Session 02-03

An individual based biophysical model to study *Sardinella aurita* population's spatial dynamic off North-West Africa

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Abstract

Sardinella aurita, or round sardinella, has been the main small pelagic fish species harvested off Senegal and Mauritania coasts over the last 4 decades and plays a central role for sub-regional food security and economic incomes. Landings of this species have strongly declined recently. Intense exploitation and climate change are acting together but population's dynamics are too poorly understood to disentangle the different drivers. Here we developed a bio-physical, full life cycle individual based model for *S. aurita* population off North-West Africa over the period 1980-2009. The hydrodynamic and biogeochemical environment were simulated by the coupled regional models "ROMS-PISCES" in a configuration covering the area 5°-40°N and 5°-30°W, with a ~8km resolution. Fish schools of S. aurita were represented by active lagrangian markers affected with ad hoc larval, juvenile and adult fish swimming behaviour. Individual's physiology was described following the local temperature and food availability by a Dynamic Energy Budget model ("DEB"). The horizontal fish movement depends on food research, temperature preference and spawning migration, whereas vertical distribution was set for each stage according to scientific knowledge. We show that the predicted seasonal migrations patterns obtained match quite well with the seasonal fluctuations of CPUE, and that some major inter)annual trends are also reproduced by the model. An analysis of the mechanisms behind the inter-annual biomass variability in the model leads to a new hypothesis. The upwelling intensity over the Sahara bank spawning grounds would play a major role on the population biomass level at the regional scale. Other potential uses of the model for data analysis are discussed.

Keywords: clupeidae**,** DEB, ROMS-PISCES, Fish school, swimming behavior, spawning migration.

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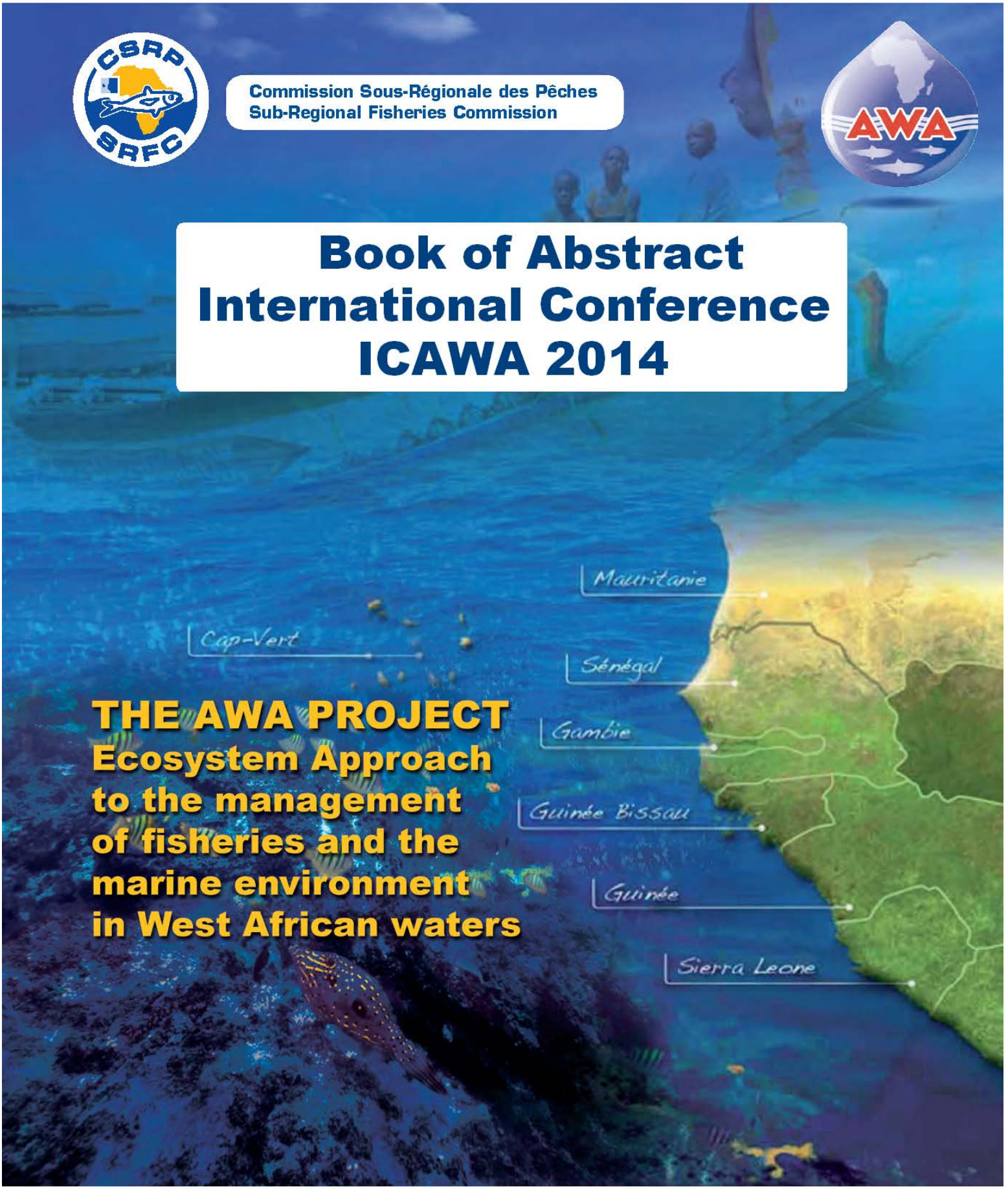

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