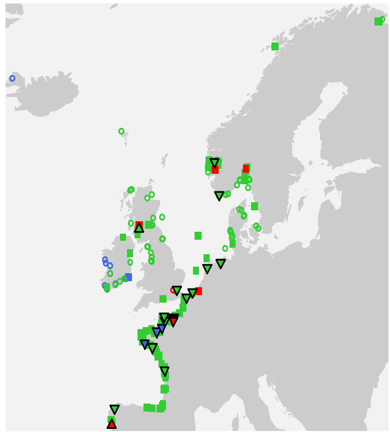
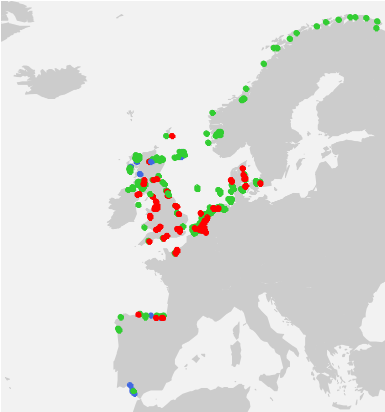
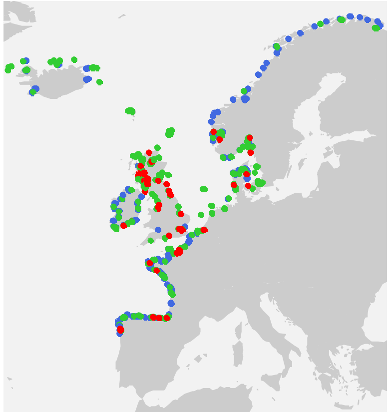

D. CB180 Biota trends

Figure A and B: Concentrations of CB180 in sediments (A) and biota (B) based on last year of monitoring in the period 2003 – 2007. Temporal trends of CB180 in sediments (C) and biota (D) based on time series within the period 1998 – 2007

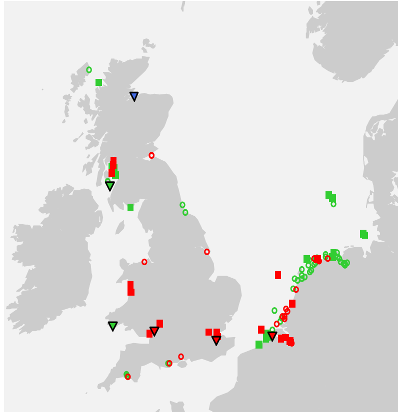
CB 28



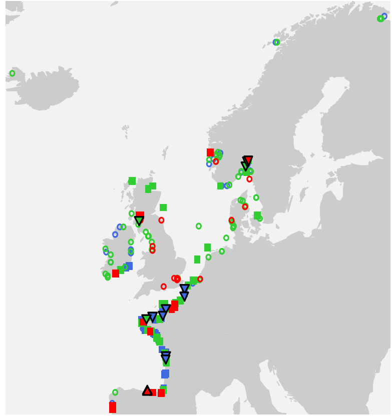
A. CB28 Sediment concentrations



B. CB28 Biota concentrations



C. CB28 Sediment trends



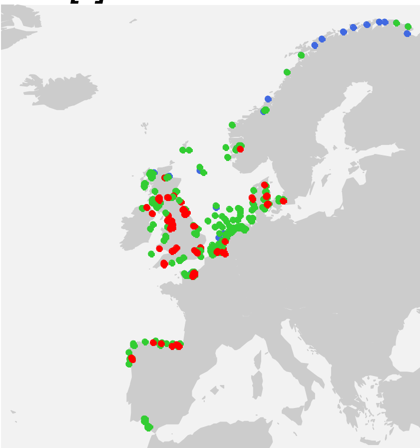
D. CB28 Biota trends

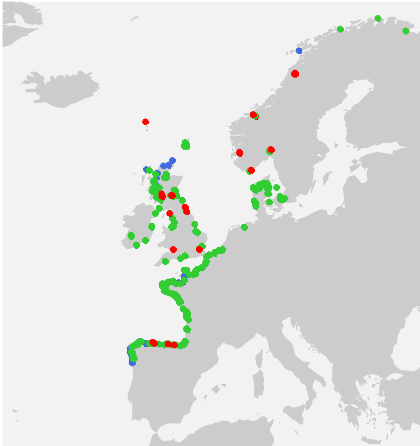
Figure A and B: Concentrations of CB28 in sediments (A) and biota (B) based on last year of monitoring in the period 2003 – 2007. Temporal trends of CB281 in sediments (C) and biota (D) based on time series within the period 1998 – 2007

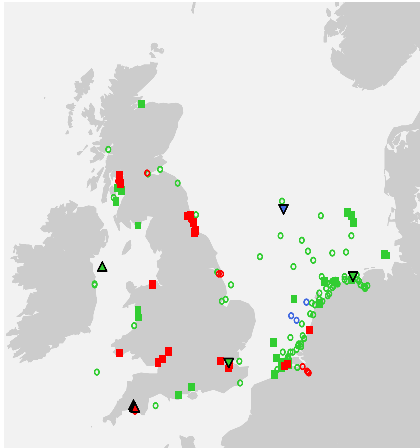
Annex 3

Assessment results for individual PAH compounds

Benz*[a]*anthracene


A. BAA sediment concentrations


B. BAA Biota concentrations


C. BAA Sediment trends

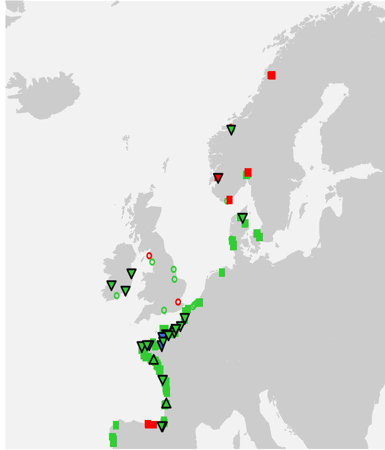
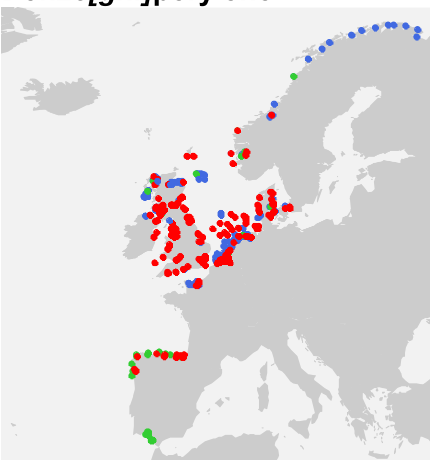
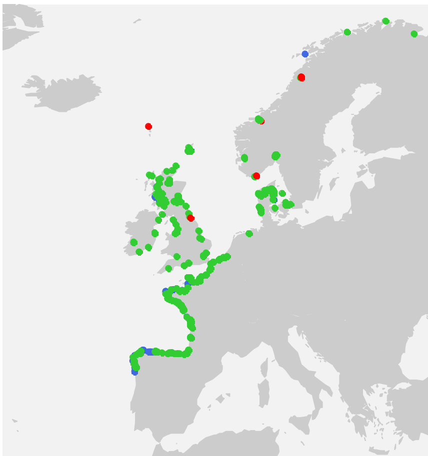
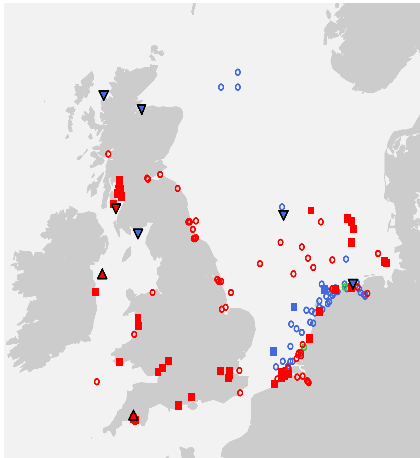

D. BAA Biota trends

Figure A and B: Concentrations of benz[a]anthracene in sediments (A) and biota (B) based on last year of monitoring in the period 2003 – 2007. Temporal trends of benz[a]anthracene in sediments (C) and biota (D) based on time series within the period 1998 – 2007

Benzo*[ghi]*perylene


A. BGHIP Sediment concentrations


B. BGHIP Biota concentrations


C. BGHIP Sediment trends

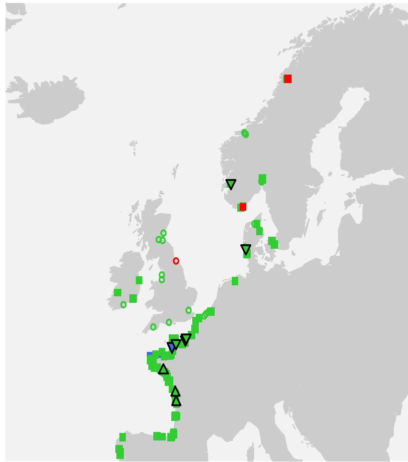
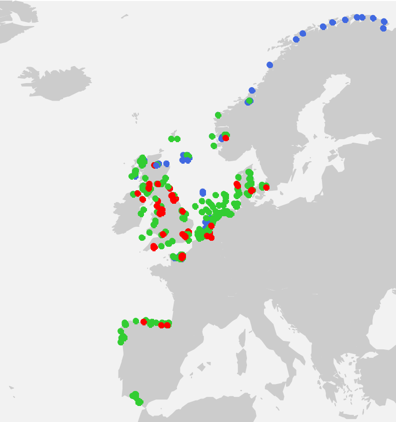
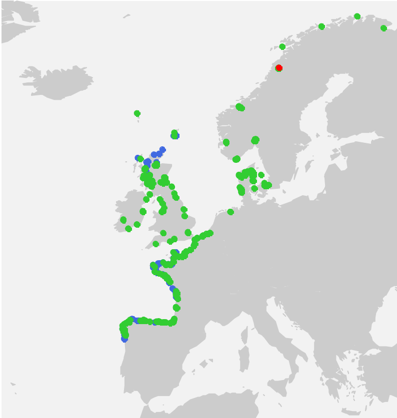

D. BGHIP Biota trends

Figure A and B: Concentrations of benzo[ghi]perylene in sediments (A) and biota (B) based on last year of monitoring in the period 2003 – 2007. Temporal trends of benzo[ghi]perylene in sediments (C) and biota (D) based on time series within the period 1998 – 2007

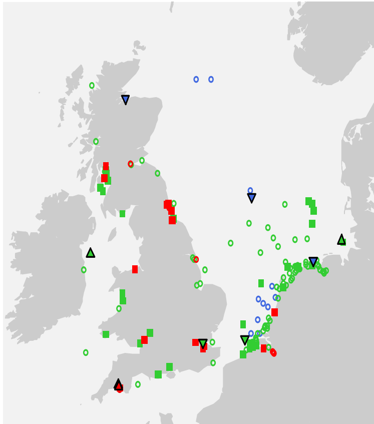
Benzo*[a]*pyrene



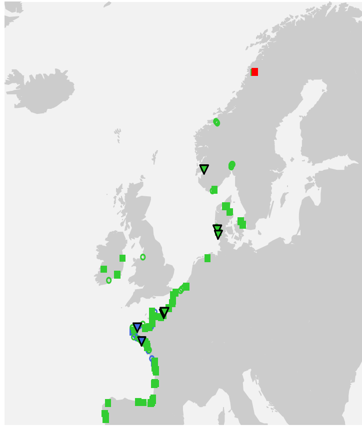
A. B[A]P Sediment concentrations



B. B[A]P Biota concentrations



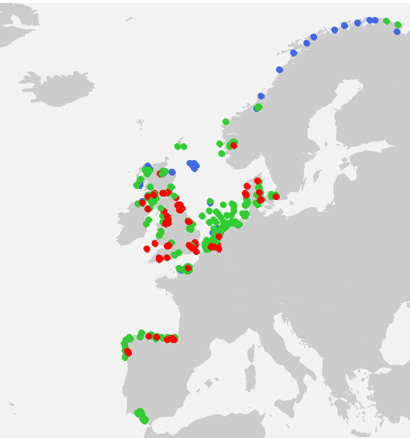
C. B[A]P Sediment trends



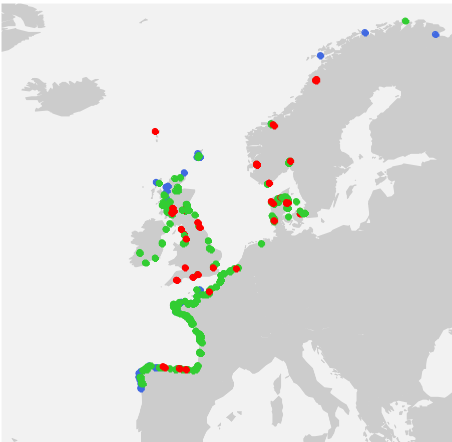
D. B[A]P Biota trends

Figure A and B: Concentrations of Benzo[a]pyrene in sediments (A) and biota (B) based on last year of monitoring in the period 2003 – 2007. Temporal trends of Benzo[a]pyrene in sediments (C) and biota (D) based on time series within the period 1998 – 2007

