Cullen Scholarship: The status of sensitive fish species within Irish waters and their vulnerability in relation to fishing and discarding practices

(PhD Award)

Background

A successful Ecosystems Approach to Fisheries Management requires the protection of all species from overfishing to maintain marine biodiversity and ecosystem health. There is national and international recognition of the importance a healthy and productive marine ecosystem plays in supporting ocean health and a thriving maritime economy. One of the UN sustainability goals (SDG 14) for example is 'to conserve and sustainably use ocean, sea and marine resources' (United Nations, 2011). With Europe's Marine Strategy Framework Directive (MSFD) aiming to support 'halting biodiversity loss, ensuring the conservation and sustainable use of marine biodiversity' (European Commission, 2008). This is also reflected in Ireland's Integrated Marine plan, 'Harnessing Our Ocean Wealth', which has goals focussed to protect and promote healthy marine ecosystems. To achieve these goals, we need to monitor and manage the health and stock-status of non-target species as well as commercially important species.

Any threat to biodiversity of the fish community is likely to come from the loss or reduction of the most sensitive species in that community. Species can be sensitive because of their life histories i.e. slow growing, late maturing, low fecundity species, the so-called k strategy species. They can also be "sensitive" due to their vulnerability to fishing i.e. due to their body shape, behaviour, habitat etc. In a recent study (Rindorf et al; 2020), a methodology was developed to classify the sensitivity of fish species with a single metric based on all these factors. The study was based on data from trawl surveys, and biological literature, in most of the major fishery areas of the NW European shelf. A key finding underpinning the approach was that species classified as threatened (based on IUCN data) were also on average significantly more sensitive to trawling than other species. While some aspects of "sensitivity" will be constant over such a wide area e.g. the degree to which a species may be classified as following a k strategy life history, other aspects, such as the behaviour, habitats, climate change effects, and types of fishing may vary at a more local level. Equally, fisheries management operates at a more local level, e.g. in an Irish context, the Celtic and Irish Seas. Therefore, any management to mitigate the impacts on "sensitive" species would also need to work at that level.

The abundance distribution of any species, and particularly those deemed sensitive, will likely be an important aspect of determining their local vulnerability especially with regard to activities such as fishing. So while a species might be considered sensitive globally, if it is distributed in a way that minimises interaction with fishing, it could be less vulnerable in some areas than in others. The same might apply to its behaviour making it more or less vulnerable to fishing. This also opens the potential for identifying areas or times for protection (i.e. MPAs and seasonal closures). This project will build on the analyses of Rindorf et al, to find out the extent to which conclusions on sensitivity and vulnerability risk at a wide scale will also apply at a local, Irish, scale. It will identify which species are most sensitive in our waters, and that merit protection. It will also show where those species are located, using the Irish groundfish surveys, drawing on mapping methodologies such as those developed by Calderwood

et al., (2020) and Probst *et al.,* (2021). The sensitivity of species with regard to their interaction with fisheries in Irish waters will also be examined using discard data. Gears or metiers within which sensitive species are most likely to be caught will be examined with regard to the spatial extent of both fishing activities and species occurrence to determine if any measures can be applied to protect them.

Proposal

We propose **a structured four-year PhD project** on a full-time basis to examine the status of sensitive species in Irish waters and to determine their spatial distributions and how they interact with Irish fisheries. The project will aim to:

- Develop previous work conducted on the status and abundance of sensitive species in the North East Atlantic to focus on Irish waters (specifically the Celtic Sea and Irish Sea). The methodology used will incorporate more detailed information on the life history traits of species in Irish waters to produce location specific results at a finer spatial resolution. This will allow for a comparison of how the occurrence and abundance of sensitive species in Irish waters may vary from the wider NE Atlantic region. Analysis of drivers of species abundance (including changes in fishing pressures, as well as temperature and oceanographic changes linked to climate change) will be examined to determine the likely drivers of any potential differences.
- Compare results with IUCN species definitions to determine whether IUCN risk categories capture all species at threat from overfishing and anthropogenic changes in Irish waters.
- Expand sensitivity analysis to include more information about the catchability of different species with regard to their behavioural response to trawls and the habitat types in which species occur and are most likely to be caught. Further consideration will be given to the survivability of discards from trawls.
- Map and examine the distribution of sensitive species from survey information and compare with catch and discard data from industry data to identify areas where sensitive species might be most at risk. Then consider the potential of spatial management in protecting these species.
- While the focus of this work will be on demersal species and fisheries there is potential to expand the analysis to include pelagic species.

Outcome

The expected outcomes from the project will be to improve understanding of the occurrence and abundance of sensitive species within Irish waters. This work will expand significantly on previous sensitive species analysis incorporating regional knowledge on species life history traits and behaviours. Examination on the distribution of sensitive species, afforded by the analysis taking place at a finer spatial scale than previously has been done, will allow for the consideration of management options that could maintain biodiversity and promote marine ecosystem health in Irish waters.

Links to MI Strategy

This proposal falls principally under Strategic Focus Area 3 - Research & Innovation. This links to Strategic Focus Area 1 – Scientific Advice & Services, specifically in providing advice on the conservation of the marine ecosystem, and in improving advice on fisheries, specifically in relation to the protection of sensitive species.

Specific Requirements

The scholar should have a primary degree in a natural or ocean science, and ideally a masters level degree in an appropriate field. The scholar should have an interest in fisheries and a knowledge of oceans, fish and fisheries. The scholar would ideally have experience in mathematical and statistical modelling.

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 from 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.

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