

Thesis – HERNVANN Pierre-Yves

Modelling of the trophic functioning of the Celtic Sea ecosystem: impact of fisheries, climate change and ecosystem-based management scenarios.

Current Research Topics

Team of supervising: Didier GASCUEL (UMR ESE, Agrocampus Ouest, Rennes), Marianne ROBERT and Dorothée KOPP (LTBH, Ifremer Lorient).

This PhD project aims to analyze and quantify the impact of fishing on the Celtic Sea ecosystem, which is a crucial area for European and especially French fishing fleets. This study will rely on a trophic approach, which allows to understand how this impact spreads from the target species to the whole ecosystem through the food-web.

This project is mainly based on trophic modelling with the widely recognized Ecopath with Ecosim software and will involve the 3 following steps:

Developing a generic method to estimate diet matrices in Ecopath models

A Bayesian integrated model will be developed to couple different kind of data such as literature information, stable isotope analysis or stomach content analysis into diets estimation. This framework will also allow to assess the uncertainty associated to these estimates. Applied to data from the EATME program, this model will improve the current knowledge on trophic functioning of the Celtic Sea and will provide a new diet matrix for the Celtic Sea model.

Spatializing the model using Ecospace

Once the Ecosim model fitted on abundance (EVHOE survey), biomass and catches (ICES) time-series, an Ecospace model will be developed. Habitat models for the main ecosystem components will be built to spatially distribute their biomass according to their ecological preferences. Outputs of habitat models for mesozooplankton (Jean-Noël Druon, JRC) will be integrated to reduce the uncertainty on low trophic levels. This second step of the PhD project may improve our the understanding of spatio-temporal changes in abundance of resources since the early 1980s and their fisheries and environmental driving factors.

Using the Celtic Sea model in a predictive way

Several scenarios will be built to simulate the future impact of climate change within Ecospace. The model will also be used to test several management scenarios for identifying key strategies to support an effective ecosystem approach of fishing management in Europe.

Collaborations

Ecology and Ecosystem Health research unit (ESE), Fisheries and Aquatic Ecology Research Team

Joint Research Center, Directorate D, Sustainable Resources unit (Ispra, Italy)

Discardless - European Project H2020