



## Range of chemicals pose risk of acute ecotoxicity in German rivers

**Research in four German rivers** indicates that several organic compounds pose a risk of acute toxic effects on invertebrates. Some of these compounds are already priority substances under the EU Water Framework Directive<sup>1</sup> (WFD); others could warrant designation at least as river basin specific pollutants in the German River Basin Management Plans.

**The Water Framework Directive** sets targets for Member States to establish good chemical and ecological status of surface waters by 2015. Chemical status relies on complying with standards set for 33 priority substances identified in 2001 as posing a risk to or via the aquatic environment at EU level. The levels of other chemicals identified by Member States as posing a risk at national level, known as river basin specific pollutants, contribute to the assessment of ecological status.

The study in Germany is one of the most comprehensive long-term research studies on the concentrations and ecological risks of organic (carbon containing) pollutants in large rivers in Europe. The concentrations of 331 compounds were analysed in four of the largest rivers in North Germany over the ten years from 1994-2004. Compounds included polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs) and pesticides. Samples were taken from several sites along each river and ecological risk was assessed using existing knowledge of the levels at which these compounds, or compounds with similar structures, become acutely toxic to three different species: fathead minnow (*Pimephales promelas*), water flea (*Daphnia magna*) and green alga (*Pseudokirchneriella subcapitata*).

24 compounds were detected in more than 40 per cent of the water samples. PAHs, the most commonly detected chemical group, were found in 43 per cent of samples. Toxic impacts on the three species chosen as markers of ecological risk were estimated based on the range of concentrations of different chemicals found in the rivers. In general, levels of chemicals found in rivers were of greater risk to the water flea than to the other two species. Organophosphate insecticides posed the greatest risk to the water flea and herbicides to the green alga. Pesticide levels were also found to pose a risk to fathead minnow, although to a lesser extent than for the other two species.

The researchers outlined a number of limitations of the study. Firstly, concentrations were derived from monthly sampling. This technique does not necessarily assess maximum concentrations, especially for compounds whose quantity in water varies over time, such as pesticides. The study did not consider chronic effects or the effects of mixtures of compounds, nor did it cover all existing organic pollutants.

The study showed that 13 out of the 24 compounds most frequently detected in the rivers are listed as priority substances under the WFD. However only 2 of the compounds with the greatest estimated risk of toxic impact on the tested species were priority substances. These were alachlor and diuron. The researchers acknowledge that not all the priority substances were included in the study and that the protection goals for priority substances include goals other than ecotoxicological risk. They suggest that the standards for some priority substances could be reviewed to consider the risk to all trophic groups. The study highlights that organic pollutants, and especially pesticides, may play a greater role in determining the ecological conditions of rivers than is currently acknowledged. The researchers propose that many of the chemicals identified in the study be included in the relevant lists of river basin specific pollutants, and that a similar approach to that used in the study be used to identify other such pollutants.

1. See: [http://ec.europa.eu/environment/water/water-framework/index\\_en.html](http://ec.europa.eu/environment/water/water-framework/index_en.html)

**Source:** Schäfer, R.B., von der Ohe, P.C., Kühne *et al.* (2011) Occurrence and Toxicity of 331 Organic Pollutants in Large Rivers of North Germany over a Decade (1994 to 2004) *Environmental Science & Technology*. 45:6167-6174.

**Contact:** [schaefer-ralf@uni-landau.de](mailto:schaefer-ralf@uni-landau.de)

**Theme(s):** Chemicals, Water

The contents and views included in Science for Environment Policy are based on independent, peer-reviewed research and do not necessarily reflect the position of the European Commission.

To cite this article/service: "Science for Environment Policy": European Commission DG Environment News Alert Service, edited by SCU, The University of the West of England, Bristol.