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The role of sea surface circulation and hydrographic processes in anchovy spawning and larvae distribution in the Strait of Sicily (Central Mediterranean).

Federico Falcini (1), Luigi Palatella (2), Angela Cuttitta (3), Francesco Bignami (1), Bernardo Patti (3), Rosalia Santoleri (1), and Fabio Fiorentino (4)

(1) ISAC, CNR, Roma, Italy (f.falcini@isac.cnr.it), (2) ISAC, CNR, Lecce, Italy , (3) IAMC,CNR, Capo Granitola, Italy, (4) IAMC,CNR, Mazara del Vallo, Italy

The European Anchovy (Engraulis encrasicolus, Linnaeus, 1758) is one of the most important resources of the Mediterranean Sea. Despite its abundance and relevance, the anchovy population off the Mediterranean coasts exhibits a patchy distribution. Moreover, its biology and the influence of environment on its variability is poorly known. We here use data from ichthyoplankton-surveys carried out during the peak spawning season in order to analyze abundance and age of anchovy larvae in the Strait of Sicily, with respect to sea surface dynamic and hydrographic parameter patterns.
The Strait of Sicily dynamics is characterized by upwelling regions, fronts, vortices, and filaments, with a consequent complexity in the spatial distribution of oceanographic parameters and anchovy larvae. To investigate the role of mesoscale features and oceanographic environment on the latter, anchovy larvae observations were paired to remote sensing data (such as sea surface temperature, chlorophyll, primary production, surface wind speed as well as light attenuation, absorption, and particle backscattering coefficients) and Lagrangian and Eulerian numerical simulations results for ocean currents and larval transport. The subsequent analysis shows and quantifies how the Atlantic Ionian Stream (AIS, a meandering current of Atlantic origin) path and variability, as well as the upwelling-induced south Sicilian coastal current, have consequences for anchovy spawning and larvae distribution. These currents transport anchovy larvae towards the Sicilian coast's south-eastern tip, where larvae are then retained in a frontal structure. However, significant cross-shore transport events due to relatively cold filament-like baroclinic instabilities generated by wind-induced coastal upwelling were also observed. Finally, the larval age distribution qualitatively agrees well with this transport pattern.