

## CERES storyline - sardine and anchovy fisheries in the Bay of Biscay

### Will small pelagisc be effected from climate change?

Spatial distribution at different life stages may change depending on climate scenarios. Changes in the adult distribution may be conveyed by a change in the growth pattern or some habitats becoming physiological unsuitable (low food, high temperature). Changes in larval dispersal are expected to depend on changes in the seasonality of currents and spawning windows depending on climate scenarios. Changes in stock productivity with climate change scenarios could be mediated by the scaling at population-level of changes in individual growth, fecundity and larval survival.

### How vulnerable are small pelagics to climate change?

The spatial organization of the life cycle may change depending on climate scenarios affecting larval dispersal, individual growth and timing of reproduction.

Stock productivity may increase with spatial displacement.

The capacity of fishers to adapt their strategies, vessels or gears will determine the viability of the pelagic fishery.



### What is the economic value of this fishery?

For sardine there is no total allowance of catch (TAC) or management plan. The resource in the Bay of Biscay is in the order of 400-500 000 tons but a larger spatial extent of stock is probable. The annual international catch is 30-40 000 tons in recent years. Fish price is in the order of 1-2 € per kg varying with fishing gear, season, location, markets.

For anchovy a management plan was evaluated as precautionary. TAC ranges between a minimum of 7000 tons and a maximum of 33000 tons set depending on the spawning stock biomass being higher/lower than reference points. The annual international catch is 20-30 000 tons in recent years. Fish price is in the order of 2-3 € per kg varying with fishing gear, season, location, markets.

### What are the challenges?

There are several knowledge gaps for these species:

- mortality (predation) in the ecosystem
- larval connectivity.
- translation of individual vital rates into population level behavior and productivity.
- behavioral adaptation of fishers to changing conditions (biology, management and markets)
- relationship between food quality changes and composition of the (changing?) phyto- and zoo plankton communities

## What is the working program in CERES?

- Outputs of the model run for currents, hydrology and zooplankton will be the input for individual based models (IBM).
- Full-life cycle IBM-dynamic energy budget (DEB) models of anchovy and sardine: The IBMs will be run in population mode in 0-d to assess how individual vital rates (growth, reproduction, survival) translate into population-level productivity (recruitment, demography) and fecundity depending on climate scenarios.
- Larval IBM-DEB models for anchovy and sardine: The IBMs will be run to assess change in larval dispersal depending on climate scenarios and reproductive windows.
- Spatially explicit pelagic fishery model: The model will be run to assess the effect of change in spatial



distributions on the economic viability of fishing strategies using different metrics.

- Statistical modelling of spatial distributions and their links to demographic and climate drivers: The models will be run to predict distributions at different life stages under different scenarios.

## For further information please contact:

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