Session 02

New insights on the spatial structure of the main small pelagic fish population (*Sardinella aurita*) in the Canary Upwelling System using an individual based biophysical model

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Abstract

Small pelagic fish species are heavily exploited by both industrial and artisanal fisheries along the North-West African coast. *Sardinella aurita*, or round sardinella, has been one of the main small pelagic fish species harvested off Senegalese and Mauritanian coasts over the last four decades showing an increasing trend of their landings. It plays a central role for food security and economic incomes in North-West Africa. Overexploitation and climate change are acting together on population dynamics. Understanding the underlying mechanisms of the effect of climate variability on the round sardinella spatial dynamics would allow elaborating efficient international, adaptative management policies. In this optic, we developed 'EvolDEB' a biophysical, individual based model that we applied to S. aurita population off North-West Africa, using the environmental conditions provided by a physical and biogeochemical hindcast simulation. We analyse the model through a Pattern Oriented Approach focused on seasonal migrations, spatio-temporal body-length distribution, and inter-annual biomass fluctuations from 1990 to 2006. According to these results, we propose a new description of the seasonal migration pattern for *S. aurita* which is in line with i) seasonal variability of the CPUE in Senegal, ii) differences in size distributions from Morocco to Senegal and iii) ecological knowledge of artisanal fishers in Senegal. Further analysis of EvolDEB predictions suggests that the variability in fish recruitment on the Sahara Bank was, for a large part, responsible of the inter-annual fluctuations of the population biomass

in the whole area. In the simulations, the presence and reproduction of *S. aurita* on the Sahara bank was limited by the intensity of the southward current which fluctuated inter-annually. We demonstrate that the model constitutes an original tool for fisheries scientists to analyze projections in a context of climate change and to propose new management scenarios aiming at an equitable share of this transboundary natural resource.

Keywords: Small pelagic, North-West Africa, spatial dynamics, EvolDEB, biophysical IBM, physical and biogeochemical hindcast simulation, migration pattern, transboundary natural resource.

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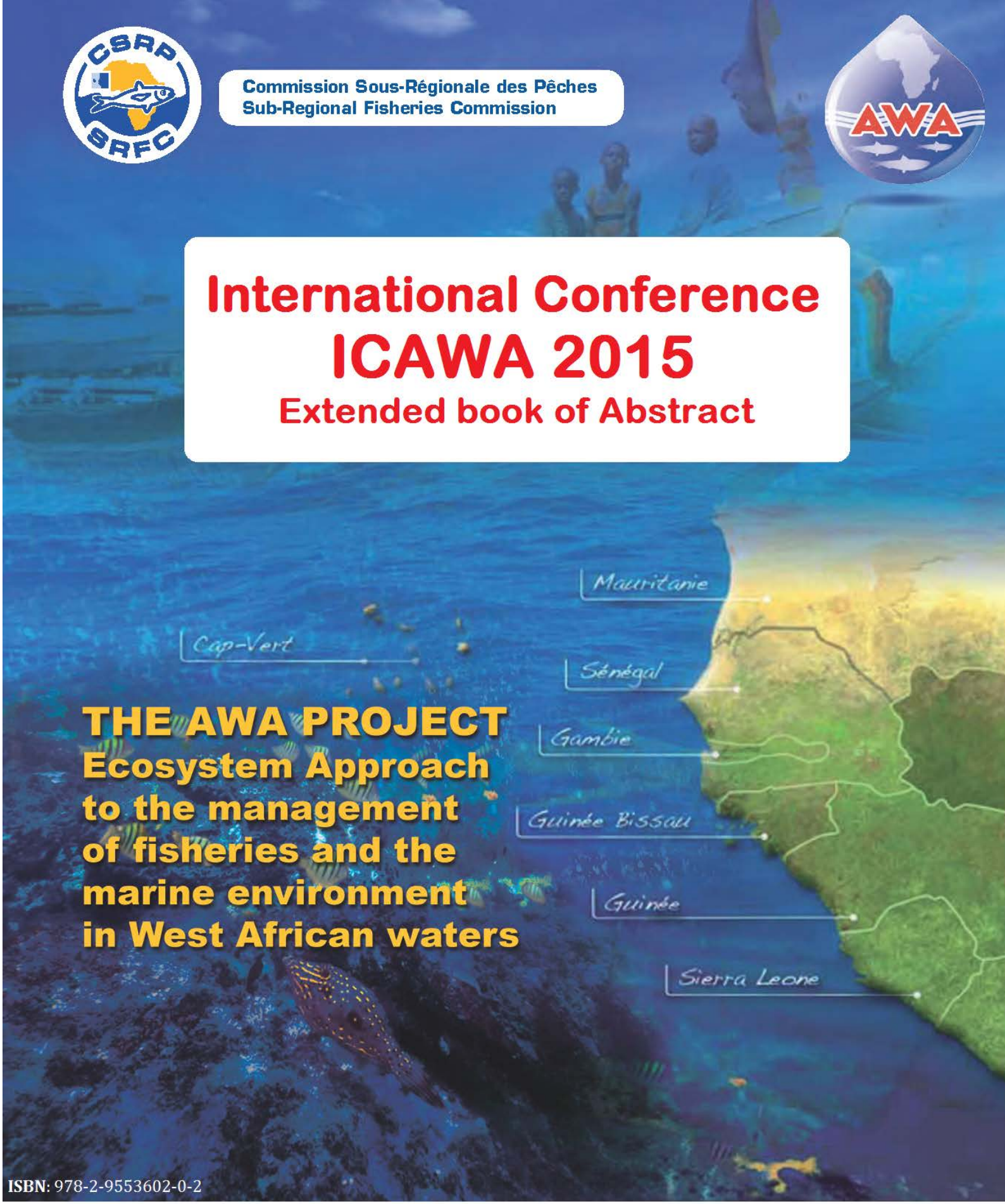

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