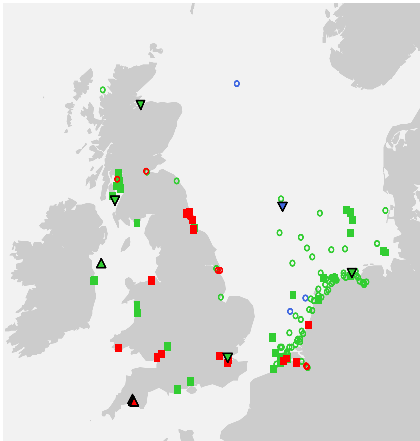
Fluoranthene



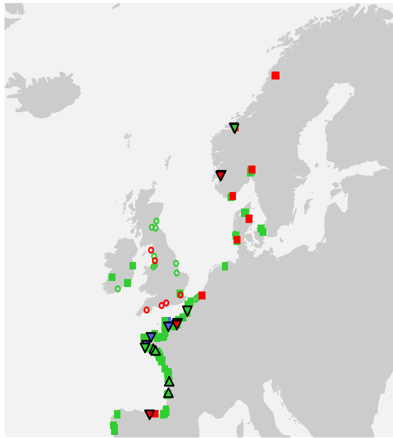
A. FLU Sediment concentrations



B. FLU Biota concentrations



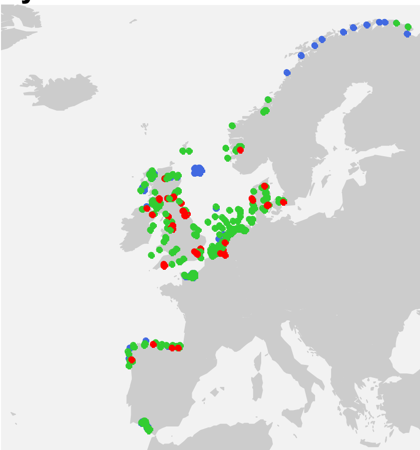
C. FLU Sediment trends

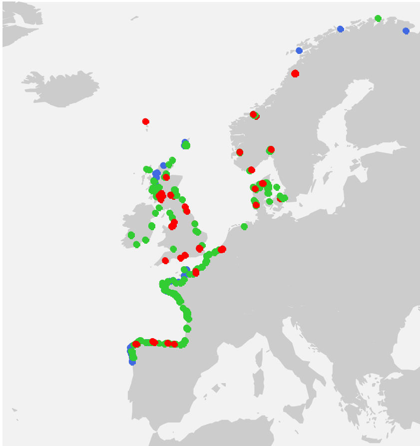


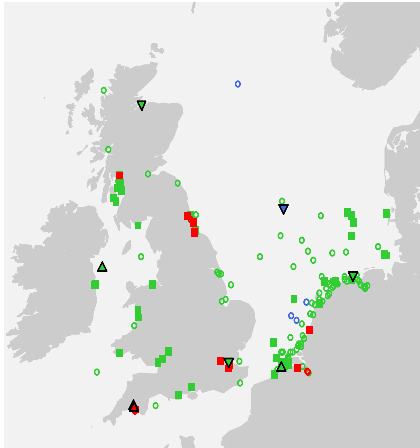
D. FLU Biota trends

Figure A and B: Concentrations of Fluoranthene in sediments (A) and biota (B) based on last year of monitoring in the period 2003 – 2007. Temporal trends of Fluoranthene in sediments (C) and biota (D) based on time series within the period 1998 – 2007

Pyrene


A. PYR Sediment concentrations


B. PYR Biota concentrations


C. PYR Sediment trends

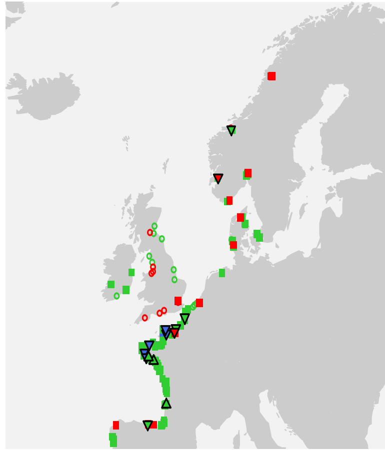
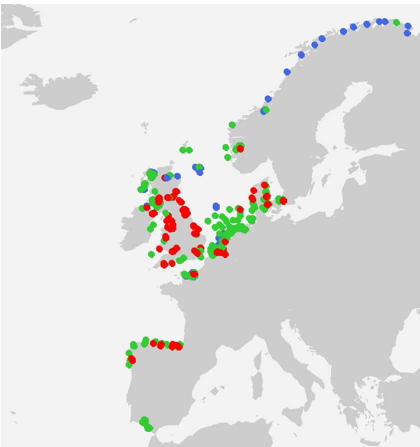
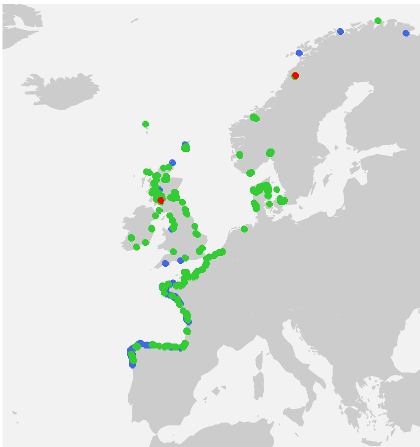
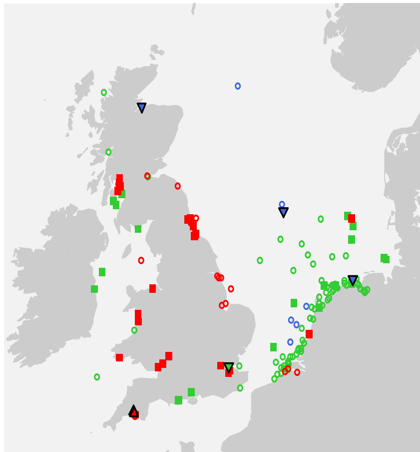

D. PYR Biota trends

Figure A and B: Concentrations of Pyrene in sediments (A) and biota (B) based on last year of monitoring in the period 2003 – 2007. Temporal trends of Pyrene in sediments (C) and biota (D) based on time series within the period 1998 – 2007

Phenanthrene


A. PA Sediment concentrations


B. PA Biota concentrations


C. PA Sediment trends

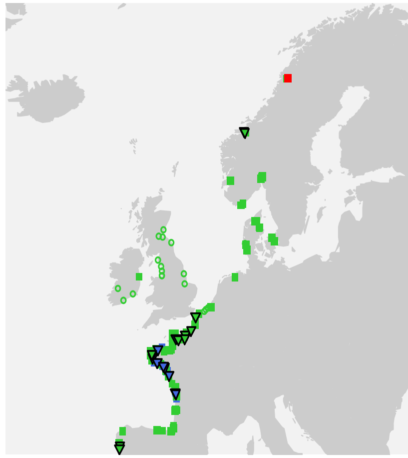
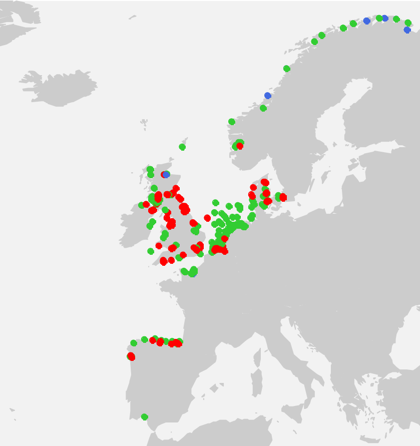
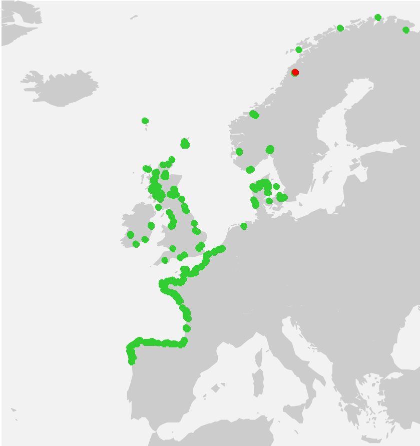

D. PA Biota trends

Figure A and B: Concentrations of phenanthrene in sediments (A) and biota (B) based on last year of monitoring in the period 2003 – 2007. Temporal trends of phenanthrene in sediments (C) and biota (D) based on time series within the period 1998 – 2007

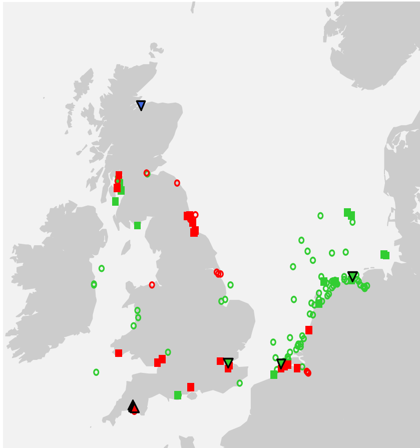
Anthracene



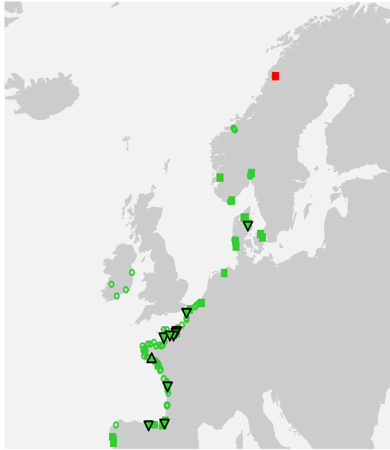
A. ANT Sediment concentrations



B. ANT Biota concentrations



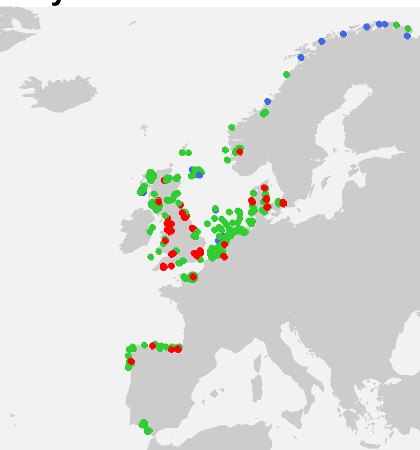
C. ANT Sediment trends



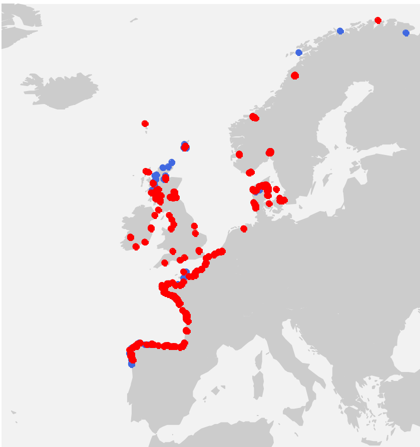
D. ANT Biota trends

Figure A and B: Concentrations of anthracene in sediments (A) and biota (B) based on last year of monitoring in the period 2003 – 2007. Temporal trends of anthracene in sediments (C) and biota (D) based on time series within the period 1998 – 2007

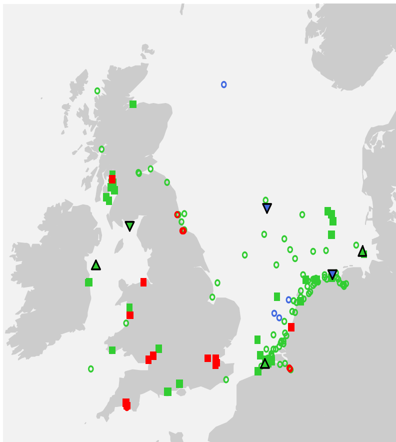
Chrysene



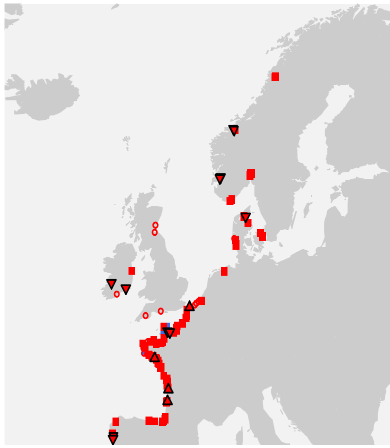
A. CHY Sediment concentrations



B. CHY Biota concentrations



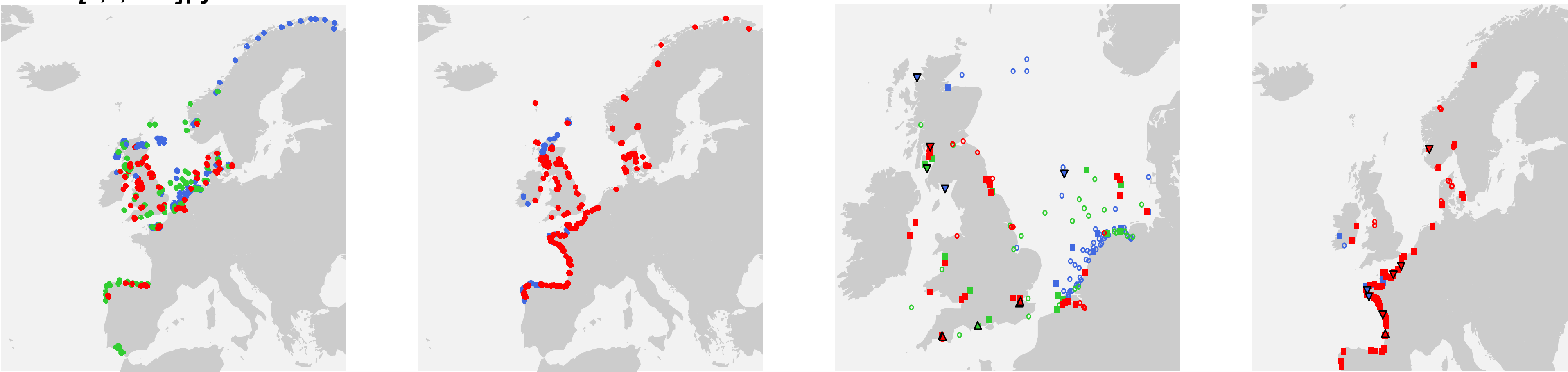
C. CHY Sediment trends



D. CHY Biota trends

Figure A and B: Concentrations of chrysene in sediments (A) and biota (B) based on last year of monitoring in the period 2003 – 2007. Temporal trends of chrysene in sediments (C) and biota (D) based on time series within the period 1998 – 2007

Indeno*[1,2,3-cd]*pyrene



A. IDCP Sediment concentrations

B. IDCP Biota concentrations

C. IDCP Sediment trends

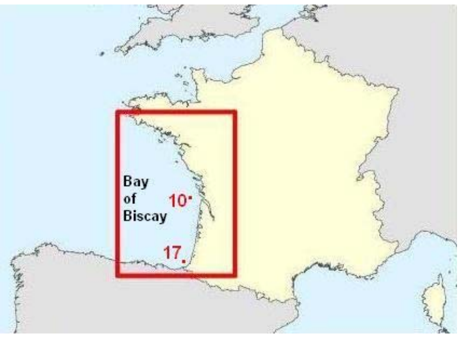
D. IDCP Biota trends

Figure A and B: Concentrations of ideno[1,2,3-cd]pyrene in sediments (A) and biota (B) based on last year of monitoring in the period 2003 – 2007. Temporal trends of ideno[1,2,3-cd]pyrene in sediments (C) and biota (D) based on time series within the period 1998 – 2007

Annex 4

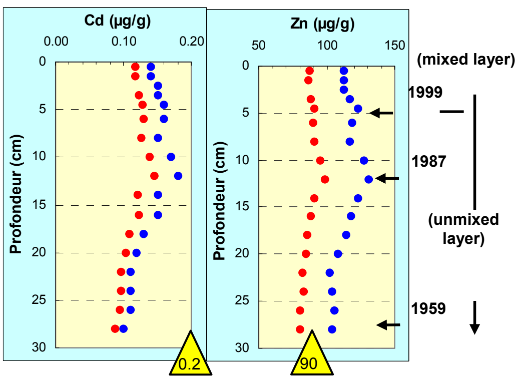
Retrospective study of metal contamination time trends in the French part of the Bay of Biscay

1. Sediment cores are used to study past variations of sediment contamination. ^{210}Pb dating and total metal determinations by ICP-MS enable analysis of the main time trends for metal concentrations in sediments.

