Informatics team & the future for WKMIXFISH-METH

Informatics in Support of Ecosystem Based Fisheries Management Project

* The strategic vision of the Informatics project is to put in place the infrastructure (human & structural), competence and political vision to efficiently integrate and utilise the ever increasing sources of fisheries related data (including fishery/ecosystem interaction data) to improve decision making, governance, enforcement, conservation, sustainability, profitability, transparency and public perception of the marine fishing sector.

This project is funded by the European Maritime and Fisheries Fund (EMFF) and the team consists of two R developers with statistical and biological/environmental backgrounds (Shawna Sanfey and Olga Kalinina), a SQL developer, a project manager and two MI team leaders who help steer and define the project (Colm Lordan and David Currie). This team is based at the Marine Institute in Oranmore.

Data is a key input into the advice which drives fisheries management but access to it is often restricted to scientists. This project provides tools for a number of different audiences to discover and explore the fisheries data that is collected within Ireland. Data can be difficult to interpret if you are not familiar with its context so rather than just providing the data itself this project has developed graphical data-driven tools and applications that will make its interpretation easier. Some fisheries data is confidential so all project work has been performed with security in mind with the aim being to make data sets as accessible as possible whilst respecting existing data protection and data sensitivity requirements. Knowledge-sharing and capacity building is embedded within the project – this has taken the form of presentations by the project personnel at the Marine Institute, to local user groups, and to the wider public at events such as SeaFest. The computer code outputs from the project will also be shared in an open-manner so that the wider community can have access to them.

Informatics Project Objectives

* + To establish an inter-departmental and agency steering group to develop a strategic work plan for the project.
  + To review existing data holdings and to anticipate future data collection and integration requirements based on CFP priorities and policy drivers which potentially impact on the CFP.
  + To establish a properly resourced cross departmental and agency data integration team that will develop and maintain data integration infrastructure and solutions.
  + To make integrated fisheries data sets as accessible as possible whilst respecting existing data protection and data sensitivity requirements.
  + To build capacity within organisations to work with and evolve integrated data.
  + To develop software systems and tools to generate useful insights and knowledge from integrated data.
  + To use integrated data to inform and monitor discard reduction plans, mixed fisheries management plans, MSY targets, habitat and species conservation plans etc.

MI based project aims;

* + to visualize existing fisheries data,
  + increase its usage/utility and
  + make it more easily accessible

These aims and objectives are very much compatible with those of the mixed fisheries working group so a natural working relationship was developed to apply the stills in R development of the Informatics team to the mixed fisheries data, tools etc.

The Mixed fisheries shiny app is still in development. Initial work has focused on digitizing the annual report produced by the group to allow more interaction between the user/reader and the data and visualisations produced by the group. The data management and exploration tools which were previously created by the WKMIXFISH group were recreated and integrated into the app with the aim to create a ‘one-stop shop’ for mixed fisheries data exploration and analysis. Elements of the Celtic seas fisheries overview were incorporated into the app as they provided important contextual information which placed the mixed fish the relevant environment and framework. An interactive mapping tool was developed within the mixed fisheries app which allows the user to examine the TAC areas along with the stock assessment areas, highlighting areas of overlap etc. There are plans to integrate other spatial output of the WKMIXFISH group into this interactive mapping tool in the future, for example this could include outputs of species distribution overlap mapping.

A multipage interactive data visualisation tool was also developed for the mixed fisheries app which allows the user to examine:

* Submitted Landings data in terms of species mixing in the Celtic Sea which allows the user to identify if the stock data are sufficiently robust to be included in a mixed fisheries forecast.
* Total fishing effort used by different countries grouped by vessels length, fishing gear for a target species during a selected year.
* An overview of historical species stock status along with other functionalities, the objective of which is to reproduce the single species advice and allow the comparison off all biological reference points to FCube baseline runs at once.
* An FCube Catch forecast which allows the user to choose different scenarios and to explore visualization strategies for potential overshoot and undershoot catch options as compared to the single species advice.
* A detailed breakdown of the changes in the relative share of species landings by countries compared to the 2017 baseline for each scenario.
* The level of effort required by each fleet to catch their quota/share within the single species TAC advice for each stock, additionally we included instant information on choaked and un-choaked stock by scenario.

Currently the app produced by the informatics team working within the Mixed Fisheries working group is accessible only through the ICES sharepoint site. The previous outputs of this team are, however, open source and freely available online. The code used to produce these outputs is available on the Marine institute Github page (<https://github.com/IrishMarineInstitute>) and the data is also freely available from the Marine Institute either as downloads through the individual shiny apps or directly from the Marine Institute.

Outputs:

* 1. **Species Dashboard**; Provides the annual review of fish stocks and the latest scientific advice that informs fishing opportunities for the following year. Makes this advice available on-line in an interactive way – for example it includes a forecasting tool that allows users to see the projected impact of different fishing scenarios. <https://shiny.marine.ie/speciesdash/>
  2. **Digital Stockbook**; Web application that makes biological fisheries data more available. This App allows people to explore the length, weight, and age data of commercial species that are caught around Ireland and allows the effects of factors such as year, sex, area, and gear on the fish to be investigated. <https://shiny.marine.ie/stockbook/>
  3. **IGFS data explorer**; The IGFS is part of an internationally coordinated series of demersal trawl surveys that provides data on fish stocks. This app allows users to explore the results of the survey using a number of tools. [https://shiny.marine.ie/igfs/](https://shiny.marine.ie/stockbook/)
  4. **Cod tagging data portal**; The Marine Institute, in partnership with AFBI and CEFAS, are conducting a cod tagging project in the Irish Sea. This graphical, data-driven tool allows users to look at the data collected including recaptures, tagging events and gear of tagging vessel. <https://shiny.marine.ie/tagging/>
  5. **BIM Fisheries Management Chart Online;** the Marine institute worked with BIM on the concept and execution of a digitized version of the fisheries management chart which BIM produces annually. This is still in development but an initial release with views for Nephrops, Pelagic, Whitefish and fixed gears can be viewed at [http://**www.fisheriesmanagementchart.ie**](http://www.fisheriesmanagementchart.ie).