Session 03

Population traits in Small pelagic fish model: emergence from interactions between turbulent environment and individual behaviors in Upwelling Systems

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Abstract

Small pelagic fish (SPF) species are heavily exploited in the four main eastern boundary upwelling systems (EBUS), including both Atlantic African ones, as their transformation are increasingly used in the world food chain. Management rely on regular monitoring, but there is a lack of model for population traits emergence and evolution according to the variability of the environment. We attempt to extract some general rules based on the analysis of a life cycle biophysical individual based model applied to the round sardinella (Sardinella aurita, Clupeidae) population off North West Africa. Our analysis focused on the processes responsible for seasonal migrations, spatio-temporal body-length distribution, and inter-annual biomass fluctuations. These patterns were found at individual level in the dynamic change of preferred habitat, and variability in exploration capacities. The former resulted from complex interactions between natal homing behavior and environmental variability, while the last was determined by individual swimming capacities, the mesoscale structure of the

habitat and the horizontal currents. Observed spatio-temporal abundance variability emerged from a superposition of numerous distinct individual life histories. This work also suggested an alongshore pattern in size distributions confirmed by in situ surveys. New insights about population structure are provided, with a focal area in Mauritania and mainly two migrating sub-populations centered at 18°N and 21°N, respectively. Inter-annual biomass fluctuations were linked to variability in Sahara Bank's fish recruitment, itself depending on southward current intensity. The identified processes constitute an analytical frame that can be transposed to study Small pelagic fish in all eastern boundary upwelling systems and used to study potential effect of regional climate change.

Keywords : biophysical individual based model, *Sardinella aurita*, North West Africa, seasonal migrations, body-length distribution, biomass fluctuations, preferred habitat, homing behavior, swimming capacities, mesoscale structure.

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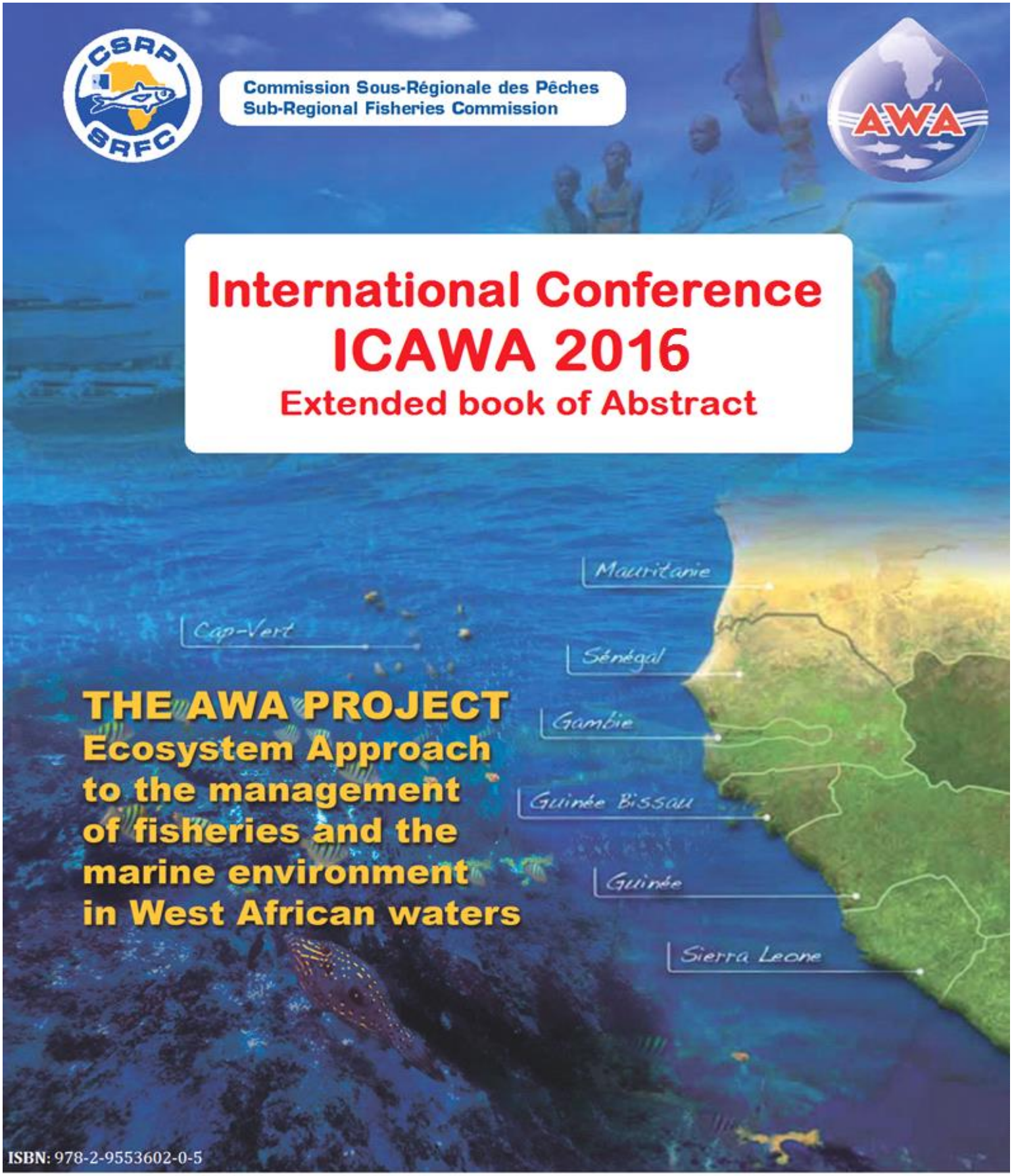

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