Cullen Fellowship Title: Culture optimisation, and bioactivity of selected toxic Irish microalgae (PhD Award)

Background

The shellfish biotoxin groups of azaspiracids (AZAs), okadaic acid (OA) group and domoic acid (DA) have had a significant impact on the production of shellfish in Ireland. Both farmed and wild shellfish can become toxic to consumers when they are contaminated by these naturally occurring toxins that are produced in the phytoplankton that shellfish feed upon. These toxins are regulated under EU legislation, and a shellfish monitoring programme is carried out in Ireland to advise on opening and closing shellfish production areas to avoid human illnesses.

The main focus of this fellowship will be on toxins prevalent to the Irish Marine sector, azaspiracids (AZAs), okadaic acid (OA) group and domoic acid (DA) toxins and their producing organisms belonging to the genera *Azadinium*, *Prorocentrum* and *Pseudonitzchia*, respectively. The culturing conditions for these species of Irish toxic microalgae will be refined and optimised for toxin production. The bioactive properties of these toxins will also be examined through a series of assays that assess pharmacological, toxicological and ecological effects. The assays applied could complement those applied to address bioactivity of other marine-derived extracts available through the National Marine Biorepository maintained at the Marine Institute.

Overall Objective

This project will optimise culturing conditions of these phytoplankton to enhance their toxin production. Bioassays will be developed to investigate pharmacological and toxicological properties of extracts, and their ecological impact on marine organisms.

Approach

- These cultures will be used to explore and describe the chemical diversity of toxins and chemically related metabolites in these species of microalgae.
- Bioassays, including anti-microbial, anti-fungal and others should be developed to study the mode of action and assess the pharmacological potential of algal extracts and purified toxins. These could be compared to assay results from other marine extracts from the Marine Institute’s marine biorepository.
- The ecological impact of these toxins and microalgae on native marine organisms will also be assessed. This could be accomplished through microcosm exposure experiments, or through relevant single species trials.

Expected outcomes

- Optimised culturing conditions to enhance toxin production will be established for different species of Irish toxic microalgae will be developed.
- Our understanding of the chemical diversity of toxins and chemically related metabolites produced by these microalgae in these species of microalgae will be increased.
- Select anti-microbial, anti-fungal, anti-parasitic and other pharmacological properties of these toxins will be assessed and the mode of action of toxic algal extracts and purified toxins will be studied.
- The ecological impacts of the toxins/toxic microalgae on native marine biota will be assessed.
**Financial Details**

The Fellowship award will be up to €23,000 per annum. This amount comprises a maintenance award of €16,000 to the student as well as payment of fees to the host institution. The maximum fees payable to the college will be €6,000 per annum. The Fellowship award includes a travel budget of up to €1000 for the sole use of the student and is payable on a reimbursement basis direct to the host institution at which the postgraduate student (Fellow) is registered. All field-work and travel covered by the travel budget is for travel taking place within the island of Ireland.

**Specific Requirements**

The fellow should have a background in biology, with, ideally, direct experience in phycology and the use of bioassays.

**Marine Institute Co-Supervisor(s)**

Joe Silke, Biotoxins, Marine Environment and Food Safety Services