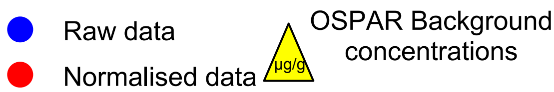


Two cores (10 and 17) were sampled in the French part of the bay of Biscay in June 1999: one a few miles off the Gironde estuary (pointe de la Coubre), the other near the Spanish border (Capbreton canyon). Uniform concentrations of Mn and Fe along the profiles indicate the absence of diagenetic reactions in sediment cores. The quality of results was checked by including in each analytical series a reference sample from the NRCC: BCSS1, MESS 1,2,3 (Chiffoleau et al. 2003).

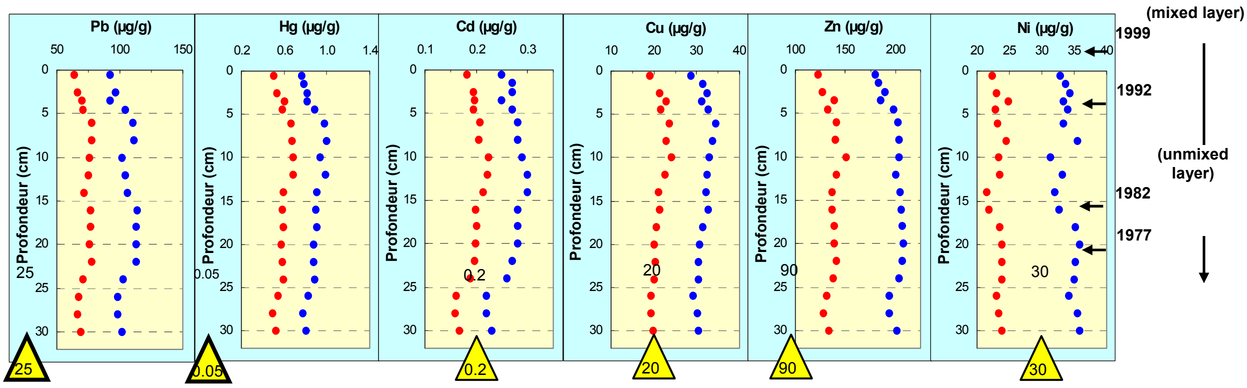
2. Off the Gironde (core 10), all metal concentrations remain less than or very near of OSPAR background values during the time interval recorded by the core (1959 – 1999).



Some variations are noticed along the Cd and Zn profiles, which may correspond to a very attenuated signal from the Gironde outputs, but never causes the concentrations to exceed the OSPAR background concentrations.
This suggests that this area was not subjected to any significant anthropogenic input of metals between1959 and 1999.



3. In the canyon of Capbreton (core 17), the undisturbed part of the core recorded the surface deposit influence between 1977 and 1999. As soon as 1977 high lead (50 µg/g) and mercury (0.5 µg/g) concentrations are noticed.



- Mercury concentrations increase until 1992, then decrease until 1999. This marks a drop of inputs in 1992, but the final concentration remains elevated (0.6 µg/g).
- Lead maintains high concentrations (more than twice the OSPAR background concentrations) throughout the profile of the core and concentration begins to decrease only in the upper level of the unmixed layer. This shows a late (near 1998) drop of lead inputs.
- Other metals (Cd, Cu, Zn, Ni) stay lower than OSPAR background concentrations (Cu, Ni) or not far from them (Cd, Zn).

4. Conclusion: This case study shows that in the core sampled off the Gironde, no evidence of contamination was found, and no significant time trend was seen. The core from Capbreton canyon showed a significant contamination by lead and mercury. Other metals were below or near background values. All metals showed a decreasing trend in last years in this core.

Appendix 1: Overview of results from monitoring stations for contaminants in sediments

Appendix 1 presents the CEMP assessment results for contaminants in sediments on a station by station and contaminants by contaminant basis. For readability a slightly different colour classification has been used to classify the contaminant concentrations at each station as follows:

Main body of report	Appendix 1	Classification
		Status is unacceptable
		Status is acceptable
		Status is acceptable: concentrations at background

country	region	station	sample.fraction	latitude	longitude	HG	CD	PB	AS	CR	CU	NI	ZN	CB28	CB52	CB101	CB118	CB138	CB153	CB180	NAP	PA	ANT	DBT	FLU	PYR	BAA	CHR	BAP	BGHIP	ICDP	NAP1M	NAPDI	PAM1	DDEPP	DIELD	HCB	HCHG	TBTIN	BD209	National comments
Belgium	II	120	SED63	51.19	2.7												↓																								
Belgium	II	140	SED63	51.33	3.05																					↑		↑					↑								
Belgium	II	150	SED63	51.42	3.4																																				
Belgium	II	230	SED63	51.31	2.85																																				
Belgium	II	330_a	SED63	51.43	2.81	↓																																			
Belgium	II	421	SED63	51.48	2.45																																				
Belgium	II	435	SED63	51.58	2.79																								↓												
Belgium	II	545	SED63	51.73	3.05			↓																																	
Belgium	II	700	SED63	51.38	3.22																																				
Belgium	II	710_a	SED63	51.44	3.14	↓																																			
Belgium	II	780	SED63	51.47	3.06	↓																	↓										↑								
Belgium	II	800	SED63	51.85	2.87																																				
Belgium	II	B03	SED63	51.43	3.21																																				
Belgium	II	B04	SED63	51.43	3.27																																				
Belgium	II	B07	SED63	51.43	3.3																																				
Belgium	II	B08	SED63	51.44	3.37									↓																											
Belgium	II	B10	SED63	51.42	3.38																																				
Belgium	II	S04	SED63	51.34	3.83	↓				↓																							↑		↑						
Belgium	II	S09	SED63	51.37	4.08		↑					↓			↑																										
Belgium	II	S18	SED63	51.27	4.3					↓	↓	↓																													
Belgium	II	S20	SED63	51.24	4.35																																				
Belgium	II	S22	SED63	51.22	4.39	↓				↓	↓		↓																												
Belgium	II	ZVL_DVZ	SED63	51.38	3.22																																				
Germany	II	BL4	SED20/US	54.25	7.8	↓																																			
Germany	II	Buesum	SED20	54.14	8.78																																				
Germany	II	EIDER	SED20	54.23	8.38																																				
Germany	II	ES1	SED20	53.67	6.5																																				
Germany	II	ES2	SED20	53.82	6.38	↑	↓																																		
Germany	II	FOE-GB3	SED20	54.95	6.35				↓																																
Germany	II	HELGO	SED20	54.25	8.1	↓																																			
Germany	II	HPAE3	SED20	54.05	7.97																																				
Germany	II	KS11	SED20/US	54.07	8.12											↑				↑								↑	↑									↓			
Germany	II	KS8	SED20/US	54.03	8.21	↓							↓																												
Germany	II	L1	SED20/US	55.05	8.2	↓																																			
Germany	II	Langeness	SED20	54.65	8.62																																				
Germany	II	List	SED20	55.03	8.45						↑																														
Germany	II	Oland	SED20	54.7	8.72																																				
Germany	II	STG16	SED20	53.94	7.4	↓					↓																														
Germany	II	Suedfall	SED20	54.47	8.75							↑																													
Germany	II	UE15	SED20/US	54.5	6.5	↓																																			
Germany	II	UE18	SED20	54.5	8	↓																																			
Germany	II	UE20	SED20/US	55	6.5	↓	↓						↑																												
Germany	II	UE67	SED20/US	55.25	4.5	↓																																			
Germany	II	URST1	SED20	54.42	7.58																																				
Germany	II	WB1	SED20/US	54.83	6.58	↓	↓	↓					↓																												
Germany	II	WB5	SED20/US	55.07	6.33	↓																																			
The Netherlands	II	AMLD70	SED63	54.09	5.56																																				
The Netherlands	II	APPZK20	SED63	51.5	3.21																																				
The Netherlands	II	BAARLDPL	SED63	51.37	3.9																																				
The Netherlands	II	BALGZWWZD	SED63	52.89	4.91																																				
The Netherlands	II	BALLMBT	SED63	53.44	5.72																																				
The Netherlands	II	BATHBI68	SED63	51.39	4.21																																				
The Netherlands	II	BATHBI71	SED63	51.38	4.17																																				
The Netherlands	II	BOCHTVWTDVVA	SED63	53.41	6.88																																				
The Netherlands	II	BOCHTVWTOT	SED63	53.34	6.94																																				
The Netherlands	II	BOONTOOVR	SED63	53.12	5.41																																				
The Netherlands	II	BORKKDZD	SED63	53.58	6.75																																				
The Netherlands	II	BORNDZWT	SED63	53.43	5.63																																				
The Netherlands	II	CALLOG1	SED63	52.86	4.69																																				
The Netherlands	II	CALLOG10	SED63	52.9	4.56																																				
The Netherlands	II	CALLOG30	SED63	52.93	4.27																																				
The Netherlands	II	CALLOG70	SED63	52.99	3.68			↓																																	
The Netherlands	II	DANTZGKDBTN	SED63	53.36	5.8																																				
The Netherlands	II	DANTZGZD	SED63	53.41	5.72																																				
The Netherlands	II	DENOVSSBTN	SED63	52.94	5.05																																				
The Netherlands	II	EEMSPGM	SED63	53.32	7.26																																				
The Netherlands	II	EGMAZE1	SED63	52.62	4.61																																				
The Netherlands	II	EGMAZE10	SED63	52.64	4.47																																				
The Netherlands	II	FRIESFT04	SED63	53.76	3.63																																				
The Netherlands	II	GOERE40	SED63	52.08	3.51																																				
The Netherlands	II	GOERE6	SED63	51.87	3.87																																				
The Netherlands	II	GRIENDKDR	SED63	53.25	5.25																																				
The Netherlands	II	GRONGWWFMLZD	SED63	53.44	6.53																																				
The Netherlands	II	HAMMOT	SED63	51.68	3.8																																				

