Invisible plastic particles in seawater damaging to sea animals

September 21 2012

(Phys.org)—Plastic nanoparticles in seawater can have an adverse effect on sea organisms. Particles measuring about a thirty millionth of a millimetre, and therefore invisible to the naked eye, are responsible. Mussels that have been exposed to such particles eat less, and thus grow less well, according to research carried out by scientists and students at Wageningen University and IMARES, both part of Wageningen UR. They wrote about their research in the most recent issue of *Environmental Toxicology and Chemistry*.

The presence of 'plastic soup' in the oceans is regarded as a big problem. Tiny plastic particles enter the sea when plastic debris decomposes. Such particles are probably also released from cosmetics and from clothes in the wash, subsequently entering the sewage system and surface waters and eventually reaching the sea.

The EU and the Dutch government recognise the problem and the need to monitor the existence of plastics in the seas in order to learn more about present and future concentrations of plastic micro- and nanoparticles in marine environments. Very little is known about the effects plastic nanoparticles have on sea life. The effects now discovered do not yet prove that plastic in the North Sea is a big problem, but they do suggest that further research is extremely important, the researchers remark.

Professor Bart Koelmans' research team, from Wageningen University and IMARES, exposed mussels to various concentrations of nanoplastic

in order to discover the concentration at which an effect was noticeable. The team also varied the quantity of algae – the normal food source for mussels. By giving the plastic nanoparticles colour, and by measuring them using dynamic light scattering, it was possible to determine the particle concentration that exerted an effect. The researchers described in their publication that the extent to which the tiny plastic particles clump together is also extremely important for understanding particle uptake and the resulting effects in marine organisms. "It means that those effects are not easy to predict because the biological availability of the particles can differ enormously from one organism to another, and because variation in water quality also plays a role", says Prof. Koelmans.

Four research studies

This publication is the first of four by Wageningen University and IMARES into the effects of plastic in the North Sea. The other studies will be published in the near future. The first of these is research into the effect of plastic on lugworms, which lose weight due to uptake of plastic particles. The worms, as a result, take in more toxic substances such as polychlorinated biphenyls (PCBs), which bind to plastics.
The researchers believe this indicates the need for good research into other toxic substances that bind to plastic – an additional consequence of the presence of microplastics. In order to analyse the interaction of plastic and other toxic substances in the food web, Koelmans' group has made a detailed computer model. This type of model is crucial for estimating the risks plastics impose in the sea. The last piece of research is into plastic debris in the stomachs of fish. An analysis of hundreds of fish has shown that 12% of them have debris in their stomachs. Around half of that debris is plastic.

More information: Wegner, A., E. Besseling, E.M. Foekema, P. Kamermans, A.A. Koelmans. 2012. Effects of Nanopolystyrene on the

Feeding Behaviour of the Blue Mussel (Mytilus edulis L.). Environ. Toxicol. Chem. Published online: onlinelibrary.wiley.com/doi/10.1002/etc.1984/pdf