



# Status and Trends Polychlorinated Biphenyls (PCB) in Sediment



MSFD Descriptor: 8 - Concentration of contaminants  
 MSFD Criterion: 8.1 - Concentration of contaminants

**Key Message** Polychlorinated biphenyls (PCBs) were banned in many countries in the mid-1980s. Since then, while local problems remain, mean PCB concentrations in sediment have decreased in three of five OSPAR sub-regions. With the exception of the most toxic congener (CB118), concentrations in sediment are below the level at which they could present an unacceptable risk to the environment

## Background

The OSPAR Hazardous Substances Strategy has the ultimate aim of achieving concentrations in the marine environment near background values for naturally occurring substances and close to zero for synthetic substances.

Polychlorinated biphenyls (PCBs) are man-made chemical compounds that were banned in the mid-1980s owing to concerns about their toxicity, persistence and potential to bioaccumulate in the environment. Since the 1980s, global action has resulted in big reductions in releases, and remaining stocks have been phased out. However, despite European and global action, releases continue through diffuse emissions to air and water from building sites and industrial materials. Remaining sources include electrical and hydraulic equipment containing PCBs, waste disposal, redistribution of historically contaminated marine sediments and by-products of thermal and chemical industrial processes.

PCBs do not break down easily in the environment and are not readily metabolised by humans or animals. They are extremely toxic to animals and humans. A sub-group of PCBs is 'dioxin-like', meaning they are more toxic than other PCB congeners.

Seven PCB congeners were selected as indicators of wider PCB contamination due to their relatively high concentrations and toxic effects.

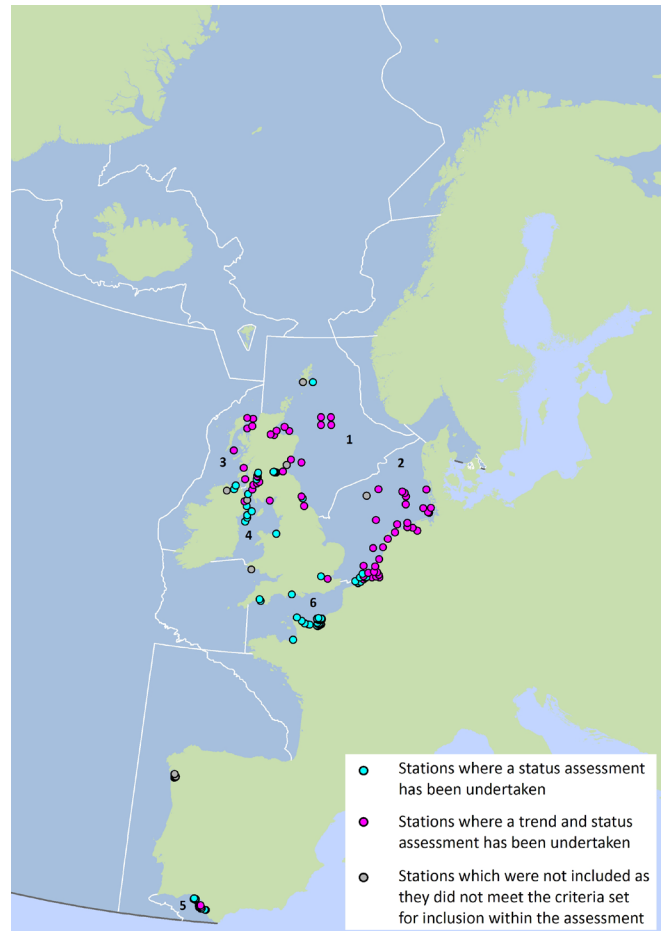


Figure 1: Monitoring sites used to assess PCB concentrations in sediment by OSPAR contaminants assessment area (white lines) determined by hydrogeographic principles and expert knowledge, not OSPAR internal boundaries.

## Results

Polychlorinated biphenyl (PCB) concentrations are measured in sediment samples taken annually (or every few years) from monitoring sites throughout much of the Greater North Sea, Celtic Seas, Iberian Coast and Bay of Biscay (Figure 1).

