

Using the ALADYM simulation model for exploring the effects of management scenarios on fish population metrics

Simulation of fisheries systems is a widely used approach that integrates monitoring and assessment tools. We applied the ALADYM (age-length based dynamic model) simulation model to three different studies aimed at investigating correlations between pressure and population metrics, exploring the viability of different mortality levels in long-term scenarios and predicting the effects of combined management measures. Uncertainty was incorporated into the simulations following the Monte Carlo paradigm. Three stocks were used for these exercises: red mullet in the central-southern Tyrrhenian Sea and European hake in both the Bay of Biscay and the Aegean Sea. The analysis of the relationships between total mortality and indicators highlighted significant pairwise negative correlations for red mullet. These signals of decline were supported by the spawning potential ratio indicator (mean exploited to mean unexploited spawning-stock biomass ESSB/USSB), which was low compared to target levels. It only remained within safe bounds (> 0.2 ; probability: 0.90–0.95) at total mortality levels lower than 1.6. The simulation results for European hake in the Bay of Biscay showed that a sustainable exploitation rate might range from 0.87 to 1.04. The benefits of combined management measures were demonstrated for European hake in the Aegean Sea, and with a further dataset on the Eastern cod stock in the Baltic Sea.

Auteurs du document : Maria Teresa Spedicato, Jean-Charles Poulard, Chrissi-Yianna Politou, Krzysztof Radtke, Giuseppe Lembo, Pierre Petitgas

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