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# Science for Environment Policy

## Lugworms harmed by marine microplastic pollution

**Microplastic pollution** impairs the heath of the marine worms that help maintain sediments for other creatures, new research suggests. This study shows that the energy reserves of lugworms living in sediment contaminated with microplastic particles were reduced by up to 50%.

**Microplastic pollution**, fragments of less than 5 mm, is of increasing concern. Although the pieces are typically formed as plastic rubbish is broken down, they may also enter the marine environment via wastewater treatment plants that are unable to filter out the microscopic plastic present in personal care products, synthetic garments or industry waste. The particles are small enough to be ingested by a variety of marine organisms, yet little is known about their impacts on these animals.

For this study, researchers examined the effects of microplastic pollution on lugworms (*Arenicola marina*). These worms are common in tidal flats, where they ingest and aerate the sediment, helping maintain it for a large variety of other marine organisms. Lugworms are also an important source of food for some bird species. Any effect of plastic pollution on these organisms may therefore have a widespread environmental impact.

The researchers kept the lugworms in tanks containing natural sediment contaminated with various concentrations of microscopic fragments of a type of polyvinyl chloride, UPVC. They assessed the effect of the microplastic fragments on the worms' feeding activity, immune responses and energy reserves (measured as the total body carbohydrate, protein and fats) over a month, as well as the impact on the transit time for material to pass through the gut over 48 hours.

The results revealed that long-term exposure to sediment contaminated with UPVC resulted in decreased energy reserves in the worms. After a month in sediments contaminated with 1% and 5% UPVC, the worms displayed considerably lower total energy reserves compared with worms kept in uncontaminated sediments. In fact, the energy reserves of worms kept in 5% UPVC sediments were only half that of worms kept in uncontaminated sediments. This was not due simply to a reduction in food, since adding clean sand in place of the plastic did not produce the same effect.

Gut transit time was also one and a half times longer in worms that had been exposed to 5% UPVC sediment, compared with unexposed worms. Furthermore, there was evidence of inflammatory immune responses to the presence of the microplastics.

The researchers conclude that the reduced energy reserves seen in this study were most likely caused by reduced feeding activity, reduced gut transit times and inflammatory immune responses. A reduction in feeding activity, the researchers point out, may lead to a lower overall intake of food and therefore energy, affecting the health of the worms, including their growth, reproduction and even survival. This could have knock-on effects for the whole ecosystem.

As an example of this, the researchers estimated that on Wadden Sea shore, a World Heritage Site where lugworms play a key role in the ecosystem, microplastic contamination of 3.17% by weight could cause lugworms to process around 130 000 $m^3$ less sediment annually. This is a growing concern, as microplastic concentrations of 3% by weight have already been found on other polluted beaches.