

EnvEast Doctoral Training Partnership

DOES MICROPLASTIC POLLUTION POSE A RISK TO MARINE LIFE AND FOOD SECURITY?



PML Supervisors:

Dr. Matthew Cole (mcol@pml.ac.uk)

Dr. Penelope Lindeque (pkw@pml.ac.uk)

University of East Anglia Supervisor:

Dr. Trevor Tolhurst (t.tolhurst@uea.ac.uk)

University of Plymouth Supervisor:

Prof. Richard Thompson (r.c.thompson@plymouth.ac.uk)

Background: Microplastics contamination is widespread in the water-column and sediments of marine and freshwater ecosystems across the globe. Plastic can be consumed by a wide range of organisms, including zooplankton, fish, seabirds and megafauna. Highly productive coastal waters, where fishing and aquaculture is prevalent, are particularly susceptible to microplastic contamination owing to their proximity to sources of anthropogenic pollution. It is therefore of little surprise that microplastic particles and fibres have been identified in animals destined for human consumption (e.g. shellfish, fish). In recent years there has been growing evidence that microplastic particles and fibres can cause adverse health effects in biota. With increasing reliance on aquaculture and fisheries for food production, the contamination of marine food stocks with microplastic is an emerging issue of concern for human health and food security.



Project aims: You will test the hypothesis that microplastics pose a risk to marine life and food security. Key research questions include:

- What is the current and predicted likelihood of animals consuming plastic in coastal areas?
- At what concentrations do microplastics pose a risk to the health of marine animals (e.g. adult and juvenile oysters and mussels)?
- How are microplastics handled by bivalves?
- Are fisheries and aquaculture at risk of high microplastic exposure?



Research methodology and training: The successful student will be primarily based at Plymouth Marine Laboratory with access to modern, refurbished laboratories, the new ultraclean microplastics research facility and the Research Vessel Plymouth Quest for field sampling. The project supervisors have extensive experience working on marine microplastics and contaminants, a strong-track record in producing internationally-recognised research, and are committed to supporting the development of their students. The project will entail the student designing and conducting a comprehensive field sampling campaign, with the aim of identifying the occurrence and types of microplastics present in water and sediment, compared with what has been ingested by biota. You will employ laboratory-based exposure studies to determine how microplastics are handled by bivalves, and how they can affect animals relevant to aquaculture (e.g. mussels, oysters), by monitoring biomarkers of health (e.g. survival, reproduction, growth and behaviour). Students will have access to the EnvEAST doctoral workshops. During your PhD, you will receive training in a broad range of analytical techniques relating to microplastics (e.g. isolation of plastics from tissues, characterisation, FT-IR analysis, electron microscopy), health biomarkers (e.g. ingestion rates, apical endpoints, sub-lethal endpoints), fieldwork, experimental design, scientific writing and statistics.

Person specification: The project would suit an exemplary student with a degree in biological, environmental, marine science or biochemistry. We seek an enthusiastic, energetic and engaged student with a passion for conducting high quality research. All enquiries should be sent to Dr Matthew Cole (mcol@pml.ac.uk).