

Cullen Scholarship: Epidemiological investigations of the salmon louse *Lepeophtheirus salmonis* on Irish Atlantic salmon farms

(PhD Award)

Background

Sea lice are ectoparasitic copepods infesting salmonid species in the marine environment with the salmon louse, *Lepeophtheirus salmonis* having significant economic impacts on marine Atlantic salmon aquaculture in Europe. In Ireland, the Marine Institute has run the *National Sea Lice Monitoring Programme* since the early 1990's. Over the years the monitoring programme has developed and is currently undertaken according to the Department of Agriculture, Food and the Marine (DAFM) *Monitoring Protocol No. 3 for Offshore Finfish farms – Sea Lice Monitoring* and the *2008 Strategy for Improved Pest Control on Irish Salmon Farms*. For over 25 years, all active marine fish farms in Ireland have been inspected 14 times per year with the results of the monitoring programme published on an annual basis.

Sea lice monitoring is now carried out in most major Atlantic salmon farming countries in the world, although variation exists in how the monitoring is performed in each country. There is a need for further empirical evidence-based assessment of the current national monitoring programme to ensure it is performed according to best practice, can be practically implemented and provides an accurate estimate of infestation levels. The monitoring programme should also be supported by scientific data on epidemiology of the parasites in addition to information on the efficacy of current management practices. These management practices have changed in recent years with the introduction of more mechanical based control methods, the use of freshwater or hyposaline baths and the use of biological control methods in the form of cleaner fish. Authorised veterinary medicines continue to play an important role in the control of sea lice infestations, however very little information is available on the level of resistance or the potential for resistance to develop in sea lice in the Irish context.

Proposal

We propose a **structured four-year PhD** on a full-time basis to undertake studies into the monitoring, control and epidemiology of the salmon louse in Ireland. The project will aim to develop a study investigating a range of potential research areas which can support the national monitoring programme with scientific data and evidence based investigations. The proposal may include some or all of the following fields of research:

- An evaluation of sampling strategies and an epidemiological study utilising sea lice data collected since the 1990's, stored on the Marine Institute *Sea Lice Database*.
- Monitoring a range of control methods, the factors which influence their efficacy (including impacts on lice biology e.g. survival, fecundity etc.) and potential impacts on fish welfare.
- Analysis of the salmon louse genome for the occurrence of resistance genes to veterinary medicines used in Ireland to control sea lice.
- Effect of control methods on the salmon louse microbiome and/or the potential presence of pathogenic organisms in sea lice.

The project output will meet the requirements outlined in the programme for government for the sustainable development of aquaculture, in addition to the new EU guidelines and the national strategic plan for sustainable aquaculture development.

Outcome

A PhD thesis, comprising of three to four chapters published in peer reviewed scientific journals. This research is designed to be multidisciplinary to train the researcher to have a broad set of skills and knowledge of aquaculture, monitoring, molecular biology and epidemiology. Furthermore, the research outputs will create an array of fundamental and applied knowledge underpinning the national sea lice monitoring programme and determining the effectiveness of current sea lice management measures.

The scholar will be expected to engage with the Irish aquaculture industry to fully utilise the knowledge gained with a view to practical implementation of the results in commercial salmon farming operations.

- Enhancing the national sea lice monitoring programme with empirical data on sampling strategies.
- Using the research to further inform and drive new salmon farming practices and policies in relation to sea lice monitoring and control.
- Increased knowledge on the current level of antiparasitic resistance and the potential for its development.
- A series of industry-oriented peer-reviewed publications and presentations at scientific/industry-based conferences/workshops.

Links to MI Strategy

This proposal falls under Strategic Focus Area 3 - Research & Innovation with strong links to Strategic Focus Area 1 – Scientific Advice and Services, providing scientific support for advice.

Financial Details

Scholarships will be up to €27,500 per annum (maximum funding of €110,000 over four years). This amount comprises a maintenance award of €18,500 (Irish Research Council rate effective 1-Jan-21) to the student as well as payment of fees to the host higher education institution (HEI). The maximum fees payable to the HEI will be €6,000 per annum. The scholarship award also includes a budget of up to €3,000 per annum for eligible research costs (travel & subsistence, publication costs, consumables and other costs e.g. laptop) for the sole use of the student, and are payable on a reimbursement basis direct to the host institution where the postgraduate student (scholar) is registered. There are no overheads payable on the scholarship. Publication costs are intended to cover publications on which the scholar is listed as first author and are published under Open Access.

Specific Requirements

The Scholar should have a primary degree/post-graduate qualification in biological sciences with an interest in aquaculture and animal health/epidemiology. The host institute should have a proven capability in applied research in the fields of epidemiology and/or animal health.

Marine Institute Co-Supervisor

Dr. Neil Ruane, Fisheries Ecosystem Advisory Services (FEAS) neil.ruane@marine.ie

Alternative contact for queries funding@marine.ie