

Microplastics in the marine environment: From top to bottom.

Supervisors

Main supervisor: Dr Penelope Lindeque (Plymouth Marine Laboratory)

Co-supervisor: Prof Tamara Galloway (University of Exeter)

Project enquiries - Email: pkw@pml.ac.uk **Contact number:** +44 (0) 1752 633415

Supervisory team:

Dr Ana Queiros (Plymouth Marine Laboratory)

Dr Matthew Cole (University of Exeter and Plymouth Marine Laboratory)

Host Institution: Plymouth Marine Laboratory

Project description

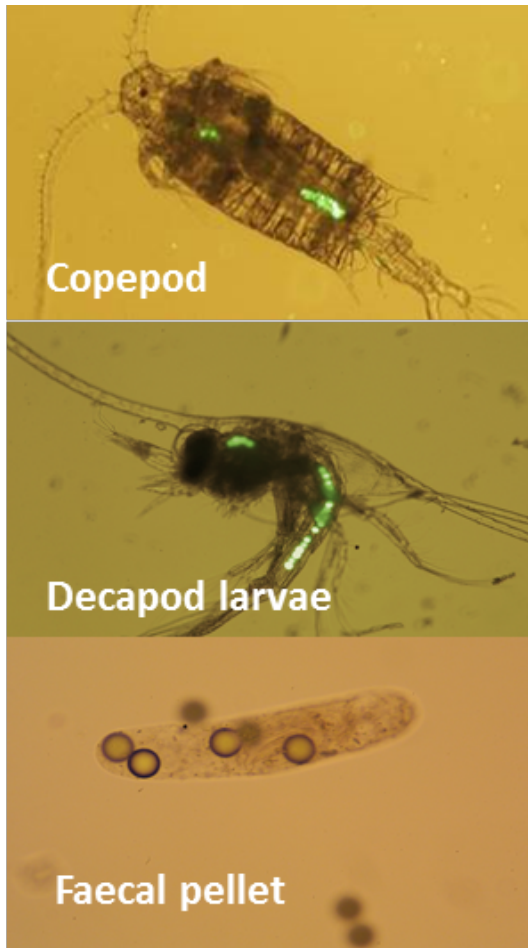
Background: Microplastics (small plastic fragments, <5 mm) are a widespread and abundant pollutant within our oceans, highlighted as a contaminant of global environmental concern by the EUs Marine Strategy Framework Directive. Microplastic litter includes plastics manufactured to be of a microscope size (e.g. cosmetic exfoliates), and fragments derived from the degradation of larger plastic debris. These microscopic plastic fragments have been identified in the water column and sediments of marine and freshwater ecosystems across the globe. Recent studies undertaken between PML and the UOE have shown that microplastics can be ingested by zooplankton; small marine animals at the base of the pelagic food web (Cole *et al.*, 2013), which can result in adverse health effects. Of particular interest was the finding that microplastics egested by copepods significantly altered the properties and sinking rates of faecal pellets, with potential repercussions for marine nutrient flux. Zooplankton faecal pellets are an important carbon sink, transferring organic matter (and potentially microplastics) from the sea surface to the benthos. However, the effect of this potential transfer of microplastic on benthic biota and processes is yet to be investigated.

Aim: To investigate the transfer of microplastic debris from the sea surface to the benthos, via pelagic zooplankton, faecal pellets and marine snow, and consequently to assess the ingestion of microplastics by benthic organisms, and community bioturbation as possible routes of benthic assimilation.

Methods: The link between pelagic and benthic marine environments (i.e. benthic-pelagic coupling) can sometimes be under-investigated as researchers often focus on one habitat alone. During this PhD we hope to cross this boundary and provide the expertise and training necessary to investigate the pathways of transfer of microplastics from the upper surfaces of the ocean to the seabed. Using pelagic and benthic faunal communities collected from the western English Channel and laboratory/mesocosm based experiments you will address the following questions:

- Do zooplankton faecal pellets, zooplankton carcasses and marine snow represent a transport mechanism for microplastic pollution to the seafloor?
- Which benthic organisms have the capacity to ingest microplastics from the pelagic environment?
- What is the fate of the microplastics once reaching the seabed, for example can bioturbation contribute to the permanent burial of microplastics into marine sediments?
- What is the consequence of microplastics to a natural benthic community assemblage, with regard to

impacts on individual fitness and mortality, and contribution to ecosystem processes?



▲ Images show microplastics ingested by a copepod (*Centropages typicus*) and a decapod larvae, and later egested within a faecal pellet.

Images show microplastics ingested by a copepod (*Centropages typicus*) and a decapod larvae, and later egested within a faecal pellet.