country	region	station	sample.fraction	latitude	longitude	HG	CD	PB	AS	CR	CU	NI	ZN	CB28	CB52	CB101	CB118	CB138	CB153	CB180	NAP	PA	ANT	DBT	FLU	PYR	BAA	CHR	BAP	BGHI	ICDP	NAP1M	NAPDI	PAM1	DDEPP	DIELD	HCB	HCHG	TBTIN	BD209	National comments
The Netherlands	II	HANSWBIOHMG	SED63	51.44	3.99		↓			↓	↓																														
The Netherlands	II	HARVT1	SED63	51.85	4.01																																				
The Netherlands	II	HARVT4	SED63	51.92	4.02																																				
The Netherlands	II	HERPNOT	SED63	53.3	7.16																																				
The Netherlands	II	KOFFBNPT	SED63	53.43	5.56																																				
The Netherlands	II	KORNWDZBTSKM	SED63	53.08	5.34																																				
The Netherlands	II	KRAMMR	SED63	51.67	4.1																																				
The Netherlands	II	LAUWOODVT	SED63	53.41	6.26																																				
The Netherlands	II	MALZZWL	SED63	52.99	4.9																																				
The Netherlands	II	MARLGOT	SED63	51.48	4.2																																				
The Netherlands	II	NIEUWBT	SED63	53.31	5.63																																				
The Netherlands	II	NOORDWK2	SED63	52.26	4.41																																				
The Netherlands	II	NOORDWK30	SED63	52.39	4.04																																				
The Netherlands	II	NOORDWK50	SED63	52.48	3.79																																				
The Netherlands	II	NOORDWK70	SED63	52.59	3.53																																				
The Netherlands	II	OESTGDN19	SED63	54.5	3																																				
The Netherlands	II	OESTGDN21	SED63	55	5																																				
The Netherlands	II	OOSTFSPZWT	SED63	53.25	7.17																																				
The Netherlands	II	PIETMKK	SED63	51.5	4.13																																				
The Netherlands	II	REIDPND	SED63	53.3	7.1																																				
The Netherlands	II	ROGGPND	SED63	51.69	3.79																																				
The Netherlands	II	ROTTMOZOT	SED63	53.54	6.61																																				
The Netherlands	II	ROTTMPT3	SED63	53.56	6.56						↓					↓	↓	↓				↓	↓		↓	↓	↓	↓	↓	↓											
The Netherlands	II	ROTTMPT70	SED63	54.12	6.21																																				
The Netherlands	II	SCHAARVCLPOT	SED63	51.61	3.86																																				
The Netherlands	II	SCHAARVCLPWT	SED63	51.61	3.81																																				
The Netherlands	II	SCHIERMNOG4	SED63	53.53	6.17																																				
The Netherlands	II	SCHOUWN10	SED63	51.72	3.49																																				
The Netherlands	II	SIEGWL	SED63	53.47	6.17																																				
The Netherlands	II	SPEELMGT	SED63	51.36	4.11																																				
The Netherlands	II	STAVNSKTN	SED63	51.6	4.02																																				
The Netherlands	II	TERHDE1	SED63	52.05	4.17																																				
The Netherlands	II	TERHDE10	SED63	52.11	4.09																																				
The Netherlands	II	TERNZBIWPT2	SED63	51.35	3.83																																				
The Netherlands	II	TERSLG100	SED63	54.15	4.34																																				
The Netherlands	II	TERSLG135	SED63	54.41	4.04																																				
The Netherlands	II	TERSLG20	SED63	53.54	5.02																																				
The Netherlands	II	TERSLG235	SED63	55.17	3.16																	↓			↓	↓	↓	↓	↓	↓	↓										
The Netherlands	II	TERSLG275	SED63	55.34	3.1																																				
The Netherlands	II	TERSLG4	SED63	53.41	5.15																																↓				
The Netherlands	II	TERSLG70	SED63	53.92	4.61																																				
The Netherlands	II	TERSLKDVSP	SED63	53.38	5.31																																				
The Netherlands	II	TEXL70	SED63	53.5	4																																				
The Netherlands	II	UITHZWEHVWT	SED63	53.46	6.8																																				
The Netherlands	II	VLAKTVKKSRND	SED63	53.13	4.91																																				
The Netherlands	II	VLAKTVOTBRM	SED63	53.27	5.56																																				
The Netherlands	II	VLISSGBISSVH	SED63	51.41	3.57																																				
The Netherlands	II	VOORDTA2	SED63	51.62	3.39																																				
The Netherlands	II	VOORDTA3	SED63	51.71	3.6																																				
The Netherlands	II	VOORDTA4	SED63	51.79	3.81																																				
The Netherlands	II	VOORDTA5	SED63	51.92	3.92																																				
The Netherlands	II	WALCRN2	SED63	51.54	3.41																																				
The Netherlands	II	WALCRN30	SED63	51.72	3.12																																				
The Netherlands	II	WALCRN4	SED63	51.56	3.39																																				
The Netherlands	II	WALCRN70	SED63	51.95	2.67																																				
The Netherlands	II	WILHMNDGGPT	SED63	51.55	3.93																																				
The Netherlands	II	ZUIDOLWOT	SED63	53.45	6.51							↑																													
United Kingdom	II	Anglia_Medway_se01	SED63	51.33	0.46									↓																	↑										
United Kingdom	II	Anglia_Medway_se02	SED63	51.39	0.52							↑							↓	↓											↑										
United Kingdom	II	Anglia_Nkent_se01	US	51.5	1																																				Historical contamination
United Kingdom	II	Anglia_Oblackwat_se01	SED63	51.76	1		↑	↑		↑		↑																													Unexpected increase in metal concentrations possibly due to change in method
United Kingdom	II	Anglia_ThameEst_se01	SED63	51.5	0.06																																				
United Kingdom	II	Anglia_ThameEst_se03	SED63	51.49	0.47																	↓	↓		↓	↓	↓		↓												
United Kingdom	II	EastChan_ECInterE_se02	SED63/US	50.98	1.02		↑				↑																														
United Kingdom	II	EastChan_ECInterW_se02	SED63/US	50.43	-3.12		↑																																		
United Kingdom	II	EastChan_PooleHar_se01	SED63	50.69	-1.99																																				
United Kingdom	II	EastChan_PooleHar_se02	SED63	50.69	-2.03																										↑										
United Kingdom	II	EastChan_SouthanWa_se01	SED63	50.88	-1.38																																				
United Kingdom	II	EScotland_EScOpenSea_se01	US	56.5	-1.5																																				
United Kingdom	II	Fladen_FlaOpenSea_se01	US	58.5	0.07																																				
United Kingdom	II	Fladen_FlaOpenSea_se02	US	58.5	0.91																																				
United Kingdom	II	Fladen_FlaOpenSea_se03	US	58.16	0.07																																				
United Kingdom	II	Fladen_FlaOpenSea_se04	US	58.16	0.91																																				
United Kingdom	II	Forth_FirthFInnerOffshore_se01	SED63/US	56.1	-2.92								↓																												Contaminated by the influx of contaminated sediments from the estuary

country	region	station	sample.fraction	latitude	longitude	HG	CD	PB	AS	CR	CU	NI	ZN	CB28	CB52	CB101	CB118	CB138	CB153	CB180	NAP	PA	ANT	DBT	FLU	PYR	BAA	CHR	BAP	BGHII	ICDP	NAP1M	NAPDI	PAM1	DDEPP	DIELD	HCB	HCHG	TBTIN	BD209	National comments
United Kingdom	II	Forth_LowerForthEstuary_se01	SED63/US	56.02	-3.54																																				Contaminated by industrial discharges. Inputs have reduced
United Kingdom	II	Forth_LowerForthEstuary_se02	US	56	-3.51																																				
United Kingdom	II	HumWash_Humber_se02	SED63	53.59	0.08	↓				↑	↑	↑																													Two TiO2 plants in the lower Humber; some elevated metal concentrations expected
United Kingdom	II	HumWash_Humber_se03	SED63	53.59	-0.04							↑																													
United Kingdom	II	HumWash_Humber_se04	SED63	53.63	-0.1																																				
United Kingdom	II	HumWash_HWInter_se01	US	53.33	0.58																																				Elevated concentrations due to riverine input
United Kingdom	II	HumWash_HWOpenSeaNE_se01	SED63	54.83	1.33																																				Influenced by the Dogger Bank, higher primary production
United Kingdom	II	HumWash_HWOpenSeaS_se01	SED63/US	54	2																																				Influenced by the Dogger Bank, higher primary production
United Kingdom	II	HumWash_Owash_se01	US	52.98	0.33																																				Elevated concentrations due to riverine input
United Kingdom	II	HumWash_Owash_se02	SED63	52.94	0.13	↑					↑																														Unexpected increase in metal concentrations possibly due to change in method
United Kingdom	II	HumWash_Owash_se04	SED63	52.92	0.36																																				
United Kingdom	II	MorayF_MoFOpenSea_se01	US	58.05	-3																																				
United Kingdom	II	MorayF_OuterCromartyFirth_se01	SED63	57.68	-4.11		↓				↓																														
United Kingdom	II	MorayF_WhitenessHead_se01	US	57.67	-3.82			↓	↓		↓	↓	↓	↓	↓	↓	↓				↓	↓	↓		↓	↓			↓	↓											
United Kingdom	II	TyneTees_HolyBudl_se01	SED63	55.61	-1.76																																				
United Kingdom	II	TyneTees_Tees_se01	SED63	54.59	-1.25																																				
United Kingdom	II	TyneTees_Tees_se02	SED63	54.63	-1.16	↓		↓																																	
United Kingdom	II	TyneTees_Tees_se03	SED63	54.59	-1.18																																				
United Kingdom	II	TyneTees_TTInter_se01	SED63/US	55.01	-1.13																																				Elevated concentrations due to riverine input
United Kingdom	II	TyneTees_TTInter_se03	SED63	54.82	-1.28					↑																															
United Kingdom	II	TyneTees_Tweed_se01	SED63	55.77	-2.03																																				
United Kingdom	II	TyneTees_Tyne_se02	SED63	54.98	-1.53		↓								↑		↑		↑																						
United Kingdom	II	TyneTees_Tyne_se03	SED63	55	-1.44		↓																																		
United Kingdom	II	TyneTees_Wear_se02	SED63	54.91	-1.41																																				
United Kingdom	II	TyneTees_Wear_se04	SED63	54.92	-1.36																																				
United Kingdom	II	WestChan_Plymco_se01	US	50.3	-4.16																																				Elevated PAH concentrations due to riverine input
United Kingdom	II	WestChan_PlymSo_se02	SED63	50.42	-4.21																	↑	↑		↑	↑	↑		↑	↑											
United Kingdom	II	WestChan_PlymSo_se03	SED63	50.38	-4.2	↑			↑							↑			↑			↑	↑		↑	↑	↑		↑		↑										Unexpected increase in metal concentrations possibly due to change in method
United Kingdom	II	WestChan_PlymSo_se04	SED63	50.35	-4.13																		↑		↑		↑				↑										
Ireland	III	Dublin Bay Trend Sediment Site 1	SED63	53.33	-6.14	↓					↓	↓																													
Ireland	III	Dublin Bay Trend Sediment Site 2	SED63	53.35	-6.11																																				
Ireland	III	Irish Sea Trend Sediment Site	SED63	53.73	-5.75																				↑	↑	↑	↑	↑	↑											
United Kingdom	III	CardBay_CBInter_se01	US	52.36	-4.17																																				
United Kingdom	III	CardBay_DyfLeri_se01	SED63	52.55	-3.97																																				
United Kingdom	III	CardBay_Mawddac_se01	SED63	52.73	-3.99																																				
United Kingdom	III	Clyde_FirthCInnerCumbraes_se01	SED63/US	55.82	-4.98	↓																																			Fine muds in depositional areas with elevated concentrations
United Kingdom	III	Clyde_FirthCInnerCumbraes_se02	US	55.85	-4.91																																				Fine muds in depositional areas with elevated concentrations
United Kingdom	III	Clyde_FirthCInnerDunoon_se01	SED63/US	55.95	-4.89																																				Fine muds in depositional areas with elevated concentrations
United Kingdom	III	Clyde_FirthCInnerDunoon_se06	US	55.97	-4.89																										↓										Fine muds in depositional areas with elevated concentrations
United Kingdom	III	Clyde_FirthCMiddleOffshor_se06	US	55.66	-4.99																																				Fine muds in depositional areas with elevated concentrations
United Kingdom	III	Clyde_FirthCOuterOffshore_se01	US	55.33	-5.08			↓		↓		↓	↓	↓			↓	↓	↓		↓				↓					↓	↓	↓									Fine muds in depositional areas with elevated concentrations
United Kingdom	III	Clyde_IrvineBay_se01	SED63/US	55.6	-4.79			↓					↓																												Fine muds offshore from coarse sands; concentrations should be intermediate
United Kingdom	III	Clyde_IrvineBay_se02	US	55.59	-4.79												↓																								Fine muds offshore from coarse sands; concentrations should be intermediate
United Kingdom	III	Clyde_LargsChannel_se01	US	55.76	-4.88																																				Fine muds offshore from coarse sands; concentrations should be intermediate
United Kingdom	III	Clyde_SouthArran_se01	US	55.42	-5.21																																				Fine muds offshore from coarse sands; concentrations should be intermediate
United Kingdom	III	IrishSea_BalcaryPoint_se01	US	54.75	-4					↓	↓										↓							↓		↓	↓										
United Kingdom	III	IrishSea_Cumbria_se01	SED63	54.5	-3.65																																				
United Kingdom	III	IrishSea_DeeNWales_se03	SED63	53.34	-3.28	↑		↑																																	Unexpected increase in metal concentrations possibly due to change in method
United Kingdom	III	IrishSea_IrSGyreIntermed_se02	SED63	54.07	-5.5																																				
United Kingdom	III	IrishSea_IrSGyreIntermed_se03	SED63	54.25	-5.2																																				
United Kingdom	III	IrishSea_IrSGyreOpenSea_se01	SED63	53.95	-5.5						↓																														
United Kingdom	III	IrishSea_IrSIntermediateE_se01	SED63	53.5	-3.69		↑																																		Elevated concentrations due to industry
United Kingdom	III	IrishSea_IrSIntermediateW_se01	SED63	55	-5.56																																				
United Kingdom	III	IrishSea_IrSOpenSea_se04	SED63/US	54	-3.83		↑																																		
United Kingdom	III	IrishSea_LiverpoolBay_se02	SED63	53.53	-3.16			↓					↓																												
United Kingdom	III	IrishSea_Mersey_se02	SED63	53.41	-3.01																																				
United Kingdom	III	IrishSea_MorecambeBay_se02	SED63	54.03	-3.1						↑																														Unexpected increase in metal concentrations possibly due to change in method
United Kingdom	III	IrishSea_Ribble_se01	SED63	53.73	-3																																				
United Kingdom	III	MinchMalin_Colonsay_se01	US	56.11	-6.08																																				
United Kingdom	III	MinchMalin_LochLinnheS_se01	SED63	56.58	-5.47	↓		↓		↓	↓	↓	↓																												
United Kingdom	III	MinchMalin_LochLinnheS_se01	US	56.58	-5.47																																				
United Kingdom	III	MinchMalin_MeallGeal_se01	US	58.33	-6.15																																				
United Kingdom	III	MinchMalin_MMSIntermediat_se01	US	55.33	-6.58																																				
United Kingdom	III	MinchMalin_TheMinchNorth_se02	US	58	-5.67																									↓	↓										
United Kingdom	III	Severn_MilfordHav_se01	SED63	51.7	-4.92								↓	↓				↓			↓																				
United Kingdom	III	Severn_SeOpenSeaW_se01	SED63/US	51.25	-6		↑																																		Muddy sediment, sink for contaminants from Bristol Channel
United Kingdom	III	Severn_Severn_se01	SED63	51.73	-2.48		↑														↑																				
United Kingdom	III	Severn_Severn_se02	SED63	51.56	-2.77		↓							↓																											
United Kingdom	III	Severn_Severn_se03	SED63	51.47	-3.02																↓																				
United Kingdom	III	SIrishSea_SISOpenSea_se01	SED63	53.78	-5.63																																				

Appendix 2: Overview of results from monitoring stations for contaminants in sediments

Appendix 2 presents the CEMP assessment results for contaminants in biota on a station by station and contaminants by contaminant basis. For readability a slightly different colour classification has been used to classify the contaminant concentrations at each station as follows:

