

Cullen Scholarship: Improving fishing survey indices through the use of spatio-temporal models (PhD Award)

Background

Abundance indices from fishing surveys are widely used in stock assessments and for management advice, contributing to sustainable fisheries and ecosystem management. These surveys are expensive and complex to execute and are subject to unexpected reductions in spatial and temporal coverage due to weather, technical problems and other complications. Additionally, due to the considerable cost of these surveys, there are strong incentives to maximise efficiency by accounting for reductions in sampling stations, reductions in survey frequency or unavoidable changes in the survey design.

These issues can be quantified through modelling of the data; models can account for the spatial and temporal nature of the data as well as environmental variables and vessel or gear effects. Model-based estimation can be used to: increase accuracy of the estimates; deal with unplanned gaps in survey coverage; quantify differences between vessels or gear types or help to improve the survey design. Despite these advantages, model-based indices are not yet widely used in stock assessment.

Proposal

We propose a structured four-year PhD on a full-time basis to develop a robust model-based approach to estimate survey indices. The approach will include biomass indices as well as age or length based indices. The approach needs to be suitable for routine use in stock assessment and collaboration with stock assessors will be an important aspect of the PhD.

The project will aim to explore the theoretical underpinnings and suitability of existing spatio-temporal models to develop robust and practical high-priority applications in order to:

- Identify influential observations; develop quality control procedures; stress-test assumptions.
- Link the distribution of the target species to environmental variables and species interactions.
- Develop approaches to address existing and future gaps in survey coverage
- Address differences in catchability between vessels or gears.
- Improve survey designs.
- Correctly account for observer and process error.

Outcome

The expected outcome from the project will be a robust, well documented and tested modelling approach for estimating survey indices, dealing with gaps in coverage and catchability issues and an improved survey design in terms of efficiency and accuracy.

Links to the MI Strategy

The work falls into Strategic Focus Area 1 (Scientific advice and services) of the MI Strategy and addresses strategic initiatives 1 and 2 (Needs of decision makers and Integrated quality services).

- The MI spends millions of euro annually on trawl, acoustic and camera surveys. All of these are vulnerable to unplanned gaps in survey coverage. This project can significantly alleviate this vulnerability to allow for **improved quality of catch advice to decision makers**, even in cases of unplanned reductions in survey coverage. Additionally, it can help improve the survey design and therefore has the potential to **reduce the cost of surveys**.
- The project will also allow for more accurate descriptions of the spatial distribution of fish species. This is relevant in the context of **climate-change, BREXIT and marine spatial planning**. This will also contribute to a better **understanding of the ecosystem**.

Specific Requirements

The scholar should have a primary degree in quantitative or fisheries research.

Financial Details

Scholarships will be up to €25,000 per annum (maximum funding of €100,000 over four years). This amount comprises a maintenance award of €16,000 (Irish Research Council rate) 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.

Marine Institute Co-Supervisor(s)

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