

Project report for SG436

Incorporating Fisher's Knowledge and Uncertainty Analyses into the Development of Ecosystem Models

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The Masts small grant (£500) contributed towards the travel expenditures required to disseminate our research at the annual American Fisheries Society conference in Atlantic City, NJ, USA. Our work with ecosystem modelling was presented orally on the 22/08/18 at the Atlantic City convention centre as one of around 1,100 talks.



Conference Abstract

For complex ecosystem models to be used as tools to inform fisheries management, their development should incorporate stakeholder knowledge and steps to address inherent uncertainty. Using an Ecopath with Ecosim model of the Irish Sea (developed as part of the first ICES Integrated Benchmark Assessment, WKIrish), we investigated how uncertainty in the diets of marine organisms and the incorporation of stakeholder knowledge (food webs and fishing effort trends) altered our perception of the ecosystem and improved the statistical fit (AICc) of model dynamics to observed data. Uncertainty analyses derived from Linear Inverse Modelling techniques enabled stronger inferences to be drawn from Ecosystem Network Analysis indicators for the Irish Sea food web. The addition of stakeholder knowledge provided altered ecosystem perceptions. Stakeholders distinguished multiple flows between discards and consumers, which were not directly identified in the fish stomach records (Figure 1), leading to higher estimations of system recycling (Finn's Cycling Index). The addition of stakeholder

fishing effort drivers increased the models capacity to replicate historic trends when used in conjunction with ICES fishing effort data and environmental drivers (temperature and North Atlantic Oscillation) (Figure 2). Steps such as these are essential to address the uncertainty in complex models and achieve greater uptake beyond academic purposes.

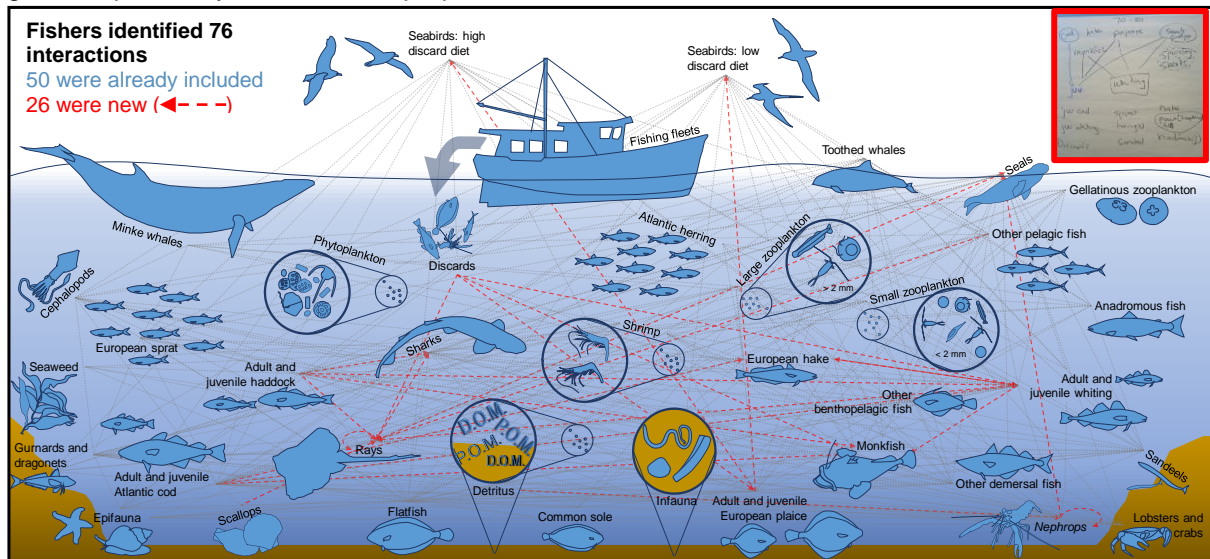


Figure 1. Irish Sea food web. Functional groups are linked by predator-prey interactions. Fishers identified 76 interactions, 26 of which were not included in the scientific literature (red arrows).