Main body of report	**Appendix 2**	**Classification**
		Status is unacceptable
		Status is uncertain: metals in biota
		Status in acceptable
		Status is acceptable: concentrations at background

country	region	station	species	latitude	longitude	HG	CD	PB	CU	ZN	CB28	CB52	CB101	CB118	CB138	CB153	CB180	CB105	CB126	CB156	CB169	NAP	PA	ANT	DBT	FLU	PYR	BAA	CHR	BAP	BGHIP	ICDP	DDEPP	HCHA	HCB	HCHG	TCDD	CDF2T	TBTIN	BDE47	HBCD	National comments
DK	I	Mýlingsgrunnur	Gadus morhua	62.38	-7.4																																					
IS	I	Ulfsa Skutulsfjordur	Mytilus edulis	66.06	-23.17																																					
N	I	10AA Skagodden-Skallneset area	Mytilus edulis	70.1	30.26																																					
N	I	10B Varangerfjorden	Gadus morhua	69.93	29.67		↓																												↓							
N	I	10F Skogerøy	Pleuronectes platessa	69.92	29.85	↓		↓																									↓									
N	I	11X Brashavn	Mytilus edulis	69.9	29.74											↓																										
N	I	98AA Husvaagen-Vatterfjord area	Mytilus edulis	68.26	14.66	↓		↓							↓	↓																										
N	I	98BA Bjørnerøya-Austnesfjord area	Gadus morhua	68.25	14.8								↓																													
N	I	98FA Bjørnerøya-Husholmen area	Pleuronectes platessa	68.22	14.81																																					
N	I	I912 Honnhammer	Mytilus edulis	62.85	8.16																		↓			↓			↓													
N	I	I913 Fjøseid	Mytilus edulis	62.81	8.27																		↓			↓	↓	↓	↓													
N	I	I915 Flåøya (northwest)	Mytilus edulis	62.76	8.44																																					
N	I	I964 Toraneskaien	Mytilus edulis	66.32	14.13																																					
N	I	I965 Moholmen (B5)	Mytilus edulis	66.31	14.13																																					
N	I	I969 Bjørnbærviken (B9)	Mytilus edulis	66.28	14.04																																					
B	II	BCP	Crangon crangon	51.33	2.83							↓		↓	↓					↓																						
B	II	BCP	Platichthys flesus	51.33	2.83							↓	↓	↓	↓		↓			↓																						
B	II	DVZ_KNO	Mytilus edulis	51.36	3.33																																					
B	II	DVZ_NWP	Mytilus edulis	51.16	2.73																																					
B	II	DVZ_OST	Mytilus edulis	51.24	2.93																																					
DK	II	ÅRH 230987	Mytilus edulis	56.55	10.23																			↓																		
DK	II	ÅRH 230988	Mytilus edulis	56.61	10.3		↓						↓									↓																				
DK	II	DMU R1035	Pleuronectes platessa	56.23	7.97																																					
DK	II	FRB 65	Mytilus edulis	55.92	12.02		↑	↑																															↓			
DK	II	NJY MSS11	Mytilus edulis	57	9.93								↓															↓	↓										↓			
DK	II	NJY MSS3	Mytilus edulis	57.01	9.65										↓	↓																										
DK	II	RIB 2161010	Mytilus edulis	55.44	8.45											↓														↓	↓								↓			
DK	II	RIB 2161011	Mytilus edulis	55.41	8.47																																					
DK	II	RIB 2161022	Mytilus edulis	55.53	8.34																																					
DK	II	RIB 2161024	Platichthys flesus	55.59	8.31																																					
DK	II	RIB 2162020	Mytilus edulis	55.3	8.58																																					
DK	II	ROS 60	Mytilus edulis	55.71	12.36																																					
DK	II	SJY JDMTM1	Mytilus edulis	55.18	8.6			↑					↓	↓	↓	↓																	↓									
DK	II	SJY LDMTM1	Mytilus edulis	55.09	8.57								↓	↓	↓	↓														↓			↓						↓			
F	II	Aber Benoît	Crassostrea gigas	48.58	-4.61							↓																↓														
F	II	Ambleteuse	Mytilus edulis	50.81	1.59		↑				↓	↓										↓	↓	↓												↓						
F	II	Antifer - digue	Mytilus edulis	49.65	0.15			↓	↓								↓					↓	↓	↓		↓		↓		↓	↓	↓				↓						**Historical CB contamination from the river Seine**
F	II	Aulne Rive droite	Crassostrea gigas	48.28	-4.26																		↓																			
F	II	Baie de la Fresnaye	Mytilus edulis	48.64	-2.29		↑			↑						↓	↓					↓																				
F	II	Bdv Grandcamp Ouest	Mytilus edulis	49.39	-1.1				↓		↓					↓	↓					↓	↓			↓	↓	↓	↓		↓					↓						
F	II	Beg Nod	Crassostrea gigas	48.82	-3.04						↓	↓										↓																				
F	II	Berck Bellevue	Mytilus edulis	50.43	1.56			↓																		↓	↓	↓								↓						
F	II	Bréville	Mytilus edulis	48.89	-1.58			↓			↓	↓	↓			↓	↓					↓						↓								↓						
F	II	Cap de la Hève	Mytilus edulis	49.51	0.06			↓	↓						↓		↓	↓						↓		↓	↓	↓								↓						**Historical CB contamination from the river Seine**
F	II	Grande rade de Cherbourg	Mytilus edulis	49.67	-1.62							↓		↓	↓	↓		↓															↓			↓						
F	II	Kervel	Mytilus edulis	48.12	-4.28											↓							↓			↓	↓							↓								
F	II	La Gauthier	Mytilus galloprovincialis	48.59	-2.01		↑							↓								↓																				
F	II	Le Moulard	Mytilus edulis	49.66	-1.23	↑		↓	↓								↓					↓					↓						↓									
F	II	Le Passage (b)	Crassostrea gigas	48.39	-4.38										↓								↓											↓								
F	II	Le Vivier sur mer	Mytilus edulis	48.64	-1.79																	↓						↓														
F	II	Ouistreham	Mytilus edulis	49.3	-0.25			↓														↓		↓									↓			↓						
F	II	Oye plage	Mytilus edulis	51	2		↑							↓	↓	↓	↓	↓				↓							↑							↓						
F	II	Pen al Lann	Crassostrea gigas	48.67	-3.89						↓			↓				↓										↓		↓			↓									
F	II	Persuel	Crassostrea gigas	48.29	-4.55										↑	↑																										
F	II	Pirou Nord	Mytilus edulis	49.18	-1.61		↑	↓		↓				↓		↓								↓				↓			↓											
F	II	Pointe de St Quentin	Mytilus edulis	50.27	1.52			↓			↓											↓										↓	↓									
F	II	Pointe du Roselier	Mytilus galloprovincialis	48.55	-2.71		↑			↑																							↓									
F	II	Port en Bessin	Mytilus edulis	49.35	-0.75			↓	↓													↓	↓	↓				↓	↓													
F	II	Rossermeur	Crassostrea gigas	48.35	-4.34			↓														↓	↓									↓		↓		↓						
F	II	St Michel en Grève	Mytilus edulis	48.69	-3.58																		↓			↓	↓	↓														
F	II	Varengeville	Mytilus edulis	49.92	0.98																		↓					↓					↓									
F	II	Vaucottes	Mytilus edulis	49.74	0.29			↓	↓						↓	↓		↓									↓	↓		↓	↓											
F	II	Villerville	Mytilus edulis	49.41	0.12												↓						↓										↓			↓						**Historical CB contamination from the river Seine**
D	II	FOE-JMP	Limanda limanda	54.35	7.61																																					
D	II	FOE-N04	Limanda limanda	54.64	2.26																																					
D	II	FOE-N11	Limanda limanda	55.58	7.23																																					
D	II	FOE-P01	Limanda limanda	55.58	4.99																																					
D	II	FOE-P02	Limanda limanda	56.48	3.04																																					
D	II	Helgoland	Mytilus edulis	54.18	7.91																															↓						
D	II	Norderaue	Mytilus edulis	54.68	8.62										↓																					↓						
N	II	15A Gåsøy (Ullerø)	Mytilus edulis	58.05	6.9																																					
N	II	15B Ullerø area	Gadus morhua	58.05	6.72				↓	↓			↓	↓	↓	↓	↓	↓															↓		↓							
N	II	15F Ullerø area	Limanda limanda	58.05	6.72																																					
N	II	21F Åkrafjord	Lepidorhombus whiffiag	59.75	6.12	↑																																				
N	II	21F Åkrafjord	Limanda limanda	59.75	6.12																																					
N	II	21F Åkrafjord	Platichthys flesus	59.75	6.12																																					
N	II	22A Espevær (west)	Mytilus edulis	59.58	5.14	↑			↑																																	
N	II	23B Karihavet area	Gadus morhua	59.9	5.13	↑																																				
N	II	30A Gressholmen	Mytilus edulis	59.88	10.71		↑											↓																				↓				
N	II	30B Oslo City area	Gadus morhua	59.81	10.55																																					
N	II	31A Solbergstrand	Mytilus edulis	59.62	10.65	↑																																				
N	II	33F Sande (east side)	Platichthys flesus	59.53	10.35		↓				↓							↓															↓		↓							
N	II	35A Mølen	Mytilus edulis	59.49	10.5		↓							↓																												
N	II	36A Færder	Mytilus edulis	59.03	10.53		↓			↓				↓	↓	↓																										
N	II	36B Færder area	Gadus morhua	59.04	10.44																																					
N	II	36F Færder area	Limanda limanda	59.07	10.38	↑										↑																	↓		↓							

country	region	station	species	latitude	longitude	HG	CD	PB	CU	ZN	CB28	CB52	CB101	CB118	CB138	CB153	CB180	CB105	CB126	CB156	CB169	NAP	PA	ANT	DBT	FLU	PYR	BAA	CHR	BAP	BGHIP	ICDP	DDEPP	HCHA	HCB	HCHG	TCDD	CDF2T	TBTIN	BDE47	HBCD	National comments
N	II	51A Byrkjenes	Mytilus edulis	60.08	6.55		↓																																			
N	II	52A Eitrheimsneset	Mytilus edulis	60.1	6.53		↓			↓																									↑							
N	II	53B Inner Sørfjord	Gadus morhua	60.17	6.57															↓																						
N	II	53F Inner Sørfjord	Platichthys flesus	60.17	6.57																																					
N	II	56A Kvalnes	Mytilus edulis	60.22	6.6		↓			↓																							↑									
N	II	57A Krossanes	Mytilus edulis	60.39	6.69		↓			↓																																
N	II	63A Ranaskjær	Mytilus edulis	60.42	6.41																																					
N	II	65A Vikingneset	Mytilus edulis	60.24	6.15																																					
N	II	67B Strandebarm area	Gadus morhua	60.27	6.03		↓		↓	↓			↓	↓	↓	↓	↓	↓															↓									
N	II	67F Strandebarm area	Lepidorhombus whiffiag	60.27	6.03				↓			↓		↓		↓	↓	↓															↓		↓							
N	II	67F Strandebarm area	Platichthys flesus	60.27	6.03	↓	↓						↓	↓	↓	↓	↓																									
N	II	69A Lille Terøy	Mytilus edulis	59.98	5.75		↓	↓		↓						↓																										
N	II	71A Bjørkøya (Risøyodden)	Mytilus edulis	59.02	9.75		↓			↓									↓		↓																↓	↓				
N	II	76A Risøy	Mytilus edulis	58.73	9.27									↓	↓	↓																										
N	II	I022 West Damholmen	Mytilus edulis	59.1	11.04							↓	↓	↓	↓	↓																	↓									
N	II	I023 Singlekalven (south)	Mytilus edulis	59.09	11.14								↓	↓	↓	↓																	↓									
N	II	I024 Kirkøy (north west)	Mytilus edulis	59.08	10.99							↓	↓	↓	↓	↓																	↓									
N	II	I131A Lastad	Mytilus edulis	58.06	7.71									↓		↓																										
N	II	I132 Svensholmen	Mytilus edulis	58.12	7.99									↓	↓	↓																	↓		↓							
N	II	I133 Odderø (west)	Mytilus edulis	58.13	8								↓	↓	↓	↓																										
N	II	I201 Ekkjegrunn (G1)	Mytilus edulis	59.64	6.36	↑																				↓	↓	↓	↓	↓	↓	↓										
N	II	I205 Bølsnes (G5)	Mytilus edulis	59.59	6.3	↑																				↓			↓													
N	II	I241 Nordnes	Mytilus edulis	60.4	5.3																														↑							
N	II	I242 Gravdalsneset	Mytilus edulis	60.39	5.27													↓		↓																						
N	II	I243 Hegreneset	Mytilus edulis	60.42	5.3																																					
N	II	I301 Akershuskaia	Mytilus edulis	59.91	10.74						↓			↓				↓		↓																						
N	II	I304 Gåsøya	Mytilus edulis	59.85	10.59						↓							↓																								
N	II	I306 Håøya	Mytilus edulis	59.71	10.56	↑								↓		↓		↓																								
N	II	I307 Ramtonholmen	Mytilus edulis	59.74	10.52									↓	↓	↓		↓																								
N	II	I712 Gjemesholmen	Mytilus edulis	59.05	9.71										↓	↓					↓														↓							
N	II	I713 Strømtangen	Mytilus edulis	59.05	9.69																																					
SE	II	E/W FLADEN	Clupea harengus	57.23	11.83	↑				↓			↓	↓	↓	↓																	↓		↓					↓		
SE	II	E/W FLADEN	Gadus morhua	57.23	11.83																																			↓		
SE	II	E/W FLADEN	Mytilus edulis	57.23	11.83	↑	↓																																			
SE	II	Väderöarna	Clupea harengus	58.52	10.9																																			↓		
SE	II	Väderöarna	Mytilus edulis	58.52	10.9	↑	↑	↑																																		
SE	II	Väderöarna	Zoarces viviparus	58.52	10.9	↑																																				
NL	II	Doggersbank	Limanda limanda	55.21	3.65	↑	↑		↓	↓																																
NL	II	Ems Dollard	Mytilus edulis	53.38	6.93		↑						↓	↓		↓	↓																									
NL	II	Ems Dollard	Platichthys flesus	53.4	6.91												↓																		↓							
NL	II	Frisian Front	Limanda limanda	53.68	4.9																																					
NL	II	IJMDWT80	Limanda limanda	52.82	3.41				↓																										↓							
NL	II	Mid Western Scheldt	Mytilus edulis	51.4	3.68																																					
NL	II	Mid Western Scheldt	Platichthys flesus	51.42	3.83							↑																														
NL	II	Wadden Sea West	Platichthys flesus	53	5.02		↓					↓	↓	↓	↓	↓	↓																									
UK	II	Anglia_AnOpenSea_fi01	Limanda limanda	52	2.33																																					
UK	II	Anglia_Medway_fi02	Platichthys flesus	51.39	0.52																																					
UK	II	Anglia_Medway_sh01	Mytilus edulis	51.41	0.56		↑																																			
UK	II	Anglia_ThameEst_fi01	Platichthys flesus	51.5	0.06			↓																																		
UK	II	Anglia_ThameEst_fi02	Platichthys flesus	51.49	0.47			↓																																		
UK	II	Anglia_ThameEst_sh01	Mytilus edulis	51.51	0.59												↓																									
UK	II	EastChan_ECInterE_fi01	Limanda limanda	50.87	0.81																																					
UK	II	EastChan_ECInterE_fi02	Limanda limanda	50.76	0																																					
UK	II	EastChan_ECInterW_fi01	Limanda limanda	50.61	-2.93																																					
UK	II	EastChan_PooleHar_fi01	Platichthys flesus	50.69	-2.03																																					
UK	II	EastChan_PooleHar_sh02	Mytilus edulis	50.71	-2.02																																					
UK	II	EastChan_SouthanWa_fi01	Platichthys flesus	50.88	-1.39																																					
UK	II	EastChan_SouthanWa_sh01	Mytilus edulis	50.89	-1.39		↓	↓																																		
UK	II	EScotland_EScOpenSea_fi01	Pleuronectes platessa	56.5	-1.5			↑																																		
UK	II	EScotland_LowerTayEstuary_sh02	Mytilus edulis	56.45	-2.86																																					
UK	II	EScotland_LowerTayEstuary_sh03	Mytilus edulis	56.47	-2.91																																					
UK	II	EScotland_MontroseBasin_sh01	Mytilus edulis	56.7	-2.46																																					
UK	II	EShetland_CatFirth_sh01	Mytilus edulis	60.27	-1.2																																					
UK	II	Forth_ElieBuckhaven_sh01	Mytilus edulis	56.21	-2.94																																					
UK	II	Forth_FirthFInnerOffshore_fi01	Limanda limanda	56.1	-2.92																																					
UK	II	Forth_KinghornLeithDocks_sh02	Mytilus edulis	55.98	-3.25			↓		↓																																
UK	II	Forth_LeithDocksPortSeton_sh01	Mytilus edulis	55.95	-3.09																																					
UK	II	Forth_LowerForthEstuary_sh01	Mytilus edulis	56	-3.51																																					Historical CB contamination
UK	II	Forth_LowerForthEstuary_sh02	Mytilus edulis	55.99	-3.42					↓																																Reduction in metal concentrations following reduction in industrial discharges
UK	II	Forth_LowerForthEstuary_sh03	Mytilus edulis	56.03	-3.48	↓				↓																																Reduction in metal concentrations following reduction in industrial discharges
UK	II	Forth_MiddleForthEstuary_sh01	Mytilus edulis	56.05	-3.64	↓	↓	↓		↓																																Reduction in metal concentrations following reduction in industrial discharges
UK	II	Forth_MiddleForthEstuary_sh02	Mytilus edulis	56.04	-3.71																																					
UK	II	Forth_PortSetonEyebrought_sh01	Mytilus edulis	55.99	-2.9																																					Close to Leith docks - possible source of PAH and CB contamination
UK	II	HumWash_Humber_sh01	Mytilus edulis	53.57	-0.03																																					High Cd concentrations unexpected, since fucus monitoring shows decline
UK	II	HumWash_HWInter_fi01	Limanda limanda	53.32	0.43																																					
UK	II	HumWash_HWOpenSeaNE_fi01	Limanda limanda	55.3	2.9																																					
UK	II	HumWash_HWOpenSeaNE_fi02	Limanda limanda	55.07	2.09																																					
UK	II	HumWash_HWOpenSeaNE_fi03	Limanda limanda	54.83	1.25																																					
UK	II	HumWash_HWOpenSeaNE_fi04	Limanda limanda	54.52	2.69		↑	↓																																		
UK	II	HumWash_HWOpenSeaS_fi01	Limanda limanda	54.06	1.79																																					
UK	II	HumWash_HWOpenSeaS_fi02	Limanda limanda	53.56	2.08																																					
UK	II	HumWash_SYorkLinc_fi01	Platichthys flesus	53.61	-0.11																																					
UK	II	HumWash_Wash_sh01	Mytilus edulis	52.93	0.08																																					
UK	II	MorayF_BeaulyFirth_sh01	Mytilus edulis	57.5	-4.32																																					
UK	II	MorayF_MoFOpenSea_fi01	Pleuronectes platessa	58.05	-3	↑	↑	↑																																		
UK	II	MorayF_MorayFirth_sh01	Mytilus edulis	57.5	-4.15																																					

