Novel technologies for early detection and monitoring of fish pathogens

Supervisory team:
Main supervisor: Prof Jo Cable (Cardiff University)
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Collaborators: Dr Jack James (Director of Pontus Research Ltd.)

Host institution: Cardiff University
CASE partner: Environment Agency

Project description:
Aquaculture is one of the fastest growing food sectors, fish is the most important source of human protein and globally the industry employs an estimated 54.8 million people. One of the greatest challenges facing wild and farmed fish stocks is disease. Indeed, the key factor determining whether or not a company is profitable or even 'remains a float' is the loss incurred by infectious disease. Recent disease problems in UK fisheries have exposed substantial gaps in our knowledge on the epidemiology of oomycete infections, and our ability to protect food supplies against emerging pathogens, such as epizootic ulcerative syndrome (EUS) caused by Aphanomyces invadans.

This studentship will build on an existing project between the Environment Agency and Cardiff University in which over 30 UK strains of Saprolegnia have been collected and assessed in terms of host-specificity. To capitalise on this long-term investment, first, the student will develop and optimise cryopreservation techniques to create an Oomycete National Archive. Then, disease surveillance methods will be assessed to determine whether drones can effectively monitor bank-side fish mortalities. Thirdly, the student will develop novel and rapid molecular methods to screen for oomycetes on fish hosts and within water samples. Validation of eDNA methods will involve laboratory challenge experiments that will also generate valuable information on virulence of different oomycete strains/species. This will help identify potential pathways of infection and interactions between wild fish stocks and aquaculture. As rapid detection of emerging pathogens is critical for control, these molecular markers will also serve as an early warning kit for detection of emerging EUS. Finally, disease surveillance records will be matched with environmental/water quality and host genotype data in order to identify potential factors influencing the risk of Saprolegnia outbreaks in host populations, natural habitats and aquaculture facilities. These will be validated through experimental studies to confirm the influence of host and environmental variables (e.g. temperature) on the growth, development and virulence of Saprolegnia.

The student will acquire a range of molecular biology and parasitological skills to be combined with innovative field survey methods (drones to eDNA) and mathematical approaches to data interpretation. In collaboration with industry and fisheries sector, outputs from this project will not only help reduce economic losses on fish farms, but will benefit future management, monitoring and conservation of wild, native fish populations.