

Developing a forecast system for Atlantic albacore tuna

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Credit: AI-generated image ([disclaimer](#))

Fish population dynamics models are essential tools used to estimate fishing impact and provide key indicators of exploitation. A EU-funded project is helping to provide a new generation of models harnessing the progress made in monitoring using in situ and satellite data.

The EU project ATLANTOS (Optimising and Enhancing the Integrated Atlantic Ocean Observing System) is achieving a transition from a loosely-coordinated set of existing ocean observing activities to an efficient Integrated Atlantic Ocean Observing System (IAOOS).

The team is now harnessing the techniques used by the Spatial Ecosystem and Population Dynamics Model (SEAPODYM), which has been used to investigate the physical-biological interaction between tuna populations and the pelagic ecosystem of the Pacific Ocean.

ATLANTOS is applying the model to albacore tuna populations in the Atlantic.

The project has now developed the first phase of a Spatial Ecosystem and Population Dynamics Model to simulate the change in abundance of Atlantic albacore tuna over time and space. Population fluctuations in the target species are identified by age class: from larvae to oldest adults. SEAPODYM also distinguishes between fishing impact and natural variability relating to factors such as climate and environment. The different fisheries are described according to characteristics such as fishing gear used, strategy and size selectivity, among other criteria.

The environment and human actions are some of the factors SEAPODYM analyses, but the behaviour of the fish themselves are also central to the modeling outcome. Fish biology and behaviour are simulated based on their relationship to environmental variables. For example, the model includes the distribution of prey species such as small fish, shrimp and squid, which drives the movement of the tuna. Currents distribute the larvae and the food sources and water temperatures along with oxygen levels control habitat preferences.

Writing in the latest ATLANTOS newsletter the project explains habitat preferences change with age and that migrations relating to spawning are impacted by light levels.

Steps in the creation of a robust modelling system

The first phase in the creation of this operational [system](#) is now in place. ATLANTOS has constructed a statistical method to calibrate and estimate abundance by age class. 'This is a critical step since management indicators will rely on this parameter (...) It uses all historical fishing data to reconstruct the whole history of the fish population,' the authors write. This first step, which involved what they describe as 'high computational requirements,' was conducted using a coarse resolution configuration.

The second phase scales the parameterisation to the required resolution and involves the forcing of the operational forecast system, resulting in density maps of larvae, juveniles, immature and mature albacore tuna cohorts. The third phase will see a chain of production being developed to run automatically in order to update the model weekly, to a spatial resolution of what the project describes as, ' $\frac{1}{4}^\circ$ (i.e., a grid with square cells on one side of ~28 km).' Phase two and three are being developed in parallel.

The operational system should help to improve the realtime monitoring of fishing activity and stock assessment that feed into the conservation measures, such as Total Allowable Catch, established by the International Commission for the Conservation of Atlantic Tunas.

The project explains, 'Since it is spatially-explicit, the system can assist in designing research sampling and collect fishing statistics, and in fighting against illegal, unregulated and unreported fishing activity by pointing out potential critical areas to control.'

This is just one of the many activities being carried out by the ATLANTOS project which seeks to define requirements and systems design, improve the readiness of observation networks and data systems,

and engage stakeholders around the Atlantic.

More information: Project website: www.atlantos-h2020.eu/

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