PCBs still sticking around

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Due to their ability to accumulate in fatty tissues, persistent organic pollutants (POPs) are an issue
of growing environmental concern (Jones & de Voogt, 1999). Although long-term monitoring
programs have been initiated to quantify marine POP concentrations, the data collected are often
scattered in space and time, hampering a thorough environmental risk assessment of these
chemicals (Lohmann et al., 2007). In this paper, we used generalized additive mixed models
(GAMMs) to predict spatiotemporal trends of POP concentrations from a fragmentary dataset. Using
this method, trends were extracted from a large, but incomplete set (n = 1833) of polychlorinated
biphenyl (PCB) concentrations measured between 1991 and 2010 in the sediment of the Belgian
Continental Zone (BCZ) and the Western Scheldt Estuary. A model including time (year and month)
and geographical area, periodicity and the octanol-organic carbon partitioning coefficient (Koc) as
predictor variables explained 47% of the observed variability. The inferred spatiotemporal time
trends indicated that the concentrations in 1991 were on average two to four times higher than
today (0.56 ± 0.46ng/g), which is a similar decrease compared to other coastal and estuarine
regions (Webster et al., 2011). However, in the Scheldt Estuary, PCB concentrations were five times
higher than in the BCZ and did not show this decrease but instead remained stable around 2.79 ±
3.99ng/g. These results demonstrate that international efforts to cut down emissions of persistent
and toxic POPs have been effective to reduce concentrations in open water ecosystems but had little
to no effect in intensely urbanized areas. A possible explanation for this difference is the proximity
of the Antwerp harbor suggesting that the most upstream parts of our study area may be subject to
industrial inputs. Alternatively, the historically accumulated PCBs in the Western Scheldt Estuary
sediment may currently function as a secondary source to the surface water and biota.

References
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