

# **Northern Alboran Sea anchovy fishery scenarios under global climate change**

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## **Introduction**

The valuation of commercial fish stock in Southern European Seas (SES) provide to policy-maker of a strong argument for the society to justify the conservation, and economic and biological sustainable exploitation of fisheries. It is also of importance the valuation of the potential change in value due to the aggregated change of the main ecosystem functions supporting fisheries in SES as a consequence of human activity for the same reasons, given that we are indirectly valuating the human impact on non-marketed ecosystem functions. The valuation of different fisheries policy alternatives and the potential impact of marine environment conditions evolution that proxi ecosystem functions changes requires the definition of realistic fishery scenarios. This valuation together with the allocation of objective or subjective probabilities of occurrence for these scenarios is the base to support the decision making of the policy-maker in an uncertainty environment.

## Aim

- Valuating the impact of ecosystem changes on small pelagics fish stocks caused by the raising of the sea surface temperatures in Northern Alboran Sea (Western Mediterranean Sea).
- Providing anchovy fishery scenarios in Northern Alboran Sea under the framework of A1B IPCC scenario for the next 50 years using regional marine environment scenarios produced in the framework of SESAME integrated project.

## Scenarios

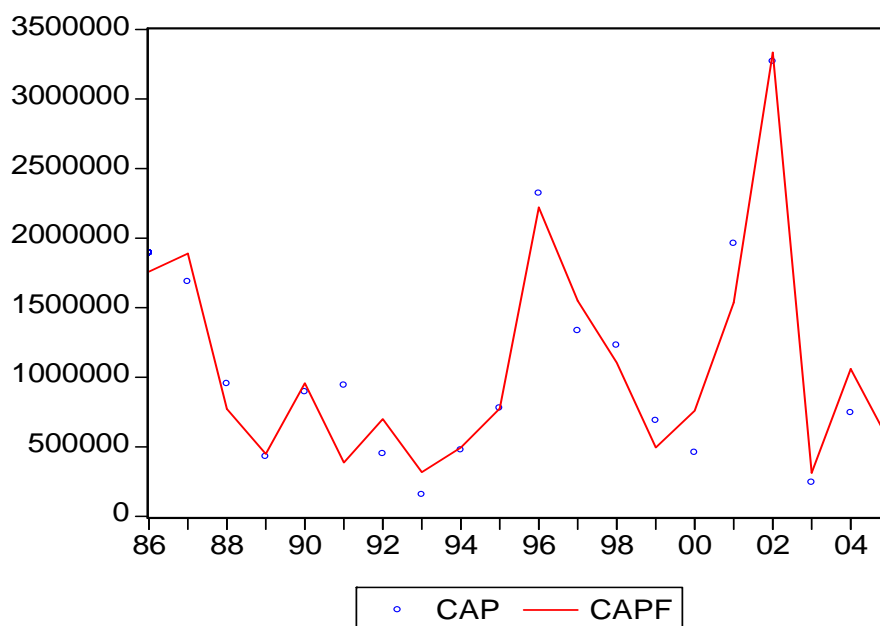
- This study considers three alternative scenarios under the framework of the A1B IPCC scenario for the next 50 years: Business as Usual (BAU), Deep Blue (DB) and Policy Target (PT) scenarios.
- The Business as Usual scenario assumes that the social system operates holding things as they are now without any new regulation on fisheries issues.
- The Deep Blue scenario assumes the implementation of ecosystem based fisheries management (Frid, *et al.* 2005) and collaborative management of shared stocks.

## Scenarios (cont.)

- The Policy Target scenario assumes that formulaic Europe-wide regulations are set without looking at specific regional needs or characteristics.

## Results

- The Stock recruitment relation based on Cushing (1971) was the one that fitted better. All parameters estimates but the intercept were significant at 1% level and the adjusted R-squared was over 90%. This relation was estimated through Non Linear Least Squares.



- The scenarios described in the theoretical framework have been simulated year by year until 2050 using the methods described in last sections. The results attained for the aforementioned simulations are summarized in the following Table.

## Results (cont.)

Scenario	Fishing effort		Capture		Biomass	
	Days / year	% Change	Tn/year	% Change	Tn/year	% Change
BAU	2261	-52.73%	242,38	-49.03%	431.07	50.78%
DB	667	-86.05%	76.49	-83.91%	397.65	39.10%
PT	3594	-24.86%	367.53	-22.71%	466.09	63.03%

## Summary and conclusions

- A stock-recruitment model of anchovy fishery located in Northern Alboran Sea accounting for marine environment conditions evolution has been estimated in this study based upon the evidences that the SST ratio has a significant influence on the evolution of the exploited stock of this fishery. Results attained provide anchovy fish stock evolution accounting for marine environment conditions.
- This study shows a literal and quantitative description of business as usual, deep blue and policy target scenario in a marine environment, characterized by A1B IPCC scenario using bioeconomic modelling and simulation techniques for anchovy fishery of Northern Alboran Sea, year by year until 2050. (see last section).
- The quantitative description of the aforementioned scenarios highlight that the deep blue scenario is the one that results in highest levels of mean fish stock while the policy target scenario is the one with lowest levels of it, so that we can conclude that the former is the best in biological terms.
- The quantitative description of the scenarios also evidences that the highest levels of captures are reached in policy target scenario while the lowest are reached in deep blue scenario. The former scenario is also characterized by the highest levels of fishing effort what implied the highest levels of labor. The business as usual scenario attains less capture than the policy target scenario, however this scenario would be significantly better in biological terms.