

## POPULATION DISTRIBUTION AND BIOMASS VARIABILITY OF SARDINE AND ANCHOVY IN THE CANARY CURRENT SYSTEM AS SIMULATED BY AN END-TO-END COUPLED MODEL

Abstract ID : 960

Conflict Declaration : None

Content Motivation : None

Additional Information : None

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Small pelagic fishes as sardine and anchovy account for as much as 20-25% of the world fisheries catch. They are particularly abundant in the four major eastern boundary upwelling ecosystems, where high levels of biological productivity are sustained by the supply of nutrient-rich water from beneath the photic zone. An intrinsic and puzzling feature of small pelagic fish is the large fluctuations of their population, typically occurring at decadal scales. The causes for such fluctuations have been extensively analyzed and discussed in the literature, yet our understanding of the mechanism involved is very limited. End-to-end models are emerging tools useful to test hypothesis for such fish population variability or to gain new insights into the problem. This comprehensive and complex model approach is now becoming possible largely thanks to the present-day computer power. This contribution focuses on the population dynamics of sardine (*Sardina pilchardus*) and anchovy (*Engraulis encrasicolus*) in the Canary Current Upwelling Ecosystem. We describe and present the results of an end-to-end coupled model simulation including these two small pelagic species. The end-to-end application includes three model components: the ROMS circulation sub-model, the lower

trophic ecosystem sub-model NEMURO, and a recently developed individual-based model for the fish (Rose et al. 2015; Fiechter et al. 2015). The computational grid for the three models covers NW Africa and the Western Iberian Peninsula at a spatial resolution of 12 km. This resolution is sufficient for certain eddy variability to occur in ROMS. Different biological traits were prescribed for anchovy and sardine: temperature optimum, diet preferences, and the onset and duration of the spawning season, among others. A hind-cast simulation of the period 1958-2007 was carried out.

Model results reveal a fairly different behavior of sardine and anchovy. Anchovies gather off the northern part of Morocco and the Gulf of Cadiz, whereas sardines appear more scattered across the domain, further offshore, and further south, where upwelling favorable conditions take place year round. Both species exhibit decadal-scale fluctuations in both the location of the center of mass of the population and their biomass abundance; the latter being reasonably correlated with historical landing records.