country	region	station	species	latitude	longitude	HG	CD	PB	CU	ZN	CB28	CB52	CB101	CB118	CB138	CB153	CB180	CB105	CB126	CB156	CB169	NAP	PA	ANT	DBT	FLU	PYR	BAA	CHR	BAP	BGHIP	ICDP	DDEPP	HCHA	HCB	HCHG	TCDD	CDF2T	TBTIN	BDE47	HBCD	National comments
UK	II	MorayF_MorayFirthOffshor_fi01	Pleuronectes platessa	57.83	-3.66		↑																																			
UK	II	MorayF_OuterCromartyFirth_sh01	Mytilus edulis	57.66	-4.15																																					
UK	II	NScotland_ScapaFlow_sh01	Mytilus edulis	58.97	-3.23																																					
UK	II	NScotland_StrathyPtDunnet_sh01	Mytilus edulis	58.61	-3.67																																					
UK	II	TyneTees_HolyBudI_sh01	Mytilus edulis	55.61	-1.76																																					
UK	II	TyneTees_Nnorthum_fi01	Platichthys flesus	55.61	-1.76	↓																																				
UK	II	TyneTees_Tees_fi01	Merlangius merlangus	54.59	-1.18																																					
UK	II	TyneTees_Tees_fi02	Merlangius merlangus	54.63	-1.16																																					
UK	II	TyneTees_Tees_sh03	Mytilus edulis	54.63	-1.14																																					
UK	II	TyneTees_TTInter_fi01	Limanda limanda	55.3	-1.25																																					
UK	II	TyneTees_TTInter_fi03	Limanda limanda	54.76	-1.14																																					
UK	II	TyneTees_TTInter_fi05	Pleuronectes platessa	54.82	-1.28																																					
UK	II	TyneTees_TTOpenSeaS_fi01	Limanda limanda	54.24	0.49																																					
UK	II	TyneTees_Tyne_fi01	Platichthys flesus	54.98	-1.53																																					
UK	II	TyneTees_Tyne_fi02	Platichthys flesus	55	-1.44	↓																																				
UK	II	TyneTees_Wear_fi01	Platichthys flesus	54.91	-1.41																																					
UK	II	WestChan_PlymSo_fi01	Platichthys flesus	50.42	-4.2																																					
UK	II	WestChan_PlymSo_sh01	Mytilus edulis	50.42	-4.19																																					
UK	II	WestChan_WCInter_fi01	Limanda limanda	50.11	-4.1																																					
UK	II	WShetland_GrutingVoe_sh01	Mytilus edulis	60.22	-1.47																																					
UK	II	WShetland_OlnaFirth_sh01	Mytilus edulis	60.36	-1.29																																					
UK	II	WShetland_RonasVoe_sh01	Mytilus edulis	60.51	-1.39																																					
UK	II	WShetland_VailaSound_sh01	Mytilus edulis	60.22	-1.55																																					
IE	III	Annagasan	Mytilus edulis	53.88	-6.31																																					
IE	III	Arthurstown	Mytilus edulis	52.24	-6.96																							↓	↓													
IE	III	Aughinish Bay Galway 1	Crassostrea gigas	53.15	-9.02																																					
IE	III	Ballysadare Bay	Mytilus edulis	54.23	-8.57																																					
IE	III	Ballysadare Bay - Rosse's Point	Mytilus edulis	54.3	-8.55																																					
IE	III	Carlingford Lough	Mytilus edulis	54.06	-6.17																																					
IE	III	Castlegregory	Ostrea edulis	52.28	-9.99																																					
IE	III	Cheekpoint	Mytilus edulis	52.27	-6.99																																					
IE	III	Clarenbridge	Crassostrea gigas	53.21	-8.92																																					
IE	III	Clarenbridge	Ostrea edulis	53.21	-8.92																																					
IE	III	Clew Bay North Stn 1	Crassostrea gigas	53.88	-9.67																																					
IE	III	Clew Bay North Stn 1	Mytilus edulis	53.88	-9.67																																					
IE	III	Clew Bay South Stn 1	Crassostrea gigas	53.79	-9.63																																					
IE	III	Cork Harbour - N & E Channels	Crassostrea gigas	51.88	-8.26																																					
IE	III	Cromane Stn 1	Mytilus edulis	52.14	-9.92																																					
IE	III	Glengariff Stn 1	Mytilus edulis	51.73	-9.53																																					
IE	III	Inner Bannow Bay Stn 1	Crassostrea gigas	52.24	-6.77				↑				↓																													
IE	III	Inner Bantry Bay Stn 1	Mytilus edulis	51.69	-9.46							↓	↓																						↓							
IE	III	Inner Killary Harbour Stn 1	Mytilus edulis	53.6	-9.76									↓		↓																										
IE	III	Inner Lough Foyle - Quigley's Point	Mytilus edulis	55.12	-7.2							↓																							↓							
IE	III	Inner Lough Swilly	Mytilus edulis	55.04	-7.49																																					
IE	III	Inner McSwynes Bay - Bruckless	Mytilus edulis	54.62	-8.39																																					
IE	III	Inner Roaringwater Bay Stn 1	Mytilus edulis	51.53	-9.4					↓		↓	↓																													
IE	III	Inner Rogerstown	Mytilus edulis	53.51	-6.13																																					
IE	III	Inner Shannon Estuary - Aughinish	Crassostrea gigas	52.62	-9.05																																					
IE	III	Inner Shannon Estuary - Aughinish	Mytilus edulis	52.62	-9.05																							↓	↓													
IE	III	Inner Tralee Bay - Fenit	Mytilus edulis	52.27	-9.84																																					
IE	III	Inner Tralee Bay - Fenit	Ostrea edulis	52.27	-9.84			↑																																		
IE	III	Kilkieran North Stn 1	Ostrea edulis	53.35	-9.67																																					
IE	III	Kilmakilloge Stn 1	Mytilus edulis	51.77	-9.81									↓	↓																											
IE	III	Lough Foyle	Mytilus edulis	55.12	-7.07																																					
IE	III	Mulroy Bay - Broadwater Stn 1	Mytilus edulis	55.15	-7.69																																					
IE	III	North Dublin Bay - Sutton	Mytilus edulis	53.39	-6.12		↑		↑	↑																		↓					↓			↓						
IE	III	Outer Carlingford Lough	Crassostrea gigas	54.03	-6.13				↓			↓																														
IE	III	Outer Carlingford Lough	Mytilus edulis	54.03	-6.13																																					
IE	III	Outer Dungarvan Bay	Crassostrea gigas	52.07	-7.59							↓																							↓							
IE	III	Outer Wexford Harbour	Mytilus edulis	52.34	-6.42		↓					↓	↓																						↓							
IE	III	Ringaskiddy	Mytilus edulis	51.83	-8.3											↓				↓													↓	↓	↓	↓						
IE	III	Sea Point	Mytilus edulis	53.3	-6.16																																					
UK	III	CardBay_CBInter_fi01	Limanda limanda	52.7	-4.53																																					
UK	III	CardBay_CBInter_fi02	Limanda limanda	52.18	-4.5																																					
UK	III	CardBay_CBInter_fi03	Limanda limanda	52.28	-4.3																																					High lead concentrations due to mining activity in the past
UK	III	CardBay_CBOpenSea_fi01	Limanda limanda	52.5	-5																																					
UK	III	Clyde_ClydeEstuaryOuter_sh01	Mytilus edulis	55.93	-4.68		↓						↑																													Historical contamination; high lead concentrations due to local weathering
UK	III	Clyde_ClydeEstuaryOuter_sh02	Mytilus edulis	55.94	-4.64																																					Historical contamination; high lead concentrations due to local weathering
UK	III	Clyde_FirthCInnerCumbraes_fi01	Pleuronectes platessa	55.85	-4.91																																					Historical contamination
UK	III	Clyde_FirthCInnerDunoon_fi01	Pleuronectes platessa	55.97	-4.89																																					Historical contamination
UK	III	Clyde_FirthCInnerDunoon_sh01	Mytilus edulis	55.93	-4.88				↓																																	Historical contamination; high lead concentrations due to local weathering
UK	III	Clyde_FirthCMiddleOffshor_fi01	Pleuronectes platessa	55.66	-4.99						↓																															Historical contamination
UK	III	Clyde_FirthCOuterOffshore_fi01	Pleuronectes platessa	55.33	-5.08																																					Historical contamination; high lead concentrations due to local weathering
UK	III	Clyde_IrvineBay_fi02	Pleuronectes platessa	55.59	-4.79																																					Concentrations should be moderate - local inputs now controlled
UK	III	Clyde_IrvineBay_sh01	Mytilus edulis	55.6	-4.79																																					Concentrations should be moderate - local inputs now controlled
UK	III	Clyde_LargsChannel_fi01	Pleuronectes platessa	55.76	-4.88																																					Historical contamination
UK	III	Clyde_LargsChannel_sh01	Mytilus edulis	55.78	-4.86																																					Historical contamination
UK	III	Clyde_LochFyneMiddleBasin_sh01	Mytilus edulis	56.06	-5.33																																					Elevated concentrations due to historical deposition in fine muds
UK	III	Clyde_LochFyneOuterBasin_sh01	Mytilus edulis	55.97	-5.45																																					Elevated concentrations due to historical deposition in fine muds
UK	III	Clyde_LochGoil_sh01	Mytilus edulis	56.12	-4.91																																					Elevated concentrations due to historical deposition in fine muds
UK	III	Clyde_LochLongNorth_sh01	Mytilus edulis	56.19	-4.78																																					Elevated concentrations due to historical deposition in fine muds
UK	III	Clyde_LochRiddon_sh01	Mytilus edulis	55.97	-5.19																																					Concentrations should be low
UK	III	Clyde_LochRyan_sh01	Mytilus edulis	54.94	-5.07																																					Concentrations should be low
UK	III	Clyde_SeamillArdrossan_sh01	Mytilus edulis	55.65	-4.82																																					Concentrations should be low
UK	III	Clyde_SeamillArdrossan_sh02	Mytilus edulis	55.66	-4.83								↑				↑																									Concentrations should be low
UK	III	Clyde_SouthArran_fi01	Pleuronectes platessa	55.42	-5.21																																					Concentrations should be low

