Identification of essential habitats for large pelagic species

Introduction

Atlantic bluefin tuna and Mediterranean and Atlantic swordfish are of great economic value for European countries as well as for non-European Mediterranean countries. UE countries have a long lasting fisheries history, but these resources are nowadays strongly overexploited and overfished. In the short-term, it is important to reverse the current fishing mortality rates and to decrease the fishing capacity. However, improvement in the medium- to long-term management and conservation of these large pelagics fish imply a better understanding of the key biological and ecological processes as well as their trophic relationships. A first step in this direction will be to better understand bluefin tuna and swordfish spawning and foraging habitat and its relationships with environmental changes.

Objectives and description of the project

The objectives of the proposed study is to model seasonal spatial trends in bluefin tuna and swordfish abundance in the Mediterranean as functions of environmental spatial, and temporal variables. Those variables will be: Sea Surface Temperature (SST), Chlorophyll-a (Chl-a), Mean Sea Level Anomaly (MSLA), Latitude, Longitude and Year. As the aforementioned species have a near-surface distribution, at least during the night, it is expected that SST will be important either as a direct influence on distribution or as a proxy for other factors (e.g. prey abundance). Chl-a level provide information on the primary production of an area, while MSLA is an indicator of possible oceanographic activities such as gyres and eddies. There may be spatial trends in abundance due to other reasons (e.g. topography of the area) than oceanographic parameters. Consequently, longitude and latitude will be included as possible predictors. Finally, year will be included as a predictor variable to account for abundance trends due to annual recruitment variations.

Abundance variations could be modeled by means of Generalized Additive models (GAM) techniques, commonly used for examining fisheries data in relation to environmental and spatiotemporal variables or other quantitative approaches. Apart from exploratory purposes, GAM analysis could be utilized in a predictive way, as the model estimates will be used to construct density distribution maps of the large pelagic species in the studied area.

Analysis will utilize a time-series of fisheries data (mainly catch-effort information) that will be made available by the participating institutions, as well as data from on board observations and tagging experiments (when available). The oceanographic data that will be used to characterize fish habitats will include satellite-derived estimates of SST, Chl-a and MSLA for the corresponding fish data locations.

Project implementation

The project will be implemented through four work packages (WP) having a total duration of 24 months that will produce the following deliverables:

WP1
Objective: Compilation of fisheries and experimental data (i.e. surveys) for the studied species.
Deliverables: Compiled data sets of fisheries and scientific data
Duration: 12 months.

WP2
Objective: Compilation of oceanographic data for the areas of interest.
Deliverables: Compiled data sets of oceanographic data.
Duration: 3 months

WP3
Objective: Data analysis and elaboration of indicators of the spatial and temporal variability in bluefin tuna and swordfish habitat
Deliverables: Statistical comparisons and evaluation
Distribution maps
Identification of essential habitats
Duration: 18 months.

WP4
Objective: Project management.
Deliverables: Technical reports.
Duration: throughout the project.

Work plan

The project will be accomplished in 24 months. A detailed planning showing the timing of the WPs and the deliverables is given below.

Gantt chart: Work planning showing the timing of the WPs and the deliverables.

Tasks	Year quarter							
	1	2	3	4	5	6	7	8
WP1								
Compiled data sets				⌂				
WP2								
Compiled data sets					⌂			
WP3								
Statistical comparisons & evaluation						⌂		
Distribution maps							⌂	
Identification of essential habitats								⌂
WP4								
Reports				⌂				⌂

⌂ Deliverables