The time series used to inform this assessment started in 1995. The data are used to investigate trends in PCB concentration over the period 1995–2015 and to compare concentrations against two sets of assessment values: Background Assessment Concentrations (BACs) and Environmental Assessment Criteria (EACs). Where concentrations are below the EAC they should not cause chronic effects in sensitive marine species and so should present no significant risk to the environment. BACs are used to assess whether concentrations are close to zero for man-made substances, the ultimate aim of the OSPAR Hazardous Substances Strategy.

### Trend Assessment

PCB concentrations are decreasing in the Northern North Sea, Southern North Sea and Gulf of Cadiz. In contrast, concentrations show no statistically significant change in the Irish and Scottish West Coast and the Irish Sea (Figure 2).

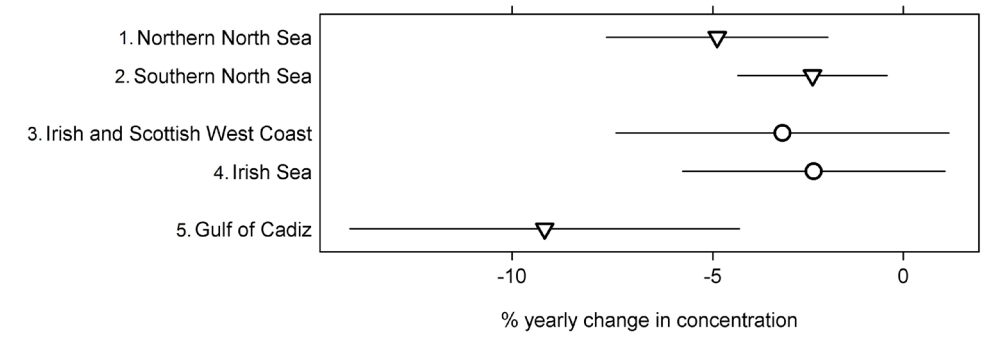
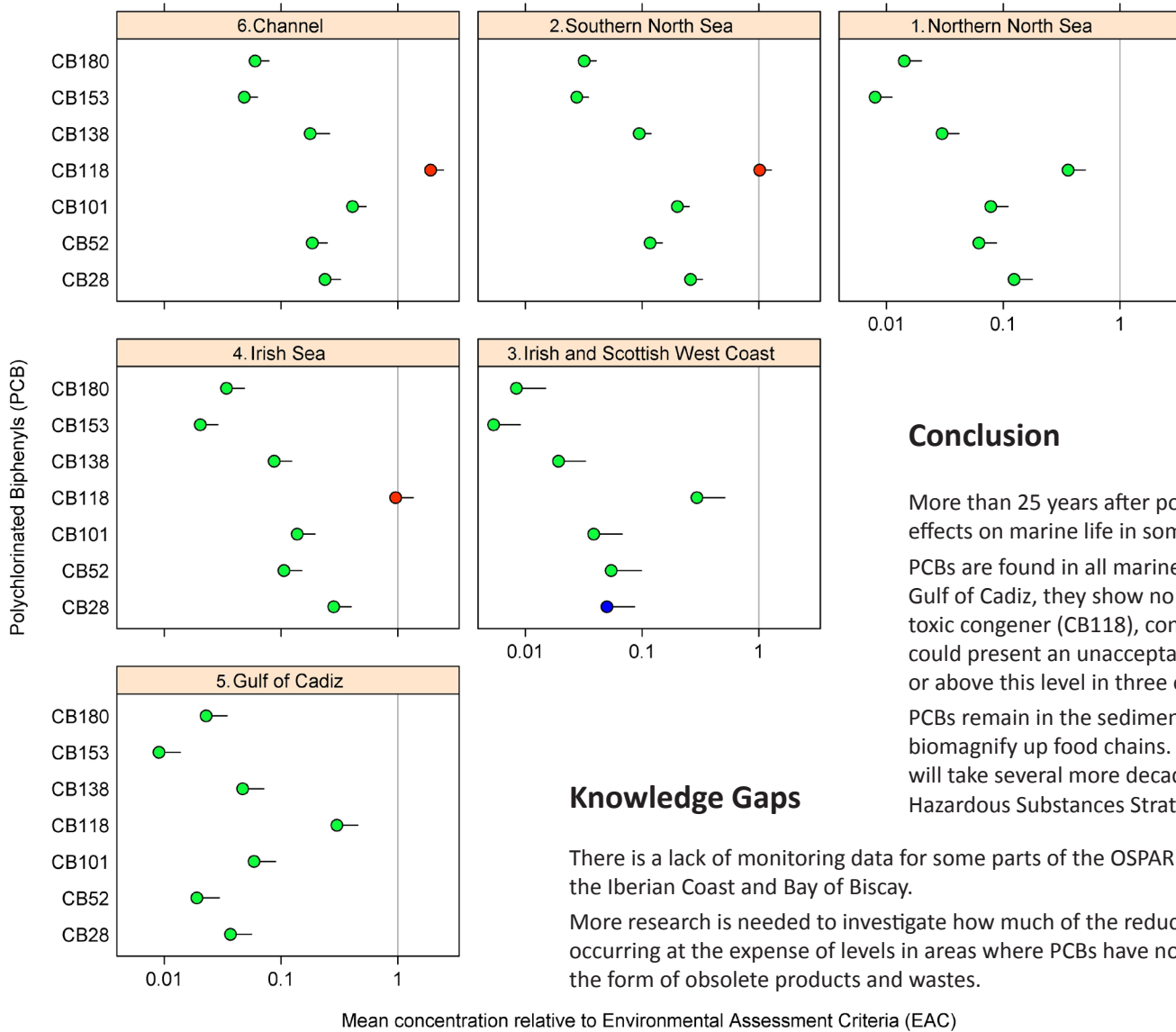


