

Plastic Fish: assessing the impacts of plastic pollution on aquaculture food security

Supervisory team:

Main supervisor: Prof Jo Cable (Cardiff University)

Second supervisor: Prof Charles Tyler (University of Exeter)

Dr Ben Ward (Cardiff University), Dr Irina Guschina (Cardiff University), Dr Numair Masud (Cardiff University)

Collaborators: Dr Riccardo Maddalena (Cardiff University), Ms Merryn Chilcott

Host institution: Cardiff University

Project description:

Plastic pollutants have been detected in all surveyed food systems, presenting a clear security threat to global food security, particularly aquaculture, the fastest growing food producing sector, projected to be worth almost £184bn by 2027. With plastic pollutants now found in all aquaculture systems, understanding how this broad class of pollutants impact aquaculture security tackles global challenges. This is all the more pressing knowing that plastic polymers are also associated with over 4000 chemical additives, many of which are classed as biohazards. Even biobased plastics widely advertised as more environmentally friendly than traditional petrochemical plastics contain the same additives. Therefore, a key concern that needs to be addressed is how plastics and their associated additives are impacting the welfare of fish within aquaculture as well as the nutrient quality of fish fillets. This is especially important for Omega-3 and Omega-6 fatty acids, which humans are unable to naturally synthesise and are considered key nutrients in preventing many human diseases. It remains unclear whether chronic and prevalent plastic pollutants and their additives impact nutrient quality of aquaculture fillets and if so, what are the underlying mechanisms.

Compounding this issue, aquaculture is also faced with what has been described as a 'disease crisis', with pathogens being a major factor limiting the sustainable expansion of fish stocks. Evidence is emerging that not only can microplastic exposure increase disease susceptibility within fish in aquaculture, but that microplastics can also be effectively colonised by pathogens. How the interaction between microplastics and microbial pathogens impacts aquaculture fish disease dynamic, however, remains largely unknown. This studentship, therefore, will use an interdisciplinary approach to assess how the nexus between plastic pollutants (petrochemical and biobased), their additives and economically important pathogens impact aquaculture fish welfare and fillet nutrient quality. This project will expect the student to have a passion for interdisciplinary research, food security and animal welfare. The ideal student will have a biology or chemistry related degree with molecular biology experience and it is desirable to have some analytical chemistry experience (especially experience with spectroscopy techniques). Based in the Schools of Biosciences and Chemistry at Cardiff University, with ecotoxicology expertise from the University of Exeter, the student will work with a range of industrial collaborators and be supported by a strong supervisory team.

Our aim as the SWBio DTP is to support students from a range of backgrounds and circumstances. Where needed, we will work with you to take into consideration reasonable project adaptations (for example to support caring responsibilities, disabilities, other significant personal circumstances) as well as flexible working and part-time study requests, to enable greater access to a PhD. All our supervisors support us with this aim, so please feel comfortable in discussing further with the listed PhD project supervisor to see what is feasible.

NOTE: For this project, only full-time is possible due to the nature of the research being carried out.