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Biophysical studies of reef fish self-recruitment and connectivity in Micronesia

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Abstract

Calibrating against a 30-year time series of larval recruitment of rabbit fish, an herbivorous coral reef fish, on the island of Guam, tropical western Pacific, I developed a high-resolution biophysical model that includes directional swimming. It reveals how meso-scale turbulence and ENSO-driven changes in the ocean circulation impact on the population dynamics of rabbit fish. ENSO drives island wakes that enhance the capacity to retain locally spawned larvae, and meso-scale turbulence generates much variability at time scales larger than the Pelagic Larval Durattion. Using the same model, I quantified the ENSO-driven variability of grouper fish self-recruitment in Palau, Micronesia. Using an altimetry-driven advection-diffusion oceanography model, I mapped for 40 mass spawning events spread over 10 years the grouper fish connectivity in Micronesia and I showed that meso-scale turbulence is the dominant process controlling connectivity and not the mean oceanographic currents. This finding applies also in the Galapagos archipelago, the Spratly Islands archipelago and the Coral Sea fringing the Great Barrier Reef.

Keywords

Fish recruitment, Connectivity, ENSO, Islands