Figure 2: Percentage yearly change in PCB concentration in sediment (1995–2015) in each OSPAR sub-region. No statistically significant ( $p < 0.05$ ) change in mean concentration (circle), mean concentration is significantly decreasing (downward triangle). Missing regions have too few monitoring sites for an assessment



## Results cont...

### Status Assessment

Concentrations in sediment for six out of seven PCB congeners are below the EAC in all OSPAR sub-regions (**Figure 3**) within the period 1995–2015. However, there are differences between congeners, with concentrations in sediment for one of the most toxic PCBs (CB118) close to or above the EAC in three sub-regions (English Channel, Southern North Sea and Irish Sea), indicating possible adverse effects on marine life in these areas. In the Irish and Scottish West Coast, Northern North Sea and Gulf of Cadiz sub-regions, CB118 concentrations in sediment are below the EAC, but still above the BAC. CB28 in the Irish and Scottish West Coasts sub-region is the only measured concentration in sediment below the BAC. There is high confidence in the assessment and sampling methodology and high confidence in the data used.

## Conclusion

More than 25 years after polychlorinated biphenyls (PCBs) were banned they may still be causing adverse effects on marine life in some parts of the OSPAR Maritime Area.

PCBs are found in all marine sediments. While concentrations are decreasing in the Greater North Sea and Gulf of Cadiz, they show no statistically significant change in the Celtic Seas. With the exception of the most toxic congener (CB118), concentrations of all PCB congeners in sediment are below the level at which they could present an unacceptable risk to the environment. Mean concentrations of CB118 in sediment are at or above this level in three of the six sub-regions assessed.

PCBs remain in the sediment for long periods and have the potential to accumulate in biota and biomagnify up food chains. Due to past industrial uses and the persistence of PCBs in the environment it will take several more decades before concentrations are close to zero, the ultimate aim of the OSPAR Hazardous Substances Strategy.

## Knowledge Gaps

There is a lack of monitoring data for some parts of the OSPAR Maritime Area, particularly in Arctic Waters, some parts of the Celtic Seas and the Iberian Coast and Bay of Biscay.

More research is needed to investigate how much of the reduction in polychlorinated biphenyl (PCB) concentrations in areas of former use is occurring at the expense of levels in areas where PCBs have not been commercially produced and used, such as Africa, which receive PCBs in the form of obsolete products and wastes.

Figure 3: Mean PCB concentrations in sediment by congener (1995–2015) in each OSPAR sub-region relative to the EAC (with 95% upper confidence limits) where value of 1 means that the mean concentration equals the EAC. Blue: mean concentration statistically significantly ( $p < 0.05$ ) below the congener's Background Assessment Concentration (BAC). Green: mean concentration statistically significantly above the congener's BAC but below the Environmental Assessment Criteria (EAC). Red: mean concentration not statistically significantly below the EAC