Diversity: Future Challenge for modelling in fisheries Oceanography

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Evolutionary simulations are developed to explore environmental constraints that select observed spatial and temporal spawning patterns for the anchovy (Engraulis capensis) in the southern Benguela. They couple a realistic 3-D hydrodynamic model with an individual-based model in which an evolutionary-based reproductive strategy for adult fish and a passive transport for early-life stages are implemented. The evolutionary success of spawning is quantified when patterns at the population level emerge after many generations from constraints at the individual level through a selective process. As a result, several self-sustaining populations are identified considering different sets of selective constraints. Simulated spawning patterns better match the observed mean spawning pattern when two selective environmental constraints are associated: a threshold temperature of 14 C, above which the development of early-life stages is insured, and the avoidance of offshore currents that constitute a loss of spawning products. Simulated recruitment patterns are more realistic when considering the constraint of reaching the nursery area. This modelling experience can help to identify, temporally and spatially, environmental factors important for fish recruitment and to establish a hierarchy of these factors. The probable coexistence in nature of several self-sustaining populations of pelagic fishes is shown to be important for recruitment studies. The role of diversity and inertia in fish population dynamics is discussed, and is thought to be important for future studies in fisheries oceanography.

This presentation is partly based on a recently published paper by

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Christian Mullon, Philippe Cury & Pierrick Penven. 2002 Evolutionary individual-based model for the recruitment of the anchovy (Engraulis capensis) in the southern Benguela CJAS, 59: 910-922.