country	region	station	species	latitude	longitude	HG	CD	PB	CU	ZN	CB28	CB52	CB101	CB118	CB138	CB153	CB180	CB105	CB126	CB156	CB169	NAP	PA	ANT	DBT	FLU	PYR	BAA	CHR	BAP	BGHIP	ICDP	DDEPP	HCHA	HCB	HCHG	TCDD	CDF2T	TBTIN	BDE47	HBCD	National comments
UK	III	Hebrides_LochRoag_sh01	Mytilus edulis	58.2	-6.84																																					
UK	III	IrishSea_BalcaryPoint_fi01	Pleuronectes platessa	54.75	-4	↑	↑																																			
UK	III	IrishSea_Cumbria_fi01	Merlangius merlangus	54.5	-3.65																																					
UK	III	IrishSea_Cumbria_sh01	Mytilus edulis	54.49	-3.61		↓							↓	↓																											
UK	III	IrishSea_DeeNWales_fi01	Pleuronectes platessa	53.34	-3.28																																					
UK	III	IrishSea_DeeNWales_sh01	Mytilus edulis	53.34	-3.28																																					
UK	III	IrishSea_IrSGyreIntermed_fi02	Limanda limanda	54.07	-5.5																																					
UK	III	IrishSea_IrSIntermediateE_fi01	Limanda limanda	53.47	-3.36			↓																																		Reduction in lead concentrations in line with reduced inputs
UK	III	IrishSea_IrSIntermediateE_fi02	Limanda limanda	53.5	-3.69																																					
UK	III	IrishSea_IrSIntermediateE_fi03	Limanda limanda	54.51	-3.79																																					
UK	III	IrishSea_IrSIntermediateE_fi04	Limanda limanda	53.91	-3.41	↑																																				
UK	III	IrishSea_IrSOpenSea_fi04	Limanda limanda	54	-3.83																																					
UK	III	IrishSea_LiverpoolBay_fi02	Limanda limanda	53.53	-3.16		↑																																			
UK	III	IrishSea_LiverpoolBay_sh01	Mytilus edulis	53.47	-3.04																																					
UK	III	IrishSea_Mersey_fi01	Platichthys flesus	53.41	-3.01	↓																																				
UK	III	IrishSea_Mersey_sh01	Mytilus edulis	53.44	-3.04																																					
UK	III	IrishSea_MorecambeBay_fi01	Pleuronectes platessa	54.03	-3.1																																					
UK	III	IrishSea_MorecambeBay_sh01	Mytilus edulis	54.07	-3.17									↓	↓	↓																										
UK	III	IrishSea_NorthAnglesey_fi01	Limanda limanda	53.36	-4.14		↓	↓																																		
UK	III	IrishSea_Ribble_fi01	Platichthys flesus	53.73	-3																																					
UK	III	IrishSea_Ribble_sh01	Mytilus edulis	53.73	-3				↓																																	
UK	III	IrishSea_StrangfordLoughS_fi01	Mytilus edulis	54.47	-5.6																																					
UK	III	MinchMalin_Colonsay_fi01	Pleuronectes platessa	56.11	-6.08							↓	↓	↓	↓	↓																										
UK	III	MinchMalin_LittleLBroom_sh01	Mytilus edulis	57.9	-5.38																																					
UK	III	MinchMalin_LochCarronOutr_sh01	Mytilus edulis	57.32	-5.7																																					
UK	III	MinchMalin_LochCreran_sh01	Mytilus edulis	56.53	-5.39																																					
UK	III	MinchMalin_LochEishort_sh01	Mytilus edulis	57.18	-5.86																																					
UK	III	MinchMalin_LochEtive_sh01	Mytilus edulis	56.46	-5.29																																					
UK	III	MinchMalin_LochEwe_sh01	Mytilus edulis	57.84	-5.59																																					
UK	III	MinchMalin_LochLeurbost_sh01	Mytilus edulis	58.13	-6.45																																					
UK	III	MinchMalin_LochLinnheS_sh01	Mytilus edulis	56.58	-5.47																																					
UK	III	MinchMalin_LochLinnheS_sh03	Mytilus edulis	56.65	-5.32																																					
UK	III	MinchMalin_LochNevis_sh01	Mytilus edulis	56.98	-5.66																																					
UK	III	MinchMalin_LochScridain_sh01	Mytilus edulis	56.38	-6.06																																					
UK	III	MinchMalin_LochSpelve_sh01	Mytilus edulis	56.39	-5.76																																					
UK	III	MinchMalin_LochTorridon_sh01	Mytilus edulis	57.55	-5.53																																					
UK	III	MinchMalin_MeallGeal_fi01	Pleuronectes platessa	58.33	-6.15																																					
UK	III	MinchMalin_SoundOfShuna_sh01	Mytilus edulis	56.28	-5.58																																					
UK	III	MinchMalin_SoundOfSleat_sh01	Mytilus edulis	57.15	-5.8																																					
UK	III	MinchMalin_TheMinchNorth_fi02	Pleuronectes platessa	58.38	-5.97		↑																																			
UK	III	MinchMalin_WLochTarbert_sh01	Mytilus edulis	55.84	-5.45																																					
UK	III	Severn_SeInter_fi01	Limanda limanda	51.55	-4.59																																					
UK	III	Severn_Severn_fi01	Platichthys flesus	51.47	-3.02																																					
F	IV	Adour marégraphe	Crassostrea gigas	43.53	-1.51										↓	↓								↓									↓			↓						
F	IV	Baie d'Audierne - Penhors	Mytilus edulis	47.94	-4.41		↑			↑																↓							↓									
F	IV	Baie de l'Aiguillon	Crassostrea gigas	46.23	-1.16										↓																↑					↓						
F	IV	Barres de Pen Bron 1	Mytilus edulis	47.31	-2.51																																					
F	IV	Beg er Vil	Crassostrea gigas	47.69	-3.2			↓														↓				↑				↓												
F	IV	Bonne Anse - Palmyre	Crassostrea gigas	45.68	-1.17																																					High cadmium concentrations due to upstream mining activity in the past
F	IV	Bourgneuf - Coupelasse	Crassostrea gigas	47.01	-2.02					↓													↓													↓						
F	IV	Boyardville	Crassostrea gigas	45.96	-1.22																	↓												↓		↓						
F	IV	Cap Ferret	Crassostrea gigas	44.65	-1.24																															↓						
F	IV	Capbreton ouest	Mytilus edulis	43.66	-1.44																															↓						
F	IV	Châtelaillon	Crassostrea gigas	46.06	-1.09						↓	↓				↓																				↓						
F	IV	Ciboure - La Nivelle	Crassostrea gigas	43.38	-1.66									↓				↓										↓					↓			↓						
F	IV	Comprian	Crassostrea gigas	44.69	-1.08																					↑	↑	↑	↑							↓						
F	IV	Dagnas	Crassostrea gigas	45.87	-1.18													↓					↓											↓		↓						
F	IV	Hendaye - Chingoudy	Crassostrea gigas	43.36	-1.78									↓	↓	↓		↓										↓					↓			↓						
F	IV	La Fosse	Crassostrea gigas	45.48	-0.98	↓	↓		↓			↑	↑	↑		↑										↑			↑													High cadmium concentrations due to upstream mining activity in the past
F	IV	La Mouclière	Mytilus edulis	45.97	-1.1																	↓		↓												↓						
F	IV	La Potée de beurre	Mytilus edulis	47.7	-3.36		↓			↓														↑																		
F	IV	Le Croisic	Mytilus edulis	47.29	-2.5																																					
F	IV	Le Guilvin	Crassostrea gigas	47.57	-2.93			↓							↓	↓	↓	↓				↓				↑	↑	↑	↑							↓						
F	IV	Les Jacquets	Crassostrea gigas	44.72	-1.19																	↓										↑				↓						
F	IV	Les Palles	Crassostrea gigas	45.97	-1.14											↓	↓	↓																↓		↓						
F	IV	Mus de loup	Crassostrea gigas	45.8	-1.14						↓												↓											↓		↓						
F	IV	Noirmoutier - Gresse-loup	Crassostrea gigas	46.95	-2.15		↓	↓				↓																								↓						
F	IV	Pen Bé	Mytilus edulis	47.43	-2.47										↓	↓						↓														↓						
F	IV	Pointe de Chemoulin	Mytilus edulis	47.23	-2.3			↓		↓																																
F	IV	Pointe de Mousterlin	Mytilus edulis	47.84	-4.04				↓						↓		↓										↓					↓										
F	IV	Pointe er Fosse	Mytilus edulis	47.51	-2.65																	↓	↓													↓						
F	IV	Pontaillac	Crassostrea gigas	45.63	-1.05		↓	↓	↓	↓																					↑					↓						High cadmium concentrations due to upstream mining activity in the past
F	IV	Riec sur Belon	Crassostrea gigas	47.82	-3.7																		↓				↑															
F	IV	Rivedoux	Crassostrea gigas	46.16	-1.27										↓	↓						↓																				
F	IV	Roguedas	Crassostrea gigas	47.62	-2.79							↓										↓	↓								↑											
F	IV	Talmont	Crassostrea gigas	46.43	-1.64																	↓						↓				↓										
E	IV	MCASPA	Mytilus edulis	43.43	-3.79	↑					↑	↑	↑			↑								↓		↓																Close to a harbour
E	IV	MCASPE	Mytilus edulis	43.45	-3.75			↓			↑															↓	↓															
E	IV	MGAARO	Mytilus edulis	42.61	-8.86											↑																										
E	IV	MGACTC	Mytilus edulis	43.37	-8.39												↓	↓																								Close to a harbour
E	IV	MGAPOR	Mytilus edulis	42.4	-8.75		↑			↑		↑											↓						↓													
E	IV	MGAVSA	Mytilus edulis	42.22	-8.78		↑						↑		↑	↑	↑			↑			↓						↓													Close to an industrial area
E	IV	MPVBIA	Mytilus edulis	43.38	-3.01	↑	↓									↑																										Close to an industrial area

Appendix 3: Overview of results from monitoring stations for TBT-specific biological effects

Appendix 3 presents the CEMP assessment results for TBT-specific biological effects on a station by station basis according to the following classification scheme

Assessment class	*Nucella* VDSI	*Nassarius* VDSI	*Buccinum* PCI	*Neptunea* VDSI	*Littorina* ISI
A	< 0.3	< 0.3[1]	< 0.3[1]	< 0.3	
B	0.3 - <2.0			0.3 - <2.0	< 0.3[2]
C	2.0 - < 4.0	0.3 - <2.0	0.3 - <2.0	2.0 - <4.0[3]	
D	4.0 - 5.0	2.0 – 3.5	2.0 - <4.0		0.3 - < 0.5
E	>5.0[4]	> 3.5[4]	4.0[4]		0.5 - 1.2
F					> 1.2

country	region	station	species	latitude	longitude	nyear	VDSI
Norway	I	11G Brashavn	Nucella lapillus	69.9	29.74	6	
Norway	I	98G Svolvær området	Nucella lapillus	68.25	14.66	7	
Denmark	II	Anholt	Buccinum undatum	56.74	11.64	6	
Denmark	II	Hanstholm	Buccinum undatum	57.25	8.08	4	
Denmark	II	Hanstholm	Neptunea antiqua	57.25	8.08	4	
Denmark	II	Hirtshals N Skagerak	Buccinum undatum	57.78	10.17	5	
Denmark	II	Hirtshals N Skagerak	Neptunea antiqua	57.78	10.17	7	
Denmark	II	Hirtshals V	Buccinum undatum	57.67	9.08	5	
Denmark	II	Nordsøen	Buccinum undatum	56.75	6.17	6	
Denmark	II	Nordsøen	Neptunea antiqua	56.75	6.17	5	
Denmark	II	Skagen	Buccinum undatum	57.73	10.68	4	
Denmark	II	St. Middelgrund	Buccinum undatum	56.53	12.07	4	
Denmark	II	Thorsminde2	Buccinum undatum	56.4	8.07	3	
Denmark	II	Tisvildeleje	Buccinum undatum	56.22	11.91	5	
Denmark	II	Tisvildeleje	Neptunea antiqua	56.22	11.91	4	
France	II	Ambleteuse - Fort Mahon	Nucella lapillus	50.81	1.6	4	
France	II	Anse Saint-Martin	Nucella lapillus	49.71	-1.87	4	
France	II	Audresselles	Nucella lapillus	50.83	1.59	5	
France	II	Baie d Ecalgrain	Nucella lapillus	49.69	-1.94	4	
France	II	Beg an Fri	Nucella lapillus	48.7	-3.71	4	↓
France	II	Boulogne	Nucella lapillus	50.75	1.6	5	
France	II	Bruneval	Nucella lapillus	49.67	0.16	5	
France	II	Camaret	Nucella lapillus	48.29	-4.57	4	
France	II	Cap de la Chèvre	Nucella lapillus	48.18	-4.56	4	
France	II	Cap de la Hague	Nucella lapillus	49.73	-1.94	5	
France	II	Cap de la Hève 2	Nucella lapillus	49.51	0.12	5	
France	II	Cap Gris Nez	Nucella lapillus	50.87	1.59	5	↓
France	II	Cap Lévy	Nucella lapillus	49.7	-1.47	5	↓
France	II	Cran aux Boeufs	Nucella lapillus	50.85	1.58	4	↓
France	II	Digue Vieux port	Nucella lapillus	48.73	-3.98	5	
France	II	Etretat	Nucella lapillus	49.71	0.2	4	
France	II	Grainval	Nucella lapillus	49.75	0.35	4	
France	II	Granville	Nucella lapillus	48.85	-1.58	4	
France	II	Grève du Man	Nucella lapillus	48.7	-3.97	5	
France	II	Kerfissien	Nucella lapillus	48.69	-4.16	4	
France	II	larmor	Nucella lapillus	48.33	-4.45	5	
France	II	Le Becquet 2	Nucella lapillus	49.66	-1.55	5	
France	II	Le Caro	Nucella lapillus	48.34	-4.44	4	
France	II	Le Croquet	Nucella lapillus	49.56	0.09	4	
France	II	Le Fret	Nucella lapillus	48.29	-4.49	5	
France	II	Le Portel 2	Nucella lapillus	50.7	1.57	5	↓
France	II	Le Tronquay	Nucella lapillus	49.59	0.11	4	
France	II	Lomergat 2	Nucella lapillus	48.29	-4.35	5	
France	II	Luc sur Mer	Nucella lapillus	49.32	-0.34	4	
France	II	Mengant	Nucella lapillus	48.35	-4.58	4	
France	II	N.D. de la Mer	Nucella lapillus	50.84	1.59	5	↓
France	II	Perharidy	Nucella lapillus	48.73	-4.01	5	↓
France	II	Phare du Portzic	Nucella lapillus	48.36	-4.53	5	
France	II	Plage du Perzel	Nucella lapillus	48.34	-4.7	5	
France	II	Plouézoc'h	Nucella lapillus	48.68	-3.86	4	
France	II	Pointe aux oies	Nucella lapillus	50.79	1.61	4	
France	II	Pointe de Corsen	Nucella lapillus	48.41	-4.79	5	
France	II	Pointe de la Loge	Nucella lapillus	49.71	-1.42	5	
France	II	Pointe de Nacqueville	Nucella lapillus	49.68	-1.71	5	
France	II	Pointe de Querqueville	Nucella lapillus	49.68	-1.68	4	
France	II	Pointe du Brick	Nucella lapillus	49.67	-1.49	3	
France	II	Pointe St Mathieu	Nucella lapillus	48.33	-4.77	5	
France	II	Pordic	Nucella lapillus	48.59	-2.79	4	
France	II	Port des Flamands	Nucella lapillus	49.66	-1.58	5	
France	II	Port du Bloscon	Nucella lapillus	48.72	-3.96	5	↓
France	II	Porz ar Bascoun	Nucella lapillus	48.71	-3.97	4	
France	II	Pte du Toulinguet	Nucella lapillus	48.28	-4.62	5	↓
France	II	Roscanvel	Nucella lapillus	48.33	-4.53	5	

