

Science for Environment Policy

Plastic debris in the Danube outnumbers fish larvae

Pieces of plastic litter outnumber fish larvae in the Austrian Danube River, new research has found. This is worrying, as some fish are likely to mistake the plastic for the prey they would normally feed on. This litter may also contribute to marine pollution; the researchers estimated that at least 4.2 tonnes of plastic debris enter the Black Sea via the Danube every day.

Globally, plastic production has risen from 1.7 to an astonishing 280 million tonnes per year over the past 60 years. Plastic [litter](#) is now accumulating in nearly all habitats and ecosystems across the globe, with a variety of negative effects on the environment. For example, fragments can be mistaken for food and eaten by wildlife, possibly leading to malnutrition, starvation or poisoning from [toxic substances](#) that may be in or on the plastic.

Plastic debris in the oceans is a well-known and prevalent problem. While some plastic is thought to originate from shipping, a significant amount is carried into seas by rivers. However, there are few data regarding the amount of plastic which enters the marine environment in this way.

The researchers in this study categorised and quantified levels of plastic drifting in the Austrian Danube between April and July – the period when the most fish larvae are present – in 2010 and 2012. They also recorded the abundance of drifting fish larvae (called ichthyoplankton) in the river.

Drift nets, with a 500 micrometre mesh size, were spread across inshore areas of the Austrian Danube and used to capture plastic and ichthyoplankton. The researchers compared the weight and abundance of plastic and ichthyoplankton, and estimated the amount of plastic that would reach the Black Sea via the Danube.

In total, the researchers took 951 samples, ensuring they captured the daily fluctuation in larval fish numbers, which tend to have nocturnal peaks, by taking samples both during the day (293) and night (658). Plastic debris was characterised as either industrial raw materials used as precursors for plastic production (which come in the form of pellets, flakes and small balls), or 'others'.

Industrial plastic accounted for 86% of total plastic items in 2010, and 31% in 2012. The reason for these differences was unclear, but the authors suggested it could be due to the accidental release of plastic during industrial processing, packaging and transport as plastic manufacturers switch production runs.

There were an average 316.8 plastic items per 1 000 cubic metres (m³) of water, weighing on average 4.8 grams per 1 000 m³, although there was large variation between sites and years and the number of plastic pieces reached a maximum of 141 648 items/1000 m³. In contrast, there were an average of 275.3 fish larvae weighing 3.2 grams per 1000 m³.

These results show that the pieces of plastic outnumbered ichthyoplankton in the river. This is a cause for concern, say the researchers, because it shows that these potentially harmful particles are highly available to species that are likely to mistake them for food.

Using the same data, the researchers estimated that 4.2 tonnes of plastic reach the Black Sea via the Danube per day (1 533 tonnes every year). Moreover, this is likely to be an underestimate, since macro- (>5 cm diameter) and micro-plastic (<0.5 mm) particles were not considered in the calculation, and litter from downstream countries is likely to accumulate, increasing the final input.



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