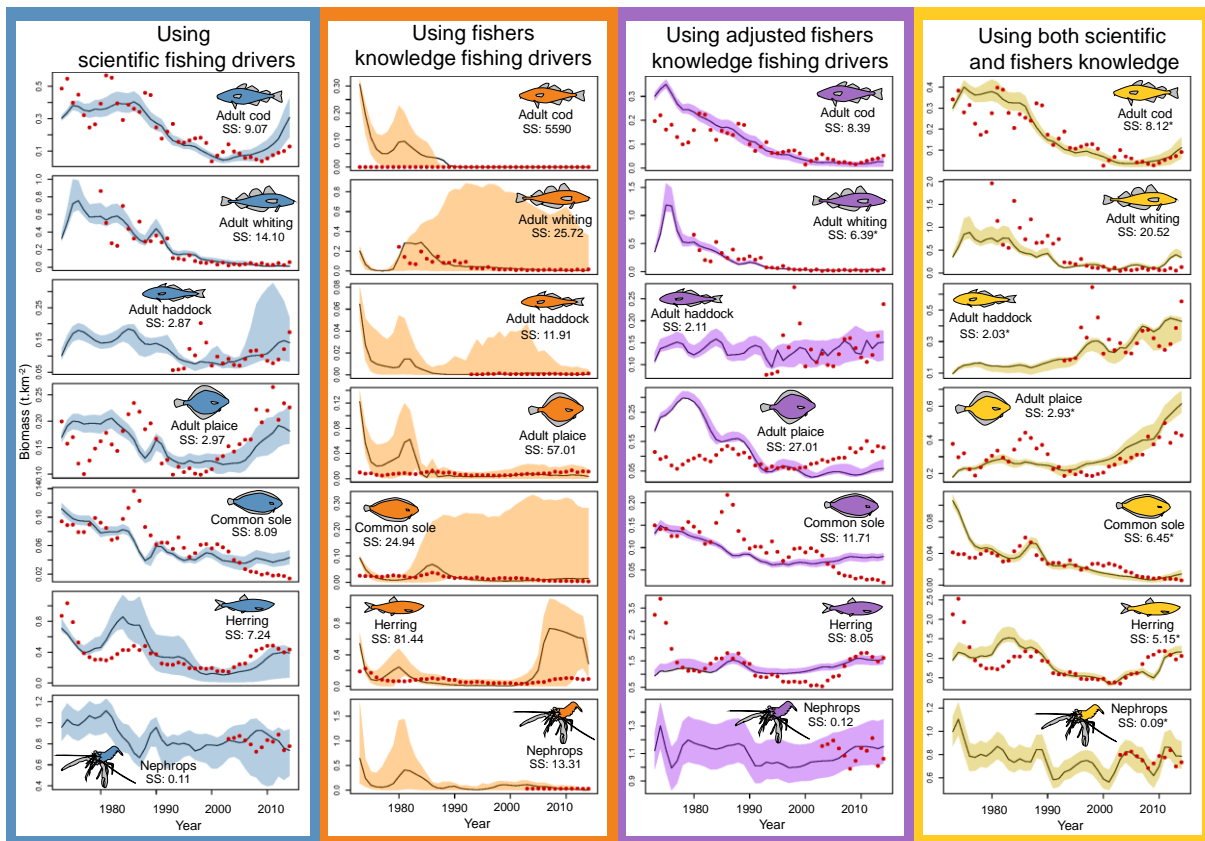


Figure 2. Biomass trends for the commercially important stocks in the Irish Sea EwE model. Solid lines indicate model predictions and dots represent observed data. Predictions are surrounded by 95% confidence intervals calculated using a Monte Carlo approach, generating 1,000 models within the range of plausible input estimates. Model predictions were generated using four sources of fishing effort data: 1) Scientific knowledge, 2) fishers knowledge, 3) adjusted fishers knowledge, 4) hybrid knowledge.