



Trends of Organotin in Sediments in the Southern North Sea

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



Key Message Following bans on tributyltin, mean concentrations in sediment have measurably reduced in the Southern North Sea and are very low or undetectable elsewhere

Background

Tributyltin (TBT) and other organotin compounds are contaminants found globally, throughout the marine environment. Organotins have many applications, such as coatings, anti-odour/anti-fungal additives, pesticides, biocides in marine antifoulant paints, catalysts, wood treatments and preservatives. Extensive use in antifouling paints on watercraft (**Figure 1**) led to the widespread distribution of TBT in water, sediment and biota.

High concentrations of TBT in sediment are associated with commercial ports, harbours, shipyards, shipping lanes and marinas (**Figure 2**).

Organotins are toxic to many marine organisms even at very low concentrations. High concentrations can cause shell deformities in oysters and impair reproduction. For example, some female marine snails develop male sexual characteristics due to hormone disruption by TBT. This has led to widespread declines in some snail populations (Imposex Indicator Assessment). However, the situation is slowly improving following legislation banning the use of TBT in antifoulant paints. The OSPAR Hazardous Substances Strategy aims to achieve concentrations in the marine environment close to zero for man-made synthetic substances. TBT use was banned in the 1980s for vessels less than 25 m, and has been prohibited on all vessels and offshore installations since 2008. However, inputs of TBT to the aquatic environment are likely to continue, from countries not

in compliance with the ban and from disused vessels or installations. Inputs of TBT may continue through the redistribution of already contaminated sediments. Wastewater treatment plants and landfills are another potential source of TBT to the marine environment, as organotin compounds are sometimes applied to consumer products.

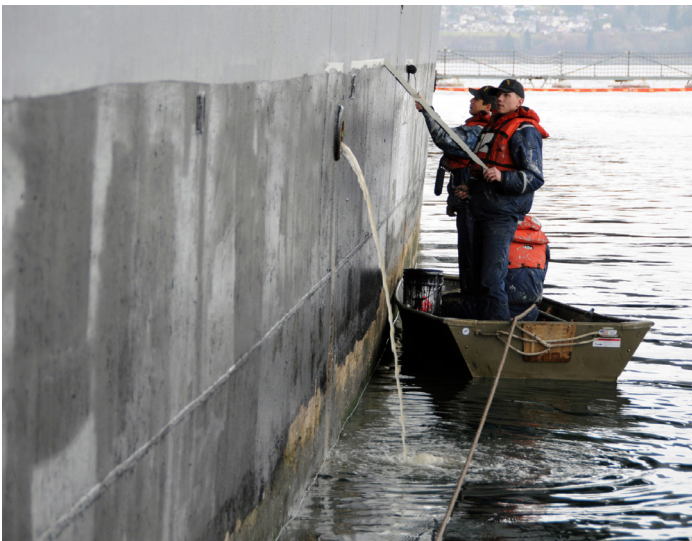


Figure 1: TBT has been used as an antifoulant in paint on ship hulls © US Navy



Figure 2: High concentrations of TBT in sediment are normally associated with commercial ports, harbours, shipyards, shipping lanes and marinas

Results

Most countries have stopped monitoring organotins in sediment, especially at offshore locations, because concentrations are now often so low that they are below the limit of detection. This means that a reliable assessment of organotin in sediment could only be carried out in the southern North Sea.

There are no environmental assessment values established for organotins in sediment. This means it is not possible to assess the environmental significance of the concentrations observed. In the Celtic Seas, data are only available for one monitoring site in the Irish Sea and one monitoring site in the Irish and Scottish West Coast OSPAR sub-regions. TBT concentrations at both monitoring sites are very low.

Results cont...

The Southern North Sea is the only OSPAR sub-region for which trend information is available for three organotin compounds (**Figure 3**): monobutyltin, dibutyltin and tributyltin. Trends in average sediment concentration for all three compounds in the Southern North Sea are decreasing, but still detectable. Annual average decreases are between 3.1% and 13.6%. These downward trends are also reflected in the reduction in biological effects associated with TBT exposure, which has been observed across the entire area assessed (Imposex Indicator Assessment). This indicates that the bans on the use of tributyltin are already having a positive effect on the marine environment.

There is high confidence in the assessment and sampling methodology and high confidence in the data used.

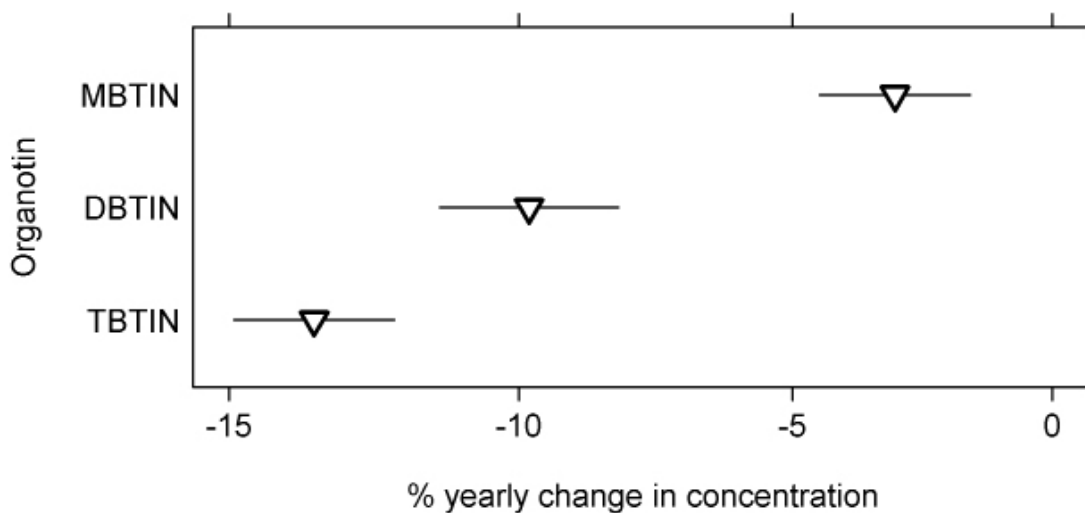


Figure 3: Percentage annual change in organotin concentrations in sediment by compound (with 95% confidence limits) in the Southern North Sea. Downward triangle: the mean concentration is statistically significantly ($p < 0.05$) decreasing, MBTIN: monobutyltin, DBTIN: dibutyltin, TBTIN: tributyltin

Conclusion

Almost a decade after the use of organotins was prohibited in antifouling paints on ships, concentrations detected in marine sediments have fallen considerably, and are often below the limit of detection. As a result, only a few countries continue to monitor organotin in sediment.

The Dutch part of the Southern North Sea is the only area with sufficient monitoring data for an assessment. Data for this area show a decreasing trend in organotin concentrations in sediment.

However, because there are no background concentrations or assessment criteria for organotin concentrations in sediment, the ecological effects of organotin in sediment have not been established. Most countries have opted to monitor the biological effects of organotin pollution, rather than tributyltin itself (Imposex Indicator Assessment).

Knowledge Gaps

Although direct inputs of TBT to the marine environment have been banned, non-pesticidal use of TBT is still ongoing in some countries and thus further monitoring of TBT concentrations in the marine environment is warranted.

As there are no background concentrations or assessment criteria for organotin concentrations in sediment, OSPAR experts should consider establishing these.

This document was published as part of OSPAR's Intermediate Assessment 2017. The full assessment can be found at www.ospar.org/assessments