France	II	Rostiviec	Nucella lapillus	48.34	-4.33	5	
France	II	Saint-Andrieux	Nucella lapillus	49.55	0.08	5	
France	II	Saint Samson	Nucella lapillus	48.55	-4.74	5	↓
France	II	Sainte Barbe	Nucella lapillus	48.73	-3.96	5	
France	II	St Jouin Bruneval	Nucella lapillus	49.65	0.15	4	
France	II	Station Océano	Nucella lapillus	48.73	-3.99	5	
France	II	Tévenn	Nucella lapillus	48.72	-4.03	4	
France	II	Vaucottes - la Pucelle	Nucella lapillus	49.74	0.3	5	
France	II	Villerville 2	Nucella lapillus	49.4	0.13	5	
France	II	Wimereux nord	Nucella lapillus	50.77	1.61	4	
France	II	Wimereux sud	Nucella lapillus	50.77	1.6	5	↓
Norway	II	131G Lastad	Nucella lapillus	58.06	7.71	7	↓
Norway	II	15G Gåsøy (Ullerø)	Nucella lapillus	58.05	6.9	7	↓
Norway	II	220G Smørstakk	Nucella lapillus	59.25	5.35	4	
Norway	II	227G2 Flatskjær	Nucella lapillus	59.34	5.31	5	↓
Norway	II	22G Espevær (west)	Nucella lapillus	59.58	5.14	7	↓
Norway	II	36G Færder	Nucella lapillus	59.03	10.53	11	↓
Norway	II	71G Fugløyskjær	Nucella lapillus	58.98	9.81	7	
Norway	II	76G Risøy	Nucella lapillus	58.73	9.28	6	↓
Sweden	II	Brofjorden 1	Nassarius reticulatus	58.33	11.4	5	↓
Sweden	II	Brofjorden 2	Nassarius reticulatus	58.35	11.41	5	
Sweden	II	Brofjorden 3	Nassarius reticulatus	58.35	11.44	5	↓
Sweden	II	Brofjorden 4	Nassarius reticulatus	58.34	11.37	5	
Sweden	II	Brofjorden 5	Nassarius reticulatus	58.35	11.39	5	
Sweden	II	Brofjorden 6	Nassarius reticulatus	58.36	11.41	5	↓
Sweden	II	Brofjorden 7	Nassarius reticulatus	58.31	11.38	4	↓
Sweden	II	Burholmen 1	Nassarius reticulatus	58.9	11.12	3	
Sweden	II	Burholmen 2	Nassarius reticulatus	58.9	11.12	3	
Sweden	II	Burholmen 3	Nassarius reticulatus	58.9	11.12	3	
Sweden	II	Burholmen 4	Nassarius reticulatus	58.89	11.12	3	
Sweden	II	Burholmen 5	Nassarius reticulatus	58.89	11.12	3	
Sweden	II	Burholmen 6	Nassarius reticulatus	58.9	11.13	3	
Sweden	II	Göteborg 1	Nassarius reticulatus	57.61	11.76	5	
Sweden	II	Göteborg 2	Nassarius reticulatus	57.65	11.76	5	
Sweden	II	Göteborg 3	Nassarius reticulatus	57.66	11.8	5	↓
Sweden	II	Göteborg 4	Nassarius reticulatus	57.7	11.62	5	
Sweden	II	Göteborg 5	Nassarius reticulatus	57.7	11.7	5	↓
Sweden	II	Göteborg 6	Nassarius reticulatus	57.69	11.76	5	↓
Sweden	II	Kalvhagefjorden 1	Nassarius reticulatus	58.23	11.4	5	
Sweden	II	Kalvhagefjorden 2	Nassarius reticulatus	58.23	11.4	5	↓
Sweden	II	Kalvhagefjorden 3	Nassarius reticulatus	58.23	11.4	5	
The Netherlands	II	EEMSDLD	Littorina littorea	53.45	6.89	4	
The Netherlands	II	HOLLSKND	Littorina littorea	52.76	4.6	4	
The Netherlands	II	HOLLSKZD	Littorina littorea	52.21	4.38	4	↓
The Netherlands	II	KUSTZNE	Littorina littorea	53	4.67	4	
The Netherlands	II	OOSTSDMDN	Littorina littorea	51.57	3.96	4	
The Netherlands	II	WADDZWDGBD	Littorina littorea	53.09	5.07	4	
The Netherlands	II	WESTSDWT	Littorina littorea	51.4	3.71	4	
United Kingdom	II	EScotland_DonEstSouterHd_sh01	Nucella lapillus	57.14	-2.05	3	
United Kingdom	II	EShetland_BressaySound_sh04	Nucella lapillus	60.18	-1.15	3	
United Kingdom	II	MorayF_BanffAndMacduff_sh01	Nucella lapillus	57.67	-2.5	4	
United Kingdom	II	MorayF_BroraHiltonCadboll_sh01	Nucella lapillus	57.86	-3.77	3	
United Kingdom	II	MorayF_FindochtyKnockHead_sh01	Nucella lapillus	57.69	-2.83	3	
United Kingdom	II	MorayF_PortgordonFindocht_sh01	Nucella lapillus	57.68	-2.95	3	
United Kingdom	II	MorayF_PortgordonFindocht_sh02	Nucella lapillus	57.68	-2.97	3	
United Kingdom	II	MorayF_Rosehearty_sh01	Nucella lapillus	57.7	-2.05	3	
United Kingdom	II	MorayF_Rosehearty_sh02	Nucella lapillus	57.7	-2	4	
United Kingdom	II	MorayF_Rosehearty_sh03	Nucella lapillus	57.68	-1.94	3	
United Kingdom	II	NScotland_ScapaFlow_sh03	Nucella lapillus	58.84	-3.13	4	
United Kingdom	II	WShetland_SullomVoe_sh01	Nucella lapillus	60.49	-1.31	10	
United Kingdom	II	WShetland_SullomVoe_sh02	Nucella lapillus	60.48	-1.31	10	↓
United Kingdom	II	WShetland_SullomVoe_sh03	Nucella lapillus	60.46	-1.32	10	↓
United Kingdom	II	WShetland_SullomVoe_sh04	Nucella lapillus	60.4	-1.38	10	
United Kingdom	II	WShetland_SullomVoe_sh05	Nucella lapillus	60.42	-1.35	10	↓

United Kingdom	II	WShetland_SullomVoe_sh06	Nucella lapillus	60.43	-1.34	10	↓
United Kingdom	II	WShetland_SullomVoe_sh07	Nucella lapillus	60.47	-1.3	10	↓
United Kingdom	II	WShetland_SullomVoe_sh08	Nucella lapillus	60.49	-1.28	10	
United Kingdom	II	WShetland_YellSound_sh01	Nucella lapillus	60.63	-1.31	8	
United Kingdom	II	WShetland_YellSound_sh02	Nucella lapillus	60.58	-1.32	8	↓
United Kingdom	II	WShetland_YellSound_sh03	Nucella lapillus	60.55	-1.32	10	↓
United Kingdom	II	WShetland_YellSound_sh04	Nucella lapillus	60.53	-1.36	10	
United Kingdom	II	WShetland_YellSound_sh05	Nucella lapillus	60.51	-1.33	10	↓
United Kingdom	II	WShetland_YellSound_sh06	Nucella lapillus	60.46	-1.19	8	
United Kingdom	II	WShetland_YellSound_sh07	Nucella lapillus	60.48	-1.1	8	↓
United Kingdom	II	WShetland_YellSound_sh08	Nucella lapillus	60.48	-1.16	8	↓
United Kingdom	II	WShetland_YellSound_sh09	Nucella lapillus	60.51	-1.19	10	↓
United Kingdom	II	WShetland_YellSound_sh10	Nucella lapillus	60.5	-1.27	10	
United Kingdom	II	WShetland_YellSound_sh11	Nucella lapillus	60.58	-1.2	7	
United Kingdom	II	WShetland_YellSound_sh12	Nucella lapillus	60.64	-1.18	7	↓
United Kingdom	III	Clyde_KilbrannanSound_sh01	Nucella lapillus	55.76	-5.35	3	
United Kingdom	III	Clyde_MullOfKintyreSE_sh01	Nucella lapillus	55.31	-5.66	3	
United Kingdom	III	IrishSea_AuchencairnBay_sh01	Nucella lapillus	54.87	-3.8	3	
United Kingdom	III	IrishSea_LuceBay_sh01	Nucella lapillus	54.67	-4.88	3	
United Kingdom	III	IrishSea_WigtownBay_sh01	Nucella lapillus	54.78	-4.12	3	
United Kingdom	III	IrishSea_WigtownBay_sh03	Nucella lapillus	54.7	-4.36	3	
United Kingdom	III	MinchMalin_Ardnamurchan_sh01	Nucella lapillus	56.73	-6.23	3	
United Kingdom	III	MinchMalin_LochCarronOutr_sh02	Nucella lapillus	57.33	-5.7	3	
United Kingdom	III	MinchMalin_LochCraignish_sh02	Nucella lapillus	56.11	-5.57	3	
United Kingdom	III	MinchMalin_LochEwe_sh02	Nucella lapillus	57.87	-5.69	3	
United Kingdom	III	MinchMalin_LochInchard_sh01	Nucella lapillus	58.45	-5.05	3	
United Kingdom	III	MinchMalin_LochInver_sh02	Nucella lapillus	58.15	-5.25	3	
United Kingdom	III	MinchMalin_LochInver_sh04	Nucella lapillus	58.14	-5.26	3	
United Kingdom	III	MinchMalin_LochLaxford_sh02	Nucella lapillus	58.39	-5.11	3	
United Kingdom	III	MinchMalin_LochLinnheS_sh02	Nucella lapillus	56.65	-5.32	3	
United Kingdom	III	MinchMalin_LochTorridon_sh02	Nucella lapillus	57.58	-5.8	3	
United Kingdom	III	MinchMalin_SoundOfKerrera_sh01	Nucella lapillus	56.39	-5.52	3	
United Kingdom	III	MinchMalin_SoundOfShuna_sh02	Nucella lapillus	56.15	-5.6	3	
United Kingdom	III	MinchMalin_SoundOfSleat_sh02	Nucella lapillus	57.01	-5.82	3	
United Kingdom	III	MinchMalin_SoundOfSleat_sh03	Nucella lapillus	57.21	-5.63	3	
United Kingdom	III	MinchMalin_SoundOfSleat_sh04	Nucella lapillus	57.01	-5.82	3	
United Kingdom	III	MinchMalin_SoundOfSleat_sh05	Nucella lapillus	56.99	-5.83	3	
United Kingdom	III	MinchMalin_TheMinchE_sh01	Nucella lapillus	58.07	-5.46	3	
United Kingdom	III	MinchMalin_TheMinchN_sh01	Nucella lapillus	58.32	-5.16	3	
United Kingdom	III	MinchMalin_TheMinchN_sh02	Nucella lapillus	58.48	-5.11	3	
United Kingdom	III	MinchMalin_TheMinchNE_sh01	Nucella lapillus	58.24	-5.4	3	
France	IV	Beg Meil	Nucella lapillus	47.86	-3.97	5	
France	IV	Bénodet	Nucella lapillus	47.86	-4.09	4	
France	IV	Concarneau	Nucella lapillus	47.87	-3.92	5	
France	IV	Gâvres	Nucella lapillus	47.7	-3.35	4	
France	IV	Kerpape	Nucella lapillus	47.7	-3.41	5	↓
France	IV	La Bernerie	Nucella lapillus	47.08	-2.04	4	
France	IV	La Normandeliere	Nucella lapillus	46.62	-1.86	3	
France	IV	Larmor Plage	Nucella lapillus	47.71	-3.39	5	
France	IV	Le Guilvinec	Nucella lapillus	47.79	-4.29	5	
France	IV	Lesconil	Nucella lapillus	47.79	-4.22	4	
France	IV	Locqueltas	Nucella lapillus	47.7	-3.38	4	
France	IV	Mousterlin	Nucella lapillus	47.85	-4.04	4	
France	IV	Plage de la Courance	Nucella lapillus	47.24	-2.27	5	
France	IV	Pointe de Courégan	Nucella lapillus	47.71	-3.47	4	
France	IV	Pointe de Ker-Biscar	Nucella lapillus	47.7	-3.44	4	
France	IV	Pointe de Langoz	Nucella lapillus	47.83	-4.16	5	
France	IV	Pointe de Trevignon	Nucella lapillus	47.79	-3.85	4	↓
France	IV	Pointe du Gâvres est	Nucella lapillus	47.69	-3.36	5	
France	IV	Pointe du Talut	Nucella lapillus	47.7	-3.46	5	
France	IV	Pointe Jument	Nucella lapillus	47.84	-3.9	5	
France	IV	Port-Louis	Nucella lapillus	47.71	-3.36	4	
France	IV	Quiberon	Nucella lapillus	47.55	-3.13	5	

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