Genomic tools for monitoring emerging kinetoplastid parasites of aquaculture

Supervisory team:
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Host institution: University of Bristol

Project description:
The kinetoplastids are a diverse group of single-celled eukaryotes that includes important parasites of animals and plants. Remarkably, our current understanding suggests that parasitic lifestyles have evolved at least five times independently within the group, and that the most devastating human parasites – such as Trypanosoma (sleeping sickness, Chagas disease) and Leishmania (leishmaniasis) – are all part of a single sub-lineage, the trypanosomatids.

Given their medical importance, most of the work on kinetoplastid infection biology, ecology and evolution to date has focussed on the trypanosomatids. But monitoring work by CASE partner Cefas (the Centre for Environment, Fisheries and Aquaculture Science) has recently identified novel kinetoplastids as emerging parasites of fish and shellfish populations. These new lineages include relatives of Ichthyobodo, a fish ectoparasite, and Perkinsela, which has been implicated in amoebic gill disease of salmon. The parasite burden and aquacultural impact of these new lineages are currently increasing as a result of aquacultural intensification, and very significant economic impacts have been reported for recent outbreaks in Asia. But attempts to devise mitigation strategies for these parasites are currently impeded by our ignorance of their basic biology and strategies for host manipulation, which may be quite distinct from that of the better-studied trypanosomatids. This project is underpinned by a unique collaboration between the University of Bristol and Cefas that provides the opportunity to address these questions for the first time.

In this project, you will characterise the genomes and parasitic modes of these novel kinetoplastids and relate them to what is known about the much better-studied trypanosomatids. Your analyses will deliver new, much-needed basic biological knowledge about the aquacultural prevalence, disease burden and genomic diversity of an increasingly important environmental reservoir of aquacultural parasites, which will also help to inform management and mitigation strategies. You will then use genome data to test hypotheses about the molecular basis of parasitism in all kinetoplastids.

In pursuing this work, you will receive training in cutting-edge techniques from three distinct but highly complementary fields: bioinformatics, genomics and data science (Williams); fieldwork, sampling and isolation of environmental microbes (Bass), and molecular parasitology (Gibson), and will benefit from extensive transferable skills training at Bristol and a work placement at Cefas. Thus, beyond the immediate project, you will gain the skills to succeed in a broad range of fields, from academia and data science to aquacultural management, fisheries and government policy.