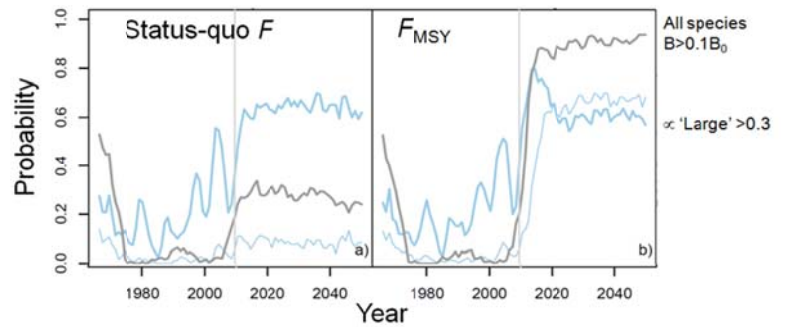


Multispecies Size Spectrum Ecological Modelling in R (MIZER)

Model type: The model was developed to represent the size and abundance of all organisms from phytoplankton and zooplankton, to large fish predators in a size-structured food web. Organisms are represented by species specific-traits and body size, or solely body size. MIZER has been used to describe the effects of fishing on interacting species and the size-spectrum¹. It provides a means of scaling from individual processes to population structure (size distribution of each species) and community structure (sum of size distributions of all species). Model outputs can be used to estimate standard fisheries and conservation reference points for these species as well as a range of community and food web indicators for evaluating the effects of fishing. Application of the multi-species size spectrum model to a wide range of systems is easy using the open source R package MIZER².



Existing Models for UK shelf seas:

Validation has been done for the North Sea by comparing catches and spawning stock biomass to time-averaged landings data and spawning stock biomass from ICES stock assessments. Modelled species size distributions have also been compared against trawl survey data from the North Sea Quarter 1 International Bottom Trawl Survey from 1983 to 2010¹.

Existing uses:

- Assessed the response of the North Sea community to fishing pressure and determined whether meeting management targets will be sufficient to meet proposed Marine Strategy Framework Directive targets for biodiversity and food web functioning.
- There are a growing number of existing but unpublished applications including deep waters off the West of Scotland, the Celtic Sea, Scotian Shelf, and Baltic Sea.

Potential new uses:

- Incorporation in management strategy evaluation and a risk assessment framework.
- Examining parameter and model uncertainty alongside error in data in order to present model outputs with associated measures of uncertainty and allow users of the advice to better assess the risks associated with alternate management options.
- Extensions being explored to seabirds and bioeconomic processes.

Key modelling issues:

- The model assumes all species feed according to size and would require future development to include other taxonomic groups (e.g. seabirds, mammals, benthos)
- Care should be taken when setting up the time and size resolution of the model as these can result in instabilities

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¹ Blanchard et al. (20114). Journal of Applied Ecology 51, 612–622.

² Scott et al. (2014). Multispecies, trait-based and community size spectrum ecological modelling in R (mizer)