

## End-to-end projections for 21<sup>st</sup> century sardine and sardinella population dynamics in the Canary Upwelling System

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Understanding how large-scale climate variability will influence the distribution and abundance of fish populations over the coming decades is a major concern for marine ecology and fishery management. Small pelagic fish, in particular, play a key ecological role by linking plankton to top predators and account for about half of the global marine fish catch, so future changes in their biomass or spatial distribution are expected to generate far-reaching ecological and socioeconomic impacts. These stocks are most abundant in major coastal upwelling regions, with the Canary Current Upwelling System (CCUS), off northwest Africa, standing as one of the most productive and ecologically significant. In this region, small pelagic fish represent almost 70% of total landings, with round sardinella (*Sardinella aurita*) and European sardine (*Sardina pilchardus*) being the most abundant species. Recent studies suggest that the combined influence of sea temperature, food availability, and coastal currents plays a vital role in regulating the population dynamics of these species. However, the way in which climate change will affect these drivers in north-west Africa over the 21st century is not yet well understood. This study presents preliminary “end-to-end” (physics-to-fish) predictions of 21st-century sardine and sardinella abundance and biomass distribution in the CCUS. Projections are generated by downscaling simulations (historical and SSP8.5) from the MPI-ESM1.2-HR model. These downscaled products are used to run the end-to-end modeling approach which couples a regional ocean circulation model (ROMS), a lower-trophic ecosystem module (NEMURO), and an individual-based model representing all life stages of sardine and sardinella. This framework provides a crucial basis for assessing how future changes in temperature, upwelling and food production will alter habitat suitability, growth and reproduction of both species, thereby offering an essential tool to support the cooperative management of transboundary fish stocks and, in turn, contributing to the economy and food security of implicated countries.