Foras na Mara
Marine Institute

Cullen Scholarship: Recruitment drivers for Boarfish and other spasmodic stocks

(PhD Award)

Background

Stocks which have infrequent or rare year classes which are significantly larger than average are known as spasmodic stocks. Once mature, large year classes can have a significant and rapid effect on stock size and structure and consequently fishing opportunities for exploited stocks. The occurrence of large year classes does not appear to be related solely to stock size. Factors associated with early life stage (egg and larval) survival including ambient temperature and salinity, physical oceanography (currents, circulations, turbulence, water column structure), prevalence of predators, the availability of food and species reproductive biology are all viable drivers of recruitment success.

Spasmodic stocks present a particular challenge for assessment and provision of management advice. The majority of fishery dependent data is related to the exploited (adult) proportion of the stock and information on incoming or recent recruitment events is limited to surveys such that assessment models typically exhibit large uncertainty in relation to recent recruitment events.

Following developments in fishing and processing techniques initiated by the Irish industry in the mid-2010s, the boarfish fishery has become an important component for the Irish pelagic fleet with Ireland the majority quota holder for this stock. Co-operation between industry and the Marine Institute led to the development of an acoustic survey, catch sampling program and species biology information which supports the assessment and provision of advice. (Hussy et al 2012a,b, Farrell et al 2012, Fassler et al 2013)

The assessment of boarfish was recently benchmarked by ICES and resulted in the introduction of a category 1 assessment model (ICES, 2024). The new assessment model indicates a significant increase in the size of the boarfish stock in recent years such that it is currently considered to be close to a historic high, and significantly larger than the stock that supported the development of the targeted fishery in the mid-2010s. The assessment also indicates that boarfish is a spasmodic recruiter with the stock composition dominated by fish from a limited number of year classes. There is little correlation between stock size and recruitment for boarfish. Improved understanding of the drivers of recruitment may provide additional information for the assessment and forecast.

Proposal

We propose **a structured four-year PhD** on a full-time basis to investigate and identify drivers of recruitment for boarfish and other species suspected of exhibiting large and unpredictable year classes (e.g. Horse Mackerel, Haddock, Blue Whiting)

The project will aim to:

- Conduct a comprehensive review of existing grey and published literature related to the exploration of drivers of recruitment success.
- Identify and collate existing sources of data related to potential drivers of recruitment for boarfish and other stocks of interest to Ireland.
- Identify gaps in understanding of boarfish reproductive biology in co-operation with industry, national and international colleagues.
- In collaboration with industry and via opportunities offered by scientific surveys, arrange for the collection of and conduct analysis of relevant biological data to enhance understanding of the biological development of boarfish.
- Employ a modelling approach to explore the relationships between recruitment and the potential drivers identified.
- Explore the development of models and data products to improve the information base available for stock assessment and the provision of management advice.
- Develop Management Strategy Evaluation tailored to spasmodic stocks and boarfish in particular (e.g., Licandeo et al. 2020).

Location of Scholar and Training Provided at the Marine Institute

The scholar will be based for circa 50% of their time over the four years at the Marine Institute HQ Rinville, Galway.

Outcome

The expected outcomes from the project include:

- an improved understanding of the recruitment dynamics of boarfish and other stocks exhibiting similar behaviour.
- an enhanced understanding of boarfish reproductive biology (spawning season duration, important spawning areas, the relationship between maturity and length/age).
- the development of models and data products in support of stock assessment.
- peer-reviewed scientific publications.

Marine Institute Corporate Strategy 2023-2027

Under the strategic priority "Delivering impact through research and innovation" of the Marine Institute's corporate strategy Ocean Knowledge that Informs and Inspires, this research will address strategic initiative number 1 by enhancing our understanding of the recruitment dynamics of stocks characterised by spasmodic recruitment, leading to improvements in the assessment and the provision of management advice to managers and stakeholders.

Under the strategic priority "Inspiring our stakeholders and society", the project proposes to continue the close co-operation between the Marine Institute and industry partners that characterised initial research on boarfish.

Specific Requirements

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

Financial Details

Scholarships will be up to €34,000 per annum (maximum funding PhD of €136,000 over four years). This amount comprises a maintenance award of €25,000 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, such as minor kit purchase e.g. camera) 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.

Scholars can also supplement this funding by applying to the Marine Institute's Networking & Marine Research Communication Awards annual call.

In addition, the cost of a laptop will be covered by the Marine Institute (purchased via the Research Funding Office).

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- Licandeo, R., Duplisea, D. E., Senay, C., Marentette, J. R., & McAllister, M. K. (2020). Management strategies for spasmodic stocks: a Canadian Atlantic redfish fishery case study. *Canadian Journal of Fisheries and Aquatic Sciences*, *77*(4), 684-702.