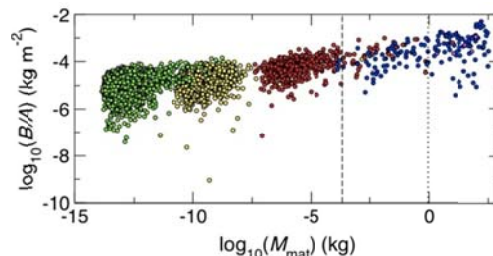


Population-Dynamical Matching Model (PDMM)

Model type: The PDMM models the complex food webs of temperate marine shelf communities. It is unique in its ability to resolve biodiversity to the level of interacting species across the entire marine food chain. The model is not spatial and does not aim to provide a representation of the particular species and their interactions in a study region. It aims to reproduce the resulting high-level patterns, and characteristic responses of species and the entire food-web to pressures. The model is well understood and has been extensively tested in comparison with data from temperate shelf communities such as those of the North Sea and particularly the Celtic Sea.¹ This allows the modelling and assessment of theoretical concepts like multispecies MSY and of environmental indicators that are needed to underpin policy and management.



Existing Models for UK shelf seas:

Area Modelled	Includes					Spatial Scale	Quality (data used)
	M ¹	B ²	F ³	I ⁴	P ⁵		
Celtic Sea	0	0	around 200	several 100	several 1000	None	Calibrated and dynamics verified

1 M = mammals, 2 B = birds, 3 F = fish, 4 I = invertebrates, 5 P = primary producers

Existing uses:

- Quantification of biodiversity ecosystem functioning (BEF) relations for exploited fish communities.
- Evaluation of high-level management strategies to achieve multispecies MSY.
- Predicting recovery of fish-community size structure to changes in fishing pressure (Celtic Sea).
- Identification of processes driving and constraining the dynamics of the Large Fish Indicator.
- Modelling and predicting recovery trajectories of Large Fish Indicator, Large Species Indicator, Mean Maximum Length, Mean Size at Maturation, and total fish biomass in response to changes in fishing pressure.
- Determination of time scales at which changes in fish community size structure affect fish species richness.

Potential new uses:

- Assessment of impacts of changes in ocean biogeochemistry on marine biodiversity and fish production.
- Quantifying the value of changes in marine biodiversity.
- Quantitative risk assessment of the impacts of invasive species.
- Quantification of adaptability of marine food webs to climate change and species composition.
- Tests of novel food-web indicators.

Key modelling issues:

- The PDMM shifts the focus from the fate of particular species to that of biodiversity at community level. Some adaptation of thinking by users of model outputs may be required.
- The PDMM does not currently distinguish between the benthic and the pelagic parts of the marine community.

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¹ Fung et al. (2015). Nature Communications, 6, 6657.

Fung et al. (2013). Marine Ecology Progress Series 484, 155–171.

Shephard et al. (2013). Fisheries Research 140, 91–95.