

# Did the use of TBT-based antifouling paints cause severe damage to the common shrimp (*Crangon crangon*) population of the Southern Bight?

Verhaegen Yves<sup>1,2</sup>, Koen Parmentier<sup>1</sup>, Kris Cooreman<sup>1</sup>, Wim de Coen<sup>3</sup> and Guy Smagghe<sup>4</sup>

<sup>1</sup> Institute for Agricultural and Fisheries Research, Animal Sciences Unit, Fisheries Department, Ankerstraat 1, B-8400 Ostend, Belgium  
E-mail: [Yves.Verhaegen@ilvo.vlaanderen.be](mailto:Yves.Verhaegen@ilvo.vlaanderen.be)

<sup>2</sup> Laboratory of Agrozoology, Faculty of Bioscience Engineering, Ghent University, Coupure Links 653, B-9000 Ghent, Belgium

<sup>3</sup> Laboratory of Ecophysiology, Biochemistry and Toxicology, Department of Biology, University of Antwerp, Groenenborgerlaan 171, B-2020 Antwerp, Belgium

The organometal tributyltin (TBT) is a potent biocide that has been used ubiquitously in antifouling paints since the 1970s. The clearly visible adverse effects (i.e. imposex and intersex) on marine gastropod populations urged the EU and IMO to adopt measures to reduce and finally ban the use of TBT-based antifouling paints on ships in 2003. Along the coast of the Southern North Sea, the common shrimp (*Crangon crangon*) is a famous regional delicacy which dominates the inshore benthic communities. Landing and effort data of the Belgian fishing fleet (Redant and Polet, 2002) reveal that the local shrimp stock has strongly decreased since the 1970s until 2003, hampering the viability of the Belgian shrimping fleet. Several potential causes have been proposed, of which a decreased areal of nursing grounds (i.e. marshes and creeks) seemed the most likely. But surprisingly, recent landing and effort data reveal that the local shrimp stock quickly recovered since 2007, reaching a historically high level in 2010. Coincidentally, environmental TBT concentrations had been strongly decreasing during the last decennium, mainly due to the TBT ban. *In vitro* research reveals that TBT interferes in the signaling of shrimp nuclear receptors (Verhaegen *et al.*, 2011), which are the molecular targets of several vital hormones (e.g. steroids). Unfortunately, end-point physiological effects of the environmental TBT concentrations cannot be determined through the classical approach (i.e. long term laboratory exposure) due to a poor survival of shrimp under captivity. Physiological effects however are regulated by gene expression, and modern molecular techniques such as microarrays allow the quantification of gene expression. Hence, short term laboratory exposure at environmental TBT concentrations, and subsequent gene expression profiling using a shrimp specific microarray, (should) reveal that TBT indeed had a significant impact on shrimp endocrinology prior to the TBT-ban in 2003.

## References

- Redant F. and H. Polet. 2002. De garnaalvisserij: een kustgebruikersgroep met kopzorgen. De Grote Rede 5:13-17.
- Verhaegen Y., K. Parmentier, L. Swevers, E. Renders, P. Rougé, W. De Coen, K. Cooreman and G. Smagghe . 2011. The heterodimeric ecdysteroid receptor complex in the brown shrimp *Crangon crangon*: EcR and RXR isoform characteristics and sensitivity towards the marine pollutant tributyltin. General and Comparative Endocrinology 172(1):158-169.