



Testing ecological toxicity in rivers

Water quality in rivers is commonly classified according to its physical and chemical properties, but this may not fully describe its biological health. Polish researchers have tested a new method of water assessment, which looks at the toxicity to organisms of not just water, but also sediment and floodplain soil samples. This provides a more complete picture of a river's health and may help river managers meet the requirements of the EU Water Framework Directive¹.

Pollutants are carried in both river water and the tiny sediments which they transport. Pollutants can accumulate in the sediments deposited on the river bed and consequently in mud which can occasionally get washed onto the surrounding floodplains. Sediment and mud can therefore represent biological hazards and should be treated as part of the river system.

Poland's mandatory testing of surface-water's physical and chemical properties treats each component, such as ammonia content, in isolation. This ignores possible effects that arise when other pollutants combine or react with each other, so does not measure the cumulative ecological stress on the river.

The researchers used 'microbiotests' to assess the effect of river samples on microscopic biological organisms. Previous research used the same tests on a variety of water samples (e.g. from rivers, groundwater and mine runoff), but they were used here for the first time on a complete river system, including sediment and soil samples.

Samples were taken from 4 rivers in central Poland and the tests included 8 species covering primary producers (including algae and plants such as duckweed), consumers (including crustaceans such as shrimps) and decomposers (protozoa and bacteria). Pollutants may kill or damage the species (e.g. restrict their growth). The toxicity results are expressed as a percentage, for example a toxicity of 25 per cent means that there were toxic effects in 1 out of every 4 tests. This allowed water quality to be ranked in five classes according to levels of toxicity.

The standard mandatory testing regime had classified the rivers in generally unsatisfactory or poor condition (Class IV / Class V). However, the microbiotests suggest higher water quality, in the range of Class I-III. Sediment and soil samples were less variable and of higher toxicity than the water samples (mostly Classes II-III) reflecting the build-up of pollutants in the sediments. Tests found 4-19 per cent toxicity in water samples, and this level of toxicity had the greatest effect on primary producers. 6-27 per cent toxicity was found in the sediment and soils, which had the greatest effect on protozoan decomposers.

The researchers propose testing river systems in this way alongside the standard tests, to provide a more complete picture of a river's health and to assess trends in changing water quality.

¹ See: http://ec.europa.eu/environment/water/water-framework/index_en.html

Source: Mankiewicz-Boczek, J., Nalecz-Jawecki, G., Drobniwska, A. *et al.* (2008). Application of a microbiotests battery for complete toxicity assessment of rivers. *Ecotoxicology and Environmental Safety*. 71(3): 830-836.

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