

Science for Environment Policy

High levels of endocrine-disrupting chemicals found in sediments and fish from the Italian River Po and its Lambro tributary

Researchers have recommended that fish from some sections of the River Po and the River Lambro, one of the Italian River Po tributaries, should not be eaten due to high levels of some endocrine-disrupting chemicals in the river sediments and fish. This recommendation is based on an extensive update regarding pollution levels of such substances in the rivers.

The River Po is Italy's longest river. Some areas of the Po basin are densely populated and the river has suffered pollution from municipal wastewater discharges, stormwater runoff, sewer overflows, agricultural runoff and industrial waste discharges. However, substantive information on most priority pollutants and contamination trends is lacking.

To ensure all types of waters across Europe are clean and healthy, the [European Commission's Water Framework Directive \(2000/60/EC\)](#) requires countries to identify chemical pollutants in the aquatic environment and take action to prevent damage. [Directive 2008/105/EC](#), recently amended by [Directive 2013/39/EU](#), sets environmental quality standards (EQSs) for 45 so-called priority substances, which pose a significant risk to freshwater environments and/or to human health via those environments.

A number of these priority substances have been identified as endocrine-disrupting chemicals, which interfere with wildlife and human hormones, affecting their normal development and functioning. Many of these substances are readily adsorbed onto solid particles in rivers, and sink to become part of the bottom sediment. Analysing sediments for the presence of pollutants is therefore an effective way of monitoring many priority substances and other chemical pollutants in rivers.

This report substantially updates past research on chemical pollution in the River Po. Researchers collected samples from the top 10 cm of sediment along four stretches of the River Po, as well as from one stretch along the River Lambro, one of the Po tributaries. They analysed the samples for the presence of a wide range of endocrine-disrupters, including: flame retardants tetrachlorobisphenol A (TBBPA), tetrabromobisphenol A bis-2,3-dibromopropylether (TCBPA-bis), tetrabromobisphenol A (TBBPA), decabromodiphenyl-ethane (DBDPE), hexabromocyclododecane (HBCD) and polybrominated diphenyl ether (PBDE), personal care products (antimicrobial agents triclosan (TCS) and triclocarban (TCC)), fragrances galaxolide (HHCB) and tonalide (AHTN), hormones (natural and synthetic oestrogens), surfactants (octylphenol (OP), nonylphenol (NP) and their ethoxylates), a plastic component (bisphenol A (BPA)) as well as legacy pollutants (dichlorodiphenyltrichloroethane (DDT) and polychlorinated biphenyl (PCBs)).

As people can be exposed to these substances by eating contaminated fish, the researchers also analysed tissue from the common carp (*Cyprinus carpio*), bream (*Abramis brama*), sander (*Sander lucioperca*) and sheatfish (*Silurus glanis*). All are found in the last stretch of the River Po before it enters the Adriatic Sea.

Nearly all sediment samples from the River Po contained detectable levels of all tested chemicals, except DBDPE, TBBPA-bis and OP, which were found only in River Lambro sediments. Most of these pollutants were not at levels high enough to individually pose a risk to the River Po. However, concentrations of PBDE, PCB, natural and synthetic oestrogens, and NP were high enough to be of concern.

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(continued)

Sediment from the River Lambro contained up to 3132 nanograms PBDE per gram of sediment. PBDE levels dropped further downstream in the River Po, indicating that no other important sources of the contaminant were entering the river and that the pollutant's primary input was from the River Lambro sub-basin.

However, high levels of PBDE were found in fish in the last stretch of the River Po. Liver samples from the four types of fish had an average of 12 ng PBDE per gram, which is 1000 times higher than the EQS of 0.0085 ng/g set by Directive 2013/39/EU.

Oestrogen levels were highest in the River Lambro sediment (e.g. 19 ng oestrone (E1)/g) but were lower further downstream in the River Po. Nevertheless, previous studies have found intersex fish (those showing both male and female characteristics) in these stretches of the River Po, indicating that freshwater species may be at risk from endocrine-disrupting chemicals including natural oestrogens.

PCB has been banned or severely restricted in Europe since the 1980s, yet concentrations of 335 ng/g were found in sediment from the River Lambro. This level is of moderate concern for benthic organisms. However, since PCB can accumulate up the food chain, this level and those detected downstream in the River Po exceed the values estimated to be protective for the consumption of fish, say the researchers.

Overall, the results suggest that PBDE, PCB, oestrogen and NP sediment levels are up to six times higher in the Lambro tributary compared with the River Po. The researchers note that the consumption of some fish species from the River Po could already pose a risk to health, and that there could be a case for prohibiting the consumption of fish from the Lambro, especially as the presence of other endocrine disruptors contributes to the overall load of toxins in the river. The researchers are further investigating how polluted sediment transported down the River Po is affecting the coastal lagoons at the entrance to the Adriatic Sea.



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