

Organic tin compounds

Organic tin compounds known to be environmental pollutants comprise mono-, di-, tri-, and tetrabutyl and triphenyltin compounds. Tributyltin (TBT) was used from the 1960s onwards in the marine environment as a biocide in antifouling coatings on underwater structures, ships and other craft. TBT has also been used for wood coatings and as an antiseptic agent in carpets and canvas. Disubstituted organotins, such as dibutyltin and dioctyltin, are used in high volumes in consumer products and as stabilisers in plastic. Triphenyltin (TPT) has been used as an agricultural pesticide.

What is the problem?

Tributyltin compounds are considered the most hazardous of all tin compounds and several studies in various parts of the world oceans have shown their effects: shell malformations of oysters, imposex in marine snails, reduced resistance to infection (e.g. in flounder), and effects on the human immune system. The effect of triphenyltin seems to be the same. Other organic tin compounds (e.g. mono- and dibutyltins) are considered less harmful for the marine environment. The main source of tributyltin is leaching from coatings of sea vessel hulls and from underwater structures. Shipyards, docking activities and disposal of dredge spoil are additional sources. The main source of TPT is from agriculture.

What has been done?

Marketing of TBT for use on small vessels was banned in the mid-1980s, as unwanted effects on marine snails and bivalves emerged. Use of TBT as a marine antifouling agent is currently being phased out through the 2001 International Convention on the Control of Harmful Anti-fouling Systems on Ships (AFS Convention), which banned the application of TBT-based antifouling paints for use on ship hulls. The Convention entered into force in 2008 but has previously been implemented through EU Regulation (EC) No 782/2003. Use of TBT for wood treatment has also been phased out. The remaining commercial uses of organic tin compounds and the use as pesticide have ceased to a large extent in the OSPAR area. Earlier, OSPAR measures have targeted the retail sale of organotin paints and their use on pleasure boats, fish net cages and sea going vessels, and the losses of TBT from docking activities to the aquatic environment.

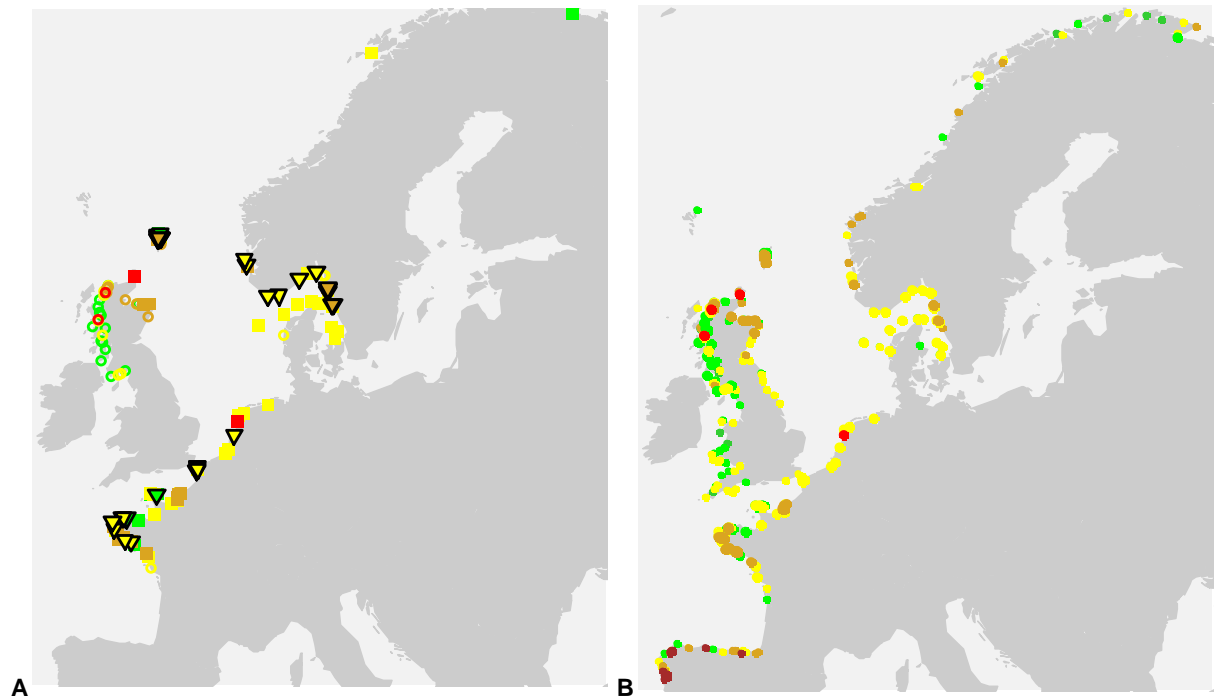
Did it work?

Releases of TBT and other organic tin compounds to water still continue. In the absence of sufficient data, quantification of releases is difficult and no statements on trends can be made. Yet, it is expected that the ban on uses of TBT as antifoulant and biocide in the EU and on ships worldwide has resulted in reduced releases. It is expected that, locally, ship docks removing ship coatings containing TBT still continue to be a source of TBT pollution. Redistribution and re-suspension of TBT and dibutyltin (DBT) through dumping of contaminated sediments, especially from harbours, can add to the pollution in other areas and the availability of those substances to living organisms in the marine environment. Releases of organic tin compounds, such as disubstituted compounds, from industrial processes and products also continue.

How does this affect the quality status?

Since 2003, monitoring of imposex and related effects of TBT in marine snails in OSPAR Regions I (Arctic Waters), II (Greater North Sea), III (Celtic Seas) and IV (Bay of Biscay/Iberian Coast) has been monitored regularly. Monitoring data for 1998 – 2007 show that the effect of the measures taken has been initially positive. A reduction in imposex has been evident at the vast majority of location monitored; none of these locations showed a significant upward trend in the level of imposex.

Although the overall status is improving, marine snails still show pollution effects from TBT over the large parts of the OSPAR area, especially Regions II, III and IV. There is a clear relationship between shipping and imposex with levels high in the vicinity of busy shipping lanes and some larger harbours (e.g. Rotterdam, Clydeport, Vigo). The situation is markedly better where there is less large vessel traffic e.g. the west coast of Scotland and in the northern part of Norway. However, even in these areas, harbours can have a detectable impact, highlighting the importance of local factors.



(A) Significant downward trends (triangle) of imposex in the period 1998 – 2007; circles indicate insufficient data for trend analysis. (B) Status of imposex measurements; large symbols = 3 or more years of data; smaller symbols = 1 or 2 years of data. The colour coding refers to the six assessment classes for TBT: dark and light green = good status; light and dark yellow = moderate status; light and dark red = bad status.

Electronic navigator to OSPAR publication sources (publication number):

- Status and trend of marine chemical pollution (395/2009)
- Trends and concentrations in marine sediments and biota (390/2009)
- Towards the cessation target (354/2008)
- Background Document for organotin (103/2000) (as updated)